Data Replication Service

Service Overview

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2 What Is DRS?

Data Replication Service (DRS) is an easy-to-use, stable, and efficient cloud service for online database migration and real-time database synchronization.

It simplifies data transfers between databases and reduces data transfer costs.

You can use DRS to quickly transmit data between different DB engines.

DRS provides multiple functions, including real-time migration, backup migration, real-time synchronization, data subscription, and real-time disaster recovery.

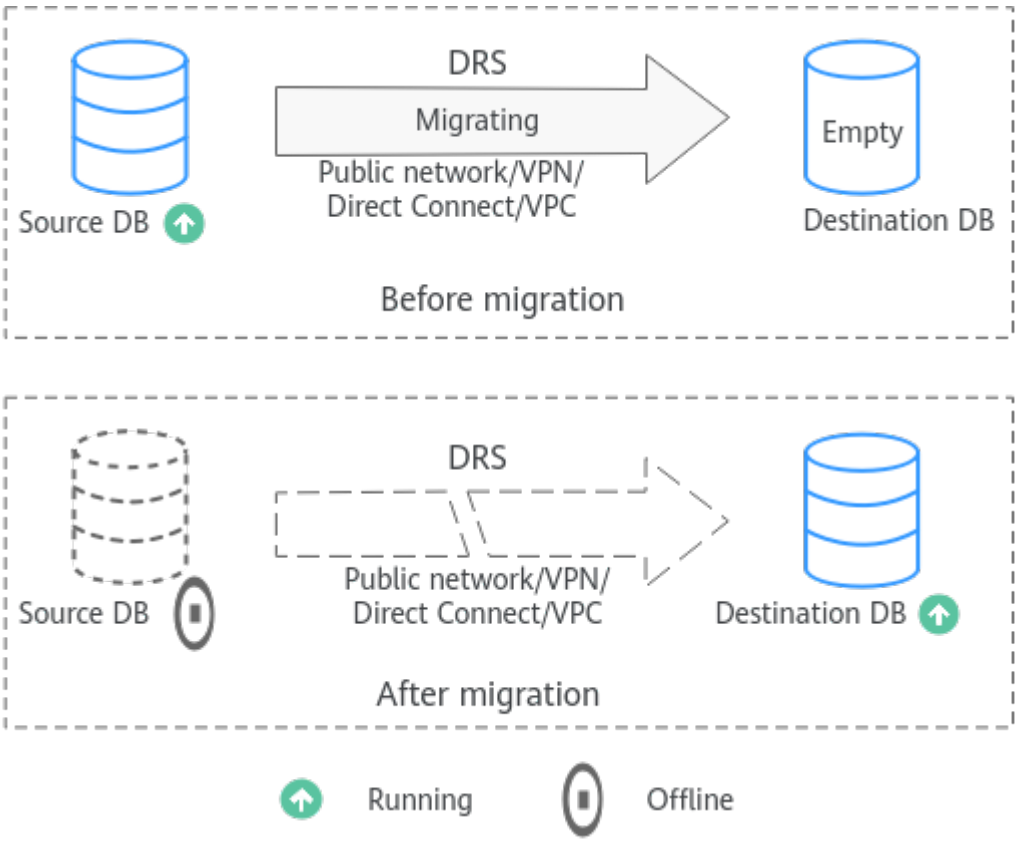
Real-Time Migration

With DRS, you can migrate data from sources to destinations in real time. You 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 source and destination, so you can determine the best time to switch to the destination database while minimizing service downtime.

Real-time migration can be performed over different networks, such as public networks, VPCs, VPNs, and Direct Connect. With these network connections, you can migrate between different cloud platforms, from on-premises databases to cloud databases, or between cloud databases across regions.

DRS supports incremental migration, so you can replicate ongoing changes to keep sources and destinations in sync while minimizing the impact of service downtime and migration.

Figure 2-1 Real-time migration process



Backup Migration

It often becomes necessary to hide the real IP address of your database for the sake of security. Migrating data through direct connections is an option, but costly. DRS supports backup migration, which allows you to export data from your source database for backup and upload the backup files to OBS. Then, you can restore the backup files to the destination database to complete the migration. Using this method, data migration can be realized without exposing your source databases.

You can use backup migration when you want to migrate on-premises databases to the cloud.

Without connecting to your sources, DRS can help you complete data migration.

Figure 2-2 Backup migration process

Real-Time Synchronization

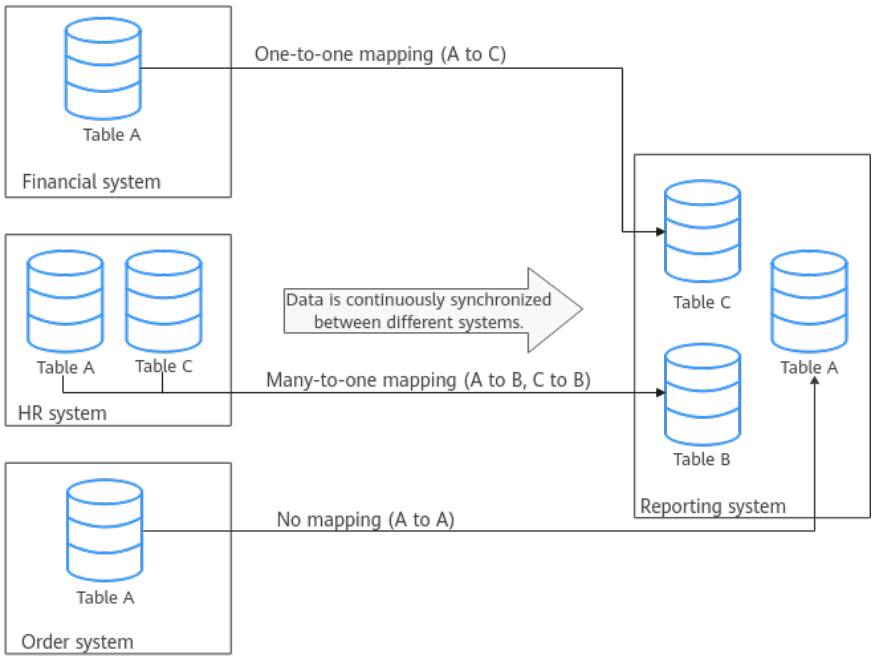
Real-time synchronization refers to the real-time flow of key service data from sources to destinations while consistency of data can be ensured.

It is different from migration. Migration means moving your overall database from one platform to another. Synchronization refers to the continuous flow of data between different services.

You can use real-time synchronization in many scenarios such as real-time analysis, report system, and data warehouse environment.

Real-time synchronization is mainly used for synchronizing tables and data. It can meet various requirements, such as many-to-one, one-to-many synchronization, dynamic addition and deletion of tables, and synchronization between tables with different names.

Figure 2-3 Many-to-one real-time synchronization process



Data Subscription

With DRS, you can subscribe changes made to key services in a database for downstream services to consume. DRS caches the changes and uses a unified SDK API to facilitate downstream services to subscribe to, obtain, and consume the changes, decoupling databases from downstream systems.

Data subscription can be used by Kafka to subscribe to MySQL incremental data.

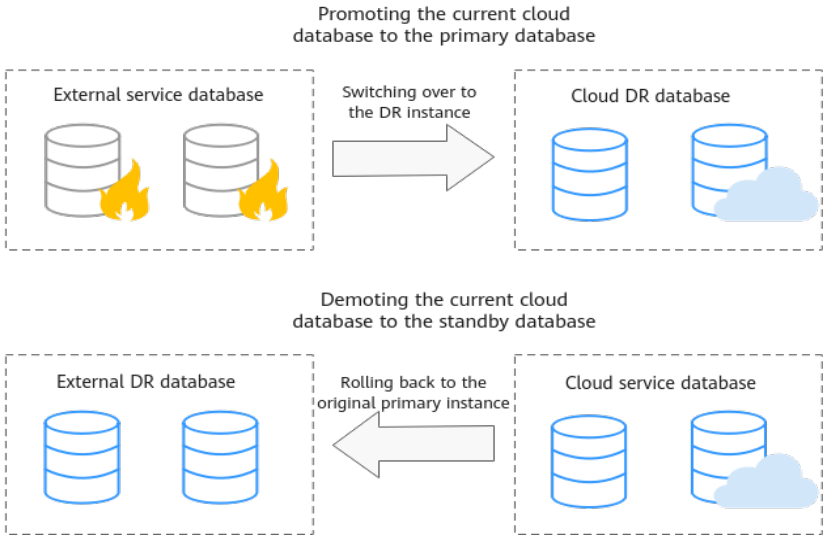
Figure 2-4 Data subscription

Real-Time Disaster Recovery

To prevent service unavailability caused by regional faults, DRS provides disaster recovery to ensure service continuity. You can easily implement disaster recovery between on-premises and cloud, without the need to invest a lot in infrastructure in advance.

The disaster recovery architectures, such as two-site three-data-center and two-site four-data center, are supported. A primary/standby switchover can be implemented by promoting a standby node or demoting a primary node in the disaster recovery scenario.

Figure 2-5 Real-time DR switchover



Workload Replay

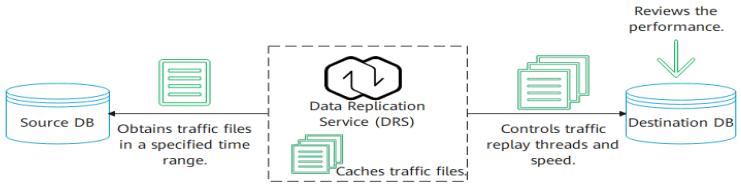
A workload replay task simulates the service load of the source database on the destination database so you can evaluate the effectiveness and performance of the destination database.

A task consists of SQL recording and replay. All of the SQL statements (create, delete, update, and query operations) executed in the required period on the source database will be downloaded by a recording tool from the binlog, and then cached and injected into the destination database where you can trigger a replay and review performance.

Typical Scenarios

- By creating a workload replay task, you can evaluate how the service load of the source database runs on the destination database.
- By specifying the replay thread and speed, you can simulate the peak service load of the source database and analyze the stability of the destination database when workloads increase sharply.

Figure 2-6 Workload replay



3 Supported Databases

DRS supports data flows between different DB engines. This section lists the supported databases in real-time migration, backup migration, real-time synchronization, data subscription, and real-time DR.

Real-Time Migration

You can migrate all database objects across cloud platforms, from on-premises databases to the cloud, or across regions on the cloud in real time. The following table lists the supported databases, versions, and migration types. For more information about real-time migration, see **Real-Time Migration**.

Self-managed databases (such as MySQL and MongoDB) include on-premises databases and databases created on an ECS. RDS for MySQL refers to the MySQL databases on Huawei Cloud RDS instances.

NOTE

- Some functions are only available for whitelisted users. To use these functions, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.
- Data cannot be migrated from a newer version database to an older version database.

- MySQL Serving as the Source in Migration

Table 3-1 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
MySQL	• Self-managed MySQL Versions 5.5, 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.5, 5.6, 5.7, and 8.0	RDS for MySQL All versions	Full Full+Incremental
		DDM The same version as that of the associated RDS instance.	Full Full+Incremental
		GaussDB(for MySQL) Compatible with MySQL 8.0	Full Full+Incremental
	RDS for MySQL All versions	RDS for MySQL All versions	Full Full+Incremental
		Self-managed or other cloud MySQL Versions 5.5, 5.6, 5.7, and 8.0	Full Full+Incremental
		DDM The same version as that of the associated RDS instance.	Full Full+Incremental
		GaussDB(for MySQL) Compatible with MySQL 8.0	Full Full+Incremental

- MongoDB Serving as the Source in Migration

Table 3-2 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
MongoDB	• Self-managed MongoDB Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • MongoDB on other clouds Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • DDS Versions 3.2, 3.4, 4.0, 4.2, and 4.4 **NOTE** • The source does not support GeminiDB Mongo.	DDS Versions 3.4, 4.0, 4.2, and 4.4	Full Full+Incremental migration supports the following scenarios: • Replica set -> Replica set • Replica set -> Cluster • Cluster -> Cluster **NOTE** • If the source is a DDS cluster instance, the incremental migration can only be performed in the VPC network. • To perform a full +incremental migration for a single node instance, the source database must be a Huawei Cloud single node instance.

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
MongoDB	• Self-managed MongoDB Versions 3.2, 3.4, and 4.0 • MongoDB on other clouds Versions 3.2, 3.4, and 4.0 • DDS Versions 3.4 and 4.0 **NOTE** • The source does not support GeminiDB Mongo.	GeminiDB Mongo Versions 3.4 and 4.0	Full Full+Incremental migration supports the following scenarios: • Replica set -> Replica set • Replica set -> Cluster • Cluster -> Cluster **NOTE** If the source is a DDS cluster, only full migration is supported.

- DDS Serving as the Source in Migration

  Table 3-3 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
DDS	DDS Versions 3.2, 3.4, 4.0, 4.2, and 4.4	• Self-managed MongoDB Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • MongoDB on other clouds Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4	Full Full+Incremental migration supports the following scenarios: • Replica set -> Single node • Replica set -> Replica set • Replica set -> Cluster • Single node -> Single node • Single node -> Replica set • Single node -> Cluster

- MySQL Schema and Logic Table Serving as the Source in Migration

Table 3-4 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
MySQL schema and logic table	DDM	DDM	Full Full+Incremental

- Redis Serving as the Source in Migration

Table 3-5 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
Redis	Self-managed official open-source single-node or primary/standby Redis Versions 2.8.x, 3.0.x, 3.2.x, 4.0.x, and 5.0.x	GeminiDB Redis	Full Full+Incremental

- Cluster Redis Serving as the Source in Migration

Table 3-6 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
Cluster Redis	• On-premises open-source cluster Redis Versions 3.0.x, 4.0.x, and 5.0.x • ECS-hosted open-source cluster Redis Versions 3.0.x, 4.0.x, and 5.0.x	GeminiDB Redis **NOTE** Only whitelisted users can use this function.	Full+Incremental

- **GeminiDB Redis Serving as the Source in Migration**

Table 3-7 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Migration Type
GeminiDB Redis	GeminiDB Redis	• Self-managed open-source Codis Version 3.0 or later • Self-managed open-source single-node Redis Versions 2.8.x, 3.0.x, 3.2.x, 4.0.x, and 5.0.x • Self-managed open-source master/standby Redis Versions 4.0.x and 5.0.x	Full+Incremental
	GeminiDB Redis	• Self-managed open-source cluster Redis Version 4.0 or later	Full+Incremental

Backup Migration

You can export data from the source database to a backup file, upload the backup file to OBS, and then restore the backup file to the destination database. In this way, data migration can be complete without exposing your source database to the Internet. **Table 3-8** lists the supported databases, versions, and migration types. For more information about backup migration, see **Backup Migration**.

NOTE

Data cannot be migrated from a newer version database to an older version database.

Table 3-8 Database information

Backup File Version	Destination DB Version	Migration Method	Backup File Source
On-premises and cloud Microsoft SQL Server backup file versions: • Microsoft SQL Server 2000 • Microsoft SQL Server 2005 • Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019	RDS for SQL Server • Microsoft SQL Server 2008 (Existing version) • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019	Full Incremental	OBS bucket RDS full backup
RDS for SQL Server full backup file versions: • Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019		Full Incremental	OBS bucket RDS full backup

Real-Time Synchronization

Real-time synchronization refers to the process of copying data from one data source to another database while keeping data consistency. In this way, the data of key services can flow in real time. The following table lists the supported databases, versions, and synchronization types. For more information about real-time synchronization, see **Real-Time Synchronization**.

Self-managed databases (such as MySQL, Oracle, and PostgreSQL) include on-premises databases and databases created on an ECS. RDS for MySQL refers to the MySQL databases on Huawei Cloud RDS instances.

NOTE

- Some functions are only available for whitelisted users. To use these functions, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.
- Data cannot be migrated from a newer version database to an older version database.

- MySQL Serving as the Source in Synchronization

Table 3-9 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
MySQL	• Self-managed MySQL Versions 5.5, 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.5, 5.6, 5.7, and 8.0	RDS for MySQL All versions	Incremental Full Full+Incremental
		GaussDB(for MySQL) Version 8.0	Incremental Full+Incremental
		RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, and 14	Full Full+Incremental
		GaussDB distributed Version 1.0.0 or later	Incremental Full Full+Incremental
		GaussDB primary/ standby Version 1.0.0 or later	Incremental Full Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Incremental Full Full+Incremental
		Kafka Version 0.11 or later	Incremental Full+Incremental
		RDS for MariaDB Version 10.5 **NOTE** Only whitelisted users can use this function.	Incremental Full Full+Incremental

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
		CSS/ES ElasticSearch 5.5, 6.2, 6.5, 7.1, 7.6, 7.9 and 7.10	Full+Incremental
	RDS for MySQL All versions	RDS for MySQL All versions	Incremental Full+Incremental
		• Self-managed MySQL Versions 5.5, 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.5, 5.6, 5.7, and 8.0	Incremental Full+Incremental
		GaussDB(for MySQL) Version 8.0	Incremental Full+Incremental
		RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, and 14	Full Full+Incremental
		GaussDB distributed Version 1.0.0 or later	Incremental Full Full+Incremental
		GaussDB primary/standby Version 1.0.0 or later	Incremental Full Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Incremental Full Full+Incremental
		Kafka Version 0.11 or later	Incremental Full+Incremental

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
		• Self-managed MariaDB Version 10.0, 10.1, 10.2, 10.3, 10.4, or 10.5 • MariaDB on other clouds Version 10.0, 10.1, 10.2, 10.3, 10.4, or 10.5 **NOTE** Only whitelisted users can use this function.	Incremental Full Full+Incremental
		CSS/ES ElasticSearch 5.5, 6.2, 6.5, 7.1, 7.6, 7.9 and 7.10	Full+Incremental
		Self-managed Oracle Versions 10g, 11g, 12c, 18c, and 19c	Full+Incremental

- MariaDB Serving as the Source in Synchronization

  Table 3-10 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
MariaDB	• On-premises MariaDB 10.3, 10.4, and 10.5 • ECS-hosted MariaDB 10.3, 10.4, and 10.5 • Other cloud MariaDB 10.3, 10.4, and 10.5	RDS for MariaDB Version 10.5	Full+Incremental

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
	RDS for MariaDB Version 10.5	• On-premises MariaDB Version 10.5 • MariaDB built on ECSs Version 10.5 • MariaDB built on other clouds Version 10.5	Full+Incremental
MariaDB	• On-premises MariaDB 10.0, 10.1, 10.2, 10.3, 10.4 and 10.5 • ECS-hosted MariaDB 10.0, 10.1, 10.2, 10.3, 10.4 and 10.5 • MariaDB 10.0, 10.1, 10.2, 10.3, 10.4 and 10.5 on other clouds	RDS for MySQL Versions 5.6, 5.7, and 8.0 **NOTE** Only whitelisted users can use this function.	Incremental Full+Incremental
		GaussDB(for MySQL) Version 8.0 **NOTE** Only whitelisted users can use this function.	Incremental Full+Incremental

- PostgreSQL Serving as the Source in Synchronization

Table 3-11 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
PostgreSQL	• Self-managed PostgreSQL Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, 14, and 15 • PostgreSQL on other clouds Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, 14, and 15 • RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, 14, and 15	RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, 14, and 15	Incremental Full Full+Incremental
	• Self-managed PostgreSQL Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, and 14 • PostgreSQL on other clouds Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, and 14 • RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, and 14	GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full+Incremental
		GaussDB primary/ standby	Incremental Full Full+Incremental **NOTE** Only whitelisted users can perform the incremental data synchronization.
		GaussDB distributed	Incremental Full Full+Incremental **NOTE** Only whitelisted users can perform the incremental data synchronization.

