

**RDS for MySQL**

# **User Guide**

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# 1 Suggestions on Instance Selection

## Overview

Before purchasing an RDS for MySQL instance, consider factors such as the price, performance, workload capacity, and workload scenario to choose the right one for your needs. This section describes the differences in instance types, billing modes, and storage types, helping you select the most suitable instance.

## Storage Engine

By default, RDS for MySQL uses the InnoDB storage engine to provide high-performance and reliable transaction processing. The RDS for MySQL kernel provides connection thread pooling, metadata lock views, online extension of varchar length, proactive termination of idle transactions, DDL progress display, and more. These capabilities make RDS for MySQL ideal for workloads demanding high performance and concurrency.

## Storage Type

RDS for MySQL provides cloud SSD (also called ultra-high I/O) and extreme SSD storage types. The table below describes the differences between the storage types to help you select a storage type that best suits your service requirements.

**Table 1-1** Storage types

| Storage Type                | Characteristics                                                                                   | Use Case                                                                                    |
|-----------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Cloud SSD or Ultra-high I/O | Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s. | CPU-intensive sub-core business systems or application modules that need to minimize costs. |

| Storage Type | Characteristics                                                                                                               | Use Case                                                                                                                                                                                                                               |
|--------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extreme SSD  | Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency. | Scenarios requiring high throughput.<br><br>Core application systems that are sensitive to performance and have demanding requirements on storage I/O during peak hours, such as those in finance, e-commerce, government, and gaming. |

## Billing Mode

There are yearly/monthly and pay-per-use billing modes. Each one has different advantages and disadvantages.

**Table 1-2** Comparison of billing modes

| Billing Mode             | Yearly/Monthly                                                                                                                                                                                                                                      | Pay-per-use                                                                                                                                                                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Payment                  | Prepaid<br>Billed by the required duration specified in your order                                                                                                                                                                                  | Postpaid<br>Billed for what you use                                                                                                                                                                                                                 |
| Supported Instance Types | <ul style="list-style-type: none"><li>• Single-node</li><li>• Primary/Standby</li></ul>                                                                                                                                                             | <ul style="list-style-type: none"><li>• Single-node</li><li>• Primary/Standby</li></ul>                                                                                                                                                             |
| Billing Period           | Billed by the required duration specified in your order                                                                                                                                                                                             | Calculated by the second but billed every hour                                                                                                                                                                                                      |
| Billed Items             | Instance classes (vCPUs and memory), storage space, backup space, cross-region backup (optional), EIP bandwidth (optional), Monitoring by Seconds (optional), database proxies (optional), and deployment in Dedicated Computing Cluster (optional) | Instance classes (vCPUs and memory), storage space, backup space, cross-region backup (optional), EIP bandwidth (optional), Monitoring by Seconds (optional), database proxies (optional), and deployment in Dedicated Computing Cluster (optional) |

|                            |                                                                                                                                                                                                                 |                                                                                                                                                                                              |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Billing Mode Change</b> | Yearly/Monthly billing can be changed to pay-per-use billing.<br><br>The change is only applied after the yearly/monthly subscription expires. For details, see <a href="#">Yearly/Monthly to Pay-per-Use</a> . | Pay-per-use billing can be changed to yearly/monthly billing. For details, see <a href="#">Pay-per-Use to Yearly/Monthly</a> .                                                               |
| <b>Scenarios</b>           | Recommended for resources expected to be in use long-term. A cost-effective option for scenarios where the resource usage duration is predictable.                                                              | Good for short-term, bursty, or unpredictable workloads that cannot tolerate any interruptions, such as applications for e-commerce promotions, temporary testing, and scientific computing. |

## Yearly/Monthly Billing

The table below lists the billed items of a yearly/monthly DB instance.

**Table 1-3** Billed items

| Billed Item      | Description                                                                                                                                                                                                                                                                                           | Billing Factor                                                                                                              |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| * Instance class | vCPUs and memory                                                                                                                                                                                                                                                                                      | Billed by vCPUs, memory, and instance type. Computing and storage capabilities vary by the number of vCPUs and memory size. |
| * Storage space  | Database storage                                                                                                                                                                                                                                                                                      | Billed based on unified standards.                                                                                          |
| * Backup space   | RDS provides free backup space of the same size as your purchased database storage.<br><br>After the free backup space is used up, charges are applied based on the backup space pricing details. Pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration. | Billed based on unified standards.                                                                                          |

| Billed Item                      | Description                                                                                                                                                                                                                                                                                                 | Billing Factor                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Optional) Cross-region backup   | RDS allows you to store backups in a region different from the one where your DB instance is located. Enabling cross-region backup will incur extra fees, and you will be billed for the storage space. Pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration. | Billed based on unified standards.                                                                                                                                                                                                                                                                                                                                                                                             |
| (Optional) EIP bandwidth         | If an EIP is purchased along with a DB instance, the EIP is billed by bandwidth.                                                                                                                                                                                                                            | An EIP is required if a DB instance needs to access the Internet.<br>Billed by bandwidth, traffic, and the EIP reservation price. <ul style="list-style-type: none"><li>EIP for a yearly/monthly DB instance: billed by bandwidth.</li><li>EIP for a pay-per-use DB instance: billed by bandwidth, traffic, or shared bandwidth. You are also charged for IP reservation if you do not bind the EIP to any instance.</li></ul> |
| (Optional) Monitoring by Seconds | Once it is enabled, pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration. RDS provides monitoring every 60 seconds for free.                                                                                                                                  | Billed based on unified standards.                                                                                                                                                                                                                                                                                                                                                                                             |
| (Optional) Database proxies      | RDS allows read and write requests to be automatically routed through a read/write splitting address. Enabling database proxy incurs extra fees.                                                                                                                                                            | Billed by the proxy instance class (vCPUs and memory) and nodes.                                                                                                                                                                                                                                                                                                                                                               |
| (Optional) Deployment in DCC     | RDS can be deployed in DCC, which incurs extra fees.                                                                                                                                                                                                                                                        | Billed by the memory size.                                                                                                                                                                                                                                                                                                                                                                                                     |
| (Optional) DRS migration         | If you use Data Replication Service (DRS) for data migration, you will be billed based on the DRS pricing standard.                                                                                                                                                                                         | For details, see <a href="#">DRS Billing</a> .                                                                                                                                                                                                                                                                                                                                                                                 |



## Pay-per-Use Billing

The table below lists the billed items of a pay-per-use DB instance.

**Table 1-4** Billed items

| Billed Item                    | Description                                                                                                                                                                                                                                                                                                 | Billing Factor                                                                                                              |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| * Instance class               | vCPUs and memory                                                                                                                                                                                                                                                                                            | Billed by vCPUs, memory, and instance type. Computing and storage capabilities vary by the number of vCPUs and memory size. |
| * Storage space                | Database storage                                                                                                                                                                                                                                                                                            | Billed based on unified standards.                                                                                          |
| * Backup space                 | RDS provides free backup space of the same size as your purchased database storage.<br><br>After the free backup space is used up, charges are applied based on the backup space pricing details. Pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration.       | Billed based on unified standards.                                                                                          |
| (Optional) Cross-region backup | RDS allows you to store backups in a region different from the one where your DB instance is located. Enabling cross-region backup will incur extra fees, and you will be billed for the storage space. Pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration. | Billed based on unified standards.                                                                                          |

| Billed Item                            | Description                                                                                                                                                                | Billing Factor                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (Optional)<br>EIP<br>bandwidth         | If an EIP is purchased along with a DB instance, the EIP is billed by bandwidth.                                                                                           | An EIP is required if the DB instance needs to access the Internet.<br><br>Billed by bandwidth, traffic, and the EIP reservation price. <ul style="list-style-type: none"><li>EIP for a yearly/monthly DB instance: billed by bandwidth.</li><li>EIP for a pay-per-use DB instance: billed by bandwidth, traffic, or shared bandwidth. You are also charged for IP reservation if you do not bind the EIP to any instance.</li></ul> |
| (Optional)<br>Monitoring<br>by Seconds | Once it is enabled, pricing is listed on a per-hour basis, but bills are calculated based on the actual usage duration. RDS provides monitoring every 60 seconds for free. | Billed based on unified standards.                                                                                                                                                                                                                                                                                                                                                                                                   |
| (Optional)<br>Database<br>proxies      | RDS allows read and write requests to be automatically routed through a read/write splitting address. Enabling database proxy incurs extra fees.                           | Billed by the proxy instance class (vCPUs and memory) and nodes.                                                                                                                                                                                                                                                                                                                                                                     |
| (Optional)<br>Deployment<br>in DCC     | RDS can be deployed in DCC, which incurs extra fees.                                                                                                                       | Billed by the memory size.                                                                                                                                                                                                                                                                                                                                                                                                           |
| (Optional)<br>DRS<br>migration         | If you use Data Replication Service (DRS) for data migration, you will be billed based on the DRS pricing standard.                                                        | For details, see <a href="#">DRS Billing</a> .                                                                                                                                                                                                                                                                                                                                                                                       |

## DB Instance Type

RDS for MySQL supports single-node and primary/standby instances. You can select an instance type tailored to your workload requirements by referring to [Table 1-5](#).

**Table 1-5** Instance types

| DB Instance Type | Description                                                                                                                     | Advantages                                                                                                                                                                                                                                                                                                                                               | Scenarios                                                                                                                                                                            |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Single-node      | DB engine version: 8.0, 5.7, and 5.6 (with 5.6 only available for existing instances)<br>Nodes: 1 primary node                  | <ul style="list-style-type: none"><li>• Different from primary/standby instances that have two database nodes, a single-node instance has only one node, reducing the price to half of a primary/standby instance.</li><li>• If a fault occurs on a single-node instance, the instance cannot recover in a timely manner.</li></ul>                      | It is suitable for development and testing of microsites, and small- and medium-sized enterprises, or for learning about RDS.                                                        |
| Primary/Standby  | DB engine version: 8.0, 5.7, and 5.6 (with 5.6 only available for existing instances)<br>Nodes: 1 primary node + 1 standby node | <ul style="list-style-type: none"><li>• The standby node of a primary/standby DB instance is only used for failover and restoration. It does not provide services.</li><li>• Since standby nodes cause extra performance overhead, the performance of single-node DB instances is similar to or even higher than primary/standby DB instances.</li></ul> | It is suitable for production databases of large- and medium-sized enterprises in Internet, Internet of Things (IoT), retail e-commerce sales, logistics, gaming, and other sectors. |

## Instance Class

**Table 1-6** lists the instance classes of RDS for MySQL DB instances.

**Table 1-6** Instance classes

| Storage Type                                                                      | Instance Class                                                                                      | Supported CPU Architecture | Description                                                                                                                                                                                            | Scenarios                                                                                                                                          |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Cloud SSD</li><li>• Extreme SSD</li></ul> | General-purpose (recommended)                                                                       | x86                        | CPU resources are shared with other general-purpose DB instances on the same physical machine. CPU usage is maximized through resource overcommitment. This instance class is a cost-effective option. | Suitable for scenarios where cost effectiveness is critical while performance stability is not critical.                                           |
|                                                                                   | Dedicated (recommended)                                                                             | x86                        | A dedicated instance has dedicated CPU and memory resources to ensure stable performance. There is no CPU resource contention between instances.                                                       | Suitable for core databases that require high performance stability, such as databases in e-commerce, gaming, finance, government, and enterprise. |
| Ultra-high I/O                                                                    | General-enhanced (only for existing instances)<br>General-enhanced II (only for existing instances) | x86                        | With a leading network acceleration engine and Data Plane Development Kit (DPDK) fast packet processing, this instance class provides higher network performance and computing power.                  | Suitable for websites and web applications that require high database computing and network performance.                                           |

## Functions Supported by Different Instance Types

**Table 1-7** Functions supported by different instance types

| Function               |                                                   | Single-Node                                     | Primary/<br>Standby                             |
|------------------------|---------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Instance lifecycle     | Stop an instance                                  | √<br>Only pay-per-use instances can be stopped. | √<br>Only pay-per-use instances can be stopped. |
|                        | Start an instance                                 | √<br>Only pay-per-use instances can be started. | √<br>Only pay-per-use instances can be started. |
|                        | Reboot an instance                                | √                                               | √                                               |
|                        | Delete a pay-per-use instance                     | √                                               | √                                               |
|                        | Recycle an instance                               | √                                               | √                                               |
| Instance modification  | Change a DB instance class                        | √                                               | √                                               |
|                        | Change a storage type                             | √                                               | √                                               |
|                        | Configure auto scaling of vCPUs and memory        | x                                               | √                                               |
|                        | Enable or disable event scheduler                 | √                                               | √                                               |
|                        | Change a single-node instance to primary/standby  | √                                               | x                                               |
|                        | Scale up storage space                            | √                                               | √                                               |
|                        | Configure storage autoscaling                     | √                                               | √                                               |
| Version upgrade        | Upgrade the minor version of an instance          | √                                               | √                                               |
|                        | Upgrade an RDS for MySQL instance from 5.7 to 8.0 | x                                               | √                                               |
| Backup and restoration | Configure a same-region backup policy             | √                                               | √                                               |

| Function       |                                                | Single-Node | Primary/<br>Standby |
|----------------|------------------------------------------------|-------------|---------------------|
|                | Configure a cross-region backup policy         | √           | √                   |
|                | Create a manual backup                         | √           | √                   |
|                | Download a full backup                         | √           | √                   |
|                | Download a binlog backup                       | √           | √                   |
|                | Set the local binlog retention period          | √           | √                   |
|                | Restore a DB instance from backups             | √           | √                   |
|                | Restore a DB instance to a point in time       | √           | √                   |
|                | Restore databases or tables to a point in time | √           | √                   |
| Read replica   | Create an HA read replica                      | √           | √                   |
|                | Create a single-node read replica              | √           | √                   |
| Data migration | Migrate data                                   | √           | √                   |
| Database proxy | Enable database proxy for read/write splitting | √           | √                   |
|                | Configure a delay threshold and routing policy | √           | √                   |
| DBA Assistant  | Check the instance status                      | √           | √                   |
|                | Manage real-time sessions                      | √           | √                   |
|                | Create a SQL insights task                     | √           | √                   |
|                | Create a SQL throttling rule                   | √           | √                   |

| Function                |                                                                         | Single-Node | Primary/<br>Standby |
|-------------------------|-------------------------------------------------------------------------|-------------|---------------------|
| Security and encryption | <a href="#">Reset the administrator password to restore root access</a> | √           | √                   |
|                         | <a href="#">Enable TDE</a>                                              | √           | √                   |
| Parameter management    | <a href="#">Modify parameters of an RDS for MySQL instance</a>          | √           | √                   |
|                         | <a href="#">Create a parameter template</a>                             | √           | √                   |
| Log management          | <a href="#">View and download error logs</a>                            | √           | √                   |
|                         | <a href="#">View and download slow query logs</a>                       | √           | √                   |
|                         | <a href="#">Enable SQL audit</a>                                        | √           | √                   |
| Metrics and alarms      | <a href="#">View metrics</a>                                            | √           | √                   |
|                         | <a href="#">Set alarm rules</a>                                         | √           | √                   |
|                         | <a href="#">Configure Monitoring by Seconds</a>                         | √           | √                   |
| Tags                    | <a href="#">Manage tags</a>                                             | √           | √                   |

# 2 Using IAM to Grant Access to RDS

---

## 2.1 Creating a User and Granting Permissions

This chapter describes how to use [Identity and Access Management \(IAM\)](#) for fine-grained permissions management for your RDS resources. With IAM, you can:

- Create IAM users for employees based on your enterprise's organizational structure. Each IAM user will have their own security credentials for accessing RDS resources.
- Grant only the permissions required for users to perform a specific task.
- Entrust a Huawei Cloud account or cloud service to perform efficient O&M on your RDS resources.

If your Huawei Cloud account does not require individual IAM users, skip this chapter.

This section describes the procedure for granting permissions (see [Figure 2-1](#)).

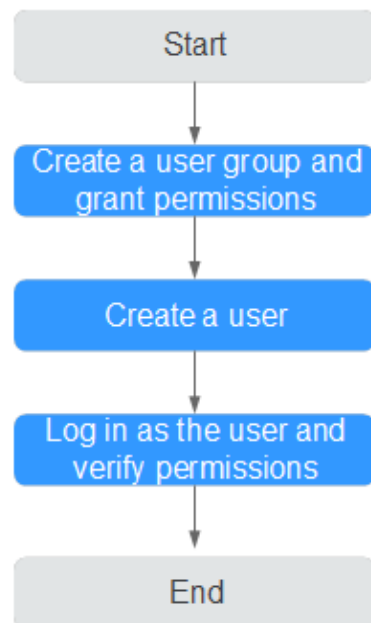
### Prerequisites

Learn about the permissions (see [Permissions](#)) supported by RDS and choose policies or roles according to your requirements. For the system policies of other services, see [System-defined Permissions](#).



## Process Flow

Figure 2-1 Process for granting RDS permissions



1. **Create a user group and assign permissions** to it.  
Create a user group on the IAM console, and attach the **RDS ReadOnlyAccess** policy to the group.  
To use some interconnected services, you also need to configure permissions of such services.  
For example, to connect to your DB instance through the console, configure the **DAS FullAccess** permission of Data Admin Service (DAS) besides **RDS ReadOnlyAccess**.
2. **Create an IAM user and add it to the user group.**  
Create a user on the IAM console and add the user to the group created in 1.
3. **Log in** and verify permissions.  
Log in to the console as the created user, switch to the region where it is authorized, and verify the permissions.
  - Choose **Relational Database Service** from the service list and click **Buy DB Instance**. If a message appears indicating that you have insufficient permissions to perform the operation, the **RDS ReadOnlyAccess** policy has already been applied.
  - Choose any other service from the service list. If a message appears indicating that you have insufficient permissions to access the service, the **RDS ReadOnlyAccess** policy has already taken effect.

## 2.2 RDS Custom Policies

Custom policies can be created to supplement the system policies of RDS. For the actions supported for custom policies, see [Permissions Policies and Supported Actions](#).

You can create custom policies in either of the following two ways:

- Visual editor: Select cloud services, actions, resources, and request conditions without the need to know policy syntax.
- JSON: Edit JSON policies from scratch or based on an existing policy.

For details, see [Creating a Custom Policy](#). This section contains examples of common RDS custom policies.

## Example Custom Policies

- Example 1: Allowing users to create RDS DB instances

```
{
  "Version": "1.1",
  "Statement": [{
    "Effect": "Allow",
    "Action": ["rds:instance:create"]
  }]
}
```

- Example 2: Denying RDS DB instance deletion

A policy with only "Deny" permissions must be used in conjunction with other policies to take effect. If the permissions assigned to a user include both "Allow" and "Deny", the "Deny" permissions take precedence over the "Allow" permissions.

The following method can be used if you need to assign permissions of the **RDS FullAccess** policy to a user but you want to prevent the user from deleting RDS DB instances. Create a custom policy for denying RDS DB instance deletion, and attach both policies to the group the user belongs to. Then, the user can perform all operations on RDS DB instances except deleting RDS DB instances. The following is an example deny policy:

```
{
  "Version": "1.1",
  "Statement": [{
    "Action": ["rds:instance:delete"],
    "Effect": "Deny"
  }]
}
```

# 3 Buying an RDS for MySQL DB Instance

---

## Scenarios

This section describes how to buy a DB instance on the RDS console.

RDS for MySQL supports the yearly/monthly and pay-per-use billing modes. It allows you to tailor your compute resources and storage space to your business needs.

You can create multiple read replicas when you are buying single-node or primary/standby DB instances.

## Precautions

RDS for MySQL supports encryption of data in transit during primary/standby replication. To use this function, you need to [submit a service ticket](#) to request required permissions before purchasing an instance. After an instance is created, [manually enable SSL](#) for it.

## Preparations

1. [Sign up for a HUAWEI ID and enable Huawei Cloud services.](#)
2. For fine-grained permissions management on Huawei Cloud resources, use Identity and Access Management (IAM) to create a user and user group and grant the user specific operation permissions. For details, see [Creating a User and Granting Permissions](#).

## Custom Purchase

**Step 1** Go to the [Buy DB Instance](#) page.

**Step 2** On that page, click the **Custom Config** tab, select a billing mode, configure information about your instance, and click **Buy**.

- Basic Settings

Figure 3-1 Basic Settings

Quick Config

Custom Config

Basic Settings

Region

CN-Hong Kong

Regions are geographic areas isolated from each other. For low network latency and quick resource access, select the nearest region.

Billing Mode

Yearly/Monthly

Pay-per-use

Engine Options

DB Engine

MySQL

PostgreSQL

MariaDB

DB Engine Version

8.0

DB Instance Type

Primary/Standby

Primary/standby HA architecture is suitable for production databases in large- and medium-sized enterprises, or for applications in Internet, IoT, retail e-commerce, logistics, and gaming industries.

Single

Single-node architecture is cost-effective and suitable for developing and testing of microsites, and small- and medium-sized enterprises, or for learning about RDS.

If you plan to use the instance in a production environment, select Primary/Standby.

Storage Type

Cloud SSD

Extreme SSD

Primary AZ

az2

Standby AZ

az1

Multi-AZ deployment provides disaster recovery capabilities across AZs.

Table 3-1 Basic Settings

| Parameter | Description                                                                                                                                                                                                                                                               |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Region    | Region where your resources are located.<br><b>NOTE</b><br>Products in different regions cannot communicate with each other through a private network. After a DB instance is created, the region cannot be changed. Therefore, exercise caution when selecting a region. |

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Billing Mode | <p>Yearly/monthly and pay-per-use billing modes are available to meet your requirements in different scenarios.</p> <ul style="list-style-type: none"><li>– <b>Yearly/Monthly:</b> A prepaid billing mode in which you pay for resources before using it. Bills are settled based on the subscription period. The longer the subscription, the bigger the discount. This mode is a good option for long-term, stable services.</li><li>– <b>Pay-per-use:</b> A postpaid billing mode. You pay as you go and just pay for what you use. The DB instance usage is calculated by the second but billed every hour. If your instance has been used for less than one hour, you will be billed based on the actual duration. This mode allows you to adjust resource usage easily. You neither need to prepare for resources in advance, nor end up with excessive or insufficient preset resources.</li></ul> |

- Engine Options

**Table 3-2** Engine Options

| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Engine         | Select <b>MySQL</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| DB Engine Version | <p>Select <b>8.0</b> or <b>5.7</b>. MySQL 5.6 is only available for existing instances. Different DB engine versions are supported in different regions.</p> <p>When creating an RDS for MySQL instance, select a proper DB engine version tailored to your workloads. You are advised to select the latest available version because it is more stable, reliable, and secure.</p>                                                                                                                                                                                                                                                                                                                             |
| DB Instance Type  | <ul style="list-style-type: none"><li>– <b>Primary/Standby:</b> uses an HA architecture with a primary DB instance and a synchronous standby DB instance. It is suitable for production databases of large- and medium-sized enterprises in Internet, Internet of Things (IoT), retail e-commerce sales, logistics, gaming, and other sectors. The standby DB instance improves instance reliability and is invisible to you after being created.</li><li>– <b>Single:</b> uses a single-node architecture, which is less expensive than primary/standby DB instances. It is suitable for development and testing of microsites, and small- and medium-sized enterprises, or for learning about RDS.</li></ul> |

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Type | <p>Determines the DB instance read/write speed. The higher the maximum throughput is, the higher the DB instance read/write speed can be. After a DB instance is created, you can change its storage type. For details, see <a href="#">Changing a Storage Type</a>.</p> <ul style="list-style-type: none"><li>– Cloud SSD or Ultra-high I/O<br/>Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s.<ul style="list-style-type: none"><li>▪ For RDS for MySQL instances, this storage type is normally displayed as <b>Cloud SSD</b>, but for existing instances in certain regions it is displayed as <b>Ultra-high I/O</b>.</li><li>▪ The supported IOPS depends on the I/O performance of the Elastic Volume Service (EVS) disk. For details, see the description about ultra-high I/O in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul></li><li>– Extreme SSD<br/>Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency.<br/>The supported IOPS depends on the I/O performance of the EVS disk. For details, see the description about extreme SSD in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li><li>– Flexible SSD<br/>Decouples capacity from performance and allows for tailored IOPS and throughput for your business requirements. This storage type is ideal for mainstream interactive applications that require high performance and low latency.<ul style="list-style-type: none"><li>▪ You can preconfigure an IOPS ranging from 3,000 to 128,000. This IOPS must also be less than or equal to 500 times the capacity. You can preconfigure a throughput ranging from 125 to 1,000 MiB/s. This throughput must also be less than or equal to the IOPS divided by 4. For details, see the descriptions of "General Purpose SSD V2" in <a href="#">Disk Types and Performance</a> in <i>Elastic Volume Service Service Overview</i>.</li></ul></li></ul> <p><b>NOTE</b><br/>To purchase instances with Flexible SSDs, <a href="#">submit a service ticket</a>.<br/>Only single-node instances, primary/standby instances, and single-node read replicas support Flexible SSDs.<br/>If you have purchased the Dedicated Distributed Storage Service (DSS), only the storage type that you have selected when you buy the DSS service is displayed.</p> |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AZ        | <p>An AZ is a physical region where resources use independent power supply and networks. AZs are physically isolated but interconnected through an internal network. You can select different AZs for your primary and standby instances for cross-AZ disaster recovery.</p> <p>To achieve high reliability, RDS will automatically deploy your primary and standby instances in different physical servers even if you deploy them in the same AZ. If you attempt to deploy your primary and standby instances in the same AZ in a Dedicated Computing Cluster (DCC) and there is only one physical server available, the creation will fail.</p> |

- Instance Configuration

Figure 3-2 Instance Configuration

Instance Configuration

Instance Class

Dedicated

General-purpose

Choose specifications that fit your workloads to prevent the system from being overloaded.

| vCPUs   Memory                                  | Recommended Connections | TPS   QPS      | IPv6          |
|-------------------------------------------------|-------------------------|----------------|---------------|
| <input checked="" type="radio"/> 2 vCPUs   4 GB | 4,000                   | 580   11,597   | Not supported |
| <input type="radio"/> 4 vCPUs   8 GB            | 6,000                   | 1,196   23,914 | Not supported |
| <input type="radio"/> 4 vCPUs   32 GB           | 10,000                  | 1,435   28,701 | Not supported |
| <input type="radio"/> 8 vCPUs   16 GB           | 8,000                   | 2,153   43,058 | Not supported |
| <input type="radio"/> 8 vCPUs   64 GB           | 32,000                  | 2,503   50,061 | Not supported |
| <input type="radio"/> 16 vCPUs   64 GB          | 32,000                  | 2,876   57,531 | Not supported |

DB Instance Specifications

rds.mysql.x1.large.2.ha | 2 vCPUs | 4 GB (Dedicated) | Recommended Connections: 4,000, TPS: 580 | QPS: 11,597

Storage Space

40

GB

Enable autoscaling

Additional storage will be billed. [Learn more](#)

Disk Encryption

Enabling disk encryption improves the security of data, but may slightly affect the database read/write performance.

Table 3-3 Instance Configuration

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Class | <p>Refers to the vCPUs and memory of a DB instance. Different instance classes support different numbers of database connections and maximum IOPS.</p> <p>For details about instance classes, see <a href="#">RDS for MySQL Instance Classes</a>.</p> <p>After a DB instance is created, you can change its instance class. For details, see <a href="#">Changing a DB Instance Class</a>.</p> <p><b>NOTE</b></p> <p>Only general-enhanced DB instances are allowed for a <a href="#">DCC</a>.</p> |

| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resource Type      | <ul style="list-style-type: none"><li>– <b>EVS</b></li><li>– <b>DSS</b></li></ul> <b>NOTE</b><br>This option is displayed only when you have purchased <a href="#">Dedicated Distributed Storage Service (DSS)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Storage Pool       | Displayed only when you select <b>DSS</b> for <b>Resource Type</b> . The storage pool is secure because it is physically isolated from other pools.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Storage Space      | Contains the system overhead required for inodes, reserved blocks, and database operation.<br>After a DB instance is created, you can scale up its storage space. For details, see <a href="#">Scaling Up Storage Space</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Enable autoscaling | If the storage type is cloud SSD or extreme SSD, you can enable storage autoscaling. If the available storage drops to a specified threshold, autoscaling is triggered. <ul style="list-style-type: none"><li>– <b>Enable autoscaling</b>: If you select this option, autoscaling is enabled.</li><li>– <b>Trigger If Available Storage Drops To</b>: If the available storage drops to a specified threshold or 10 GB, autoscaling is triggered.</li><li>– <b>Autoscaling Limit</b>: The default value range is from 40 to 4,000, in GB. The limit must be no less than the storage of the DB instance.</li></ul> <b>NOTE</b><br>If you specify a read replica when creating a primary DB instance and enable storage autoscaling for the primary DB instance, storage autoscaling is also enabled for the read replica by default. |



| Parameter       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disk Encryption | <p>Enabling disk encryption enhances data security but reduces the database's read and write performance by 5%.</p> <p><b>Key Name:</b> indicates the tenant key. Select one from the drop-down list. If no key is available, click <b>Create Key</b> and configure parameters to create one. For details, see <a href="#">Creating a Custom Key</a> in the <i>Data Encryption Workshop User Guide</i>.</p> <p>After disk encryption is enabled, the following restrictions apply:</p> <ul style="list-style-type: none"><li>– If you enable disk encryption during instance creation, the disk encryption status and the key cannot be changed later.</li><li>– Enabling disk encryption will not encrypt backup data stored in Object Storage Service (OBS). To enable backup data encryption, contact customer service.</li><li>– Keep the key secure. Once the key is disabled, deleted, or frozen, your instance will be inaccessible and its data may not be restored.</li></ul> <p>If disk encryption is enabled but backup data encryption is not enabled, you can <a href="#">restore the data to a new instance from backups</a>.</p> <p>If both disk encryption and backup data encryption are enabled, the data cannot be restored.</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"><li>– If a shared KMS key is used, the corresponding CTS events are <b>createdatakey</b> and <b>decrydatakey</b>. Only the key owner can receive the events.</li></ul> |

- Basic Settings and Connectivity

Figure 3-3 Basic Settings and Connectivity

Basic Settings

DB Instance Name ⓘ

rds-7e18

If you buy multiple DB instances at a time, they will be named with four digits appended in the format "DB instance name-SN". For example, if the DB instance name is "instance", the first instance will be named "instance-0001", the second "instance-0002", and so on.

Password

Stop

Configure

To log in, you will have to reset the password later on the Basic Information page for this instance.

Enterprise Project ⓘ

Select

Q

Create Enterprise Project [↗](#)

Connectivity

VPC ⓘ

default\_vpc

Q

Create VPC [↗](#)

The VPC an RDS instance is deployed in cannot be changed later. ECSs in different VPCs cannot communicate with each other by default.

Subnet

default\_subnet(192.168.0.0/24)

Q

⚠ An EIP is required if you want to access DB instances through a public network. [View EIP](#) [↗](#)

IPv4 Address

.

.

.

Addresses available: 232 [View IP Addresses](#)

Database Port

3306

Security Group ⓘ

default X

Q

Create Security Group [↗](#) [Security Group Rules](#)

Ensure that port 3306 of the security group allows traffic from your server IP address to the DB instance.

Table 3-4 Basic Settings and Connectivity

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Instance Name | <div>Must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (_) are allowed.</div> <div><div><div>– If you intend to create multiple DB instances and read replicas at a time, the allowed length for each instance name will change.</div><div>– If you buy multiple DB instances at a time, their names will include a four-digit suffix. For example, if you specify <b>instance</b> here, the names will be <i>instance-0001</i>, <i>instance-0002</i>, and so on. If existing instances' suffixes have already reached up to <i>0010</i>, the new instance names will start from <i>instance-0011</i>.</div></div></div> |

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| Parameter              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Password               | <ul style="list-style-type: none"><li>– <b>Configure</b> (default setting): Configure a password for your DB instance during the creation process.</li><li>– <b>Skip</b>: Configure a password later after the DB instance is created. After a DB instance is created, you can reset the password. For details, see <a href="#">Resetting the Administrator Password to Restore root Access</a>.</li></ul> <b>NOTICE</b><br>If you select <b>Skip</b> for <b>Password</b> , you need to reset the password before you can log in to the instance.                                                                                                                                                                                                                                                            |
| Administrator          | The default login name for the database is <b>root</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Administrator Password | <p>Must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^*_-=+?,()&amp;.). Enter a strong password and periodically change it for security reasons.</p> <p>If the password you provide is regarded as a weak password by the system, you will be prompted to enter a stronger password.</p> <p>Keep this password secure. The system cannot retrieve it.</p> <p>After a DB instance is created, you can reset this password. For details, see <a href="#">Resetting the Administrator Password to Restore root Access</a>.</p>                                                                                                                                                      |
| Confirm Password       | Must be the same as <b>Administrator Password</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| VPC                    | <p>A virtual network in which your RDS DB instances are located. A VPC can isolate networks for different workloads. You can select an existing VPC or create a VPC. For details about how to create a VPC, see <a href="#">Creating a VPC with a Subnet</a>.</p> <p>To use a shared VPC, select a VPC that another account shares with the current account from the drop-down list.</p> <p>VPC owners can share the subnets in a VPC with one or multiple accounts through <a href="#">Resource Access Manager (RAM)</a>. Through VPC sharing, you can easily configure, operate, and manage multiple accounts' resources at low costs. For more information about VPC and subnet sharing, see <a href="#">VPC Sharing</a>.</p> <b>NOTICE</b><br>After a DB instance is created, the VPC cannot be changed. |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subnet    | <p>Improves network security by providing dedicated network resources that are logically isolated from other networks. Subnets take effect only within an AZ. The Dynamic Host Configuration Protocol (DHCP) function is enabled by default for subnets in which you create RDS DB instances and cannot be disabled.</p> <ul style="list-style-type: none"><li>IPv4 address:<br/>A floating IPv4 address is automatically assigned when you create a DB instance. You can also enter an unused floating IPv4 address in the subnet CIDR block. After the DB instance is created, you can change the floating IP address.</li><li>IPv6 address:<br/>A DB instance assigned a floating IPv6 address will be created only when the vCPUs and memory you selected support IPv6 addresses.<br/>A floating IPv6 address is automatically assigned during instance creation and cannot be specified. After the DB instance is created, this floating IP address cannot be changed. If no IPv6 subnets are available, <a href="#">submit a service ticket</a>.</li></ul> <p><b>Requirements for available private IP addresses in a subnet hosting your DB instance:</b></p> <ul style="list-style-type: none"><li>When creating a single-node DB instance, ensure that there are at least two available private IP addresses.<ul style="list-style-type: none"><li>If you also need to create single-node read replicas, there should be at least four available private IP addresses.</li><li>If you need to create HA read replicas, there should be at least six available private IP addresses.</li></ul></li><li>When creating a primary/standby DB instance, ensure that there are at least three available private IP addresses.<br/>If you also need to create HA read replicas, there should be at least seven available private IP addresses.</li></ul> <p><b>Figure 3-4 Viewing available private IP addresses</b></p>  |

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database Port  | <p>The default database port is <b>3306</b>. You can change it after a DB instance is created.</p> <p>RDS for MySQL instances can use database ports 1024 to 65535, excluding 12017, 33071, and 33062, which are reserved for RDS system use.</p>                                                                                                                                                                                                                                                                                                                     |
| Security Group | <p>Enhances security by controlling access to RDS from other services. In addition, a network <b>access control list (ACL)</b> can help control inbound and outbound traffic of subnets in your VPC. Ensure that the security group you select allows the client to access the DB instance.</p> <p>When creating a DB instance, you can select multiple security groups. For better network performance, you are advised to select no more than five security groups. In such a case, the access rules of all the selected security groups apply on the instance.</p> |

• Additional Options

Figure 3-5 Additional Options



Table 3-5 Additional Options

| Parameter          | Description                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enterprise Project | <p>If your account has been associated with an enterprise project, select the target project from the <b>Enterprise Project</b> drop-down list.</p> <p>For more information about enterprise projects, see <a href="#">Enterprise Management User Guide</a>.</p> |

| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter Template | <p>Contains engine configuration values that can be applied to one or more DB instances of the same DB engine.</p> <p>In the drop-down list, you can select a default parameter template, high-performance parameter template, or custom parameter template in the current region as required.</p> <ul style="list-style-type: none"><li>– A default parameter template contains DB engine defaults and system defaults that are configured based on the engine, compute class, and storage space allocated of an instance. Default parameter templates cannot be modified, but you can create your own parameter template to change parameter settings.</li><li>– High-performance parameter templates are only available for RDS for MySQL 5.7 and 8.0. Compared with standard parameter templates, high-performance templates provide higher read/write speed but lower data security. For details, see <a href="#">Creating a Parameter Template</a>.</li><li>– You can select a custom parameter template and change the parameter values as required. The changes to parameter values in a custom parameter template are not applied to your instance until you apply the template to the instance. For details, see <a href="#">Creating a Parameter Template</a>.</li></ul> <p>If you select a custom parameter template when creating a DB instance, specification-related parameters (including <b>back_log</b>, <b>innodb_io_capacity_max</b>, <b>max_connections</b>, <b>innodb_io_capacity</b>, <b>innodb_buffer_pool_size</b>, and <b>innodb_buffer_pool_instances</b>) in the custom template are not applied. Instead, the default values are used.</p> <p>You can modify the instance parameters as required after the DB instance is created. For details, see <a href="#">Modifying Parameters of an RDS for MySQL Instance</a>.</p> |
| Time Zone          | <p>You need to select a time zone for your instance based on the region hosting your instance. You can select a time zone during instance creation and change it later as needed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Table Name         | <p>Specifies whether table names are case sensitive.</p> <p>The case sensitivity of table names (<b>lower_case_table_names</b>) for created RDS for MySQL 8.0 instances cannot be changed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Parameter   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tag         | <p>Tags an RDS DB instance. This parameter is optional. Adding tags to RDS DB instances helps you better identify and manage the DB instances. A maximum of 20 tags can be added for each DB instance.</p> <p>If your organization has configured tag policies for RDS, add tags to DB instances based on the policies. If a tag does not comply with the policies, DB instance creation may fail. Contact your organization administrator to learn more about tag policies.</p> <p>After a DB instance is created, you can view its tag details on the <b>Tags</b> page. For details, see <a href="#">RDS for MySQL Tags</a>.</p> |
| Certificate | <p>(Optional) Specifies the certificate created by Cloud Certificate Manager (CCM). The default certificate is the system certificate that is automatically generated. You can also select another certificate from the drop-down list.</p> <p><b>NOTICE</b></p> <p>If you want to specify a certificate when creating a DB instance, <a href="#">submit a service ticket</a> to request required permissions.</p>                                                                                                                                                                                                                 |

- Read Replica

Figure 3-6 Read Replica

只读实例

暂不购买

立即购买

购买只读实例时，实例名称在主实例名称后加read和2位数字后缀。例如主实例名称是instance-0001，只读实例从instance-0001-read-01开始命名。[了解更多](#)

只读实例的网络和主实例一致。

只读模式

高可用只读

只读

只读可靠性增强，降低只读故障概率。[了解更多](#)

存储类型

SSD云盘

只读实例可用区

可用区一

可用区七

可用区二

可用区三

性能规格

独享型

通用型

| vCPUs   内存                                      | 建设连接数  | TPS   QPS      | IPv6 |
|-------------------------------------------------|--------|----------------|------|
| <input checked="" type="radio"/> 2 vCPUs   4 GB | 4,000  | 500   11,597   | 支持   |
| <input type="radio"/> 2 vCPUs   8 GB            | 6,000  | 590   11,804   | 支持   |
| <input type="radio"/> 2 vCPUs   16 GB           | 8,000  | 841   16,859   | 不支持  |
| <input type="radio"/> 4 vCPUs   8 GB            | 6,000  | 1,196   23,914 | 支持   |
| <input type="radio"/> 4 vCPUs   16 GB           | 8,000  | 1,357   27,159 | 支持   |
| <input type="radio"/> 4 vCPUs   32 GB           | 10,000 | 1,435   28,701 | 不支持  |

当前选择实例

rds.mysql.x1.large.2.rha.r | 2 vCPUs | 4 GB (独享型)，建议连接数：4,000，TPS：500 | QPS：11,597

只读规格远小于主实例规格时，创建只读有可能会失败

只读实例数量

-

1

+

每个主实例购买的只读实例数量。

**Table 3-6** Read Replica

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read Replica | <p>You can determine whether to create read replicas when creating a DB instance.</p> <ul style="list-style-type: none"><li>– By default, <b>Skip</b> is selected.</li><li>– If you select <b>Create</b>, read replicas are named with "read" and two digits appended to the primary instance name by default. For example, if the primary instance name is instance-0001, the first read replica will be named instance-0001-read-01. The network and storage configurations of read replicas are the same as those of the primary instance.</li></ul>                                                                                                    |
| Replica Type | <ul style="list-style-type: none"><li>– <b>HA read replica</b>: If the physical server where the primary read replica resides fails, the standby read replica automatically takes over workloads from the primary read replica.</li><li>– <b>Read replica</b>: If you want to buy single-node read replicas, you are advised to buy more than one single-node read replica and enable database proxy. That way, if one read replica fails, the database proxy can route traffic to other read replicas or the primary DB instance. When you purchase a single-node read replica, select the same value for <b>Table Name</b> as the DB instance.</li></ul> |



| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Type | <p>Determines the DB instance read/write speed. The higher the maximum throughput is, the higher the DB instance read/write speed can be. After a DB instance is created, you can change its storage type. For details, see <a href="#">Changing a Storage Type</a>.</p> <ul style="list-style-type: none"><li>– Cloud SSD or Ultra-high I/O<br/>Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s.<ul style="list-style-type: none"><li>▪ For RDS for MySQL instances, this storage type is normally displayed as <b>Cloud SSD</b>, but for existing instances in certain regions it is displayed as <b>Ultra-high I/O</b>.</li><li>▪ The supported IOPS depends on the I/O performance of the Elastic Volume Service (EVS) disk. For details, see the description about ultra-high I/O in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul></li><li>– Extreme SSD<br/>Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency.<br/>The supported IOPS depends on the I/O performance of the EVS disk. For details, see the description about extreme SSD in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li><li>– Flexible SSD<br/>Decouples capacity from performance and allows for tailored IOPS and throughput for your business requirements. This storage type is ideal for mainstream interactive applications that require high performance and low latency.<ul style="list-style-type: none"><li>▪ You can preconfigure an IOPS ranging from 3,000 to 128,000. This IOPS must also be less than or equal to 500 times the capacity. You can preconfigure a throughput ranging from 125 to 1,000 MiB/s. This throughput must also be less than or equal to the IOPS divided by 4. For details, see the descriptions of "General Purpose SSD V2" in <a href="#">Disk Types and Performance</a> in <i>Elastic Volume Service Service Overview</i>.</li></ul></li></ul> <p><b>NOTE</b></p> <p>To purchase instances with Flexible SSDs, <a href="#">submit a service ticket</a>.</p> <p>Only single-node instances, primary/standby instances, and single-node read replicas support Flexible SSDs.</p> <p>If you have purchased the Dedicated Distributed Storage Service (DSS), only the storage type that you have selected when you buy the DSS service is displayed.</p> |

| Parameter             | Description                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read Replica AZ       | By default, read replicas are deployed in an AZ different from that of its primary instance.                                                                                                                                                                                                                                                                          |
| Instance Class        | You can select an instance class different from that of the primary instance for a read replica. To prevent a creation failure, long delay, and high load of a read replica, it is recommended that the instance class of the read replica be at least equal to that of the primary instance.                                                                         |
| Read Replica Quantity | <p>You can create a maximum of five read replicas for each DB instance. After a DB instance is created, the system automatically triggers the creation of read replicas.</p> <p>If you intend to create primary/standby DB instances and set <b>Read Replica Quantity</b> to <b>1</b>, a pair of primary/standby DB instances and a read replica will be created.</p> |

- Required Duration and Quantity

**Table 3-7** Required Duration and Quantity

| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required Duration | <p>This option is available only for yearly/monthly DB instances. The system will automatically calculate the configuration fee based on the selected required duration. The longer the required duration is, the larger discount you will enjoy.</p> <p>If you want to set this parameter to 5 years, the restrictions are as follows:</p> <ul style="list-style-type: none"><li>– You need to obtain the required permissions by <a href="#">submitting a service ticket</a>.</li><li>– This setting is supported only in CN North-Beijing4, CN East-Shanghai1, CN South-Guangzhou, and CN Southwest-Guiyang1.</li><li>– This setting is supported only with general-purpose instances.</li></ul> |
| Auto-renew        | <ul style="list-style-type: none"><li>– This option is available only for yearly/monthly DB instances and is not selected by default.</li><li>– If you select this option, the auto-renewal cycle is determined by the selected required duration.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Quantity          | RDS supports batch creation of DB instances. If you intend to create primary/standby DB instances and set <b>Quantity</b> to <b>1</b> , a primary DB instance and a synchronous standby DB instance will be created.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

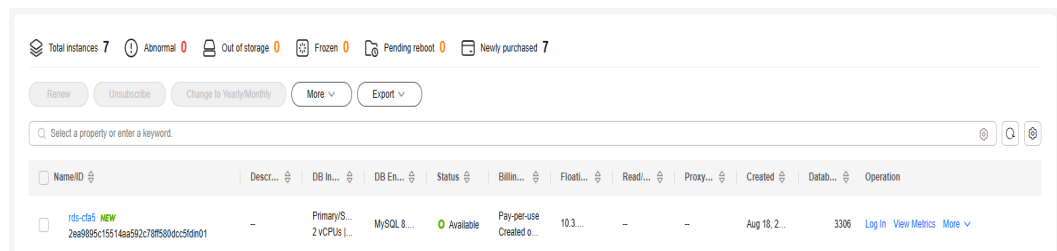
If you have any questions about the price, click **Pricing details** at the bottom of the page.

**NOTE**

The performance of your DB instance depends on its configurations. Hardware configuration items include the instance specifications, storage type, and storage space.

**Step 3** Confirm the instance information.

- For pay-per-use instances, confirm the specifications.
  - If you need to modify your settings, click **Previous**.
  - If you do not need to modify your settings, select the agreement and click **Submit**.
- For yearly/monthly instances, confirm the order.
  - If you need to modify your settings, click **Previous**.
  - If you do not need to modify your settings, select the agreement and click **Pay Now** to go to the payment page. Select a payment method and complete the payment.

**Step 4** To view and manage your DB instance, go to the **Instances** page.**Figure 3-7** Instance successfully purchased

| NameID                                       | Descr... | DB In...                      | DB En...   | Status    | Billin...                   | Floot... | Read... | Proxy... | Created      | Datab... | Operation                                                                |
|----------------------------------------------|----------|-------------------------------|------------|-----------|-----------------------------|----------|---------|----------|--------------|----------|--------------------------------------------------------------------------|
| rds-cb5<br>2as8895c15514ae592c70f50d0c5f0d01 |          | Primary/S...<br>2 vCPUs [...] | MySQL 8... | Available | Pay-per-use<br>Created o... | 10.3...  | -       | -        | Aug 18, 2... | 3306     | <a href="#">Log In</a> <a href="#">View Metrics</a> <a href="#">More</a> |

- When your DB instance is being created, the status is **Creating**. The status changes to **Available** after the instance is created. To view the detailed progress and result of the creation, go to the **Task Center** page.
- The automated backup policy is enabled by default. You can change it after the DB instance is created. An automated full backup is immediately triggered once your DB instance is created.

----End

## Quick Purchase

**Step 1** Go to the [Buy DB Instance](#) page.

**Step 2** On the **Quick Config** page, set basic parameters.

**NOTE**

Only mandatory parameters are provided on the **Quick Config** page. To configure more parameters, see [Custom Purchase](#).

The following parameter settings are only for reference. Tailor your settings to your workloads.

Figure 3-8 Basic Settings

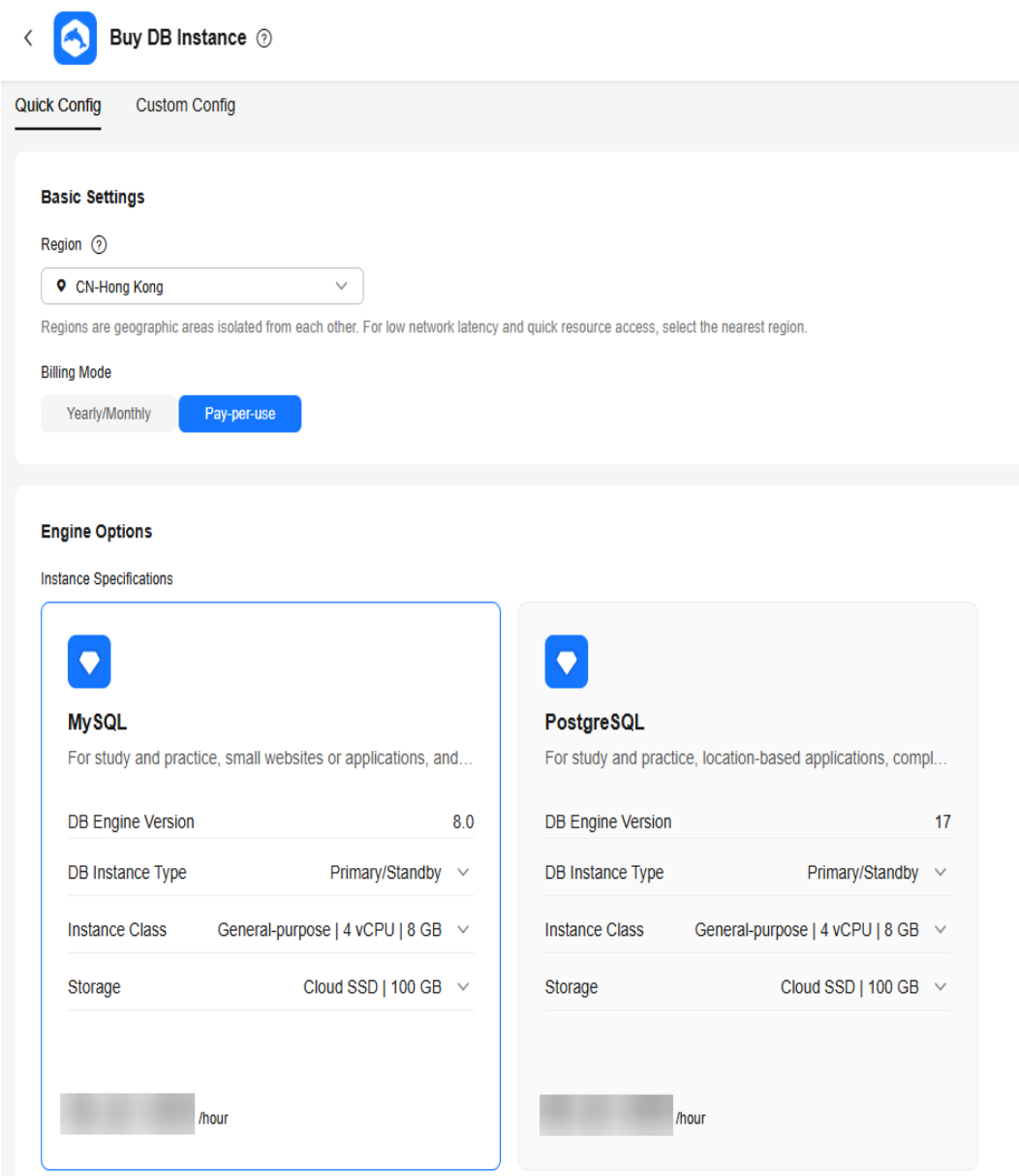


Table 3-8 Basic Settings

| Parameter | Example Value | Description                                                                                                                                                                                                                                                 |
|-----------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Region    | CN-Hong Kong  | The region where your resources are located. Products in different regions cannot communicate with each other through a private network. After a DB instance is created, the region cannot be changed. Therefore, exercise caution when selecting a region. |

| Parameter         | Example Value                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Billing Mode      | Pay-per-use                     | <p>Yearly/monthly and pay-per-use billing modes are available to meet your requirements in different scenarios.</p> <ul style="list-style-type: none"><li>• <b>Yearly/Monthly:</b> A prepaid billing mode in which you pay for resources before using it. Bills are settled based on the subscription period. The longer the subscription, the bigger the discount. This mode is a good option for long-term, stable services.</li><li>• <b>Pay-per-use:</b> A postpaid billing mode. You pay as you go and just pay for what you use. The DB instance usage is calculated by the second but billed every hour. If your instance has been used for less than one hour, you will be billed based on the actual duration. This mode allows you to adjust resource usage easily. You neither need to prepare for resources in advance, nor end up with excessive or insufficient preset resources.</li></ul> |
| DB Engine Version | 8.0                             | The database version.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| DB Instance Type  | Primary/<br>Standby             | <p>The architecture type of an instance.</p> <p><b>Primary/Standby:</b> An HA architecture. In a primary/standby pair, each instance has the same instance class. When a primary instance is being created, a standby instance is provisioned along with it to provide data redundancy. The standby instance is invisible to you after being created.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Instance Class    | General-purpose   2 vCPU   4 GB | The vCPUs and memory of an instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Storage           | Cloud SSD   100 GB              | <p>The storage space of an instance.</p> <p>It contains the system overhead required for inodes, reserved blocks, and database operation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Disk Encryption   | Disable                         | <p>Enabling disk encryption improves data security, but slightly affects the read and write performance of the database.</p> <p>If a shared KMS key is used, the corresponding CTS events are <b>createdatakey</b> and <b>decrydatakey</b>. Only the key owner can receive the events.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Step 3 Set parameters for **Additional Options**.

Figure 3-9 Additional Options

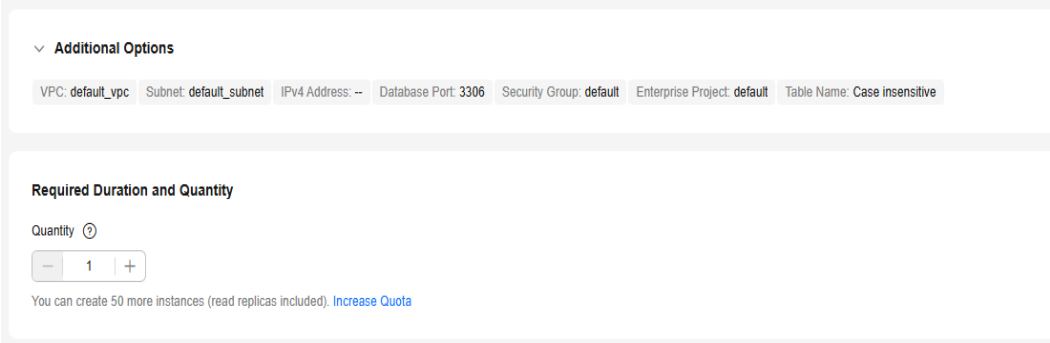


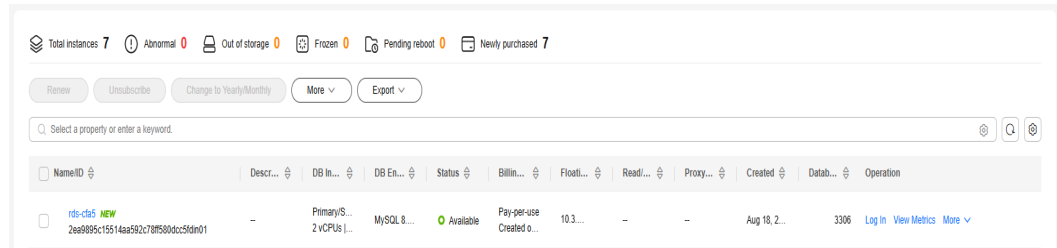
Table 3-9 Additional Options

| Parameter          | Example Value    | Description                                                                                                                                                                                                                                                          |
|--------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VPC                | default_vpc      | The virtual network in which your instance is located. A VPC can isolate networks for different workloads.<br><br>If no VPC is available, click <b>Create VPC</b> . After a VPC is created, click . For details, see <a href="#">Creating a VPC with a Subnet</a> .  |
| Subnet             | default_subnet   | A subnet provides dedicated network resources that are logically isolated from other networks for network security.                                                                                                                                                  |
| Security Group     | default          | It can enhance security by controlling access to RDS for MySQL from other services.                                                                                                                                                                                  |
| Enterprise Project | default          | If your account has been associated with an enterprise project, select the target project from the <b>Enterprise Project</b> drop-down list.<br><br>For more information about enterprise projects, see the <a href="#">Enterprise Management User Guide</a> .       |
| Table Name         | Case insensitive | Whether table names are case sensitive. Restoration may fail if the case sensitivity settings of table names on the source and target instances are different.<br><br>The case sensitivity of table names for created RDS for MySQL 8.0 instances cannot be changed. |
| Quantity           | 1                | The number of instances to be created in a batch.                                                                                                                                                                                                                    |

**Step 4** Click **Buy**.

**Step 5** To view and manage your DB instance, go to the **Instances** page.

**Figure 3-10** Instance successfully purchased



- When your DB instance is being created, the status is **Creating**. The status changes to **Available** after the instance is created. To view the detailed progress and result of the creation, go to the **Task Center** page.
- The automated backup policy is enabled by default. You can change it after the DB instance is created. An automated full backup is immediately triggered once your DB instance is created.

----End

## Follow-up Operations

After a DB instance is created, you can enter a description for it. For details, see [Changing a DB Instance Description](#).

The default database port is **3306**. You can change it after a DB instance is created. To ensure data and instance security, you are advised to change the database port in a timely manner. For details, see [Changing a Database Port](#).

## How Long Does It Take to Create an RDS for MySQL Instance?

- It takes 5 to 7 minutes to create a single-node or primary/standby instance.
- Creating a read replica that is in the same AZ as the primary or standby instance takes about 15 minutes. In other cases, the time required for creating a read replica depends on how much data there is in the primary instance. More data means longer creation.

If creating an instance takes much more time than described above, there may be problems during the creation. In this case, contact customer service by [submitting a service ticket](#).

## What Can I Do If I Can't Find My RDS Resources?

- Your purchased resources are not in the selected region.
  - a. In the upper part of the page, switch to the region that your RDS resources belong to.
  - b. Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Your purchased resources are not under the selected service.

- a. [Go to the My Resources page.](#)
  - b. Select the correct service and region to view the purchased resources.
- Your resources are released due to arrears.

If your subscriptions have expired and not renewed, or you are in arrears due to an insufficient balance, your resources enter a grace period. If the renewal is still not completed or the outstanding amount is not paid off when the grace period ends, the resources enter a retention period, during which the resources will be unavailable. If the renewal is still not completed or the outstanding amount is still not paid off when the retention period ends, the stored data will be deleted and the cloud service resources will be released. For details, see [Resource Suspension and Release](#).

## Related Operations

[Creating a DB Instance Using an API](#)

[Modifying RDS for MySQL Instance Parameters](#)



# 4 Instance Connection

## 4.1 Overview

Before connecting to a DB instance, you must create one first. For details about how to create a DB instance, see [Buying an RDS for MySQL DB Instance](#). You can connect to an RDS for MySQL instance through a command-line interface (CLI), graphical user interface (GUI), Data Admin Service (DAS), or using Java database connectivity (JDBC).

### Connection Methods

**Table 4-1** Connection methods

| Connection Method                                                                  | Connect ion Address | Description                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">(Recommended)<br/>Connect to an RDS for MySQL instance through DAS</a> | Not required        | DAS enables you to manage databases on a web-based console. It supports SQL execution, advanced database management, and intelligent O&M, simplifying database management and improving both efficiency and data security. The permissions required for connecting to DB instances through DAS are enabled by default. |

| Connection Method                                                                 | Connection Address                                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">Connect to an RDS for MySQL instance through the MySQL CLI client</a> | For details, see <a href="#">Connecting to a DB Instance over a Private or Public Network Using CLI</a> . | <p>In Linux, you need to install a MySQL client on the ECS and connect to the instance through the MySQL CLI over a private or public network.</p> <ul style="list-style-type: none"><li>• A floating IP address is provided by default. When your applications are deployed on an ECS that is in the same region and VPC as the RDS for MySQL instance, you are advised to use a floating IP address to connect to the instance through the ECS.</li><li>• If you cannot access your RDS instance through a floating IP address, bind an EIP to the instance and connect to the instance through the EIP.</li></ul>              |
| <a href="#">Connect to an RDS for MySQL instance through the GUI</a>              | EIP for read/write                                                                                        | In Windows, you can use any common database client to connect to an RDS for MySQL instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <a href="#">Connect to an RDS for MySQL instance through JDBC</a>                 | Floating IP address for read/write or EIP for read/write                                                  | <p>RDS for MySQL is compatible with the community ecosystem and does not provide the driver service. You can select a community driver version as required.</p> <p>If you are connecting to an instance through JDBC, an SSL certificate is optional, but using an SSL certificate can improve the security of your data. SSL is disabled by default for newly created instances. You can enable SSL by referring to <a href="#">Configuring an SSL Connection</a>. SSL encrypts connections to your instances but it increases the connection response time and CPU usage. For this reason, enabling SSL is not recommended.</p> |

## Connecting to a DB Instance over a Private or Public Network Using CLI

[Table 4-2](#) lists how to use CLI to connect to an RDS for MySQL instance over a private or public network.

**Figure 4-1** Connecting to a DB instance over a private or public network

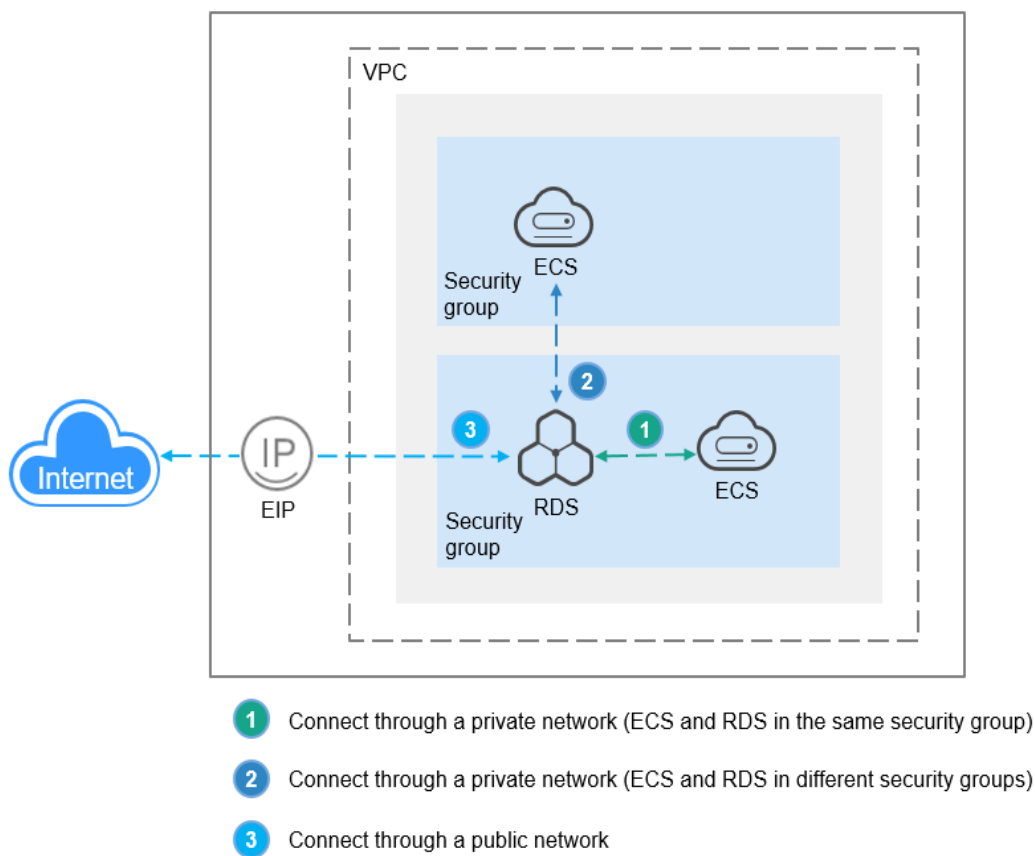


**Table 4-2** Connecting to a DB instance over a private or public network

| Connect<br>ion<br>Method        | IP Address          | Security Group Rules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Description                                                                                         |
|---------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <a href="#">Private network</a> | Floating IP address | <ul style="list-style-type: none"><li>• If the ECS and RDS DB instance are in the same security group, they can communicate with each other over a private network by default. No security group rules need to be configured.</li><li>• If they are in different security groups, configure security group rules for them, separately.<ul style="list-style-type: none"><li>– RDS DB instance: Configure an <b>inbound</b> rule for the security group with which the RDS DB instance is associated. For details, see <a href="#">Configuring a Security Group Rule</a>.</li><li>– ECS: The default security group rule allows all outgoing data packets. In this case, you do not need to configure a security group rule for the ECS. If not all outbound traffic is allowed in the security group, you need to configure an <b>outbound rule</b> for the ECS.</li></ul></li></ul> | <ul style="list-style-type: none"><li>• Secure and high-performance</li><li>• Recommended</li></ul> |

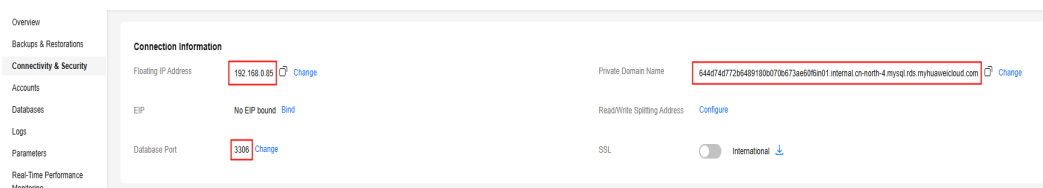
| Connect ion Method    | IP Address                                                                          | Security Group Rules                                                                                                                                                                                                                                 | Description                                                                                                                                                                                                                                                                                      |
|-----------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Public network</b> | You need to purchase an EIP. For pricing details, see <a href="#">EIP Billing</a> . | To access a DB instance from resources outside the security group that the DB instance is associated with, you need to configure an <b>inbound</b> rule for the security group. For details, see <a href="#">Configuring a Security Group Rule</a> . | <ul style="list-style-type: none"><li>• Less secure</li><li>• To achieve a higher transmission rate and security level, you are advised to migrate your applications to an ECS that is in the same VPC as your RDS DB instance and use a private IP address to access the DB instance.</li></ul> |

## Connection Address Description

- **Floating IP address for read/write**

This IP address is always bound to the primary node. If your applications are deployed on a server that is in the same VPC as your DB instance, you can connect to the DB instance using this IP address to perform read and write operations. If a failover occurs, this IP address will be reassigned to the new primary node and can still be used for read and write operations.

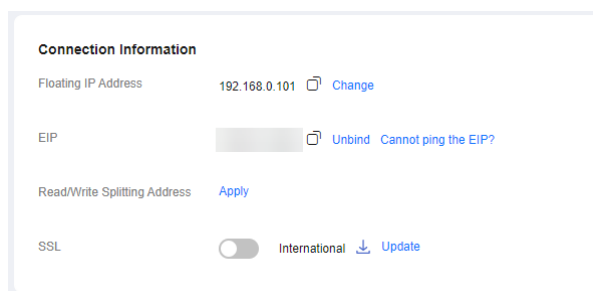
**Figure 4-2** Floating IP address



- **EIP for read/write (which needs to be bound to an instance)**

After you **buy** and bind an EIP to an instance, you can use this IP address to perform read and write operations on the instance. Just like a floating IP address, an EIP is always bound to the primary node for read and write operations.

Figure 4-3 EIP



## 4.2 Connecting to an RDS for MySQL Instance Through DAS (Recommended)

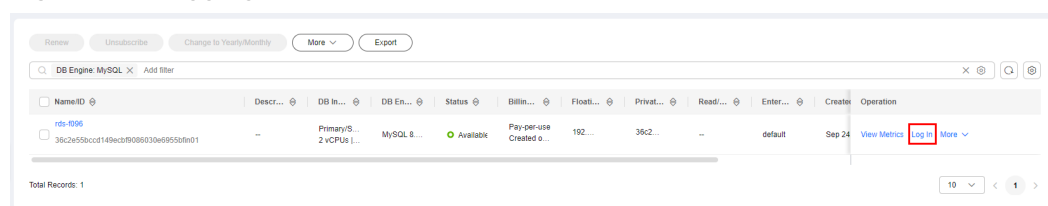
### Scenarios

Data Admin Service (DAS) enables you to connect to and manage DB instances with ease on a web-based console. By default, you have the remote login permission. Using DAS to connect to your DB instance is recommended, which is more secure and convenient.

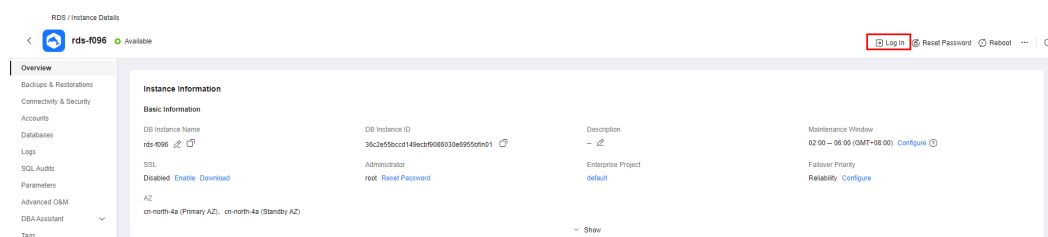
### Procedure

- Step 1** [Log in to the management console.](#)
- Step 2** Click  in the upper left corner and select a region.
- Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.

Figure 4-4 Logging in to an instance



Alternatively, click the DB instance on the **Instances** page. On the displayed **Overview** page, click **Log In** in the upper right corner.

**Figure 4-5** Logging in to an instance

**Step 5** On the displayed login page, enter the username and password and click **Log In**.

- **Login Username:** Enter **root**.
- **Password:** Enter the **root** password you specified during instance creation. If you forget the password, reset it. For details, see [Resetting the Administrator Password to Restore root Access](#).

**Figure 4-6** Login pageThe 'Instance Login Information' dialog box is shown. It contains the following fields and controls:

- DB Instance Name:** A text field with a blue selection bar.
- DB Engine Version:** Displayed as 'MySQL 5.7'.
- Login Username:** A text field containing 'root'.
- Password:** A password field with a toggle icon. To its right is a 'Test Connection' button.
- Remember Password:** An unchecked checkbox with the text 'Your password will be encrypted and stored securely.'
- Description:** A text field containing 'created by sync rds instance'.
- Show Executed SQL Statements:** A toggle switch that is currently turned off. Below it is a note: 'If not enabled, the executed SQL statements cannot be viewed, and you need to input each SQL statement manually.'
- Buttons:** 'Cancel' and 'Log In' buttons at the bottom right.

-----End

## What Can I Do If the DAS Console Is Not Displayed After I Click Log In in the Operation Column of an Instance on the Instances Page?

Set your browser to allow pop-ups and try again.

## What Should I Do If I Can't Connect to My DB Instance Due to Insufficient Permissions?

1. Error message: You do not have the required permission. The policy does not allow action das:connections:xxx.  
Error cause: Your account does not have the DAS FullAccess permission.  
Solution: Add the DAS FullAccess permission by referring to [Creating a User and Granting Permissions](#).

2. Error message: You do not have the permission to perform this operation. Contact your administrator to request the required permission.  
Error cause: Your account does not have the DAS FullAccess permission.  
Solution: Add the DAS FullAccess permission by referring to [Creating a User and Granting Permissions](#).
3. Error message: Your current account only has the read-only permission and cannot perform this operation. To ensure that you can use DAS smoothly, add the DAS Administrator permission.  
Error cause: Your account does not have the DAS FullAccess permission.  
Solution: Add the DAS FullAccess permission by referring to [Creating a User and Granting Permissions](#).

## What Should I Do If I Fail to Connect to My DB Instance Using DAS?

1. Error message: **Access denied for user 'user\_name'@'100.xxx.xx.xx' (using password: YES).**
  - a. Error cause: The username or password of the RDS instance is incorrect.  
Solution: Check whether the username and password are correct. If you are not sure, log in to the RDS console to reset the password.

### NOTICE

Changing the password may affect services.

If the username and password are correct, log in to the database using a client or CLI and run **select \* from mysql.user where user = 'user\_name'** to view the account. If **100.%** (an IP address starting with **100**) is assigned to a user, only the user can connect to the database through DAS. **user\_name @%** and **user\_name @100.%** are different users with independent passwords and permissions. Enter the password of **user\_name @100.%**.

- b. Error cause: The IP address of the DAS server is not in the whitelist of the login user.

Solution: Log in to the database using the client or CLI tool, and create a user account that can be used to access the database through DAS.

```
create user 'user_name'@'100.%' identified by 'password';
grant select on *.* to 'user_name'@'100.%';
```

### NOTE

- Ensure that the IP address of the DAS server is in a CIDR block starting with 100. Add the IP address to the whitelist of the login user.
  - Grant permissions to user **user\_name@100.%** based on service requirements.
- c. Error cause: The SSL function is not enabled on the server.  
Solution: Run the following statement to check whether the user is an SSL user. If yes, enable SSL on the RDS instance details page. The user is an SSL user if the **ssl\_type** field has a value.

```
select user, host, ssl_type from mysql.user where user = 'user_name';
```

2. Error message: **Trying to connect with ssl, but ssl not enabled in the server.**



Error cause: The SSL function is not enabled on the server.

Solution: Run the following statement to check whether the user is an SSL user. If yes, enable SSL on the RDS instance details page. The user is an SSL user if the **ssl\_type** field has a value.

```
select user, host, ssl_type from mysql.user where user = 'user_name';
```

3. Error message: **Client does not support authentication protocol requested by server. plugin type was = 'sha256\_password'.**
  - a. Error cause: DAS does not allow you to connect to the database whose password is encrypted with SHA-256.  
Solution: Execute the following SQL statements to change the password encryption method to `mysql_native_password`.  

```
alter user 'user_name'@'%' identified with mysql_native_password by 'password';
```
  - b. Error cause: For MySQL 8.0, the IP address of the DAS server is not in the whitelist of the user.  
Solution: Log in to the database using the client or CLI tool, and create a user that can be used to access the database through DAS.
4. Error message: **Communications link failure The last packet sent successfully to the server was 0 milliseconds ago. The driver has not received any packets from the server.**  
Error cause: The network between the DAS server and the target instance is disconnected.  
Solution: [Submit a service ticket](#) to contact customer service.
5. Error message: **Instance connect timeout, please login again.**  
Error cause: The connection to the DAS server timed out.  
Solution: [Submit a service ticket](#) to contact customer service.
6. Error information: **RSA public key is not available client side (option serverRsaPublicKeyFile not set).**  
Error cause: The identity authentication mode of the database user has high requirements on password security. The password transmitted over the network during user authentication must be encrypted.
  - For an SSL connection, the SSL certificate and key pair are used during the TLS handshake to securely establish a symmetric key. This symmetric key is then used to encrypt the password and data.
  - For a non-SSL connection, the client uses the RSA public key of the MySQL server to encrypt the user password, and the server uses the RSA private key to decrypt and verify the password. This protects the password against snooping during network transmission.  
Solution: Enable SSL for the instance or change the identity authentication mode of the database user.

## Follow-up Operations

After logging in to the DB instance, you can create or migrate your databases.

- [Creating a MySQL Database Using the Console](#)
- [Creating a MySQL Database Using an API](#)
- [Migration Solution Overview](#)

## 4.3 Connecting to an RDS for MySQL Instance Through the MySQL CLI Client

### 4.3.1 Using MySQL CLI to Connect to an Instance Through a Private Network

If your applications are deployed on an ECS that is in the same region and VPC as your DB instance, you are advised to use a floating IP address to connect to the DB instance through the ECS.

This section uses a Linux ECS as an example to describe how to connect a Linux ECS to a DB instance with SSL enabled through a floating IP address. SSL encrypts connections to the DB instance, making in-transit data more secure.

If you want to connect to a DB instance with SSL disabled, see [Buying an RDS for MySQL Instance and Connecting to It Using a MySQL Client](#).

#### Step 1: Buy an ECS

1. [Log in to the management console](#) and check whether there is an ECS available.
  - If there is a Linux ECS, go to [3](#).

NOTICE

If the ECS image is CentOS, CentOS 7.4 64bit must be used.

- If there is a Windows ECS, see [Buying an RDS for MySQL Instance and Connecting to It Using MySQL-Front](#).
- If no ECS is available, go to [2](#).

Figure 4-7 ECS

| Name/ID                           | AZ | Status  | Specifications/Image                     | IP Address                                   | Enterprise Project | Tag | Operation           |
|-----------------------------------|----|---------|------------------------------------------|----------------------------------------------|--------------------|-----|---------------------|
| <input type="checkbox"/> ecs-5068 |    | Running | 1 vCPU   2 GB   c3.medium.2<br>Centos7.4 | (EIP) 1 Mbit/s<br>192.168.0.103 (Private IP) | default            | --  | Remote Login More ▾ |

2. Buy an ECS and select Linux (for example, CentOS 7.4 64bit) as its OS.

To download a MySQL client to the ECS, bind an EIP to the ECS. The ECS must be in the same region, VPC, and security group as the RDS for MySQL DB instance for mutual communications.

For details about how to purchase a Linux ECS, see [Purchasing a Custom ECS in Elastic Cloud Server User Guide](#).
3. On the **ECS Information** page, view the region and VPC of the ECS.

Figure 4-8 ECS information

| ECS Information |                                                   |
|-----------------|---------------------------------------------------|
| ID              | be9dbfb7-e968-4be0-add9-14a17ef5d1bf              |
| Name            | ecs-e5d6-test <a href="#">✎</a>                   |
| Region          |                                                   |
| AZ              | AZ1                                               |
| Specifications  | General computing   2 vCPUs   16 GiB   m2.large.8 |
| Image           | <a href="#">SYS_Linux</a>   Private image         |
|                 | Version: CentOS 7.6 64bit                         |
| VPC             | <a href="#">default_vpc</a>                       |
| <hr/>           |                                                   |
| Billing Mode    | Pay-per-use                                       |
| Obtained        | Jun 05, 2023 09:54:35 GMT+08:00                   |
| Launched        | Jun 05, 2023 09:54:45 GMT+08:00                   |
| Deletion Time   | -- <a href="#">Modify</a>                         |

4. On the **Overview** page of the RDS for MySQL instance, view the region and VPC of the DB instance.

Figure 4-9 Overview

<

🔍

rds-5c07

Available

Overview

Backups & Restorations

Connectivity & Security

Accounts

Databases

Logs

SQL Audits

Parameters

Advanced OAM

DBA Assistant

Tags

Database Proxy

Memory Acceleration

None

Instance Information

Basic Information

DB Instance Name

rds-5c07

DB Instance ID

640754177a04074b16d900155a4b5bb01

Description

Maintenance Window

02:00 – 06:00 (GMT+08:00)

Configure

SSL

Disabled

Enable

Download

Administrator

Enterprise Project

default

Failure Priority

Reliability

Configure

AZ

cn-north-4a (Primary AZ), cn-north-4a (Standby AZ)

Configurations

DB Engine Version

MySQL 8.0.28

Upgrade Minor Version

None

Replication Mode

Semi-synchronous

Configure

Connectivity

Floating IP Address

192.168.0.137

Configure

Private Domain Name

640754177a04074b16d900155a4b5bb01.internal-cn-north-4.mysql.rds.myhuaweicloud.com

Configure

VPC

default\_vpc

Database Port

3306

Configure

Subnet

default\_subnet1

192.168.0.0/24

Configure

Recommended Max. Connections

4,000

Security Group

1 security group

Manage

Read/Write Splitting Address

Apply

Billing

Billing Mode

Pay-per-use

Configure

Created

Sep 11, 2024 14:48:55 GMT+08:00

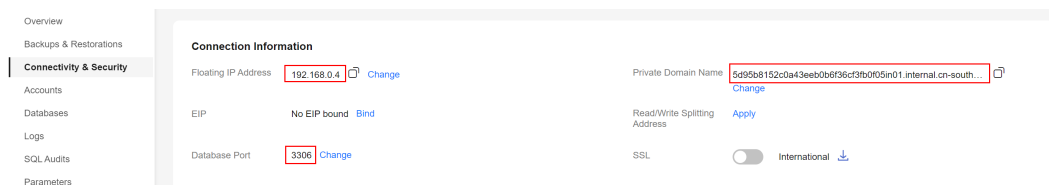
Hide

5. Check whether the ECS and RDS for MySQL instance are in the same region and VPC.
  - If yes, go to **Step 2: Test Connectivity and Install a MySQL Client**.
  - If they are not in the same region, purchase another ECS or DB instance. The ECS and DB instance in different regions cannot communicate with each other. To reduce network latency, deploy your DB instance in the region nearest to your workloads.
  - If the ECS and DB instance are in different VPCs, change the VPC of the ECS to that of the DB instance. For details, see **Changing a VPC**.

## Step 2: Test Connectivity and Install a MySQL Client

1. Log in to the ECS. For details, see [Logging In to a Linux ECS Using VNC](#) in the *Elastic Cloud Server User Guide*.
2. On the **Instances** page of the RDS console, click the DB instance name.
3. Choose **Connectivity & Security** from the navigation pane. In the **Connection Information** area, obtain the floating IP address (or private domain name) and database port of the DB instance.

Figure 4-10 Connection information



4. After logging in to the ECS, check whether the floating IP address and database port obtained in 3 can be connected.

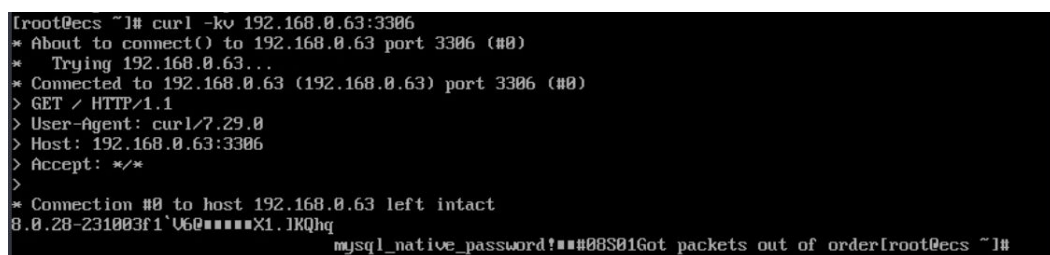
`curl -kv Floating_IP_address.Port`

Example:

```
curl -kv 192.168.0.4:3306
```

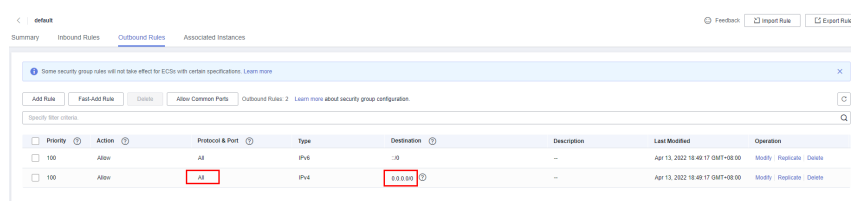
- If yes, network connectivity is normal. Go to 5.

Figure 4-11 Normal network connectivity



- If no, check the security group rules.
  - If in the security group of the ECS, there is no outbound rule with **Destination** set to **0.0.0.0/0** and **Protocol & Port** set to **All**, add an outbound rule for the floating IP address and port of the DB instance.

Figure 4-12 ECS security group



- If in the security group of the DB instance, there is no inbound rule allowing the access from the private IP address and port of the ECS, add an inbound rule for the private IP address and port of the ECS. For details, see [Configuring a Security Group Rule](#).

5. Import a MySQL client installation package to the ECS using Method 1 or Method 2 and install the client.

## Method 1: Obtaining an Installation Package Using Commands

1. Download a MySQL client installation package for Linux using the ECS. To do so, you need to bind an EIP to the ECS.
  - **MySQL 8.0:**  
`wget https://dev.mysql.com/get/mysql-community-client-8.0.28-1.el6.x86_64.rpm`
  - **MySQL 5.7:**  
`wget https://dev.mysql.com/get/mysql-community-client-5.7.38-1.el6.x86_64.rpm`

### NOTE

A MySQL client running a version later than that of the DB instance is recommended.

2. Run the following command to install the MySQL client:
  - **MySQL 8.0:**  
`rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm`

**Figure 4-13** Installing a client

```
[root@ecs ~]# rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm
warning: mysql-community-client-8.0.28-1.el6.x86_64.rpm: Header U4 RSA/SHA256 Signature, key ID 3a79bd2f
Preparing...
Updating / installing...
1:mysql-community-client-8.0.28-1.el6.x86_64.rpm: [100%]
[root@ecs ~]#
```

- **MySQL 5.7:**  
`rpm -ivh --nodeps mysql-community-client-5.7.38-1.el6.x86_64.rpm`

### NOTE

- If any conflicts occur during the installation, add the **replacefiles** parameter to the command and install the client again.  
`rpm -ivh --replacefiles mysql-community-client-installation_package_version-1.el6.x86_64.rpm`
- If a message is displayed prompting you to install a dependent package during the installation, add the **nodeps** parameter to the command and install the client again.  
`rpm -ivh --nodeps mysql-community-client-installation_package_version-1.el6.x86_64.rpm`

## Method 2: Downloading an Installation Package Using a Browser

1. Download a MySQL client installation package for Linux using a browser and upload the package to the ECS.

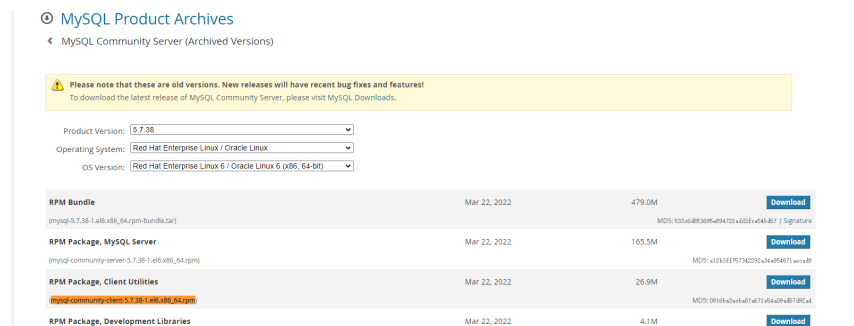
You can use any terminal connection tool, such as WinSCP and PuTTY, to upload the installation package to the ECS.

- **MySQL 8.0:**  
Click [here](#) to download an installation package. **mysql-community-client-8.0.28-1.el6.x86\_64.rpm** is used as an example.

**Figure 4-14** Downloading a MySQL 8.0 installation package

|                                                                                                                                          |                                                                     |         |                          |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---------|--------------------------|
| Product Version:                                                                                                                         | <div>8.0.28</div>                                                   |         |                          |
| Operating System:                                                                                                                        | <div>Red Hat Enterprise Linux / Oracle Linux</div>                  |         |                          |
| OS Version:                                                                                                                              | <div>Red Hat Enterprise Linux 6 / Oracle Linux 6 (x86_64-bit)</div> |         |                          |
|                                                                                                                                          |                                                                     |         |                          |
| RPM Bundle                                                                                                                               | Dec 18, 2021                                                        | 1139.7M | <a href="#">Download</a> |
| <div><div>mysql-8.0.28-1.el6.x86_64.rpm-bundle.tar</div><div>MD5: 9a232715e4d22099594a289e4e27e4   <a href="#">Signature</a></div></div> |                                                                     |         |                          |
| RPM Package, MySQL Server                                                                                                                | Dec 18, 2021                                                        | 743.6M  | <a href="#">Download</a> |
| <div><div>mysql-community-server-8.0.28-1.el6.x86_64.rpm</div><div>MD5: 58a429a0e14a09b485303423001a24</div></div>                       |                                                                     |         |                          |
| RPM Package, Client Utilities                                                                                                            | Dec 18, 2021                                                        | 79.4M   | <a href="#">Download</a> |
| <div><div>mysql-community-client-8.0.28-1.el6.x86_64.rpm</div><div>MD5: 72010702b14a09a761038a8931a0253</div></div>                      |                                                                     |         |                          |
| RPM Package, Client Plugins                                                                                                              | Dec 18, 2021                                                        | 8.1M    | <a href="#">Download</a> |
| <div><div>mysql-community-client-plugins-8.0.28-1.el6.x86_64.rpm</div><div>MD5: 02164898a0711b7e0424e08a102902</div></div>               |                                                                     |         |                          |

- MySQL 5.7:  
Click [here](#) to download an installation package. **mysql-community-client-5.7.38-1.el6.x86\_64.rpm** is used as an example.

**Figure 4-15** Downloading a MySQL 5.7 installation package**NOTE**

A MySQL client running a version later than that of the DB instance is recommended.

2. Run the following command to install the MySQL client:

- MySQL 8.0:  
`rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm`

**Figure 4-16** Installing a client

```
[root@ecs ~]# rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm
warning: mysql-community-client-8.0.28-1.el6.x86_64.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd29:
Preparing...
Updating / installing...
 1:mysql-community-client-8.0.28-1.el6.x86_64.rpm: [100%]
[root@ecs ~]#
```

- MySQL 5.7:  
`rpm -ivh --nodeps mysql-community-client-5.7.38-1.el6.x86_64.rpm`

**NOTE**

- If any conflicts occur during the installation, add the **replacefiles** parameter to the command and install the client again.  
`rpm -ivh --replacefiles mysql-community-client-installation_package_version-1.el6.x86_64.rpm`
- If a message is displayed prompting you to install a dependent package during the installation, add the **nodeps** parameter to the command and install the client again.  
`rpm -ivh --nodeps mysql-community-client-installation_package_version-1.el6.x86_64.rpm`

## Step 3: Connect to the DB Instance Using a CLI

On the **Instances** page of the RDS console, click the instance name to go to the **Overview** page. Under **SSL**, check whether SSL is enabled.

- If it is disabled (default), use a **non-SSL connection**.
- If it is enabled, use an **SSL connection**. SSL encrypts connections to the instance, making in-transit data more secure.

## Non-SSL Connection

1. Run the following command on the ECS to connect to the DB instance:  
`mysql -h <host> -P <port> -u <userName> -p`

Example:

```
mysql -h 172.16.0.31 -P 3306 -u root -p
```

**Table 4-3** Parameter description

| Parameter  | Description                                                                                                                                                                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <host>     | The floating IP address or private domain name of the DB instance, which can be obtained from <a href="#">3</a> .<br><b>NOTE</b><br>If your DB instance is connected through a private domain name, changing its floating IP address does not interrupt services. |
| <port>     | The database port of the DB instance, which can be obtained from <a href="#">3</a> . The default value is <b>3306</b> .                                                                                                                                           |
| <userName> | The administrator account <b>root</b> .                                                                                                                                                                                                                           |

2. Enter the password of the database account if the following information is displayed:

Enter password:

**Figure 4-17** Successful connection

```
[root@ecs-e5d6-test ~]# mysql -h 172.16.0.31 -P 3306 -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 108609
Server version: 5.7.26 MySQL Community Server - (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

## SSL Connection

1. On the **Instances** page of the RDS console, click the DB instance name.
2. Click **Download** under **SSL** to download **Certificate Download.zip**, and extract the root certificate **ca.pem** and bundle **ca-bundle.pem** from the package.
3. Upload **ca.pem** to the ECS. It is recommended that the root certificate be stored in the same directory as the MySQL client installation package.

**NOTE**

- You can use any terminal connection tool, such as WinSCP and PuTTY, to upload the root certificate.
  - TLS v1.2 or later is recommended. Versions earlier than TLS v1.2 have security risks. You can change the value of **loose\_tls\_version** to set the protocol version. For details, see [Modifying Parameters of an RDS for MySQL Instance](#).
  - **ca-bundle.pem** contains both the new certificate provided as of April 2017 and the old certificate.
  - Both **ca.pem** and **ca-bundle.pem** can be used for SSL connections because **ca-bundle.pem** contains **ca.pem**.
  - RDS for MySQL DB instances do not support X.509-based authentication.
4. Run the following command on the ECS to connect to the DB instance:
- ```
mysql -h <host> -P <port> -u <userName> -p --ssl-ca=<caName>
```

Example:

```
mysql -h 172.16.0.31 -P 3306 -u root -p --ssl-ca=ca.pem
```

**Table 4-4** Parameter description

| Parameter  | Description                                                                                                                                                                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <host>     | The floating IP address or private domain name of the DB instance, which can be obtained from <a href="#">3</a> .<br><b>NOTE</b><br>If your DB instance is connected through a private domain name, changing its floating IP address does not interrupt services. |
| <port>     | The database port of the DB instance, which can be obtained from <a href="#">3</a> . The default value is <b>3306</b> .                                                                                                                                           |
| <userName> | The administrator account <b>root</b> .                                                                                                                                                                                                                           |
| <caName>   | The name of the CA certificate.                                                                                                                                                                                                                                   |

5. Enter the password of the database account if the following information is displayed:
- ```
Enter password:
```

**Figure 4-18** Successful connection

```
[root@ecs-e5d6-test ~]# mysql -h 172.16.0.31 -P 3306 -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 108609
Server version: 5.7.26 MySQL Community Server - (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

## What Should I Do If I Forget My Password?

On the **Instances** page, locate the target DB instance, choose **More > Reset Password** in the **Operation** column, and set a new password.



## Common Connection Error Messages

- [Warning] Access denied for user 'username'@'yourIp' (using password: NO)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- [Warning] Access denied for user 'username'@'yourIp' (using password: YES)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- ERROR 2013: Lost connection to MySQL server during query  
If the values of **wait\_timeout** and **interactive\_timeout** are too small, the RDS for MySQL client will automatically stop connections that timed out. For details, see [RDS for MySQL Client Automatically Disconnected from a DB Instance](#).
- ERROR 1045 (28000): Access denied for user 'root'@'192.168.0.30' (using password: YES)  
Check whether the password is correct, whether the ECS has the permission to connect to the DB instance, and whether the RDS for MySQL client can ping the DB instance's floating IP address. For details, see [RDS for MySQL DB Instance Inaccessible](#).
- ERROR 1226 (42000): User 'test' has exceeded the 'max\_user\_connections' resource (current value:10)  
Check whether the number of connections to the DB instance is limited. For details, see [RDS for MySQL DB Instance Inaccessible](#).
- ERROR 1129 (HY000): Host '192.168.0.111' is blocked because of many connection errors; unblock with 'mysqladmin flush-hosts'  
Check whether the number of failed connection attempts (not caused by incorrect passwords) of the RDS for MySQL client exceeds the value of **max\_connection\_errors**. For details, see [RDS for MySQL DB Instance Inaccessible](#).

For more solutions to connection failures, see [What Should I Do If I Can't Connect to My RDS DB Instance?](#)

## Follow-up Operations

After logging in to the DB instance, you can create or migrate databases.

- [Creating a MySQL Database Using the Console](#)
- [Creating a MySQL Database Using an API](#)
- [Managing MySQL Databases Using DAS](#)
- [Migration Solution Overview](#)

## 4.3.2 Using MySQL CLI to Connect to an Instance Through a Public Network

If you cannot access your DB instance through a floating IP address, bind an EIP to the DB instance and connect to it through the EIP.

This section uses a Linux ECS as an example to describe how to connect a Linux ECS to a DB instance with SSL enabled through a public network. SSL encrypts connections to the DB instance, making in-transit data more secure.

You can also access your DB instance through Network Address Translation (NAT). If you have configured both NAT and EIP, the EIP is preferentially used.

## Step 1: Buy an ECS

1. [Log in to the management console](#) and check whether there is an ECS available.
  - If there is a Linux ECS, go to [3](#).
  - If no ECS is available, go to [2](#).

**Figure 4-19** ECS

| Name/ID  | AZ | Status  | Specifications/Image                     | IP Address                                 | Enterprise Project | Tag | Operation         |
|----------|----|---------|------------------------------------------|--------------------------------------------|--------------------|-----|-------------------|
| ecs-5068 |    | Running | 1 vCPU   2 GB   c3.medium.2<br>Centos7.4 | (EIP) 1 MB/s<br>192.168.0.103 (Private IP) | default            | --  | Remote Login More |

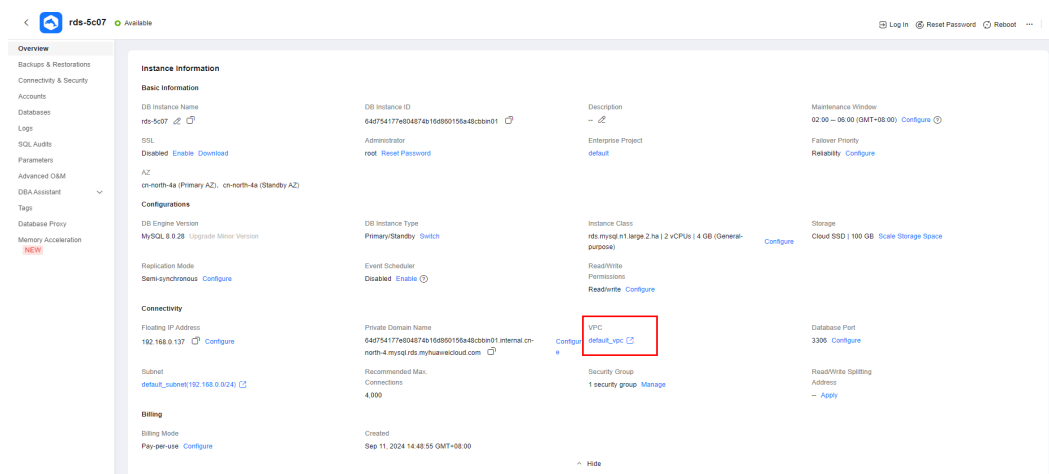
2. Buy an ECS and select Linux (for example, CentOS) as its OS.  
To download a MySQL client to the ECS, bind an EIP to the ECS.  
For details about how to purchase a Linux ECS, see [Purchasing a Custom ECS](#) in *Elastic Cloud Server User Guide*.
3. On the **ECS Information** page, view the region and VPC of the ECS.

**Figure 4-20** ECS information

| ECS Information |                                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------|
| ID              | be9dbfb7-e968-4be0-add9-14a17ef5d1bf                                                              |
| Name            | ecs-e5d6-test  |
| Region          |                                                                                                   |
| AZ              | AZ1                                                                                               |
| Specifications  | General computing   2 vCPUs   16 GiB   m2.large.8                                                 |
| Image           | SYS_Linux   Private image<br>Version: CentOS 7.6 64bit                                            |
| VPC             | default_vpc                                                                                       |
| <hr/>           |                                                                                                   |
| Billing Mode    | Pay-per-use                                                                                       |
| Obtained        | Jun 05, 2023 09:54:35 GMT+08:00                                                                   |
| Launched        | Jun 05, 2023 09:54:45 GMT+08:00                                                                   |
| Deletion Time   | -- <a href="#">Modify</a>                                                                         |

4. On the **Overview** page of the RDS for MySQL instance, view the region and VPC of the DB instance.

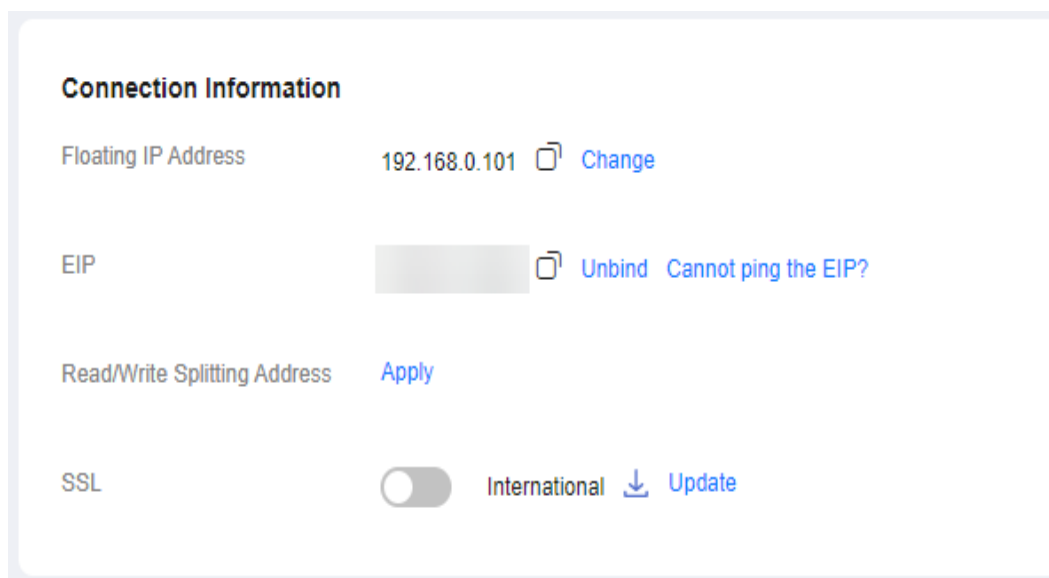
Figure 4-21 Overview



## Step 2: Test Connectivity and Install a MySQL Client

1. Log in to the ECS. For details, see [Logging In to a Linux ECS Using VNC](#) in the *Elastic Cloud Server User Guide*.
2. On the **Instances** page of the RDS console, click the DB instance name.
3. Choose **Connectivity & Security** from the navigation pane. In the **Connection Information** area, obtain the EIP and database port of the DB instance.

Figure 4-22 Connection information



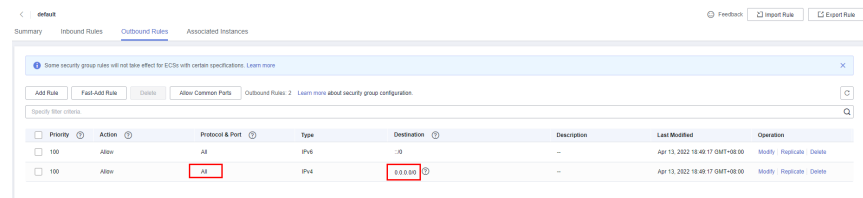
If no EIP has been bound to the DB instance, see [Binding an EIP](#).

4. After logging in to the ECS, check whether the EIP and database port obtained in [3](#) can be connected.

```
curl -kv EIP.Port
```

- If yes, network connectivity is normal. Go to [5](#).
- If no, check the security group rules.

- If in the security group of the ECS, there is no outbound rule with **Destination** set to **0.0.0.0/0** and **Protocol & Port** set to **All**, add an outbound rule for the EIP and port of the DB instance.

**Figure 4-23** ECS security group

- If in the security group of the DB instance, there is no inbound rule allowing the access from the private IP address and port of the ECS, add an inbound rule for the private IP address and port of the ECS. For details, see [Configuring a Security Group Rule](#).
5. Import a MySQL client installation package to the ECS using Method 1 or Method 2 and install the client.

## Method 1: Obtaining an Installation Package Using Commands

1. Download a MySQL client installation package for Linux using the ECS. To do so, you need to bind an EIP to the ECS.
  - **MySQL 8.0:**  
`wget https://dev.mysql.com/get/mysql-community-client-8.0.28-1.el6.x86_64.rpm`
  - **MySQL 5.7:**  
`wget https://dev.mysql.com/get/mysql-community-client-5.7.38-1.el6.x86_64.rpm`

### NOTE

A MySQL client running a version later than that of the DB instance is recommended.

2. Run the following command to install the MySQL client:
  - **MySQL 8.0:**  
`rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm`

**Figure 4-24** Installing a client

```
[root@ecs ~]# rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm
warning: mysql-community-client-8.0.28-1.el6.x86_64.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd2f
Preparing...
Updating / installing...
 1:mysql-community-client-8.0.28-1.el6.x86_64.rpm [100%]
[root@ecs ~]#
```

- **MySQL 5.7:**  
`rpm -ivh --nodeps mysql-community-client-5.7.38-1.el6.x86_64.rpm`

### NOTE

- If any conflicts occur during the installation, add the **replacefiles** parameter to the command and install the client again.  
`rpm -ivh --replacefiles mysql-community-client-installation_package_version-1.el6.x86_64.rpm`
- If a message is displayed prompting you to install a dependent package during the installation, add the **nodeps** parameter to the command and install the client again.  
`rpm -ivh --nodeps mysql-community-client-installation_package_version-1.el6.x86_64.rpm`

## Method 2: Downloading an Installation Package Using a Browser

1. Download a MySQL client installation package for Linux using a browser and upload the package to the ECS.

You can use any terminal connection tool, such as WinSCP and PuTTY, to upload the installation package to the ECS.

- MySQL 8.0:

Click [here](#) to download an installation package. **mysql-community-client-8.0.28-1.el6.x86\_64.rpm** is used as an example.

Figure 4-25 Downloading a MySQL 8.0 installation package

|                                                          |                                                      |                                               |
|----------------------------------------------------------|------------------------------------------------------|-----------------------------------------------|
| Product Version:                                         | 8.0.28                                               |                                               |
| Operating System:                                        | Red Hat Enterprise Linux / Oracle Linux              |                                               |
| OS Version:                                              | Red Hat Enterprise Linux 6 / Oracle Linux 6 (x86_64) |                                               |
|                                                          |                                                      |                                               |
| RPM Bundle                                               | Dec 18, 2021                                         | 1139.7M                                       |
| [mysql-8.0.28-1.el6.x86_64.rpm-bundle.tar]               |                                                      |                                               |
|                                                          |                                                      | MDS: v4252715e4d2099546a286e1e2e1   Signature |
| RPM Package, MySQL Server                                | Dec 18, 2021                                         | 743.6M                                        |
| [mysql-community-server-8.0.28-1.el6.x86_64.rpm]         |                                                      |                                               |
|                                                          |                                                      | MDS: f16427d0f14e09b499302f42902b44           |
| RPM Package, Client Utilities                            | Dec 18, 2021                                         | 79.4M                                         |
| [mysql-community-client-8.0.28-1.el6.x86_64.rpm]         |                                                      |                                               |
|                                                          |                                                      | MDS: 782b7072b14e0b4761b103a4933ba053         |
| RPM Package, Client Plugins                              | Dec 18, 2021                                         | 8.1M                                          |
| [mysql-community-client-plugins-8.0.28-1.el6.x86_64.rpm] |                                                      |                                               |
|                                                          |                                                      | MDS: 02164896d711b7e0424e0b4e329832           |

- MySQL 5.7:

Click [here](#) to download an installation package. **mysql-community-client-5.7.38-1.el6.x86\_64.rpm** is used as an example.

Figure 4-26 Downloading a MySQL 5.7 installation package

|                                                                                                                                                                                           |                                                      |                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------|
| MySQL Product Archives                                                                                                                                                                    |                                                      |                                                |
| MySQL Community Server (Archived Versions)                                                                                                                                                |                                                      |                                                |
| Please note that these are old versions. New releases will have recent bug fixes and features!<br>To download the latest release of MySQL Community Server, please visit MySQL Downloads. |                                                      |                                                |
| Product Version:                                                                                                                                                                          | 5.7.38                                               |                                                |
| Operating System:                                                                                                                                                                         | Red Hat Enterprise Linux / Oracle Linux              |                                                |
| OS Version:                                                                                                                                                                               | Red Hat Enterprise Linux 6 / Oracle Linux 6 (x86_64) |                                                |
|                                                                                                                                                                                           |                                                      |                                                |
| RPM Bundle                                                                                                                                                                                | Mar 22, 2022                                         | 479.0M                                         |
| [mysql-5.7.38-1.el6.x86_64.rpm-bundle.tar]                                                                                                                                                |                                                      |                                                |
|                                                                                                                                                                                           |                                                      | MDS: 533a1803094d9472242d1e44b4817   Signature |
| RPM Package, MySQL Server                                                                                                                                                                 | Mar 22, 2022                                         | 165.5M                                         |
| [mysql-community-server-5.7.38-1.el6.x86_64.rpm]                                                                                                                                          |                                                      |                                                |
|                                                                                                                                                                                           |                                                      | MDS: 41331f707342292c3d4d5f071   ver=0P        |
| RPM Package, Client Utilities                                                                                                                                                             | Mar 22, 2022                                         | 26.9M                                          |
| [mysql-community-client-5.7.38-1.el6.x86_64.rpm]                                                                                                                                          |                                                      |                                                |
|                                                                                                                                                                                           |                                                      | MDS: 09163a3734074e71c44a2b4b7180c4            |
| RPM Package, Development Libraries                                                                                                                                                        | Mar 22, 2022                                         | 4.1M                                           |
|                                                                                                                                                                                           |                                                      |                                                |

### NOTE

A MySQL client running a version later than that of the DB instance is recommended.

2. Run the following command to install the MySQL client:

- MySQL 8.0:

```
rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm
```

Figure 4-27 Installing a client

```
[root@ecs ~]# rpm -ivh --nodeps mysql-community-client-8.0.28-1.el6.x86_64.rpm
warning: mysql-community-client-8.0.28-1.el6.x86_64.rpm: Header V4 RSA/SHA256 Signature, key ID 3a79bd2f
Preparing...
Updating / installing...
 1: mysql-community-client-8.0.28-1.el6.x86_64.rpm [100%]
[root@ecs ~]#
```

- MySQL 5.7:

```
rpm -ivh --nodeps mysql-community-client-5.7.38-1.el6.x86_64.rpm
```

 NOTE

- If any conflicts occur during the installation, add the **replacefiles** parameter to the command and install the client again.  
`rpm -ivh --replacefiles mysql-community-client-installation_package_version-1.el6.x86_64.rpm`
- If a message is displayed prompting you to install a dependent package during the installation, add the **nodeps** parameter to the command and install the client again.  
`rpm -ivh --nodeps mysql-community-client-installation_package_version-1.el6.x86_64.rpm`

### Step 3: Connect to the DB Instance Using a CLI

On the **Instances** page of the RDS console, click the instance name to go to the **Overview** page. Under **SSL**, check whether SSL is enabled.

- If it is disabled (default setting), go to [Non-SSL Connection](#).
- If it is enabled, go to [SSL Connection](#). SSL encrypts connections to the instance, making in-transit data more secure.

### Non-SSL Connection

1. Run the following command on the ECS to connect to the DB instance:

```
mysql -h <host> -P <port> -u <userName> -p
```

Example:

```
mysql -h 172.16.0.31 -P 3306 -u root -p
```

**Table 4-5** Parameter description

| Parameter  | Description                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <host>     | The EIP or public domain name, which can be obtained from <a href="#">3</a> .<br><b>NOTE</b><br>To connect to a DB instance using a public domain name, apply for a public domain name first. For details, see <a href="#">Applying for and Changing a Public Domain Name</a> .<br>After a public domain name is generated, changing the EIP will interrupt database connections. Exercise caution when performing this operation. |
| <port>     | The database port of the DB instance, which can be obtained from <a href="#">3</a> . The default value is <b>3306</b> .                                                                                                                                                                                                                                                                                                            |
| <userName> | Administrator account <b>root</b> .                                                                                                                                                                                                                                                                                                                                                                                                |

2. Enter the password of the database account if the following information is displayed:

Enter password:

Figure 4-28 Successful connection

```
[root@ecs-e5d6-test ~]# mysql -h <host> -P 3306 -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 108609
Server version: <version> MySQL Community Server - (GPL)

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Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

## SSL Connection

1. On the **Instances** page, click the DB instance name.
2. Click **Download** under **SSL** to download **Certificate Download.zip**, and extract the root certificate **ca.pem** and bundle **ca-bundle.pem** from the package.
3. Upload **ca.pem** to the ECS.

### NOTE

- TLS v1.2 or later is recommended. Versions earlier than TLS v1.2 have security risks. You can change the value of **loose\_tls\_version** to set the protocol version. For details, see [Modifying Parameters of an RDS for MySQL Instance](#).
  - **ca-bundle.pem** contains both the new certificate provided as of April 2017 and the old certificate.
  - Both **ca.pem** and **ca-bundle.pem** can be used for SSL connections because **ca-bundle.pem** contains **ca.pem**.
  - RDS for MySQL DB instances do not support X.509-based authentication.
4. Run the following command on the ECS to connect to the DB instance:  
`mysql -h <host> -P <port> -u <userName> -p --ssl-ca=<caName>`

Example:

```
mysql -h 172.16.0.31 -P 3306 -u root -p --ssl-ca=ca.pem
```

Table 4-6 Parameter description

| Parameter  | Description                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <host>     | The EIP or public domain name, which can be obtained from <a href="#">3</a> .<br><b>NOTE</b><br>To connect to a DB instance using a public domain name, apply for a public domain name first. For details, see <a href="#">Applying for and Changing a Public Domain Name</a> .<br>After a public domain name is generated, changing the EIP will interrupt database connections. Exercise caution when performing this operation. |
| <port>     | The database port of the DB instance, which can be obtained from <a href="#">3</a> . The default value is <b>3306</b> .                                                                                                                                                                                                                                                                                                            |
| <userName> | Administrator account <b>root</b> .                                                                                                                                                                                                                                                                                                                                                                                                |

| Parameter | Description                                                                                                  |
|-----------|--------------------------------------------------------------------------------------------------------------|
| <caName>  | Name of the CA certificate. The certificate should be stored in the directory where the command is executed. |

5. Enter the password of the database account if the following information is displayed:

Enter password:

**Figure 4-29** Successful connection

```
[root@ecs-e5d6-test ~]# mysql -h -P 3306 -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 108609
Server version:      MySQL Community Server - (GPL)

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
```

## What Should I Do If I Forget My Password?

On the **Instances** page, locate the target DB instance, choose **More > Reset Password** in the **Operation** column, and set a new password.

## Common Connection Error Messages

- [Warning] Access denied for user 'username'@'yourIp' (using password: NO)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- [Warning] Access denied for user 'username'@'yourIp' (using password: YES)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- ERROR 2013: Lost connection to MySQL server during query  
If the values of **wait\_timeout** and **interactive\_timeout** are too small, the RDS for MySQL client will automatically stop connections that timed out. For details, see [RDS for MySQL Client Automatically Disconnected from a DB Instance](#).
- ERROR 1045 (28000): Access denied for user 'root'@'192.168.0.30' (using password: YES)  
Check whether the password is correct, whether the ECS has the permission to connect to the DB instance, and whether the RDS for MySQL client can ping the DB instance's floating IP address. For details, see [RDS for MySQL DB Instance Inaccessible](#).
- ERROR 1226 (42000): User 'test' has exceeded the 'max\_user\_connections' resource (current value:10)  
Check whether the number of connections to the DB instance is limited. For details, see [RDS for MySQL DB Instance Inaccessible](#).
- ERROR 1129 (HY000): Host '192.168.0.111' is blocked because of many connection errors; unblock with 'mysqladmin flush-hosts'



Check whether the number of failed connection attempts (not caused by incorrect passwords) of the RDS for MySQL client exceeds the value of `max_connection_errors`. For details, see [RDS for MySQL DB Instance Inaccessible](#).

For more solutions to connection failures, see [What Should I Do If I Can't Connect to My RDS DB Instance?](#)

## Why Can't I Ping My EIP After It Is Bound to a DB Instance?

1. On the **Instances** page, click the target instance name to go to the **Overview** page.
2. Under **Security Group**, click the security group name.
3. Check whether the security group allows the inbound ICMP traffic.

**Table 4-7** Security group rules

| Direction | Action | Type | Protocol & Port | Source/Destination | Description                                                                                                                                       |
|-----------|--------|------|-----------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Inbound   | Allow  | IPv4 | ICMP: All       | Source: 0.0.0.0/0  | This rule allows ICMP traffic to RDS instances in this security group over any port to verify network connectivity using the <b>ping</b> command. |

## Follow-up Operations

After logging in to the DB instance, you can create or migrate databases.

- [Creating a MySQL Database Using the Console](#)
- [Creating a MySQL Database Using an API](#)
- [Managing MySQL Databases Using DAS](#)
- [Migration Solution Overview](#)

## 4.4 Connecting to an RDS for MySQL Instance Through MySQL-Front

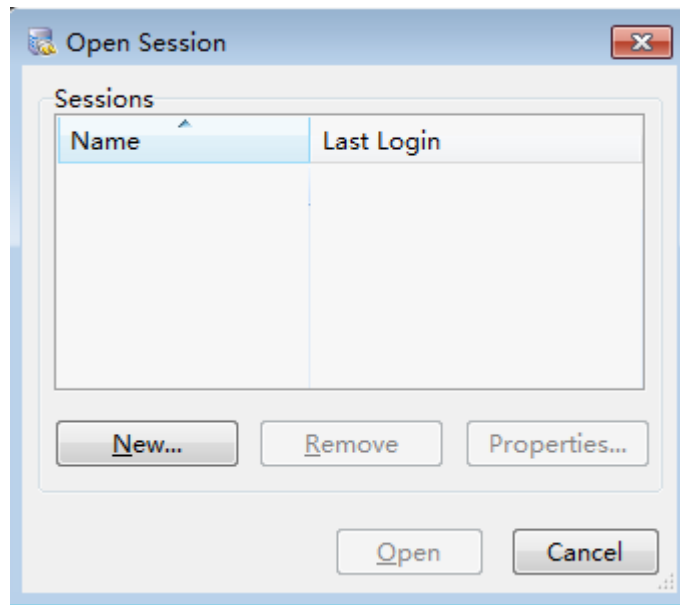
MySQL-Front is a Windows front end for MySQL databases. It allows you to interact with MySQL databases through a GUI, including connecting to a database, running SQL commands, and managing tables and records.

This section uses MySQL-Front 5.4 as an example to describe how to use MySQL-Front to connect to an RDS for MySQL instance through an EIP.

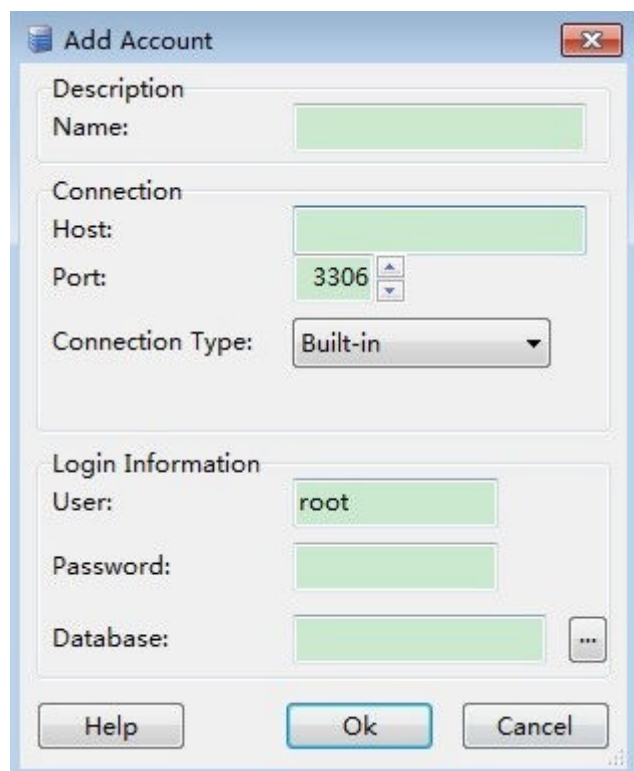
## Procedure

- Step 1** Download and install MySQL-Front (for example, MySQL-Front 5.4).
- Step 2** Start the MySQL-Front.
- Step 3** In the displayed dialog box, click **New**.

**Figure 4-30** Connection management



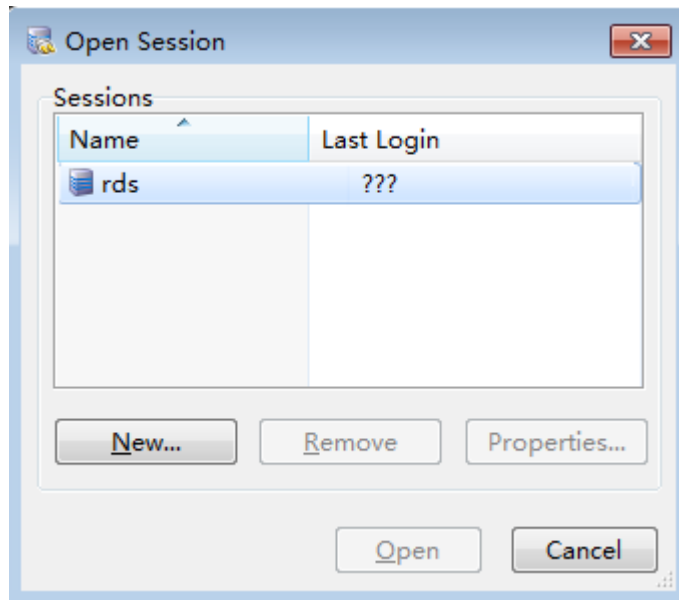
- Step 4** Enter the information of the DB instance to be connected and click **Ok**, as shown in [Figure 4-31](#).

**Figure 4-31** Adding an account**Table 4-8** Parameter description

| Parameter | Description                                                                                                                                                                                                                             |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name      | Specify a name for the database connection task. If you do not specify this parameter, it will be the same as that configured for <b>Host</b> by default.                                                                               |
| Host      | Enter the EIP bound to the DB instance.<br>To obtain the EIP:<br>1. Click the instance name to enter the <b>Overview</b> page.<br>2. In the navigation pane, click <b>Connectivity &amp; Security</b> and check the EIP.                |
| Port      | Enter the database port of the DB instance.<br>To obtain the port:<br>1. Click the instance name to enter the <b>Overview</b> page.<br>2. In the navigation pane, click <b>Connectivity &amp; Security</b> and check the database port. |
| User      | Enter the username used for accessing the instance. The default user is <b>root</b> .                                                                                                                                                   |
| Password  | Enter the password of the username.                                                                                                                                                                                                     |

- Step 5** In the displayed window, select the connection that you have created in [Step 4](#) and click **Open**. If the connection information is correct, the DB instance will be connected.

**Figure 4-32** Opening a session



----End

## What Should I Do If I Forget My Password?

On the **Instances** page, locate the target DB instance, choose **More > Reset Password** in the **Operation** column, and set a new password.

## Common Connection Error Messages

- [Warning] Access denied for user 'username'@'yourIp' (using password: NO)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- [Warning] Access denied for user 'username'@'yourIp' (using password: YES)  
If this error message is displayed when you attempt to connect to an RDS for MySQL instance, check whether the username or password is correct.
- ERROR 2013: Lost connection to MySQL server during query  
If the values of **wait\_timeout** and **interactive\_timeout** are too small, the RDS for MySQL client will automatically stop connections that timed out. For details, see [RDS for MySQL Client Automatically Disconnected from a DB Instance](#).
- ERROR 1045 (28000): Access denied for user 'root'@'192.168.0.30' (using password: YES)  
Check whether the password is correct, whether the ECS has the permission to connect to the DB instance, and whether the RDS for MySQL client can ping the DB instance's floating IP address. For details, see [RDS for MySQL DB Instance Inaccessible](#).

- ERROR 1226 (42000): User 'test' has exceeded the 'max\_user\_connections' resource (current value:10)

Check whether the number of connections to the DB instance is limited. For details, see [RDS for MySQL DB Instance Inaccessible](#).

- ERROR 1129 (HY000): Host '192.168.0.111' is blocked because of many connection errors; unblock with 'mysqladmin flush-hosts'

Check whether the number of failed connection attempts (not caused by incorrect passwords) of the RDS for MySQL client exceeds the value of **max\_connection\_errors**. For details, see [RDS for MySQL DB Instance Inaccessible](#).

For more solutions to connection failures, see [What Should I Do If I Can't Connect to My RDS DB Instance?](#)

## Follow-up Operations

After logging in to the DB instance, you can create or migrate databases.

- [Creating a MySQL Database Using the Console](#)
- [Creating a MySQL Database Using an API](#)
- [Managing MySQL Databases Using DAS](#)
- [Migrating MySQL Databases Using DRS](#)
- [Migrating Data to RDS for MySQL Using mysqldump](#)

## 4.5 Connecting to an RDS for MySQL Instance Through JDBC

If you are connecting to an instance through JDBC, an SSL certificate is optional, but using an SSL certificate can improve the security of your data. SSL is disabled by default for newly created instances. You can enable SSL by referring to [Configuring an SSL Connection](#). SSL encrypts connections to your instances but it increases the connection response time and CPU usage. For this reason, enabling SSL is not recommended.

### Prerequisites

You are familiar with:

- Computer basics.
- Java.
- JDBC.

### Connection with the SSL Certificate

Download the SSL certificate and verify it before connecting to your instance. RDS for MySQL instances do not support X.509-based authentication.

**Step 1** Download the CA certificate or certificate bundle.

1. On the **Instances** page, click the instance name to go to the **Overview** page.

2. Under **SSL**, click **Download**.

**Step 2** Use keytool to generate a truststore file using the CA certificate.

```
<keytool-installation-path> ./keytool.exe -importcert -alias <MySQLCACert> -file <ca.pem> -keystore  
<truststore_file> -storepass <password>
```

**Table 4-9** Parameter description

| Parameter                      | Description                                                                                                |
|--------------------------------|------------------------------------------------------------------------------------------------------------|
| <keytool<br>installation path> | Bin directory in the JDK or JRE installation path, for example, C:\Program Files (x86)\Java\jdk11.0.7\bin. |
| <MySQLCACert>                  | Name of the truststore file. Set it to a name specific to the service for future identification.           |
| <ca.pem>                       | Name of the CA certificate downloaded and decompressed in <a href="#">Step 1</a> , for example, ca.pem.    |
| <truststore_file>              | Path for storing the truststore file.                                                                      |
| <password>                     | Password of the truststore file.                                                                           |

Code example (using keytool in the JDK installation path to generate the truststore file):

```
Owner: CN=MySQL_Server_5.7.17_Auto_Generated_CA_Certificate  
Issuer: CN=MySQL_Server_5.7.17_Auto_Generated_CA_Certificate  
Serial number: 1  
Valid from: Thu Feb 16 11:42:43 EST 2017 until: Sun Feb 14 11:42:43 EST 2027  
Certificate fingerprints:  
  MD5: 18:87:97:37:EA:CB:0B:5A:24:AB:27:76:45:A4:78:C1  
  SHA1: 2B:0D:D9:69:2C:99:BF:1E:2A:25:4E:8D:2D:38:B8:70:66:47:FA:ED  
  SHA256:C3:29:67:1B:E5:37:06:F7:A9:93:DF:C7:B3:27:5E:09:C7:FD:EE:2D:18:86:F4:9C:40:D8:26:CB:DA:95:  
A0:24  
  Signature algorithm name: SHA256withRSA Subject Public Key Algorithm: 2048-bit RSA key  
  Version: 1  
  Trust this certificate? [no]: y  
  Certificate was added to keystore
```

**Step 3** Connect to your RDS for MySQL instance through JDBC.

```
jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?  
param1=value1&param2=value2&param3=value3&param4=value4&param5=value5&param6=value6
```

**Table 4-10** Parameter description

| Parameter     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <instance_ip> | IP address of the DB instance.<br><b>NOTE</b> <ul style="list-style-type: none"><li>If you are accessing the DB instance through an ECS, <i>instance_ip</i> is the floating IP address of the DB instance. You can obtain this IP address on the <b>Connectivity &amp; Security</b> page.</li><li>If you are accessing the DB instance through a public network, <i>instance_ip</i> indicates the EIP that has been bound to the instance. You can obtain this IP address on the <b>Connectivity &amp; Security</b> page.</li></ul> |

| Parameter                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>&lt;instance_port&gt;</code> | Database port of the DB instance. The default port is <b>3306</b> .<br><b>NOTE</b><br>You can obtain this port number on the <b>Connectivity &amp; Security</b> page.                                                                                                                                                                                                                                                                                                   |
| <code>&lt;database_name&gt;</code> | Database name used for connecting to the DB instance. The default value is <b>mysql</b> .                                                                                                                                                                                                                                                                                                                                                                               |
| <code>&lt;param1&gt;</code>        | <b>requireSSL</b> , indicating whether the server supports SSL. Its value can be either of the following: <ul style="list-style-type: none"><li>• <b>true</b>: The server supports SSL.</li><li>• <b>false</b>: The server does not support SSL.</li></ul> <b>NOTE</b><br>For details about the relationship between <b>requireSSL</b> and <b>sslmode</b> , see <a href="#">Table 4-11</a> .                                                                            |
| <code>&lt;param2&gt;</code>        | <b>useSSL</b> , indicating whether the client uses SSL to connect to the server. Its value can be either of the following: <ul style="list-style-type: none"><li>• <b>true</b>: The client uses SSL to connect to the server.</li><li>• <b>false</b>: The client does not use SSL to connect to the server.</li></ul> <b>NOTE</b><br>For details about the relationship between <b>useSSL</b> and <b>sslmode</b> , see <a href="#">Table 4-11</a> .                     |
| <code>&lt;param3&gt;</code>        | <b>verifyServerCertificate</b> , indicating whether the client verifies the server certificate. It can be either of the following: <ul style="list-style-type: none"><li>• <b>true</b>: The client verifies the server certificate.</li><li>• <b>false</b>: The client does not verify the server certificate.</li></ul> <b>NOTE</b><br>For details about the relationship between <b>verifyServerCertificate</b> and <b>sslmode</b> , see <a href="#">Table 4-11</a> . |
| <code>&lt;param4&gt;</code>        | <b>trustCertificateKeyStoreUrl</b> . Its value is <b>file:&lt;truststore_file&gt;</b> .<br>Replace <b>&lt;truststore_file&gt;</b> with the path for storing the truststore file set in <a href="#">Step 2</a> .                                                                                                                                                                                                                                                         |
| <code>&lt;param5&gt;</code>        | <b>trustCertificateKeyStorePassword</b> . Its value is the password of the truststore file set in <a href="#">Step 2</a> .                                                                                                                                                                                                                                                                                                                                              |
| <code>&lt;param6&gt;</code>        | <b>allowMultiQueries</b> . This parameter specifies whether multi-statement execution is supported.<br>If it is set to <b>true</b> , the application code can combine multiple SQL statements using semicolons (;) to batch process SQL statements.                                                                                                                                                                                                                     |

**Table 4-11** Relationship between connection parameters and sslmode

| useSSL | requireSSL | verifyServerCertificate | sslMode   |
|--------|------------|-------------------------|-----------|
| false  | N/A        | N/A                     | DISABLED  |
| true   | false      | false                   | PREFERRED |
| true   | true       | false                   | REQUIRED  |
| true   | N/A        | true                    | VERIFY_CA |

Code example (Java code for connecting to an RDS for MySQL instance):

```
import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.ResultSet;
import java.sql.Statement;
import java.sql.SQLException;

// There will be security risks if the username and password used for authentication are directly written into
// code. Store the username and password in ciphertext in the configuration file or environment variables.
// In this example, the username and password are stored in the environment variables. Before running this
// example, set environment variables EXAMPLE_USERNAME_ENV and EXAMPLE_PASSWORD_ENV as needed.
public class JDBCtest {

    String USER = System.getenv("EXAMPLE_USERNAME_ENV");
    String PASS = System.getenv("EXAMPLE_PASSWORD_ENV");

    public static void main(String[] args) {
        Connection conn = null;
        Statement stmt = null;

        // Set the required parameters in the URL based on the site requirements.
        String url = "jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?
param1=value1&param2=value2";

        try {
            Class.forName("com.mysql.cj.jdbc.Driver");
            conn = DriverManager.getConnection(url, USER, PASS);

            stmt = conn.createStatement();
            String sql = "show status like 'ssl%'";
            ResultSet rs = stmt.executeQuery(sql);

            int columns = rs.getMetaData().getColumnCount();
            for (int i = 1; i <= columns; i++) {
                System.out.print(rs.getMetaData().getColumnName(i));
                System.out.print("\t");
            }

            while (rs.next()) {
                System.out.println();
                for (int i = 1; i <= columns; i++) {
                    System.out.print(rs.getObject(i));
                    System.out.print("\t");
                }
            }
            rs.close();
            stmt.close();
            conn.close();
        } catch (SQLException se) {
            se.printStackTrace();
        }
    }
}
```



```
    } catch (Exception e) {  
        e.printStackTrace();  
    } finally {  
        // release resource ....  
    }  
}  
}
```

----End

## Connection Without the SSL Certificate

You do not need to download the SSL certificate because certificate verification on the server is not required.

**Step 1** Connect to the RDS for MySQL DB instance through JDBC.

