

GaussDB(for MySQL)

FAQs

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1 Product Consulting

1.1 What Should I Pay Attention to When Using GaussDB(for MySQL)?

1. Instance operating systems (OSs) are invisible to you. Your applications can access a database only through an IP address and a port.
2. The backup files stored in Object Storage Service (OBS) buckets and the Elastic Cloud Servers (ECSs) used by GaussDB(for MySQL) are invisible to you. They are visible only to the instance management system.
3. When you view your instance in the instance list, select the region where your instance is located.
4. Precautions after GaussDB(for MySQL) instances are created:
After your instance is created, you do not need to perform basic database O&M operations, such as applying HA and security patches, but you must pay attention to:
 - a. vCPUs and memory of your instance. If they become insufficient, you need to change them in a timely manner.
 - b. Storage space of your instance. If the storage is used up, you will be billed on a pay-per-use basis for any additional storage, but if you scale up storage in advance, you can pay for the additional storage at yearly/monthly rates.
 - c. Performance of your instance. You need to check for slow query SQL statements, SQL statements to be optimized, or redundant or missing indexes regularly.

1.2 What Can I Do About Slow Response of Websites When They Use GaussDB(for MySQL)?

To solve this problem:

- Check the performance of GaussDB(for MySQL) instances on the GaussDB(for MySQL) console.

- Compare the database connection status of local databases and GaussDB(for MySQL) instances. This problem depends on web applications.

1.3 Does GaussDB(for MySQL) Support Automatic Failover?

Yes. During the creation of a GaussDB(for MySQL) instance, a primary node and a read replica are both created. If the primary node fails, the read replica is automatically promoted to the primary node to provide services, and the original primary node is demoted to be a read replica.

1.4 Does GaussDB(for MySQL) Support Decoupling of Compute and Storage?

GaussDB(for MySQL) supports the decoupling of compute and storage, improving high availability and the experience in backup and restoration, upgrade and capacity expansion.

2 Database Connections

2.1 Can an External Server Access the GaussDB(for MySQL) Database?

An Instance Bound with an EIP

For an instance that has been bound with an EIP, you can access it through the EIP.

For details, see:

[Connecting to a DB Instance over a Public Network](#)

An Instance Not Bound with an EIP

- Enable a VPN in a VPC and use the VPN to connect to the GaussDB(for MySQL) instance.
- Create a GaussDB(for MySQL) instance and an ECS in the same VPC and access GaussDB(for MySQL) through the ECS.

For details, see:

[Connecting to a DB Instance over a Private Network](#)

2.2 What Do I Do If the Number of GaussDB(for MySQL) Database Connections Reaches the Upper Limit?

The number of database connections indicates the number of applications that can be simultaneously connected to a database, and is irrelevant to the maximum number of users allowed by your applications or websites.

If there is an excessive number of database connections, applications may fail to be connected, and the full and incremental backups may fail, affecting services.

Fault Locating

1. Check whether applications are connected, optimize the connections, and release unnecessary connections.
2. Check the specifications and scale them up if needed.
3. Check whether any metrics are abnormal and whether any alarms are generated on the Cloud Eye console. Cloud Eye monitors database metrics, such as the CPU usage, memory usage, storage space usage, and database connections, and allows you to configure alarm policies to identify risks in advance if any alarms are generated. For details, see the *Cloud Eye User Guide*.

Solution

1. Connect to an instance through a private network. Using a private network prevents congestion caused by insufficient bandwidth.
For details, see:
[Connecting to a DB Instance over a Private Network](#)
2. On the console, set the parameter `innodb_adaptive_hash_index` to `off` to reduce lock wait time.
For details, see [Modifying a Parameter Template](#).
3. Optimize slow queries.

2.3 What Is the Maximum Number of Connections to a GaussDB(for MySQL) Instance?

GaussDB(for MySQL) does not have constraints on the number of connections. This number is determined by the default value and value range of the DB engine. For example, you can set `max_connections` and `max_user_connections` in a parameter template to configure the maximum number of connections for a GaussDB(for MySQL) instance.

Changing the Maximum Number of Connections

The number of connections can be changed online. For details, see [Modifying a Parameter Template](#).

You can run commands to change the maximum number of connections.

1. Check the maximum number of connections:
`show global variables like 'max_connections';`
2. Change the value of `max_connections` under `mysqld` in the `my.cnf` file.
`[mysqld]`
`max_connections = 1000`

About `max_connections`

`max_connections` indicates the maximum number of clients that can be connected at the same time. If this parameter is set to `default`, it is related to the instance memory (unit: GB). The calculation formula is as follows:

Estimated value of max_connections = Available node memory/Estimated memory occupied by a single connection

- Available node memory = Total memory – Memory occupied by the buffer pool – 1 GB (mysqld process, OS, and monitoring program)
- Estimated memory usage of a single connection (single_thread_memory) = thread_stack (256 KB) + binlog_cache_size (32 KB) + join_buffer_size (256 KB) + sort_buffer_size (256 KB) + read_buffer_size (128 KB) + read_rnd_buffer_size (256 KB) ≈ 1 MB

The following table lists the default values of **max_connections** for different memory specifications.

Table 2-1 Max_connections for different memory specifications

Memory (GB)	Connections
512	100,000
384	80,000
256	60,000
128	30,000
64	18,000
32	10,000
16	5,000
8	2,500
4	1,500
2	800

2.4 What Should I Do If an ECS Cannot Connect to a GaussDB(for MySQL) Instance?

Perform the following steps to identify the problem:

- Step 1** Check whether the ECS and GaussDB(for MySQL) instance are located in the same VPC.
- If they are in the same VPC, go to [Step 2](#).
 - If they are in different VPCs, create an ECS in the VPC where the instance is located.
- Step 2** Check whether a security group has been created for the ECS.
- If a security group has been created, check whether its rules are appropriate.
 - If no security group has been created, go to the VPC console from the ECS details page and create a security group.

Step 3 Check whether the ECS can connect to the instance over the instance port.

The default port of a primary/standby instance is **3306**.

```
telnet <IP address> {Port number}
```

- If the ECS can connect to the instance, no further action is required.
- If the ECS still cannot connect to the instance port, contact technical support.

----End

2.5 How Can I Connect to a MySQL Database Through JDBC?

Although the SSL certificate is optional if you choose to connect to a database through Java database connectivity (JDBC), you are advised to download the SSL certificate to encrypt the connections for security purposes. By default, SSL data encryption is enabled for newly created GaussDB(for MySQL) instances. Enabling SSL will increase the network connection response time and CPU usage. Before enabling SSL, evaluate the impact on service performance.

Prerequisites

Familiarize yourself with:

- Computer basics
- Java programming language
- JDBC knowledge

Connection with the SSL Certificate

The SSL certificate needs to be downloaded and verified for connecting to databases.


NOTE

If the **ssl_type** value of a database user is **x509**, this method is unavailable.

To check the **ssl_type** value of the current user, run the following command:

```
select ssl_type from mysql.user where user = 'xxx';
```

Step 1 Download the CA certificate or certificate bundle.

1. On the **Instances** page, click the instance name to go to the **Basic Information** page.
2. In the **DB Instance Information** area, click  next to **SSL**.

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 2-2 Parameter description

Parameter	Description
<keytool 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 Step 1 , 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_8.0.22_Auto_Generated_CA_Certificate
Issuer: CN=MySQL_Server_8.0.22_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 the GaussDB(for MySQL) instance through JDBC.

```
jdbc:mysql://<instance_ip>:<instance_port>|<database_name>?
requireSSL=<value1>&useSSL=<value2>&verifyServerCertificate=<value3>&trustCertificateKeyStoreUrl=f
ile:
<truststore_file>&trustCertificateKeyStorePassword=<password>
```

Table 2-3 Parameter description

Parameter	Description
<instance_ip>	IP address of the DB instance. NOTE <ul style="list-style-type: none"> If you are accessing the instance through ECS, <i>instance_ip</i> is the private IP address of the instance. You can view the private IP address in the Network Information area on the Basic Information. If you are accessing the instance through a public network, <i>instance_ip</i> indicates the EIP that has been bound to the instance. You can view the private IP address in the Network Information area on the Basic Information.