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
	RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, and 14	Kafka Version 0.11 or later	Incremental
	RDS for PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, 14, and 15	Self-managed PostgreSQL Versions 9.5, 9.6, 10, 11, 12, 13, and 14	Incremental Full Full+Incremental
	• Self-managed PostgreSQL Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, and 14 • PostgreSQL on other clouds Versions 9.4, 9.5, 9.6, 10, 11, 12, 13, and 14	Kafka Version 0.11 or later	Incremental

- Oracle Serving as the Source in Synchronization

  Table 3-12 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
Oracle	Self-managed Oracle Versions 10g, 11g, 12c, 18c, 19c, and 21c	RDS for MySQL All versions	Incremental Full Full+Incremental
		GaussDB(for MySQL) Version 8.0	Full Full+Incremental
		RDS for PostgreSQL 9.5, 9.6, 10, 11, 12, 13, and 14	Full Full+Incremental

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
		GaussDB primary/ standby Version 1.0.0 or later	Incremental Full Full+Incremental
		GaussDB distributed Version 1.0.0 or later	Incremental Full Full+Incremental
		DDM	Full Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Incremental Full Full+Incremental
		Kafka Version 0.11 or later	Incremental

- DDM Serving as the Source in Synchronization

  Table 3-13 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
DDM	DDM	RDS for MySQL All versions	Incremental Full Full+Incremental
		Self-managed or other cloud MySQL Versions 5.6, 5.7, and 8.0	Incremental Full Full+Incremental
		DDM Based on the live network	Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full+Incremental
		Self-managed Oracle Versions 10g, 11g, 12c, 18c, and 19c	Incremental Full Full+Incremental

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
		Kafka Version 0.11 or later	Incremental

- GaussDB(for MySQL) Serving as the Source in Synchronization

  Table 3-14 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
GaussDB(for MySQL)	GaussDB(for MySQL) Version 8.0	• RDS for MySQL Version 8.0 • Self-managed or other cloud MySQL Version 8.0	Incremental Full+Incremental
		GaussDB(for MySQL) Version 8.0	Incremental Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full+Incremental
		Kafka Version 0.11 or later	Incremental Full+Incremental
		CSS/ES ElasticSearch 5.5, 6.2, 6.5, 7.1, 7.6, 7.9 and 7.10	Full+Incremental
		Self-managed Oracle Versions 10g, 11g, 12c, 18c, and 19c	Full+Incremental

- GaussDB Distributed Serving as the Source in Synchronization

Table 3-15 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
GaussDB distributed	GaussDB distributed Version 1.1.0 or later	RDS for MySQL Versions 5.6 and 5.7	Full Incremental Full+Incremental
		Self-managed or other cloud MySQL Versions 5.5, 5.6, and 5.7	Full Incremental Full+Incremental
		Self-managed Oracle Versions 10g, 11g, 12c, 18c, and 19c	Full Incremental Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full Incremental Full+Incremental **NOTE** Only whitelisted users can perform the full+incremental synchronization.
		Kafka Version 0.11 or later	Incremental
		GaussDB distributed Version 1.1.0 or later	Full Incremental Full+Incremental
		GaussDB primary/standby Version 1.1.0 or later	Full Incremental Full+Incremental

- GaussDB Primary/Standby Serving as the Source in Synchronization

Table 3-16 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
GaussDB primary/standby	GaussDB primary/standby Version 1.3 or later	RDS for MySQL Versions 5.6 and 5.7	Full Incremental Full+Incremental
		Self-managed or other cloud MySQL Versions 5.5, 5.6, and 5.7	Full Incremental Full+Incremental
		Self-managed Oracle Versions 10g, 11g, 12c, 18c, and 19c	Full Incremental Full+Incremental
		Kafka Version 0.11 or later	Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full Incremental Full+Incremental
		GaussDB distributed Version 1.1.0 or later	Full Incremental Full+Incremental
		GaussDB primary/standby Version 1.1.0 or later	Full Incremental Full+Incremental

- MongoDB Serving as the Source in Synchronization

Table 3-17 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
MongoDB	• Self-managed MongoDB Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • MongoDB on other clouds Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • DDS Versions 3.2, 3.4, 4.0, 4.2, and 4.4 **NOTE** The source does not support GeminiDB Mongo.	DDS Versions 3.4, 4.0, 4.2, and 4.4	Full+Incremental synchronization supports the following scenarios: • Replica set -> Replica set

- DDS Serving as the Source in Synchronization

Table 3-18 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
DDS	DDS Versions 3.2, 3.4, 4.0, 4.2, and 4.4	• Self-managed MongoDB Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4 • MongoDB on other clouds Versions 3.2, 3.4, 3.6, 4.0, 4.2, and 4.4	Incremental synchronization supports the following modes: Replica set -> Replica set Cluster -> Cluster (the source cluster version must be 4.0 or later)
	DDS Versions 4.0, 4.2, and 4.4	Kafka Version 0.11 or later	Incremental

- DB2 for LUW Serving as the Source in Synchronization

Table 3-19 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
DB2 for LUW	DB2 for LUW Versions 9.7, 10.1, 10.5, 11.1, and 11.5	GaussDB distributed Version 1.1.0 or later	Full Full+Incremental
		GaussDB primary/ standby Version 1.1.0 or later	Full Full+Incremental
		GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full Full+Incremental

- TiDB Serving as the Source in Synchronization

Table 3-20 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
TiDB	TiDB Version 4.0.0 and later (excluding the development version)	GaussDB(for MySQL) Version 8.0	Full+Incremental

- Microsoft SQL Server as the Source in Synchronization

Table 3-21 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version	Synchronization Mode
Microsoft SQL Server	• Self-managed Microsoft SQL Server Enterprise Edition 2012, 2014, 2016, 2017 and 2019 Standard Edition 2016 SP2 or later, 2017, and 2019 • Microsoft SQL Server on other clouds Enterprise Edition 2012, 2014, 2016, 2017 and 2019 Standard Edition 2016 SP2 or later, 2017, and 2019 • RDS for SQL Server Enterprise Edition 2012, 2014, 2016, 2017 and 2019 Standard Edition 2016 SP2 or later, 2017, and 2019	GaussDB(DWS) Versions 8.1.3 and 8.2.0	Full+Incremental
		GaussDB distributed Version 1.1.0 or later	Full Incremental Full+Incremental
		GaussDB primary/ standby Version 1.1.0 or later	Full Incremental Full+Incremental
		RDS for SQL Server • Enterprise Edition 2012, 2014, 2016, 2017 and 2019 • Standard Edition 2016 SP2 or later, 2017, and 2019 **NOTE** Only whitelisted users can use this function.	Full+Incremental
		Kafka Version 0.11 or later **NOTE** Only whitelisted users can use this function.	Incremental

Data Subscription

Data subscription is used to obtain data changes of key services in the database. DRS caches the data changes and provides a unified SDK interface for downstream services to subscribe to, obtain, and consume the changes. **Table 3-22** describes

the supported databases and data types. For details about data subscription, see **Data Subscription**.

Table 3-22 Database information

DB Engine	Data Type
RDS for MySQL Versions 5.6 and 5.7	• Data update • Structure update

Real-Time Disaster Recovery

To prevent service unavailability caused by regional faults, DRS provides disaster recovery to ensure service continuity. The floowing table lists the databases and versions supported by real-time DR. For more information about real-time DR, see **Real-Time Disaster Recovery**.

Self-managed databases (for example, MySQL) refer to on-premises databases and the databases created on an ECS. RDS for MySQL refers to the MySQL databases on Huawei Cloud RDS instances.

NOTE

- Some functions are only available for whitelisted users. To use these functions, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.
- Disaster recovery cannot be performed from a later version database to an earlier version database.

- MySQL Serving as the Source in DR

Table 3-23 Database information

Service DB Engine	Service DB Type and Version	DR DB Type and Version
MySQL	• Self-managed MySQL Versions 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.6, 5.7, and 8.0	RDS for MySQL All versions
		GaussDB(for MySQL) Version 8.0
	RDS for MySQL All versions	RDS for MySQL All versions

Service DB Engine	Service DB Type and Version	DR DB Type and Version
		• Self-managed MySQL Versions 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.6, 5.7, and 8.0
		GaussDB(for MySQL) Version 8.0

- DDM Serving as the Source in DR

  Table 3-24 Database information

Service DB Engine	Service DB Type and Version	DR DB Type and Version
DDM	DDM	DDM

- GaussDB(for MySQL) Serving as the Source in DR

Service DB Engine	Service DB Type and Version	DR DB Type and Version
GaussDB(for MySQL)	GaussDB(for MySQL) Version 8.0	GaussDB(for MySQL) Version 8.0

Workload Replay

A workload replay task simulates the service load of the source database on the destination database so you can evaluate the effectiveness and performance of the destination database. **Table 3-25** lists the supported databases and versions. For more information about workload replay, see **Workload Replay**.

Self-managed databases (such as MySQL and MariaDB) refer to on-premises databases and databases created on an ECS. RDS for MySQL refers to the MySQL databases on Huawei Cloud RDS instances.

NOTE

- A database workload cannot be replayed from a later version database to an earlier version database.

Table 3-25 Database information

Source DB Engine	Source DB Type and Version	Destination DB Type and Version
MySQL	RDS for MySQL All versions	RDS for MySQL All versions
		GaussDB(for MySQL) Compatible with MySQL 8.0
	• Self-managed MySQL Versions 5.6, 5.7, and 8.0 • MySQL on other clouds Versions 5.6, 5.7, and 8.0	RDS for MySQL All versions
		GaussDB(for MySQL) Compatible with MySQL 8.0
GaussDB(for MySQL)	GaussDB(for MySQL) Compatible with MySQL 8.0	GaussDB(for MySQL) Compatible with MySQL 8.0

4 Advantages

Easy to Use

DRS simplifies migration procedures and does not require too much technical knowledge. Traditional migration requires professional technical personnel and migration procedures are complicated.

Fast Setup

DRS sets up a migration task within minutes. Traditional migration takes several days, weeks, or even months to set up.

Low Costs

DRS saves traditional database administrator (DBA) labor costs and hardware costs, and supports on-demand pricing.

Secure

DRS allows you to query the migration progress, check migration logs, and compare migration items, so you can easily complete migration and synchronization tasks.

5 Functions and Features

5.1 Real-Time Migration

In real-time migration, you only need to configure the source database, destination database, and migration objects. DRS will help you compare and analyze data so you can determine when to migrate with minimal service disruption.

NOTE

Only whitelisted users can use this function. To use this function, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket** to submit a service ticket.

Supported Database Types

For details about the supported databases, versions, and migration types, see **Supported Databases**.

Supported Network Types

DRS supports data migration through a Virtual Private Cloud (VPC), Virtual Private Network (VPN), Direct Connect, or public network. **Table 5-1** lists the application scenarios of each network type and required preparations, and **Table 5-2** lists the supported network types of each migration scenario.

Table 5-1 Network types

Network Type	Application Scenario	Preparations
VPC	Migrations between cloud databases in the same region	• The source and destination databases must be in the same region. • The source and destination databases can be in either the same VPC or in different VPCs. • If source and destination databases are in the same VPC, they can communicate with each other by default. Therefore, you do not need to configure a security group. • If the source and destination databases are not in the same VPC, the CIDR blocks of the source and destination databases cannot be duplicated or overlapped, and the source and destination databases are connected through a VPC peering connection. • DRS does not support communication between the source database and destination database over a VPC across tenants. If necessary, you can create a VPC peering connection and select **VPN** for **Network Type** to enable communication between the source and destination databases. For details about how to create a VPC peering connection, see **VPC Peering Connection** in the *Virtual Private Cloud User Guide*.
VPN	Migrations from on-premises databases to cloud databases or between cloud databases across regions	Establish a VPN connection between your local data center and the VPC that hosts the destination database. Before migration, ensure that the VPN network is accessible. For more information about VPN, see ***Getting Started with Virtual Private Network***.
Direct Connect	Migrations from on-premises databases to cloud databases or between cloud databases across regions	Use a dedicated network connection to connect your data center to VPCs. For more information about Direct Connect, see ***Getting Started with Direct Connect***.

Network Type	Application Scenario	Preparations
Public network	Migrations from on-premises or other cloud databases to destination databases	To ensure network connectivity between the source and destination databases, perform the following operations: 1. Enable public accessibility. Enable public accessibility for the source database based on your service requirements. 2. Configure security group rules. • Add the EIPs of the replication instance to the whitelist of the source database for inbound traffic. • If destination databases and the replication instance are in the same VPC, they can communicate with each other by default. You do not need to configure a security group. **NOTE** • The IP address on the **Configure Source and Destination Databases** page is the EIP of the replication instance. • If SSL is not enabled, migrating confidential data is not recommended.

Table 5-2 Supported network types

Migration Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
To the cloud	MySQL	MySQL	Supported	Supported	Supported
		DDM	Supported	Supported	Supported
		GaussDB(for MySQL)	Supported	Supported	Supported
	MongoDB	DDS	Supported	Supported	Supported
		GeminiDB Mongo	Supported	Supported	Supported

Migration Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
	MySQL schema and logic table	DDM	Supported	Supported	Supported
	Redis	GeminiDB Redis	Supported	Supported	Supported
	Cluster Redis	GeminiDB Redis **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
From the cloud	MySQL	MySQL	Supported	Supported	Supported
	DDS	MongoDB	Supported	Supported	Supported
	GeminiDB Redis	Redis	Supported	Supported	Supported
		Cluster Redis	Supported	Supported	Supported

Migration Objects

DRS allows you to migrate objects at different levels. The following table lists the supported migration objects.

Table 5-3 Supported migration objects

Direction	Source DB	Destination DB	Full Migration	Table-Level Migration	Database-Level Migration
To the cloud	MySQL	MySQL	Supported	Supported	Supported
		GaussDB(for MySQL)	Supported	Supported	Supported
		DDM	Not supported	Supported	Not supported
	MongoDB	DDS	Supported	Supported	Supported

Direction	Source DB	Destination DB	Full Migration	Table-Level Migration	Database-Level Migration
		GeminiDB Mongo	Supported	Supported	Supported
	MySQL schema and logic table	DDM	Not supported	Supported	Not supported
	Redis	GeminiDB Redis	Not supported	Not supported	Supported
	Cluster Redis	GeminiDB Redis **NOTE** Only whitelisted users can use this function.	Supported	Not supported	Not supported
From the cloud	MySQL	MySQL	Supported	Supported	Supported
	DDS	MongoDB	Supported	Supported	Supported
	GeminiDB Redis	Redis	Supported	Not supported	Not supported
	GeminiDB Redis	Cluster Redis	Supported	Not supported	Not supported

Advanced Features

DRS supports multiple features to ensure successful real-time migration.

Table 5-4 Advanced features

Feature	Description
Flow control	Allows you to limit the overall migration speed to make the impact of migration on bandwidth and database I/O controllable. Flow control mode takes effect only during a full migration.
Account migration	Allows you to migrate accounts, permissions, and passwords.

Feature	Description
Parameter comparison	Checks the consistency of common parameters and performance parameters between source and destination databases to ensure that the migrated service is running properly.

5.2 Backup Migration

DRS supports backup migrations of various database types.

Supported Database Types

Table 5-5 Database types

Data Flow	Backup File Source	Destination DB Type
Microsoft SQL Server -> RDS for SQL Server	• On-premises Microsoft SQL Server backup files • RDS for SQL Server full backup files • Microsoft SQL Server backup files on other clouds	RDS for SQL Server DB instances

Migration Methods

Table 5-6 Migration methods

Data Flow	Full Migration	Incremental Migration
Microsoft SQL Server -> RDS for SQL Server	Supported	Supported

Supported Database Versions

Table 5-7 Database versions

Data Flow	Backup File Version	Destination DB Version
Microsoft SQL Server -> RDS for SQL Server	On-premises and other cloud's Microsoft SQL Server backup file versions: • Microsoft SQL Server 2000 • Microsoft SQL Server 2005 • Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019	• Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019
	RDS for SQL Server full backup file versions: • Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019	• Microsoft SQL Server 2008 • Microsoft SQL Server 2012 • Microsoft SQL Server 2014 • Microsoft SQL Server 2016 • Microsoft SQL Server 2017 • Microsoft SQL Server 2019

Backup Migration Scenarios

Table 5-8 Migration scenarios

Scenario	Description
OBS bucket	If you copy the database backup files to an Object Storage Service (OBS) bucket, ensure that the OBS bucket is located in the same region as the destination instance.
RDS full backup	If you select an RDS full backup as the backup file source, ensure that the RDS instance has a full backup.

5.3 Real-Time Synchronization

Real-time synchronization refers to the real-time flow of key service data from sources to destinations while consistency of data can be ensured. It is different from migration. Migration means moving your overall database from one platform to another. Synchronization refers to the continuous flow of data between different services.

NOTE

Only whitelisted users can use this function. To use this function, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.

Supported Database Types

For details about supported database types and versions and synchronization types, see **Supported Databases**.

Network Types

DRS supports real-time synchronization through a Virtual Private Cloud (VPC), Virtual Private Network (VPN), Direct Connect, or public network. **Table 5-9** lists the application scenarios of each network type and required preparations, and **Table 5-10** lists the supported network types of each synchronization scenario.

Table 5-9 Network types

Network Type	Application Scenario	Preparations
VPC	Synchronization between cloud databases in the same region	• The source and destination databases must be in the same region. • The source and destination databases can be in either the same VPC or in different VPCs. • If source and destination databases are in the same VPC, they can communicate with each other by default. Therefore, you do not need to configure a security group. • If the source and destination databases are not in the same VPC, the CIDR blocks of the source and destination databases cannot be duplicated or overlapped, and the source and destination databases are connected through a VPC peering connection. • DRS does not support communication between the source database and destination database over a VPC across tenants. If necessary, you can create a VPC peering connection and select **VPN** for **Network Type** to enable communication between the source and destination databases. For details about how to create a VPC peering connection, see **VPC Peering Connection** in the *Virtual Private Cloud User Guide*.
VPN	Synchronization from on-premises databases to cloud databases or between cloud databases across regions	Establish a VPN connection between your local data center and the VPC that hosts the destination database. Before synchronization, ensure that the VPN network is accessible. For more information about VPN, see ***Getting Started with Virtual Private Network***.

Network Type	Application Scenario	Preparations
Direct Connect	Synchronization from on-premises databases to cloud databases or between cloud databases across regions	Use a dedicated network connection to connect your data center to VPCs. For more information about Direct Connect, see ***Getting Started with Direct Connect***.
Public network	Synchronization from on-premises or external cloud databases to the destination databases.	To ensure network connectivity between the source and destination databases, perform the following operations: 1. Enable public accessibility. Enable public accessibility for the source database based on your service requirements. 2. Configure security group rules. • Add the EIPs of the synchronization instance to the whitelist of the source database for inbound traffic. • If destination databases and the synchronization instance are in the same VPC, they can communicate with each other by default. Therefore, you do not need to configure a security group. **NOTE** • The IP address on the **Configure Source and Destination Databases** page is the EIP of the synchronization instance. • If SSL is not enabled, synchronizing confidential data is not recommended.

Table 5-10 Supported network types

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
To the cloud	MySQL	MySQL	Supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
		PostgreSQL	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
		GaussDB Primary/Standby instances	Supported	Supported	Supported
		GaussDB(for MySQL)	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
		MariaDB **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
	PostgreSQL	PostgreSQL	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
	DDM	MySQL	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
		DDM	Supported	Supported	Supported
	Oracle	MySQL	Supported	Supported	Supported
		DDM	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
		PostgreSQL	Supported	Supported	Supported
		GaussDB(for MySQL)	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
	DB2 for LUW	GaussDB Primary/Standby instances	Supported	Supported	Supported
		GaussDB Distributed instances	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
	TiDB	GaussDB(for MySQL)	Not supported	Supported	Supported
	Microsoft SQL Server	GaussDB(DWS)	Supported	Supported	Supported
		GaussDB Primary/Standby instances	Supported	Supported	Supported
		GaussDB Distributed instances	Supported	Supported	Supported
		Microsoft SQL Server **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
	MongoDB	DDS	Supported	Supported	Supported
	GaussDB(for MySQL)	GaussDB(for MySQL)	Supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
	MariaDB	MariaDB	Supported	Supported	Supported
		MySQL **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
		GaussDB(for MySQL) **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
From the cloud	MySQL	MySQL	Supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Supported	Supported
		Oracle	Supported	Supported	Supported
		MariaDB **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
	DDM	MySQL	Supported	Supported	Supported
		Oracle	Supported	Supported	Supported
		Kafka	Supported	Supported	Supported
	DDS	MongoDB	Supported	Supported	Supported
		Kafka	Supported	Supported	Supported
	PostgreSQL	PostgreSQL	Supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
		Kafka	Not supported	Supported	Supported
	GaussDB Primary/Standby	MySQL	Not supported	Supported	Supported
		Oracle	Not supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		GaussDB(DWS)	Not supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
	GaussDB Distributed	MySQL	Not supported	Supported	Supported
		Oracle	Not supported	Supported	Supported
		GaussDB(DWS)	Not supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
	GaussDB(for MySQL)	MySQL	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
		Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Supported	Supported
		Oracle	Supported	Supported	Supported
	MariaDB	MariaDB	Supported	Supported	Supported
	Microsoft SQL Server	Kafka **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
Self-built -> Self-built	MySQL	Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Supported	Supported
		GaussDB Primary/Standby instances	Not supported	Supported	Supported
		GaussDB Distributed instances	Not supported	Supported	Supported
	Oracle	Kafka	Supported	Supported	Supported
		GaussDB Primary/Standby instances	Not supported	Supported	Supported
		GaussDB Distributed instances	Not supported	Supported	Supported
	PostgreSQL	Kafka	Not supported	Supported	Supported
	GaussDB Primary/Standby instances	MySQL	Not supported	Supported	Supported

Synchronization Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
		Oracle	Not supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
	GaussDB Distributed instances	MySQL	Not supported	Supported	Supported
		Oracle	Not supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		GaussDB Distributed	Supported	Supported	Supported
		GaussDB Primary/Standby	Supported	Supported	Supported
	DB2 for LUW	GaussDB Primary/Standby instances	Not supported	Supported	Supported
		GaussDB Distributed instances	Not supported	Supported	Supported
	Microsoft SQL Server	Kafka **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported

Supported Synchronization Objects

DRS allows you to synchronize different objects. The following table lists the supported objects.