```
jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?useSSL=false&param1=value1
```

**Table 4-12** Parameter description

| Parameter       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <instance_ip>   | IP address of the DB instance.<br><b>NOTE</b> <ul style="list-style-type: none"><li>If you are accessing the DB instance through an ECS, <i>instance_ip</i> is the floating IP address of the DB instance. You can obtain this IP address on the <b>Connectivity &amp; Security</b> page.</li><li>If you are accessing the DB instance through a public network, <i>instance_ip</i> indicates the EIP that has been bound to the instance. You can obtain this IP address on the <b>Connectivity &amp; Security</b> page.</li></ul> |
| <instance_port> | Database port of the DB instance. The default port is <b>3306</b> .<br><b>NOTE</b><br>You can obtain this port number on the <b>Connectivity &amp; Security</b> page.                                                                                                                                                                                                                                                                                                                                                               |
| <database_name> | Database name used for connecting to the DB instance. The default value is <b>mysql</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <param1>        | <b>allowMultiQueries</b> . This parameter specifies whether multi-statement execution is supported.<br><br>If it is set to <b>true</b> , the application code can combine multiple SQL statements using semicolons (;) to batch process SQL statements.                                                                                                                                                                                                                                                                             |

Code example (Java code for connecting to an RDS for MySQL instance):

```
import java.sql.Connection;  
import java.sql.DriverManager;  
import java.sql.ResultSet;  
import java.sql.Statement;  
// There will be security risks if the username and password used for authentication are directly written into  
// code. Store the username and password in ciphertext in the configuration file or environment variables.  
// In this example, the username and password are stored in the environment variables. Before running this  
// example, set environment variables EXAMPLE_USERNAME_ENV and EXAMPLE_PASSWORD_ENV as needed.
```

```
public class MyConnTest {
    final public static void main(String[] args) {
        Connection conn = null;

        // Set the required parameters in the URL based on the site requirements.
        String url = "jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?
param1=value1&param2=value2";
        String USER = System.getenv("EXAMPLE_USERNAME_ENV");
        String PASS = System.getenv("EXAMPLE_PASSWORD_ENV");
        try {
            Class.forName("com.mysql.jdbc.Driver");

            conn = DriverManager.getConnection(url,USER,PASS);
            System.out.println("Database connected");

            Statement stmt = conn.createStatement();
            ResultSet rs = stmt.executeQuery("SELECT * FROM mytable WHERE columnfoo = 500");
            while (rs.next()) {
                System.out.println(rs.getString(1));
            }
            rs.close();
            stmt.close();
            conn.close();
        } catch (Exception e) {
            e.printStackTrace();
            System.out.println("Test failed");
        } finally {
            // release resource ....
        }
    }
}
```

----End

## Common Errors Reported for JDBC SSL Connection Failures

- Symptom

When you use JDK 8.0 or a later version to connect to an RDS for MySQL instance with an SSL certificate downloaded, an error similar to the following is reported:

```
javax.net.ssl.SSLHandshakeException: No appropriate protocol (protocol is disabled or
cipher suites are inappropriate)
    at sun.security.ssl.HandshakeContext.<init>(HandshakeContext.java:171) ~[na:1.8.0_292]
    at sun.security.ssl.ClientHandshakeContext.<init>(ClientHandshakeContext.java:98) ~
[na:1.8.0_292]
    at sun.security.ssl.TransportContext.kickstart(TransportContext.java:220) ~
[na:1.8.0_292]
    at sun.security.ssl.SSLSocketImpl.startHandshake(SSLSocketImpl.java:428) ~
[na:1.8.0_292]
    at
com.mysql.cj.protocol.ExportControlled.performTlsHandshake(ExportControlled.java:316) ~
[mysql-connector-java-8.0.17.jar:8.0.17]
    at
com.mysql.cj.protocol.StandardSocketFactory.performTlsHandshake(StandardSocketFactory.java
:188) ~[mysql-connector-java8.0.17.jar:8.0.17]
    at
com.mysql.cj.protocol.a.NativeSocketConnection.performTlsHandshake(NativeSocketConnection.
java:99) ~[mysql-connector-java8.0.17.jar:8.0.17]
    at
com.mysql.cj.protocol.a.NativeProtocol.negotiateSSLConnection(NativeProtocol.java:331) ~
[mysql-connector-java8.0.17.jar:8.0.17]
    ... 68 common frames omitted
```

- Solution

Specify the corresponding parameter values in the code link of [Step 3](#) based on the JAR package used by the client. Example:

- mysql-connector-java-5.1.xx.jar (For 8.0.18 and earlier versions, use the **enabledTLSProtocols** parameter. For details, see [Connecting Securely Using SSL](#).)

In the database connection URL `jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?param1=value1&param2=value2`, replace **param1=value1** with **enabledTLSProtocols=TLSv1.2**.

- mysql-connector-java-8.0.xx.jar (For versions later than 8.0.18, use the **tlsVersions** parameter.)

In the database connection URL `jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?param1=value1&param2=value2`, replace **param1=value1** with **tlsVersions=TLSv1.2**.

## 4.6 Connection Management

### 4.6.1 Changing a Floating IP Address

#### Scenarios

You can change floating IP addresses after migrating on-premises databases or other cloud databases to RDS.

#### Constraints

After read/write splitting is enabled, the floating IP addresses of primary DB instances and read replicas cannot be changed.

Changing the floating IP address will interrupt the database connection. You are advised to change a floating IP address during off-peak hours.

Only floating IPv4 addresses can be changed.

#### Procedure

When you buy a DB instance, select a VPC and subnet on the **Buy DB Instance** page. Then, a floating IP address will be automatically assigned to your instance.

You can change the floating IP address of an existing DB instance.

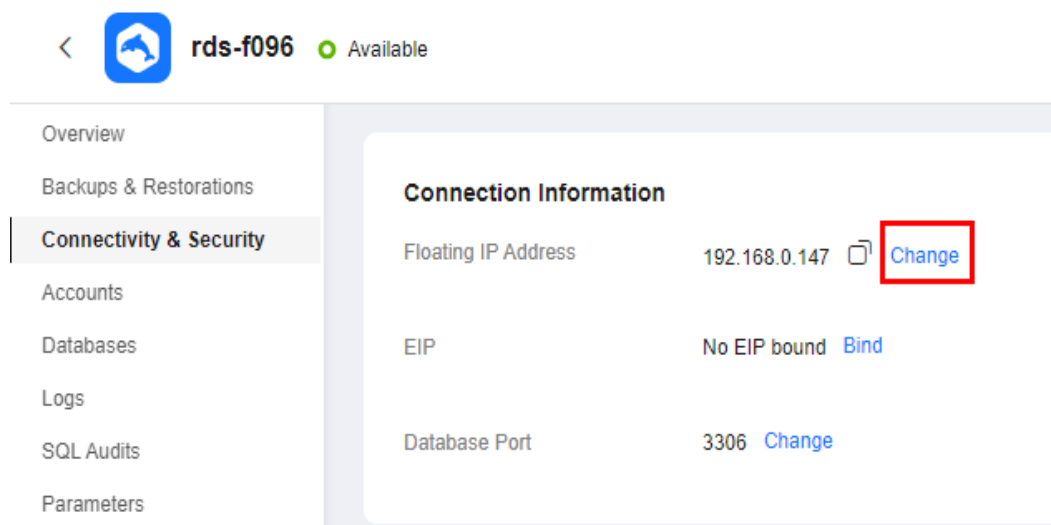
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.

**Step 4** Under **Floating IP Address**, click **Configure**.

Alternatively, in the navigation pane on the left, choose **Connectivity & Security**. In the **Connection Information** area, click **Change** next to the **Floating IP Address** field.

**Figure 4-33** Floating IP address

**Step 5** In the displayed dialog box, check the number of in-use IP addresses. If the in-use IP addresses are less than 254, there are unused floating IP addresses.

**Figure 4-34** Changing a floating IP address

### Change Floating IP Address ✕

 Changing the floating IP address will interrupt database connections because the new floating IP address needs to be resolved for several minutes. Perform this operation during off-peak hours.

Unused (231)

In use (23)

| IP Address                                   | Used By |
|----------------------------------------------|---------|
| <input checked="" type="radio"/> 192.168.0.2 | Unused  |
| <input type="radio"/> 192.168.0.3            | Unused  |
| <input type="radio"/> 192.168.0.4            | Unused  |
| <input type="radio"/> 192.168.0.5            | Unused  |
| <input type="radio"/> 192.168.0.6            | Unused  |
| <input type="radio"/> 192.168.0.7            | Unused  |
| <input type="radio"/> 192.168.0.8            | Unused  |
| <input type="radio"/> 192.168.0.9            | Unused  |
| <input type="radio"/> 192.168.0.10           | Unused  |
| <input type="radio"/> 192.168.0.11           | Unused  |

Total Records: 231

10 < 1 2 3 ... 24 >

Old Address

192.168.0.230

New Address

192.168.0.2

Cancel

OK

**Step 6** Select an available IP address and click **OK**.

An in-use IP address cannot be used as the new floating IP address of the DB instance.

**Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## FAQ

- Question 1: Do I Need to Change the Application Connection Address After Changing the Floating IP Address of My DB Instance?
  - If your application accesses the DB instance through the floating IP address, changing this address on the console will interrupt the database connection. To reconnect your application to the DB instance, you need to change the connection address for the application.
  - If your application accesses the DB instance through its private domain name, changing the floating IP address does not interrupt services.
- Question 2: Does the New Floating IP Address Is Applied Immediately? Is an Instance Reboot Required?

The new floating IP address is applied immediately. You do not need to reboot the DB instance.
- Question 3: After the Floating IP Address of a DB Instance Is Changed, Can the Original IP Address Be Used for Another Instance?

Yes.
- Question 4: Does the Floating IP Address of a DB Instance Change After a Primary/Standby Switchover?

A primary/standby switchover does not change the connection information of an instance, including the VPC, subnet, security group, floating IP address, private domain name, and database port.

## Related APIs

[Changing a Floating IP Address](#)

### 4.6.2 Changing a Private Domain Name

You can connect to RDS DB instances through private domain names.

## Constraints

- Changing the private domain name will interrupt your database connection. To reconnect to the instance, change the connection address of your applications. The new private domain name is applied to the instance about 5 minutes after the change.
- If your DB instance is connected through a private domain name, changing its floating IP address does not interrupt services.

## Procedure

When you buy a DB instance, the system automatically assigns a private domain name to your instance.

After the DB instance is created, you can change the private domain name as needed.

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.

**Step 4** Under **Private Domain Name**, click **Configure**.

Alternatively, in the navigation pane on the left, choose **Connectivity & Security**. On the displayed page, click **Change** next to the **Private Domain Name** field.

**Step 5** In the displayed dialog box, enter a new domain name and click **Yes**.

- Only the prefix of a private domain name can be modified.
- The prefix of a private domain name contains 8 to 63 characters, and can include only letters and digits.
- The new private domain name must be different from existing ones.

**Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## FAQ

- **Question 1: Do I Need to Change the Connection Domain Name for My Application After Changing the Private Domain Name of My DB Instance?**  
Changing the private domain name on the console will interrupt database connections. To reconnect your application to the DB instance, you need to change the domain name for the application.
- **Question 2: Does the New Private Domain Name Is Applied Immediately? Is an Instance Reboot Required?**  
The new domain name is applied immediately. You do not need to reboot the DB instance.
- **Question 3: Does the IP Address of a DB Instance Change After a Primary/Standby Switchover?**  
A primary/standby switchover does not change the connection information of an instance, including the VPC, subnet, security group, floating IP address, private domain name, and database port.

## 4.6.3 Changing a Database Port

### Scenarios

This section describes how to change the database port of a primary DB instance or a read replica. For primary/standby DB instances, changing the database port of

the primary DB instance will cause the database port of the standby DB instance to also be changed.

If specific security group rules have been configured for a DB instance, you need to change the inbound rules of the security group to which the DB instance belongs after changing the database port.

## Constraints

After read/write splitting is enabled, the database ports of primary DB instances and read replicas cannot be changed.

Changing the database port of a DB instance will cause the instance to reboot.

When the database port of a DB instance is being changed, you cannot:

- Bind an EIP to the DB instance.
- Delete the DB instance.
- Create a backup for the DB instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance or click  first and then click the target read replica.
- Step 4** On the **Overview** page, find **Database Port** and click **Configure** under it.

Alternatively, choose **Connectivity & Security** in the navigation pane on the left. On the displayed page, click **Change** next to the **Database Port** field.

RDS for MySQL instances can use database ports 1024 to 65535, excluding 12017, 33071, and 33062, which are reserved for RDS system use.

- In the displayed dialog box, enter a new port and click **Yes**.  
If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.  
Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).
  - If you change the database port of the primary DB instance, that of the standby DB instance will also be changed and both DB instances will be rebooted.
  - If you change the database port of a read replica, the change will not affect other DB instances. Only the read replica will reboot.
  - This process takes about 1–5 minutes.
- In the displayed dialog box, click **No** to cancel the modification.



**Step 5** Check the results on the **Overview** page.

----End

## FAQ

- Question 1: Do I Need to Change the Connection Port for My Application After Changing the Database Port of My DB Instance?

Changing the port will interrupt database connections. To reconnect your application to the DB instance, you need to change the connection port for the application.

- Question 2: Will My DB Instance Be Rebooted After I Change Its Port?

Changing the database port of a DB instance will cause the instance to reboot.

- Question 3: Does the Port of a DB Instance Change After a Primary/Standby Switchover?

A primary/standby switchover does not change the connection information of an instance, including the VPC, subnet, security group, floating IP address, private domain name, and database port.

## Related APIs

[Changing a Database Port](#)

## 4.6.4 Binding and Unbinding an EIP

### Scenarios

You can bind an EIP to a DB instance for public accessibility, and you can unbind the EIP from the DB instance later if needed.

### Precautions

- To ensure that a DB instance is accessible, the security group associated with the instance must allow access to its database port. For example, if the database port is 8635, ensure that the security group allows access to the port 8635.
- You need to configure security groups and enable specific IP addresses and ports to access the target DB instance. Before accessing the DB instance, add an individual IP address or an IP address range that will access the DB instance to the inbound rule. For details, see [Configuring a Security Group Rule](#).
- You can buy an EIP on the [network console](#) and bind it to a DB instance. One EIP can be bound to only one DB instance. For pricing details, see [Elastic IP pricing details](#).

### Prerequisites

- You can bind an EIP to a primary DB instance or a read replica only.
- If a DB instance has already an EIP bound, you must unbind the EIP from the DB instance first before binding a new EIP to it.

## Binding an EIP

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Connectivity & Security**. In the **Connection Information** area, click **Bind** next to the **EIP** field.
- Alternatively, in the **Connection Topology** area, click **Public Connection** and then **Bind** in the connection topology.
- Step 5** In the displayed dialog box, all unbound EIPs are listed. Select the EIP to be bound and click **OK**.
- Step 6** On the **Connectivity & Security** page, check the EIP that has been bound to the DB instance.
- You can also view the progress and result of binding an EIP to a DB instance on the **Task Center** page.
- To unbind the EIP from the DB instance, see [Unbinding an EIP](#).
- End

## Unbinding an EIP

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance that has an EIP bound to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Connectivity & Security**. In the **Connection Information** area, click **Unbind** next to the **EIP** field.
- Alternatively, in the **Connection Topology** area, click **Public Connection** and then **Unbind** in the connection topology.
- Step 5** In the displayed dialog box, click **OK**.
- Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.
- Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).
- Step 7** On the **Connectivity & Security** page, check the results.

You can also view the progress and result of unbinding an EIP from a DB instance on the **Task Center** page.

To bind an EIP to the DB instance again, see [Binding an EIP](#).

----End

## 4.6.5 Applying for and Changing a Public Domain Name

You can apply for a public domain name for your DB instance after binding an EIP to it, and connect to the instance through the public domain name.

### Constraints

- To apply for or change a public domain name, you need to contact customer service to request required permissions.
- Before applying for a public domain name, you need to bind an EIP to your instance.
- After a public domain name is generated, changing the EIP will interrupt database connections. Exercise caution when performing this operation.

### Applying for a Public Domain Name

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the DB instance name.

**Step 4** In the navigation pane on the left, choose **Connectivity & Security**. On the displayed page, click **Apply** next to the **Public Name** field.

----End

### Changing a Public Domain Name

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 4** In the navigation pane on the left, choose **Connectivity & Security**. On the displayed page, click **Change** next to the **Public Name** field.

**Step 5** In the displayed dialog box, enter a new public domain name. Click **OK**.

- Only the prefix of a public domain name can be modified.
- The prefix of a public domain name can contain 8 to 63 characters, and can include only letters and digits.

- The new public domain name must be different from existing ones.

**Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## FAQ

- **Question 1: Will I Be Billed for Public Domain Names?**  
No. Public domain names are not billed. You can apply for a public domain name for your instance after binding an EIP to it. For details about EIP pricing, see [Elastic IP pricing details](#).
- **Question 2: Do I Need to Change the Connection Domain Name for My Application After Changing the Public Domain Name of My DB Instance?**  
Changing the public domain name on the console will interrupt database connections. To reconnect your application to the DB instance, you need to change the domain name for the application.
- **Question 3: Does the New Public Domain Name Is Applied Immediately? Is an Instance Reboot Required?**  
The new domain name is applied immediately. You do not need to reboot the DB instance.
- **Question 4: How Do I Connect to a DB Instance Using Its Public Domain Name?**  
For details, see [Using MySQL CLI to Connect to an Instance Through a Public Network](#).

## 4.6.6 Configuring a Certificate

RDS allows you to reset and download a certificate.

Contact customer service to apply for the required permissions.

### Resetting a Certificate

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 4** Under **SSL**, click **Update**.

Alternatively, choose **Connectivity & Security** from the navigation pane. In the **Connection Information** area, click **Update** next to the **SSL** field.

**Step 5** In the displayed dialog box, select the target certificate and click **OK**.

 **NOTE**

Updating a certificate will cause the DB instance to reboot.

**Step 6** View the update result on the **Overview** page.

----End

## Downloading a Certificate

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 4** Click **Download** under **SSL** to download **Certificate Download.zip**, and extract the root certificate **ca.pem** and bundle **ca-bundle.pem** from the package.

Alternatively, choose **Connectivity & Security** from the navigation pane. In the **Connection Information** area, click  next to the **SSL** field to download the root certificate or certificate bundle.

 **NOTE**

- You can also download the certificate bundle, which contains both the new certificate provided since April 2017 and the old certificate.
- TLS v1.2 or later is recommended. Versions earlier than TLS v1.2 have security risks. You can change the value of **loose\_tls\_version** to set the protocol version. For details, see [Modifying Parameters of an RDS for MySQL Instance](#).

----End

## 4.6.7 Configuring a Security Group Rule

### Scenarios

A security group is a collection of access control rules for ECSs and RDS DB instances that have the same security protection requirements and are mutually trusted within a VPC.

Before you can connect to your DB instance, you need to create security group rules to enable specific IP addresses and ports to access your RDS instance.

- When you attempt to connect to an RDS DB instance through an EIP, you need to configure an inbound rule for the security group associated with the DB instance.
- When you attempt to connect to an RDS DB instance through a private network, check whether the ECS and DB instance are in the same security group.
  - If they are in the same security group, they can communicate with each other by default. No security group rule needs to be configured.

- If they are in different security groups, you need to configure security group rules for them, separately.
  - RDS DB instance: Configure an **inbound rule** for the security group with which the RDS DB instance is associated.
  - ECS: The default security group rule allows all outgoing data packets. In this case, you do not need to configure a security rule for the ECS. If not all outbound traffic is allowed in the security group, you need to configure an **outbound rule** for the ECS.

This section describes how to configure an inbound rule for an RDS DB instance.

For details about the requirements of security group rules, see [Adding a Security Group Rule](#) in the *Virtual Private Cloud User Guide*.

## Precautions

The default security group rule allows all outgoing data packets. ECSs and RDS DB instances can access each other if they are in the same security group. After a security group is created, you can configure security group rules to control access from and to the DB instances in the security group.

- By default, you can create a maximum of 100 security groups in your cloud account.
- By default, you can add up to 50 security group rules to a security group.
- One RDS instance can be associated with multiple security groups, and one security group can be associated with multiple RDS instances.
- Too many security group rules will increase the first packet latency. You are advised to create no more than 50 rules for a security group.
- To access a DB instance from resources outside the security group, you need to configure an **inbound rule** for the security group associated with the DB instance.

### NOTE

To ensure the security of your data and DB instances, you are advised to use the principle of least privilege for database access. Change the default database port **3306**, and set the IP address to the remote server's address or the remote server's smallest subnet address to control the access from the remote server.

The default value of **Source** is **0.0.0.0/0**, indicating that RDS DB instances in the security group can be accessed from any IP address.

For details about the requirements of security group rules, see [Adding a Security Group Rule](#) in the *Virtual Private Cloud User Guide*.

## Procedure

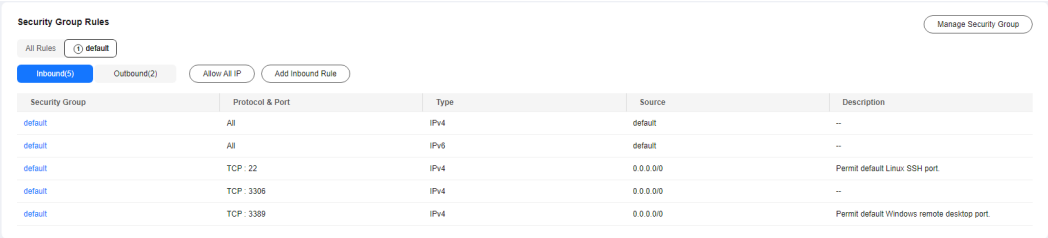
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the DB instance name.

**Step 4** In the navigation pane, choose **Connectivity & Security**. In the **Security Group Rules** area, click the security group name to view the security group rules.

Figure 4-35 Security group rules



**Step 5** Click **Add Inbound Rule** or **Allow All IP** to configure security group rules.

To add more inbound rules, click .

 **NOTE**

**Allow All IP** allows all IP addresses to access RDS DB instances in the security group, which poses high security risks. Exercise caution when performing this operation.

Figure 4-36 Adding an inbound rule

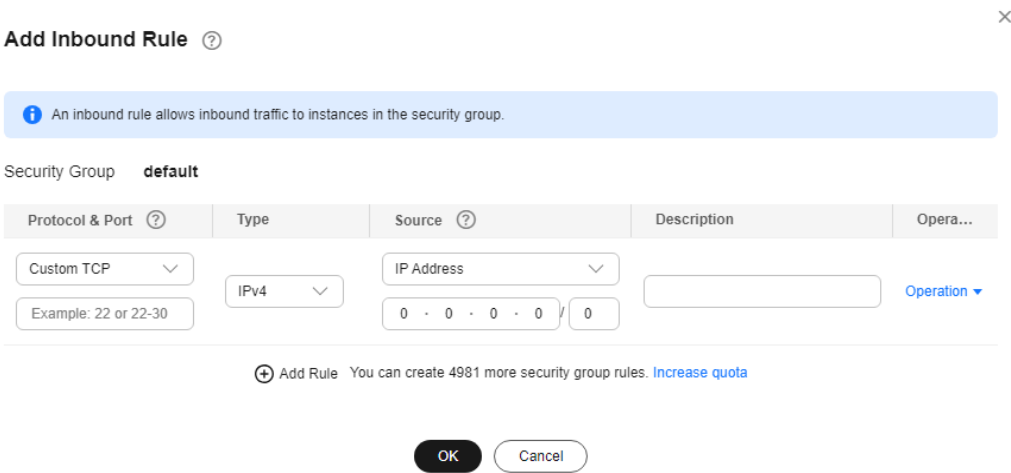


Table 4-13 Inbound rule parameter description

| Parameter       | Example Value | Description                                                                                                                                                                                                     |
|-----------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocol & Port | Custom TCP    | <b>Protocol:</b> network protocol. Available options: <b>All ports</b> , <b>Custom TCP</b> , <b>Custom UDP</b> , <b>ICMP</b> , and <b>GRE</b> .                                                                 |
|                 | 3306          | <b>Port:</b> the port over which the traffic can reach your DB instance.<br><br>RDS for MySQL instances can use database ports 1024 to 65535, excluding 12017 and 33071, which are reserved for RDS system use. |

| Parameter   | Example Value | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type        | IPv4          | IP address type. <ul style="list-style-type: none"><li>• IPv4</li><li>• IPv6</li></ul>                                                                                                                                                                                                                                                                                                                                                                           |
| Source      | 0.0.0.0/0     | Source address. It can be a single IP address, an IP address group, or a security group to allow access from them to your DB instance. Examples: <ul style="list-style-type: none"><li>• Single IP address: 192.168.10.10/32 (IPv4); 2002:50::44/128 (IPv6)</li><li>• All IP addresses: 0.0.0.0/0 (IPv4); ::/0 (IPv6)</li><li>• IP address range: 192.168.1.0/24 (IPv4); 2407:c080:802:469::/64 (IPv6)</li><li>• Security group: default_securitygroup</li></ul> |
| Description | N/A           | Supplementary information about the security group rule. This parameter is optional.<br><br>The description can contain a maximum of 255 characters and cannot contain angle brackets (<) or (>).                                                                                                                                                                                                                                                                |

----End



# 5 Database Usage

---

## 5.1 Suggestions on Using RDS for MySQL

### 5.1.1 Instance Usage Suggestions

#### DB Instances

##### DB Instance Types

- Primary/Standby
  - A primary/standby pair provides an HA architecture. It is suitable for production databases of large and medium enterprises in the Internet, Internet of Things (IoT), retail e-commerce sales, logistics, gaming, and other sectors.
  - When a primary instance is being created, a standby instance is provisioned along with it to provide data redundancy. The standby instance is invisible to you after being created.
  - If a failover occurs due to a primary instance failure, there is a brief interruption between your database client and the instance. The client needs to be able to reconnect to the instance.
- Single-node
  - A single-node architecture is more cost-effective than primary/standby pairs.
  - It is recommended for development and testing of microsites, and small- and medium-sized enterprises, or for learning about RDS.
  - If a fault occurs on a single instance, the instance cannot recover in a timely manner.
- Read replica

Read replicas include single read replicas and HA read replicas.

  - Single read replica

If you want to use single read replicas, you are advised to buy more than one single read replica and enable database proxy. By doing so, the

database proxy can route traffic to other read replicas if a read replica is faulty.

- HA read replica

If the physical server where the primary read replica is deployed fails, the standby read replica automatically takes over workloads.

When you purchase a read replica, select the same value for **Table Name** as that of the DB instance.

Recommendations for using read replicas:

- Configure HA read replicas if you plan to configure no more than two read replicas for a DB instance.
- If your DB instance is associated with more than two read replicas, enable database proxy for cost-effectiveness.

#### NOTE

If the replication between a read replica (single or HA) and the DB instance is abnormal, it can take a long time to rebuild and restore the read replica (depending on the data volume).

After a read replica is created, you can [change its time zone](#) by adjusting the **time\_zone** parameter. Ensure that the read replica uses the same time zone as the primary instance to avoid data synchronization errors.

### Instance Classes

- Dedicated

The instance has dedicated CPU and memory resources to ensure stable performance. The performance of a dedicated instance is never affected by other instances on the same physical machine. This instance class is good when performance stability is important.

- General-purpose

CPU resources are shared with other general-purpose DB instances on the same physical machine. CPU usage is maximized through resource overcommitment. This instance class is a cost-effective option and suitable for scenarios where performance stability is not critical.

### Database Connection

- Configure RDS for MySQL parameters that match your workloads.
- Keep an appropriate number of active connections.
- Periodically release persistent connections because maintaining them may require a large cache and use up memory.

### Reliability and Availability

- Select primary/standby DB instances for production databases.
- Deploy primary and standby instances in different AZs.
- Create read replicas and enable read/write splitting for workloads involving frequent read/write operations.
- Change instance classes during off-peak hours.
- Select an instance class and storage space appropriate to your workloads.

- After scaling up your DB instance, scale up its read replicas in a timely manner to prevent service exceptions caused by insufficient storage of read replicas.

## Backup and Restoration

- Backups may fail if the instance has a heavy workload during peak hours. To prevent this, create manual backups during off-peak hours and tailor the time window for automated backups to your workload requirements.
- Set the backup cycle to **All** for write-intensive DB instances.
- Configure a backup retention period suited to your workload. The default value is 7 days.
- Set the local retention period of binlogs as required. The default value is **0**, indicating that local binlogs are deleted once they are successfully backed up to OBS.
- Before restoring tables to a specified point in time, check whether any large tables without primary keys were deleted before the selected point in time. If yes, it is difficult to estimate when the restoration can be complete.
- Select the right storage type before creating a DB instance. DB instances using local SSDs cannot be restored to existing instances.
- If a DB instance is deleted, its automated full backups and binlog backups are also deleted. Create a manual backup of all data before deleting a DB instance.
- Configure a custom recycling policy to ensure that any instances that are deleted by mistake can be rebuilt.

## SQL Audit

- Enable **Audit Logging** when periodic audits are required.
- Enable SQL Explorer when SQL analysis is required.

## Routine O&M

- Periodically check slow query logs and error logs to identify problems in advance.
- Periodically check the resource usage of DB instances. If the resources are insufficient, scale up the resources in a timely manner.
- Monitor instance metrics. If any metric is beyond its expected range, address related issues as soon as possible.
- Before deleting or modifying a record, run SELECT to check that it is the one you desire.

## Security

- Prevent your database from being directly accessed from the Internet. If you want to allow access from the Internet, bind an EIP to your DB instance and configure a whitelist.
- Use SSL to connect to your DB instance.

## 5.1.2 Database Usage Suggestions

### Database Naming

- The names of database objects like databases, tables, and columns should be in lowercase. Different words in the name are separated with underscores (\_).
- Reserved words and keywords cannot be used to name database objects in RDS for MySQL.
  - Reserved words and keywords for MySQL 8.0: <https://dev.mysql.com/doc/refman/8.0/en/keywords.html>
  - Reserved words and keywords for MySQL 5.7: <https://dev.mysql.com/doc/refman/5.7/en/keywords.html>
- In addition to those of MySQL 8.0 Community Edition, some other keywords and reserved words are added to RDS for MySQL. Do not use such words to name objects.

**Table 5-1** New reserved words of RDS for MySQL

| Reserved Word | Scenario    |
|---------------|-------------|
| RECYCLE_BIN   | Recycle bin |

- Each database object name must be explainable and contain a maximum of 32 characters.
- Each temporary table in databases is prefixed with **tmp** and suffixed with a date.
- Each backup table in databases is prefixed with **bak** and suffixed with a date.
- All columns storing the same data in different databases or tables must have the same name and be of the same type.

### Database Design

- All tables use the InnoDB storage engine unless otherwise specified. InnoDB supports transactions and row locks. It delivers excellent performance, making it easy to recover data.
- Databases and tables all use the UTF8 character set to avoid characters getting garbled by character set conversion.
- All tables and fields require comments that can be added using the COMMENT clause to maintain the data dictionary from the beginning of the design.
- The length of a single row in the table cannot exceed 1,024 bytes.
- To avoid cross-partition queries, RDS for MySQL partitioned tables are not recommended. Cross-partition queries will decrease the query efficiency. A partitioned table is logically a single table, but the data is actually stored in multiple different files.
- Do not create too many columns in one table. Store cold and warm data separately to reduce the width of a table. In doing so, more rows of data can be stored in each memory page, decreasing disk I/O and making more efficient use of the cache.

- Columns that are frequently used together should be in the same table to avoid JOIN operations.
- Do not create reserved fields in a table. Otherwise, modifying the column type will lock the table, which has a greater impact than adding a field.
- Do not store binary data such as images and files in databases.
- Full-text indexes are not recommended because there are many limitations on full-text indexes for MySQL Community Edition.
- Create no more than 20,000 tables in an instance.
- Do not maintain your client connection to an instance for more than 8 hours.
- To prevent out of memory (OOM) exceptions from occurring when your instance handles a large number of concurrent requests, set **tmp\_table\_size**, **innodb\_buffer\_pool\_size**, **max\_connections**, **sort\_buffer\_size**, **read\_buffer\_size**, **read\_rnd\_buffer\_size**, **join\_buffer\_size**, **thread\_stack**, and **binlog\_cache\_size** to the values not exceeding their default values.
- Specify character sets and collations for client connections and ensure that the character sets and collations are the same as those on the server.

## Field Design

- Ensure that each table contains no more than 50 fields.
- Select a small data type for each column as much as possible. Numeric data is preferred, followed by dates or binary data, and the least preferred is characters. The larger the column data type, the more the space required for creating indexes. As a result, there are fewer indexes on a page and more I/O operations required, so database performance deteriorates.
- If the integer type is used as the database field type, select the shortest column type. If the value is a non-negative number, it must be the unsigned type.
- Each field should have the NOT NULL attribute. The default value for the numeric type such as INT is recommended to be 0, and that for the character type such as VARCHAR is recommended to be an empty string.
- Do not use the ENUM type. Instead, use the TINYINT type.  
Change ENUM values using ALTER. The ORDER BY operations on ENUM values are inefficient and require extra operations.  
If you have specified that ENUM values cannot be numeric, other data types (such as char) can be used.
- If the numeric data type is required, use DECIMAL instead of FLOAT or DOUBLE.  
FLOAT and DOUBLE data cannot be stored precisely, and value comparison results may be incorrect.
- When you want to record a date or specific time, use the DATETIME or TIMESTAMP type instead of the string type.
- Store IP addresses using the INT UNSIGNED type. You can convert IP addresses into numeric data using function inet\_aton or inet\_ntoa.
- The VARCHAR data should be as short as possible. Although the VARCHAR data varies in length dynamically on disks, it occupies the maximum length in memory.

- Use VARBINARY to store variable-length character strings that are case-sensitive. VARBINARY is case-sensitive by default and quick to process because no character sets are involved.

## Index Design

- Create a primary key for each InnoDB table. Neither use a frequently-updated column as the primary key nor a multi-column primary key. Do not use the UUID, MD5, or character string column as the primary key. Use a column whose values can increment continuously as the primary key. So, the auto-increment ID column is recommended.
- Use no more than 5 indexes in a single table. Indexes speed up queries, but too many indexes may slow down writes. Inappropriate indexes sometimes reduce query efficiency.
- Do not create an independent index for each column in a table. A well-designed composite index is much more efficient than a separate index on each column.
- Create an index on the following columns:
  - Columns specified in the WHERE clause of SELECT, UPDATE, or DELETE statements
  - Columns specified in ORDER BY, GROUP BY, or DISTINCT
  - Columns used to join multiple tables
- The index column order is as follows:
  - Put the column with the highest selectivity on the far left when creating a composite index. Selectivity = Different values in a column/Total rows in the column
  - Put the column with the smallest field length on the far left of the composite index. The smaller length a field has, the more data one page stores, and the better the I/O performance is.
  - Put the most frequently used column on the left of the composite index, so you can create fewer indexes.
- Avoid using redundant indexes, such as primary key (id), index (id), and unique index (id).
- Avoid using duplicate indexes, such as index(a,b,c), index(a,b), and index(a). Duplicate and redundant indexes may slow down queries because the RDS for MySQL query optimizer does not know which index it should use.
- When creating an index on the VARCHAR field, specify the index length based on selectivity. Do not index the entire field.

If an index with the length of 20 bytes is the string type, its selectivity can reach 90% or above. In this case, use **count(distinct left(column name, index length))/count(\*)** to check index selectivity.

- Use covering indexes for frequent queries.

A covering index is a special type of index where all required fields for a query are included in the index. The index itself contains columns specified in WHERE and GROUP BY clauses, but also column combinations queried in SELECT, without having to execute additional queries.
- Constraints on foreign keys are as follows:

The character sets of the columns for which a foreign key relationship is established must be the same, or the character sets of the parent and child tables for which a foreign key relationship is established must be the same.

## SQL Statement Development

- Use prepared statements to perform database operations in programs. Prepared statements can be executed multiple times in a program once they are written, more efficient than SQL statements.
- Avoid implicit conversions because they may cause index to become invalid. Do not perform function conversions or math calculations on columns in the WHERE clause. Otherwise, the index becomes invalid.
- Do not use double percent signs (%%) or place % before a query condition, or the index cannot be used.
- Do not use **select \*** for queries because using **select \***:
  - Consumes more CPUs, IP addresses, and bandwidth.
  - Causes covering indexes to become unavailable.
  - Increases the impact of table structure changes on code.
- Do not use subqueries. Subqueries generate temporary tables that do not have any indexes. If there is a lot of data, the query efficiency is severely affected. Convert subqueries into join queries.
- Minimize the use of JOIN operations for more than 5 tables. Use the same data type for the fields that require JOIN operations.

Each JOIN operation on a table occupies extra memory (controlled by **join\_buffer\_size**) and requires temporary table operations, affecting query efficiency. Do not use NATURAL JOIN.
- Reduce interactions with the same database as much as possible. The database is more suitable for processing batch operations.
- Replace OR clauses with IN clauses because IN clauses can effectively use indexes. Specify no more than 500 values for an IN clause.
- Do not perform reverse queries, for example, NOT IN and NOT LIKE.
- Do not use ORDER BY RAND() for random sorting.

This operation loads all data that meets the conditions from the table to the memory for sorting, consuming more CPUs, I/O, and memory resources.

Obtain a random value from the program and retrieve data from the involved database based on the value.
- If deduplication is not required, use UNION ALL instead of UNION.

UNION ALL does not sort out result sets.
- Combine multiple operations and perform them in batches. The database is good for batch processing.

This reduces interactions with the same database.
- If there are more than 1 million rows of write operations, perform them in multiple batches.

A large number of batch writes may result in excessive primary/standby latency.
- If ORDER BY is used, use the order of indexes.

- The last field of ORDER BY is a part of a composite index and is placed at the end of the composite index order.
- Avoid file\_sort to speed up queries.

Correct example: in **where a=? and b=? order by c**;; index: **a\_b\_c**

Wrong example: If an index supports range search, the index order cannot be used. For example, **WHERE a>10 ORDER BY b**;; index: **a\_b** (sorting is not allowed)

- Use ANSI-standard SQL statements instead of MySQL extended SQL statements for DML operations. Common MySQL extended SQL statements include:
  - REPLACE INTO
  - INSERT ... ON DUPLICATE KEY UPDATE
- Stored procedures are not recommended because they are difficult to debug, extend, and transplant.
- To avoid logical dependency on the database, do not use triggers, event schedulers, or views for service logic.
- Large transactions are not recommended. If possible, a transaction should contain no more than five SQL statements because large transactions have problems such as long data lock time, too many caches, and connection consumption.
- TRUNCATE TABLE is faster than DELETE and uses fewer system and log resources. If the table to be deleted does not have a trigger and the entire table needs to be deleted, TRUNCATE TABLE is recommended.
- Do not run the **flush logs** command frequently to prevent automatic binlog deletion failures.
- Keep the time that a transaction can run no more than 180 seconds. There should be no more than 10 concurrent transactions whose duration is longer than 30 seconds.
- Do not modify more than 1 million rows in a single transaction.
- Do not run large SQL statements that are generated by the system. For example, if you run an **SELECT** statement of 9 MB, the memory consumption increases by about 37 MB during the execution, which is about 4 times the size of the statement.

## Session-level Parameters That Are Recommended Not to Be Modified

- **foreign\_key\_checks**

Description: The bool type. The default global value is **ON**. If this parameter is set to **ON** when a foreign key is created, the system checks the standardization of the foreign key, for example, the foreign key cannot reference other keys in the same table.

Reasons for not changing its value:

- If **foreign\_key\_checks** is set to **ON**, the foreign keys that cannot be checked using this parameter are not used in a standard manner. You are advised to optimize the SQL statements.
- If this parameter is set to **OFF** at the thread level and some non-standard foreign keys are created on the primary instance, the DDL statements used for creating these foreign keys will fail to be executed during



replication to the standby instance because the value of **foreign\_key\_checks** is still **ON** on the standby instance, thus causing replication exceptions. For details, see [Instance Reboot Failure or ERROR 1146: Table 'xxx' doesn't exist Reported During Table Operations](#).

- You are advised to set **foreign\_key\_checks** to **ON** also for single-node instances.

- **innodb\_strict\_mode**

Description: The bool type. The default global value is **ON**. If this parameter is set to **ON**, an error instead of a warning is reported for some non-standard InnoDB table operations. For example, an error will be reported when the InnoDB page size is 16 KB but the size of a single row exceeds 8 KB.

Reasons for not changing its value:

- If this parameter is set to **OFF** at the thread level for the primary instance, the DDL statement ALTER TABLE can be executed successfully on the primary instance when there are many columns and the length of a single row exceeds 8 KB. However, because this parameter is still set to **ON** on the standby instance, an error will be reported when this statement is executed on the standby instance, causing a replication exception.
- If you do need to change the value of this parameter, change it globally, for example, both on the primary and standby instances.

- **default\_storage\_engine**

Description: The enumerated type. The value can only be an available storage engine name. The default global value is **InnoDB**. The default storage engine will be used if no storage engine is explicitly specified in the DDL statement CREATE TABLE or ALTER TABLE.

Reasons for not changing its value:

- RDS for MySQL primary/standby replication uses binlog-based replication of the open-source community. If no storage engine is explicitly specified in the DDL statement CREATE TABLE or ALTER TABLE, the default storage engine will not be recorded in binlogs (consistent with the community). But when this statement is executed on the standby instance during primary/standby replication, the default value (**InnoDB**) of **default\_storage\_engine** of the replication thread is used.
- If this parameter is changed to a storage engine other than InnoDB at the session level on the primary instance, running CREATE TABLE or ALTER TABLE will cause inconsistent storage engines used by tables created on the primary instance and standby instance.

- **unique\_checks**

Description: The bool type. The default global value is **ON**, which indicates that a uniqueness check will be performed on the unique keys of secondary indexes in InnoDB tables.

Reasons for not changing its value:

If this parameter is set to **OFF** at the session level for the primary instance, the uniqueness of the unique keys of secondary indexes will not be checked, and a DML statement with duplicate unique keys of secondary indexes can be executed successfully. However, on the standby instance, this DML statement

will fail to be executed due to the uniqueness check, causing a replication exception.

- **sql\_log\_bin**

Description: This parameter controls whether SQL statements of the current session are recorded in binlogs. The default value is **ON**.

Reasons for not changing its value:

RDS for MySQL primary/standby replication uses binlog-based replication of the open-source community. If this parameter is set to **OFF** for a single session for the primary instance, updates made to tables are not recorded in binlogs and cannot be synchronized to the standby instance. Data will be inconsistent between the primary and standby instances.

- **old\_alter\_table**

Description: The bool type. The default value is **OFF**. If the value is set to **ON**, the algorithm implemented by copying temporary tables used in the ALTER TABLE statement affects database performance.

Reasons for not changing its value:

- The ALTER IGNORE option may fail to be replayed on the standby instance.
- The performance of ALTER TABLE based on COPY is poor.

## 5.2 Database Management

### 5.2.1 Creating a Database

#### Scenarios

After a DB instance is created, you can create databases on it.

**If your RDS instance is associated with a DDM instance, go to the DDM console to manage databases and accounts.**

#### Constraints

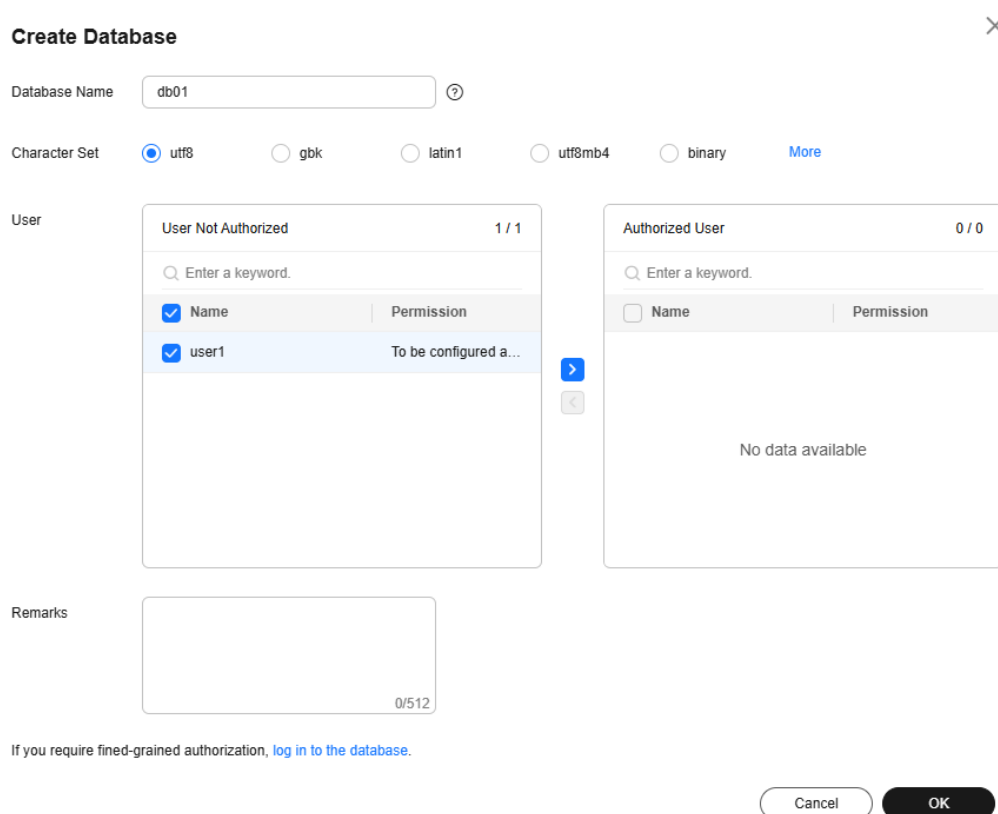
- Databases cannot be created for DB instances that are in the process of being restored.
- **AUTO\_PK\_ROW\_ID** is a reserved column name for RDS for MySQL instances. You cannot create it.
- You can only manage databases in the primary instance, for example, creating or authorizing users for databases.
- Database names must be unique.
- After a database is created on the RDS console, its name cannot be changed.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.

- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Creating a Database Through RDS

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts**.
- Step 5** On the **Databases** page, click **Create Database**. In the displayed dialog box, enter a database name and remarks, select a character set, and authorize permissions for users. Then, click **OK**.

Figure 5-1 Creating a database



**Create Database**

Database Name:

Character Set: ☒ utf8 ☐ gbk ☐ latin1 ☐ utf8mb4 ☐ binary [More](#)

User:

User Not Authorized 1 / 1

| <input checked="" type="checkbox"/> Name  | Permission            |
|-------------------------------------------|-----------------------|
| <input checked="" type="checkbox"/> user1 | To be configured a... |

Authorized User 0 / 0

| <input type="checkbox"/> Name | Permission |
|-------------------------------|------------|
|-------------------------------|------------|

No data available

- The database name consists of 1 to 64 characters. Only letters, digits, hyphens (-), underscores (\_), and dollar signs (\$) are allowed. RDS for MySQL 8.0 does not support dollar signs (\$). The total number of hyphens (-) and dollar signs (\$) cannot exceed 10.

- The default character set is **utf8**. You can click **More** and select another one.
- The remarks can be empty or contain up to 512 characters. This parameter is available only for specified kernel versions. If your kernel version does not meet the following requirements, upgrade the kernel to the latest version by referring to [Upgrading a Minor Version](#).
  - For RDS for MySQL 5.6, the kernel version should be 5.6.51.3 or later.
  - For RDS for MySQL 5.7, the kernel version should be 5.7.33.1 or later.
  - For RDS for MySQL 8.0, the kernel version should be 8.0.21.4 or later.
- Select unauthorized users and click  to authorize permissions or select authorized users and click  to revoke permissions.

If there are no unauthorized users, you can create one by referring to [Creating a Database Account](#).
- If you require fine-grained permissions control, log in to the database through the DAS console.

**Step 6** After the database is created, manage it on the **Databases** page of the selected DB instance.

----End

## Creating a Database Through DAS

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.

**Step 4** On the displayed login page, enter the correct username and password and click **Log In**.

**Step 5** On the top menu bar, choose **SQL Operations > SQL Query**.

**Step 6** Run the following command to create a database.

```
create database database_name;
```

----End

## 5.2.2 Modifying Database Remarks

### Scenarios

RDS allows you to modify remarks for databases.

The **Remarks** column is displayed for all instances of the latest minor version. If the **Remarks** column is not displayed on the console, [check](#) and [upgrade the minor version of your instance](#).

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts** to go to the **Databases** page.
- Step 5** Locate the target database and click  in the **Remarks** column.
- The database remarks can be empty or contain up to 512 characters.
- To submit the modification, click .
  - To cancel the modification, click .

----End

## 5.2.3 Granting Database Permissions

### Scenarios

You can grant permissions to database users you have created to use specific databases or revoke permissions from specific database users.

### Constraints

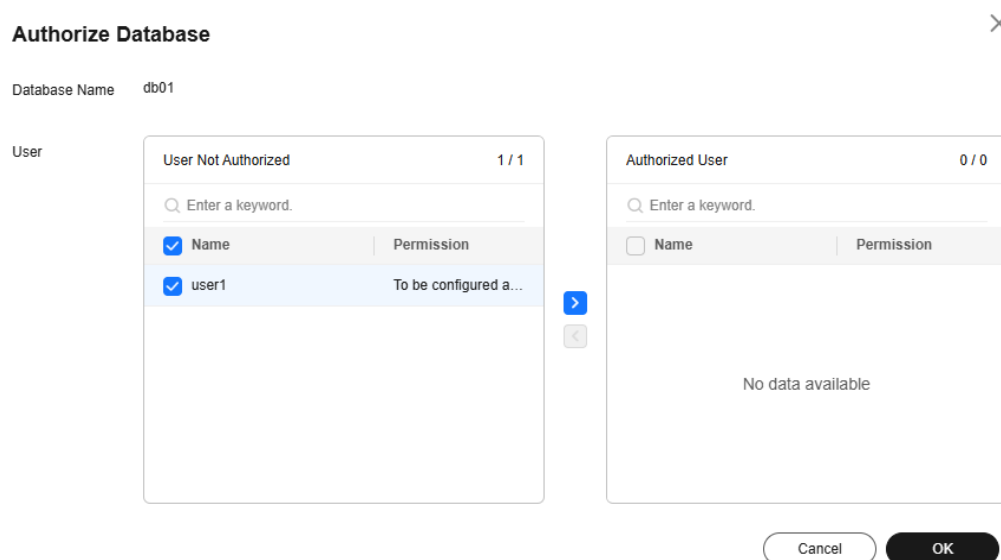
- Permissions cannot be granted to database users for a DB instance that is in the process of being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.
- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.

- Step 4** In the navigation pane on the left, choose **Databases and Accounts**.
- Step 5** On the **Databases** tab page, locate the target database and click **Authorize** in the **Operation** column.
- Step 6** In the displayed dialog box, select unauthorized users and click  to authorize them or select authorized users and click  to revoke permissions.
- If no users are available, you can create one by referring to [Creating a Database Account](#).

**Figure 5-2** Granting database permissions



- Step 7** Click **OK**.

-----End

## 5.2.4 Deleting a Database

### Scenarios

You can delete databases that you have created.

### Constraints

- Deleted databases cannot be recovered. Exercise caution when performing this operation.
- Custom databases cannot be deleted from DB instances that are in the process of being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.

- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts**.
- Step 5** On the **Databases** tab page, locate the target database and click **Delete** in the **Operation** column.
- Step 6** In the displayed dialog box, enter **DELETE** and click **OK**.
- Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## 5.3 Account Management (Non-Administrator)

### 5.3.1 Creating a Database Account

#### Scenarios

When you create a DB instance, account **root** is created at the same time by default. You can create other database accounts as needed.

**If your RDS instance is associated with a DDM instance, go to the DDM console to manage databases and accounts.**

You can create a database account using RDS or DAS:

- **RDS**: RDS is easy to use. There are no special commands to remember.
- **DAS**: DAS is a powerful platform that offers more flexibility, but you need to be familiar with the creation commands. The process requires a bit more expertise.

## Account Type

**Table 5-2** Account description

| Account Type                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Administrator account <b>root</b> | <p>Only the administrator account <b>root</b> is provided on the instance creation page. For details about the supported permissions, see <a href="#">RDS for MySQL Constraints</a>.</p> <p>Running <b>revoke</b>, <b>drop user</b>, or <b>rename user</b> on <b>root</b> may cause service interruption. Exercise caution when running any of these statements.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| System accounts                   | <p>To provide O&amp;M services, the system automatically creates system accounts when you create RDS for MySQL DB instances. These system accounts are unavailable to you.</p> <ul style="list-style-type: none"><li>• <b>rdsAdmin</b>: a management account with the highest permission. It is used to query and modify instance information, rectify faults, migrate data, and restore data.</li><li>• <b>rdsRepl</b>: a replication account, used to synchronize data from the primary instance to the standby instance or read replicas.</li><li>• <b>rdsBackup</b>: a backup account, used for backend backup.</li><li>• <b>rdsMetric</b>: a metric monitoring account used by watchdog to collect database status data.</li><li>• <b>rdsProxy</b>: a database proxy account, used for authentication when the database is connected through the read/write splitting address. This account is automatically created when you enable read/write splitting.</li></ul> |
| Other accounts                    | <p>Accounts created through the console, APIs, or SQL statements</p> <p>After an account is created, you can assign permissions to it as required. For details, see <a href="#">Changing Permissions for a Database Account</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## Constraints

- Accounts cannot be created for DB instances that are being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.

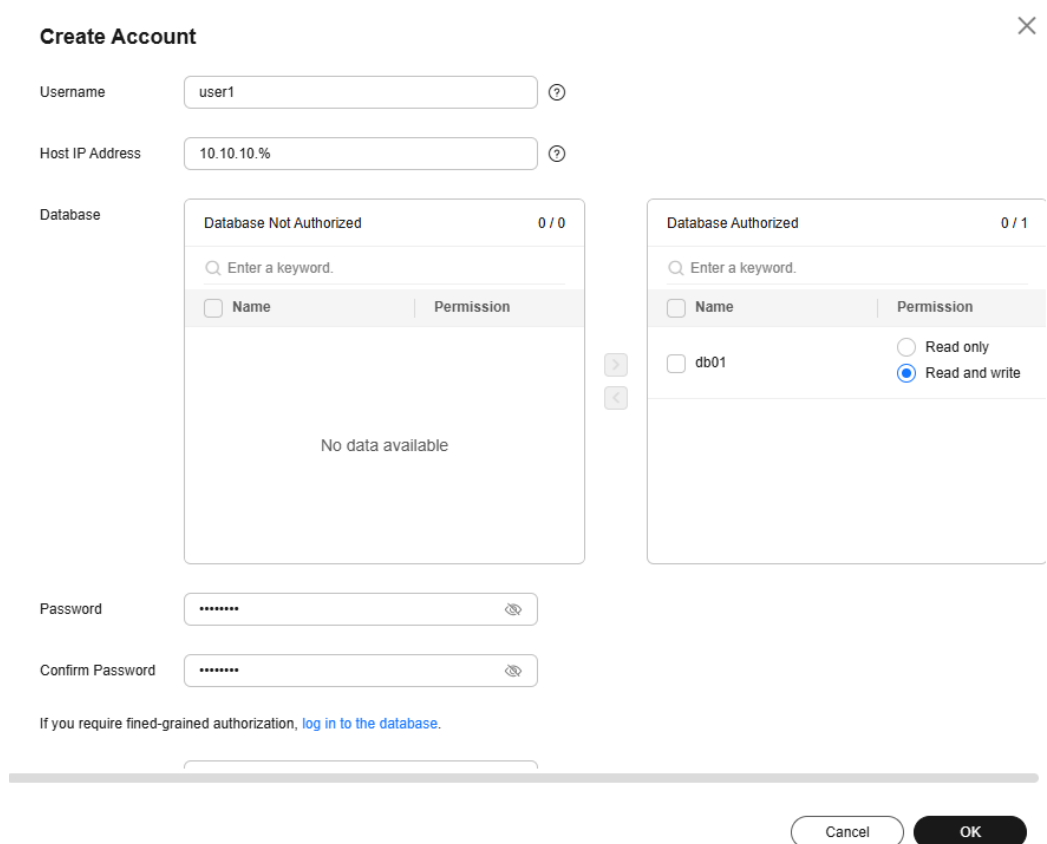


- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Creating a Database Account Through RDS

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts** and then click the **Accounts** tab.
- Step 5** On the displayed page, click **Create Account**.
- Step 6** In the displayed dialog box, specify **Username** and **Host IP Address**, authorize permissions for databases, enter a password, and confirm the password. Then, click **OK**.

**Figure 5-3** Creating a database account



**Create Account**

Username

Host IP Address

Database

Database Not Authorized 0 / 0

Enter a keyword.

| Name              | Permission |
|-------------------|------------|
| No data available |            |

Database Authorized 0 / 1

Enter a keyword.

| Name | Permission                                                                         |
|------|------------------------------------------------------------------------------------|
| db01 | <input type="radio"/> Read only<br><input checked="" type="radio"/> Read and write |

Password

Confirm Password

If you require fined-grained authorization, [log in to the database](#).

Cancel OK

- If the DB engine version is MySQL 5.6, the username can contain 1 to 16 characters. Only letters, digits, hyphens (-), and underscores (\_) are allowed.

- If the DB engine version is MySQL 5.7 or 8.0, the username can contain 1 to 32 characters. Only letters, digits, hyphens (-), and underscores (\_) are allowed.
- You can specify IP addresses that are allowed to access your DB instance.
  - To enable all IP addresses to access your instance, enter % for **Host IP Address**.
  - To enable all IP addresses in the subnet 10.10.10.X to access your instance, enter **10.10.10.%** for **Host IP Address**.
  - To specify multiple IP addresses, separate them with commas (,), for example, **192.168.0.1,172.16.213.9** (no spaces before or after the comma).
- Select unauthorized databases and click  to authorize them or select authorized databases and click  to revoke permissions.

If there are no unauthorized databases, you can create one by referring to [Creating a Database](#). You can also modify the permissions after the account creation by referring to [Changing Permissions for a Database Account](#).
- The password must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^\*\_-=+?,()&.).
- The password must be different from the username or username spelled backwards.
- You are advised to enter a strong password to improve security and prevent security risks such as brute force cracking.
- If you require fine-grained permissions control, log in to the database through the DAS console.

**Step 7** After the database account is created, you can add remarks (for 8.0.25 and later versions), reset the password, modify permissions, change the host IP addresses for the account, and delete the account.

----End

## Creating a Database Account Through DAS

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.
- Step 4** On the displayed page, enter the correct username and password and click **Log In**.
- Step 5** Create an account.
- On the top menu bar, choose **Account Management > User Management**. On the displayed page, click **Create User**. Then, configure basic information, advanced settings, global permissions, and object permissions, and click **Save**. In the displayed dialog box, click **OK**.

For details about how to set permissions, see [Creating a User](#).

- You can also choose **SQL Operations > SQL Query** from the top menu bar and run the following command to create an account:  

```
create user username;
```

----End

## 5.3.2 Resetting a Password for a Database Account

### Scenarios

You can reset passwords for the accounts you have created. To protect against brute force hacking attempts and ensure system security, change your password periodically, such as every three or six months.

### Constraints

- Passwords cannot be reset for DB instances that are in the process of being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.
- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

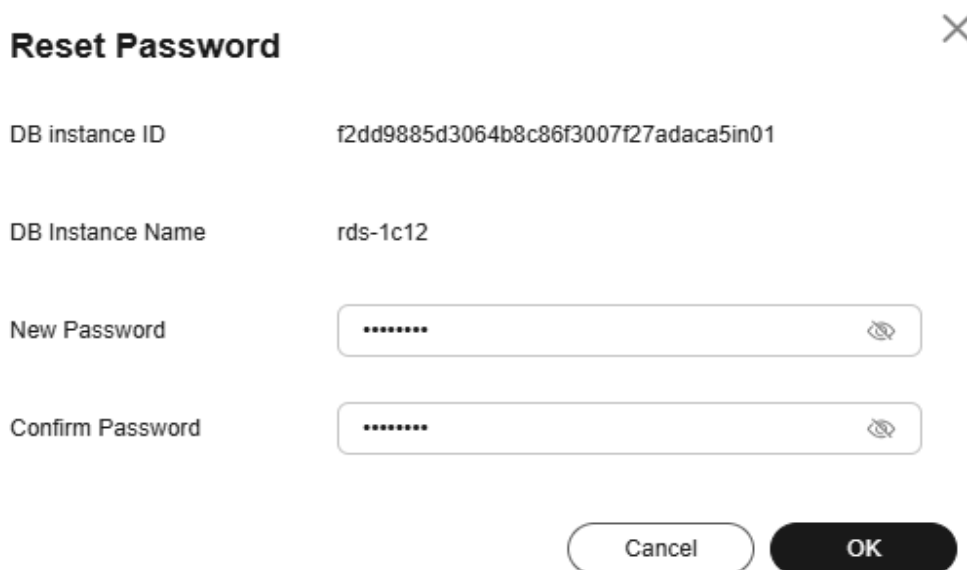
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Databases and Accounts** and then click the **Accounts** tab.

**Step 5** Locate the target account and click **Reset Password** in the **Operation** column.

**Step 6** In the displayed **Reset Password** dialog box, enter and confirm a new password, and click **OK**.

**Figure 5-4** Resetting a password

The dialog box is titled "Reset Password" with a close button (X) in the top right corner. It contains the following fields and controls:

- DB instance ID:** f2dd9885d3064b8c86f3007f27adaca5in01
- DB Instance Name:** rds-1c12
- New Password:** A text input field with masked characters (dots) and a toggle icon (eye) on the right.
- Confirm Password:** A text input field with masked characters (dots) and a toggle icon (eye) on the right.
- Buttons:** "Cancel" and "OK" buttons at the bottom right.

- The password must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^\*\_-=+?,()&.).
- The password must be different from the username or username spelled backwards.
- You are advised to enter a strong password to improve security and prevent security risks such as brute force cracking.
- After the password is reset, the database will not be rebooted and permissions will not be changed.
- You can query password reset records on the CTS console. For details, see [Viewing CTS Traces in the Trace List](#).

**Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

----End

### 5.3.3 Changing Permissions for a Database Account

#### Scenarios

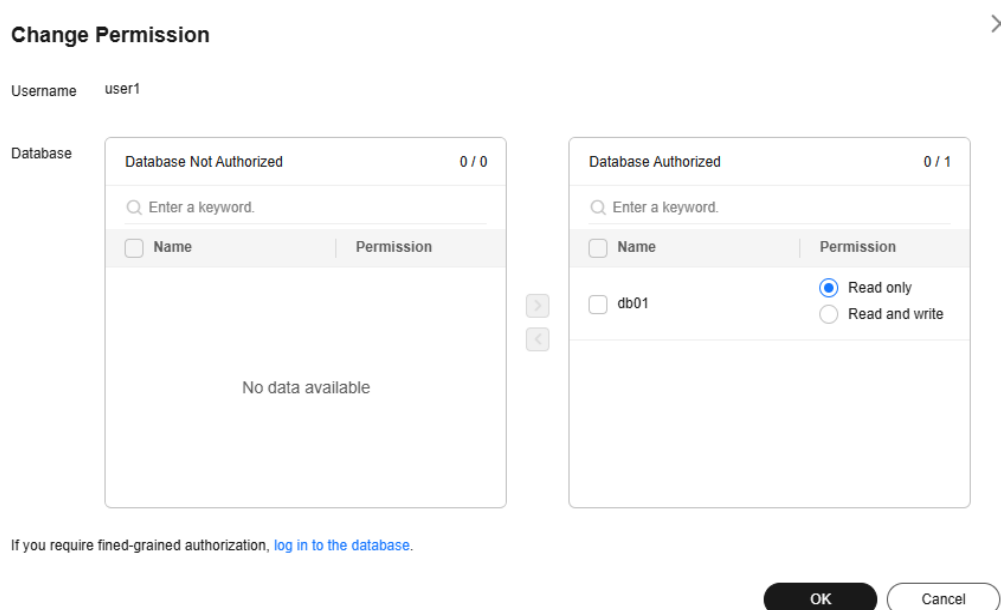
You can authorize database users you have created to specific databases or revoke permissions from authorized database users.

## Constraints

- Take care when changing account permissions. Inappropriately configured account permissions can impact the DB instance or workloads.
- Permissions cannot be changed for DB instances that are in the process of being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.
- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts** and then click the **Accounts** tab.
- Step 5** Locate the target account and click **Change Permission** in the **Operation** column.
- Step 6** In the displayed dialog box, select unauthorized databases and click  to authorize them. You can also select authorized databases and click  to revoke permissions.

**Figure 5-5** Changing permissions

- If there are no unauthorized databases, you can create one by referring to [Creating a Database](#).
- If you require fine-grained permissions control, log in to the database through the DAS console.

**Step 7** Click **OK**.

-----End

## 5.3.4 Modifying Host IP Addresses

### Scenarios

You can change the host IP addresses that are allowed to access your instance as needed.

### Constraints

- This operation cannot be performed for DB instances that are being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.
- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts** and then click the **Accounts** tab.
- Step 5** Locate the target account and choose **More > Modify Host IP Address** in the **Operation** column.
- To enable all IP addresses to access your instance, enter % for **Host IP Address**.
  - To enable all IP addresses in the subnet 10.10.10.X to access your instance, enter 10.10.10.% for **Host IP Address**.
  - To specify multiple IP addresses, separate them with commas (,), for example, 192.168.0.1,172.16.213.9 (no spaces before or after the comma).
- Step 6** Click **OK**.
- Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## 5.3.5 Deleting a Database Account

### Scenarios

You can delete database accounts you have created.

### Constraints

- Deleted database accounts cannot be restored. Exercise caution when deleting an account.
- Accounts cannot be deleted from DB instances that are in the process of being restored.
- Databases and accounts created using other methods than the RDS console and APIs are also displayed on the RDS console. If the names of the created databases or accounts do not meet the [database naming rule](#) or [account naming rule](#), for example, the names containing Chinese characters or unsupported special characters, the databases or accounts cannot be managed on the RDS console or through APIs.
- If the name of any database or account on the source database does not meet the [database naming rule](#) or [account naming rule](#), the database or

account cannot be managed on the RDS console or through APIs after being migrated to the destination RDS for MySQL instance.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Databases and Accounts** and then click the **Accounts** tab.
- Step 5** Locate the target account and choose **More > Delete** in the **Operation** column.
- Step 6** In the displayed dialog box, enter **DELETE** and click **OK**.
- Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End



# 6 Database Migration

---

## 6.1 Migration Solution Overview

You can migrate data from DDM, GaussDB, TaurusDB, self-managed MySQL databases, self-managed Oracle databases, or MySQL databases built on other clouds to RDS for MySQL, or from one RDS for MySQL instance to another RDS for MySQL instance.

Data migration tools include Data Replication Service (DRS), mysqldump, and Data Admin Service (DAS). You are advised to use DRS because it is easy to use and can complete a migration task in minutes. DRS facilitates data transfer between databases, helping you reduce DBA labor costs and hardware costs.

DRS provides real-time migration and synchronization.

- **Real-time migration:** With DRS, you can migrate data from sources to destinations in real time. You just need to create a replication instance to connect to both the source and destination and configure objects to be migrated. DRS will help you compare metrics and data between the source and destination, so you can determine the best time to switch to the destination database while minimizing service downtime.
- **Real-time synchronization:** It refers to the real-time flow of workload data from sources to destinations through a synchronization instance while consistency of data is ensured. It is different from migration. Migration means moving entire data of a database to another. Synchronization refers to the continuous flow of data between different applications.

For more information, see [What Is DRS?](#)

### NOTE

During a DRS full migration, a large number of binlogs are generated in a short period of time and may be temporarily stored on your instance, which may cause the storage space to be used up. You are advised to [enable autoscaling](#) for your instance. To free up storage space, you can [set an appropriate retention period for binlogs](#) and [clear the binlogs](#) in a timely manner.

## Migration Solutions

**Table 6-1** RDS for MySQL migration solutions

| Source Database | Data Size | One-Time or Continuous Migration | Application Downtime | Solution                                                                                                                                                                                                                   | Document                                                                                                                                                                                                             |
|-----------------|-----------|----------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RDS for MySQL   | Small     | One-time                         | Some time            | Use mysqldump to copy data from the source to the destination RDS for MySQL instance.                                                                                                                                      | <a href="#">Migrating Data to RDS for MySQL Using mysqldump</a>                                                                                                                                                      |
|                 | Any       | One-time or continuous           | Minimal              | Use DRS to migrate table, database, or instance data of the source to the destination RDS for MySQL instance.<br><b>NOTE</b><br>For details about real-time migration billing, see <a href="#">DRS Migration Billing</a> . | <a href="#">From MySQL to RDS for MySQL</a>                                                                                                                                                                          |
|                 | Medium    | One-time                         | Some time            | Use DAS to export data from the source and then import the data to the destination RDS for MySQL instance.                                                                                                                 | <a href="#">Migrating Data to RDS for MySQL Using the Export and Import Functions of DAS</a>                                                                                                                         |
|                 | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from the source to the destination RDS for MySQL instance.                                                                                                                                     | <a href="#">From MySQL to RDS for MySQL</a>                                                                                                                                                                          |
|                 | Any       | Continuous                       | Minimal              | Use DRS to synchronize data from the source to the DR RDS for MySQL instance.<br><b>NOTE</b><br>If there is a regional failure, this solution can ensure service continuity by synchronizing data between databases.       | <ul style="list-style-type: none"><li>• <a href="#">Configuring Remote Single-Active DR for an RDS for MySQL Instance Using DRS</a></li><li>• <a href="#">From MySQL to RDS for MySQL (Dual-Active DR)</a></li></ul> |

| Source Database                                                                                             | Data Size | One-Time or Continuous Migration | Application Downtime | Solution                                                                                                                                                                                                                                                                                                                                                                                         | Document                                                                          |
|-------------------------------------------------------------------------------------------------------------|-----------|----------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| DDM                                                                                                         | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from DDM to RDS for MySQL.                                                                                                                                                                                                                                                                                                                                           | <a href="#">From DDM to RDS for MySQL</a>                                         |
| GaussDB distributed                                                                                         | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from a GaussDB distributed instance to RDS for MySQL.                                                                                                                                                                                                                                                                                                                | <a href="#">From GaussDB Distributed to RDS for MySQL</a>                         |
| GaussDB primary/standby                                                                                     | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from a GaussDB primary/standby instance to RDS for MySQL.                                                                                                                                                                                                                                                                                                            | <a href="#">From GaussDB Primary/Standby to RDS for MySQL</a>                     |
| TaurusDB                                                                                                    | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from TaurusDB to RDS for MySQL.                                                                                                                                                                                                                                                                                                                                      | <a href="#">From TaurusDB to RDS for MySQL</a>                                    |
| <ul style="list-style-type: none"><li>On-premises MySQL databases</li><li>MySQL databases on ECSs</li></ul> | Any       | One-time or continuous           | Minimal              | <p>Use DRS to migrate data from self-managed MySQL databases to RDS for MySQL.</p> <p>DRS supports incremental migration, so you can replicate ongoing data changes to keep sources and destinations in sync while minimizing the impact of service downtime and migration.</p> <p><b>NOTE</b><br/>For details about real-time migration billing, see <a href="#">DRS Migration Billing</a>.</p> | <a href="#">Migrating Data from Self-Managed MySQL Databases to RDS for MySQL</a> |

| Source Database                                                                                                   | Data Size | One-Time or Continuous Migration | Application Downtime | Solution                                                                                                                                                                                                                                                                                                                                                             | Document                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                   | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from self-managed MySQL databases to RDS for MySQL.<br><br>Real-time synchronization refers to the real-time flow of workload data from sources to destinations through a synchronization instance while consistency of data is ensured. It is suitable for real-time analysis, and data transfer in report systems and data warehouses. | <a href="#">From MySQL to RDS for MySQL</a>                                                                                                                                             |
|                                                                                                                   | Any       | Continuous                       | Minimal              | Use DRS to synchronize data from self-managed MySQL databases to the DR RDS for MySQL instance.<br><br><b>NOTE</b><br>If there is a regional failure, this solution can ensure service continuity by synchronizing data between databases.                                                                                                                           | <ul style="list-style-type: none"><li>• <a href="#">From MySQL to RDS for MySQL (Single-Active DR)</a></li><li>• <a href="#">From MySQL to RDS for MySQL (Dual-Active DR)</a></li></ul> |
| <ul style="list-style-type: none"><li>• On-premises Oracle databases</li><li>• Oracle databases on ECSs</li></ul> | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from self-managed Oracle databases to RDS for MySQL.                                                                                                                                                                                                                                                                                     | <a href="#">From Oracle to RDS for MySQL</a>                                                                                                                                            |

| Source Database                 | Data Size | One-Time or Continuous Migration | Application Downtime | Solution                                                                                                                                                                                                                                  | Document                                                                                                                                                                                |
|---------------------------------|-----------|----------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MySQL databases on other clouds | Any       | One-time or continuous           | Minimal              | Use DRS to migrate data from MySQL databases on other clouds to RDS for MySQL.<br><b>NOTE</b><br>For details about real-time migration billing, see <a href="#">DRS Migration Billing</a> .                                               | <a href="#">Migrating MySQL Databases from Other Clouds to RDS for MySQL</a>                                                                                                            |
|                                 | Any       | One-time or continuous           | Minimal              | Use DRS to synchronize data from MySQL databases on other clouds to RDS for MySQL.                                                                                                                                                        | <a href="#">From MySQL to RDS for MySQL</a>                                                                                                                                             |
|                                 | Any       | Continuous                       | Minimal              | Use DRS to synchronize data from MySQL databases on other clouds to the DR RDS for MySQL instance.<br><b>NOTE</b><br>If there is a regional failure, this solution can ensure service continuity by synchronizing data between databases. | <ul style="list-style-type: none"><li>• <a href="#">From MySQL to RDS for MySQL (Single-Active DR)</a></li><li>• <a href="#">From MySQL to RDS for MySQL (Dual-Active DR)</a></li></ul> |

## DRS Migration Billing

- Real-time migration supports only the pay-per-use billing mode.  
Real-time migration tasks are free of configuration and traffic fees in the first seven days, lowering your costs for migrating data to the cloud.
- Real-time synchronization and DR support pay-per-use and yearly/monthly billing modes.  
Real-time migration and synchronization will provide long-term discounts, lowering your costs for data transfers.

For more information, see [Data Replication Service Billing](#).

## 6.2 Migrating Data to RDS for MySQL Using mysqldump

### Preparing for Data Migration

You can access RDS DB instances through an EIP or through an ECS.

1. Prepare an ECS for accessing DB instances in the same VPC or prepare a device for accessing RDS through an EIP.
  - To connect to a DB instance through an ECS, you need to create an ECS first.
  - To connect to a DB instance through an EIP, you must:
    - i. Bind an EIP to the DB instance. For details, see [Binding an EIP](#).
    - ii. Ensure that the local device can access the EIP.
2. Install a MySQL client on the prepared ECS or device. For details, see [5](#).

#### NOTE

The MySQL client version must be the same as the DB engine version of your RDS for MySQL instance. A MySQL database or client will provide mysqldump and mysql.

After data is migrated to RDS, you may need to change the IP address. For details, see [Changing a Floating IP Address](#).

RDS system databases **mysql** and **sys** cannot be imported from one RDS for MySQL instance to another.

### Exporting Data

Before migrating a database to RDS, its data needs to be exported.

#### NOTICE

- The export tool must match the DB engine version.
- Database migration is performed offline. Before the migration, you have to stop all applications using the source database.
- Take care when exporting or importing data. Improper operations can cause instance or workload exceptions.

**Step 1** Log in to the source database.

**Step 2** Use the mysqldump tool to export the table structure to an SQL file.

#### NOTICE

The **mysql** database is required for RDS management. When exporting the table structure, do not specify **--all-database**. Otherwise, a database fault will occur.

```
mysqldump--databases<DB_NAME>--single-transaction --order-by-primary --hex-blob --no-data --routines --events --set-gtid-purged=OFF-u <DB_USER>-p -h<DB_ADDRESS>-P <DB_PORT>|sed -e 's/DEFINER[ ]*=[ ]*[^\]*\*/' -e 's/DEFINER[ ]*.*FUNCTION/FUNCTION/' -e 's/DEFINER[ ]*.*PROCEDURE/PROCEDURE/' -e 's/DEFINER[ ]*.*TRIGGER/TRIGGER/' -e 's/DEFINER[ ]*.*EVENT/EVENT/' ><BACKUP_FILE>
```

- *DB\_NAME* indicates the name of the database to be migrated.
- *DB\_USER* indicates the database username.
- *DB\_ADDRESS* indicates the database address.
- *DB\_PORT* indicates the database port.
- *BACKUP\_FILE* indicates the name of the file to which the data will be exported.

Enter the database password when prompted.

Example:

```
mysqldump --databases rdsdb --single-transaction --order-by-primary --hex-blob --no-data --routines --events --set-gtid-purged=OFF -u root -p -h 192.168.151.18 -P 3306 |sed -e 's/DEFINER[ ]*=[ ]*[^\]*\*/' -e 's/DEFINER[ ]*.*FUNCTION/FUNCTION/' -e 's/DEFINER[ ]*.*PROCEDURE/PROCEDURE/' -e 's/DEFINER[ ]*.*TRIGGER/TRIGGER/' -e 's/DEFINER[ ]*.*EVENT/EVENT/' > dump-defs.sql
```

Enter password:

#### NOTE

If you use mysqldump with a version earlier than 5.6, remove **--set-gtid-purged=OFF** before running this command.

After this command is executed, a **dump-defs.sql** file will be generated as follows:

```
[rds@localhost ~]$ ll dump-defs.sql
-rw-r-----. 1 rds rds 2714 Sep 21 08:23 dump-defs.sql
```

**Step 3** Use the mysqldump tool to export data to an SQL file.

#### NOTICE

The **mysql** database is required for RDS management. When exporting data, do not specify **--all-database**. Otherwise, a database fault will occur.

```
mysqldump --databases<DB_NAME>--single-transaction --hex-blob --set-gtid-purged=OFF --no-create-info --skip-triggers-u<DB_USER>-p-h<DB_ADDRESS>-P<DB_PORT>-r<BACKUP_FILE>
```

For details on the parameters in the preceding command, see [Step 2](#).

Enter the database password when prompted.

Example:

```
mysqldump --databases rdsdb --single-transaction --hex-blob --set-gtid-purged=OFF --no-create-info --skip-triggers -u root -p -h 192.168.151.18 -P 3306 -r dump-data.sql
```

 NOTE

If you use mysqldump with a version earlier than 5.6, remove **--set-gtid-purged=OFF** before running this command.

After this command is executed, a **dump-data.sql** file will be generated as follows:

```
[rds@localhost ~]$ ll dump-data.sql
-rw-r-----. 1 rds rds 2714 Sep 21 08:23 dump-data.sql
```

----End

## Importing Data

You can connect your client to an RDS instance and import exported SQL files into the instance.

---

**NOTICE**

If the source database calls triggers, stored procedures, functions, or events, you must set **log\_bin\_trust\_function\_creators** to **ON** on the destination database before importing data.

---

**Step 1** Log in to the ECS or the device that can access the RDS DB instance.

**Step 2** Connect to the RDS DB instance through a client.

**Step 3** Import the table structure into the DB instance.

```
# mysql -f -h<RDS_ADDRESS>-P<DB_PORT>-uroot-p < <BACKUP_DIR>/dump-
defs.sql
```

- *RDS\_ADDRESS* indicates the IP address of the RDS DB instance.
- *DB\_PORT* indicates the RDS DB instance port.
- *BACKUP\_DIR* indicates the directory where **dump-defs.sql** is stored.

Example:

```
# mysql -f -h 172.16.66.198 -P 3306 -u root -p < dump-defs.sql
```

Enter password:

 NOTE

If you intend to import SQL statements of a table to RDS, specify a database in the command. Otherwise, the error message "No database selected" may be displayed. For example, if you intend to import SQL statements of a table to database **mydb**, run the following command:

```
# mysql -f -h 172.16.66.198 -P 3306 -u root -p mydb < dump-defs.sql
```

Enter password:

**Step 4** Import data into the DB instance.

```
# mysql -f -h<RDS_ADDRESS>-P<DB_PORT>-uroot-p< <BACKUP_DIR>/dump-
data.sql
```

- *RDS\_ADDRESS* indicates the IP address of the RDS DB instance.



- *DB\_PORT* indicates the RDS DB instance port.
- *BACKUP\_DIR* indicates the directory where **dump-data.sql** is stored.

Example:

```
# mysql -f -h 172.16.66.198 -P 3306 -u root -p < dump-data.sql
```

Enter password:

#### NOTE

If you intend to import SQL statements of a table to RDS, specify a database in the command. Otherwise, the error message "No database selected" may be displayed. For example, if you intend to import SQL statements of a table to database **mydb**, run the following command:

```
# mysql -f -h 172.16.66.198 -P 3306 -u root -p mydb < dump-defs.sql
```

Enter password:

**Step 5** View the import result.

```
mysql> show databases;
```

The following result indicates that database **rdsdb** has been imported.

```
mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| rdsdb |
| mysql |
| performance_schema |
| sys |
+-----+
4 rows in set (0.00 sec)
```

----End

## 6.3 Migrating Data to RDS for MySQL Using the Export and Import Functions of DAS

### Scenarios

Data Admin Service (DAS) is a one-stop management platform that allows you to manage Huawei Cloud databases on a web console. It offers database development, O&M, and intelligent diagnosis, making it easy to use and maintain databases.

To back up or migrate data, you can use DAS to export data from the source database first and then import the data to from your local PC or OBS bucket to the destination database.

For more information, see [Import and Export](#).

### Constraints

- Take care when exporting or importing data. Improper operations can cause instance or workload exceptions.

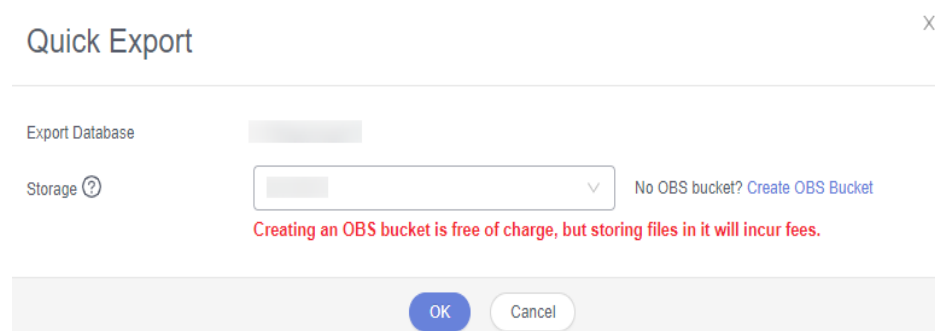
- Only one file that is no larger than 1 GB can be imported at a time.
- Only data files in the CSV or SQL format can be imported.
- Binary fields such as BINARY, VARBINARY, TINYBLOB, BLOB, MEDIUMBLOB, and LONGBLOB are not supported.
- Data cannot be exported or imported using cross-region OBS buckets.
- If there are more than 100,000 tables in an RDS for MySQL 8.0 instance (or more than 10,000 tables in an RDS for MySQL 5.7 or 5.6 instance), an error will be reported when you export data using the **Export Database** function of DAS. In this case, use the **Export SQL Result** function instead.

## Exporting Data

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.
- Step 4** On the displayed login page, enter the username and password and click **Log In**.
- Step 5** On the top menu bar, choose **Import and Export > Export**.
- Step 6** On the displayed page, click **Create Task** and choose **Export Database** or **Export SQL Result** as required. The following takes database export as an example.

Alternatively, click **Quick Export** and select the target database. On the displayed page, select a storage path and click **OK**.

**Figure 6-1** Quick export



Quick Export

Export Database

Storage   No OBS bucket? [Create OBS Bucket](#)

Creating an OBS bucket is free of charge, but storing files in it will incur fees.

**OK** **Cancel**

- Step 7** On the displayed page, set parameters as required in areas **Basic Information** and **Advanced Settings**. Then, select the tables to be exported on the right.

**Figure 6-2** Creating an export task

**Export Database**

**Basic Information**

Database:  ☐ Export all tables

Allowed Rows:

File Type: ☒ SQL ☐ CSV

Object to Export: ☒ Data ☐ Structure ☐ Data and structure

Charset: ☒ UTF8 ☐ GBK

Storage:  No OBS bucket? [Create OBS Bucket](#)

**Creating an OBS bucket is free of charge, but storing files in it will incur fees.**

Options: ☒ Combine INSERT statements. (Combine INSERT statements into files, with each file smaller than 5 MB.)  
☐ Generate a file for each table. (Downloading table files in the details slows down the export.)

Remarks:

**Advanced Settings**

**Tables**

Selected Tables: 0

| <input type="checkbox"/> | Table Name    | Column               | WHERE Clause         |
|--------------------------|---------------|----------------------|----------------------|
| <input type="checkbox"/> | asd           | <a href="#">Edit</a> | <a href="#">Edit</a> |
| <input type="checkbox"/> | dddd          | <a href="#">Edit</a> | <a href="#">Edit</a> |
| <input type="checkbox"/> | new_db1_tb1   | <a href="#">Edit</a> | <a href="#">Edit</a> |
| <input type="checkbox"/> | rule_aml_main | <a href="#">Edit</a> | <a href="#">Edit</a> |
| <input type="checkbox"/> | test1         | <a href="#">Edit</a> | <a href="#">Edit</a> |

10 / page Total Records: 5 < 1 >

- In a SQL result export task, the executed SQL statements cannot exceed 5 MB.

**Export SQL Result**

**Basic Information**

Database:

Allowed Rows:

File Type: ☒ SQL-Insert ☐ CSV

Charset: ☒ UTF8 ☐ GBK

Storage:  No OBS bucket? [Create Bucket](#)

**Creating an OBS bucket is free of charge, but storing files in it will incur fees.**

Options: ☒ Combine INSERT statements. (Combine INSERT statements into files, with each file smaller than 5 MB.)  
☐ Generate one file for each result.

SQL to Execute:

Remarks:

**Advanced Settings**

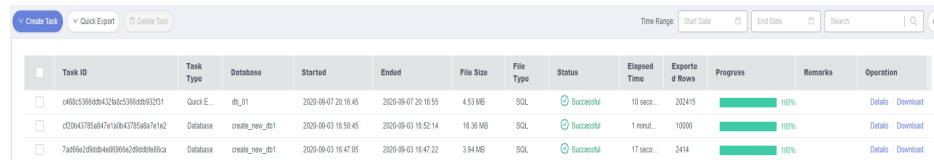
- Databases are classified into user databases and system databases. System databases cannot be exported. If system database data is required, deploy system database services in a created user database, so that you can export the system database data from the user database.
- DAS connects to your standby database to export data. This prevents the primary database from being affected by data export. However, if the standby database has a high replication delay, the exported data may not be the latest.

**Step 8** After settings are complete, click **OK**.

**Step 9** In the task list, view the task ID, type, status, and progress.

**Step 10** Click **Details** in the **Operation** column to view task details.

**Figure 6-3** Task list



|                          | Task ID                         | Task Type  | Database       | Started             | Ended               | File Size | File Type | Status     | Elapsed Time | Exported Rows | Progress                    | Remarks | Operation                                        |
|--------------------------|---------------------------------|------------|----------------|---------------------|---------------------|-----------|-----------|------------|--------------|---------------|-----------------------------|---------|--------------------------------------------------|
| <input type="checkbox"/> | c468c5986db43226b53968db692051  | Quick E... | db_01          | 2020-09-07 20:16:45 | 2020-09-07 20:16:55 | 4.53 MB   | SQL       | Successful | 10 secs...   | 202415        | <div><div></div></div> 100% |         | <a href="#">Details</a> <a href="#">Download</a> |
| <input type="checkbox"/> | c02843785847e1a0b43795aba7e1a02 | Database   | create_new_db1 | 2020-09-03 16:50:45 | 2020-09-03 16:52:14 | 16.36 MB  | SQL       | Successful | 1 min...     | 10000         | <div><div></div></div> 100% |         | <a href="#">Details</a> <a href="#">Download</a> |
| <input type="checkbox"/> | 7a959a2986b4a88999a28f8db6d5ca  | Database   | create_new_db1 | 2020-09-03 16:47:05 | 2020-09-03 16:47:22 | 3.84 MB   | SQL       | Successful | 17 secs...   | 2414          | <div><div></div></div> 100% |         | <a href="#">Details</a> <a href="#">Download</a> |

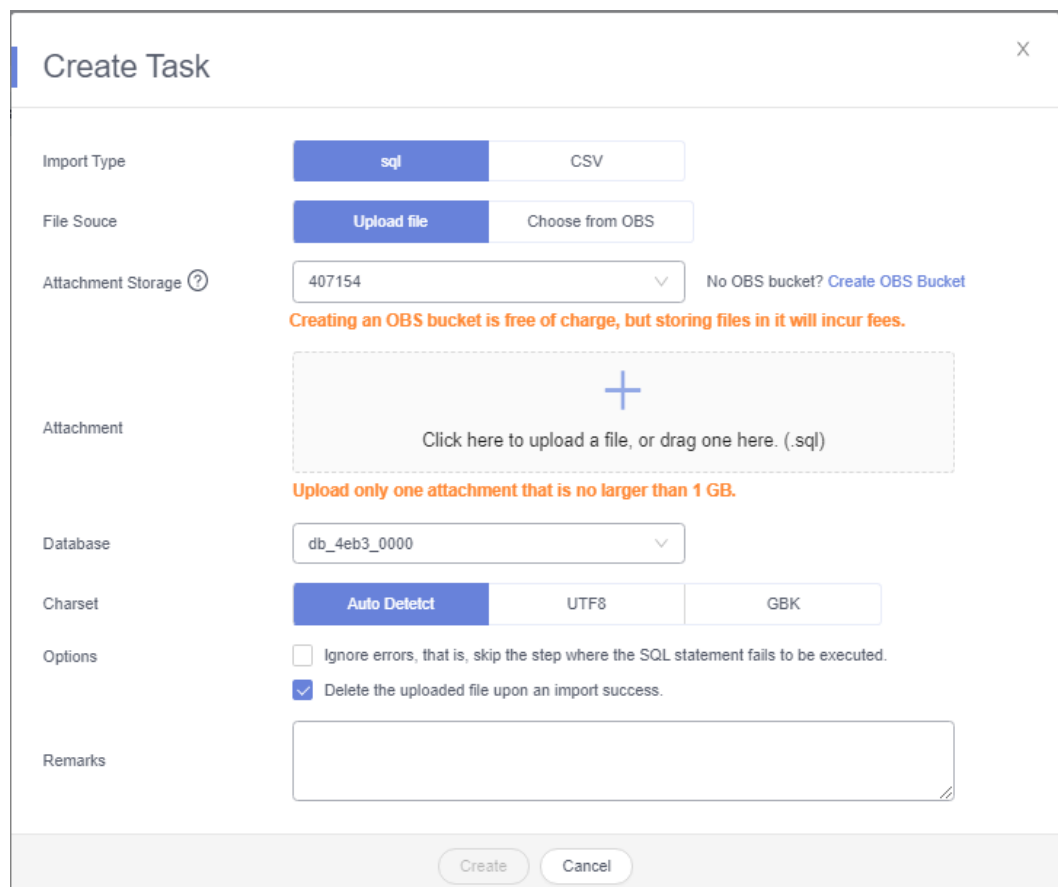
-----End

## Importing Data

**Step 1** On the top menu bar, choose **Import and Export > Import**.

**Step 2** Import a file from your local PC or an OBS bucket.

**Figure 6-4** Creating an import task



**Create Task**

Import Type: **sql** | CSV

File Source: **Upload file** | Choose from OBS

Attachment Storage: 407154 No OBS bucket? [Create OBS Bucket](#)

Creating an OBS bucket is free of charge, but storing files in it will incur fees.

Attachment: 

Click here to upload a file, or drag one here. (.sql)

  
Upload only one attachment that is no larger than 1 GB.

Database: db\_4eb3\_0000

Charset: **Auto Detect** | UTF8 | GBK

Options:  
☐ Ignore errors, that is, skip the step where the SQL statement fails to be executed.  
☒ Delete the uploaded file upon an import success.

Remarks:

**Create** **Cancel**

- From your local PC  
In the upper left corner, click **Create Task**. On the displayed page, select an import type, select **Upload file** for **File Source**, set the attachment storage, and upload the file. Then, set other parameters as required.  
For security purposes, imported files are stored in OBS buckets.

 **NOTE**

- To keep your data secure, provide your own OBS bucket to store the attachments you upload. In this way, DAS automatically connects to your OBS bucket for in-memory reading.
- If you select **Delete the uploaded file upon an import success**, the file you uploaded will be automatically deleted from the OBS bucket after being imported to the destination database.
- From an OBS bucket  
In the upper left corner, click **Create Task**. On the displayed page, select an import type, select **Choose from OBS** for **File Source**, and select a file from the bucket. Then, set other parameters as required.

 **NOTE**

The file uploaded from an OBS bucket will not be deleted upon an import success.

**Step 3** After setting the import parameters, click **Create**. Confirm the information again before you click **OK** because original data may be overwritten after data import.

**Step 4** View the import progress in the task list or check task details.

----End

# 7 Version Upgrade

## 7.1 Upgrading a Minor Version

### Scenarios

RDS for MySQL supports minor version upgrades to improve performance, add new functions, and fix bugs.

By default, a newly created DB instance uses the latest minor version. When a new minor version is released on Huawei Cloud, the **Upgrade** link is displayed in the **DB Engine Version** column on the **Instances** page. You can click **Upgrade** to go to the minor version upgrade page.

Figure 7-1 Version upgrade

| <input type="checkbox"/> | Name/ID | Descr. | DB Instan. | DB Engine Version       | Status | Billin. | Floati. | Privat. | Enter. | Created | Datab. | Stora. | Operation              |
|--------------------------|---------|--------|------------|-------------------------|--------|---------|---------|---------|--------|---------|--------|--------|------------------------|
| <input type="checkbox"/> |         |        | Single     | MySQL 5.6.45<br>Upgrade | +      | Yearly  |         |         |        |         |        |        | View Metric Renew More |

### Upgrade Methods

The system upgrades the minor version of your instance in either of the following ways:

- For a single-node instance or read replica, the system uses an in-place upgrade by first stopping the kernel process and then upgrading the kernel.
- For a primary/standby instance, the system uses a rolling upgrade, which requires two primary/standby switchovers. The system first upgrades the standby instance, then performs a primary/standby switchover and upgrades the original primary instance, and finally performs another switchover.

You can choose an upgrade time as needed.

- Upon submission: The system **upgrades the minor version** upon your manual submission of the upgrade request.
- In maintenance window: The system upgrades the minor version during the maintenance window you specified. For details about how to change the maintenance window, see **Changing the Maintenance Window**.

If the kernel version of your instance has potential risks or major defects, has expired, or has been brought offline, the system will notify you by SMS message or email and deliver an upgrade task during the maintenance window.

## Precautions

- When any new minor version is released for addressing issues and vulnerabilities from the open source community, upgrade the minor version of your instance **immediately** or **during the maintenance window**.
- The upgrade will cause the DB instance to reboot and briefly interrupt services. To limit the impact of the upgrade, perform the upgrade during off-peak hours, or ensure that your applications support automatic reconnection.
- A minor version upgrade involves switchovers between primary and standby instances, which cause a brief service interruption. Besides, there can be two waits of up to 10s for a single SQL statement to update or write data because the default replication between primary and standby instances is semi-synchronous. To avoid the waits, change the replication mode to asynchronous before the upgrade.
- If primary and standby DB instances are deployed in the same AZ, a minor version upgrade will trigger a switchover. If they are deployed in different AZs, a minor version upgrade will trigger two switchovers.
- When you upgrade a minor version of a primary DB instance, minor versions of read replicas (if any) will also be upgraded automatically (they cannot be upgraded separately). Perform the upgrade during off-peak hours because the DB instance will be rebooted after the upgrade is complete.
- If your RDS instance is involved in a DRS task, upgrading the minor version may cause the DRS task to fail.

You are advised to check the retention period of RDS instance binlogs before upgrading the minor version.

- If the binlogs are within the retention period, the DRS task will automatically restart after the minor version is upgraded.
- If the binlogs are beyond the retention period, you need to reconfigure or recreate a DRS task.
- A minor version upgrade cannot be rolled back after the upgrade is complete. If the upgrade fails, the DB instance will be automatically rolled back to the source version.
- You are advised to perform a full backup before upgrading a minor version.
- A minor version can be upgraded in minutes. Do not perform any of the following operations during an upgrade, as they can significantly increase the upgrade time:
  - Frequent access to system databases or tables such as `performance_schema` and `mysql`
  - Frequent writes causing a replication delay or high dirty page ratio of the buffer pool
- DDL operations on events, such as `CREATE EVENT`, `DROP EVENT`, and `ALTER EVENT`, are not allowed during a minor version upgrade. If there is any DDL operation, handle it by referring to [What Can I Do If a DDL Operation Is Being Performed on the Primary Node During a Minor Version Upgrade?](#).

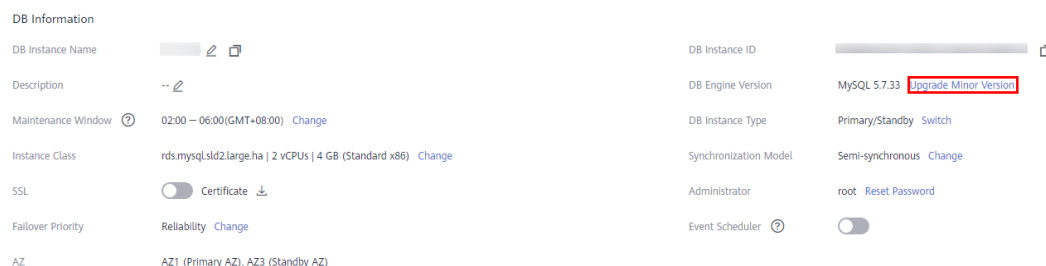
## Constraints

- If the replication delay between primary and standby DB instances is longer than 300 seconds, the minor version cannot be upgraded.
- For primary/standby DB instances, the standby DB instance is upgraded first and then the primary DB instance is upgraded afterwards.
- Minor versions cannot be upgraded for DB instances with abnormal nodes.
- RDS for MySQL DB instances with the event scheduler function enabled do not support minor version upgrades. If you want to perform a minor version upgrade, disable event scheduler first. For operation details, see [Enabling or Disabling Event Scheduler](#).
- TLSv1.1 is not supported for RDS for MySQL 8.0.28 or later versions. To modify the TLS version, change the value of the parameter `loose_tls_version`.

## Procedure

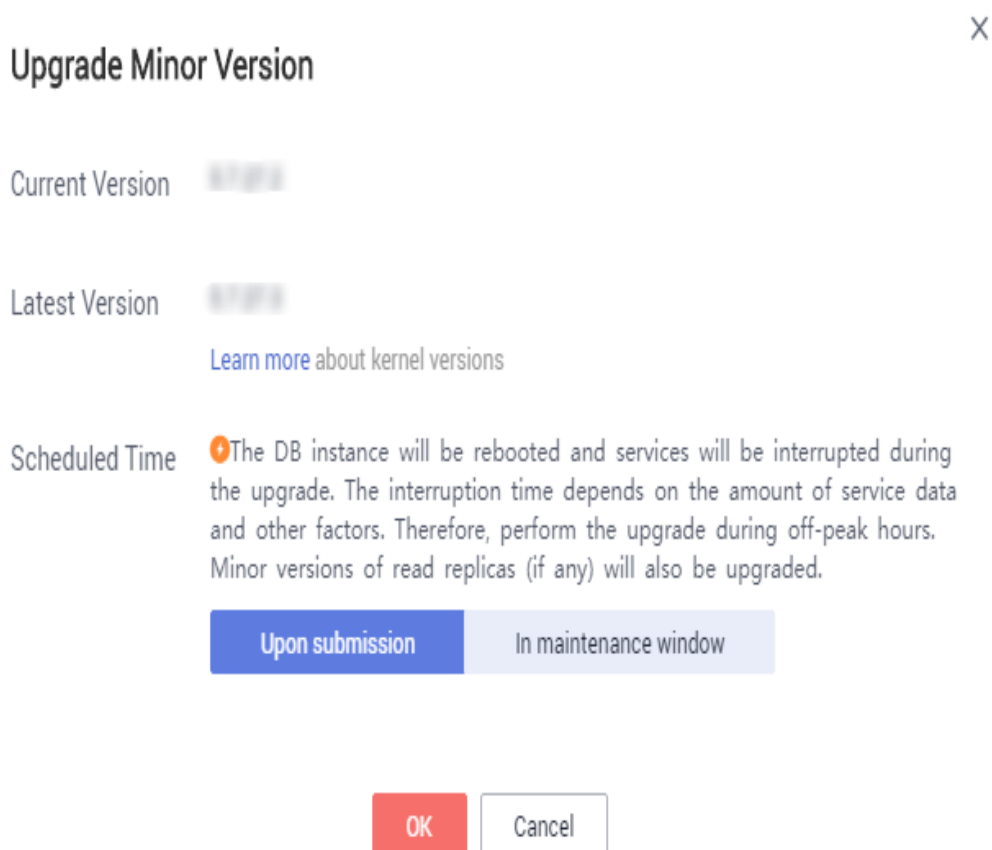
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.
- Step 4** Under **DB Engine Version**, click **Upgrade Minor Version**.

**Figure 7-2** Upgrading a minor version



- Step 5** In the displayed dialog box, select a scheduled time and click **OK**.
- **Upon submission:** The system upgrades the minor version immediately after you have submitted your upgrade request.
  - **In maintenance window:** The system will upgrade the minor version during the maintenance window that you have configured.



**Figure 7-3** Selecting a scheduled time

**Step 6** After the upgrade is complete, the minor version of your instance becomes the latest minor version.

----End

## Follow-up Operations

Return to the instance list. In the navigation pane on the left, choose **Task Center** and check the progress of the upgrade task.

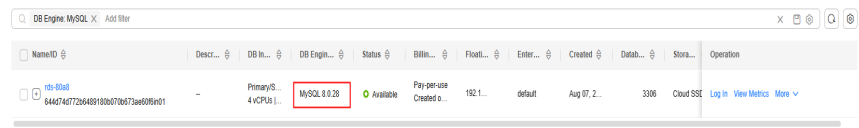
- If you have selected **Upon submission** for **Scheduled Time**:  
On the **Instant Tasks** page, search for the task **Upgrading a MySQL DB instance engine version** and check the execution progress. Instant tasks cannot be canceled.
- If you have selected **In maintenance window** for **Scheduled Time**:  
On the **Scheduled Tasks** page, search for the instance ID and check the execution status of the upgrade task.  
If the task is in the **To be executed** state, you can click **Cancel** to cancel the task.

For details, see [Viewing a Task](#).

## How Do I Check the Version of My DB Instance?

- Check it on the **Instances** page of the RDS console.

Figure 7-4 Instances



| NameID                          | Descr... | DB In...    | DB Engin...  | Status    | Bin...      | Flatt... | Enter... | Created      | Detail... | Stora...  | Operation                                                                |
|---------------------------------|----------|-------------|--------------|-----------|-------------|----------|----------|--------------|-----------|-----------|--------------------------------------------------------------------------|
| 644674d72b6489180b70873ae0909d1 |          | PrimaryS... | MySQL 8.0.28 | Available | Pay-per-use | 192.1... | default  | Aug 07, 2... | 3306      | Cloud SSE | <a href="#">Log In</a> <a href="#">View Metrics</a> <a href="#">More</a> |

- Check it on the DAS console.
  - a. Log in to the target DB instance on the DAS console.
  - b. On the top menu bar, choose **SQL Operations** > **SQL Query**.
  - c. Run **select @@version;** to query the version of the DB instance.

## What Can I Do If a DDL Operation Is Being Performed on the Primary Node During a Minor Version Upgrade?

- Method 1

Change the status of the event whose status is **SLAVESIDE\_DISABLED** to **ENABLED** or **DISABLED**, and then perform the upgrade. The procedure is as follows:

- a. Query the event whose status is **SLAVESIDE\_DISABLED**.  

```
select * from mysql.event where status='SLAVESIDE_DISABLED';
```
- b. Change the event status to **ENABLED** or **DISABLED**.

- Enabled  

```
ALTER EVENT event_name ENABLED;
```

- Disabled  

```
ALTER EVENT event_name DISABLED;
```

- Method 2

Delete the event whose status is **SLAVESIDE\_DISABLED** and then perform the upgrade. The procedure is as follows:

- a. Disable the event scheduler. For details, see [Enabling or Disabling Event Scheduler](#).
- b. Change the event status to **DISABLED**.  

```
ALTER EVENT event_name DISABLED;
```

## 7.2 Upgrading an RDS for MySQL Instance from 5.7 to 8.0

### Scenarios

You can upgrade your DB instance from 5.7 to 8.0 for more functions and better experience.

## Upgrade Methods

During a major upgrade, the system first creates a target instance of the new version, synchronizes data from the source instance to the target instance, and then switches the virtual IP address of the source instance to the target instance.

RDS for MySQL allows you to upgrade the major version of a DB instance in either of the following ways:

- **Upgrading a major version on the RDS console:** For details about version functions, see [RDS for MySQL Kernel Version Description](#).  
To use this function, [submit a service ticket](#) to request required permissions.
- **Upgrading a major version using DRS:** You can migrate instance data from an earlier version to a later version.

## Upgrade Notes

**Table 7-1** Upgrade notes

| Phase             | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before an upgrade | <ul style="list-style-type: none"><li>You are advised to restore data to a new instance and perform a test first. After confirming that all functions are normal, upgrade the original instance.</li><li>A pre-check is required for DB instances to be upgraded from MySQL 5.7 to 8.0. Note that:<ul style="list-style-type: none"><li>The time required for the pre-check depends on how many tables there are in your instance. To prevent service interruptions, perform the upgrade during off-peak hours.</li><li>The check report is retained for 24 hours. Download it before it is deleted.</li><li>If the <b>Parameters</b> item fails the check, rectify the fault based on the check items in the check details by referring to <a href="#">Table 7-3</a>. Check items whose severity is <b>Error</b> must be rectified before the upgrade can be performed. Check items whose severity is <b>Warning</b> only requires you to learn about the kernel feature changes after the upgrade.</li><li>After the fault is rectified, you need to click <b>Retry</b> to obtain the new check results.</li></ul></li><li>Only the latest minor version of MySQL 5.7 can be upgraded to that of MySQL 8.0. Ensure that your</li></ul> | <ul style="list-style-type: none"><li>After your instance is upgraded to a new major version, it cannot be downgraded. For details about kernel versions, see <a href="#">Kernel Version Description</a>.</li><li>Upgrade from MySQL 5.7 to 8.0 cannot be performed for any of the following instances:<ul style="list-style-type: none"><li>Instance associated with a DDM instance or with database proxy enabled</li><li>Single-node instance. By default, single-node instances do not support major version upgrades, because upgrading a single-node instance to a new major version may affect the instance performance during the pre-check. If you need to use this function, <a href="#">submit a service ticket</a> to request required permissions.</li><li>Instance whose read replicas have been configured with SQL throttling rules. To upgrade the instance, delete such rules from the read replicas first.</li></ul></li><li>If the replication delay between primary and standby instances is longer than 300 seconds, the major version cannot be upgraded.</li><li>The major version cannot be upgraded for DB instances with abnormal nodes.</li><li>If there are DRS tasks in the DB instance, the major version cannot be upgraded. Delete DRS tasks before the upgrade.</li><li>RDS for MySQL DB instances support a maximum of 500,000 tables (including system tables)</li></ul> |

| Phase | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | <p>instance uses the latest minor version of MySQL 5.7.</p> <ul style="list-style-type: none"><li>• You are advised not to perform a major version upgrade during the backup time window.</li><li>• You are advised to perform a full backup before upgrading a major version.</li><li>• After your instance is upgraded to MySQL 8.0, read replicas (if any) share the SQL throttling rules of the primary instance. To prevent those rules of the primary instance from affecting workloads on the read replicas, review and adjust the rules of the primary instance before the upgrade.</li></ul> | <p>and data tables). If the number of tables is greater than 500,000, the major version upgrade may fail.</p> <ul style="list-style-type: none"><li>• RDS for MySQL DB instances with event scheduler enabled do not support major version upgrades. If you want to perform a major version upgrade, disable event scheduler first. For details, see <a href="#">Enabling or Disabling Event Scheduler</a>.</li><li>• Before an upgrade, if there are any XA transactions in the prepared state, commit or roll back the transactions first. For details, see <a href="#">#rds_05_0004/section148913248415</a>.</li><li>• If you have upgraded your instance from version 5.6 to 5.7, to prevent potential issues, wait at least 24 hours before upgrading it to version 8.0.</li></ul> |

| Phase             | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| During an upgrade | <ul style="list-style-type: none"><li>• The time required for upgrading the major version of your instance depends on how many tables there are in the instance and how much data is stored. Perform an upgrade during off-peak hours.</li><li>• Upgrading a major version will cause an interruption for 10 to 120 seconds. Ensure that your applications support automatic reconnection. Perform this operation during off-peak hours because upgrading a major version during peak hours takes longer time.</li><li>• When you upgrade a major version of a primary DB instance, major versions of its read replicas (if any) will also be upgraded. Major versions of read replicas cannot be upgraded separately.</li></ul> | <ul style="list-style-type: none"><li>• When your instance is being upgraded, storage autoscaling does not take effect, so sufficient storage must be reserved to ensure that data writes can continue during the upgrade.</li><li>• DDL operations on events, such as CREATE EVENT, DROP EVENT, and ALTER EVENT, are not allowed during a major version upgrade.</li><li>• Scheduled major version upgrades need to be prepared in advance and cannot be canceled.</li></ul> |

| Phase            | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Constraints                                                                                                                                                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After an upgrade | <ul style="list-style-type: none"><li>Before the upgrade, compare the old and new versions carefully. To ensure that the syntax and features of the old version used by your applications are compatible with the new version, create a new RDS for MySQL 5.7 or 8.0 instance to test the syntax before the upgrade.</li><li>After a major version upgrade, specification parameters are reset to the default values of the new version, including <b>threadpool_size</b>, <b>innodb_buffer_pool_size</b>, <b>innodb_io_capacity</b>, <b>innodb_io_capacity_max</b>, <b>innodb_buffer_pool_instances</b>, <b>back_log</b>, and <b>max_connections</b>.</li><li>The value ranges of a given parameter may be different in RDS for MySQL 5.7 and 8.0. For example, if <b>max_execution_time</b> is set to a value less than <b>60000</b> in an RDS for MySQL 5.7 instance, it will be reset to the default value <b>0</b> after a major version upgrade. This is because the minimum value of <b>max_execution_time</b> in RDS for MySQL 8.0 can only be <b>60000</b>.</li></ul> | <ul style="list-style-type: none"><li>After a major version upgrade is complete, the backups before the upgrade cannot be used for the instance of the new version, and the time points before the upgrade cannot be selected for point-in-time recovery (PITR).</li></ul> |

## Upgrading a Major Version on the RDS Console

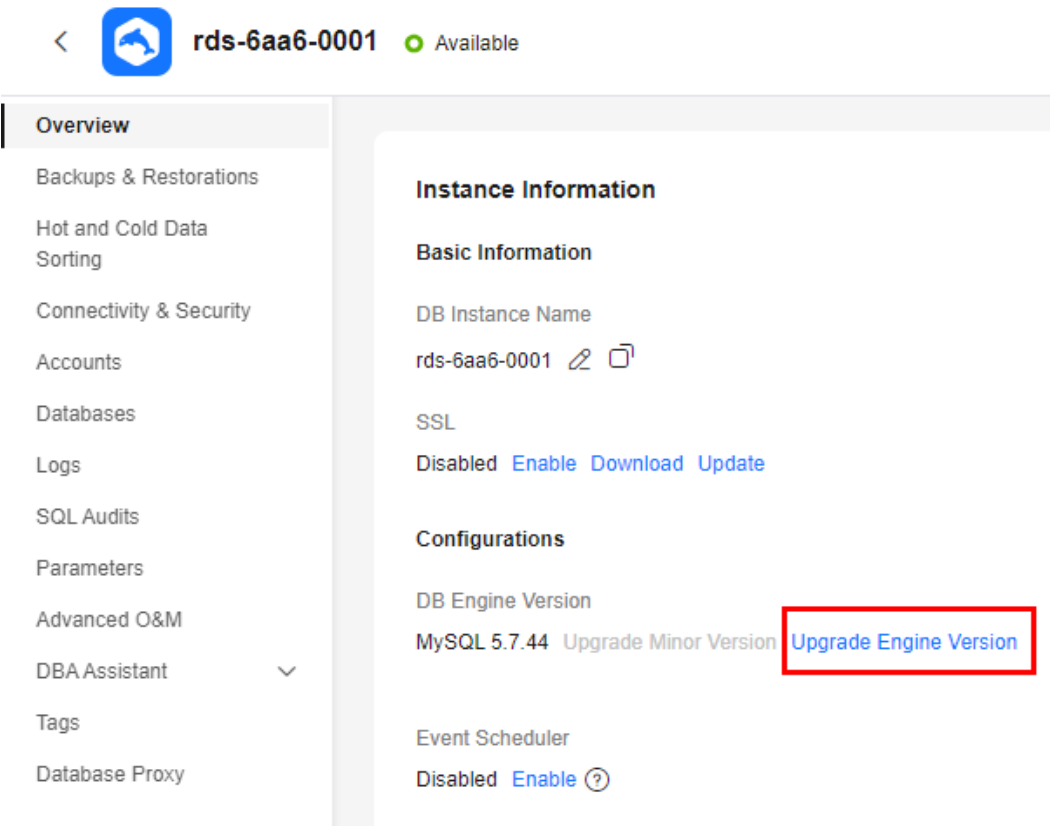
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.

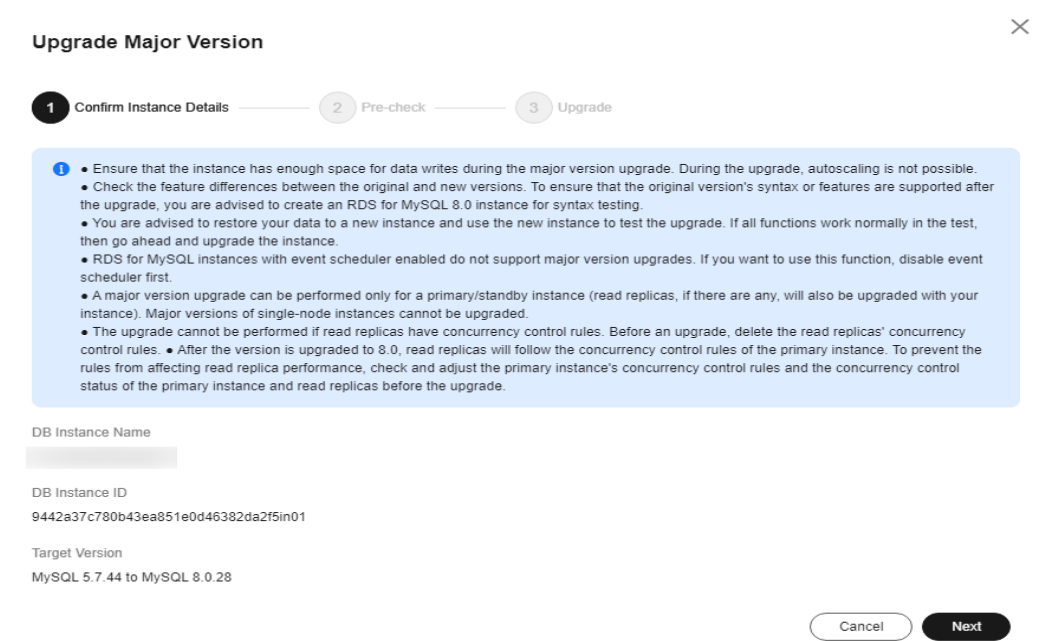
**Step 4** Under **DB Engine Version**, click **Upgrade Engine Version**.

**Figure 7-5** Upgrading a major version



**Step 5** In the displayed dialog box, confirm instance details and click **Next**.

**Figure 7-6** Confirming instance details

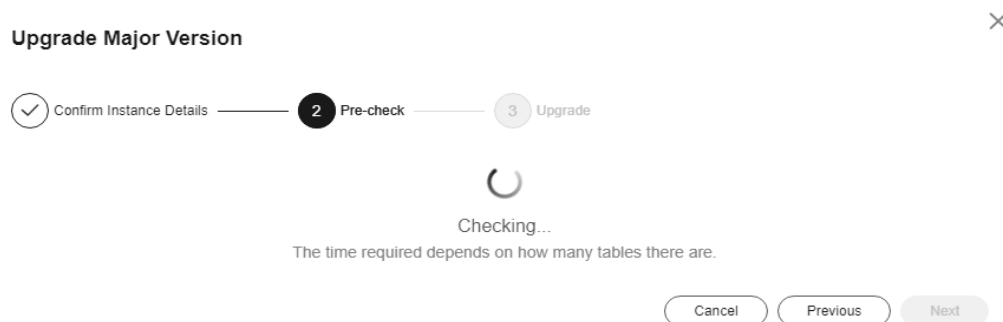




- If the instance is to be upgraded from MySQL 5.7 to 8.0, go to [Step 6](#).
- In other scenarios, go to [Step 7](#).

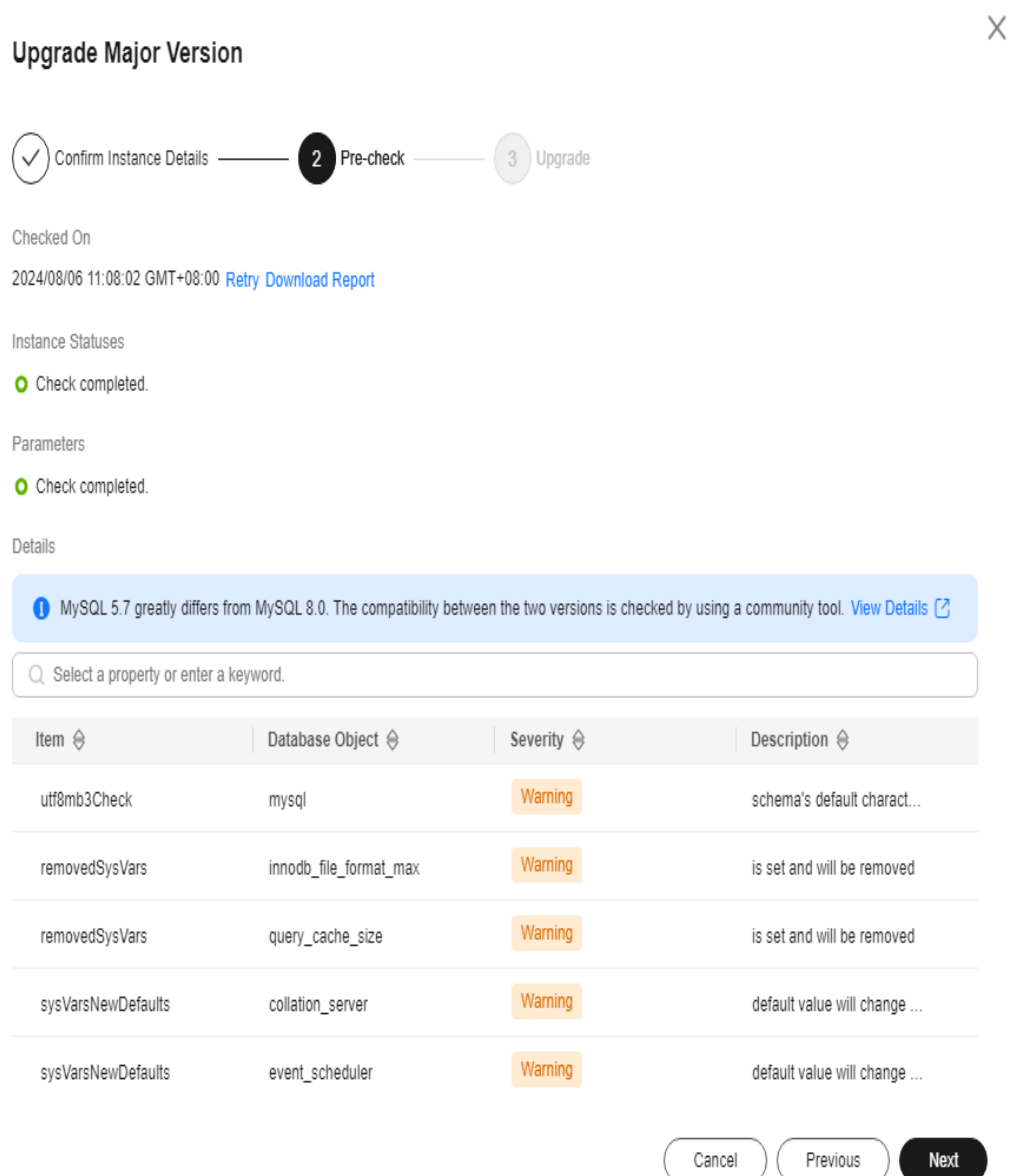
**Step 6** Perform a pre-check.

**Figure 7-7** Performing a pre-check



After the pre-check is complete, rectify the fault (if any) based on the pre-check results by referring to [Table 7-3](#).

After the fault is rectified, click **Retry** to perform a check again until the values of both **Instance Statuses** and **Parameters** are **Check completed**. Then, click **Next**.

**Figure 7-8** Check completed

**Step 7** Select a scheduled time and click **OK**.

- **Upon submission:** The system upgrades your instance to the latest version of 5.7 or 8.0 immediately after you submit the upgrade request.
- **In maintenance window:** The system will upgrade your instance to the latest version of 5.7 or 8.0 during the maintenance window you specified. For details about how to configure a maintenance window, see [Changing the Maintenance Window](#).

Figure 7-9 Selecting a scheduled time

Upgrade Major Version

Confirm Instance Details

Pre-check

3 Upgrade

• After a major version upgrade is complete, the version cannot be downgraded.

• After a major version upgrade is complete, the following specification parameters will restore to the default values of the new version: threadpool\_size, innodb\_buffer\_pool\_size, innodb\_io\_capacity, innodb\_io\_capacity\_max, innodb\_buffer\_pool\_instances, back\_log, and max\_connections

• After the major version is upgraded, backups created before the upgrade cannot be used for restoring the instance of the new version, and the instance, databases, or tables can only be restored to a point in time from a moment after the upgrade.

Scheduled Time

Upon submission

• A major version upgrade will interrupt your applications for no more than 5 minutes. To minimize the impact, perform the upgrade during off-peak hours and ensure that your applications support automatic reconnection.

☒ I have understood the upgrade precautions.

Cancel

Previous

OK

If the upgrade fails, rectify the fault by referring to [Table 7-4](#).

----End

### Upgrading a Major Version Using DRS

You can migrate data from an RDS for MySQL 5.7 instance to an RDS for MySQL 8.0 instance using Data Replication Service (DRS). **Before the migration, prepare a DB instance of the target version.**

On the **Instances** page, click the instance you want to migrate. On the displayed **Overview** page, click **Migrate Database** in the upper right corner.

For more information, see [Creating a Migration Task](#) in the *Data Replication Service User Guide*.

Table 7-2 MySQL database version information

| Source Database Version                                                                                                                                | Destination Database Version                                                                    | Migration Type  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------|
| RDS for MySQL/Self-managed MySQL/MySQL in other clouds <ul style="list-style-type: none"><li>5.5.x</li><li>5.6.x</li><li>5.7.x</li><li>8.0.x</li></ul> | RDS for MySQL <ul style="list-style-type: none"><li>5.6.x</li><li>5.7.x</li><li>8.0.x</li></ul> | Version upgrade |

 NOTE

DRS supports migration only from an earlier version to a later version.

Upgrade Pre-check

Table 7-3 Check items and rectification

| Check Item         | Description                                           | Rectification                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| utf8mb3Check       | Check the character set utf8mb3.                      | In MySQL 5.7, the character set utf8 is equivalent to utf8mb3. In MySQL 8.0, the character set utf8 is equivalent to utf8mb4. After the upgrade, if you use utf8 to create tables, utf8mb4 is actually used.<br>No action is required.                                                                                                                                                                                                                                                     |
| removedSysVars     | Check the removed system variables.                   | Some system variables have been deleted from MySQL 8.0.<br>This check item does not affect the upgrade. No action is required.                                                                                                                                                                                                                                                                                                                                                             |
| sysVarsNewDefaults | Check the default values of system variables.         | Some system variables have new default values in MySQL 8.0. If you have changed the values of such variables before the upgrade, the new values are retained after the upgrade. If you have not changed the values, the new default values in MySQL 8.0 are used.<br>This check item does not affect the upgrade. No action is required.                                                                                                                                                   |
| zeroDatesCheck     | Check for zero dates, DATETIME, and TIMESTAMP values. | In MySQL 8.0.16 or later versions, when a zero-value date (for example, 2024-00-00) is used as a query condition, MySQL converts the character string to DATE. If the conversion fails, an error is reported.<br>This check item does not affect the upgrade but affects the query logic after the upgrade. You do not need to handle the error reported for the <b>global.sql_mode</b> setting. You are advised to check for such values. If there is any, change it to a non-zero value. |

| Check Item                 | Description                                                          | Rectification                                                                                                                                                                                                                                        |
|----------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| enumSetElementLengthCheck  | Check the length of elements in ENUM and SET columns.                | If any column contains more than 255 characters, modify it and ensure that its length does not exceed this limit.                                                                                                                                    |
| reservedKeywordsCheck      | Check reserved words.                                                | If there are any objects with names conflicting with the reserved words of MySQL 8.0, change the names.                                                                                                                                              |
| mysqlDollarSignNameCheck   | Check the dollar sign (\$).                                          | If any database object name contains \$, delete it from the name.                                                                                                                                                                                    |
| mysqlInvalid57NamesCheck   | Check for invalid database names, table names, and column names.     | Modify invalid names.                                                                                                                                                                                                                                |
| groupByAscCheck            | Check the GROUP BY ASC and DESC syntax.                              | The GROUP BY ASC and DESC syntax has been removed from MySQL 8.0. Modify the database objects that contain the GROUP BY ASC or DESC syntax. You can remove the ASC and DESC keywords from the GROUP BY clause and place them in the ORDER BY clause. |
| checkTableOutput           | Check tables using the <b>check table x for upgrade</b> command.     | Rectify the fault based on the description in the check results.                                                                                                                                                                                     |
| engineMixupCheck           | Check whether InnoDB recognizes tables that belong to other engines. | If there are tables recognized by the InnoDB engine, but the SQL layer considers that they belong to other engines, <a href="#">submit a service ticket</a> .                                                                                        |
| foreignKeyLengthCheck      | Check the length of the foreign key constraint name.                 | If the foreign key constraint name contains more than 64 characters, modify it.                                                                                                                                                                      |
| nonNativePartitioningCheck | Check for partitioned tables of non-native partitioning engines.     | MySQL 8.0 supports only InnoDB and NDB as partitioning engines. Convert the engine to InnoDB or delete the partitions.                                                                                                                               |

| Check Item                          | Description                                                            | Rectification                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| routinesSyntaxCheck                 | Check for syntax incompatibility.                                      | If the definitions of database objects such as stored procedures and functions contain incompatible syntax, for example, the syntax conflicts with the reserved words in MySQL 8.0, modify the syntax based on the description in the check results. |
| maxdbFlagCheck                      | Check for obsolete MAXDB sql_mode flags.                               | In MySQL 8.0, the <b>MAXDB</b> option has been deleted from <b>sql_mode</b> . Modify the <b>sql_mode</b> parameter to exclude MAXDB.                                                                                                                 |
| sqlModeFlagCheck                    | Check for obsolete sql_mode flags.                                     | Some sql_mode flags have been deleted from MySQL 8.0. Modify the <b>sql_mode</b> parameter based on the description in the check results.                                                                                                            |
| removedSysLogVars                   | Check the removed system variables for system logs.                    | Some system variables for system logs have been removed from MySQL 8.0.<br>No action is required.                                                                                                                                                    |
| mysqlIndexTooLargeCheck             | Check the index length.                                                | Both MySQL 5.7 and MySQL 8.0 allow the maximum index length of 767 bytes. In MySQL 8.0, if utf8mb4 is used, an index cannot be longer than 191 characters. Change the index length to no more than 191 characters.                                   |
| circularDirectoryCheck              | Check whether any tablespace data file path uses a circular directory. | The target version does not allow tablespace data file paths to contain circular directory references (for example, /../). <a href="#">Submit a service ticket</a> for handling the problem.                                                         |
| columnsWhichCannotHaveDefaultsCheck | Check default values of columns.                                       | Default values are not allowed for columns of the BLOB, TEXT, GEOMETRY, or JSON type. Run the ALTER TABLE statement to delete the default values.                                                                                                    |
| removedFunctionsCheck               | Check the removed functions.                                           | Some functions have been deleted from the target version. Modify the corresponding database objects based on the description in the check results.                                                                                                   |

| Check Item                         | Description                                                                                                      | Rectification                                                                                                                                                                                                                                                                                                              |
|------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mysqlOrphanedRoutinesCheck         | Check for orphaned stored procedures or functions.                                                               | Orphaned stored procedures or functions cannot run because the database objects referenced by them do not exist. Delete such stored procedures or functions.                                                                                                                                                               |
| mysqlEmptyDatabaseTableSyntaxCheck | Check for obsolete identifiers.                                                                                  | Change such identifiers in database objects based on the description in the check results.                                                                                                                                                                                                                                 |
| mysqlSchemaCheck                   | Check for table name conflicts.                                                                                  | There are some tables added to MySQL 8.0. Run the RENAME TABLE statement to change the conflicting table names.                                                                                                                                                                                                            |
| mysqlInvalidEngineForeignKeyCheck  | Check for foreign keys pointing to tables from other engines.                                                    | Run the ALTER TABLE statement to change the table's engine or delete the foreign key reference.                                                                                                                                                                                                                            |
| lowerCaseNameCheck                 | Check whether any table name contains uppercase letters when <b>lower_case_table_names</b> is set to 1.          | If any table name contains uppercase letters when <b>lower_case_table_names</b> is set to 1, the upgrade will fail. Change the value of <b>lower_case_table_names</b> to 0 first, run the RENAME TABLE statement to change the table name to lowercase, and then change the <b>lower_case_table_names</b> value back to 1. |
| specVarInConfigFileCheck           | Check whether the values of <b>sql_mode</b> and <b>loose_tls_version</b> in the configuration file are outdated. | Some sql_mode flags have been removed from the target version. In MySQL 8.0.28 and later versions, the <b>loose_tls_version</b> parameter does not support TLSv1 or TLSv1.1. Change the values of <b>sql_mode</b> and <b>loose_tls_version</b> based on the check results.                                                 |
| reversedUserCheck                  | Check whether the <b>mysql.infoschema@localhost</b> account has been created.                                    | MySQL 8.0 has a built-in <b>mysql.infoschema@localhost</b> account. If this account exists in MySQL 5.7, the upgrade will fail. Delete this account before the upgrade.                                                                                                                                                    |
| schemaInconsistencyCheck           | Check for database structure inconsistency due to table file removal or corruption.                              | If the .frm table file is missing, <a href="#">submit a service ticket</a> .                                                                                                                                                                                                                                               |

| Check Item                               | Description                                                                                 | Rectification                                                                                                                                                                                                                       |
|------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| geometryIndexCheck                       | Check whether any spatial coordinate is a spatial index when it is used as an index.        | In the target version, the spatial coordinate index must be a spatial index. Recreate or delete the index.                                                                                                                          |
| danglingIndexCheck                       | Check for dangling indexes.                                                                 | If any table has dangling FTS_DOC_ID due to deletion of the full-text index column, run the OPTIMIZE TABLE statement.                                                                                                               |
| viewColumnNameCheck                      | Check the length of the view column name.                                                   | In the target version, a view column name can contain a maximum of 64 characters. If this limit is exceeded, run the ALTER VIEW statement to modify the column name.                                                                |
| partitionedTablesInSharedTablespaceCheck | Check whether there are any partitioned tables in shared tablespaces.                       | The target version does not support shared tablespaces. Run the ALTER TABLE statement to move partitioned tables to independent tablespaces.                                                                                        |
| partitionsReferencedCheck                | Check whether any partitioned table is referenced by an ordinary table using a foreign key. | Partitioned tables cannot be referenced by ordinary tables. Delete the foreign key reference.                                                                                                                                       |
| partitionsRangeDateCheck                 | Check for tables partitioned by time.                                                       | In MySQL 8.0, if tables are partitioned by time, the content in the time column must be in the standard format (for example, YYYY-MM-DD hh:mm:ss or YY-MM-DD hh:mm:ss). Change the time values in the table to the standard format. |

## Handling Suggestions for Upgrade Failures

An upgrade starts after the pre-check is passed. If the upgrade fails, rectify the fault by following the instructions provided in [Table 7-4](#).



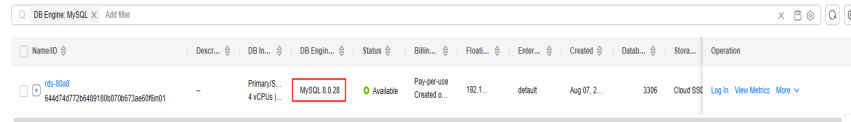
**Table 7-4** Handling suggestions for upgrade failures

| Symptom                                                                                                                                                                                                                     | Impact                                                                                                                                                                                                                                                                                                                                      | Handling Suggestion                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| After RDS for MySQL 5.7 is upgraded to 8.0, indexes become invalid when some SQL statements are executed because the default character set is changed.<br>By default, MySQL 5.7 uses utf8mb3, while MySQL 8.0 uses utf8mb4. | If you create a table using the default character set in MySQL 5.7, the upgrade will not change the character set to that of MySQL 8.0. After the upgrade, if you create another table and join the two tables with different character sets by running <b>JOIN</b> , the SQL statement execution will be prolonged due to index selection. | Modify the character sets of databases, tables, and fields and the default character set in MySQL 8.0 to be the same as those in MySQL 5.7.   |
| The full-text index is deleted.                                                                                                                                                                                             | The upgrade may fail.                                                                                                                                                                                                                                                                                                                       | Run the <b>OPTIMIZE TABLE</b> statement to recreate the table and check for dangling FTS_DOC_ID. For details, see <a href="#">Table 7-3</a> . |
| There are foreign key constraints (specified by the <b>foreign_key_check</b> parameter) on partitioned tables.                                                                                                              | The upgrade fails.                                                                                                                                                                                                                                                                                                                          | Remove the foreign key constraint.                                                                                                            |
| RDS for MySQL 5.7 contains the <b>mysql.events</b> table whose DEFINER column is blank or null.                                                                                                                             | The upgrade fails.                                                                                                                                                                                                                                                                                                                          | Set the DEFINER column to a non-null value.                                                                                                   |
| The case formats of column names at the server and InnoDB layers do not match.                                                                                                                                              | The upgrade fails.                                                                                                                                                                                                                                                                                                                          | Run the <b>OPTIMIZE TABLE</b> statement to recreate the table.                                                                                |
| The case formats of the fields contained in the indexes at the server and InnoDB layers do not match.                                                                                                                       | The upgrade fails.                                                                                                                                                                                                                                                                                                                          | Run the <b>OPTIMIZE TABLE</b> statement to recreate the table.                                                                                |
| The BTREE SPATIAL INDEX index, which is not supported by RDS for MySQL 8.0, is used.                                                                                                                                        | The upgrade fails.                                                                                                                                                                                                                                                                                                                          | Delete the BTREE SPATIAL INDEX index.                                                                                                         |

## How Do I Check the Version of My DB Instance?

- Check it on the **Instances** page of the RDS console.

Figure 7-10 Instances



| NameID                                         | Descr... | DB In...            | DB Engin...  | Status    | Billin...                   | Flow...  | Enter... | Created      | Datab... | Stora...  | Operation                                                                |
|------------------------------------------------|----------|---------------------|--------------|-----------|-----------------------------|----------|----------|--------------|----------|-----------|--------------------------------------------------------------------------|
| rds-01a0l<br>644674677264891806770673ae0950e01 | -        | PrimaryS<br>4 vCPUs | MySQL 5.6.28 | Available | Pay-per-use<br>Created a... | 192.1... | default  | Aug 07, 2... | 3306     | Cloud SSS | <a href="#">Log In</a> <a href="#">View Metrics</a> <a href="#">More</a> |

- Check it on the DAS console.
  - a. Log in to the target DB instance on the DAS console.
  - b. On the top menu bar, choose **SQL Operations** > **SQL Query**.
  - c. Run **select @@version;** to query the version of the DB instance.

## How Can I Check Whether There Are Any XA Transactions in the Prepared State Before an Upgrade?

- Run the **XA recover;** statement to check for the XA transactions. To ensure a successful upgrade, commit or roll back these transactions first.
  - The **XA recover** statement returns only the XA transactions in the prepared state. It does not return any XA transactions in other phases, such as **XA start**, **XA end**, **XA commit**, and **XA rollback**.
  - To commit or roll back an XA transaction in the prepared state, find the value in the **data** column (for example, **xid1** in Figure 7-11) in the result returned by **XA recover** and use it as the input of **XA commit** or **XA rollback**.

**Figure 7-11** Checking for XA transactions