Parameter	Description
<instance_port>	Database port of the instance. The default port is 3306 . NOTE You can view the private IP address in the Network Information area on the Basic Information .
<database_name >	Database name used for connecting to the instance. The default value is mysql .
<value1>	Value of requireSSL , indicating whether the server supports SSL. It can be either of the following: <ul style="list-style-type: none"> • true: The server supports SSL. • false: The server does not support SSL. NOTE For details about the relationship between requireSSL and sslmode , see Table 2-4 .
<value2>	Value of useSSL , indicating whether the client uses SSL to connect to the server. It can be either of the following: <ul style="list-style-type: none"> • true: The client uses SSL to connect to the server. • false: The client does not use SSL to connect to the server. NOTE For details about the relationship between useSSL and sslmode , see Table 2-4 .
<value3>	Value of verifyServerCertificate , indicating whether the client verifies the server certificate. It can be either of the following: <ul style="list-style-type: none"> • true: The client verifies the server certificate. • false: The client does not verify the server certificate. NOTE For details about the relationship between verifyServerCertificate and sslmode , see Table 2-4 .
<truststore_file>	Path for storing the truststore file configured in Step 2 .
<password>	Password of the truststore file configured in Step 2 .

Table 2-4 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 a GaussDB(for MySQL) instance):

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

public class JDBCtest {
    static final String USER = "xxx";
    static final String PASS = "xxx";

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

        String url = "jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?
requireSSL=true&useSSL=true&verifyServerCertificate=true&trustCertificateKeyStoreUrl=file:
<truststore_file>&trustCertificateKeyStorePassword=<password>";

        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

NOTE

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

Step 1 Connect to your GaussDB(for MySQL) instance through JDBC.

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

Table 2-5 Parameter description

Parameter	Description
<i><instance_ip></i>	IP address of the instance. NOTE <ul style="list-style-type: none">If you are accessing the instance through ECS, <i>instance_ip</i> is the private IP address of the instance. You can view the private IP address in the Network Information area on the Basic Information.If you are accessing the instance through a public network, <i>instance_ip</i> indicates the EIP that has been bound to the instance. You can view the private IP address in the Network Information area on the Basic Information.
<i><instance_port></i>	Database port of the instance. The default port is 3306 . NOTE You can view the private IP address in the Network Information area on the Basic Information .
<i><database_name ></i>	Database name used for connecting to the instance. The default value is mysql .

Code example (Java code for connecting to a GaussDB(for MySQL) instance):

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

public class MyConnTest {
    final public static void main(String[] args) {
        Connection conn = null;
        // set sslmode here.
        // no ssl certificate, so do not specify path.
        String url = "jdbc:mysql://192.168.0.225:3306/my_db_test?useSSL=false";
        try {
            Class.forName("com.mysql.jdbc.Driver");
            conn = DriverManager.getConnection(url, "root", "password");
            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

Related Issues

- Symptom

When you use JDK 8.0 or a later version to connect to your 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

```
jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?
```

```
requireSSL=true&useSSL=true&verifyServerCertificate=true&trustCertificateKeyStoreUrl=file:
<truststore_file>&trustCertificateKeyStorePassword=<password>&
enabledTLSProtocols=TLSv1.2
```

- mysql-connector-java-8.0.xx.jar

```
jdbc:mysql://<instance_ip>:<instance_port>/<database_name>?
```

```
requireSSL=true&useSSL=true&verifyServerCertificate=true&trustCertificateKeyStoreUrl=file:
<truststore_file>&trustCertificateKeyStorePassword=<password>& tlsVersions =TLSv1.2
```

2.6 How Can I Create and Connect to an ECS?

1. For details about how to create an ECS, see *Elastic Cloud Server User Guide*.
 - The ECS to be created must be in the same VPC with the GaussDB(for MySQL) instance to which it connects.
 - Configure a security group to allow the ECS to access the instance through the IP address.
2. For details on how to connect to the ECS, see section "Logging In to an ECS" in the *Elastic Cloud Server User Guide*.

2.7 What Should I Do If a Database Client Problem Causes a Connection Failure?

Check the following items to troubleshoot GaussDB(for MySQL) connection failures caused by a client problem:

1. ECS security policy

In Windows, check whether the GaussDB(for MySQL) instance port is enabled in the Windows security policy. In Linux, run **iptables** to check whether the GaussDB(for MySQL) instance port is enabled in firewall settings.

2. Application configuration

Check whether the connection address, port parameter configuration, and JDBC connection parameter configuration are correct.

3. Username or password

Check whether the username or password is correct if an error similar to the following occurs during the database connection:

- [Warning] Access denied for user 'username'@'yourIp' (using password: NO)
- [Warning] Access denied for user 'username'@'yourIp' (using password: YES)

 **NOTE**



If the problem persists, contact post-sales technical support.

2.8 Why Cannot I Ping My EIP After It Is Bound to a DB Instance?

Fault Locating

1. Check security group rules.
2. Check network ACLs.
3. Ping the ECS to the instance in the same region.

Solution

1. Check security group rules.
 - a. Log in to the management console.
 - b. Click  in the upper left corner and select a region and a project.
 - c. Click  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.
 - d. On the **Instances** page, click the instance name to go to the **Basic Information** page.

- e. In the **Network Information** area on the **Basic Information** page, click the security group.
- f. Check whether the ECS NIC security group allows the inbound ICMP traffic.

Table 2-6 Security group rules

Direction	Type	Protocol/Port Range	Source IP Address
Inbound	IPv4	Any: Any	0.0.0.0/0 (all IP addresses)
Inbound	IPv4	ICMP: Any	0.0.0.0/0 (all IP addresses)

2. Check network ACLs.
 - a. Check the network ACL status.
 - b. Check whether the NIC to which the EIP bound belongs to the subnet associated with the network ACL.
 - c. If the network ACL is enabled, add an ICMP rule to allow traffic.

NOTE

The default network ACL rule denies all incoming and outgoing packets. After the network ACL is disabled, the default rule still takes effect.

3. Ping the affected EIP from another ECS in the same region.
If the affected EIP can be pinged from another ECS in the same region, the virtual network is functional. In such a case, contact customer service for technical support.

2.9 What Can I Do If the Connection Test Failed?


Fault Locating

1. Check security group rules.
2. Check network ACLs.
3. Check the NIC information of ECSs.
4. Check the disconnected ports.

Solution

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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.

- Step 4** On the **Instances** page, click the instance name to go to the **Basic Information** page. In the **Network Information** area of the page, view the VPC where the instance is located.
- Step 5** Check whether the instance to which distributed transactions are added is in the same VPC as an ECS.
- If they are in the same VPC, see [Why Does Communication Fail Between Two ECSs in the Same VPC or Packet Loss Occur When They Communicate?](#)
 - If they are in different VPCs:
 - Public access: Bind an EIP to the instance. For details, see [Binding an EIP](#).
 - Private access: Create a VPC peering connection.
 - Change the VPC hosting the ECS to the same as that hosting the GaussDB(for MySQL). For details, see [Changing a VPC](#).

----End

2.10 Can I Access a GaussDB(for MySQL) Instance over an Intranet Connection Across Regions?

By default, instances cannot be accessed over an intranet across regions. Cloud services in different regions cannot communicate with each other over an intranet. You can use Cloud Connect (CC) or Virtual Private Network (VPN) to connect to instances across regions.

- CC allows you to connect two VPCs of the same account or different accounts even if they are in different regions.
- VPN uses an encrypted tunnel to connect VPCs in different regions and sends traffic over the Internet. It is inexpensive, easy to configure, and easy to use. However, the quality of VPN connections depends on the quality of Internet connections.

2.11 Are There Any Potential Risks If There Are Too Many Connections to a GaussDB(for MySQL) Instance?

If there is an excessive number of GaussDB(for MySQL) connections, applications may fail to be connected, and the full and incremental backups may fail, affecting services.