Table 5-11 Supported synchronization objects

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
To the cloud	MySQL	MySQL	Supported	Supported	Supported
		PostgreSQL	Supported	Supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
		GaussDB Primary/Standby instances	Supported	Not supported	Supported
		GaussDB(for MySQL)	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
		MariaDB **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
	PostgreSQL	PostgreSQL	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Not supported
		GaussDB Primary/Standby instances	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	DDM	MySQL	Supported	Not supported	Not supported
		GaussDB(DWS)	Supported	Supported	Not supported
		DDM	Supported	Supported	Not supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
	Oracle	MySQL	Supported	Not supported	Supported
		DDM	Supported	Not supported	Not supported
		GaussDB(DWS)	Supported	Not supported	Supported
		PostgreSQL	Supported	Not supported	Supported
		GaussDB(for MySQL)	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	DB2 for LUW	GaussDB Primary/Standby instances	Supported	Not supported	Supported
		GaussDB Distributed instances	Supported	Not supported	Supported
		GaussDB(DWS)	Supported	Not supported	Supported
	TiDB	GaussDB(for MySQL)	Supported	Supported	Not supported
	Microsoft SQL Server	GaussDB(DWS)	Supported	Not supported	Not supported
		GaussDB Primary/Standby instances	Supported	Not supported	Not supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
		GaussDB Distributed instances	Supported	Not supported	Not supported
		Microsoft SQL Server **NOTE** Only whitelisted users can use this function.	Supported	Not supported	Not supported
	MongoDB	DDS	Supported	Supported	Not supported
	GaussDB(for MySQL)	GaussDB(for MySQL)	Supported	Supported	Supported
	MariaDB	MariaDB	Supported	Supported	Supported
		MySQL **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
		GaussDB(for MySQL) **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
From the cloud	MySQL	MySQL	Supported	Supported	Not supported
		Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Not supported	Supported
		Oracle	Supported	Not supported	Supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
		MariaDB **NOTE** Only whitelisted users can use this function.	Supported	Supported	Supported
	DDM	MySQL	Supported	Not supported	Not supported
		Oracle	Supported	Supported	Not supported
		Kafka	Supported	Supported	Not supported
	DDS	MongoDB	Supported	Supported	Not supported
		Kafka	Supported	Supported	Not supported
	PostgreSQL	PostgreSQL	Supported	Supported	Supported
		Kafka	Supported	Supported	Not supported
	GaussDB Primary/Standby	MySQL	Supported	Not supported	Not supported
		Oracle	Supported	Not supported	Supported
		Kafka	Supported	Supported	Not supported
		GaussDB(DWS)	Supported	Not supported	Not supported
		GaussDB Distributed	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
	GaussDB Distributed	MySQL	Supported	Not supported	Not supported
		Oracle	Supported	Not supported	Supported
		GaussDB(DWS)	Supported	Not supported	Not supported
		Kafka	Supported	Supported	Not supported
		GaussDB Distributed	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
	GaussDB(for MySQL)	MySQL	Supported	Supported	Supported
		GaussDB(DWS)	Supported	Supported	Supported
		Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Supported	Not supported
		Oracle	Supported	Not supported	Supported
	MariaDB	MariaDB	Supported	Supported	Supported
	Microsoft SQL Server	Kafka **NOTE** Only whitelisted users can use this function.	Supported	Not supported	Supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
Self-built -> Self-built	MySQL	Kafka	Supported	Supported	Supported
		CSS/ES	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	Oracle	Kafka	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	GaussDB Primary/Standby instances	MySQL	Supported	Not supported	Not supported
		Oracle	Supported	Not supported	Supported
		Kafka	Supported	Supported	Not supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	GaussDB Distributed instances	MySQL	Supported	Not supported	Not supported

Synchronization Direction	Source DB	Destination DB	Table-level	Database-level	Importing an Object File
		Oracle	Supported	Not supported	Supported
		Kafka	Supported	Supported	Not supported
		GaussDB Distributed	Supported	Not supported	Supported
		GaussDB Primary/Standby	Supported	Not supported	Supported
	PostgreSQL	Kafka	Supported	Supported	Not supported
	DB2 for LUW	GaussDB Primary/Standby	Supported	Not supported	Supported
		GaussDB Distributed	Supported	Not supported	Supported
	Microsoft SQL Server	Kafka **NOTE** Only whitelisted users can use this function.	Supported	Not supported	Supported

Advanced Features

DRS supports multiple features to ensure successful data synchronization.

Table 5-12 Advanced features

Feature	Description
Synchronization level	DRS supports database- and table-level synchronization. • Database-level synchronization refers to a type of synchronization method using database as a unit. You do not need to select tables to be synchronized. New tables in the database are automatically added to the synchronization task. • Table-level synchronization uses table as a unit, indicating that you need to add new tables to the synchronization task manually.
Mapping object names	Allows the names of synchronization objects (including databases, schemas, tables, and columns) in the source database to be different from those in the destination database. If the synchronization objects in source and destination databases have different names, you can map the source object name to the destination one. The following objects can be mapped: databases, schemas and tables.
Dynamically adding or deleting synchronization objects	During data synchronization, you can add or delete synchronization objects as required.

Feature	Description
Conflict policy	DRS uses primary key or unique key conflict policies to ensure that tables with primary key or unique constraints in the source database can be synchronized to the destination database as expected. The following conflict policies are supported: • Ignore The system will skip the conflicting data and continue the subsequent synchronization process. • Overwrite Conflicting data will be overwritten. • Report error The synchronization task will be stopped and fail. Ignore and overwrite: Synchronization stability is prioritized, so tasks will not be interrupted as data conflicts occur. Report error: Data quality is prioritized. Any data conflicts are not allowed, so once a conflict occurs, the synchronization task fails and an error is reported. You need to manually find the cause of the fault. If the task is in the failed state for a long time, the storage space may be used up and the task cannot be restored.
Structure synchronization	DRS does not provide data structure synchronization as an independent function during real-time synchronization. Instead, it directly synchronizes data and structures to the destination database.

5.4 Data Subscription

Data Source Types

Data subscription supports the following data source type:

- RDS for MySQL DB instances

Subscription Objects

The subscription objects are tables.

The incremental data is divided into Data Manipulation Language (DML) and Data Definition Language (DDL).

Database Versions

DRS supports the following source database versions:

- MySQL 5.6.x
- MySQL 5.7.x

Advanced Features

Data subscription provides multiple features. For details, see **Table 5-13**.

Table 5-13 Advanced features

Feature	Description
Dynamically adding or deleting subscription objects	During data subscription, you add or delete subscription objects as required.
Viewing subscription data	View the incremental data on the management console.
Modifying the consumption start time	During consumption, you can change the consumption start time at any time.

5.5 Real-Time Disaster Recovery

For details about the supported databases and versions, see **Supported Databases**.

NOTE

Only whitelisted users can use this function. To use this function, submit a service ticket. In the upper right corner of the management console, choose **Service Tickets** > **Create Service Ticket**.

Network Preparations

DRS supports disaster recovery through a Virtual Private Network (VPN), Direct Connect, or public network. **Table 5-14** lists the application scenarios of each network type and required preparations, and **Table 5-15** lists the supported network types of each DR scenario.

Table 5-14 Network types

Network Type	Application Scenario	Preparations
VPN	Disaster recovery from on-premises databases to cloud databases or between cloud databases across regions	Establish a VPN connection between your local data center and the VPC that hosts the destination database. Before disaster recovery, ensure that the VPN network is accessible. For more information about VPN, see ***Getting Started with Virtual Private Network***.
Direct Connect	Disaster recovery from on-premises databases to cloud databases or between cloud databases across regions	Use a dedicated network connection to connect your data center to VPCs. For more information about Direct Connect, see ***Getting Started with Direct Connect***.
Public network	Disaster recovery from on-premises databases or other cloud databases to destination databases.	To ensure network connectivity between the source and destination databases, perform the following operations: 1. Enable public accessibility. Enable public accessibility for the source database based on your service requirements. 2. Configure security group rules. • Add the EIPs of the disaster recovery instance to the whitelist of the source database for inbound traffic. • If destination databases and the DR instance are in the same VPC, they can communicate with each other by default. You do not need to configure a security group. **NOTE** • The IP address on the **Configure Source and Destination Databases** page is the EIP of the DR instance. • If SSL is not enabled, backing up confidential data for disaster recovery is not recommended.

Table 5-15 Supported network types

DR Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
Current cloud as standby	MySQL	MySQL	Not supported	Supported	Supported
		GaussDB(for MySQL)	Not supported	Supported	Supported
	DDM	DDM	Not supported	Supported	Supported
	GaussDB(for MySQL)	GaussDB(for MySQL)	Not supported	Supported	Supported
Current cloud as active	MySQL	MySQL	Not supported	Supported	Supported
	DDM	DDM	Not supported	Supported	Supported
	GaussDB(for MySQL)	GaussDB(for MySQL)	Not supported	Supported	Supported
Dual-Active DR	MySQL **NOTE** Only whitelisted users can use this function.	MySQL	Not supported	Supported	Supported
	GaussDB(for MySQL) **NOTE** Only whitelisted users can use this function.	GaussDB(for MySQL)	Not supported	Supported	Supported

5.6 Workload Replay

For details about the supported databases and versions, see **Supported Databases**.

Database Types

DRS supports workload replay management for the following types of databases.

Table 5-16 Database types

Replay Direction	Data Flow	Source DB	Destination DB	Destination DB Type
Current cloud	MySQL->MySQL	RDS for MySQL instances	RDS for MySQL instances	• Single • Primary / Standby
Current cloud	MySQL->GaussDB(for MySQL)	RDS for MySQL instances	GaussDB(for MySQL) instances	Primary/ Standby
Current cloud	GaussDB(for MySQL)->GaussDB(for MySQL)	GaussDB(for MySQL) instances	GaussDB(for MySQL) instances	Primary/ Standby
To the cloud	MySQL->MySQL	• On-premises MySQL databases • ECS-hosted MySQL databases • MySQL databases on other clouds	RDS for MySQL instances	• Single • Primary / Standby
To the cloud	MySQL->GaussDB(for MySQL)	• On-premises MySQL databases • ECS-hosted MySQL databases • MySQL databases on other clouds	GaussDB(for MySQL) instances	Primary/ Standby

Database Versions

Table 5-17 Database versions

Replay Direction	Data Flow	Source DB Version	Destination Database Version
Current cloud	MySQL->MySQL	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x
Current cloud	MySQL->GaussDB(for MySQL)	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x	Compatible with MySQL 8.0
Current cloud	GaussDB(for MySQL)->GaussDB(for MySQL)	Compatible with MySQL 8.0	Compatible with MySQL 8.0
To the cloud	MySQL->MySQL	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x
To the cloud	MySQL->GaussDB(for MySQL)	• MySQL 5.6.x • MySQL 5.7.x • MySQL 8.0.x	Compatible with MySQL 8.0

Network Types

DRS supports workload replay through a Virtual Private Cloud (VPC), Virtual Private Network (VPN), Direct Connect, or public network. **Table 5-18** lists the application scenarios of each network type and required preparations, and **Table 5-19** lists the supported network types of each workload replay scenario.

Table 5-18 Network types

Network Type	Application Scenario	Preparations
VPC	Workload replay between cloud databases in the same region	• The source and destination databases must be in the same region. • The source and destination databases can be in either the same VPC or in different VPCs. • If source and destination databases are in the same VPC, they can communicate with each other by default. You do not need to configure a security group. • If the source and destination databases are not in the same VPC, the CIDR blocks of the source and destination databases cannot be duplicated or overlapped, and the source and destination databases are connected through a VPC peering connection. • DRS does not support communication between the source database and destination database over a VPC across tenants. If necessary, you can create a VPC peering connection and select **VPN** for **Network Type** to enable communication between the source and destination databases. For details about how to create a VPC peering connection, see ***Virtual Private Cloud User Guide***.
VPN	Workload replay from on-premises databases to cloud databases or between cloud databases across regions	Establish a VPN connection between your local data center and the VPC that hosts the destination database. Before workload replay, ensure that the VPN network is accessible. For more information about VPN, see ***Getting Started with Virtual Private Network***.
Direct Connect	Workload replay from on-premises databases to cloud databases or between cloud databases across regions	Use a dedicated network connection to connect your data center to VPCs. For more information about Direct Connect, see ***Getting Started with Direct Connect***.

Network Type	Application Scenario	Preparations
Public network	Workload replay from on-premises databases or other cloud databases to destination databases	To ensure network connectivity between the source and destination databases, perform the following operations: 1. Enable public accessibility. Enable public accessibility for the source database based on your service requirements. 2. Configure security group rules. • Add the EIPs of the DRS instance to the whitelist of the source database for inbound traffic. • If destination databases and the DRS instance are in the same VPC, they can communicate with each other by default. You do not need to configure a security group. **NOTE** • The IP address displayed on the **Configure Source and Destination Databases** page is the EIP of the DRS instance.

Table 5-19 Supported network types

Replay Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
Current cloud	MySQL	MySQL	Supported	Supported	Supported
Current cloud	MySQL	GaussDB(for MySQL)	Supported	Supported	Supported
Current cloud	GaussDB(for MySQL)	GaussDB(for MySQL)	Supported	Supported	Supported

Replay Direction	Source DB	Destination DB	VPC	Public Network	VPN or Direct Connect
To the cloud	MySQL	MySQL	Supported	Supported	Supported
To the cloud	MySQL	GaussDB(for MySQL)	Supported	Supported	Supported

6 Specification Description

6.1 Real-Time Synchronization

Precautions

The performance indicators provided in this section are for reference only. The actual environment is affected by factors such as the performance of the source or destination database, network bandwidth, data model, and service model.

Specifications

Based on the performance of data flow types, there are five types of specifications: micro, small, medium, large, and ultra-large. **Table 6-1** lists the performance upper limit of each specification.

Table 6-1 Performance upper limit

Specifications	Reference Values of Maximum Performance (Rows/Second)
Micro	300
Small	3,000
Medium	7,500
Large	10000
Ultra-large	20000

NOTE

- The performance of each specification is affected by factors such as the networks, source and destination database performance, and latency. The values in the table are for reference only.
- DRS measures the performance of different specifications using the full (with flow control disabled) and incremental synchronization tasks as the standard.
- The maximum performance (row/second) is measured by the number of transactions synchronized per second. The statement types include BEGIN, COMMIT, DML (INSERT, DELETE, and UPDATE), and DDL. You can **view the destination database write frequency (apply_rows_rate) monitoring metric** on Cloud Eye.
- DRS allows you to upgrade specifications only for single-AZ synchronization tasks. Task specifications cannot be upgraded for dual-AZ tasks or downgraded. For details, see **Changing Specifications**.
- If you want to compare values for a DRS task, select large or ultra-large specifications when creating the DRS task.

Testing Models

Create a full+incremental real-time synchronization task for two RDS for MySQL instances. **Table 6-2** shows the instance configurations.

Table 6-2 Instance specifications

Parameter	Source RDS for MySQL instance	Destination RDS for MySQL instance
Flavor	c6.4xlarge.4 (general-enhanced II)	c6.4xlarge.4 (general-enhanced II)
Instance specifications	Ultra-high I/O	Ultra-high I/O
Storage type	16 vCPUs|64 GB	16 vCPUs|64 GB
Storage space	300 GB	300 GB
Maximum connections	18,000	18,000
Maximum QPS	3,325	3,325
Maximum IOPS	114,152	114,152

Test model:

- The number of test tables is 20.
- All test tables have primary keys.
- The record size is 1 KB.
- Each transaction contains two DML operations and one COMMIT operation. The ratio of INSERT, UPDATE, and DELETE operations is 1:1:1.

Multiple Specifications

DRS real-time synchronization allows you to select specifications for some specified data flow tasks.

Table 6-3 Data flow types that support multiple specifications

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
To the cloud	MySQL->MySQL	Supported	Supported only for single-AZ tasks
To the cloud	MySQL->PostgreSQL	Supported	Supported only for single-AZ tasks
To the cloud	MySQL -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
To the cloud	MySQL -> GaussDB Primary/ Standby	Supported	Supported only for single-AZ tasks
To the cloud	MySQL->GaussDB(DWS)	Supported	Supported only for single-AZ tasks
To the cloud	MySQL->GaussDB(for MySQL)	Supported	Supported only for single-AZ tasks
To the cloud	MySQL->MariaDB	Not supported	Not supported
To the cloud	PostgreSQL->PostgreSQL	Supported	Supported only for single-AZ tasks
To the cloud	PostgreSQL->GaussDB(DWS)	Not supported	Not supported
To the cloud	PostgreSQL -> GaussDB Primary/ Standby	Not supported	Not supported
To the cloud	PostgreSQL -> GaussDB Distributed	Not supported	Not supported

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
To the cloud	DDM->MySQL	Supported	Supported only for single-AZ tasks
To the cloud	DDM->GaussDB(DWS)	Supported	Supported only for single-AZ tasks
To the cloud	DDM->DDM	Supported	Supported only for single-AZ tasks
To the cloud	Oracle->GaussDB(DWS)	Supported	Supported only for single-AZ tasks
To the cloud	Oracle->PostgreSQL	Supported	Supported only for single-AZ tasks
To the cloud	Oracle->MySQL	Supported	Supported only for single-AZ tasks
To the cloud	Oracle->GaussDB(for MySQL)	Supported	Supported only for single-AZ tasks
To the cloud	Oracle -> GaussDB Primary/ Standby	Supported	Supported only for single-AZ tasks
To the cloud	Oracle -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
To the cloud	Oracle->DDM	Supported	Supported only for single-AZ tasks

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
To the cloud	DB2 for LUW -> GaussDB Primary/Standby	Not supported	Not supported
To the cloud	DB2 for LUW -> GaussDB Distributed	Not supported	Not supported
To the cloud	DB2 for LUW->GaussDB(DWS)	Not supported	Not supported
To the cloud	TiDB->GaussDB(for MySQL)	Not supported	Not supported
To the cloud	Microsoft SQL Server->GaussDB(DWS)	Not supported	Not supported
To the cloud	Microsoft SQL Server -> GaussDB Primary/Standby	Not supported	Not supported
To the cloud	Microsoft SQL Server -> GaussDB Distributed	Not supported	Not supported
To the cloud	Microsoft SQL Server->Microsoft SQL Server	Not supported	Not supported
To the cloud	MongoDB->DDS	Supported	Supported only for single-AZ tasks
To the cloud	MariaDB->MariaDB	Supported	Supported only for single-AZ tasks
To the cloud	MariaDB->MySQL	Not supported	Not supported
To the cloud	MariaDB->GaussDB(for MySQL)	Not supported	Not supported
To the cloud	GaussDB(for MySQL)->GaussDB(for MySQL)	Supported	Supported only for single-AZ tasks
From the cloud	MySQL->MySQL	Supported	Supported only for single-AZ tasks

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
From the cloud	MySQL->Kafka	Supported	Supported only for single-AZ tasks
From the cloud	MySQL->CSS/ES	Supported	Supported only for single-AZ tasks
From the cloud	MySQL->Oracle	Supported	Supported only for single-AZ tasks
From the cloud	MySQL->MariaDB	Not supported	Not supported
From the cloud	DDM->MySQL	Supported	Supported only for single-AZ tasks
From the cloud	DDM->Oracle	Supported	Supported only for single-AZ tasks
From the cloud	DDM->Kafka	Supported	Supported only for single-AZ tasks
From the cloud	DDS->MongoDB	Supported	Supported only for single-AZ tasks
From the cloud	DDS->Kafka	Supported	Supported only for single-AZ tasks
From the cloud	PostgreSQL->PostgreSQL	Supported	Supported only for single-AZ tasks

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
From the cloud	PostgreSQL->Kafka	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> MySQL	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> Oracle	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> Kafka	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> GaussDB(DWS)	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Primary/Standby -> GaussDB Primary/Standby	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Distributed -> MySQL	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Distributed -> Oracle	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Distributed -> GaussDB(DWS)	Supported	Supported only for single-AZ tasks

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
From the cloud	GaussDB Distributed -> Kafka	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Distributed -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB Distributed->GaussDB Primary/Standby	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB(for MySQL)->MySQL	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB(for MySQL)->GaussDB(DWS)	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB(for MySQL)->Kafka	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB(for MySQL)->CSS/ES	Supported	Supported only for single-AZ tasks
From the cloud	GaussDB(for MySQL)->Oracle	Supported	Supported only for single-AZ tasks
From the cloud	MariaDB->MariaDB	Supported	Supported only for single-AZ tasks
From the cloud	Microsoft SQL Server->Kafka	Not supported	Not supported

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
Self-built -> Self-built	MySQL->Kafka	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	MySQL->CSS/ES	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	MySQL -> GaussDB Primary/ Standby	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	MySQL -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	Oracle->Kafka	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	Oracle -> GaussDB Primary/ Standby	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	Oracle -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	PostgreSQL->Kafka	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Primary/Standby -> MySQL	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Primary/Standby -> Oracle	Supported	Supported only for single-AZ tasks

Synchronization Direction	Data Flow	Multiple Specifications	Specification Upgrade
Self-built -> Self-built	GaussDB Primary/Standby -> Kafka	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Primary/Standby -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Primary/Standby -> GaussDB Primary/Standby	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Distributed -> MySQL	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Distributed -> Oracle	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Distributed -> Kafka	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Distributed->GaussDB Primary/Standby	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	GaussDB Distributed -> GaussDB Distributed	Supported	Supported only for single-AZ tasks
Self-built -> Self-built	DB2 for LUW -> GaussDB Primary/Standby	Not supported	Not supported
Self-built -> Self-built	DB2 for LUW -> GaussDB Distributed	Not supported	Not supported
Self-built -> Self-built	Microsoft SQL Server->Kafka	Not supported	Not supported

6.2 Real-Time Disaster Recovery

Precautions

The performance indicators provided in this section are for reference only. The actual environment is affected by factors such as the performance of the source or destination database, network bandwidth, data model, and service model.

Specification Description

Based on the performance of data flow types, there are four types of specifications: micro, small, medium, and large. **Table 6-4** lists the performance upper limit of each specification.

Table 6-4 Performance upper limit

Specifications	Reference Values of Maximum Performance (Rows/Second)
Micro	300
Small	3000
Medium	7500
Large	10000

NOTE

- The performance of each specification is affected by factors such as the networks, service and DR database performance, and latency. The values in the table are for reference only.
- DRS provides specifications of different performance which is measured by DR initialization (no flow control) and DR performance.
- The maximum performance (row/second) is measured by the number of transactions synchronized per second. The statement types include BEGIN, COMMIT, DML (INSERT, DELETE, and UPDATE), and DDL. You can **view the destination database write frequency (apply_rows_rate) monitoring metric** on Cloud Eye.
- DRS allows you to upgrade specifications only for DR tasks from MySQL to MySQL, MySQL to GaussDB(for MySQL), and GaussDB(for MySQL) to GaussDB(for MySQL). Task specifications cannot be downgraded. For details, see **Changing Specifications**.
- If you want to compare values for a DRS task, select large specifications when creating the DRS task.