```
mysql> create table t1(`a` int, `b` int,primary key(`a`));
Query OK, 0 rows affected (0.07 sec)

mysql> XA START 'xid1';
Query OK, 0 rows affected (0.00 sec)

mysql> xa recover;
Empty set (0.00 sec)

mysql> insert into t1 values(1,1),(2,2);
Query OK, 2 rows affected (0.01 sec)
Records: 2 Duplicates: 0 Warnings: 0

mysql> XA END 'xid1';
Query OK, 0 rows affected (0.00 sec)

mysql> xa recover;
Empty set (0.00 sec)

mysql> XA prepare 'xid1';
Query OK, 0 rows affected (0.01 sec)

mysql> xa recover;
+-----+-----+-----+-----+
| formatID | gtrid_length | bqual_length | data |
+-----+-----+-----+-----+
|          1 |          4 |          0 | xid1 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)

mysql> XA commit 'xid1';
Query OK, 0 rows affected (0.01 sec)

mysql> xa recover;
Empty set (0.00 sec)
```

## 7.3 Upgrading an RDS for MySQL Instance from 5.6 to 5.7

### Scenarios

RDS for MySQL 5.6 has reached the end of service (EOS). You can upgrade your instances of this version to 5.7 to experience enhanced features.

### Upgrade Methods

During a major version upgrade, the system first creates a target instance of the new version, synchronizes data from the source instance to the target instance,

and finally switches the virtual IP address of the source instance to the target instance.

You can upgrade your RDS for MySQL instance from 5.6 to 5.7 using either of the following methods:

- **Upgrading a major version on the RDS console:** For details about version functions, see [RDS for MySQL Kernel Version Description](#).  
To use this function, [submit a service ticket](#) to request required permissions.
- **Upgrading a major version using DRS:** You can migrate instance data from an earlier version to a later version.

## Upgrade Notes

**Table 7-5** Upgrade notes

| Phase             | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before an upgrade | <ul style="list-style-type: none"><li>• You are advised to perform a full backup before upgrading a major version.</li><li>• You are advised to clone the original instance and use the cloned instance to perform an upgrade check. After confirming that all functions are normal, upgrade the original instance.</li><li>• Compare the old and new versions carefully. To ensure that the syntax and features of the old version used by your applications are compatible with the new version, create a new RDS for MySQL 5.7 instance to test the syntax before the upgrade.</li></ul> | <ul style="list-style-type: none"><li>• After your instance is upgraded to a new major version, it cannot be downgraded. For details about kernel versions, see <a href="#">Kernel Version Description</a>.</li><li>• If the replication delay between primary and standby instances is longer than 300 seconds, the major version cannot be upgraded.</li><li>• The major version cannot be upgraded for DB instances with abnormal nodes.</li><li>• RDS for MySQL 5.7 and later versions no longer support Sequence Engine.</li><li>• RDS for MySQL DB instances support a maximum of 500,000 tables. If the number of tables is greater than 500,000, the major version upgrade may fail.</li><li>• RDS for MySQL DB instances with event scheduler enabled do not support major version upgrades. If you want to perform a major version upgrade, disable event scheduler first. For details, see <a href="#">Enabling or Disabling Event Scheduler</a>.</li></ul> |

| Phase             | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Constraints                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| During an upgrade | <ul style="list-style-type: none"><li>• The time required for upgrading the major version of your instance depends on how many tables there are in the instance and how much data is stored.</li><li>• Upgrading a major version will cause a connection interruption for 10 to 120 seconds. Ensure that your applications support automatic reconnection. Perform this operation during off-peak hours because upgrading a major version during peak hours takes much more time.</li><li>• When you upgrade the major version of a primary DB instance, the major versions of its read replicas (if any) will also be upgraded. You cannot upgrade the major version of a read replica without upgrading that of the primary instance.</li></ul> | <ul style="list-style-type: none"><li>• Sufficient storage needs to be reserved to ensure data writes during the upgrade.</li><li>• DDL operations on events, such as CREATE EVENT, DROP EVENT, and ALTER EVENT, are not allowed during a major version upgrade.</li><li>• Scheduled major version upgrades need to be prepared in advance and cannot be canceled.</li></ul> |
| After an upgrade  | <ul style="list-style-type: none"><li>• After a major version upgrade, specification parameters are reset to the default values of the new version, including <b>threadpool_size</b>, <b>innodb_buffer_pool_size</b>, <b>innodb_io_capacity</b>, <b>innodb_io_capacity_max</b>, <b>innodb_buffer_pool_instances</b>, <b>back_log</b>, and <b>max_connections</b>.</li></ul>                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"><li>• After a major version upgrade is complete, the backups before the upgrade cannot be used for the instance of the new version, and the time points before the upgrade cannot be selected for point-in-time recovery (PITR).</li></ul>                                                                                                 |

## Upgrading a Major Version on the RDS Console

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.

**Step 4** Under **DB Engine Version**, click **Upgrade Engine Version**.

**Step 5** In the displayed dialog box, select a scheduled time and click **OK**.

- **Upon submission:** The system upgrades your instance to the latest version of 5.7 immediately after you submit the upgrade request.
- **In maintenance window:** The system will upgrade your instance to the latest version of 5.7 during the maintenance window you specified. For details about how to configure a maintenance window, see [Changing the Maintenance Window](#).

**Figure 7-12** Selecting a scheduled time

Upgrade Major Version

Confirm Instance Details — Pre-check — 3 Upgrade

**1**

- After a major version upgrade is complete, the version cannot be downgraded.
- After a major version upgrade is complete, the following specification parameters will restore to the default values of the new version: threadpool\_size, innodb\_buffer\_pool\_size, innodb\_io\_capacity, innodb\_io\_capacity\_max, innodb\_buffer\_pool\_instances, back\_log, and max\_connections
- After the major version is upgraded, backups created before the upgrade cannot be used for restoring the instance of the new version, and the instance, databases, or tables can only be restored to a point in time from a moment after the upgrade.

Scheduled Time

Upon submission

**⚠** • A major version upgrade will interrupt your applications for no more than 5 minutes. To minimize the impact, perform the upgrade during off-peak hours and ensure that your applications support automatic reconnection.

☒ I have understood the upgrade precautions.

Cancel Previous OK

----End

## Upgrading a Major Version Using DRS

You can migrate data from an RDS for MySQL 5.6 instance to an RDS for MySQL 5.7 instance using Data Replication Service (DRS). **Before the migration, prepare a DB instance of the target version.**

On the **Instances** page, click the instance you want to migrate. On the displayed **Overview** page, click **Migrate Database** in the upper right corner.

For more information, see [Creating a Migration Task](#) in the *Data Replication Service User Guide*.

**Table 7-6** MySQL database version information

| Source Database Version                                                                                                                                | Destination Database Version                                                                    | Migration Type  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------|
| RDS for MySQL/Self-managed MySQL/MySQL in other clouds <ul style="list-style-type: none"><li>5.5.x</li><li>5.6.x</li><li>5.7.x</li><li>8.0.x</li></ul> | RDS for MySQL <ul style="list-style-type: none"><li>5.6.x</li><li>5.7.x</li><li>8.0.x</li></ul> | Version upgrade |

**NOTE**

DRS supports migration only from an earlier version to a later version.

## How Do I Check the Version of My DB Instance?

- Check it on the **Instances** page of the RDS console.

**Figure 7-13** Instances

| NameID                                       | Descr... | DB In...    | DB Engin...  | Status    | Billin...     | Float... | Enter... | Created      | Datab... | Stora...  | Operation                                                                |
|----------------------------------------------|----------|-------------|--------------|-----------|---------------|----------|----------|--------------|----------|-----------|--------------------------------------------------------------------------|
| db-5lual<br>644674d7726489183b070673ae095m01 | -        | PrimaryS... | MySQL 8.0.28 | Available | Pay-as-you... | 192.1... | default  | Aug 07, 2... | 3306     | Cloud SSE | <a href="#">Log In</a> <a href="#">View Metrics</a> <a href="#">More</a> |

- Check it on the DAS console.
  - Log in to the target DB instance on the DAS console.
  - On the top menu bar, choose **SQL Operations** > **SQL Query**.
  - Run **select @@version;** to query the version of the DB instance.

# 8 Instance Management

## 8.1 Instance Overview

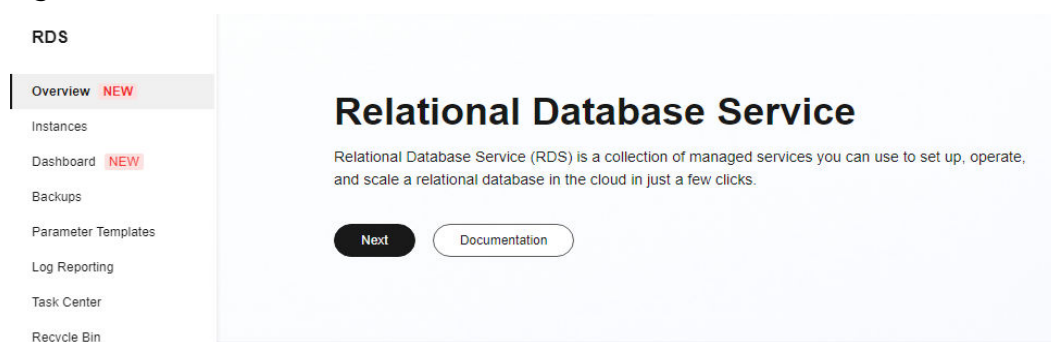
The **Overview** page gives you an overview of your DB instances, including instances by status, alarms, and key performance metrics. It also displays detected exceptions and provides handling suggestions with RDS intelligent diagnosis.

### Learning About RDS

If you are new to RDS, you can quickly learn about RDS concepts, common functions, APIs, and how to buy and get started with a DB instance by referring to [RDS Progressive Knowledge](#).

1. To purchase an RDS for MySQL instance, click **Buy** on the **Overview** page and select your desired version and specifications. For details, see [Buying an RDS for MySQL DB Instance](#).
2. After the purchase is complete, you can view instances by status, alarms, and intelligent diagnosis statistics on the **Overview** page.

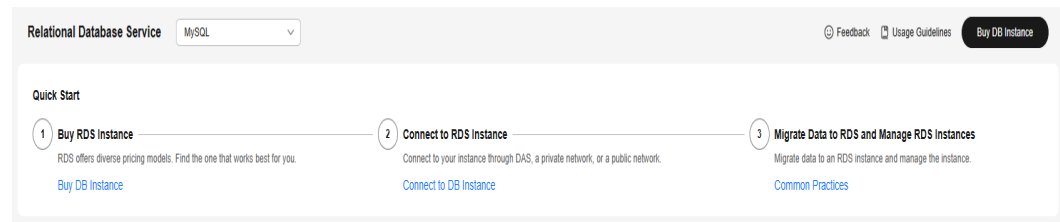
Figure 8-1 Overview



### Viewing Instances by Status

The statuses of all RDS for MySQL instances under your account are displayed after you select **MySQL** for **Relational Database Service** in the upper part of the **Overview** page.



**Figure 8-2** Instances by Status**Table 8-1** Status description

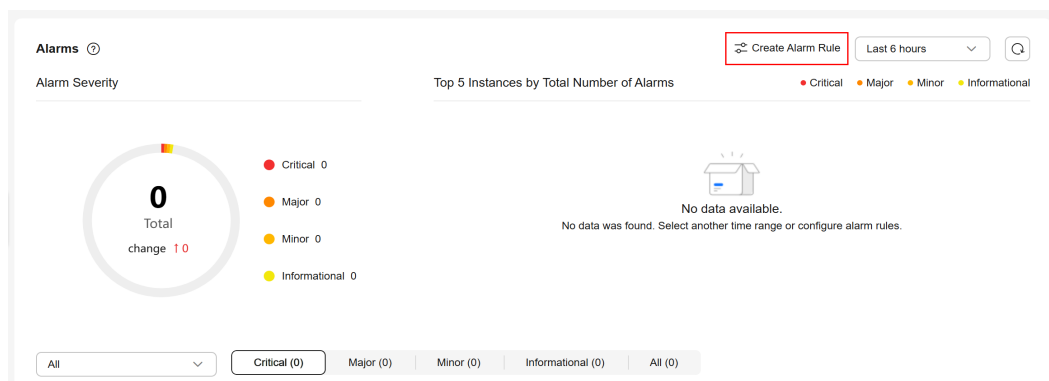
| Item            | Description                                                                                                                                                                                | Operation                                                                                                    | Solution                                                                                             |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Total instances | Total number of DB instances and read replicas in all statuses.                                                                                                                            | Click <b>Total instances</b> to go to the instance list and view all instances.                              | -                                                                                                    |
| Abnormal        | Total number of instances in the <b>Abnormal</b> status.                                                                                                                                   | Click <b>Abnormal</b> to go to the instance list and view abnormal instances.                                | <a href="#">Submit a service ticket.</a>                                                             |
| Out of storage  | Total number of instances in the <b>Storage full</b> status.                                                                                                                               | Click <b>Out of storage</b> to go to the instance list and view instances that are out of storage.           | For details, see <a href="#">Full Storage of RDS for MySQL Instances.</a>                            |
| Frozen          | Total number of instances in the <b>Frozen</b> status.                                                                                                                                     | Click <b>Frozen</b> to go to the instance list and view frozen instances.                                    | For details, see <a href="#">Resource Freezing, Release, Stopping, Deletion, and Unsubscription.</a> |
| Pending reboot  | Total number of instances in the <b>Parameter change. Pending reboot</b> status.<br><b>NOTE</b><br>Modifications to some parameters require an instance reboot before they can be applied. | Click <b>Pending reboot</b> to go to the instance list and view instances waiting to be rebooted.            | Reboot the instances.                                                                                |
| Newly purchased | Total number of RDS for MySQL instances purchased in the last seven days.                                                                                                                  | Click <b>Newly purchased</b> to go to the instance list and view instances purchased in the last seven days. | -                                                                                                    |

## Viewing Alarms

Based on the configuration of alarm rules, you can see active alarms of all RDS for MySQL instances under your current account, including alarms in the **Alarm** (metric) and **Triggered** (event) states.

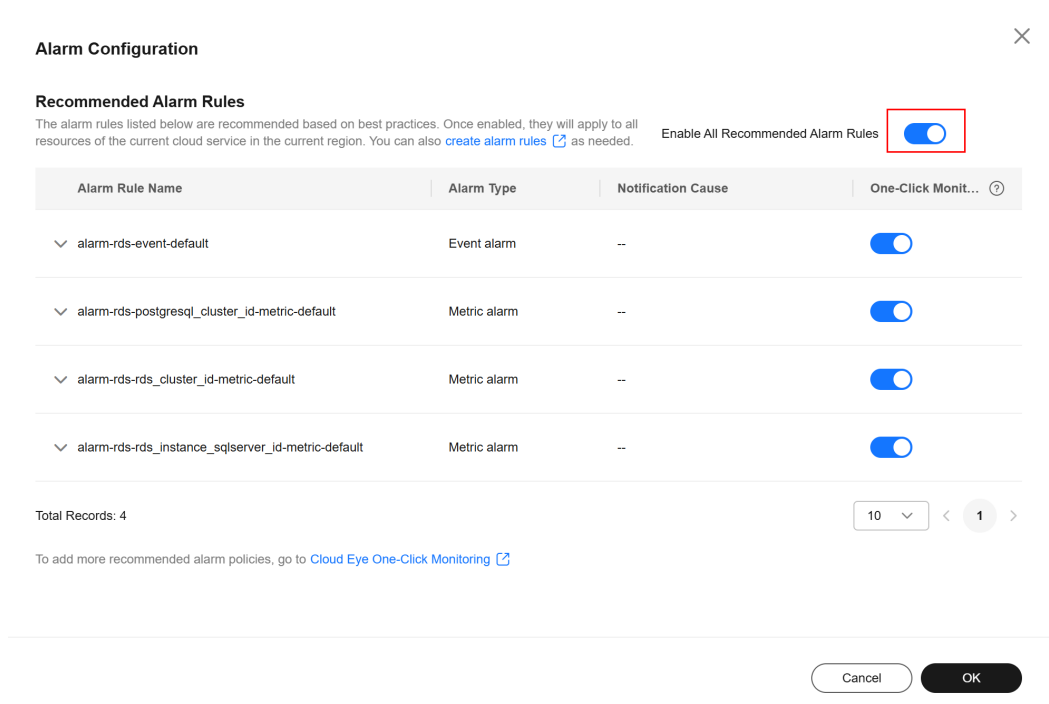
1. In the **Alarms** area, click **Create Alarm Rule**.

**Figure 8-3** Create Alarm Rule



2. In the dialog box displayed on the right, toggle on the **Enable All Recommended Alarm Rules** switch. Once this function is enabled, it applies to all resources in the current region.

**Figure 8-4** Enable All Recommended Alarm Rules



After the function is enabled, you can modify alarm policies and disable alarm rules.

3. If the recommended alarm rules do not meet your requirements, you can create custom ones. Click **create alarm rules** to create alarm rules to monitor metrics or events for your DB instance. For details, see [Setting Alarm Rules](#).

Figure 8-5 Creating an alarm rule

Create Alarm Rule

Relational Database Service

MySQL Instances

×

Name

alarm-3712

Monitoring Scope

Specific resources

Select Resource

| name     | id                  | tags | status   | Enterprise Project | Operation |
|----------|---------------------|------|----------|--------------------|-----------|
| test1125 | 1b905b29d9774d2b... | --   | SHUTDOWN | default            | Remove    |

Total Records: 1

10

<

1

>

Alarm Policy

| Metric Name               | Alarm Policy            | Operation                        |
|---------------------------|-------------------------|----------------------------------|
| If MySQL Instances / C... | R... >... Critical: 90% | 3 times (conse... Then O... Copy |

Add Alarm Policy You can add 49 more.

Notification Policies

--Select--

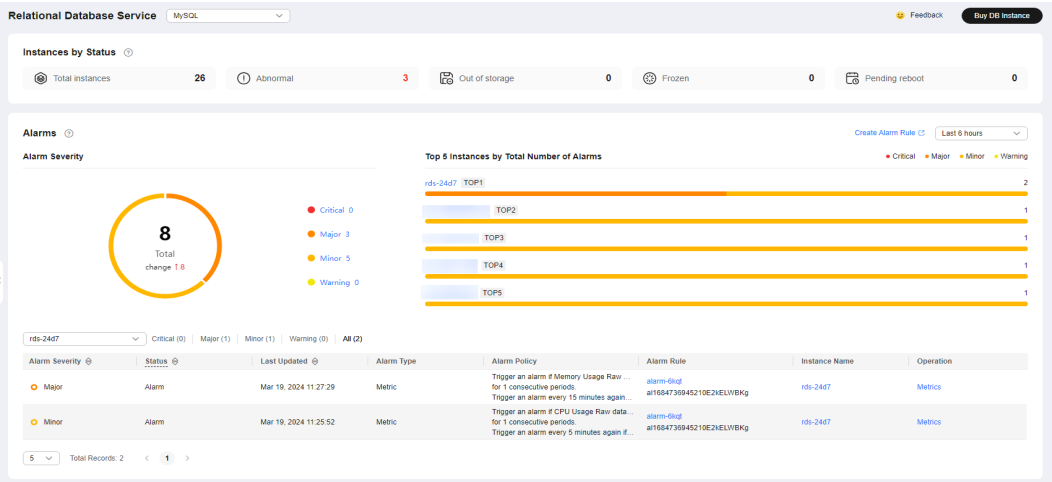
Create Notification Policy

Cancel

OK

4. To view alarm details, select a time window in the upper part of the **Alarms** area.
- The time window can be **Last 1 hour**, **Last 6 hours**, **Last 12 hours**, **Last day**, **Last week**, or **Last month**.

Figure 8-6 Alarms



Instance alarm details are displayed from multiple dimensions. For details, see [Table 8-2](#) and [Table 8-3](#).

**Table 8-2** Alarms

| Item                                      | Description                                                                                                                                                                                                                           |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Severity                            | Displays the number of alarms at each severity. The alarm severity can be critical, major, minor, or informational.                                                                                                                   |
| Top 5 Instances by Total Number of Alarms | Displays alarm statistics of the top 5 instances with the largest number of alarms. Hover over an instance to see the number of its alarms of each severity.<br>You can view alarm details of a specific instance and alarm severity. |

**Table 8-3** Alarm list

| Item           | Description                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Severity | There are four severities: critical, major, minor, and informational. Above the alarm list, you can choose to view alarms of a specific severity or all severities.                                                                                                                      |
| Status         | <ul style="list-style-type: none"><li>● <b>Alarm:</b> A metric value has reached the preset alarm threshold, triggering an alarm for the resource, but the alarm has not been cleared.</li><li>● <b>Triggered:</b> An event configured in the alarm policy triggered an alarm.</li></ul> |
| Last Updated   | The latest time when the alarm was triggered.                                                                                                                                                                                                                                            |
| Alarm Type     | The alarm type that the alarm rule applies to. <ul style="list-style-type: none"><li>● <b>Metric</b></li><li>● <b>Event</b></li></ul>                                                                                                                                                    |

| Item          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Policy  | <p>The policy for triggering an alarm.</p> <ul style="list-style-type: none"><li>• If you set <b>Alarm Type</b> to <b>Metric</b>, the system triggers an alarm if the metric value hits the preset threshold in consecutive periods. For example, an alarm is triggered if the average CPU usage is 80% or higher for three consecutive 5-minute periods.<ul style="list-style-type: none"><li>– For details about how to troubleshoot high CPU usage, see <a href="#">High CPU Usage of RDS for MySQL Instances</a>.</li><li>– For details about how to troubleshoot high memory usage, see <a href="#">High Memory Usage of RDS for MySQL Instances</a>.</li><li>– For details about how to troubleshoot full storage, see <a href="#">Full Storage of RDS for MySQL Instances</a>.</li></ul></li><li>• If you set <b>Alarm Type</b> to <b>Event</b>, the event that triggers an alarm is an instant operation. For example, if an instance fails to be created, an alarm is triggered. For details about the supported events and handling suggestions, see <a href="#">Events Supported by Event Monitoring</a>.</li></ul> |
| Alarm Rule    | The name or ID of the alarm rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Instance Name | <p>The name of the instance that triggers the alarm. You can select <b>All</b> or a specific instance from the drop-down list to view the alarm details.</p> <p>Refresh the page to display details of the latest triggered alarms in real time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Operation     | Click <b>Metrics</b> . In the dialog box displayed on the right, you can see the metric changes in the selected time window.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Viewing Intelligent Diagnosis

Intelligent Diagnosis checks instance health using instance operation data and intelligent algorithms and provides diagnosis results and suggestions.

1. To view problematic instances and related metrics, click the name of a diagnosis item.
2. To view detailed diagnosis results and optimization suggestions, click **Diagnosis Details**.

**Figure 8-7** Intelligent Diagnosis

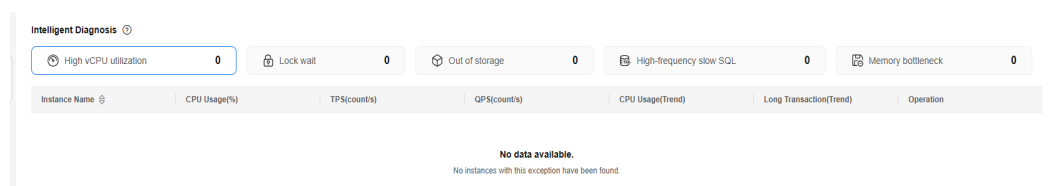


**Table 8-4** provides the supported diagnosis items and handling suggestions.

**Table 8-4** Intelligent diagnosis details

| Diagnosis Item        | Metric                  | Metric Description                                                                                                                                                                                               | Solution                                                                                                                                                                                           | Practices                                                 |
|-----------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| High vCPU utilization | CPU Usage(%)            | CPU usage of the monitored object                                                                                                                                                                                | <ul style="list-style-type: none"><li>Evaluate the SQL execution plan and add indexes to avoid full table scanning.</li><li>Upgrade vCPU specifications for compute-intensive workloads.</li></ul> | <a href="#">High CPU Usage of RDS for MySQL Instances</a> |
|                       | TPS(Times/s)            | Execution times of submitted and rollback transactions per second                                                                                                                                                |                                                                                                                                                                                                    |                                                           |
|                       | QPS(Times/s)            | Query times of SQL statements (including stored procedures) per second                                                                                                                                           |                                                                                                                                                                                                    |                                                           |
|                       | CPU Usage(Trend)        | CPU usage of the monitored object                                                                                                                                                                                |                                                                                                                                                                                                    |                                                           |
|                       | Long Transaction(Trend) | Maximum duration for starting a transaction<br>A complete long transaction is counted only when the <b>BEGIN</b> and <b>COMMIT</b> commands exist before and after the related operation commands, respectively. |                                                                                                                                                                                                    |                                                           |

| Diagnosis Item | Metric                               | Metric Description                                                                                                                                                                                               | Solution                                                                                                                                                                                                                                                                                                                                              | Practices                                                                                                                                           |
|----------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Lock wait      | Row Locks Waits Transactions(Counts) | Number of InnoDB row lock waits<br>This metric indicates the total number of historical transactions waiting for row locks. Lock waits will be cleared after the instance is rebooted.                           | <ul style="list-style-type: none"><li>Metadata locks:<br/>Terminate sessions with metadata locks to resume blocked operations .</li><li>InnoDB locks:<br/>Check whether there are lock waits. Terminate the source sessions with locks and resume blocked operations .</li></ul> For details, see <a href="#">Managing Locks &amp; Transactions</a> . | <ul style="list-style-type: none"><li><a href="#">RDS for MySQL Metadata Locks</a></li><li><a href="#">Slow Response Due to Deadlocks</a></li></ul> |
|                | Average Row Lock Wait Time(ms)       | Average wait time of historical InnoDB row locks                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
|                | Current Row Lock Waits(Counts)       | Number of current InnoDB row lock waits<br>This metric indicates the number of transactions that are currently waiting for row locks.                                                                            |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
|                | MDL Locks(Counts)                    | Number of metadata locks                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
|                | Long Transaction(Trend)              | Maximum duration for starting a transaction<br>A complete long transaction is counted only when the <b>BEGIN</b> and <b>COMMIT</b> commands exist before and after the related operation commands, respectively. |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |

| Diagnosis Item | Metric                     | Metric Description                          | Solution                                                                                                                                                                                                                                                                                                                                                                              | Practices                                               |
|----------------|----------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Out of storage | Storage Space Usage(%)     | Storage space usage of the monitored object | <ul style="list-style-type: none"><li>• Scaling up storage space: You can configure storage autoscaling. When the storage usage reaches the threshold, autoscaling is triggered.</li><li>• Reducing disk data: Delete useless historical data.</li><li>• If temporary files generated by sorting queries occupy too much storage space, optimize your SQL query statements.</li></ul> | <a href="#">Full Storage of RDS for MySQL Instances</a> |
|                | Used Storage Space(GB)     | Used storage space of the monitored object  |                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |
|                | Total Storage Space(GB)    | Total storage space of the monitored object |                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |
|                | Storage Space Usage(Trend) | Storage space usage of the monitored object |                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |



| Diagnosis Item          | Metric                            | Metric Description                                                      | Solution                                                                                                                                                                                                                                     | Practices                                                                                                                                                       |
|-------------------------|-----------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| High-frequency slow SQL | Slow Query Logs(Count/min)        | Number of MySQL slow query logs generated per minute                    | <ul style="list-style-type: none"><li>Optimize slow SQL statements based on the execution plan.</li><li>Upgrade vCPU specifications for compute-intensive workloads.</li></ul>                                                               | <a href="#">Slow SQL Statements Due to Improper Composite Index Settings</a>                                                                                    |
|                         | Slow Query Logs(Trend)            | Number of MySQL slow query logs generated per minute                    |                                                                                                                                                                                                                                              |                                                                                                                                                                 |
| Memory bottleneck       | Memory Usage(%)                   | Memory usage of the monitored object                                    | <ul style="list-style-type: none"><li>Upgrade instance specifications.</li><li>Optimize SQL statements to reduce the use of temporary tables.</li><li>Reconnect sessions at a specific interval to release memory of the sessions.</li></ul> | <ul style="list-style-type: none"><li><a href="#">Out of Memory (OOM) Errors</a></li><li><a href="#">High Memory Usage of RDS for MySQL Instances</a></li></ul> |
|                         | Total Connections(Count)          | Total number of connections that attempt to connect to the MySQL server |                                                                                                                                                                                                                                              |                                                                                                                                                                 |
|                         | Current Active Connections(Count) | Number of connections that are not in the sleep state                   |                                                                                                                                                                                                                                              |                                                                                                                                                                 |
|                         | Memory Usage(Trend)               | Memory usage of the monitored object                                    |                                                                                                                                                                                                                                              |                                                                                                                                                                 |

## 8.2 Monitoring Dashboard

Cloud Eye monitors operating statuses of DB instances. RDS allows you to view real-time performance metrics and historical metrics of all RDS for MySQL instances under your account. This helps you identify abnormal instances and take actions in a timely manner.

## Viewing Real-Time Metrics

1. On the **Dashboard** page, select **MySQL** for **Monitoring Dashboards** to view the real-time performance metrics of RDS for MySQL instances under your account.

**Table 8-5** List description

| Item               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Name/ID   | Only monitoring data of created DB instances is displayed.<br>You can click an instance name to go to the <b>Overview</b> page of the instance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Instance Type      | The following types are available: <ul style="list-style-type: none"><li>• <b>Single-node</b></li><li>• <b>Primary/Standby</b></li><li>• <b>Read replica</b></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DB Engine Version  | All RDS for MySQL versions can be displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Status             | The following statuses are available: <ul style="list-style-type: none"><li>• <b>Normal</b>: Real-time monitoring data is displayed.</li></ul> <b>NOTE</b><br>The monitoring data and graphics are available for a new instance after the instance runs for about 10 minutes. <ul style="list-style-type: none"><li>• <b>Abnormal</b>: There is no monitoring data. The default values for all metrics are 0. The monitoring data is available only after the instance becomes normal.</li><li>• <b>Stopped</b>: There is no monitoring data. The default values for all metrics are 0. The monitoring data is available only after the instance is started.</li></ul> |
| Monitoring Metrics | For details about metric description and handling suggestions for abnormal metrics, see <a href="#">Table 8-6</a> . The following metrics are available: <ul style="list-style-type: none"><li>• CPU Usage (%)</li><li>• Memory Usage (%)</li><li>• Storage Usage (%)</li><li>• TPS</li><li>• QPS</li><li>• IOPS</li><li>• Active Connections</li><li>• Slow SQL Statements</li></ul>                                                                                                                                                                                                                                                                                  |

**Table 8-6** Monitoring metrics

| Metric           | Description                          | Solution                                                                                                                                                                                                                                           | Practices                                                                                                                                                           |
|------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CPU Usage (%)    | CPU usage of the monitored object    | <ul style="list-style-type: none"><li>• Evaluate the SQL execution plan and add indexes to avoid full table scanning.</li><li>• Upgrade vCPU specifications for compute-intensive workloads.</li></ul>                                             | <a href="#">High CPU Usage of RDS for MySQL Instances</a>                                                                                                           |
| Memory Usage (%) | Memory usage of the monitored object | <ul style="list-style-type: none"><li>• Upgrade instance specifications.</li><li>• Optimize SQL statements to reduce the use of temporary tables.</li><li>• Reconnect sessions at a specific interval to release memory of the sessions.</li></ul> | <ul style="list-style-type: none"><li>• <a href="#">Out of Memory (OOM) Errors</a></li><li>• <a href="#">High Memory Usage of RDS for MySQL Instances</a></li></ul> |

| Metric            | Description                                                            | Solution                                                                                                                                                                                                                                                                                                                                                                              | Practices                                                 |
|-------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Storage Usage (%) | Storage space usage of the monitored object                            | <ul style="list-style-type: none"><li>• Scaling up storage space: You can configure storage autoscaling. When the storage usage reaches the threshold, autoscaling is triggered.</li><li>• Reducing disk data: Delete useless historical data.</li><li>• If temporary files generated by sorting queries occupy too much storage space, optimize your SQL query statements.</li></ul> | <a href="#">Full Storage of RDS for MySQL Instances</a>   |
| TPS               | Execution times of submitted and rollback transactions per second      | <ul style="list-style-type: none"><li>• Evaluate the SQL execution plan and add indexes to avoid full table scanning.</li><li>• Upgrade vCPU specifications for compute-intensive workloads.</li></ul>                                                                                                                                                                                | <a href="#">High CPU Usage of RDS for MySQL Instances</a> |
| QPS               | Query times of SQL statements (including stored procedures) per second |                                                                                                                                                                                                                                                                                                                                                                                       |                                                           |

| Metric              | Description                                                                  | Solution                                                                                                                                                                                                                   | Practices                                                                                                                                                                                                                                    |
|---------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IOPS                | Average number of I/O requests processed by the system in a specified period | <ul style="list-style-type: none"><li>• Upgrade instance specifications.</li><li>• To reduce data reads from the disk, optimize the application to make it read data from the buffer first.</li></ul>                      | <a href="#">Insufficient Disk Bandwidth</a>                                                                                                                                                                                                  |
| Active Connections  | Number of connections that are not in the sleep state                        | <ul style="list-style-type: none"><li>• Check whether applications are connected to the instance, optimize the connections, and release unnecessary connections.</li><li>• Upgrade the specifications if needed.</li></ul> | <ul style="list-style-type: none"><li>• <a href="#">What Do I Do If the Number of RDS Database Connections Reaches the Upper Limit?</a></li><li>• <a href="#">What Is the Maximum Number of Connections to an RDS DB Instance?</a></li></ul> |
| Slow SQL Statements | Number of MySQL slow query logs generated per minute                         | <ul style="list-style-type: none"><li>• Optimize slow SQL statements based on the execution plan.</li><li>• Upgrade vCPU specifications for compute-intensive workloads.</li></ul>                                         | <a href="#">Slow SQL Statements Due to Improper Composite Index Settings</a>                                                                                                                                                                 |

## Viewing Historical Metrics

You can select multiple instances from the monitoring list and click **View history monitor** to view metric trend charts of the instances in the **Historical Metrics** area.

- You can view metric changes of up to 10 instances at a time.
- The following monitoring time windows are supported: last 1 hour, last 3 hours, last 12 hours, last 24 hours, last 7 days, and a custom time period.
- For details about monitoring metrics and handling suggestions for abnormal metrics, see [Table 8-6](#).
- If the real-time replication delay metric is abnormal, see [Primary/Standby Replication Delay Scenarios and Solutions](#).

## 8.3 Instance Lifecycle

### 8.3.1 Buying a Same DB Instance as an Existing DB Instance

#### Scenarios

This section describes how to quickly buy a DB instance with the same configurations as the selected one.

#### Constraints

- You can buy DB instances with the same configurations numerous times.
- This function is unavailable for read replicas.

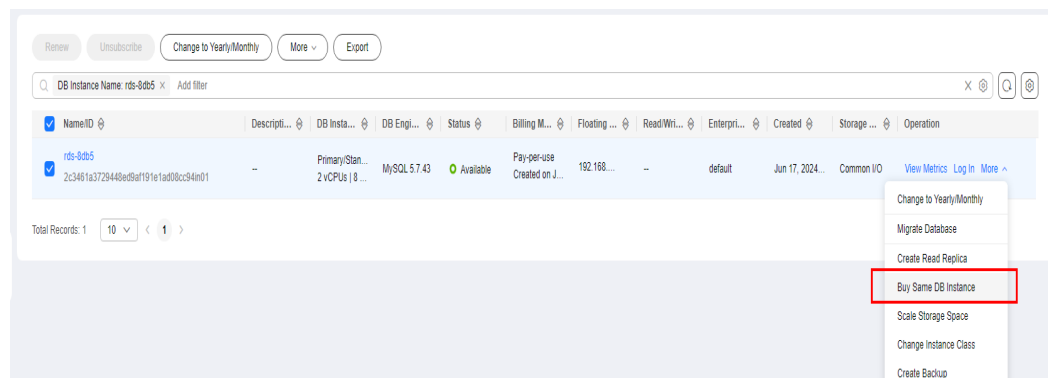
#### Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance and choose **More > Buy Same DB Instance** in the **Operation** column.

Figure 8-8 Buying a same instance



**Step 4** On the displayed page, the configurations are the same as those of the selected DB instance. You can change them as required. Then, click **Buy**.

For details about RDS for MySQL DB instance configurations, see [Buying an RDS for MySQL DB Instance](#).

**Step 5** Confirm the instance specifications.

- For pay-per-use DB instances, click **Submit**.
- For yearly/monthly DB instances, click **Pay Now**.

**Step 6** Refresh the DB instance list and view the status of the DB instance. If the status is **Available**, it has been created successfully.

You can manage the DB instance on the **Instances** page.

----End

## 8.3.2 Stopping an Instance

### Scenarios

If you use DB instances only for routine development, you can temporarily stop pay-per-use instances to save money.

### Billing

After a DB instance is stopped, the VM where the DB instance is located is no longer billed. Other resources, including EIPs, storage resources, database proxies, and backups, are still billed.

### Constraints

- Only pay-per-use instances using cloud SSDs or extreme SSDs can be stopped. RDS DB instances created in a [Dedicated Computing Cluster \(DCC\)](#) cannot be stopped.
- A stopped instance will not be moved to the recycle bin after being deleted.
- Stopping a DB instance will also stop its automated backups. After the DB instance is started, a full backup is automatically triggered.
- If you stop a primary instance, read replicas (if there are any) will also be stopped. Both the primary instance and read replicas can be stopped for up to 15 days. You cannot stop a read replica without stopping the primary instance.
- If you do not manually start your DB instance within 15 days after it is stopped, the instance will automatically start during the next maintenance window. For details about the maintenance window, see [Changing the Maintenance Window](#). To start an instance, see [Starting an Instance](#).
- A stopped pay-per-use instance may fail to start due to insufficient ECS resources. In this case, try again later or [restore data to a new DB instance](#) using the latest backup. If you need assistance, [submit a service ticket](#).
- A DB instance can fail to be stopped during peak hours. You are advised to stop instances during off-peak hours.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the primary instance that you want to stop and choose **More > Stop** in the **Operation** column.
- Step 4** In the displayed dialog box, enter **YES** and click **OK**.

**Figure 8-9** Stopping an instance

Stop

**i** If you stop a primary DB instance, its read replicas (if any) will also be stopped. After a DB instance is stopped, the ECS hosting the DB instance is no longer billed, but other related resources are billed normally. By default, the primary DB instance and its read replicas are automatically started and billed again 15 days later. [Learn more](#)

Are you sure you want to stop this DB instance?

| DB Instance Name                                 | Status                   | DB Instance Type                  |
|--------------------------------------------------|--------------------------|-----------------------------------|
| rds-a4a3<br>131fa460613a492e9911dcddd761438cin01 | <span>●</span> Available | Primary/Standby<br>2 vCPUs   4 GB |

**⚠** Manual backups will continue to be billed after the instance is stopped. If you do not need the backups, delete them on the Backups page.

[Backup pricing](#) [How to delete manual backups](#)

To confirm the stop, enter "YES" below. [Auto Enter](#)

YES

CancelOK

- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

- Step 6** Refresh the instance list and view the status of the instance. If the status is **Stopped**, the instance is stopped successfully.

-----End

## Related APIs

- [Stopping an Instance](#)
- [Starting an Instance](#)



## 8.3.3 Starting an Instance

### Scenarios

You can stop your instance temporarily to save money. After stopping your instance, you can restart it to begin using it again.

### Billing

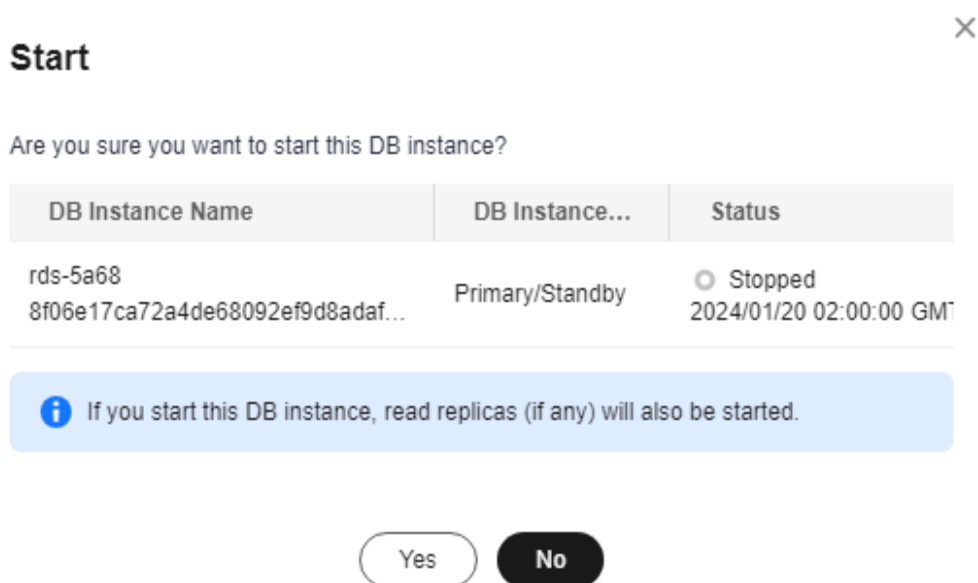
After a DB instance is started, the VM where the DB instance is located is billed again.

### Constraints

- If you start a primary instance, read replicas (if there are any) will also be started.
- Only DB instances in **Stopped** state can be started.
- When a stopped DB instance is started, a full backup is automatically triggered.
- A stopped pay-per-use instance may fail to start due to insufficient ECS resources. In this case, try again later or [restore data to a new DB instance](#) using the latest backup. If you need assistance, [submit a service ticket](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the primary instance that you want to start and choose **More > Start** in the **Operation** column.
- Step 4** In the displayed dialog box, click **Yes**.

**Figure 8-10** Starting an instance

- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

- Step 6** Refresh the instance list and view the status of the instance. If the status is **Available**, the instance is started successfully.

----End

## Related APIs

- [Stopping an Instance](#)
- [Starting an Instance](#)

## 8.3.4 Rebooting DB Instances or Read Replicas

### Scenarios

You may need to reboot a DB instance during maintenance. For example, after you modify some parameters, a reboot is required for the modifications to take effect. You can reboot a primary DB instance or a read replica on the management console. You can reboot a single DB instance or multiple DB instances at a time.

### Constraints

- Rebooting DB instances will roll back the running transactions. Before rebooting a DB instance, reduce the number of its active connections and workload requests to shorten the reboot duration.

- If the DB instance status is **Abnormal**, the reboot may fail.
- Rebooting DB instances will cause service interruptions. During the reboot process, the DB instance status is **Rebooting**.
- Rebooting DB instances will cause instance unavailability and clear cached memory. To prevent traffic congestion during peak hours, you are advised to reboot DB instances during off-peak hours.
- After a primary/standby DB instance is rebooted, it takes about one minute to establish the replication relationship. During this period, some operations, such as changing the instance class, cannot be performed.
- A reboot task configured during the current maintenance window will not be executed until the next maintenance window.

## Rebooting a DB Instance or Read Replica

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance, or click  and then locate the target read replica. Choose **More > Reboot** in the **Operation** column.

Alternatively, click the target DB instance on the **Instances** page to go to the **Overview** page. In the upper right corner, click **Reboot**.

For primary/standby DB instances, if you reboot the primary DB instance, the standby DB instance is also rebooted automatically.

**Step 4** In the displayed dialog box, select a scheduled time, select the check box, and click **OK**.

- **Immediate:** RDS reboots the instance immediately.
- **During maintenance window:** RDS will reboot the instance during the maintenance window you configured.

If you select **During maintenance window**, you can further click **Modify** under the option to change the maintenance window to a preferred time.

**Figure 8-11** Rebooting an instance as scheduled

Reboot DB Instance

Are you sure you want to reboot this DB instance?

| DB Instance Name                                 | DB Instance Type | Status                 |
|--------------------------------------------------|------------------|------------------------|
| rds-1c12<br>f2dd9885d3064b8c86f3007f27adaca5in01 | Primary/Standby  | <span>Available</span> |

Scheduled Time

Immediate

During maintenance window

Maintenance Window

02:00 — 06:00 (GMT+08:00)

Modify

The maintenance window cannot overlap the time window configured for automated backup.

The DB instance will be unavailable when it is being rebooted. Rebooting an instance will clear its cached memory. To prevent traffic congestion during peak hours, reboot the instance during off-peak hours.

☒ I have read this warning and understand the risks.

Cancel

OK

**Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 6** Refresh the DB instance list and view the status of the DB instance. If its status is **Available**, it has rebooted successfully.

----End

## Rebooting DB Instances or Read Replicas in Batches

**Step 1** Click in the upper left corner and select a region.

**Step 2** Click in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, select one or more DB instances or read replicas (maximum: 50) to be rebooted and choose **More > Reboot** above the DB instance list.

**Step 4** In the displayed dialog box, click **Yes**.

**Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

- Step 6** Refresh the DB instance list and view the statuses of the DB instances. If their statuses are **Available**, they have rebooted successfully.

----End

## Follow-up Operations

Return to the instance list. In the navigation pane on the left, choose **Task Center** and check the progress of the reboot task.

- If you have selected **Immediate** for **Scheduled Time**:  
On the **Instant Tasks** page, search for **Rebooting a MySQL DB instance** and check the execution progress. Instant tasks cannot be canceled.
- If you have selected **During maintenance window** for **Scheduled Time**:  
On the **Scheduled Tasks** page, search for the instance ID and check the execution status of the reboot task.  
If the task is in the **To be executed** state, you can click **Cancel** to cancel the task.

For details, see [Viewing a Task](#).

## Related APIs

- [Rebooting a DB Instance](#)

## 8.3.5 Selecting Displayed Items

### Scenarios

You can customize which instance items are displayed on the **Instances** page.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click  to edit columns displayed in the DB instance list.
- **Table Text Wrapping**: If you enable this function, excess text will move down to the next line.
  - **Fixed Columns**: You can fix the first, first two, or last column.
  - The following items can be displayed: **Name/ID**, **Description**, **DB Instance Type**, **DB Engine Version**, **Status**, **Disk Encryption** ([submit a service ticket](#) to apply for required permissions), **Billing Mode**, **Floating IP Address**, **Private Domain Name**, **EIP**, **IPv6 Address**, **Read/Write Splitting Address**,

**Proxy ID, Enterprise Project, Created, Database Port, Storage Type, Tags, and Operation.**

----End

## 8.3.6 Exporting DB Instance Information

### Scenarios

You can export information about all or selected DB instances to view and analyze DB instance information.

### Constraints

A tenant can export a maximum of 3,000 instances at a time. The time required for the export depends on the number of instances.

### Exporting Information About All DB Instances

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, choose **Export > All data to CSV** above the DB instance list. By default, information about all DB instances is exported. In the displayed dialog box, you can select the items to be exported and click **OK**.
- Step 4** Find a .csv file locally after the export task is completed.

----End

### Exporting Information About Selected DB Instances

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, filter DB instances by DB engine, DB instance name, DB instance ID, floating IP address, DB instance tag, or enterprise project, or select the DB instances to be exported, and choose **Export > Selected data to CSV** above the DB instance list. In the displayed dialog box, select the items to be exported and click **OK**.
- Step 4** Find a .csv file locally after the export task is completed.

----End

## 8.3.7 Deleting Pay-per-Use DB Instances or Read Replicas

### Scenarios

To release resources, you can delete DB instances or read replicas billed on the pay-per-use basis as required on the **Instances** page. To delete DB instances or read replicas billed on the yearly/monthly basis, you need to unsubscribe from the order. For details, see [Unsubscribing from a Yearly/Monthly Instance](#).

Before deleting a DB instance, check whether there are any manual backups. If you do not need to retain manual backups, [delete them](#) when deleting the DB instance. If you have purchased an EIP, [release or unsubscribe from it](#) before deleting the DB instance to save costs.

### Billing

- You will not be billed for the instances that were not successfully created.
- If you delete a pay-per-use DB instance, its automated backups will also be deleted and you will no longer be billed for them. Manual backups, however, will be retained and generate additional costs.

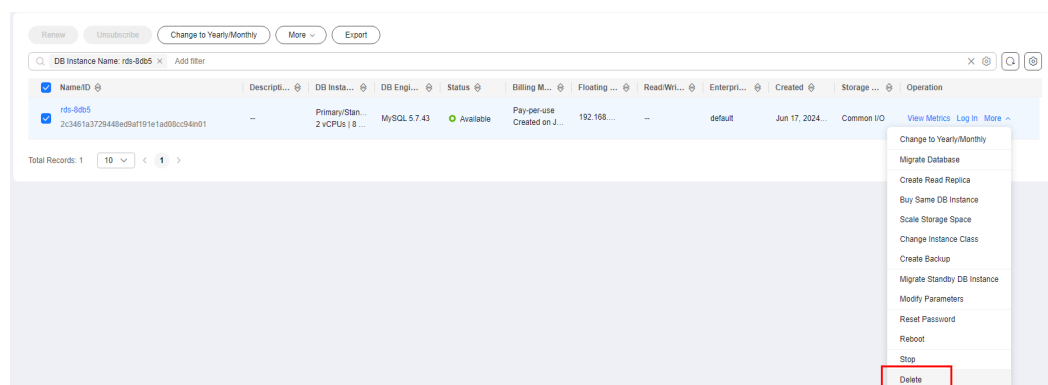
### Constraints

- DB instances cannot be deleted when operations are being performed on them. They can be deleted only after the operations are complete.
- If a backup of a DB instance is being restored, the instance cannot be deleted.
- A maximum of 50 pay-per-use DB instances can be deleted at a time.
- If you delete a primary DB instance, its standby DB instance and read replicas (if any) are also deleted automatically. Exercise caution when performing this operation.
- Deleted DB instances cannot be recovered and resources are released. Exercise caution when performing this operation. If you want to retain data, [create a manual backup](#) first before deleting the DB instance.
- You can [rebuild a DB instance](#) that was deleted up to 7 days ago from the recycle bin.
- You can use a manual backup to restore a DB instance. For details, see [Restoring a DB Instance from Backups](#).

### Deleting a Pay-per-Use DB Instance

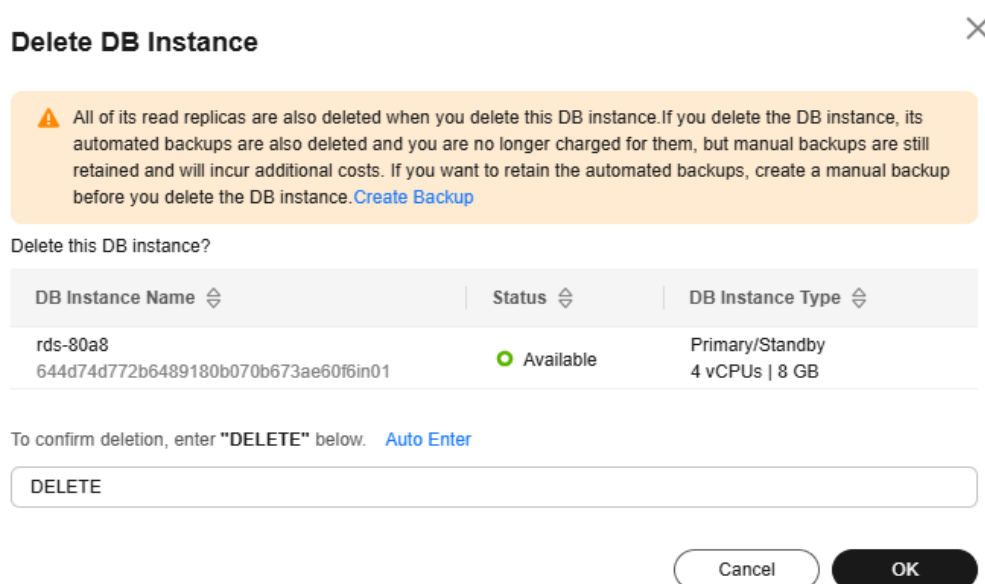
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the primary DB instance to be deleted and choose **More > Delete** in the **Operation** column.

Figure 8-12 Primary instance list



**Step 4** In the displayed dialog box, enter **DELETE** and click **OK**.

Figure 8-13 Deleting an instance



**Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 6** Refresh the DB instance list later to confirm that the deletion was successful.

-----End

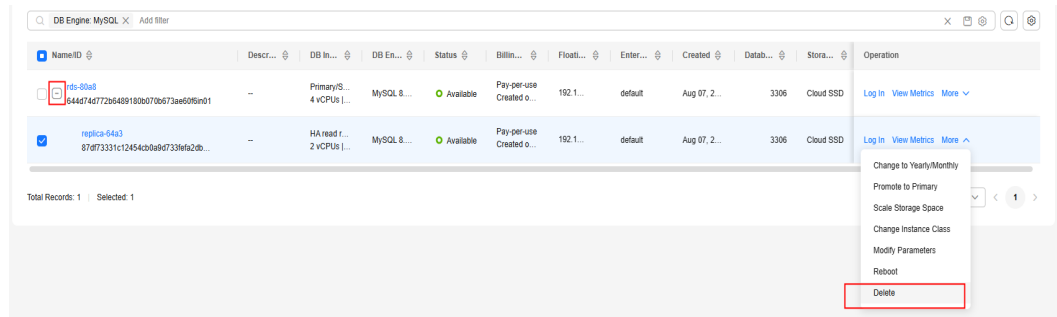
## Deleting a Pay-per-Use Read Replica

**Step 1** Click  in the upper left corner and select a region.



- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and click . All the read replicas created for the DB instance are displayed.
- Step 4** Locate the read replica to be deleted and click **More > Delete** in the **Operation** column.

**Figure 8-14** Read replica list



- Step 5** In the displayed dialog box, enter **DELETE** and click **OK**.
- Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

- Step 7** Refresh the DB instance list later to check that the deletion is successful.

----End

## Deleting Pay-per-Use DB Instances in Batches

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, select the RDS for MySQL pay-per-use DB instances to be deleted and choose **More > Delete** above the DB instance list.
- Step 4** In the displayed dialog box, enter **DELETE** and click **OK**.
- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 6** Refresh the DB instance list later to check that the deletion is successful.

----End

## Related APIs

- [Deleting a DB Instance](#)

## 8.3.8 Unsubscribing from a Yearly/Monthly Instance

### Scenarios

To delete a DB instance billed on the yearly/monthly basis, you need to unsubscribe from the order. You can unsubscribe from a single instance by referring to [Method 1](#) and [Method 2](#) or unsubscribe from instances in batches by referring to [Unsubscribing from DB Instances in Batches](#). For unsubscription fees, see [Unsubscription Rules](#).

To release DB instances or read replicas billed on a pay-per-use basis, you need to locate the target DB instances or read replicas and click **Delete** on the **Instances** page. For details, see [Deleting Pay-per-Use DB Instances or Read Replicas](#).

### Constraints

- If you unsubscribe from a DB instance, its read replicas (if any) will also be unsubscribed.
- A DB instance cannot be unsubscribed when any operations are being performed on it. It can be unsubscribed only after the operations are complete.
- If a backup of a DB instance is being restored, the instance cannot be unsubscribed.
- After an unsubscription request is submitted, resources and data will be deleted and cannot be retrieved. If you want to retain data, complete a manual backup before submitting the unsubscription request.

### Method 1

Unsubscribe from a yearly/monthly DB instance on the **Instances** page.

**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, locate the target DB instance and choose **More > Unsubscribe** in the **Operation** column.

**Step 5** In the displayed dialog box, click **OK**.

**Step 6** On the displayed page, confirm the order to be unsubscribed and select a reason. Then, click **Confirm**.

For details about unsubscribing from resources, see [Unsubscription Rules](#).

**Step 7** In the displayed dialog box, confirm the refund information, enter **YES**, and click **OK**.

#### NOTICE

1. After an unsubscription request is submitted, resources and data will be deleted and cannot be retrieved.
2. If you want to retain data, complete a manual backup before submitting the unsubscription request.

**Step 8** View the unsubscription results. After the DB instance order is successfully unsubscribed, the DB instance is no longer displayed in the instance list on the **Instances** page.

----End

## Method 2

Unsubscribe from a yearly/monthly DB instance on the **Billing Center** page.

**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

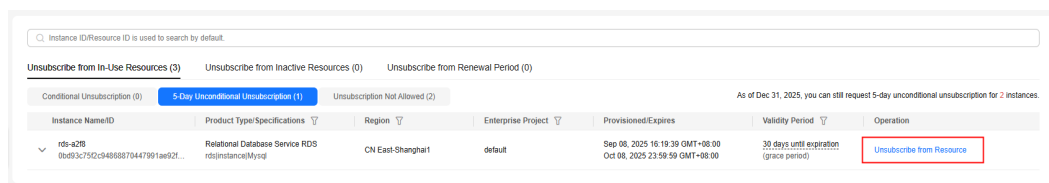
**Step 4** In the upper right corner, click **Billing**.

**Step 5** In the navigation pane, choose **Orders > Unsubscriptions**.

**Step 6** On the displayed page, select the resource to be unsubscribed and click **Unsubscribe from Resource** in the **Operation** column.

- You can select **Relational Database Service RDS** in the product type column to filter all RDS orders.

**Figure 8-15** Filtering all RDS orders



- Alternatively, search for target orders by name, order No., or ID in the search box.
- A maximum of 20 resources can be unsubscribed at a time.

**Step 7** On the displayed page, confirm the order to be unsubscribed and select a reason. Then, click **Confirm**.

For details about unsubscribing resources, see [Unsubscription Rules](#).

**Step 8** In the displayed dialog box, click **Yes**.

#### NOTICE

1. After an unsubscription request is submitted, resources and data will be deleted and cannot be retrieved.
2. If you want to retain data, complete a manual backup before submitting the unsubscription request.

**Step 9** View the unsubscription result. After the DB instance order is successfully unsubscribed, the DB instance is no longer displayed in the instance list on the **Instances** page.

----End

## Unsubscribing from DB Instances in Batches

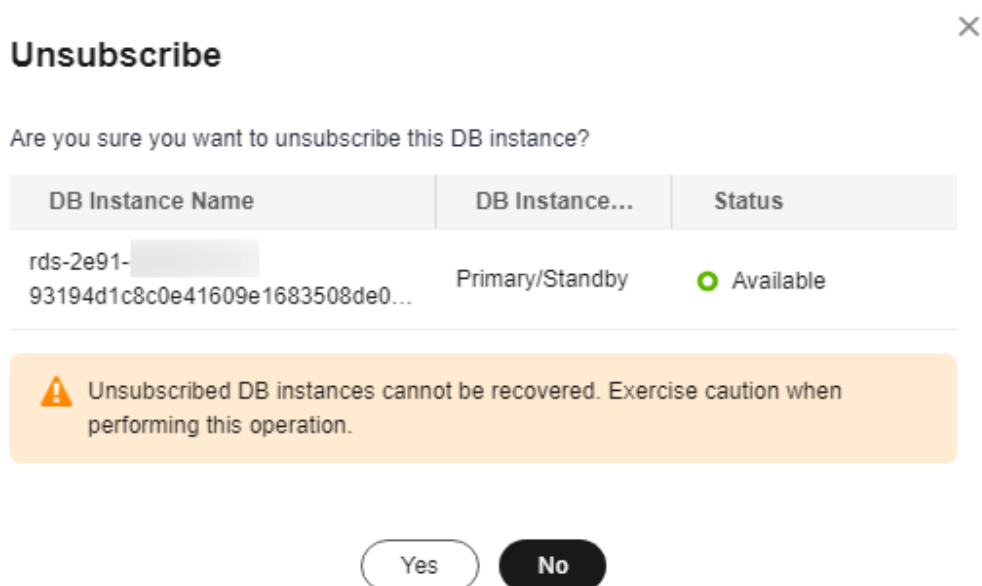
**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, select the target DB instances to be unsubscribed and click **Unsubscribe** above the DB instance list. In the displayed dialog box, click **Yes**.

**Figure 8-16** Unsubscribing from yearly/monthly instances in batches



**Step 5** On the displayed page, confirm the order to be unsubscribed and select a reason. Then, click **Confirm**.

For details about unsubscribing resources, see [Unsubscription Rules](#).

**Step 6** In the displayed dialog box, confirm the refund information, enter **YES**, and click **OK**.

---

**NOTICE**

1. After an unsubscription request is submitted, resources and data will be deleted and cannot be retrieved.
  2. If you want to retain data, complete a manual backup before submitting the unsubscription request.
- 

**Step 7** View the unsubscription results. After the DB instance order is successfully unsubscribed, the DB instances are no longer displayed in the instance list on the **Instances** page.

----End

## 8.3.9 Recycling a DB Instance

### Scenarios

RDS allows you to move unsubscribed yearly/monthly DB instances and deleted pay-per-use DB instances to the recycle bin. You can rebuild a DB instance that was deleted up to 7 days ago from the recycle bin.

If resources are not renewed after expiration, you can rebuild DB instances from the recycle bin to restore data.

### Constraints

- The recycle bin is free for use.
- Read replicas cannot be moved to the recycle bin.
- A stopped instance will not be moved to the recycle bin after being deleted.
- The recycle bin is enabled by default and cannot be disabled.
- After an instance is deleted, the system keeps the most recent automated full backup of the previous day. If there is no automated full backup generated on that day, it retains the latest available one. A full backup is also created. You can choose either backup to rebuild the instance.
- Instances in the recycle bin are retained for 7 days by default. A new recycling policy only applies to DB instances that were put in the recycle bin after the new policy was put into effect. For DB instances that were in the recycle bin before the modification, the original recycling policy takes effect.

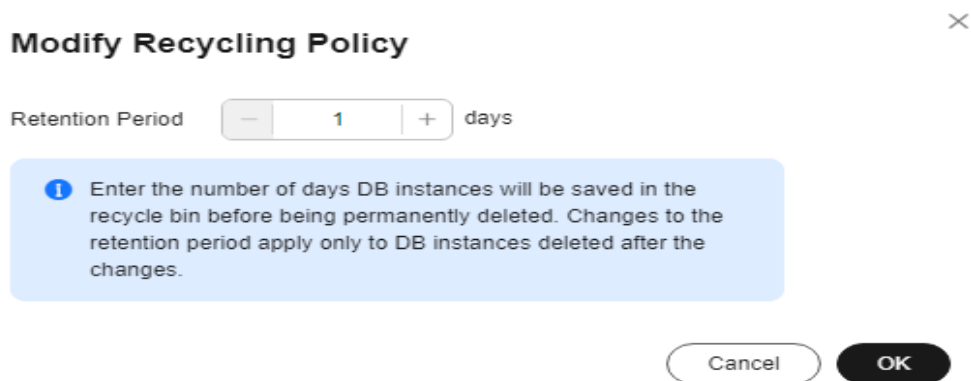
### Modifying the Recycling Policy

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

- Step 3** In the navigation pane on the left, choose **Recycle Bin**.
- Step 4** On the **Recycle Bin** page, click **Modify Recycling Policy**. In the displayed dialog box, set the retention period for the deleted DB instances to 1 to 7 days.
- Step 5** Then, click **OK**.

**Figure 8-17** Modifying the recycling policy



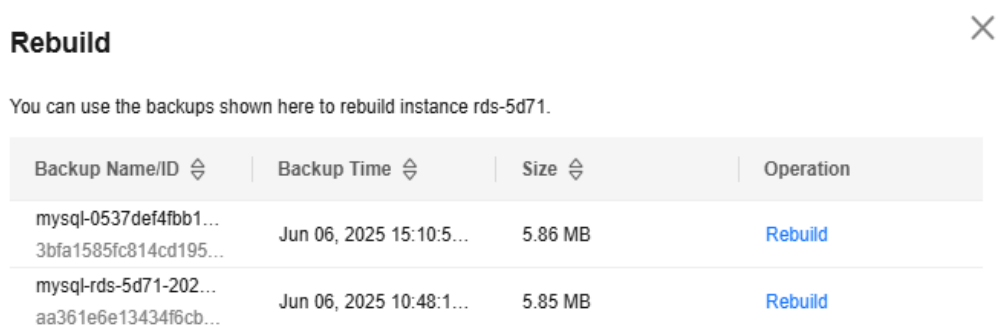
----End

## Rebuilding a DB Instance

You can rebuild the DB instances in the recycle bin within the retention period.

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the navigation pane on the left, choose **Recycle Bin**.
- Step 4** On the **Recycle Bin** page, locate the target DB instance to be rebuilt and click **Rebuild** in the **Operation** column.
- Step 5** In the displayed dialog box, locate a backup and click **Rebuild** in the **Operation** column.

**Figure 8-18** Rebuilding an instance



After an instance is deleted, the system keeps the most recent automated full backup of the previous day. If there is no automated full backup generated on that day, it retains the latest available one. A full backup is also created. You can choose either backup to rebuild the instance.

- Step 6** On the **Rebuild DB Instance** page, configure required information, click **Buy**, and submit the rebuild task. For details, see [Restoring Data to a New Instance](#).

----End

## Related APIs

- [Modifying the Recycling Policy](#)
- [Querying the Recycling Policy](#)
- [Querying Instances in the Recycle Bin](#)

## 8.3.10 Rebuilding a DB Instance

### Scenarios

The recycle bin stores deleted or unsubscribed instances. You can rebuild DB instances within the retention period from the recycle bin. For details about the retention period, see [Recycling a DB Instance](#).

### Constraints

- The recycle bin is free for use.
- Read replicas cannot be moved to the recycle bin.
- A stopped instance will not be moved to the recycle bin after being deleted.
- The recycle bin is enabled by default and cannot be disabled.
- After an instance is deleted, the system keeps the most recent automated full backup of the previous day. If there is no automated full backup generated on that day, it retains the latest available one. A full backup is also created. You can choose either backup to rebuild the instance.

### Rebuilding a DB Instance

- Step 1** Click  in the upper left corner and select a region.

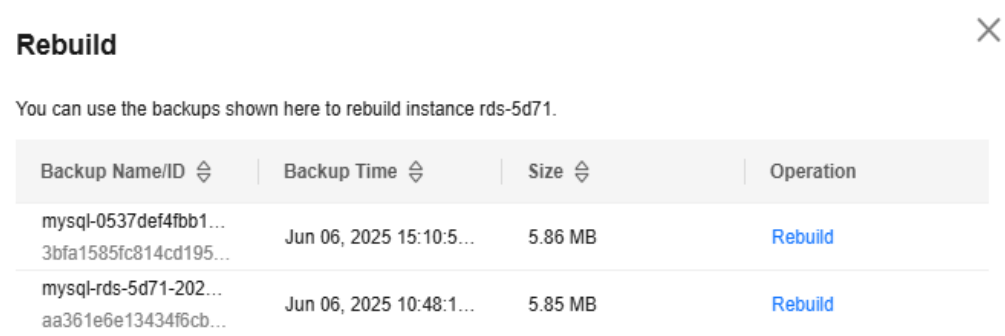
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

- Step 3** In the navigation pane on the left, choose **Recycle Bin**.

- Step 4** On the **Recycle Bin** page, locate the DB instance to be rebuilt and click **Rebuild** in the **Operation** column.

- Step 5** Locate a backup and click **Rebuild** in the **Operation** column.

Figure 8-19 Rebuilding an instance



After an instance is deleted, the system keeps the most recent automated full backup of the previous day. If there is no automated full backup generated on that day, it retains the latest available one. A full backup is also created. You can choose either backup to rebuild the instance.

- Step 6** On the displayed page, select a billing mode and configure information about your DB instance. Then, click **Buy**.
- Basic Settings

Table 8-7 Basic Settings

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Billing Mode | <p>Yearly/monthly and pay-per-use billing modes are available to meet your requirements in different scenarios.</p> <ul style="list-style-type: none"><li><b>Yearly/Monthly:</b> A prepaid billing mode in which you pay for resources before using it. Bills are settled based on the subscription period. The longer the subscription, the bigger the discount. This mode is a good option for long-term, stable services.</li><li><b>Pay-per-use:</b> A postpaid billing mode. You pay as you go and just pay for what you use. The DB instance usage is calculated by the second but billed every hour. If your instance has been used for less than one hour, you will be billed based on the actual duration. This mode allows you to adjust resource usage easily. You neither need to prepare for resources in advance, nor end up with excessive or insufficient preset resources.</li></ul> |

- Engine Options



Figure 8-20 Engine Options

<

 Rebuild DB Instance

Basic Settings

Billing Mode ⓘ  

Yearly/Monthly

Pay-per-use

Region  

📍 CN South-Guangzhou-InvitationOnly

Engine Options

DB Engine  

MySQL

DB Engine Version  

8.0

DB Instance Type  

Primary/Standby

Single

Primary/standby HA architecture is suitable for production databases in large- and medium-sized enterprises, or for applications in Internet, IoT, retail e-commerce, logistics, and gaming industries.

Storage Type  

Cloud SSD

Primary AZ  

az1

az2

Multi-AZ deployment provides disaster recovery capabilities across AZs.

Standby AZ  

az1

az2

Table 8-8 Engine Options

| Parameter         | Description                                |
|-------------------|--------------------------------------------|
| DB Engine         | MySQL by default                           |
| DB Engine Version | The same as that of the original instance. |

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Instance Type | <ul style="list-style-type: none"><li>– <b>Primary/Standby:</b> uses an HA architecture with a primary DB instance and a synchronous standby DB instance. It is suitable for production databases of large- and medium-sized enterprises in Internet, Internet of Things (IoT), retail e-commerce sales, logistics, gaming, and other sectors. The standby DB instance improves instance reliability and is invisible to you after being created.</li><li>– <b>Single:</b> uses a single-node architecture, which is less expensive than primary/standby DB instances. It is suitable for development and testing of microsites, and small- and medium-sized enterprises, or for learning about RDS.</li></ul> |

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Type | <p>Determines the DB instance read/write speed. The higher the maximum throughput is, the higher the DB instance read/write speed can be. After a DB instance is created, you can change its storage type. For details, see <a href="#">Changing a Storage Type</a>.</p> <ul style="list-style-type: none"><li>– Cloud SSD or Ultra-high I/O<br/>Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s.<ul style="list-style-type: none"><li>▪ For RDS for MySQL instances, this storage type is normally displayed as <b>Cloud SSD</b>, but for existing instances in certain regions it is displayed as <b>Ultra-high I/O</b>.</li><li>▪ The supported IOPS depends on the I/O performance of the Elastic Volume Service (EVS) disk. For details, see the description about ultra-high I/O in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul></li><li>– Extreme SSD<br/>Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency.<br/>The supported IOPS depends on the I/O performance of the EVS disk. For details, see the description about extreme SSD in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li><li>– Flexible SSD<br/>Decouples capacity from performance and allows for tailored IOPS and throughput for your business requirements. This storage type is ideal for mainstream interactive applications that require high performance and low latency.<ul style="list-style-type: none"><li>▪ You can preconfigure an IOPS ranging from 3,000 to 128,000. This IOPS must also be less than or equal to 500 times the capacity. You can preconfigure a throughput ranging from 125 to 1,000 MiB/s. This throughput must also be less than or equal to the IOPS divided by 4. For details, see the descriptions of "General Purpose SSD V2" in <a href="#">Disk Types and Performance</a> in <i>Elastic Volume Service Service Overview</i>.</li></ul></li></ul> <p><b>NOTE</b><br/>To purchase instances with Flexible SSDs, <a href="#">submit a service ticket</a>.<br/>Only single-node instances, primary/standby instances, and single-node read replicas support Flexible SSDs.<br/>If you have purchased the Dedicated Distributed Storage Service (DSS), only the storage type that you have selected when you buy the DSS service is displayed.</p> |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AZ        | <p>An AZ is a physical region where resources use independent power supply and networks. AZs are physically isolated but interconnected through an internal network. You can select different AZs for your primary and standby instances for cross-AZ disaster recovery.</p> <p>To achieve high reliability, RDS will automatically deploy your primary and standby instances in different physical servers even if you deploy them in the same AZ. If you attempt to deploy your primary and standby instances in the same AZ in a Dedicated Computing Cluster (DCC) and there is only one physical server available, the creation will fail.</p> |

● Instance Configuration

Figure 8-21 Instance Configuration

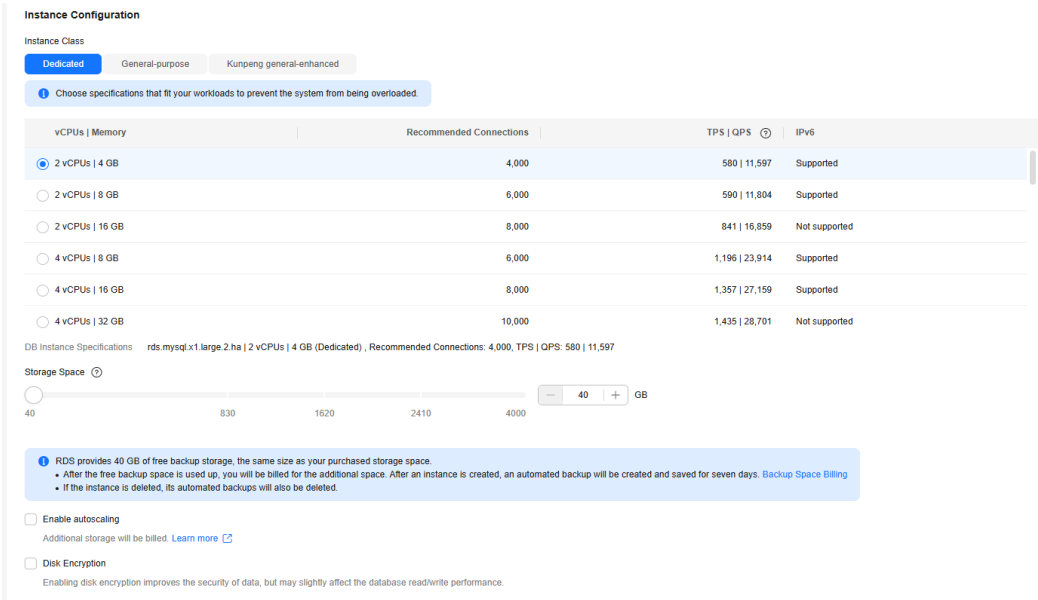


Table 8-9 Instance Configuration

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Class | <p>Refers to the vCPUs and memory of a DB instance. Different instance classes support different numbers of database connections and maximum IOPS.</p> <p>For details about instance classes, see <a href="#">RDS for MySQL Instance Classes</a>.</p> <p>After a DB instance is created, you can change its instance class. For details, see <a href="#">Changing a DB Instance Class</a>.</p> <p><b>NOTE</b><br/>Only general-enhanced DB instances are allowed for a <a href="#">DCC</a>.</p> |

| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Space      | <p>Contains the system overhead required for inodes, reserved blocks, and database operation.</p> <p>After a DB instance is created, you can scale up its storage space. For details, see <a href="#">Scaling Up Storage Space</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Enable autoscaling | <p>If the storage type is cloud SSD or extreme SSD, you can enable storage autoscaling. If the available storage drops to a specified threshold, autoscaling is triggered.</p> <ul style="list-style-type: none"><li>– <b>Enable autoscaling:</b> If you select this option, autoscaling is enabled.</li><li>– <b>Trigger If Available Storage Drops To:</b> If the available storage drops to a specified threshold or 10 GB, autoscaling is triggered.</li><li>– <b>Autoscaling Limit:</b> The default value range is from 40 to 4,000, in GB. The limit must be no less than the storage of the DB instance.</li></ul> <p><b>NOTE</b></p> <p>If you specify a read replica when creating a primary DB instance and enable storage autoscaling for the primary DB instance, storage autoscaling is also enabled for the read replica by default.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Disk Encryption    | <p>Enabling disk encryption enhances data security but reduces the database's read and write performance by 5%.</p> <p><b>Key Name:</b> indicates the tenant key. Select one from the drop-down list. If no key is available, click <b>Create Key</b> and configure parameters to create one. For details, see <a href="#">Creating a Custom Key</a> in the <i>Data Encryption Workshop User Guide</i>.</p> <p>After disk encryption is enabled, the following restrictions apply:</p> <ul style="list-style-type: none"><li>– If you enable disk encryption during instance creation, the disk encryption status and the key cannot be changed later.</li><li>– Enabling disk encryption will not encrypt backup data stored in Object Storage Service (OBS). To enable backup data encryption, contact customer service.</li><li>– Keep the key secure. Once the key is disabled, deleted, or frozen, your instance will be inaccessible and its data may not be restored.</li></ul> <p>If disk encryption is enabled but backup data encryption is not enabled, you can <a href="#">restore the data to a new instance from backups</a>.</p> <p>If both disk encryption and backup data encryption are enabled, the data cannot be restored.</p> <p><b>NOTE</b></p> <ul style="list-style-type: none"><li>– If a shared KMS key is used, the corresponding CTS events are <b>createdatakey</b> and <b>decrydatakey</b>. Only the key owner can receive the events.</li></ul> |

- Basic Settings and Connectivity

Figure 8-22 Basic Settings and Connectivity

Basic Settings

DB Instance Name ⓘ

rds-6954

If you buy multiple DB instances at a time, they will be named with four digits appended in the format "DB instance name-SN". For example, if the DB instance name is "instance", the first instance will be named "instance-0001", the second "instance-0002", and so on.

Password

Skip

Configure

To log in, you will have to reset the password later on the Basic Information page for this instance.

Enterprise Project ⓘ

default

Q

Create Enterprise Project

Connectivity

VPC ⓘ

default\_vpc

Q

Create VPC

The VPC an RDS instance is deployed in cannot be changed later. ECSs in different VPCs cannot communicate with each other by default.

Subnet

default\_subnet(192.168.0.0/24)

Q

An EIP is required if you want to access DB instances through a public network. [View EIP](#)

IPv4 Address

Addresses available: 226 [View IP Addresses](#)

Database Port

3306

Security Group ⓘ

default X

Q

Create Security Group

Security Group Rules

Ensure that port 3306 of the security group allows traffic from your server IP address to the DB instance.

Table 8-10 Network

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Instance Name | Must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (_) are allowed.                                                                                                                                                                                                                                                                                                                                                                                                         |
| Password         | <div><div><div>– <b>Configure</b> (default setting): Configure a password for your DB instance during the creation process.</div><div>– <b>Skip</b>: Configure a password later after the DB instance is created. After a DB instance is created, you can reset the password. For details, see <a href="#">Resetting the Administrator Password to Restore root Access</a>.</div></div><div><div>NOTICE</div><div>If you select <b>Skip</b> for <b>Password</b>, you need to reset the password before you can log in to the instance.</div></div></div> |

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| Parameter              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Administrator          | The default login name for the database is <b>root</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Administrator Password | <p>Must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^*_+=?,()&amp;.). Enter a strong password and periodically change it for security reasons.</p> <p>If the password you provide is regarded as a weak password by the system, you will be prompted to enter a stronger password.</p> <p>Keep this password secure. The system cannot retrieve it.</p> <p>After a DB instance is created, you can reset this password. For details, see <a href="#">Resetting the Administrator Password to Restore root Access</a>.</p>                                                                                                                                                               |
| Confirm Password       | Must be the same as <b>Administrator Password</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| VPC                    | <p>A virtual network in which your RDS DB instances are located. A VPC can isolate networks for different workloads. You can select an existing VPC or create a VPC. For details about how to create a VPC, see <a href="#">Creating a VPC with a Subnet</a>.</p> <p>To use a shared VPC, select a VPC that another account shares with the current account from the drop-down list.</p> <p>VPC owners can share the subnets in a VPC with one or multiple accounts through <a href="#">Resource Access Manager (RAM)</a>. Through VPC sharing, you can easily configure, operate, and manage multiple accounts' resources at low costs. For more information about VPC and subnet sharing, see <a href="#">VPC Sharing</a>.</p> <p><b>NOTICE</b><br/>After a DB instance is created, the VPC cannot be changed.</p> |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subnet    | <p>Improves network security by providing dedicated network resources that are logically isolated from other networks. Subnets take effect only within an AZ. The Dynamic Host Configuration Protocol (DHCP) function is enabled by default for subnets in which you create RDS DB instances and cannot be disabled.</p> <ul style="list-style-type: none"><li>IPv4 address:<br/>A floating IPv4 address is automatically assigned when you create a DB instance. You can also enter an unused floating IPv4 address in the subnet CIDR block. After the DB instance is created, you can change the floating IP address.</li><li>IPv6 address:<br/>A DB instance assigned a floating IPv6 address will be created only when the vCPUs and memory you selected support IPv6 addresses.<br/>A floating IPv6 address is automatically assigned during instance creation and cannot be specified. After the DB instance is created, this floating IP address cannot be changed. If no IPv6 subnets are available, <a href="#">submit a service ticket</a>.</li></ul> <p><b>Requirements for available private IP addresses in a subnet hosting your DB instance:</b></p> <ul style="list-style-type: none"><li>When creating a single-node DB instance, ensure that there are at least two available private IP addresses.<ul style="list-style-type: none"><li>If you also need to create single-node read replicas, there should be at least four available private IP addresses.</li><li>If you need to create HA read replicas, there should be at least six available private IP addresses.</li></ul></li><li>When creating a primary/standby DB instance, ensure that there are at least three available private IP addresses.<br/>If you also need to create HA read replicas, there should be at least seven available private IP addresses.</li></ul> <p><b>Figure 8-23 Viewing available private IP addresses</b></p>  |



| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database Port  | <p>The default database port is <b>3306</b>. You can change it after a DB instance is created.</p> <p>RDS for MySQL instances can use database ports 1024 to 65535, excluding 12017, 33071, and 33062, which are reserved for RDS system use.</p>                                                                                                                                                                                                                                                                                                                     |
| Security Group | <p>Enhances security by controlling access to RDS from other services. In addition, a network <b>access control list (ACL)</b> can help control inbound and outbound traffic of subnets in your VPC. Ensure that the security group you select allows the client to access the DB instance.</p> <p>When creating a DB instance, you can select multiple security groups. For better network performance, you are advised to select no more than five security groups. In such a case, the access rules of all the selected security groups apply on the instance.</p> |

- Additional Options

Figure 8-24 Additional Options

Additional Options

Enterprise Project ⓘ

Select

Q

Create Enterprise Project

Parameter Template

Default-HighPerformance-Edition-MySQL-8.0

Q

View Parameter Template

⚠ Using a high-performance template tends to result in lost data and replication exceptions after an instance recovers from a crash. There may also be out of memory (OOM) errors with small instance classes in high concurrency scenarios. For details, see the user guide. [View Details](#)

Time Zone

(UTC+08:00) Beijing, Chongqing, Hong Kong, Urumqi

▼

Tag

TMS's predefined tags are recommended for adding the same tag to different cloud resources. [Create predefined tags](#)

+ Add

Tags you can still add: 20

Table 8-11 Additional Options

| Parameter          | Description                                                                                                                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enterprise Project | <p>If your account has been associated with an enterprise project, select the target project from the <b>Enterprise Project</b> drop-down list.</p> <p>For more information about enterprise projects, see <a href="#">Enterprise Management User Guide</a>.</p> |

| Parameter          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Parameter Template | <p>Contains engine configuration values that can be applied to one or more DB instances of the same DB engine.</p> <p>In the drop-down list, you can select a default parameter template, high-performance parameter template, or custom parameter template in the current region as required.</p> <ul style="list-style-type: none"><li>- A default parameter template contains DB engine defaults and system defaults that are configured based on the engine, compute class, and storage space allocated of an instance. Default parameter templates cannot be modified, but you can create your own parameter template to change parameter settings.</li><li>- High-performance parameter templates are only available for RDS for MySQL 5.7 and 8.0. Compared with standard parameter templates, high-performance templates provide higher read/write speed but lower data security. For details, see <a href="#">Creating a Parameter Template</a>.</li><li>- You can select a custom parameter template and change the parameter values as required. The changes to parameter values in a custom parameter template are not applied to your instance until you apply the template to the instance. For details, see <a href="#">Creating a Parameter Template</a>.</li></ul> <p>If you select a custom parameter template when creating a DB instance, specification-related parameters (including <b>back_log</b>, <b>innodb_io_capacity_max</b>, <b>max_connections</b>, <b>innodb_io_capacity</b>, <b>innodb_buffer_pool_size</b>, and <b>innodb_buffer_pool_instances</b>) in the custom template are not applied. Instead, the default values are used.</p> <p>You can modify the instance parameters as required after the DB instance is created. For details, see <a href="#">Modifying Parameters of an RDS for MySQL Instance</a>.</p> |
| Time Zone          | <p>You need to select a time zone for your instance based on the region hosting your instance. You can select a time zone during instance creation and change it later as needed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Tag                | <p>Tags an RDS DB instance. This parameter is optional. Adding tags to RDS DB instances helps you better identify and manage the DB instances. A maximum of 20 tags can be added for each DB instance.</p> <p>If your organization has configured tag policies for RDS, add tags to DB instances based on the policies. If a tag does not comply with the policies, DB instance creation may fail. Contact your organization administrator to learn more about tag policies.</p> <p>After a DB instance is created, you can view its tag details on the <b>Tags</b> page. For details, see <a href="#">RDS for MySQL Tags</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

If you have any questions about the price, click **Pricing details** at the bottom of the page.

#### NOTE

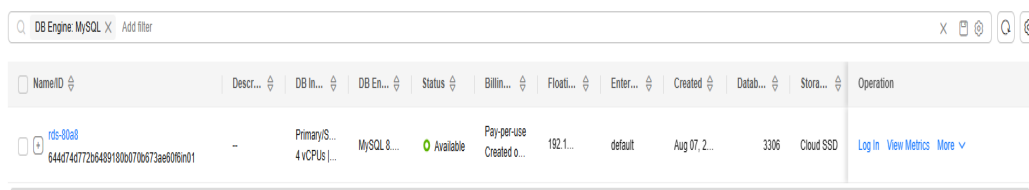
The performance of your DB instance depends on its configurations. Hardware configuration items include the instance specifications, storage type, and storage space.

#### Step 7 Confirm the instance information.

- For pay-per-use instances, confirm the specifications.
  - If you need to modify your settings, click **Previous**.
  - If you do not need to modify your settings, click **Submit**.
- For yearly/monthly instances, confirm the order.
  - If you need to modify your settings, click **Previous**.
  - If you do not need to modify your settings, click **Pay Now** to go to the payment page. Select a payment method and complete the payment.

#### Step 8 To view and manage your DB instance, go to the **Instances** page.

**Figure 8-25** Instance successfully purchased



| NameID                                                                                                                               | Descr... | DB In...     | DB En...   | Status    | Billin...   | Floa...  | Enter... | Created      | Datab... | Stora...  | Operation                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------|----------|--------------|------------|-----------|-------------|----------|----------|--------------|----------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  rds-8l3ad<br>644d74d772b6489180b070b673ae806ind1 | -        | Primary(S... | MySQL 8... | Available | Pay-per-use | 192.1... | default  | Aug 07, 2... | 3306     | Cloud SSD | <a href="#">Log In</a> <a href="#">View Metrics</a> <a href="#">More</a>  |

- When your DB instance is being created, the status is **Creating**. The status changes to **Available** after the instance is created. To view the detailed progress and result of the creation, go to the **Task Center** page.
- The automated backup policy is enabled by default. You can change it after the DB instance is created. An automated full backup is immediately triggered once your DB instance is created.

-----End

## Follow-up Operations

After a DB instance is created, you can enter a description for it. For details, see [Changing a DB Instance Description](#).

The default database port is **3306**. You can change it after a DB instance is created. To ensure data and instance security, you are advised to change the database port in a timely manner. For details, see [Changing a Database Port](#).

## How Long Does It Take to Create an RDS for MySQL Instance?

- It takes 5 to 7 minutes to create a single-node or primary/standby instance.
- Creating a read replica that is in the same AZ as the primary or standby instance takes about 15 minutes. In other cases, the time required for creating a read replica depends on how much data there is in the primary instance. More data means longer creation.

If creating an instance takes much more time than described above, there may be problems during the creation. In this case, contact customer service by [submitting a service ticket](#).

## What Can I Do If I Can't Find My RDS Resources?

- Your purchased resources are not in the selected region.
  - a. In the upper part of the page, switch to the region that your RDS resources belong to.
  - b. Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Your purchased resources are not under the selected service.
  - a. [Go to the My Resources page](#).
  - b. Select the correct service and region to view the purchased resources.
- Your resources are released due to arrears.

If your subscriptions have expired and not renewed, or you are in arrears due to an insufficient balance, your resources enter a grace period. If the renewal is still not completed or the outstanding amount is not paid off when the grace period ends, the resources enter a retention period, during which the resources will be unavailable. If the renewal is still not completed or the outstanding amount is still not paid off when the retention period ends, the stored data will be deleted and the cloud service resources will be released. For details, see [Resource Suspension and Release](#).

## Related APIs

- [Modifying the Recycling Policy](#)
- [Querying the Recycling Policy](#)
- [Querying Instances in the Recycle Bin](#)

# 9 Instance Modifications

---

## 9.1 Introduction to Instance Overview

On the **Overview** page, you can get knowledge of the overall status of your RDS for MySQL instance, including alarms, intelligent anomaly diagnosis, and key performance metrics. Intelligent anomaly diagnosis uses operational data analytics and intelligent algorithms to access instance health, and provides you with solutions and suggestions for handling detected exceptions.

### Functions

[Table 9-1](#) lists the functions provided on the **Overview** page.

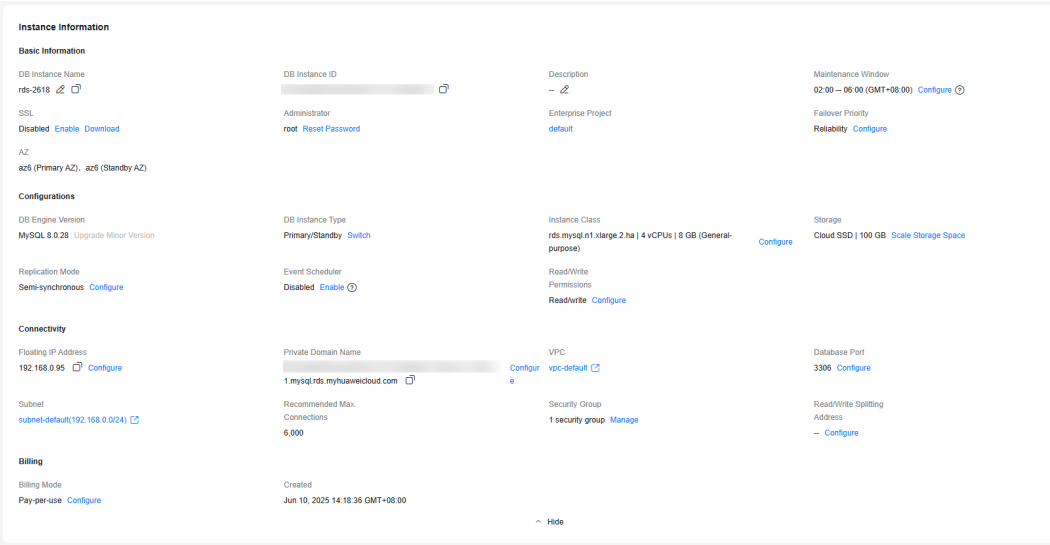
**Table 9-1** Function description

| Function                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Information          | <p>Shows basic information about your instance and allows you to modify the instance.</p> <ul style="list-style-type: none"><li>• <b>Basic Information</b><br/>This area displays the DB instance name/ID, description, AZ, and enterprise project, and allows you to <a href="#">configure a maintenance window</a>, <a href="#">configure SSL</a>, <a href="#">reset root password</a>, and <a href="#">configure a failover priority</a>.</li><li>• <b>Configurations</b><br/>This area displays the DB engine version, and allows you to <a href="#">switch between the primary and standby nodes</a>, <a href="#">change the instance class</a>, <a href="#">scale up storage</a>, <a href="#">configure a replication mode</a>, <a href="#">configure event scheduler</a>, and <a href="#">configure read/write permissions</a>.</li><li>• <b>Connectivity</b><br/>This area displays the VPC, subnet, recommended maximum connections, and read/write splitting address, and allows you to <a href="#">change the floating IP address</a>, <a href="#">change the private domain name</a>, <a href="#">change the database port</a>, and <a href="#">manage security groups</a>.</li><li>• <b>Billing</b><br/>This area displays the creation time and allows you to <a href="#">change the billing mode</a>.</li></ul> |
| Alarms                        | Shows the active alarms of your instance, including alarms in the <b>Alarm</b> (metric) or <b>Triggered</b> (event) state.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Intelligent Anomaly Diagnosis | Shows the health status of your instance based on operational data analytics and intelligent algorithms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Performance Monitoring        | Shows key performance metrics of the instance, including the CPU usage, memory usage, slow SQL queries, and connections.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Storage & Backup              | Shows the storage space and backup space usage of your instance, and allows you to scale up the storage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## Instance Information

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the **Instance Information** area, check the instance information and modify the instance as required.

Figure 9-1 Instance Information



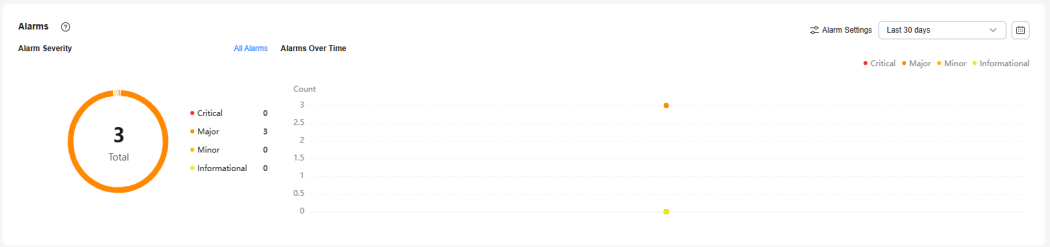
----End

Alarms

In the **Alarms** area, check alarm information of your instance.

Based on the configured alarm rules, you can see active alarms of your instance, including alarms in the **Alarm** (metric) or **Triggered** (event) state.

Figure 9-2 Alarms



- To check all alarm records, click **All Alarms**.
  - To configure alarm rules, click **Alarm Settings**.
  - To check alarms over time, select a time window in the upper part of the **Alarms** area.
- The time window can be last 1 hour, last 6 hours, last 12 hours, last 24 hours, last 7 days, last 30 days, or a custom time period.

Intelligent Anomaly Diagnosis

In the **Intelligent Anomaly Diagnosis** area, view the health diagnosis results of your instance.

Intelligent Anomaly Diagnosis checks instance health using instance operation data and intelligent algorithms and provides diagnosis results and suggestions. It provides diagnosis results for check items in the past 5 minutes. If any diagnosis result is abnormal, the check item is abnormal in the past 5 minutes.

Figure 9-3 Intelligent Anomaly Diagnosis

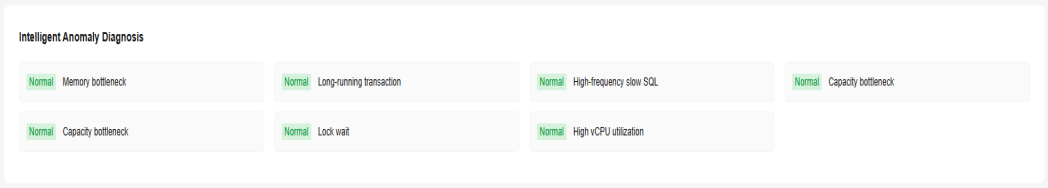


Table 9-2 provides the supported diagnosis items and handling suggestions.

Table 9-2 Intelligent Anomaly Diagnosis

| Diagnosis Item           | Metric                             | Metric Description                                                                                                                                                                                               | Handling Suggestions                                                                                                                                                                                                                         | Practices                                                                                                                       |
|--------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Memory bottleneck        | Memory Usage (%)                   | Memory usage of the monitored object                                                                                                                                                                             | <ul style="list-style-type: none"><li>Upgrade instance specifications.</li><li>Optimize SQL statements to reduce the use of temporary tables.</li><li>Reconnect sessions at a specific interval to release memory of the sessions.</li></ul> | <ul style="list-style-type: none"><li>Out of Memory (OOM) Errors</li><li>High Memory Usage of RDS for MySQL Instances</li></ul> |
|                          | Total Connections (Count)          | Total number of connections that attempt to connect to the MySQL server                                                                                                                                          |                                                                                                                                                                                                                                              |                                                                                                                                 |
|                          | Current Active Connections (Count) | Number of connections that are not in the sleep state                                                                                                                                                            |                                                                                                                                                                                                                                              |                                                                                                                                 |
| Long-running transaction | Long Transaction (s)               | Maximum duration for starting a transaction<br>A complete long transaction is counted only when the <b>BEGIN</b> and <b>COMMIT</b> commands exist before and after the related operation commands, respectively. | Obtain the session ID of a long-running transaction and run the <b>kill</b> command to terminate it.                                                                                                                                         | Handling RDS for MySQL Long-Running Transactions                                                                                |



| Diagnosis Item          | Metric                      | Metric Description                                   | Handling Suggestions                                                                                                                                                           | Practices                                                                    |
|-------------------------|-----------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| High-frequency slow SQL | Slow Query Logs (Count/min) | Number of MySQL slow query logs generated per minute | <ul style="list-style-type: none"><li>Optimize slow SQL statements based on the execution plan.</li><li>Upgrade vCPU specifications for compute-intensive workloads.</li></ul> | <a href="#">Slow SQL Statements Due to Improper Composite Index Settings</a> |

| Diagnosis Item      | Metric                   | Metric Description                          | Handling Suggestions                                                                                                                                                                                                                                                                                                                                                            | Practices                                               |
|---------------------|--------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Capacity bottleneck | Storage Space Usage (%)  | Storage space usage of the monitored object | <ul style="list-style-type: none"><li>Scaling up storage space: You can configure storage autoscaling. When the storage usage reaches the threshold, autoscaling is triggered.</li><li>Reducing disk data: Delete useless historical data.</li><li>If temporary files generated by sorting queries occupy too much storage space, optimize your SQL query statements.</li></ul> | <a href="#">Full Storage of RDS for MySQL Instances</a> |
|                     | Used Storage Space (GB)  | Used storage space of the monitored object  |                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |
|                     | Total Storage Space (GB) | Total storage space of the monitored object |                                                                                                                                                                                                                                                                                                                                                                                 |                                                         |

| Diagnosis Item     | Metric                                              | Metric Description                                                                                                                                                                                                                                                                 | Handling Suggestions                                                                                                                                                                              | Practices                          |
|--------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Storage bottleneck | IOPS (Times/s)                                      | Average number of I/O requests processed by the system in a specified period                                                                                                                                                                                                       | <ul style="list-style-type: none"><li>Upgrade instance specifications.</li><li>To reduce data reads from the disk, optimize the application to make it read data from the buffer first.</li></ul> | <b>Insufficient Disk Bandwidth</b> |
|                    | The time percentage of disk I/O in a non-idle state | Percentage of time when the disk is not idle (there are I/O activities). This parameter indicates how busy the disk is. The disk can process I/O requests in parallel. Even if the value of this parameter reaches 100%, the disk may not reach its maximum processing capability. |                                                                                                                                                                                                   |                                    |
|                    | Disk Read Throughput (Bytes/s)                      | Number of bytes read from the disk per second                                                                                                                                                                                                                                      |                                                                                                                                                                                                   |                                    |
|                    | Disk Write Throughput (Bytes/s)                     | Number of bytes written into the disk per second                                                                                                                                                                                                                                   |                                                                                                                                                                                                   |                                    |

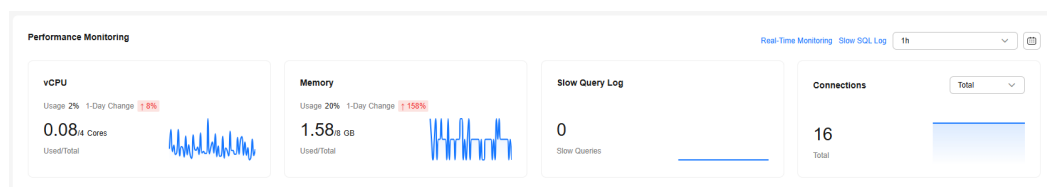
| Diagnosis Item | Metric                                | Metric Description                                                                                                                                                                         | Handling Suggestions                                                                                                                                                                                                                                                                                                                                  | Practices                                                                                                                                           |
|----------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Lock wait      | Row Locks Waits Transactions (Counts) | Number of InnoDB row lock waits<br><br>This metric indicates the total number of historical transactions waiting for row locks. Lock waits will be cleared after the instance is rebooted. | <ul style="list-style-type: none"><li>Metadata locks:<br/>Terminate sessions with metadata locks to resume blocked operations .</li><li>InnoDB locks:<br/>Check whether there are lock waits. Terminate the source sessions with locks and resume blocked operations .</li></ul> For details, see <a href="#">Managing Locks &amp; Transactions</a> . | <ul style="list-style-type: none"><li><a href="#">RDS for MySQL Metadata Locks</a></li><li><a href="#">Slow Response Due to Deadlocks</a></li></ul> |
|                | Average Row Lock Wait Time (ms)       | Average wait time of historical InnoDB row locks                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
|                | Current Row Lock Waits (Counts)       | Number of current InnoDB row lock waits<br><br>This metric indicates the number of transactions that are currently waiting for row locks.                                                  |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |
|                | MDL Locks (Counts)                    | Number of metadata locks                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                     |

| Diagnosis Item        | Metric        | Metric Description                                                     | Handling Suggestions                                                                                                                                                                               | Practices                                                 |
|-----------------------|---------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| High vCPU utilization | CPU Usage (%) | CPU usage of the monitored object                                      | <ul style="list-style-type: none"><li>Evaluate the SQL execution plan and add indexes to avoid full table scanning.</li><li>Upgrade vCPU specifications for compute-intensive workloads.</li></ul> | <a href="#">High CPU Usage of RDS for MySQL Instances</a> |
|                       | TPS (Times/s) | Execution times of submitted and rollback transactions per second      |                                                                                                                                                                                                    |                                                           |
|                       | QPS (Times/s) | Query times of SQL statements (including stored procedures) per second |                                                                                                                                                                                                    |                                                           |

## Performance Monitoring

In the **Performance Monitoring** area, you can view the vCPUs (used/total), memory (used/total), slow SQL logs, and connections of your instance.

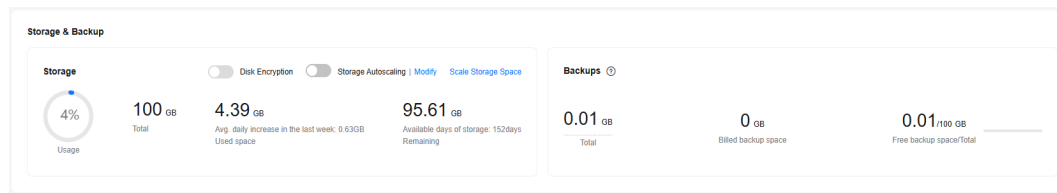
Figure 9-4 Performance Monitoring



- To check all metrics, click **Real-Time Monitoring** to go to the DBA Assistant page. For details, see [Viewing Performance Metrics of a DB Instance](#).
- To check the analysis results of slow queries, click **Slow SQL Log** to go to the DBA Assistant page. For details, see [Viewing Slow Query Logs of a DB Instance](#).
- To check metric changes over time, select a time range in the upper part. The time window can be last 1 hour, last 6 hours, last 12 hours, last 24 hours, last 7 days, last 30 days, or a custom time period.

## Storage & Backup

In the **Storage & Backup** area, you can check the storage space usage and backup space usage of your instance, enable disk encryption, and scale up storage space.

**Figure 9-5 Storage & Backup**

- Files that occupy the storage space include data files, log files, and other temporary files. To check the distribution and changes of used storage, see [Managing Storage Capacity](#).
- After an instance is purchased, the disk encryption status and the key cannot be changed.  
If you enable disk encryption when purchasing an instance, the new storage space after scale-up still uses the original encryption key. Keep the key secure. Once the key is disabled, deleted, or frozen, your instance will become inaccessible.
- As workload data increases, the storage capacity of your instance may be insufficient. To scale up the storage space, see [Scaling Up Storage Space](#).
- Backups are stored as packages in OBS and occupy the backup space. If the free space RDS provides is used up, the additional space required will be billed. For the billing details, see [How Is RDS Backup Data Billed?](#)

## 9.2 Changing a DB Instance Name

### Scenarios

You can change the name of a primary DB instance or read replica.

### Procedure

- Step 1** [Log in to the management console](#).
- Step 2** Click  in the upper left corner and select a region.
- Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4** On the **Instances** page, locate the target DB instance and click  next to it to edit the instance name. Then, click **OK**.

Alternatively, click the instance name to go to the **Overview** page. Under **DB Instance Name**, click  to edit the instance name.

The instance name must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (\_) are allowed.

- To submit the change, click .
- To cancel the change, click .

**Step 5** Check the results on the **Overview** page.

----End

## Related APIs

- [Changing a DB Instance Name](#)

## 9.3 Changing a DB Instance Description

### Scenarios

After a DB instance is created, you can add a description.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the DB instance you wish to edit the description for and click  in the **Description** column to make your modification. When you are finished, click **OK**.

Alternatively, click the instance name to go to the **Overview** page. Under **Description**, click  to edit the instance description.

The DB instance description can include up to 64 characters, and can include letters, digits, hyphens (-), underscores (\_), and periods (.).

- To submit the change, click .
- To cancel the change, click .

**Step 4** Check the results on the **Overview** page.

----End

## Related APIs

- [Changing the Description of a DB Instance](#)

## 9.4 Changing the Replication Mode

### Scenarios

You can change the replication mode for primary/standby DB instances to **Asynchronous** or **Semi-synchronous**.

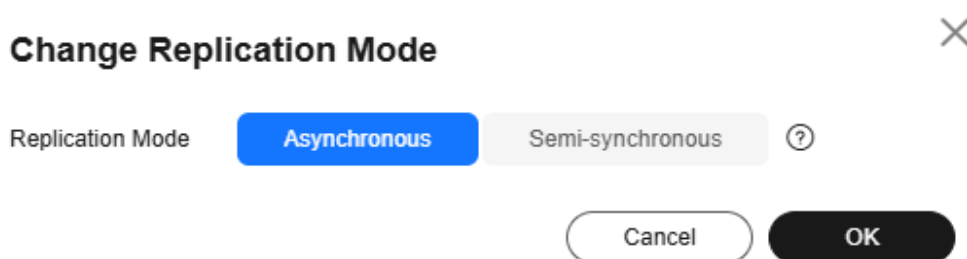
- **Asynchronous:**

- When applications update data, the primary DB instance responds to the applications immediately after data is updated. This mode provides better performance than the semi-synchronous mode.
- **Semi-synchronous** (default value):
  - When applications update data, the primary DB instance responds to the applications only after the standby DB instance receives logs, which affects database performance.
  - If the standby DB instance is abnormal, the primary DB instance waits for the response of the standby DB instance for several seconds and does not respond to write operations during this period.
    - If the standby DB instance is recovered during the waiting period, the primary DB instance starts to respond to write operations normally.
    - If the standby DB instance is not recovered during the waiting period, the replication mode is automatically switched to asynchronous. After the switchover is complete, the primary DB instance starts to respond to write operations.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** On the displayed **Overview** page, find **Replication Mode** and click **Configure** under it. In the displayed dialog box, select a mode and click **OK**.

**Figure 9-6** Changing the replication mode



- Step 5** On the **Overview** page, check for the new replication mode.

----End

## Related APIs

- [Changing the Data Replication Mode of Primary/Standby DB Instances](#)



## 9.5 Changing the Failover Priority

### Scenarios

RDS gives you control over the failover priority of your primary/standby DB instance. You can set it to **Reliability** or **Availability**.

- **Reliability** (default setting): Data consistency is preferentially ensured during a primary/standby failover. This is recommended for applications whose highest priority is data consistency. In extreme scenarios, there may be a small amount of data lost.
- **Availability**: Database availability is preferentially ensured during a primary/standby failover and the failover can be performed with a certain replication delay. This is recommended for applications that require databases to provide uninterrupted online services.

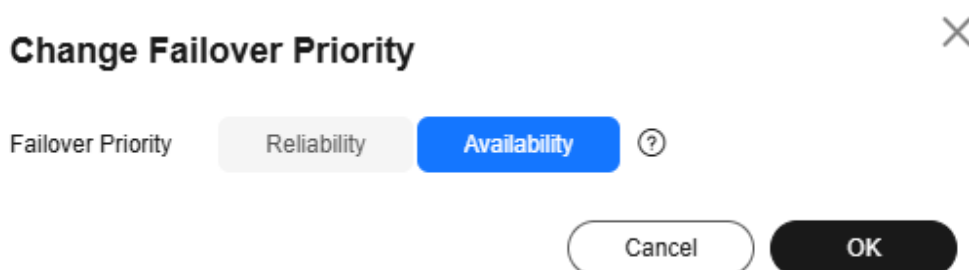
### Constraints

The failover priority cannot be changed when the DB instance is stopped or its instance class is being changed.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** On the displayed **Overview** page, find **Failover Priority** and click **Configure** under it. In the displayed dialog box, select a priority and click **OK**.

**Figure 9-7** Changing the failover priority



- Step 5** Check the results on the **Overview** page.

----End

## Related APIs

- [Changing the Failover Priority](#)

# 9.6 Changing Read/Write Permissions

## Scenarios

RDS for MySQL allows you to change the read/write permissions of your instance to meet different workload requirements. You can select **Read-only** or **Read/write** for **Read/Write Permissions**.

- **Read-only**  
If **Read-only** is selected, data in the DB instance cannot be modified anymore. You can set **Read/Write Permissions** to **Read-only** even for a DB instance that is already read-only due to full storage. In this case, after the instance becomes available, it is still read-only.
- **Read/write**  
If **Read/write** is selected, the DB instance becomes readable and writable. You can set **Read/Write Permissions** to **Read/write** even for a DB instance that is read-only due to full storage. In this case, only after the instance becomes available, it is readable and writable.

## Constraints

- This function is only available for single-node and primary/standby DB instances.
- Read/write permissions cannot be changed when the instance is in any of the following statuses: creating, changing instance class, frozen, or abnormal.
- This function is available for open beta testing (OBT) in some regions. If this function is not available in your region, [submit a service ticket](#) to request permissions.

## Precautions

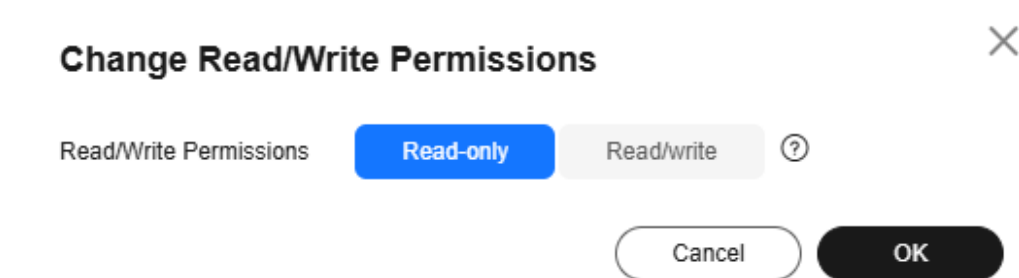
- Before setting **Read/Write Permissions** to **Read-only**, to ensure data consistency, ensure that no data is being written to the database.
- If the DB instance is abnormal (except when the storage is full), it cannot be set to read-only.
- If your instance is set to read-only, you can still perform operations on the **Accounts** and **Databases** pages on the console.
- If your instance is set to read-only, non-administrator users cannot write data to it anymore. When your instance is processing large transactions or DDL requests, changing it to read-only may fail due to timeout.
- If your RDS instance is associated with a DDM instance, changing it to read-only will affect DDM instance functions.
- If you have selected **Read/write** but the DB instance is still read-only, check whether the DB instance is involved in an ongoing DRS migration task or if the instance storage is full.

- If your instance becomes read-only for other reasons (such as full storage and DRS migration), it cannot be changed to readable and writable by setting **Read/Write Permissions** to **Read/write**.
- This function configures read/write permissions only for primary DB instances.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** On the **Overview** page, find **Read/Write Permissions** and click **Configure** under it. In the displayed dialog box, select **Read-only** or **Read/write** as required and click **OK**.

**Figure 9-8** Changing read/write permissions



----End

## Related APIs

- [Changing Read/Write Permissions](#)

## 9.7 Enabling or Disabling Event Scheduler

### Scenarios

Event scheduler manages the scheduling and execution of events. The MySQL built-in event scheduler cannot guarantee the consistency of event statuses between primary and standby DB instances. If a failover or switchover occurs, events will not be scheduled. RDS for MySQL resolves this issue. With RDS for MySQL, even if there is a failover or switchover, the events will still be properly scheduled. You can simply enable or disable the event scheduler on the RDS console.

- By default, the event scheduler is disabled after a DB instance is created.

- After a primary/standby failover or switchover is performed, the event scheduler setting remains unchanged. The **event\_scheduler** is **on** for the original primary DB instance and **off** for the original standby DB instance.
- After a restoration to a new DB instance, the event scheduler setting is the same as that of the original DB instance.
- After a single-node DB instance is changed to a primary/standby DB instance, the event scheduler setting is the same as that of the primary DB instance.

## Constraints

- To use this function, your RDS for MySQL kernel version must be at least 5.6.43.2, 5.7.25.2, or 8.0.17.4. For details about how to query the version of an instance, see [How Can I View the Version of an RDS DB Instance?](#) If your database version does not meet this requirement, [upgrade the minor version of your instance](#).
- Event scheduler cannot be enabled for read replicas.

## Enabling Event Scheduler

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name.
- Step 4** On the **Overview** page, click **Enable** under **Event Scheduler**.
- Step 5** After the event scheduler is enabled, reactivate the previously created events (that is, re-execute the event scripts) to ensure that the event statuses on the primary and standby instances are the same.
- End

## Disabling Event Scheduler

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name.
- Step 4** On the **Overview** page, click **Disable** under **Event Scheduler**.
- End

## FAQ

What Should I Do If I Do Not Have the Permission to Change the event\_scheduler Settings?

Answer: You can only enable or disable the event scheduler on the console. For details, see this section.

## 9.8 Changing a DB Instance Class

### Scenarios

You can change the instance class (vCPUs and memory) of a DB instance as required.

RDS for MySQL supports both an increase and a decrease in the instance class.

### Constraints

**Table 9-3** Constraints

| Phase             | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before the change | <ul style="list-style-type: none"><li>You can change the DB instance class only when your account balance is greater than or equal to \$0 USD.</li><li>Changing the instance class will temporarily occupy IP addresses, and the IP addresses will not be released until 12 hours later by default. Before changing an instance class, ensure that there are available <b>floating IP addresses</b> (two for a primary/standby instance and one for a single-node instance or read replica) in the subnet. Otherwise, the change will fail.</li><li>An instance class can fail to be changed when:<ul style="list-style-type: none"><li>The instance status is <b>Abnormal</b>, <b>Creation failed</b>, <b>Storage full</b>, or <b>Creating</b>.</li><li>The replication delay between the primary instance and standby instance is greater than 300 seconds, or the replication relationship is abnormal.</li><li>The standby instance is being rebuilt.</li><li>The database proxy is abnormal or being changed.</li><li>The instance has a scheduled instance class change task.</li></ul></li></ul> |

| Phase             | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| During the change | <ul style="list-style-type: none"><li>• If there are any large transactions being processed during an instance class change, the change may fail.</li><li>• Any session that holds a global read lock can cause a change failure.</li><li>• An instance cannot be deleted while its instance class is being changed.</li><li>• The following operations cannot be performed on an instance whose instance class is being changed: <a href="#">rebooting the instance</a>, <a href="#">scaling up storage space</a>, <a href="#">modifying the parameter template</a>, <a href="#">creating a manual backup</a>, <a href="#">creating a database account</a>, and <a href="#">creating a database</a>.</li><li>• If you change the instance class of a read replica, <a href="#">binlog clearing</a> will be disabled for the primary DB instance. Pay attention to the storage space usage.</li></ul> |
| After the change  | <ul style="list-style-type: none"><li>• After an instance class is changed, some parameters are automatically changed to the default values defined in the new instance class. For details, see <a href="#">Parameter Changes</a>.</li><li>• After an instance class is changed, binlogs are reset by default. If you do not want to reset binlogs, <a href="#">submit a service ticket</a>.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## Change Duration and Impact on Workloads

- Changing an instance class will interrupt services for about 10 to 120 seconds. Ensure that your applications support automatic reconnection. Perform this operation during off-peak hours because changing an instance class during peak hours takes much more time.
- The time required for changing an instance class (during off-peak hours) is as follows:
  - For an instance using a cloud disk, the process takes 5 to 16 minutes.
  - If the change takes an extended period of time, contact customer service.
- If you choose to change an instance class during the maintenance window, after the request is submitted, you can locate the scheduled task and click **Execute Now** in the **Operation** column. (If this option is not displayed on the console, [submit a service ticket](#).) The time required for changing an instance class can be a little bit long during peak hours due to high replication delay.

## Instance Class Type Change

You can change a general-purpose instance to a dedicated instance, and vice versa. However, changing a dedicated instance to a general-purpose instance may compromise database performance. Exercise caution when performing this operation. For details about instance classes, see [x86-based Instance Classes \(Cloud Disk Storage\)](#).

## Billing

**Table 9-4** Billing

| Billing Mode       | Operation              | Impact on Fees                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yearly/<br>Monthly | Instance class upgrade | <p>After an instance class is upgraded, the new instance class takes effect in the original usage period.</p> <p>You need to pay for the difference in price based on the remaining period.</p> <p>The following prices are for reference only. The actual prices are displayed on the console.</p> <p>Suppose you purchased a one-month RDS for MySQL 5.7 single-node DB instance (instance class: general-purpose, 2 vCPUs   8 GB; storage: cloud SSD, 40 GB) in CN-Hong Kong on June 1, 2023. The instance price was \$59.56 USD per month.</p> <p>On June 15, 2023, you changed the instance class to 4 vCPUs   8 GB. The instance price became \$121.56 USD per month.</p> <p><b>Price difference of upgrade = Price for the new instance class × Remaining period - Price for the original instance class × Remaining period</b></p> <p>The remaining period is the remaining days of each calendar month divided by the maximum number of days in each calendar month.</p> <p>In this example, the remaining period and price difference are calculated as follows:</p> <p>Remaining period = 15 (Remaining days in June)/30 (Maximum number of days in June) = 0.5</p> <p>Price difference of the upgrade = \$121.56 USD × 0.5 - \$59.56 USD × 0.5 = \$31 USD</p> |

| Billing Mode | Operation                | Impact on Fees                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | Instance class downgrade | <p>After an instance class is downgraded, the new instance class takes effect in the original usage period.</p> <p>RDS refunds the difference in price based on the remaining period.</p> <p>The following prices are for reference only. The actual prices are displayed on the console.</p> <p>Suppose you purchased a one-month RDS for MySQL 5.7 single-node DB instance (instance class: general-purpose, 2 vCPUs   8 GB; storage: cloud SSD, 40 GB) in CN-Hong Kong on June 1, 2023. The instance price was \$59.56 USD per month.</p> <p>On June 15, 2023, you changed the instance class to 2 vCPUs   4 GB. The instance price became \$50.56 USD per month.</p> <p><b>Refunded fees = Price for the original instance class × Remaining period - Price for the new instance class × Remaining period</b></p> <p>The remaining period is the remaining days of each calendar month divided by the maximum number of days in each calendar month.</p> <p>In this example, the remaining period and refunded fees are calculated as follows:</p> <p>Remaining period = 15 (Remaining days in June)/30 (Maximum number of days in June) = 0.5</p> <p>Refunded fees = \$59.56 USD × 0.5 - \$50.56 USD × 0.5 = \$4.5 USD</p> |
| Pay-per-use  | Instance class upgrade   | After an instance class is changed, the new instance class is billed by hour. For details, see <a href="#">Product Pricing Details</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|              | Instance class downgrade |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Parameter Changes

vCPU-related parameters, such as **threadpool\_size** and **slave\_parallel\_workers**, will be reset according to the following rules during an instance class change.



**Table 9-5** Parameter value changes with vCPU changes

| Scenario      | Rule for a vCPU Parameter with No Changes Made to Its Value                 | Rule for a vCPU Parameter Changed to a Custom Value                                                    |
|---------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| vCPU increase | The parameter will be reset to the default value of the new instance class. | The larger one between the custom value and the default value of the new instance class will be used.  |
| vCPU decrease | The parameter will be reset to the default value of the new instance class. | The smaller one between the custom value and the default value of the new instance class will be used. |

Memory-related parameters, such as **innodb\_buffer\_pool\_size**, **innodb\_log\_buffer\_size**, **innodb\_log\_files\_in\_group**, **max\_connections**, **innodb\_page\_cleaners**, **innodb\_buffer\_pool\_instances**, and **back\_log**, will be reset according to the following rules during an instance class change.

**Table 9-6** Parameter value changes with memory changes

| Scenario        | Rule for a Memory Parameter with No Changes Made to Its Value               | Rule for a Memory Parameter Changed to a Custom Value                                                 |
|-----------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Memory increase | The parameter will be reset to the default value of the new instance class. | The larger one between the custom value and the default value of the new instance class will be used. |

| Scenario        | Rule for a Memory Parameter with No Changes Made to Its Value               | Rule for a Memory Parameter Changed to a Custom Value                                                  |
|-----------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Memory decrease | The parameter will be reset to the default value of the new instance class. | The smaller one between the custom value and the default value of the new instance class will be used. |

However, values of **innodb\_io\_capacity** and **innodb\_io\_capacity\_max** will be reset to the default values of the new instance class if no custom values have been specified for them or they will remain unchanged if you have specified custom values for them.

## Changing the Instance Class of a Primary DB Instance

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and choose **More > Change Instance Class** in the **Operation** column.
- Alternatively, click the target instance name to go to the **Overview** page. Under **Instance Class**, click **Configure**.
- Step 4** On the displayed page, specify a new instance class and click **Next**.
- For RDS for MySQL DB instances billed on the pay-per-use basis, choose a new instance class and a scheduled time, and click **Next**.

**Figure 9-9** Changing a DB instance class

**Current Configuration**

|                  |                   |                |                                                                     |
|------------------|-------------------|----------------|---------------------------------------------------------------------|
| DB Instance Name | rds-8db5          | DB Instance ID | 2c3451a3729448e9aff191e1ad08cc94e01                                 |
| Storage          | Common I/O, 40 GB | Specifications | rds.mysql.large.arm4.hs   2 vCPUs   8 GB (Kunpeng general-enhanc... |
| Billing Mode     | Pay-per-use       |                |                                                                     |

**New Instance Class** **Kunpeng general-enhanced**

| vCPUs   Memory                                   | Recommended Connections | TPS   QPS      | IPv6          |
|--------------------------------------------------|-------------------------|----------------|---------------|
| <input type="radio"/> 2 vCPUs   8 GB (Current)   | 6,000                   | 446   8,942    | Not supported |
| <input checked="" type="radio"/> 4 vCPUs   16 GB | 8,000                   | 1,006   20,124 | Not supported |
| <input type="radio"/> 8 vCPUs   32 GB            | 8,000                   | 2,064   41,263 | Not supported |
| <input type="radio"/> 12 vCPUs   48 GB           | 12,000                  | 2,400   45,600 | Not supported |
| <input type="radio"/> 16 vCPUs   64 GB           | 32,000                  | 2,596   51,930 | Not supported |
| <input type="radio"/> 24 vCPUs   96 GB           | 38,000                  | 3,894   77,894 | Not supported |

New Instance Class rds.mysql.xlarge.arm4.hs | 4 vCPUs | 16 GB (Kunpeng general-enhanced)

**Scheduled Time** **Maintenance Window**

Upon submission **Maintenance Window** 02:00 - 06:00 GMT+08:00 [Modify](#)

⚠ The maintenance window cannot overlap the time window configured for automated backup.

DB instances in a DCC only support the general-enhanced instance class.

- **Upon submission:** An instance class change is applied immediately after the request is submitted.
- **Maintenance Window:** If you select this option, you are advised to set the maintenance window to off-peak hours.

#### Step 5 Confirm the specifications.

- If you need to modify your settings, click **Previous**.
- For pay-per-use DB instances, click **Submit**.

To view the cost incurred by the DB instance class change, choose **Billing & Costs > Bills** in the upper right corner.

- For yearly/monthly DB instances:
  - If you intend to scale down the DB instance class, click **Submit**.  
The refund is automatically returned to your account. You can click **Billing** in the upper right corner and then choose **Orders > My Orders** in the navigation pane on the left to view the details.
  - If you intend to scale up the instance class, click **Pay Now**. The scale-up starts only after the payment is successful.

#### Step 6 Check the change result.

Return to the **Instances** page and view the instance status. During the change period, the instance status is **Changing instance class**. You can view the execution progress of **Changing a MySQL DB instance class** on the **Task Center** page. After a few minutes, view the DB instance class on the **Overview** page to check that the change is successful.

For DB instances using cloud disks, if you have selected **Maintenance Window** for **Scheduled Time**, the status of the DB instance on the **Instances** page is **Changing instance class** in the maintenance window.

----End

## Changing the Instance Class of a Read Replica

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target read replica and choose **More > Change Instance Class** in the **Operation** column.

Alternatively, click the read replica name to go to the **Overview** page. Under **Instance Class**, click **Configure**.

**Step 4** On the displayed page, specify a new instance class and click **Next**.

For RDS for MySQL read replicas billed on the pay-per-use basis, choose a new instance class and a scheduled time, and click **Next**.

Read replicas in a DCC only support the general-enhanced instance class.

- **Upon submission:** An instance class change is applied immediately after the request is submitted.
- **Maintenance Window:** If you select this option, you are advised to set the maintenance window to off-peak hours.

**Step 5** Confirm the settings.

- If you need to modify your settings, click **Previous**.
- For pay-per-use read replicas, click **Submit**.  
To view the cost incurred by the instance class change, choose **Billing & Costs > Bills** in the upper right corner.
- For yearly/monthly read replicas:
  - If you intend to scale down the instance class, click **Submit**.  
The refund is automatically returned to your account. You can click **Billing** in the upper right corner and then choose **Orders > My Orders** in the navigation pane on the left to view the details.
  - If you intend to scale up the instance class, click **Pay Now**. The scale-up starts only after the payment is successful.

**Step 6** Check the change result.

Return to the **Instances** page and view the read replica status. During the change period, its status is **Changing instance class**. You can view the execution progress of **Changing a MySQL DB instance class** on the **Task Center** page. After a few minutes, view the instance class of the read replica on the **Overview** page to check that the change is successful.

For read replicas using cloud disks, if you have selected **Maintenance Window for Scheduled Time**, the read replica status on the **Instances** page is **Changing instance class** in the maintenance window.

----End

## Can I Change the Instance Class of a Primary DB Instance and Its Read Replicas at the Same Time?

No.

To prevent long delay and high load of a read replica, its instance class should be greater than or equal to that of its primary DB instance.

### Follow-up Operations

Return to the instance list. In the navigation pane on the left, choose **Task Center** and check the progress of the change task.

- If you have selected **Upon submission** for **Scheduled Time**:  
On the **Instant Tasks** page, search for "Changing a MySQL DB instance class" and check the execution progress. Instant tasks cannot be canceled.
- If you have selected **Maintenance Window** for **Scheduled Time**:  
On the **Scheduled Tasks** page, search for the instance ID and check the execution status of the change task.  
If the task is in the **To be executed** state, you can click **Cancel** to cancel the task.

For details, see [Viewing a Task](#).

### Related APIs

- [Querying Available Instance Classes for a DB Instance](#)
- [Changing DB Instance Specifications](#)

## 9.9 Changing a Storage Type

### Scenarios

If the storage type of your RDS DB instance does not match your workloads, you can change it as needed.

For details about storage types, see [DB Instance Storage Types](#).

## Constraints

**Table 9-7** Constraints

| Phase             | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before the change | <ul style="list-style-type: none"><li>The storage type of an instance can be changed only when the instance is in the <b>Available</b> state.</li><li>Changing the storage type may affect storage performance, so the storage type should be changed during off-peak hours.</li><li>If the storage type of a read replica is different from that of its associated DB instance, the data synchronization may be affected. To change the storage type of a DB instance, change that of its read replica (if any) first to ensure that the storage type of the read replica is the same as that of the DB instance.</li></ul> |
| During the change | Changing a storage type takes several minutes or even hours, depending on the throughput, storage space, original storage type, and new storage type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| After the change  | In rare cases, a storage type may fail to be changed due to a backend issue. If this happens, try again later.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Table 9-8** Storage types

| Instance Type                                                                            | Original Storage Type | Target Storage Type | Remarks                                       |
|------------------------------------------------------------------------------------------|-----------------------|---------------------|-----------------------------------------------|
| <ul style="list-style-type: none"><li>Primary/ Standby</li><li>HA read replica</li></ul> | Cloud SSD             | Extreme SSD         | Extreme SSD can also be changed to cloud SSD. |

## Billing

**Table 9-9** Billing

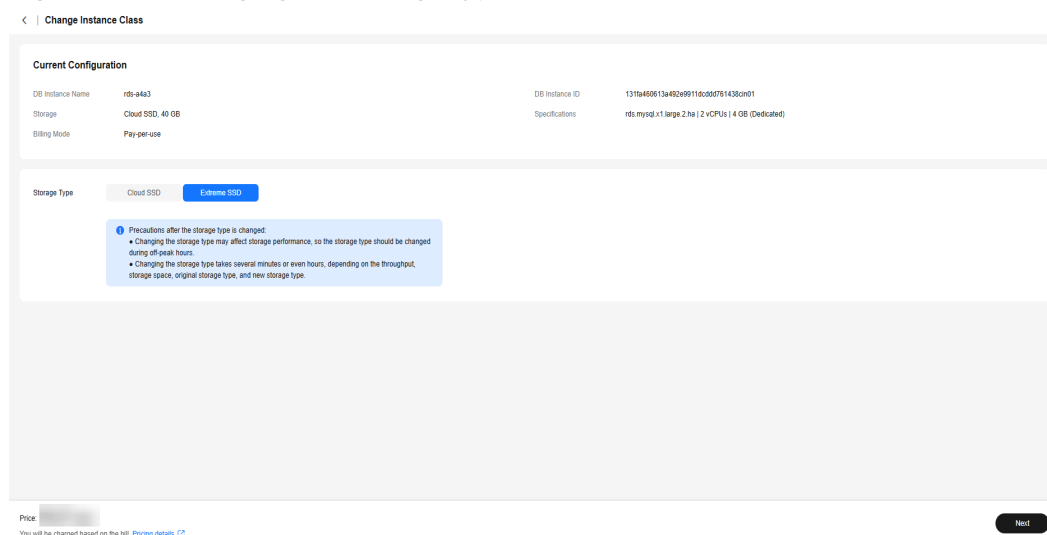
| Billing Mode       | Operation           | Impact on Price                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yearly/<br>Monthly | Storage type change | <p>You will be billed for the new storage type based on the time remaining in the requested period of your instance.</p> <ul style="list-style-type: none"><li>• Price difference payment: If the new storage type is more expensive than the old one, you need to pay for the difference based on how much time is left in the subscription.</li><li>• Price difference refund: If the new storage type is cheaper than the old one, Huawei Cloud will refund the difference to you based on how much time is left in the subscription.</li></ul> <p>The following prices are for reference only. The actual prices are displayed on the console.</p> <p>Suppose you purchased a one-month RDS for MySQL 8.0 primary/standby instance (instance class: general-purpose, 2 vCPUs   4 GB; storage: cloud SSD, 40 GB) in CN-Hong Kong on August 1, 2024. The instance price was \$88.69 USD per month.</p> <p>On August 15, 2024, you changed the storage type to extreme SSD. The instance price became \$103.67 USD per month.</p> <p><b>Price difference = Price for the new storage type x Remaining period - Price for the original storage type x Remaining period</b></p> <p>Remaining period = Remaining days of each calendar month/Maximum number of days in each calendar month</p> <p>In this example, the remaining period and price difference are calculated as follows: Remaining period = 15 (Remaining days in August)/30 (Maximum number of days in August) = 0.5.<br/>Price difference = \$103.67 USD x 0.5 - \$88.69 USD x 0.5 = \$7.49 USD</p> |
| Pay-per-use        | Storage type change | <p>The new storage type is billed by the hour. For details, move your pointer over the price on the <a href="#">Price Calculator</a> page to view the storage price.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## Procedure

### Changing the storage type from cloud SSD to extreme SSD

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate a DB instance using cloud SSD and choose **More > Change Instance Class** in the **Operation** column.
- Alternatively, click the instance name to go to the **Overview** page. Under **Instance Class**, click **Configure**.
- Step 4** On the displayed page, select **Extreme SSD** for **Storage Type** and click **Next**.

**Figure 9-10** Changing the storage type from cloud SSD to extreme SSD



- Step 5** Confirm the new storage type.
- For pay-per-use instances, click **Submit**.
  - For yearly/monthly instances, click **Pay Now**. The change starts only after the payment is successful.
- Step 6** Check the results.

Return to the **Instances** page. A few minutes later, click the instance name and check the new storage type on the displayed **Overview** page.

----End

## 9.10 Configuring Auto Scaling of vCPUs and Memory

### Scenarios

RDS for MySQL allows you to set limits on CPU usage. When the average CPU usage of your DB instance reaches the configured limits, the vCPU and memory



specifications will be scaled up or down. Auto scaling of vCPUs and memory can handle changes in database load, helping you optimize resource costs and utilization.

## Constraints

- Only primary/standby instances using cloud disks support auto scaling.
- To configure auto scaling, you must have related permissions. For details, see [Permissions](#).
- To configure auto scaling, you need to [submit a service ticket](#) to request required permissions.
- Auto scaling of instance specifications will briefly interrupt services.
- Auto scaling cannot be triggered if the instance is abnormal, stopped, or frozen.
- Auto scaling cannot be enabled if the instance has other ongoing tasks or scheduled specification changes. If it has been enabled, it still cannot be triggered.
- Auto scaling cannot be triggered for any yearly/monthly instance that has unfinished orders or is in arrears.
- If your instance has read replicas, the read replica specifications should not be too small, or they may have excessive latency and a heavy load.
- There are temporary IP addresses used when auto scaling is performed, and they are not released immediately after the scaling is complete. There is a 12-hour delay by default. If there are not enough private IP addresses available, the scaling will fail.
- During a scale-up, the system searches for a specification with more vCPUs and at least the same memory as the current amount. If the next larger matching specification is sold out or unavailable, the system continues to search for a higher one that matches the requirements. During a scale-down, to avoid out of memory (OOM) problems, if the next smaller specification is sold out or unavailable, the system will stop matching downwards.
- Enabling auto scaling automatically creates the RDSAccessProjectResource agency. This agency is visible to you. Deleting the agency can cause auto scaling to fail.

## Billing

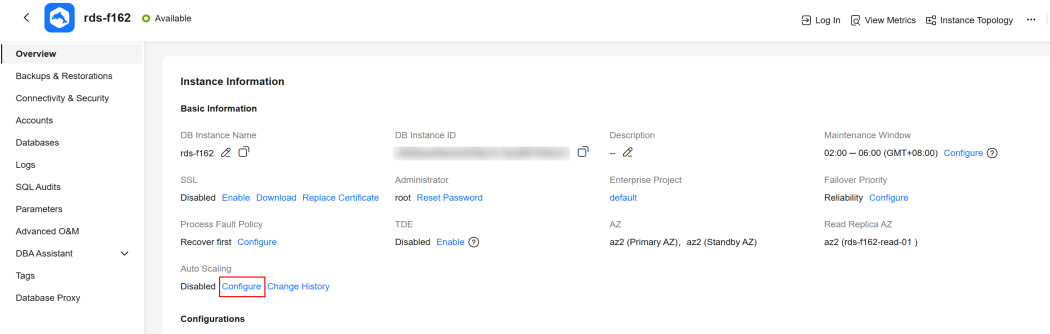
The billing for auto scaling is the same as that for changing an instance class. For details, see [Billing](#).

## Configuring Auto Scaling

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the name of the target primary/standby instance to go to the **Overview** page.

Step 4 Click **Configure** under **Auto Scaling**.

Figure 9-11 Configuring Auto Scaling



Step 5 In the displayed dialog box, configure the required parameters.

Figure 9-12 Setting auto scaling parameters

Configure Auto Scaling

• Auto scaling cannot be triggered if the instance has other ongoing tasks or scheduled specification changes.

• Auto scaling cannot be triggered for any yearly/monthly instance that has unfinished orders or is in arrears.

• IP addresses are temporarily used when scaling is performed, and will not be released immediately (12 hours by default) after the scaling. If there are not enough private IP addresses available, the scaling will fail.

• If the instance has read replicas, you are advised not to set the read replica specifications to a small value, or they may have excessive latency and a heavy load.

Auto Scale-up

EnabledDisabled?

Observation Period

5 min

Max. Specifications

2 vCPUs | 4 GB | rds.mysql.x1.large.2.ha

Trigger If Avg. vCPU Usage Reaches

—60+

%

Auto Scale-down

?

Min. Specifications

2 vCPUs | 4 GB | rds.mysql.x1.large.2.ha

Trigger If Avg. vCPU Usage Drops To

—30+

%

Silent Period

5 min

Cancel

OK

Table 9-10 Parameter description

| Parameter     | Description                             |
|---------------|-----------------------------------------|
| Auto Scale-up | You can enable or disable it as needed. |

| Parameter                           | Description                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Observation Period                  | <ul style="list-style-type: none"><li>When auto scale-up is enabled, the system periodically checks the vCPU usage. If the average vCPU usage exceeds the preset limit within the observation period, the system adapts the specifications to the read and write traffic. The system then enters a silent period.</li><li>The minimum observation period is 5 minutes.</li></ul> |
| Max. Specifications                 | The maximum specifications after the final auto scale-up. The system scales up specifications level by level. Each time the specifications are upgraded to a higher level, the system then enters a silent period.                                                                                                                                                               |
| Trigger If Avg. vCPU Usage Reaches  | The vCPU usage limit for triggering an auto scale-up. If the average vCPU usage exceeds this limit during the observation period, an auto scale-up is triggered.                                                                                                                                                                                                                 |
| Auto Scale-down                     | You can enable or disable it as needed.                                                                                                                                                                                                                                                                                                                                          |
| Min. Specifications                 | The minimum specifications after the final auto scale-down. The system scales down specifications level by level. Each time the specifications are downgraded to a lower level, the system then enters a silent period.                                                                                                                                                          |
| Trigger If Avg. vCPU Usage Drops To | The vCPU usage limit for triggering an auto scale-down. When the average vCPU usage in the observation period is less than this limit, an auto scale-down is triggered.                                                                                                                                                                                                          |
| Silent Period                       | The silent period is the minimum interval between two specification changes (triggered automatically or manually). During the silent period, RDS for MySQL will not trigger auto scaling.                                                                                                                                                                                        |

**Step 6** Click **OK**.

----End

## Checking the Change History

**Step 1** On the **Instances** page, click the name of the target primary/standby instance to go to the **Overview** page.

**Step 2** Click **Change History** under **Auto Scaling**.

**Step 3** In the displayed dialog box, check the change time, change type, status, original specifications, and new specifications of the historical tasks.

----End

## 9.11 Scaling Up Storage Space

### Scenarios

If the storage space is not enough for your workloads, you can scale up storage space of your DB instance. **The backup space will also increase with the storage.**

You can configure an alarm rule for the storage space usage, so you are alerted if the threshold is reached. For details, see [Setting Alarm Rules](#).

For details about the causes and solutions of insufficient storage space, see [What Should I Do If My Data Exceeds the Available Storage of an RDS Instance?](#)

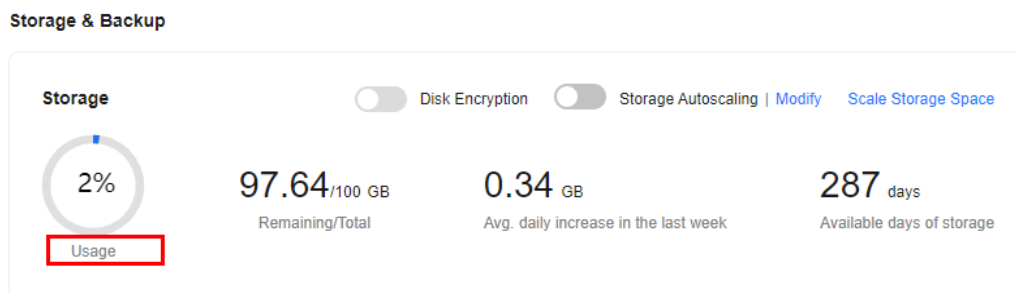
**Services are not interrupted during storage scale-up.** If you need to change the storage type, refer to [Instance Class Type Change](#).

### Storage Full Situations Causing Instances to Be Read-Only

**Table 9-11** Conditions for causing instances to be read-only

| Storage Size                                   | Condition                                                                                                                                                                                                                                             |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage size is less than 1 TB.                | <ul style="list-style-type: none"><li>If the storage usage is displayed as 100%, the instance becomes read-only.</li><li>If the storage usage decreases to 87%, the instance exits the read-only state.</li></ul>                                     |
| Storage size is greater than or equal to 1 TB. | <ul style="list-style-type: none"><li>If the available storage space is less than 30 GB, the instance becomes read-only.</li><li>If the available storage space is greater than or equal to 150 GB, the instance exits the read-only state.</li></ul> |

**Figure 9-13** Checking storage usage

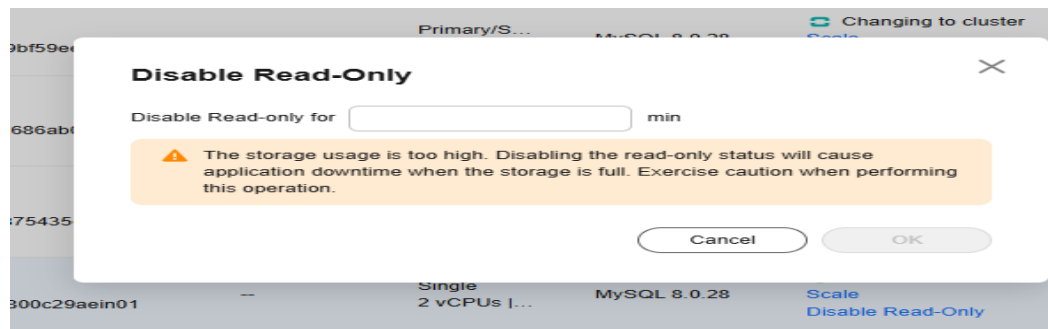


## How to Disable Read-Only

Locate the instance in the **Storage full** state, click **Disable Read-only**. In the displayed dialog box, specify how long the read-only status is disabled for (from 5 to 10 minutes), and click **OK**.

Disabling the read-only status will cause application downtime when the storage is full. Exercise caution when performing this operation.

Figure 9-14 Disable Read-Only



## Constraints

- You can scale up storage space only when your account balance is greater than or equal to \$0 USD.
- You can scale up storage space only when your instance status is **Available** or **Storage full**.
- The maximum allowed storage is 4,000 GB. If you want to increase the storage upper limit to 10 TB, [submit a service ticket](#).
- When storage space is being scaled up, the DB instance is in **Scaling up** state and the backup tasks of the instance are not affected.
- For primary/standby DB instances, scaling up the primary DB instance will cause the standby DB instance to also be scaled up accordingly.
- Reboot is not required during scale-up.
- You cannot reboot or delete a DB instance that is being scaled up.
- Storage space can only be scaled up, not down.
- If you scale up a DB instance with disk encryption enabled, the expanded storage space will also use the original key for encryption.

## Billing

**Table 9-12** Billing

| Billing Mode       | Operation        | Impact on Fees                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yearly/<br>Monthly | Storage scale-up | <p>You need to pay for the difference in price based on the remaining period.</p> <p>The following prices are for reference only. Final prices on the console may differ.</p> <p>Suppose you purchased a one-month RDS for MySQL 5.7 single-node DB instance (instance class: general-purpose, 2 vCPUs   8 GB; storage: cloud SSD, 40 GB) in CN-Hong Kong on June 1, 2023. The unit price of storage space is \$0.214 USD/GB per month.</p> <p>On June 15, 2023, you scaled up the storage by 60 GB. The total storage after scale-up is 100 GB.</p> <p><b>Price difference = Scale-up volume x Unit price x Remaining period</b></p> <p>The remaining period is the remaining days of each calendar month divided by the maximum number of days in each calendar month.</p> <p>In this example, the remaining period and price difference are calculated as follows:</p> <p>Remaining period = 15 (Remaining days in June)/30 (Maximum number of days in June) = 0.5</p> <p>Price difference = 60 GB x \$0.214 USD x 0.5 = \$6.42 USD</p> |
| Pay-per-use        | Storage scale-up | The new storage space is billed by hour. For details, see <a href="#">Product Pricing Details</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## Scaling Up a Primary DB Instance

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and choose **More > Scale Storage Space** in the **Operation** column.
- You can also perform the following operations to scale up storage space:
- Click the target instance name to enter the **Overview** page. In the **Storage & Backup** area, click **Scale Storage Space**.

- If the storage space is full, locate the target DB instance on the **Instances** page and click **Scale** in the **Status** column.

**Step 4** On the displayed page, specify the new storage space and click **Next**.

The minimum increment for each scaling is 10 GB.

**Step 5** Confirm specifications.

- If you need to modify your settings, click **Previous**.
- If you do not need to modify the settings, click **Submit** for a pay-per-use instance or click **Pay Now** for a yearly/monthly instance.

**Step 6** View the scale-up result.

Scaling up storage space takes 3-5 minutes. During this time period, the status of the DB instance on the **Instances** page will be **Scaling up**. After a while, click the DB instance and view the new storage space on the displayed **Overview** page to verify that the scale-up is successful.

You can view the detailed progress of the task on the **Task Center** page. For details, see [Task Center](#).

-----End

## Scaling Up a Read Replica

Scaling up the storage space of a read replica does not affect that of the primary DB instance. Therefore, you can separately scale read replicas to meet service requirements. New storage space of read replicas after scaling up must be greater than or equal to that of the primary DB instance.

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance and click  in front of it. Locate the read replica to be scaled and choose **More > Scale Storage Space** in the **Operation** column.

You can also perform the following operations to scale up storage space:

- Click the read replica name to enter the **Overview** page. In the **Storage & Backup** area, click **Scale Storage Space**.
- If the storage space is full, locate the read replica on the **Instances** page and click **Scale** in the **Status** column.

**Step 4** On the displayed page, specify the new storage space and click **Next**.

The minimum increment for each scaling is 10 GB.

**Step 5** Confirm specifications.

- If you need to modify your settings, click **Previous**.
- If you do not need to modify your settings and the read replica uses pay-per-use billing, click **Submit**.



**Step 6** View the scale-up result.

Scaling up storage space takes 3-5 minutes. During this time period, the status of the read replica on the **Instances** page will be **Scaling up**. After a while, click the read replica name and view the new storage space on the displayed **Overview** page to verify that the scale-up is successful.

You can view the detailed progress of the task on the **Task Center** page. For details, see [Task Center](#).

----End

**Related APIs**

- [Scaling Up Storage Space of a DB Instance](#)
- [Configuring an Autoscaling Policy](#)
- [Querying an Autoscaling Policy](#)

## 9.12 Configuring Storage Autoscaling

**Scenarios**

With storage autoscaling enabled, when RDS detects that you are running out of database space, it automatically scales up your storage.

You can enable storage autoscaling in either of the following ways:

- Enable this function when you create a DB instance. For details, see [Buying an RDS for MySQL DB Instance](#).
- Enable this function after you create a DB instance. See the operations provided in this section.

**Constraints**

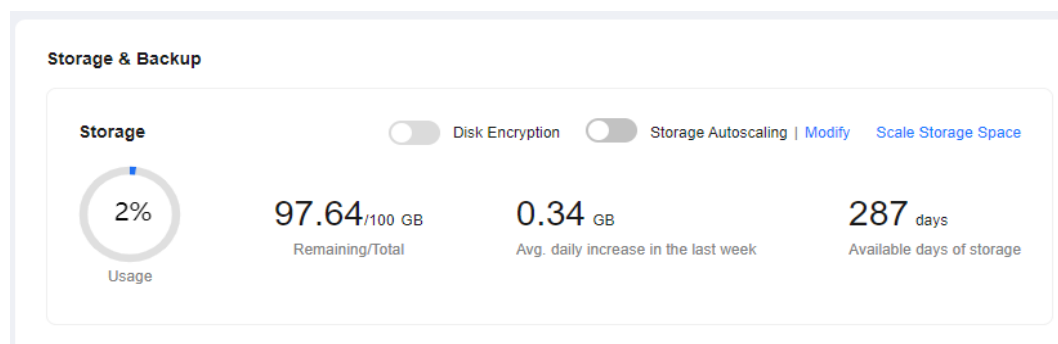
- You can enable storage autoscaling only when your account balance is greater than or equal to \$0 USD.
- The storage space can be scaled up automatically only when your instance status is **Available** or **Storage full**.
- Storage autoscaling for RDS for MySQL DB instances is supported only for cloud SSD and extreme SSD storage types. For details about storage types, see [DB Instance Storage Types](#).
- Whether storage autoscaling of the primary DB instance is also applied to its read replicas depends on when you enable this function for the primary instance:
  - If you create read replicas together with a primary instance and enable storage autoscaling for the primary instance during creation, this function applies to the read replicas by default as well.
  - If you enable storage autoscaling for a primary instance after it is created, this function does not apply to its read replicas. To allow a read replica to autoscale its storage, enable storage autoscaling for it separately. Set the autoscaling limit of the read replica's storage to be at least equal to the storage of the primary instance.

- The maximum allowed storage is 4,000 GB.
- For a primary/standby DB instance, autoscaling the storage for the primary node will also autoscale the storage for the standby node.
- Storage autoscaling is unavailable when the DB instance is in any of the following statuses: changing instance class, upgrading a minor version, migrating the standby DB instance, and rebooting.
- If a yearly/monthly DB instance has pending orders, it will not be autoscaled.
- Enabling storage autoscaling automatically creates the RDSAccessProjectResource agency. This agency is visible to you. Deleting the agency can cause autoscaling to fail.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance or read replica name (click  in front of a DB instance to locate its read replica) to go to the **Overview** page.
- Step 4** In the **Storage & Backup** area, toggle on the **Storage Autoscaling** switch.

**Figure 9-15** Storage space



- Step 5** In the displayed dialog box, set the following parameters:

Figure 9-16 Configuring autoscaling

Configure Autoscaling

Enable autoscaling

Trigger If Available Storage Drops To

10%

Autoscaling Limit

4,000

GB

Increment

20

%

i

Additional storage will be billed. [Learn more](#)

If available storage drops below 10% or 10 GB, your storage will autoscale by 20% (in increments of 10 GB) of your allocated storage. If your account balance is insufficient, autoscaling will fail.

Cancel

OK

Table 9-13 Parameter description

| Parameter                             | Description                                                                                                                                          |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enable autoscaling                    | If you select this option, autoscaling is enabled.                                                                                                   |
| Trigger If Available Storage Drops To | If the available storage drops to a specified threshold or 10 GB, autoscaling is triggered.<br>Value range: <b>10%</b> , <b>15%</b> , and <b>20%</b> |
| Autoscaling Limit                     | The default value range is from 40 to 4,000, in GB. The limit must be no less than the storage of the DB instance.                                   |
| Increment                             | Percentage of allocated storage that is automatically scaled up each time.<br>Value range: 5%–50%                                                    |

Step 6 Click **OK**.  
----End

Related APIs

- [Scaling Up Storage Space of a DB Instance](#)
- [Configuring an Autoscaling Policy](#)

- [Querying an Autoscaling Policy](#)

## 9.13 Changing the Maintenance Window

### Scenarios

The maintenance window is 02:00–06:00 by default and you can change it as required. To prevent service interruptions, you are advised to set the maintenance window to off-peak hours.

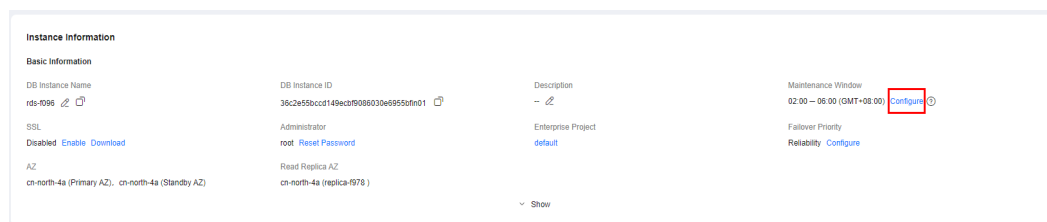
### Constraints

- Changing the maintenance window does not affect the execution time of the scheduled tasks in the original maintenance period.
- During the maintenance window, the DB instance will be intermittently disconnected once or twice. Ensure that your applications support automatic reconnection.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page. Under **Maintenance Window**, click **Configure**.

**Figure 9-17** Changing the maintenance window



- Step 4** In the displayed dialog box, select an interval and a time range, and click **OK**.

**Figure 9-18** Changing the maintenance window

**Change Maintenance Window**

Interval: 1h 2h 3h **4h**

Maintenance Window (GMT+08:00): 02:00 — 06:00

Changing the maintenance window will not affect the execution of scheduled tasks in the original maintenance window.  
The maintenance window cannot overlap the time window configured for automated backup.

Cancel OK

-----End

## Related APIs

- [Configuring the Maintenance Window](#)

## 9.14 Changing a DB Instance Type from Single-Node to Primary/Standby

### Scenarios

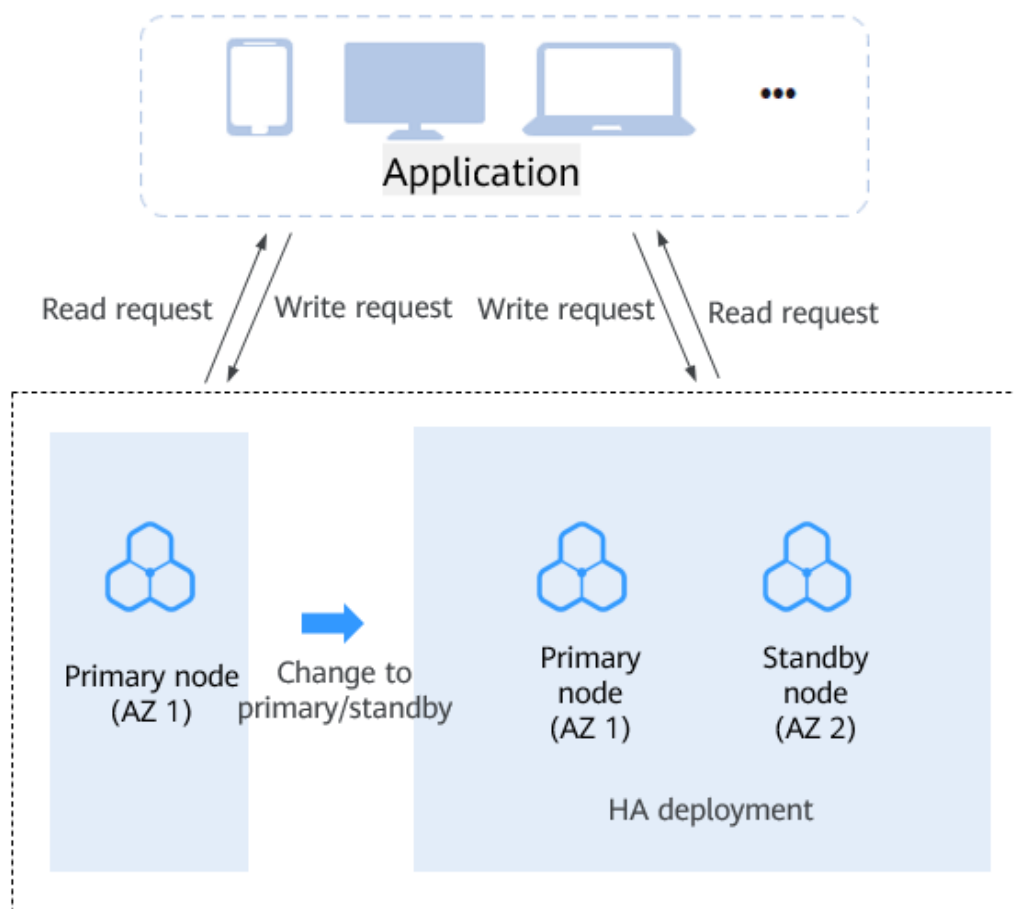
RDS enables you to change single-node DB instances to primary/standby DB instances to improve instance reliability.

The time required for changing an instance type from single-node to primary/standby depends on the amount of data to be backed up. Changing a single-node instance to a primary/standby instance does not affect workloads on the instance.

### Instance Architecture

A single-node instance has only one database node. If a single-node instance fails, it cannot recover in a timely manner.

A primary/standby instance uses an HA architecture with a primary node and a standby node. If a VM, hard disk, or network fault occurs on the primary node, a failover is triggered and the standby node quickly takes over workloads. You are advised to deploy primary and standby DB instances in different AZs for high availability and disaster recovery.

**Figure 9-19** Topology

## Precautions

- RDS single-node DB instances can be changed to primary/standby DB instances, but not the other way around. You can use Data Replication Service (DRS) or the export and import tool of the client to migrate data from primary/standby DB instances to single-node DB instances.
- Changing a single-node instance to primary/standby does not change its networking information, including the VPC, subnet, security group, floating IP address, private domain name, and database port.

## Billing

**Table 9-14** Billing

| Billing Mode       | Operation                                             | Impact on Fees                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Yearly/<br>Monthly | Changing a single-node DB instance to primary/standby | <p>You need to pay for the difference in price based on the remaining period.</p> <p>The following prices are for reference only. The actual prices are subject to the price displayed on the console.</p> <p>Suppose you purchased a one-month RDS for MySQL 5.7 single-node DB instance (instance class: general-purpose, 2 vCPUs   8 GB; storage: cloud SSD, 40 GB) in CN-Hong Kong on June 1, 2023. The instance price was \$59.56 USD per month.</p> <p>On June 15, 2023, you changed the instance type from single-node to primary/standby. The instance price became \$155.69 USD per month.</p> <p><b>Price difference = Price for the primary/standby instance × Remaining period - Price for the single-node instance × Remaining period</b></p> <p>The remaining period is the remaining days of each calendar month divided by the maximum number of days in each calendar month.</p> <p>In this example, the remaining period and price difference are calculated as follows:</p> <p>Remaining period = 15 (Remaining days in June)/30 (Maximum number of days in June) = 0.5</p> <p>Price difference = \$155.69 USD × 0.5 - \$59.56 USD × 0.5 = \$48.06 USD</p> |
| Pay-per-use        | Changing a single-node DB instance to primary/standby | The primary/standby DB instance is billed by hour. For details, see <a href="#">Product Pricing Details</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate a single-node DB instance and choose **More > Change Type to Primary/Standby** in the **Operation** column.

**Step 4** Select a standby AZ. Other configurations are the same as those of the primary DB instance by default. Confirm the configurations and click **Submit**.

For yearly/monthly DB instances, click **Pay Now**.

**Step 5** Check the instance status on the **Instances** page.

- The DB instance is in the **Changing type to primary/standby** status. You can view the task progress (not the time progress) on the **Task Center** page. For details, see [Task Center](#).
- In the upper right corner of the DB instance list, click  to refresh the list. After the DB instance type is changed to primary/standby, the instance status will change to **Available** and the instance type will change to **Primary/Standby**.

----End

## Related APIs

- [Changing a Single-Node DB Instance to Primary/Standby DB Instances](#)

# 9.15 Promoting a Read Replica to Primary

## Scenarios

If your DB instance fails and you want to quickly obtain a readable and writable instance, promote one of the instance's [read replicas](#) to primary.

After a read replica is promoted to primary, the replication relationship between the read replica and its primary instance is removed and the read replica serves as a standalone DB instance. Promoting a read replica has no impact on its original primary DB instance.

## Constraints

- This function is available only to RDS for MySQL 5.7 and 8.0.
- Only pay-per-use read replicas can be changed to standalone DB instances.
- This function is unavailable for DB instances [with proxy enabled](#).
- Only general-purpose and Kunpeng general-enhanced read replicas using cloud SSDs can be promoted to primary.

## Procedure

**Step 1** Click  in the upper left corner and select a region.

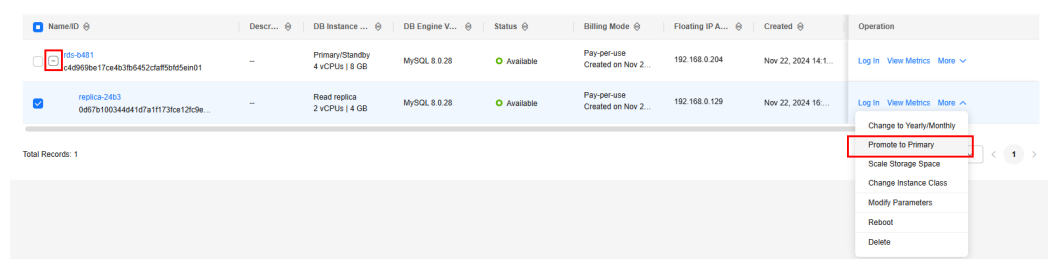
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.



**Step 3** On the **Instances** page, locate the target RDS for MySQL instance and click  in front of it to expand the read replica list.

**Step 4** Find the desired read replica and choose **More > Promote to Primary** in the **Operation** column.

**Figure 9-20** Locating a read replica



**Step 5** In the displayed dialog box, click **Yes**.

**Figure 9-21** Promoting a read replica to primary

### Promote to Primary

Are you sure you want to promote the read replica to the primary node for this DB instance?

| DB Instance Name                                     | DB Instance Type | Status    |
|------------------------------------------------------|------------------|-----------|
| replica-24b3<br>0d67b100344d41d7a1f173fce12fc9e2in01 | Read replica     | Available |

This operation takes about 3 to 5 minutes to complete and may affect services. Perform this operation during off-peak hours.

No

Yes

**Step 6** After the promotion is complete, check and manage the new instance on the **Instances** page.

- During the promotion, the read replica status is **Promoting to primary**. Upon the completion of the promotion, a full backup is automatically performed.
- After the read replica is promoted to primary, it is disassociated from the original DB instance. Its **Status** becomes **Available** and **DB Instance Type** becomes **Single**.
- The billing mode on the new instance remains unchanged.

----End

## 9.16 Manually Switching Between Primary and Standby DB Instances

### Scenarios

If the primary node of a primary/standby instance is unavailable due to a VM, disk, or network fault, RDS automatically triggers a primary/standby failover. In addition to automatic failover, you can manually switch between the primary and standby instances for rack-level DR.

### Introduction to Primary/Standby DB Instances

A primary/standby instance uses an HA architecture and can be deployed across AZs. The primary and standby instances share the same IP address.

- Data is synchronized from the primary instance to the standby instance in real time. You can only access the primary instance. The standby instance serves as a backup.
- When a primary instance is being created, a standby instance is provisioned along with it to provide data redundancy. The standby instance is invisible to you after being created.
- If the primary instance fails, a failover occurs, during which database connection is interrupted. If there is a replication delay between the primary and standby instances, the failover takes an extended period of time. The client needs to be able to reconnect to the instance.

### Constraints

- A manual switchover does not change the connection information of the DB instance, including its VPC, subnet, security group, floating IP address, private domain name, and database port.
- A primary/standby switchover may cause a brief interruption of several seconds or minutes (depending on the replication delay). If transaction logs are generated at a speed higher than 30 MB/s, services will probably be interrupted for several minutes. To prevent traffic congestion, perform a switchover during off-peak hours.
- You can perform a switchover only when the following conditions are met:
  - The primary/standby instance is running properly.
  - The primary/standby replication is normal.
  - The replication delay is less than 5 minutes, and the data on the primary and standby instances is consistent.

### Procedure

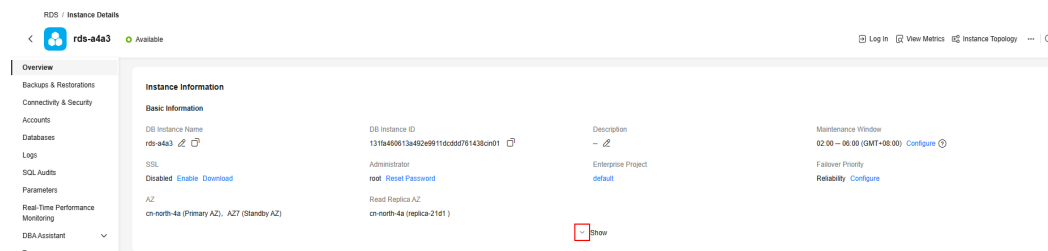
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target primary/standby instance name to go to the **Overview** page.

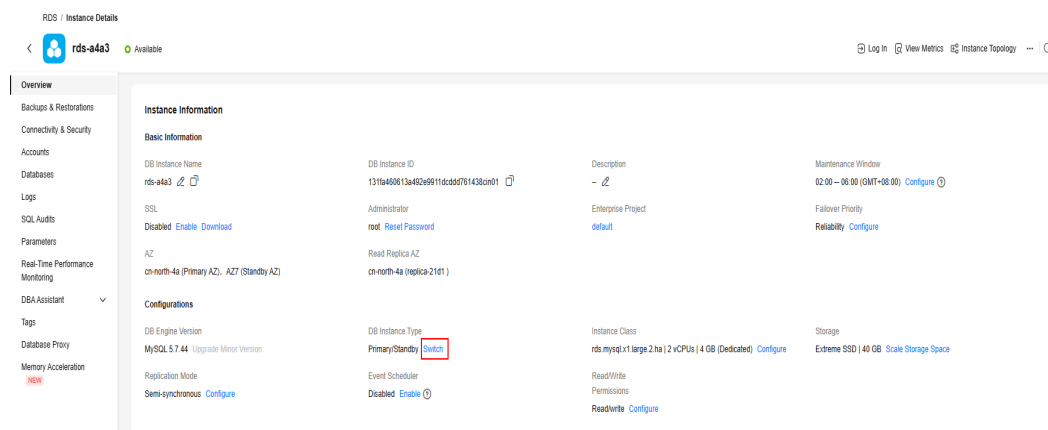
**Step 4** Click  to show all the details.

**Figure 9-22 Overview**



**Step 5** Under **DB Instance Type**, click **Switch**.

**Figure 9-23 Primary/standby switchover**



**Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

**Step 7** In the displayed dialog box, click **Yes**.

**Step 8** After the switchover is successful, check the status of the DB instance on the **Instances** page.

- During the switchover, the DB instance status is **Switchover in progress**.
- In the upper right corner of the DB instance list, click  to refresh the list. After the switchover is successful, the DB instance status will become **Available**.

----End

## Related APIs

- [Manually Switching Primary/Standby DB Instances](#)

## 9.17 Changing the AZ of a Standby DB Instance

### Scenarios

You can migrate a standby DB instance to another AZ in the same region as the original AZ. The migration speed is about 150 MB/s. If a large amount of data is written during the migration, there may be a long replication delay between the primary and standby instances after the migration.

### Constraints

- Primary/standby instances running MySQL 5.6, 5.7, or 8.0 support standby instance migration to another AZ.
- Before changing the AZ of a standby instance, ensure that there are enough resources in the primary AZ and new standby AZ.
- Batch write operations during peak hours may cause migration failures. To ensure successful migration, perform the migration during off-peak hours.
- DDL operations and scheduled events will be suspended during migration. To prevent service interruptions, perform the migration during off-peak hours.
- During the migration, snapshots are triggered for instances using cloud disks. But full backups will not be created when the migration is complete.
- For details about regions and AZs, see [Regions and AZs](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and choose **More > Migrate Standby Instance to Another AZ** in the **Operation** column.
- Step 4** On the displayed page, select a target AZ and click **Submit**.
- Step 5** Check the DB instance status on the **Instances** page.
- During the migration process, the DB instance status is **Migrating standby DB instance**. You can view the progress on the **Task Center** page. For details, see [Task Center](#).
  - In the upper right corner of the DB instance list, click  to refresh the list. After the migration is complete, the DB instance status will become **Available**.
  - On the **Overview** page, find **AZ** and check the AZ hosting the standby DB instance.

----End

## Related APIs

- [Migrating a Standby DB Instance](#)

## 9.18 Updating the OS of a DB Instance

To improve database performance and security, the OS of an RDS for MySQL instance needs to be updated timely.

Every time you upgrade the kernel version of your instance, RDS for MySQL determines whether to update the OS and selects the right cold patch to upgrade the OS if necessary.

Updating the OS does not change the DB instance version or other information.

In addition, RDS for MySQL installs hot patches as required to fix major OS vulnerabilities within the maintenance window you specified.

# 10 Data Backups

---

## 10.1 Introduction to Backups

### What Are Database Backups?

RDS for MySQL automatically creates backups for DB instances during the backup time window. The backups are stored based on a preset retention period (1 to 732 days).

A backup file is generated each time a backup is complete. If the instance fails or data is damaged, you can use the backup file to restore the instance, ensuring data reliability.

### Backup Types

RDS for MySQL supports multiple backup types. For details, see [Backup Types](#).

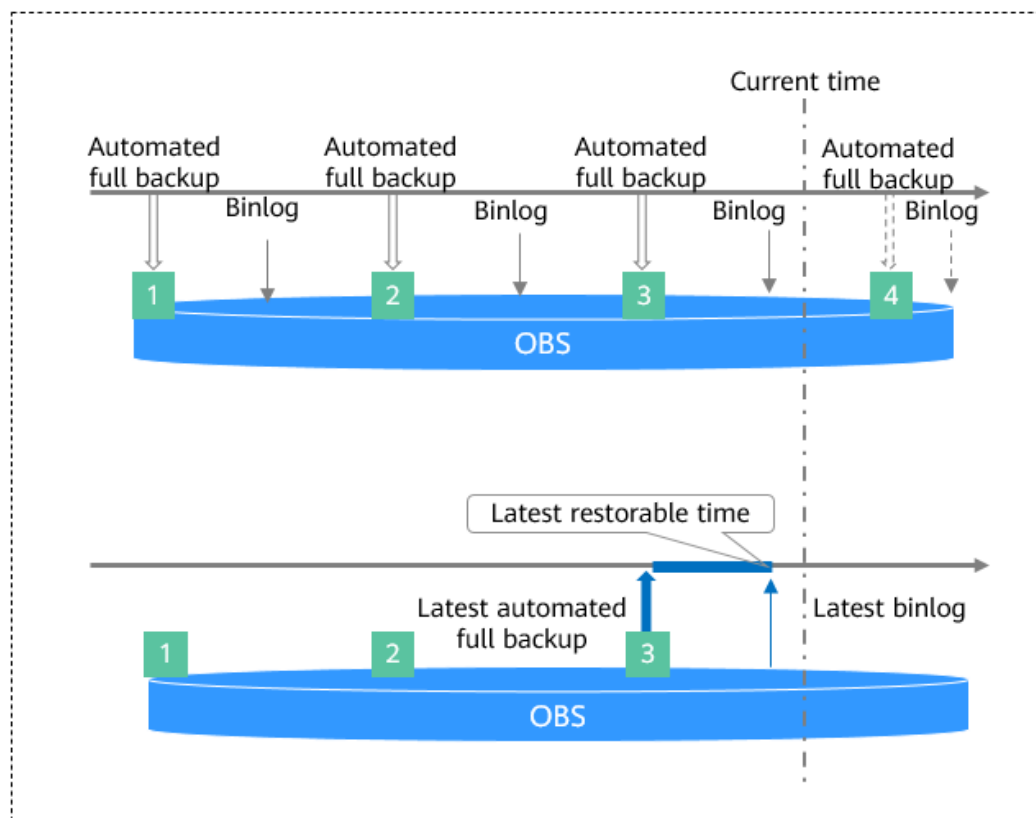
### Where Data Is Backed Up

- **Single-node instance**  
A single-node architecture, which is more cost-effective than mainstream primary/standby DB instances. After a backup is triggered, data is backed up from the primary instance and stored as a package on OBS. The backup does not take up storage space of the instance.
- **Primary/standby instance**  
An HA architecture. In a primary/standby pair, each instance has the same instance class. After a backup task is triggered, data is backed up from the standby instance (or from the primary instance only when there is a long primary/standby replication delay) and stored as a package on OBS. The backup does not take up storage space of the instance.  
  
If a database or table in the primary instance is maliciously or mistakenly deleted, the database or table in the standby instance will also be deleted. In this case, you can only use backups to restore the deleted data.

## How Data Is Backed Up

RDS for MySQL automated backup is enabled by default and cannot be disabled. RDS for MySQL performs automated full backups based on the time window and interval specified in the backup policy. It also backs up data modifications made after the most recent automated full or binlog backup every 5 minutes or when a certain amount of incremental data is generated. When you restore an instance to a point in time, the most recent full backup will be downloaded from OBS for restoration. After the restoration is complete, binlog backups will be replayed to the specified point in time.

**Figure 10-1** How data is backed up



## Backup Compression Ratio

RDS uses [sysbench](#) to import data models and a certain amount of data. After data is backed up, the compression ratio is about 80%. The more duplicate data there is, the higher the compression ratio is.

Compression ratio = Space occupied by backup files / Space occupied by data files x 100%

## Backup Storage and Billing

Backups are saved as packages in OBS buckets. Backups occupy backup space in OBS. If the free space RDS provides is used up, the additional space required will be billed. For details, see [How Is RDS Backup Data Billed?](#)

After CBR snapshot-based backup is enabled, the free backup space is unavailable. You are billed for database server backup vaults on a pay-per-use basis. For details, see [How Is CBR Billed?](#)

## Deleting Backups

- Manual backups and automated backups can be deleted in different ways:
  - Manual backups can only be manually deleted.
  - Automated backups cannot be manually deleted. To delete them, you can adjust the retention period specified in your [automated backup policy](#). When the retention period expires, automated backups will be deleted.

- Local binlogs

If the retention period is set to **0**, the binlogs of your DB instance will be deleted once they are synchronized to the standby instance and read replicas and successfully backed up to OBS.

If the retention period is set to a value greater than 0, for example, 1 day, the binlogs will be retained for one day after they are synchronized to the standby instance and read replicas from the primary instance and successfully backed up to OBS. After the retention period expires, the binlogs will be automatically deleted.

## 10.2 Backup Types

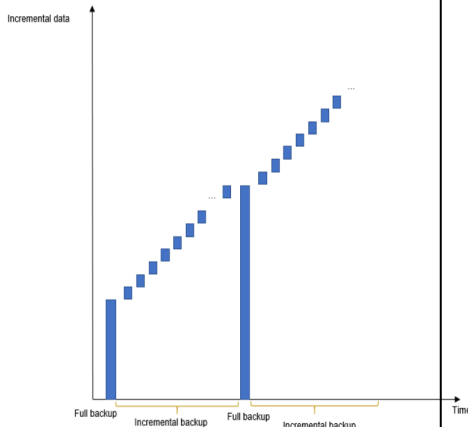
RDS for MySQL supports multiple backup types. Based on different dimensions, there are the following backup types:

### Full Backups and Incremental Backups Based on Data Volume

**Table 10-1** Comparison between full backups and incremental backups

| Backup Type        | Full backups                          | Incremental backups                                              |
|--------------------|---------------------------------------|------------------------------------------------------------------|
| Description        | All data in an instance is backed up. | Only data changes within a certain period of time are backed up. |
| Enabled by Default | Yes                                   | Yes                                                              |



|                                 |                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Retention Period</b>         | <ul style="list-style-type: none"><li>You can specify how many days automated backups can be retained for. If you shorten the retention period, the new backup policy takes effect for existing backups.</li><li>Manual backups will not be deleted until you delete them manually.</li></ul>               | Incremental backups will be deleted along with automated full backups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Characteristics</b>          | <ul style="list-style-type: none"><li>A full backup is to back up all data of your DB instance in the current point of time.</li><li>You can use a full backup to restore the complete data generated when the backup was created.</li><li>Full backups can be created automatically or manually.</li></ul> | <ul style="list-style-type: none"><li>The system automatically backs up data modifications made after the most recent automated or incremental backup every 5 minutes or when a certain amount of incremental data is generated.</li><li>Incremental backups can only be created automatically.</li><li>Restoring data from incremental backups relies on the most recent full backup, as shown in <a href="#">Figure 10-2</a>, so the most recent full backup that exceeds the retention period will not be deleted to ensure successful restoration.</li></ul> <p><b>Figure 10-2</b> Incremental data restoration</p>  |
| <b>How to Check Backup Size</b> | Click the target instance name. On the <b>Backups &amp; Restorations</b> page, click the <b>Full Backups</b> tab and check the backup size.                                                                                                                                                                 | Click the target instance name. On the <b>Backups &amp; Restorations</b> page, click the <b>Binlog Backups</b> tab and check the backup size.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Automated Backups and Manual Backups Based on Backup Methods

**Table 10-2** Comparison between automated backups and manual backups

| Backup Type        | Automated backups                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Manual backups                                                                                                                                                                                                                                                                                                           |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description        | <ul style="list-style-type: none"><li>You can set an automated backup policy on the console, and the system will back up your instance data based on the time window and backup cycle you set in the backup policy and will store the backups for the retention period you specified.</li><li>Automated backups cannot be manually deleted. To delete them, you can adjust the retention period specified in your automated backup policy. Retained backups (including full and incremental backups) will be automatically deleted at the end of the retention period.</li></ul> | <ul style="list-style-type: none"><li>Manual backups are user-initiated full backups of your DB instance. They are retained until you delete them manually.</li><li>Regularly backing up your DB instance is recommended, so if your DB instance fails or data is corrupted, you can restore it using backups.</li></ul> |
| Enabled by Default | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes                                                                                                                                                                                                                                                                                                                      |
| Retention Period   | Automated backups are retained for the number of days you specified.<br>The retention period ranges from 1 to 732 days.                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Manual backups are always retained until you delete them manually.                                                                                                                                                                                                                                                       |
| How to Configure   | See <a href="#">Configuring a Same-Region Backup Policy</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | See <a href="#">Creating a Manual Backup</a> .                                                                                                                                                                                                                                                                           |

## Same-Region Backups and Cross-Region Backups Based on Backup Regions

### NOTE

To use cross-region backup, [submit a service ticket](#) to request required permissions.

**Table 10-3** Comparison between same-region backups and cross-region backups

| Backup Type              | Same-region backups                                                                                                                            | Cross-region backups                                                                                                                                                                           |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Description              | Backups are stored in the same region as your DB instance.                                                                                     | Backups are stored in a different region from that of your DB instance.                                                                                                                        |
| Enabled by Default       | Yes                                                                                                                                            | No                                                                                                                                                                                             |
| Retention Period         | Backups are retained for the number of days you specified.<br>The retention period ranges from 1 to 732 days.                                  | Backups are retained for the number of days you specified.<br>The retention period ranges from 1 to 1,825 days.                                                                                |
| Characteristics          | Backups are stored in the same region as your DB instance. Same-region backup (automated backup) is enabled by default and cannot be disabled. | Backups are stored in a region different from the one where your DB instance is located. After you enable cross-region backup, the backups are automatically stored in the region you specify. |
| How to Configure         | See <a href="#">Configuring a Same-Region Backup Policy</a> .                                                                                  | See <a href="#">Configuring a Cross-Region Backup Policy</a> .                                                                                                                                 |
| How to Check Backup Size | Click <b>Backups</b> in the navigation pane. On the <b>Same-Region Backups</b> tab, check the backup size.                                     | Click <b>Backups</b> in the navigation pane. On the <b>Cross-Region Backups</b> tab, click <b>View Cross-Region Backup</b> and check the backup size.                                          |

## 10.3 Performing Backups

### 10.3.1 Configuring a Same-Region Backup Policy

#### Scenarios

When you create a DB instance, an automated backup policy is enabled by default. For security purposes, the automated backup policy cannot be disabled. After the DB instance is created, you can customize the automated backup policy as required and then RDS backs up data based on the automated backup policy you configure.

RDS backs up data at the DB instance level, rather than the database level. If a database is faulty or data is damaged, you can restore it from backups. Backups are saved as packages in OBS buckets to ensure data confidentiality and durability. Since backing up data affects database read and write performance, the automated backup time window should be set to off-peak hours.

After an automated backup policy is configured, full backups are created based on the time window and backup cycle specified in the policy. The time required for creating a backup depends on how much data there is in the instance. Backups are stored for as long as you specified in the backup policy.

You do not need to set an interval for incremental backup because RDS automatically backs up incremental data every 5 minutes or when a certain amount of incremental data is generated. Incremental backups can be used to restore data to a specific point in time.

## Differences Between Common Backup and Sparse Backup

**Table 10-4** Backup functions

| Item                 | Common Backup                                                                                                                                                                                                                                         | Sparse Backup                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Function description | RDS for MySQL uses common backup by default. Common backup backs up all instance data based on the specified time window and backup cycle. A backup file is generated each time a backup is complete, and is stored for the retention period you set. | If you want to retain backups for a long time, you can enable sparse backup to reduce costs. Compared with the default backup policy, sparse backup reduces the backup frequency while maintaining the same retention period for the backups.<br><br>To enable sparse backup, <a href="#">submit a service ticket</a> to request required permissions. After sparse backup is enabled, a common backup policy is displayed by default. You can add sparse backup policies as needed. |

| Item                      | Common Backup                                                                                                                                                                                         | Sparse Backup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of backup policies | <p>An instance has only one backup policy, which cannot be deleted.</p> <p>The default policy is weekly backup. Select at least one day in a week. The backups can be retained for 1 to 732 days.</p> | <p>The default policy cannot be deleted, but the manually added sparse backup policies can be deleted.</p> <p>After enabling sparse backup, you can also add sparse backup policies alongside the default backup policy.</p> <ul style="list-style-type: none"><li>• The default policy is weekly backup and cannot be deleted. Select at least one day in a week. The backups can be retained for 1 to 732 days.</li><li>• There are three types of sparse backup policies. The backups can be retained for 1 to 732 days.<ul style="list-style-type: none"><li>– Weekly: Select at least one day in a week.</li><li>– Monthly: Select at least one day in a month.</li><li>– Yearly: Select a specific day in a year.</li></ul></li></ul> |
| Time window               | A one-hour period the backup will be scheduled within 24 hours, such as 01:00-02:00 or 12:00-13:00                                                                                                    | A one-hour period the backup will be scheduled within 24 hours, such as 01:00-02:00 or 12:00-13:00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CBR backup                | Supported                                                                                                                                                                                             | Supported                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## Constraints (CBR Backup Disabled)

- For primary/standby instances, if the standby instance is faulty or the replication delay of the standby instance exceeds one day, backups will be performed on the primary instance.
- When you delete a DB instance, its automated backups are also deleted but its manual backups are retained.
- Rebooting the instance is not allowed during full backup. Exercise caution when selecting a backup time window.
- The system verifies the connection to the DB instance when starting a full backup task. If either of the following conditions is met, the verification fails and a retry is automatically performed. If the retry fails, the backup will fail.
  - DDL operations are being performed on the DB instance.
  - The backup lock failed to be obtained from the DB instance.

- Performing a full backup may decrease instance throughput and increase replication delay because it occupies node resources, especially disk bandwidth.

## Constraints (CBR Backup Enabled)

- CBR backups depend on the Cloud Backup and Recovery (CBR) service. For details, see [What Is CBR?](#)
- Enabling CBR backup will incur fees. CBR backups are billed by actual vault usage, which is calculated by CBR.
- The backup time is proportional to how much data your instance has. Too much data can decrease the backup efficiency. If you have large amounts of data and want to speed up the backup process, [submit a service ticket](#) to enable [CBR snapshot backup](#).
- After CBR is enabled, snapshot backup is used. Existing automated and manual backups can still be used to restore data.
- When you delete a DB instance, its automated backups are also deleted but its manual backups are retained.
- DDL operations cannot be performed when a CBR snapshot is being created. If a DDL operation is being performed, a snapshot will be created after the DDL operation is complete.
- After CBR is enabled, the next full backup is a snapshot backup. You can use the snapshot backup to restore data.

## Billing

Backups are saved as packages in OBS buckets. For the billing details, see [How Is RDS Backup Data Billed?](#)

After CBR is enabled, the free backup space is unavailable. You are billed for database server backup vaults on a pay-per-use basis. For details, see [How Is CBR Billed?](#)

## Configuring a Common Backup Policy (Sparse Backup Disabled)

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**.
- Step 5** In the upper right corner of the page, choose **Modify Backup Policy > Configure Same-Region Backup Policy**. On the displayed page, you can view the existing backup policy. If you want to modify the policy, adjust the values of the following parameters:

**Figure 10-3** Modifying a backup policy

×

### Configure Same-Region Backup Policy

Notes for automated backup

- Backup data is copied from the instance, compressed, and uploaded to OBS.
- After automated backup is enabled, an incremental backup is automatically performed every 5 minutes to ensure data reliability.
- The time required for the backup depends on how much data the instance has. The average backup speed is 60 MB/s.

#### Automated Backup

Automated Backup ?

Backup Frequency  
Regular

Time Window  
01:00 – 02:00 ▼

Backup Cycle ?

Monday ×

Tuesday ×

Wednesday ×

Thursday ×

Friday ×

Saturday ×

Sunday ×

▼

A minimum of one day must be selected.

Retention Period (days)

–

7

+

Enter an integer from 1 to 732.

<

Cancel

OK

- **Retention Period:** How many days your automated full backups and binlog backups can be retained. The retention period is from 1 to 732 days and the default value is 7.
  - Extending the retention period improves data reliability.
  - Reducing the retention period takes effect for existing backups. Any backups (except manual backups) that have expired will be automatically deleted. Exercise caution when performing this operation.

**Policy for automatically deleting automated full backups:**

To ensure data integrity, even after the retention period expires, the most recent backup will be retained, for example, if **Backup Cycle** was set to **Monday** and **Tuesday** and **Retention Period** was set to 2:

- The full backup generated on Monday will be automatically deleted on Thursday because:  
The backup generated on Monday expires on Wednesday, but it is the last backup, so it will be retained until a new backup expires. The next

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backup will be generated on Tuesday and will expire on Thursday. So the full backup generated on Monday will not be automatically deleted until Thursday.

- The full backup generated on Tuesday will be automatically deleted on the following Wednesday because:

The backup generated on Tuesday will expire on Thursday, but as it is the last backup, it will be retained until a new backup expires. The next backup will be generated on the following Monday and will expire on the following Wednesday, so the full backup generated on Tuesday will not be automatically deleted until the following Wednesday.

- **Time Window:** A one-hour period the backup will be scheduled for each day, such as 01:00-02:00 or 12:00-13:00. The backup time window indicates when the backup starts. The backup duration depends on the data volume of your instance.

#### NOTE

To minimize the potential impact on services, set the time window to off-peak hours. The backup time window is saved in the UTC time zone of the local browser. It changes with the time zone during the switch between the DST and standard time.

- **Backup Cycle:** Daily backups are selected by default, but you can change it. At least one day must be selected.

**Step 6** Click **OK**.

-----End

## Configuring a Sparse Backup Policy

To use this function, [submit a service ticket](#) to request required permissions.

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Backups & Restorations**.

**Step 5** In the upper right corner of the page, choose **Modify Backup Policy > Configure Same-Region Backup Policy**. You can see the configured backup policy. To modify the backup policy, adjust the parameter values as needed.



**Figure 10-4** Configuring a sparse backup policy

Configure Same-Region Backup Policy

Notes for automated backup

- Backup data is copied from the instance, compressed, and uploaded to OBS.
- After automated backup is enabled, an incremental backup is automatically performed every 5 minutes to ensure data reliability.
- The time required for the backup depends on how much data the instance has. The average backup speed is 60 MB/s.

Automated Backup

Automated Backup ?

Backup Frequency

Sparse

Time Window

01:00 — 02:00

Sparse Backup Policy

| Frequency  | Time           | Local Retention Period(days) |        |
|------------|----------------|------------------------------|--------|
| Weekly     | Monday Tuesday | 7                            |        |
| Weekly     | Monday         | 100                          | Delete |
| Monthly    | 1 2            | 100                          | Delete |
| Every year | 1 / 1          | 100                          | Delete |

Add Policy

Policies you can still add: 6

Cancel

OK

- **Time Window:** Set it to a one-hour period the backup will be scheduled for each day, such as 01:00-02:00 or 12:00-13:00. The backup time window indicates when the backup starts. The backup duration depends on the data volume of your instance.

**NOTE**

To minimize the potential impact on services, set the time window to off-peak hours. The backup time window is saved in the UTC time zone of the local browser. It changes with the time zone during the switch between the DST and standard time.

- **Sparse Backup Policy**  
The default backup policy is weekly backup. Select at least one day in a week. The backups can be retained for 1 to 732 days.  
You can add more backup policies to back up data by week, month, or year.

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**Table 10-5** Configuring sparse backup policies

| Frequency   | Time                                | Retention Period                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Every week  | Select at least one day in a week.  | The retention period is the number of days for storing full automated backups and binlog backups. It can be set to 1 to 732 days. <ul style="list-style-type: none"><li>Extending the retention period improves data reliability.</li><li>Reducing the retention period takes effect for existing backups. Any backups (except manual backups) that have expired will be automatically deleted. Exercise caution when performing this operation.</li></ul> |
| Every month | Select at least one day in a month. |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Every year  | Select a specific day in a year.    |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

- If multiple sparse backup policies need to create backups on the same day, the system generates only one backup on that day and retains the backup based on the longest retention period.
- After sparse backup policies are configured, if no backup is generated in the specified backup window of a day (the backup conflicts with other operations or the backup fails), the backup will be skipped.
- If sparse backup policies are deleted and the backups that have been generated cannot match any existing policy, they will still be kept for the original retention period.

**Step 6** Click **OK**.

----End

## FAQ

- [Why Has Automated Backup of My RDS Instance Failed?](#)
- Q: How Do I Clear Automated Backups?  
A: Automated backups cannot be manually deleted. To delete them, you can adjust the retention period specified in your [automated backup policy](#). Retained backups will be automatically deleted at the end of the retention period.

## Related APIs

- [Setting an Automated Backup Policy](#)
- [Obtaining an Automated Backup Policy](#)
- [Obtaining Backups](#)

## 10.3.2 Configuring a Cross-Region Backup Policy

### Scenarios

RDS can store backups in a different region from the DB instance for disaster recovery. If a DB instance in one region fails, you can use backups from another region to restore the data to a new DB instance.

If you enable cross-region backup, backups are automatically stored in the region you specify. On the **Backups** page of the RDS console, you can click **View Backup** in the **Operation** column and manage cross-region backups. If cross-region backup is not enabled, backups are stored in the region where your instance is located by default.

You can set cross-region backup policies for up to 150 instances under an account by default.

### Precautions

To use cross-region backup, [submit a service ticket](#) to request required permissions. This function cannot ensure data timeliness. Therefore, the SLA is not guaranteed. If timeliness is a concern, instead of cross-region backup, you are advised to use Data Replication Service (DRS).

### Billing

**Table 10-6** Billing method

| Specification Code              | Pay-per-Use (USD/GB/Hour) |
|---------------------------------|---------------------------|
| rds.mysql.crossreg.backup.space | 0.0002                    |

### Supported Regions

To use cross-region backup, [submit a service ticket](#) to apply for required permissions.

Cross-region backup is only supported in the regions listed in the following table.

**Table 10-7** Supported regions

| Source Region         | Destination Region                       |
|-----------------------|------------------------------------------|
| CN North-Beijing4     | CN East-Shanghai1 and CN South-Guangzhou |
| CN East-Shanghai1     | CN North-Beijing4 and CN South-Guangzhou |
| CN Southwest-Guiyang1 | CN North-Ulanqab1                        |

| Source Region     | Destination Region    |
|-------------------|-----------------------|
| CN North-Ulanqab1 | CN Southwest-Guiyang1 |

## Enabling or Modifying a Cross-Region Backup Policy

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance you want to configure a backup policy for.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**.
- Step 5** In the upper right corner of the page, choose **Modify Backup Policy > Configure Cross-Region Backup Policy**.
- Step 6** In the displayed dialog box, enable only **Cross-Region Full Backup** or enable both **Cross-Region Full Backup** and **Cross-Region Log Backup**, and specify the region and retention period.

Figure 10-5 Setting a cross-region backup policy

### Set Cross-Region Backup Policy ×

**i**

- All cross-region backups of your DB instances are stored in the region you specify.
- After cross-region backup is enabled, the backups generated will be billed separately.

Cross-Region Full Backup ☒

Cross-Region Log Backup ☐

Region

Retention Period (days)

Enter an integer from 1 to 1,825.

OK Cancel

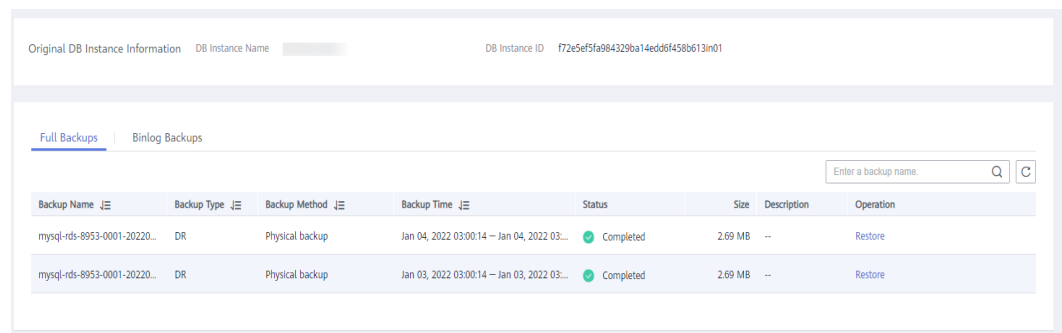
- Encrypted backups cannot be stored across regions.
- The instance name is synchronized only when cross-region backups are synchronized for the first time. The instance ID is the unique identifier for the cross-region backups.
- If you enable **Cross-Region Full Backup**, automated full backup files of the DB instance are stored in OBS in the region you specify.
- If you enable **Cross-Region Log Backup**, binlog (incremental) backup files of the DB instance are stored in OBS in the region you specify.
- Cross-region backup files can be retained from 1 to 1,825 days.
- Only new backup files generated after you set a cross-region backup policy will be stored in OBS in the region you specify.
- After cross-region log backup is enabled, you can restore a DB instance to a specified point in time only after the next automated full backup replication is complete. The specified time point must be later than the time when the automated full backup is complete.
- The cross-region backups of all your instances must be stored in the same destination region.
- After you enable cross-region backup, the completed backup files in the region where your instance is located will be asynchronously replicated to the region you specify.
- Deleting an instance does not delete its cross-region backups. You need to manually [disable the cross-region backup policy](#).

**Step 7** Click **OK**.

**Step 8** To manage cross-region backups, return to the instance list, choose **Backups** in the navigation pane, and click the **Cross-Region Backups** tab.

- By default, all instances with cross-region backups are displayed.
  - To modify the cross-region backup policy, click **Set Cross-Region Backup** in the **Operation** column.
  - To view generated cross-region backup files, click **View Cross-Region Backup** in the **Operation** column. If a DB instance fails, you can use the cross-region backup files to restore data to a new DB instance.

**Figure 10-6** Full backups

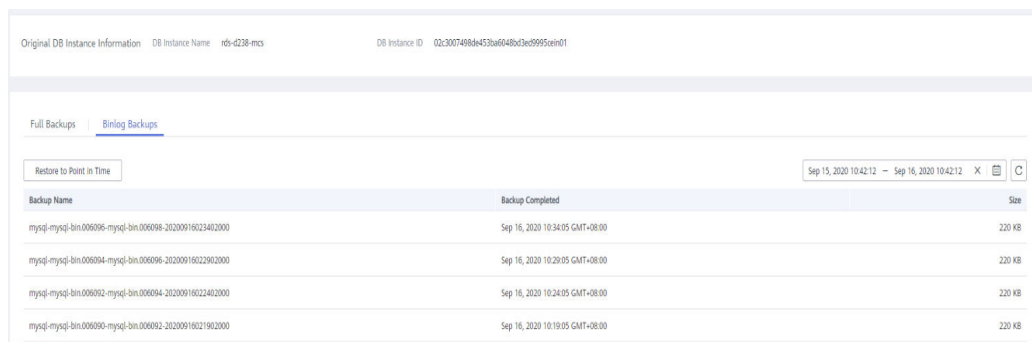


Original DB Instance Information DB Instance Name  DB Instance ID f72e5ef5fa964329ba14edd6f458b613in01

Full Backups | Binlog Backups

Enter a backup name

| Backup Name                  | Backup Type | Backup Method   | Backup Time                                  | Status    | Size    | Description | Operation |
|------------------------------|-------------|-----------------|----------------------------------------------|-----------|---------|-------------|-----------|
| mysql-rds-8953-0001-20220... | DR          | Physical backup | Jan 04, 2022 03:00:14 -- Jan 04, 2022 03:... | Completed | 2.69 MB | --          | Restore   |
| mysql-rds-8953-0001-20220... | DR          | Physical backup | Jan 03, 2022 03:00:14 -- Jan 03, 2022 03:... | Completed | 2.69 MB | --          | Restore   |

**Figure 10-7** Binlog backups

The screenshot shows the 'Binlog Backups' tab in the RDS console. At the top, it displays 'Original DB Instance Information' with 'DB Instance Name' as 'rds4238-mys' and 'DB Instance ID' as '03-3007498b453ba648a3ce9995aef01'. Below this, there are tabs for 'Full Backups' and 'Binlog Backups', with the latter being selected. A 'Restore to Point in Time' button is visible. A date range filter is set to 'Sep 15, 2020 10:42:12' to 'Sep 16, 2020 10:42:12'. The main table lists four binlog backups, each with a name, completion time, and size of 220 KB.

| Backup Name                                             | Backup Completed                | Size   |
|---------------------------------------------------------|---------------------------------|--------|
| mysql-mysq-bin.006096-mysq-bin.006098-20200916023402000 | Sep 16, 2020 10:34:05 GMT+08:00 | 220 KB |
| mysql-mysq-bin.006094-mysq-bin.006096-20200916022902000 | Sep 16, 2020 10:29:05 GMT+08:00 | 220 KB |
| mysql-mysq-bin.006092-mysq-bin.006094-20200916022402000 | Sep 16, 2020 10:24:05 GMT+08:00 | 220 KB |
| mysql-mysq-bin.006090-mysq-bin.006092-20200916021902000 | Sep 16, 2020 10:19:05 GMT+08:00 | 220 KB |

----End

## Disabling a Cross-Region Backup Policy

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Backups** page, click the **Cross-Region Backups** tab.
- Step 4** Locate a DB instance and click **Set Cross-Region Backup** in the **Operation** column. On the displayed page, disable the cross-region backup policy.

### NOTE

Disabling the cross-region backup policy deletes the backups stored in the destination region.

**Figure 10-8** Disabling a cross-region backup policy

**Set Cross-Region Backup Policy** ×

**i** • All cross-region backups of your DB instances are stored in the region you specify.  
• After cross-region backup is enabled, the backups generated will be billed separately.

Cross-Region Full Backup ☐

Cross-Region Log Backup ☐

Region

Retention Period (days)  – +

Enter an integer from 1 to 1,825.

OK Cancel

**Step 5** Click **OK**.

----End

## Related APIs

- [Setting a Cross-Region Backup Policy](#)
- [Querying Information About a Cross-Region Backup Policy](#)
- [Querying Cross-Region Backups](#)
- [Querying DB Instances for Which Cross-Region Backups Are Created](#)

## 10.3.3 Creating a Manual Backup

### Scenarios

RDS allows you to create manual backups for a running primary DB instance. You can use these backups to restore data.

### Constraints (CBR Disabled)

- You can create manual backups only when your account balance is no less than \$0 USD.
- When you delete a DB instance, its automated backups are also deleted but its manual backups are retained.

- The number of tables in a DB instance affects the backup speed. The maximum number of tables is 500,000.
- The system verifies the connection to the DB instance when starting a full backup task. If either of the following conditions is met, the verification fails and a retry is automatically performed. If the retry fails, the backup will fail.
  - DDL operations are being performed on the DB instance.
  - The backup lock failed to be obtained from the DB instance.
- Performing backups consumes memory resources. If there are a large number of tables in your instance but the available memory is insufficient, a backup task may fail. In this case, you need to reduce the number of tables or upgrade the instance specifications.
- Metadata locks will be generated while a backup is being created, which may cause DDL blocking or replication delay.

## Constraints (CBR Enabled)

- The backup time is proportional to how much data your instance has. Too much data can decrease the backup efficiency. If you have large amounts of data and want to speed up the backup process, [submit a service ticket](#) to enable [CBR snapshot backup](#).
- After CBR is enabled, snapshot backup is used. Existing automated and manual backups can still be used to restore data.
- When you delete a DB instance, its automated backups are also deleted but its manual backups are retained.
- DDL operations cannot be performed when a CBR snapshot is being created. If a DDL operation is being performed, a snapshot will be created after the DDL operation is complete.
- After CBR is enabled, the next full backup is a snapshot backup. You can use the snapshot backup to restore data.

## Billing

Backups are saved as packages in OBS buckets. For the billing details, see [How Is RDS Backup Data Billed?](#)

After a DB instance is deleted, the free backup space of the DB instance is automatically canceled. Manual backups are billed based on the space required. For details, see [Product Pricing Details](#).

After CBR is enabled, the free backup space is unavailable. You are billed for database server backup vaults on a pay-per-use basis. For details, see [How Is CBR Billed?](#)

## Method 1

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.



**Step 3** On the **Instances** page, locate the target DB instance and choose **More > Create Backup** in the **Operation** column.

**Step 4** In the displayed dialog box, enter a backup name and description. Then, click **OK**.

- The backup name must consist of 4 to 64 characters and start with a letter. It can contain only uppercase letters, lowercase letters, digits, hyphens (-), and underscores (\_).
- The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: >!<"&'=
- The time required for creating a manual backup depends on the amount of data.

To check whether the backup has been created, you can click  in the upper right corner of the page to check the DB instance status. If the DB instance status becomes **Available** from **Backing up**, the backup has been created.

**Step 5** After a manual backup has been created, you can view and manage it on the **Backups** page.

Alternatively, click the target DB instance. On the **Backups & Restorations** page, you can view and manage the manual backups.

----End

## Method 2

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target DB instance.

**Step 4** On the **Backups & Restorations** page, click **Create Backup**. In the displayed dialog box, enter a backup name and description and click **OK**.

- The backup name can contain 4 to 64 characters and must start with a letter. Only letters (case-sensitive), digits, hyphens (-), and underscores (\_) are allowed.
- The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: >!<"&'=
- The time required for creating a manual backup depends on the amount of data.

**Step 5** After a manual backup has been created, you can view and manage it on the **Backups** page.

Alternatively, click the target DB instance. On the **Backups & Restorations** page, you can view and manage the manual backups.

----End

## Related APIs

- [Creating a Manual Backup](#)
- [Obtaining Backups](#)
- [Deleting a Manual Backup](#)

## 10.3.4 Replicating a Backup

### Scenarios

RDS supports replication of automated and manual backups.

### Constraints

You can replicate backups and use them only within the same region.

Snapshot-based backups, including CBR snapshot-based backups, cannot be replicated.

### Backup Retention Policy

- If a DB instance is deleted, the automated backups created for it are also deleted.
- If an [automated backup policy](#) is enabled, the automated backups will be deleted after the backup retention period expires.
- If you want to retain the automated backups for a long time, you can replicate them to generate manual backups, which will be always retained until you delete them.
- If the storage occupied by manual backups exceeds the provisioned free backup storage, additional storage costs may incur.
- Replicating a backup does not interrupt your services.

### Billing

Backups are saved as packages in OBS buckets. For the billing details, see [How Is RDS Backup Data Billed?](#)

After a DB instance is deleted, the free backup space of the DB instance is automatically canceled. Manual backups are billed based on the space required. For details, see [Product Pricing Details](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name. On the **Backups & Restorations** page, locate the backup to be replicated and click **Replicate** in the **Operation** column.

Alternatively, choose **Backups** in the navigation pane on the left. On the displayed page, locate the backup to be replicated and click **Replicate** in the **Operation** column.

- Step 4** In the displayed dialog box, enter a new backup name and description and click **OK**.
- The backup name must consist of 4 to 64 characters and start with a letter. It can contain only uppercase letters, lowercase letters, digits, hyphens (-), and underscores (\_).
  - The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: >!"&'=
- Step 5** After the new backup has been created, you can view and manage it on the **Backups** page.

-----End

## 10.4 Managing Backups

### 10.4.1 Transferring Backups to a Specified OBS Bucket

#### Scenarios

You can transfer the generated automated or manual backups to a specified OBS bucket.

- To manually transfer backups, [submit a service ticket](#) to request required permissions.

#### Constraints

- Only physical backup files can be transferred to a specified OBS bucket.
- When being transferred to an OBS bucket, encrypted backups will be decrypted first.
- The maximum size of a single backup that can be transferred each time is 10 TB. If this limit is exceeded, the transfer task will fail.
- Ensure that the target OBS bucket is available and has enough space. Otherwise, the transfer task will fail.
- Expired or deleted backups will not be transferred.
- Deleting the instance during a transfer will cause the transfer task to fail.
- You need to configure permissions and add system roles for manual OBS transfer. For details, see [Permissions](#).
- The transfer speed depends on the OBS upload rate, and the estimated time required may fluctuate.
- Backups transferred to OBS cannot be directly restored to RDS for MySQL instances. If you want to restore the backups, [restore them to a self-managed MySQL database first](#), and then [migrate the self-managed MySQL database to RDS for MySQL](#).

## Manually Transferring Backups to an OBS Bucket

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane, choose **Backups & Restorations**.
- Step 5** Select the backups to be transferred and click **Transfer to OBS Bucket**.
- Step 6** In the displayed dialog box, select an OBS bucket, specify a folder directory, and click **OK**.

Figure 10-9 Transfer to OBS Bucket

### Transfer to OBS Bucket

- 1**
- When being transferred to the target OBS bucket, encrypted backups will be decrypted first.
  - The maximum size of a single backup that can be transferred each time is 10 TB. If this limit is exceeded, the transfer task will fail.
  - Ensure that the target OBS bucket is available. Otherwise, the transfer task will fail.
  - Expired or deleted backups will not be transferred.
  - Deleting the instance during a transfer will cause the transfer task to fail.
  - If a transfer task fails, the task workflow will be stopped and subsequent backups will not be transferred.
  - Backups can be transferred only to the OBS buckets in the central AZ.
  - The transfer speed depends on the OBS upload rate, and the estimated time required may fluctuate.

Backup ID

aaa3e51b1f6c4b808f49e32be283b114br01

Destination OBS Bucket

obs-rds-1094



[Create Bucket](#)

Destination Bucket Prefix

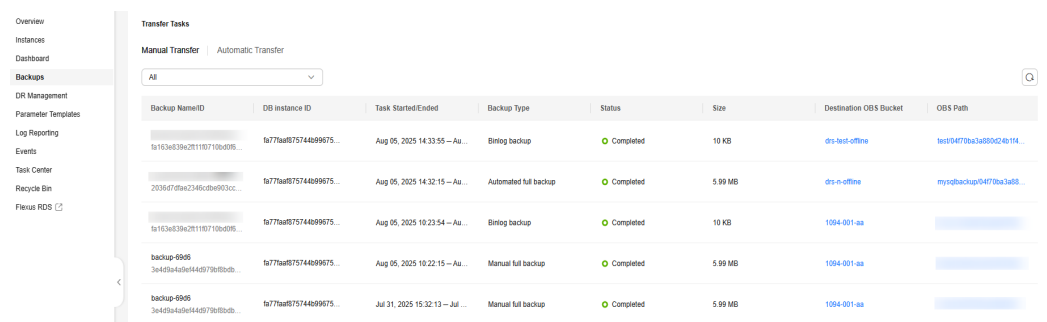
test/

A destination bucket prefix indicates where you want to store your backup data in an OBS bucket. It is in a folder structure and ends with a slash (/). Enter a maximum of 1,024 characters.

Cancel

OK

- Step 7** After the task is submitted, return to the **Instances** page, choose **Backups > Transfer Tasks**, and check the execution result of the manual transfer task.

**Figure 10-10** Checking transfer tasks

| Backup Name/ID                           | DB Instance ID         | Task Started/Ended             | Backup Type           | Status    | Size    | Destination OBS Bucket | OBS Path                  |
|------------------------------------------|------------------------|--------------------------------|-----------------------|-----------|---------|------------------------|---------------------------|
| ts163e839e28110710b095...                | ts77bae87574d899675... | Aug 05, 2025 14:33:55 – Au...  | Binlog backup         | Completed | 10 KB   | obs-test-offline       | test0470ba3a80024e114...  |
| 2039c7d9e2345cd9e903cc...                | ts77bae87574d899675... | Aug 05, 2025 14:32:15 – Au...  | Automated full backup | Completed | 5.99 MB | obs-n-offline          | mysqlbackup/0470ba3a88... |
| ts163e839e28110710b095...                | ts77bae87574d899675... | Aug 05, 2025 10:23:54 – Au...  | Binlog backup         | Completed | 10 KB   | 1094-001-aa            |                           |
| backup-4905<br>3e4d8a4a6d44d970b6b0db... | ts77bae87574d899675... | Aug 05, 2025 10:22:15 – Au...  | Manual full backup    | Completed | 5.99 MB | 1094-001-aa            |                           |
| backup-4905<br>3e4d8a4a6d44d970b6b0db... | ts77bae87574d899675... | Jul 31, 2025 15:32:13 – Jul... | Manual full backup    | Completed | 5.99 MB | 1094-001-aa            |                           |

----End

## 10.4.2 Downloading a Full Backup

### Scenarios

You can download manual and automated backups to restore cloud data to self-managed databases, perform audits, store data locally, or query backup data. The backup files are in **.qp** format.

### Constraints

- Full backup files of frozen DB instances cannot be downloaded.
- When you use OBS Browser+ to download backup data, there is no charge for the outbound traffic from OBS.
- If the size of the backup data is greater than 400 MB, you are advised to use OBS Browser+ to download the backup data.

### Method 1: Using OBS Browser+

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

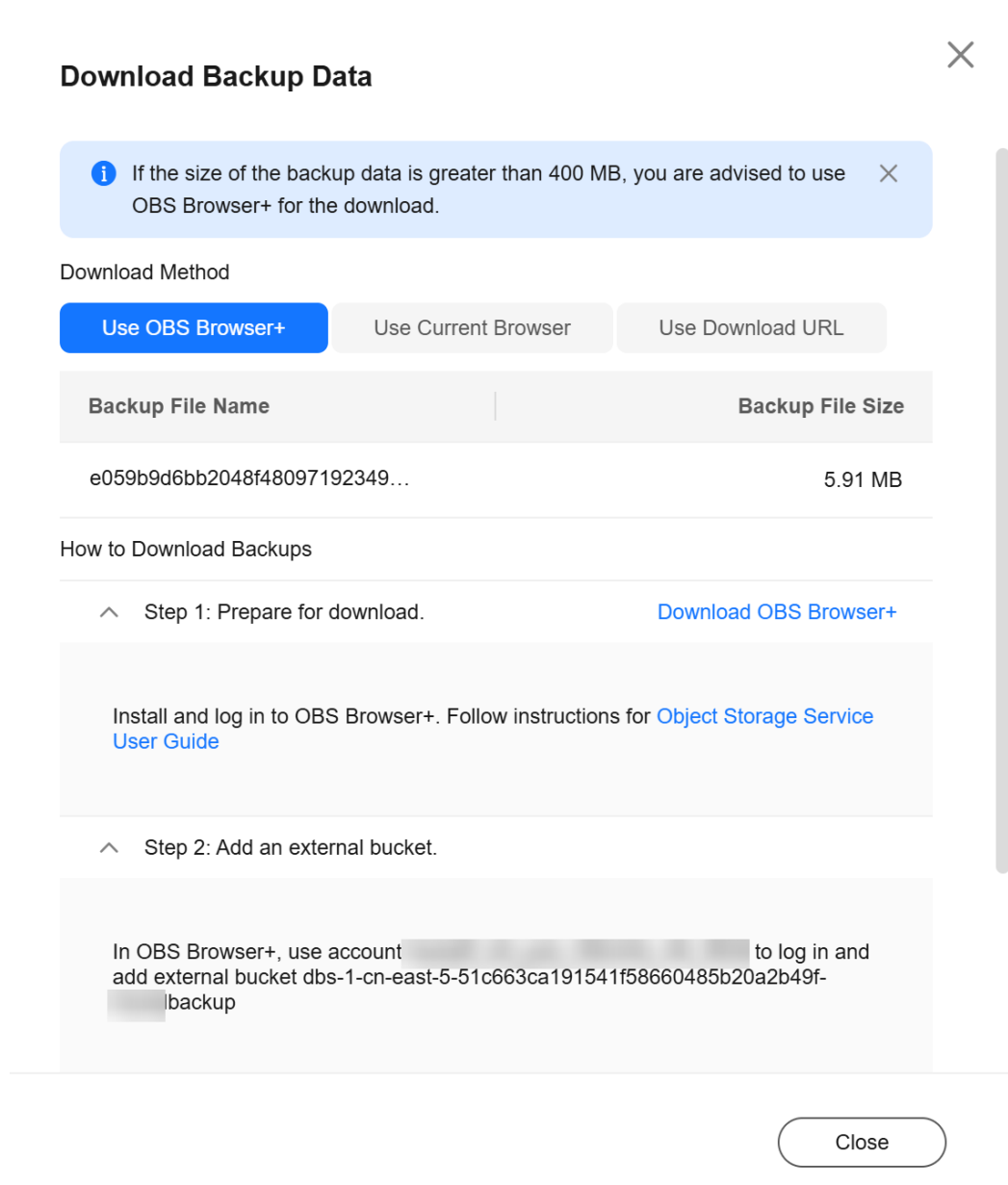
**Step 3** On the **Backups** page, locate the backup to be downloaded and click **Download** in the **Operation** column.

Alternatively, click the target DB instance. In the navigation pane on the left, choose **Backups & Restorations**. On the **Full Backups** page, locate the backup to be downloaded and click **Download** in the **Operation** column.

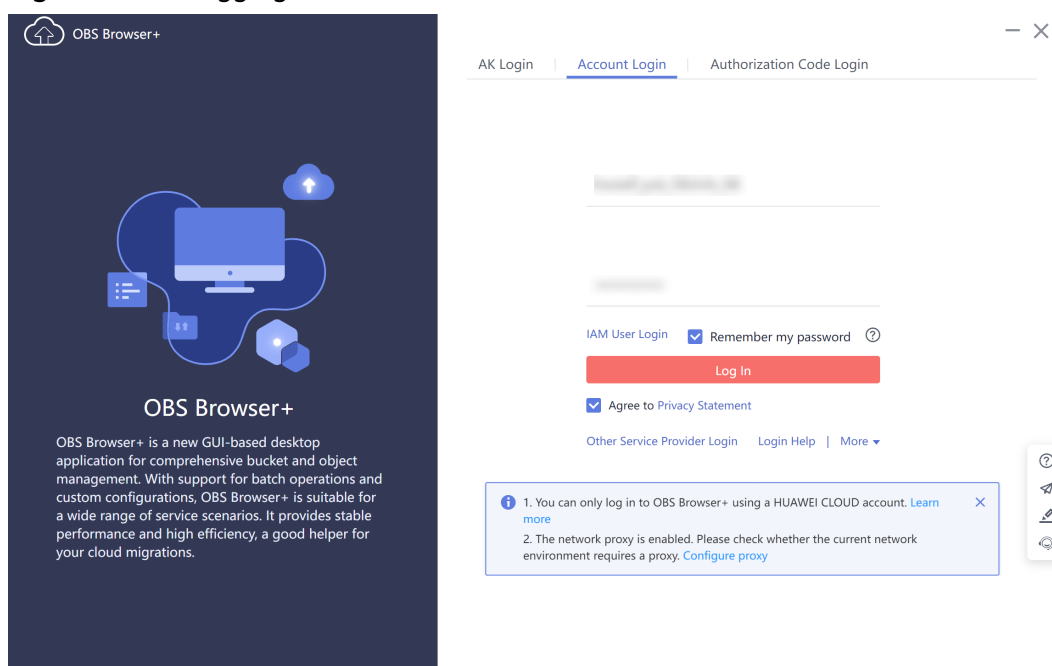
**Step 4** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

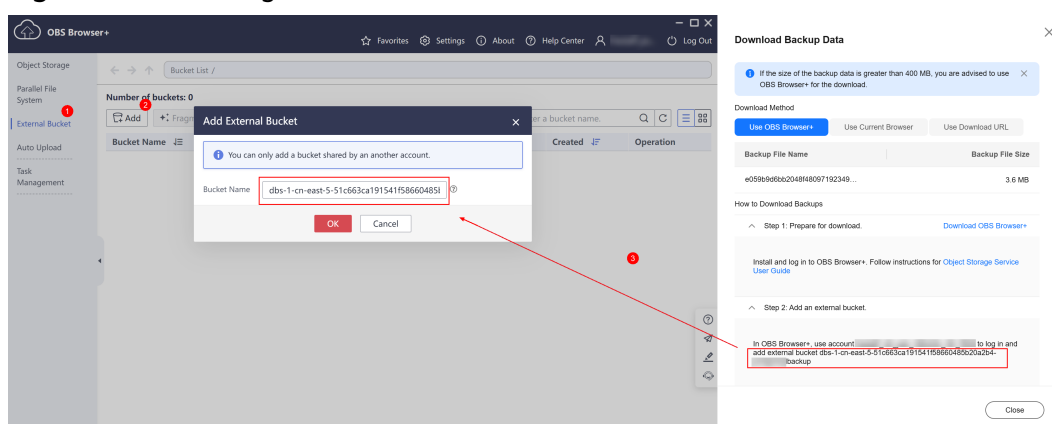
**Step 5** In the displayed dialog box, select **Use OBS Browser+** for **Download Method** and download the backup as prompted.

**Figure 10-11** Using OBS Browser+

1. Download OBS Browser+ by clicking **Download OBS Browser+** in Step 1 on the download guide page.
2. Decompress and install OBS Browser+.
3. Log in to OBS Browser+ using the username provided in Step 2 on the download guide page.

**Figure 10-12** Logging in to OBS Browser+

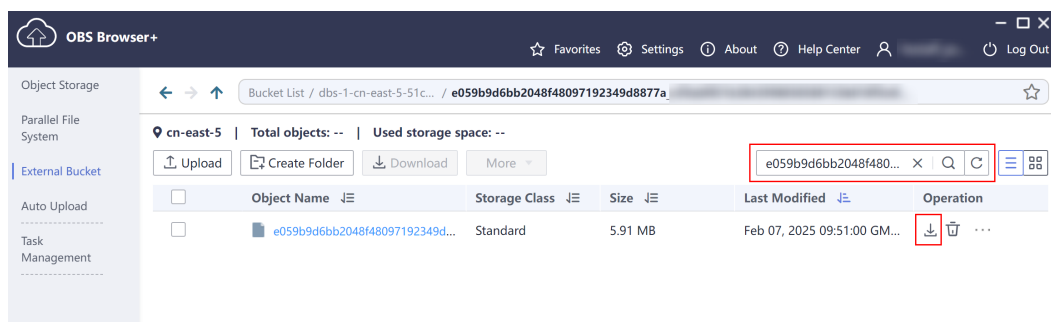
4. Add an external bucket using the bucket name provided in Step 2 on the download guide page.

**Figure 10-13** Adding an external bucket

#### NOTE

If you want to access OBS external buckets across accounts, the access permission is required. For details, see [Granting IAM Users Under an Account the Access to a Bucket and the Resources in It](#).

5. Download the backup file.  
On the OBS Browser+ page, click the bucket that you added. In the search box on the right of the object list page, enter the backup file name and start a search. In the search result, locate the target backup and click  in the **Operation** column.

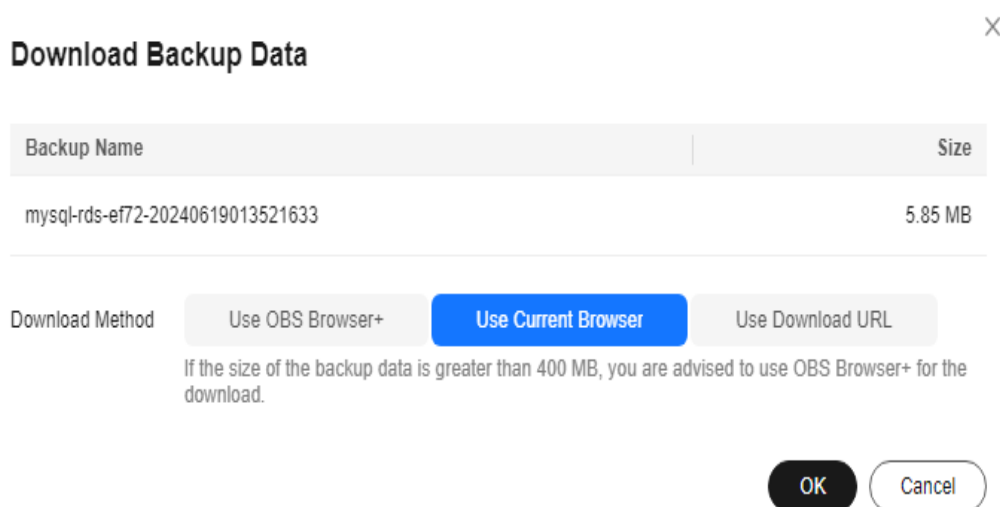
**Figure 10-14** Downloading a backup

----End

## Method 2: Using Current Browser

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Backups** page, locate the backup to be downloaded and click **Download** in the **Operation** column.
- Alternatively, click the target DB instance. In the navigation pane on the left, choose **Backups & Restorations**. On the **Full Backups** page, locate the target backup to be downloaded and click **Download** in the **Operation** column.
- Step 4** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.
- Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).
- Step 5** In the displayed dialog box, select **Use Current Browser** for **Download Method** and click **OK**.



**Figure 10-15** Using the current browser

----End

### Method 3: Using Download URL

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Backups** page, locate the backup to be downloaded and click **Download** in the **Operation** column.
- Alternatively, click the target DB instance. In the navigation pane on the left, choose **Backups & Restorations**. On the **Full Backups** page, locate the target backup to be downloaded and click **Download** in the **Operation** column.
- Step 4** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.
- Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).
- Step 5** In the displayed dialog box, select **Use Download URL** for **Download Method**, click  to copy the URL, and enter the URL in your browser.

**Figure 10-16** Using the download URL

**Download Backup Data** ✕

| Backup Name                      | Size    |
|----------------------------------|---------|
| mysql-rds-ef72-20240619013521633 | 5.85 MB |

Download Method: Use OBS Browser+ Use Current Browser **Use Download URL**

If the size of the backup data is greater than 400 MB, you are advised to use OBS Browser+ for the download.

URL: <https://obs.ap-southeast-1.myhuaweicloud.com:443/dbsbucket-ap-southeast-1-15...> 📄 ⬇️ ↻

Valid for 5 minutes.

Cancel

A valid URL for downloading the backup data is displayed.

- You can use various download tools, such as your browser to download backup files.
- You can also run the following command to download backup files:

**wget -O *FILE\_NAME* --no-check-certificate "*DOWNLOAD\_URL*"**

The parameters in the command are as follows:

*FILE\_NAME*: indicates the new backup file name after the download is successful. The original backup file name may be too long and exceed the maximum characters allowed by the client file system. You are advised to use the **-O** argument with wget to rename the backup file.

*DOWNLOAD\_URL*: indicates the location of the backup file to be downloaded. If the location contains special characters, escape is required.

----End

## Related APIs

[Obtaining the Link for Downloading a Backup](#)

## 10.4.3 Downloading a Binlog Backup

### Scenarios

You can download binlog backups for audit, local storage, or query. For details, see [Downloading a Single Binlog Backup](#) and [Downloading a Merged Binlog](#).

### Constraints

- The completion time displayed in the binlog backup list indicates the time when the last transaction was committed.
- Binlog backups on the management console are named in the format of "binlog name+timestamp" and use the row-based logging.

- Binlog backups of frozen DB instances cannot be downloaded.
- If the total size of binlogs within the selected period is greater than 500 MB, the binlogs cannot be merged for download.
- When binlogs of a single-node instance are being merged, the CPU usage of the instance increases. Consider the impact on the instance performance before merging binlogs.

## Downloading a Single Binlog Backup

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**. On the **Binlog Backups** page, locate the target backup to be downloaded and click **Download** in the **Operation** column.
- You can also select the binlog backups to be downloaded and click **Download** above the list.
- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.
- Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).
- Step 6** After the download is complete, you can view the binlog backups on your computer.
- End

## Downloading a Merged Binlog

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**. On the **Merged Binlogs** page, select a binlog time range and click **Merge**.
- The maximum time range for merging binlogs is 24 hours.
  - The available time range is consistent with the retention period you have set for the automated backups. For details about how to set the retention period, see [Configuring a Same-Region Backup Policy](#).

**Step 5** During the merging process, the merged file status is **Merging**. Wait until the status becomes **Merged successfully** and click **Download** in the **Operation** column.

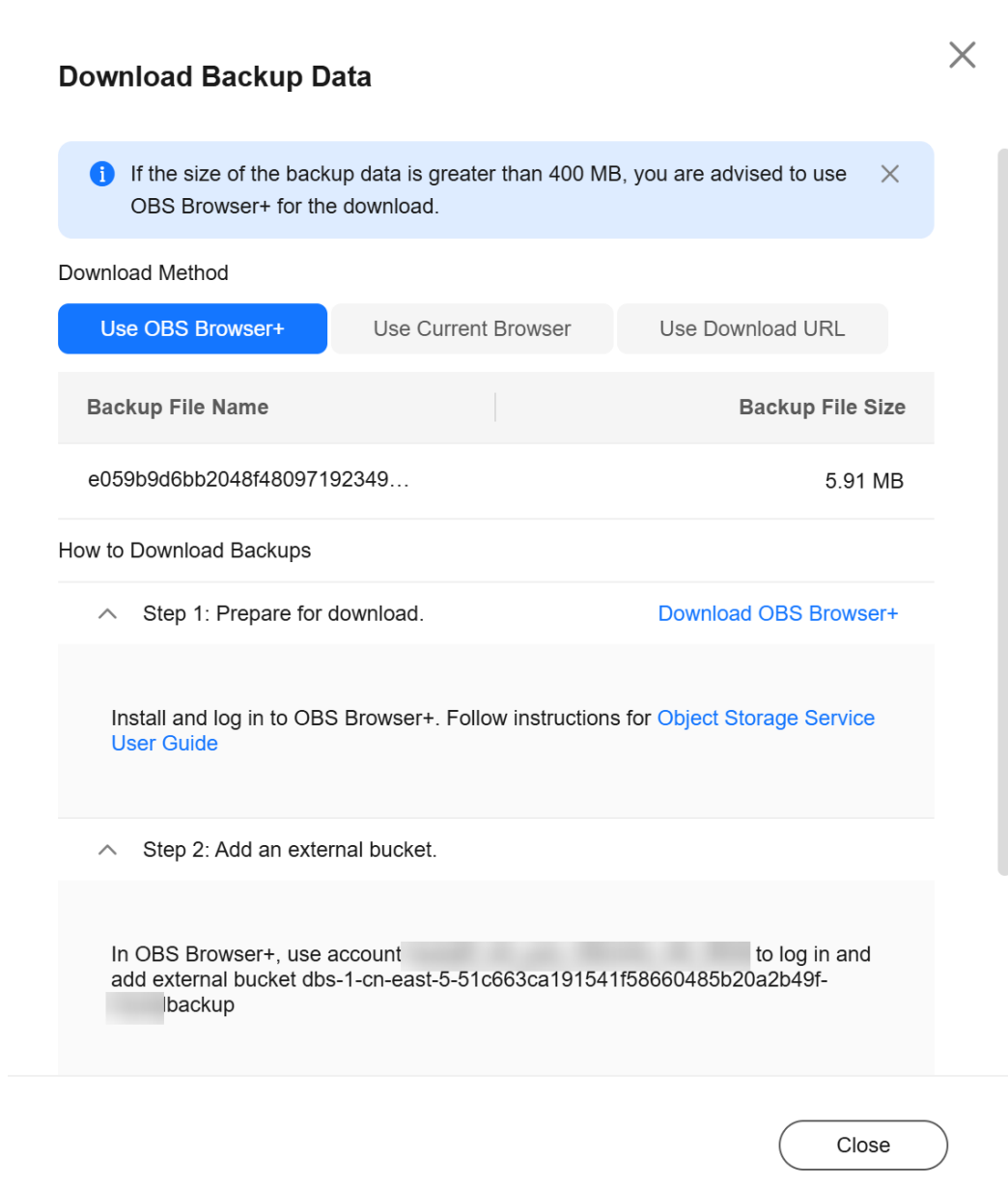
**Step 6** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 7** In the displayed dialog box, select a method to download the merged binlog.

 **NOTE**

- To reduce backup storage usage, delete the merged binlog after the download is complete. On the **Merged Binlogs** page, you can locate the target merged binlog to be deleted and click **Delete** in the **Operation** column.
- If you do not manually delete the merged binlogs, they will be deleted 30 days later.
- **Use OBS Browser+**  
When you use OBS Browser+ to download backup data, there is no charge for the generated outbound traffic.

**Figure 10-17** Using OBS Browser+ to download a merged binlog

- Download OBS Browser+ following Step 1 provided on the download guide page.
- Decompress and install OBS Browser+.
- Log in to OBS Browser+ using the username provided in Step 2 on the download guide page.  
For details about how to log in to OBS Browser+, see [Logging In to OBS Browser+](#) in the *Object Storage Service Tools Guide*.
- Add an external bucket using the bucket name provided in Step 2 on the download guide page.  
In the **Add External Bucket** dialog box of OBS Browser+, enter the bucket name provided in step 2 on the download guide page, and click **OK**.

 NOTE

If you want to access OBS external buckets across accounts, the access permission is required. For details, see [Granting IAM Users Under an Account the Access to a Bucket and the Resources in It](#).

- e. Download a merged binlog.

On the OBS Browser+ page, click the bucket that you added. In the search box on the right of the object list page, enter the backup file name and start a search. In the search result, locate the target backup and click  in the **Operation** column.

- **Use Current Browser**

Download the merged binlog directly from the current browser.

- **Use Download URL**

Click  to copy the URL within the validity period to download the merged binlog.

- You can use other download tools to download the merged binlog.
- You can also run the following command to download the merged binlog:

```
wget -O FILE_NAME--no-check-certificate" DOWNLOAD_URL"
```

Variables in the command are described as follows:

*FILE\_NAME*: indicates the new name of the merged binlog file. The original backup file name may be too long and exceed the maximum characters allowed by the client file system. You are advised to use the **-O** argument with wget to rename the backup file.

*DOWNLOAD\_URL*: indicates the location of the merged binlog to be downloaded. If the location contains special characters, escape is required.

----End

## Related APIs

[Obtaining the Link for Downloading a Backup](#)

## 10.4.4 Checking and Exporting Backup Information

### Scenarios

You can export backup information of RDS DB instances to an Excel file for further analysis. The exported information includes the DB instance name, backup start and end time, backup status, and backup size.

For details about how to export backup data, see [Downloading a Full Backup](#) and [Downloading a Binlog Backup](#).

### Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** In the navigation pane, choose **Backups**. On the displayed page, select the backups you want to export and click **Export** to export backup information.

- Only the backup information displayed on the current page can be exported. The backup information displayed on other pages cannot be exported.
- The backup information is exported to an Excel file for your further analysis.

**Figure 10-18** RDS for MySQL backup information

|   | A                                   | B                                | C                | D                                   | E      | F            | G           | H               | I            | J         | K       | L           |
|---|-------------------------------------|----------------------------------|------------------|-------------------------------------|--------|--------------|-------------|-----------------|--------------|-----------|---------|-------------|
|   | Backup ID                           | Backup Name                      | DB Instance Name | DB Instance ID                      | Key ID | DB Engine    | Backup Type | Backup Method   | Backup Time  | Status    | Size    | Description |
| 1 | b9c5b5880d74842ad023d4f78994000e01  | mysql-rds-19e8-20231120181149503 | rds-19e8         | b8ba9799b1a24b59bba10a74eba422a1n01 | ---    | MySQL 5.7.41 | Automated   | Physical backup | Nov 27, 2023 | Completed | 3.54 MB | ---         |
| 2 | 194d1ca4b907499fa9b4d2055d5b97a0e01 | mysql-rds-19e8-20231120181149503 | rds-19e8         | b8ba9799b1a24b59bba10a74eba422a1n01 | ---    | MySQL 5.7.41 | Automated   | Physical backup | Nov 26, 2023 | Completed | 3.53 MB | ---         |
| 3 | 09e8bffa5575432baabff6a909cc5d7eb01 | mysql-rds-19e8-20231124181146092 | rds-19e8         | b8ba9799b1a24b59bba10a74eba422a1n01 | ---    | MySQL 5.7.41 | Automated   | Physical backup | Nov 25, 2023 | Completed | 3.53 MB | ---         |
| 4 | 0bcac64afdd2b4caa88fa0176f97e378201 | mysql-rds-19e8-20231124021028785 | rds-19e8         | b8ba9799b1a24b59bba10a74eba422a1n01 | ---    | MySQL 5.7.41 | Automated   | Physical backup | Nov 24, 2023 | Completed | 3.51 MB | ---         |
| 5 |                                     |                                  |                  |                                     |        |              |             |                 |              |           |         |             |
| 6 |                                     |                                  |                  |                                     |        |              |             |                 |              |           |         |             |

**Step 4** View the exported backup information.

----End

## 10.4.5 Using mysqlbinlog to View Binlogs

### Scenarios

The mysqlbinlog tool is used to parse binlogs and is contained in the MySQL software package. You can download a MySQL software package of your desired version from the MySQL official website, decompress the package, and obtain the mysqlbinlog tool from the decompressed package (mysqlbinlog 3.4 is for MySQL 5.6 and 5.7). If your mysqlbinlog version is too old to correctly parse binlogs, perform the operations described in this section.

You can also use a third-party tool to parse binlogs for RDS for MySQL.

### Procedure

- [Download a MySQL software package.](#)

#### NOTICE

It is recommended that the software package version be the same as your current MySQL major version.

If your MySQL version is 5.7.27, download the following software packages:

- Product Version: 5.7.27
- Operating System: Linux-Generic

The downloaded MySQL software package is **mysql-5.7.27-linux-glibc2.12-x86\_64.tar.gz**.

**Figure 10-19** Download[MySQL Product Archives](#)[MySQL Community Server \(Archived Versions\)](#)

**Please note that these are old versions. New releases will have recent bug fixes and features!**  
To download the latest release of MySQL Community Server, please visit [MySQL Downloads](#).

Product Version:   
Operating System:   
OS Version:

|                                                                                                                                       |              |        |                          |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|--------------------------|
| Linux - Generic (glibc 2.12) (x86, 32-bit), Compressed TAR Archive<br>(mysql-5.7.27-linux-glibc2.12-i686.tar.gz)                      | Jun 10, 2019 | 585.0M | <a href="#">Download</a> |
| Linux - Generic (glibc 2.12) (x86, 64-bit), Compressed TAR Archive<br>(mysql-5.7.27-linux-glibc2.12-x86_64.tar.gz)                    | Jun 10, 2019 | 615.0M | <a href="#">Download</a> |
| Linux - Generic (glibc 2.12) (x86, 32-bit), Compressed TAR Archive<br>Test Suite<br>(mysql-test-5.7.27-linux-glibc2.12-i686.tar.gz)   | Jun 10, 2019 | 30.0M  | <a href="#">Download</a> |
| Linux - Generic (glibc 2.12) (x86, 64-bit), Compressed TAR Archive<br>Test Suite<br>(mysql-test-5.7.27-linux-glibc2.12-x86_64.tar.gz) | Jun 10, 2019 | 30.2M  | <a href="#">Download</a> |
| Linux - Generic (glibc 2.12) (x86, 32-bit), TAR<br>(mysql-5.7.27-linux-glibc2.12-i686.tar)                                            | Jun 10, 2019 | 615.0M | <a href="#">Download</a> |
| Linux - Generic (glibc 2.12) (x86, 64-bit), TAR<br>(mysql-5.7.27-linux-glibc2.12-x86_64.tar)                                          | Jun 10, 2019 | 645.2M | <a href="#">Download</a> |

2. Decompress the software package and find the mysqlbinlog tool.

3. Find the mysqlbinlog tool version.

```
[root@ecs]# tar -zxf mysql-5.7.27-linux-glibc2.12-x86_64.tar.gz
[root@ecs]# cd mysql-5.7.27-linux-glibc2.12-x86_64/bin
[root@ecs]# ll mysqlbinlog
-rwxr-xr-x 1 7161 31415 11310886 Jun 10 2019 mysqlbinlog
[root@ecs]# ./mysqlbinlog -V
./mysqlbinlog Ver 3.4 for linux-glibc2.12 at x86_64
```

4. Use mysqlbinlog to parse binlogs.

The following uses mysql-bin.000001 as an example:

```
[root@ecs]# ./mysqlbinlog --no-defaults -vv /root/mysql-bin.000001
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=1*/;
/*!50003 SET @@OLD_COMPLETION_TYPE=@@COMPLETION_TYPE,COMPLETION_TYPE=0*/;
DELIMITER /*!*/;
# at 4
#200316 17:54:14 server id 1 end_log_pos 126 CRC32 0x92b3f2ca Start: binlog v
4, server v 5.7.27-5-debug-log created 200316 17:54:14 at startup
ROLLBACK/*!*/;
BINLOG '
xkxvXg8BAAAAegAAAH4AAAAAAQANS43LjI3LTUtZGVidWctbG9nAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAADGTG9eEzgNAAGAEgAEBAQEgEgAAAYgAEGggAAAAICAgCAAAACgoKKioAEjQA
Xz0AAAcrysSI=
'/*!*/;
# at 126
#200316 17:54:14 server id 1 end_log_pos 157 CRC32 0xfcc47ad6 Previous-GTIDs
# [empty]
# at 157
#200316 17:54:27 server id 1 end_log_pos 204 CRC32 0xa7febd1f Rotate to mysqlbin.
000002 pos: 4
SET @@SESSION.GTID_NEXT= 'AUTOMATIC' /* added by mysqlbinlog */ /*!*/;
DELIMITER ;
# End of log file
/*!50003 SET COMPLETION_TYPE=@@OLD_COMPLETION_TYPE*/;
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=0*/;
```

## 10.4.6 Deleting a Manual Backup

### Scenarios

You can delete manual backups to free up backup storage.



## Constraints

- Deleted manual backups cannot be recovered.
- Manual backups that are being created cannot be deleted.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the navigation pane on the left, choose **Backups**. On the displayed page, locate the manual backup to be deleted and choose **More > Delete** in the **Operation** column.
- The following backups cannot be deleted:
- Automated backups
  - Backups that are being restored
  - Backups that are being replicated
- Step 4** In the displayed dialog box, click **Yes**.
- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

-----End

## Related APIs

- [Creating a Manual Backup](#)
- [Obtaining Backups](#)
- [Deleting a Manual Backup](#)

# 10.5 Clearing Binlogs

## 10.5.1 Setting a Local Retention Period for RDS for MySQL Binlogs

### Scenarios

RDS for MySQL deletes local binlogs after they are backed up to OBS. You can set the local retention period for binlogs as required.

In addition to the retention period, you can also configure other items such as the maximum storage space usage, maximum number of files to be retained, and

automatic storage space protection. To use these items, [submit a service ticket](#) to request required permissions.

## Constraints

- Binary logging is enabled for RDS by default and uses row-based logging.
- On the RDS console, you can set the binlog retention period only for the primary instance. The binlog retention period for read replicas is the same as that of the primary instance.
- If there are abnormal read replicas or standby instances, local binlogs will not be cleared. This prevents replication failures on the read replicas or standby instances.
- If the retention period is set to **0**, the binlogs of your DB instance will be deleted once they are synchronized to the standby instance and read replicas and successfully backed up to OBS. If the retention period is set to a value greater than 0, for example, 1, the binlogs will be retained for one day after they are synchronized to the standby instance and read replicas from the primary instance and successfully backed up to OBS. After the retention period expires, the binlogs will be automatically deleted. For details about how to view binlogs, see [Downloading a Binlog Backup](#).
- The binlog retention period is measured in hours on the console. However, the values of **expire\_logs\_days** (MySQL 5.7) and **binlog\_expire\_logs\_seconds** (MySQL 8.0) are measured in days when you query the binlog retention period by running a command, which cannot be used as a reference. To check how long the binlogs can be retained, view the binlog retention period on the console.

## Differences Between Local Binlogs and Binlog Backups

Table 10-8 Differences

| Item     | Local binlogs                                                                          | Binlog backups                                                                                                                                                                                                                                         |
|----------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overview | Local binlogs are used to set up a primary/standby architecture and subscribe to data. | RDS automatically backs up data modifications made after the most recent full or incremental backup every 5 minutes or when a certain amount of incremental data is generated. You can use binlog backups to restore instance data to a point in time. |

| Item          | Local binlogs                                                                                                                                                                                                                                                          | Binlog backups                                                                                                                                                                                                                       |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Status        | This function is enabled by default and cannot be disabled. The default retention period is 0, which means that local binlogs will be deleted upon they are backed up.<br><br>For details about how to customize the retention period, see <a href="#">Procedure</a> . | This function is enabled by default and cannot be disabled.                                                                                                                                                                          |
| Billing       | N/A                                                                                                                                                                                                                                                                    | If the free space RDS provides is used up, the additional space required will be billed. For the billing details, see <a href="#">How Is RDS Backup Data Billed?</a>                                                                 |
| Storage space | Local binlogs occupy the storage space of your instance.<br><br>You can view the storage space occupied by binlogs on the DBA Assistant page. For details, see <a href="#">Managing Storage Capacity</a> .                                                             | Binlog backups do not occupy the storage space of your instance.<br><br>Backups are saved as packages in OBS buckets. They occupy the OBS backup space. To query data in a backup, see <a href="#">Downloading a Binlog Backup</a> . |

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**. On the **Binlog Backups** page, click **Set Binlog Retention Period**.
- Step 5** In the displayed dialog box, set required parameters and click **OK**.

Figure 10-20 Setting the binlog retention period (default settings)

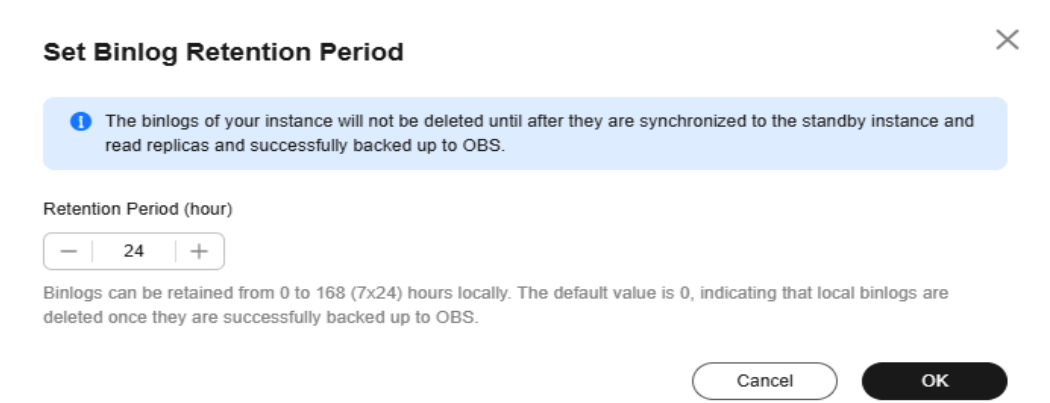


Figure 10-21 Setting the binlog retention period (advanced settings)

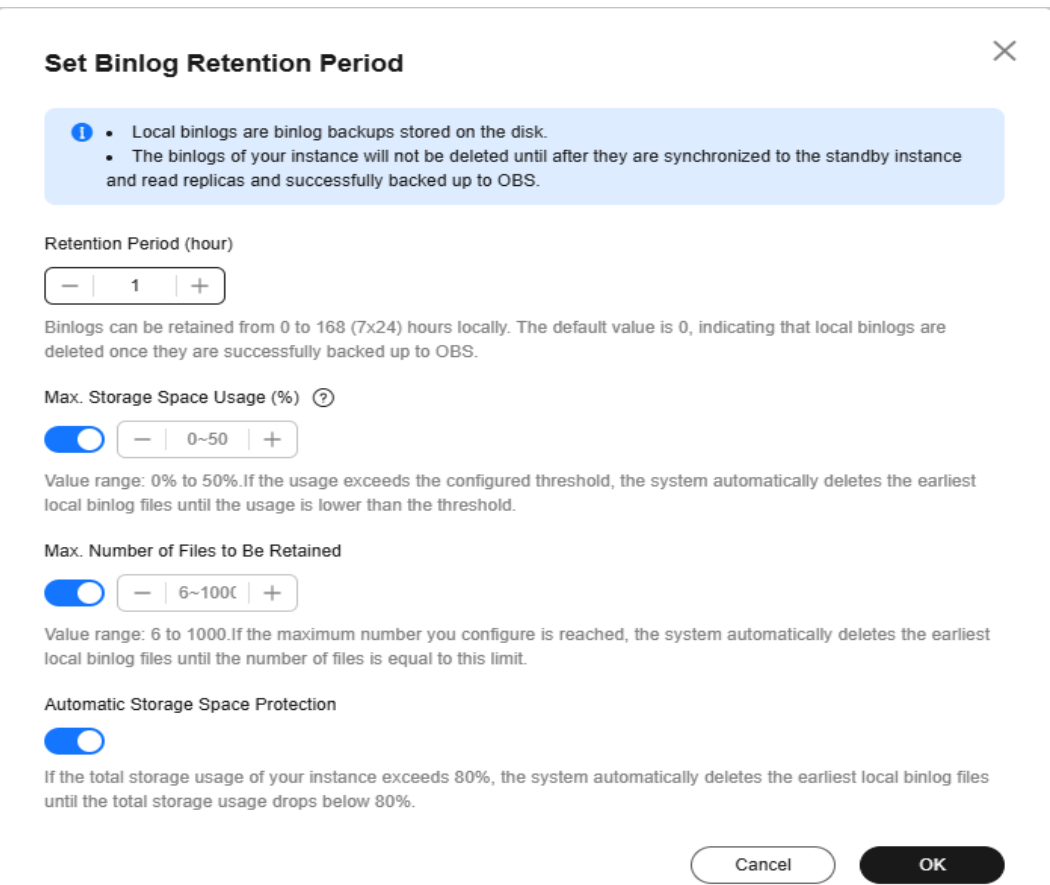


Table 10-9 Parameter description

| Parameter               | Description                                                                                                                                              |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retention Period (hour) | The value range is from 0 to 168 (7 x 24). The default value is <b>0</b> , indicating that local binlogs will be deleted once they are backed up to OBS. |

| Parameter                           | Description                                                                                                                                                                                                                                                                   |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Max. Storage Space Usage (%)        | Storage usage = Size of local binlog files/Total storage of the instance<br><br>The value range is from 0 to 50. If the usage exceeds the configured threshold, the system automatically deletes the earliest local binlog files until the usage is lower than the threshold. |
| Max. Number of Files to Be Retained | The value range is from 6 to 1000. If the maximum number you configure is reached, the system automatically deletes the earliest local binlog files until the number of files is equal to this limit.                                                                         |
| Automatic Storage Space Protection  | If the total storage usage of your instance exceeds 80%, the system automatically deletes the earliest local binlog files until the total storage usage drops below 80%.                                                                                                      |

----End

## Related APIs

- [Setting the Local Retention Period of Binlogs](#)
- [Obtaining the Local Retention Period of Binlogs](#)

## 10.5.2 Clearing Binlogs from DB Instances

### Scenarios

You can clear local binlogs with a few clicks for RDS for MySQL instances to free up storage space.

### Binlog Clearing Based on Specified Retention Period

RDS for MySQL allows you to clear the binlogs exceeding the [specified retention period](#) with just a few clicks.

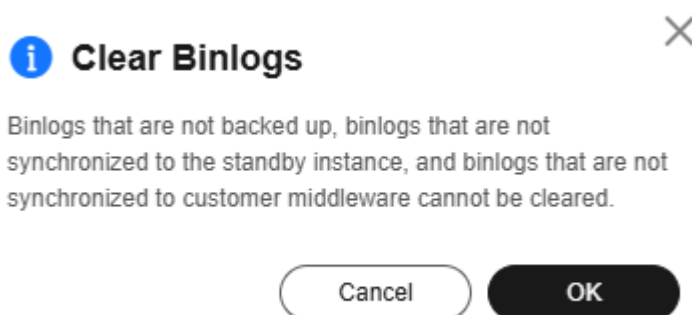
### Precautions

- There is a delay in clearing binlogs. Every time after clearing binlogs, check whether the [storage](#) occupied by these binlogs was released. Do not submit the request multiple times.
- The following binlogs cannot be cleared using this function:
  - Binlogs that are not backed up to OBS yet
  - Binlogs that have not been synchronized to the standby instance
  - Binlogs that have not been received by the incremental backup parsing tool

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **Backups & Restorations**. On the **Binlog Backups** tab page, click **Clear Binlogs**.
- Step 5** In the displayed dialog box, click **OK**.

**Figure 10-22** Clearing binlogs



----End

# 11 Data Restorations

## 11.1 Restoration Solutions

If your database is damaged or mistakenly deleted, you can restore it from backups.

### Restoring a Mistakenly Deleted Instance

- RDS moves unsubscribed yearly/monthly instances and deleted pay-per-use instances to the recycle bin. You can [rebuild an instance](#) that was deleted up to 7 days ago from the recycle bin.
- You can restore a deleted instance from its retained manual backups. For details, see [Restoring a DB Instance from Backups](#).

### Restoring Mistakenly Deleted or Modified Data of a DB Instance

Table 11-1 Restoration solutions

| Sol<br>uti<br>on | Cate<br>gory | Storage<br>Type | Rest<br>orati<br>on<br>Time<br>Poin<br>t | Scope | Restore To | Time<br>Requ<br>ired |
|------------------|--------------|-----------------|------------------------------------------|-------|------------|----------------------|
|                  |              |                 |                                          |       |            |                      |

|                              |                               | Cloud SSD | Extreme SSD | Point in Time When a Backup Was Generated | All Databases and Tables | Certain Databases and Tables | New Instance | Original Instance | Existing Instance Other than the Original Instance |                                                     |
|------------------------------|-------------------------------|-----------|-------------|-------------------------------------------|--------------------------|------------------------------|--------------|-------------------|----------------------------------------------------|-----------------------------------------------------|
| Restoring an entire instance | Restoration from backups      | √         | √           | x                                         | √                        | x                            | √            | √                 | √                                                  | Depending on how much data there is in the instance |
|                              | Point-in-time recovery (PITR) | √         | √           | √                                         | √                        | x                            | √            | √                 | √                                                  | Depending on how much data there is in the instance |



|                                |                      |   |   |   |   |   |   |   |   |                                                                                     |
|--------------------------------|----------------------|---|---|---|---|---|---|---|---|-------------------------------------------------------------------------------------|
| Restoring databases and tables | Standard restoration | √ | √ | √ | x | √ | x | √ | x | Depending on how much data there is in the instance and in the databases and tables |
|                                | Fast restoration     | √ | √ | √ | x | √ | x | √ | x | Depending on how much data there is in the databases and tables                     |

## Restoring or Migrating Data to an RDS for MySQL Instance

- You can restore data to an RDS for MySQL instance from backups. For details, see [Restoring Data to RDS for MySQL](#).
- You can migrate data to an RDS for MySQL instance using Data Replication Service (DRS), mysqldump, or Data Admin Service (DAS). For details, see [Migration Solution Overview](#).

## Restoring or Migrating Data to a Self-Managed MySQL Database

- You can restore data to a self-managed MySQL database from backups. For details, see [Restoring Data to an On-Premises MySQL Database](#).
- You can migrate data to a self-managed MySQL database using DRS. For details, see [From MySQL to MySQL](#).

## 11.2 Restoring Data to RDS for MySQL

### 11.2.1 Restoring a DB Instance from Backups

#### Scenarios

This section describes how to use an automated or manual backup to restore a DB instance to the status when the backup was created. The restoration is at the DB instance level.

When you restore a DB instance from a backup file, the backup file is downloaded from OBS and then restored to the DB instance at an average speed of 100 MB/s.

#### Function Description

**Table 11-2** Function description

| Item                                           | Description                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Restoration scope                              | The entire instance                                                                                                                                                                                                                                                                                                                                                                   |
| Instance data after restoration                | <p>The instance data after restoration is consistent with that in the full backup used for the restoration.</p> <ul style="list-style-type: none"><li>Restoring data to a new instance creates an instance with the same data as that in the backup.</li><li>Restoring data to the original or an existing instance will overwrite the instance data.</li></ul>                       |
| Restoration type                               | <ul style="list-style-type: none"><li>Restoration to a new instance</li><li>Restoration to the original instance</li><li>Restoration to an existing instance other than the original one</li></ul>                                                                                                                                                                                    |
| Configurations for restoring to a new instance | <ul style="list-style-type: none"><li>The DB engine and engine version of the new instance are the same as those of the original instance.</li><li>The storage space of the new instance is the same as that of the original instance by default and the new instance must be at least as large as the original instance.</li><li>Other parameters need to be reconfigured.</li></ul> |
| Time required                                  | The time required depends on how much data there is in the instance. The average restoration speed is 100 MB/s.                                                                                                                                                                                                                                                                       |

## Constraints

- You can restore to new DB instances from backups only when your account balance is greater than or equal to \$0 USD. You will pay for the new instance specifications.
- If transparent page compression is enabled by specifying attributes in the CREATE TABLE statement for the original DB instance, the restoration may fail due to insufficient storage space.
- Constraints on restoring data to the original DB instance:
  - If the DB instance for which the backup is created has been deleted, data cannot be restored to the original DB instance.
  - Restoring to the original DB instance will overwrite all existing data and passwords, and the DB instance will be unavailable during the restoration.
- Constraints on restoring data to an existing DB instance:
  - If the target existing DB instance has been deleted, data cannot be restored to it.
  - Restoring to an existing DB instance will overwrite data and passwords on it and cause the existing DB instance to be unavailable.
  - The selected DB instance must use the same DB engine and same major version as the original DB instance, and its minor version cannot be earlier than that of the original DB instance.
  - Ensure that the storage space of the selected existing DB instance is greater than or equal to the storage space of the original DB instance. Otherwise, the task cannot be delivered.
- If SQL throttling is enabled for the DB instance, different constraints apply to different restoration scenarios:
  - Restoration to a new instance: In RDS for MySQL 5.7, the original SQL throttling rules become invalid. In RDS for MySQL 5.6 and 8.0, the SQL throttling rules of the original instance are retained.
  - Restoration to the original instance: The SQL throttling rules of the original instance are restored to the state when the backup was created.
  - Restoration to an existing instance: In RDS for MySQL 5.7, all SQL throttling rules of the target instance become invalid. In RDS for MySQL 5.6 and 8.0, the rules of the original instance will overwrite those of the target instance.

## Supported Storage Types

If you restore data to your original instance, the storage type of the instance does not change. If you restore data to a new instance or an existing instance other than the original one, the storage types supported are listed in [Table 11-3](#).

**Table 11-3** Supported storage types

| Original Storage Type | Restore To                                                          | New Storage Type                                                              |
|-----------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Cloud SSD             | New instance and existing instance other than the original instance | <ul style="list-style-type: none"><li>Cloud SSD</li><li>Extreme SSD</li></ul> |
| Extreme SSD           | New instance and existing instance other than the original instance | <ul style="list-style-type: none"><li>Cloud SSD</li><li>Extreme SSD</li></ul> |

## Restoring Data to a New Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Backups** page, select the backup to be restored and click **Restore** in the **Operation** column.

Alternatively, click the target DB instance on the **Instances** page. On the displayed page, choose **Backups & Restorations**. On the displayed page, select the backup to be restored and click **Restore** in the **Operation** column.

**Step 4** Set **Restoration Method** to **Create New Instance** and click **OK**.

### NOTE

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Figure 11-1** Restoring to a new DB instance

**Restore Backup** ×



- Restoration from a physical backup means restoring a backup file into an instance. When you choose a physical backup for restoration, the system downloads a full backup file from OBS and then restores it to the instance at an average speed of 100 MB/s.
- After restoration, the concurrence control rules of the target instance will be overwritten by those of the original instance so you need to check the concurrence control rules of the target instance.

×

|             |                                              |                           |                   |
|-------------|----------------------------------------------|---------------------------|-------------------|
| DB Instance | Name/ID                                      | Backup Name               | DB Engine Version |
|             | rds-80a8<br>644d74d772b6489180b070b673ae6... | mysql-rds-80a8-2025080... | MySQL 8.0.28      |

Restoration Method

Create New InstanceRestore to OriginalRestore to Existing

CancelOK

**Step 5** On the displayed page, set required parameters and click **Buy**.

- The DB engine and engine version of the new instance are the same as those of the original instance.
- Storage space of the new DB instance is the same as that of the original DB instance by default and the new instance must be at least as large as the original DB instance.
- Other settings are the same as those of the original DB instance by default and can be modified. For details, see [Buying an RDS for MySQL DB Instance](#).

**Figure 11-2** Creating a new instance

The screenshot displays the 'Create Instance' interface in the RDS console. It includes a summary section at the top with fields for DB Instance Name, ID, Region, AZ, DB Engine Version, Storage Type, and Storage Space. Below this, there are sections for Billing Mode, Region, Project, and detailed configuration options for the DB Instance Name, DB Engine, DB Engine Version, DB Instance Type (Primary/Standby), Storage Type, Primary AZ, Standby AZ, and Time Zone. A 'Buy' button is located at the bottom right of the configuration area.

**Step 6** View the restoration result.

A new DB instance is created using the backup data. The status of the DB instance changes from **Creating** to **Available**.

The new DB instance is independent from the original one. If you need read replicas to offload read pressure, create one or more for the new DB instance.

After the new instance is created, a full backup will be automatically triggered.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

-----End

## Restoring Data to the Original Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Backups** page, select the backup to be restored and click **Restore** in the **Operation** column.

Alternatively, click the target DB instance on the **Instances** page. On the displayed page, choose **Backups & Restorations**. On the displayed page, select the backup to be restored and click **Restore** in the **Operation** column.

- Step 4** Set **Restoration Method** to **Restore to Original**, select the confirmation check box, and click **Next**.

 **NOTE**

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

- Step 5** Confirm the information and click **OK**.

- Step 6** View the restoration result.

On the **Instances** page, the status of the original DB instance changes from **Restoring** to **Available**. If the original DB instance contains read replicas, the read replica status is the same as the original DB instance status.

After the restoration is complete, a full backup will be automatically triggered.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

----End

## Restoring Data to an Existing Instance

- Step 1** Click  in the upper left corner and select a region.

- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

- Step 3** On the **Backups** page, select the backup to be restored and click **Restore** in the **Operation** column.

Alternatively, click the target DB instance on the **Instances** page. On the displayed page, choose **Backups & Restorations**. On the displayed page, select the backup to be restored and click **Restore** in the **Operation** column.

- Step 4** Set **Restoration Method** to **Restore to Existing**, select the confirmation check box, select an existing instance, and click **Next**.

 **NOTE**

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

- Step 5** Confirm the information and click **OK**.

- Step 6** View the restoration result.

On the **Instances** page, the status of the target existing DB instance changes from **Restoring** to **Available**. If the target DB instance contains read replicas, the read replica status is the same as the target DB instance status.

After the restoration is complete, a full backup will be automatically triggered.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

----End

## Follow-up Operations

After the restoration is successful, you can [log in to the DB instance](#) for verification.

## FAQ

- [How can I restore data if no backup is available?](#)
- Q: Why does the storage usage metric fluctuate greatly when I restore data to a new DB instance from a backup?  
A: The metric changes occur in two restoration stages:
  - First fluctuation: A full backup is downloaded from the backup space to the VM where the DB instance is located. Since the file is decompressed and then deleted, the storage usage first increases and then drops.
  - Second fluctuation: The extracted files are restored to the data directory, causing the storage usage to rise again. Unlike the previous stage, the files are not deleted after restoration, so the storage usage remains stable from that point onward.

## 11.2.2 PITR: Restoring a DB Instance to a Point in Time

### Scenarios

You can restore an instance from automated backups to a specified point in time.

You can restore one or multiple DB instances at a time.

When you enter the time point that you want to restore the DB instance to, RDS downloads the most recent full backup file from OBS to the DB instance. Then, incremental backups are also restored to the specified point in time on the DB instance. Data is restored at an average speed of 80 MB/s.

### Function Description

**Table 11-4** Function description

| Item              | Description         |
|-------------------|---------------------|
| Restoration scope | The entire instance |

| Item                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance data after restoration                | <p>The instance data after restoration is consistent with that in the full backup plus the incremental backup used for the restoration.</p> <ul style="list-style-type: none"><li>Restoring data to a new instance creates an instance with the same data as that generated by that time point.</li><li>Restoring data to the original or an existing instance will overwrite the instance data.</li></ul> |
| Restorable time point                          | Any time point within the retention period after the earliest full backup is generated                                                                                                                                                                                                                                                                                                                     |
| Scenario                                       | <ul style="list-style-type: none"><li>Restoration to a new instance</li><li>Restoration to the original instance</li><li>Restoration to an existing instance other than the original one</li></ul>                                                                                                                                                                                                         |
| Configurations for restoring to a new instance | <ul style="list-style-type: none"><li>The DB engine and engine version of the new instance are the same as those of the original instance.</li><li>Other parameters need to be reconfigured.</li></ul>                                                                                                                                                                                                     |
| Time required                                  | The time required depends on how much data there is in the instance. The average restoration speed is 80 MB/s.                                                                                                                                                                                                                                                                                             |

## Constraints

- You can restore to new DB instances from backups only when your account balance is greater than or equal to \$0 USD. You will pay for the new instance specifications.
- Do not run the **reset master** command on RDS for MySQL DB instances within their lifecycle. Otherwise, an exception may occur when restoring an RDS for MySQL DB instance to a specified point in time.
- To restore DB instances to a point in time in batches, you must contact customer service to request required permissions.
- When you restore data to a new DB instance, large transactions in the original DB instance backup may cause a restoration failure. If the restoration fails, [submit a service ticket](#).
- Constraints on restoring data to the original DB instance:
  - Restoring to the original DB instance will overwrite all existing data and passwords, and the DB instance will be unavailable during the restoration.
- Constraints on restoring data to an existing DB instance:
  - Restoring to an existing DB instance will overwrite data and passwords on it and cause the existing DB instance to be unavailable.



- The selected DB instance must use the same DB engine and same major version as the original DB instance, and its minor version cannot be earlier than that of the original DB instance.
  - Ensure that the storage space of the selected DB instance is greater than or equal to the storage space of the original DB instance. Otherwise, the task cannot be delivered.
- If SQL throttling is enabled for the DB instance, different constraints apply to different restoration scenarios:
  - Restoration to a new instance: In RDS for MySQL 5.7, the original SQL throttling rules become invalid. In RDS for MySQL 5.6 and 8.0, the SQL throttling rules of the original instance are retained.
  - Restoration to the original instance: The SQL throttling rules of the original instance are restored to the state when the backup was created.
  - Restoration to an existing instance: In RDS for MySQL 5.7, all SQL throttling rules of the target instance become invalid. In RDS for MySQL 5.6 and 8.0, the rules of the original instance will overwrite those of the target instance.

## Supported Storage Types

If you restore data to your original instance, the storage type of the instance does not change. If you restore data to a new instance or an existing instance other than the original one, the storage types supported are listed in [Table 11-5](#).

**Table 11-5** Supported storage types

| Original Storage Type | Restore To                                                          | New Storage Type                                                                  |
|-----------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Cloud SSD             | New instance and existing instance other than the original instance | <ul style="list-style-type: none"><li>• Cloud SSD</li><li>• Extreme SSD</li></ul> |
| Extreme SSD           | New instance and existing instance other than the original instance | <ul style="list-style-type: none"><li>• Cloud SSD</li><li>• Extreme SSD</li></ul> |

## Restoring Data to a New Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Backups & Restorations**.

**Step 5** In the upper right corner of the page, choose **Restore to Point in Time > Restore Instance**.

**Step 6** Select the restoration date and time range, enter a time point within the selected time range, and set **Restoration Method** to **Create New Instance**. Then, click **OK**.

 **NOTE**

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 7** On the displayed page, set required parameters and click **Buy**.

- The DB engine and version of the new DB instance are the same as those of the original DB instance and cannot be changed.
- Other settings are the same as those of the original DB instance by default and can be modified. For details, see [Buying an RDS for MySQL DB Instance](#).

**Step 8** View the restoration result.

A new DB instance is created using the backup data. The status of the DB instance changes from **Creating** to **Available**.

The new DB instance is independent from the original one. If you need read replicas to offload read pressure, create one or more for the new DB instance.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

After the new DB instance is created, a full backup will be automatically triggered.

----End

## Restoring Data to the Original Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Backups & Restorations**.

**Step 5** In the upper right corner of the page, choose **Restore to Point in Time > Restore Instance**.

**Step 6** Select the restoration date and time range, enter a time point within the selected time range, set **Restoration Method** to **Restore to Original**, select the confirmation check box, and click **Next**.

 **NOTE**

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

**Step 7** Confirm the information and click **OK**.

**Step 8** View the restoration result.

On the **Instances** page, the status of the DB instance changes from **Restoring** to **Available**.

A new restoration time range is available. There will be a difference between the new and original time ranges. This difference reflects the duration of the restoration.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

After the restoration is complete, a full backup will be automatically triggered.

----End

## Restoring Data to an Existing Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Backups & Restorations**.

**Step 5** In the upper right corner of the page, choose **Restore to Point in Time > Restore Instance**.

**Step 6** Select the restoration date and time range, and enter a time point within the selected time range.

**Step 7** Set **Restoration Method** to **Restore to Existing**, select the confirmation check box, select an existing instance, and click **Next**.

### NOTE

If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see the [Identity and Access Management User Guide](#).

**Step 8** Confirm the information and click **OK**.

**Step 9** View the restoration result.

On the **Instances** page, the status of the DB instance changes from **Restoring** to **Available**.

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Viewing a Task](#).

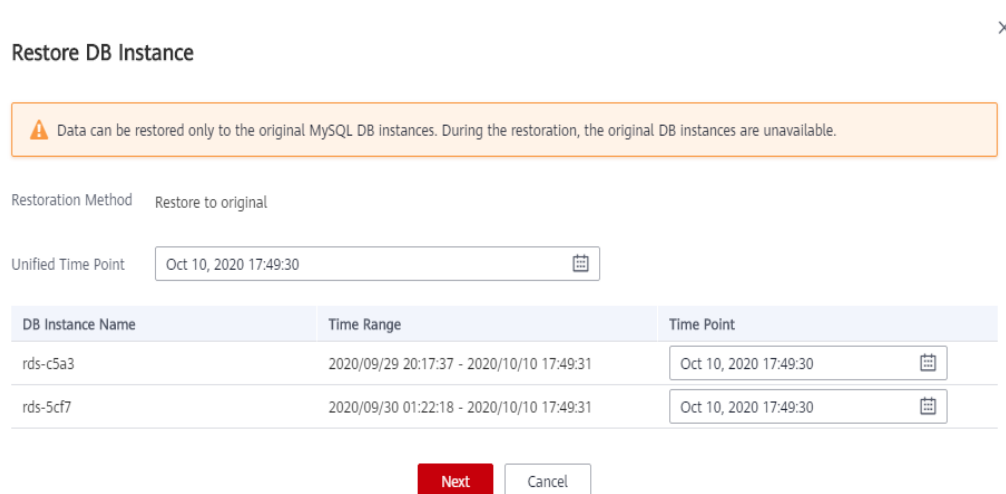
After the restoration is complete, a full backup will be automatically triggered.

----End

## Restoring Multiple DB Instances at a Time

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, select target DB instances and choose **More > Restore** above the DB instance list.
- Step 4** In the displayed dialog box, set a unified restoration time point, or select different time points for different DB instances.

**Figure 11-3** Batch restoration



Restore DB Instance

 Data can be restored only to the original MySQL DB instances. During the restoration, the original DB instances are unavailable.

Restoration Method: Restore to original

Unified Time Point: Oct 10, 2020 17:49:30

| DB Instance Name | Time Range                                | Time Point            |
|------------------|-------------------------------------------|-----------------------|
| rds-c5a3         | 2020/09/29 20:17:37 - 2020/10/10 17:49:31 | Oct 10, 2020 17:49:30 |
| rds-5cf7         | 2020/09/30 01:22:18 - 2020/10/10 17:49:31 | Oct 10, 2020 17:49:30 |

**Next** Cancel

- Step 5** Click **Next** to confirm the information.
- Step 6** Click **OK** to submit the batch restoration task.
- Step 7** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

----End

## Follow-up Operations

After the restoration is successful, you can [log in to the DB instance](#) for verification.

## FAQ

[How Can I Restore Data If No Backup Is Available?](#)

## 11.2.3 PITR: Restoring Databases or Tables to a Point in Time

### Scenarios

RDS allows you to restore databases or tables using point-in-time recovery (PITR). This ensures your data integrity and minimizes impact on the original instance performance. You can select databases or tables and restore them to a specified point in time. During database or table PITR, RDS downloads the most recent full backup before that point in time from OBS and restores it to a temporary DB instance, and then replays binlogs to that point in time on the temporary instance. After that, data on the temporary instance is written to the target databases or tables of the original instance at an average speed of 35 MB/s.

The time required depends on the amount of data to be restored on the DB instance. Restoring databases or tables will not overwrite data in the DB instance. You can select the databases or tables to be restored.

RDS for MySQL allows you to restore databases or tables of one instance or multiple instances at a time.

### Constraints

- Take care when restoring tables. Improper operations can cause instance or service exceptions.
- Table-level restoration will temporarily occupy two floating IP addresses.
- During a standard or fast table restoration, the foreign keys of tables containing foreign keys will be deleted and the table structures will be changed.
- During table PITR, a maximum of 2,000 tables can be restored for one instance at a time.
- During database PITR, a maximum of 1,000 databases and 20,000 tables can be restored for a single instance at a time.
- If you want to restore databases or tables of multiple instances at a time, the instances must be of the same engine version and in the **Available** state.
- You can select a maximum of 20 instances at a time for PITR.
- During the PITR, DB instances and read replicas cannot be rebooted or deleted, and their instance specifications cannot be modified.
- During the PITR, the database or table information to be restored is read from the latest full backup before the selected time point. You can select any time point within the restoration time range. Therefore, a database or table can be restored to the earliest full backup time point when its information exists.
- If a table you selected does not exist at the specified point in time, the table will not be restored.
- Table-level PITR does not support view restoration. To restore a view, restore the tables involved in the view and create the view again.
- Database-level PITR restores only table data in the databases. The new databases generated after restoration do not contain views.
- If a DB instance has more than 20,000 tables, RDS does not collect the database and table metadata at a historical time point for performance purposes. Instead, RDS searches for the database and table information from

the current instance for restoration. If the target database and table are not displayed but they do exist at the specified time point, you can create an empty database and table with the same names and restore them.

- During database-level PITR, the table names in the original database cannot contain periods (.). Otherwise, the restoration task may fail.
- If any level-2 partitioned table has been created or any level-2 partitioned table parameter has been modified, data may be incompatible after table-level PITR.

## Prerequisites

After the restoration, a new database or table will be generated in the DB instance. Ensure that the DB instance has sufficient storage space for the generated database or table.

## Restoring Databases or Tables of One Instance

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name.
- Step 4** In the navigation pane on the left, choose **Backups & Restorations**.
- Step 5** In the upper right corner of the page, choose **Restore to Point in Time > Restore Databases or Tables**.
- Step 6** On the displayed page, enter the restoration information and click **Next: Confirm**.
- To facilitate your operations, you can search for the databases or tables to be restored.
  - After the restoration is complete, new databases or tables with timestamps appended as suffixes to original database or table names are generated in the DB instance. You can rename the new databases or tables.
  - The new table name must be unique and consist of 1 to 64 characters. Only letters, digits, underscores (\_), hyphens (-), and dollar signs (\$) are allowed.
  - Databases whose names contain periods (.) cannot be restored.
  - Database-level PITR and table-level PITR are not supported for databases and tables that contain JSON virtual columns.
  - Cold tables cannot be restored when you restore databases or tables using PITR.
  - During database PITR, if you create new databases with the same names as the restored databases, the data in the new databases may be overwritten, causing data loss.
  - During table PITR, if you create new tables with the same names as the restored tables, the data in the new tables may be overwritten, causing data loss.
  - If the DB instance and the selected time point support fast restoration, you can select **Fast** for **Restoration Mode**.

- If your DB instance has XA transactions, select **Standard** for **Restoration Mode** because fast restoration can cause data loss.
- During a fast restoration, if the target table is renamed in the replayed binlog, the target table may fail to be restored.

Figure 11-4 Restoring databases or tables to a point in time

**Note**

- When you enter the time point that you want to restore the databases and tables to, RDS downloads the most recent full backup file from OBS to a temporary DB instance. Then incremental backups are also restored to the specified point in time on the temporary DB instance. After that, data on the temporary DB instance is written to the target databases and tables of the original DB instance at an average speed of 35 MB/s.
- After the restoration is complete, new tables with timestamps as suffixes are generated in the DB instance. You can rename the new tables and manage data in the tables as needed.
- Ensure the DB instance has sufficient storage space for generated tables.
- Database tables that have foreign key constraints can be restored. Standard or fast table-level PITR will delete foreign keys, which changes the table structure.
- If a table you selected does not exist at the specified point in time, the table will not be restored.
- Databases and tables whose names contain any Chinese characters cannot be restored.
- Cold tables in databases will not be restored during database-level restoration. Table-level restoration cannot restore cold tables.

**Instance Information**

DB Instance Name: [ ] DB Instance ID: C59b057bcb44c207d945e1b412b3b01

**Set Restoration Time and Level**

Restore To: Oct 17, 2024

Time Range: Oct 17, 2024 09:22:13 — Oct 17, 2024 09:30:02 GMT+08:00

Time Point: 09:30:02

Restore: ☐ Databases ☒ Tables

Restoration Mode: ☐ Fast ☒ Standard

Fast restoration may fail if the instance has XA transactions. To change to standard restoration, go to Basic Information > Backups & Restorations > Restore Databases or Tables.

**Choose Databases and Tables**

**Available Tables**

☐ All ☒ Database Name: [ ] Table Name: [ ]

| Original Table Name   | New Name | Operation |
|-----------------------|----------|-----------|
| [ ] (Total tables: 1) |          |           |

**Selected Tables**

| Original Table Name | New Name | Operation |
|---------------------|----------|-----------|
| [ ]                 |          |           |

Tables: 1

**Step 7** On the displayed page, confirm the information and click **Submit**.

**Step 8** On the **Instances** page, check that the DB instance status is **Restoring**. During the restoration, services are not interrupted.

- Data is restored at an average speed of 35 MB/s.
- Restoring databases or tables to a specified point in time does not affect new data. The restored database or table is a temporary database or table with a timestamp suffix. You can manage the data in the temporary database or table as required.
- You can view the progress and result of restoring databases or tables to a specified point in time on the **Task Center** page.

----End

## Restoring Databases or Tables of Multiple Instances in Batches

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, select multiple instances and choose **More > Restore Databases or Tables** above the instance list.

**Step 4** On the displayed page, enter the restoration information and click **Next: Confirm**.

- To facilitate your operations, you can search for the instances, databases, or tables to be restored by name.

- After the restoration is complete, new databases or tables with timestamps appended as suffixes to original database or table names are generated in the DB instance. You can rename the new databases or tables.
- The new table name must be unique and consist of 1 to 64 characters. Only letters, digits, underscores (\_), hyphens (-), and dollar signs (\$) are allowed.
- Databases whose names contain periods (.) cannot be restored.
- Cold tables cannot be restored when you restore databases or tables using PITR.
- During database PITR, if you create new databases with the same names as the restored databases, the data in the new databases may be overwritten, causing data loss.
- During table PITR, if you create new tables with the same names as the restored tables, the data in the new tables may be overwritten, causing data loss.
- During database PITR, a maximum of 2,000 databases and 20,000 tables can be restored for one instance at a time.

**Figure 11-5** Restoring databases or tables of multiple instances in batches

**Note**

- When you enter the time point that you want to restore the databases and tables to, RDS downloads the most recent full backup file from OBS to a temporary DB instance. Then incremental backups are also restored to the specified point in time on the temporary DB instance. After that, data on the temporary DB instance is written to the target databases and tables of the original DB instance at an average speed of 35 MB/s.
- After the restoration is complete, new tables with timestamps as suffixes are generated in the DB instance. You can rename the new tables and manage data in the tables as needed.
- Ensure the DB instance has sufficient storage space for generated tables.
- Database tables that have foreign key constraints can be restored. Standard or fast table-level PITR will delete foreign keys, which changes the table structure.
- If a table you selected does not exist at the specified point in time, the table will not be restored.
- Databases and tables whose names contain any Chinese characters cannot be restored.
- Cold tables in databases will not be restored during database-level restoration. Table-level restoration cannot restore cold tables.
- Fast restoration may fail if the instance has XA transactions. To change to standard restoration, go to Basic Information > Backups & Restorations > Restore Databases or Tables.

**Set Restoration Time and Level**

Restore To: Oct 17, 2024 15:05:15

Restore: ☐ Databases ☒ Tables

**Choose Databases and Tables**

**Available Tables**

Select one or more filters from the pop-up lists. If you enter a keyword in the search bar, only the tables that match the keyword will be displayed.

**Selected Tables**

| Original Table Name                                | Original Table Name | New Name  | Operation |
|----------------------------------------------------|---------------------|-----------|-----------|
| DB Instance ID: D2590576c8b4ec2978465a19412b30b0d1 |                     | Tables: 1 | X         |

Next: Confirm

**Step 5** On the displayed page, confirm the information and click **Submit**.

**Step 6** On the **Instances** page, check that the instances are **Restoring**. During the restoration process, services are not interrupted.

- Data is restored at an average speed of 35 MB/s.
- Restoring databases or tables to a specified point in time does not affect new data. The restored database or table is a temporary database or table with a timestamp suffix. You can manage the data in the temporary database or table as required.
- You can view the progress and result of restoring databases or tables to a specified point in time on the **Task Center** page.

----End

## Follow-up Operations

After the restoration is successful, you can [log in to the DB instance](#) for verification.



## FAQ

### How Can I Restore Data If No Backup Is Available?

## Related APIs

- [Restoring Tables to a Specified Point in Time \(RDS for MySQL\)](#)
- [Restoring Databases to a Specified Point in Time](#)
- [Checking Whether Fast Restoration Can Be Used for Restoring Databases or Tables \(RDS for MySQL\)](#)

## 11.2.4 Restoring Data Across Regions

### Scenarios

RDS for MySQL supports cross-region backups. If a DB instance in one region fails, you can use backups stored in another region to restore data to a new instance in that region.

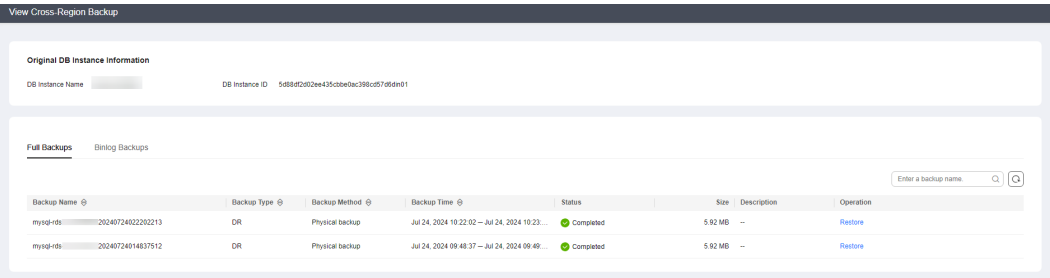
### Prerequisites

- Cross-region backups have been created. For details, see [Configuring a Cross-Region Backup Policy](#).
- Encrypted backups cannot be used to restore data to existing instances.
- Instances with Transparent Data Encryption (TDE) enabled do not support cross-region restoration.
- The kernel version of the target instance cannot be earlier than that of the original instance.

### Restoring a Full Backup Across Regions

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the upper part of the page, select the region where the backup is stored.
- Step 4** In the navigation pane on the left, choose **Backups**. On the displayed page, click the **Cross-Region Backups** tab.
- Step 5** Locate the instance you want to restore and click **View Cross-Region Backup** in the **Operation** column.
- Step 6** On the **Full Backups** page, locate the backup you want to restore and click **Restore** in the **Operation** column.

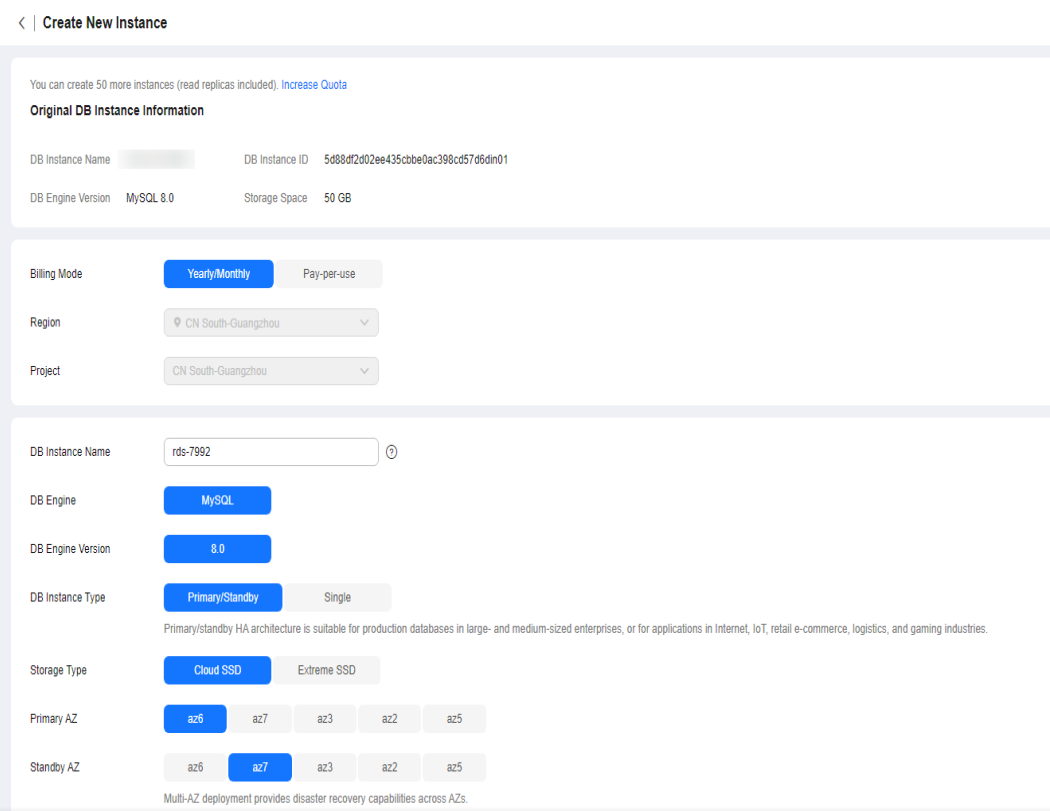
Figure 11-6 Full backups



- Step 7
- In the displayed dialog box, select a restoration method and click **OK**.

**Create New Instance:** Set parameters for the new instance and click **Buy**.

Figure 11-7 Creating a new instance



- The DB engine and version of the new instance are the same as those of the original instance and cannot be changed.
- Other settings are the same as those of the original DB instance by default and can be modified. For details, see [Buying an RDS for MySQL DB Instance](#).

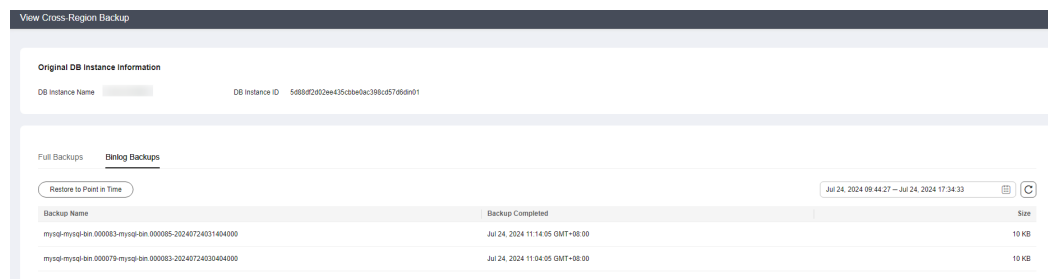
----End

## Restoring an Incremental Backup Across Regions

- Step 1
- In the upper part of the page, select the region where the backup is stored.
- Step 2
- In the navigation pane on the left, choose **Backups**. On the displayed page, click the **Cross-Region Backups** tab.

- Step 3** Locate the instance you want to restore and click **View Cross-Region Backup** in the **Operation** column.
- Step 4** On the **Binlog Backups** page, click **Restore to Point in Time**.

**Figure 11-8** Restoring an incremental backup



- Step 5** Select the restoration date and time range, enter a time point within the selected time range, and select a restoration method. Then, click **OK**.

**Create New Instance:** Set parameters for the new instance and click **Buy**.

- The DB engine and version of the new instance are the same as those of the original instance and cannot be changed.
- Other settings are the same as those of the original DB instance by default and can be modified. For details, see [Buying an RDS for MySQL DB Instance](#).

----End

## Related APIs

### [Querying the Restoration Time Range of a Cross-Region Backup](#)

## 11.3 Restoring Data to an On-Premises MySQL Database

This section describes how to restore a downloaded RDS for MySQL full backup to an on-premises MySQL database.

If you want to migrate all data from your RDS for MySQL DB instance to an on-premises MySQL database, you can download a full backup in **.qp** format and restore it to the on-premises database following the steps described in this section.

- [Step 1: Download a Full Backup of Your RDS for MySQL DB Instance](#)
- [Step 2: Install qpress and XtraBackup on the On-Premises MySQL Database](#)
- [Step 3: Restore the Backup to the On-Premises MySQL Database](#)

## Operation Process

1. Download the target full backup of your RDS for MySQL DB instance.
2. Upload the full backup to the on-premises MySQL database.
3. Use the qpress tool to decompress the full backup.

4. Use the XtraBackup tool to restore the full backup to the **data** directory of the on-premises database and save the original data of the database to the **data\_back** file.
5. Restart the on-premises database.

## Constraints

- This section only covers restoring a full backup of an RDS for MySQL 5.6, 5.7 or 8.0 DB instance to an on-premises database of the corresponding version. Incremental backup restoration is not included.
- **The minor version of the on-premises MySQL database must be the same as that of your RDS for MySQL DB instance.**  
To view the MySQL kernel version, run **mysql -V** or **mysqld --version**.
- The backup can be restored only to an on-premises database running Linux.
- Since the open-source backup tool supports only the x86 package, you cannot restore a backup to a database built on an Arm-based ECS by following the operations described in this section. To restore data to a database built on an Arm-based ECS, you can use Data Replication Service (DRS) or data export and import. For details, see [Migration Solution Overview](#).
- The following software is required to restore a full backup to an on-premises database:
  - MySQL database
  - qpress
  - Percona XtraBackup
  - Use the tools of the corresponding version. Otherwise, the restoration will fail.

**Table 11-6** Version mapping

| Database                | qpress   | Percona XtraBackup        |
|-------------------------|----------|---------------------------|
| MySQL 8.0               | qpress 7 | XtraBackup 8.0.0 or later |
| MySQL 5.7 and MySQL 5.6 | qpress 7 | XtraBackup 2.4.9 or later |

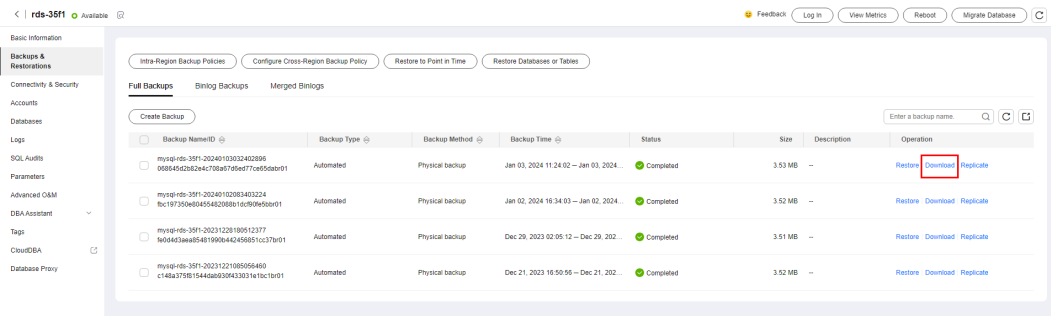
- During the restoration, do not run other workloads on the on-premises database.

## Step 1: Download a Full Backup of Your RDS for MySQL DB Instance

RDS for MySQL DB instances automatically perform full backups at the time you specified. You can also create manual backups for your DB instance. The generated **.qp** files can be downloaded and restored to an on-premises database.

1. Click the DB instance name on the RDS console, choose **Backups & Restorations** > **Full Backups**, locate the target full backup, and click **Download** in the **Operation** column to download the backup.

Figure 11-9 Downloading a full backup



2. Use a file transfer tool (such as WinSCP) to upload the full backup file to the Linux device where the on-premises MySQL database is located.

Step 2: Install qpress and XtraBackup on the On-Premises MySQL Database

Method 1: Manual Installation

1. Download qpress and XtraBackup of a correct version. You can also download them according to Table 11-7. After the download is complete, upload the installation package to the Linux device where the on-premises MySQL database is located.
- qpress: <https://repo.percona.com/yum/release/>
  - Percona XtraBackup:
    - For MySQL 5.6 and 5.7, download **XtraBackup 2.4.9** or later.
    - For MySQL 8.0, download **XtraBackup 8.0** or later.

Table 11-7 Download example

| Tool               | Example                                              |
|--------------------|------------------------------------------------------|
| MySQL 5.6          | mysql-5.6.51-linux-glibc2.12-x86_64.tar.gz           |
| MySQL 5.7          | mysql-5.7.38-linux-glibc2.12-x86_64.tar.gz           |
| MySQL 8.0          | mysql-8.0.26-linux-glibc2.12-x86_64.tar              |
| qpress             | <a href="#">qpress-11-1.el7.x86_64.rpm</a>           |
| Percona XtraBackup | <a href="#">XtraBackup 2.4.9</a> (MySQL 5.6 and 5.7) |
|                    | <a href="#">XtraBackup 8.0</a> (MySQL 8.0)           |

2. Install the qpress RPM package. Enterprise Linux 7 (including CentOS 7, RHEL 7, Rocky Linux 7, and AlmaLinux 7) is used as an example.
- rpm -ivh qpress-11-1.el7.x86\_64.rpm**
3. Decompress the XtraBackup package and change the name to **xtrabackup**.
- tar -zxvf percona-xtrabackup-2.4.9-Linux-x86\_64.tar.gz**
- mv percona-xtrabackup-2.4.9-Linux-x86\_64 xtrabackup**

4. Add **xtrabackup** to environment variables.  

```
echo "export PATH=$PATH:/usr/local/xtrabackup/bin" >> /etc/profile
mv xtrabackup/ /usr/local/
source /etc/profile
```

### Method 2: Installation Using wget

1. Install the [qpress RPM package](#).  

```
wget https://repo.percona.com/yum/release/7/RPMS/x86_64/
qpress-11-1.el7.x86_64.rpm
rpm -ivh qpress-11-1.el7.x86_64.rpm
```
2. Install Percona XtraBackup.
  - For MySQL 5.6 and 5.7, Percona XtraBackup 2.4.9 is used as an example.  

```
wget https://downloads.percona.com/downloads/Percona-
XtraBackup-2.4/Percona-XtraBackup-2.4.9/binary/redhat/7/x86_64/
percona-xtrabackup-24-2.4.9-1.el7.x86_64.rpm
rpm -ivh percona-xtrabackup-24-2.4.9-1.el7.x86_64.rpm --nodeps --
force
```
  - For MySQL 8.0, Percona XtraBackup 8.0 is used as an example.  

```
wget https://downloads.percona.com/downloads/Percona-
XtraBackup-8.0/Percona-XtraBackup-8.0.32-26/binary/redhat/7/
x86_64/percona-xtrabackup-80-8.0.32-26.1.el7.x86_64.rpm
rpm -ivh percona-xtrabackup-80-8.0.32-26.1.el7.x86_64.rpm --nodeps
--force
```

## Step 3: Restore the Backup to the On-Premises MySQL Database

1. Create a temporary directory **backupdir**.  

```
mkdir backupdir
```

2. Decompress the full backup.

#### NOTE

Before decompressing the full backup to the temporary directory **backupdir**, ensure that the temporary directory is empty to prevent restoration exceptions.

To prevent decompression failures caused by full disks, ensure that there is enough disk space of the target directory.

- MySQL 5.6 and 5.7:  

```
xbstream -x -p 4 < ./full_backup.qp -C ./backupdir/
innobackupex --parallel 4 --decompress ./backupdir
```
  - MySQL 8.0:  

```
xbstream -x -p 4 < ./full_backup.qp -C ./backupdir/
xtrabackup --parallel 4 --decompress --target-dir=./backupdir
```
3. Delete the **.qp** file.  

```
find ./backupdir/ -name '*.qp' | xargs rm -f
```
  4. Apply redo logs.
    - MySQL 5.6 and 5.7:  

```
innobackupex --apply-log ./backupdir
```

- MySQL 8.0:  
**xtrabackup --prepare --target-dir=./backupdir**
- 5. Back up data.
  - a. Stop the MySQL database service.  
**service mysql stop**  
For MySQL 5.7, run the following command:  
**/bin/systemctl stop mysqld.service**
  - b. Back up the original database directory.  
**mv /usr/local/mysql/data /usr/local/mysql/data\_bak**  
**mkdir /usr/local/mysql/data**
  - c. Create a new database directory and change the permissions.  
**chown mysql:mysql /usr/local/mysql/data**
- 6. Restore data to the on-premises database and change the directory permissions.  
Before performing this step, clear the **data** directory of the on-premises database. For details, see [5.b](#).
  - MySQL 5.6 and 5.7:  
**innobackupex --defaults-file=/etc/my.cnf --copy-back ./backupdir**  
**chown -R mysql:mysql /usr/local/mysql/data**
  - MySQL 8.0:  
**xtrabackup --defaults-file=/etc/my.cnf --copy-back --target-dir=./backupdir**  
**chown -R mysql:mysql /usr/local/mysql/data**

 **NOTE**

- The relative path (**./backupdir**) in the commands can be replaced with an absolute path.
  - **--defaults-file** is followed by the location (for example, **/etc/my.cnf**) of the MySQL configuration file. You can specify the location based on the site requirements.
- 7. Start the MySQL database.  
**service mysql start**  
For MySQL 5.7, run the following command:  
**/bin/systemctl start mysqld.service**
  - 8. Log in to the database and view the restoration result.  
**show databases**

# 12 Read Replicas

---

## 12.1 Introduction to Read Replicas

### Introduction

Currently, RDS for MySQL supports read replicas and read/write splitting.

In read-intensive scenarios, a single DB instance may be unable to handle the read pressure and service performance may be affected. To offload read pressure on the primary DB instance, you can create one or more read replicas in the same region as the primary instance. These read replicas can process a large number of read requests and increase application throughput.

Once read replicas are created, you can [enable read/write splitting](#). Write requests are automatically routed to the primary DB instance and read requests are routed to read replicas by user-defined weights.

If read/write splitting is disabled, separately configure connection addresses for the primary DB instance and each read replica on your applications so that read requests are sent to read replicas and write requests are sent to the primary DB instance.

A read replica uses a single-node architecture (without a standby node). Changes to the primary DB instance are also automatically synchronized to all associated read replicas through the native MySQL replication function. Read replicas and the primary DB instance must be in the same region but can be in different AZs.

### Single Read Replicas and HA Read Replicas

In read-intensive scenarios, read replicas help offload read pressure from the primary instance.

Data is replicated from the primary instance to read replicas asynchronously. Although there is a replication delay, the data on read replicas will eventually be consistent with that on the primary instance. You can use read replicas if you do not mind such a replication delay.

Read replicas include single-node read replicas and HA read replicas.



- Single-node read replicas: If you choose single-node read replicas, you are advised to buy more than one single-node read replica and enable database proxy. That way, if one read replica fails, the database proxy can route traffic to other read replicas or the primary DB instance. When you purchase a single-node read replica, select the same value for **Table Name** as the DB instance.
- HA read replicas: If the physical server where the primary read replica resides is faulty, the standby read replica automatically takes over workloads from the primary read replica. When you purchase an HA read replica, select the same value for **Table Name** as the DB instance.

Recommendations for using read replicas:

- Configure no more than two HA read replicas for a DB instance.
- If your DB instance is associated with more than two read replicas, enable database proxy for cost-effectiveness.

If the replication between a read replica (single-node or HA) and the DB instance is abnormal, it takes a long time to rebuild and restore the read replica (depending on the data volume).

## Billing Standards

Read replicas are billed on a yearly/monthly or pay-per-use basis.

## Functions

- Read replica specifications can be different from primary DB instance specifications. To prevent a creation failure, long delay, and high load of a read replica, it is recommended that the specifications of the read replica be at least equal to those of the primary instance.
- Read replicas are billed on a yearly/monthly or pay-per-use basis. Yearly/monthly billing provides a larger discount than pay-per-use billing and is recommended for long-term users.
- Read replicas support system performance monitoring.  
RDS provides up to 20 monitoring metrics, including storage space, IOPS, the number of database connections, CPU usage, and network traffic. You can view these metrics to learn about the load on DB instances.

## Constraints

- A maximum of 10 read replicas can be created for a DB instance.
- You can purchase read replicas only for your created primary DB instance.
- You cannot stop a read replica without stopping the primary instance. If you stop a primary instance, read replicas (if there are any) will also be stopped.
- All databases and tables in the primary instance are synchronized to read replicas. Data of the primary instance, standby instance, and read replicas is consistent.
- Read replicas do not support automated backups or manual backups. Read replicas do not provide binlogs.
- Read replicas do not support restoration from backups to new, existing, or original read replicas.

- Data cannot be migrated to read replicas.
- Read replicas do not support database creation or deletion.
- Read replicas do not support database account creation. Create database accounts on the primary DB instance. For details, see [Creating a Database Account](#).
- Read replicas cannot be recycled after they are deleted.

## Creating and Managing a Read Replica

- [Creating a Single-Node Read Replica](#)
- [Creating Read Replicas in Batches](#)
- [Managing a Read Replica](#)

# 12.2 Creating an HA Read Replica

## Scenarios

Read replicas enhance the read capabilities and reduce the load on your DB instances.

After an RDS instance is created, you can create HA read replicas for it as required.

## Constraints

- To create HA read replicas, you must have the required permissions. You can [submit a service ticket](#) to apply for the permissions.
- If you are creating an HA read replica, you can select **Cloud SSD** for **Storage Type**.
  - Cloud SSD: General-purpose, dedicated, and Kunpeng general-enhanced instance classes are supported.
- If you want to change a single-node read replica to an HA read replica, the single-node read replica must use **Cloud SSD** as its storage type.
  - Cloud SSD: General-purpose, dedicated, and Kunpeng general-enhanced instance classes are supported.
- If you are a DeC user, you can also create HA read replicas or change read replicas to HA read replicas. When you select **DSS** for **Resource Type**, only the storage type that you have selected when buying the DSS service is displayed by default.
- When you create an HA read replica, the SSL certificate, disk encryption, port, and subnet of the HA read replica are unconfigurable. They are kept the same as an existing HA read replica, or your primary instance if no HA read replica has been created.
- To change a non-HA read replica to an HA read replica, ensure that the SSL certificate, disk encryption, port, and subnet of the non-HA read replica are the same as an existing HA read replica, or your primary instance if no HA read replica has been created.
- Ensure that the subnet where your instance resides has at least four private IP addresses to be assigned to HA read replicas.

- To ensure reliable operation of your workloads, do not modify parameters of HA read replicas.
- For an HA read replica, do not change its port or change it to a non-HA read replica.
- The instance class of a read replica must be no smaller than that of the primary DB instance. Otherwise, the read replica creation may fail or the replication delay may increase.
- Do not perform DDL operations when creating read replicas. Otherwise, creating read replicas may fail.

## Creating an HA Read Replica

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and choose **More > Create Read Replica** in the **Operation** column.
- Step 4** On the displayed page, configure required parameters and click **Buy**.

Figure 12-1 Basic information

Primary DB Instance Information

DB Instance Name

rds-f096

DB Instance ID

36c2e55bccd149ecbf9086030e6955bfin01

Region

CN North-Beijing4

AZ

cn-north-4a

DB Engine Version

MySQL 8.0.28

DB Instance Type

Primary/Standby

Instance Specifications

rds.mysql.n1.large.2.ha | 2 vCPUs | 4 GB

Storage Type

Cloud SSD

Storage Space

100 GB

Basic Settings

Billing Mode ⓘ

Yearly/Monthly

Pay-per-use

Region

📍 CN North-Beijing4

▼

Engine Options

DB Engine

MySQL

DB Engine Version

8.0

▼

Replica Type

HA read replica

Read replica

Enabling High Availability improves reliability for read replicas.[Learn more](#)

Storage Type

Cloud SSD

AZ

cn-north-4a

AZ7

cn-north-4b

cn-north-4c

Table 12-1 Basic information

| Parameter         | Description                                                                         |
|-------------------|-------------------------------------------------------------------------------------|
| Billing Mode      | Yearly/monthly billing and pay-per-use billing are supported.                       |
| Region            | By default, read replicas are in the same region as your DB instance.               |
| DB Engine         | Same as the DB engine of your DB instance by default and cannot be changed.         |
| DB Engine Version | Same as the DB engine version of your DB instance by default and cannot be changed. |
| Replica Type      | Select <b>HA read replica</b> .                                                     |

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| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Type | <p>The storage type determines the read/write speed of an instance. The higher the maximum throughput is, the higher the read/write speed can be. After a DB instance is created, you can change its storage type. For details, see <a href="#">Changing a Storage Type</a>.</p> <ul style="list-style-type: none"><li>• Cloud SSD or Ultra-high I/O<br/>Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s.<ul style="list-style-type: none"><li>– For RDS for MySQL instances, this storage type is normally displayed as <b>Cloud SSD</b>, but for existing instances in certain regions it is displayed as <b>Ultra-high I/O</b>.</li><li>– The supported IOPS depends on the I/O performance of the Elastic Volume Service (EVS) disk. For details, see the description about ultra-high I/O in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul></li><li>• Extreme SSD<br/>Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency.<br/>The supported IOPS depends on the I/O performance of the EVS disk. For details, see the description about extreme SSD in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul> <p><b>NOTE</b><br/>If you select <b>DSS</b> for <b>Resource Type</b>, only the storage type that you have selected when buying the DSS service is displayed by default.</p> |
| AZ           | RDS allows you to deploy your DB instance and read replicas in a single AZ or across AZs to improve reliability.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

Figure 12-2 Specifications

Instance Class

Dedicated

General-purpose

| vCPUs   Memory                                  | Recommended Connections | TPS   QPS      |  |
|-------------------------------------------------|-------------------------|----------------|--|
| <input checked="" type="radio"/> 2 vCPUs   4 GB | 4,000                   | 470   9,400    |  |
| <input type="radio"/> 2 vCPUs   8 GB            | 6,000                   | 621   12,394   |  |
| <input type="radio"/> 4 vCPUs   8 GB            | 6,000                   | 969   19,383   |  |
| <input type="radio"/> 4 vCPUs   16 GB           | 8,000                   | 1,230   24,608 |  |
| <input type="radio"/> 4 vCPUs   32 GB           | 10,000                  | 1,488   29,765 |  |
| <input type="radio"/> 8 vCPUs   16 GB           | 8,000                   | 1,768   35,360 |  |

DB Instance Specifications

rds.mysql.x1.large.2.rha.rr | 2 vCPUs | 4 GB (Dedicated) , Recommended Connections: 4,000, TPS | QPS: 470 | 9,400

If the read replica specifications are far less than those of the primary DB instance, the read replica may fail to be created.

Storage Space

40 GB

Table 12-2 Specifications

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Class | <p>vCPUs and memory of an instance. Different instance classes support different numbers of database connections and maximum IOPS.</p> <p>After a DB instance is created, you can change its instance class. For details, see <a href="#">Changing a DB Instance Class</a>.</p> <p>DB instances in a DCC only support the general-enhanced instance class.</p> |
| Storage Space  | <p>Storage space contains the system overhead required for inodes, reserved blocks, and database operation.</p> <p>By default, storage space of a read replica is the same as that of the primary instance.</p>                                                                                                                                                |

Figure 12-3 Connectivity and additional options

Basic Settings

DB Instance Name ⓘ  
replica-dc45

Connectivity

VPC  
default\_vpc

Subnet  
default\_subnet(192.168.0.0/24) ⓘ

An EIP is required if you want to access DB instances through a public network.[View EIP](#) ⓘ

IPv4 Address  

· · ·

Addresses available: 233 [View In-use IP Addresses](#)

Security Group  
default

Additional Options

Enterprise Project ⓘ  

--Select-- ⓘ

 ⓘ [Create Enterprise Project](#) ⓘ

Tag  
TMS's predefined tags are recommended for adding the same tag to different cloud resources. [Create predefined tags](#) ⓘ ⓘ  
[+ Add Tag](#)  
You can add 20 more tags.

**Table 12-3** Connectivity

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Instance Name | Must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (_) are allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| VPC              | Same as the primary instance's VPC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Subnet           | <p>Same as the primary instance's subnet.</p> <ul style="list-style-type: none"><li>• IPv4 address:<br/>A floating IPv4 address is automatically assigned when you create a read replica. You can also enter an unused floating IPv4 address in the subnet CIDR block. After the read replica is created, you can change the floating IP address.</li><li>• IPv6 address:<br/>A read replica assigned a floating IPv6 address will be created only when the vCPUs and memory you selected support IPv6 addresses.<br/><br/>A floating IPv6 address is automatically assigned during read replica creation and cannot be specified. After the read replica is created, this floating IP address cannot be changed.</li></ul> |
| Security Group   | Same as the primary instance's security group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Table 12-4** Additional options

| Parameter          | Description                                                                                                                                                                                                                                                                                             |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enterprise Project | <p>If your account has been associated with an enterprise project, select the target project from the <b>Enterprise Project</b> drop-down list.</p> <p>For more information about enterprise projects, see <a href="#">Enterprise Management User Guide</a>.</p>                                        |
| Tag                | <p>Optional. Using tags can help you easily identify and categorize your read replicas. A maximum of 20 tags can be added for each read replica.</p> <p>After a read replica is created, you can view its tag details on the <b>Tags</b> page. For details, see <a href="#">RDS for MySQL Tags</a>.</p> |

**Table 12-5** Yearly/monthly read replicas

| Parameter         | Description                                                                                                                                                                     |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required Duration | The system will automatically calculate the configuration fee based on the selected required duration. The longer the required duration is, the larger discount you will enjoy. |

| Parameter  | Description                                                                                                                                                                         |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto-renew | <ul style="list-style-type: none"><li>By default, this option is not selected.</li><li>If you select this option, the renewal cycle is the same as the selected duration.</li></ul> |

**Step 5** Confirm specifications.

- If you need to modify your settings, click **Previous**.
- If you do not need to modify your settings, click **Submit** for pay-per-use read replicas.
- For yearly/monthly read replicas, click **Pay Now**.

**Step 6** After a read replica is created, you can view and manage it.

For details about how to manage read replicas, see [Managing a Read Replica](#).

To view the detailed progress and result of the creation, go to the **Task Center** page. For details, see [Task Center](#).

----End

## FAQ

Q: Does creating read replicas during peak hours increase the load on my primary instance when my primary instance's CPU usage is high?

A: Yes. When a read replica is created, it synchronizes data from the primary instance, which consumes I/O and CPU resources of the primary instance. To avoid this impact, you can create read replicas during off-peak hours.

Q: Does an HA read replica can be deployed across AZs?

A: Yes. Although you can select only one AZ when creating an HA read replica, it is deployed across AZs in fact.

## 12.3 Creating a Single-Node Read Replica

### Scenarios

Read replicas enhance the read capabilities and reduce the load on your DB instances.

After an RDS instance is created, you can create single-node read replicas for it as required.

### Constraints

- A maximum of 10 read replicas can be created for a DB instance.
- Ensure that the subnet where your instance resides has at least two IP addresses to be assigned to single-node read replicas.

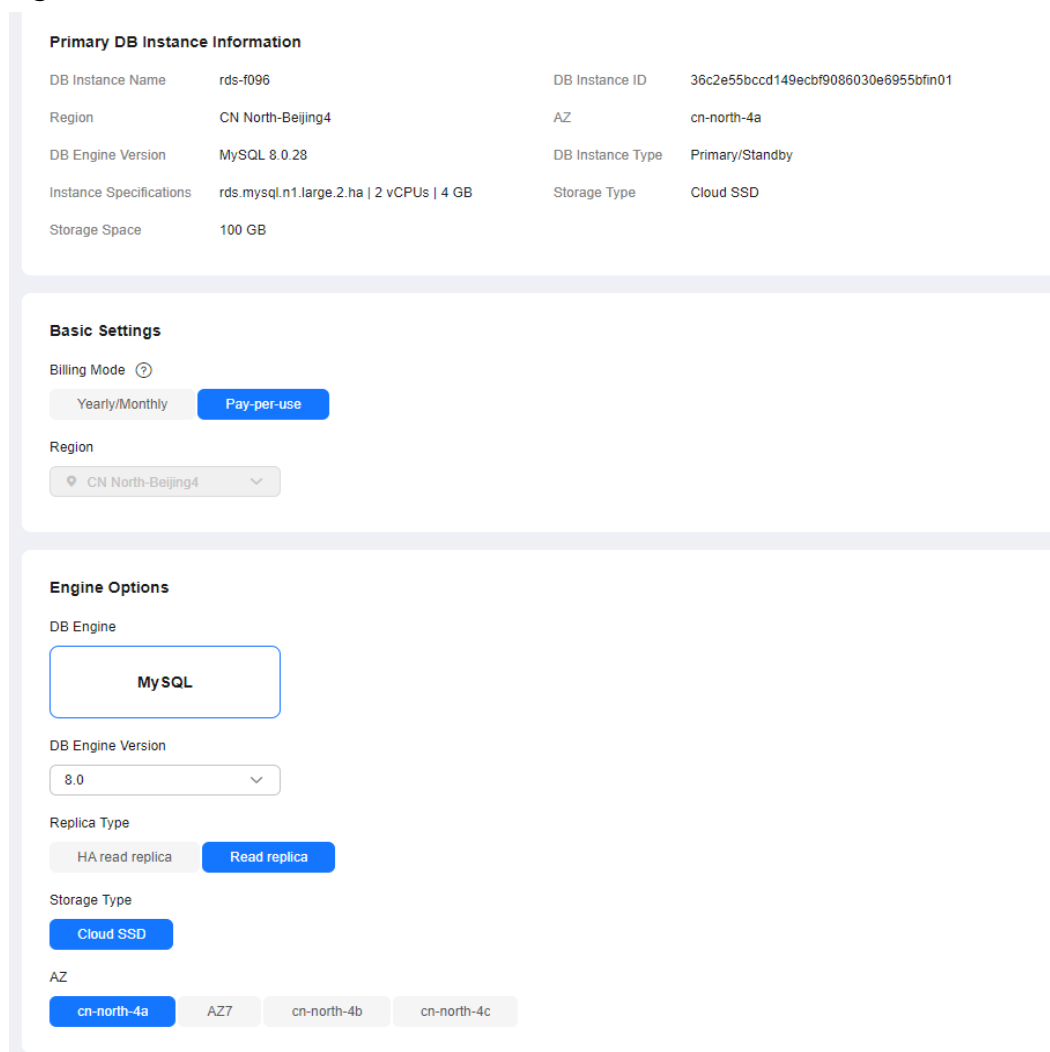


- The instance class of a read replica must be no smaller than that of the primary DB instance. Otherwise, the read replica creation may fail or the replication delay may increase.
- For details about how to create read replicas in batches, see [Creating Read Replicas in Batches](#).
- Do not perform DDL operations when creating read replicas. Otherwise, creating read replicas may fail.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the target DB instance and choose **More > Create Read Replica** in the **Operation** column.
- Step 4** On the displayed page, configure required parameters and click **Buy**.

Figure 12-4 Basic information



**Primary DB Instance Information**

|                         |                                          |                  |                                      |
|-------------------------|------------------------------------------|------------------|--------------------------------------|
| DB Instance Name        | rds-f096                                 | DB Instance ID   | 36c2e55bccd149ecbf9086030e6955bfin01 |
| Region                  | CN North-Beijing4                        | AZ               | cn-north-4a                          |
| DB Engine Version       | MySQL 8.0.28                             | DB Instance Type | Primary/Standby                      |
| Instance Specifications | rds.mysql.n1.large.2.ha   2 vCPUs   4 GB | Storage Type     | Cloud SSD                            |
| Storage Space           | 100 GB                                   |                  |                                      |

**Basic Settings**

Billing Mode 

☐ Yearly/Monthly ☒ Pay-per-use

Region

 CN North-Beijing4 

**Engine Options**

DB Engine

☒ MySQL

DB Engine Version

8.0 

Replica Type

☐ HA read replica ☒ Read replica

Storage Type

☒ Cloud SSD

AZ

☒ cn-north-4a ☐ AZ7 ☐ cn-north-4b ☐ cn-north-4c

**Table 12-6** Basic information

| Parameter         | Description                                                                         |
|-------------------|-------------------------------------------------------------------------------------|
| Billing Mode      | Yearly/monthly billing and pay-per-use billing are supported.                       |
| Region            | By default, read replicas are in the same region as your DB instance.               |
| DB Engine         | Same as the DB engine of your DB instance by default and cannot be changed.         |
| DB Engine Version | Same as the DB engine version of your DB instance by default and cannot be changed. |
| Replica Type      | Select <b>Read replica</b> .                                                        |

| Parameter    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage Type | <p>Determines the DB instance read/write speed. The higher the maximum throughput is, the higher the DB instance read/write speed can be.</p> <ul style="list-style-type: none"><li>• Cloud SSD or Ultra-high I/O<br/>Stores data in cloud disks for decoupled storage and compute. The maximum throughput is 350 MB/s.<ul style="list-style-type: none"><li>– For RDS for MySQL instances, this storage type is normally displayed as <b>Cloud SSD</b>, but for existing instances in certain regions it is displayed as <b>Ultra-high I/O</b>.</li><li>– The supported IOPS depends on the I/O performance of the Elastic Volume Service (EVS) disk. For details, see the description about ultra-high I/O in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li></ul></li><li>• Extreme SSD<br/>Uses 25GE network and RDMA technologies to provide you with up to 1,000 MB/s throughput per disk and sub-millisecond latency.<br/>The supported IOPS depends on the I/O performance of the EVS disk. For details, see the description about extreme SSD in <a href="#">Disk Types and Performance</a> of the <i>Elastic Volume Service Service Overview</i>.</li><li>• Flexible SSD<br/>Decouples capacity from performance and allows for tailored IOPS and throughput for your business requirements. This storage type is ideal for mainstream interactive applications that require high performance and low latency.<ul style="list-style-type: none"><li>– You can preconfigure an IOPS ranging from 3,000 to 128,000. This IOPS must also be less than or equal to 500 times the capacity. You can preconfigure a throughput ranging from 125 to 1,000 MiB/s. This throughput must also be less than or equal to the IOPS divided by 4. For details, see the descriptions of "General Purpose SSD V2" in <a href="#">Disk Types and Performance</a> in <i>Elastic Volume Service Service Overview</i>.</li></ul></li></ul> <p><b>NOTE</b><br/>To purchase instances with Flexible SSDs, <a href="#">submit a service ticket</a>.<br/>If you select <b>DSS</b> for <b>Resource Type</b>, only the storage type that you have selected when buying the DSS service is displayed by default.</p> |
| AZ           | RDS allows you to deploy your DB instance and read replicas in a single AZ or across AZs to improve reliability.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Figure 12-5 Instance configuration

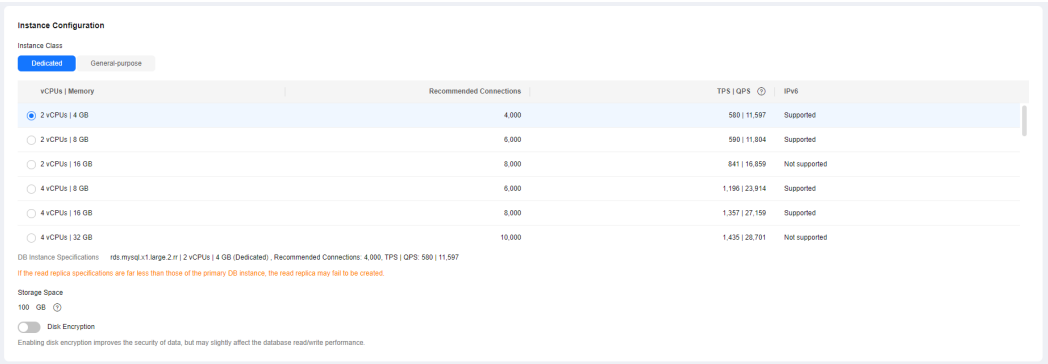


Table 12-7 Instance specifications

| Parameter       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Class  | <p>Refers to the vCPUs and memory of a DB instance. Different instance classes support different numbers of database connections and maximum IOPS.</p> <p>After a DB instance is created, you can change its instance class (CPU and memory). For details, see section <a href="#">Changing a DB Instance Class</a>.</p> <p>DB instances in a DCC only support the general-enhanced instance class.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Storage Space   | <p>Contains the system overhead required for inodes, reserved blocks, and database operation.</p> <p>By default, storage space of a read replica is the same as that of the primary DB instance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Disk Encryption | <ul style="list-style-type: none"><li><b>Disable:</b> indicates the encryption function is disabled.</li><li><b>Enable:</b> indicates the encryption function is enabled. Enabling disk encryption enhances data security but reduces the database's read and write performance by 5%.<br/><b>Key Name:</b> indicates the tenant key. You can select an existing key or create a new one.</li></ul> <p><b>NOTE</b></p> <ul style="list-style-type: none"><li>If you enable disk encryption during instance creation, the disk encryption status and the key cannot be changed later.</li><li>After an RDS DB instance is created, do not disable or delete the key that is currently in use. Otherwise, RDS will be unavailable and data cannot be restored.</li><li>For details about how to create a key, see <a href="#">"Creating a CMK"</a> in <i>Data Encryption Workshop User Guide</i>.</li></ul> |

Figure 12-6 Connectivity and additional options

**Basic Settings**

DB Instance Name ?

replica-dd11

**Connectivity**

VPC

default\_vpc

Subnet

default\_subnet(192.168.0.0/24)

An EIP is required if you want to access DB instances through a public network. [View EIP](#)

IPv4 Address

Addresses available: 233 [View In-use IP Addresses](#)

Security Group

default

**Additional Options**

Enterprise Project ?

--Select--

Create Enterprise Project

Tag

TMS's predefined tags are recommended for adding the same tag to different cloud resources. [Create predefined tags](#)

+ Add Tag

You can add 20 more tags.

Table 12-8 Network

| Parameter        | Description                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| DB Instance Name | Must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (_) are allowed. |
| VPC              | Same as the primary DB instance's VPC.                                                                                                           |

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subnet         | <p>Select the same subnet as the primary DB instance or another subnet in the same VPC. For details about how to create a subnet, see <a href="#">Creating a Subnet for the VPC</a>.</p> <ul style="list-style-type: none"><li>• IPv4 address:<br/>A floating IPv4 address is automatically assigned when you create a read replica. You can also enter an unused floating IPv4 address in the subnet CIDR block. After the read replica is created, you can change the floating IP address.</li><li>• IPv6 address:<br/>You can create a read replica using a floating IPv6 address only when the vCPU and memory you selected support IPv6 addresses.<br/><br/>A floating IPv6 address is automatically assigned during read replica creation and cannot be specified. After the read replica is created, this floating IP address cannot be changed.</li></ul> |
| Security Group | Same as the primary DB instance's security group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 12-9** Additional options

| Parameter          | Description                                                                                                                                                                                                                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enterprise Project | <p>If your account has been associated with an enterprise project, select the target project from the <b>Enterprise Project</b> drop-down list.</p> <p>For more information about enterprise projects, see <a href="#">Enterprise Management User Guide</a>.</p>                          |
| Tag                | <p>Optional. Tags help you easily identify and manage your read replicas. A maximum of 20 tags can be added for each read replica.</p> <p>After a read replica is created, you can view its tag details on the <b>Tags</b> page. For details, see <a href="#">RDS for MySQL Tags</a>.</p> |

**Table 12-10** Yearly/monthly read replicas

| Parameter         | Description                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required Duration | The system will automatically calculate the configuration fee based on the selected required duration. The longer the required duration is, the larger discount you will enjoy.                         |
| Auto-renew        | <ul style="list-style-type: none"><li>• By default, this option is not selected.</li><li>• If you select this option, the auto-renewal cycle is determined by the selected required duration.</li></ul> |

**Step 5** Confirm specifications.

- If you need to modify your settings, click **Previous**.
- If you do not need to modify your settings, click **Submit** for pay-per-use read replicas.
- For yearly/monthly read replicas, click **Pay Now**.

**Step 6** After a read replica is created, you can view and manage it.

For details about how to manage read replicas, see [Managing a Read Replica](#).

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Task Center](#).

----End

## FAQ

Q: Does creating read replicas during peak hours increase the load on my primary instance when my primary instance's CPU usage is high?

A: Yes. When a read replica is created, it synchronizes data from the primary instance, which consumes I/O and CPU resources of the primary instance. To avoid this impact, you can create read replicas during off-peak hours.

## Follow-up Operations

[Managing a Read Replica](#)

# 12.4 Changing a Single-Node Read Replica to an HA Read Replica

## Scenarios

You can change a single-node read replica to an HA read replica as needed. This operation does not affect your workloads.

A single-node read replica has only one physical node. If it fails, it cannot recover in a timely manner. However, an HA read replica has one primary node and one standby node. If the physical server where the primary read replica is located fails, the standby read replica automatically takes over workloads from the primary read replica. For more information, see [Introduction to Read Replicas](#).

## Constraints

- If you want to change a single read replica to an HA read replica, the single read replica must use **Cloud SSD** as its storage type.
  - Cloud SSD: General-purpose, dedicated, and Kunpeng general-enhanced instance classes are supported.
- If you are a DeC user, you can create HA read replicas or change single read replicas to HA read replicas. When you select **DSS** for **Resource Type**, only the storage type that you have selected when buying the DSS service is displayed by default.

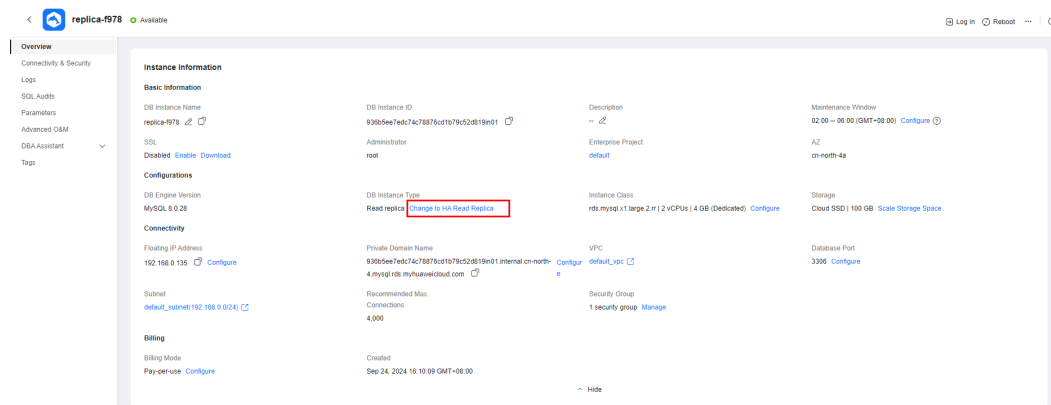
- To change a single read replica to an HA read replica, ensure that the SSL certificate, disk encryption, port, and subnet of the single read replica are the same as an existing HA read replica, or your primary instance if no HA read replica has been created.
- Ensure that the subnet where your instance is located has sufficient IP addresses ( $\geq 3$ ) to be assigned to HA read replicas.
- To ensure reliable operation of your workloads, do not modify parameters of HA read replicas.
- For an HA read replica, do not change its port or change it to a single read replica.

## Changing to an HA Read Replica

A single read replica can be changed to an HA read replica, but an HA read replica cannot be changed to a single read replica.

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the DB instance list, click  in front of the DB instance and click the target read replica name.
- Step 4** On the **Overview** page, find **DB Instance Type** and click **Change to HA Read Replica**.

Figure 12-7 DB information



- Step 5** On the displayed page, confirm the information and click **Submit**.



**Figure 12-8** Changing to an HA read replica

< | Change to HA Read Replica

**Original DB Instance Information**

|                   |                                                     |                |                                    |
|-------------------|-----------------------------------------------------|----------------|------------------------------------|
| DB Instance Name  | replica-9778                                        | DB Instance ID | 9365ee7edc74c78876cd1b79c52d819e01 |
| DB Engine Version | MySQL 8.0.28                                        | AZ             | cn-north-4a                        |
| Billing Mode      | Pay-per-use                                         | Region         | CN North-Beijing4                  |
| Storage Type      | Cloud SSD                                           | Storage Space  | 100GB                              |
| Disk Encryption   | Disabled                                            | VPC            | default_vpc                        |
| Subnet            | default_subnet                                      | Security Group | default                            |
| Instance Class    | rds.mysql.x1.large.2.m   2 vCPUs   4 GB (Dedicated) |                |                                    |

**HA Read Replica Information** Enabling High Availability improves reliability for read replicas. [Learn more](#)

|                   |                                                         |                |                                    |
|-------------------|---------------------------------------------------------|----------------|------------------------------------|
| DB Instance Name  | replica-9778                                            | DB Instance ID | 9365ee7edc74c78876cd1b79c52d819e01 |
| DB Engine Version | MySQL 8.0.28                                            | Region         | CN North-Beijing4                  |
| Storage Type      | Cloud SSD                                               | Storage Space  | 100GB                              |
| Disk Encryption   | Disabled                                                | VPC            | default_vpc                        |
| Subnet            | default_subnet                                          | Security Group | default                            |
| Instance Class    | rds.mysql.x1.large.2.mha.m   2 vCPUs   4 GB (Dedicated) |                |                                    |

Price:  ⓘ Submit

----End

## 12.5 Creating Read Replicas in Batches

### Scenarios

Read replicas are used to enhance read capabilities and reduce the load on primary DB instances. On the **Instances** page, you can select one or more MySQL DB instances and create read replicas for them in batches.

### Constraints

- To create read replicas in batches, [submit a service ticket](#) to apply for required permissions.
- A maximum of 10 read replicas can be created for a DB instance.
- You can create read replicas for a maximum of 50 MySQL DB instances.
- You can create read replicas in batches only for DB instances of the same DB engine version and CPU architecture. For details about the supported instance classes and CPU architectures, see [RDS for MySQL Instance Classes](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, select one or more DB instances and choose **More > Create Read Replica** above the instance list.
- Step 4** On the displayed page, configure required information and click **Next**.
- By default, read replicas are named with "read" and two digits appended to the primary DB instance name. For example, if the primary instance name is instance-0001, the first read replica will be named instance-0001-read-01.

- The VPC and storage configurations are the same as those of the primary DB instance.
- In a batch creation, the number of read replicas you can create is limited by whichever DB instance already has the most replicas.

For example, in a batch creation where most of the DB instances only have one read replica, if any DB instance in the batch has more than one, for example, 2, you would only be able to add 8 more replicas for each DB instance in that particular batch operation.

**Step 5** Confirm specifications.

- If you need to modify your settings, click **Previous**.
- If you do not need to modify your settings, click **Submit** for pay-per-use read replicas.
- For yearly/monthly read replicas, click **Pay Now**.

**Step 6** After read replicas are created, you can view and manage them.

For details about how to manage read replicas, see [Managing a Read Replica](#).

You can view the detailed progress and result of the task on the **Task Center** page. For details, see [Task Center](#).

----End

## Follow-up Operations

[Managing a Read Replica](#)

# 12.6 Managing a Read Replica

## Entering the Management Interface Through a Read Replica

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** In the DB instance list, click  to expand the DB instance details and click the target read replica name to go to the **Overview** page.

----End

## Entering the Management Interface Through DAS

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance and click  in front of it. In the expanded panel, locate the read replica you want to manage and click **Log In** in the **Operation** column.

**Step 4** On the displayed login page, enter the correct username and password and click **Log In**.

----End

## Deleting a Read Replica

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** In the DB instance list, click  in front of a DB instance, locate the read replica to be deleted, and choose **More > Delete** in the **Operation** column.

----End

# 13 Database Proxy (Read/Write Splitting)

---

## 13.1 Introduction to RDS for MySQL Database Proxy

Database Proxy is a network proxy service that sits between RDS for MySQL and applications. It is used to handle all requests from the applications to access RDS for MySQL instances.

Read/write splitting enables read and write requests to be automatically routed through a database proxy address. After creating an RDS for MySQL instance, you can [enable database proxy](#). Through the proxy address, write requests are routed to the primary instance and read requests to read replicas based on the routing policy of the proxy, reducing the read pressure of the primary instance.

### Proxy Address

After purchasing a database proxy, you can view the proxy address on the **Database Proxy** page. The database proxy sends write requests to the primary instance and read requests to read replicas through this address.

### Proxy Role

There are read-only and read/write proxies. The read/write processing logic varies depending on the proxy role. For details, see [Table 13-1](#).

- Read-only proxy: The proxy does not connect to the primary instance. It cannot route read requests to the primary instance, and will report an error when receiving a write request.
- Read/write proxy: The proxy connects to the primary instance and read replicas. It distributes read requests to the primary instance and read replicas by read weights and automatically routes write requests to the primary instance.

**Table 13-1** Database proxy processing logic by role

| Role           | Routing Policy          | Weight of Primary Instance | Normal Case                                                                                        | All Read Replicas Are Faulty                                                              |
|----------------|-------------------------|----------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Read only      | Weighted Load balancing | Not configurable           | Primary instance: does not process read-only requests.<br>Proxy address: readable but not writable | Primary instance: does not process read-only requests.<br>Proxy address: connection error |
| Read and write | Load balancing          | Assigned by system         | Primary instance: readable and writable<br>Proxy address: readable and writable                    | Primary instance: readable and writable<br>Proxy address: readable and writable           |
|                | Weighted                | > 0                        | Primary instance: readable and writable<br>Proxy address: readable and writable                    | Primary instance: readable and writable<br>Proxy address: readable and writable           |
|                |                         | = 0                        | Primary instance: not readable but writable<br>Proxy address: readable and writable                | Primary instance: readable and writable<br>Proxy address: readable and writable           |

## Transaction Splitting

Database proxies support transaction splitting. With this feature enabled, the read requests prior to write operations in a transaction are routed to read replicas, offloading read pressure from the primary instance.

For more information about transaction splitting, see [Configuring Transaction Splitting](#).

## Connection Pool

Database proxies provide session-level connection pooling. It helps reduce the database load caused by frequently setting up short connections.

For more information about connection pools, see [Configuring Connection Pools](#).

## Routing Policy

RDS for MySQL database proxies support weighted and load balancing routing policies.

- **Weighted:** Read requests are routed based on the read weights you specify.
- **Load balancing:** Read requests are routed to database nodes with fewer active connections. With this policy enabled, you do not need to configure the weights of nodes.

For more information about routing policies, see [Configuring the Delay Threshold and Routing Policy](#).

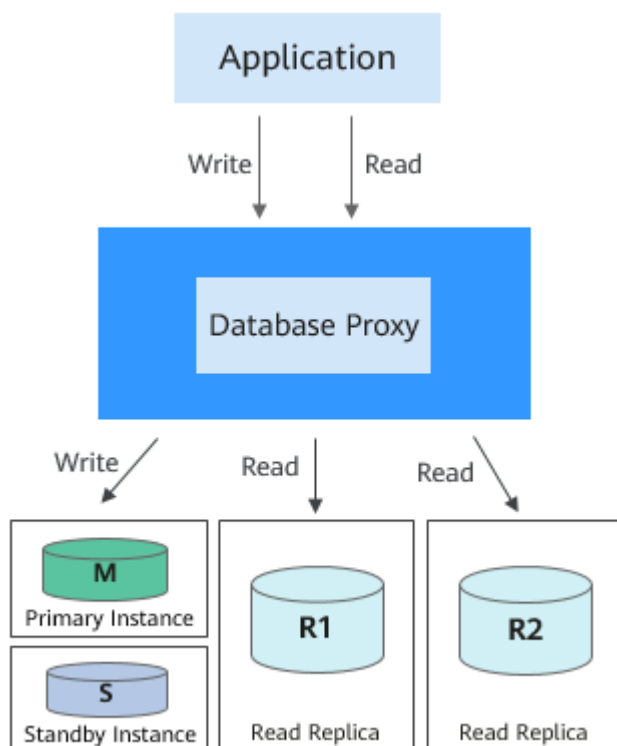
## How Read/Write Splitting Works

Read/write splitting uses database proxies to split read and write requests. You can create one or more database proxies for your DB instance.

### Single database proxy

If your RDS for MySQL instance has only one database proxy, applications connect to the database proxy through the proxy address. Write requests are forwarded to the primary instance and read requests to the primary instance or read replicas based on the routing policy you specify.

**Figure 13-1** Read/write splitting with only one database proxy

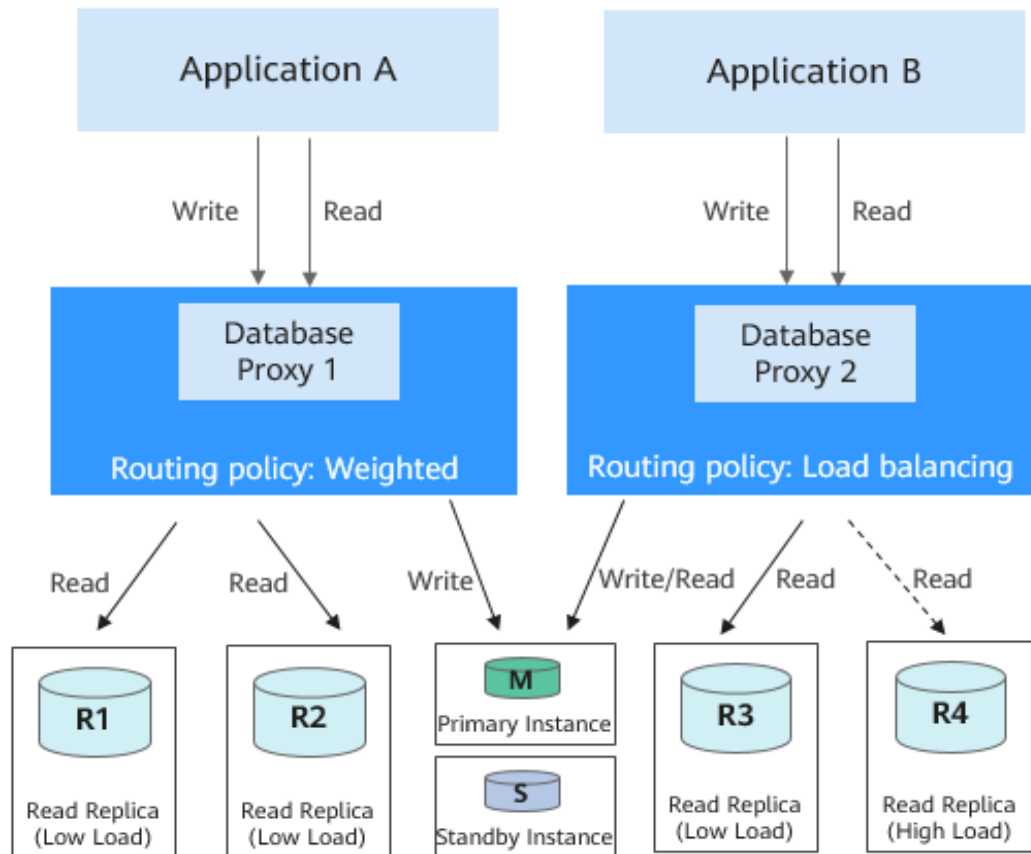


### Multiple database proxies

To isolate workloads from one another, you can create up to four database proxies for an RDS for MySQL instance. Different applications can connect to different

database proxies as required. The database proxies connect to specified read replicas and forward read requests from different applications to different read replicas for workload isolation.

**Figure 13-2** Read/write splitting with multiple database proxies



## Advantages of Read/Write Splitting

- Read/write splitting enables read and write requests to be automatically routed. You can easily scale out a database proxy as required at low maintenance costs.
- Read requests are distributed to your read replicas based on weights to balance your database traffic and improve resource utilization.
- A proxy routes read requests of your application only to the read replicas you specify for the proxy.
- By default, database proxies provide overload protection to prevent operations with large result sets from causing out of memory (OOM) exceptions of the server. If the database kernel pressure is high, database traffic throttling is required.

## Requests sent only to the primary node

- INSERT, UPDATE, DELETE, and SELECT FOR UPDATE
- All DDL operations (such as table/database creation, table/database deletion, table structure change, and permission change)

- All requests in transactions (But if transaction splitting is enabled, some read requests in transactions may be sent to read replicas. For details, see [Configuring Transaction Splitting](#).)
- User-defined functions
- Stored procedures
- Multi-statement requests
- Requests that use temporary tables
- SELECT last\_insert\_id()
- All queries of and changes to user variables

### Requests sent either to the primary node or a read replica

- SELECT not in a transaction
- COM\_STMT\_EXECUTE

### Requests always sent to all nodes

- Changes to all system variables
- The USE command

## Billing

Database proxy can be enabled for purchased DB instances. After it is enabled, it is separately billed.

Database proxy supports only pay-per-use billing.

The database proxy service is available for commercial use. It is billed by node. When you purchase a database proxy instance on the console, two nodes are created by default. The total fee is calculated as follows: Total fee = Number of nodes x Unit price. For details about the unit price, see the price of database proxy in [RDS Pricing Details](#).

## 13.2 Constraints on Database Proxy

### Supported Regions

Database proxy is available in the CN-Hong Kong, AP-Bangkok, and AP-Singapore regions. If your instance is deployed in any other region, [submit a service ticket](#) to request the required permissions.

To purchase multiple database proxies, you need to [submit a service ticket](#) to request the required permissions.

### Supported Versions

- MySQL 5.6: 5.6.51.7 or later
- MySQL 5.7: 5.7.37.2 or later
- MySQL 8.0: all minor versions



For details about how to query the instance version, see [How Can I View the Version of an RDS DB Instance?](#)

If your kernel version is not supported, [upgrade the minor version](#).

## Function Constraints

- One RDS for MySQL read replica can connect to different proxies. However, you are advised to configure only one proxy that can allocate requests to the read replica.
- rdsProxy is an internal database proxy account for RDS. To ensure proper read/write splitting, you are advised not to create an account with the same name as rdsProxy.
- If read/write splitting is enabled and you delete a primary RDS for MySQL instance, its read replicas are also deleted and read/write splitting is disabled.
- Read/write splitting does not support the caching\_sha2\_password identity authentication plugin for RDS for MySQL 8.0.
- After read/write splitting is enabled, the database ports and floating IP addresses of both the primary instance and read replicas cannot be changed.
- Read/write splitting does not support compression protocols.
- Read/write splitting does not support the isolation level READ UNCOMMITTED.
- If multi-statements are executed, all subsequent requests will be routed to the primary instance by default. To restore read/write splitting, disconnect the connection between your application and the read/write splitting address and establish a connection again. Multiple multi-statement processing modes are supported. For details, see [Configuring Multi-Statement Processing Modes](#).
- If operations for explicitly creating a temporary table are performed, all subsequent requests over the current connection will be routed to the primary instance by default. To restore read/write splitting, disconnect the connection and reestablish another one.
- If [the HANDLER statement](#) is executed, all subsequent requests will be routed to the primary instance by default. To restore read/write splitting, disconnect the connection and reestablish a connection.
- When the read/write splitting address is used, all transaction requests are routed to the primary instance (you can use the transaction splitting feature to route read requests prior to write operations in a transaction to read replicas). The non-transaction read consistency is not ensured. To ensure read consistency, encapsulate the read requests into a transaction.
- When the read/write splitting address is used, the LAST\_INSERT\_ID() function can be used only in transactions.
- When user-defined variables are used, statements containing user-defined variables are routed to the primary instance.
- When a database proxy is used, the size of a concatenate SQL statement cannot exceed 100 MB to prevent statement parsing from consuming too many resources.
- When a .NET client is used to connect to database proxies, the MySQL.Data driver version of the client must be 8.0.19 or later because earlier driver versions may be incompatible with database proxies.

- To use transaction splitting, you need to upgrade the database proxy to the latest version.
- Database proxies do not support the SQL mode parameter [PAD\\_CHAR\\_TO\\_FULL\\_LENGTH](#).

## Syntax Constraints

Read/write splitting routes frontend requests to backend instance nodes by the configured weights.

Therefore, some SQL statements may have different results when being executed multiple times.

- If you connect to a DB instance through a proxy and run **show processlist**, the result returned displays only the running threads on the proxy node where **show processlist** is executed, so it is different from that returned when you directly connect to the DB instance.
- If a proxy node is abnormal, and you connect to the proxy through the read/write splitting address and run **show processlist** or **kill**, the command execution may be prolonged or freezes, but your services are not affected.
- If you run **show processlist** on a proxy and this proxy has a node deleted, the running threads on this node may be returned.
- If you run **kill** on a proxy, errors such as timeout may be reported. In this case, you can run **show processlist** again to check whether the thread is killed successfully.
- Requests that are routed by a database proxy can be killed only by running **kill** on the proxy.
- When the read/write splitting address is used, the **show errors** and **show warnings** commands are not supported.
- When the read/write splitting address is used, if stored procedures and functions depend on user variables (@variable), the execution result may be incorrect.

## 13.3 Enabling Database Proxy for Read/Write Splitting

You can enable database proxy for your RDS for MySQL instance to automatically forward read and write requests through a proxy address. To reduce read pressure of the primary instance, write requests are forwarded to the primary instance and read requests to read replicas based on the routing policy of the database proxy.

This section describes how to use a database proxy to implement read/write splitting. The process is as follows:

- [Step 1: Enable Database Proxy](#)
- [Step 2: Grant Access Permissions](#)
- [Step 3: Check Security Group Rules](#)
- [Step 4: Use the Read/Write Splitting Address to Connect to the RDS for MySQL Instance](#)
- [Step 5: Verify Read/Write Splitting](#)

## Precautions

Keep in mind the following notes on database proxies:

- Before enabling database proxy, ensure that you have purchased an RDS for MySQL instance.
- Both the primary instance and read replicas must be available.
- You have learned the regions and versions that support database proxies. For details, see [Constraints on Database Proxy](#).

## Step 1: Enable Database Proxy

- **Buying a single database proxy:** In the CN-Hong Kong, AP-Bangkok, and AP-Singapore regions, single database proxy is enabled by default. That means only one database proxy can be purchased for an RDS for MySQL instance. With low flexibility, single-proxy is suitable for a single workload environment where workload isolation is not required. A single proxy provides only one entry for accessing the database.
- **Buying multiple database proxies:** In the CN North-Beijing4, CN East-Shanghai1, CN South-Guangzhou, and CN Southwest-Guiyang1 regions, multi-proxy is enabled by default. That means multiple database proxies (up to 4) can be purchased for an RDS for MySQL instance. Multi-proxy is suitable for a complex multi-workload environment. Multiple database proxies provide different entries for accessing the database. This ensures workload isolation and improves resource utilization.

For more information, see [Introduction to RDS for MySQL Database Proxy](#).

For details about region restrictions, see [Constraints on Database Proxy](#).

## Buying a Single Database Proxy

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

Alternatively, on the **Overview** page, expand the details and click **Configure** under **Read/Write Splitting Address**.

**Step 5** On the displayed page, click **Create Database Proxy**.

**Step 6** Configure parameters and click **Next**.

Figure 13-3 Selecting the weighted routing policy

<

Enable Database Proxy

The recommended number of proxy nodes is:  
(Number of vCPUs of the primary DB instance + Number of vCPUs of all read replicas)/(4 x Number of vCPUs of the proxy instances). The result is rounded up.

Billing Mode

Pay-per-use

Routing Policy

Weighted

Load balancing

New Instance Class

General-enhanced

Kunpeng general-enhanced

vCPUs | Memory

2 vCPUs | 4 GB

4 vCPUs | 8 GB

8 vCPUs | 16 GB

DB Instance Specifications

General-enhanced

2 vCPUs | 4 GB

Subnet

default\_subnet(192.168.0.0/24)

View In-Use IP Addresses (Addresses available: 245)

Proxy Nodes

2

The number of read replicas and proxy nodes should be the same. Select 1 proxy node for each read replica.

Figure 13-4 Selecting the load balancing policy

<

Enable Database Proxy

The recommended number of proxy nodes is:  
(Number of vCPUs of the primary DB instance + Number of vCPUs of all read replicas)/(4 x Number of vCPUs of the proxy instances). The result is rounded up.

Billing Mode

Pay-per-use

Routing Policy

Weighted

Load balancing

Read Requests Accepted by Primary DB Instance

Yes

No

New Instance Class

General-enhanced

Kunpeng general-enhanced

vCPUs | Memory

2 vCPUs | 4 GB

4 vCPUs | 8 GB

8 vCPUs | 16 GB

DB Instance Specifications

General-enhanced

2 vCPUs | 4 GB

Subnet

default\_subnet(192.168.0.0/24)

View In-Use IP Addresses (Addresses available: 245)

Proxy Nodes

2

The number of read replicas and proxy nodes should be the same. Select 1 proxy node for each read replica.

**Table 13-2** Parameter description

| Parameter                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Billing Mode                                  | <ul style="list-style-type: none"><li>Only <b>Pay-per-use</b> can be selected for pay-per-use DB instances.</li><li>Either <b>Pay-per-use</b> or <b>Yearly/monthly</b> can be selected for yearly/monthly DB instances. A pay-per-use proxy can be <a href="#">changed to a yearly/monthly proxy</a> later.</li></ul>                                                                                                                                                                                                                                                                                                                                |
| Routing Policy                                | <ul style="list-style-type: none"><li><b>Weighted</b>: You can change the weights of your DB instance and read replicas after read/write splitting is enabled.</li><li><b>Load balancing</b>: This policy is only available if proxy load balancing is enabled. After <b>Load balancing</b> is selected, read requests are automatically distributed to multiple read replicas based on the number of active connections to balance the load among these read replicas.</li></ul> <p>You can change the routing policy after the database proxy is created. For details, see <a href="#">Configuring the Delay Threshold and Routing Policy</a>.</p> |
| Read Requests Accepted by Primary DB Instance | <p>This parameter is only available if <b>Load balancing</b> is selected.</p> <ul style="list-style-type: none"><li><b>Yes</b>: Read requests can be routed to both the primary instance and read replicas.</li><li><b>No</b>: Read requests are routed only to read replicas to offload read pressure from the primary instance.</li></ul>                                                                                                                                                                                                                                                                                                          |
| New Instance Class                            | <p>Select specifications for the proxy instance based on service demands. You can change the specifications after the proxy instance is created. For details, see <a href="#">Changing the Instance Class of a DB Proxy Instance</a>.</p> <p>For details about performance metrics, see <a href="#">Table 18-2</a>.</p>                                                                                                                                                                                                                                                                                                                              |
| Subnet                                        | Select the subnet where the proxy is located.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Proxy Nodes                                   | <p>Enter an integer from 2 to 8. You can change the nodes after the proxy instance is created. For details, see <a href="#">Changing the Number of Proxy Nodes</a>.</p> <p>You are advised to set proxy nodes to the quantity of read replicas, with one proxy node for one read replica.</p>                                                                                                                                                                                                                                                                                                                                                        |

- Read/write splitting maintains database connectivity but splits read and write requests. If read/write splitting is enabled, an additional address called a read/write splitting address is provided. To use read/write splitting, switch your applications to this address.
- Read/write splitting address: You can connect to databases through the read/write splitting address, with read and write requests distributed to different databases automatically.

The read/write splitting address and the floating IP address of the DB instance are in the same VPC and subnet and are independent from each other.

- Delay threshold: You can set the delay threshold after read/write splitting is enabled. For details, see [Configuring Delay Threshold](#).
- DB instances for load balancing: You can select DB instances for load balancing after read/write splitting is enabled.

**Step 7** Confirm the database proxy configuration.

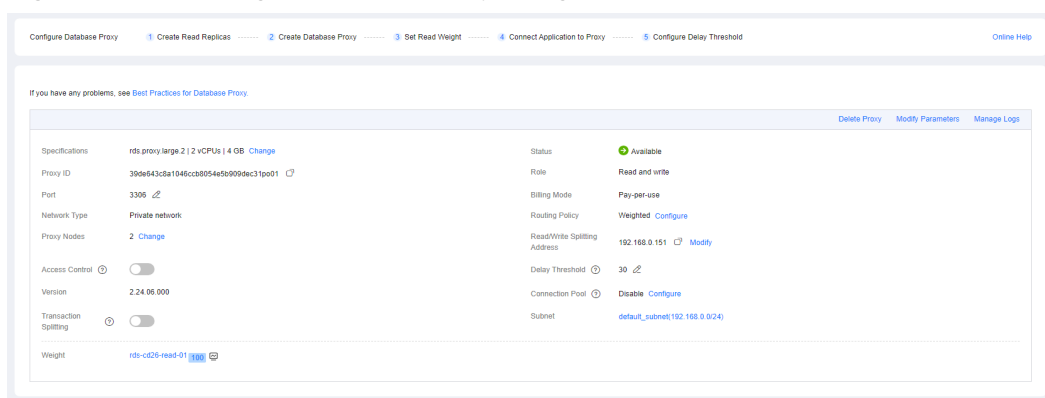
- To modify the configuration, click **Previous**.
- If there is no need to change the settings, click **Submit**.

**Step 8** View and manage the proxy on the **Database Proxy** page.

You can view the read/write splitting address on the **Overview** page. Read and write requests can be split through the read/write splitting address.

The read/write splitting address and the floating IP address of the DB instance are in the same VPC and subnet and are independent from each other.

**Figure 13-5** Viewing the read/write splitting address



----End

## Buying Multiple Database Proxies

**Step 1** Click  in the upper left corner and select a region.

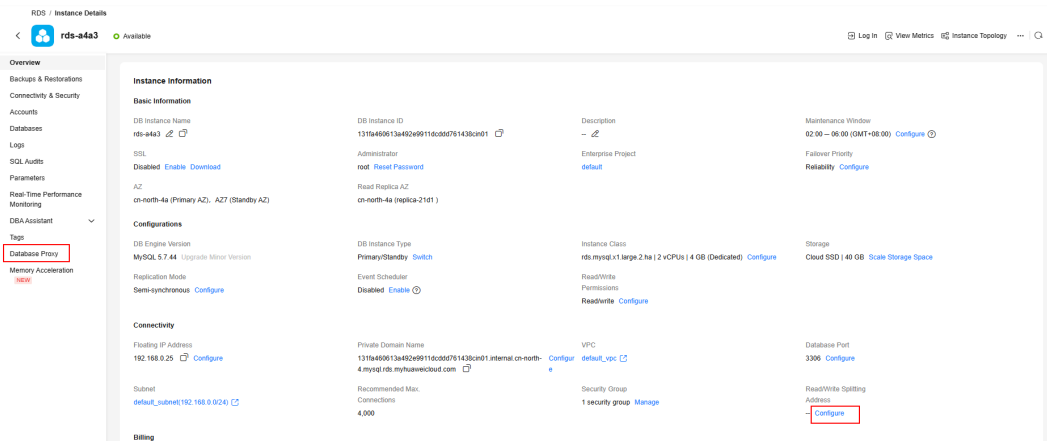
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

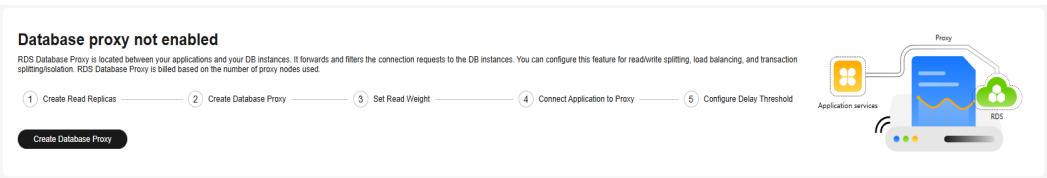
Alternatively, on the **Overview** page, expand the details and click **Configure** under **Read/Write Splitting Address**.

Figure 13-6 Applying for a read/write splitting address



Step 5 On the displayed page, click **Create Database Proxy**.

Figure 13-7 Creating database proxy



Step 6 On the displayed page, set the required parameters and click **Next**.

Figure 13-8 Setting Routing Policy to Weighted

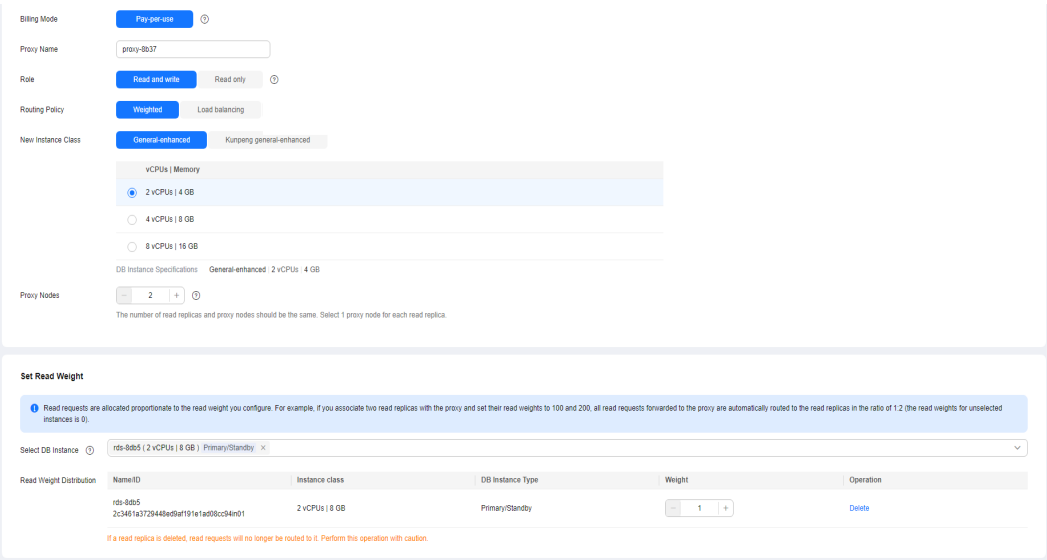


Figure 13-9 Setting Routing Policy to Load balancing

Billing Mode: **Pay per use**

Proxy Name: proxy-8b37

Role: **Read and write**

Routing Policy: **Load balancing**

Read Requests Accepted by Primary DB Instance: **Yes**

New Instance Class: **General-enhanced**

vCPUs | Memory: **2 vCPUs | 4 GB**

DB Instance Specifications: **General-enhanced 2 vCPUs | 4 GB**

Proxy Nodes: **2**

Select DB instances for Load Balancing

Select DB Instance: replica-RB2 (2 vCPUs | 4 GB) Read replica

| DB Instance ID                                 | Instance class | DB Instance Type | Operation |
|------------------------------------------------|----------------|------------------|-----------|
| replica-RB2<br>as79n00eeae40da695da54395637m01 | 2 vCPUs   4 GB | Read replica     | Delete    |

Table 13-3 Parameter description

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Billing Mode   | <ul style="list-style-type: none"><li>Only <b>Pay-per-use</b> can be selected for pay-per-use DB instances.</li><li>Either <b>Pay-per-use</b> or <b>Yearly/monthly</b> can be selected for yearly/monthly DB instances. A pay-per-use proxy can be <b>changed to a yearly/monthly proxy</b> later.</li></ul>                                                                                                                                                                                                                             |
| Proxy Name     | The proxy name must start with a letter and consist of 4 to 64 characters. Only letters (case-sensitive), digits, hyphens (-), and underscores (_) are allowed.                                                                                                                                                                                                                                                                                                                                                                          |
| Role           | <ul style="list-style-type: none"><li><b>Read and write:</b> Read and write requests are split.</li><li><b>Read only:</b> The proxy is not connected to your primary instance and cannot receive write requests.</li></ul>                                                                                                                                                                                                                                                                                                               |
| Routing Policy | <ul style="list-style-type: none"><li><b>Weighted:</b> You can change the weights of your DB instance and read replicas after read/write splitting is enabled.</li><li><b>Load balancing:</b> If selected, to balance the load among read replicas, read requests are automatically distributed to multiple read replicas based on the number of active connections.</li></ul> <p>You can change the routing policy after the database proxy is created. For details, see <b>Configuring the Delay Threshold and Routing Policy</b>.</p> |



| Parameter                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read Requests Accepted by Primary DB Instance | <p>This parameter is available only when <b>Load balancing</b> is selected.</p> <ul style="list-style-type: none"><li>• <b>Yes:</b> Read requests can be routed to both the primary instance and read replicas, which increases the load of the primary instance. Configure this parameter as required.</li><li>• <b>No:</b> Read requests are routed only to read replicas to offload read pressure from the primary instance.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| New Instance Class                            | <p>Select specifications for the proxy instance based on service requirements. You can change the specifications after the proxy instance is created. For details, see <a href="#">Changing the Instance Class of a DB Proxy Instance</a>.</p> <p>For details about performance metrics, see <a href="#">Table 18-2</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Proxy Nodes                                   | <p>Enter an integer from 2 to 8. You can change the nodes after the proxy instance is created. For details, see <a href="#">Changing the Number of Proxy Nodes</a>.</p> <p>You are advised to set proxy nodes to the quantity of read replicas, with one proxy node for one read replica.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Set Read Weight                               | <p>This parameter is only available if <b>Weighted</b> is selected. Select the primary instance and read replicas to which you want to assign weights.</p> <p>Rules for configuring read weights</p> <ul style="list-style-type: none"><li>• Read requests are allocated proportionate to the read weight you configure. For example, if you associate two read replicas with the proxy and set their read weights to 100 and 200, all read requests forwarded to the proxy are automatically routed to the read replicas in the ratio of 1:2 (the read weights for unselected instances is 0).</li><li>• A read replica can be associated with more than one proxy. To balance traffic among the read replicas of your primary instance, set read weights for them based on the existing proxies' weights and on the amount of traffic routed to the read replicas.</li><li>• You can change read weights of the primary instance and read replicas after read/write splitting is enabled. For details, see <a href="#">Configuring the Delay Threshold and Routing Policy</a>.</li></ul> |
| Select DB Instances for Load Balancing        | <p>This parameter is available only when <b>Load balancing</b> is selected. Select the DB instances for load balancing.</p> <p>After <b>Load balancing</b> is selected, the proxy forwards read requests to database nodes with fewer active connections.</p> <p>You can change the DB instances for load balancing after read/write splitting is enabled. For details, see <a href="#">Configuring the Delay Threshold and Routing Policy</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Step 7** Confirm the database proxy configuration.

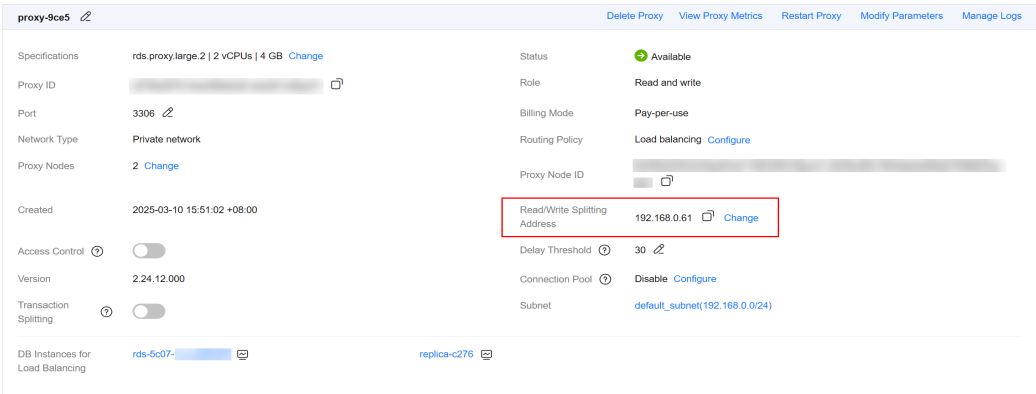
- To modify the configuration, click **Previous**.
- To submit the request, click **Submit**.

**Step 8** View and manage the proxy on the **Database Proxy** page.

You can view the read/write splitting address on the **Overview** page. Read and write requests can be split through the read/write splitting address.

The read/write splitting address and the floating IP address of the DB instance are in the same VPC and subnet and are independent from each other.

**Figure 13-10** Viewing the read/write splitting address



----End

**Step 2: Grant Access Permissions**

Before using a database proxy to connect to an RDS for MySQL instance, ensure that the current database account has the permission to access the proxy address.

You can perform the following steps to check and grant an account the permission to access a proxy address.

**Step 1** Connect to your RDS for MySQL instance by referring to [Instance Connection](#).

**Step 2** Check whether **host** of your account contains a database proxy address.

```
SELECT user,host FROM mysql.user;
```

**Figure 13-11** Checking the host address



If the address is %, the host contains all CIDR blocks.

- Step 3** If the host does not contain the CIDR block where the database proxy is located, grant the remote access permission to the account.

For example, if you want to connect to an RDS for MySQL instance from the IP address range starting with 192.168.0 as the **root** user, you can set **host** of the account to **192.168.%** on the user management page of Data Admin Service (DAS). For details, [Editing a User](#).

**Figure 13-12** Configuring the host IP address

The screenshot shows the 'Basic Information' tab of a user management interface. It includes fields for Username (set to 'root'), Host (set to '192.168.%'), Password, and Confirm Password. Below these are expandable sections for Advanced Settings, Global Permissions, Object Permissions, and Role.

----End

### Step 3: Check Security Group Rules

Ensure that there is an inbound rule that allows access from the proxy address. The default port is **3306**.

- Step 1** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 2** In the navigation pane, choose **Connectivity & Security**. In the **Security Group Rules** area, click the security group name to view the security group rules.
- Step 3** On the **Inbound** tab, check whether access through port **3306** is allowed by default.

If there is no such a rule, click **Add Inbound Rule** or **Allow All IP**.

**Figure 13-13** Adding an inbound rule

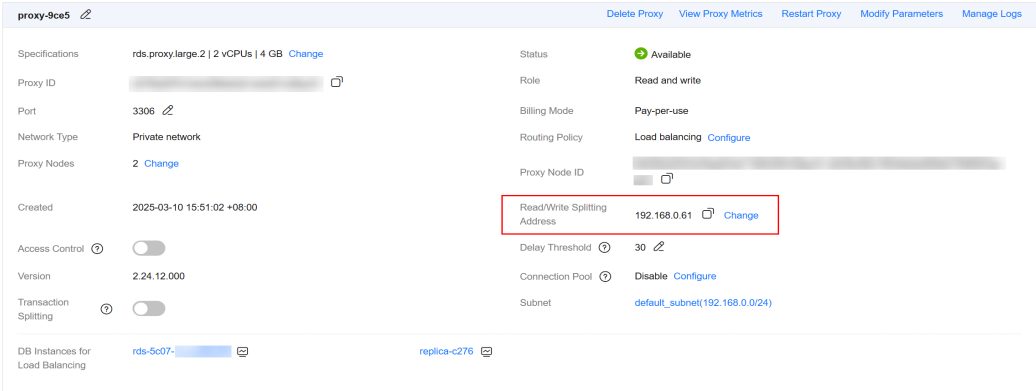
The screenshot shows the 'Add Inbound Rule' dialog box. It includes a title bar with a close button. Below the title is a blue information bar stating: 'An inbound rule allows inbound traffic to instances in the security group.' The 'Security Group' is set to 'default'. The dialog contains a table with columns: Protocol & Port, Type, Source, Description, and Operation. The 'Protocol & Port' row is set to 'Custom TCP' with a dropdown menu showing 'Example: 22 or 22-30'. The 'Type' row is set to 'IPv4'. The 'Source' row is set to 'IP Address' with a dropdown menu showing '0 . 0 . 0 . 0 / 0'. The 'Description' row is empty. The 'Operation' row is set to 'Operation' with a dropdown menu. At the bottom, there is a '+ Add Rule' button and a message: 'You can create 4981 more security group rules. [Increase quota](#)'. At the very bottom are 'OK' and 'Cancel' buttons.

----End

Step 4: Use the Read/Write Splitting Address to Connect to the RDS for MySQL Instance

Step 1 Obtain the read/write splitting address and port by referring to Step 8.

Figure 13-14 Obtaining the read/write splitting address and port



Step 2 Log in to an ECS.

For details, see Logging In to a Linux ECS.

Step 3 Run the following command to connect to the RDS for MySQL instance through the read/write splitting address:

```
mysql -h <host> -P <port> -u <userName> -p
```

Example:

```
mysql -h 192.168.0.61 -P 3306 -u root -p
```

Enter the password of the database account if the following information is displayed:  
Enter password:

Table 13-4 Parameter description

| Parameter  | Description                                                                               |
|------------|-------------------------------------------------------------------------------------------|
| <host>     | The read/write splitting address obtained in Step 1.                                      |
| <port>     | The database port obtained in Step 1.                                                     |
| <userName> | The username of the database administrator account. The default username is <b>root</b> . |

NOTE

When you use a MySQL 8.0 client to access a database proxy, the error message "auth user failed" may be displayed.  
Add **--default-auth=mysql\_native\_password** when connecting to the database.

----End

## Step 5: Verify Read/Write Splitting

You can run the **show last route** command to check the routing result after you perform a read operation.

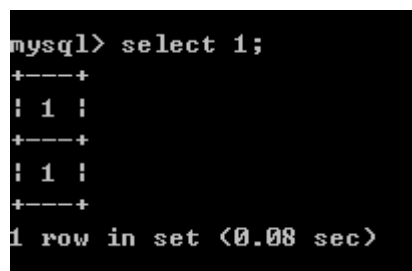
The following uses a read operation as an example to describe how to check the routing result of read requests.

**Step 1** After connecting to your RDS for MySQL instance, perform a read operation.

Example:

```
select 1;
```

**Figure 13-15** Performing a read operation



```
mysql> select 1;
+----+
| 1 |
+----+
| 1 |
+----+
1 row in set (0.08 sec)
```

**Step 2** Run the following command to check the routing result of the read operation in [Step 1](#):

```
show last route;
```

**Figure 13-16** Query result



```
mysql> select 1;
+----+
| 1 |
+----+
| 1 |
+----+
1 row in set (0.08 sec)