Solution

1. Check whether applications are connected, optimize the connections, and release unnecessary connections.
2. Cloud Eye monitors database metrics, such as the CPU usage, memory usage, storage space usage, and database connections, and allows you to set alarm policies to identify potential risks if any alarms are generated.

2.12 What Should I Do If an ECS and a GaussDB(for MySQL) instance Deployed in Different VPCs Cannot Communicate with Each Other?

When a GaussDB(for MySQL) instance and an ECS are deployed in different VPCs of the same region, they cannot communicate with each other through a private network. After a GaussDB(for MySQL) instance is created, you cannot change its VPC.

Solution

1. Create a VPC peer connection.
2. Change the VPC hosting the ECS to the same as that hosting the GaussDB(for MySQL). For details, see [Changing a VPC](#).

2.13 How Do I View All IP Addresses Connected to a Database?

You can run the following SQL statement on the database to query the number of connected IP addresses:

```
SELECT substring_index(host, ':',1) AS host_name,state,count(*) FROM  
information_schema.processlist GROUP BY state,host_name;
```

3 Client Installation

3.1 How Can I Install the MySQL Client?

MySQL provides client installation packages for different OSs on its official website. Download the [MySQL 8.0 client installation package](#) or [packages of other versions](#). The following uses Red Hat Linux as an example to show how to obtain the required installation package and install it.

Procedure

Step 1 Obtain the installation package.

Find the [link](#) to the required version on the download page. The `mysql-community-client-8.0.21-1.el6.x86_64` is used as an example.

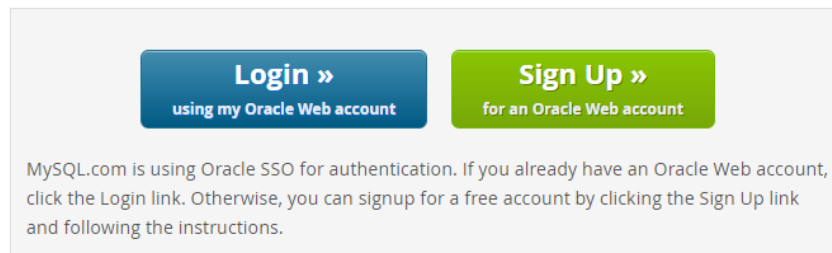
Figure 3-1 Download

MySQL Community Downloads

Login Now or Sign Up for a free account.

An Oracle Web Account provides you with the following advantages:

- Fast access to MySQL software downloads
- Download technical White Papers and Presentations
- Post messages in the MySQL Discussion Forums
- Report and track bugs in the MySQL bug system



No thanks, just start my download.

NOTE

Click **No thanks, just start my download.** to download the installation package.

Step 2 Upload the installation package to the ECS.

NOTE

When you create an ECS, select an OS, such as Red Hat 6.6, and bind an EIP to it. Then, upload the installation package to the ECS using a remote connection tool, and use PuTTY to connect to the ECS.

Step 3 Run the following command to install the MySQL client:

```
sudo rpm -ivh mysql-community-client-8.0.21-1.el6.x86_64.rpm
```

NOTE

- If any conflicts occur during the installation, add the **replacefiles** parameter to the command and try to install the client again. Example:

```
rpm -ivh --replacefiles mysql-community-client-8.0.21-1.el6.x86_64.rpm
```
- If a message is displayed prompting you to install a dependency package, you can add the **nodeps** parameter to the command and install the client again. Example:

```
rpm -ivh --nodeps mysql-community-client-8.0.21-1.el6.x86_64.rpm
```

Step 4 Use the MySQL client to connect to the database and check whether the client can run properly.

```
mysql -h <hostIP> -P <port> -u <userName> -p --ssl-ca=<cafile>
```

Table 3-1 Parameter description

Parameter	Description
<i><hostIP></i>	Private IP address. To obtain this parameter, go to the Basic Information page of the instance and view the private IP address in the Network Information area.
<i><port></i>	Database port. By default, the value is 3306 . To obtain this parameter, go to the Basic Information page of the instance and view the database port in the Network Information area.
<i><userName></i>	Username of the GaussDB(for MySQL) database administrator account. The default username is root .
<i><cafile></i>	SSL certificate file, which should be stored in the same directory where the command is executed.

Example:

To connect to a DB instance through an SSL connection as user **root**, run the following command:

```
mysql -h 172.xx.xx.xx -P 3306 -u root -p --ssl-ca=ca.pem
```

Enter the password of the database account as prompted.

Enter password:

NOTE

If error information similar to "mysql: error while loading shared libraries: libxxx: cannot open shared object file: No such file or directory" is displayed, perform the following steps:
For example, if the error "mysql: error while loading shared libraries: libtinfo.so.5: cannot open shared object file: No such file or directory" is displayed,

1. Query the current version file of the dynamic library that reports the error on the local host.

```
find / -name libtinfo.so*
```

Assume that the query result is as follows:

```
/usr/lib64/libtinfo.so.6.2
```

```
/usr/lib64/libtinfo.so.6
```

2. Set up the soft link of the required version.

```
ln -s /usr/lib64/libtinfo.so.6 /usr/lib64/libtinfo.so.5
```

3. Connect to the database again.

```
mysql -h <hostIP> -P <port> -u <userName> -p --ssl-ca=<cafile>
```

----End

4 Database Migration

4.1 What Types of DB Engines Does GaussDB(for MySQL) Support for Importing Data?

- Exporting or importing data between DB engines of the same type is called homogeneous database export or import.
- Exporting or importing data between DB engines of different types is called heterogeneous database export or import. For example, import data from Oracle to the DB engines supported by GaussDB(for MySQL).

Generally, data cannot be exported or imported between heterogeneous databases due to the different data formats involved. However, if the data formats are compatible, table data can, in theory, be migrated between them.

Third-party software is usually required for data replication to export and import between heterogeneous databases. For example, you can use a third-party tool to export table records from Oracle in .txt format. Then, you can use Load statements to import the exported table records to the DB engines supported by GaussDB(for MySQL).

5 Database Permissions

5.1 Does GaussDB(for MySQL) Provide the Root Account or Super Permission?

GaussDB(for MySQL) provides the administrator user **root** which has the permissions except super, file, shutdown, and create tablespace.

Most cloud database service platforms do not provide the super permission for the **root** user. The super permissions allow users to execute many management commands, such as reset master, set global, kill, and reset slave. These operations may cause unpredictable exceptions and faults for GaussDB(for MySQL). This is a major difference between cloud databases and on-premises MySQL databases. To ensure stable running of instances, GaussDB(for MySQL) does not provide the super permission for the **root** user.

If you need to perform actions that normally require super permissions, GaussDB(for MySQL) provides alternative methods.

For example:

You can modify parameter values only on the GaussDB(for MySQL) console. You cannot run the following command on a database to modify parameter values.

set global parameter name=*Parameter value*;

If the script contains the **set global** command, delete the **set global** command and modify parameter values on the console.

An error is reported after you run the following command because the **root** user does not have super permissions. You can delete **definer='root'** from the command.

create definer='root'@'%' trigger(procedure)...

You can import and export data using mysqldump. For details, see [Migrating Data to GaussDB\(for MySQL\) Using mysqldump](#).

6 Database Performance

6.1 What Should I Do If the CPU Usage of My Instance Is High?

If the CPU usage is high or close to 100% when you use GaussDB(for MySQL), data read/write processing slows down, connections cannot be established, and errors are reported, interrupting services.

Solution

1. Check slow SQL logs for slow queries and examine their performance characteristics (if any) to locate the cause.
For details on viewing MySQL logs, see [Viewing Slow Query Logs](#).
2. View the CPU usage of your GaussDB(for MySQL) instance to facilitate problem locating.
3. Create read replicas to offload read pressure from the primary node.
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.

6.2 How Do I Handle Slow SQL Statements Caused by Inappropriate Composite Index Settings?

Scenario

On your instance, an SQL query that ran at 11:00 and was expected to take 8 seconds took more than 30 seconds.