Multiple Specifications

DRS real-time DR allows you to select specifications for some specified data flow tasks.

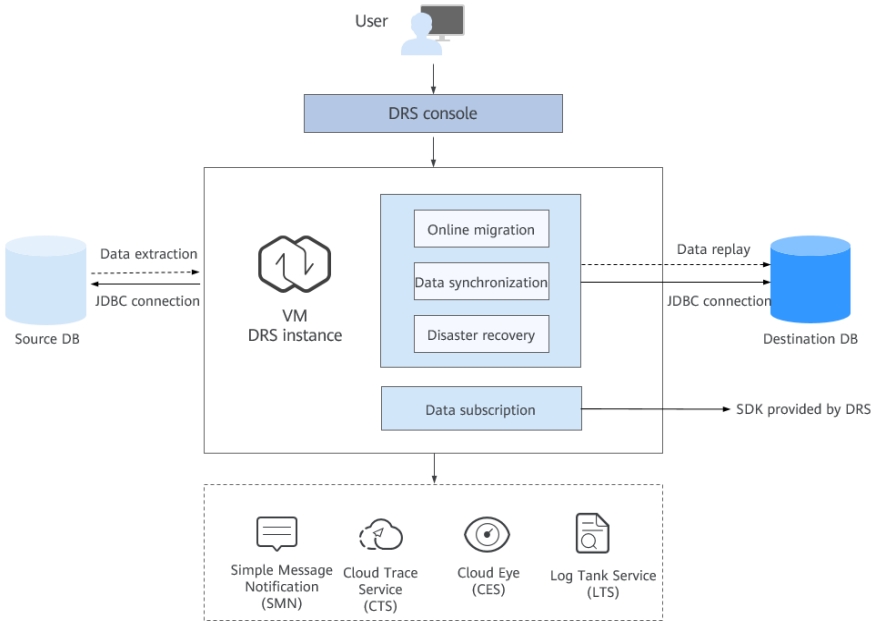
Table 6-5 Data types that support multiple specifications

DR Direction	Data Flow	Multiple Specifications	Specification Upgrade
Current cloud as standby	MySQL->MySQL	Supported	Yes
Current cloud as active	MySQL->MySQL	Supported	Yes
Current cloud as standby	MySQL->GaussDB(for MySQL)	Supported	Yes
Current cloud as standby	DDM -> DDM	Unsupported	No
Current cloud as active	DDM -> DDM	Unsupported	No
Current cloud as standby	GaussDB(for MySQL)->GaussDB(for MySQL)	Supported	Yes
Current cloud as active	GaussDB(for MySQL)->GaussDB(for MySQL)	Supported	Yes
Dual-active DR	MySQL->MySQL	Supported	Yes
Dual-active DR	GaussDB(for MySQL)->GaussDB(for MySQL)	Supported	No

7 Product Architecture and Function Principles

The following figure shows the product architecture and function principles of DRS.

Figure 7-1 DRS product architecture



Architecture Description

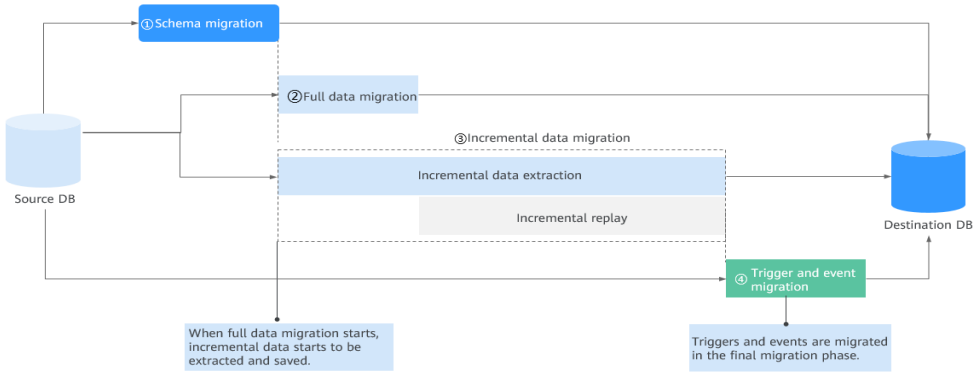
- Minimum permission design
  a. Java Database Connectivity (JDBC) is used to connect to the source and destination databases, so you do not have to deploy programs on the databases.
  b. A task runs on an independent and exclusively used VM. Data is isolated between tenants.
  c. The number of IP addresses is limited. Only the DRS instance IP address is allowed to access the source and destination databases.

- Reliability design
  a. Automatic reconnection: If the connection between DRS and your database breaks down due to bad network or database switchover, DRS automatically retries the connection until the task is restored.
  b. Resumable upload: When the connection to the source or the destination is abnormal, DRS automatically marks the current replay point. After the fault is rectified, you can resume data transfer from the replay point to ensure data consistency.
  c. If the VM where the DRS replication instance is located fails, services are automatically switched to a new VM with the IP address unchanged to ensure that the migration task is not interrupted.

The character set standard used by DRS is Unicode 6.2.0.

Basic Principles of Real-Time Migration

Figure 7-2 Real-time migration principle



- Take the full+incremental migration as an example. A complete migration process includes four phases.
  a. **Phase 1**: Structure migration. DRS queries the databases, tables, and primary keys to be migrated from the source and creates corresponding objects in the destination.
  b. **Phase 2**: Full data migration. DRS uses the parallel technology to query all data from the source and inserts the data into the destination, which is fast and convenient. Before the full migration is started, incremental data is extracted and saved in advance to ensure data integrity and consistency in the subsequent incremental migration process.
  c. **Phase 3**: Incremental data migration. After the full migration task is complete, the incremental migration task is started. The incremental data generated after the start of the full migration is continuously parsed, converted, and replayed to the destination database until data is in sync between the source and destination databases.
  d. **Phase 4**: To prevent data from being operated by triggers and events during the migration, triggers and events will be migrated after a migration task is complete.

- Principles of the underlying module for full migration:

  Sharding module: calculates the sharding logic of each table using the optimized sharding algorithm.

  Extraction module: queries data from the source database in parallel mode based on the calculated shard information.

  Replay module: inserts the data queried by the extraction module into the destination database in parallel and multi-task mode.

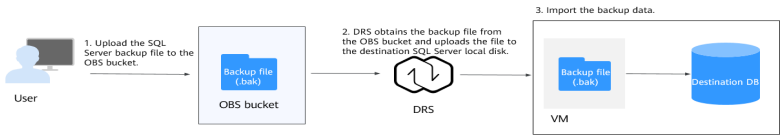
- Principles of the underlying module for incremental migration:

  Log reading module: reads the original incremental log data (for example, binlog for MySQL) from the source database, parses the data, converts the data into the standard log format, and stores it locally.

  Log replay module: processes and filters incremental logs based on the standard format converted by the log reading module, and synchronizes the incremental data to the destination database.

Basic Principles of Backup Migration

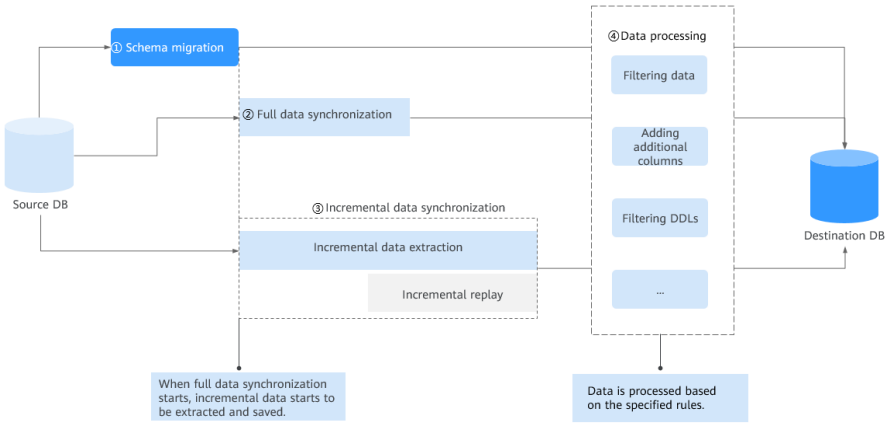
Figure 7-3 Backup migration principle



DRS allows you to migrate data from a Microsoft SQL Server database to the cloud using the backup file of the database. You can copy the full and incremental backup files of the source database to an OBS bucket. DRS downloads that files from the bucket and uploads them to the disk of the destination database. After the pre-check and verification are complete, DRS runs the import command to restore the data to the destination database.

Basic Principles of Real-Time Synchronization

Figure 7-4 Real-time synchronization principle

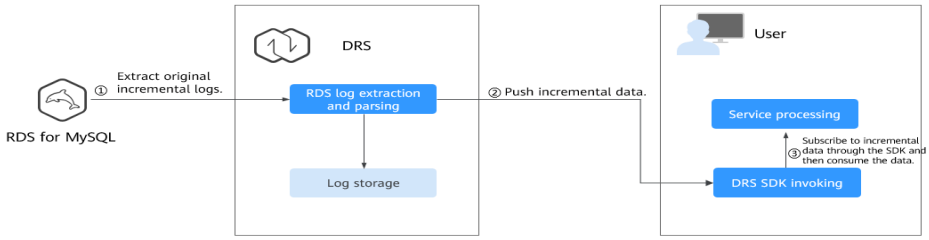


Real-time synchronization can ensure that data is always in sync between the source and destination databases. It mainly applies to synchronization from OLTP to OLAP or from OLTP to big data components in real time. The technical principles of full|+incremental synchronization and real-time migration are basically the same. However, there is a slight difference between them in different scenarios.

1. DRS supports heterogeneous synchronization (between different DB engines). It means that DRS converts the structure definition statements of the source database to match that of the destination database. In addition, DRS can map and convert database field types. You can refer to **Mapping Data Types** of heterogeneous databases or use Database and Application Migration UGO (UGO) to synchronize the structure of heterogeneous databases.
2. DRS allows you to configure data processing rules, so you can use these rules to extract, parse, and replay data to meet your service requirements.
3. Objects such as accounts, triggers, and events cannot be synchronized.
4. Real-time synchronization is often used in many-to-one scenario. DDL operations in many-to-one and one-to-many scenarios are specially processed.

Basic Principles of Data Subscription

Figure 7-5 Data subscription principle



Data subscription provides an SDK so that customers' service programs can obtain incremental data from the source database in real time.

DRS extracts original incremental logs from the source database, parses the logs into the standard format, and persists the logs to the local host. In addition, DRS invokes the notification interface of the client subscription SDK in real time to push incremental data to the client service program. Then, the client can consume data changes based on service requirements.

The incremental data consumed by the client program is recorded on the server in real time. The DRS server can continues to push incremental data from the last consumption position in scenarios such as service interruption and reconnection.

Basic Principles of Real-Time Disaster Recovery

DRS uses the real-time replication technology to implement disaster recovery for two databases. The underlying technical principles are the same as those of real-time migration. The difference is that real-time DR supports forward

synchronization and backward synchronization. In addition, disaster recovery is performed on the instance-level, which means that databases and tables cannot be selected.

Basic Principles of Workload Replay

A workload replay task consists of SQL recording and replay. All of the SQL statements (create, delete, update, and query operations) executed in the required period on the source database will be downloaded by a recording tool from the binlog, and then cached and injected into the destination database where you can trigger a replay and review performance. By specifying the replay thread and speed, you can simulate the peak service load of the source database and analyze the stability of the destination database when workloads increase sharply.

8 Mapping Data Types

DRS allows you to migrate or synchronize between sources and destinations that use different DB engines through mappings between different data types.

This section provides mappings between different data types for your reference.

8.1 MySQL->PostgreSQL

Table 8-1 Data type mapping

Data Type (MySQL)	Data Type (PostgreSQL)	Whether to Support Mapping
BIGINT	NUMERIC|BIGINT	Yes
BINARY	BYTEA	Yes
BIT	BIT	Yes
BLOB	BYTEA	Yes
BOOLEAN	BOOL	Yes
CHAR	CHAR	Yes
DATE	DATE	Yes
DATETIME	TIMESTAMP	Yes
DECIMAL	NUMERIC	Yes
DOUBLE	FLOAT8	Yes
ENUM	VARCHAR	Yes
FLOAT	FLOAT4|FLOAT8	Yes
INT	INTEGER	Yes
LONGBLOB	BYTEA	Yes

Data Type (MySQL)	Data Type (PostgreSQL)	Whether to Support Mapping
LONGTEXT	TEXT	Yes
MEDIUMBLOB	BYTEA	Yes
MEDIUMINT	INT	Yes
SET	VARCHAR	Yes
SMALLINT	INT|SMALLINT	Yes
TEXT	TEXT	Yes
TIME	TIME	Yes
TIMESTAMP	TIMESTAMP	Yes
TINYBLOB	BYTEA	Yes
TINYINT	SMALLINT	Yes
TINYTEXT	TEXT	Yes
VARBINARY	BYTEA	Yes
VARCHAR	VARCHAR	Yes
YEAR	SMALLINT	Yes
GEOMETRY	-	No

NOTE

- DATE values supported by MySQL range from '1000-01-01' to '9999-12-31'.

  DATETIME values supported by MySQL range from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'.

  TIMESTAMP values supported by MySQL range from '1970-01-01 00:00:01' UTC to '2038-01-19 03:14:07' UTC.

  For details, see **official MySQL documentation**.

  For PostgreSQL, 0000-00-00 is an invalid date and will be converted to 1970-01-01 by DRS. For example, '0000-00-00' of the DATE type in MySQL is converted to '1970-01-01' by DRS, and '1000-00-31 23:59:59' of the DATETIME or TIMESTAMP type in MySQL is converted to '1970-01-01 00:00:00' by DRS.
- TIME values supported by MySQL range from '-838:59:59' to '838:59:59'. For details, see the **official MySQL documentation**. For PostgreSQL, the minimum value of the TIME type is 00:00:00 and the maximum value is 24:00:00. In MySQL, if a value of the TIME type is less than 00:00:00 or greater than 24:00:00, DRS will convert it to 00:00:00.
- YEAR value ranges supported by MySQL are 1901 to 2155 and 0000. For details, see **official MySQL documentation**. PostgreSQL does not have the YEAR type, so DRS will convert the YEAR type of MySQL to the SMALLINT type.
- For MySQL databases, '0000' of the DATE type will be converted to 0 by DRS.
- If the data type of a column is INT and the column contains the AUTO_INCREMENT attribute, DRS converts the data type of the column to SERIAL during synchronization.

8.2 MySQL->GaussDB(DWS)

Table 8-2 Data type mapping

Data Type (MySQL)	Data Type (GaussDB(DWS))	Whether to Support Mapping
BIT[(M)]	BIT	Yes
TINYINT[(M)]	SMALLINT	Yes
TINYINT[(M)] [UNSIGNED]	SMALLINT	Yes
SMALLINT[(M)]	SMALLINT	Yes
SMALLINT[(M)] [UNSIGNED]	INTEGER	Yes
MEDIUMINT[(M)]	INTEGER	Yes
MEDIUMINT[(M)] [UNSIGNED]	INTEGER	Yes
INT[(M)]	INTEGER	Yes
INT[(M)] [UNSIGNED]	BIGINT	Yes
BIGINT[(M)]	BIGINT	Yes
BIGINT[(M)] [UNSIGNED]	NUMERIC	Yes
DECIMAL[(M[,D])]	SMALLINT| INTEGER| BIGINT | NUMERIC	Yes. Use a data type that meets the precision and scale requirements.
FLOAT(p)	FLOAT4	Yes
DOUBLE[(M,D)]	FLOAT8	Yes
DATE	DATE	Yes. In earlier versions, the data type is TIMESTAMP(0) WITHOUT TIME ZONE.
DATETIME[(fsp)]	TIMESTAMP	Yes
TIMESTAMP[(fsp)]	TIMESTAMP WITH TIME ZONE	Yes
TIME[(fsp)]	TIME	Yes
YEAR[(4)]	SMALLINT	Yes
CHAR[(M)]	CHAR	Yes

Data Type (MySQL)	Data Type (GaussDB(DWS))	Whether to Support Mapping
VARCHAR(M)	CHARACTER VARYING()	Yes. The length of a varchar column is increased multiple times in the destination database based on the column character set in the source database.
BINARY[(M)]	BYTEA	Yes
VARBINARY(M)	BYTEA	Yes
TINYBLOB	BLOB	Yes
TINYTEXT	TEXT	Yes
BLOB	BLOB	Yes
TEXT	TEXT	Yes
MEDIUMBLOB	BLOB	Yes
MEDIUMTEXT	TEXT	Yes
LONGBLOB	BLOB	Yes
LONGTEXT	TEXT	Yes
ENUM	VARCHAR	Yes
SET	VARCHAR	Yes
JSON	JSONB	Yes

NOTE

- DATE values supported by MySQL range from '1000-01-01' to '9999-12-31'.

  DATETIME values supported by MySQL range from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'.

  TIMESTAMP values supported by MySQL range from '1970-01-01 00:00:01' UTC to '2038-01-19 03:14:07' UTC.

  For details, see **official MySQL documentation**.

  For GaussDB(DWS), 0000-00-00 is an invalid date and the DRS synchronization task will fail. For example, '0000-00-00' of the DATE type in MySQL is converted to '1970-01-01' by DRS, and '1000-00-31 23:59:59' of the DATETIME or TIMESTAMP type in MySQL is converted to '1970-01-01 00:00:00' by DRS.
- TIME values supported by MySQL range from '-838:59:59' to '838:59:59'. For details, see the **official MySQL documentation**. For GaussDB(DWS), the minimum value of the TIME type is 00:00:00 and the maximum value is 24:00:00. In MySQL, if a value of the TIME type is less than 00:00:00 or greater than 24:00:00, the DRS synchronization task will fail.
- YEAR value ranges supported by MySQL are 1901 to 2155 and 0000. For details, see **official MySQL documentation**. GaussDB(DWS) does not have the YEAR type, so DRS will convert the YEAR type of MySQL to the SMALLINT type.
- For '0000' of the DATE type in MySQL, the DRS synchronization task will fail.
- If the data type of a column is INT and the column contains the AUTO_INCREMENT attribute, DRS converts the data type of the column to SERIAL during synchronization.

8.3 MySQL->GaussDB

MySQL -> GaussDB B- or MYSQL-Compatible Mode

Table 8-3 Data type mapping

Data Type (MySQL)	Data Type (GaussDB)	Whether to Support Mapping
CHAR	CHARACTER	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
VARCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
BINARY	BYTEA	Yes

Data Type (MySQL)	Data Type (GaussDB)	Whether to Support Mapping
VARBINARY	BYTEA	Yes
TINYBLOB	BYTEA	Yes
BLOB	BYTEA	Yes
MEDIUMBLOB	BYTEA	Yes
LONGBLOB	BYTEA	Yes
TINYTEXT	TEXT	Yes
TEXT	TEXT	Yes
MEDIUMTEXT	TEXT	Yes
LONGTEXT	TEXT	Yes
ENUM	VARCHAR	Yes
SET	VARCHAR	Yes
TINYINT	SMALLINT	Yes
SMALLINT	SMALLINT	Yes
MEDIUMINT	INT	Yes
INT	INT	Yes
BIGINT	BIGINT	Yes
FLOAT	REAL/DOUBLE PRECISION	Yes
DOUBLE	DOUBLE PRECISION	Yes
DATE	DATE	Yes
DATETIME	TIMESTAMP WITHOUT TIME ZONE	Yes
TIMESTAMP	TIMESTAMP WITH TIME ZONE	Yes
TIME	TIME WITHOUT TIME ZONE	Yes
BIT	BIT	Yes
JSON	JSON	Yes, but JSON containing BIT data is not supported.
DECIMAL	NUMERIC	Yes
NUMERIC	NUMERIC	Yes

Data Type (MySQL)	Data Type (GaussDB)	Whether to Support Mapping
YEAR	SMALLINT	Yes
BOOLEAN	SMALLINT	Yes

NOTE

- DATE values supported by MySQL range from '1000-01-01' to '9999-12-31'.

  DATETIME values supported by MySQL range from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'.

  TIMESTAMP values supported by MySQL range from '1970-01-01 00:00:01' UTC to '2038-01-19 03:14:07' UTC.

  For details, see **official MySQL documentation**.

  For GaussDB, 0000-00-00 is an invalid date and will be converted to 1970-01-01 by DRS. For example, '0000-00-00' of the DATE type in MySQL is converted to '1970-01-01' by DRS, and '1000-00-31 23:59:59' of the DATETIME or TIMESTAMP type in MySQL is converted to '1970-01-01 00:00:00' by DRS.
- TIME values supported by MySQL range from '-838:59:59' to '838:59:59'. For details, see the **official MySQL documentation**. For GaussDB, the minimum value of the TIME type is 00:00:00 and the maximum value is 24:00:00. In MySQL, if a value of the TIME type is less than 00:00:00 or greater than 24:00:00, DRS will convert it to 00:00:00.
- YEAR value ranges supported by MySQL are 1901 to 2155 and 0000. For details, see **official MySQL documentation**. GaussDB does not have the YEAR type, so DRS will convert the YEAR type of MySQL to the SMALLINT type.
- For MySQL databases, '0000' of the DATE type will be converted to 0 by DRS.
- If the data type of a column is INT and the column contains the AUTO_INCREMENT attribute, DRS converts the data type of the column to SERIAL during synchronization.