mysql> show last route;
+-----+
| LAST ROUTE |
+-----+
| 192.168.120.92 |
+-----+
1 row in set (0.05 sec)
```

The IP address in the command output is the IP address of the node to which the read operation is routed. Read operations are routed to the primary node or read replicas based on the specified [routing policy](#).

### NOTE

Do not include **show last route** in service code or multi-statement requests.

----End

## How Do I Check the IP Addresses of a DB Instance and Its Read Replicas?

- Checking the IP address of the primary node
  - a. On the **Instances** page, click the primary instance name to go to the **Overview** page.
  - b. Expand the details and check the IP address of the primary node under **Floating IP Address**.
- Checking the IP address of a read replica
  - a. On the **Instances** page, click  and then click the target read replica name to go to the **Overview** page.
  - b. Expand the details and check the IP address of the read replica under **Floating IP Address**.

### Related APIs

- [Enabling Database Proxy](#)
- [Querying Database Proxies](#)
- [Querying Database Proxy Specifications](#)
- [Configuring the Routing Policy for a Database Proxy](#)
- [Disabling Database Proxy](#)

## 13.4 Database Proxy Configurations

### 13.4.1 Configuring Transaction Splitting

#### Scenarios

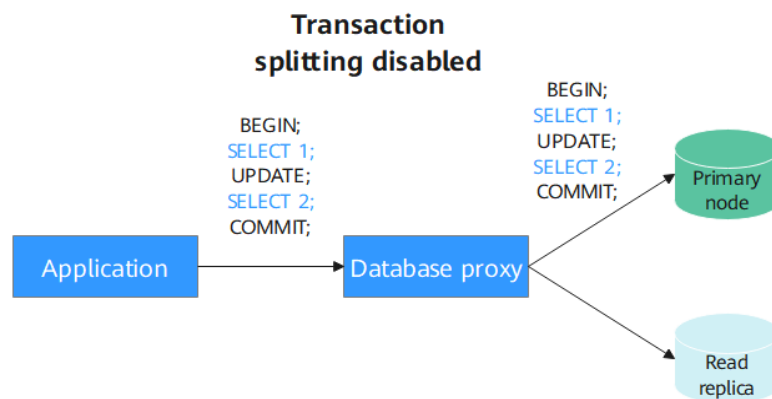
In most cases, an RDS for MySQL proxy instance sends all requests in transactions to the primary DB instance to ensure transaction correctness. However, in some frameworks, all requests are encapsulated into transactions that are not automatically committed using **set autocommit=0**. This causes heavy loads on the primary DB instance.

#### How the Feature Works

Database proxies support transaction splitting. With this feature enabled, RDS can route the read requests prior to write operations in a transaction to read replicas, reducing the pressure of the primary DB instance.

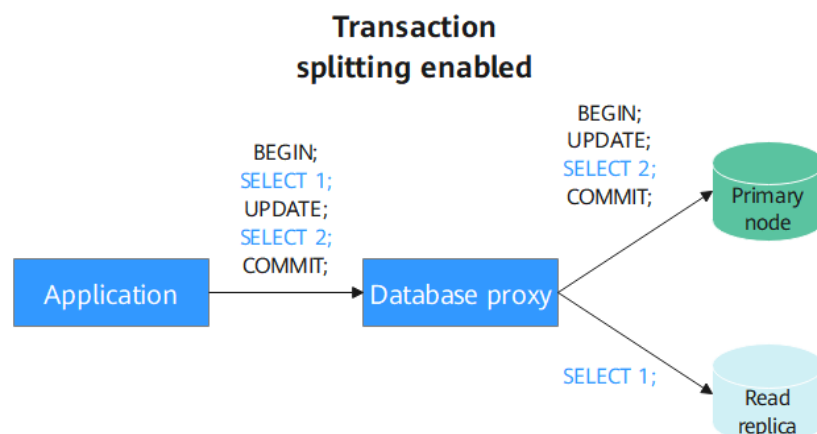
Transaction splitting is disabled by default. If it is enabled under the default READ COMMITTED isolation level, RDS for MySQL only starts a transaction for write operations when automatic commit is disabled. Before the transaction starts, read requests are routed to read replicas through load balancers.

- Transaction splitting disabled  
When transaction splitting is disabled, all requests in a transaction are routed to the primary node to guarantee read/write consistency.



- Transaction splitting enabled

After this function is enabled, the database proxy distributes all read requests before the first write in a transaction to read replicas. This reduces the load on the primary node.



## Precautions

- Enabling transaction splitting affects global consistency of certain workloads. Before enabling this feature, evaluate its impact on your workloads.
- All proxies of your DB instance must be in the **Available** state.
- Before enabling transaction splitting, you need to upgrade the database proxy to the latest version because the transaction processing logic has been optimized in the latest version.
- After transaction splitting is enabled, read requests of the transactions committed using **BEGIN** cannot be routed to read replicas.

## Configuring Transaction Splitting

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the primary instance name.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

**Step 5** On the displayed page, click  next to **Transaction Splitting**.

**Step 6** In the displayed dialog box, click **Yes**.

----End

## 13.4.2 Configuring Connection Pools

### Scenarios

A session-level connection pool is suitable for short connections. A session-level connection pool helps reduce the database load caused by frequent setup of short connections.

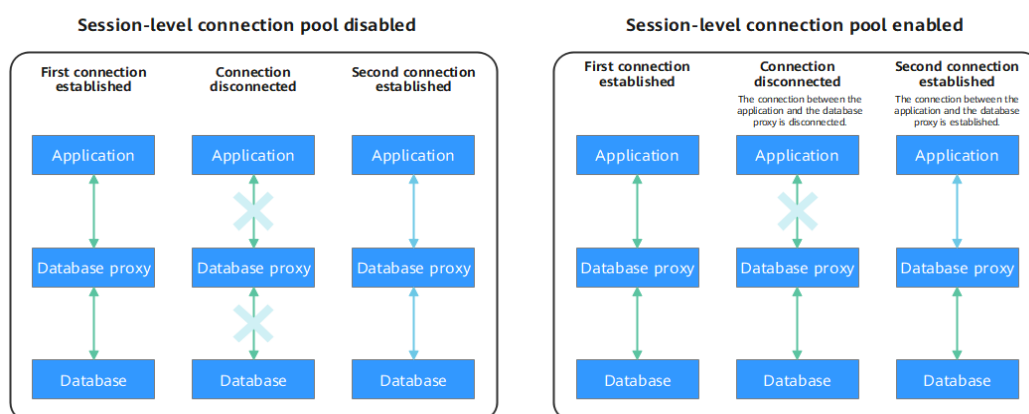
Connection Pool is disabled by default. You can enable a session-level connection pool.

### How a Session-Level Connection Pool Works

When your client disconnects from your database, RDS checks whether the connection is idle. If it is, RDS places the connection in the connection pool and retains the connection for a short period of time.

When your client re-initiates a connection, any available connection in the connection pool is used, reducing the overhead of establishing a new connection to the database. If no connections are available in the connection pool, a new connection will be established.

A session-level connection pool helps reduce the database load caused by frequent setup of short connections.



### Constraints

- Only RDS for MySQL 8.0 and 5.7 support the connection pool function. For details about how to query the instance version, see [Query the RDS Instance Version](#).
- All proxies of your DB instance must be in the **Available** state.
- This function is incompatible with Application Lossless and Transparent (ALT). If ALT is enabled, the connection pool becomes invalid.

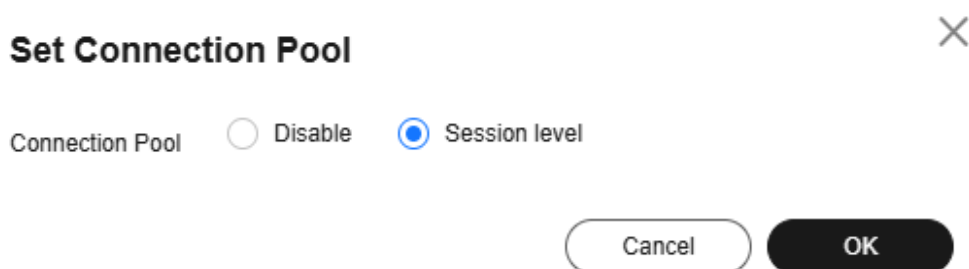


- When any of the following operations is performed, the connection is locked until the connection ends. That is, the connection will not be placed in the connection pool for other users to use.
  - Running the **PREPARE** statement
  - Creating a temporary table
  - Modifying user variables
  - Inserting or querying big data (for example, more than 16 MB)
  - Running the LOCK TABLE statement
  - Executing a multi-statement query (concatenated SQL statements with semicolons, for example, SELECT 1;SELECT 2)
  - Calling a stored procedure

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** On the displayed page, click **Configure** next to **Connection Pool**.
- Step 6** Set **Connection Pool** to **Session level** and click **OK**.

Figure 13-17 Configuring connection pool



-----End

### 13.4.3 Modifying Read/Write Splitting Parameters

#### Scenarios

After read/write splitting is enabled, you can modify proxy parameters, for example, **multiStatementType**.

## Constraints

- To change the value of **multiStatementType**, the proxy version must be 2.22.11.000 or later. To find the proxy kernel version, go to the proxy instance details page.
- All proxies of your DB instance must be in the **Available** state.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** On the displayed page, click **Modify Parameters** in the proxy information area.
- Step 6** Change the parameter value and click **OK**.

**multiStatementType** is not available for read-only proxies.

- **Strict** (default): After a multi-statement request is sent to the primary instance, the read/write splitting of the current connection becomes unavailable and all subsequent requests are routed to the primary instance.
- **Loose**: After a multi-statement request is sent to the primary instance, the read/write splitting of the current connection still works.
- **Parse**: After a multi-statement request is sent to the primary instance, the request is parsed to determine whether to split subsequent read and write requests.

-----End

### 13.4.4 Configuring the Delay Threshold and Routing Policy

After read/write splitting is enabled and read replicas are created, you can configure the delay threshold and routing policy as required.

**Table 13-5** Read/write splitting parameters

| Parameter                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delay Threshold          | <p>The maximum delay for data to be synchronized from primary DB instances to read replicas. This parameter works only with instances that have read replicas. If a read replica's delay goes beyond the configured limit, read requests will not be forwarded to this read replica to prevent prolonged data mismatches with the primary DB instance. This happens no matter what read weight the read replica has.</p> <p>When read/write splitting is enabled, the default delay threshold is 30s and the default value range is 0–7,200s. It is recommended that the threshold be greater than or equal to 30s. Traffic is not allocated to read replicas whose delay exceeds the configured threshold.</p>        |
| Read Weight Distribution | <p>After read/write splitting is enabled, you can configure read weights for the primary DB instance and read replicas. If no read replicas are selected for the database proxy, read/write splitting cannot be used.</p> <p>The read weight ranges from 1 to 1,000. Read replicas with higher read weight distributions process more read requests. For example, if the read weights distributed to one primary DB instance and four read replicas are 0, 100, 200, 500, and 300, respectively, the primary DB instance does not process any read requests (write requests are still automatically routed to the primary DB instance) while the four read replicas process read requests with a ratio of 1:2:5:3.</p> |

## Constraints

All proxies of your DB instance must be in the **Available** state.

## Configuring Delay Threshold

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** In the proxy information area, click  next to the **Delay Threshold** field.

----End

## Configuring Routing Policy in Single-Proxy Mode

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the primary instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** If proxy load balancing is not enabled, click **Configure** next to the **Routing Policy** field in the proxy information area. In the displayed dialog box, configure read weights for the primary instance and read replicas.

### NOTE

- The system automatically distributes weights to read replicas, including read replicas created afterwards, according to the default distribution rules. If a read replica breaks down or is deleted, the weight is automatically removed. After the read replica recovers, the weight is automatically restored.
- If the weight of a node is set to **0**, read requests will not be routed to the node. If the weights of all nodes are set to **0**, read requests will be randomly routed to these nodes.
- Forcible routing is also supported. For details, see [Adding a Hint to Specify the Direction that a SQL Statement Will Be Routed](#).

Figure 13-18 Setting read weight

Configure Routing Policy

1

Read requests are allocated proportionate to the read weight you configure. For example, if you associate two read replicas with the proxy and set their read weights to 100 and 200, all read requests forwarded to the proxy are automatically routed to the read replicas in the ratio of 1:2 (the read weights for unselected instances is 0).

Routing Policy

Weighted

Load balancing

Select DB Instance

rds-cd26-read-01 ( 2 vCPUs | 4 GB ) Read replica

Read Weight Distribution

| Name/ID                                | Instance class | DB Instance Type | Weight                                            | Operation         |
|----------------------------------------|----------------|------------------|---------------------------------------------------|-------------------|
| rds-cd26-read-01<br>7d9ed18029914d0181 | 2 vCPUs   4 GB | Read replica     | <div><div>−</div><div>100</div><div>+</div></div> | <div>Delete</div> |

If a read replica is deleted, read requests will no longer be routed to it. Perform this operation with caution.

OK

Cancel

**Step 6** Click **OK** and view the weights on the **Database Proxy** page.

**Step 7** If proxy load balancing is enabled, click **Configure** next to the **Routing Policy** field in the proxy information area. In the displayed dialog box, set required parameters.

Select **Load balancing** as the routing policy. Read requests will be automatically distributed to read replicas based on the number of active connections to balance the load among these read replicas.

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**Figure 13-19** Routing policy - Load balancing

**Configure Routing Policy** ✕

**1** If Load Balancing is selected, the proxy forwards read requests to database nodes with fewer active connections. Setting Read Requests Accepted by Primary DB Instance to Yes will allow RDS to forward read requests to your primary DB instance, which increases pressure on the instance. If there are no read replicas available, setting Read Requests Accepted by Primary DB Instance to No will allow RDS to forward read requests to your primary DB instance.

Routing Policy: Weighted **Load balancing**

Read Requests Accepted by Primary DB Instance: **Yes** No

Select DB Instance ?: rds-cd26-read-01 ( 2 vCPUs | 4 GB ) Read replica ✕ ▼

DB Instances for Load Balancing

| Name/ID                                | Instance class | DB Instance Type | Operation              |
|----------------------------------------|----------------|------------------|------------------------|
| rds-cd26-read-01<br>7d9ed18029914d018c | 2 vCPUs   4 GB | Read replica     | <a href="#">Delete</a> |

OK Cancel

**Read Requests Accepted by Primary DB Instance:**

- **Yes:** Read requests can be routed to both the primary instance and read replicas, which increases the load of the primary instance. Configure this parameter as required.
- **No:** To offload read pressure from the primary instance, read requests are only routed to read replicas.

**Step 8** Click **OK**. On the **Database Proxy** page, view the result. You can select the instances for load balancing as required.

----End

**Configuring Routing Policy in Multi-Proxy Mode**

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the primary instance name.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

**Step 5** In the proxy information area, click **Configure** next to the **Routing Policy** field. In the displayed dialog box, set required parameters.

- **Weighted:** You can distribute read weights for the DB instance and read replicas. For details, see [Table 13-5](#).

 NOTE

The system automatically distributes weights to read replicas, including read replicas created afterwards, according to the default distribution rules. If a read replica breaks down or is deleted, the weight is automatically removed. After the read replica recovers, the weight is automatically restored.

Forcible routing is also supported. For details, see [Adding a Hint to Specify the Direction that a SQL Statement Will Be Routed](#).

Figure 13-20 Weighted

Configure Routing Policy

Read requests are allocated proportionate to the read weight you configure. For example, if you associate two read replicas with the proxy and set their read weights to 100 and 200, all read requests forwarded to the proxy are automatically routed to the read replicas in the ratio of 1:2 (the read weights for unselected instances is 0).

Routing Policy

Weighted

Load balancing

Select DB Instance

replica-eb92 ( 2 vCPUs | 4 GB ) Read replica

Read Weight Distribution

| Name/ID                             | Instance class | DB Instance Type | Weight                                            | Operation              |
|-------------------------------------|----------------|------------------|---------------------------------------------------|------------------------|
| replica-eb92<br>5b0d426d5c284c10882 | 2 vCPUs   4 GB | Read replica     | <div><div>-</div><div>100</div><div>+</div></div> | <a href="#">Delete</a> |

If a read replica is deleted, read requests will no longer be routed to it. Perform this operation with caution.

OK

Cancel

Click **OK** and view the weights in the proxy information area.

Figure 13-21 Viewing weights

Specifications

Instance type

Instance class

Proxy ID

Port

Network Type

Proxy Nodes

Access Control

Version

Transaction Splitting

Weight

replica-eb92 100

Status

Role

Billing Mode

Routing Policy

Read/Write Splitting

Address

Delay Threshold

Connection Pool

Subnet

Available

Read and write

Pay-per-use

Weighted

192.168.0.41

30

Disable

default\_subnet(192.168.0.0/24)

- Load balancing:** If selected, to balance the load among read replicas, read requests are automatically distributed to multiple read replicas based on the number of active connections.

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Figure 13-22 Load balancing

Configure Routing Policy

If Load Balancing is selected, the proxy forwards read requests to database nodes with fewer active connections. Setting Read Requests Accepted by Primary DB Instance to Yes will allow RDS to forward read requests to your primary DB instance, which increases pressure on the instance. If there are no read replicas available, setting Read Requests Accepted by Primary DB Instance to No will allow RDS to forward read requests to your primary DB instance.

Routing Policy

Weighted

Load balancing

Read Requests Accepted by Primary DB Instance

Yes

No

Select DB Instance

replica-eb92 ( 2 vCPUs | 4 GB ) Read replica

DB Instances for Load Balancing

| Name/ID                              | Instance class | DB Instance Type | Operation |
|--------------------------------------|----------------|------------------|-----------|
| replica-eb92<br>5b0d426d5c284c10882f | 2 vCPUs   4 GB | Read replica     | Delete    |

OK

Cancel

In the **Select DB Instance** drop-down list, select the instances for load balancing.

**NOTE**

To add new read replicas for load balancing, select the read replicas from the **Select DB Instance** drop-down list and click **OK**.

Click **OK** and view DB instances for load balancing in the proxy information area.

Figure 13-23 Viewing DB instances for load balancing

Specifications

rds proxy large arm 2 | 2 vCPUs | 4 GB

Change

Proxy ID

707a18c14a4740d8890cd3582917a6adpo01

Port

3306

Network Type

Private network

Proxy Nodes

2

Change

Access Control

Version

2.24.03.000

Transaction Splitting

Status

Available

Role

Read and write

Billing Mode

Pay-per-use

Routing Policy

Load balancing

Configure

Read/Write Splitting Address

192.168.0.41

Modify

Delay Threshold

30

Connection Pool

Disable

Configure

Subnet

default\_subnet/192.168.0.0/24

DB Instances for Load Balancing

rds-ef72

replica-eb92

----End

**Adding a Hint to Specify the Direction that a SQL Statement Will Be Routed**

Add hints at the beginning of SQL statements to specify where a statement will be routed.

- If you add **/\*FORCE\_MASTER\*/**, the statement will be forcibly routed to the primary node.
- If you add **/\*FORCE\_SLAVE\*/**, the statement will be forcibly routed to a read replica.

In addition to the weight distribution of read/write splitting, hints are a useful type of SQL syntax that allows you to specify whether a SQL statement is executed on the primary DB instance or on a read replica.

Hints are only suggestions for routing and cannot force non-read-only SQL statements or statements within transactions to be routed to read replicas.

## 13.4.5 Enabling or Disabling Access Control

If load balancing is enabled for a database proxy instance, the security group associated with the proxy instance does not apply. You need to use access control to grant access from specific IP addresses.

### Constraints

If access control is not displayed on the RDS console, the security group associated with the proxy instance is used.

### Enabling Access Control

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** On the **Database Proxy** page, in the proxy information area, click  next to the **Access Control** field.
- Step 5** Click **Configure**. In the displayed dialog box, set the access control mode and IP addresses or CIDR blocks.
  - **Access Control:** The blocklist and allowlist cannot be configured at the same time. If you switch between lists, your previously entered settings will be lost. IP addresses or CIDR blocks in the blocklist are not allowed to access proxy instances.
  - **IP Address or CIDR Block:** Enter valid IP addresses or CIDR blocks that meet the following requirements:
    - Each line contains an IP address or a CIDR block and ends with a line break.
    - Each IP address or CIDR block can include a description separated by a vertical bar symbol (|), for example, 192.168.10.10|RDS01. The description can include up to 50 characters but cannot contain angle brackets (<>).
    - Up to 300 IP addresses or CIDR blocks can be added.



**Figure 13-24** Configuring access control

**Configure Access Control**

Access ☒ Blocklist ☐ Allowlist

Control IP addresses or CIDR blocks in the blocklist are not allowed to access proxy instances.

IP Address or CIDR Block

Example: 192.107.0.1|proxy

OK Cancel

-----End

## Disabling Access Control

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** On the **Database Proxy** page, in the proxy information area, click  next to the **Access Control** field.

-----End

## 13.4.6 Changing the Read/Write Splitting Address

### Scenarios

After database proxy is enabled, applications access the database through the read/write splitting address. This section describes how to change the read/write splitting address, if needed.

## Precautions

Changing the read/write splitting address will interrupt database connections and services. Therefore, change the read/write splitting address during off-peak hours or when services are stopped.

## Constraints

The new IP address is not in use and must be in the same subnet as the RDS for MySQL instance.

## Procedure

You can change the read/write splitting address for DB instances with read/write splitting enabled.

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 4** Click **Database Proxy** in the navigation pane on the left. On the displayed page, click **Modify** next to the **Read/Write Splitting Address** field.

**Figure 13-25** Read/write splitting area (single-proxy)

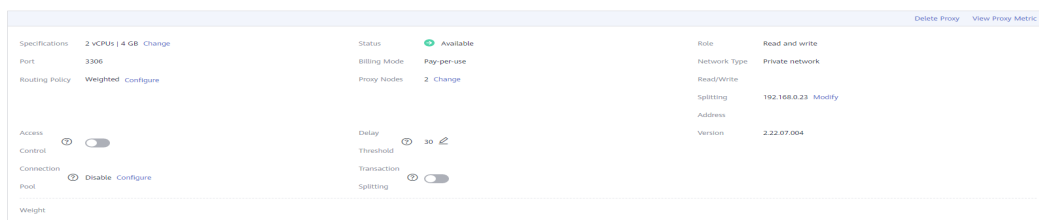
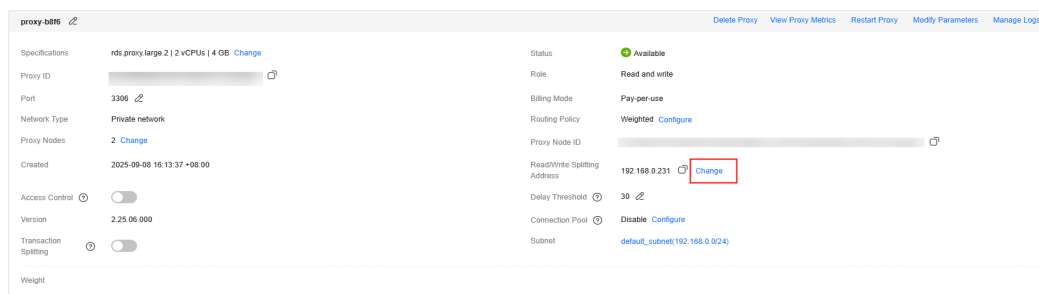


**Figure 13-26** Read/write splitting area (multi-proxy)



- Step 5** In the displayed dialog box, enter a new address. Click **OK**.

In-use IP addresses cannot be used as read/write splitting addresses.

**Figure 13-27** Changing the read/write splitting address

### Change Read/Write Splitting Address ✕

Changing the read/write splitting IP address will interrupt database connections. Perform this operation during off-peak hours.

New Read/Write Splitting Address

In-use IP addresses cannot be used as read/write splitting addresses.

In-Use IP Addresses

| IP Address   | Used By        |
|--------------|----------------|
| 192.168.0.1  | Gateway        |
| 192.168.0.14 | ECS IP Address |
| 192.168.0.16 | In-use         |
| 192.168.0.17 | Others         |
| 192.168.0.18 | ECS IP Address |
| 192.168.0.24 | Others         |

Total Records: 33

10 ▾

< 1 2 3 4 >

Cancel

OK

-----End

## 13.4.7 Applying for and Changing a Private Domain Name for a Database Proxy

### Scenarios

After a database proxy is created, you can apply for a private domain name for it and change the domain name later as needed.

### Precautions

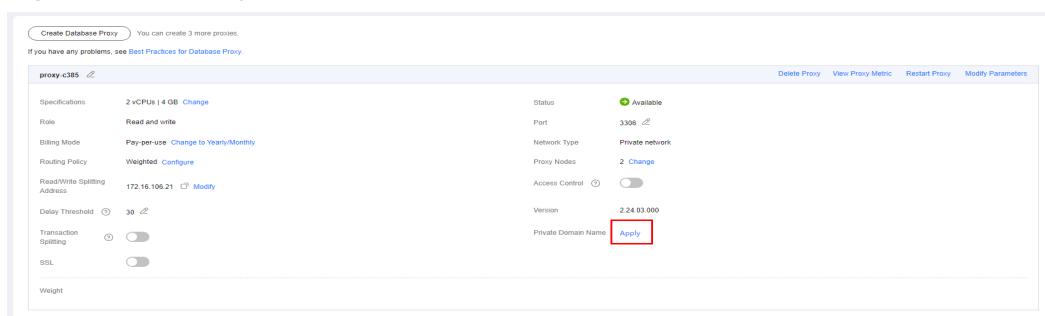
- To use a private domain name for a database proxy, you need to [submit a service ticket](#) to request required permissions.

- The private domain name must be unique in a given region.
- Changing the private domain name for a database proxy will interrupt your database connection. To reconnect to the proxy, change the connection address of your applications. The new private domain name is applied to the proxy about 5 minutes after the change.

## Applying for a private domain name

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** In the proxy information area, click **Apply** next to the **Private Domain Name** field.

Figure 13-28 Proxy information



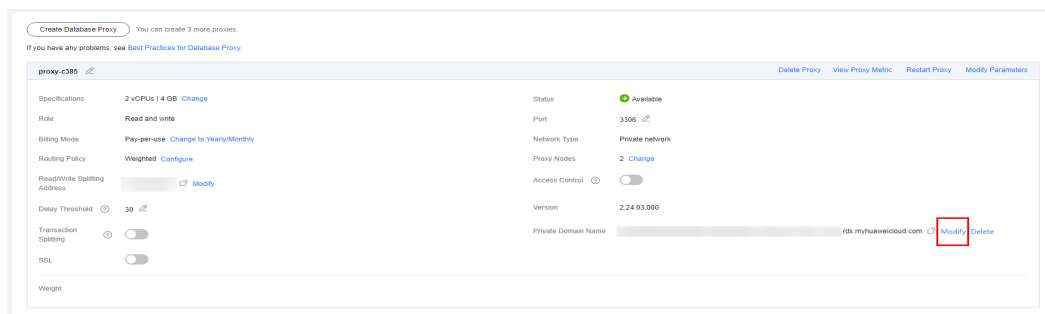
- Step 6** In the displayed dialog box, click **OK**.

----End

## Changing a Private Domain Name

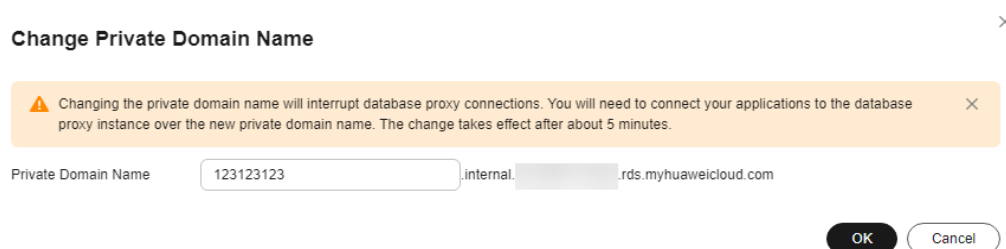
- Step 1** On the **Instances** page, click the DB instance name.
- Step 2** In the navigation pane on the left, choose **Database Proxy**.
- Step 3** In the proxy information area, click **Change** next to the **Private Domain Name** field.

Figure 13-29 Proxy information



- Step 4** In the displayed dialog box, enter a new domain name and click **OK**.
- Only the prefix of the private domain name can be modified.
  - The prefix of a private domain name contains 8 to 63 characters, and can include only lowercase letters and digits.
  - The new private domain name must be different from any existing ones.

**Figure 13-30** Changing a private domain name



- Step 5** If the private domain name is no longer needed, click **Delete** next to the **Private Domain Name** field.

-----End

## 13.4.8 Changing the Read/Write Splitting Port

### Scenarios

After read/write splitting is enabled, you can change the read/write splitting port as needed.

### Constraints

- Changing the proxy port number interrupts the database connection. You are advised to change the port number during off-peak hours.
- The read/write splitting port can be changed only for ELB proxies.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** On the displayed page, click  next to the **Port** field.

A database proxy can use a port ranging from 1024 to 65535, excluding 12017, 33071, and 1033, which are used by RDS.

- To submit the change, click .

- In the displayed dialog box, click **OK**.  
Changing the proxy port number interrupts the database connection. You are advised to change the port number during off-peak hours.
- To cancel the change, click **Cancel**.
- To cancel the change, click .

----End

## 13.4.9 Changing the Number of Proxy Nodes

### Scenarios

After read/write splitting is enabled, you can change the number of proxy nodes as required.

### Prerequisites

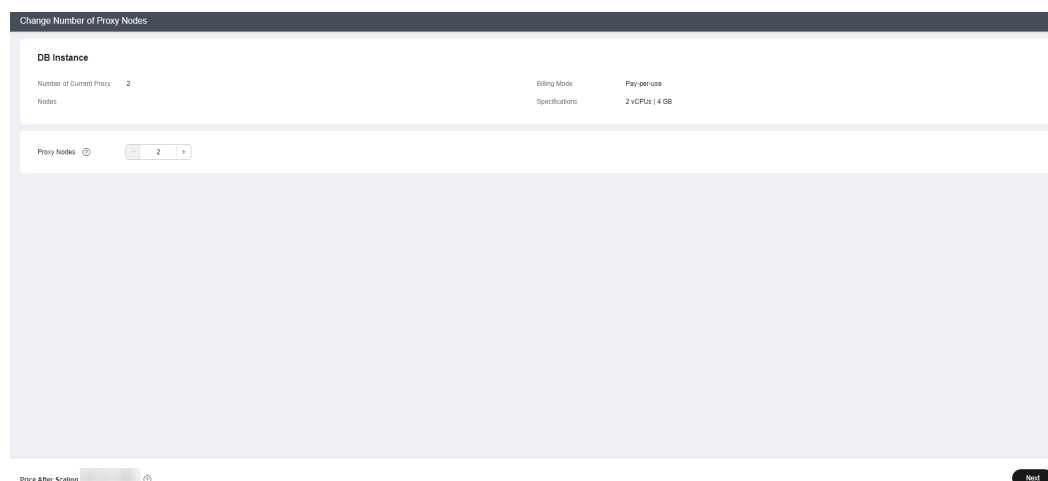
- Read/write splitting has been enabled.
- The primary instance, read replicas, and database proxies must be all available if you want to change nodes of ELB proxies.

### Constraints

- The number of proxy nodes ranges from 2 to 8.
- Only one order can be created at a time for changing the instance classes or nodes of multiple yearly/monthly proxies of the same DB instance.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name.
- Step 4** In the proxy information area on the **Database Proxy** page, click **Change** next to the **Proxy Nodes** field.
- Step 5** Set the number of proxy nodes and click **Next**.

**Figure 13-31** Changing the number of proxy nodes

**Step 6** Confirm the settings and click **Submit**.

----End

## 13.4.10 Changing the Instance Class of a DB Proxy Instance

### Scenarios

You can change the instance class (vCPU or memory) of a DB proxy instance as required. If the DB instance status changes from **Changing proxy instance class** to **Available**, the change was successful.

### Constraints

- You can change the instance class of a DB proxy instance only when the statuses of your primary DB instance, read replicas, and DB proxy instance are **Available**.
- A DB proxy instance cannot be deleted when its instance class is being changed.
- Changing the instance class of a DB proxy instance will cause the instance to reboot. Therefore, perform the operation during off-peak hours.
- Only one order can be created at a time for changing the instance classes or nodes of multiple yearly/monthly proxies of the same DB instance.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

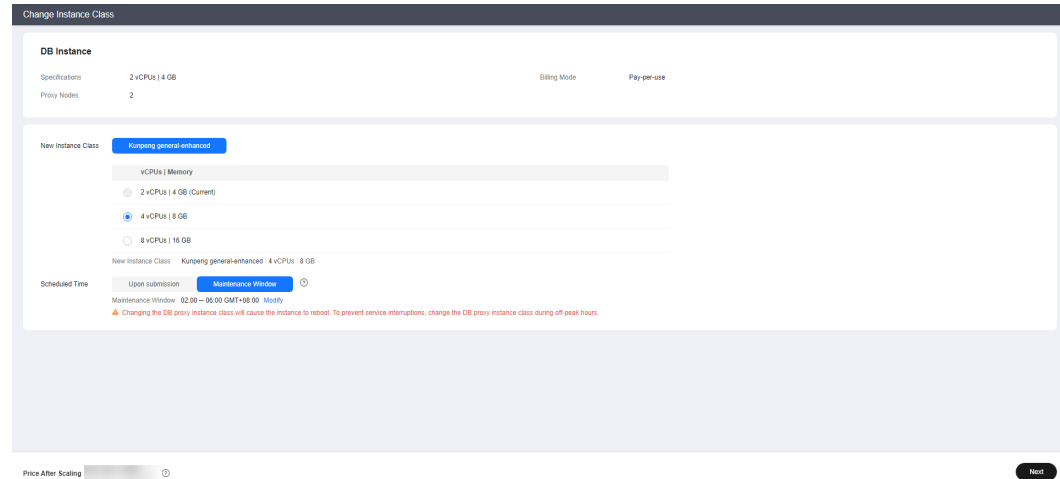
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name.

**Step 4** Choose **Database Proxy** from the navigation pane on the left. In the proxy information area, click **Change** next to the **Specifications** field.

For pay-per-use DB proxy instances, configure **New Instance Class** and **Scheduled Time** on the **Change Instance Class** page, and then click **Next**.

Figure 13-32 Changing a DB proxy instance class



- You can change the DB proxy instance class if required.
- Changing the DB proxy instance class will cause the instance to reboot. To prevent service interruptions, change the DB proxy instance class during off-peak hours.
- If you have selected **Maintenance Window** for **Scheduled Time**, the DB proxy instance will be rebooted during the instance class change time and services will be interrupted. To prevent service interruptions, you are advised to set the maintenance window to off-peak hours. For details, see [Changing the Maintenance Window](#).

**Step 5** Confirm the specifications.

- If you need to modify your settings, click **Previous**.
- For pay-per-use DB proxy instances, click **Submit**.

To view the cost incurred by the DB instance class change, choose **Billing & Costs > Bills** in the upper right corner.

**Step 6** View the instance class change result.

Changing the DB proxy instance class takes 13–15 minutes. During this period, the status of the primary DB instance on the **Instances** page is **Changing proxy instance class**. After a few minutes, view the proxy instance class on the **Database Proxy** page to check that the change is successful.

-----End

## 13.4.11 Configuring Multi-Statement Processing Modes

### Scenarios

You can configure the way how database proxies process [multiple statements](#) as needed.



## Multi-Statement Processing Modes

- **Strict** (default): If a request containing multiple statements is routed to the primary instance, the subsequent read and write requests sent over the same connection are all routed to the primary instance. Read/write splitting can be restored only after you disconnect your connection to the DB instance and re-establish it. Your database proxy will not parse these statements, so the **Strict** mode is suitable when short connections are used or there is no connection reuse.
- **Loose**: If a request containing multiple statements is routed to the primary instance, the subsequent requests sent over the current connection can still be routed to the primary instance or read replicas. Your database proxy will not parse these statements, so **Loose** is recommended when multiple statements contain only DML SQL statements and do not contain operations like setting session variables, creating temporary tables, creating stored procedures, or executing uncommitted transactions.
- **Parse**: A read-only request containing multiple statements is routed based on weights. A read/write request containing multiple statements is routed to the primary instance, and the database proxy parses these statements and determines whether to split subsequent read and write requests received over the current connection based on the operations in the SQL statements (**Parse Mode**). Parsing a multi-statement request consumes more resources. The impact on proxy performance depends on the length and complexity of the statements, so it is recommended that the statements be less than 100 MB.

## Parse Mode

If a multi-statement request contains any of the following operations, all subsequent requests are routed to the primary instance. To restore read/write splitting, you need to disconnect the connection and then re-establish it.

- Creating temporary tables
- Creating stored procedures
- Executing uncommitted transactions (For example, **begin** is executed but **commit** or **rollback** is not executed.)
- Executing complex or special syntax (In this case, parsing these statements will fail.)

Changing the multi-statement processing mode applies to your proxy immediately. You do not need to reboot the proxy. If read/write splitting is invalid on the connection over which the proxy has processed a multi-statement request, changing the multi-statement processing mode will not restore read/write splitting on this connection. You need to re-establish it.

## 13.4.12 Changing a Proxy from Pay-per-Use to Yearly/Monthly

### Scenarios

If you want to use a pay-per-use proxy created for a yearly/monthly DB instance for a long time, you can change the proxy from pay-per-use to yearly/monthly to reduce costs.

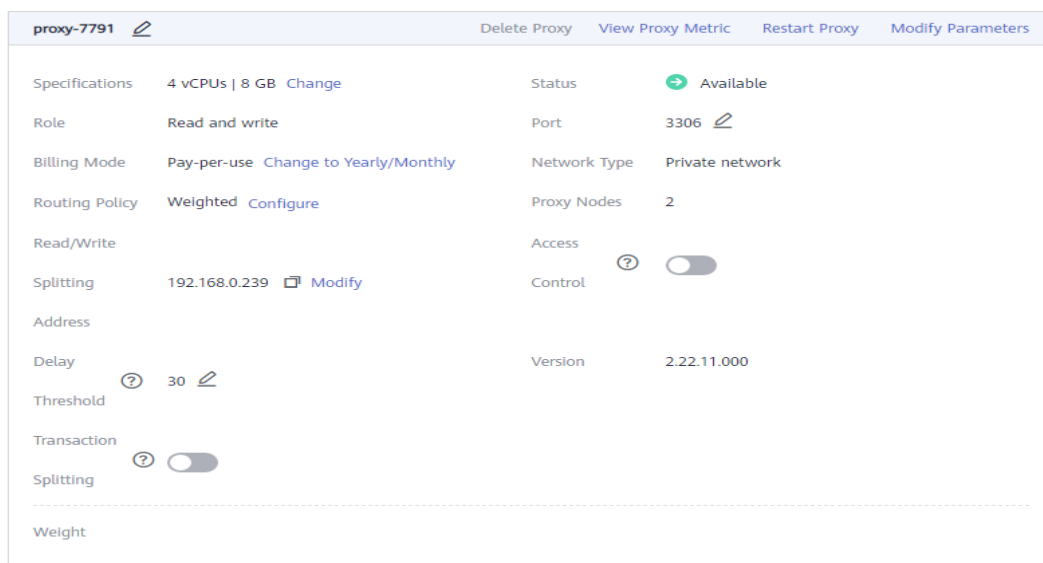
## Constraints

- Enabling database proxy
  - Only pay-per-use proxies can be created for pay-per-use DB instances.
  - Either pay-per-use or yearly/monthly proxies can be created for yearly/monthly DB instances.
    - The expiration time of yearly/monthly proxies is the same as that of the yearly/monthly DB instance by default.
    - If auto-renewal is enabled for the yearly/monthly DB instance, it is also enabled for the proxies by default.
- Changing the billing mode
  - To change a proxy from pay-per-use to yearly/monthly, you need to [submit a service ticket](#) to apply for required permissions.
  - Pay-per-use proxies in HA mode cannot be changed to yearly/monthly.

## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the name of the target yearly/monthly instance.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** In the proxy information area, click **Change to Yearly/Monthly** next to the **Billing Mode** field.

**Figure 13-33** Proxy information area



- Step 6** On the displayed page, confirm the information and click **Submit**.

----End

## 13.4.13 Configuring Binlog Pulling

### Scenarios

After binlog pulling is enabled, you can pull binlogs through database proxies.

You can choose to pull binlogs from the primary instance or read replicas by toggling on or off the **Pull Binlogs from Primary** switch.

### Constraints

- To use this function, you need to [submit a service ticket](#) to request required permissions.
- Binlogs can be pulled only when the statuses of your primary DB instance, read replicas, and proxy instance are all **Available**.
- The proxy kernel version must be 2.25.06.000 or later.
- If your proxy does not support binlog pulling, the **Pull Binlogs** option is not displayed on the console.
- Whether to pull binlogs from the primary DB instance:
  - Read-only proxies do not support **Pull Binlogs from Primary**. They pull binlogs from read replicas by default.
  - If you want to pull binlogs from read replicas, set read replica weights for your proxy. If no weight is set, binlogs cannot be pulled from read replicas.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

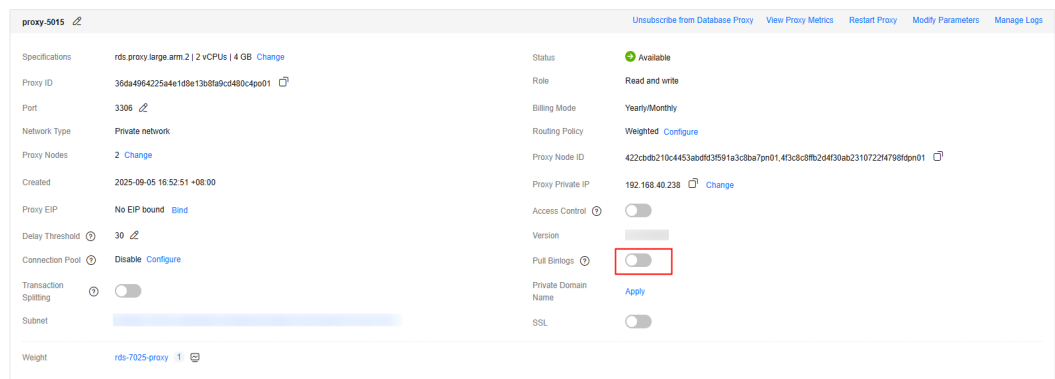
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the primary instance name to go to the **Overview** page.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

**Step 5** On the displayed page, click  next to the **Pull Binlogs** field.

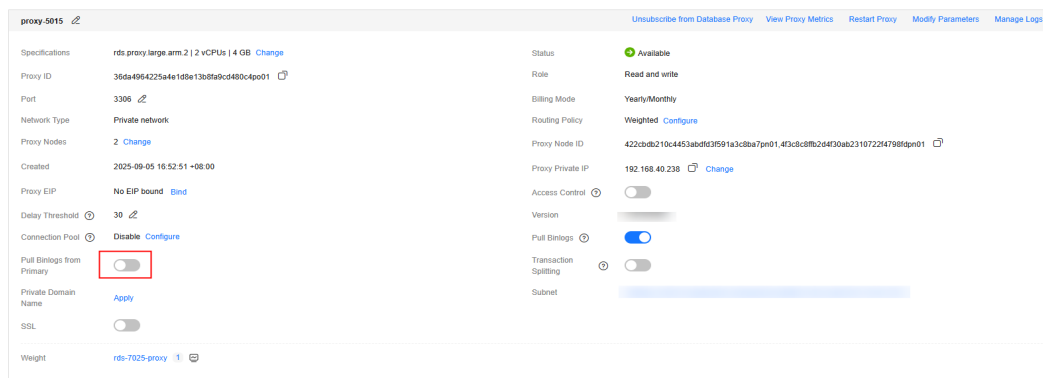
**Figure 13-34** Enabling binlog pulling



**Step 6** For read/write proxies, after **Pull Binlogs** is enabled, click  next to the **Pull Binlogs from Primary** field.

- If this function is enabled, binlogs are pulled from the primary instance.
- If this function is disabled, binlogs are pulled from read replicas.

**Figure 13-35** Enabling Pull Binlogs from Primary



----End

## 13.5 Database Proxy Lifecycle

### 13.5.1 Restarting a Database Proxy

#### Scenarios

After read/write splitting is enabled, you can restart the database proxy when necessary.

#### Constraints

Restarting the proxy interrupts the database connection, so restart it during off-peak hours.

#### Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** In the instance list, click the target instance name to go to the **Overview** page.

**Step 4** In the navigation pane on the left, choose **Database Proxy**.

**Step 5** In the proxy information area, click **Restart Proxy**.

**Step 6** In the displayed dialog box, click **OK**.

----End

## 13.5.2 Disabling Read/Write Splitting

### Scenarios

You can disable read/write splitting as required. If the multi-proxy function is enabled, you can delete the proxy.

### Constraints

- If the database proxy is disabled, read/write splitting is also disabled and services using the read/write splitting address are interrupted. You need to switch your applications to the instance address.
- After read/write splitting is disabled, read replicas are still be billed. You can release them if they are not required for your workloads anymore.

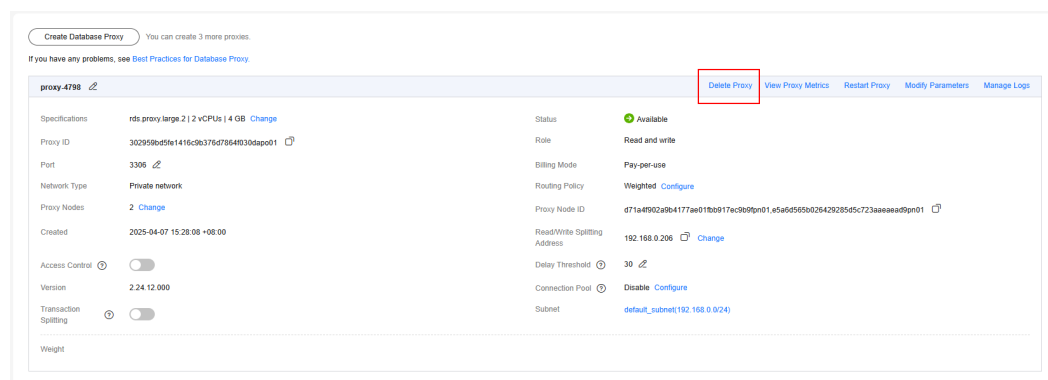
### Billing

After a database proxy is deleted, it is no longer billed.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the instance list, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** In the proxy instance area, click **Delete Proxy**.

Figure 13-36 Proxy instance area



- Step 6** In the displayed dialog box, enter **DELETE** and click **OK**.

----End

## 13.6 Viewing Slow Query Logs of a Database Proxy

### Scenarios

After slow query logging is enabled for a database proxy, statements whose execution time (from the time when the proxy receives a client request to the time when all result sets are returned to the client) exceeds a threshold are logged. By analyzing these proxy logs alongside database slow query logs and client request time, you can identify potential bottlenecks and optimize the query performance. To view database slow query logs, see [Viewing and Downloading Slow Query Logs](#).

### Constraints

Slow query logs generated within the past month can be viewed.

### Parameter Description

**Table 13-6** Parameters for proxy slow query logs

| Parameter        | Description                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slowLogQueryTime | The execution duration threshold (in ms) of SQL statements. If this threshold is exceeded, the statements will be recorded in proxy slow query logs. Default value: <b>500</b><br><br>If you modify this parameter, the modification is applied immediately.<br><br>Modifying this parameter does not affect existing slow query logs. |

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the instance list, click the target instance name to go to the **Overview** page.
- Step 4** In the navigation pane on the left, choose **Database Proxy**.
- Step 5** In the proxy information area, click **Manage Logs**.
- Step 6** Click  to enable slow query log collection.
- Step 7** On the **Slow Query Logs** tab page, select a time range to view details about slow SQL statements.

**Figure 13-37** Slow query log details

| Statement                           | Execution Started            | Execution Ended              | Response Time (ms) | Database Account | Client IP Address | Database IP Address | Execution Tracking ID |
|-------------------------------------|------------------------------|------------------------------|--------------------|------------------|-------------------|---------------------|-----------------------|
| select '590432', count(1), sleep... | Jan 30, 2024 13:59:59 GMT... | Jan 30, 2024 14:00:00 GMT... | 532ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bce95040000       |
| select '590431', count(1), sleep... | Jan 30, 2024 13:59:58 GMT... | Jan 30, 2024 13:59:59 GMT... | 562ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bce59040000       |
| select '590430', count(1), sleep... | Jan 30, 2024 13:59:57 GMT... | Jan 30, 2024 13:59:58 GMT... | 521ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bce50040000       |
| select '590429', count(1), sleep... | Jan 30, 2024 13:59:56 GMT... | Jan 30, 2024 13:59:57 GMT... | 566ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bce10040000       |
| select '590428', count(1), sleep... | Jan 30, 2024 13:59:55 GMT... | Jan 30, 2024 13:59:56 GMT... | 522ms              | root             | 10.2.1.155        | 10.2.1.202          | 1470bbeb2040000       |
| select '590427', count(1), sleep... | Jan 30, 2024 13:59:54 GMT... | Jan 30, 2024 13:59:55 GMT... | 534ms              | root             | 10.2.1.155        | 10.2.1.202          | 1470bbe92040000       |
| select '590426', count(1), sleep... | Jan 30, 2024 13:59:53 GMT... | Jan 30, 2024 13:59:53 GMT... | 545ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bbe59040001       |
| select '590425', count(1), sleep... | Jan 30, 2024 13:59:52 GMT... | Jan 30, 2024 13:59:52 GMT... | 523ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bbe14040000       |
| select '590424', count(1), sleep... | Jan 30, 2024 13:59:51 GMT... | Jan 30, 2024 13:59:51 GMT... | 530ms              | root             | 10.2.1.155        | 10.2.1.205          | 1470bae21040000       |

- Slow query logs record executed statements whose execution duration exceeds the threshold.
- The **slowLogQueryTime** parameter defines the SQL execution time for a query to be considered slow and recorded in the slow query log. However, if you modify this parameter, the change does not affect already recorded logs. For example, if you change the value of this parameter from **500** to **300** (unit: ms), RDS starts recording statements that meet the new threshold and still displays the previously recorded logs that do not meet the new threshold.
- Slow query logs are displayed in log loading mode. There is no upper limit on the number of log records displayed within the query time range, and the total number of log records is not displayed.

----End

## 13.7 Database Proxy Kernel Versions

### 13.7.1 Kernel Versions

The following table describes the updates in each kernel version of RDS for MySQL database proxy.

| Version     | Description                                                                                                                                                  |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.24.12.000 | Resolved issues <ul style="list-style-type: none"><li>• Optimized the slow query log processing logic.</li><li>• Optimized .NET client adaptation.</li></ul> |

| Version     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.24.09.020 | <p>New features</p> <ul style="list-style-type: none"><li>• Support for IPv6</li></ul> <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Resolved the issue that proxy resource reclamation is slow after SSL is enabled.</li><li>• Resolved the issue that read requests cannot be split from write requests after transaction splitting is enabled with <b>set autocommit</b> set to <b>0</b> and <b>commit</b> used to commit transactions.</li></ul> |
| 2.24.06.000 | <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Resolved the issue that SELECT statements starting with ( are sent to the primary instance.</li></ul>                                                                                                                                                                                                                                                                                                  |
| 2.23.12.000 | <p>New features</p> <ul style="list-style-type: none"><li>• Reduced proxy authentication synchronization latency, so that new accounts and databases can be synchronized more quickly.</li><li>• Full-link error tracking</li><li>• Display of slow SQL statements recorded by database proxy</li></ul>                                                                                                                                                               |
| 2.23.09.002 | <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Optimized the logic for the proxy to retry service SQL statements after the instance breaks down.</li></ul>                                                                                                                                                                                                                                                                                            |
| 2.23.09.001 | <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Fixed the issue that an error is occasionally reported during execution of the prepared SELECT FOR UPDATE statement.</li></ul>                                                                                                                                                                                                                                                                         |
| 2.23.09.000 | <p>New features</p> <ul style="list-style-type: none"><li>• <b>Change User</b> protocol</li><li>• Parsing of multiple hints</li><li>• <b>show processlist</b> and <b>kill</b> commands</li><li>• Resolved the issue that the <b>set autocommit</b> setting is synchronized to read replicas after transaction splitting is enabled.</li></ul>                                                                                                                         |
| 2.23.06.001 | <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Resolved the increased backend database connections caused by enabling session connection pool.</li></ul>                                                                                                                                                                                                                                                                                              |
| 2.23.06.000 | <ul style="list-style-type: none"><li>• New features<br/>Binlog pulling through the proxy kernel</li><li>• Resolved issues<br/>Optimized the performance of the <b>prepare stmt</b> protocol again.</li></ul>                                                                                                                                                                                                                                                         |



| Version     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.23.02.007 | <p>Resolved issues</p> <ul style="list-style-type: none"><li>• Optimized the performance of the <b>prepare stmt</b> protocol.</li><li>• Resolved unexpected traffic allocation of the <b>/* FORCE_SLAVE*/ Hint</b> statement.</li></ul>                                                                                                                                                                                                                |
| 2.23.02.000 | <ul style="list-style-type: none"><li>• Resolved issues</li></ul> <p>Optimized the database proxy performance.</p>                                                                                                                                                                                                                                                                                                                                     |
| 2.22.11.000 | <ul style="list-style-type: none"><li>• New features</li></ul> <p>Multi-statement processing modes</p> <ul style="list-style-type: none"><li>• Resolved issues</li></ul> <p>Optimized the error messages reported during SQL statement execution in some scenarios.</p>                                                                                                                                                                                |
| 2.22.07.000 | <ul style="list-style-type: none"><li>• New features<ul style="list-style-type: none"><li>– Session-level connection pooling</li><li>– Dynamic load balancing</li></ul></li><li>• Resolved issues<ul style="list-style-type: none"><li>– Optimized the logic for setting session-level transaction isolation levels of database proxies. By default, the transaction isolation levels are synchronized with those of the database.</li></ul></li></ul> |
| 2.7.5.0     | Application Lossless and Transparent (ALT)                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2.7.4.0     | <ul style="list-style-type: none"><li>• New features<ul style="list-style-type: none"><li>– A query for more than 16 MB of data</li></ul></li><li>• Resolved issues<ul style="list-style-type: none"><li>– Optimized the way how metrics of read-only proxies are collected by Cloud Eye.</li></ul></li></ul>                                                                                                                                          |
| 2.3.9.8     | <p>New features</p> <ul style="list-style-type: none"><li>• Batch execution of prepared statements</li></ul>                                                                                                                                                                                                                                                                                                                                           |
| 2.3.9.7     | <ul style="list-style-type: none"><li>• New features<ul style="list-style-type: none"><li>– Support for MySQL 8.0</li><li>– Transaction splitting</li><li>– Read-only mode</li></ul></li><li>• Resolved issues</li></ul> <p>Optimized the execution logic of prepared statements to improve performance.</p>                                                                                                                                           |

| Version | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.3.9.0 | <ul style="list-style-type: none"><li>• New features<br/>Added database proxy metrics <b>Front-End Connections Created per Second</b>, <b>Transaction Queries per Second</b>, and <b>Multi-Statement Queries per Second</b>. For details, see <a href="#">Table 18-2</a>.</li><li>• Resolved issues<ul style="list-style-type: none"><li>– Optimized the database proxy performance.</li><li>– Resolved traffic congestion occurring when your applications connect to database proxy over short connections.</li></ul></li></ul> |
| 2.3.8.0 | <ul style="list-style-type: none"><li>• New features<br/>Real client IP addresses can be obtained through database proxies.</li><li>• Resolved issues<ul style="list-style-type: none"><li>– Fixed the issue that monitoring data of database proxy is inaccurate.</li><li>– Shortened the downtime of database proxies during a primary/standby switchover.</li></ul></li></ul>                                                                                                                                                  |
| 2.3.6.0 | <ul style="list-style-type: none"><li>• Fixed the issue of connection failures caused by database overload.</li><li>• Improved proxies' compatibility with MySQL protocols.</li></ul>                                                                                                                                                                                                                                                                                                                                             |
| 2.3.1.0 | <ul style="list-style-type: none"><li>• Maintaining connectivity between clients and database proxies.</li><li>• Monitoring metrics of database proxies. For details, see <a href="#">Table 18-2</a>.</li></ul>                                                                                                                                                                                                                                                                                                                   |

## 13.7.2 Upgrading the Kernel Version of Database Proxy

### Scenarios

You can manually upgrade the RDS for MySQL database proxy to the latest kernel version to improve performance, add new functions, and fix problems.

For details about kernel versions, see [Kernel Versions](#).

### Upgrade Methods

A kernel version can be upgraded in either of the following ways:

- Upon submission: The system [upgrades the proxy instance version](#) immediately after you submit the upgrade request.
- In maintenance window: When you submit an upgrade request, the system waits for a maintenance window to perform the upgrade. For details on how to change the maintenance window, see [Changing the Maintenance Window](#).

If the kernel version of your instance has potential risks or major defects, has expired, or has been brought offline, the system will notify you by SMS message or email and deliver an upgrade task during the maintenance window.

## Precautions

- The upgrade duration depends on how many nodes your database proxy has. Perform the upgrade during off-peak hours.
- During the upgrade, short connections are not affected. Persistent connections lasting for more than 24 hours will be interrupted intermittently.
- Only HA or cluster proxies can be upgraded. To confirm the proxy type, [submit a service ticket](#).

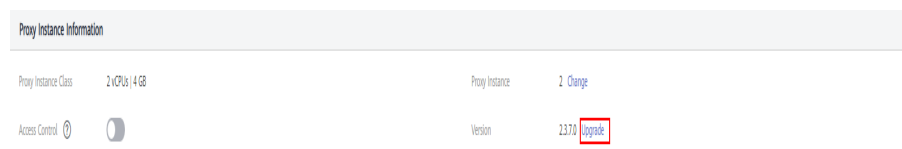
## Constraints

- Only proxy instances with kernel version 2.3.0.1 or later can be upgraded manually on the console.
- A version upgrade cannot be rolled back after the upgrade is complete.

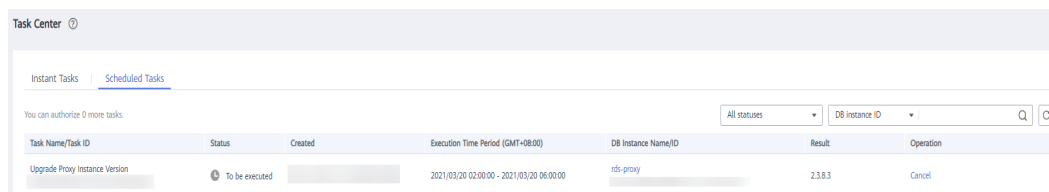
## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** On the **Database Proxy** page, in the proxy information area, click **Upgrade** next to the **Version** field.

**Figure 13-38** Upgrading the proxy instance version



- Step 5** In the displayed dialog box, select a scheduled time and click **OK**.
- Upon submission: The system upgrades the proxy instance to the latest version immediately after you submit the request. You can view the task progress in **Task Center > Instant Tasks**.
  - In maintenance window: The system upgrades the proxy instance to the latest version during a maintenance window. You can view the task progress in **Task Center > Scheduled Tasks**.

**Figure 13-39** Viewing a scheduled task

The screenshot shows the 'Task Center' interface with a 'Scheduled Tasks' tab selected. It displays a table with one task: 'Upgrade Proxy Instance Version'. The task is in a 'To be executed' status. The table columns are: Task Name/Task ID, Status, Created, Execution Time Period (GMT+08:00), DB Instance Name/ID, Result, and Operation.

| Task Name/Task ID              | Status         | Created | Execution Time Period (GMT+08:00)         | DB Instance Name/ID | Result  | Operation |
|--------------------------------|----------------|---------|-------------------------------------------|---------------------|---------|-----------|
| Upgrade Proxy Instance Version | To be executed |         | 2021/03/20 02:00:00 - 2021/03/20 06:00:00 | rds-proxy           | 2.3.8.3 | Cancel    |

----End

## 13.8 Best Practices for Database Proxy

### Using Hints for Read/Write Splitting

In addition to the weight assignment rules of read/write splitting, hints serve as a complementary SQL syntax to specify whether an SQL statement is executed on a primary node or read replica.

- Hints are only suggestions for routing and cannot force non-read-only SQL statements or statements within transactions to be routed to read replicas.
- If you want to connect to a DB instance through the MySQL CLI and using hints, you must add the **-c** option to the command. Otherwise, the hint will be filtered out by the MySQL CLI.

Add hints at the beginning of SQL statements to specify where a statement will be routed.

- If you add **/\*FORCE\_MASTER\*/**, the statement will be forcibly routed to the primary node. **/\*FORCE\_MASTER\*/** works only for read/write addresses. If your primary instance is read-only, adding **/\*FORCE\_MASTER\*/** will not help route the statement to the primary node.
- If you add **/\*FORCE\_SLAVE\*/**, the statement will be forcibly routed to a read replica.

For example, the statement **select \* from table1** will be routed to a read replica by default. If you change it to **/\*FORCE\_MASTER\*/ select \* from table1**, it will be forcibly routed to the primary instance.

### Connection Pool Configuration

To ensure that your application obtains an available connection from a connection pool, you need to configure how the connection pool will check connection availability. For example, set **testOnBorrow** to **true** for a JDBC or Druid connection pool or set **connectionTestQuery** to **SELECT 1** for a HikariCP connection pool.

```
<bean id="hikariConfig" class="com.zaxxer.hikari.HikariConfig">
  <property name="poolName" value="springHikariCP" />
  <property name="connectionTestQuery" value="SELECT 1" />
  <property name="dataSourceClassName" value="com.mysql.jdbc.jdbc2.optional.MysqlDataSource" />
  <property name="dataSourceProperties">
    <props>
      <prop key="url">${jdbc.url}</prop>
      <prop key="user">${jdbc.username}</prop>
      <prop key="password">${jdbc.password}</prop>
    </props>
  </property>
</bean>

<bean id="dataSource" class="com.zaxxer.hikari.HikariDataSource" destroy-method="close">
  <constructor-arg ref="hikariConfig" />
</bean>
```

## Read Requests Routed to the Primary DB Instance

1. If a query statement is placed in a transaction, all transaction requests will be routed to the primary DB instance. If **set autocommit=0** is configured before a query statement, the query statement will be treated as a transaction and routed to the primary DB instance.
2. If no read replica exists, all read replicas are abnormal, or the read weights allocated to the read replicas are 0, queries will be routed to the primary DB instance. You can set read weights allocated to read replicas and the primary DB instance after read/write splitting is enabled. For details, see [Configuring the Delay Threshold and Routing Policy](#).
3. If multiple statements (for example, **insert \*\*\*;select \*\*\***) are executed, all subsequent requests will be routed to the primary DB instance. To restore read/write splitting, disconnect the connection from your applications and then reconnect.
4. Read operations with locks (for example, **SELECT for UPDATE**) will be routed to the primary DB instance.
5. When the **/\*FORCE\_MASTER\*/** hint is used, requests will be routed to the primary DB instance.

# 14 Problem Diagnosis and SQL Analysis

---

## 14.1 Function Overview

DBA Assistant provides visualized database O&M and intelligent diagnosis for developers and database administrators (DBAs), making database O&M easy and efficient. By analyzing alarms, resources, health data, performance metrics, and storage usage, it helps users quickly locate faults and keep track of instance status.

To use DBA Assistant on the RDS console, IAM users must have the **RDS FullAccess**, **DAS FullAccess**, **DAS Administrator**, and **CES FullAccess** permissions. For details, see [Creating a User and Granting Permissions](#).

### Scenarios

- Setting a slow session threshold can help you quickly identify abnormal sessions and kill the sessions when an exception occurs in your instance, so that your instance can recover quickly and ensure database availability.
- If your DB instance is unstable due to a large number of concurrent SQL requests from new services, you can set SQL throttling rules for SQL statements to limit concurrent SQL statements and ensure instance stability.
- If your instance storage is full, you can learn about the storage usage and disk space distribution on the **Storage Analysis** page. You can enable storage autoscaling. When the available storage of your instance drops to the threshold, autoscaling is triggered. For details, see [Configuring Storage Autoscaling](#).
- You can configure auto throttling to limit active connections in high burst traffic or abnormal read/write scenarios to ensure the availability of core workloads.

### Functions

[Table 14-1](#) lists the functions supported by DBA Assistant.

**Table 14-1** Function description

| Function                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reference                                                                                                                                                            |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sessions                | The <b>Sessions</b> page displays slow sessions, active sessions, and total sessions. You can quickly filter slow sessions or active sessions by user, host IP address, or database name. Kill Session and SQL Throttling can be used for urgent instance recovery to ensure database availability.                                                                                                                                                                                                                                           | <a href="#">Managing Real-Time Sessions</a>                                                                                                                          |
| Performance             | The <b>Performance</b> page displays key metrics of your instance and provides metric comparison between different days. You can keep track of metric changes and detect exceptions in a timely manner. Monitoring by Seconds helps accurately locate faults.                                                                                                                                                                                                                                                                                 | <a href="#">Viewing Performance Metrics of a DB Instance</a>                                                                                                         |
| Storage Analysis        | Storage occupied by data and logs and historical changes of storage usage are important for database performance. The <b>Storage Analysis</b> page displays storage overview and disk space distribution of your instance. In addition, DBA Assistant can estimate the available days of your storage based on historical data and intelligent algorithms, so that you can scale up storage in a timely manner. <b>Autoscaling</b> , <b>Tablespaces</b> , <b>Top 50 Databases</b> , and <b>Top 50 Tables</b> are also available on this page. | <a href="#">Managing Storage Capacity</a>                                                                                                                            |
| Locks & Transactions    | The <b>Locks &amp; Transactions</b> page displays metadata locks and InnoDB locks. You can manage blocked transactions, optimize your workloads, and reduce lock conflicts based on the lock information.                                                                                                                                                                                                                                                                                                                                     | <a href="#">Managing Locks &amp; Transactions</a>                                                                                                                    |
| Historical Transactions | This function is used to analyze and discover large transactions and the transactions that have been there for a long time without being committed in the database.                                                                                                                                                                                                                                                                                                                                                                           | <a href="#">Managing Historical Transactions</a>                                                                                                                     |
| Slow Query Log          | The <b>Slow Query Log</b> page displays slow queries within a specified time period. You can view top slow query logs by user or IP address, sort statistics, and identify sources of slow SQL statements.                                                                                                                                                                                                                                                                                                                                    | <a href="#">Viewing Slow Query Logs of a DB Instance</a>                                                                                                             |
| SQL Explorer            | After <b>Collect All SQL Statements</b> is enabled, you can gain a comprehensive insight into SQL statements on the <b>SQL Explorer</b> page. Top SQL helps you locate exceptions.                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>• <a href="#">Viewing Top SQL Statements of a DB Instance</a></li><li>• <a href="#">Creating a SQL Insights Task</a></li></ul> |

| Function          | Description                                                                                                                                                                                                                                                                                                                                  | Reference                                      |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| SQL Throttling    | SQL Throttling restricts the execution of SQL statements based on specified rules when there are SQL statements that cannot be optimized timely or a resource (for example, vCPU) bottleneck occurs.                                                                                                                                         | <a href="#">Creating a SQL Throttling Rule</a> |
| Auto Throttling   | This function automatically detects database exceptions such as high vCPU usage and excessive active sessions, and limits traffic based on specified priorities.<br><br>You can control traffic by database or user as required. Limiting traffic of non-core databases or from non-core users can ensure that core workloads remain stable. | <a href="#">Configuring Auto Throttling</a>    |
| Daily Reports     | The <b>Daily Reports</b> page provides overall information about your instance status of the previous day, including slow SQL analysis, all SQL analysis, and performance & storage analysis. You can download and subscribe to analysis reports. A daily diagnosis is recommended.                                                          | <a href="#">Daily Reports</a>                  |
| Anomaly Snapshots | This function intelligently detects instance anomalies and records information about session, lock, and transaction snapshots to facilitate subsequent fault locating.                                                                                                                                                                       | <a href="#">Managing Anomaly Snapshots</a>     |

## 14.2 Performance Monitoring

### 14.2.1 Viewing Performance Metrics of a DB Instance

DBA Assistant allows you to view the performance metrics of your DB instance. Historical trends of performance metrics within a specified time period help you learn about the status and resource usage of your DB instance. If any alarm is reported, you can take actions timely. For details, see [Viewing Real-Time Metrics](#).

RDS supports monitoring by seconds. You can set the monitoring interval to 1s or 5s for higher precision. For details, see [Configuring Monitoring by Seconds](#).

#### Billing

The following table lists the price of monitoring by seconds.

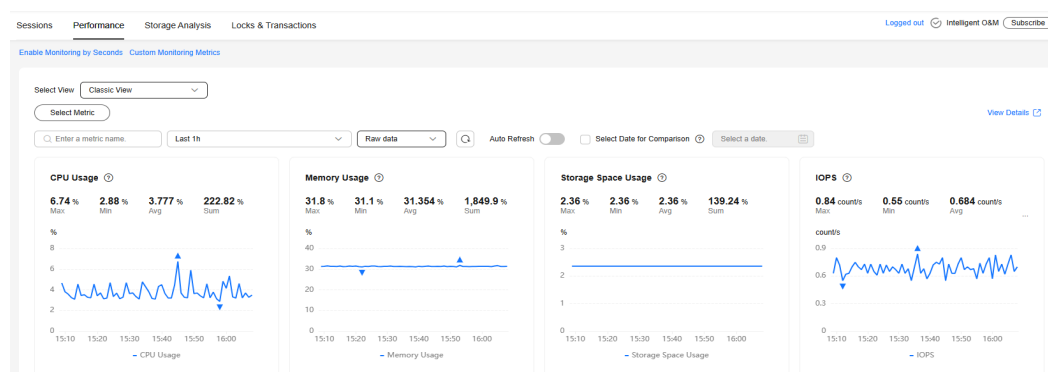


**Table 14-2** Pay-per-use price

| Specification Code       | Price (USD/Hour) |
|--------------------------|------------------|
| rds.mysql.second.monitor | 0.012            |

## Viewing Real-Time Metrics

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Real-Time Diagnosis**.
- Step 5** Click the **Performance** tab to view historical performance for each metric of your instance within the same time range on different days.

**Figure 14-1** Viewing real-time performance

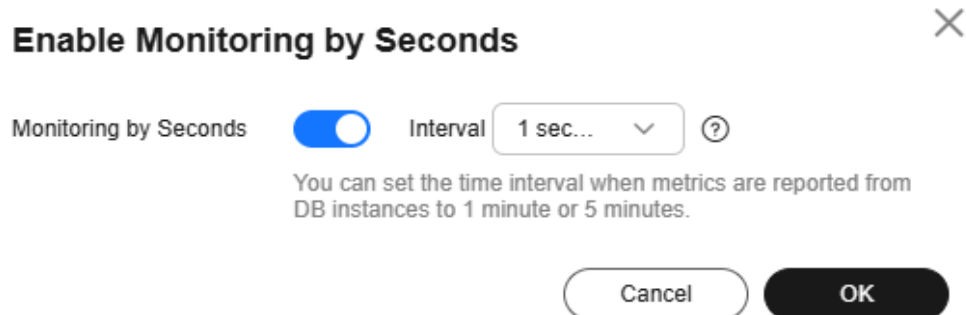
----End

## Configuring Monitoring by Seconds

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Real-Time Diagnosis**.
- Step 5** On the **Performance** tab page, click **Enable Monitoring by Seconds**.
- Step 6** In the displayed dialog box, enable **Monitoring by Seconds** and click **OK**.
- This function is unavailable for any DB instances with fewer than four vCPUs.

- Once you turn on this function, the system will report monitoring data again and show it in about 5 minutes.
- You can turn off this function if needed. Once it is turned off, the system will report monitoring data again and show it in about 5 minutes.

**Figure 14-2** Enabling Monitoring by Seconds



-----End

## 14.3 Problem Diagnosis

### 14.3.1 Managing Real-Time Sessions

#### Scenarios

You can query session snapshots of your instance while sorting, filtering, and displaying the snapshots as needed. You can filter and identify the desired slow SQL sessions and active sessions by user, host, and database. Sessions can be killed for urgent instance recovery to ensure database availability.

#### Precautions

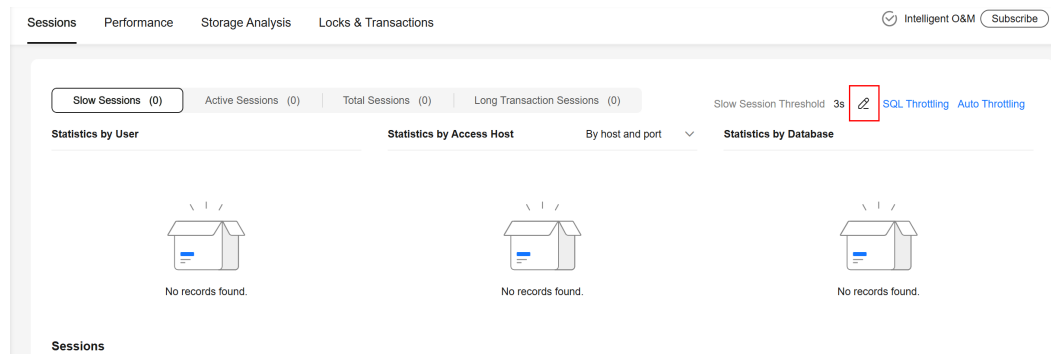
Killing a session may cause service disconnection. Your applications should be able to reconnect to the instance.

#### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Real-Time Diagnosis**.
- Step 5** Click the **Sessions** tab. You can perform the following operations on this tab page:
  - Viewing session statistics

In the sessions statistics, you can view statistics on the slow sessions, active sessions, total sessions, long transaction sessions by user, access host, and database.

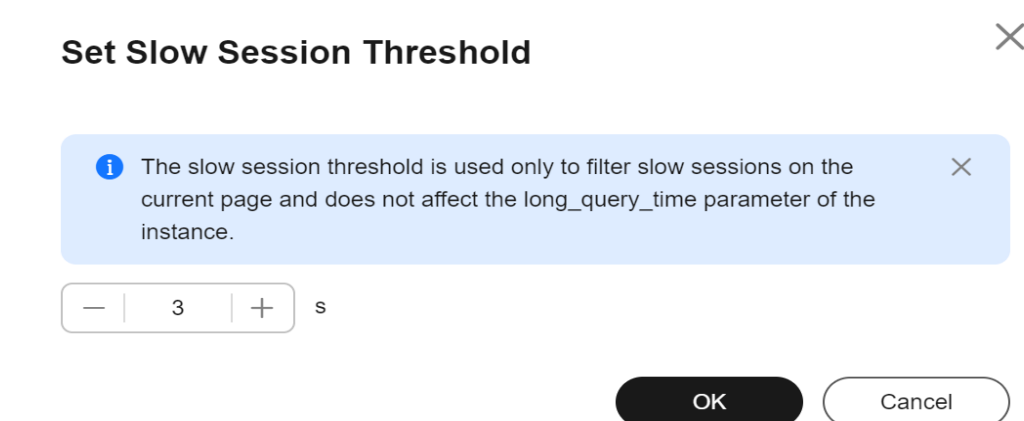
**Figure 14-3 Sessions**



- Setting a slow session threshold

Click  next to the **Slow Session Threshold** field. In the displayed dialog box, set a slow session threshold and click **OK**. Sessions whose execution durations are greater than this threshold are automatically displayed.

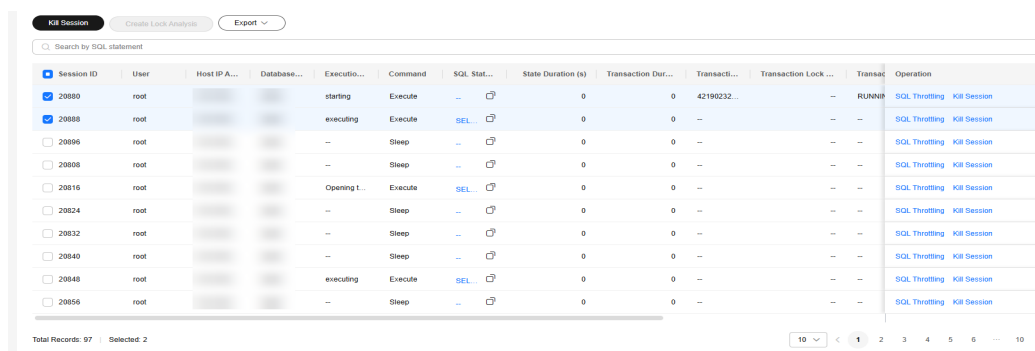
**Figure 14-4** Setting a slow session threshold



- Killing abnormal sessions

In the session list, you can view session details. You can also select the abnormal session you want to end and click **Kill Session** to recover the database.

A maximum of 100 sessions can be killed at a time.

**Figure 14-5** Killing a session

- **Configuring SQL throttling**  
In the session list, click **SQL Throttling** and set the SQL type and keyword to match SQL statements. When the number of matched SQL statements exceeds the configured upper limit, the DB instance will refuse to execute the SQL statements, thus ensuring the instance stability.  
For details, see [Creating a SQL Throttling Rule](#).
- **Creating lock analysis**  
To create a lock analysis task, log in to the DB instance on the **Locks & Transactions** page first. For details, see [Managing Locks & Transactions](#). Then, click **Create Lock Analysis**. A lock analysis record is generated, which is used to check whether there are any sessions that hold locks.
- **Exporting the session list**  
Click **Export** to export all or specified sessions.

----End

## 14.3.2 Managing Storage Capacity

### Function Description

Data and log storage space and its changes significantly impact database performance. RDS for MySQL shows you the distribution and changes of used storage on the **Storage Analysis** page. It also provides storage autoscaling, intelligent tablespace diagnosis, and analysis of top 50 largest databases and tables.

**Table 14-3** Functions

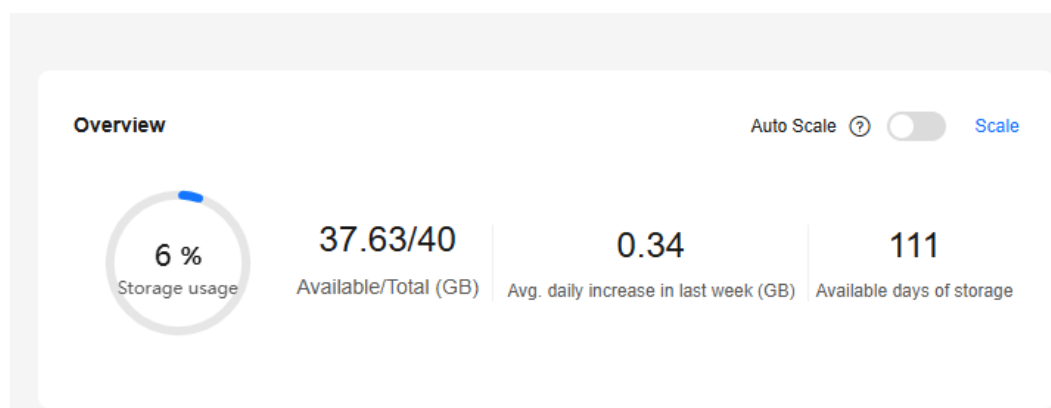
| Function | Description                                                                                                                             | Related Operations                           |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Overview | You can view storage usage, available storage, total storage, daily increase in the last week, and estimated available days of storage. | <a href="#">Viewing the Storage Overview</a> |

| Function                                | Description                                                                                                                                                   | Related Operations                                             |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Tablespaces                             | It shows you tables with abnormal tablespace growth, tables without primary keys, and tables without indexes.                                                 | <a href="#">Tablespaces</a>                                    |
| Used Storage and Used Storage over Time | You can view the distribution of storage space and its changes over time.                                                                                     | <a href="#">Disk Space Distribution</a>                        |
| Top Databases and Tables                | You can view the top 50 databases and tables by physical file size and identify the databases and tables with high usage based on storage space distribution. | <a href="#">Top Databases and Tables by Physical File Size</a> |

## Viewing the Storage Overview

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Real-Time Diagnosis**.
- Step 5** Click the **Storage Analysis** tab to view storage usage. If your storage is insufficient, scale it up. Or you can [enable storage autoscaling](#).

Figure 14-6 Overview



If the average daily increase in last week is 0 GB, the estimated available days of storage are unlimited and are not displayed.

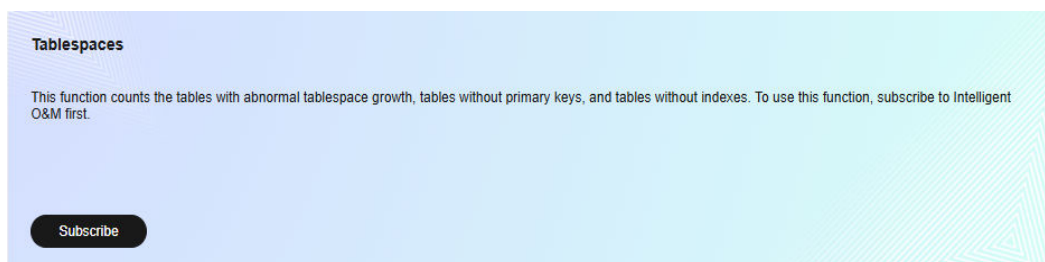
----End

## Tablespaces

This function counts tables with abnormal tablespace growth, tables without primary keys, and tables without indexes. To use this function, subscribe to Intelligent O&M first.

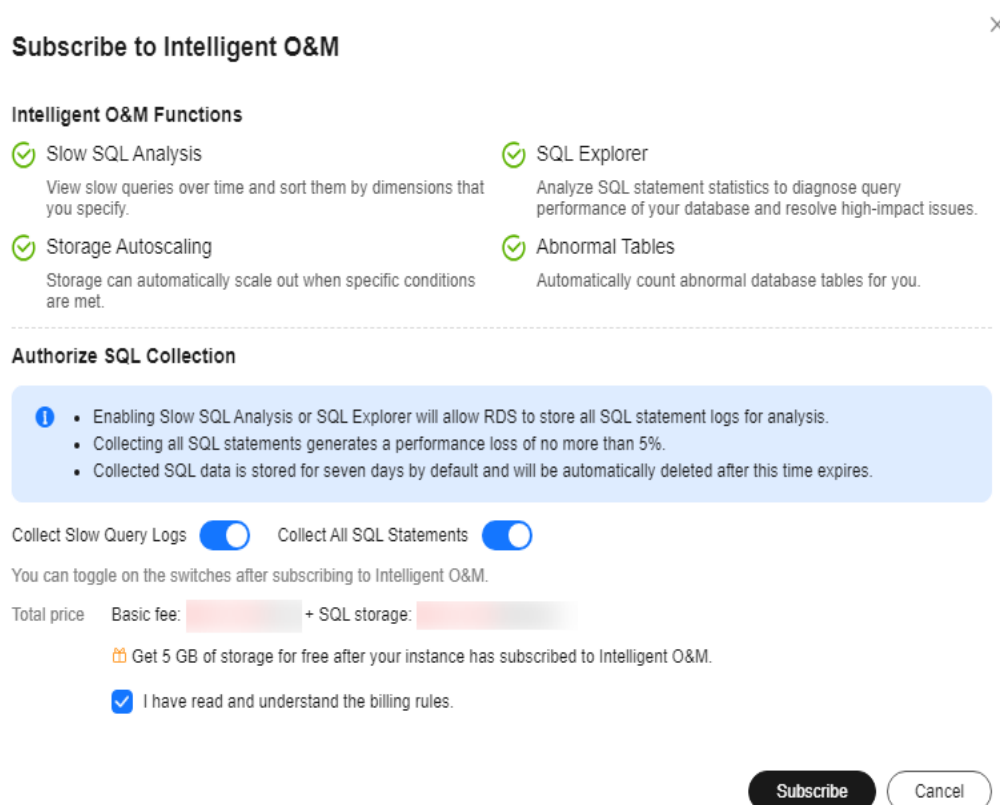
**Step 1** Click the **Storage Analysis** tab to view abnormal tables.

**Figure 14-7** Tablespaces



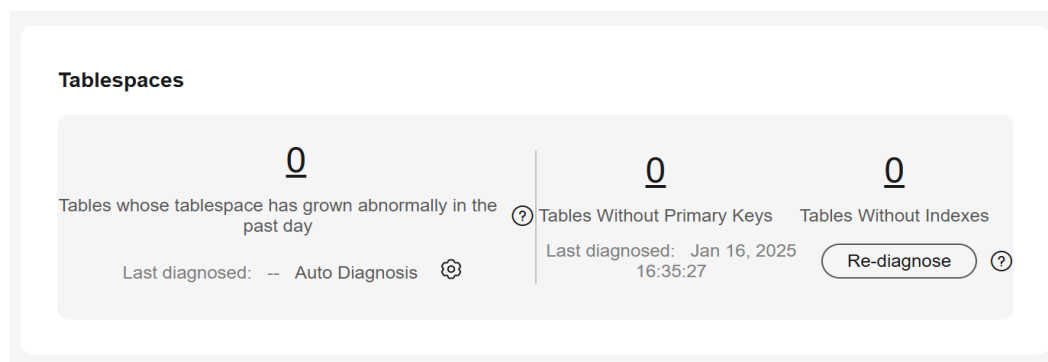
**Step 2** Click **Subscribe**. In the displayed dialog box, you can learn about Intelligent O&M functions and pricing.

**Figure 14-8** Subscribing to Intelligent O&M



**Step 3** After subscribing to Intelligent O&M, view the table diagnosis results of your instance.

Figure 14-9 Table diagnosis results



**Step 4** Click  next to **Auto Diagnosis**. In the displayed dialog box, configure the daily tablespace increase limit and click **OK**.

Figure 14-10 Configuring a daily tablespace increase limit

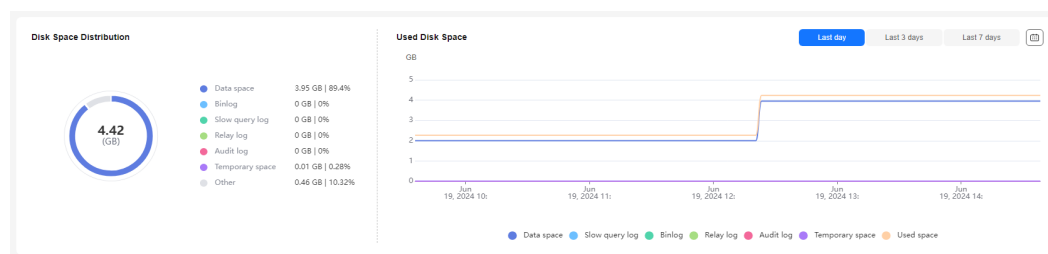


-----End

## Disk Space Distribution

You can view storage space distribution of your instance.

Figure 14-11 Disk space distribution



If the total number of files in your storage (including data space, binlog space, slow query log space, relay log space, audit log space, temporary space, and other space) exceeds 10,000, RDS will not collect information about the files or display space distribution and usages over time on the console. This prevents performance slowdowns caused by collecting statistics on too many files. If this happens, [submit a service ticket](#).

- **Data space:** Disk space occupied by user data (including temporary table files and ib\_logfile files generated by the database)
- **Binlogs:** Disk space occupied by binlogs
- **Slow query logs:** Disk space occupied by slow logs
- **Relay logs:** Disk space occupied by relay logs
- **Audit logs:** Disk space occupied by audit logs
- **Temporary space:** Disk space occupied by temporary files
- **Other:** Disk space occupied by files such as ibdata1, ib\_buffer\_pool, ib\_doublewrite, and error.log, plus the reserved space (about 5% of the disk space) for OS

## Top Databases and Tables by Physical File Size

You can view the top 50 databases and tables by physical file size and identify the databases and tables with high usage based on storage space distribution.

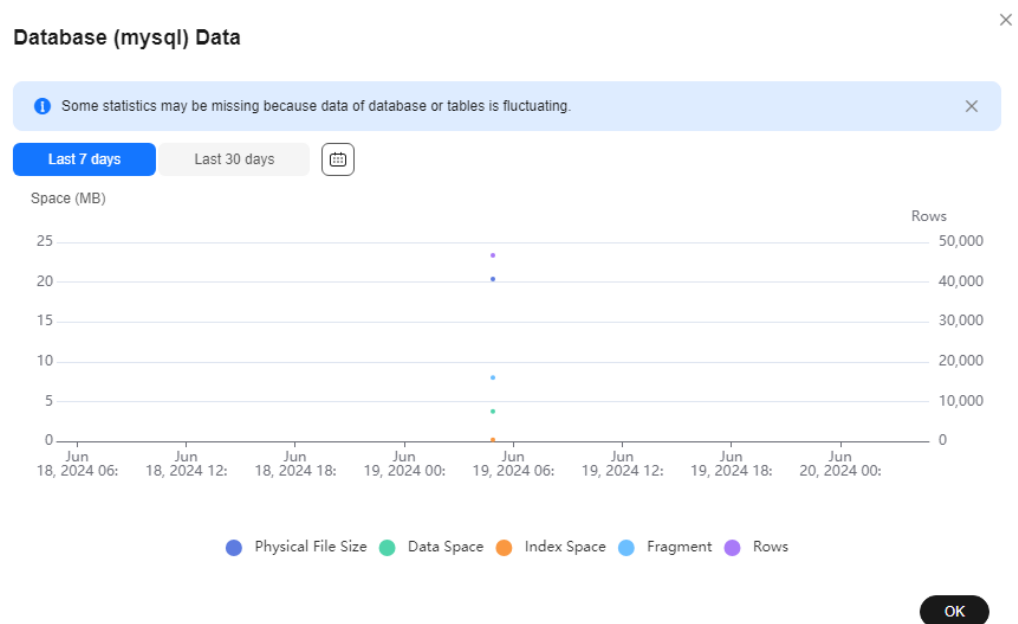
- Physical file sizes are precisely recorded, but other fields' values are estimated. If there is a large gap between a file size and another field, run **ANALYZE TABLE** on the table.
- A database or table whose name contains special characters, including slashes (/) and #p#p, is not counted.
- Top databases and tables are available only in RDS for MySQL 5.7 and 8.0.
- If your instance's memory usage is greater than 85% or it has more than 50,000 tables, RDS will not collect related information. This prevents performance slowdowns caused by collecting statistics on too many databases and tables.

**Figure 14-12** Top 50 databases

| Database | Physical File Size(MB) | Rows  | Data Space(MB) | Index Space(MB) | Fragment(MB) | Fragmentation Rate(%) | Operation                  |
|----------|------------------------|-------|----------------|-----------------|--------------|-----------------------|----------------------------|
| mysql    | 20.3915                | 46744 | 3.7496         | 0.1718          | 8            | 39.23                 | <a href="#">View Chart</a> |
| sys      | 0.0938                 | 6     | 0.0156         | 0               | 0            | 0                     | <a href="#">View Chart</a> |

Click **View Chart** to view data volume changes in the last 7 days, last 30 days, or a custom time period (spanning no more than 30 days).



**Figure 14-13** Viewing data volume changes

## FAQ

Q: What can I do if the storage space of my DB instance is full?

A: Reduce the storage usage by referring to [Storage Full Situations Causing Instances to Be Read-Only](#), so that the DB instance becomes available and data can be written to the instance. You can use either of the following methods to reduce the storage usage:

- Scale up the storage space: **Services are not interrupted during storage scale-up.** You can also enable autoscaling. When the available storage of a DB instance drops to the threshold, autoscaling is triggered.
- Reducing disk data: Delete useless historical data.
  - a. If your instance becomes read-only, [unlock it from this state](#) first. If your instance is not in the read-only state, you can delete data directly.
  - b. Check the top 50 databases and tables with large physical files and identify the historical table data that can be deleted. For details, see [Top Databases and Tables by Physical File Size](#).
  - c. To clear up space, you can optimize tables with a high fragmentation rate during off-peak hours.

To delete data of an entire table, run **DROP** or **TRUNCATE**. To delete part of table data, run **DELETE** and **OPTIMIZE TABLE**.
- If temporary files generated by sorting queries occupy too much storage space, optimize your SQL query statements.

You can query [slow query logs](#), and analyze and optimize the problematic SQL statements.

## 14.3.3 Managing Locks & Transactions

### Scenarios

DBA Assistant allows you to check whether your DB instance has metadata locks and InnoDB locks. You can also check the recent deadlock analysis and full deadlock analysis.

For details, see [Lock Analysis](#).

### Introduction

#### Metadata Locks

- Metadata locks are used for tables to prevent conflicting DDL and DML operations from being executed concurrently on these tables. Executing DDL statements on a table generates metadata write locks. If there is a metadata lock, all subsequent SELECT, DML, and DDL operations on the table will be blocked, causing a connection backlog.
- Metadata locks are displayed in real time. You can quickly identify problems and terminate the sessions with metadata locks to restore blocked operations.
- DML locks are not included. You can view and analyze them on the **InnoDB Locks** page.
- A maximum of 1,000 records can be displayed.

#### InnoDB Locks

- InnoDB lock waits generated before DML operations are displayed in real time. You can quickly locate the session waits and any blocks that happened when multiple sessions update the same piece of data at the same time, and can terminate the source session that holds locks to restore blocked operations.
- DDL locks, also called metadata locks, are not included. You can view and analyze them on the **Metadata Locks** page.
- To view lock information of RDS for MySQL 8.0 instances, set **performance\_schema** to **ON**. You can run the **SHOW GLOBAL VARIABLES LIKE "performance\_schema"** command or refer to [Modifying Parameters of an RDS for MySQL Instance](#) to check the **performance\_schema** settings.

#### Deadlock Analysis

- DBA Assistant analyzes the latest deadlock log returned by **SHOW ENGINE INNODB STATUS**. If there are multiple deadlocks, only the latest one is analyzed.
- The **innodb\_deadlock\_detect** parameter must be set to **ON** (only for RDS for MySQL 5.7).

#### Full Deadlock Analysis

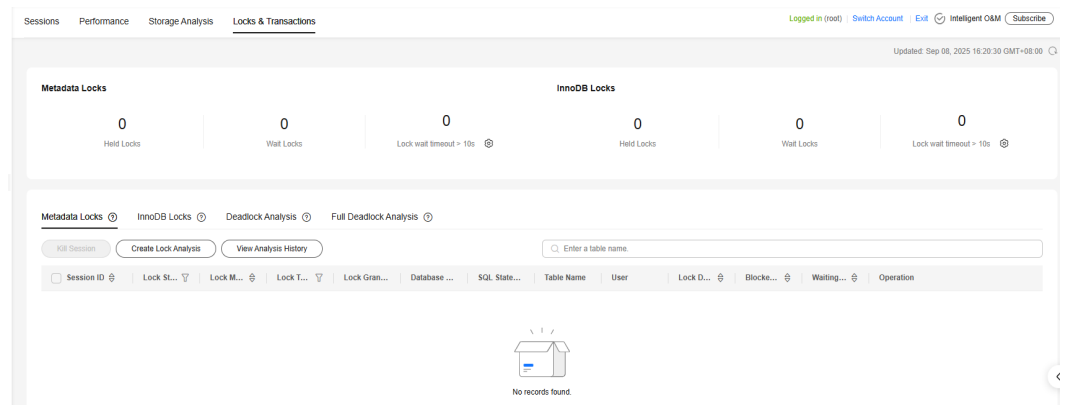
- DBA Assistant analyzes error logs at regular intervals, parses deadlock information, and performs comprehensive deadlock analysis.
- Dependent parameters:
  - The **innodb\_deadlock\_detect** parameter must be set to **ON** (only for RDS for MySQL 5.7).

- The **innodb\_print\_all\_deadlocks** parameter must be set to **ON** and the **log\_error\_verbosity** parameter must be set to **3** (only for other versions than 5.7).
- Up to 10,000 records can be displayed.

## Procedure

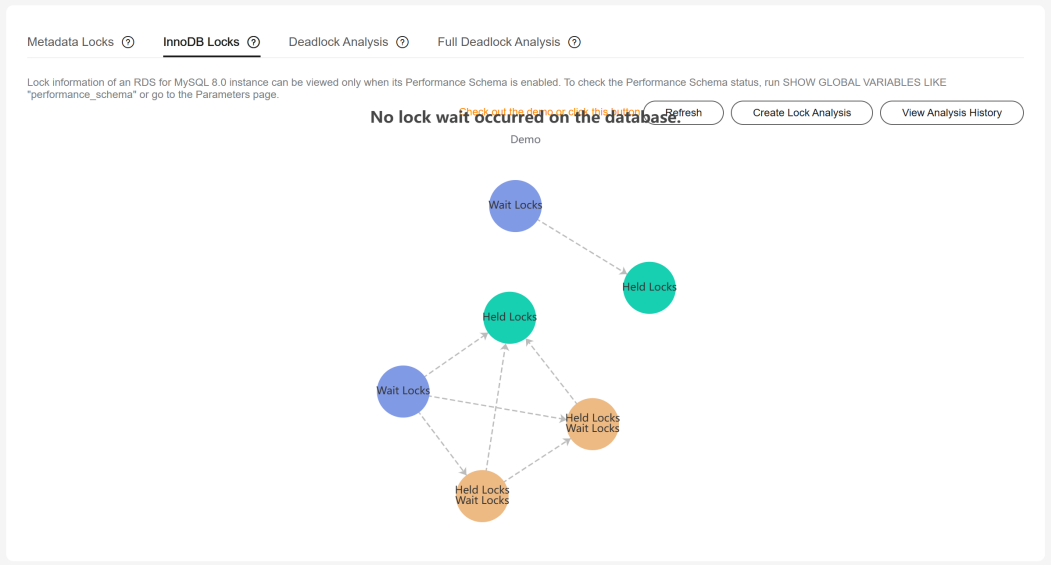
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Real-Time Diagnosis**.
- Step 5** Click the **Locks & Transactions** tab and enter the administrator password to log in to the instance.
- Step 6** On the **Locks & Transactions** tab page, perform the following operations:
- Click the **Metadata Locks** tab, create a lock analysis task and check whether the instance has metadata locks.
- By default, locks whose wait time is longer than 10s are displayed, but you can change this time if needed.

**Figure 14-14** Metadata Locks



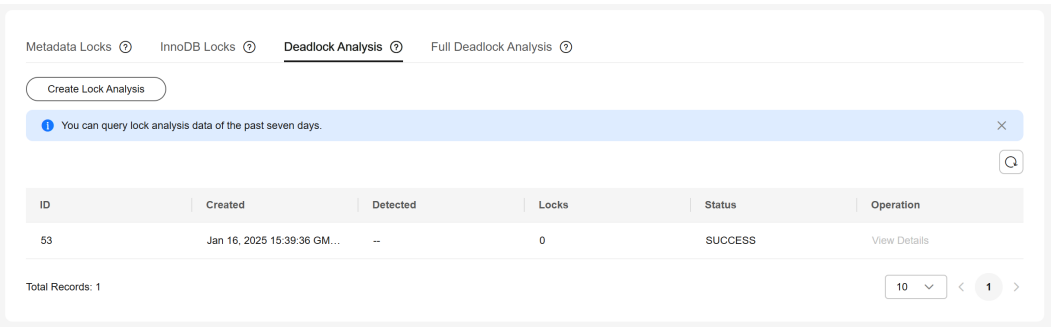
- Click the **InnoDB Locks** tab, create a lock analysis task and check whether the instance has InnoDB locks.
- By default, locks whose wait time is longer than 10s are displayed, but you can change this time if needed.

Figure 14-15 InnoDB Locks



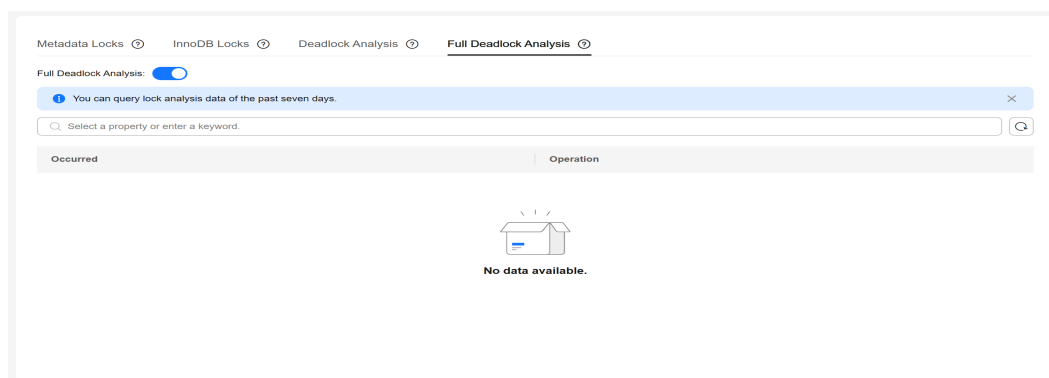
- Click the **Deadlock Analysis** tab and create a lock analysis task. DBA Assistant analyzes the latest deadlock log returned by **SHOW ENGINE INNODB STATUS**. If there are multiple deadlocks, only the latest one is analyzed.  
You can only query lock analysis data of the past seven days.

Figure 14-16 Deadlock Analysis



- Click the **Full Deadlock Analysis** tab and enable **Full Deadlock Analysis**. DBA Assistant regularly examines error logs, extracts deadlock details from them, and conducts a full deadlock analysis.  
You can only query lock analysis data of the past seven days.

Figure 14-17 Full Deadlock Analysis



----End

## 14.3.4 Managing Historical Transactions

### Introduction

This function is used to analyze and discover large transactions and the transactions that have been there for a long time without being committed in the database.

Data on historical transactions comes from the output of the **SHOW ENGINE INNODB STATUS** command. It shows the snapshot of historical transactions and is collected every 5 minutes.

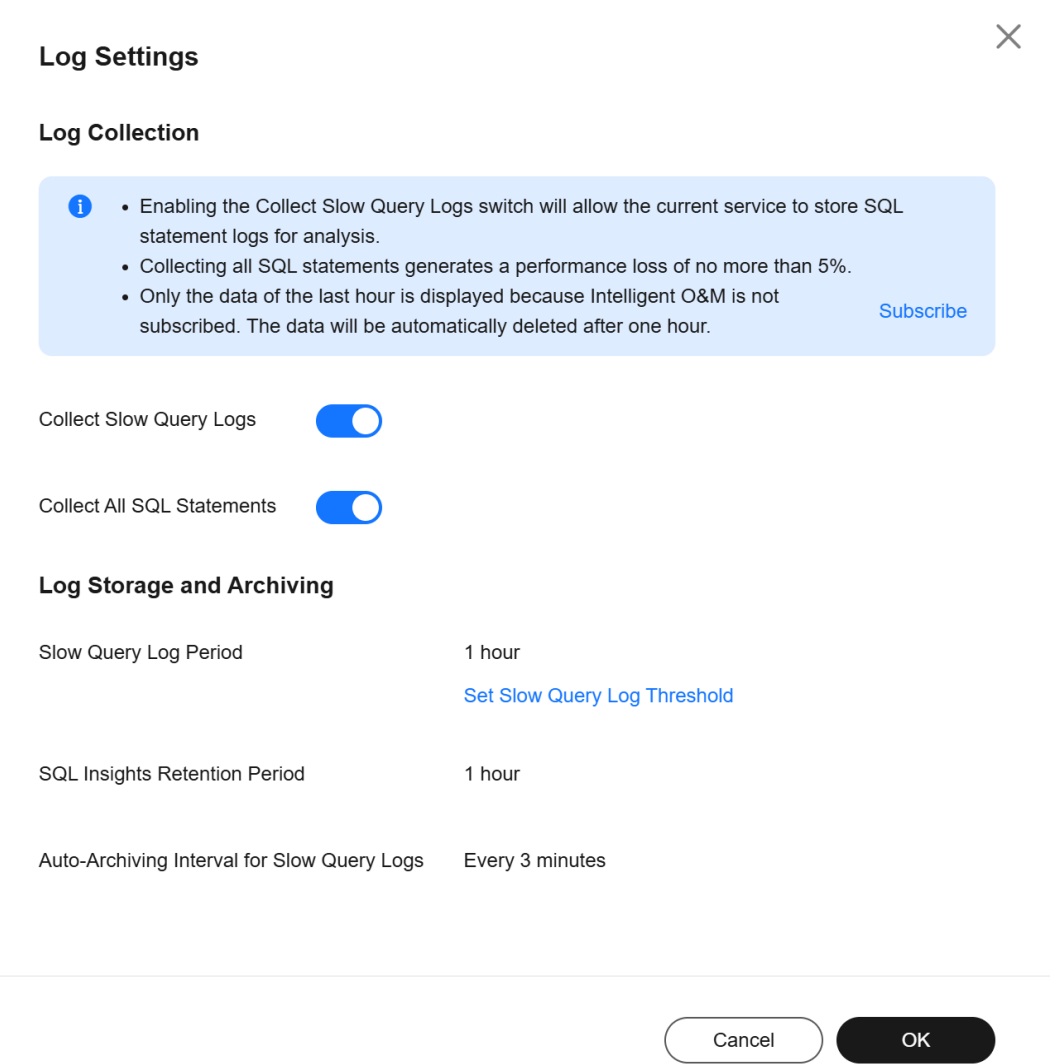
### Constraints

- The snapshot of historical transactions only lists the transactions that are currently being executed. It does not include those that started and committed during a collection interval.
- To collect historical transactions, enable **Collect Slow Query Logs** or **Collect All SQL Statements** first.
- A maximum of 10,000 records generated in the past 7 days can be displayed.

### Procedure

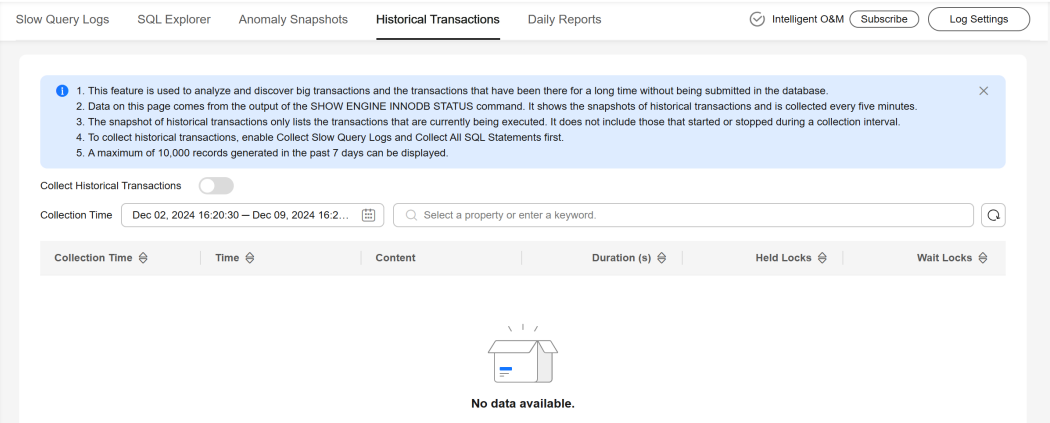
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 5** Click the **Historical Transactions** tab.
- Step 6** In the upper part of the page, click **Log Settings**, enable **Collect Slow Query Logs** or **Collect All SQL Statements**, and click **OK**.

Figure 14-18 Log Settings



Step 7 Enable **Collect Historical Transactions** and view historical transactions.

Figure 14-19 Collect Historical Transactions



----End

## 14.3.5 Daily Reports

### Scenarios

You can start a diagnosis for your DB instance and subscribe to diagnosis reports.

- **Starting a Diagnosis:** You can perform an overall health diagnosis on your instance and view details of the current and historical diagnosis reports.
- **Subscribing to Diagnosis Reports:** Simple Message Notification (SMN) can send diagnosis exception reports to the preset email address so that you can learn about the overall health status of your instance in real time.

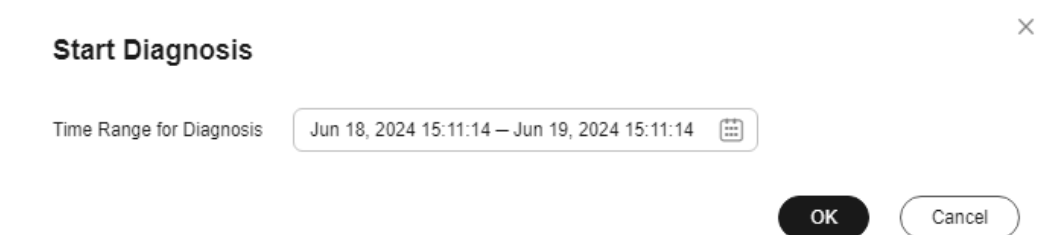
### Billing

When you use SMN, only pay for what you use. There are no minimum fees. For details, see [Billing](#).

### Starting a Diagnosis

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 5** Click the **Daily Reports** tab.
- Step 6** Click **Start Diagnosis**. Select a time range for the diagnosis. The time span is within one day.

Figure 14-20 Start Diagnosis



If you want to be notified of risks through email, see [Subscribing to Diagnosis Reports](#).

- Step 7** In the **Diagnosis Dimensions** area, click **Slow SQL Analysis**, **All SQL Analysis**, or **Performance & Storage** to view diagnosis report details.

Figure 14-21 Diagnosis Dimensions

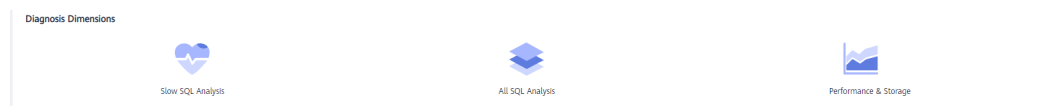
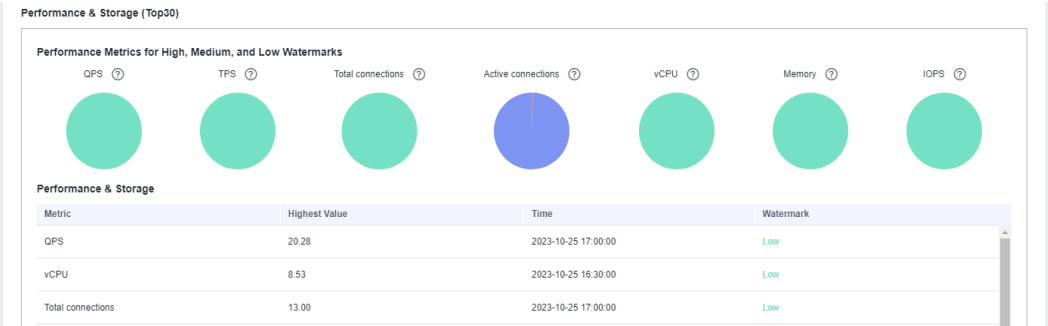
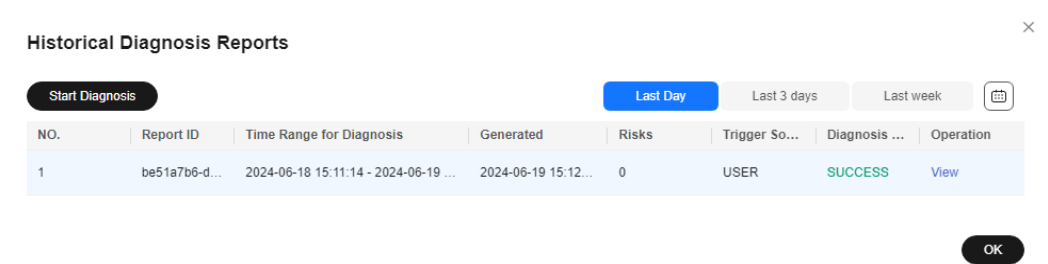


Figure 14-22 Performance & Storage



- Step 8** You can also view historical diagnosis reports or download a report to your local PC.
- To view historical diagnosis reports, click **View History** in the upper right corner of the page.
  - To download a report to your local PC, click **Download** in the upper right corner of the page.

Figure 14-23 Historical Diagnosis Reports



-----End

Subscribing to Diagnosis Reports

- Step 1** On the **Instances** page, click the target instance name.
- Step 2** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 3** Click the **Daily Reports** tab.
- Step 4** In the upper right corner of the page, click **Subscribe** and set subscription parameters. For details about the parameters, see [Table 14-4](#).



Figure 14-24 Subscribe to Daily Report

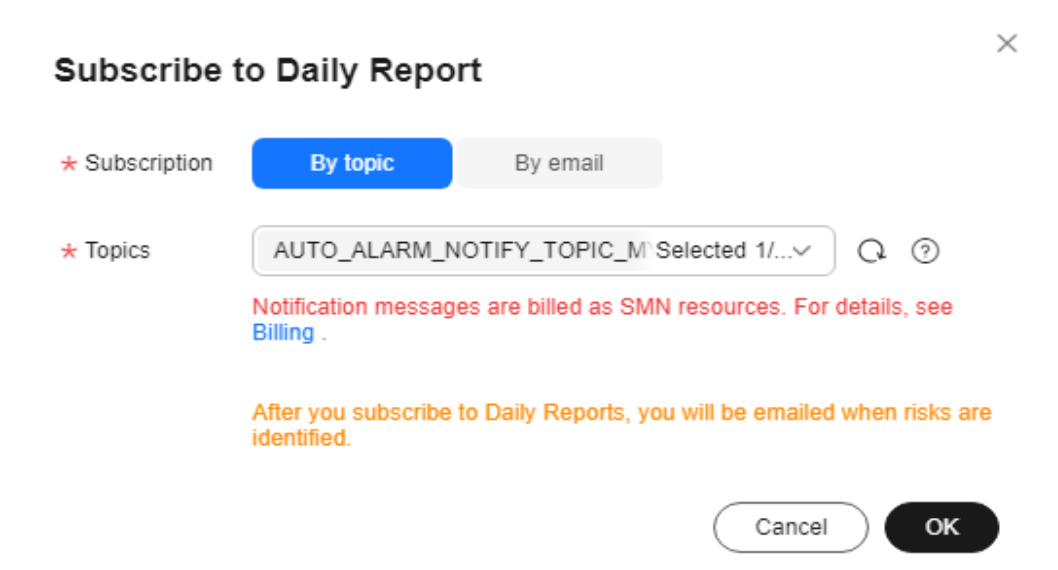


Table 14-4 Subscription parameters

| Parameter       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subscription    | Select <b>By topic</b> or <b>By email</b> .                                                                                                                                                                                                                                                                                                                                                                                                     |
| Topics          | <p>A topic is used to publish messages and subscribe to notifications. It serves as a message transmission channel between publishers and subscribers.</p> <p>If there are no topics you want to select, <a href="#">create one</a>. After a topic is created, click <b>Add Subscription</b> in the <b>Operation</b> column of the topic. In the displayed dialog box, specify a protocol (only <b>Email</b> is supported) and an endpoint.</p> |
| Email Addresses | <p>If you select <b>By email</b> for <b>Subscription</b>, you need to specify <b>Email Addresses</b>.</p> <p>An email will be sent to the specified email address only when risks are identified after a diagnosis is performed. You can enter up to 15 email addresses and separate each email address with a semicolon (;).</p>                                                                                                               |

- Step 5** Click **OK**.
- Step 6** If you want to unsubscribe from diagnosis reports, click **Unsubscribe** in the upper right corner of the page. In the displayed dialog box, confirm the information and click **OK**.
- End

## 14.3.6 Managing Anomaly Snapshots

### Scenarios

This function intelligently detects instance anomalies and records information about session, lock, and transaction snapshots to facilitate subsequent fault locating.

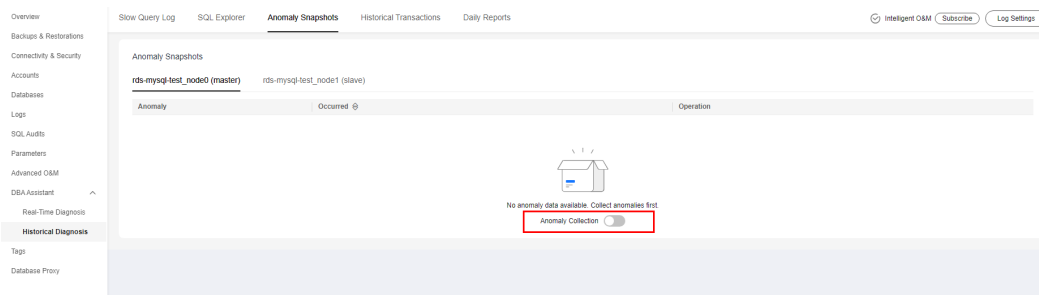
### Constraints

- Enabling anomaly collection will cause about 5% of instance performance loss.
- For an HA read replica with anomaly snapshots enabled, if the primary read replica node fails and workloads are automatically switched over to the standby read replica node, anomaly snapshots will not be enabled for the new primary read replica node.
- Each anomaly snapshot can be retained for a maximum of seven days. A maximum of 10 anomaly snapshots can be retained for each node at the same time.
- Anomaly snapshots record long-running transactions.

### Enabling Anomaly Collection

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 5** Click the **Anomaly Snapshots** tab.
- Step 6** On the displayed page, toggle on the **Anomaly Collection** switch.

Figure 14-25 Anomaly Snapshots



----End

## Viewing Anomaly Snapshots

- Step 1** Click the **Anomaly Snapshots** tab.
- Step 2** On the displayed page, view session snapshots, metadata lock snapshots, InnoDB lock snapshots, and transaction snapshots of the DB instance.
- To view anomaly causes, click **Diagnosis Details** in the **Operation** column.
  - To view details about slow SQL statements, click **Slow SQL** in the **Operation** column. For details, see [Viewing Slow Query Logs of a DB Instance](#).
- End

## 14.4 SQL Analysis

### 14.4.1 Viewing Slow Query Logs of a DB Instance

#### Scenarios

**Slow Query Log** displays a chart of SQL statements that are taking too long to execute and allows you to sort slow SQL statements by multiple dimensions, such as by user, host, or SQL template. It helps you quickly identify bottlenecks and improve instance performance.

#### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 5** Click the **Slow Query Log** tab.
- Slow SQL Analysis needs to be purchased separately. To use this function, subscribe to Intelligent O&M first.
- Step 6** Click **Subscribe**. In the displayed dialog box, you can learn about Intelligent O&M functions and pricing.
- Step 7** After subscribing to Intelligent O&M, view slow queries over time of your instance.
- Step 8** You can view slow queries over time and you can see the slow log archive history for the last 1 hour, last 3 hours, last 12 hours, or a custom time period (spanning no more than one day).
- Step 9** To export slow query log details or statistics, click the **Details** or **Statistics** tab above the log list and click **Export** on the tab page.
- End

## Follow-up Operations

To view historical export records, do as follows:

1. Above the log list, click the **Details** or **Statistics** tab.
2. Click **View All Export Records**. The displayed dialog box shows all historical export records.

## 14.4.2 Viewing Top SQL Statements of a DB Instance

### Scenarios

Top SQL shows the SQL queries that have been contributing the most to DB load. You can sort them by multiple dimensions.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

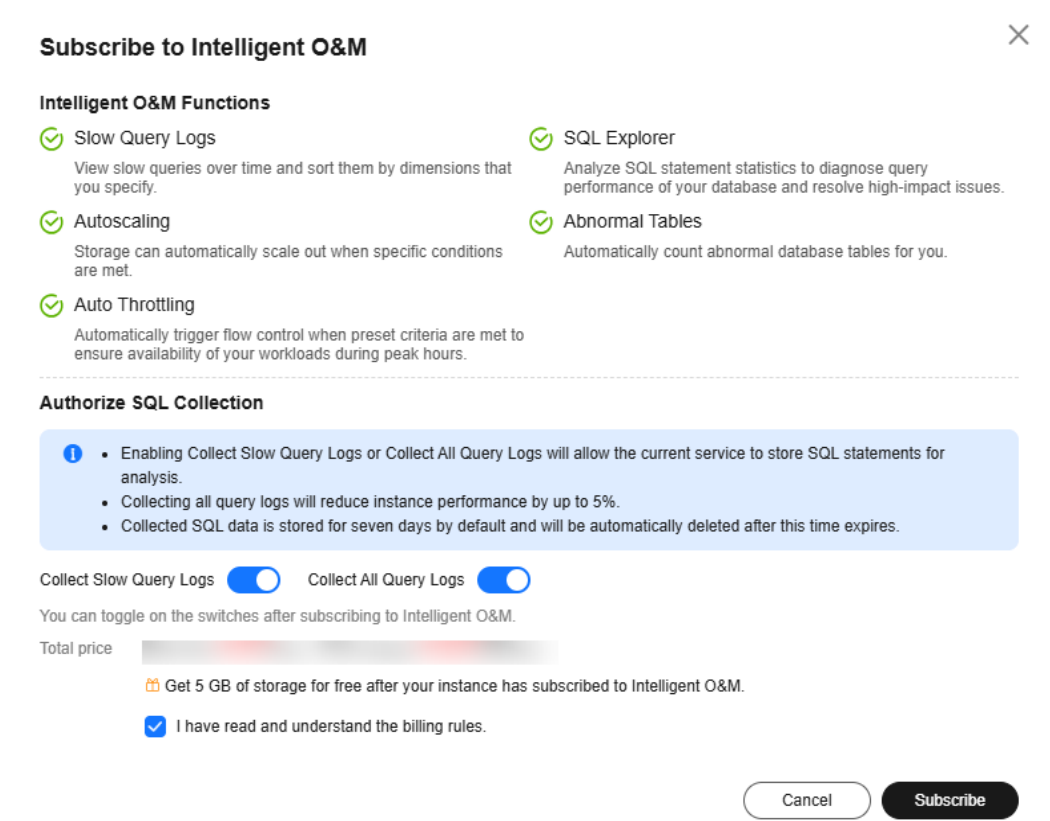
**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.

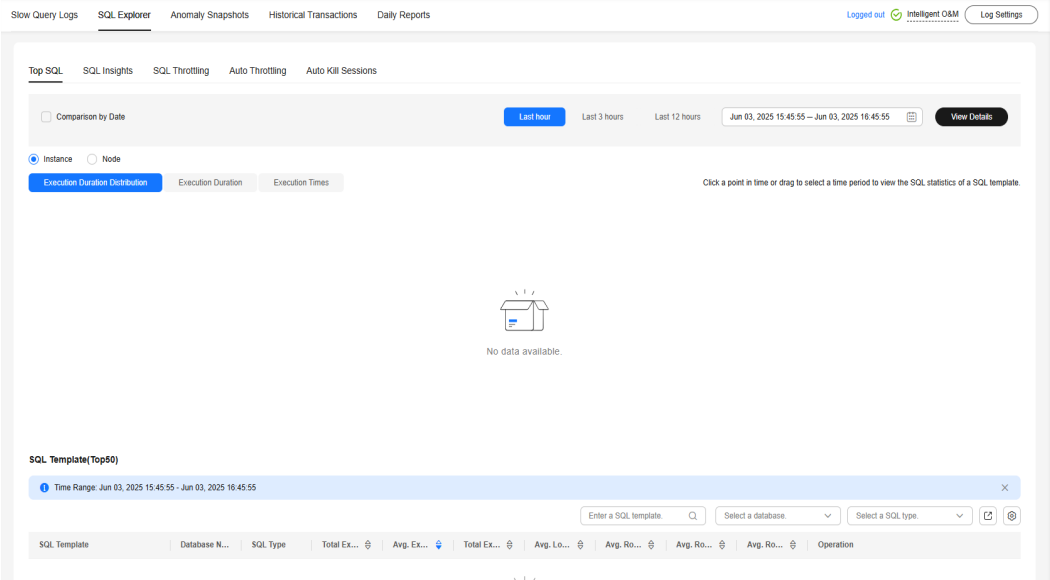
**Step 5** Choose **SQL Explorer > Top SQL**.

Top SQL needs to be purchased separately. To use this function, subscribe to Intelligent O&M first.

**Step 6** Click **Subscribe**. In the displayed dialog box, learn about Intelligent O&M functions and pricing.



- Step 7** After subscribing to Intelligent O&M, view top SQL statements of your instance.
- Step 8** View execution durations of the top SQL statements in the last 1 hour, last 3 hours, last 12 hours, or a custom time period (spanning no more than one day).



----End

## 14.4.3 Creating a SQL Insights Task

### Scenarios

SQL Insights allows you to not only query all executed SQL statements, but also analyze and search for the tables that are accessed and updated most frequently, and the SQL statements that have the longest lock wait, helping you quickly identify exceptions.

### Constraints

- You need to enable **Collect All SQL Statements** before using SQL Insights.
- After **Collect All SQL Statements** is disabled, new SQL statements will not be collected anymore and the collected SQL data will be deleted.
- If there is a buffer overrun, some data cannot be recorded.
- Any SQL statement that exceeds 4,096 bytes will not be recorded by default.  
In RDS for MySQL 5.7.33.3 and later minor versions, you can set the **rds\_sql\_tracer\_reserve\_big\_records** parameter to **ON** (which indicates that SQL statements containing more than 4,096 bytes are still recorded) on the **Parameters** page to remove this constraint. For details, see [Modifying Parameters of an RDS for MySQL Instance](#). RDS for MySQL 5.6 and 8.0 do not support this parameter. For details about how to query the instance version, see [Query the RDS Instance Version](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.
- Step 5** Click **SQL Explorer** and then **SQL Insights**.
- Step 6** Click  next to **Collect All SQL Statements**.

To disable this function, click **Log Settings** in the upper right corner, toggle off the **Collect All SQL Statements** switch, and click **OK**.

#### NOTE

Collecting all SQL statements generates a performance loss of no more than 5%.

Figure 14-26 Log settings

×

### Log Settings

#### Log Collection

ⓘ

- Enabling the Collect Slow Query Logs switch will allow the current service to store SQL statement logs for analysis.
- Collecting all SQL statements generates a performance loss of no more than 5%.
- Collected SQL data is stored for seven days by default and will be automatically deleted after this time expires.

Collect Slow Query Logs

☒

Collect All SQL Statements

☒

#### Log Storage and Archiving

★ Slow Query Log Period

–

7

+

Enter an integer from 1 to 30.

[Set Slow Query Log Threshold](#)

★ SQL Insights Retention Period

–

7

+

Enter an integer from 1 to 180.

Auto-Archiving Interval for Slow Query Logs

Every 3 minutes

Log Size

0 GB

Each paid instance can use 5 GB of storage for free. Any storage used in excess of 5 GB will be billed at **\$0.00 USD** USD/GB per hour.

Cancel

OK

**Step 7** Click **Create Task**. In the displayed dialog box, specify **Time Range**, **Dimension**, and other configuration items, and click **OK**.

Figure 14-27 Creating a SQL Insights task

Create Task

★ Time Range

Jun 19, 2024 14:44:37 – Jun 19, 2024 15:02:16

Select a time range that starts after when Collect All SQL Statements is toggled on, or the task will fail to be parsed.

★ Synchronization to Other Instances

NoYes

★ Dimension

☒ Instance ☐ Node

Username

Separate usernames using a space, for example, user1 user2 user3.

Keyword

Separate keywords using a space, for example, keyword1 keyword2 keyword3.

Database

Separate database names using a space, for example, DB1 DB2 DB3.

Thread ID

Separate thread IDs using a space, for example, ThreadId1 ThreadId2 ThreadId3.

SQL Type

☐ SELECT ☐ INSERT ☐ UPDATE ☐ DELETE ☐ SHOW ☐ CREATE ☐ DROP ☐ ALTER ☐ REPLACE ☐ USE ☐ START ☐ COMMIT ☐ ROLLBACK ☐ SET

SQL Type

☐ Successful ☐ Failed

CancelOK

**Step 8** In the task list, click **Details** in the **Operation** column to view task details.

Figure 14-28 Viewing task details

Create Task

| Task ID | Start and End Time             | Node ID | Status                        | Progress                    | Created               | Username | Keyword | Database | Thread ID | SQL Type | SQL Type | Operation                                               |
|---------|--------------------------------|---------|-------------------------------|-----------------------------|-----------------------|----------|---------|----------|-----------|----------|----------|---------------------------------------------------------|
| 129     | Jun 19, 2024 14:44:37 - Jun... | --      | <div><div></div></div> Parsed | <div><div></div></div> 100% | Jun 19, 2024 15:03... | --       | --      | --       | --        | --       | --       | <a href="#">Details</a> <a href="#">View Sync Tasks</a> |

----End

## 14.4.4 Creating a SQL Throttling Rule

### Scenarios

SQL throttling allows you to create rules to control concurrent execution of SQL statements by specifying SQL type, keywords, and maximum concurrency. To maintain better performance at high concurrency, SQL statements that meet the specified SQL type and keyword and exceed the maximum concurrency will not be executed.

High SQL concurrency can be caused by the following factors:

- A sharp increase in requests: Concurrent SQL statements of a certain type surge due to cache penetration and abnormal calls.
- Stacked slow queries: If a large number of SQL statements without indexes are called, many slow SQL statements will be generated, affecting services.

### Version Constraints

SQL throttling is available to only the versions listed in [Table 14-5](#). For details about how to query the instance version, see [Query the RDS Instance Version](#).



**Table 14-5** Version constraints on instance types

| Major Version | Minor Version (Primary Instance) | Minor Version (Read Replica) | Setting Rules for Read Replicas Separately |
|---------------|----------------------------------|------------------------------|--------------------------------------------|
| 8.0           | ≥ 8.0.25.1                       | ≥ 8.0.25.1                   | Not supported                              |
| 5.7           | ≥ 5.7.31.4                       | ≥ 5.7.37.1                   | ≥ 5.7.38.221000                            |
| 5.6           | ≥ 5.6.50.3                       | ≥ 5.6.51.6                   | Not supported                              |

**Table 14-6** lists the version constraints on built-in users and user **root**.

**Table 14-6** Version constraints on users

| Major Version | Minor Version                      | Built-in User                    | Root User                        |
|---------------|------------------------------------|----------------------------------|----------------------------------|
| 8.0           | ≥ 8.0.28.231000                    | Not affected by throttling rules | Subject to throttling rules      |
|               | 8.0.25.1 ≤ Version < 8.0.28.231000 | Not affected by throttling rules | Not affected by throttling rules |
|               | < 8.0.25.1                         | Subject to throttling rules      | Subject to throttling rules      |
| 5.7           | ≥ 5.7.43.231000                    | Not affected by throttling rules | Subject to throttling rules      |
|               | 5.7.33.1 ≤ Version < 5.7.43.231000 | Not affected by throttling rules | Not affected by throttling rules |
|               | < 5.7.33.1                         | Subject to throttling rules      | Subject to throttling rules      |
| 5.6           | ≥ 5.6.51.4                         | Not affected by throttling rules | Not affected by throttling rules |
|               | < 5.6.51.4                         | Subject to throttling rules      | Subject to throttling rules      |

If your instance runs version 5.7.43.231000 or later or it runs version 8.0.28.231000 or later, SQL throttling rules will be applied to user **root**. To disable this function for user **root**, [submit a service ticket](#).

To achieve better performance at high concurrency, you are advised to upgrade your DB instance to the latest minor version. For details about how to upgrade a minor version, see [Upgrading a Minor Version](#).

## Constraints

- A maximum of 100 SQL throttling rules can be configured.

- Only SELECT, UPDATE, DELETE, and INSERT statements are supported for SQL throttling.
- INSERT statements are only supported for RDS for MySQL 5.7 (5.7.44.240100 or later) and 8.0 (8.0.32.240100 or later) for SQL throttling. To use this function, [submit a service ticket](#) to apply for required permissions.
- If a SQL statement matches multiple SQL throttling rules, only the most recently added rule is applied.
- SQL statements that have been executed before a SQL throttling rule is added are not counted.
- If the replication delay is too long, adding or deleting a SQL throttling rule for a read replica does not take effect immediately.
- SQL throttling rules are not applied to system tables.
- SQL throttling rules are not applied to SQL statements not used for data query, such as **select sleep(\*\*\*)**;
- SQL throttling rules are not applied to stored procedures, triggers, or functions.
- You can run the following SQL statement through DAS to view the execution of SQL throttling rules: **select \* from information\_schema.rds\_sql\_filter\_info**;
- Too many SQL throttling rules affect the database performance. Delete unnecessary rules after using them.
- SQL throttling rules are not applied to system databases.
- For instances whose kernel version is earlier than 5.6.51.4, 5.7.33.5, or 8.0.25.220700, SQL throttling rules are applied to all users. You are advised to include table names in keywords when configuring SQL throttling rules. Configuring only the SELECT keyword may impact the functionality.

## Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.

**Step 5** Choose **SQL Explorer > SQL Throttling**.

**Step 6** Toggle on the SQL throttling switch . SQL throttling rules take effect only after SQL throttling is enabled.

**Step 7** Click **Add Rule**. Configure the parameters listed in [Table 14-7](#).

**Figure 14-29** Adding a rule (entering keywords)

×

Add Rule

SQL Type

SELECT

UPDATE

DELETE

INSERT

Keyword Generation

☒ Manually ☐ Using SQL statements

★ Keyword ?

Example: SELECT~COUNT~FROM~t1~WHERE~id

0/1,024 ↗

Enter keywords and separate them with tildes (~), for example, select~a. Keywords are case-insensitive.  
Maximum keywords: 128

★ Max. Concurrency

–

+

☐ Kill existing sessions that match this rule

Cancel

OK

Figure 14-30 Adding a rule (generating keywords from a SQL statement)

Add Rule

SQL Type

SELECT

UPDATE

DELETE

INSERT

Keyword Generation

Manually

Using SQL statements

Original SQL Statements

Keywords generated from the SQL statement you entered are only suggestions.

Example: SELECT COUNT(1) FROM t1 WHERE id > 100;

☒ Check SQL statements

☐ Retain operators

Generate Keyword

\* Keyword

Example: SELECT~COUNT~FROM~t1~WHERE~id

0/1,024

Enter keywords and separate them with tildes (~), for example, select~a. Keywords are case-insensitive.

Maximum keywords: 128

\* Max. Concurrency

-

+

☐ Kill existing sessions that match this rule

Cancel

OK

Table 14-7 Parameter description

| Parameter | Description                                                                                 |
|-----------|---------------------------------------------------------------------------------------------|
| SQL Type  | There are four options: <b>SELECT</b> , <b>UPDATE</b> , <b>DELETE</b> , and <b>INSERT</b> . |

| Parameter                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Keyword                                     | <p>A maximum of 128 keywords (case-insensitive) are supported. You can specify keywords in either of the following ways:</p> <ul style="list-style-type: none"><li>• <b>Manually:</b> Take <b>select~a</b> as an example. <b>select</b> and <b>a</b> are two keywords contained in a SQL throttling rule. The keywords are separated by a tilde (~). In this example, the rule restricts the execution of only the SQL statements containing keywords <b>select</b> and <b>a</b>.</li><li>• <b>Using SQL statements:</b> You can enter a SQL statement and then click <b>Generate Keyword</b>. The generated keywords are for reference only. Exercise caution when using them.</li></ul> <p>SQL statements match the keywords from first to last. For example, if one rule contains the keyword <b>a~and~b</b>, the statement <b>*** a&gt;1 and b&gt;2</b> can match the keyword, but <b>*** b&gt;2 and a&gt;1</b> cannot.</p> <p>Empty characters before and after each keyword will be ignored, for example, spaces, '\n', '\r', and '\t'.</p> |
| Max. Concurrency                            | <p>If the number of concurrent SQL statements matching the keyword exceeds this limit, the SQL statements will not be executed. The value ranges from 0 to 1,000,000,000.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Kill existing sessions that match this rule | <p>If this option is selected, all sessions generated by users subject to this SQL throttling rule will be killed.</p> <p>For details about the versions where user <b>root</b> is not subject to SQL throttling rules, see <a href="#">Version Constraints</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Step 8** Confirm the settings and click **OK**.

----End

## Follow-up Operations

To delete a SQL throttling rule, locate it in the rule list and click **Delete** in the **Operation** column. In the displayed dialog box, click **OK**.

**Figure 14-31** Deleting a rule



## 14.4.5 Configuring Auto Throttling

### Scenarios

Auto throttling allows you to set criteria, such as the vCPU threshold and maximum number of active connections. When the criteria are met, the system

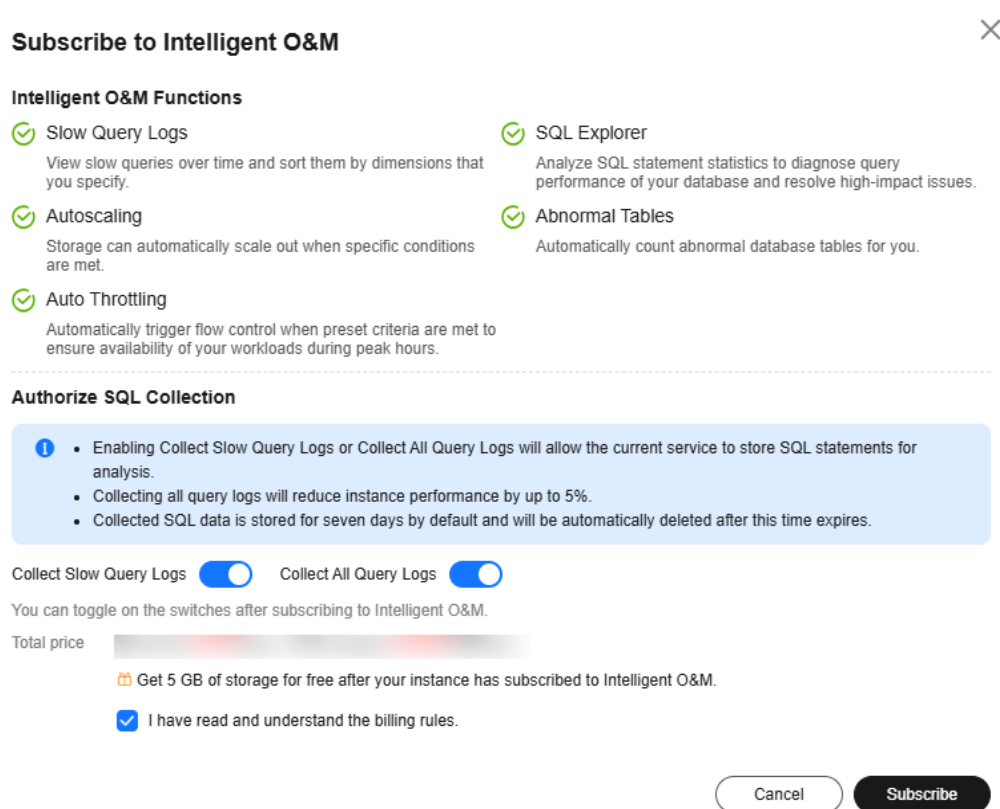
automatically performs flow control on sessions to ensure the availability of core services in scenarios such as high burst traffic and abnormal reads/writes.

## Prerequisites

If you use auto throttling for the first time, subscribe to Intelligent O&M first.

1. In the **Auto Throttling** area, click **Subscribe**. In the displayed dialog box, you can learn about the value-added functions and billing rules.
2. (Optional) If you enable **Collect Slow Query Logs** and **Collect All SQL Statements**, slow query logs and all SQL statements are collected and analyzed from multiple angles. For details, see [Viewing Slow Query Logs of a DB Instance](#) and [Viewing Top SQL Statements of a DB Instance](#).

Figure 14-32 Subscribing to Intelligent O&M



## Procedure

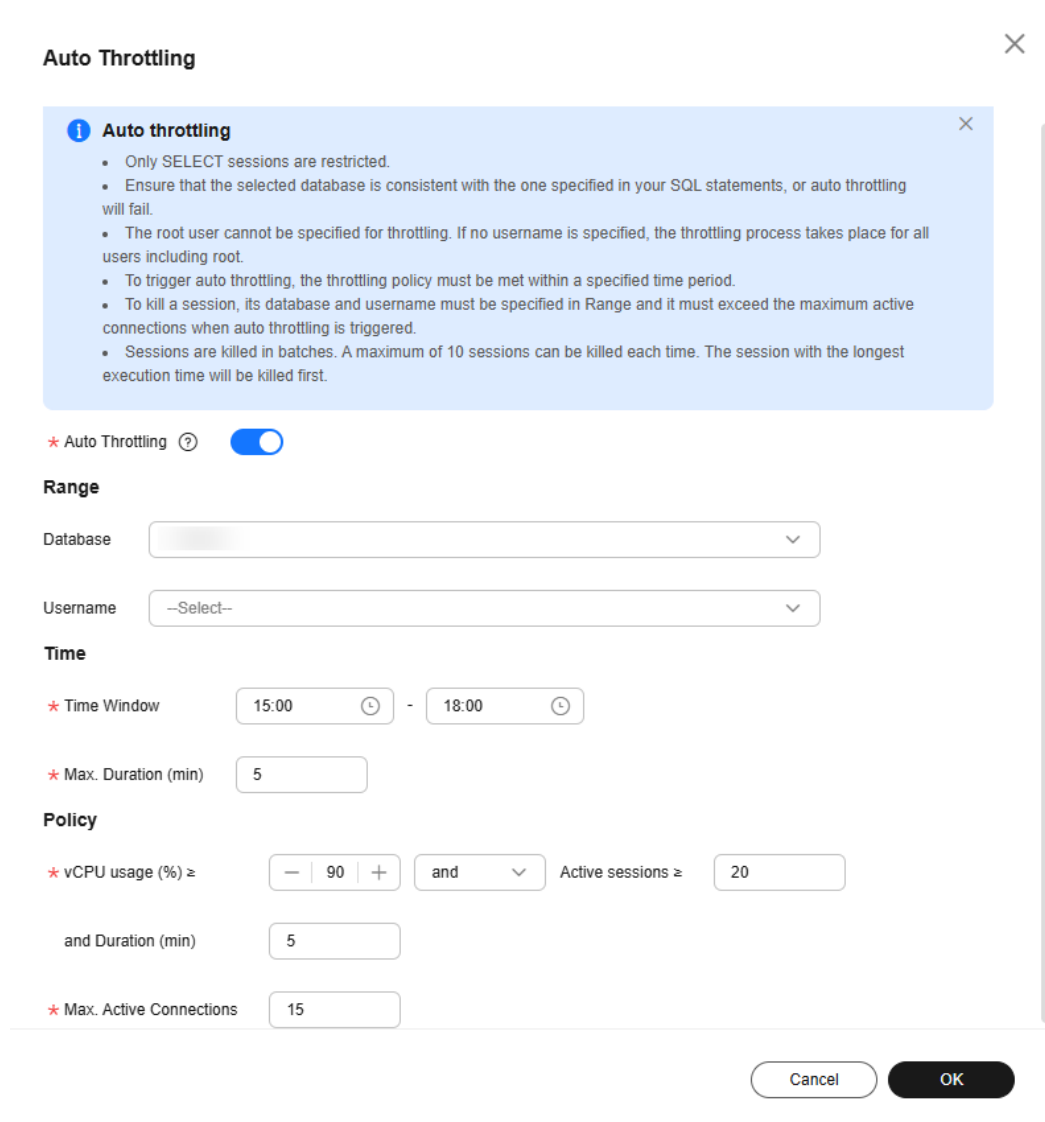
- Step 1** Click in the upper left corner and select a region.
- Step 2** Click in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the DB instance name.
- Step 4** In the navigation pane, choose **DBA Assistant > Historical Diagnosis**.

**Step 5** Click **SQL Explorer** and then **Auto Throttling**.

**Step 6** Click **Auto Throttling**.

**Step 7** Toggle on  and configure required parameters. For details about the parameters, see [Table 14-8](#).

**Figure 14-33** Example



**Auto Throttling**

**Auto throttling**

- Only SELECT sessions are restricted.
- Ensure that the selected database is consistent with the one specified in your SQL statements, or auto throttling will fail.
- The root user cannot be specified for throttling. If no username is specified, the throttling process takes place for all users including root.
- To trigger auto throttling, the throttling policy must be met within a specified time period.
- To kill a session, its database and username must be specified in Range and it must exceed the maximum active connections when auto throttling is triggered.
- Sessions are killed in batches. A maximum of 10 sessions can be killed each time. The session with the longest execution time will be killed first.

★ Auto Throttling 

**Range**

Database

Username

**Time**

★ Time Window  -

★ Max. Duration (min)

**Policy**

★ vCPU usage (%) ≥  and  and Duration (min)

★ Max. Active Connections

Cancel OK

### Example for setting auto throttling parameters

Set **Time Window** to **15:00-18:00**, **Max. Duration** to **Last 5 minutes**, **vCPU usage** ≥ to **90%**, **Active sessions** ≥ to **20**, and **and Duration (min)** to **5**. When all the criteria are met, auto throttling is triggered. If your vCPU usage or number of active sessions falls below the threshold during the time window, auto throttling ends.

**Table 14-8** Parameter description

| Parameter               | Description                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Database                | The name of the database for which auto throttling needs to be enabled. Ensure that the database you select is consistent with the one specified in your SQL statements, or the auto throttling policy will fail.<br><br>If the database name is not specified, auto throttling is applied to all databases by default.                                                                                       |
| Username                | The name of the user that auto throttling is applied.                                                                                                                                                                                                                                                                                                                                                         |
| Time Window             | The time when auto throttling is applied. Auto throttling can be triggered only once within the time window.                                                                                                                                                                                                                                                                                                  |
| Max. Duration           | Maximum length of time that SQL statements matching the auto throttling policy can be throttled within the time window.                                                                                                                                                                                                                                                                                       |
| vCPU usage              | vCPU usage threshold for the instance ( $\geq 70\%$ ). You also need to specify the relationship between the vCPU usage and active sessions. Their relationship can be <b>and</b> or <b>or</b> .                                                                                                                                                                                                              |
| Active sessions         | Threshold for active sessions. Value range: 1 to 5000                                                                                                                                                                                                                                                                                                                                                         |
| Duration (min)          | How long vCPU usage and active sessions exceed the specified values. The duration can range from 2 minutes to 60 minutes.<br><br>For example, if you set <b>vCPU usage</b> $\geq$ to <b>90%</b> , <b>Active sessions</b> $\geq$ to <b>1000</b> , and <b>Duration (min)</b> to <b>30</b> , auto throttling will be triggered only when the vCPU usage and active sessions exceed 90% and 1,000 for 30 minutes. |
| Max. Active Connections | Maximum number of active connections allowed. The value can range from 1 to 5,000. Auto throttling stops when the number of active connections drops to this limit.                                                                                                                                                                                                                                           |

**Step 8** Click **OK**.

**Step 9** You will see a record generated on the page every time auto throttling is triggered. You can see historical details, too.

----End

## Follow-up Operations

After auto throttling is enabled, you can determine whether to kill sessions based on service requirements. To learn how to kill sessions, see [Managing Real-Time Sessions](#).

## 14.5 Common Performance Problems



## 14.5.1 High CPU Usage of RDS for MySQL Instances

If the CPU usage of your RDS for MySQL instance is high or close to 100%, database performance deteriorates. For example, data read/write becomes slow, connecting to the instance takes a longer time, or errors are reported when you are trying to delete data.

Since November 25, 2021, 00:00 GMT+08:00, certain functions of Data Admin Service (DAS) have been available only to existing customers and no updates have been provided. The functions include SQL tuning, table structure comparison and synchronization, data tracking and rollback, test data generation, and DBA intelligent O&M in Development Tool, as well as storage analysis, intelligent parameter recommendation, historical transactions, and binlog parsing functions.

- For DB instances created after November 25, 2021, 00:00 GMT+08:00, [Solution 1](#) is recommended.
- For DB instances created before November 25, 2021, 00:00 GMT+08:00, [Solution 2](#) is recommended.

You are advised to [enable SQL audit](#) in advance so that you can view SQL execution records in audit logs to locate the fault when the CPU usage is high.

### Solution 1

Analyze slow SQL logs and CPU usage to locate slow queries and then optimize them.

1. View the slow SQL logs to check for slowly executed SQL queries and view their performance characteristics (if any) to locate the cause.  
For details about how to query RDS for MySQL logs, see [Viewing Slow Query Logs](#).
2. View the CPU usage metric of your DB instance.  
For details, see [Viewing Performance Metrics](#).
3. Create read replicas to reduce read pressure on the primary DB instance.
4. Add indexes for associated fields in multi-table association queries.
5. Do not use the SELECT statement to scan all tables. You can specify fields or add the WHERE condition.

### Solution 2

You can identify slow query statements and optimize them according to the suggestions provided by DAS to reduce the CPU usage.

**Step 1** Connect to the RDS for MySQL DB instance.

You can connect to an instance through a private or public network. For details, see the *Relational Database Service Getting Started*.

**Step 2** Run the following command to show the running threads and locate the queries that are slowly executed:

**show full processlist**

Check the values in the **Time** and **State** columns. As shown in the preceding figure, the long-running transaction ID is **4038566**.

1. Log in to the DAS console.
2. In the navigation pane, choose **Intelligent O&M** > **Instance List**.
3. Click **Details** on the instance.

DAS

Overview

Development Tool

Intelligent O&M

Instance List

Slow Query Logs

SQL Explorer

DDS Instance Connections and Sessions

Intelligent O&M Development Tool Learn more

We would much appreciate if you could complete our questionnaire on DAS. Your feedback will help us provide

Used/Total Quota: 0/1. After paid instances are set, you can use advanced features like SQL statement conc

Batch Set as PaidIncrease Instance Quota

Instance Overview

Total Instances  
1Set Login Account

Instances Without Login Accounts  
0Set Login Account

Last synchronized: Apr 11, 2023 16:54:12 GMT+08:00. Synchronize instances in a timely manner.

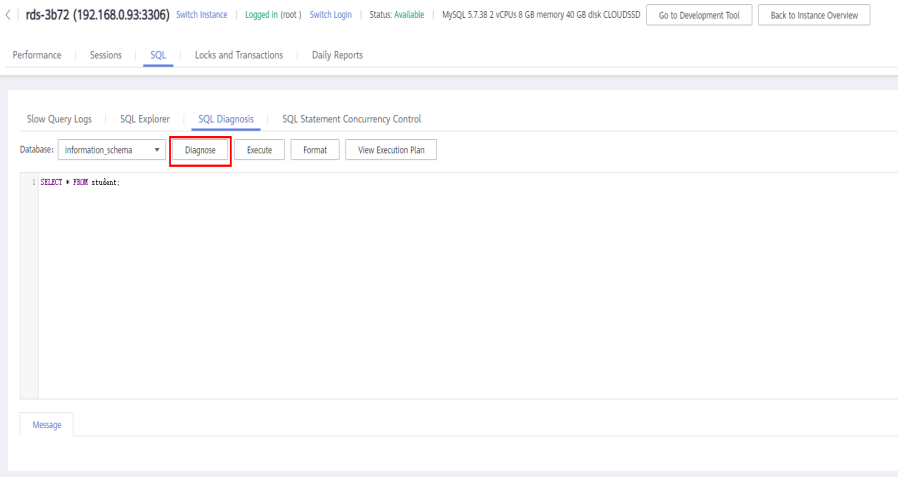
Available Abnormal metric data Abnormal Instances

rds-3b72  
192.168.0.93:3306  
Free

Set as PaidDetails

4. Choose **SQL > SQL Diagnosis**.
5. Select a database, enter an SQL statement, and click **Diagnose**.

Figure 14-35 SQL diagnosis



6. View diagnosis details and obtain statement optimization suggestions.

Figure 14-36 Tuning details



- Only SELECT, INSERT, UPDATE, and DELETE statements can be diagnosed, and INSERT statements must contain SELECT clauses.
- SQL statements that use views cannot be diagnosed.
- SQL diagnosis obtains table structure and data distribution information (not raw data). The information is only used for logic diagnosis and is not stored on the DAS server.
- Obtaining table structure and data distribution information may cause additional load on the DB instance, but has little impact on its performance.
- SQL diagnosis history is the only data stored on the DAS server. If you delete the data, it will be permanently deleted from the server.

----End

## 14.5.2 High Memory Usage of RDS for MySQL Instances

**For a DB instance storing mission-critical application data**

Scale up your instance by referring to [Changing a DB Instance Class](#).

**For a DB instance not storing mission-critical application data**

Check the memory usage of the local computer. If the memory usage curve is stable, no action is required.

**For a DB instance storing mission-critical application data and configured with a large instance class**

1. During off-peak hours, change the value of **performance\_schema** to **OFF**. For RDS for MySQL 5.6 and earlier versions, you should reboot the instance for the change to take effect.
2. View the memory usage of your instance using DBA Assistant. For details, see [Viewing Performance Metrics of a DB Instance](#).

If the memory usage remains high, perform either of the following operations:

- Scale up the instance class.
- Change the value of **innodb\_buffer\_pool\_size**. [Table 14-9](#) lists the recommended values for different memory specifications. The actual value ranges are displayed on the RDS console.

**Table 14-9** Recommended values for different memory specifications

| Memory (GB) | Recommended Value in Version 5.6 | Recommended Value in Version 5.7 | Recommended Value in Version 8.0 |
|-------------|----------------------------------|----------------------------------|----------------------------------|
| 2           | 536,870,912 bytes (512 MB)       | 536,870,912 bytes (512 MB)       | 536,870,912 bytes (512 MB)       |
| 4           | 1,073,741,824 bytes (1 GB)       | 1,073,741,824 bytes (1 GB)       | 1,073,741,824 bytes (1 GB)       |
| 8           | 4,294,967,296 bytes (4 GB)       | 4,294,967,296 bytes (4 GB)       | 5,368,709,120 bytes (5 GB)       |
| 16          | 8,589,934,592 bytes (8 GB)       | 8,589,934,592 bytes (8 GB)       | 9,663,676,416 bytes (9 GB)       |
| 32          | 22,548,578,304 bytes (21 GB)     | 22,548,578,304 bytes (21 GB)     | 21,474,836,480 bytes (20 GB)     |
| 64          | 47,244,640,256 bytes (44 GB)     | 47,244,640,256 bytes (44 GB)     | 47,244,640,256 bytes (44 GB)     |
| 128         | 96,636,764,160 bytes (90 GB)     | 94,489,280,512 bytes (88 GB)     | 94,489,280,512 bytes (88 GB)     |

| Memory (GB) | Recommended Value in Version 5.6 | Recommended Value in Version 5.7 | Recommended Value in Version 8.0 |
|-------------|----------------------------------|----------------------------------|----------------------------------|
| 192         | 146,028,888,064 bytes (136 GB)   | 146,028,888,064 bytes (136 GB)   | 146,028,888,064 bytes (136 GB)   |
| 256         | 193,273,528,320 bytes (180 GB)   | 193,273,528,320 bytes (180 GB)   | 193,273,528,320 bytes (180 GB)   |
| 384         | 298,500,227,072 bytes (278 GB)   | 300,647,710,720 bytes (280 GB)   | 300,647,710,720 bytes (280 GB)   |
| 512         | 412,316,860,416 bytes (384 GB)   | 412,316,860,416 bytes (384 GB)   | 412,316,860,416 bytes (384 GB)   |
| 768         | 618,475,290,624 bytes (576 GB)   | 618,475,290,624 bytes (576 GB)   | 618,475,290,624 bytes (576 GB)   |
| 1024        | 824,633,720,832 bytes (768 GB)   | 824,633,720,832 bytes (768 GB)   | 824,633,720,832 bytes (768 GB)   |

## Memory Description

- Change the value of **innodb\_buffer\_pool\_size** as needed.
- MySQL has a dynamic memory balancing mechanism. If the memory usage is less than 90%, no action is required. You are advised to set the alarm threshold for memory usage to 90% or above.
- The memory used by the buffer pool will gradually increase to the value of **innodb\_buffer\_pool\_size** as the database runs. You can check the memory usage of the buffer pool based on the metric **Buffer Pool Usage**.
- RDS for MySQL memory is allocated to the engine layer and server layer.
  - The memory allocated to the engine layer includes the InnoDB buffer pool, log buffer, and full text index cache. The InnoDB buffer pool is resident memory and accounts for a large proportion.

The InnoDB buffer pool is a memory area that holds cached InnoDB data for tables, indexes, and other auxiliary buffers. You can use the **innodb\_buffer\_pool\_size** parameter to define the buffer pool size.
  - The memory allocated to the server layer is occupied by the thread cache, binlog cache, sort buffer, read buffer, and join buffer. These caches and buffers are usually released when connections are closed.

Such memory allocation keeps memory usage of a running RDS for MySQL instance at about 80%.

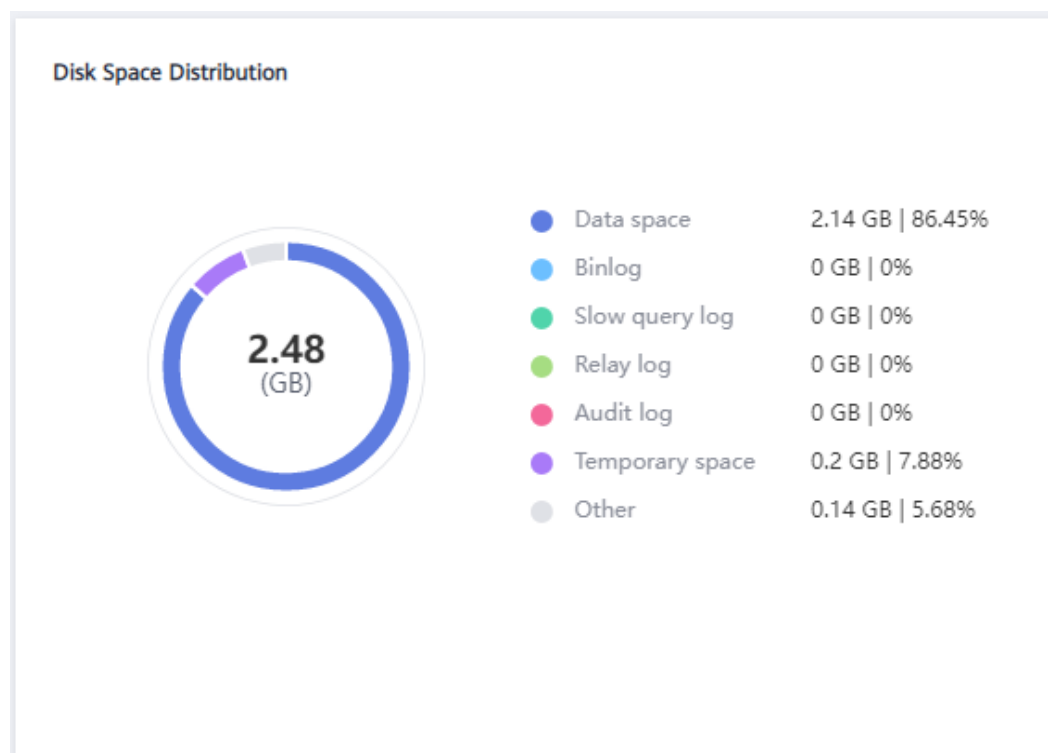
## 14.5.3 Full Storage of RDS for MySQL Instances

### Symptom

There is not enough storage available for an RDS instance and the instance becomes read-only, so applications cannot write any data to the instance.

You can check which data or files occupy too much storage in the **Disk Space Distribution** area on the **Storage Analysis** page. For details, see [Storage Analysis](#).

**Figure 14-37** Disk space distribution



### Causes

1. Increased workload data
2. Too much data being stored
3. Too many RDS for MySQL binlogs generated due to a large number of transactions and write operations
4. Too many temporary files generated due to a large number of sorting queries executed by applications

### Solution

1. For insufficient storage caused by increased workload data, [scale up storage space](#).  
If the original storage has reached the maximum, [upgrade the specifications](#) first.

For instances using cloud disks, you can configure [storage autoscaling](#) so that RDS can autoscale your storage when the storage usage reaches the specified threshold.

2. If too much data is stored, delete unnecessary historical data.
  - a. If the instance becomes read-only, [unlock it from this state first](#). If it is not read-only, delete the data directly.
  - b. Check the top 50 databases and tables with large physical files and identify the historical table data that can be deleted. For details, see [Storage Analysis](#).
  - c. To clear up space, you can optimize tables with a high fragmentation rate during off-peak hours.

To delete data of an entire table, run **DROP** or **TRUNCATE**. To delete part of table data, run **DELETE** and **OPTIMIZE TABLE**.
3. If binlog files occupy too much space, [clear local binlogs](#).
4. If temporary files generated by sorting queries occupy too much storage space, optimize your SQL statements.

You can query [slow query logs](#) and [top SQL statements](#), and analyze and optimize the problematic SQL statements.
5. Subscribe to daily health reports to obtain SQL and performance analysis results, including slow SQL analysis, all SQL analysis, performance & storage analysis, and performance metric trend charts. You can receive a diagnosis report if there are any risks detected.

For details, see [Daily Reports](#).

## 14.5.4 RDS for MySQL Metadata Locks

RDS for MySQL uses metadata locking to manage concurrent access to database objects and to ensure data consistency. Metadata locks have been introduced since MySQL 5.5. A metadata lock on a table prevents any data from being read or written, resulting in SQL statements being blocked. You can use Data Admin Service (DAS) to resolve this issue.

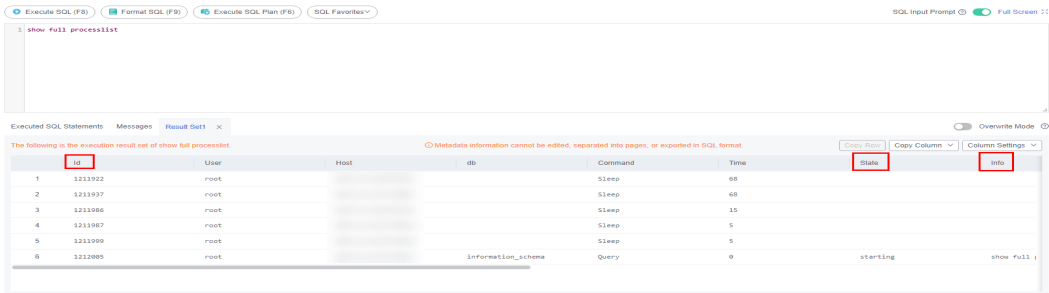
### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.

Alternatively, click the instance name on the **Instances** page. On the displayed **Overview** page, click **Log In** in the upper right corner.
- Step 4** On the displayed login page, enter the username and password and click **Log In**.
- Step 5** On the top menu bar, choose **SQL Operations > SQL Query**.
- Step 6** Run the following SQL statement in the SQL window to view the states of all database threads:

show full processlist

Figure 14-38 Execution result



**Step 7** Check whether a large number of **Waiting for table metadata lock** are displayed in the **State** column, which would indicate that SQL statements are being blocked. Locate the sessions in the table operations in the **Info** column and record the values in the **Id** column.

**Step 8** Run the following command in the SQL window to unlock the metadata lock:

kill Id

Figure 14-39 Execution result



----End



## 14.5.5 Troubleshooting Slow SQL Issues for RDS for MySQL DB Instances

This section describes how to troubleshoot slow SQL statements on RDS for MySQL DB instances. For any given service scenario, query efficiency depends on the architecture and on the database table and index design. Poorly designed architecture and indexes will cause many slow SQL statements.

### Slow SQL Statements Caused by SQL Exceptions

- Causes and symptoms

There are many causes for SQL exceptions, for example, unsuitable database table structure design, missing indexes, or too many rows that need to be scanned.

On the slow query logs page of the management console, you can download slow query logs to identify the slow SQL statements and see how long they took to execute. For details, see [Viewing and Downloading Slow Query Logs](#).

- Solution

Optimize the SQL statements that you need to execute.

### Slow SQL Statements Caused by DB Instance Limits

- Causes and symptoms

DB instance performance can be limited because:

- Your workloads have been increasing but the storage has not been scaled up accordingly.
- The performance of your DB instance has been deteriorating as the physical server of the instance ages.
- The amount of data has been increasing, and the data structure has been changing.

You can view the resource usage of the DB instance on the console. If the values of all resource usage metrics are close to 100%, your DB instance may reach its maximum performance. For details, see [Viewing Performance Metrics of a DB Instance](#).

- Solution

Upgrade the instance class. For details, see [Changing a DB Instance Class](#).

### Slow SQL Statements Caused by Version Upgrades

- Causes and symptoms

Upgrading your DB instance may change the SQL execution plan. The join types determined in the execution plan are, in descending order of efficiency: system > const > eq\_ref > ref > fulltext > ref\_or\_null > index\_merge > unique\_subquery > index\_subquery > range > index > all

For more information, see [official MySQL documentation](#).

If your application frequently resends query requests that specify range and index joins but RDS processes these query requests slowly, a number of SQL statements are parallelized. In this case, your application is slow to release

threads. As a result, the connections in the connection pool get depleted, affecting all the workloads on your DB instance.

You can log in to the console to see how many current connections your DB instance has established. For details, see [Viewing Performance Metrics of a DB Instance](#).

- Solution

Analyze the index usage and the number of rows to scan, estimate the query efficiency, reconstruct SQL statements, and adjust indexes. For details, see [Executing SQL Plan](#).

 **NOTE**

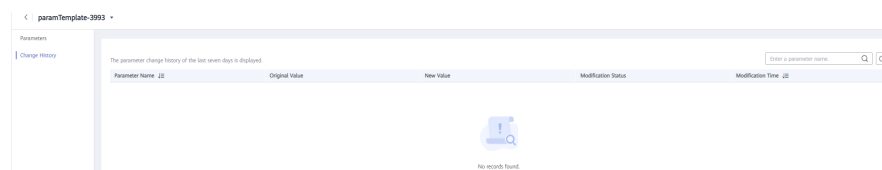
Incorrectly optimizing slow queries may cause service exceptions. Exercise caution when performing this operation.

## Slow SQL Statements Caused by Inappropriate Parameter Settings

- Causes and symptoms

Inappropriate settings of some parameters (such as `innodb_spin_wait_delay`) can impact performance.

You can view parameter modifications on the console. For details, see [Viewing Parameter Change History of a DB Instance](#).



- Solution

Modify related parameters based on your specific service scenario. For details, see [Suggestions on RDS for MySQL Parameter Tuning](#).

## Slow SQL Statements Caused by Batch Operations

- Causes and symptoms

A large number of operations are performed to import, delete, and query data.

You can view **Total Storage Space**, **Storage Space Usage**, and **IOPS** on the console. For details, see [Viewing Performance Metrics of a DB Instance](#).

- Solution

Perform batch operations during off-peak hours, or split them.

## Slow SQL Statements Caused by Scheduled Tasks

- Causes and symptoms

If the load of your DB instance changes regularly over time, there may be scheduled tasks causing this.

You can view **DELETE Statements per Second**, **INSERT Statements per Second**, **INSERT\_SELECT Statements per Second**, **REPLACE Statements per Second**, **REPLACE\_SELECTION Statements per Second**, **SELECT Statements per Second**, and **UPDATE Statements per Second** on the console to

determine whether the load has been changing regularly. For details, see [Viewing Monitoring Metrics](#).

- **Solution**

Adjust the time when scheduled tasks are run. You are advised to run scheduled tasks during off-peak hours and change the maintenance window to off-peak hours. For details, see [Changing the Maintenance Window](#).

# 15 Security and Encryption

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## 15.1 Database Account Security

### Setting the Account Password Complexity

For details about the database password strength requirements on the RDS console, see the database configuration table in [Buying an RDS for MySQL DB Instance](#).

RDS for MySQL has a password security policy for user-created database accounts. Passwords must:

- Consist of at least eight characters.
- Contain at least one uppercase letter, one lowercase letter, one digit, and one special character.

When you are creating a DB instance, the password strength is checked. You can modify the password strength as user **root**. For security reasons, the new password strength must be at least as strong as the initial setting.

### Account Description

To provide O&M services, the system automatically creates system accounts when you create RDS for MySQL DB instances. These system accounts are unavailable to you.

---

#### NOTICE

Attempting to delete, rename, and change passwords or permissions for these accounts will result in an error. Exercise caution when performing these operations.

---

- **rdsAdmin**: the management account, which has the superuser permissions and is used to query and modify DB instance information, rectify faults, migrate data, and restore data.

- **rdsRepl**: the replication account, which is used to synchronize data from primary DB instances to standby DB instances or read replicas.
- **rdsBackup**: the backup account, which is used for backend backup.
- **rdsMetric**: the metric monitoring account, which is used by watchdog to collect database status data.
- **rdsProxy**: the proxy account, which is automatically created when read/write splitting is enabled and is used for authentication when a database is connected through a read/write splitting address.

## Setting Password Complexity

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target DB instance to navigate to the **Overview** page.

Passwords must:

- Consist of at least eight characters.
- Contain at least one uppercase letter, one lowercase letter, one digit, and one special character.
- Must be different from the user name.

**Step 4** In the navigation pane on the left, choose **Parameters**. On the displayed page, modify the required parameters.

The following parameters can be modified only for RDS for MySQL 5.6 and 5.7.

- **validate\_password\_length**: Set this parameter to **8**.
- **validate\_password\_mixed\_case\_count**: Set this parameter to **1**.
- **validate\_password\_number\_count**: Set this parameter to **1**.
- **validate\_password\_special\_char\_count**: Set this parameter to **1**.
- **validate\_password\_policy**: Set this parameter to **MEDIUM**.
- To save the modifications, click **Save**.
- To cancel the modifications, click **Cancel**.
- To preview the modifications, click **Preview**.

**Step 5** After the parameters are modified, check the values in the **Effective upon Reboot** column.

- If any value is **Yes** and the instance status on the **Instances** page is **Parameter change. Pending reboot**, reboot the instance to apply the modifications.
  - If you have modified parameters of a primary DB instance, you need to reboot the primary DB instance for the modifications to take effect. (For primary/standby DB instances, the parameter modifications are also applied to the standby DB instance.)

- If you have modified parameters of a read replica, you need to reboot the read replica for the modifications to take effect.
- If all values are **No**, the modifications are applied immediately without rebooting the instance.

----End

## 15.2 Resetting the Administrator Password to Restore root Access

### Scenarios

If you forget the password of the administrator account **root**, you can reset the password. The new password is applied immediately without rebooting the instance.

### Precautions

- If the password you provide is regarded as a weak password by the system, you will be prompted to enter a stronger password.
- If you have changed the administrator password of the primary DB instance, the administrator passwords of the standby DB instance and read replicas (if any) will also be changed.
- The time required for the new password to take effect depends on the amount of service data currently being processed by the primary DB instance.
- To protect against brute force hacking attempts and ensure system security, change your password periodically.
- If you have logged in to your instance as the **root** user, resetting the password may interrupt services. Exercise caution when performing this operation.

### Method 1

**Step 1** Click  in the upper left corner and select a region.

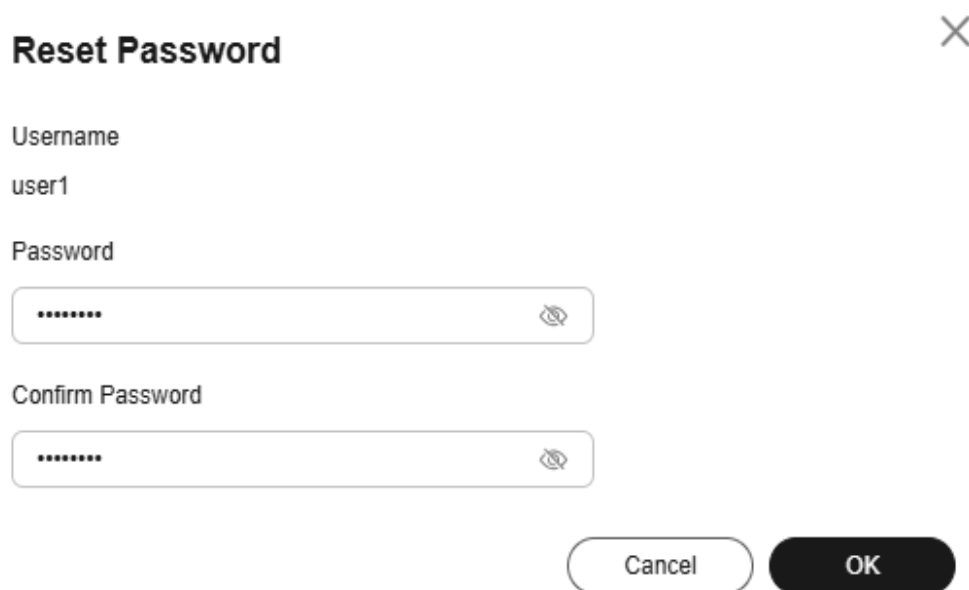
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance and choose **More > Reset Password** in the **Operation** column.

**Step 4** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 5** Enter and confirm the new password.

**Figure 15-1** Resetting the administrator password

The image shows a 'Reset Password' dialog box with a close button (X) in the top right corner. It contains two input fields: 'Username' with the value 'user1' and 'Password' with masked characters '.....'. Below the password field is a 'Confirm Password' field, also with masked characters '.....'. At the bottom right are two buttons: 'Cancel' and 'OK'.

**NOTICE**

Keep this password secure. The system cannot retrieve it.

The password must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^\*\_-=+?,()&.|). Enter a strong password and periodically change it for security reasons.

- To submit the new password, click **OK**.
- To cancel the reset operation, click **Cancel**.

----End

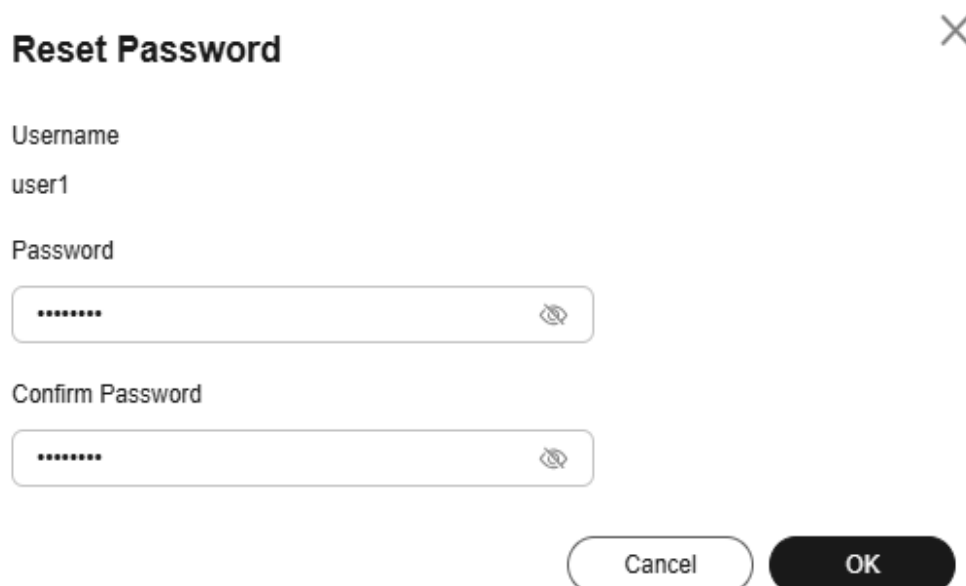
## Method 2

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** On the **Overview** page, find **Administrator** and click **Reset Password** under it.
- Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 6** Enter and confirm the new password.

**Figure 15-2** Resetting the administrator password



The image shows a 'Reset Password' dialog box with a close button (X) in the top right corner. It contains two input fields: 'Username' with the value 'user1' and 'Password' with masked characters '\*\*\*\*\*'. Below the password field is a 'Confirm Password' field, also with masked characters '\*\*\*\*\*'. At the bottom right, there are two buttons: 'Cancel' and 'OK'.

#### NOTICE

Keep this password secure. The system cannot retrieve it.

The password must consist of 8 to 32 characters and contain at least three types of the following characters: uppercase letters, lowercase letters, digits, and special characters (~!@#\$%^\*\_-=+?,()&.). Enter a strong password and periodically change it for security reasons.

- To submit the new password, click **OK**.
- To cancel the reset operation, click **Cancel**.

----End

## 15.3 Changing a Security Group

### Scenarios

This section describes how to change the security group of a primary DB instance or read replica. For primary/standby DB instances, changing the security group of the primary DB instance will cause the security group of the standby DB instance to be changed as well.



## Precautions

- If you need to change the security group of a DB instance with read/write splitting enabled, [submit a service ticket](#) to apply for required permissions.
- Changing the security group of a DB instance with read/write splitting enabled will also change the security group of its read replicas. The security group of the read replicas cannot be changed independently. Check whether the new security group meets the expectation to prevent impact on existing workloads.
- You can add or modify rules for the security group associated with your DB instance, or delete the security group.

## Managing Security Groups

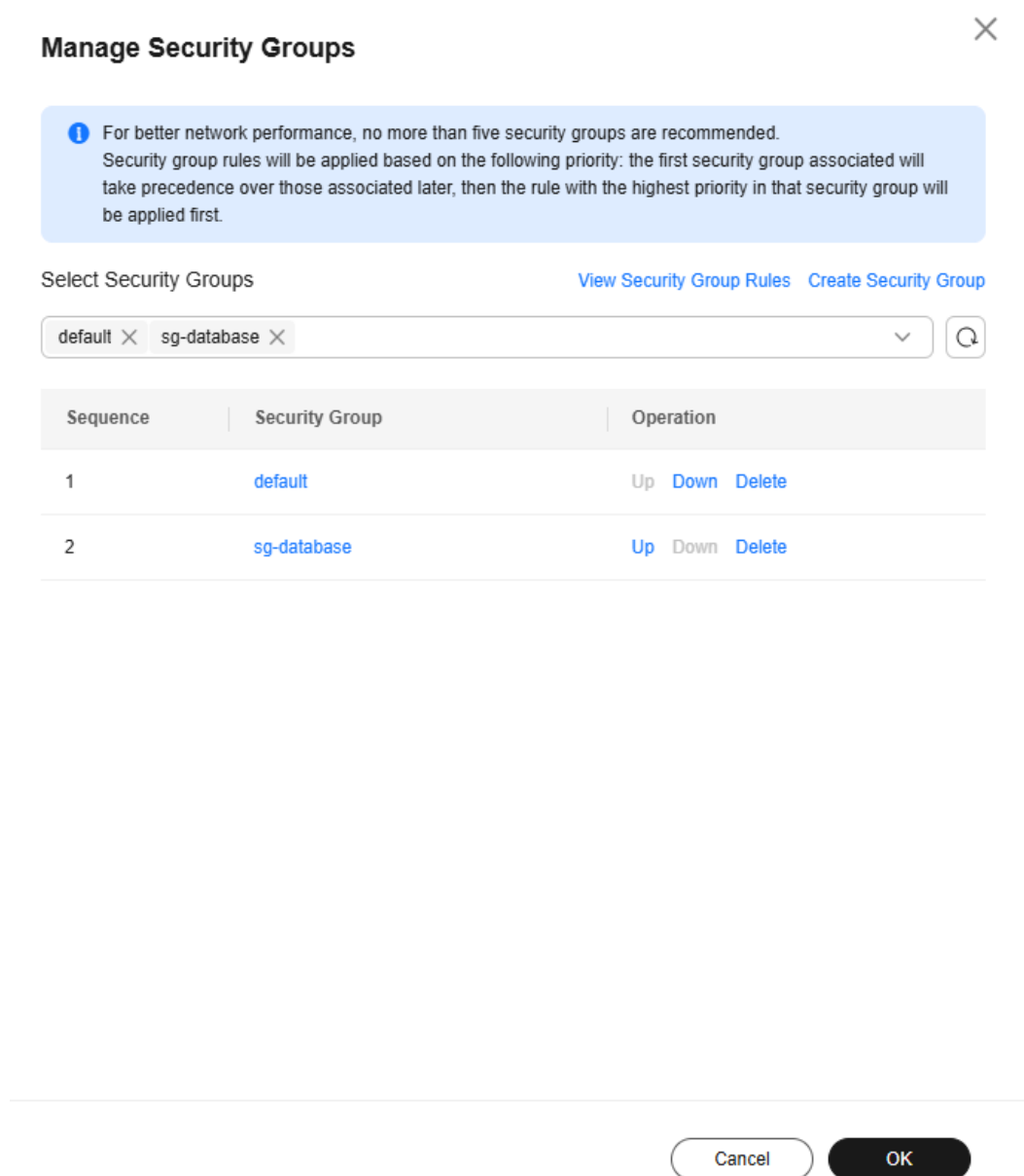
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the DB instance or read replica.

**Step 4** On the **Overview** page, click **Manage** under **Security Group**.

- You can select multiple security groups at a time. The security group rules will be applied based on the following sequence: the first security group associated will take precedence over those associated later, then the rule with the highest priority in that security group will be applied first.
- To create a security group, click **Create Security Group**.
- Using multiple security groups may impact the network performance. No more than five security groups are recommended.

**Figure 15-3** Managing security groups

**Step 5** Click **OK** to submit the modification.

----End

## 15.4 Performing a Server-Side Encryption

### Introduction

The RDS console provides server-side encryption with Data Encryption Workshop (DEW)-managed keys.

DEW uses a third-party hardware security module (HSM) to protect keys, enabling you to easily create and control encryption keys. For security reasons, keys are not displayed in plaintext outside of HSMs. With DEW, all operations on keys are

controlled and logged, and usage records of all keys can be provided to meet regulatory compliance requirements.

If server-side encryption is enabled, disk data will be encrypted and stored on the server when you create a DB instance or expand disk capacity. When downloading encrypted objects, the encrypted data will be decrypted on the server and displayed to you in plaintext.

## Encrypting Disks Using Server-Side Encryption

For server-side encryption, you need to first create a key using Data Encryption Workshop (DEW) or use the default key that DEW comes with. When creating a DB instance, select **Enable** for disk encryption and select or create a key. The key is the end tenant key and is used for server-side encryption.

- You will need the KMS administrator permission for the region where RDS is deployed. This permission can be granted using Identity and Access Management (IAM). On the IAM console, add permission policies to user groups. For details, see [Creating a User Group and Assigning Permissions](#).
- If you want to use a user-defined key to encrypt objects to be uploaded, create a key using DEW. RDS supports only symmetric keys. For details, see [Creating a Key](#).
- If you enable disk encryption during instance creation, the disk encryption status and the key cannot be changed later. Disk encryption will not encrypt backup data stored in OBS. To enable backup data encryption, [submit a service ticket](#) to request required permissions.
- If disk encryption or backup data encryption is enabled, keep the key properly. Once the key is disabled, deleted, or frozen, the database will be unavailable and data may not be restored.
  - If disk encryption is enabled but backup data encryption is not enabled, you can [restore data to a new instance from backups](#).
  - If both disk encryption and backup data encryption are enabled, data cannot be restored.
- If you scale up a DB instance with disks encrypted, the expanded storage space will also be encrypted using the original encryption key.

## 15.5 Configuring an SSL Connection

Secure Socket Layer (SSL) is an encryption-based Internet security protocol for establishing an encrypted link between a server and a client. It provides authenticated Internet connections to ensure the privacy and integrity of online communications. SSL:

- Authenticates users and servers, ensuring that data is sent to the correct clients and servers.
- Encrypts data, preventing it from being intercepted during transmission.
- Ensures data integrity during transmission.

Clients using versions earlier than 5.1 have SSL compatibility issues. By default, SSL is disabled for new RDS for MySQL instances. If your client has no SSL compatibility issues, you can enable SSL by referring to [Enabling SSL](#). Enabling

SSL will increase the network connection response time and CPU resource consumption. Before enabling it, evaluate any potential impacts on service performance. If a client cannot connect to the DB instance due to compatibility issues, upgrade the client and try again.

You can connect to a DB instance through a client using an SSL or non-SSL connection.

- If SSL is disabled (default), use a non-SSL connection.
- If SSL is enabled, use an SSL connection. SSL encrypts connections to the instance, making in-transit data more secure.

## Constraints

Enabling or disabling SSL will cause instances to reboot and interrupt connections. Exercise caution when performing this operation.

## Enabling SSL

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** On the **Overview** page, find **SSL** and click **Enable**.

**Step 5** In the displayed dialog box, click **OK**.

**Step 6** After a while, check the SSL status on the **Overview** page. It is enabled.

----End

## Disabling SSL

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** On the **Overview** page, find **SSL** and click **Disable**.

**Step 5** In the displayed dialog box, click **OK**.

**Step 6** After a while, check the SSL status on the **Overview** page. It is disabled.

----End

## 15.6 Configuring the TDE Function

### Scenarios

Transparent Data Encryption (TDE) performs real-time I/O encryption and decryption on data files. Data is encrypted before being written to disks and is decrypted when being read from disks to memory. This effectively protects the security of databases and data files.

TDE ensures data security in the following scenarios:

- Hard disks are stolen, causing data leakage.
- Hackers intrude the system and copy the files, causing data leakage. If TDE is not enabled for a database, hackers can browse all data in it as long as they obtain the database file. If TDE is enabled, all data in the database is encrypted. No one can access the data without a key.

### Supported Versions

RDS for MySQL supports TDE in the following versions:

- 8.0: 8.0.32.250300 and later
- 5.7: 5.7.38.221000 and later

For details about how to query the instance version, see [Query the RDS Instance Version](#).

### Impacts on Performance

When there are data reads and writes in an encrypted table, the encryption and decryption algorithms introduce additional computational overhead. This causes the CPU load to increase.

In most cases, if the CPU usage of an instance does not reach the bottleneck, the read and write performance of encrypted tables will decrease by no more than 5%.

In high concurrency and high CPU load scenarios, I/O-intensive workloads involving encrypted tables will cause instances with fewer than 8 vCPUs to struggle more with performance degradation. The extent of deterioration depends on the business model and encryption algorithm used.

## Constraints

**Table 15-1** Constraints

| Stage                     | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before TDE is enabled     | <ul style="list-style-type: none"><li>• To enable TDE, submit a service ticket by choosing <a href="#">Service Tickets &gt; Create Service Ticket</a> in the upper right corner of the management console.</li><li>• You need to enable Key Management Service (KMS) for your RDS for MySQL instance first. The Customer Master Key (CMK) used for encryption is generated and managed by KMS. RDS does not provide any keys or certificates required for encryption.</li><li>• TDE cannot be enabled for the following instances:<ul style="list-style-type: none"><li>– Instances with cross-region backup enabled</li><li>– Instances with CBR snapshot-based backup enabled</li></ul></li><li>• TDE is supported for cloud SSDs.</li><li>• TDE encrypts instance data, including full backups but excluding incremental backups.</li><li>• Once enabled, TDE cannot be disabled. Exercise caution when deciding to enable TDE.</li></ul> |
| When TDE is being enabled | <ul style="list-style-type: none"><li>• Enabling TDE will not cause your instance to reboot, but will increase CPU usage significantly. You are advised to enable TDE during off-peak hours.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Stage                | Constraints                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| After TDE is enabled | <ul style="list-style-type: none"><li>• The following limitations apply to the instance after TDE is enabled:<ul style="list-style-type: none"><li>– You cannot configure remote disaster recovery for it.</li><li>– You cannot disable this function or change the default CMK.</li><li>– You cannot restore data to another existing DB instance from a TDE-encrypted backup.</li><li>– Data cannot be restored to another existing DB instance during point-in-time recovery (PITR).</li><li>– Manual backups created using custom keys cannot be used for restoration. They can only be downloaded.</li><li>– Manual or automated backups created using default keys cannot be downloaded.</li><li>– You cannot perform a major version upgrade.</li></ul></li><li>• Tables can be encrypted or decrypted only after TDE is enabled. Pay attention to the following after enabling this function:<ul style="list-style-type: none"><li>– Ensure that common database tools can still be used.</li><li>– When table data is queried, the data is decrypted and read to the memory, so the query result is displayed in plaintext. After TDE is enabled, backups are encrypted, preventing data leakage caused by backup leakage.</li></ul></li></ul> |

## Enabling Instance-Level TDE

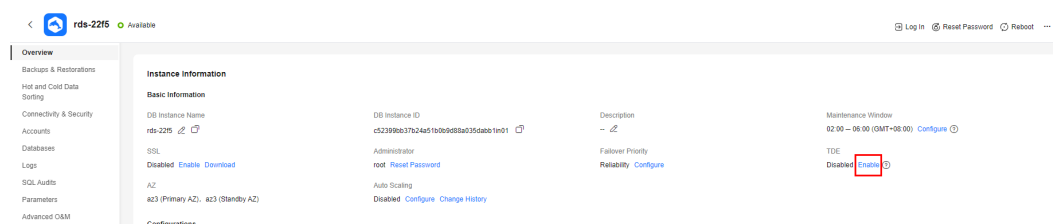
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name to go to the **Overview** page.

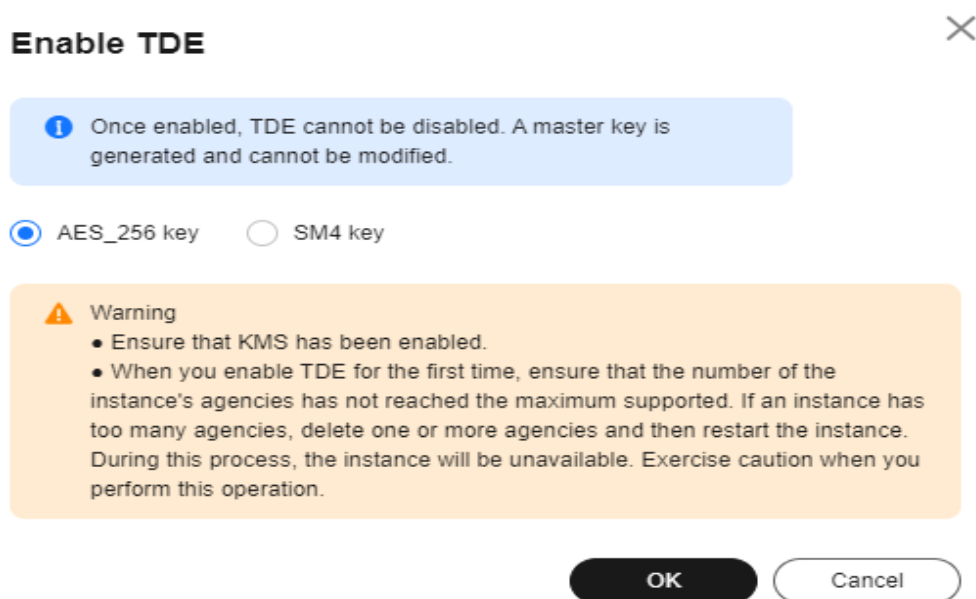
**Step 4** Under **TDE**, click **Enable**.

**Figure 15-4** Enabling instance-level TDE



**Step 5** In the displayed dialog box, click **OK**.

Figure 15-5 Enabling TDE



**Step 6** After TDE is enabled, to restore data to an on-premises database, use either of the following methods.

- Method 1: Decrypt data.
  - a. Decrypt data by referring to [Decryption](#).
  - b. Create a manual backup for the instance to be restored.
  - c. Restore data from the manual backup.
- Method 2: Use the transition key **--transition-key**.
  - a. When creating a manual backup on the console, enter a custom key string as prompted to re-encrypt the data. For details, see [Creating a Manual Backup](#).



Figure 15-6 Custom encryption

### Create Backup

**!** When the DB instance is being backed up, data is copied and then compressed and uploaded to OBS at an average speed of 100 MB/s. Creating a backup increases the disk I/O load. Perform this operation during off-peak hours.

|                   |                                                                                                                                                                                                                                                   |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DB instance ID    | c52399bb37b24a51b0b9d88a035dabb1in01                                                                                                                                                                                                              |
| DB Instance Name  | rds-22f5                                                                                                                                                                                                                                          |
| * Backup Name     | <input type="text" value="backup-e085"/>                                                                                                                                                                                                          |
| Description       | <div><div></div><div>0/256</div></div>                                                                                                                                                                                                            |
| Backup Encryption | <div><div>Automatically assigned</div><div>Custom</div></div> <div>Backups encrypted with custom keys cannot be restored on the cloud. They can only be downloaded to a local device for restoration.</div> <div><div></div><div>0/32</div></div> |

Cancel

OK

- b. Download a full backup and use the third-party full backup tool Percona XtraBackup to restore the backup locally.
  - i. **prepare** phase: `--transition-key = {custom_key}`
  - ii. **copy-back** phase: `--transition-key={custom_key} --generate-new-master-key`

----End

## Encrypting or Decrypting a Table

**Step 1** [Connect to the target DB instance.](#)

**Step 2** Run the following commands to encrypt or decrypt a table. In the commands, *tablename* indicates the name of the table to be encrypted or decrypted.

- Encryption  
`alter table tablename encryption='Y';`
- Decryption  
`alter table tablename encryption='N';`

Both **alter table *tablename* encryption='Y';** and **alter table *tablename* encryption='N';** are DDL statements that use **ALGORITHM=COPY**. Such statements are executed by creating a table, copying all data to the table, and then renaming the table. This results in the following symptoms:

- After a DDL statement is executed, there will be brief fluctuations in the performance of queries on that table.
- If the buffer pool is not fully used, the memory load increases.

----End

## 15.7 Configuring a Password Expiration Policy

### Scenarios

Using the same password too long makes it easier for hackers to crack or guess your password. Requiring password changes after a certain amount of time can improve security.

You can configure a password expiration policy for your instance in either of the following ways:

- **Modify the database parameter:** RDS for MySQL 5.7 and 8.0 allow you to set the global variable **default\_password\_lifetime** to define the number of days before your password expires and must be changed.
- **Configure the password expiration policy through DAS:** Different password expiration policies can be configured for different users.

### Precautions

- Once your password expires, you cannot log in to the database.
- After the password expiration policy is configured, you need to periodically check whether your password is about to expire.

### Modifying the Database Parameter

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name.

**Step 4** In the navigation pane, choose **Parameters**.

**Step 5** On the displayed page, change the value of **default\_password\_lifetime**.

The value of this parameter indicates how many days until a password expires. The default value is **0**, indicating that the created user password will never expire.

**Step 6** Click **Save**. In the displayed dialog box, click **Yes**.

-----End

## Configuring the Password Expiration Policy Through DAS

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the DB instance and click **Log In** in the **Operation** column.

Alternatively, click the DB instance on the **Instances** page. On the displayed **Overview** page, click **Log In** in the upper right corner.

**Step 4** Enter the username and password and click **Log In**.

**Step 5** Choose **SQL Operations > SQL Query**.

**Step 6** In the editing area, compile the statement shown below. The unit of **password\_life\_time** is day. You are advised to set it to **180**.