Possible Causes

1. Check the CPU usage. In this example, during that time period, the CPU usage of the instance did not increase sharply and remained low, so we know that the slow query was not caused by high CPU usage.

- Analyze slow query logs generated during that period. In this example, shown below, there were several SQL statements that involved millions of rows being scanned. These were the slow statements. But no large amount of data was inserted into the table during that time, so we know that the slow execution was caused by missing or incorrect index settings. By running **EXPLAIN**, you can find that the execution plan of the SQL statement was full table scanning.

Figure 6-1 Slow query logs

select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	6.027128 s	0.000105	125	2119000
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	5.479857 s	0.000104	123	2085096
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	5.288656 s	0.000105	123	2085096
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	33.601792 s	0.000064	140	16961077
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	34.342761 s	0.000171	140	16961077
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	44.536072 s	0.000167	140	16961077
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	46.501796 s	0.000095	140	16961077
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	33.050367 s	0.000099	139	16944097
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	38.523306 s	0.000101	139	16944097
select query_date, sum(queue) queue, sum(server_user_num) serverUserNum, su...	SELECT	1	40.108127 s	0.000090	139	16944097

- Perform **SHOW INDEX FROM** on the table on the instance to check the cardinality of the three columns.

Figure 6-2 Index cardinality

```

***** 3. row *****
Table: [redacted]
Non_unique: 1
Key_name: idx_query_date_channel_group_id
Seq_in_index: 1
Column_name: query_date
Collation: A
Cardinality: 133994
Sub_part: NULL
Packed: NULL
Null: YES
Index_type: BTREE
Comment:
Index_comment:
***** 4. row *****
Table: [redacted]
Non_unique: 1
Key_name: idx_query_date_channel_group_id
Seq_in_index: 2
Column_name: channel
Collation: A
Cardinality: 405333
Sub_part: NULL
Packed: NULL
Null: YES
Index_type: BTREE
Comment:
Index_comment:
***** 5. row *****
Table: [redacted]
Non_unique: 1
Key_name: idx_query_date_channel_group_id
Seq_in_index: 3
Column_name: group_id
Collation: A
Cardinality: 16213328
Sub_part: NULL
Packed: NULL
Null: YES
Index_type: BTREE
    
```

The **query_date** field with the smallest cardinality was in the first place of the composite index, and the **group_id** field with the largest cardinality was in the last place of the composite index. In addition, the SQL statement contained the range query of the **query_date** field. As a result, only the **query_date** field was indexed.

The SQL statement could only use the index of the **query_date** column. Additionally, the optimizer may have selected full table scanning during cost estimation because the cardinality was too small.

A new composite index was created with the **group_id** field in the first place and the **query_date** field in the last place. The query time met the expectation.

Solution

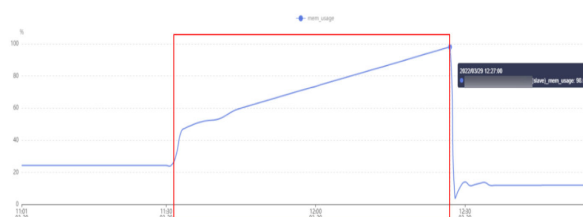
1. Check whether the slow query was caused by insufficient CPU resources.
2. Check whether the table structure is properly designed and whether index settings are correct.
3. Execute the **ANALYZE TABLE** statement periodically to prevent incorrect execution plans because performing a large number of INSERT or DELETE operations for table data may result in outdated statistics.

6.3 How Do I Handle a Large Number of Temporary Tables Being Generated for Long Transactions and High Memory Usage?

Scenario

The memory usage of a GaussDB(for MySQL) instance kept increasing from 11:30 to 12:27 and reached the memory limit.

Figure 6-3 Memory usage



Possible Causes

1. Check the **processlist.log** file. In this example, shown below, there were two slow SQL statements in that time period.

Figure 6-4 Slow SQL statements

```

2022-03-29 12:27:45
[000079] dbanqpt: [000079] dbanqpt: Query 3811 executing select app_ver,pro_name,login_status,sum(case login_status
when 'true' then 1 else 0 end)as success,sum(case login_status when 'false' then 1 else 0 end)as failed
,count(login_status),sum(case login_status when 'true' then 1 else 0 end)) / count(login_status)
from
where login_status is not null
and (date_format(p_6,'%Y-%m-%d') BETWEEN '2022-03-21' AND '2022-03-28')
group by app_ver
[000079] dbanqpt: [000079] dbanqpt: Query 2079 executing select app_ver,pro_name,login_status,sum(case login_status
when 'true' then 1 else 0 end)as success,sum(case login_status when 'false' then 1 else 0 end)as failed
,count(login_status),sum(case login_status when 'true' then 1 else 0 end)) / count(login_status)
from
where login_status is not null
and (date_format(p_6,'%Y-%m-%d') BETWEEN '2022-03-21' AND '2022-03-28')
group by app_ver
    
```

- Analyze slow query logs generated in that time period. There was about 90 GB of data and about 1 billion of data rows in the logs, and there were two SQL statements that took 40 to 50 minutes to execute. The execution time basically overlapped when the memory usage went up in the monitoring results, so we know that the high memory usage was caused by temporary tables.

```
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
mysql> SHOW
+-----+
| table    |
+-----+
| table    |
+-----+
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
mysql> SELECT query_id FROM
+-----+
| query_id |
+-----+
| 41631    |
+-----+
```

Solution

- Upgrade the instance specifications to maintain the memory usage within a proper range, preventing a sudden increase in traffic from causing an OOM crash. For details, see [Changing vCPUs and Memory of an Instance](#).
- Optimize slow SQL statements as needed.

6.4 What Should I Do If Locks on Long Transactions Block the Execution of Subsequent Transactions?

Scenario

Error code 1205 was reported:

"MySQL error code MY-001205 (ER_LOCK_WAIT_TIMEOUT): **Lock wait timeout exceeded; try restarting transaction**"

Possible Causes

- Check the value of the monitoring metric **Row Lock Time**. In this example, the value of this metric was high, so we know there were lock conflicts in the system.

For details about monitoring metrics, see [Viewing Instance Monitoring Metrics](#).



- Log in to the DB instance and run the following SQL statement to check the long transactions in the system and the row locks held by the transactions:

```
select trx_mysql_thread_id, trx_id, trx_state, trx_started, trx_tables_locked, trx_rows_locked,
trx_isolation_level, trx_query, trx_operation_state from information_schema.innodb_trx order by
trx_started;
```

```
mysql> select trx_mysql_thread_id, trx_id, trx_state, trx_started, trx_tables_locked, trx_rows_locked, trx_isolation_level, trx_query, trx_operation_state from information_schema.innodb_trx order by trx_started;
```

trx_mysql_thread_id	trx_id	trx_state	trx_started	trx_tables_locked	trx_rows_locked	trx_isolation_level	trx_query	trx_operation_state
416	51965	RUNNING	2022-07-28 19:27:55	2	1	READ COMMITTED	NULL	NULL
415	51967	LOCK WAIT	2022-07-29 09:11:03	1	2	READ COMMITTED		fetching rows

- **information_schema.innodb_trx**: information about transactions that are being executed in the InnoDB.
- **trx_started**: start time of a transaction, which is used to determine whether the current transaction is a long transaction. The execution time of a transaction is the current time minus the start time.
- **trx_state**: Status of the current transaction. The values are as follows:

- **RUNNING**
- **LOCK WAIT**

 **NOTE**

If the status of a transaction is **LOCK WAIT**, the transaction holds a row lock.

- **ROLLING BACK**
- **COMMITTING**

Solution

Kill the long transactions.

7 Database Usage

7.1 Why Are the Results Inconsistent After the MATCH AGAINST Statement Is Executed, Respectively, on Primary Nods and Read Replicas?