MySQL -> GaussDB M-Compatible Mode

Table 8-4 Data type mapping

Data Type (MySQL)	Data Type (GaussDB)	Whether to Support Mapping
BOOL	BOOL	Yes
BOOLEAN	BOOLEAN	Yes
TINYINT	TINYINT	Yes
SMALLINT	SMALLINT	Yes
MEDIUMINT	MEDIUMINT	Yes
INT	INT	Yes
INTEGER	INTEGER	Yes
BIGINT	BIGINT	Yes

Data Type (MySQL)	Data Type (GaussDB)	Whether to Support Mapping
DECIMAL	DECIMAL	Yes
NUMERIC	DECIMAL	Yes
DEC	DEC	Yes
FIXED	DECIMAL	Yes
FLOAT	FLOAT	Yes
DOUBLE	DOUBLE	Yes
DOUBLE PRECISION	DOUBLE	Yes
REAL	DOUBLE	Yes
DATE	DATE	Yes
DATETIME	DATETIME	Yes
TIMESTAMP	TIMESTAMP	Yes
TIME	TIME	Yes
YEAR	YEAR	Yes
CHAR	CHAR	Yes
VARCHAR	VARCHAR	Yes
TINYTEXT	TINYTEXT	Yes
TEXT	TEXT	Yes
MEDIUMTEXT	MEDIUMTEXT	Yes
LONGTEXT	LONGTEXT	Yes
ENUM('value1','value2',...)	VARCHAR	Yes
SET('value1','value2',...)	VARCHAR+CHECK	Yes
BINARY	BINARY	Yes
VARBINARY	VARBINARY	Yes
TINYBLOB	TINYBLOB	Yes
BLOB	BLOB	Yes
MEDIUMBLOB	MEDIUMBLOB	Yes
LONGBLOB	LONGBLOB	Yes
BIT	BIT	Yes
JSON	TEXT	Yes

8.4 MySQL->Oracle

Table 8-5 Data type mapping

Data Type (MySQL)	Data Type (Oracle)	Whether to Support Mapping
ENUM	VARCHAR2	Yes
SET	VARCHAR2	Yes
VARCHAR	VARCHAR2	Yes
NUMERIC	NUMBER	Yes
FLOAT	BINARY_FLOAT	Yes
TIMESTAMP	TIMESTAMP WITH TIME ZONE	Yes
DATETIME	TIMESTAMP	Yes
DATE	DATE	Yes
TIME	INVERVAL DAY TO SECOND	Yes
YEAR	VARCHAR2	Yes
BIT	RAW	Yes
CLOB	CLOB	Yes
GEOMETRY	-	No
VARBINARY	BLOB	Yes
BINARY	RAW	Yes
DOUBLE	BINARY_DOUBLE	Yes
DECIMAL	NUMBER	Yes
INT	NUMBER	Yes
TINYINT	NUMBER	Yes
SMALLINT	NUMBER	Yes
MEDIUMINT	NUMBER	Yes
BIGINT	NUMBER	Yes
BLOB	BLOB	Yes
LONGBLOB	BLOB	Yes
MEDIUMBLOB	BLOB	Yes

Data Type (MySQL)	Data Type (Oracle)	Whether to Support Mapping
CHAR	CHAR	Yes
TEXT	CLOB	Yes
JSON	CLOB	Yes

8.5 MySQL->CSS/ES

Table 8-6 Data type mapping

Data Type (MySQL)	Data Type (Elasticsearch)	Whether to Support Mapping
BIT[(M)]	BOOLEAN | LONG|TEXT	Yes BOOLEAN: 1 byte LONG: 2 to 63 bytes TEXT: 64 bytes
TINYINT[(M)]	SHORT	Yes
TINYINT[(M)] [UNSIGNED]	INTEGER	Yes
SMALLINT[(M)]	SHORT	Yes
SMALLINT[(M)] [UNSIGNED]	INTEGER	Yes
MEDIUMINT[(M)]	INTEGER	Yes
MEDIUMINT[(M)] [UNSIGNED]	INTEGER	Yes
INT[(M)]	INTEGER	Yes
INT[(M)] [UNSIGNED]	LONG	Yes
BIGINT[(M)]	LONG	Yes
BIGINT[(M)] [UNSIGNED]	TEXT	Yes
DECIMAL[(M[,D])]	SHORT| INTEGER| LONG| TEXT| DOUBLE	Yes. Use a data type that meets the precision and scale requirements.
FLOAT(p)	FLOAT	Yes
DOUBLE[(M,D)]	DOUBLE	Yes
DATE	DATE	Yes; format: yyyy-mm-dd

Data Type (MySQL)	Data Type (Elasticsearch)	Whether to Support Mapping
DATETIME[(fsp)]	DATE	Yes; format: yyyy-mm-dd't'hh:mm:ss
TIMESTAMP[(fsp)]	DATE	Yes; format: yyyy-mm-dd't'hh:mm:ss
TIME[(fsp)]	DATE	Yes; format: hh:mm:ss
YEAR[(4)]	DATE	Yes; format: yyyy
CHAR[(M)]	TEXT	Yes
VARCHAR(M)	TEXT	Yes
BINARY[(M)]	BINARY	Yes
VARBINARY(M)	BINARY	Yes
TINYBLOB	BINARY	Yes
TINYTEXT	TEXT	Yes
BLOB	BINARY	Yes
TEXT	TEXT	Yes
MEDIUMBLOB	BINARY	Yes
MEDIUMTEXT	TEXT	Yes
LONGBLOB	BINARY	Yes
LONGTEXT	TEXT	Yes
ENUM('value1','value2',...)	KEYWORD	Yes
SET('value1','value2',...)	KEYWORD	Yes
GEOMETRY	GEO_SHAPE	Yes
POINT	GEO_SHAPE	Yes
LINESTRING	GEO_SHAPE	Yes
POLYGON	GEO_SHAPE	Yes
MULTIPOINT	GEO_SHAPE	Yes
MULTILINESTRING	GEO_SHAPE	Yes
MULTIPOLYGON	GEO_SHAPE	Yes
GEOMETRYCOLLECTION/GEOMCOLLECTION	GEO_SHAPE	Yes
JSON	OBJECT	Yes

8.6 Oracle->MySQL

Table 8-7 Data type mapping

Data Type (Oracle)	Condition	Data Type (MySQL)	Whether to Support Mapping
CHAR	length<=255	CHAR	Yes
CHAR	length>255	VARCHAR	Yes
VARCHAR	Length (row size) ≤ 65536	VARCHAR	Yes
VARCHAR	Length (row size) > 65536	TEXT	Yes
VARCHAR2	-	VARCHAR2	Yes
NCHAR	length<=255	NCHAR	Yes
NCHAR	length>255	NVARCHAR	Yes
NVARCHAR2	-	NVARCHAR	Yes
NUMBER	precision=0 scale = 0	DECIMAL(65,30)	Yes
NUMBER	precision!=0 scale!=0	DECIMAL(precision, scale)	Yes
FLOAT	-	FLOAT	Yes
BINARY_FLOAT	-	FLOAT	Yes
BINARY_DOUBLE	-	DOUBLE	Yes
DATE	-	DATETIME	Yes
TIMESTAMP	-	DATETIME	Yes
TIMESTAMP WITH TIME ZONE	6 digit precision	TIMESTAMP	Yes
TIMESTAMP WITH LOCAL TIME ZONE	6 digit precision	TIMESTAMP	Yes
INTERVAL	6 digit precision	VARCHAR(30)	Yes
BLOB	-	LONGBLOB	Yes
CLOB	-	LONGTEXT	Yes
NCLOB	-	LONGTEXT	Yes

Data Type (Oracle)	Condition	Data Type (MySQL)	Whether to Support Mapping
LONG	-	LONGTEXT	Yes
RAW	-	VARBINARY	Yes
LONG RAW	-	LONGBLOB	Yes
ROWID	-	VARCHAR(18)	Yes
UROWID	-	-	No
XMLTYPE	-	-	No
BFILE	-	-	No
SDO_GEOMETRY	-	-	No

8.7 Oracle->GaussDB(for MySQL)

Table 8-8 Data type mapping

Data Type (Oracle)	Condition	Data Type (GaussDB(for MySQL))	Whether to Support Mapping
CHAR	length<=255	CHAR	Yes
CHAR	length>255	VARCHAR	Yes
VARCHAR	Size<=65536	VARCHAR	Yes
VARCHAR	Size>65536	TEXT	Yes
VARCHAR2	-	VARCHAR2	Yes
NCHAR	length<=255	NCHAR	Yes
NCHAR	length>255	NVARCHAR	Yes
NVARCHAR2	-	NVARCHAR	Yes
NUMBER	precision=0 scale = 0	DECIMAL(65,30)	Yes
NUMBER	precision!=0 scale!=0	DECIMAL(precision, scale)	Yes
FLOAT	-	FLOAT	Yes
BINARY_FLOAT	-	FLOAT	Yes
BINARY_DOUBLE	-	DOUBLE	Yes
DATE	-	DATETIME	Yes

Data Type (Oracle)	Condition	Data Type (GaussDB(for MySQL))	Whether to Support Mapping
TIMESTAMP	-	DATETIME	Yes
TIMESTAMP WITH TIME ZONE	6 digit precision	TIMESTAMP	Yes
TIMESTAMP WITH LOCAL TIME ZONE	6 digit precision	TIMESTAMP	Yes
INTERVAL	Incremental	VARCHAR(30)	No
INTERVAL	Full; 6 digit precision	VARCHAR(30)	Yes
BLOB	-	LONGBLOB	Yes
CLOB	-	LONGTEXT	Yes
NCLOB	-	LONGTEXT	Yes
LONG	-	LONGTEXT	Yes
RAW	-	VARBINARY	Yes
LONG RAW	-	LONGBLOB	Yes
ROWID	-	VARCHAR(18)	Yes
UROWID	-	-	No
XMLTYPE	-	-	No
BFILE	-	-	No
SDO_GEOMETRY	-	-	No

8.8 Oracle->GaussDB

Table 8-9 Data type mapping

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
CHAR	CHARACTER	Supported	Supported	Supported. The spaces before and after the character are ignored.	Supported. The spaces before and after the character are ignored.	-
VARCHAR	CHARACTER VARYING	Supported	Supported	Supported	Supported	The precision ranges of the source and destination databases are different, causing precision loss.
VARCHAR2	CHARACTER VARYING	Supported	Supported	Supported	Supported	-
NCHAR	CHARACTER	Supported	Supported	Supported. The spaces before and after the character are ignored.	Supported. The spaces before and after the character are ignored.	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
NVARCHAR2	NVARCHAR2	Supported	Supported	Supported	Supported	-
NUMBER	NUMERIC	Supported	Supported	Supported	Supported	-
NUMBER (6,3)	NUMERIC(6,3)	Supported	Supported	Supported	Supported	-
NUMBER (6,0)	INTEGER	Supported	Supported	Supported	Supported	-
NUMBER (3)	SMALLINT	Supported	Supported	Supported	Supported	-
NUMBER (6,-2)	INTEGER	Supported	Supported	Supported	Supported	-
BINARY_FLOAT	REAL	Supported	Supported	Not supported	Supported	The precision ranges of the source and destination databases are different, causing precision loss.
BINARY_DOUBLE	DOUBLE PRECISION	Supported	Supported	Not supported	Supported	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
FLOAT	DOUBLE PRECISION	Supported	Supported	Not supported	Supported	The precision ranges of the source and destination databases are different, causing precision loss.
INT	NUMERIC	Supported	Supported	Supported	Supported	-
INTEGER	NUMERIC	Supported	Supported	Supported	Supported	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
DATE	TIMESTAMP(0) WITHOUT TIME ZONE	Supported	Supported	Not supported	Supported	If a table with date type is created in the destination database, the data type precision range in the source database is different from that in the destination database, causing precision loss. Therefore, comparison is not supported.
TIMESTAMP	TIMESTAMP(6) WITHOUT TIME ZONE	Supported	Supported	Not supported	The value is accurate to six decimal places.	The maximum precision supported by the source database is 6.

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
TIMESTAMP_TZ	TIMESTAMP(6) WITH TIME ZONE	Not supported (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-
TIMESTAMP_LTZ	TIMESTAMP(6) WITH TIME ZONE	Not supported (The destination database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
INTERVAL_YM	INTERVAL YEAR TO MONTH	Supported	Supported	Not supported	Not supported	Incremental synchronization does not support this type.
INTERVAL_DS	INTERVAL DAY TO SECOND	Supported	Supported	Not supported	Not supported	Incremental synchronization does not support this type. The maximum precision supported by the source database is 6.
BLOB	BLOB	Not supported (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
CLOB	CLOB	Not supported (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-
NCLOB	TEXT	Not supported (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
LONG	TEXT	No (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-
LONG_RAW	BYTEA	Not supported (The source database does not support creating tables using the primary key.)	Supported	Not supported	Filter this column.	-
RAW	RAW	Supported	Supported	Not supported	Supported	-
ROWID	CHARACTER(18)	Supported	Supported	Supported	Supported	-

Source Data Type	Destination Data Type	Synchronization (Source Data Type as Primary Key)	Synchronization (Source Data Type as Non-Primary Key)	Comparison (Source Data Type as Primary Key)	Comparison (Source Data Type as Non-Primary Key)	Remarks
BFILE	-	Not supported	Not supported	Not supported	Not supported	Restrictions on the source database: The BFILE type is not supported.
XMLTYPE	-	Not supported	Not supported	Not supported	Not supported	Restrictions on the source database: The XMLTYPE type is not supported.
UROWID	-	Not supported	Not supported	Not supported	Not supported	Full and incremental synchronizations are not supported.
SDO_GEOMETRY	-	Not supported	Not supported	Not supported	Not supported	Restrictions on the source database: The SDO_GEOMETRY type is not supported.
NUMBER(*, 0)	NUMERIC	Supported	Supported	Supported	Supported	-

8.9 Oracle->DDM

Table 8-10 Data type mapping

Data Type (Oracle)	Condition	Data Type (DDM)	Whether to Support Mapping
CHAR(n)	n<=255	CHAR(n)	Yes
CHAR(n)	n>255	VARCHAR(n)	Yes
VARCHAR(Size)	Length (row size) ≤ 65535	VARCHAR(n)	Yes
VARCHAR(Size)	Length (row size) > 65535	TEXT	Yes
VARCHAR2(n)	-	VARCHAR(n)	Yes
NCHAR(n)	n<=255	NCHAR(n)	Yes
NCHAR(n)	n>255	NVARCHAR(n)	Yes
NVARCHAR2(n)	-	NVARCHAR(n)	Yes
NUMBER(p,s)	s>0	NUMBER(p,s)	Yes
NUMBER(p,s)	s<=0	NUMBER(p-s,0)	Yes
BINARY_FLOAT	-	FLOAT	Yes
BINARY_DOUBLE	-	DOUBLE	Yes
FLOAT(b)	b<=99	DECIMAL(b*0.30103*2, b*0.30103)	Yes
FLOAT(b)	b>99	DOUBLE	Yes
DATE	-	DATETIME	Yes
TIMESTAMP	-	TIMESTAMP	Yes
TIMESTAMP WITH LOCAL TIME ZONE	-	TIMESTAMP	Yes
TIMESTAMP WITH TIME ZONE	-	TIMESTAMP	Yes
INTERVAL	Incremental	VARCHAR(30)	No
INTERVAL	Full; 6 digit precision	VARCHAR(30)	Yes

Data Type (Oracle)	Condition	Data Type (DDM)	Whether to Support Mapping
BLOB	-	LONGBLOB	Yes
CLOB	-	LONGTEXT	Yes
NCLOB	-	LONGTEXT	Yes
LONG	-	LONGTEXT	Yes
LONG_RAW	-	LONGBLOB	Yes
RAW	-	VARBINARY	Yes
ROWID	-	VARCHAR(18)	Yes

8.10 Oracle->GaussDB(DWS)

Table 8-11 Data type mapping

Data Type (Oracle)	Data Type (GaussDB(DWS))	Whether to Support Mapping
CHAR	CHAR	Yes
VARCHAR	VARCHAR	Yes
VARCHAR2	VARCHAR	Yes
NCHAR	NCHAR	Yes
NVARCHAR2	NVARCHAR	Yes
NUMBER	NUMBER	Yes
BINARY_FLOAT	REAL	Yes
BINARY_DOUBLE	DOUBLE	Yes
FLOAT	FLOAT/REAL	Yes
DATE	TIMESTAMP	Yes
TIMESTAMP	TIMESTAMP	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMPTZ	Yes
TIMESTAMP WITH LOCAL TIME ZONE	TIMESTAMPTZ	Yes
INTERVAL	INTERVAL	Yes
BLOB	BYTEA	Yes

Data Type (Oracle)	Data Type (GaussDB(DWS))	Whether to Support Mapping
CLOB	CLOB	Yes
NCLOB	TEXT	Yes
LONG	TEXT	Yes
LONG_RAW	BYTEA	Yes
RAW (non-primary key and non-unique key column)	BYTEA	Yes
RAW (primary key and unique key column)	VARCHAR	Yes
ROWID	CHARACTER(18)	Yes
UROWID	-	No
XMLTYPE	-	No
BFILE	-	No
SDO_GEOMETRY	-	No

8.11 Oracle->PostgreSQL

Oracle -> PostgreSQL Community Edition

Table 8-12 Data type mapping

Data Type (Oracle)	Data Type (PostgreSQL Community Edition)	Whether to Support Mapping
CHAR	CHAR	Yes
VARCHAR	VARCHAR	Yes
VARCHAR2	VARCHAR	Yes
NCHAR	NCHAR	Yes
NVARCHAR2	VARCHAR	Yes
NUMBER	NUMBER	Yes
BINARY_FLOAT	REAL	Yes
BINARY_DOUBLE	DOUBLE	Yes
FLOAT	FLOAT	Yes

Data Type (Oracle)	Data Type (PostgreSQL Community Edition)	Whether to Support Mapping
DATE	TIMESTAMP	Yes
TIMESTAMP	TIMESTAMP	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMPTZ	Yes
TIMESTAMP WITH LOCAL TIME ZONE	TIMESTAMPTZ	Yes
INTERVAL	INTERVAL	Yes
BLOB	BYTEA	Yes
CLOB	CLOB	Yes
NCLOB	TEXT	Yes
LONG	TEXT	Yes
LONG_RAW	BYTEA	Yes
RAW (non-primary key and non-unique key column)	BYTEA	Yes
RAW (primary key and unique key column)	VARCHAR	Yes
ROWID	CHARACTER(18)	Yes
UROWID	-	No
XMLTYPE	-	No
BFILE	-	No
SDO_GEOMETRY	-	No

8.12 GaussDB(for MySQL)->Oracle

Table 8-13 Data type mapping

Data Type (GaussDB for MySQL)	Data Type (Oracle)	Whether to Support Mapping
ENUM	VARCHAR2	Yes
SET	VARCHAR2	Yes
VARCHAR	VARCHAR2	Yes
NUMERIC	NUMBER	Yes

Data Type (GaussDB for MySQL)	Data Type (Oracle)	Whether to Support Mapping
FLOAT	BINARY_FLOAT	Yes
TIMESTAMP	TIMESTAMP WITH TIME ZONE	Yes
DATETIME	TIMESTAMP	Yes
DATE	DATE	Yes
TIME	INVERVAL DAY TO SECOND	Yes
YEAR	VARCHAR2	Yes
BIT	RAW	Yes
CLOB	CLOB	Yes
VARBINARY	BLOB	Yes
BINARY	RAW	Yes
DOUBLE	BINARY_DOUBLE	Yes
DECIMAL	NUMBER	Yes
INT	NUMBER	Yes
TINYINT	NUMBER	Yes
SMALLINT	NUMBER	Yes
MEDIUMINT	NUMBER	Yes
BIGINT	NUMBER	Yes
BLOB	BLOB	Yes
LONGBLOB	BLOB	Yes
MEDIUMBLOB	BLOB	Yes
CHAR	CHAR	Yes
TEXT	CLOB	Yes
JSON	CLOB	Yes
GEOMETRY	-	No

8.13 GaussDB(for MySQL)->CSS/ES

Table 8-14 Data type mapping

Data Type (GaussDB(for MySQL))	Data Type (Elasticsearch)	Whether to Support Mapping
BIT[(M)]	BOOLEAN | LONG|TEXT	Yes BOOLEAN: 1 byte LONG: 2 to 63 bytes TEXT: 64 bytes
TINYINT[(M)]	SHORT	Yes
TINYINT[(M)] [UNSIGNED]	INTEGER	Yes
SMALLINT[(M)]	SHORT	Yes
SMALLINT[(M)] [UNSIGNED]	INTEGER	Yes
MEDIUMINT[(M)]	INTEGER	Yes
MEDIUMINT[(M)] [UNSIGNED]	INTEGER	Yes
INT[(M)]	INTEGER	Yes
INT[(M)] [UNSIGNED]	LONG	Yes
BIGINT[(M)]	LONG	Yes
BIGINT[(M)] [UNSIGNED]	TEXT	Yes
DECIMAL[(M[,D])]	SHORT| INTEGER| LONG| TEXT| DOUBLE	Yes. Use a data type that meets the precision and scale requirements.
FLOAT(p)	FLOAT	Yes
DOUBLE[(M,D)]	DOUBLE	Yes
DATE	DATE	Yes; format: yyyy-mm-dd
DATETIME[(fsp)]	DATE	Yes; format: yyyy-mm-dd't'hh:mm:ss
TIMESTAMP[(fsp)]	DATE	Yes; format: yyyy-mm-dd't'hh:mm:ss
TIME[(fsp)]	DATE	Yes; format: hh:mm:ss
YEAR[(4)]	DATE	Yes; format: yyyy