```
ALTER USER username PASSWORD EXPIRE INTERVAL password_life_time DAY;
```

**Step 7** Click **Execute SQL**. Then, view SQL execution status on the **Executed SQL Statements, Messages, and Result** tab pages.

-----End

## 15.8 Unbinding an EIP

The Elastic IP (EIP) service enables your RDS instances to communicate with the Internet using static public IP addresses and scalable bandwidths. But this increases the risk of network-wide attacks on your instances. Using an EIP leaves you open to DoS or DDoS attacks.

As an internal component, the database can be accessed using an internal IP address. Therefore, you are advised to unbind the EIP from the database.

### Unbinding an EIP

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the DB instance that has an EIP bound.

**Step 4** In the navigation pane on the left, choose **Connectivity & Security**. In the **Connection Information** area, click **Unbind** next to the **EIP** field. In the displayed dialog box, click **OK**.

Alternatively, in the **Connection Topology** area, click **Public Connection** and then **Unbind** in the connection topology. In the displayed dialog box, click **OK**.

**Step 5** If you have enabled operation protection, click **Send Code** in the displayed **Identity Verification** dialog box and enter the obtained verification code. Then, click **OK**.

Two-factor authentication improves the security of your account and cloud product. For details about how to enable operation protection, see [Identity and Access Management User Guide](#).

**Step 6** On the **Connectivity & Security** page, check the result.

You can also view the progress and result of unbinding an EIP from a DB instance on the **Task Center** page.

To bind an EIP to the DB instance again, see [Binding an EIP](#).

----End

## 15.9 Using the Database of the Latest Version

When the MySQL community releases new CVE vulnerabilities, we analyze the impacts of the vulnerabilities in a timely manner and determine patch release plans based on the analysis results. You are advised to upgrade your database and fix the vulnerabilities in a timely manner to prevent the vulnerabilities from affecting data security.

For more information about minor versions, see [RDS for MySQL Kernel Version Description](#).

### Procedure

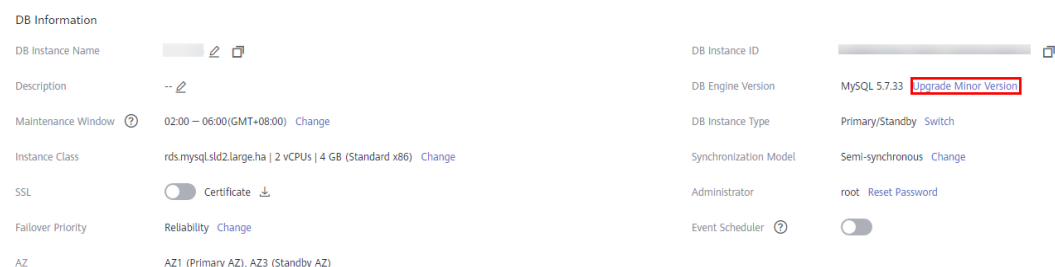
**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the instance name to go to the **Overview** page.

**Step 4** Under **DB Engine Version**, click **Upgrade Minor Version**.

**Figure 15-7** Upgrading a minor version

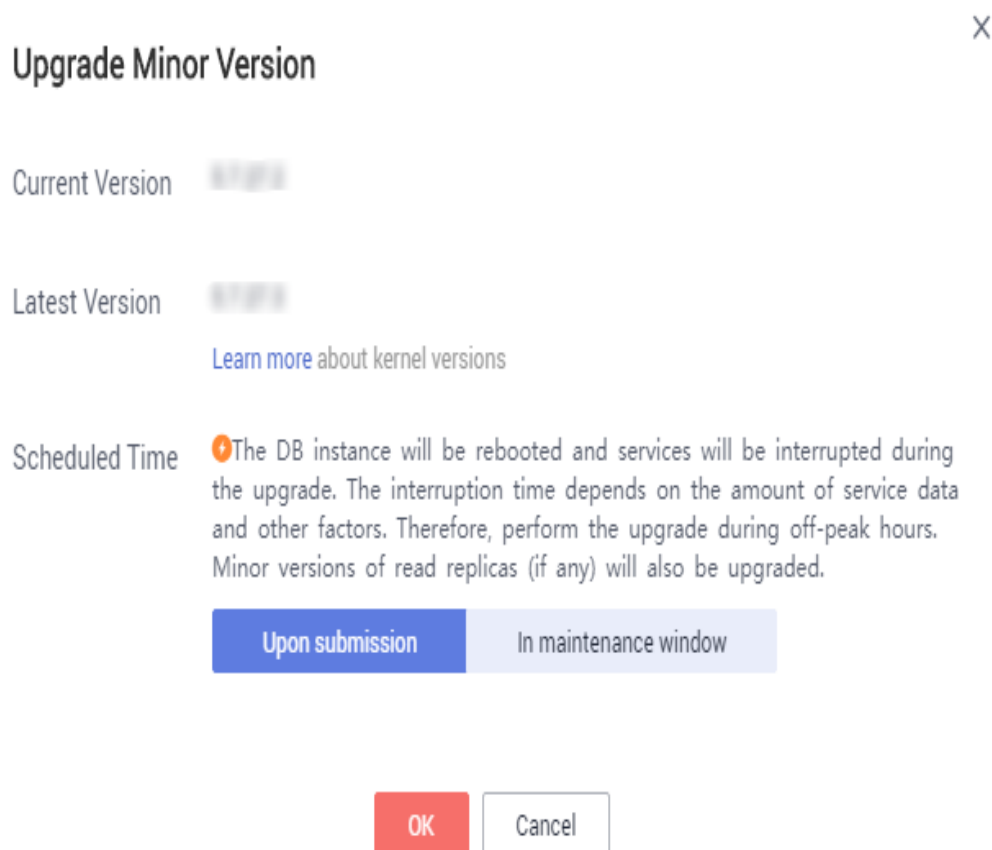


**Step 5** In the displayed dialog box, select a scheduled time and click **OK**.

- **Upon submission:** The system upgrades the minor version immediately after you have submitted your upgrade request.

- **In maintenance window:** The system will upgrade the minor version during the maintenance window that you have configured.

**Figure 15-8** Selecting a scheduled time

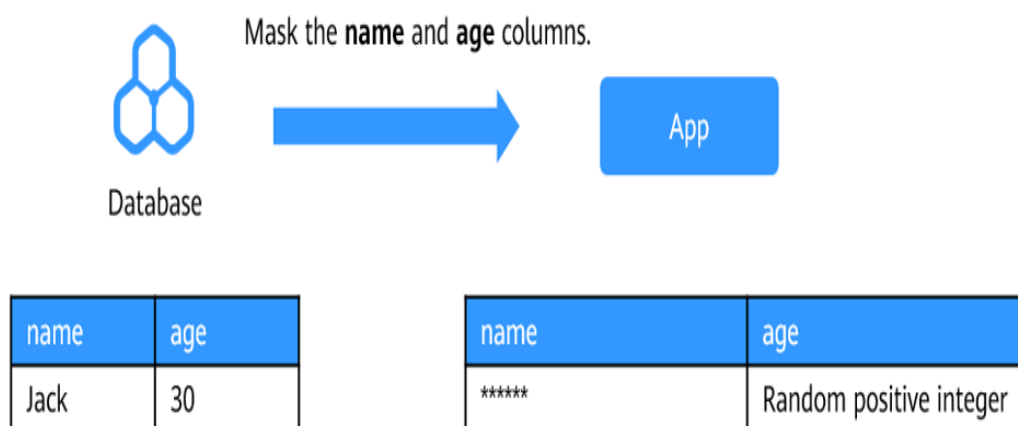


----End

## 15.10 Configuring Dynamic Data Masking for an RDS for MySQL Instance

### Function

Dynamic data masking is a security technology that masks data when databases send data to clients. RDS for MySQL allows you to add masking rules to mask data in specified databases, tables, and columns.

**Figure 15-9** Topology**NOTE**

If dynamic data masking is enabled and a full-field masking rule (**add\_mask\_rule(", ", ", ")**) is configured, the database performance loss is within 5% under the following conditions when sysbench is used to perform a stress test: There are 128 tables each with 25,000 rows of data imported to the instance, and the QPS is about 400,000.

QPS stands for queries per second.

## Supported Versions

To use this function, the kernel version of your instance must be 8.0.32.250300 or later.

## Constraints

- This function can take effect only for SELECT statements.
- The masking rules are not applied to system databases. System databases include **mysql**, **information\_schema**, **performance\_schema**, and **sys**.
- Spaces and special null characters (such as '\t', '\r', and '\n') at the beginning and end of a database name, table name, column name, or username will be ignored.
- A database name, table name, or column name should be no longer than 64 bytes. A username should be no longer than 32 bytes.
- The administrator list (the value of **rds\_dynamic\_masking\_super\_users**) should be no longer than 1,024 bytes.
- The masking method varies depending on the data type. For details, see [Table 15-2](#).

**Table 15-2** Data masking

| Data Type                                                        | After Masking      |
|------------------------------------------------------------------|--------------------|
| Integer (TINYINT, SMALLINT, MEDIUMINT, INT, BIGINT, and BOOLEAN) | A positive integer |

| Data Type                                  | After Masking                                                                                                                                            |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Decimal (DECIMAL, FLOAT, and DOUBLE)       |                                                                                                                                                          |
| Time (YEAR)                                |                                                                                                                                                          |
| Time (DATE, TIME, DATETIME, and TIMESTAMP) | DATE: [1000:01:01,9999:12:31.4999999]<br>TIME: [00:00:00,838:59:59.4999999]<br>DATETIME and TIMESTAMP: [1971:01:01 00:00:00, 2037:12:31 23:59:59.499999] |
| String                                     | *****                                                                                                                                                    |

## Parameters for Dynamic Data Masking

Table 15-3 Parameter description

| Parameter                       | Level  | Description                                                                                                                                                                                                                             |
|---------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| rds_dynamic_masking_enabled     | Global | Whether to enable dynamic data masking. The default value is <b>OFF</b> .                                                                                                                                                               |
| rds_dynamic_masking_super_users | Global | Multiple administrator accounts can be configured. The default value is an empty string ("").<br><br>Use commas (,) to separate administrator accounts. The masking rules do not take effect for administrators. Example: 'user1,user2' |
| rds_masking_parameter_max_count | Global | The maximum number of database names, table names, column names, or usernames that can be configured. Default value: <b>100</b> ; value range: [1, 1000]                                                                                |

## Adding a masking rule

- Syntax  
CALL dbms\_mask.add\_mask\_rule(  
    db\_name text,  
    table\_name text,  
    column\_name text,  
    user\_name text);

**Table 15-4** Parameter description

| Parameter   | Type | Description                                                                                                                                                                                                                                                                                                                        |
|-------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| db_name     | text | The name of the database that the masking rule is to be applied to.<br>You can configure multiple database names separated by commas (,). If <b>db_name</b> is set to an empty string ("), the masking rule takes effect for all databases.                                                                                        |
| table_name  | text | The name of the table that the masking rule is to be applied to.<br>You can configure multiple table names separated by commas (,). If <b>table_name</b> is set to an empty string ("), the masking rule takes effect for all tables in the database specified by <b>db_name</b> .                                                 |
| column_name | text | The name of the column that the masking rule is to be applied to.<br>You can configure multiple column names separated by commas (,). If <b>column_name</b> is set to an empty string ("), the masking rule takes effect for all columns of the table specified by <b>table_name</b> in the database specified by <b>db_name</b> . |
| user_name   | text | The name of the user that the masking rule is to be applied to.<br>You can configure multiple usernames separated by commas (,). If <b>user_name</b> is set to an empty string ("), the masking rule takes effect for all users (excluding administrators).                                                                        |

- Permission constraints  
Only the **root** user can add masking rules.
- Operation Examples
  - Add a masking rule to mask data in columns **col\_a** and **col\_b** of table **tab\_a** in databases **db\_1** and **db\_2** for users **user1** and **user2**.  
`CALL dbms_mask.add_mask_rule('db_1,db_2', 'tab_a', 'col_a,col_b', 'user1,user2');`
  - Add a masking rule to mask data in all columns of all tables in all databases for all users.  
`CALL dbms_mask.add_mask_rule("", "", "", "");`

## Querying masking rules

- Syntax



```
CALL dbms_mask.show_mask_rule();
```

- Permission constraints  
All users can query masking rules.
- Operation Examples  

```
CALL dbms_mask.show_mask_rule();
```

## Deleting a masking rule

- Syntax  

```
CALL dbms_mask.delete_mask_rule(mask_id bigint);
```

**Table 15-5** Parameter description

| Parameter | Type   | Description      |
|-----------|--------|------------------|
| mask_id   | bigint | Masking rule ID. |

- Permission constraints  
Only the **root** user can delete masking rules.
- Operation Examples  
Delete the masking rule whose ID is 2.  

```
CALL dbms_mask.delete_mask_rule(2);
```

## Updating a masking rule

- Syntax  

```
CALL dbms_mask.update_mask_rule(  
    mask_id bigint,  
    enabled enum('N','Y'),  
    db_name text,  
    table_name text,  
    column_name text,  
    user_name text);
```

**Table 15-6** Parameter description

| Parameter | Type   | Description                                                                                                                                                                                                                              |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mask_id   | bigint | Masking rule ID.                                                                                                                                                                                                                         |
| enabled   | enum   | Whether the masking rule is enabled. The options are <b>Y</b> (enabled) and <b>N</b> (disabled).                                                                                                                                         |
| db_name   | text   | The name of the database that the masking rule is to be applied to. You can configure multiple database names separated by commas (.). If <b>db_name</b> is set to an empty string ("), the masking rule takes effect for all databases. |

| Parameter   | Type | Description                                                                                                                                                                                                                                                                                                                     |
|-------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| table_name  | text | The name of the table that the masking rule is to be applied to. You can configure multiple table names separated by commas (.). If <b>table_name</b> is set to an empty string ("), the masking rule takes effect for all tables in the database specified by <b>db_name</b> .                                                 |
| column_name | text | The name of the column that the masking rule is to be applied to. You can configure multiple column names separated by commas (.). If <b>column_name</b> is set to an empty string ("), the masking rule takes effect for all columns of the table specified by <b>table_name</b> in the database specified by <b>db_name</b> . |
| user_name   | text | The name of the user that the masking rule is to be applied to. You can configure multiple usernames separated by commas (.). If <b>user_name</b> is set to an empty string ("), the masking rule takes effect for all users (excluding administrators).                                                                        |

- Permission constraints

Only the **root** user can update masking rules.

- Operation Examples

Update the status of masking rule 1 to disabled. This rule is used to mask data in all columns of table **tab\_1** in database **db\_test** for **user1**.

```
CALL dbms_mask.update_mask_rule(1,'N','db_test','tab_1',' ','user1');
```

## Enabling a masking rule

- Syntax

```
CALL dbms_mask.enable_mask_rule(mask_id bigint);
```

**Table 15-7** Parameter description

| Parameter | Type   | Description      |
|-----------|--------|------------------|
| mask_id   | bigint | Masking rule ID. |

- Permission constraints

Only the **root** user can enable masking rules.

- Operation Examples

Enable the masking rule whose ID is 2.

```
CALL dbms_mask.enable_mask_rule(2);
```

## Disabling a masking rule

- Syntax

```
CALL dbms_mask.disable_mask_rule(mask_id bigint);
```

**Table 15-8** Parameter description

| Parameter | Type   | Description      |
|-----------|--------|------------------|
| mask_id   | bigint | Masking rule ID. |

- Permission constraints

Only the **root** user can disable masking rules.

- Operation Examples

Disable the masking rule whose ID is 2.

```
CALL dbms_mask.disable_mask_rule(2);
```

## 15.11 Using DBSS (Recommended)

Database Security Service (DBSS) is an intelligent database security service. Based on the machine learning mechanism and big data analytics technologies, it can audit your databases, detect SQL injection attacks, and identify high-risk operations.

You are advised to use DBSS to provide extended data security capabilities. For details, see [Database Security Service](#).

### Advantages

- DBSS can help you meet security compliance requirements.
  - DBSS can help you comply with DJCP (graded protection) standards for database audit.
  - DBSS can help you comply with security laws and regulations, and provide compliance reports that meet data security standards (such as Sarbanes-Oxley).
- DBSS can back up and restore database audit logs and meet the audit data retention requirements.
- DBSS can monitor risks, sessions, session distribution, and SQL distribution in real time.
- DBSS can report alarms for risky behavior and attacks and respond to database attacks in real time.
- DBSS can locate internal violations and improper operations and keep data assets secure.

Deployed in bypass pattern, database audit can perform flexible audits on the database without affecting user services.

- Database audit monitors database logins, operation types (data definition, operation, and control), and operation objects based on risky operations to effectively audit the database.
- Database audit analyzes risks and sessions, and detects SQL injection attempts so you can stay apprised of your database status.
- Database audit provides a report template library to generate daily, weekly, or monthly audit reports according to your configurations. It sends real-time alarm notifications to help you obtain audit reports in a timely manner.

# 16 Parameters

---

## 16.1 Modifying Parameters of an RDS for MySQL Instance

You can change parameter values in a custom parameter template and apply it to optimize RDS database performance.

You can only change the values in custom parameter templates. You cannot change the values in default parameter templates.

Keep in mind the following points before modifying the parameters:

- **Modifying instance parameters:** If you modify dynamic parameters on the **Parameters** page of a DB instance and save the modifications, the modifications take effect immediately regardless of the **Effective upon Reboot** setting. However, if you modify static parameters on the **Parameters** page of a DB instance and save the modifications, the modifications do not take effect until you manually reboot the DB instance.
- **Modifying parameter template parameters:** If you modify parameters in a custom parameter template on the **Parameter Templates** page and save the modifications, the modifications do not take effect until you apply the template to your DB instances. If you modify static parameters in a custom parameter template on the **Parameter Templates** page and save the modifications, the modifications do not take effect until you apply the template to your DB instances and manually reboot those DB instances. For details, see [Applying a Parameter Template](#).

Global parameters can only be modified on the console. Session-level parameters can be modified using SQL statements. When you modify a parameter, the time when modifications take effect varies with the parameter type.

The RDS console displays the statuses of DB instances that the parameter template applies to. For example, if the DB instance has not yet used the latest modifications made to its parameter template, its status is **Parameter change. Pending reboot**. You need to manually reboot the DB instance for the latest modifications to take effect for that DB instance.

## Constraints

- For better parameter modification experience, you are advised to **upgrade the minor version of your DB instance** to the latest.
- RDS has default parameter templates whose parameter values cannot be changed. You can view these parameter values by clicking the default parameter templates. If an instance cannot be started due to incorrect parameter settings of a parameter template, you can reconfigure the parameters based on the default parameter template.
- Before modifying parameters, make sure you understand their meanings and fully verify the changes in a test environment to avoid instance or workload exceptions caused by inappropriate parameter settings.

## Modifying a Custom Parameter Template and Applying It to a DB Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

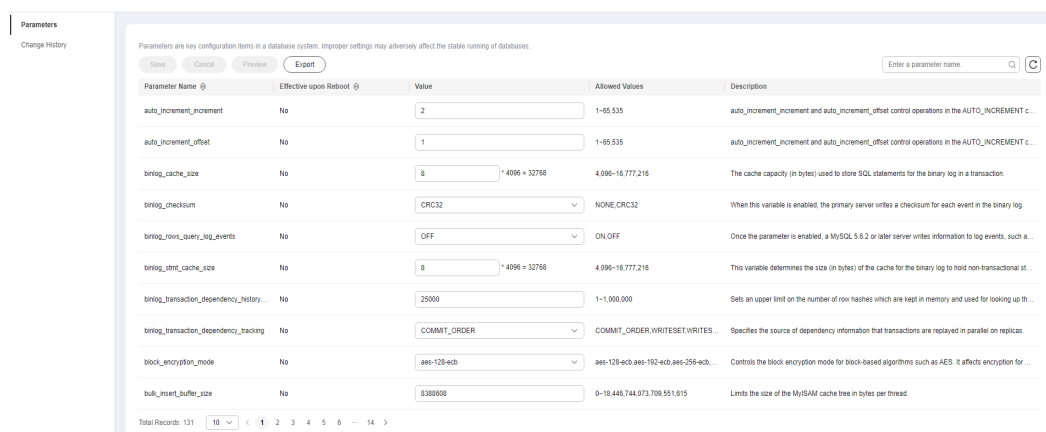
**Step 3** Choose **Parameter Templates** in the navigation pane on the left. On the **Custom Templates** page, click the target parameter template.

**Step 4** On the **Parameters** page, modify parameters as required.

For parameter details, see [Suggestions on RDS for MySQL Parameter Tuning](#).

Available operations are as follows:

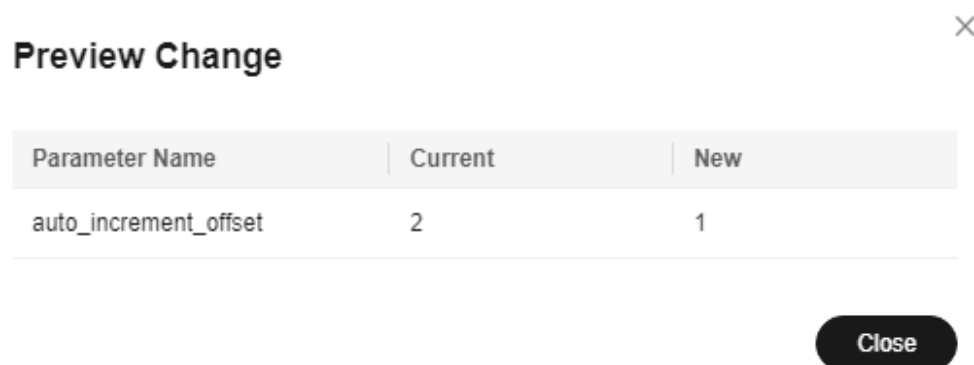
**Figure 16-1** Modifying parameters in a parameter template



The screenshot shows the 'Parameters' page in the RDS console. It features a table with columns: Parameter Name, Effective upon Reboot, Value, Allowed Values, and Description. The table lists various parameters such as auto\_increment\_increment, auto\_increment\_offset, binlog\_cache\_size, binlog\_checksum, binlog\_row\_query\_log\_events, binlog\_stmt\_cache\_size, binlog\_transaction\_dependency\_history, binlog\_transaction\_dependency\_tracking, block\_encryption\_mode, and bulk\_insert\_buffer\_size. Each row has a 'Value' column with a text input field and an 'Allowed Values' column with a dropdown menu. The 'Effective upon Reboot' column has a 'No' checkbox. At the top of the table, there are buttons for 'Save', 'Cancel', 'Preview', and 'Export'. A search bar is located at the top right of the table area.

| Parameter Name                         | Effective upon Reboot | Value        | Allowed Values                         | Description                                                                                                  |
|----------------------------------------|-----------------------|--------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------|
| auto_increment_increment               | No                    | 2            | 1-65,535                               | auto_increment_increment and auto_increment_offset control operations in the AUTO_INCREMENT c...             |
| auto_increment_offset                  | No                    | 1            | 1-65,535                               | auto_increment_increment and auto_increment_offset control operations in the AUTO_INCREMENT c...             |
| binlog_cache_size                      | No                    | 8            | 4,096-16,777,216                       | The cache capacity (in bytes) used to store SQL statements for the binary log in a transaction.              |
| binlog_checksum                        | No                    | CRC32        | NONE,CRC32                             | When this variable is enabled, the primary server writes a checksum for each event in the binary log.        |
| binlog_row_query_log_events            | No                    | OFF          | ON,OFF                                 | Once the parameter is enabled, a MySQL 5.6.2 or later server writes information to log events, such a...     |
| binlog_stmt_cache_size                 | No                    | 8            | 4,096-16,777,216                       | This variable determines the size (in bytes) of the cache for the binary log to hold non-transactional st... |
| binlog_transaction_dependency_history  | No                    | 25000        | 1-1,000,000                            | Sets an upper limit on the number of row hashes which are kept in memory and used for looking up th...       |
| binlog_transaction_dependency_tracking | No                    | COMMIT_ORDER | COMMIT_ORDER,WRITESET,WRITES...        | Specifies the source of dependency information that transactions are replayed in parallel on replicas.       |
| block_encryption_mode                  | No                    | aes-128-ecb  | aes-128-ecb,aes-192-ecb,aes-256-ecb... | Controls the block encryption mode for block-based algorithms such as AES. It affects encryption for ...     |
| bulk_insert_buffer_size                | No                    | 8388608      | 0-18,446,744,073,709,551,615           | Limits the size of the MyISAM cache tree in bytes per thread.                                                |

- To save the modifications, click **Save**.
- To cancel the modifications, click **Cancel**.
- To preview the modifications, click **Preview**.

**Figure 16-2** Previewing changes

| Parameter Name        | Current | New |
|-----------------------|---------|-----|
| auto_increment_offset | 2       | 1   |

Close

**Step 5** Click **Change History** to view the changes.

**Step 6** Apply the parameter template to your DB instance. For details, see [Applying a Parameter Template](#).

**Step 7** View the status of the DB instance to which the parameter template has been applied.

If the DB instance status is **Parameter change. Pending reboot**, you need to reboot the DB instance for the modifications to take effect.

- The DB instance reboot caused by instance class changes will not make parameter modifications take effect.
- If you have modified parameters of a primary DB instance, you need to reboot the primary DB instance for the modifications to take effect. (For primary/standby DB instances, the parameter modifications are also applied to the standby DB instance.)
- If you have modified parameters of a read replica, you need to reboot the read replica for the modifications to take effect.

----End

## Modifying Parameters of a DB Instance

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the DB instance name.

**Step 4** In the navigation pane on the left, choose **Parameters**. On the displayed page, modify parameters as required.

Figure 16-3 Parameters

| Parameter Name                | Effective upon Reboot | Value | Allowed Values                     | Description                                                                                            |
|-------------------------------|-----------------------|-------|------------------------------------|--------------------------------------------------------------------------------------------------------|
| auto_increment_increment      | No                    | 1     | 1-65,535                           | auto_increment_increment and auto_increment_offset control operations in the AUTO_INCREMENT ...        |
| auto_increment_offset         | No                    | 1     | 1-65,535                           | auto_increment_increment and auto_increment_offset control operations in the AUTO_INCREMENT ...        |
| back_log                      | Yes                   | 1000  | 1-65,535                           | Number of valid connection requests that MySQL can have. This comes into play when the main My...      |
| binlog_cache_size             | No                    | 8     | * 4096 - 32768<br>4,096-16,777,216 | The cache capacity (in bytes) used to store SQL statements for the binary log in a transaction.        |
| binlog_checksum               | No                    | CRC32 | NONE, CRC32                        | When this variable is enabled, the primary server writes a checksum for each event in the binary log.  |
| binlog_rowid_query_log_events | No                    | OFF   | ON, OFF                            | Once the parameter is enabled, a MySQL 5.6.2 or later server writes information to log events, such... |

- To save the modifications, click **Save**.
- To cancel the modifications, click **Cancel**.
- To preview the modifications, click **Preview**.

**Step 5** After the parameters are modified, choose whether to reboot the instance based on the information in the **Effective upon Reboot** column.

- If **Yes** is displayed and the DB instance status on the **Instances** page is **Parameter change. Pending reboot**, a reboot is required for the modifications to take effect.
  - If you have modified parameters of a primary DB instance, you need to reboot the primary DB instance for the modifications to take effect. (For primary/standby DB instances, the parameter modifications are also applied to the standby DB instance.)
  - If you have modified parameters of a read replica, you need to reboot the read replica for the modifications to take effect.
- If **No** is displayed, the modifications take effect immediately.

----End

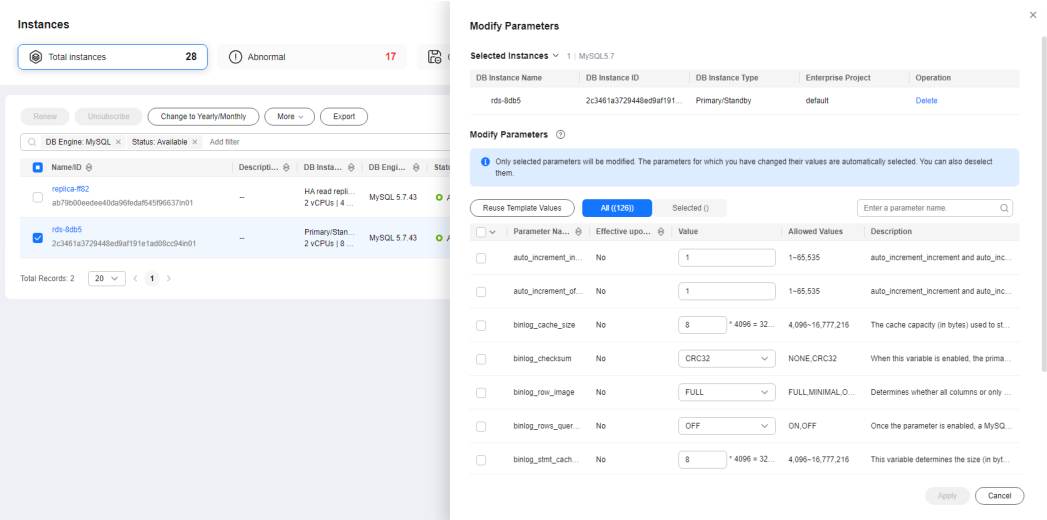
## Modifying Parameters of Multiple DB Instances at a Time

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, select the DB instances with the same DB engine of the same version and choose **More > Modify Parameters** above the DB instance list.
- Step 4** On the **Modify Parameters** page, select the parameters you want to modify, change the parameter values, and click **Apply**.

A maximum of 30 parameters can be modified at a time. Only selected parameters will be applied to your DB instances. The modified parameters are automatically selected. You can also deselect them.

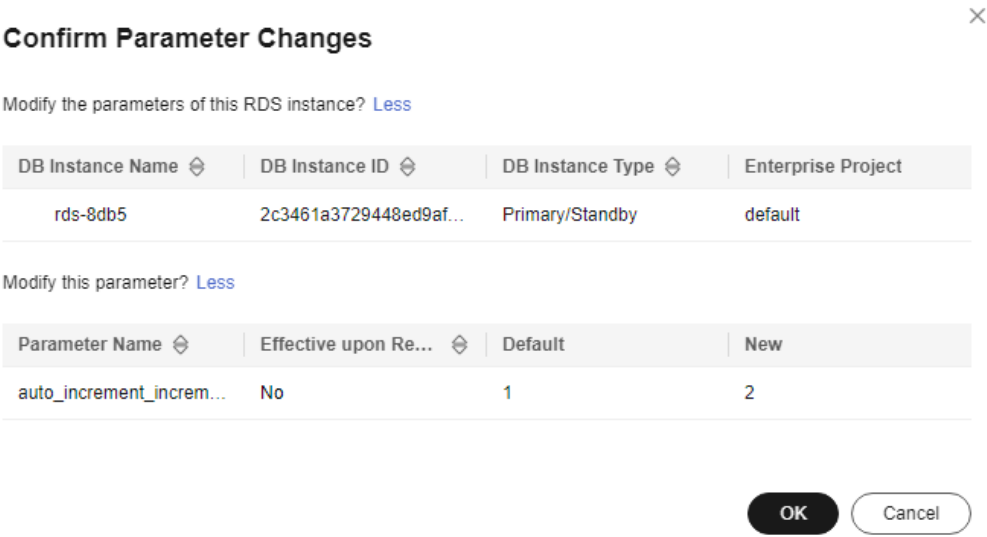


Figure 16-4 Modifying parameters



**Step 5** In the displayed dialog box, click **OK**.

Figure 16-5 Confirming parameter changes



- Step 6** After the parameters are modified, choose whether to reboot the instance based on the information in the **Effective upon Reboot** column.
- If **Yes** is displayed and the DB instance status on the **Instances** page is **Parameter change. Pending reboot**, a reboot is required for the modifications to take effect.
    - If you have modified parameters of a primary DB instance, you need to reboot the primary DB instance for the modifications to take effect. (For primary/standby DB instances, the parameter modifications are also applied to the standby DB instance.)
    - If you have modified parameters of a read replica, you need to reboot the read replica for the modifications to take effect.

- If **No** is displayed, the modifications take effect immediately.

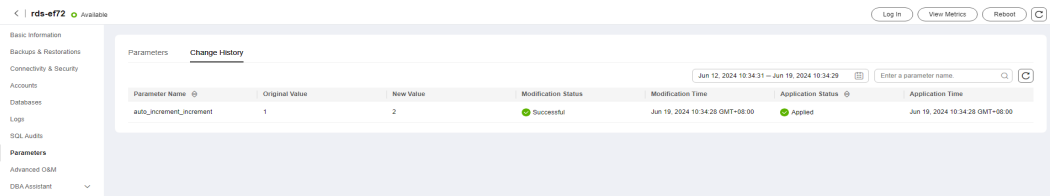
----End

### Viewing Parameter Change History of a DB Instance

- Step 1
- Click  in the upper left corner and select a region.
- Step 2
- Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3
- On the **Instances** page, click the target instance name.
- Step 4
- In the navigation pane on the left, choose **Parameters**. On the displayed page, click **Change History**.

You can view the parameter change history within a specified period (no more than two years). By default, the parameter change history of the last seven days is queried.

Figure 16-6 Viewing parameter change history



You can view the parameter names, original parameter values, new parameter values, modification statuses, modification time, application statuses, and application time.

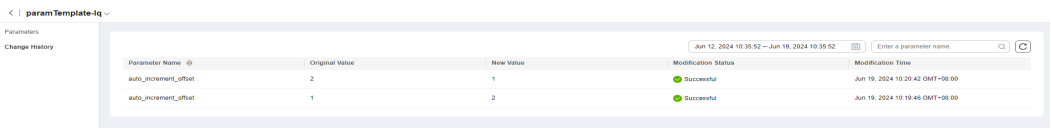
----End

### Viewing Change History of a Parameter Template

- Step 1
- Click  in the upper left corner and select a region.
- Step 2
- Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3
- In the navigation pane, choose **Parameter Templates**. On the **Custom Templates** page, click the target parameter template.
- Step 4
- On the displayed page, choose **Change History** in the navigation pane.

You can view the parameter change history within a specified period (no more than two years). By default, the parameter change history of the last seven days is queried.

Figure 16-7 Viewing parameter change history



You can view the parameter names, original parameter values, new parameter values, modification statuses, and modification time.

You can apply the parameter template to DB instances as required by referring to [Applying a Parameter Template](#).

----End

## Viewing Parameter Changes

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Parameter Templates** page, click the **Parameter Changes** tab.

**Step 4** Click **View Details** in the **Operation** column.

You can view detailed information about the modified parameters.

----End

## Common Parameters

**Table 16-1** Common parameters

| Parameter                 | Description                                                                                                                                                                                                                      | Reference                                                                                               |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| time_zone                 | The time zone. Keep the value of this parameter for read replicas the same as that for the primary instance.                                                                                                                     | <a href="#">How Can I Change the Time Zone?</a>                                                         |
| default_password_lifetime | The global automatic password expiration policy, in days.                                                                                                                                                                        | <a href="#">How Do I Configure a Password Expiration Policy for RDS for MySQL DB Instances?</a>         |
| tx_isolation              | The default transaction isolation level.                                                                                                                                                                                         | <a href="#">How Do I Change the RDS Transaction Isolation Level?</a>                                    |
| character_set_server      | The server character set.                                                                                                                                                                                                        | <a href="#">How Do I Use the utf8mb4 Character Set to Store Emojis in an RDS for MySQL DB Instance?</a> |
| lower_case_table_names    | The case sensitivity of table names. If this parameter is set to <b>0</b> , table names are stored as specified and are case sensitive. If it is set to <b>1</b> , table names are stored in lowercase and are case insensitive. | <a href="#">How Do I Set Case Sensitivity for RDS for MySQL Table Names?</a>                            |

| Parameter            | Description                                                                                                                                                | Reference                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| group_concat_max_len | The maximum permitted result length in bytes for the GROUP_CONCAT() function.                                                                              | <a href="#">Incorrect GROUP_CONCAT Results</a>                                   |
| max_connections      | The maximum number of concurrent client connections. If this parameter is set to <b>default</b> , the parameter value depends on how much memory there is. | <a href="#">What Is the Maximum Number of Connections to an RDS DB Instance?</a> |

## Related APIs

- [Obtaining Parameter Templates](#)
- [Modifying Parameters of a Specified DB Instance](#)

# 16.2 Managing Parameter Templates

## 16.2.1 Creating a Parameter Template

You can use database parameter templates to manage the DB engine configuration. A database parameter template acts as a container for engine configuration values that can be applied to one or more DB instances.

If you create a DB instance without specifying a custom parameter template, the system uses a default one for the instance. Each default parameter template contains DB engine defaults and system defaults that are configured based on the engine, compute class, and storage space allocated of an instance. Default parameter templates cannot be modified, but you can create your own parameter template to change parameter settings.

If you want to use a custom parameter template, you simply create a parameter template and select it when you create a DB instance or apply it to an existing DB instance following the instructions provided in [Applying a Parameter Template](#).

When you have already created a parameter template and want to include most of the custom parameters and values from that template in a new parameter template, you can replicate that parameter template following the instructions provided in [Replicating a Parameter Template](#).

## Constraints

- Not all of the DB engine parameters in a custom parameter template can be changed.
- When you change a parameter value in a parameter template that has been applied to a DB instance and save the change, the change takes effect only to the DB instance and does not affect other DB instances.

- The changes to parameter values in a custom parameter template take effect only after you apply the template to DB instances. For details, see [Applying a Parameter Template](#).
- When you change dynamic parameter values in parameter templates in batches and save the changes, the changes will take effect only after you apply the parameter templates to DB instances. When you change static parameter values in parameter templates in batches and save the changes, the changes will take effect for DB instances only after you apply the parameter templates to DB instances and manually reboot the DB instances.
- Improper parameter settings may have unintended consequences, including reduced performance and system instability. Exercise caution when modifying database parameters and you need to back up data before modifying parameters in a parameter template. Before applying parameter template changes to a production DB instance, you should try out these changes on a test DB instance.
- RDS does not share parameter template quotas with Document Database Service (DDS).

You can create up to 100 parameter templates for RDS. All RDS engines share this quota.

## Differences Between Standard and High-Performance Parameter Templates

Only RDS for MySQL 5.7 and 8.0 support high-performance parameter templates. Compared with standard parameter templates, high-performance templates provide higher read/write speed but lower data security. The parameter comparisons are as follows:

## Differences in Version 5.7

**Table 16-2** Differences between standard and high-performance parameter templates for MySQL 5.7

| Parameter         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Recommended Value in a High-Performance Template | Recommended Value in a Standard Template |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------|
| sync_binlog       | <p>This parameter is used to control how often the server synchronizes the binlogs to disk. If the default value is used, the binlogs are synchronized to disk each time a transaction is committed. If it is set to <b>0</b>, the MySQL server relies on the operating system to flush the binlogs to disk from time to time as it does for any other file. This setting provides the best performance but lowest security. If it is set to <math>N</math> (<math>N &gt; 1</math>), the binlogs are synchronized to disk after <math>N</math> transactions are committed.</p> <p>This parameter has been adjusted in high-performance parameter templates. If you use a high-performance parameter template for your DB instance, data may be lost after your instance is recovered from a crash and replication exceptions may occur.</p> | 1000                                             | 1                                        |
| binlog_cache_size | <p>This parameter specifies the size of the binlog cache. If write operations are frequent, increasing the value of this parameter can improve performance.</p> <p>After this parameter is adjusted, out-of-memory risks increase in high-concurrency scenarios, especially for instances with small specifications.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2097152                                          | 32768                                    |

| Parameter                      | Description                                                                                                                                                                         | Recommended Value in a High-Performance Template | Recommended Value in a Standard Template |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------|
| innodb_flush_log_at_trx_commit | Setting this parameter to <b>0</b> improves write performance in low-concurrency scenarios.<br>Adjusting this parameter may cause 1 second of data to be lost in extreme scenarios. | 2                                                | 1                                        |

## Differences in Version 8.0

**Table 16-3** Differences between standard and high-performance parameter templates for MySQL 8.0

| Parameter             | Description                                                                                                                                                                                                                                                                                                                                 | Recommended Value in a High-Performance Template | Recommended Value in a Standard Template |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------|
| transaction_isolation | This parameter specifies the default transaction isolation level.<br>A high-performance template uses the READ COMMITTED level. Compared with REPEATABLE READ, this level reduces row lock conflicts and does not have gap locks. This isolation level can prevent dirty reads, but phantom reads and non-repeatable reads may still occur. | READ-COMMITTED                                   | REPEATABLE-READ                          |

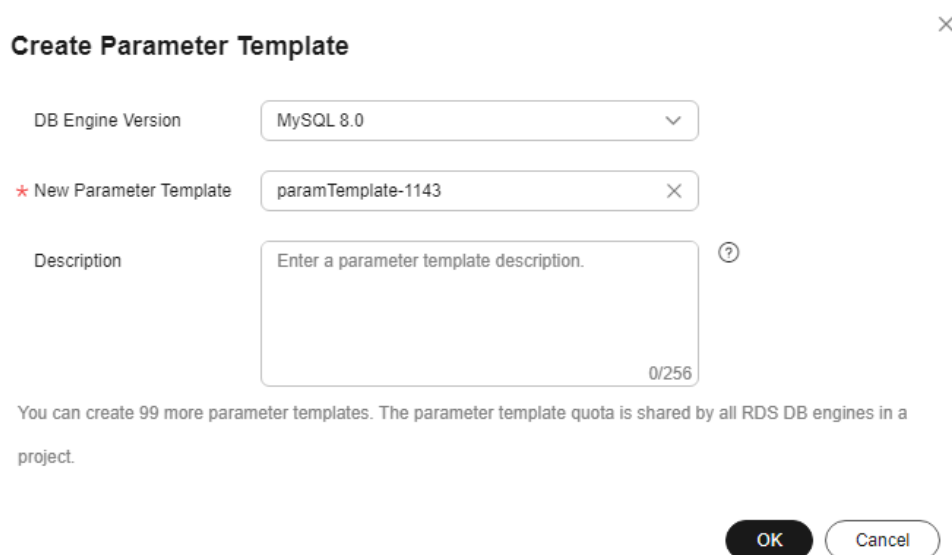
| Parameter                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Recommended Value in a High-Performance Template | Recommended Value in a Standard Template |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------|
| sync_binlog                    | <p>This parameter is used to control how often the server synchronizes the binlogs to disk. If the default value is used, the binlogs are synchronized to disk each time a transaction is committed. If it is set to <b>0</b>, the MySQL server relies on the operating system to flush the binlogs to disk from time to time as it does for any other file. This setting provides the best performance but lowest security. If it is set to <math>N</math> (<math>N &gt; 1</math>), the binlogs are synchronized to disk after <math>N</math> transactions are committed.</p> <p>This parameter has been adjusted in high-performance parameter templates. If you use a high-performance parameter template for your DB instance, data may be lost after your instance is recovered from a crash and replication exceptions may occur.</p> | 1000                                             | 1                                        |
| binlog_cache_size              | <p>This parameter specifies the size of the binlog cache. If write operations are frequent, increasing the value of this parameter can improve performance.</p> <p>After this parameter is adjusted, out-of-memory risks increase in high-concurrency scenarios, especially for instances with small specifications.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2097152                                          | 32768                                    |
| innodb_flush_log_at_trx_commit | <p>Setting this parameter to <b>0</b> improves write performance in low-concurrency scenarios.</p> <p>Adjusting this parameter may cause 1 second of data to be lost in extreme scenarios.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2                                                | 1                                        |



## Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Create Parameter Template**.
- Step 4** In the displayed dialog box, configure required information and click **OK**.
- Select a DB engine for the parameter template.
  - The template name must consist of 1 to 64 characters. It can contain only uppercase letters, lowercase letters, digits, hyphens (-), underscores (\_), and periods (.).
  - The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: > ! < " & ' =

**Figure 16-8** Creating a parameter template



----End

## 16.2.2 Applying a Parameter Template

### Scenarios

You can apply parameter templates to DB instances as needed.

- The parameter **innodb\_buffer\_pool\_size** is determined by the memory. DB instances of different specifications have different value ranges. If this parameter value is out of range of the DB instance that the parameter template applies to, the maximum value within the range is used.

- A parameter template can be applied only to DB instances of the same DB engine version.
- After a default parameter template is applied to an instance, all parameters in the instance are changed to be the same as those in the default parameter template, and all specification parameters are reset based on the instance specifications.

## Applying a Parameter Template

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, perform the following operations based on the type of the parameter template to be applied:
- If you intend to apply a default parameter template to DB instances, click **Default Templates**, locate the target parameter template, and click **Apply** in the **Operation** column.
  - If you intend to apply a custom parameter template to DB instances, click **Custom Templates**, locate the target parameter template, and choose **More > Apply** in the **Operation** column.

A parameter template can be applied to one or more DB instances.

- Step 4** In the displayed dialog box, select one or more DB instances to which the parameter template will be applied and click **OK**.

After the parameter template is successfully applied, you can view the application records by referring to [Viewing Application Records of a Parameter Template](#).

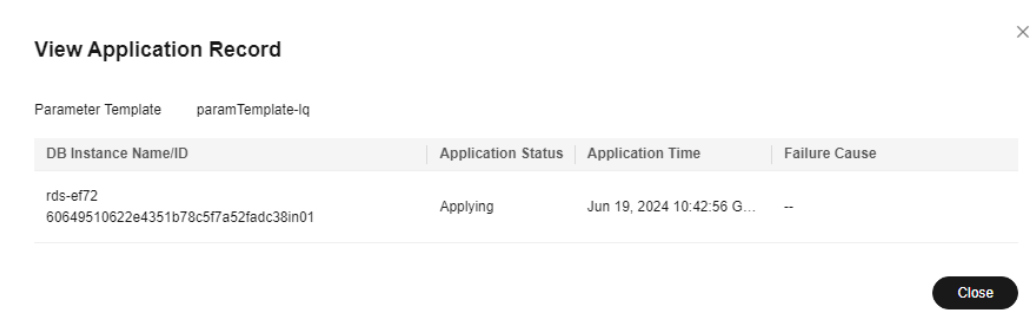
----End

## Viewing Application Records of a Parameter Template

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** Choose **Parameter Templates** in the navigation pane on the left.
- Step 4** On the **Default Templates** or **Custom Templates** page, locate the target parameter template and choose **More > View Application Record** in the **Operation** column.

You can view the name or ID of the DB instance that the parameter template applies to, as well as the application status, application time, and failure cause (if failed).

Figure 16-9 Viewing application records of a parameter template



-----End

### 16.2.3 Replicating a Parameter Template

#### Scenarios

You can replicate a parameter template you have created. When you have already created a parameter template and want to include most of the custom parameters and values from that template in a new parameter template, you can replicate that parameter template. You can also export the instance's parameters to generate a new template.

After a parameter template is replicated, it takes about 5 minutes before the new template is displayed.

Default parameter templates cannot be replicated, but you can create parameter templates based on the default ones.

#### Procedure

- Step 1 Click  in the upper left corner and select a region.
- Step 2 Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3 On the **Parameter Templates** page, click **Custom Templates**. Locate the target parameter template and click **Replicate** in the **Operation** column.

Alternatively, click the target DB instance on the **Instances** page. On the **Parameters** page, click **Export** to generate a new parameter template for future use.

 **NOTE**

To ensure that your parameter templates are applicable to all types of DB instances and databases can be started normally, the values of `innodb_flush_log_at_trx_commit` and `sync_binlog` exported from primary DB instances or read replicas are **1** by default.

- Step 4 In the displayed dialog box, configure required information and click **Yes**.

**Figure 16-10** Replicating a parameter template

×

### Replicate Parameter Template

1

After a parameter template is replicated, the new template may be displayed about 5 minutes later.

Source Parameter Template

paramTemplate-lq

★ New Parameter Template

paramTemplate-625c

×

Description

Enter a parameter template description.

0/256

?

You can create 99 more parameter templates. The parameter template quota is shared by all RDS DB engines in a project.

Yes

No

- The template name must consist of 1 to 64 characters. It can contain only uppercase letters, lowercase letters, digits, hyphens (-), underscores (\_), and periods (.).
- The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: > ! < " & ' =

After the parameter template is replicated, a new template is generated in the list on the **Parameter Templates** page.

----End

## 16.2.4 Resetting a Parameter Template

### Scenarios

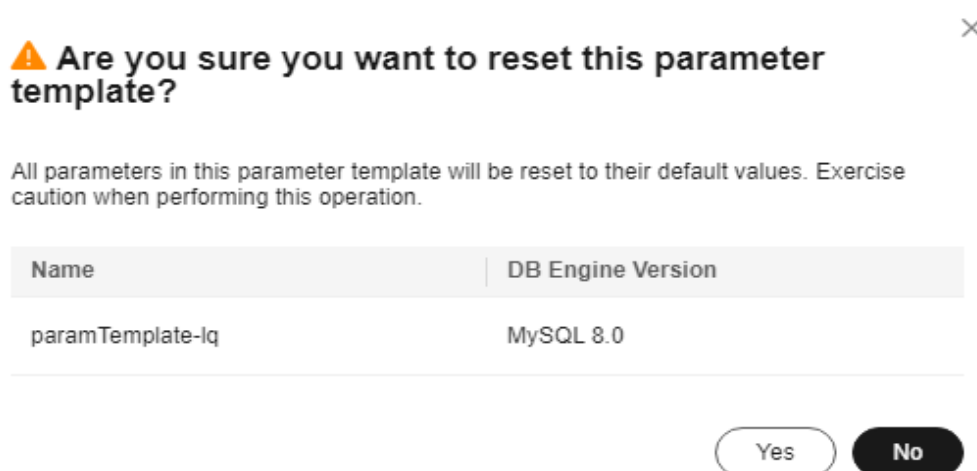
You can reset all parameters in a custom parameter template to their default settings.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

- Step 3** On the **Parameter Templates** page, click **Custom Templates**. Locate the target parameter template and choose **More > Reset** in the **Operation** column.
- Step 4** Click **Yes**.

**Figure 16-11** Confirming the reset



- Step 5** Apply the parameter template to your DB instance. For details, see [Applying a Parameter Template](#).
- Step 6** View the status of the DB instance to which the parameter template is applied.

If the DB instance status is **Parameter change. Pending reboot**, a reboot is required for the modifications to take effect.

- The DB instance reboot caused by instance class changes will not make parameter modifications take effect.
- If you have modified parameters of a primary DB instance, you need to reboot the primary DB instance for the modifications to take effect. (For primary/standby DB instances, the parameter modifications are also applied to the standby DB instance.)
- If you have modified parameters of a read replica, you need to reboot the read replica for the modifications to take effect.

----End

## 16.2.5 Comparing Parameter Templates

### Scenarios

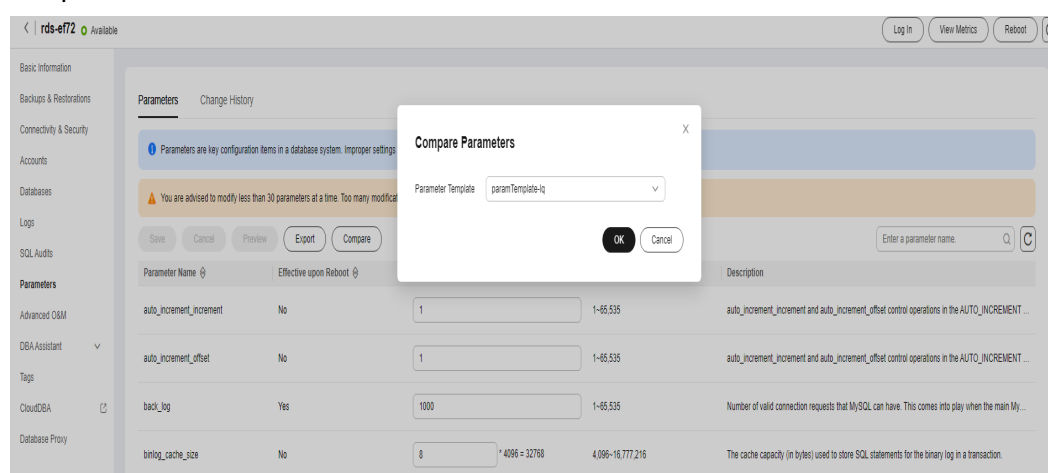
You can compare DB instance parameters with a parameter template that uses the same DB engine to understand the differences of parameter settings.

You can also compare default parameter templates that use the same DB engine to understand the differences of parameter settings.

## Comparing Instance Parameters with a Parameter Template

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the instance name.
- Step 4** In the navigation pane on the left, choose **Parameters**. On the displayed page, click **Compare** above the parameter list.

**Figure 16-12** Comparing instance parameters with those in a specified parameter template

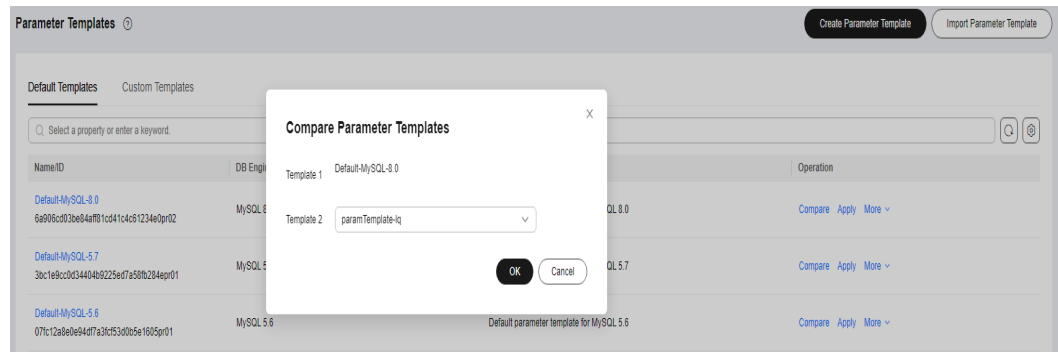


- Step 5** In the displayed dialog box, select a parameter template to be compared and click **OK**.
- If their settings are different, the parameter names and values of both parameter templates are displayed.
  - If their settings are the same, no data is displayed.

----End

## Comparing Parameter Templates

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Custom Templates**. Locate the target parameter template and click **Compare** in the **Operation** column.
- Step 4** In the displayed dialog box, select a parameter template that uses the same DB engine as the target template and click **OK**.

**Figure 16-13** Selecting a parameter template to be compared

- If their settings are different, the parameter names and values of both parameter templates are displayed.
- If their settings are the same, no data is displayed.

----End

## 16.2.6 Exporting a Parameter Template

### Scenarios

Exporting instance parameters:

- You can export parameters of a DB instance as a new parameter template for future use. To apply the exported parameter template to new DB instances, see [Applying a Parameter Template](#). If the specification parameters of the instance have been modified, the exported parameter template also contains the specification parameters. For details about the specification parameters, see [Parameter Changes](#).
- You can also export the parameter information (including parameter names, values, and descriptions) of a DB instance to a CSV file for viewing and analyzing details.

Exporting a parameter template:

- You can export an RDS for MySQL parameter template (including parameter names, values, and descriptions) to a CSV file for viewing and analyzing details.

### Exporting Instance Parameters

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Parameters**. On the displayed page, click **Export** above the parameter list.

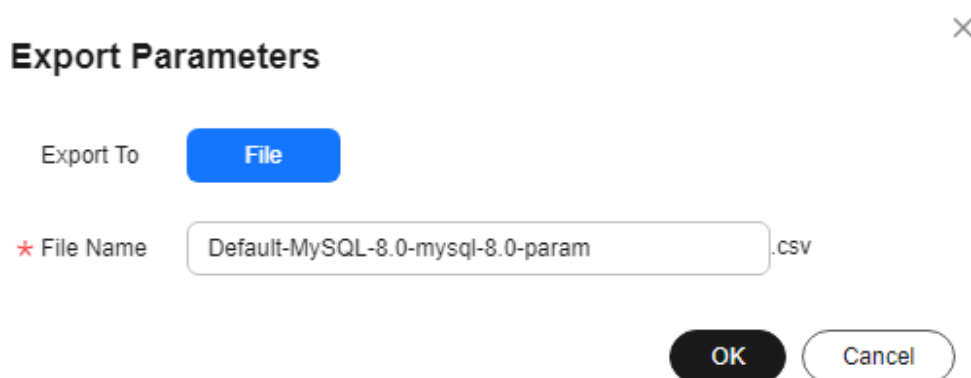
- Exporting to a custom template  
In the displayed dialog box, configure required information and click **OK**.
  - The template name must consist of 1 to 64 characters. It can contain only uppercase letters, lowercase letters, digits, hyphens (-), underscores (\_), and periods (.).
  - The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: >!, <"&'=After the parameter template is exported, a new template is generated in the list in the **Custom Templates** tab on the **Parameter Templates** page.
- Exporting to a CSV file  
The parameter template information (parameter names, values, and descriptions) of the DB instance is exported to a file. In the displayed dialog box, enter the file name and click **OK**.  
The file name can contain 4 to 81 characters.

----End

## Exporting a Parameter Template

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Default Templates** or **Custom Templates** as needed. On the displayed page, locate the target template and choose **More > Export** in the **Operation** column.
- Step 4** In the displayed dialog box, enter a file name and click **OK**.  
The file name can contain 4 to 81 characters.

**Figure 16-14** Exporting a parameter template



----End



## 16.2.7 Importing a Parameter Template

### Scenarios

RDS allows you to import new parameter templates for future use. To apply an imported parameter template to new DB instances, see [Applying a Parameter Template](#).

### Constraints

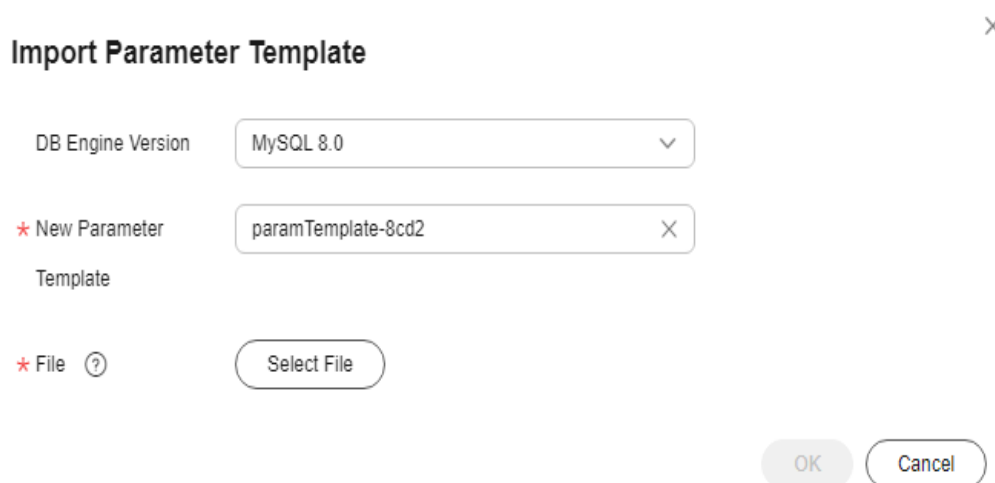
- Only parameter templates that were exported from the **Parameter Templates** page on the RDS console can be imported.
- If any modification to an exported parameter template causes a change in the file format, the template may not be able to be imported.
- The parameter template to be imported cannot contain parameters related to specifications. For details about such parameters, see [Constraints](#).

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Import Parameter Template**.
- Step 4** In the displayed dialog box, select a DB engine version, enter a new parameter template name, click **Select File**, select the target parameter list (containing parameter names, values, and description), and click **OK**.

Only one file (CSV format) can be imported at a time. The file size cannot exceed 50 KB.

**Figure 16-15** Importing a parameter template



**Import Parameter Template** ×

DB Engine Version

★ New Parameter Template  ×

★ File ?

----End

## 16.2.8 Modifying a Parameter Template Description

### Scenarios

You can modify the description of a parameter template you have created.

### Constraints

You cannot modify the description of a default parameter template.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Custom Templates**. Locate the target parameter template and click  in the **Description** column.
- Step 4** Enter a new description and click **OK** to submit the modification or click **Cancel** to cancel the modification.
  - The description consists of a maximum of 256 characters and cannot contain carriage return characters or the following special characters: > ! < " & ' =
  - After the modification is successful, you can view the new description in the **Description** column of the parameter template list.

-----End

## 16.2.9 Deleting a Parameter Template

### Scenarios

You can delete a custom parameter template that is no longer in use.

### Constraints

- Deleted parameter templates cannot be recovered. Exercise caution when performing this operation.
- Default parameter templates cannot be deleted.

### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Parameter Templates** page, click **Custom Templates**. Locate the target parameter template to be deleted and choose **More > Delete** in the **Operation** column.

**Step 4** In the displayed dialog box, click **Yes**.

----End

## 16.3 Suggestions on RDS for MySQL Parameter Tuning

Parameters are key configuration items in a database system. Improper parameter settings may adversely affect database performance. This section describes some important parameters for your reference. For details, visit the [MySQL official website](#).

For details on how to modify RDS for MySQL parameters on the console, see [Modifying Parameters of an RDS for MySQL Instance](#).

### lower\_case\_table\_names

- Supported versions: 5.7 and 5.6
- Function: It controls whether table names are case-sensitive when databases and tables are created.
- Reboot required: Yes
- Default value: **1**
- Configuration suggestions: Changing its value may cause primary/standby replication exceptions. If you do need to change the value, set the parameter as follows:
  - The default value **1** indicates that table names are case-insensitive and are lowercase by default.
  - If you want to change this parameter value from **1** to **0**, change it on read replicas and reboot them first, and then repeat the operations on the primary DB instance.
  - If you want to change this parameter value from **0** to **1**, change it on the primary DB instance, reboot and run **SELECT @@GLOBAL.GTID\_EXECUTED** on the primary instance first. Then run **SELECT @@GLOBAL.GTID\_EXECUTED** on read replicas. Wait until the result set is at least the same as the primary DB instance and then change this parameter value on read replicas and reboot them.

### innodb\_flush\_log\_at\_trx\_commit

- Supported versions: 8.0, 5.7, and 5.6
- Function: It controls the balance between strict ACID compliance for commit operations and higher performance.
- Reboot required: No
- Default value: **1**
- Configuration suggestions: If this parameter value is not **1**, data security is not guaranteed. Once the system fails, data may be lost.
  - If it is set to the default value **1**, InnoDB writes transaction logs from the buffer to the log file and flushes the log file data to the disk at each transaction commit. This setting helps to keep the database ACID-compliant.

- If it is set to **0**, InnoDB writes transaction logs in the buffer to the log file and flushes the log file data to the disk once per second.
- If it is set to **2**, InnoDB writes transaction logs from the buffer to the log file at each transaction commit and flushes the log file data to the disk once per second.

## sync\_binlog

- Supported versions: 8.0, 5.7, and 5.6
- Function: It controls how often the MySQL server flushes binary logs to the disk.
- Reboot required: No
- Default value: **1**
- Configuration suggestions: The default value **1** indicates that the MySQL server synchronizes binlogs to the disk before transactions are committed. This is the safest setting.

If this parameter is set **0**, the MySQL server does not flush binlogs. Instead, the file system flushes binlog data from the cache to the disk. This setting provides the best performance, but in the event of a power failure or OS crash, all binlog data in the binlog\_cache will be lost.

## innodb\_large\_prefix

- Supported version: 5.6
- Function: It specifies the maximum length of a single-column index in an InnoDB table.
- Reboot required: No
- Default value: **OFF**
- Configuration suggestions: Changing this parameter value during DDL execution may cause primary/standby replication exceptions. If you do need to change the value, set the parameter as follows:
  - If you want to change this parameter value from **OFF** to **ON**, change it on read replicas first and then on the primary DB instance.
  - If you want to change it from **ON** to **OFF**, change it on the primary DB instance first and then on read replicas.

## innodb\_buffer\_pool\_size

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the size of the InnoDB buffer pool. The InnoDB buffer pool is used to cache table and index data. Increasing the value of this parameter reduces disk I/O.
- Reboot required: No
- Default value: Its value is determined by the DB instance specifications.
- Configuration suggestions: Setting this parameter to a large value may cause system breakdown. Exercise caution when changing this parameter value. Its value must be an integer multiple of the product of the parameters **innodb\_buffer\_pool\_chunk\_size** and **innodb\_buffer\_pool\_instances**. For example, if **innodb\_buffer\_pool\_chunk\_size** is **134217728** and

**innodb\_buffer\_pool\_instances** is **1**, the value of **innodb\_buffer\_pool\_size** must be a multiple of **134217728**.

- If **innodb\_adaptive\_hash\_index** and **innodb\_buffer\_pool\_size** are modified at the same time, changing the value of **innodb\_adaptive\_hash\_index** from **OFF** to **ON** will fail.
- If **innodb\_buffer\_pool\_instances** is set to **2**, the value of **innodb\_buffer\_pool\_size** must be greater than or equal to **1** (unit: GB).

## innodb\_buffer\_pool\_instances

- Supported versions: 8.0, 5.7, and 5.6
- Function:
  - In InnoDB, data is accessed by page. The default size of each page is 16 KB. The buffer pool is used to manage and cache these pages. InnoDB allocates a continuous memory block to the buffer pool and divides it into multiple buffer pool instances to better manage the memory. Each instance has the same size. An algorithm is used to ensure that a page is in only one specific instance. Using buffer pool instances improves the concurrent performance of the buffer pool.
  - Each buffer pool instance maintains its own buffer pool module. InnoDB reads data from files into the buffer pool in 16 KB pages and caches these pages in a Least Recently Used (LRU) list. Pages that are frequently accessed are placed at the front of the LRU list, and pages that are not frequently accessed are placed at the end. When accessing a page, InnoDB first obtains the page from the buffer pool. If the page is not obtained, InnoDB accesses the data file, reads the page, and puts it to the LRU list. When there are no available idle pages in the buffer pool of an instance, pages in the LRU list are evicted.
  - Each buffer pool instance has its own locks, including mutex, buffer chunks, and page linked lists. Each instance is independent and supports multi-thread concurrent access. A page can be stored only in a specific instance.

Each buffer pool instance contains a `page_hash` (hash table). The `page_hash` can be used to quickly find pages in the LRU list, avoiding scanning the entire LRU list and greatly improving the page access efficiency.
- Reboot required: Yes
- Default value: The default value of **innodb\_buffer\_pool\_instances** is related to the memory specifications of an instance. Changing this parameter value will affect the concurrency performance of the buffer pool.

## innodb\_spin\_wait\_delay

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the maximum delay between polls for a spin lock.
- Reboot required: No
- There is no default value.
- Configuration suggestions: Its value is determined by the instance specifications. Setting it to a very large value may impact database performance.

## query\_alloc\_block\_size

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the size of the blocks allocated during query parsing and execution.
- Reboot required: No
- There is no default value.
- Configuration suggestions: Its value is determined by the instance specifications. Setting it to a very large value may impact database performance.

## max\_connections

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the maximum number of concurrent connections to a DB instance.
- Reboot required: No
- Default value: Its value is determined by the DB instance specifications.
- Configuration suggestions: Part of this limit is reserved for system built-in connections. To prevent concurrent connection conflicts, do not set this parameter to a value less than 30. This parameter cannot be set to a value smaller than the number of current connections.

## character\_set\_server

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the server character set.
- Reboot required: No
- There is no default value.
- Configuration suggestions: If you change the value of this parameter, the system changes the values of **collation\_server**, **character\_set\_database**, and **collation\_database** accordingly.

The parameters **character\_set\_server** and **collation\_server** are correlated with each other. The value of **collation\_server** starts with the value of **character\_set\_server**. For example, if **character\_set\_server** is set to **latin1**, the value of **collation\_server** starts with **latin1**.

## innodb\_io\_capacity

- Supported versions: 8.0, 5.7, and 5.6
- Function: It specifies the maximum number of I/O operations InnoDB can perform per second.
- Reboot required: No
- Default value: It depends on the disk type.
- Configuration suggestions: Its value must be less than or equal to the value of **innodb\_io\_capacity\_max**. For example, if **innodb\_io\_capacity\_max** is set to **2000**, the maximum value of **innodb\_io\_capacity** is **2000**.

## max\_prepared\_stmt\_count

- Supported versions: 8.0, 5.7, and 5.6
- Function: It limits the total number of prepared statements. Too many prepared statements consume server memory resources. If this parameter is set to a small value, your DB instance may be vulnerable to denial of service (DoS) attacks. Adjust this parameter value as necessary.
- Reboot required: No
- There is no default value.
- Configuration suggestions: In MySQL 8.0, if the kernel version is earlier than 8.0.18, the value of this parameter cannot exceed **1048576**.

## innodb\_strict\_mode

- Supported versions: 8.0, 5.7, and 5.6
- Function: It restricts the InnoDB check policy.
- Reboot required: No
- Default value: **OFF**
- Configuration suggestions: Set this parameter to **ON** when page data compression is used.

## binlog\_rows\_query\_log\_events

- Supported versions: 8.0, 5.7, and 5.6
- Function: It controls whether to write original SQL statements into binlogs.
- Reboot required: No
- Default value: **OFF**
- Configuration suggestions: If this parameter is set to **ON**, database performance may deteriorate when a large amount of data is updated. Before changing the parameter value, consider its compatibility with tools such as Otter.

## innodb\_print\_all\_deadlocks

- Supported versions: 8.0, 5.7, and 5.6
- Function: When this parameter is enabled, information about all deadlocks in InnoDB user transactions is recorded in the mysqld error log.
- Reboot required: No
- Default value: **OFF**
- Configuration suggestions: Setting this parameter to its default value can avoid the performance overhead caused by frequent log writes. If it is set to **ON** and there are a large number of deadlocks in the system, frequent log writes will increase I/O overhead. If information about all deadlocks is recorded, there will be more and more error logs. For example, if deadlocks frequently occur in high-concurrency scenarios, the storage space is quickly consumed. You can set this parameter to **ON** temporarily when you want to troubleshoot and analyze deadlocks.

## back\_log

- Supported versions: 8.0, 5.7, and 5.6
- Function: The **back\_log** value indicates how many requests can be stacked during the interval before MySQL temporarily stops responding to new requests.
- Reboot required: Yes
- Default value: Its value is determined by the DB instance specifications.
- Configuration suggestions: None

## Parameters Related to Kernel Rules

The values of the following parameters will be automatically adjusted based on kernel rules:

- **key\_cache\_age\_threshold**: changed to a multiple of 100
- **join\_buffer\_size** and **key\_cache\_block\_size**: changed to multiples of 128
- **query\_cache\_size**, **query\_prealloc\_size**, **innodb\_log\_buffer\_size**, **max\_allowed\_packet**, and **thread\_stack**: changed to multiples of 1024
- **read\_buffer\_size**, **read\_rnd\_buffer\_size**, **binlog\_cache\_size**, and **binlog\_stmt\_cache\_size**: adjusted to multiples of 4096
- **data\_buffer\_size**, **log\_buffer\_size**, **shared\_pool\_size**, and **temp\_buffer\_size**: adjusted to multiples of 1048576



# 17 Log Management

---

## 17.1 Log Reporting

### Scenarios

If you enable log reporting for your DB instance, new logs generated for the instance will be uploaded to Log Tank Service (LTS).

### Prerequisites

- Ensure that there are available LTS log groups and log streams in the same region as your instance.

For details about how to create a log group and log stream, see [Overview of Log Management](#).

### Billing

You will be billed for enabling this function under LTS. For details, see [LTS Pricing Details](#).

### Constraints

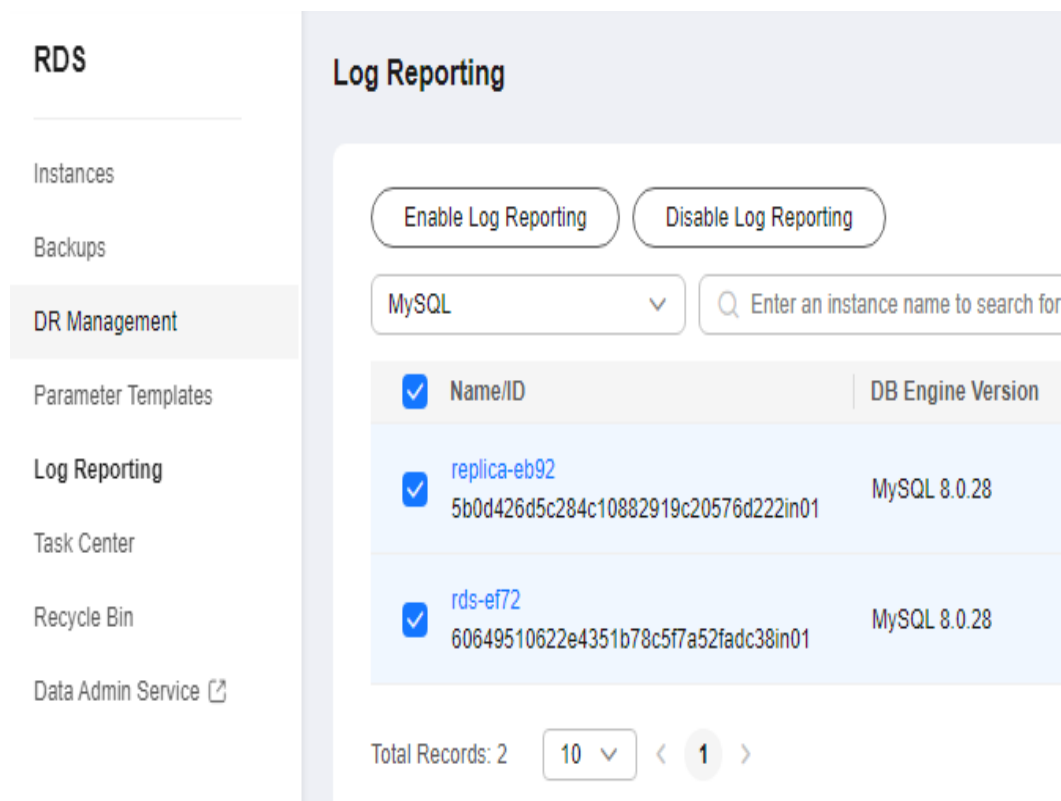
- Error logs and slow query logs cannot share the same log stream.
- Once configured, there is a delay of approximately 10 minutes before the changes are applied.
- If a structuring template (MySQL slow log template or MySQL error log template) has been bound to a log stream, ensure that the template type is the same as the log type when you select the log stream. For example, if an error log template has been bound to a log stream, the log stream cannot be selected for slow query logs.

For details about how to bind a system template to a log stream, see [Log Structuring](#).

## Enabling Log Reporting in Batches

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** In the navigation pane, choose **Log Reporting**.

**Figure 17-1** Log reporting



- Step 4** Select one or more instances and click **Enable Log Reporting**.
- Step 5** Select an LTS log group and log stream and click **OK**.

**Figure 17-2** Enabling log reporting

×

### Enable Log Reporting

ⓘ

Logs record all requests sent to your DB instance and are stored in Log Tank Service (LTS).  
This request does not take effect immediately. There is a delay of about 10 minutes.  
You will be billed for log reporting.

Log Type

☒ Slow logs ☐ Error Logs

Report Slow Logs to LTS

★ Log Group

🔄 [View Log Groups](#)

★ Log Stream

🔄

OK

Cancel

**Step 6** To disable log reporting, select one or more instances and click **Disable Log Reporting**.

**Step 7** In the displayed dialog box, click **OK**.

**Figure 17-3** Disabling log reporting

×

### Disable Log Reporting

⚠

If log reporting is disabled, logs generated for the DB instance will not be reported to Log Tank Service (LTS). This request does not take effect immediately. There is a delay of about 10 minutes.

Log Type

☒ Slow logs ☐ Error Logs

OK

Cancel

----End

## 17.2 Viewing and Downloading Error Logs

RDS log management allows you to view database-level logs, including error logs and slow SQL query logs.

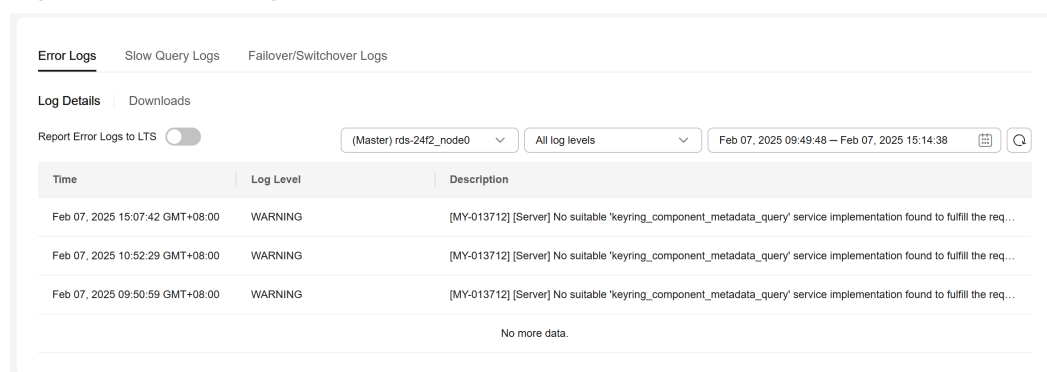
Error logs help you analyze problems with databases. You can download error logs for further analysis.

You can view error logs generated within the last month.

### Viewing Log Details

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the **Error Logs** page, click **Log Details** to view details about error logs.

**Figure 17-4** Error log details



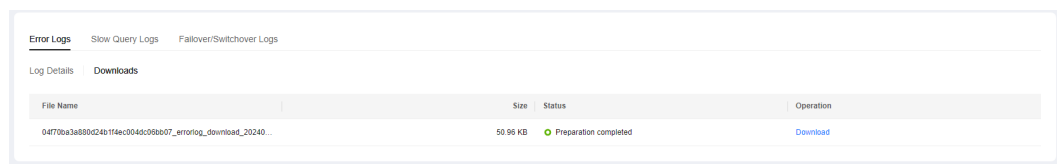
- You can select a log level in the upper right corner to view logs of the selected level.
  - All log levels
  - ERROR
  - WARNING
  - NOTE
- A maximum of 2,000 error log records can be displayed. To view more error log records, [submit a service ticket](#).
- You can click  in the upper right corner to view logs generated in different time segments.
- If the description of a log is truncated, locate the log and move your pointer over the description in the **Description** column to view details.

----End

## Downloading an Error Log

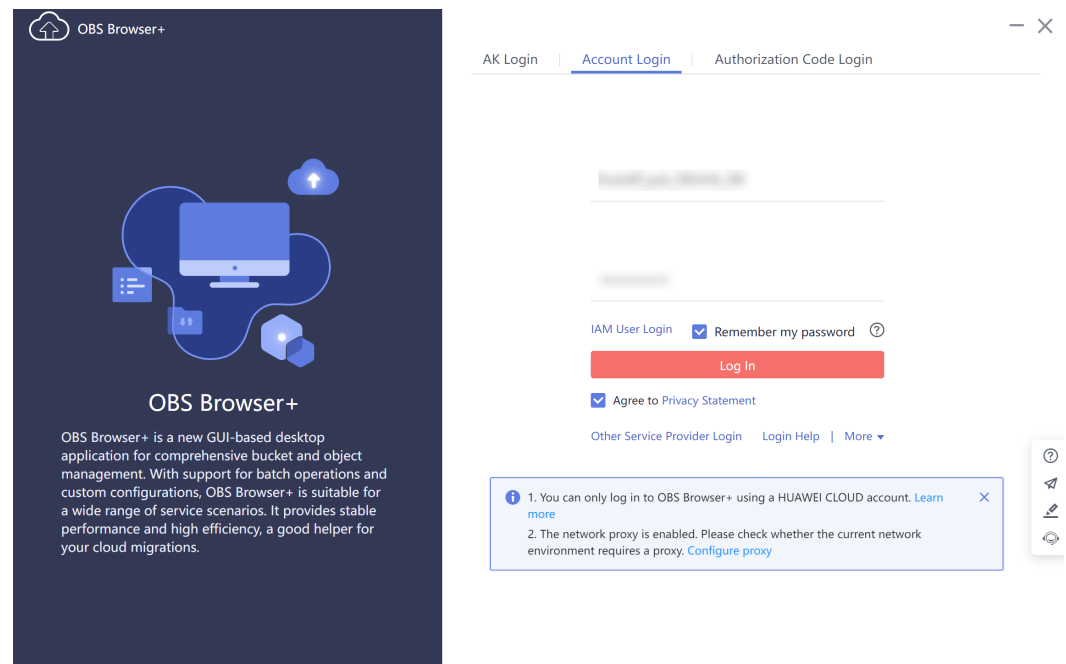
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the **Error Logs** page, click the **Downloads** tab. In the log list, locate a log file whose status is **Preparation completed** and click **Download** in the **Operation** column.

**Figure 17-5** Downloading an error log



| File Name                                                   | Size     | Status                | Operation                |
|-------------------------------------------------------------|----------|-----------------------|--------------------------|
| 04f70ba3a880d24b1f4ec004dc99be07_errorlog_download_20240... | 50.95 KB | Preparation completed | <a href="#">Download</a> |

- The system automatically loads the downloading preparation tasks. The loading duration is determined by the log file size and network environment.
  - When the log is being prepared for download, the log status is **Preparing**.
  - When the log is ready for download, the log status is **Preparation completed**.
  - If the preparation for download fails, the log status is **Abnormal**. Logs in the **Preparing** or **Abnormal** status cannot be downloaded.
- The download link is valid for 5 minutes. After the download link expires, a message is displayed indicating that the download link has expired. If you need to redownload the log, click **OK**.
- The downloaded logs contain only the logs of the primary node.
- If the size of a log to be downloaded is greater than 40 MB, you need to use OBS Browser+ to download it.
  - a. [Download OBS Browser+](#).
  - b. Decompress and install OBS Browser+.

**Figure 17-6** Logging in to OBS Browser+

- c. On the OBS Browser+ download page of any backup, obtain the name of an external bucket. For details, see [Method 1: Using OBS Browser+](#).

**Figure 17-7** Obtaining an external bucket name

Download Backup Data

If the size of the backup data is greater than 400 MB, you are advised to use OBS Browser+ for the download.

Download Method

Use OBS Browser+

Use Current Browser

Use Download URL

| Backup File Name              | Backup File Size |
|-------------------------------|------------------|
| e059b9d6bb2048f48097192349... | 5.91 MB          |

How to Download Backups

^ Step 1: Prepare for download.

Download OBS Browser+

Install and log in to OBS Browser+. Follow instructions for [Object Storage Service User Guide](#)

^ Step 2: Add an external bucket.

In OBS Browser+, use account [REDACTED] to log in and add external bucket db5-1-cn-east-5-51c663ca191541f58660485b20a2b49f-[REDACTED] backup

Close

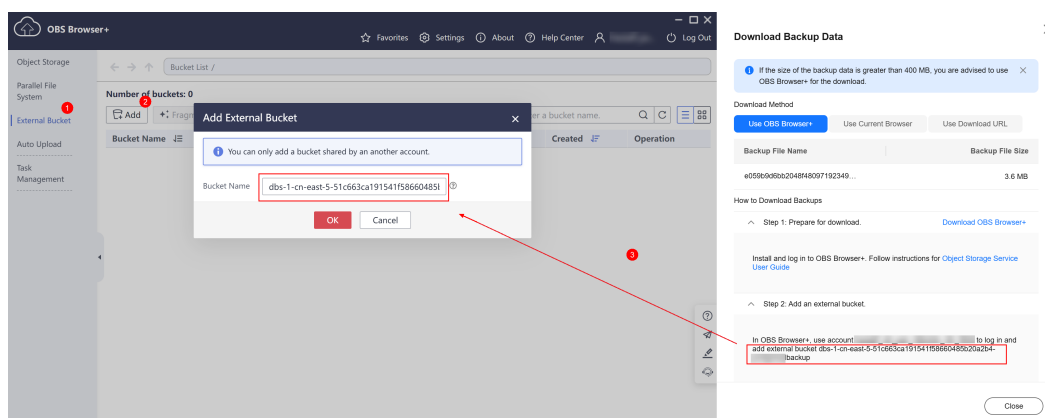
d. Add an external bucket.

Issue 01 (2025-09-15)

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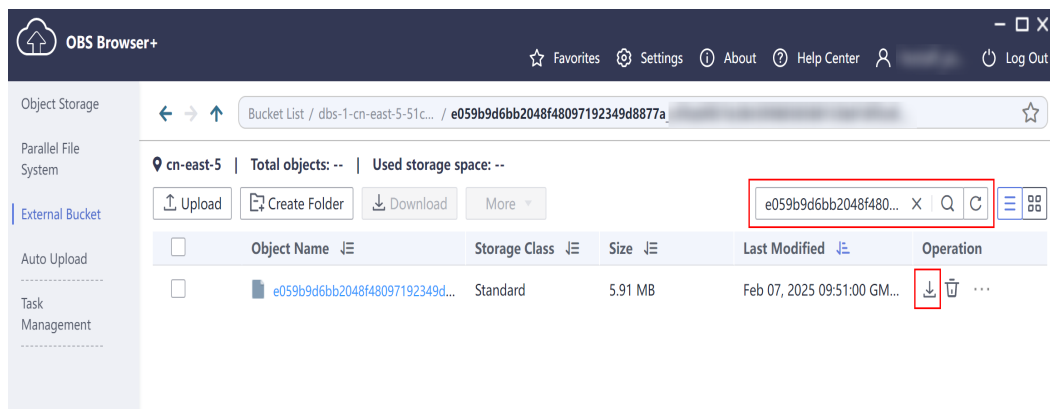
Figure 17-8 Adding an external bucket

**NOTE**

If you want to access OBS external buckets across accounts, the access permission is required. For details, see [Granting IAM Users Under an Account the Access to a Bucket and Resources in the Bucket](#).

- e. Click the name of the external bucket to go to the object list page. In the search box on the right, enter the log file name and start a search. In the search result, click  to download the log file.

Figure 17-9 Downloading a log file



----End

## Enabling Error Log Reporting to LTS

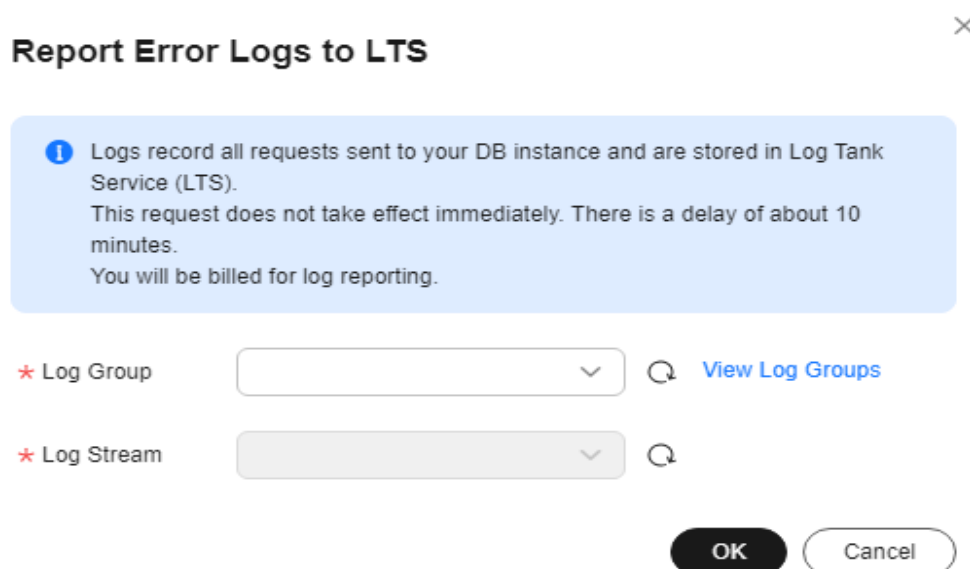
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, click **Logs**. On the **Error Logs** page, click **Log Details**.



**Step 5** Click  next to **Report Error Logs to LTS**.

**Step 6** Select an LTS log group and log stream and click **OK**.

**Figure 17-10** Enabling error log reporting to LTS



----End

## 17.3 Viewing and Downloading Slow Query Logs

### Scenarios

Slow query logs record statements that exceed the **long\_query\_time** value (1 second by default). You can view log details and statistics to identify statements that are executing slowly and optimize the statements. You can also download slow query logs for service analysis.

Slow query logs generated within the last month can be viewed.

RDS supports the following types of statements: All types, SELECT, INSERT, UPDATE, DELETE, CREATE, CALL, ALTER, TRUNCATE, RENAME, FLUSH, EXPLAIN, LOCK, GRANT, REVOKE, COMMIT, ROLLBACK, DROP, and WITH.

### Constraints

Original logs will be automatically deleted 30 days later. If the instance is deleted, its logs are also deleted.

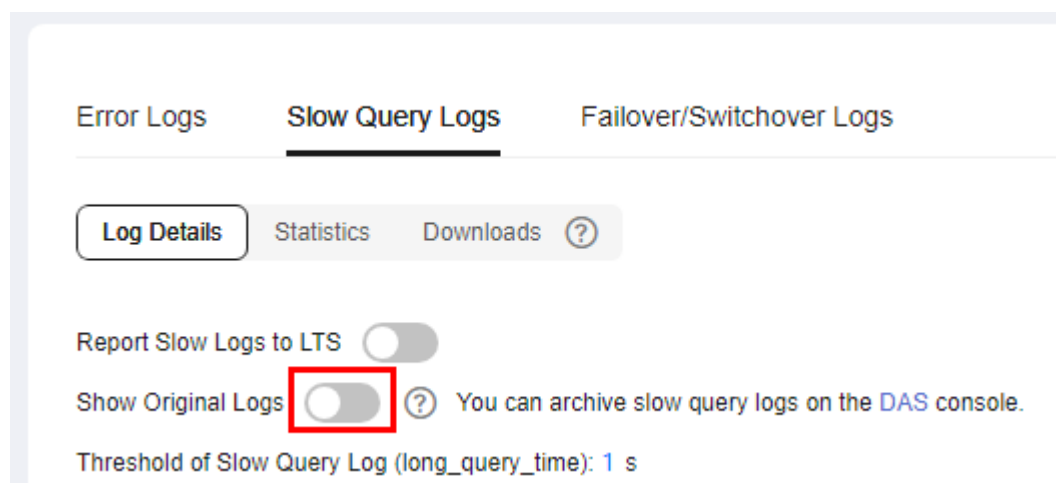
## Parameter Description

**Table 17-1** Parameters related to slow queries

| Parameter                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| long_query_time                        | <p>Specifies how many microseconds a SQL query has to take to be defined as a slow query log. The default value is 1s. When the execution time of an SQL statement exceeds the value of this parameter, the SQL statement is recorded in slow query logs.</p> <p>The recommended value is <b>1s</b>. Note: The lock wait time is not calculated into the query time.</p> <p>Modifying <b>long_query_time</b> takes effect globally. After the modification, the new value is applied to new connections. The existing connections still use the old value.</p> |
| log_queries_not_using_indexes          | <p>Specifies whether to record the slow query without indexes. The default value is <b>OFF</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| log_throttle_queries_not_using_indexes | <p>Limits the number of SQL statements without indexes per minute that can be written to the slow query log. The default value is <b>0</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |

## Showing Original Logs

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the **Slow Query Logs** page, click **Log Details** and then click  on the right of **Show Original Logs**.

**Figure 17-11** Enabling Show Original Logs

**Step 5** In the displayed dialog box, click **Yes** to enable the display of original slow query logs.

----End

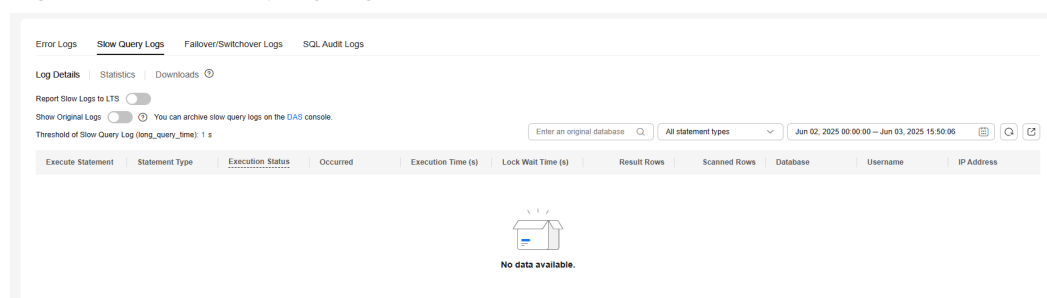
## Viewing Log Details

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Logs**. On the **Slow Query Logs** page, click the **Log Details** tab.

**Figure 17-12** Slow query log details

- You can view the slow query log records of a specified statement or a specific time period.
- The **Scanned Rows** column indicates the number of data rows that are actually accessed and processed during SQL execution.
- Only SELECT statements return the number of result rows (column **Result Rows**). The number of result rows for the INSERT, UPDATE, DELETE, and CREATE statements is 0 by default.

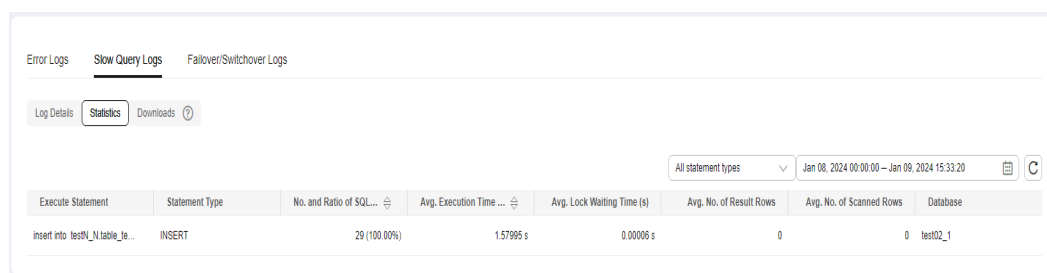
- You can view slow query logs of a specified database name (which cannot contain any special characters). The database name supports only exact search.
- Slow query logs record executed statements whose execution duration exceeds the threshold.
- The **long\_query\_time** parameter determines when a slow query log is recorded. Changes to this parameter do not affect already recorded logs. For example, if the value of this parameter is changed from **1** to **0.1** (unit: second), RDS starts recording statements that meet the new threshold and still displays the previously recorded logs that do not meet the new threshold.
- A maximum of 2,000 slow log records can be queried. To view more slow query log records, [submit a service ticket](#).
- To export log details, [submit a service ticket](#). You can export them by time range. A maximum of 1,000 records can be exported at a time.
- If the length of a single line of an SQL statement exceeds 10 KB or the statement has more than 200 lines, the SQL statement will be truncated. When you view slow query log details, SQL statements may be incomplete after special processing and are for reference only.

----End

## Viewing Statistics

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the **Slow Query Logs** page, click **Statistics** to view details.

**Figure 17-13** Statistics



| Error Logs <b>Slow Query Logs</b> Failover/Switchover Logs |                |                         |                                                                     |                            |                         |                          |          |
|------------------------------------------------------------|----------------|-------------------------|---------------------------------------------------------------------|----------------------------|-------------------------|--------------------------|----------|
| Log Details <b>Statistics</b> Downloads                    |                |                         |                                                                     |                            |                         |                          |          |
|                                                            |                |                         | All statement types   Jan 08, 2024 00:00:00 – Jan 09, 2024 15:33:20 |                            |                         |                          |          |
| Execute Statement                                          | Statement Type | No. and Ratio of SQL... | Avg. Execution Time ...                                             | Avg. Lock Waiting Time (s) | Avg. No. of Result Rows | Avg. No. of Scanned Rows | Database |
| insert into testN_N_table_je...                            | INSERT         | 29 (100.00%)            | 1.57995 s                                                           | 0.00006 s                  | 0                       | 0                        | test02_1 |

- On the **Statistics** page, only one of the SQL statements of the same type is displayed as an example. For example, if two **select sleep(N)** statements, **select sleep(1)** and **select sleep(2)**, are executed in sequence, only **select sleep(1)** will be displayed.
- If **Show Original Logs** is enabled, all of the slow SQL statements are displayed. For example, if **select sleep(1)** and **select sleep(2)** are executed in sequence, both of them will be displayed.

- **No. and Ratio of SQL Executions** shows the ratio of the slow executions to the total executions of the SQL statement.
- On the **Statistics** page, only the latest 5,000 slow SQL queries within a specified period are analyzed.
- To export statistics, [submit a service ticket](#). You can export them by time range. A maximum of 1,000 records can be exported at a time.
- You can filter slow log statistics by specifying a database name (which cannot contain any special characters), statement type, or time period. The database name supports only exact search.
- If any database name in the slow log statistics contains special characters(such as < > '), the special characters will be escaped.

----End

## Downloading a Slow Query Log File

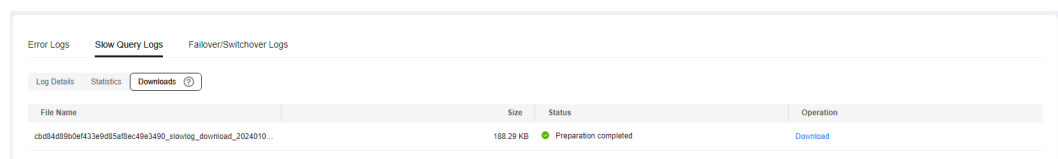
You can download a log file that is not larger than 40 MB directly [from the console](#).

To download a log file larger than 40 MB, use [OBS Browser+](#).

## Downloading a Slow Query Log Directly from the Console

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the **Slow Query Logs** page, click the **Downloads** tab. In the log list, locate a log whose status is **Preparation completed** and click **Download** in the **Operation** column.

**Figure 17-14** Downloading a slow query log



| Error Logs   Slow Query Logs   Failover/Switchover Logs                                                                  |           |                                                                                                           |                          |  |
|--------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------|--------------------------|--|
| Log Details   Statistics   Downloads  |           |                                                                                                           |                          |  |
| File Name                                                                                                                | Size      | Status                                                                                                    | Operation                |  |
| cb0848980e4f33e9d5f8f8ec49e3490_slowlog_download_2024010...                                                              | 188.29 KB |  Preparation completed | <a href="#">Download</a> |  |

- The system automatically loads the downloading preparation tasks. The loading duration is determined by the log file size and network environment.
  - When the log is being prepared for download, the log status is **Preparing**.
  - When the log is ready for download, the log status is **Preparation completed**.
  - If the preparation for download fails, the log status is **Abnormal**.Logs in the **Preparing** or **Abnormal** status cannot be downloaded.

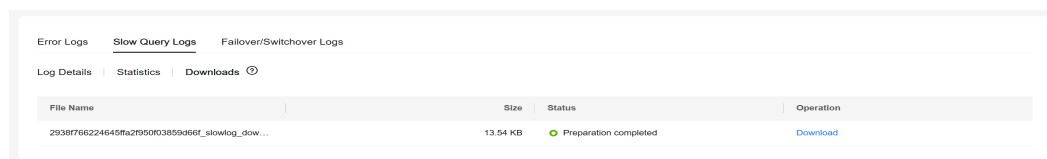
- The download link is valid for 5 minutes. After the download link expires, a message is displayed indicating that the download link has expired. If you need to redownload the log, click **OK**.
- The downloaded log file contains only the logs of the primary node or a read replica.

----End

## Downloading a Slow Query Log Using an OBS Client

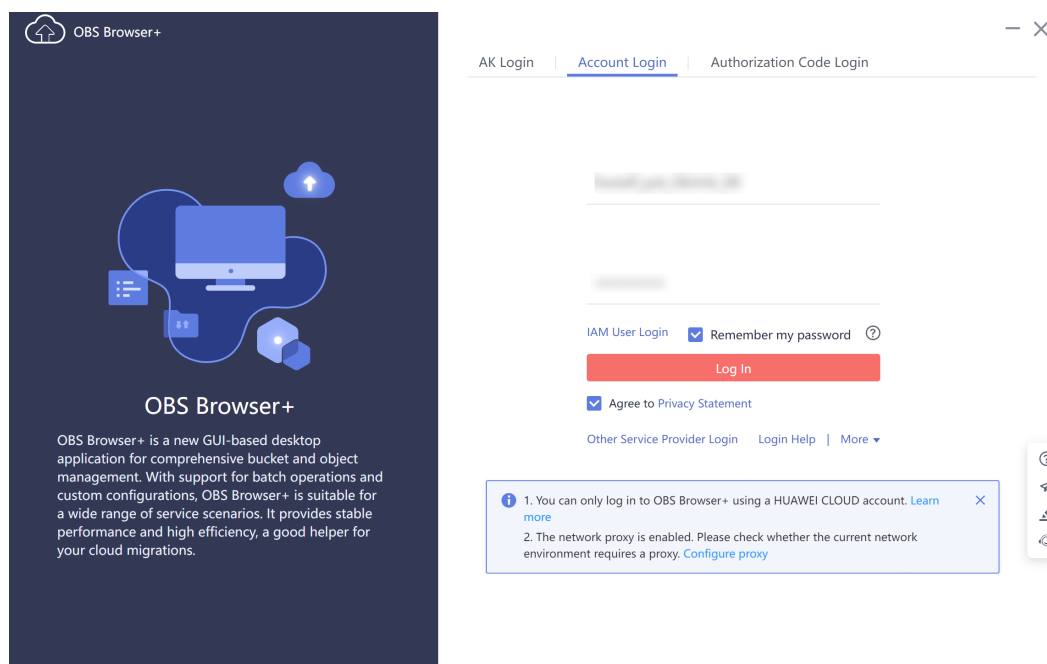
- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, click **Logs**. On the **Slow Query Logs** page, obtain the name of the slow query log file.

**Figure 17-15** Downloading a slow query log



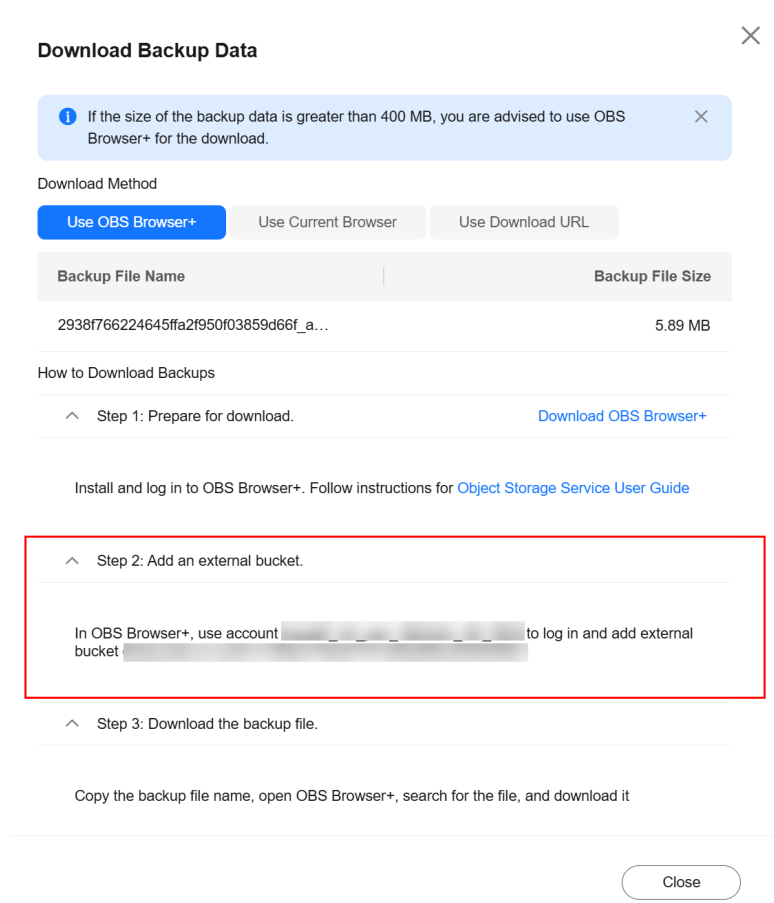
- Step 5** [Download OBS Browser+](#).
- Step 6** Decompress and install OBS Browser+.

**Figure 17-16** Logging in to OBS Browser+



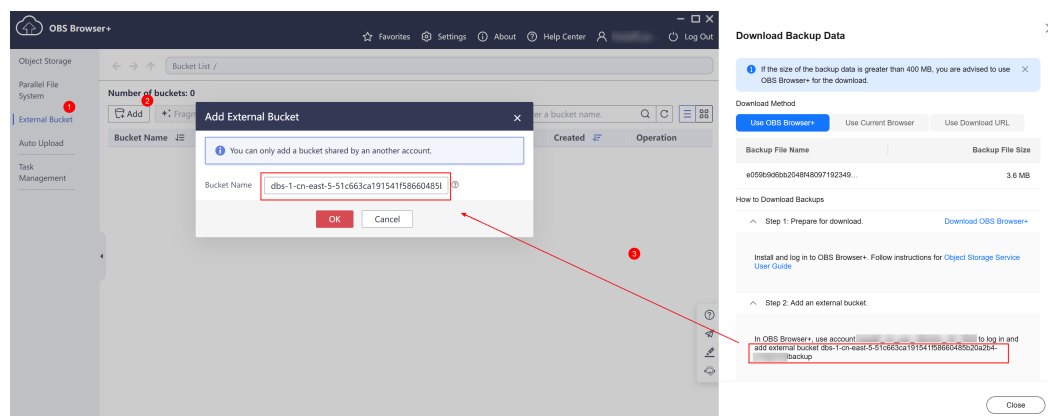
**Step 7** On the OBS Browser+ download page of any backup of the current instance, **obtain the name of an external bucket**.

**Figure 17-17** Obtaining an external bucket name



**Step 8** Add an external bucket.

**Figure 17-18** Adding an external bucket

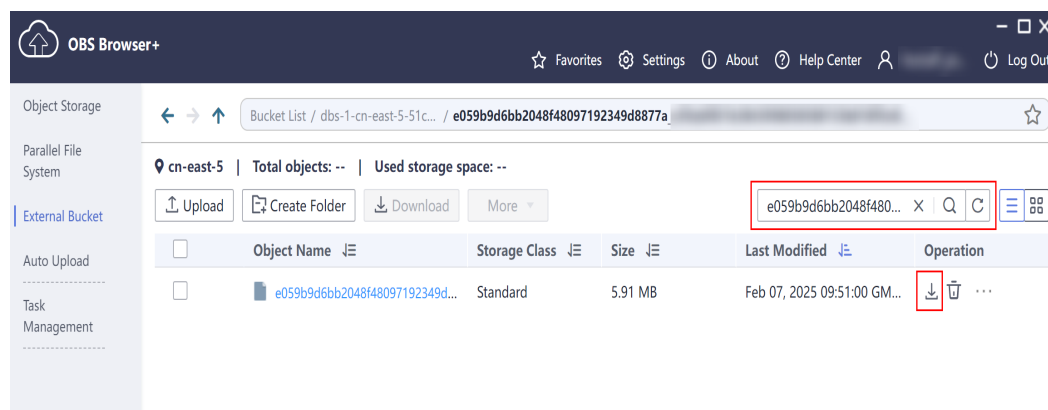


**NOTE**

If you want to access OBS external buckets across accounts, the access permission is required. For details, see [Granting IAM Users Under an Account the Access to a Bucket and Resources in the Bucket](#).

- Step 9** Click the name of the external bucket to go to the object list page. In the search box on the right, search for the log file name obtained in [Step 4](#) and click  to download the log file.

**Figure 17-19** Downloading a log file

**NOTE**

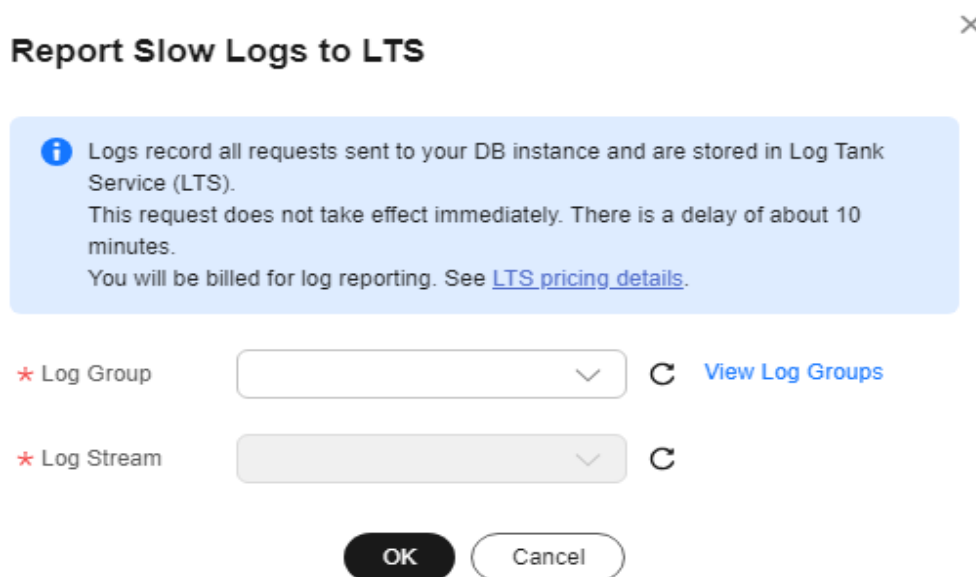
The downloaded log file contains only the logs of the primary node or a read replica.

----End

## Enabling Slow Log Reporting to LTS

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane, click **Logs**. On the **Slow Query Logs** page, click **Log Details**.
- Step 5** Click  next to **Report Slow Logs to LTS**.
- Step 6** Select an LTS log group and log stream and click **OK**.



**Figure 17-20** Enabling slow log reporting to LTS

----End

## How Long Is the Delay of RDS for MySQL Slow Query Logs?

In most cases, the delay is 5 minutes. If the size of slow query logs reaches 10 MB within 5 minutes, the logs will be uploaded to OBS in advance. Slow query log statistics cannot be exported.

## Related APIs

- [Showing Original Logs](#)
- [Obtaining Links for Downloading Slow Query Logs](#)

## 17.4 Viewing Failover/Switchover Logs

You can view failover or switchover logs of RDS for MySQL DB instances to evaluate the impact on services.

## Precautions

You can query only failover and switchover logs generated within recent 30 days. The logs cannot be dumped to OBS buckets.

## Procedure

**Step 1** Click in the upper left corner and select a region.

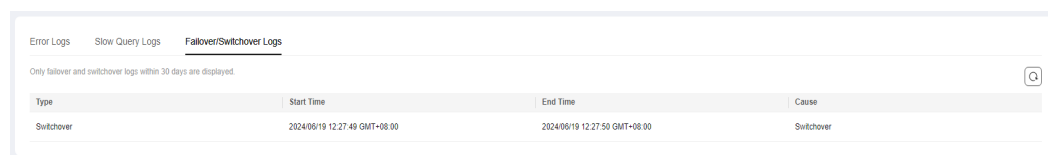
**Step 2** Click in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Logs**. On the displayed page, click **Failover/Switchover Logs** to view log details.

These logs record the failovers caused by database exceptions and manual switchovers.

**Figure 17-21** Failover/Switchover logs



| Type       | Start Time                    | End Time                      | Cause      |
|------------|-------------------------------|-------------------------------|------------|
| Switchover | 2024/06/19 12:27:49 GMT+08:00 | 2024/06/19 12:27:50 GMT+08:00 | Switchover |

----End

## 17.5 Enabling SQL Audit

After you enable the SQL audit function, all SQL operations will be recorded in log files. You can [download](#) audit logs to view log details.

By default, SQL audit is disabled because enabling this function may affect database performance. This section describes how to enable, modify, or disable SQL audit.

### Supported Database Versions

Only the versions listed below support SQL audit. If your DB engine version is too old, upgrade it to the latest version by referring to [Upgrading a Minor Version](#).

- RDS for MySQL 5.6 instances using cloud disks: 5.6.43 and later versions
- RDS for MySQL 5.7 instances using cloud disks: 5.7.23 and later versions
- RDS for MySQL 8.0

### Constraints

- While a standby read replica is acting as a primary read replica due to an exception in the primary, the audit logs generated are invisible.
- If your instance is deployed in LA-Mexico City2 and you want to enable SQL audit for it, [submit a service ticket](#).
- To enable audit log reporting to LTS, [submit a service ticket](#) to apply for the required permissions.
- Both primary DB instances and read replicas support SQL audit logging.
- Times in audit logs use the Coordinated Universal Time (UTC) format, regardless of the time zone configured for the DB instance.
- After SQL auditing is enabled, RDS records SQL operations in audit logs. The generated audit log files are temporarily stored in the instance and then uploaded to OBS and stored in the backup space. If there is not enough free backup space available for generated audit logs, the additional space required is billed.

- Audit logs are cleared every hour. After you change the retention period of audit logs, expired audit logs will be deleted 1 hour later.
- After SQL auditing is enabled, a large number of audit logs may be generated during peak hours. As a result, there are many audit log files temporarily stored in the instance, and the storage may be full. You are advised to enable [storage autoscaling](#).

## Enabling SQL Audit

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the displayed page, click the **SQL Audit Logs** tab.
- Step 5** On the displayed tab page, click **Set SQL Audit**. In the displayed dialog box, specify parameters and click **OK**.

### Enabling or setting SQL audit

- To enable SQL audit, toggle on the switch (from  to ).
- Audit logs can be retained from 1 to 732 days and are retained for 7 days by default.

Figure 17-22 Setting SQL audit

### Set SQL Audit

**1**

- If audit logging is enabled, the generated audit log files are temporarily stored in the local PC. Then they are uploaded to OBS and stored in the backup storage space.
- A large number of log files may be temporarily stored on the local PC during peak hours, which may cause the storage to fill up quickly. To prevent this, enable storage autoscaling as well.

Audit Logging

☒

Audit logs will be saved to OBS.

Retention Period (days)

-

7

+

Audit logs can be retained from 1 to 732 days and are retained for 7 days by default.

Operations

Custom

☒ All ?

DDL

☒ CREATE

☒ ALTER

☒ DROP

☒ RENAME

☒ TRUNCATE

☒ REPAIR

☒ OPTIMIZE

DML

☒ INSERT

☒ DELETE

☒ UPDATE

☒ REPLACE

☒ SELECT

DCL

☒ CREATE\_USER

☒ DROP USER

OK

Cancel

**NOTE**

The **Operations** option is available only in the CN North-Beijing4, CN South-Guangzhou, and CN-Hong Kong regions. To use this option in other regions, [submit a service ticket](#).

The SQL statements executed by PreparedStatement and scheduled tasks through a MySQL client will be treated as **PREPARED\_STATEMENT** and **CREATE**, respectively. However, the SQL statements executed by PreparedStatement through JDBC will not be recorded.

After SQL auditing is enabled, Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), and other operation types are supported. The details are as follows:

**Table 17-2** DDL types and operations

| Type     | Operation                                                                                                                                   | Remarks                                                                |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| CREATE   | create_db, create_event,<br>create_function, create_index,<br>create_procedure, create_table,<br>create_trigger, create_udf,<br>create_view | -                                                                      |
| ALTER    | alter_db, alter_db_upgrade,<br>alter_event, alter_function,<br>alter_instance, alter_procedure,<br>alter_table, alter_tablespace            | The alter_user operation is no longer supported from January 26, 2024. |
| DROP     | drop_db, drop_event,<br>drop_function, drop_index,<br>drop_procedure, drop_table,<br>drop_trigger, drop_view                                | -                                                                      |
| RENAME   | rename_table                                                                                                                                | -                                                                      |
| TRUNCATE | truncate                                                                                                                                    | -                                                                      |
| REPAIR   | repair                                                                                                                                      | Added on January 26, 2024                                              |
| OPTIMIZE | optimize                                                                                                                                    | Added on January 26, 2024                                              |

**Table 17-3** DML types and operations

| Type    | Operation               | Remarks                                                   |
|---------|-------------------------|-----------------------------------------------------------|
| INSERT  | insert, insert_select   | -                                                         |
| DELETE  | delete, delete_multi    | -                                                         |
| UPDATE  | update, update_multi    | The update_multi operation was added on January 26, 2024. |
| REPLACE | replace, replace_select | -                                                         |
| SELECT  | select                  | -                                                         |

**Table 17-4** DCL types and operations

| Type                    | Operation                        | Remarks                                                   |
|-------------------------|----------------------------------|-----------------------------------------------------------|
| CREATE_USER             | create_user                      | -                                                         |
| DROP_USER               | drop_user                        | -                                                         |
| RENAME_USER             | rename_user                      | -                                                         |
| GRANT                   | grant_roles, grant               | The grant_roles operation was added on January 26, 2024.  |
| REVOKE                  | revoke, revoke_all, revoke_roles | The revoke_roles operation was added on January 26, 2024. |
| ALTER_USER              | alter_user                       | Added on January 26, 2024                                 |
| ALTER_USER_DEFAULT_ROLE | alter_user_default_role          | Added on January 26, 2024                                 |

**Table 17-5** Other types and operations

| Type                  | Operation                                                                    | Remarks                                                  |
|-----------------------|------------------------------------------------------------------------------|----------------------------------------------------------|
| BEGIN/COMMIT/ROLLBACK | begin, commit, release_savepoint, rollback, rollback_to_savepoint, savepoint | -                                                        |
| PREPARED_STATEMENT    | execute_sql, prepare_sql, dealloc_sql                                        | The dealloc_sql operation was added on January 26, 2024. |
| CALL_PROCEDURE        | call_procedure                                                               | Added on January 26, 2024                                |
| KILL                  | kill                                                                         | Added on January 26, 2024                                |
| SET_OPTION            | set_option                                                                   | Added on January 26, 2024                                |
| CHANGE_DB             | change_db                                                                    | Added on January 26, 2024                                |
| UNINSTALL_PLUGIN      | uninstall_plugin                                                             | Added on January 26, 2024                                |
| INSTALL_PLUGIN        | install_plugin                                                               | Added on January 26, 2024                                |
| SHUTDOWN              | shutdown                                                                     | Added on January 26, 2024                                |

| Type          | Operation                                                   | Remarks                   |
|---------------|-------------------------------------------------------------|---------------------------|
| SLAVE_START   | slave_start                                                 | Added on January 26, 2024 |
| SLAVE_STOP    | slave_stop                                                  | Added on January 26, 2024 |
| LOCK_TABLES   | lock_tables                                                 | Added on January 26, 2024 |
| UNLOCK_TABLES | unlock_tables                                               | Added on January 26, 2024 |
| FLUSH         | flush                                                       | Added on January 26, 2024 |
| XA            | xa_commit,xa_end,xa_prepare,xa_recover,xa_rollback,xa_start | Added on January 26, 2024 |

### Disabling SQL audit

To disable SQL audit, toggle  (enabled) to  (disabled).

If you select the check box "I acknowledge that after audit log is disabled, all audit logs are deleted." and click **OK**, all audit logs will be deleted.

#### NOTICE

Deleted audit logs cannot be recovered. Exercise caution when performing this operation.

----End

## Enabling Audit Log Reporting to LTS

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the displayed page, click the **SQL Audit Logs** tab.
- Step 5** Click  next to the **Report Audit Logs to LTS** field.
- Step 6** Select an LTS log group and log stream and click **OK**.

**Figure 17-23** Enabling audit log reporting to LTS

### Report Audit Logs to LTS

**i** Logs record all requests sent to your DB instance and are stored in Log Tank Service (LTS).  
This request does not take effect immediately. There is a delay of about 10 minutes.  
You will be billed for log reporting. See [LTS pricing details](#).  
After this function is enabled, all audit policies are reported by default.  
If Audit Policy is enabled, LTS reuses the audit policy set for your DB instance and you will also be billed for reporting audit logs to LTS. (Only after you disable Audit Policy, the fee will be terminated.)  
If you enable audit log reporting to LTS for an instance with the Audit Policy toggle switch turned on, you can turn off this switch only when the instance status becomes available.  
Before enabling audit logging, ensure that sensitive information has been anonymized.  
A large number of log files may be temporarily stored on the local PC during peak hours, which may cause the storage to fill up quickly. To prevent this, enable storage autoscaling as well.

★ Log Group

[View Log Groups](#)

★ Log Stream



OK

Cancel

- After this function is enabled, audit logs record all requests sent to your DB instance and are stored in LTS.
- This function does not take effect immediately. There is a delay of about 10 minutes.
- You will be billed for enabling this function. For details, see [LTS pricing details](#).
- After this function is enabled, all audit policies are reported by default.
- Keep the following points in mind before you enable audit logging or audit log reporting to LTS:
  - Enabling audit logging or audit log reporting to LTS generates audit logs and the sensitive information in the audit logs is not anonymized.
  - If you enable audit logging first and then enable audit log reporting to LTS, LTS reuses the audit policy set for your instance and you will also be billed for reporting audit logs to LTS. Only after you disable audit logging, billing for audit logging will be terminated.
  - If you enable audit logging first and then enable audit log reporting to LTS, you are not advised to disable audit logging before audit log reporting to LTS is running properly.



- Audit logs may be lost while being uploaded to LTS in certain situations. If audit logging is enabled, you can download all audit logs from OBS.
  - There is a low probability that some logs are lost when the service traffic is heavy, audit logs are generated too fast, or the LTS service fails.
  - Each audit log record uploaded to LTS cannot exceed 512 KB. Larger records will be truncated.

----End

### If SQL Audit Is Disabled but Audit Log Reporting to LTS Is Enabled, Will SQL Audit Logs Still Be Generated?

Yes.

### If Audit Log Reporting to LTS Is Enabled but the Corresponding Log Stream Is Deleted, Will SQL Audit Logs Still Be Generated?

If the log stream is deleted, RDS for MySQL will continue to generate audit logs and will try to report the logs. If the number of logs that fail to be reported exceeds the upper limit 50, the excess logs will be deleted.

#### Related APIs

- [Setting an Audit Log Policy](#)
- [Querying an Audit Log Policy](#)
- [Obtaining Audit Logs](#)

## 17.6 Downloading SQL Audit Logs

### Scenarios

If you [enable SQL audit](#), the system records all SQL operations and uploads logs every half an hour or when the size is accumulated to 100 MB. You can download audit logs to view details. The minimum time unit of audit logs is second. By default, SQL audit is disabled. Enabling this function may affect database performance.

### Constraints

You are advised to download no more than six audit log files at a time. Too many files can fail to be downloaded completely due to the limit on the number of concurrent requests of the browser.

### Procedure

**Step 1** Click  in the upper left corner and select a region.

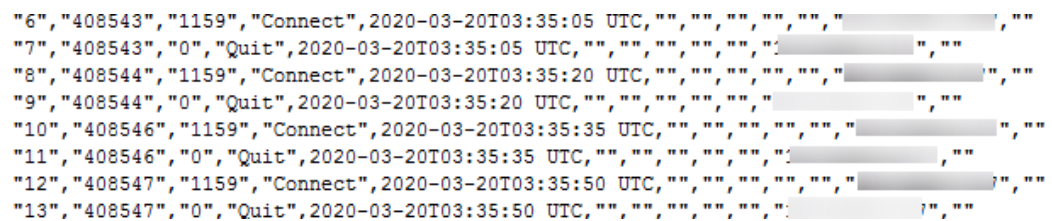
**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Logs**. On the displayed page, click the **SQL Audit Logs** tab.
- Step 5** On the displayed page, select a time range in the upper right corner, select SQL audit logs to be downloaded in the list, and click **Download** above the list to download SQL audit logs in batches.

Alternatively, select an audit log and click **Download** in the **Operation** column to download an individual SQL audit log.

- Step 6** The following figure shows the SQL audit log content. For field descriptions, see [Table 17-6](#).

**Figure 17-24** RDS for MySQL audit logs