MATCH AGAINST is used to search for MySQL full-text indexes. For rows in the table, MATCH returns relevance values, that is, a similarity measure between the search string (given as the argument to AGAINST() function and the text in that row in the columns named in the MATCH() list). This statement uses the **stat_n_rows** value to calculate the relevance value. Primary nodes and read replicas use different methods to obtain the **stat_n_rows** value. The primary nodes use the persistent method and the read replicas use the transient method. Therefore, the obtained values are slightly different from each other. The execution result of MATCH AGAINST on primary nodes and read replicas are different.

7.2 How Do I Add Columns Using INSTANT?

GaussDB(for MySQL) is compatible with open-source MySQL 8.0.22, so you can use **ALGORITHM=INSTANT** to quickly add columns, preventing lock waiting from affecting services or SQL statement execution timeout.

Constraints

- Columns can be added only in one statement. If there are other non-INSTANT operations in the same statement, columns cannot be added immediately.
- Columns can be added only at the end of existing columns.
- COMPRESSED row format is not supported.
- Tables that already have full-text indexes are not supported.


NOTE


If a table has a full-text index, you must run the OPTIMIZE TABLE statement on the table after deleting the full-text index.

- Temporary tables are not supported.
- A new field cannot have a default value.

Procedure

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  in the upper left corner of the page, choose **Database** > **GaussDB(for MySQL)**.

Step 4 On the **Instances** page, locate the instance and click **Log In** in the **Operation** column.

Alternatively, on the **Instances** page, click the instance name to go to the **Basic Information** page. Click **Log In** in the upper right corner of the page.

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

Step 6 On the top menu bar, choose **SQL Operations** > **SQL Query**.

Step 7 Run the following SQL statement to quickly add a column:

```
ALTER TABLE table_name ADD COLUMN column_name column_definition,  
ALGORITHM=INSTANT;
```

- *table_name*: table name
- *column_name*: column name
- *column_definition*: column remarks

----End

7.3 How Do I Use LOAD DATA to Import Local Data?

You can use LOAD DATA to import local data to GaussDB(for MySQL).

Syntax

```
LOAD DATA LOCAL  
  INFILE 'file_name'  
  [REPLACE | IGNORE]  
  INTO TABLE tbl_name  
  [CHARACTER SET charset_name]  
  [{FIELDS | COLUMNS}  
   [TERMINATED BY 'string']  
   [[OPTIONALLY] ENCLOSED BY 'char']  
  ]  
  [LINES  
   [TERMINATED BY 'string']  
  ]  
  [IGNORE number {LINES | ROWS}]  
  [(col_name_or_user_var  
   [, col_name_or_user_var] ...)]
```

Parameters

- **file_name**: path of the local file to be imported.
- **REPLACE | IGNORE**: whether to replace or ignore duplicate records.
- **tbl_name**: name of the table to be imported.
- **CHARACTER SET charset_name**: file encoding format. You are advised to use the encoding format of the GaussDB(for MySQL) instances to avoid garbled characters.
- **FIELDS TERMINATED BY 'string'**: separator between columns. The default value is `\t`.
- **[OPTIONALLY] ENCLOSED BY 'char'**: used to ignore symbols in data source fields.
- **LINES TERMINATED BY 'string'?**: newline character between lines. The default value is `\n`.

NOTE

On some hosts running the Windows servers, the newline characters of text files may be `\r\n`, which is invisible.

- **IGNORE number LINES**: used to ignore lines at the start of the file.
- **(column_name_or_user_var, ...)**: columns to be imported. If this parameter is not configured, data is imported based on the column sequence by default.
- For other parameters, see the [load data infile](#) on the MySQL official website. The sequence of other parameters must be correct. For sequence details, visit [the MySQL official website](#).

Standard Example

Prerequisites

- The **local_infile** parameter must be enabled on the server. Click the instance name to go to the **Basic Information** page. On the **Parameters** page, change the value of this parameter to **ON**.
- The **local-infile** parameter must be enabled on the client. Configure **local-infile** in the **my.cnf** file or use the **--local-infile=1** option to connect to the database.

```
[mysql]
local-infile
```

1. Import the data in the local file **qq.txt** to the **test** table. The **qq.txt** file contains five rows of data. The column separator is `,` and the row separator is `\n`.

```
1,a
2,b
3,c
4,d
5,"e"
```

2. Create the **test** table.

```
CREATE TABLE test (
  `id` int NOT NULL,
  `a` varchar(4) NOT NULL,
  PRIMARY KEY (`id`)
);
```


3. On the client, run the LOAD DATA statement to import data in the **qq.txt** file to the **test** table, set the character set to **utf8**, and ignore the double quotation marks in the data source field.

```
mysql> LOAD DATA LOCAL INFILE '/data/qq.txt' IGNORE INTO TABLE test CHARACTER SET 'utf8'  
FIELDS TERMINATED BY ',' OPTIONALLY ENCLOSED BY '"' LINES TERMINATED BY '\n';  
Query OK, 5 rows affected, 1 warning (0.00 sec)  
Records: 5 Deleted: 0 Skipped: 0 Warnings: 1
```

```
mysql> select * from test;
```

```
+----+----+
```

```
| id | a |
```

```
+----+----+
```

```
| 1 | a |
```

```
| 2 | b |
```

```
| 3 | c |
```

```
| 4 | d |
```

```
| 5 | e |
```

```
+----+----+
```

```
5 rows in set (0.00 sec)
```

NOTICE

1. Importing data affects performance of GaussDB(for MySQL) instances. Import data during off-peak hours.
 2. Do not to initiate multiple LOAD DATA requests at the same time. When multiple LOAD DATA requests are initiated, SQL transactions may time out due to highly concurrent data write operations, table locking, and system I/O occupation, resulting in failure of all LOAD DATA requests.
-

8 Backups

8.1 How Long Does GaussDB(for MySQL) Store Backup Data?

Automated backup data is kept based on the backup retention period you specified. For details, see [Configuring an Automated Backup Policy](#).

There is no limit for the manual backup retention period. For details, see [Deleting a Manual Backup](#).

The backup data is stored in OBS and does not occupy the database storage space.

8.2 How Do I Clear GaussDB(for MySQL) Backup Space?

The GaussDB(for MySQL) backup space stores automated backups and manual backups.

- **Automated full and incremental backups**
Automated backup files cannot be manually deleted. You need to change the backup cycle by referring to [Configuring an Automated Backup Policy](#). The backup files that have expired will be deleted.
- **Manual full backups**
You can manually delete manual backups. For details, see [Deleting a Manual Backup](#).

8.3 How Can I Back Up a GaussDB(for MySQL) Database to an ECS?

You can back up data to an ECS in the same way you export SQL statements. The ECS service does not have restrictions on the types of data to be backed up as

long as the data complies with local laws and regulations. You can store backup data on an ECS.

You are advised to store the data to OBS for higher data reliability and service assurance.

8.4 How Do I View My Backup Storage Usage?

In the **Storage/Backup Space** area of the **Basic Information** page on the console, you can view the backup space usage.

Procedure



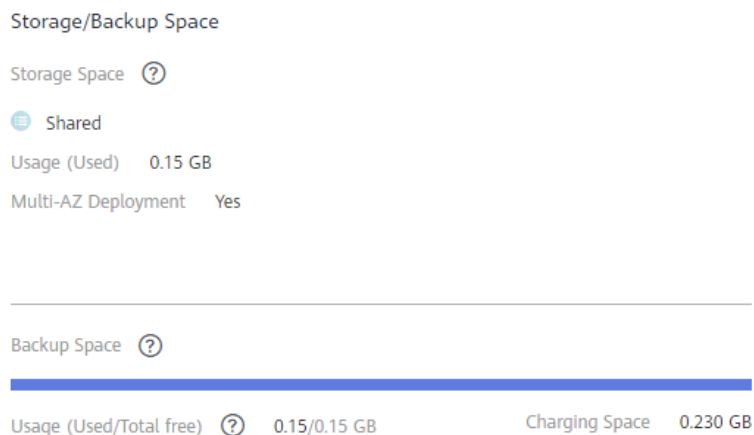
- Step 1** Log in to the management console.
- Step 2** Click  in the upper left corner and select a region and a project.
- Step 3** Click  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.
- Step 4** On the **Instances** page, click the instance name to go to the **Basic Information** page.
- Step 5** On the **Basic Information** page, view the backup space usage in the **Backup Space** area.