Data Type (GaussDB(for MySQL))	Data Type (Elasticsearch)	Whether to Support Mapping
CHAR[(M)]	TEXT	Yes
VARCHAR(M)	TEXT	Yes
BINARY[(M)]	BINARY	Yes
VARBINARY(M)	BINARY	Yes
TINYBLOB	BINARY	Yes
TINYTEXT	TEXT	Yes
BLOB	BINARY	Yes
TEXT	TEXT	Yes
MEDIUMBLOB	BINARY	Yes
MEDIUMTEXT	TEXT	Yes
LONGBLOB	BINARY	Yes
LONGTEXT	TEXT	Yes
ENUM('value1','value2',...)	KEYWORD	Yes
SET('value1','value2',...)	KEYWORD	Yes
GEOMETRY	GEO_SHAPE	Yes
POINT	GEO_SHAPE	Yes
LINESTRING	GEO_SHAPE	Yes
POLYGON	GEO_SHAPE	Yes
MULTIPOINT	GEO_SHAPE	Yes
MULTILINESTRING	GEO_SHAPE	Yes
MULTIPOLYGON	GEO_SHAPE	Yes
GEOMETRYCOLLECTION/ GEOMCOLLECTION	GEO_SHAPE	Yes
JSON	OBJECT	Yes

8.14 GaussDB->MySQL

Table 8-15 Data type mapping

Data Type (GaussDB)	Data Type (MySQL)	Whether to Support Mapping
CHARACTER	CHAR	Yes
CHARACTER VARYING	VARCHAR	Yes
BYTEA/BLOB/RAW	BINARY/VARBINARY/ TINYBLOB /BLOB/ MEDIUMBLOB/ LONGBLOB	Yes
TEXT/CLOB	TINYTEXT/ MEDIUMTEXT / LONGTEXT/ TEXT	Yes
TINYINT	SMALLINT	Yes
SMALLINT	SMALLINT	Yes
INTEGER	INT	Yes
BIGINT	BIGINT	Yes
FLOAT4	FLOAT	Yes
FLOAT8/DOUBLE PRECISION	DOUBLE	Yes
DATE	DATE	Yes
TIMESTAMP WITHOUT TIME ZONE	DATETIME	Yes
SMALLDATETIME	DATETIME	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMP	Yes
TIME WITH TIME ZONE	TIME	Yes
TIME WITHOUT TIME ZONE	TIME	Yes
BIT	BIT	Yes
MONEY	VARCHAR	Yes
BOOLEAN	BOOLEAN	Yes
NUMBER	DECIMAL	Yes
NUMBERIC	DECIMAL	Yes

Data Type (GaussDB)	Data Type (MySQL)	Whether to Support Mapping
DECIMAL	DECIMAL	Yes

8.15 GaussDB->GaussDB(DWS)

Table 8-16 Data type mapping

Data Type (GaussDB)	Data Type (GaussDB(DWS))	Whether to Support Mapping
TINYINT	TINYINT	Yes
SMALLINT	SMALLINT	Yes
INT	INT	Yes
BIGINT	BIGINT	Yes
NUMERIC	NUMERIC	Yes
NUMERIC(P,S)	NUMERIC(P,S)	Yes
REAL	REAL	Yes
DOUBLE PRECISION	DOUBLE PRECISION	Yes
CHAR(N)	CHAR(N)	Yes
VARCHAR(N)	VARCHAR(N)	Yes
NVARCHAR2	NVARCHAR2	Yes
TEXT	TEXT	Yes
BOOLEAN	BOOLEAN	Yes
TIMESTAMP WITHOUT TIME ZONE	TIMESTAMP WITHOUT TIME ZONE	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMP WITH TIME ZONE	Yes
TIME WITHOUT TIME ZONE	TIME WITHOUT TIME ZONE	Yes
TIME WITH TIME ZONE	TIME WITH TIME ZONE	Yes
CHARACTER	CHAR	Yes
CHARACTER VARYING	VARCHAR2	Yes
DATE	DATE	Yes
BIT(N)	BIT(N)	Yes (only in full mode)

Data Type (GaussDB)	Data Type (GaussDB(DWS))	Whether to Support Mapping
BIT VARYING(N)	BIT VARYING(N)	Yes
BLOB	BLOB	Yes
RAW	RAW	Yes (only in full mode)
BYTEA	BYTEA	Yes
MONEY	MONEY	Yes (only in full mode)

8.16 DB2 for LUW->GaussDB

Table 8-17 Data type mapping

Data Type (DB2 for LUW)	Data Type (GaussDB)	Whether to Support Mapping
CHARACTER	CHARACTER	Yes
VARCHAR	VARCHAR	Yes
LONG VARCHAR	TEXT	Yes
GRAPHIC	NVARCHAR2	Yes
VARGRAPHIC	NVARCHAR2	Yes
LONG VARGRAPHIC	TEXT	Yes
CLOB	CLOB	Yes
DBCLOB	TEXT	Yes
BLOB	BLOB	Yes
BINARY	RAW	Yes
VARBINARY	RAW	Yes
REAL	REAL	Yes
DOUBLE	FLOAT8	Yes
SMALLINT	SMALLINT	Yes
INTEGER	INTEGER	Yes
BIGINT	BIGINT	Yes
DECIMAL	DECIMAL	Yes
DECFLOAT	NUMERIC	Yes
DATE	DATE	Yes

Data Type (DB2 for LUW)	Data Type (GaussDB)	Whether to Support Mapping
TIME	TIME(0) WITHOUT TIME ZONE	Yes
TIMESTAMP	TIMESTAMP(6) WITHOUT TIME ZONE	Yes
XML	TEXT	Yes
BOOLEAN	BOOLEAN	Yes
DB2SECURITYLABEL	VARCHAR (128)	Yes

8.17 DB2 for LUW->GaussDB(DWS)

Table 8-18 Data type mapping

Data Type (DB2 for LUW)	Data Type (GaussDB(DWS))	Whether to Support Mapping
CHARACTER	CHARACTER VARYING	Yes
VARCHAR	CHARACTER VARYING	Yes
LONG VARCHAR	TEXT	Yes
GRAPHIC	CHARACTER VARYING	Yes
VARGRAPHIC	CHARACTER VARYING	Yes
LONG VARGRAPHIC	TEXT	Yes
CLOB	TEXT	Yes
DBCLOB	TEXT	Yes
BLOB	BYTEA	Yes
BINARY	BYTEA	Yes
VARBINARY	BYTEA	Yes
REAL	FLOAT4	Yes
DOUBLE	DOUBLE PRECISION	Yes
SMALLINT	INT2	Yes
INTEGER	INT4	Yes
BIGINT	INT8	Yes
DECIMAL	NUMERIC	Yes

Data Type (DB2 for LUW)	Data Type (GaussDB(DWS))	Whether to Support Mapping
DECFLOAT	NUMERIC(65,10)	Yes
DATE	TIMESTAMP	Yes
TIME	TIME	Yes
TIMESTAMP	TIMESTAMP(6) WITHOUT TIME ZONE	Yes
XML	TEXT	Yes
BOOLEAN	BOOL	Yes
DB2SECURITYLABEL	CHARACTER VARYING(128)	Yes

8.18 PostgreSQL->GaussDB

Table 8-19 Data type mapping

Data Type (PostgreSQL)	Data Type (GaussDB)	Whether to Support Mapping
SMALLINT	SMALLINT	Yes
INTEGER	INTEGER	Yes
BIGINT	BIGINT	Yes
INTEGER	INTEGER	Yes
REAL	REAL	Yes
DOUBLE PRECISION	DOUBLE PRECISION	Yes
NUMERIC	NUMERIC	Yes
CHARACTER VARYING	CHARACTER VARYING	Yes
CHARACTER	CHARACTER	Yes
BIT	BIT	Yes
BIT VARYING	BIT VARYING	Yes
BOOLEAN	BOOLEAN	Yes
BYTEA	BYTEA	Yes
TEXT	TEXT	Yes
TIME WITHOUT TIME ZONE	TIME WITHOUT TIME ZONE	Yes

Data Type (PostgreSQL)	Data Type (GaussDB)	Whether to Support Mapping
TIME WITH TIME ZONE	TIME WITH TIME ZONE	Yes
TIMESTAMP WITHOUT TIME ZONE	TIMESTAMP WITHOUT TIME ZONE	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMP WITH TIME ZONE	Yes
INTERVAL	INTERVAL	Yes
CIDR	CIDR	Yes
PATH	PATH	Yes
BOX	BOX	Yes
LSEG	LSEG	Yes
MACADDR	MACADDR	Yes
POINT	POINT	Yes
POLYGON	POLYGON	Yes
INET	INET	Yes
TSQUERY	TSQUERY	Yes
TSVECTOR	TSVECTOR	Yes
UUID	UUID	Yes
JSON	JSON	Yes
JSONB	JSONB	Yes

8.19 PostgreSQL->GaussDB(DWS)

Table 8-20 Data type mapping

Data Type (PostgreSQL)	Data Type (GaussDB(DWS))	Whether to Support Mapping
SMALLINT	SMALLINT	Yes
INTEGER	INTEGER	Yes
BIGINT	BIGINT	Yes
INTEGER	INTEGER	Yes
REAL	REAL	Yes

Data Type (PostgreSQL)	Data Type (GaussDB(DWS))	Whether to Support Mapping
DOUBLE PRECISION	DOUBLE PRECISION	Yes
NUMERIC	NUMERIC	Yes
CHARACTER VARYING	CHARACTER VARYING	Yes
CHARACTER	CHARACTER	Yes
BIT	BIT	Yes
BIT VARYING	BIT VARYING	Yes
BOOLEAN	BOOLEAN	Yes
BYTEA	BYTEA	Yes
TEXT	TEXT	Yes
TIME WITHOUT TIME ZONE	TIME WITHOUT TIME ZONE	Yes
TIME WITH TIME ZONE	TIME WITH TIME ZONE	Yes
TIMESTAMP WITHOUT TIME ZONE	TIMESTAMP WITHOUT TIME ZONE	Yes
TIMESTAMP WITH TIME ZONE	TIMESTAMP WITH TIME ZONE	Yes
INTERVAL	INTERVAL	Yes
CIDR	CIDR	Yes
PATH	PATH	Yes
BOX	BOX	Yes
LSEG	LSEG	Yes
MACADDR	MACADDR	Yes
POINT	POINT	Yes
POLYGON	POLYGON	Yes
INET	INET	Yes
TSQUERY	TSQUERY	Yes
TSVECTOR	TSVECTOR	Yes
UUID	UUID	Yes
JSON	JSON	Yes
JSONB	JSONB	Yes

8.20 TiDB->GaussDB(for MySQL)

Table 8-21 Data type mapping

Data Type (TiDB)	Data Type (GaussDB for MySQL)	Whether to Support Mapping
BIGINT	BIGINT	Yes
BINARY	BINARY	Yes
BIT	BIT	Yes
BLOB	BLOB	Yes
BOOLEAN	BOOLEAN	Yes
CHAR	CHAR	Yes
DATE	DATE	Yes
DATETIME	DATETIME	Yes
DECIMAL	DECIMAL	Yes
DOUBLE	DOUBLE	Yes
ENUM	ENUM	Yes
FLOAT	FLOAT	Yes
INT	INT	Yes
JSON	JSON	Yes
LONGBLOB	LONGBLOB	Yes
LONGTEXT	LONGTEXT	Yes
MEDIUMBLOB	MEDIUMBLOB	Yes
MEDIUMINT	MEDIUMINT	Yes
SET	SET	Yes
SMALLINT	SMALLINT	Yes
TEXT	TEXT	Yes
TIME	TIME	Yes
TIMESTAMP	TIMESTAMP	Yes
TINYBLOB	TINYBLOB	Yes
TINYINT	TINYINT	Yes
TINYTEXT	TINYTEXT	Yes

Data Type (TiDB)	Data Type (GaussDB for MySQL)	Whether to Support Mapping
VARBINARY	VARBINARY	Yes
VARCHAR	VARCHAR	Yes
YEAR	YEAR	Yes

8.21 Microsoft SQL Server->GaussDB(DWS)

Table 8-22 Data type mapping

Data Type (Microsoft SQL Server)	Data Type (GaussDB(DWS))	Whether to Support Mapping
TINYINT	SMALLINT	Yes
SMALLINT	SMALLINT	Yes
INT	INTEGER	Yes
BIGINT	BIGINT	Yes
DECIMAL	NUMERIC	Yes
NUMERIC	NUMERIC	Yes
FLOAT	DOUBLE PRECISION	Yes
REAL	REAL	Yes. The precision of SQL Server is 7 digits, while that of GaussDB(DWS) is 6 digits. If the REAL value of the source database has 7 digits, 1-digit precision loss will occur when the value is synchronized to the destination database.
SMALLMONEY	NUMERIC(10,4)	Yes
MONEY	NUMERIC(19,4)	Yes
BIT	BOOLEAN	Yes
DATE	TIMESTAMP (0) WITHOUT TIME ZONE	Yes
DATETIME	TIMESTAMP WITHOUT TIME ZONE	Yes

Data Type (Microsoft SQL Server)	Data Type (GaussDB(DWS))	Whether to Support Mapping
DATETIME2	TIMESTAMP WITHOUT TIME ZONE	Yes
DATETIMEOFFSET	TIMESTAMP WITH TIME ZONE	Yes
TIME(p)	TIME(P) WITHOUT TIME ZONE	The value can be accurate to seconds. Decimals are discarded.
TIMESTAMP	BYTEA	Yes
XML	TEXT	Yes
CHAR	CHARACTER	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
VARCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
NCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
NVARCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
BINARY	BYTEA	Yes

Data Type (Microsoft SQL Server)	Data Type (GaussDB(DWS))	Whether to Support Mapping
VARBINARY	BYTEA	Yes
IMAGE	BYTEA	Yes
HIERARCHYID	BYTEA	Yes
NTEXT	TEXT	Yes
TEXT	TEXT	Yes
UNIQUEIDENTIFIER	CHARACTER(36)	Yes

8.22 Microsoft SQL Server->GaussDB

Table 8-23 Data type mapping

Data Type (Microsoft SQL Server)	Data Type (GaussDB)	Whether to Support Mapping
TINYINT	SMALLINT	Yes
SMALLINT	SMALLINT	Yes
INT	INTEGER	Yes
BIGINT	BIGINT	Yes
DECIMAL	NUMERIC	Yes
NUMERIC	NUMERIC	Yes
FLOAT	DOUBLE PRECISION	Yes
REAL	REAL	Yes. The precision of SQL Server is 7 digits, while that of GaussDB is 6 digits. If the REAL value of the source database has 7 digits, 1-digit precision loss will occur when the value is synchronized to the destination database.
SMALLMONEY	NUMERIC(10,4)	Yes
MONEY	NUMERIC(19,4)	Yes
BIT	BOOLEAN	Yes

Data Type (Microsoft SQL Server)	Data Type (GaussDB)	Whether to Support Mapping
DATE	DATE	Yes
SMALLDATETIME	SMALLDATETIME	Yes
DATETIME	TIMESTAMP WITHOUT TIME ZONE	Yes
DATETIME2	TIMESTAMP WITHOUT TIME ZONE	Yes
DATETIMEOFFSET	TIMESTAMP WITH TIME ZONE	Yes
TIME(p)	TIME(P) WITHOUT TIME ZONE	The value can be accurate to seconds. Decimals are discarded.
TIMESTAMP	BYTEA	Yes
XML	TEXT	Yes
CHAR	CHARACTER	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
VARCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
NCHAR	CHARACTER VARYING()	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.

Data Type (Microsoft SQL Server)	Data Type (GaussDB)	Whether to Support Mapping
NVARCHAR	NVARCHAR2	Yes. If a column of this type in the source database contains characters that occupy more than one byte, increase the length of the column in the destination database.
BINARY	BYTEA	Yes
VARBINARY	BYTEA	Yes
IMAGE	BYTEA	Yes
HIERARCHYID	BYTEA	Yes
NTEXT	TEXT	Yes
TEXT	TEXT	Yes
UNIQUEIDENTIFIER	CHARACTER(36)	Yes

9 Billing

9.1 Billing Mode

You will be charged for the configuration and data transfer based on a pay-per-use or yearly/monthly basis.

Table 9-1 Billing items

Item	Description	Rule
Configuration fee	Configuration fees are generated when you use computing and storage resources and process data.	• In pay-per-use mode, you are charged based on the actual usage on an hourly basis. If the usage duration is less than one hour, you are charged a full hour. • In yearly/monthly mode, you need to make upfront payments on a yearly or monthly basis.
Data transfer fee	Data transfer fees are generated when you process or transfer data through a public network (excluding VPN, VPC, Direct Connect, and CC networks).	You are billed based on the actually used public network traffic in GB.

NOTE

Real-time migration supports only the pay-per-use billing mode.

Real-time synchronization and DR tasks support pay-per-use and yearly/monthly billing modes.

Billing Scenarios

Table 9-2 shows the common billed data flow types.

Table 9-2 Billing description

Function	Billing Mode	Commercial Data Flow	Direction
Real-time migration	Only the pay-per-use billing is supported. For details, see **Pay-Per-Use**.	• MySQL->MySQL • MySQL->DDM • MySQL->GaussDB(for MySQL) • MongoDB->DDS • MongoDB->GeminiDB Mongo • MySQL schema and logic table -> DDM	To the cloud
		• MySQL->MySQL • DDS->MongoDB	From the cloud
Backup migration	Free of charge	-	-

Function	Billing Mode	Commercial Data Flow	Direction
Real-time synchronization	Pay-per-use and Yearly/Monthly • For details about pay-per-use billing, see **Pay-Per-Use**. • For details about the yearly/monthly billing, see **Yearly/Monthly**.	• MySQL->MySQL • MySQL->PostgreSQL • MySQL->GaussDB(DWS) • MySQL->GaussDB(for MySQL) • MySQL -> GaussDB Primary/Standby • MySQL -> GaussDB Distributed • DDM->MySQL • DDM->GaussDB(DWS) • DDM->DDM • Oracle->MySQL • Oracle->GaussDB(DWS) • Oracle->GaussDB(for MySQL) • Oracle->DDM • Oracle->PostgreSQL • Oracle -> GaussDB primary/standby • Oracle -> GaussDB distributed • PostgreSQL->PostgreSQL • MongoDB->DDS • MariaDB->MariaDB • GaussDB(for MySQL)->GaussDB(for MySQL)	To the cloud

Function	Billing Mode	Commercial Data Flow	Direction
		• MySQL->MySQL • MySQL->Oracle • MySQL->CSS/ES • MySQL->Kafka • DDM->MySQL • DDM->Oracle • DDM->Kafka • DDS->MongoDB • DDS->Kafka • GaussDB(for MySQL)->MySQL • GaussDB(for MySQL)->GaussDB(DWS) • GaussDB(for MySQL)->Kafka • GaussDB(for MySQL)->Oracle • GaussDB(for MySQL)->CSS/ES • GaussDB primary/standby -> MySQL • GaussDB primary/standby -> Oracle • GaussDB primary/standby -> GaussDB(DWS) • GaussDB primary/standby -> Kafka • GaussDB primary/standby -> GaussDB primary/standby • GaussDB primary/standby -> GaussDB distributed • GaussDB distributed -> MySQL • GaussDB distributed -> Oracle • GaussDB distributed -> GaussDB(DWS) • GaussDB distributed -> Kafka • GaussDB distributed -> GaussDB distributed • GaussDB distributed -> GaussDB primary/standby • PostgreSQL->Kafka • MariaDB->MariaDB	From the cloud

Function	Billing Mode	Commercial Data Flow	Direction
		• MySQL->CSS/ES • MySQL->Kafka • MySQL -> GaussDB primary/standby • MySQL -> GaussDB Distributed • Oracle -> GaussDB primary/standby • Oracle -> GaussDB distributed • Oracle->Kafka • PostgreSQL->Kafka • GaussDB Primary/Standby -> MySQL • GaussDB primary/standby -> Oracle • GaussDB primary/standby -> Kafka • GaussDB primary/standby -> GaussDB primary/standby • GaussDB primary/standby -> GaussDB distributed • GaussDB distributed -> MySQL • GaussDB distributed -> Oracle • GaussDB distributed -> Kafka • GaussDB distributed -> GaussDB distributed • GaussDB Distributed -> GaussDB Primary/Standby	Self-built -> Self-built
Data subscription	In the open beta test (OBT) phase, you can apply for the service free of charge.	-	-
Real-time disaster recovery	Pay-per-use and Yearly/Monthly • For details about pay-per-use billing, see **Pay-Per-Use**. • For details about the yearly/monthly billing, see **Yearly/Monthly**.	• MySQL->MySQL	• Current cloud as standby • Current cloud as active • Dual-Active DR
		• MySQL->GaussDB(for MySQL)	• Current cloud as standby

Function	Billing Mode	Commercial Data Flow	Direction
		• GaussDB(for MySQL)->GaussDB(for MySQL)	• Current cloud as standby • Current cloud as active • Dual-Active DR
Workload replay	In the open beta test (OBT) phase, you can apply for the service free of charge.	-	-

9.2 Pay-Per-Use

Preferential Policies

We have arranged preferential pricing in the following scenarios:

- 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 migration and synchronization tasks will provide long-term discounts, lowering your costs for data transfers.

Billing Standards

DRS supports the pay-per-use billing mode. You are charged for the configuration and data transfer of each instance.