```
"6","408543","1159","Connect",2020-03-20T03:35:05 UTC,"","","","","","",""  
"7","408543","0","Quit",2020-03-20T03:35:05 UTC,"","","","","","",""  
"8","408544","1159","Connect",2020-03-20T03:35:20 UTC,"","","","","","",""  
"9","408544","0","Quit",2020-03-20T03:35:20 UTC,"","","","","","",""  
"10","408546","1159","Connect",2020-03-20T03:35:35 UTC,"","","","","","",""  
"11","408546","0","Quit",2020-03-20T03:35:35 UTC,"","","","","","",""  
"12","408547","1159","Connect",2020-03-20T03:35:50 UTC,"","","","","","",""  
"13","408547","0","Quit",2020-03-20T03:35:50 UTC,"","","","","","",""
```

**Table 17-6** Audit log field description

| Parameter         | Description                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| record_id         | ID of a single record, which is the unique global ID of each SQL statement recorded in the audit log.                                             |
| connection_id     | ID of the session executed for the record, which is the same as the ID in the <b>show processlist</b> command output.                             |
| connection_status | Session status, which is usually the returned error code of a statement. If a statement is successfully executed, the value <b>0</b> is returned. |
| name              | Recorded type name. Generally, DML and DDL operations are QUERY, connection and disconnection operations are CONNECT and QUIT, respectively.      |
| timestamp         | UTC time for the record.                                                                                                                          |
| command_class     | SQL command type. The value is the parsed SQL type, for example, select or update. (This field does not exist if the connection is disconnected.) |
| sqltext           | Executed SQL statement content. (This field does not exist if the connection is disconnected.)                                                    |
| user              | Login account.                                                                                                                                    |
| host              | Login host. The value is <b>localhost</b> for local login and is empty for remote login.                                                          |

| Parameter     | Description                                                                            |
|---------------|----------------------------------------------------------------------------------------|
| external_user | External username.                                                                     |
| ip            | IP address of the remotely-connected client. For local connection, the field is empty. |
| default_db    | Default database on which SQL statements are executed.                                 |

----End

## FAQ

Q: Why is the **default\_db** field in SQL audit logs displayed as **A** when I connect to database A and insert data into database B?

A: The **default\_db** field in SQL audit logs displays the current database, which is irrelevant to the SQL statement for inserting data. For example, if you execute **use db1**; or an SQL statement for connecting to database db1, the value of **default\_db** is **db1**. If no database is specified, **default\_db** is empty.

## Related APIs

[Obtaining the Links for Downloading Audit Logs](#)

# 18 Metrics and Alarms

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## 18.1 Configuring Displayed Metrics

The RDS Agent monitors RDS DB instances and collects monitoring metrics only.

### Description

This section describes the RDS metrics that can be monitored by Cloud Eye as well as their namespaces and dimensions. You can use APIs provided by Cloud Eye to query the monitoring metrics and alarms generated for RDS.

The monitoring interval can be 1 minute, 1 second, or 5 seconds. The default monitoring interval is 1 minute. To enable Monitoring by Seconds, see [Configuring Monitoring by Seconds](#).

### Namespace

- Namespace of RDS for MySQL single or primary/standby instance metrics: SYS.RDS
- Namespace of database proxy metrics: SYS.DBPROXY

### Performance Metrics

- [Table 18-1](#) lists the performance metrics of RDS for MySQL instances.
- [Table 18-2](#) lists the performance metrics of RDS for MySQL database proxies.

RDS for MySQL Instance Metrics

Table 18-1 Performance metrics

| Metric ID        | Name                      | Description                                                                  | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|------------------|---------------------------|------------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|-----------------------------------|
| rds001_cpu_util  | CPU Usage                 | CPU usage of the monitored object                                            | 0–100       | %       | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds002_mem_util  | Memory Usage              | Memory usage of the monitored object                                         | 0–100       | %       | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds003_iops      | IOPS                      | Average number of I/O requests processed by the system in a specified period | ≥ 0         | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds004_bytes_in  | Network Input Throughput  | Incoming traffic in bytes per second                                         | ≥ 0         | KiB/s   | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds005_bytes_out | Network Output Throughput | Outgoing traffic in bytes per second                                         | ≥ 0         | KiB/s   | N/A             | RDS for MySQL instance       | 1 minute                          |

| Metric ID                | Name                       | Description                                                             | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|--------------------------|----------------------------|-------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|-----------------------------------|
| rds006_conn_count        | Total Connections          | Total number of connections that attempt to connect to the MySQL server | $\geq 0$    | count   | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds007_conn_active_count | Current Active Connections | Number of connections not in the sleep state                            | $\geq 0$    | count   | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds008_qps               | QPS                        | Query times of SQL statements (including stored procedures) per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds009_tps               | TPS                        | Execution times of submitted and rollback transactions per second       | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds010_innodb_buf_usage  | Buffer Pool Usage          | Ratio of used pages to total pages in the InnoDB buffer                 | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds011_innodb_buf_hit    | Buffer Pool Hit Ratio      | Ratio of read hits to read requests in the InnoDB buffer                | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                          |

| Metric ID                  | Name                          | Description                                                  | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|----------------------------|-------------------------------|--------------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds012_innodb_buffer_dirty | Buffer Pool Dirty Block Ratio | Ratio of dirty data to used pages in the InnoDB buffer       | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds013_innodb_reads        | InnoDB Read Throughput        | Number of read bytes per second in the InnoDB buffer         | $\geq 0$    | Byte/s  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds014_innodb_writes       | InnoDB Write Throughput       | Number of write bytes per second in the InnoDB buffer        | $\geq 0$    | Byte/s  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds015_innodb_read_count   | InnoDB File Read Frequency    | Number of times that InnoDB reads data from files per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds016_innodb_write_count  | InnoDB File Write Frequency   | Number of times that InnoDB writes data to files per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                         | Name                                 | Description                                                            | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------------------|--------------------------------------|------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds017_innodb_log_write_req_count | InnoDB Log Write Requests per Second | Number of InnoDB log write requests per second                         | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds018_innodb_log_write_count     | InnoDB Log Physical Write Frequency  | Number of InnoDB physical write times to log files per second          | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds019_innodb_log_fsync_count     | InnoDB Log fsync() Write Frequency   | Number of completed fsync() write times to InnoDB log files per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds020_temp_tbl_rate              | Temporary Tables Created per Second  | Number of temporary tables created on hard disks per second            | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |



| Metric ID                      | Name                        | Description                                                  | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|--------------------------------|-----------------------------|--------------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds021_myisam_buf_usage        | Key Buffer Usage            | MyISAM key buffer usage                                      | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds022_myisam_buf_write_hit    | Key Buffer Write Hit Ratio  | MyISAM key buffer write hit ratio                            | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds023_myisam_buf_read_hit     | Key Buffer Read Hit Ratio   | MyISAM key buffer read hit ratio                             | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds024_myisam_disk_write_count | MyISAM Disk Write Frequency | Number of times that indexes are written to disks per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds025_myisam_disk_read_count  | MyISAM Disk Read Frequency  | Number of times that indexes are read from disks per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                     | Name                                         | Description                                                            | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|-------------------------------|----------------------------------------------|------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|-----------------------------------|
| rds026_myisam_buf_write_count | MyISAM Buffer Pool Write Requests per Second | Number of requests for writing indexes into the buffer pool per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds027_myisam_buf_read_count  | MyISAM Buffer Pool Read Requests per Second  | Number of requests for reading indexes from the buffer pool per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds028_c_omdml_del_count      | DELETE Statements per Second                 | Number of DELETE statements executed per second                        | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds029_c_omdml_ins_count      | INSERT Statements per Second                 | Number of INSERT statements executed per second                        | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |

| Metric ID                  | Name                                      | Description                                             | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|----------------------------|-------------------------------------------|---------------------------------------------------------|-------------|---------|-----------------|------------------------------|-----------------------------------|
| rds030_omdml_ins_sel_count | INSERT_Statement<br>per Second            | Number of INSERT statements executed per second         | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds031_omdml_rep_count     | REPLACE<br>Statement<br>per Second        | Number of REPLACE statements executed per second        | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds032_omdml_rep_sel_count | REPLACE_SELECT<br>Statement<br>per Second | Number of REPLACE_SELECT statements executed per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds033_omdml_sel_count     | SELECT<br>Statement<br>per Second         | Number of SELECT statements executed per second         | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |

| Metric ID                    | Name                         | Description                                              | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|------------------------------|------------------------------|----------------------------------------------------------|-------------|---------|-----------------|------------------------------|-----------------------------------|
| rds034_comdml_upd_count      | UPDATE Statements per Second | Number of UPDATE statements executed per second          | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute<br>5 seconds<br>1 second |
| rds035_innodb_del_row_count  | Row Delete Frequency         | Number of rows deleted from the InnoDB table per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds036_innodb_ins_row_count  | Row Insert Frequency         | Number of rows inserted into the InnoDB table per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds037_innodb_read_row_count | Row Read Frequency           | Number of rows read from the InnoDB table per second     | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds038_innodb_upd_row_count  | Row Update Frequency         | Number of rows updated into the InnoDB table per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                          |
| rds039_disk_util             | Storage Space Usage          | Storage space usage of the monitored object              | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                          |

| Metric ID                    | Name                  | Description                                                          | Value Range | Unit   | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|------------------------------|-----------------------|----------------------------------------------------------------------|-------------|--------|-----------------|------------------------------|--------------------------------|
| rds047_disk_total_size       | Total Storage Space   | Total storage space of the monitored object                          | 40–4000     | GiB    | 1024            | RDS for MySQL instance       | 1 minute                       |
| rds048_disk_used_size        | Used Storage Space    | Used storage space of the monitored object                           | 0–4000      | GiB    | 1024            | RDS for MySQL instance       | 1 minute                       |
| rds049_disk_read_throughput  | Disk Read Throughput  | Number of bytes read from the disk per second                        | $\geq 0$    | Byte/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds050_disk_write_throughput | Disk Write Throughput | Number of bytes written into the disk per second                     | $\geq 0$    | Byte/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds072_connection_usage      | Connection Usage      | Percent of used MySQL connections to the total number of connections | 0–100       | %      | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                    | Name                        | Description                                                                                                                                          | Value Range | Unit | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|------------------------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|-----------------|------------------------------|--------------------------------|
| rds173_replication_delay_avg | Average Replication Delay   | Average replication delay within 60s between standby DB instances or read replicas and primary DB instances, corresponding to seconds_behind_master. | $\geq 0$    | s    | N/A             | RDS for MySQL instance       | 10 seconds                     |
| rds073_replication_delay     | Real-time Replication Delay | Real-time replication delay between standby DB instances or read replicas and primary DB instances, corresponding to seconds_behind_master.          | $\geq 0$    | s    | N/A             | RDS for MySQL instance       | 1 minute 5 seconds             |

| Metric ID                    | Name            | Description                                                                                                                                                                                           | Value Range | Unit      | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|-----------------|------------------------------|--------------------------------|
| rds074_slow_queries          | Slow Query Logs | Number of slow query logs generated per minute on RDS for MySQL. This metric counts the number of SQL statements whose execution duration exceeds the threshold specified by <b>long_query_time</b> . | $\geq 0$    | count/min | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds075_avg_disk_ms_per_read  | Disk Read Time  | Average time required for each disk read in a specified period                                                                                                                                        | $\geq 0$    | ms        | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds076_avg_disk_ms_per_write | Disk Write Time | Average time required for each disk write in a specified period                                                                                                                                       | $\geq 0$    | ms        | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds077_vma                   | VMA             | Virtual memory area size of an RDS process                                                                                                                                                            | $\geq 0$    | count     | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds078_threads               | Threads         | Number of threads in a process                                                                                                                                                                        | $\geq 0$    | count     | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                         | Name                                                | Description                                                                                                                                                                                                                                                                | Value Range | Unit          | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|-----------------|------------------------------|--------------------------------|
| rds079_vm_hwm                     | Peak Resident Set Size                              | Peak physical memory usage of an RDS process                                                                                                                                                                                                                               | $\geq 0$    | KiB           | 1024            | RDS for MySQL instance       | 1 minute                       |
| rds080_vm_peak                    | Peak Virtual Memory Size                            | Peak virtual memory usage of an RDS process                                                                                                                                                                                                                                | $\geq 0$    | KiB           | 1024            | RDS for MySQL instance       | 1 minute                       |
| rds081_vm_ioutils                 | The time percentage of disk I/O in a non-idle state | Percentage of time when the disk is not idle (there is I/O activity). This parameter indicates how busy the disk is. The disk can process I/O requests in parallel. If the value of this parameter reaches 100%, the disk may not reach its maximum processing capability. | 0-100       | %             | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds082_semi_sync_tx_avg_wait_time | Transaction Wait Time                               | Average wait time of transactions in semi-synchronous mode                                                                                                                                                                                                                 | $\geq 0$    | $\mu\text{s}$ | N/A             | RDS for MySQL instance       | 1 minute                       |



| Metric ID                  | Name                                  | Description                                         | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|----------------------------|---------------------------------------|-----------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| sys_swap_usage             | SWAP Usage                            | SWAP usage of the monitored object                  | 0-100       | %       | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_lock_waits      | Row Locks Waits Transactions          | Number of InnoDB transactions waiting for row lock  | $\geq 0$    | count   | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_bytes_recv_rate        | Received Bytes per Second             | Number of bytes received by the database per second | $\geq 0$    | Byte/s  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_bytes_sent_rate        | Sent Bytes per Second                 | Number of bytes sent from the database per second   | $\geq 0$    | Byte/s  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_pages_read_rate | Data Volume Read By InnoDB per Second | Data volume read by InnoDB per second               | $\geq 0$    | pages/s | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                                  | Name                                         | Description                                            | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|--------------------------------------------|----------------------------------------------|--------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds_innodb_pages_written_rate              | Data Volume Written by InnoDB per Second     | Data volume written by InnoDB per second               | $\geq 0$    | pages/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_os_log_written_rate             | Redo Log Size Written per Second             | Size of redo logs written per second                   | $\geq 0$    | Byte/s  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_buffer_pool_read_requests_rate  | InnoDB buffer pool Read Requests per Second  | Number of innodb_buffer_pool read requests per second  | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_buffer_pool_write_requests_rate | InnoDB buffer pool Write Requests per Second | Number of innodb_buffer_pool write requests per second | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                                 | Name                                               | Description                                                               | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds_innodb_buffer_pool_pages_flushed_rate | InnoDB Buffer Pool Page Flushes per Second         | Number of innodb_buffer_pool_page_flushes per second                      | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_log_waits_rate                 | Flush Times to Disk Due to Insufficient Log Buffer | Times of transaction logs flushed to disks due to insufficient log buffer | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_created_tmp_tables_rate               | Temporary Tables Created per Second                | Number of temporary tables created per second                             | $\geq 0$    | count/s | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_wait_thread_count                     | Waiting Threads                                    | Total number of waiting threads in an instance.                           | $\geq 0$    | count   | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                         | Name                                         | Description                                                                                                                           | Value Range | Unit  | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-----------------|------------------------------|--------------------------------|
| rds_threadpool_waiting_threads    | Number of Waiting Threads in the Thread Pool | Number of waiting threads in the thread pool                                                                                          | $\geq 0$    | count | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_row_lock_time_avg      | Average Row Lock Wait Time                   | Average wait time of historical InnoDB row locks                                                                                      | $> 0$       | ms    | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_row_lock_current_waits | Current Row Lock Waits                       | Number of current InnoDB row lock waits<br>This metric indicates the number of transactions that are currently waiting for row locks. | $\geq 0$    | count | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_mdll_lock_count               | MDL Locks                                    | Number of MDL locks                                                                                                                   | $\geq 0$    | count | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID                   | Name                               | Description                                                                                                                                                                                                | Value Range | Unit  | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|-----------------|------------------------------|--------------------------------|
| rds_buffer_pool_wait_free   | Dirty Pages to Be Flushed to Disks | When InnoDB needs to read or create a page and no clean pages are available, InnoDB flushes some dirty pages first and waits for that operation                                                            | $\geq 0$    | count | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_connection_active_usage | Active Connection Usage            | Usage of active connections                                                                                                                                                                                | 0–100       | %     | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_innodb_log_waits_count  | Log Waits                          | Number of times that the log buffer was too small and a wait was required for it to be flushed before continuing<br><br>The value is an accumulated value and is incremented by 1 each time a wait occurs. | $\geq 0$    | count | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID             | Name                                 | Description                                                                                                                                                                                                      | Value Range | Unit | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|-----------------|------------------------------|--------------------------------|
| rds_long_transaction  | Long Transaction                     | Maximum duration for starting a transaction<br>A complete long transaction is counted only when the <b>BEGIN</b> and <b>COMMIT</b> commands exist before and after the related operation commands, respectively. | ≥ 0         | s    | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_slave_io_running  | Status of the Replication I/O Thread | The status of the replication I/O thread <ul style="list-style-type: none"><li>• <b>0</b>: abnormal</li><li>• <b>1</b>: normal</li><li>• <b>2</b>: connecting</li></ul>                                          | 0-2         | N/A  | N/A             | RDS for MySQL instance       | 1 minute                       |
| rds_slave_sql_running | Status of the Replication SQL Thread | The status of the replication SQL thread <ul style="list-style-type: none"><li>• <b>0</b>: abnormal</li><li>• <b>1</b>: normal</li></ul>                                                                         | 0-1         | N/A  | N/A             | RDS for MySQL instance       | 1 minute                       |

| Metric ID            | Name                      | Description                                             | Value Range | Unit | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|----------------------|---------------------------|---------------------------------------------------------|-------------|------|-----------------|------------------------------|--------------------------------|
| rds_temp_table_usage | Temporary Tablespace Size | Disk space occupied by the current temporary tablespace | ≥ 0         | MiB  | 1024            | RDS for MySQL instance       | 1 minute                       |

Database Proxy Metrics

Table 18-2 RDS for MySQL database proxy metrics

| Metric ID       | Name                     | Description                          | Value Range | Unit   | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data)    |
|-----------------|--------------------------|--------------------------------------|-------------|--------|-----------------|------------------------------|-----------------------------------|
| rds001_cpu_util | CPU Usage                | CPU usage of the monitored object    | 0–100       | %      | N/A             | RDS for MySQL proxy instance | 1 minute<br>5 seconds<br>1 second |
| rds002_mem_util | Memory Usage             | Memory usage of the monitored object | 0–100       | %      | N/A             | RDS for MySQL proxy instance | 1 minute<br>5 seconds<br>1 second |
| rds004_bytes_in | Network Input Throughput | Incoming traffic in bytes per second | ≥ 0         | Byte/s | 1024(IEC)       | RDS for MySQL proxy instance | 1 minute                          |

| Metric ID                         | Name                      | Description                                              | Value Range | Unit   | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|-----------------------------------|---------------------------|----------------------------------------------------------|-------------|--------|-----------------|------------------------------|--------------------------------|
| rds005_bytes_out                  | Network Output Throughput | Outgoing traffic in bytes per second                     | $\geq 0$    | Byte/s | 1024(IEC)       | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_frontend_connections    | Frontend Connections      | Number of connections between applications and the proxy | $\geq 0$    | count  | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_backend_connections     | Backend Connections       | Number of connections between the proxy and RDS database | $\geq 0$    | count  | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_average_response_time   | Average Response Time     | Average response time                                    | $\geq 0$    | ms     | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_query_per_seconds       | QPS                       | Query times of SQL statements                            | $\geq 0$    | count  | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_read_query_proportions  | Read Proportion           | Proportion of read requests to total requests            | 0-100       | %      | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_write_query_proportions | Write Proportion          | Proportion of write requests to total requests           | 0-100       | %      | N/A             | RDS for MySQL proxy instance | 1 minute                       |



| Metric ID                              | Name                                     | Description                                                                          | Value Range | Unit    | Conversion Rule | Monitored Object (Dimension) | Monitoring Interval (Raw Data) |
|----------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------|-------------|---------|-----------------|------------------------------|--------------------------------|
| rds_proxy_frontend_connection_creation | Front-End Connections Created per Second | Number of connections created per second between the database proxy and applications | $\geq 0$    | count/s | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_transaction_query            | Transaction Queries per Second           | Number of SELECT statements executed in transactions per second                      | $\geq 0$    | count/s | N/A             | RDS for MySQL proxy instance | 1 minute                       |
| rds_proxy_multi_statement_query        | Multi-Statement Queries per Second       | Number of multi-statements executed in transactions per second                       | $\geq 0$    | count/s | N/A             | RDS for MySQL proxy instance | 1 minute                       |

## Dimension

| Key                 | Value                           |
|---------------------|---------------------------------|
| rds_cluster_id      | RDS for MySQL DB instance ID    |
| dbproxy_instance_id | RDS for MySQL proxy instance ID |
| dbproxy_node_id     | RDS for MySQL proxy node ID     |

## 18.2 Viewing Monitoring Metrics

### Scenarios

Cloud Eye monitors the statuses of RDS DB instances. You can view RDS metrics on the management console. For details, see [Viewing Metrics of DB Instances](#).

Monitored data takes some time before it can be displayed. The RDS status displayed on the Cloud Eye console is about 5 to 10 minutes delayed. When you create a new RDS DB instance, it takes 5 to 10 minutes before monitoring data is displayed on Cloud Eye.

### Prerequisites

- RDS is running properly.  
Monitoring metrics of the RDS DB instances that are faulty or have been deleted are not displayed on the Cloud Eye console. You can view their monitoring metrics after they are rebooted or restored to normal.  
If an RDS DB instance has been faulty for 24 hours, Cloud Eye considers it to no longer exist and deletes it from the monitoring object list. You need to manually clear the alarm rules created for the DB instance.
- RDS has been running properly for about 10 minutes.  
For a newly created RDS DB instance, you need to wait a bit before you can view the metrics.

### Viewing Metrics of DB Instances

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, locate the target DB instance and click **View Metrics** in the **Operation** column.

Alternatively, click the target DB instance. On the displayed page, click **View Metrics** in the upper right corner of the page.

**Step 4** View the instance metrics on the displayed page.

- On the displayed page, click **Select Metric** in the upper right corner. In the displayed dialog box, you can select the metrics to be displayed and sort them by dragging them to desired locations.
- You can sort graphs by dragging them based on service requirements.
- You can view the performance metrics in the last 1 hour, 3 hours, 12 hours, 1 day, 7 days, and 6 months.

----End

## Real-Time Monitoring

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** In the navigation pane on the left, choose **Advanced O&M**.
- Step 5** On the displayed page, click the **Real-Time Monitoring** tab to view real-time monitoring data such as CPU usage, memory usage, and storage space usage.
- You can also click **View details** to view more metrics on the Cloud Eye console.
- End

## 18.3 Setting Alarm Rules

### Scenarios

The Cloud Eye console allows you to set alarm rules. You can specify objects to be monitored and configure notification policies to stay on top of RDS for MySQL statuses.

You can create an alarm rule by specifying parameters such as the rule name, alarm type, resource level, monitoring scope, alarm policy, and notification.

### Setting Alarm Rules

- Step 1** [Log in to the management console](#).
- Step 2** Click  in the upper left corner and select a region and a project.
- Step 3** Click **Service List**. Under **Management & Governance**, click **Cloud Eye**.
- Step 4** In the navigation pane, choose **Alarm Management > Alarm Rules**.
- Step 5** Click **Create Alarm Rule** in the upper right corner.
- Step 6** On the displayed page, configure required parameters.

Figure 18-1 Configuring alarm rule information

Create Alarm Rule

Metrics

Namealarm-5u35

Description

Alarm TypeMetricEvent

Cloud productRelational Database Service - MySQL Instances

Resource LevelCloud productSpecific dimension

Monitoring ScopeAll resourcesResource groupsSpecific resources

MethodAssociate templateConfigure manually

Trigger an alarm whenany policyis metUse Template

Metric NameMySQL Instances/CPU Usage

Alarm PolicyAvg/5 minutes>=Critical: 80%

3 times (consecutively)ThenEvery 5 minutes

Operation

Add Alarm Policy

You can add 49 more.

Table 18-3 Alarm rule information

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name             | Alarm rule name. The system generates a random name, which you can modify.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Description      | Description about the rule.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Alarm Type       | Select <b>Metric</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cloud product    | Select <b>Relational Database Service - MySQL Instances</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Resource Level   | <b>Cloud product</b> is recommended.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Monitoring Scope | <ul style="list-style-type: none"><li>● <b>All resources</b>: An alarm will be triggered if any resource of the current cloud product meets the alarm policy. To exclude resources that do not require monitoring, click <b>Select Resources to Exclude</b>.</li><li>● <b>Resource groups</b>: An alarm will be triggered if any resource in the selected resource group meets the alarm policy.</li><li>● <b>Specific resources</b>: Click <b>Select Specific Resources</b> to select resources.</li></ul> |
| Method           | <ul style="list-style-type: none"><li>● <b>Associate template</b>: After an associated template is modified, the policies contained in this alarm rule to be created will be modified accordingly. You are advised to select <b>Use existing template</b>. The existing templates already contain three common alarm metrics: CPU usage, memory usage, and storage space usage.</li><li>● <b>Configure manually</b>: Configure alarm policies manually.</li></ul>                                           |
| Template         | If you select <b>Associate template</b> for <b>Method</b> , you need to select a template.<br><br>You can select a default alarm template or create a custom template.                                                                                                                                                                                                                                                                                                                                      |

| Parameter      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Policy   | <p>If you select <b>Configure manually</b> for <b>Method</b>, you need to configure alarm policies.</p> <p>Whether to trigger an alarm depends on whether the metric data in consecutive periods reaches the threshold. For example, Cloud Eye triggers an alarm every 5 minutes if the average CPU usage of the monitored object is 80% or more for three consecutive 5-minute periods.</p> <p><b>NOTE</b></p> <p>A maximum of 50 alarm policies can be added to an alarm rule. If any one of these alarm policies is met, an alarm is triggered.</p> |
| Alarm Severity | The alarm severity can be <b>Critical</b> , <b>Major</b> , <b>Minor</b> , or <b>Informational</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Figure 18-2 Configuring alarm notification

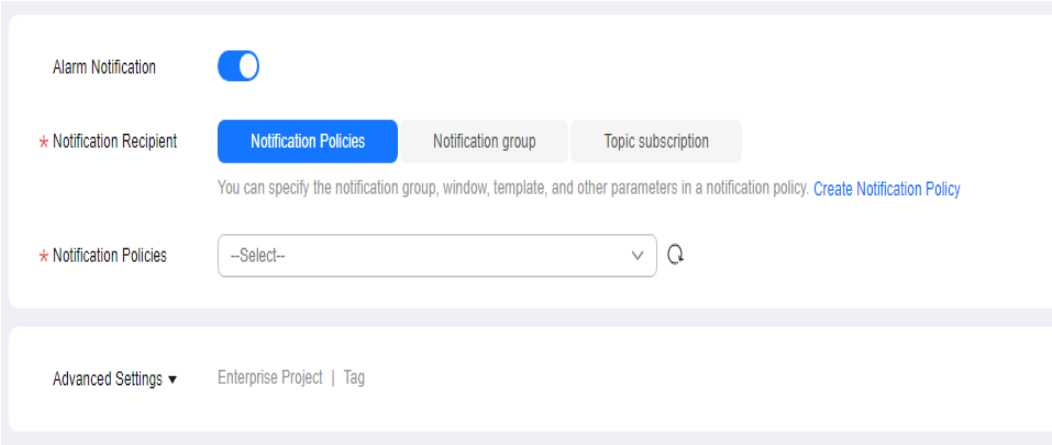


Table 18-4 Alarm notification

| Parameter              | Description                                                                                                                                                                                                                                                                                                                   |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Notification     | Whether to notify users when alarms are triggered. Notifications can be sent by email, text message, or HTTP/HTTPS message.                                                                                                                                                                                                   |
| Notification Recipient | You can select a notification group or topic subscription as required.                                                                                                                                                                                                                                                        |
| Notification Group     | Notification group the alarm notification is to be sent to.                                                                                                                                                                                                                                                                   |
| Notification Object    | <p>Object the alarm notification is to be sent to. You can select the account contact or a topic.</p> <ul style="list-style-type: none"><li>The account contact is the mobile phone number and email address of the registered account.</li><li>A topic is used to publish messages and subscribe to notifications.</li></ul> |

| Parameter           | Description                                                                                                                                                                                                           |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Notification Window | Cloud Eye sends notifications only within the notification window specified in the alarm rule.<br>If <b>Notification Window</b> is set to <b>08:00-20:00</b> , Cloud Eye sends notifications only within 08:00-20:00. |
| Trigger Condition   | Condition for triggering an alarm notification. You can select <b>Generated alarm</b> (when an alarm is generated), <b>Cleared alarm</b> (when an alarm is cleared), or both.                                         |
| Enterprise Project  | Enterprise project that the alarm rule belongs to. Only users with the enterprise project permissions can view and manage the alarm rule.                                                                             |
| Tag                 | A tag is a key-value pair. Tags identify cloud resources so that you can easily categorize and search for your resources.                                                                                             |

**Step 7** Click **Create**. The alarm rule is created.

For details about how to create alarm rules, see [Creating an Alarm Rule](#) in the *Cloud Eye User Guide*.

----End

## When There Are Only 16 Slow Query Logs, Why Is an Alarm Reported Indicating that the Number of Slow Query Logs Is Greater Than or Equal to 20 per Minute?

Slow logs are sorted by the occurrence time. The time when logs are collected in the backend is not an exact hour, and there is a deviation. If logs are filtered by exact hour, the number of logs may be incorrect.

## 18.4 Configuring Alarm Reporting

### Scenarios

If you want to be notified when CPU and disk usage thresholds are reached, enable alarm reporting for RDS for MySQL DB instances in an enterprise project. Once alarm reporting is enabled, the DB instances you create after this function is enabled are automatically added to Cloud Eye. If a configured threshold is reached, you will see an alarm reported on Cloud Eye and be notified by a text message or email sent from Simple Message Notification (SMN).

To view or modify the DB instances with alarm reporting enabled, go to the Cloud Eye console. For details, see [Modifying an Alarm Rule](#).

To view or modify the phone number or email address, open the details page of the alarm rule on Cloud Eye and click the topic under **Alarm Notifications**. For details, see [Adding a Subscription](#). You will be billed for the notifications sent using SMN. For details, see [Product Pricing Details](#).

## Supported Regions

Alarm reporting is supported in the following regions: CN North-Beijing2, CN North-Beijing4, CN East-Shanghai1, CN South-Guangzhou, CN Southwest-Guiyang1, CN-Hong Kong, CN North-Ulanqab201, and CN North-Ulanqab202.

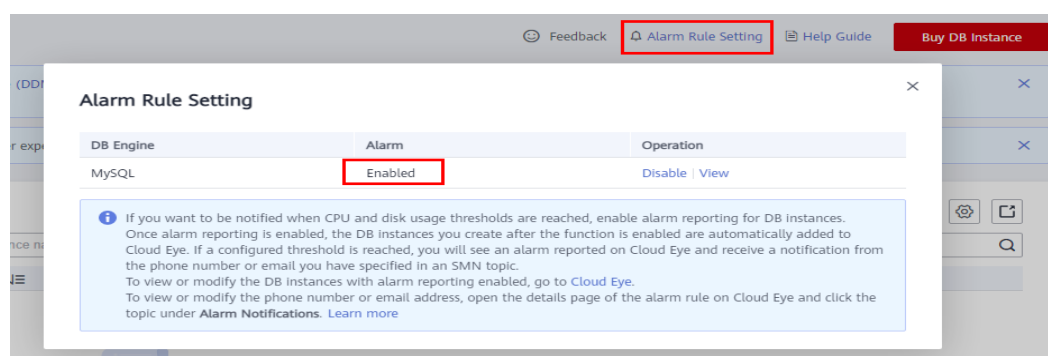
## Alarm Policy

- By default, the following metrics are supported for alarm reporting: CPU Usage (rds001\_cpu\_util), Storage Space Usage (rds039\_disk\_util), and Connection Usage (rds072\_conn\_usage). For more metrics, see [Configuring Displayed Metrics](#).
- When you enable alarm reporting, the phone number and email of your Huawei Cloud account are bound by default.
- After alarm reporting is enabled, new instances are automatically added to the alarm monitoring resource list. If a configured threshold is reached, you will see an alarm reported on Cloud Eye and be notified by a text message or email sent from SMN.
- To add a DB instance to or remove it from the alarm monitoring resource list, go to the Cloud Eye console. For details, see [Modifying an Alarm Rule](#).

## Configuring Alarm Reporting

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** Click **Alarm Rule Setting** in the upper right corner.
- Step 4** In the displayed dialog box, configure alarm reporting.
- To enable or disable alarm reporting, click **Enable** or **Disable** in the **Operation** column.
  - To view alarm details, click **View** in the **Operation** column.

**Figure 18-3** Configuring alarm reporting



----End

## 18.5 Configuring Monitoring by Seconds

RDS for MySQL supports monitoring by seconds. You can set the monitoring interval to 1 second or 5 seconds to view the metric values.

### Constraints

DB instances with fewer than four vCPUs do not support monitoring by seconds.

### Billing

**Table 18-5** Pay-per-use price

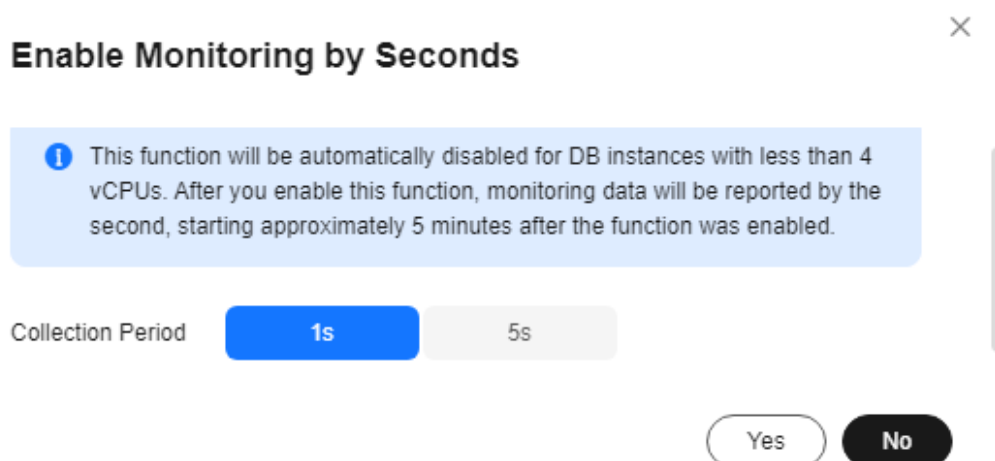
| Specification Code       | Price (USD/Hour) |
|--------------------------|------------------|
| rds.mysql.second.monitor | 0.012            |

### Enabling Monitoring by Seconds

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** In the navigation pane on the left, choose **Real-Time Performance Monitoring**.
- Step 5** Click  next to **Monitoring by Seconds**.
- Step 6** In the displayed dialog box, select a collection period and click **Yes**.

After you enable this function, monitoring data will be reported again and will be displayed by the second, starting approximately 5 minutes after the function was enabled.



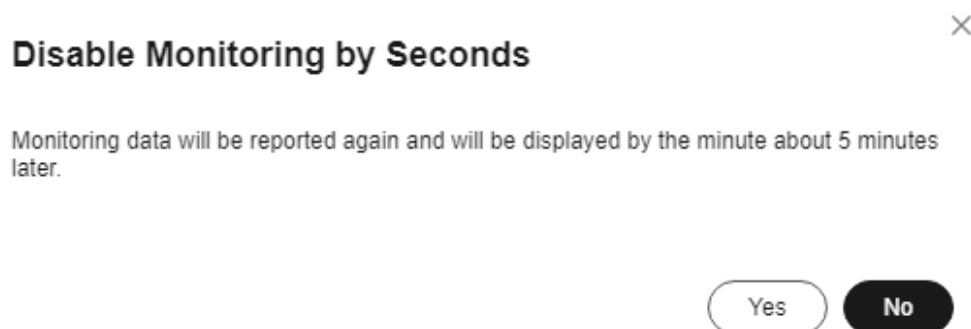
**Figure 18-4** Enabling Monitoring by Seconds

----End

## Disabling Monitoring by Seconds

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, click the target DB instance.
- Step 4** In the navigation pane on the left, choose **Real-Time Performance Monitoring**.
- Step 5** Click  next to **Monitoring by Seconds**.
- Step 6** In the displayed dialog box, click **Yes**.

After you disable this function, monitoring data will be reported again and will be displayed by the minute, starting approximately 5 minutes after the function was disabled.

**Figure 18-5** Disabling Monitoring by Seconds

----End

## 18.6 Event Monitoring

### 18.6.1 Introduction to Event Monitoring

Event monitoring provides event data reporting, query, and alarm reporting. You can create alarm rules for both system and custom events. When specific events occur, Cloud Eye generates alarms for you.

Events are key operations on RDS resources that are stored and monitored by Cloud Eye. You can view events to see operations performed by specific users on specific resources, for example, resetting the administrator password or modifying the backup policy.

Event monitoring is enabled by default. You can view monitoring details about system events and custom events. For details about system events, see [Events Supported by Event Monitoring](#).

Event monitoring provides an API for reporting custom events, which helps you collect and report abnormal events or important change events generated by services to Cloud Eye.

For details about how to report custom events, see [Reporting Events](#).

### 18.6.2 Viewing Event Monitoring Data

#### Scenarios

This section describes how to view the event monitoring data.

#### Procedure

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** On the **Instances** page, locate the DB instance and click **View Metrics** in the **Operation** column to go to the Cloud Eye console.  
  
Alternatively, go to the Cloud Eye console using the following method:  
  
On the **Instances** page, click the DB instance name. On the displayed **Overview** page, click **View Metrics** in the upper right corner to go to Cloud Eye.
- Step 4** Go to the Cloud Eye console.
- Step 5** In the navigation pane on the left, choose **Event Monitoring**.  
  
On the displayed **Event Monitoring** page, all system events generated in the last 24 hours are displayed by default.  
  
You can also click **1h**, **3h**, **12h**, **1d**, **7d**, or **30d** to view the events generated in different periods.

**Step 6** Click **View Graph**. On the details page, click **View Event** in the **Operation** column of a specific event to view details.

----End

## 18.6.3 Creating an Alarm Rule to Monitor an Event

### Scenarios

This section describes how to create an alarm rule to monitor an event.

### Procedure

**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner of the page. Under **Management & Governance**, click **Cloud Eye**.

**Step 3** In the navigation pane on the left, choose **Event Monitoring**.

**Step 4** On the event list page, click **Create Alarm Rule** in the upper right corner.

**Step 5** On the **Create Alarm Rule** page, configure the parameters.

**Table 18-6** Parameter description

| Parameter          | Description                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name               | Specifies the alarm rule name. The system generates a random name, which you can modify.                                                                                                                                                                                                       |
| Description        | (Optional) Provides supplementary information about the alarm rule.                                                                                                                                                                                                                            |
| Enterprise Project | You can select an existing enterprise project or click <b>Create Enterprise Project</b> to create one.                                                                                                                                                                                         |
| Alarm Type         | Specifies the alarm type corresponding to the alarm rule.                                                                                                                                                                                                                                      |
| Event Type         | Specifies the event type of the metric corresponding to the alarm rule.                                                                                                                                                                                                                        |
| Event Source       | Specifies the service the event is generated for.<br>Select <b>Relational Database Service</b> or <b>Database Proxy Service</b> .                                                                                                                                                              |
| Monitoring Scope   | Specifies the monitoring scope for event monitoring.                                                                                                                                                                                                                                           |
| Method             | Specifies the means you use to create the alarm rule.                                                                                                                                                                                                                                          |
| Alarm Policy       | <b>Event Name</b> indicates the instantaneous operations users performed on system resources, such as login and logout.<br>For events supported by event monitoring, see <a href="#">Events Supported by Event Monitoring</a> .<br>You can select a trigger mode and alarm severity as needed. |

Click  to enable alarm notification. The validity period is 24 hours by default. If the topics you require are not displayed in the drop-down list, click **Create an SMN topic**.

**Table 18-7** Alarm notification

| Parameter           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm Notification  | Specifies whether to notify users when alarms are triggered. Notifications can be sent by email, text message, or HTTP/HTTPS message.                                                                                                                                                                                                                                                                                                                                                                                      |
| Notification Object | Specifies the object that receives alarm notifications. You can select the account contact or a topic. <ul style="list-style-type: none"><li>• <b>Account contact</b> is the mobile phone number and email address of the registered account.</li><li>• <b>Topic</b> is used to publish messages and subscribe to notifications. If the required topic is unavailable, create one first and add subscriptions to it. For details, see <a href="#">Creating a Topic</a> and <a href="#">Adding Subscriptions</a>.</li></ul> |
| Notification Window | Cloud Eye sends notifications only within the notification window specified in the alarm rule.<br>If <b>Notification Window</b> is set to <b>08:00-20:00</b> , Cloud Eye sends notifications only within 08:00-20:00.                                                                                                                                                                                                                                                                                                      |
| Trigger Condition   | Specifies the condition for triggering the alarm notification.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Step 6** Click **Create**.

----End

## 18.6.4 Events Supported by Event Monitoring

### Function Description

Event monitoring provides data collection, query, and alarm reporting for events. You can create alarm rules for both system events and custom events. When specific events occur, Cloud Eye generates alarms for you.

### Namespaces

- RDS namespace: SYS.RDS
- Database proxy namespace: SYS.DBPROXY

## Events That Can Be Monitored

**Table 18-8** Resource exception events

| Event Source | Event Name                                  | Event ID                    | Event Severity | Description                                                                                                                                                                                  | Solution                                                                                                      | Impact                                                            |
|--------------|---------------------------------------------|-----------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| RDS          | DB instance creation failure                | createInstanceFailed        | Major          | A DB instance fails to create because the number of disks is insufficient, the quota is insufficient, or underlying resources are exhausted.                                                 | Check the number of disks and quota size. Release resources and create DB instances again.                    | DB instances cannot be created.                                   |
|              | Cross-region backup synchronization failure | crossRegionBackupSyncFailed | Minor          | Generally, this problem is caused by insufficient underlying network and replication resources.                                                                                              | If this event is continuously reported, submit a service ticket to adjust the underlying resource allocation. | Backups cannot be used for restoration in the destination region. |
|              | Full backup failure                         | fullBackupFailed            | Major          | A single full backup failure does not affect the files that have been successfully backed up, but prolongs the incremental backup restoration time during the point-in-time recovery (PITR). | Create a manual backup again.                                                                                 | Backup failed.                                                    |

| Event Source | Event Name                         | Event ID                  | Event Severity | Description                                                                                                                                                                                                                                                                                                                                                        | Solution                                                                                  | Impact                                                                                        |
|--------------|------------------------------------|---------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|              | Primary/standby switchover failure | activeStandbySwitchFailed | Major          | The standby DB instance does not take over workloads from the primary DB instance due to network or server failures. The original primary DB instance continues to provide workloads within a short time.                                                                                                                                                          | Check whether the connection between your application and the database is re-established. | None                                                                                          |
|              | Replication status abnormal        | abnormalReplicationStatus | Major          | <p>The possible causes are as follows:</p> <p>The replication delay between the primary and standby instances is too long, which usually occurs when a large amount of data is written to databases or a large transaction is processed. During peak hours, data may be blocked.</p> <p>The network between the primary and standby instances is disconnected.</p> | <a href="#">Submit a service ticket.</a>                                                  | Your applications are not affected because this event does not interrupt data read and write. |

| Event Source | Event Name                   | Event ID                   | Event Severity | Description                                                                                                                                      | Solution                                                                                                       | Impact                                   |
|--------------|------------------------------|----------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------|
|              | Replication status recovered | replicationStatusRecovered | Major          | The replication delay between the primary and standby instances is within the normal range, or the network connection between them has restored. | No action is required.                                                                                         | None                                     |
|              | DB instance faulty           | faultyDBInstance           | Major          | A single or primary DB instance was faulty due to a disaster or a server failure.                                                                | Check whether an automated backup policy has been configured for the DB instance, and submit a service ticket. | The database service may be unavailable. |
|              | DB instance recovered        | DBInstanceRecovered        | Major          | RDS rebuilds the standby DB instance with its high availability. After the instance is rebuilt, this event will be reported.                     | No action is required.                                                                                         | None                                     |

| Event Source | Event Name                                                | Event ID                 | Event Severity | Description                                                                                                                                                                                                                                              | Solution                                                                                                                                                                                                                                              | Impact                                                                                                                 |
|--------------|-----------------------------------------------------------|--------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
|              | Failure of changing single DB instance to primary/standby | singleToHaFailed         | Major          | A fault occurs when RDS is creating the standby DB instance or configuring replication between the primary and standby DB instances. The fault may occur because resources are insufficient in the data center where the standby DB instance is located. | <a href="#">Submit a service ticket.</a>                                                                                                                                                                                                              | Your applications are not affected because this event does not interrupt data read and write of the DB instance.       |
|              | Database process restarted                                | DatabaseProcessRestarted | Major          | The database process is stopped due to insufficient memory or high load.                                                                                                                                                                                 | Log in to the Cloud Eye console. Check whether the memory usage increases sharply, the CPU usage is too high for a long time, or the storage space is insufficient. You can increase the CPU and memory specifications or optimize the service logic. | Down time occurs. In this case, RDS automatically restarts the database process and attempts to recover the workloads. |



| Event Source | Event Name                      | Event ID                  | Event Severity | Description                                                    | Solution               | Impact                                                                                                           |
|--------------|---------------------------------|---------------------------|----------------|----------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------------------------------------|
|              | Instance storage full           | instanceDiskFull          | Major          | Generally, the cause is that the data space usage is too high. | Scale up the instance. | The DB instance becomes read-only because the storage space is full, and data cannot be written to the database. |
|              | Instance storage full recovered | instanceDiskFullRecovered | Major          | The instance disk is recovered.                                | No action is required. | The instance is restored and supports both read and write operations.                                            |

| Event Source | Event Name                                | Event ID                      | Event Severity | Description                                                                                     | Solution                                                                                                                                                                                                 | Impact                                                           |
|--------------|-------------------------------------------|-------------------------------|----------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|              | MySQL instance connection limit reached   | mysqlConnectionsFull          | Major          | The maximum number of connections supported has been reached as the workload was increasing.    | <ul style="list-style-type: none"><li>• Release unnecessary connections.</li><li>• Reduce the load by controlling concurrency.</li><li>• Upgrade the instance class to allow more connections.</li></ul> | New connections cannot be established.                           |
|              | MySQL instance connections full recovered | mysqlConnectionsFullRecovered | Major          | The number of instance connections has been reduced to below the maximum number of connections. | Check whether the workload on your instance is running properly.                                                                                                                                         | The number of instance connections is below the maximum allowed. |

| Event Source | Event Name                                               | Event ID                                    | Event Severity | Description                                                                                                                                  | Solution                                                                                                                                                                                                                                                                                                                          | Impact                                            |
|--------------|----------------------------------------------------------|---------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|              | New connection errors caused by a MySQL overload         | highLoadInstanceConnectionAbnormal          | Major          | New connections cannot be set up or are abnormal because resources such as CPUs, the memory, storage, or network bandwidth are insufficient. | <ul style="list-style-type: none"><li>• Scale up system resources like CPUs, the memory, and storage.</li><li>• Adjust MySQL parameters, for example, increasing the connection pool size and adjusting the cache size.</li><li>• Select the abnormal session you want to end and kill it for the databases to recover.</li></ul> | New connections cannot be set up or are abnormal. |
|              | New connection failure caused by MySQL overload resolved | highLoadInstanceConnectionAbnormalRecovered | Major          | The new connection failure caused by overload has been resolved.                                                                             | Check whether the workload on your instance is running properly.                                                                                                                                                                                                                                                                  | The new connection failure has been resolved.     |

| Event Source    | Event Name                                                | Event ID                                | Event Severity | Description                                                                                                                                                                                                                                        | Solution                                                                                                                                                                                         | Impact                                                              |
|-----------------|-----------------------------------------------------------|-----------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
|                 | Kafka connection failed                                   | kafkaConnectionFailed                   | Major          | The network is unstable or the Kafka server does not work properly.                                                                                                                                                                                | Check your network connection and the Kafka server status.                                                                                                                                       | Audit logs cannot be sent to the Kafka server.                      |
| Data base proxy | Proxy instance access to DB instance failure              | proxy_connection_failure_security_group | Major          | No rules in the security group of the DB instance allow the proxy instance to access the DB instance.                                                                                                                                              | Add the proxy instance address to the rules of the security group.                                                                                                                               | Service requests routed through the proxy instance are interrupted. |
|                 | Connection failure between proxy instance and DB instance | proxy_connection_failure_to_db          | Major          | The proxy instance failed to establish a new connection with the primary DB instance, and it may fail to establish a new connection with a read replica. The DB instance or proxy instance is overloaded, or the network between them is abnormal. | Change values of related parameters based on metrics (connections, active connections, and CPU usage) of the DB instance and proxy instance. If the metrics are normal, submit a service ticket. | Service requests routed through the proxy instance are interrupted. |

| Event Source | Event Name                                                 | Event ID                            | Event Severity | Description                                                                                                                                                                          | Solution                                                                                                                                                                       | Impact                                                                     |
|--------------|------------------------------------------------------------|-------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
|              | Connection failure between database proxy and read replica | proxy_connection_failure_to_replica | Minor          | The proxy instance failed to establish a new connection with a read replica. The read replica is overloaded, or the network between the proxy instance and read replica is abnormal. | Change values of related parameters based on metrics (connections, active connections, and CPU usage) of the read replica. If the metrics are normal, submit a service ticket. | Read requests routed through the proxy instance are partially interrupted. |

**Table 18-9** Operation events

| Event Source | Event Name                   | Event ID             | Event Severity | Description                                          |
|--------------|------------------------------|----------------------|----------------|------------------------------------------------------|
| RDS          | Reset administrator password | resetPassword        | Major          | The password of the database administrator is reset. |
|              | Storage space scaled         | instanceChangeVolume | Major          | The storage capacity is changed.                     |
|              | Instance class changed       | instanceResizeFlavor | Major          | The instance class is changed.                       |
|              | Modify backup policy         | setBackupPolicy      | Minor          | The backup policy is modified.                       |
|              | Modify parameter group       | updateParameterGroup | Minor          | The parameter group is modified.                     |

| Event Source | Event Name                             | Event ID                 | Event Severity | Description                                                                                   |
|--------------|----------------------------------------|--------------------------|----------------|-----------------------------------------------------------------------------------------------|
|              | Delete parameter group                 | deleteParameterGroup     | Minor          | The parameter group is deleted.                                                               |
|              | Reset parameter group                  | resetParameterGroup      | Minor          | The parameter group is reset.                                                                 |
|              | Change database port                   | changeInstancePort       | Major          | The database port is changed.                                                                 |
|              | Primary/standby switchover or failover | PrimaryStandbySwitchover | Major          | Only automatic failovers are monitored. Manual primary/standby switchovers are not supported. |

# 19 Billing Management

## 19.1 Renewing DB Instances

### Scenarios

You can renew one or multiple yearly/monthly DB instances at a time.

#### NOTE

Pay-per-use DB instances cannot be renewed.

The statuses of yearly/monthly DB instances to be renewed must be **Available** or **Abnormal**.

### Renewing One DB Instance

**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, select the DB instance and click **Renew** in the **Operation** column.

Alternatively, click the DB instance name to go to the **Overview** page. In the **Billing** area, click **Renew** under **Billing Mode**.

**Step 5** Renew the DB instance.

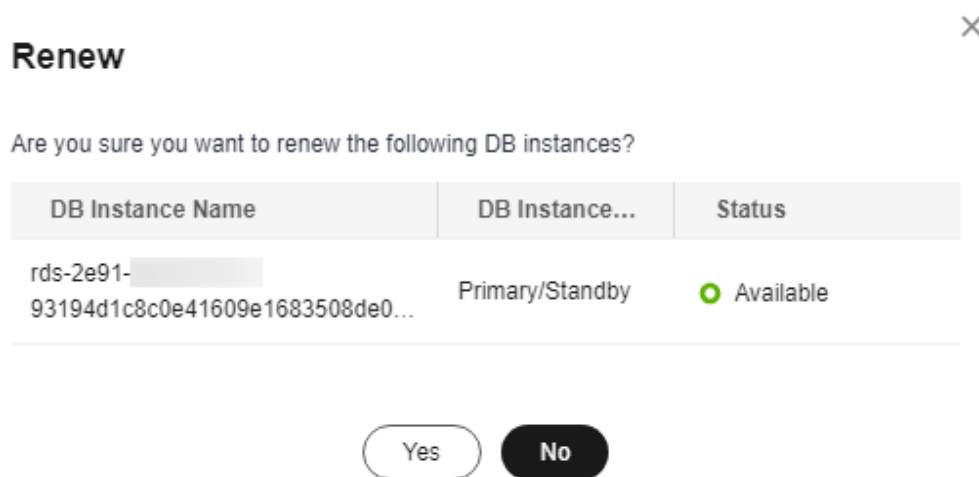
----End

### Renewing DB Instances in Batches

**Step 1** [Log in to the management console](#).

- Step 2** Click  in the upper left corner and select a region.
- Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4** On the **Instances** page, select the DB instances and click **Renew** above the DB instance list.
- Step 5** In the displayed dialog box, click **Yes**.

**Figure 19-1** Renewing DB instances



----End

## 19.2 Changing the Billing Mode from Pay-per-Use to Yearly/Monthly

### Scenarios

If you use RDS for MySQL for a long time, you can change the billing mode of one or multiple DB instances from pay-per-use to yearly/monthly at a time to save money.

#### NOTE

- Pay-per-use DB instances cannot be changed to yearly/monthly if their status is: frozen, creation failed, changing instance class, or scaling up.
- Currently, RDS DB instances in a Dedicated Computing Cluster (DCC) only supports pay-per-use billing.
- Changing the billing mode from pay-per-use to yearly/monthly does not affect services.

### Changing the Billing Mode of One DB Instance

- Step 1** [Log in to the management console](#).



**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, locate the DB instance and choose **More > Change to Yearly/Monthly** in the **Operation** column.

Alternatively, click the DB instance name to go to the **Overview** page. In the **Billing** area, click **Configure** under **Billing Mode**.

**Step 5** Select the renewal duration, in months. The minimum duration is one month.

- If you do not need to modify your settings, click **Pay** to go to the payment page.
- If you are not sure about the settings, the system will reserve your order. You can choose **Billing & Costs > Unpaid Orders** in the upper right corner and pay or cancel the order. The instance status is **Changing to Yearly/Monthly. Payment incomplete. Pay Now**.

**Step 6** Select a payment method and click **Confirm**.

**Step 7** Wait until the billing mode is successfully changed and view the instance on the **Instances** page.

In the upper right corner of the instance list, click  to refresh the list. After the change completes, the instance status will change to **Available** and the billing mode will change to **Yearly/Monthly**.

----End

## Changing the Billing Mode of DB Instances in Batches

### NOTE

Only pay-per-use DB instances can be changed to yearly/monthly DB instances.  
The statuses of pay-per-use DB instances must be **Available** or **Abnormal**.

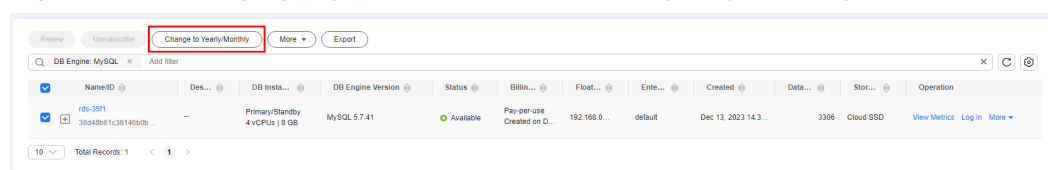
**Step 1** [Log in to the management console](#).

**Step 2** Click  in the upper left corner and select a region.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, select multiple DB instances and click **Change to Yearly/Monthly** above the DB instance list.

**Figure 19-2** Changing pay-per-use DB instances to yearly/monthly in batches



- Step 5** Select the renewal duration in the unit of month. The minimum duration is one month.
- If you do not need to modify your settings, click **Pay** to go to the payment page.
  - If you are not sure about the settings, the system will reserve your order. You can choose **Billing & Costs > Unpaid Orders** in the upper right corner and pay or cancel the order. The instance status is **Changing to Yearly/Monthly. Payment incomplete. Pay Now.**
- Step 6** Select a payment method and click **Confirm**.
- Step 7** Wait until the billing mode is successfully changed and view the instance on the **Instances** page.

In the upper right corner of the instance list, click  to refresh the list. After the change completes, the instance status will change to **Available** and the billing mode will change to **Yearly/Monthly**.

----End

## 19.3 Changing the Billing Mode from Yearly/Monthly to Pay-per-Use

### Scenarios

You can change the billing mode of a DB instance from yearly/monthly to pay-per-use.

---

#### NOTICE

The pay-per-use billing mode is not applied until a yearly/monthly subscription expires, and only if auto-renewal is not in effect.

---

### Changing the Billing Mode from Yearly/Monthly to Pay-per-Use

- Step 1** [Log in to the management console](#).
- Step 2** Click  in the upper left corner and select a region.
- Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4** On the **Instances** page, locate the yearly/monthly DB instance and choose **More > Change to Pay-per-use** in the **Operation** column.
- Alternatively, click the DB instance name to go to the **Overview** page. In the **Billing** area, click **Change to Pay-per-use** under **Billing Mode**.
- Step 5** On the displayed page, change the billing mode of the DB instance.

**Step 6** Wait until the billing mode is successfully changed and view the instance on the **Instances** page.



In the upper right corner of the DB instance list, click  to refresh the list. After the DB instance billing mode is changed to pay-per-use, the instance status will change to **Available** and the billing mode will change to **Pay-per-use**.

----End

# 20 Interconnection with CTS

## 20.1 Key Operations Supported by CTS

Cloud Trace Service (CTS) records operations related to RDS for further query, audit, and backtrack.

Table 20-1 RDS operations that can be recorded by CTS

| Operation                                                                        | Resource Type | Trace Name          |
|----------------------------------------------------------------------------------|---------------|---------------------|
| Creating a DB instance or a read replica, or restoring data to a new DB instance | instance      | createInstance      |
| Scaling up storage space and changing instance class                             | instance      | instanceAction      |
| Rebooting a DB instance                                                          | instance      | instanceRestart     |
| Restoring data to the original DB instance                                       | instance      | instanceRestore     |
| Renaming a DB instance                                                           | instance      | instanceRename      |
| Resetting a password                                                             | instance      | resetPassword       |
| Setting database version parameters                                              | instance      | setDBParameters     |
| Resetting database version parameters                                            | instance      | resetDBParameters   |
| Enabling, modifying, or disabling a backup policy                                | instance      | setBackupPolicy     |
| Changing a database port                                                         | instance      | changeInstancePort  |
| Binding or unbinding an EIP                                                      | instance      | setOrResetPublicIP  |
| Modifying a security group                                                       | instance      | modifySecurityGroup |

| Operation                                                  | Resource Type  | Trace Name                |
|------------------------------------------------------------|----------------|---------------------------|
| Adding a tag                                               | instance       | setInstanceTag            |
| Deleting a tag                                             | instance       | setInstanceTag            |
| Editing a tag                                              | instance       | setInstanceTag            |
| Deleting a DB instance                                     | instance       | deleteInstance            |
| Performing a primary/standby switchover                    | instance       | instanceFailOver          |
| Changing the replication mode                              | instance       | instanceFailOver-Mode     |
| Changing a failover priority                               | instance       | instanceFailOver-Strategy |
| Changing a DB instance type from single to primary/standby | instance       | modifySingleToHaInstance  |
| Creating a backup                                          | backup         | createManualSnapshot      |
| Replicating a backup                                       | backup         | copySnapshot              |
| Downloading a backup (using OBS)                           | backup         | downloadSnapshot          |
| Downloading a backup (using a browser)                     | backup         | backupsDownload           |
| Deleting a backup                                          | backup         | deleteManualSnapshot      |
| Downloading merged binlogs                                 | backup         | packBackupsDownload       |
| Creating a parameter template                              | parameterGroup | createParameterGroup      |
| Modifying parameters in a parameter template               | parameterGroup | updateParameterGroup      |
| Deleting a parameter template                              | parameterGroup | deleteParameterGroup      |
| Replicating a parameter template                           | parameterGroup | copyParameterGroup        |
| Resetting a parameter template                             | parameterGroup | resetParameterGroup       |
| Applying a parameter template                              | parameterGroup | applyParameterGroup       |
| Saving parameters in a parameter template                  | parameterGroup | saveParameterGroup        |

| Operation                                                                                               | Resource Type | Trace Name             |
|---------------------------------------------------------------------------------------------------------|---------------|------------------------|
| Deleting a frozen DB instance                                                                           | all           | rdsUnsubscribeInstance |
| Freezing a DB instance                                                                                  | all           | rdsfreezeInstance      |
| Changing the billing mode of a DB instance from pay-per-use to yearly/monthly or renewing a DB instance | all           | bssUpdateMetadata      |
| Creating a database account                                                                             | instance      | createDBUser           |
| Resetting a password                                                                                    | instance      | resetDBUserPassword    |
| Changing account permissions                                                                            | instance      | grantDBUser            |
| Modifying the host IP addresses of an account                                                           | instance      | UpdateHostPrivilege    |
| Deleting a database account                                                                             | instance      | deleteDBUser           |
| Creating a database                                                                                     | instance      | createDatabase         |
| Authorizing a database                                                                                  | instance      | grantDBUser            |
| Deleting a database                                                                                     | instance      | deleteDatabase         |

## 20.2 Viewing Traces

### Scenarios

After Cloud Trace Service (CTS) is enabled, it starts recording operations on cloud resources. You can check the records generated over the last 7 days on the CTS console.

This section describes how to check the operation records generated over the last 7 days on the CTS console.

For details about how to view audit logs, see [Querying Real-Time Traces](#).

### Prerequisites

Before using CTS, you need to enable it. For details, see [Enabling CTS](#).

### Procedure

**Step 1** [Log in to the management console](#).

**Step 2** In the upper left corner of the page, click  and choose **Management & Governance > Cloud Trace Service** to go to the **Trace List** page on the CTS console.

- Step 3** In the time range drop-down list above the trace list, select a desired query time range: **Last 1 hour**, **Last 1 day**, or **Last 1 week**. You can also select **Custom** to specify a custom time range within the last seven days.
- Step 4** The search box above the trace list supports advanced queries. Combine one or more filters to refine your search.

**Table 20-2** Trace filtering parameters

| Parameter     | Description                                                                                                                                                                                                                                                                                                                                   |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Trace Name    | Name of a trace.<br>The entered value is case-sensitive and requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                                                         |
| Trace Source  | Cloud service name abbreviation.<br>The entered value is case-sensitive and requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                                         |
| Resource Name | Name of a cloud resource involved in a trace.<br>The entered value is case-sensitive and requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                            |
| Resource ID   | ID of a cloud resource involved in a trace.<br>The entered value is case-sensitive and requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                              |
| Trace ID      | Value of the <b>trace_id</b> parameter for a trace reported to CTS.<br>The entered value requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                            |
| Resource Type | Type of a resource involved in a trace.<br>The entered value is case-sensitive and requires an exact match. Fuzzy matching is not supported.                                                                                                                                                                                                  |
| Operator      | User who triggers a trace.<br>Select one or more operators from the drop-down list.<br>If the value of <b>trace_type</b> in a trace is <b>SystemAction</b> , the operation is triggered by the service and the trace's operator may be empty.                                                                                                 |
| Trace Status  | Select one of the following options from the drop-down list: <ul style="list-style-type: none"><li>● <b>normal</b>: The operation succeeded.</li><li>● <b>warning</b>: The operation failed.</li><li>● <b>incident</b>: The operation caused a fault that is more serious than a normal failure, for example, causing other faults.</li></ul> |

| Parameter             | Description                                                                                                                                                                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enterprise Project ID | ID of the enterprise project to which a resource belongs.<br>To check enterprise project IDs, go to the Enterprise Project Management Service (EPS) console and choose <b>Project Management</b> in the navigation pane.                                            |
| Access Key            | Temporary or permanent access key ID.<br>To check access key IDs, hover over your username in the upper right corner of the console and select <b>My Credentials</b> from the pop-up list. On the displayed page, choose <b>Access Keys</b> in the navigation pane. |

**Step 5** Check the traces that meet the search criteria.

**Step 6** Click a trace name. Details about the trace are displayed in the dialog box on the right.

**Step 7** Click **Export** to export all traces in the query result as an .xlsx file.

For details about key fields in a trace structure, see [Trace Structure](#) and [Example Traces](#) in the *Cloud Trace Service User Guide*.

----End



# 21 Events

## Scenarios

The system regularly checks your instance for risky versions or underlying software/hardware failures to help maintain its availability. If the risk cannot be automatically mitigated, the system generates an event for the instance and reports it on the console.

You can view the instance ID, event type, event cause, event status, and service impact of each event and also modify the event execution time.

To use this function, [submit a service ticket](#).

## Event Types

**Table 21-1** Supported events

| Event Type            | Risk Level | Event Cause                                                                                                                    |
|-----------------------|------------|--------------------------------------------------------------------------------------------------------------------------------|
| Minor version upgrade | Major      | The risky version needs to be upgraded.                                                                                        |
| Instance redeployment | Critical   | The instance is redeployed due to an underlying software or hardware failure. The fault must be rectified as soon as possible. |

## Precautions

Executing certain events may cause a brief workload interruption. To ensure that workloads can be restored quickly, make sure your application can auto-connect to the DB instance.

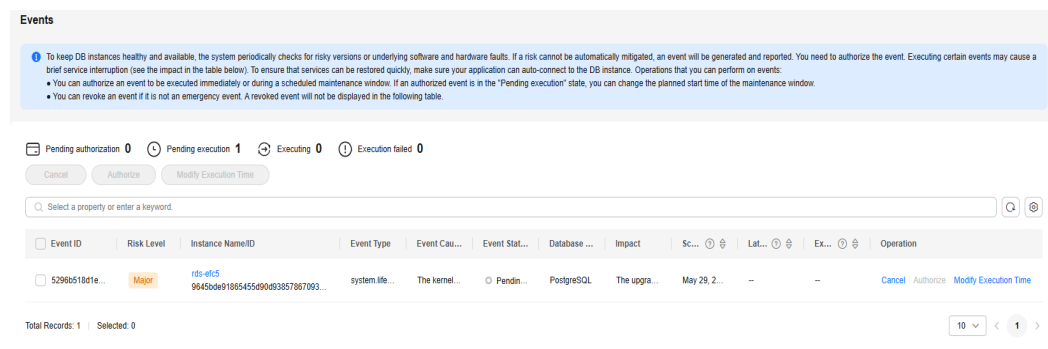
## Procedure

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** Open the **Events** page to view event details.

**Figure 21-1** Events



- **Authorize:** You can authorize an event to be executed immediately or during a scheduled maintenance window. If an authorized event is in the "Pending execution" state, you can change the planned start time of the maintenance window.
- **Cancel:** You can revoke an event if it is not an emergency event. A revoked event will not be displayed in the following table.
- **Modify Execution Time:** You can change the planned execution time of an event.

Figure 21-2 Modifying the event execution time

Modify Execution Time

Execution of this event will be authorized.

| Event...    | Insta...                                | Event...      | Risk ... | Event...    | Impact      | Sche...      |
|-------------|-----------------------------------------|---------------|----------|-------------|-------------|--------------|
| 5296b518... | <a href="#">rds-efc5</a><br>9645bde9... | system.lif... | Major    | The kern... | The upgr... | May 29, 2... |

New Execution Time

Immediate

Scheduled

To confirm the operation, enter YES. [Auto Enter](#)

YES

Cancel

OK

----End

# 22 Task Center

## 22.1 Viewing a Task

### Scenarios

You can view the progress and results of scheduled and instant tasks on the **Task Center** page.

### Supported Tasks

Table 22-1 Supported tasks

| Task Type     | Category               | Task Name                                                                                                                                                                                                                                                                                                                                         |
|---------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instant tasks | Instance creation      | Creating a MySQL DB instance, creating a MySQL read replica                                                                                                                                                                                                                                                                                       |
|               | Instance lifecycle     | Rebooting a MySQL DB instance                                                                                                                                                                                                                                                                                                                     |
|               | Instance modifications | Scaling a MySQL DB instance, changing the MySQL instance type from single to primary/standby, switching MySQL primary/standby DB instances, applying for a MySQL private domain name, migrating a standby MySQL DB instance, changing a MySQL DB instance class, binding an EIP to a MySQL DB instance, unbinding an EIP from a MySQL DB instance |
|               | Version upgrade        | Upgrading a MySQL DB instance engine version                                                                                                                                                                                                                                                                                                      |
|               | Backup and restoration | Restoring to a new MySQL DB instance, restoring to an existing MySQL DB instance, restoring to the current MySQL DB instance, restoring tables to a point in time, restoring databases to a point in time                                                                                                                                         |

| Task Type       | Category               | Task Name                                                   |
|-----------------|------------------------|-------------------------------------------------------------|
| Scheduled tasks | Instance lifecycle     | Starting a MySQL DB instance, rebooting a MySQL DB instance |
|                 | Instance modifications | Changing a MySQL DB instance class                          |
|                 | Version upgrade        | Upgrading a MySQL DB instance engine version                |

## Viewing an Instant Task

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** Choose **Task Center** in the navigation pane on the left. Locate the target task and view its details on the displayed **Instant Tasks** page.

- To identify the target task, you can use the task name, order ID, or DB instance name/ID, or simply enter the target task name in the search box in the upper right corner.
- You can view the progress and status of tasks in a specific period. The default period is seven days.  
The task list can only show up to 30 days of past tasks.
- You can view instant tasks in the following statuses:
  - Running
  - Completed
  - Failed
- You can view the task creation and completion time.

----End

## Viewing a Scheduled Task

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** Choose **Task Center** in the navigation pane on the left. On the **Scheduled Tasks** page, view the task progress and results.

- To identify the target task, you can use the DB instance name/ID or enter the target DB instance ID in the search box in the upper right corner.
- You can view the scheduled tasks in the following statuses:
  - Running

- Completed
- Failed
- Canceled
- To be executed
- To be authorized

----End

## FAQ

Q: Why does the task progress percentage remain unchanged?

A: The task progress percentage does not change linearly. If the percentage remains unchanged for a long time, some time-consuming steps are being performed. Please wait.

## 22.2 Deleting a Task Record

### Scenarios

You can delete task records so that they are no longer displayed in the task list. This operation only deletes the task records, and does not delete the DB instances or terminate the tasks that are being executed.

### Constraints

Deleted task records cannot be recovered. Exercise caution when performing this operation.

### Deleting an Instant Task

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** Choose **Task Center** in the navigation pane on the left. On the displayed **Instant Tasks** page, locate the task record to be deleted and click **Delete** in the **Operation** column. In the displayed dialog box, click **Yes**.

You can delete the records of instant tasks in any of the following statuses:

- Completed
- Failed

----End

### Deleting a Scheduled Task Record

**Step 1** Click  in the upper left corner and select a region.

- Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 3** Choose **Task Center** in the navigation pane on the left. On the **Scheduled Tasks** page, locate the task record to be deleted and check whether the task status is **To be executed** or **To be authorized**.
- If yes, go to [Step 4](#).
  - If no, go to [Step 5](#).
- Step 4** Click **Cancel** in the **Operation** column. In the displayed dialog box, click **OK** to cancel the task. Then, click **Delete** in the **Operation** column. In the displayed dialog box, click **OK** to delete the task record.
- Step 5** Click **Delete** in the **Operation** column. In the displayed dialog box, click **OK** to delete the task record.

You can delete the records of scheduled tasks in any of the following statuses:

- Completed
- Failed
- Canceled
- To be executed
- To be authorized

----End

# 23 RDS for MySQL Tags

## Scenarios

Tag Management Service (TMS) enables you to use tags on the management console to manage resources. TMS works with other cloud services to manage tags. TMS manages tags globally. Other cloud services manage only their own tags.

- Log in to the management console and choose **Management & Governance** > **Tag Management Service**. Set predefined tags on the TMS console.
- A tag consists of a key and value. You can add only one value for each key.
- Each instance can have up to 20 tags.

## Editing a Tag

- Step 1** Click  in the upper left corner and select a region.
- Step 2** Click  in the upper left corner of the page and choose **Databases** > **Relational Database Service**.
- Step 3** On the **Instances** page, click the target instance name.
- Step 4** In the navigation pane on the left, choose **Tags**.
- Step 5** Click **Edit Tag**. On the displayed page, click **Add**, enter the tag key and value, and click **OK**.

**Figure 23-1** Adding tags

**Edit Tag**×

TMS's predefined tags are recommended for adding the same tag to different cloud resources.  
[Create predefined tags](#)  

Delete

[+ Add](#)

Tags you can still add: 19



- When you enter a tag key and value, the system automatically displays all predefined tags associated with all your instances except the current one.
- The tag key must be unique. It must consist of 1 to 128 characters and can include letters, digits, spaces, and the following characters: \_ . : = + - @. It cannot start or end with a space, or start with \_sys\_.
- The tag value (optional) can consist of up to 255 characters and can include letters, digits, spaces, and the following characters: \_ . : / = + - @

**Step 6** After a tag is added, view and manage it on the **Tags** page.

----End

## Deleting Tags

**Step 1** Click  in the upper left corner and select a region.

**Step 2** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 3** On the **Instances** page, click the target instance name.

**Step 4** In the navigation pane on the left, choose **Tags**.

**Step 5** Click **Edit Tag**.

**Step 6** On the displayed page, click **Delete** at the end of the tag you want to delete and click **OK**.

Deleted tags are no longer displayed on the **Tags** page.

----End

# 24 RDS for MySQL Quotas

## What Is a Quota?

A quota is a limit on the quantity or capacity of a certain type of service resources available to you. Examples of RDS quotas include the maximum number of DB instances that you can create. Quotas are put in place to prevent excessive resource usage.

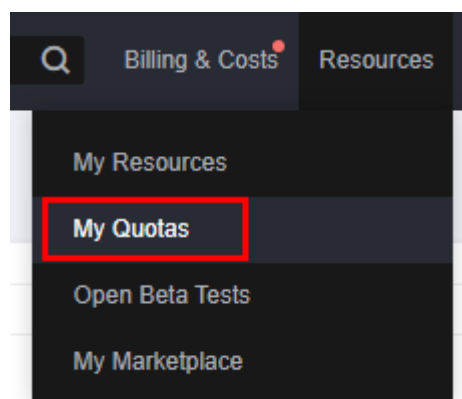
If a quota cannot meet your needs, apply for a higher quota.

## Viewing Quotas

**Step 1** Click  in the upper left corner and select a region.

**Step 2** In the upper right corner, choose **Resources** > **My Quotas**.

Figure 24-1 My quotas



**Step 3** On the **Quotas** page, view the used and total quotas of each type of resources.

----End

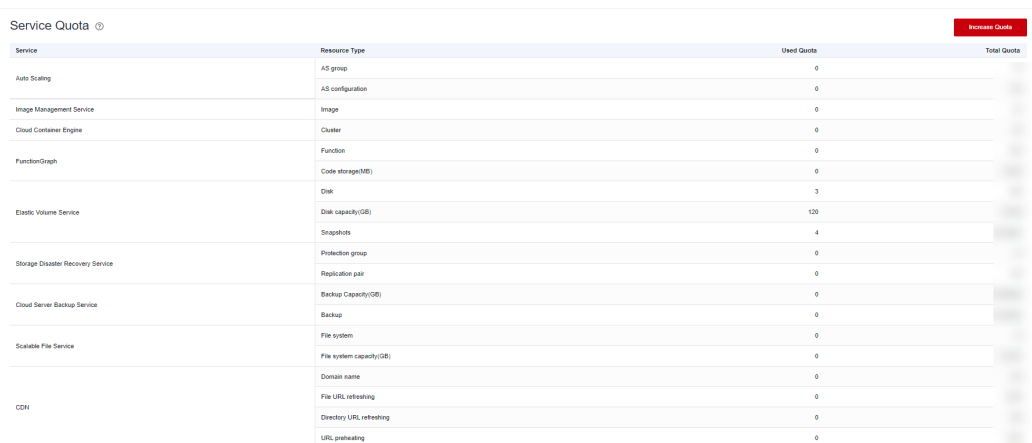
## Increasing Quotas

**Step 1** Click  in the upper left corner and select a region.

**Step 2** In the upper right corner, choose **Resources > My Quotas**.

**Step 3** In the upper right corner of the page, click **Increase Quota**.

**Figure 24-2** Increasing quotas



| Service                           | Resource Type            | Used Quota | Total Quota |
|-----------------------------------|--------------------------|------------|-------------|
| Auto Scaling                      | AS group                 | 0          |             |
|                                   | AS configuration         | 0          |             |
| Image Management Service          | Image                    | 0          |             |
| Cloud Container Engine            | Cluster                  | 0          |             |
| FunctionGraph                     | Function                 | 0          |             |
|                                   | Code storage(MB)         | 0          |             |
| Elastic Volume Service            | Disk                     | 3          |             |
|                                   | Disk capacity(GB)        | 120        |             |
|                                   | Snapshots                | 4          |             |
| Storage Disaster Recovery Service | Protection group         | 0          |             |
|                                   | Replication pair         | 0          |             |
| Cloud Server Backup Service       | Backup Capacity(GB)      | 0          |             |
|                                   | Backup                   | 0          |             |
| Scalable File Service             | File system              | 0          |             |
|                                   | File system capacity(GB) | 0          |             |
| CDN                               | Domain name              | 0          |             |
|                                   | File URL refreshing      | 0          |             |
|                                   | Directory URL refreshing | 0          |             |
|                                   | URL prefetching          | 0          |             |

**Step 4** On the **Create Service Ticket** page, configure parameters as required.

In the **Problem Description** area, fill in the content and reason for adjustment.

**Step 5** After all required parameters are configured, select the agreement and click **Submit**.

----End

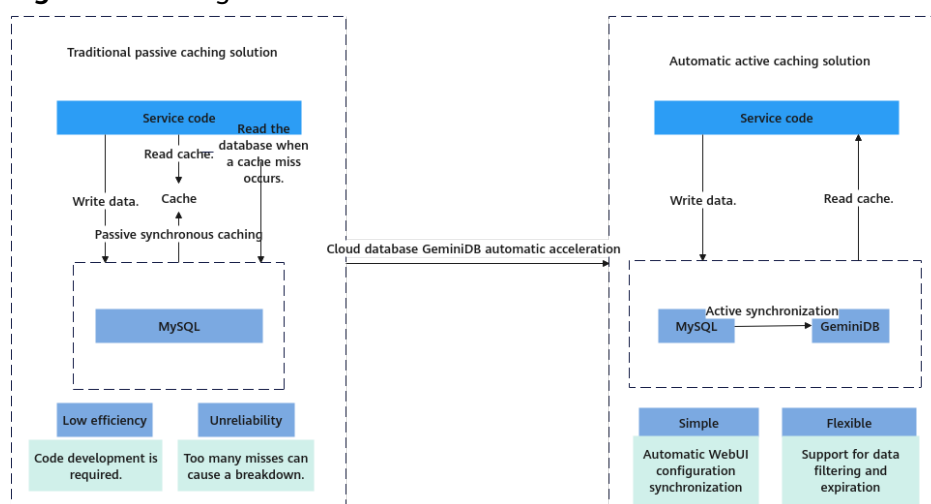
# 25 RDS Memory Acceleration

## 25.1 Memory Acceleration Overview

GeminiDB Redis API offers memory acceleration to enhance the conventional cache solution. With this feature, users can set up rules on the GUI to cache MySQL data automatically, thereby speeding up MySQL access.

The conventional cache solution is inefficient and unreliable as it necessitates users to create code for writing MySQL data to the cache. The active cache solution with cloud data memory acceleration (DB Cache) supports visualized configuration on the GUI, making it easier to set up. Once the configuration is done, data can be synchronized automatically. DB Cache also supports data filtering and expiration time setting, which enhances development efficiency and data reliability.

Figure 25-1 Diagram



## 25.2 Enabling and Using Memory Acceleration

This section describes how to enable memory acceleration. The process is as follows:

## Selecting a GeminiDB Instance

## Creating a Mapping Rule

## Using the Memory Acceleration Module

### Usage Notes

- After memory acceleration is enabled, commands such as RESET MASTER and FLUSH LOGS used to delete binlogs on MySQL instances are not allowed.
- Currently, only hash data from MySQL can be converted to GeminiDB Redis API.
- A Redis key prefix and a delimiter in a new rule can neither include those nor be included in those specified for an existing rule. For example, if the key prefix in a new rule is **pre1:** and is separated by a comma (,) and the key prefix in an existing rule is **pre1** and is separated by a colon (:), the new rule cannot be created.
- Currently, the ENUM, SET, and JSON data cannot be synchronized.
- Currently, only single-table queries are supported during lightweight incremental synchronization. Joint queries are not supported.
- Only GeminiDB Redis instances are charged. There are no other fees for this function.
- If you delete an RDS instance, the GeminiDB Redis instance with DB Cache enabled will not be deleted. If you do not need the GeminiDB Redis instance, delete it in a timely manner to avoid extra fees.
- When you purchase an RDS instance, if you select **Buy Now** for memory acceleration, a GeminiDB instance is automatically provisioned with DB Cache enabled. You can skip instance creation and start from [Creating a Mapping Rule](#). This function is now in OBT. To use it, choose [Service Tickets > Create Service Ticket](#) in the upper right corner of the console and contact the customer service.

### Procedure

#### Selecting a GeminiDB Instance

**Step 1** [Log in to the Huawei Cloud console](#).

**Step 2** Click  in the upper left corner and select a region and project.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, click the target instance name to go to the **Overview** page.

**Step 5** In the navigation pane, choose **Memory Acceleration**. On the **Memory Acceleration** page, click **Create GeminiDB Instance** or **Use Existing GeminiDB Instance**.

- Click **Create GeminiDB Instance** and perform [Step 6](#).

- Click **Use Existing GeminiDB Instance** and select an existing GeminiDB Redis instance.

 **NOTE**

When you select **Use Existing GeminiDB Instance**, only primary/standby instances are supported. The region, VPC, subnet, and security group of the GeminiDB and RDS instances must be the same.

**Step 6** Set parameters listed in [Table 25-1](#) and click **Submit**.

**Table 25-1** Basic information

| Parameter               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Instance Specifications | CPU and memory of the instance. For details, see <a href="#">Table 25-2</a> .                                                                                                                                                                                                                                                                                                                                                                                   |
| Database Port           | <p>Port number for accessing the instance.</p> <p>You can specify a port number based on your requirements. The port number ranges from 1024 to 65535 except 2180, 2887, 3887, 6377, 6378, 6380, 8018, 8079, 8091, 8479, 8484, 8999, 12017, 12333, and 50069.</p> <p>If you do not specify a port number, port 6379 is used by default.</p> <p><b>NOTE</b><br/>You cannot change the database port after an instance is created.</p>                            |
| DB Instance Name        | <p>The instance name:</p> <ul style="list-style-type: none"><li>Can be the same as an existing instance name.</li><li>Can include 4 to 64 bytes and must start with a letter. It is case-sensitive and allows only letters, digits, hyphens (-), and underscores (_).</li></ul>                                                                                                                                                                                 |
| Database Password       | <p>Database password set by a user:</p> <ul style="list-style-type: none"><li>Can contain 8 to 32 characters.</li><li>Can contain at least two types of the following characters: uppercase letters, lowercase letters, digits, and special characters ~!@#%^*_-=+?</li><li>For security reasons, set a strong password. The system will verify the password strength.</li></ul> <p>Keep your password secure. The system cannot retrieve it if it is lost.</p> |
| Confirm Password        | Enter the administrator password again.                                                                                                                                                                                                                                                                                                                                                                                                                         |

 **NOTE**

By default, the region, AZ, VPC, and subnet of the GeminiDB and RDS instances are the same.

Table 25-2 GeminiDB Redis instance specifications

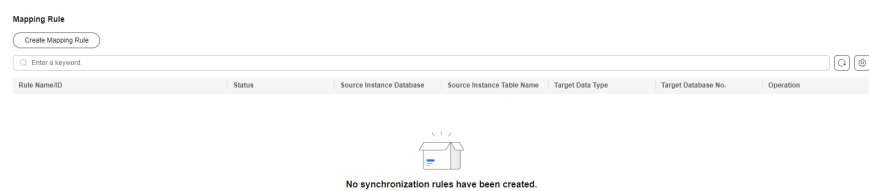
| Storage (GB) | Nodes | vCPUs | QPS     | Maximum Connections per Single-node Instance | Databases |
|--------------|-------|-------|---------|----------------------------------------------|-----------|
| 16           | 2     | 1     | 10,000  | 10,000                                       | 1,000     |
| 24           | 2     | 2     | 20,000  | 10,000                                       | 1,000     |
| 32           | 2     | 2     | 20,000  | 10,000                                       | 1,000     |
| 48           | 2     | 4     | 40,000  | 20,000                                       | 1,000     |
| 64           | 2     | 4     | 40,000  | 20,000                                       | 1,000     |
| 96           | 2     | 8     | 80,000  | 20,000                                       | 1,000     |
| 128          | 2     | 16    | 160,000 | 20,000                                       | 1,000     |

----End

Creating a Mapping Rule

- Step 1 [Log in to the Huawei Cloud console.](#)
- Step 2 Click  in the upper left corner and select a region and project.
- Step 3 Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4 On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 5 In the navigation pane, choose **Memory Acceleration**. In the **Mapping Rule** area, click **Create Mapping Rule**.

Figure 25-2 Mapping rule

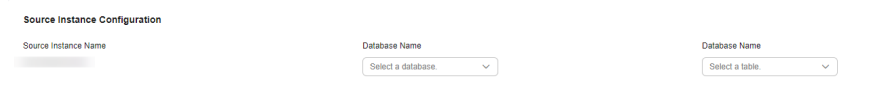


- Step 6 On the displayed page, configure parameters.
1. Enter a rule name.

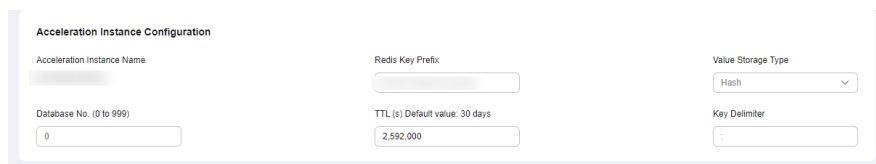
**Rule Name:** Enter a mapping rule name. The rule name must be unique within a GeminiDB instance and cannot exceed 256 characters or include number signs (#).

**Figure 25-3 Rule name**A screenshot of a web form titled "Rule Name". It features a single text input field with a light blue border and rounded corners. Inside the field, the placeholder text "Enter a rule name." is displayed in a light blue font.

2. Configure source instance information.
  - **Database Name:** Select a database of the acceleration instance.
  - **Table Name:** Select a table of the acceleration instance.

**Figure 25-4 Configuring source instance information**A screenshot of the "Source Instance Configuration" form. It contains three main sections: "Source Instance Name" with a text input field, "Database Name" with a dropdown menu labeled "Select a database.", and another "Database Name" with a dropdown menu labeled "Select a table.".

3. Configure acceleration instance information.
  - **Redis Key Prefix:** This parameter is optional. The default value is in the format of *Database name:Table name:Field name 1:Field name 2...* and can contain a maximum of 1,024 characters. If you have created a custom prefix, it will be used instead of the default one.
  - **Value Storage Type:** Data type of the cache. Currently, only hash data is supported.
  - **Database No. (0-999):** ID of a database that stores cached data in the acceleration instance. The default value is **0**.
  - **TTL (s) Default value: 30 days:** Validity period of cached data in the acceleration instance. The default value is 30 days (2,592,000 seconds). If you enter **-1**, the cached data will never expire.
  - **Key Delimiter:** Separator among the Redis key prefix, key, and key fields. It is a single character in length.

**Figure 25-5 Configuring acceleration instance information**A screenshot of the "Acceleration Instance Configuration" form. It includes several fields: "Acceleration Instance Name" (text input), "Redis Key Prefix" (text input), "Value Storage Type" (dropdown menu with "Hash" selected), "Database No. (0 to 999)" (text input with "0" entered), "TTL (s) Default value: 30 days" (text input with "2,592,000" entered), and "Key Delimiter" (text input with ":" entered).

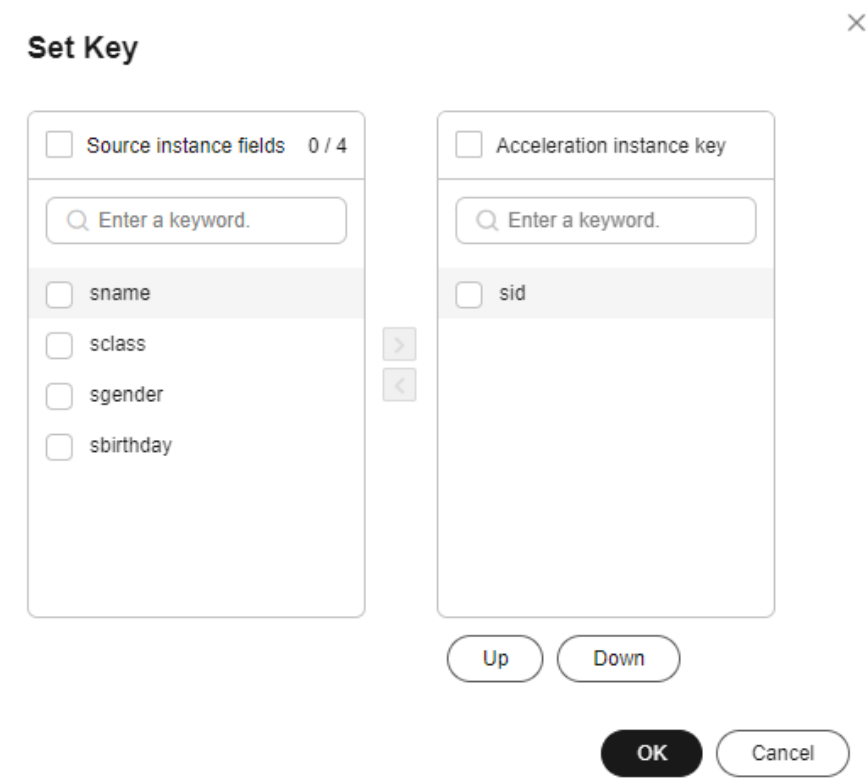
4. Click **Set Key**, select a key field of the acceleration instance, and click **OK**.

**NOTE**

If an acceleration instance key consists of multiple source instance fields, the key must be unique in a MySQL instance. You can click **Up** or **Down** to adjust the sequence of each field.

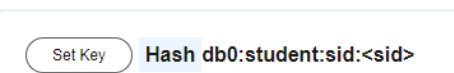


Figure 25-6 Key settings



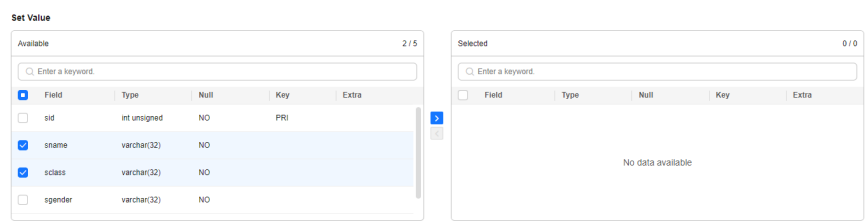
After the parameters are set, the key is displayed.

Figure 25-7 Key



- Configure the acceleration instance fields.  
Move the required fields in the source instance to the acceleration instance.

Figure 25-8 Configuring acceleration instance fields



- After setting the parameters, click **Submit**.

----End

## Using the Memory Acceleration Module

- Create database **db1** in the source MySQL instance and create table **students** in **db1**.

```
mysql> CREATE DATABASE db1;  
Query OK, 1 row affected (0.00 sec)
```

```
mysql> CREATE TABLE db1.students(  
    sid INT UNSIGNED PRIMARY KEY AUTO_INCREMENT NOT NULL,  
    sname VARCHAR(20),  
    sclass INT,  
    sgender VARCHAR(10),  
    sbirthday DATE  
);
```

Query OK, 0 rows affected (0.00 sec)

```
mysql> DESC db1.students;
```

| Field     | Type         | Null | Key | Default | Extra          |
|-----------|--------------|------|-----|---------|----------------|
| sid       | int unsigned | NO   | PRI | NULL    | auto_increment |
| sname     | varchar(20)  | YES  |     | NULL    |                |
| sclass    | int          | YES  |     | NULL    |                |
| sgender   | varchar(10)  | YES  |     | NULL    |                |
| sbirthday | date         | YES  |     | NULL    |                |

5 rows in set (0.00 sec)

- After the table is created, on the memory acceleration page, create a mapping rule to convert each row in the **students** table into a Redis hash. The key of a hash is in the format of *Database name.Data table name:sid:<sid value>*. The selected fields are **sname**, **sclass**, **sgender**, and **sbirthday**.

Figure 25-9 Configuring a mapping rule

Rule Name: students-to-hash

Source Instance Configuration

Source Instance Name: Database Name: db1 Database Name: student

Acceleration Instance Configuration

Acceleration Instance Name: Redis Key Prefix: Enter a Redis key prefix. Value Storage Type: Hash

Database No. (0 to 999): 5 TTL (s) Default value: 30 days Key Delimiter:

Test Key: Hash

Set Value

Available 0 / 1

| Field | Type         | Null | Key | Extra |
|-------|--------------|------|-----|-------|
| sid   | int unsigned | NO   | PRI |       |

Selected 0 / 4

| Field     | Type        | Null | Key | Extra |
|-----------|-------------|------|-----|-------|
| sname     | varchar(32) | NO   |     |       |
| sclass    | varchar(32) | NO   |     |       |
| sgender   | varchar(32) | NO   |     |       |
| sbirthday | varchar(32) | NO   |     |       |

- After a mapping rule is created, check the mapping rule and information.

Figure 25-10 Mapping information

Mapping

Mapping Name: Mapping ID: Source Instance ID: Acceleration Instance ID:

Mapping Rule

| Rule Name        | Status    | Source Instance Database | Source Instance Table Name | Target Data Type | Target Database No. | Operations  |
|------------------|-----------|--------------------------|----------------------------|------------------|---------------------|-------------|
| students-to-hash | Available | db1                      | student                    | Hash             | 5                   | Edit Delete |

Total Records: 1

- Insert a new data record to the **students** table in the MySQL instance.  

```
mysql> INSERT INTO db1.students (sname, sclass, sgender, sbirthday) VALUES ('zhangsan', 1, 'male', '2015-05-20');
```

```
Query OK, 1 row affected (0.01 sec)

mysql> SELECT * FROM db1.students;
+-----+-----+-----+-----+-----+
| sid | sname | sclass | sgender | sbirthday |
+-----+-----+-----+-----+-----+
| 1 | zhangsan | 1 | male | 2015-05-20 |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

5. After the mapping rule is created, the data is automatically synchronized to the GeminiDB instance. Run commands in the GeminiDB instance to query the data.

```
127.0.0.1:6379> KEYS *
1) "db1:students:sid:1"

127.0.0.1:6379> HGETALL db1:students:sid:1
1) "sbirthday"
2) "2015-05-20"
3) "sclass"
4) "1"
5) "sgender"
6) "male"
7) "sname"
8) "zhangsan"
```

6. Insert a new data record to the **students** table in the MySQL instance.

```
mysql> INSERT INTO db1.students (sname, sclass, sgender, sbirthday) VALUES ('lisi', 10, 'male',
'2015-05-22');
Query OK, 1 row affected (0.00 sec)
```

```
mysql> SELECT * FROM db1.students;
+-----+-----+-----+-----+-----+
| sid | sname | sclass | sgender | sbirthday |
+-----+-----+-----+-----+-----+
| 1 | zhangsan | 1 | male | 2015-05-20 |
| 2 | lisi | 10 | male | 2015-05-22 |
+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

7. Check whether the new data is synchronized to the GeminiDB instance.

```
127.0.0.1:6379> KEYS *
1) "db1:students:sid:1"
2) "db1:students:sid:2"

127.0.0.1:6379> HGETALL db1:students:sid:2
1) "sbirthday"
2) "2015-05-22"
3) "sclass"
4) "10"
5) "sgender"
6) "male"
7) "sname"
```

8. Update data in the **students** table in the MySQL instance.

```
mysql> UPDATE db1.students SET sclass=12, sname='wangwu' WHERE sid = 1;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1 Changed: 1 Warnings: 0
```

```
mysql> SELECT * FROM db1.students;
+-----+-----+-----+-----+-----+
| sid | sname | sclass | sgender | sbirthday |
+-----+-----+-----+-----+-----+
| 1 | wangwu | 12 | male | 2015-05-20 |
| 2 | lisi | 10 | male | 2015-05-22 |
+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

9. Check whether the data is updated in the GeminiDB instance.

```
127.0.0.1:6379> KEYS *
1) "db1:students:sid:1"
```

```
2) "db1:students:sid:2"
127.0.0.1:6379> HGETALL db1:students:sid:1
1) "sbirthday"
2) "2015-05-20"
3) "sclass"
4) "12"
5) "sgender"
6) "male"
7) "sname"
8) "wangwu"
```

10. Delete data from the **students** table in the MySQL instance.

```
mysql> DELETE FROM db1.students WHERE sid = 1;
Query OK, 1 row affected (0.00 sec)
```

```
mysql> SELECT * FROM db1.students;
+-----+-----+-----+-----+-----+
| sid | sname | sclass | sgender | sbirthday |
+-----+-----+-----+-----+-----+
| 2 | lisi | 10 | male | 2015-05-22 |
+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

11. Check whether the data is deleted from the GeminiDB instance.

```
127.0.0.1:6379> KEYS *
1) "db1:students:sid:2"
```

## 25.3 Modifying and Deleting a Memory Acceleration Rule

A memory acceleration rule can enable automated data synchronization from MySQL to GeminiDB. You can also modify and delete this rule.

### Precautions

- Currently, only hashes from MySQL can be converted to GeminiDB Redis API.
- If a table name of the MySQL instance in the memory acceleration rule is changed, you need to reconfigure the rule.
- Currently, the ENUM, SET, and JSON data cannot be synchronized.
- If you rename or delete one or more key fields of a memory acceleration rule, the rule becomes invalid.

### Modifying a Mapping Rule

**Step 1** [Log in to the Huawei Cloud console.](#)

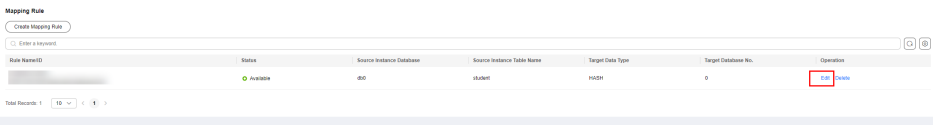
**Step 2** Click  in the upper left corner and select a region and project.

**Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.

**Step 4** On the **Instances** page, click the target instance name to go to the **Overview** page.

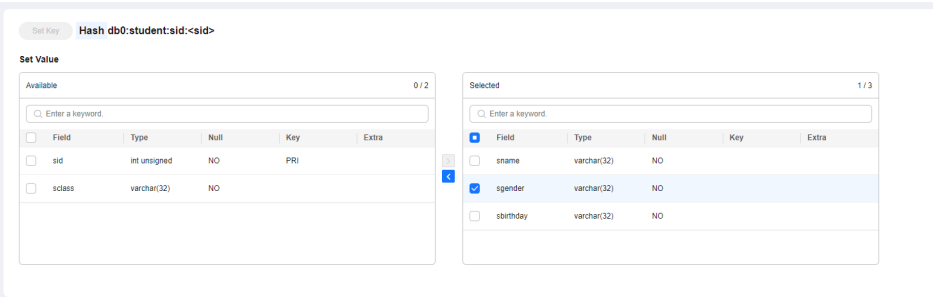
**Step 5** In the navigation pane on the left, choose **Memory Acceleration**. In the **Mapping Rule** area, locate the target rule and click **Edit** in the **Operation** column.

Figure 25-11 The **Edit** button



**Step 6** After editing the fields, click **Submit**.

Figure 25-12 Editing a mapping rule



----End

## Deleting a Mapping Rule

- Step 1** [Log in to the management console](#).
- Step 2** Click  in the upper left corner and select a region and project.
- Step 3** Click  in the upper left corner of the page and choose **Databases > Relational Database Service**.
- Step 4** On the **Instances** page, click the target instance name to go to the **Overview** page.
- Step 5** In the navigation pane on the left, choose **Memory Acceleration**. In the **Mapping Rule** area, locate the target rule and click **Delete** in the **Operation** column.

----End

## 25.4 Viewing and Removing Mappings

You can view the mapping list on the **Memory Acceleration Management** page and remove mappings.

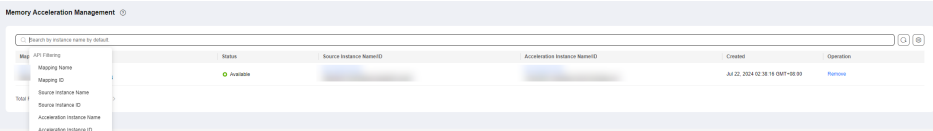
### Usage Notes

- After a mapping is removed, service applications cannot obtain the latest data of the source database from the acceleration instance.
- The corresponding mapping rule will be cleared after a mapping is removed.
- If the source instance or acceleration instance is not normal, the mapping cannot be removed.

Querying the Mapping List

- Step 1 Log in to the Huawei Cloud console.
- Step 2 In the service list, choose **Databases** > **GeminiDB**.
- Step 3 In the navigation pane on the left, choose **Memory Acceleration Management**. On the displayed page, search for your target mapping by keyword (such as the mapping name or mapping ID).

Figure 25-13 Mapping list

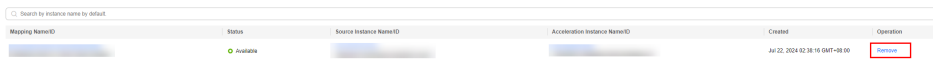


----End

Removing a Mapping

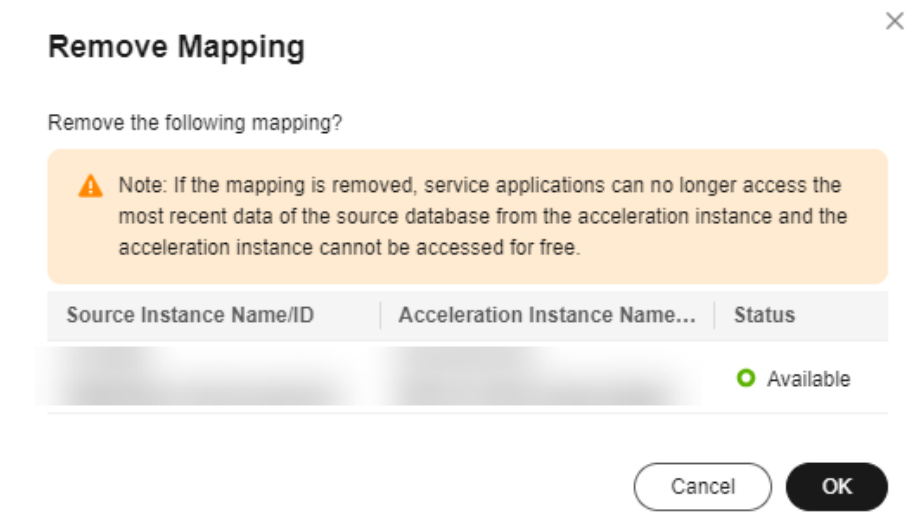
- Step 1 Log in to the Huawei Cloud console.
- Step 2 In the service list, choose **Databases** > **GeminiDB**.
- Step 3 In the navigation pane on the left, choose **Memory Acceleration Management**. On the displayed page, locate the target mapping and click **Remove** in the **Operation**.

Figure 25-14 Memory acceleration management



- Step 4 In the displayed dialog box, click **OK**.

Figure 25-15 Removing a mapping



----End