Figure 8-1 Viewing backup space



NOTE

There are data and binlog backups of an instance in the backup space.

Free backup storage space of the same size as your purchased storage space are provided.

----End

8.5 Why Has My Automated Backup Failed?

Automated backups may fail for the following reasons:

1. The network environment is unstable due to issues such as network delay or interruption. GaussDB(for MySQL) will detect these problems and trigger another automated backup half an hour later. You can also perform a manual backup before then.
2. Multi-task executions are complicated, resulting in problems such as task waiting or interruptions. GaussDB(for MySQL) will detect these problems and trigger another automated backup half an hour later. You can also perform a manual backup.
3. An instance is unavailable, possibly because the instance is faulty or being modified. GaussDB(for MySQL) will trigger an automated backup when the instance status becomes available. You can also perform a manual backup before then.
4. A parameter is changed incorrectly. For example, an instance may become faulty after a parameter template containing incorrect parameters was applied to it. You can check whether original and current values are correct, check whether any related parameters also need to be changed, reset the parameter template, or reboot the instance.
5. An error occurred during data import.
If system catalog records get lost due to improper data import, you can use DRS to import the data again.
6. If the issue persists, contact technical support.

8.6 How Is GaussDB(for MySQL) Backup Data Billed?

All the GaussDB(for MySQL) backups are stored on OBS without occupying the storage of your DB instances. GaussDB(for MySQL) provides free backup space of the same size as your purchased storage.

The lifecycle of automated backups is the same as that of the DB instance. If you delete a DB instance, its automated backups are also deleted, but manual backups will not be automatically deleted.

For example, if you purchase a DB instance with 200 GB of storage, you can get an additional 200 GB of backup space and are only charged for backups in excess of 200 GB. The first 200 GB of backup data is free. When the 200 GB storage is used up, the backups will be billed on a pay-per-use basis.

NOTICE

If your storage is frozen, it is no longer charged and the free backup space is also unavailable.

If your DB instance is frozen, no free backup space is available. As a result, the original automated backups of the DB instance will be charged.



- If you unfreeze the DB instance, the free backup space will be restored.
 - If you directly delete the frozen DB instance, its automated backups will also be deleted and the backup space will not be charged any longer.
-

9 Database Parameter Modification

9.1 How Can I Change the Time Zone?

GaussDB(for MySQL) allows you to select a time zone when you create an instance and change the time zone after the instance is created.

Procedure

- 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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.
 - Step 4** On the **Instances** page, click the instance name.
 - Step 5** In the navigation pane on the left, choose **Parameters**.
 - Step 6** Search for a time zone parameter in the search box, for example, **time_zone**.
 - Step 7** Select a time zone, and click **Save**.
 - Step 8** In the displayed dialog box, click **OK**.
- End

9.2 How Do I Configure a Password Expiration Policy for GaussDB(for MySQL) Instances?

In GaussDB(for MySQL) 8.0, you can configure the global variable **default_password_lifetime** to control the default validity period of a user password.

The value of **default_password_lifetime** indicates how many days until a password expires. The default value is **0**, indicating that the created user password will never expire.

```
mysql> show variables like 'default_password_lifetime';
+-----+-----+
| Variable_name | Value |
+-----+-----+
| default_password_lifetime | 0 |
+-----+-----+
1 row in set (0.00 sec)
```

Changing the Global Automatic Password Expiration Policy

- Change the value of the `default_password_lifetime` parameter on the GaussDB(for MySQL) console.
For details, see [Modifying a Parameter Template](#).
- Run the following command to change the value of `default_password_lifetime`:
`mysql> set global default_password_lifetime=0;`

Checking the Password Expiration Date of All Users

Run the following command:

```
mysql> select
user,host,password_expired,password_last_changed,password_lifetime from
user;
```

```
mysql> select user,host,password_expired,password_last_changed,password_lifetime from user;
+-----+-----+-----+-----+-----+
| user | host | password_expired | password_last_changed | password_lifetime |
+-----+-----+-----+-----+-----+
| mysql.session | localhost | N | 2020-01-17 15:02:23 | NULL |
| mysql.sys | localhost | N | 2020-01-17 15:02:23 | NULL |
| rdsAdmin | localhost | N | 2020-01-17 15:02:30 | 0 |
| root | % | N | 2020-03-05 14:23:54 | NULL |
| rdsRepl | 192.168.% | N | 2020-01-17 15:02:45 | 0 |
| rdsMetric | 192.168.% | N | 2020-01-17 15:02:30 | 0 |
| rdsBackup | localhost | N | 2020-01-17 15:02:30 | 0 |
| u_test01 | % | N | 2020-03-05 14:28:10 | 30 |
| u_test02 | % | N | 2020-03-05 14:28:38 | NULL |
| jeffrey | localhost | N | 2020-03-05 15:23:17 | NULL |
+-----+-----+-----+-----+-----+
10 rows in set (0.00 sec)
```

Checking the Password Expiration Policy of a Specified User

Run the following command:

```
mysql> show create user jeffrey@'localhost';
```

```
mysql> show create user jeffrey@'localhost';
+-----+-----+
| CREATE USER for jeffrey@localhost |
| CREATE USER 'jeffrey'@'localhost' IDENTIFIED WITH 'mysql_native_password' AS '*1369F151659FC90255853119A9CBB0554D80D7F' REQUIRE NONE PASSWORD EXPIRE DEFAULT ACCOUNT UNLOCK |
+-----+-----+
1 row in set (0.00 sec)
```

`EXPIRE DEFAULT` indicates that the password follows the global expiration policy.

Configuring the Password Expiration Policy for a Specified User

- Configuring the password expiration policy during user creation
`create user 'script'@'localhost' identified by '*****' password expire interval 90 day;`

- Configuring the password expiration policy after user creation
ALTER USER 'script'@'localhost' PASSWORD EXPIRE INTERVAL 90 DAY;
- Setting the password to be permanently valid
mysql> CREATE USER 'mike'@'%' PASSWORD EXPIRE NEVER;
mysql> ALTER USER 'mike'@'%' PASSWORD EXPIRE NEVER;
- Setting the password to follow the global expiration policy
mysql> CREATE USER 'mike'@'%' PASSWORD EXPIRE DEFAULT;
mysql> ALTER USER 'mike'@'%' PASSWORD EXPIRE DEFAULT;

9.3 How Do I Ensure that the Database Character Set of a GaussDB(for MySQL) Instance Is Correct?


UTF-8 supports 4 byte characters, but GaussDB(for MySQL) utf8 supports only 3 byte characters. Emojis and newly added Unicode characters cannot be stored using MySQL utf8 character set. MySQL released the utf8mb4 character set in 2010 and added the utf8mb4 code after 5.5.3 to be compatible with the 4-byte unicode. You only need to change utf8 to utf8mb4. No other conversion is required.

Data Admin Service (DAS) is a professional database management tool. You can view the database and system character sets through the DAS console.

Procedure

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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.

Step 4 On the **Instances** page, locate the instance and click **Log In** in the **Operation** column.

Alternatively, on the **Instances** page, click the instance name to go to the **Basic Information** page. Click **Log In** in the upper right corner of the page.

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

Step 6 On the top menu bar, choose **SQL Operations > SQL Window**.