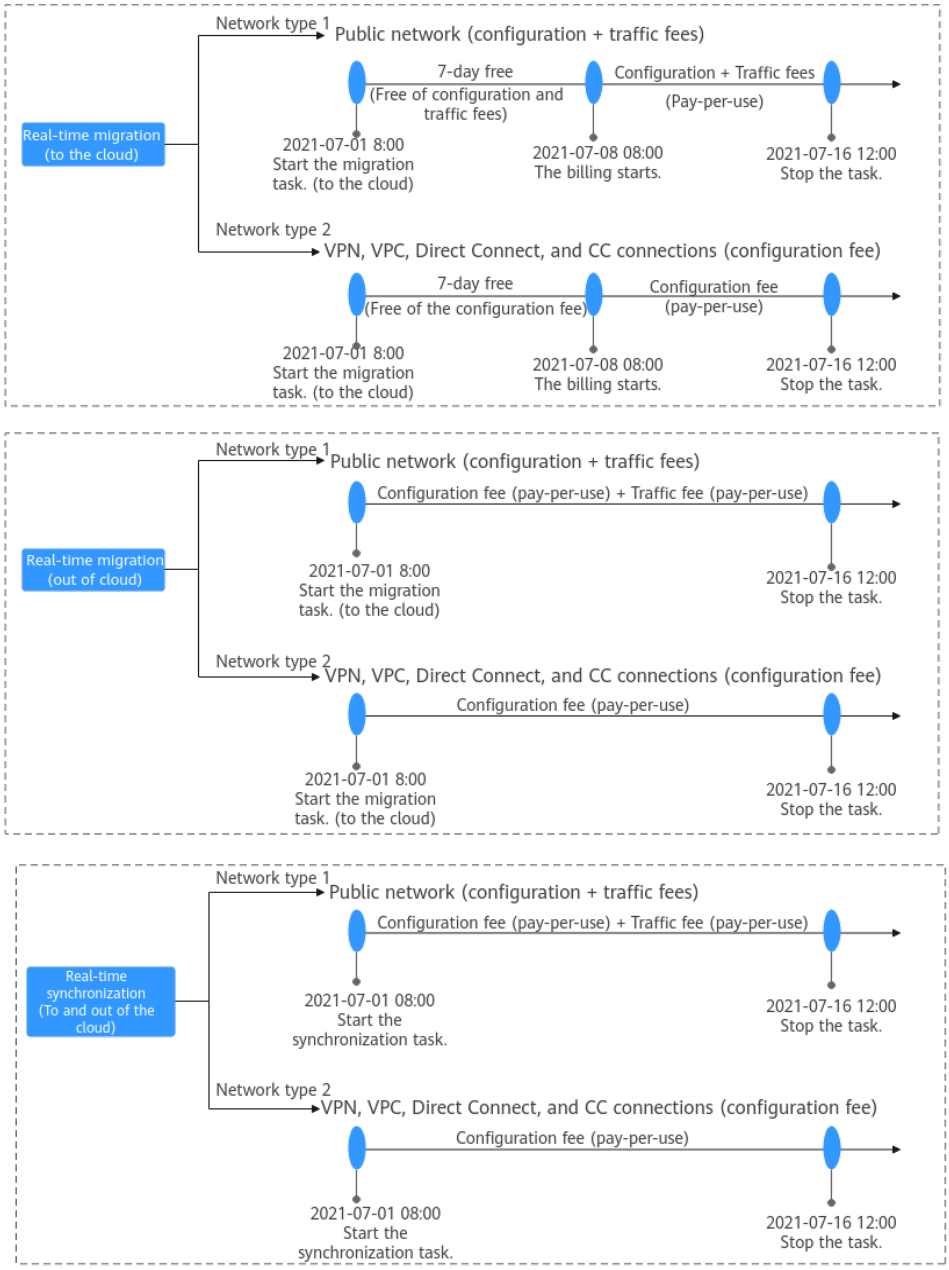
Table 9-3 Pay-per-use pricing details

Item	Description
Configuration fee	Configuration fees are generated when you use computing and storage resources and process data. You are charged for a full hour regardless of whether you use the full or partial hour.
Data transfer fee	Data transfer fees are generated when you process or transfer data through a **public network** (excluding VPN, VPC, Direct Connect, and CC networks). No matter what billing mode is used, DRS charges you for the actual public network traffic you use in GB.

For details about the DRS configuration fee, see **Product Pricing Details**. You can use the **price calculator** provided by DRS to quickly calculate the reference price based on the required specifications.

Billing Example

Figure 9-1 Billing example



The following uses full plus incremental migration of a MySQL database in region CN Hong Kong as an example to describe DRS pricing:

- Scenario 1: Migrating data to the cloud within the free-of-charge period

If you started the migration to the cloud at 8:00 on July 1, 2021 and ended the task at 12:00 on July 3, 2021, the service duration is less than one week so you will not be charged.

- Scenario 2: Migrating data to the cloud beyond the free-of-charge period

  If you started the migration to the cloud at 8:00 on July 1, 2021 and ended the task at 12:00 on July 16, 2021, the service duration exceeds the free-of-charge period that ends at 8:00 on July 8, 2021. From 08:00 on July 8, 2021 to the end of the task, you will be charged $0.35 USD per hour for the configuration and $0.21 USD/GB for data transfer.

- Scenario 3: Migrating data out of the cloud

  If you started migrating 100 GB of data out of the cloud at 8:00 on July 1, 2021 and ended the migration task at 8:00 on July 3, 2021 over a public network, you will be charged for configuration and data transfer. The configuration fee is calculated as follows: 2 days x 24 hours x $0.35 USD/hour = $16.8 USD. The data transfer fee is $21 USD (100 GB x $0.21 USD/GB). The total amount is $37.8 USD (16.8+21).

- Scenario 4: Starting multiple migration tasks

  Task 1: You started migrating 100 GB of data to the cloud at 08:00 on July 1, 2021 and ended the task at 12:00 on July 9, 2021. Task 2: You started migrating 200 GB of data out of the cloud at 8:00 on July 1, 2021 and ended the migration task at 8:00 on July 6, 2021 over a public network.

  - The free-of-charge period ended at 8:00 on July 7, 2021. For task 1, you will be charged configuration fees of $0.35 USD per hour from 8:00 on July 7, 2021 to the end of the task. Any data transfer coming from the Internet into our cloud is free. Task 1 fees = Configuration fee + Data transfer fee = (2 days x 24 hours + 4 hours) x $0.35 USD/hour = $18.2 USD.
  - Task 2 charges configuration fees of $0.35 USD per hour. The data transfer fee is charged at $0.21 USD. Task 2 fees = Configuration fee + Data transfer fee = 5 days x 24 hours x $0.35 USD/hour + 200 GB x $0.21 USD/GB = $84 USD.

- Scenario 5: Migrating data over non-public networks

  If you started migrating 100 GB of data to the cloud at 08:00 on July 1, 2021 and ended the task at 08:00 on July 3, 2021 through a VPC network, you will not be charged because the service duration is within one week and data transfer in a private network is free.

9.3 Yearly/Monthly

Billing Standards

NOTE

Real-time migration supports only the pay-per-use billing mode.

Real-time synchronization and DR tasks support pay-per-use and yearly/monthly billing modes.

DRS supports the yearly/monthly billing mode. You are charged for the configuration and data transfer of each instance.

Table 9-4 Billing standards

Item	Description
Configuration fee	Configuration fees are generated when you use computing and storage resources, and process data. You can select a duration based on service requirements. The fee is charged at a time.
Data transfer fee	Data transfer fees are generated when you process or transfer data through a public network (excluding VPN, VPC, Direct Connect, and CC networks). No matter what billing mode is used, DRS charges you for the actual public network traffic you use in GB.

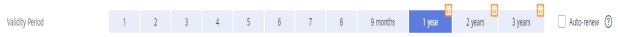
Only real-time synchronization and DR tasks support the yearly/monthly billing mode. When creating a task, you can select the required duration to meet your service requirements.

For details about the DRS fee, see **Product Pricing Details**. You can use the **price calculator** provided by DRS to quickly calculate the reference price based on the required specifications.

Auto-Renew

Yearly/Monthly supports automatic renewal. You can select **Auto-renew** as required when selecting the required duration. Monthly subscriptions are auto renewed by month and yearly subscriptions by year.

Figure 9-2 Validity Period



9.4 Changing the Billing Mode from Pay-per-Use to Yearly/Monthly

DRS allows you to change the billing mode from pay-per-use to yearly/monthly. If you need to use DRS for a long time, you can change the billing mode to yearly/monthly for lower costs.

NOTE

- Migration tasks: Only the pay-per-use billing is supported.
- Synchronization tasks: Only single-AZ tasks that are not frozen and in the incremental state can be changed from pay-per-use to yearly/monthly.
- DR tasks: Only tasks that are not frozen and in the DR state can be changed from pay-per-use to yearly/monthly. For dual-active DR, the billing mode can be changed from pay-per-use to yearly/monthly only when both the forward and backward subtasks are in DR state.
- Changing the billing mode from pay-per-use to yearly/monthly does not affect your services.

Procedure

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 and choose **Databases** > **Data Replication Service**. The DRS information page is displayed.

Step 4 On the task management page, locate the target task and choose **More** > **Change to Yearly/Monthly** in the **Operation** column.

Step 5 Select a required duration. The minimum duration is one month. Confirm the order and click **Pay**.

Step 6 Select a payment method and click **Pay**.

Step 7 After the billing mode is changed to yearly/monthly, view and manage the task in the tasks list.

In the upper right corner of the task list, click  to refresh the list. After the billing mode is changed to yearly/monthly, the **Billing Mode** status changes to **Yearly/Monthly**.

----End

9.5 Renewal

DRS supports the yearly/monthly and pay-per-use billing modes. You can select a billing mode to meet your service requirements.

- In the pay-per-use billing period, you are charged based on the actual usage duration. You can use the service as long as your account balance is sufficient. If your account balance is not paid in a timely manner, your account will be in arrears.
- In the yearly/monthly billing period, you need to make a one-off payment when purchasing a yearly/monthly package. No additional fees are incurred during the validity period. After the package expires, you can renew it as required. If you select **Auto-renew**, your services will not be affected as long as your account balance is sufficient.

Method

- Go to the **Renewals** page.
- For a yearly/monthly task, on the task management page, locate the task you want to renew and choose **More** > **Renew** in the **Operation** column.

9.6 Expiration and Overdue Payment

Expiration

- Expiration date is not applicable to pay-per-use billing.
- If your bills on yearly/monthly tasks are overdue and you have not topped up your account or renew resources in a timely manner, your tasks will enter a grace period. If you do not top up your account or renew resources after the grace period expires, the tasks enter the retention period. During the retention period, you cannot perform any operations on the task on the DRS console, or call related APIs, and O&M activities such as automatic monitoring and alarm reporting are stopped. If the account is not topped up or the resource package is not renewed before the retention period expires, the DRS instance will become unavailable and data stored on DRS will be deleted and cannot be recovered.

Overdue Payment

If your account balance is insufficient and the account is not topped up or resources are not renewed in a timely manner, your account is in arrears and cannot be used before you top up the account. After a task is in arrears, it enters the grace period. If you do not top up your account or renew resources after the grace period expires, the tasks enter the retention period. During the retention period, the resource service is suspended. If you still do not complete the payment or renewal after the retention period expires, your data stored in the cloud service will be deleted and the resource will be released.

10 Security

10.1 Shared Responsibilities

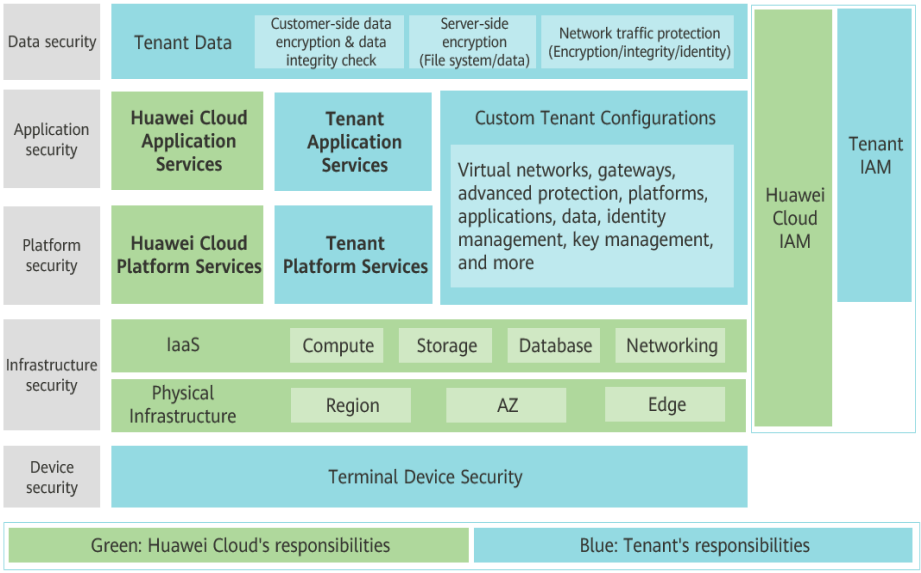
Huawei guarantees that its commitment to cyber security will never be outweighed by the consideration of commercial interests. To cope with emerging cloud security challenges and pervasive cloud security threats and attacks, Huawei Cloud builds a comprehensive cloud service security assurance system for different regions and industries based on Huawei's unique software and hardware advantages, laws, regulations, industry standards, and security ecosystem.

Figure 10-1 illustrates the responsibilities shared by Huawei Cloud and users.

- **Huawei Cloud**: Ensure the security of cloud services and provide secure clouds. Huawei Cloud's security responsibilities include ensuring the security of our IaaS, PaaS, and SaaS services, as well as the physical environments of the Huawei Cloud data centers where our IaaS, PaaS, and SaaS services operate. Huawei Cloud is responsible for not only the security functions and performance of our infrastructure, cloud services, and technologies, but also for the overall cloud O&M security and, in the broader sense, the security and compliance of our infrastructure and services.
- **Tenant**: Use the cloud securely. Tenants of Huawei Cloud are responsible for the secure and effective management of the tenant-customized configurations of cloud services including IaaS, PaaS, and SaaS. This includes but is not limited to virtual networks, the OSs of virtual machine hosts and guests, virtual firewalls, API Gateway, advanced security services, all types of cloud services, tenant data, identity accounts, and key management.

Huawei Cloud Security White Paper elaborates on the ideas and measures for building Huawei Cloud security, including cloud security strategies, the shared responsibility model, compliance and privacy, security organizations and personnel, infrastructure security, tenant service and security, engineering security, O&M security, and ecosystem security.

Figure 10-1 Huawei Cloud shared security responsibility model



10.2 Identity Authentication and Access Control

Identity Authentication

DRS uses **Identity and Access Management (IAM)** to implement fine-grained permission management. IAM provides identity authentication, permission assignment and access control, grants different permissions to different user groups, uses fine-grained authentication to control the usage scope of DRS resources, and ensures users have secure access to resources. For details, see **Step 2: Create IAM Users and Log In**.

Access Control

- **Permissions control**

  You can use AIM to assign different permissions to different employees in your enterprise to access your instance resources. For details about DRS permissions, see **Permissions Management**.

- **Network isolation**

  When creating a DRS instance, you can select a subnet in the VPC where the DRS instance is located based on service requirements. After the DRS instance is created, DRS will assign an IP address in the subnet to the DRS instance for connecting to source and destination instances. If the DRS instance is in the same VPC as the source instance or destination instance on Huawei Cloud, you can configure security groups for the source instance, destination instance, or DRS instance to control network access.

  For details, see **Creating a VPC**.

10.3 Data Protection

DRS provides a series of methods and features to ensure data security and integrity during transmission.

Host Security and Data Reliability and Durability

At the underlying layer, DRS uses **Elastic Cloud Servers (ECSs)** for computing and **Elastic Volume Service (EVS)** disks for storage. With secure ECSs and reliable EVS disks, the host security, data reliability, and data durability of DRS instances can be effectively ensured.

Instance High Availability

To improve service availability and resilience, DRS provides resumable data transfer and fault recovery. If data in the source database is not corrupted or lost, the DRS instance can resume data transfer from the point at which the transfer was stopped. If the underlying resources of an instance are faulty, data is migrated to a new instance in the AZ, and then the interrupted transfer continues. DRS also provides the cross-AZ HA. If the instance in the primary AZ becomes faulty, services can be switched over to the instance in the standby AZ to continue data replication.

Data Transmission Encryption

To secure data replication, DRS allows you to encrypt data transmission over a public network, VPN, Direct Connect, or VPC.

Permanent Data Deletion

When a DRS instance is deleted, the computing and storage resources of the instance are reclaimed. In addition, all data on the DRS instance is deleted and cannot be restored, including basic instance information, run logs, and data comparison results.

10.4 Audit and Logs

Audit

Cloud Trace Service (CTS) records operations on the cloud resources in your account. You can use the logs generated by CTS to perform security analysis, track resource changes, audit compliance, and locate faults.

For details about how to enable and configure CTS, see **Enabling CTS**.

With CTS, you can record operations associated with DRS for later query, audit, and backtracking. For details, see **Key Operations Recorded by CTS**.

Logs

DRS logs refer to the warning-, error-, and info-level logs generated during the migration process. You can view logs to locate and analyze database problems and rectify tasks. For details, see **Viewing Migration Logs**.

10.5 Risk Monitoring

Cloud Eye is a comprehensive monitoring platform for resources like cloud databases and cloud servers. It enables you to monitor resources, configure alarm rules, identify resource exceptions, and quickly respond to resource changes.

You can monitors resources and operations, such as CPU usage and network throughput using Cloud Eye. You can configure DRS alarm rules to customize the monitored objects and notification policies and learn the DRS running status in a timely manner. For details about supported monitoring metrics and how to create alarm rules, see **Supported Metrics**.

Cloud Eye can monitor performance metrics from the last 1 hour, 3 hours, 12 hours, 1 day, 7 days, and 6 months.

10.6 Fault Recovery

Resumable Data Transfer

To improve service availability and resilience, DRS provides resumable data transfer and fault recovery. If data in the source database is not corrupted or lost, the DRS instance can resume data transfer from the point at which the transfer was stopped.

Instance High Availability

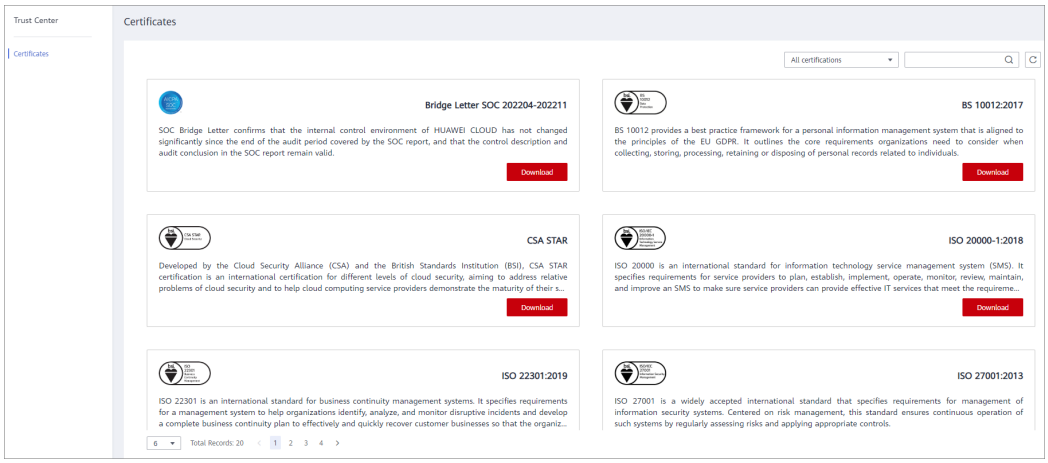
An availability zone (AZ) is a physical region where resources use independent power supply and networks. AZs are physically isolated but interconnected over a local network. DRS also provides the cross-AZ HA. If the instance in the primary AZ becomes faulty, services can be switched over to the instance in the standby AZ to continue data replication.

10.7 Certificates

Compliance Certificates

Huawei Cloud services and platforms have obtained various security and compliance certifications from authoritative organizations, such as International Organization for Standardization (ISO), system and organization controls (SOC), and Payment card industry (PCI) compliance standards. These certifications are available for **download**.

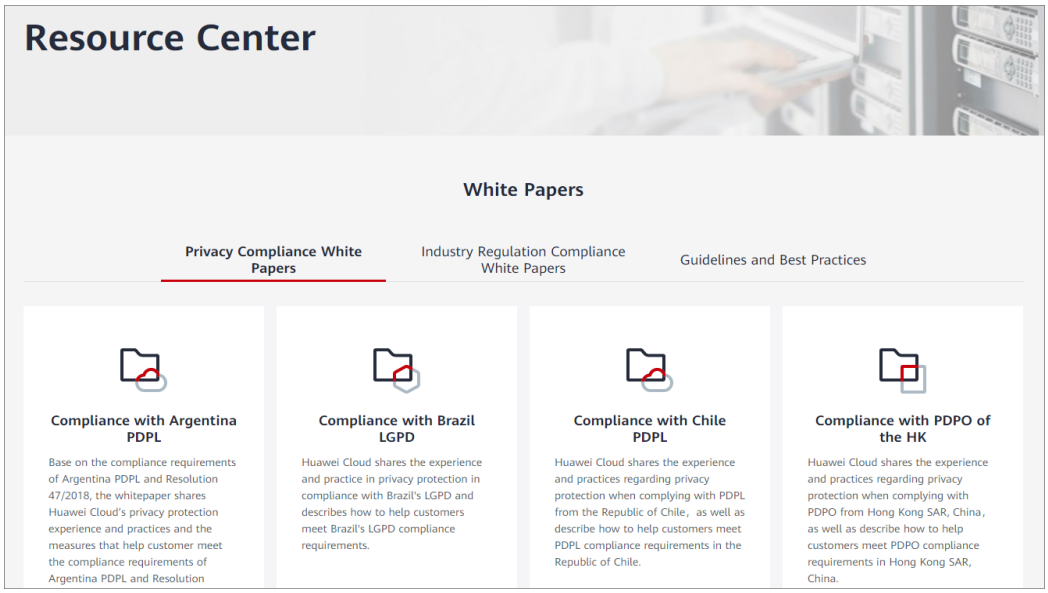
Figure 10-2 Downloading compliance certificates



Resource Center

Huawei Cloud also provides the following resources to help users meet compliance requirements. For details, see **Resource Center**.