Step 7 Run the following SQL statement in the SQL window to view the database character set:

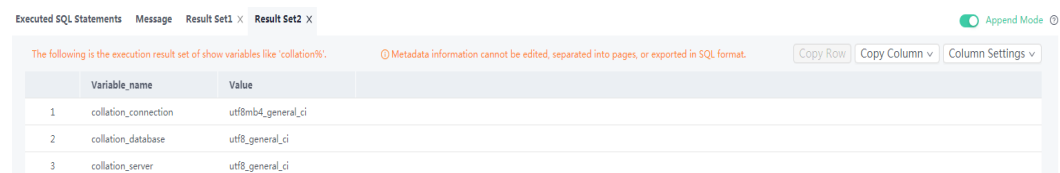
```
show variables like '%character%';
```


Figure 9-1 SQL execution result

The screenshot shows a SQL execution result window with the following table:

Variable_name	Value
character_set_client	utf8mb4
character_set_connection	utf8mb4
character_set_database	utf8
character_set_filesystem	binary
character_set_results	
character_set_server	utf8
character_set_system	utf8
character_sets_dir	/usr/local/mysql-5.7.27...

Step 8 Run the following SQL statement in the SQL window to view the database coding:
show variables like 'collation%';

Figure 9-2 SQL execution result

The screenshot shows a SQL execution result window with the following table:

Variable_name	Value
collation_connection	utf8mb4_general_ci
collation_database	utf8_general_ci
collation_server	utf8_general_ci

Step 9 Change the character set to utf8mb4.

1. Run the following SQL statement to change the database character sets.
ALTER DATABASE *DATABASE_NAME* DEFAULT CHARACTER SET utf8mb4 COLLATE utf8mb4_general_ci;
2. Run the following SQL statement to change the table character sets.
ALTER TABLE *TABLE_NAME* DEFAULT CHARACTER SET utf8mb4 COLLATE utf8mb4_general_ci;

 **NOTE**

The SQL statement just changes the character sets of tables. The character sets of fields in the tables are not changed.

3. Run the following SQL statement to change all the field character sets in tables:

ALTER TABLE *TABLE_NAME* CONVERT TO CHARACTER SET utf8mb4 COLLATE utf8mb4_general_ci;

 **NOTE**

- **character_set_client**, **character_set_connection**, and **character_set_results** are the settings of the client.
- **character_set_system**, **character_set_server**, and **character_set_database** are the settings of the server.
- The priorities of the parameters on the server are as follows: **character_set_database** > **character_set_server** > **character_set_system**.



----End

9.4 How Do I Use the utf8mb4 Character Set to Store Emojis in a GaussDB(for MySQL) Instance?

To store emoji in a GaussDB(for MySQL) instance, ensure that:

- The client outputs the utf8mb4 character set.
- The connection supports the utf8mb4 character set. If you want to use a JDBC connection, download MySQL Connector/J 5.1.13 or a later version and leave **characterEncoding** undefined for the JDBC connection string.
- Configure the instance as follows:
 - Setting **character_set_server** to **utf8mb4**

Parameter Name	Effective upon Reboot	Value	Allowed Values	Description
character_set_server	Yes	utf8mb4	utf8, latin1, gbk, utf8mb4	The server's default character set.

- Log in to the management console.
 - Click  in the upper left corner and select a region and a project.
 - Click  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.
 - On the **Instances** page, click the instance name.
 - In the navigation pane on the left, choose **Parameters**. On the **Parameters** tab page, locate **character_set_server** and change its value to **utf8mb4**.
 - Click **Save**. In the displayed dialog box, click **Yes**.
- Setting the character set of the table to **utf8mb4**

```
([...]) [ ... ]> create table emoji_01 (id int auto_increment primary key, content varchar(255)) default charset utf8mb4;
Query OK, 0 rows affected (0.01 sec)

([...]) [ ... ]> show create table emoji_01 \G
***** 1. row *****
Table: emoji_01
Create Table: CREATE TABLE 'emoji_01' (
  'id' int(11) NOT NULL AUTO INCREMENT,
  'content' varchar(255) DEFAULT NULL,
  PRIMARY KEY ('id')
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4
1 row in set (0.00 sec)
```

FAQs

If you have set **characterEncoding** to **utf8** for the JDBC connection string, or the emoji data cannot be inserted properly after you have performed the above operations, you are advised to set the connection character set to **utf8mb4** as follows:

```
String query = "set names utf8mb4";
stat.execute(query);
```

9.5 How Do I Set Case Sensitivity for GaussDB(for MySQL) Table Names?

You can specify case sensitivity for table names when creating an instance on the console or using APIs. It cannot be changed after the instance is created.

- Set **Table Name Case Sensitivity** on the console.

Figure 9-3 Configuring case sensitivity for table names



The screenshot shows a web interface for configuring database parameters. At the top, there are fields for 'Administrator' (root) and 'Administrator Password' (with a note: 'Keep your password secure. The system cannot retrieve your password.'). Below that is a 'Confirm Password' field. A horizontal separator line follows. Underneath, there is a 'Parameter Template' dropdown menu set to 'Default-GaussDB-for-MySQL 8.0' with a 'View Parameter Template' link. The 'Table Name' section has two radio buttons: 'Case sensitive' (unselected) and 'Case insensitive' (selected), with a note: 'This option cannot be changed later.' Below this is an 'Enterprise Project' dropdown menu set to '--Select--' with a 'Create Enterprise Project' link.

- Set **lower_case_table_names** by invoking an API.
Value range:
 - **0**: Table names are case sensitive.
 - **1** (default value): Table names are stored in lowercase and are case insensitive.

9.6 Can I Use SQL Commands to Modify Global Parameters?

Sorry, you cannot use SQL commands to modify global parameters, but you can modify specific parameters on the console.

Procedure

- 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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.
- Step 4** On the **Instances** page, click the target DB instance.
- Step 5** In the navigation pane on the left, choose **Parameters**.
- Step 6** Change the value of the target parameter and click **Save**.
- Step 7** In the displayed dialog box, click **OK**.

----End

10 Network Security

10.1 What Security Assurance Measures Does GaussDB(for MySQL) Have?

Network

- GaussDB(for MySQL) allows you to configure your instances in a VPC, ensuring that the instances are isolated from other services.
- GaussDB(for MySQL) uses security groups to ensure that only trusted sources can access your instances.
- GaussDB(for MySQL) supports SSL connections to encrypt data during transmission.

Management

You can use the Identity and Access Management (IAM) to manage GaussDB(for MySQL) permissions.

10.2 How Can I Prevent Untrusted Source IP Addresses from Accessing GaussDB(for MySQL)?

- If you enable public accessibility, your EIP DNS and database port may be vulnerable to hacking. To protect information such as your EIP, DNS, database port, database account, and password, you are advised to specify the range of source IP addresses in the GaussDB(for MySQL) security group to ensure that only trusted source IP addresses can access your instances.
- To prevent your database password from being cracked, specify a strong password and periodically change it.

10.3 How Do I Configure a Security Group to Enable Access to a GaussDB(for MySQL) Instance?

- When you attempt to connect to a GaussDB(for MySQL) instance through a private network, check whether the ECS and GaussDB(for MySQL) instance are in the same security group.
 - If the ECS and GaussDB(for MySQL) instance are in the same security group, they can communicate with each other by default. No security group rules need to be configured.
 - If the ECS and GaussDB(for MySQL) instance are in different security groups, configure security group rules for the ECS and instance, respectively.
 - Instance: Configure an **inbound rule** for the security group to which the instance is associated.
 - ECS: The default security group rule allows all outbound 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 may need to configure an outbound rule for the ECS to allow all outbound packets.
- When you attempt to access an instance through an EIP, you need to configure an **inbound rule** for the security group associated with the instance.

10.4 How Can I Import the Root Certificate to a Windows or Linux Server?

Importing the Root Certificate to a Windows Server

1. Click **Start** and choose **Run**. In the displayed **Run** dialog box, enter **MMC** and press **Enter**.
2. On the displayed console, choose **File > Add/Remove Snap-in**.
3. In the left **Available snap-ins** pane of the displayed dialog box, select **Certificates**. Click **Add** to add the certificate.
4. In the displayed **Certificates snap-in** dialog box, select **Computer account** and click **Next**.
5. In the displayed **Select Computer** dialog box, click **Finish**.
6. In the **Add or Remove Snap-ins** dialog box, click **OK**.
7. On the console, double-click **Certificates**.
8. Right-click **Trusted Root Certification Authorities** and choose **All Tasks > Import**.
9. Click **Next**.
10. Click **Browse** to change the file type to **All Files (*.*)**.
11. Locate the downloaded root certificate (a **ca.pem** file) and click **Open**. Then, click **Next**.

NOTICE

You must change the file type to **All Files (*.*)** because **.pem** is not a standard certificate extension name.

12. Click **Next**.
13. Click **Finish**.
14. Click **OK** to complete the import of the root certificate.

Importing the Root Certificate to a Linux Server

You can use a connection tool (such as WinSCP or PuTTY) to upload the certificate to any directory on a Linux Server.

10.5 How Do I Manage and Ensure GaussDB(for MySQL) Security?

For security reasons, do not use the username and password of your account. We recommend that you create IAM users and other users (if necessary) for your database users.

An error may occur if you do not have sufficient permissions or your account configuration is incorrect. For example, you fail to create instances if you do not have the permissions to do so. If required, contact your IAM administrator to assign the permissions

11 Log Management

11.1 How Do I View All SQL Logs Executed by GaussDB(for MySQL)?

You can use the visualized database management service Data Admin Service (DAS) to quickly search for target SQL execution records.

Querying SQL Logs Through DAS



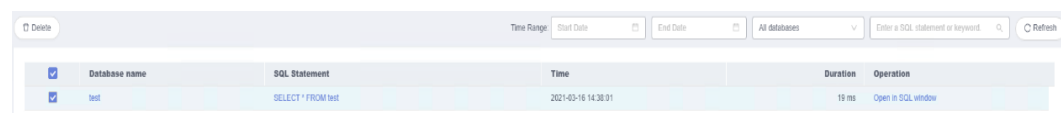
- Step 1** Log in to the management console.
- Step 2** Click  in the upper left corner and select a region and a project.
- Step 3** Click  in the upper left corner of the page, choose **Database** > **GaussDB(for MySQL)**.
- Step 4** On the **Instances** page, locate the instance you want to log in and click **Log In** in the **Operation** column.
- Step 5** On the displayed login page, enter the correct username and password and click **Log In**.
- Step 6** On the top menu bar, choose **SQL Operations** > **SQL History**.
- Step 7** On the displayed page, search for execution information about the target SQL statement by time range, database name, or keyword.

Figure 11-1 SQL history



Database name	SQL Statement	Time	Duration	Operation
test	SELECT * FROM test	2021-05-16 14:38:01	18 ms	Open in SQL window

- To access the **Database Management** page, click a database name.
- To copy and use a SQL statement, click it in the **SQL Statement** column.

- To execute a SQL statement, locate the statement and click **Open in SQL Window** in the **Operation** column.


----End

11.2 How Do I View Slow Query Logs of GaussDB(for MySQL)?

Viewing Log Details

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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.

Step 4 On the **Instances** page, click the instance name to go to the **Basic Information** page.

Step 5 In the navigation pane on the left, choose **Logs**.

Step 6 On the **Slow Query Logs** page, view the slow query log details.

You can view the slow query log records of a specified execution statement type or a specific time period.


----End

11.3 How Do I Enable and View Binlog of My GaussDB(for MySQL) Instance?

Enabling Binlog

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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.

Step 4 Click the instance name to go to the **Basic Information** page.

Step 5 In the navigation pane on the left, choose **Parameters**.

Step 6 Enter **log-bin** in the search box and click the search button. Locate the displayed parameter, select **ON** from the **Value** drop-down list. Click **Save** above the parameter list.

Step 7 Reboot the instance for the modification to take effect.

----End

Viewing Binlog Files

Step 1 Connect to an instance.

Step 2 Run the following command to view binlog files:

```
SHOW BINLOG EVENTS [IN 'log_name'] [FROM pos] [LIMIT [offset,] row_count];
```

 **NOTE**

If a message indicating that the account permissions are insufficient, use the **root** account.

----End

Impact of Enabling Binlog on GaussDB(for MySQL) Performance

Enabling binlog does not affect SELECT operations, but affects INSERT, UPDATE, DELETE and other write operations.

 **NOTE**

There are no significant differences between GaussDB(for MySQL) binlog and open-source MySQL binlog. The binlog syntax of GaussDB(for MySQL) is fully compatible with that of the open-source MySQL.


11.4 How Do I Change the Binlog Retention Period?

GaussDB(for MySQL) is compatible with the **binlog_expire_logs_seconds** parameter of community version 8.0. You can change binlog retention period using this parameter.

Procedure

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  in the upper left corner of the page, choose **Database > GaussDB(for MySQL)**.

Step 4 On the **Instances** page, click the instance name to go to the **Basic Information** page.

Step 5 In the navigation pane on the left, choose **Parameters**. On the **Parameters** tab, search for the parameter **log-bin** and change its value to **ON** (indicating that binlog is enabled).

Step 6 On the **Parameters** tab, configure **binlog_expire_logs_seconds**.

 **NOTE**

- When a new binlog file is generated, any existing binlog files that have expired will be deleted.
- If no new binlog file is generated, historical binlog files will not be deleted even if they have expired. To delete binlog files manually, connect to the database and run **flush logs;** to forcibly generate a new binlog file.

----End

12 Version Upgrade

12.1 How Can I Check a GaussDB(for MySQL) Instance Version?

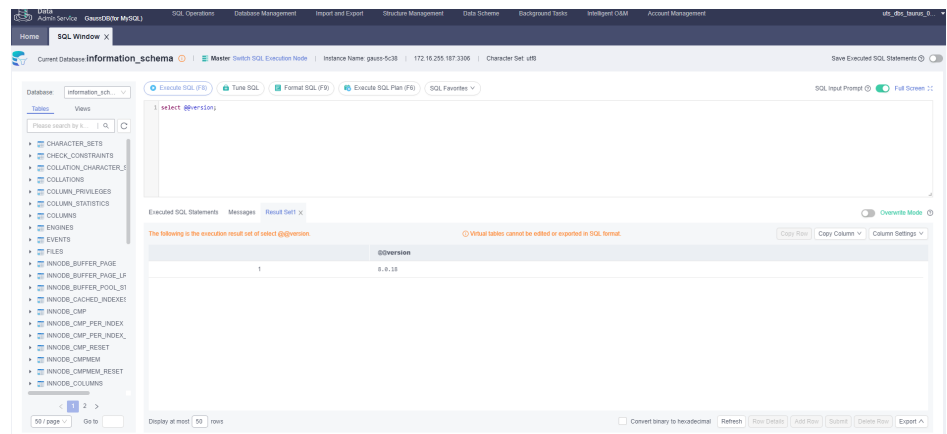
- On the **Basic Information** page of the target instance, view the instance version.

Figure 12-1 Viewing instance basic information

DB Instance Information			
DB Instance Name	gauss ✎ 🔗	DB Instance ID	bf10ede6894043d9a029136cc3db31e4in07 🔗
Status	● Available	Nodes	2
DB Engine Version	MySQL 8.0 Upgrade	Time Zone	UTC+08:00
Instance Class	gaussdb.mysql.2xlarge.x86_4 8 vCPUs 32 GB Change	Region	Beijing4
AZ Type	Single-AZ	Primary AZ	cn-north-4b
Administrator	root Reset Password	SSL	Certificate ↓
Maintenance Window	🔔 02:00 – 06:00 Change	Enterprise Project	default

- On the DAS console, perform the following steps to view the version of the target instance:
 - a. Log in to the target instance.
 - b. On the top menu bar, choose **SQL Operations > SQL Query**.
 - c. Run **select @@version;** to view the version of the instance.

Figure 12-2 Viewing the instance version



A Change History

Released On	Description
2023-04-18	<p>This issue is the second official release, which incorporates the following changes:</p> <ul style="list-style-type: none">• Added How Do I Ensure that the Database Character Set of a GaussDB(for MySQL) Instance Is Correct?• Added How Do I View All SQL Logs Executed by GaussDB(for MySQL)?• Added How Can I Check a GaussDB(for MySQL) Instance Version?
2023-02-28	<p>This issue is the first official release.</p>