Figure 10-3 Resource center



10.8 Compliance Description

You understand and agree that your use of this service complies with laws and regulations, including but not limited to legal compliance requirements on data content, data transfer, and cross-border data transfer. DRS only provides a standard service upon your request and is not responsible for the legal compliance of your use. If you use the services illegally or engage in illegal actions using the services, you shall bear all consequences arising therefrom.

11 Permissions Management

If you need to assign different permissions to employees in your enterprise to access your DRS resources, IAM is a good choice for fine-grained permissions management. IAM provides identity authentication, permissions management, and access control, helping you to securely access your Huawei Cloud resources.

With IAM, you can use your Huawei account to create IAM users for your employees, and assign permissions to the users to control their access to specific resources. For example, some software developers in your enterprise need to use DRS resources but must not delete DRS or perform any high-risk operations. To achieve this result, you can create IAM users for the software developers and grant them only the permissions required for using DRS resources.

If your Huawei account does not need individual IAM users for permissions management, you may skip over this topic.

IAM can be used free of charge. You pay only for the resources in your Huawei Cloud account. For more information about IAM, see **IAM Service Overview**.

DRS Permissions

By default, new IAM users do not have permissions assigned. You need to add a user to one or more groups, and attach permissions policies or roles to these groups. Users inherit permissions from the groups to which they are added and can perform specified operations on cloud services based on the permissions.

DRS is a project-level service deployed and accessed in specific physical regions. To assign DRS permissions to a user group, specify the scope as region-specific (for example, CN-Hong Kong) projects and select projects for example, (ap-southeast-1) for the permissions to take effect. If All projects is selected, the permissions will take effect for the user group in all region-specific projects. When accessing DRS, users need to switch to a region where they have been authorized to use DRS.

You can grant users permissions by using roles and policies.

- Roles: A type of coarse-grained authorization mechanism that defines permissions related to user responsibilities. This mechanism provides only a limited number of service-level roles for authorization. When using roles to grant permissions, you need to also assign other roles on which the permissions depend to take effect. However, roles are not an ideal choice for fine-grained authorization and secure access control.

- Policies: A type of fine-grained authorization mechanism that defines permissions required to perform operations on specific cloud resources under certain conditions. This mechanism allows for more flexible policy-based authorization, meeting requirements for secure access control. For example, you can grant ECS users only the permissions for managing a certain type of ECSs. Most fine-grained policies are API-based.

Table 11-1 lists all the system policies supported by DRS.

Table 11-1 System-defined roles and policies supported by DRS

Policy Name/ System Role	Description	Type	Dependency
Security Administrator	Security administrator To improve your experience with DRS, add the Security Administrator permission using IAM in case some functions become unavailable, such as scheduled task startup, automatic ending of full-migration tasks, and automatic retry of failed tasks. If the automatic function is unavailable, see **Why Cannot Scheduled DRS Tasks Be Started?**	System-defined role	None
DRS Administrator	DRS administrator Basic permission, which must be added when DRS is used.	System role	Dependent on the **Tenant Guest**, **Server Administrator**, and **RDS Administrator** roles. • **Tenant Guest**: A project-level role, which must be assigned in the same project. • **Server Administrator**: A project-level role, which must be assigned in the same project. • **RDS Administrator**: A project-level role, which must be assigned in the same project.

Policy Name/ System Role	Description	Type	Dependency
DRS FullAccess	Full permissions for DRS	System policy	Dependent on the **VPC FullAccess**, **RDS ReadOnlyAccess**, and **SMN Administrator**, **OBS Administrator**, and **EPS ReadOnlyAccess** policies. • VPC FullAccess: This parameter needs to be configured when the VPC and subnet are selected. • RDS ReadOnlyAccess: This parameter needs to be configured when RDS is selected. • SMN Administrator: This parameter needs to be configured when SMN is selected. • OBS Administrator: This parameter needs to be configured when bucket information is selected for a backup task. • EPS ReadOnlyAccess: This parameter needs to be configured when an enterprise project is selected. For a yearly/monthly task, the following permissions must be configured: BSS Operator or BSS Administrator

Policy Name/ System Role	Description	Type	Dependency
DRS ReadOnlyAccess	Read-only permissions for DRS resources.	System policy	Configure the following policies as required: RDS ReadOnlyAccess: This parameter needs to be configured when RDS is selected. SMN Administrator: This parameter needs to be configured when SMN is selected.
DRS FullWithOutDeletePermission	All permissions on DRS except the deletion permission	System Policy	Dependent on the **VPC FullAccess**, **RDS ReadOnlyAccess**, and **SMN Administrator**, and **OBS Administrator** policies. • VPC FullAccess: This parameter needs to be configured when the VPC and subnet are selected. • RDS ReadOnlyAccess: This parameter needs to be configured when RDS is selected. • SMN Administrator: This parameter needs to be configured when SMN is selected. • OBS Administrator: This parameter needs to be configured when bucket information is selected for a backup task. For a yearly/monthly task, the following permissions must be configured: BSS Operator or BSS Administrator

NOTE

In addition to the preceding permissions, the read permission for the corresponding DB instance is required. For example, if a DDM database is used, configure the DDM ReadOnlyAccess permission for the project. If a DDS database is used, configure the DDS ReadOnlyAccess permission for the project.

Table 11-2 lists the common operations supported by the DRS system policy.

Table 11-2 Common operations supported by the DRS system policy

Procedure	DRS FullAccess	DRS ReadOnlyAccess	DRS Administrator	DRS FullWithOutDeletePermission
Creating a task	√	x	√	√
Editing a task	√	x	√	√
Deleting a task	√	x	√	x
Starting a task	√	x	√	√
Retrying a task	√	x	√	√
Stopping a task	√	x	√	√

Table 11-3 lists common DRS operations and corresponding actions. You can refer to this table to customize permission policies.

Table 11-3 Common operations and supported actions

Permission	Actions	Remarks
Querying the RPO and RTO	drs:dataGuardJob:list	None
Performing a primary/standby switchover	drs:disasterRecovery-Job:switchover	None

Permission	Actions	Remarks
Performing operations on tasks.	drs:migrationJob:action	The VPC FullAccess permission for the project is required. The read permission for the corresponding instance is required. For example, if the RDS database is used, configure the RDS ReadOnlyAccess permission for the project. If the DDS database is used, configure the DDS ReadOnlyAccess permission for the project. The OBS Administrator permission for backup tasks is required.
Stopping a task	drs:migrationJob:terminate	Permissions required for the project: VPC FullAccess RDS ReadOnlyAccess Permissions required for the backup task: OBS Administrator Permission required for subscribing to message notification: SMN Administrator
Modifying a migration task	drs:migrationJob:modify	Permission required for selecting VPCs and subnets on the GUI: VPC FullAccess The read permission for the corresponding instance is required. For example, if the RDS database is used, configure the RDS ReadOnlyAccess permission for the project. If the DDS database is used, configure the DDS ReadOnlyAccess permission for the project. Permission required for subscribing to message notification: SMN Administrator

Permission	Actions	Remarks
Creating a migration task	drs:migrationJob:create	Permission required for selecting VPCs and subnets on the GUI: VPC FullAccess The read permission for the corresponding instance is required. For example, if the RDS database is used, configure the RDS ReadOnlyAccess permission for the project. If the DDS database is used, configure the DDS ReadOnlyAccess permission for the project. Permission required for subscribing to message notification: SMN Administrator For a yearly/monthly task, the following permissions must be configured: BSS Operator or BSS Administrator
Deleting a migration task	drs:migrationJob:delete	None
Updating the database user information.	drs:migrationJob:modifyUserInfo	The read permission for the corresponding instance is required. For example, if the RDS database is used, configure the RDS ReadOnlyAccess permission for the project.
Controlling the migration speed	drs:migrationJob:setMigrationTransSpeed	None
Modify database parameters	drs:dataBaseParams:modify	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.

Permission	Actions	Remarks
Updating the data processing information	drs:dataTransformation:update	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Adding the data processing information	drs:dataTransformation:add	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Deleting the data processing data	drs:dataTransformation:delete	None
Updating the database object selection information	drs:migrationJob:update	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Updating the ignore policy of a synchronization task	drs:synchronization-Job:update	None
Updating the task configuration	drs:migrationJob:updateJobConfig	None
Updating the DDL filtering policy.	drs:migrationJob:updateDDLPolicy	None
Modifying the comparison policy	drs:healthCompare:modify	None
Stopping a comparison task	drs:healthCompare:stop	None
Creating an object-level table comparison task	drs:migrationCompare-Job:create	None
Canceling a data-level table comparison task	drs:migrationCompare-Job:delete	None
Immediately starting a data-level table comparison task	drs:migrationCompare-Job:start	None

Permission	Actions	Remarks
Creating a data subscription task	drs:subscriptionJob:create	Permission required for selecting RDS on the GUI: RDS ReadOnlyAccess Permission required for subscribing to message notification: SMN Administrator Permission required for the project: VPC FullAccess
Modifying a data subscription task	drs:subscriptionJob:update	Permission required for selecting RDS on the GUI: OBS Administrator RDS ReadOnlyAccess Permission required for subscribing to message notification: SMN Administrator Permission required for the project: VPC FullAccess
Editing the data subscription information	drs:subscriptionJob:edit	Permission required for selecting buckets and RDS on the GUI: OBS Administrator RDS ReadOnlyAccess Permission required for subscribing to message notification: SMN Administrator Permissions required: VPC FullAccess
Deleting a subscription task	drs:subscriptionJob:delete	None

Permission	Actions	Remarks
Performing operations on a subscription task	drs:subscriptionJob:subscribe	Permissions required for the project: VPC FullAccess RDS ReadOnlyAccess Permissions required for the backup task: OBS Administrator Permission required for subscribing to message notification: SMN Administrator
Modifying consumption start time	drs:subscriptionJob:UpdateConsumeTime	None
Creating a backup migration task 2.0	drs:backupMigration-Job:create	Permission required for selecting buckets and RDS on the GUI: OBS Administrator RDS ReadOnlyAccess Permission required for subscribing to message notification: SMN Administrator
Deleting a backup migration task	drs:backupMigration-Job:delete	None
Modifying backup migration task details	drs:backupMigration-Job:modify	Permission required for selecting buckets and RDS on the GUI: OBS Administrator RDS ReadOnlyAccess Permission required for subscribing to message notification: SMN Administrator
Freezing and unfreezing resources.	drs:frozenOrUnfreeze-Job:frozen	None
Cleaning up resources	drs:cleanJob:clean	The VPC FullAccess permission is required.
Verifying the backup task name.	drs:backupMigration-Job:check	None

Permission	Actions	Remarks
Verifying data processing	drs:dataTransformation:check	None
Verifying online task names	drs:migrationJob:check	None
Obtaining database parameters	drs:databaseParameters:get	None
Querying backup migration tasks	drs:backupMigration-Job:list	None
Querying backup migration task details	drs:backupMigration-Job:get	None
Obtaining the data subscription task details	drs:subscriptionJob:get	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Querying operation results	drs:job:getResult	None
Obtaining the task pricing details	drs:migrationJob:getMeteringPrice	None
Querying the data processing information	drs:migrationTransforma-tionJob:get	None
Obtaining the task pre-check results	drs:precheckJob:get	None
Obtaining the object-level migration comparison overview	drs:compareJob:getOverview	None
Querying data-level table comparison tasks	drs:compareJob:list	None
Querying data-level table comparison results	drs:compareJob:getResult	None
Obtaining object-level migration comparison details	drs:compareJob:getDetails	None

Permission	Actions	Remarks
Querying details about a data-level table comparison task	drs:compareJob:getContentsInfo	None
Querying the estimated time of a comparison task	drs:compareJob:getEstimateTime	None
Querying the value comparison overview.	drs:compareJob:getContentOverview	None
Querying the row comparison overview	drs:compareJob:getLineOverview	None
Querying row comparison details	drs:compareJob:getLineDetail	None
Obtaining account comparison details	drs:compareJob:getAccountDetails	None
Querying value comparison details	drs:compareJob:getContentDetail	None
Querying value comparison differences	drs:compareJob:getContentDiff	None
Obtaining the online migration task list	drs:migrationJob:list	None
Obtaining the online migration task details	drs:migrationJob:get	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Obtaining the object-level migration comparison overview	drs:migrationJob:getCompareStruct	None
Obtaining the data-level stream comparison	drs:migrationJob:getStreamComparison	None

Permission	Actions	Remarks
Obtaining the source database user list	drs:migrationJob:getSrcUsers	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Obtaining the migration progress of a specified migration task	drs:migrationJob:getSpecifiedProgress	None
Obtaining the database affected time of a specified task.	drs:migrationJob:getEffectTime	None
Querying the migration progress	drs:migrationJobs:getProgress	None
Querying the health comparison report list	drs:healthCompareJob:list	None
Obtaining the object-level migration comparison overview	drs:healthCompareJob:getOverview	None
Obtaining object-level comparison details	drs:healthCompareJob:getObjectDetail	None
Obtaining account comparison details	drs:healthCompareJob:getAccountDetails	None
Querying row comparison details	drs:healthCompareJob:getLineDetail	None
Querying the comparison policy	drs:healthCompareJob:getComparePolicy	None
Obtaining the disaster recovery monitoring data	drs:disasterRecovery-Job:get	Permissions required: CES ReadOnlyAccess
Obtaining the RPO and RTO of a specified task	drs:dataGuardJob:list	None
Obtaining the replay failure list	drs:replayFaultsJob:list	None

Permission	Actions	Remarks
Processing data	drs:migrationJob:action	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Starting a task	drs:migrationJob:action	The VPC FullAccess permission is required.
Querying task details	drs:migrationJob:get	The read permission for the corresponding instance is required. For example, if the RDS database is used, you need to configure the RDS ReadOnlyAccess permission for the project.
Querying task statuses	drs:migrationJob:get	None
Querying resource tags	drs:tag:get	None
Deleting resource tags	drs:tags:delete	None
Adding a resource tag	drs:tag:add	None
Modifying resource tags	drs:tag:modify	None
Obtaining migration logs	drs:migrationJob:getLog	None
Querying the involved Kafka topic information	drs:kafkaJob:get	None
Obtaining the supported feature list	drs:supportFeature:get	None
Querying the feature whitelist	drs:featureWhiteJob:list	None
Querying the quotas that need adjustment	drs:quota:adjust	None
Updating the quotas	drs:quota:update	None

Permission	Actions	Remarks
Querying resource quotas	drs:quota:get	None
Updating the user guide	drs:userGuide:update	None
Obtaining user guide details	drs:userGuide:list	None
Querying predefined tags	-	To query predefined tags, configure the following action: tms:resourceTags:list
Querying configured log groups	-	To query configured log groups, configure the following action: lts:groups:get
Querying configured log streams	-	To query configured log streams, configure the following action: lts:topics:get
Obtaining the real-time synchronization task list	drs:synchronizationJob:list	None
Obtaining the real-time synchronization task details	drs:synchronizationJob:get	None
Obtaining the real-time DR task details	drs:dataGuardJob:get	None
Obtaining the data subscription task list	drs:subscriptionJob:list	None
Obtaining the workload replay task list	drs:replayJob:list	None
Obtaining the workload replay task details	drs:replayJob:get	None

12 Agency Management

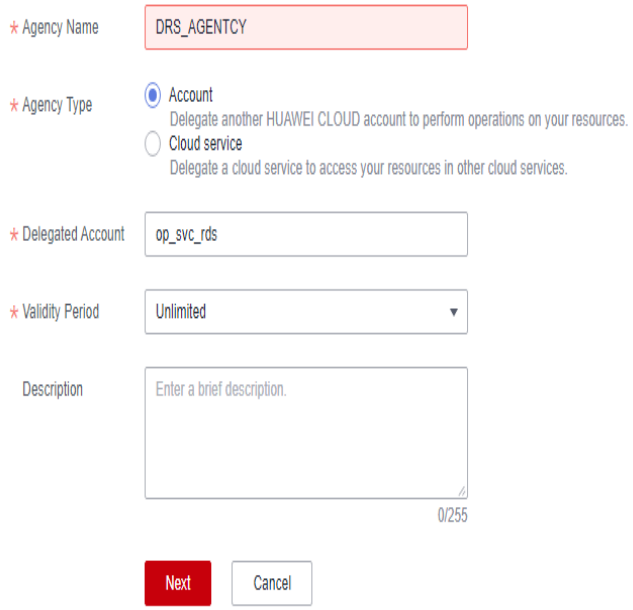
If you use a member account to create a DRS task, your scheduled tasks may fail, including automatic startup, completion, resumable transfer, and comparison. To rectify the fault, you can use an agency to create a task.

For example, if you enable scheduled startup tasks, DRS will automatically entrust your account to DRS administrator **op_svc_rds** or to RDS during the task creation to implement automated management on the scheduled tasks.

Solution

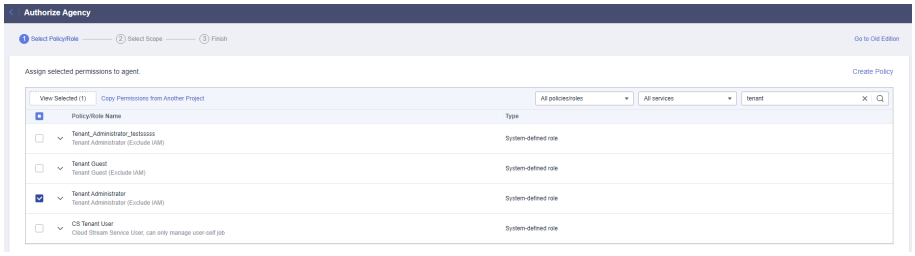
- Method 1: Use the master account to create a task again because the master account has the Security Administrator permission by default. After the task is created using the master account, an agency is created.
- Method 2: Use the master account to add the Security Administrator permission to the user group to which the member account belongs, and create a task again. For details about how to add permissions, see **Creating a User Group and Assigning Permissions**.
- Method 3: Manually add an agency. The procedure is as follows:
  a. Log in to Huawei Cloud using the master account and click **Console** in the upper right corner.
  b. On the management console, hover the mouse pointer over the username in the upper right corner, and choose **Identity and Access Management** from the drop-down list.
  c. In the navigation pane on the left, click **Agencies**.
  d. In the upper right corner, click **+Create Agency**.
  e. Enter **DRS_AGENTCY** in field **Agency Name**. If you select **Account** for **Agency Type**, enter **op_svc_rds** in field **Delegated Account**. If you select **Cloud service** for **Agency Type**, select **MySQL** for **Delegated Account**. Select **Unlimited** for **Validity Period** and then click **Next**.

Figure 12-1 Creating an agency



f. On the **Select Policy/Role** page, select **Tenant Administrator** and click **Next**.

Figure 12-2 Select Policy



g. Select the authorization for global services and then region-specific projects, and click **OK**.

Figure 12-3 Authorization for global services

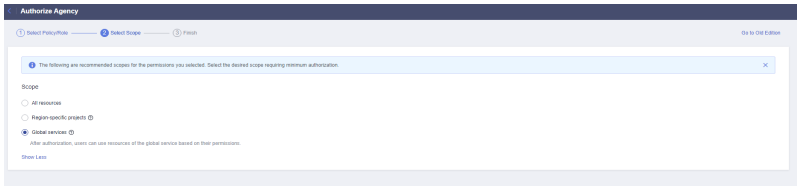
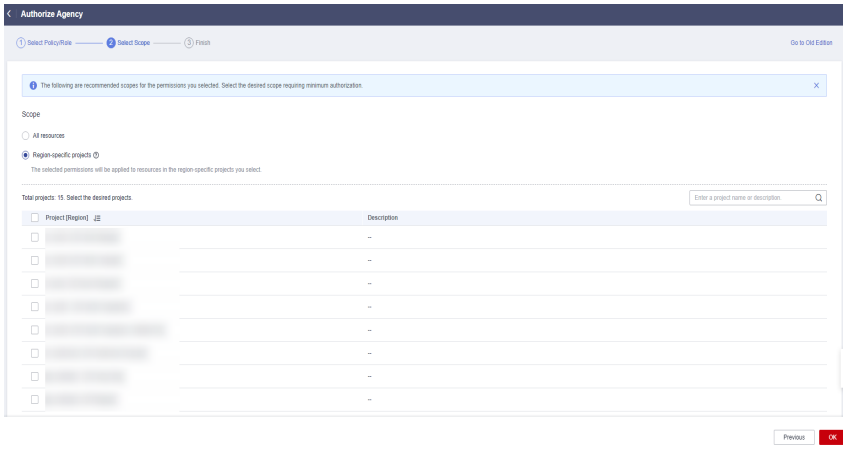
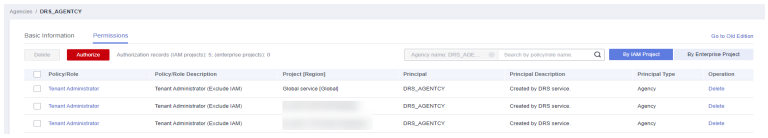


Figure 12-4 Authorization for region-specific projects



h. Click the agency name. On the **Permissions** tab, you can view permissions for global services and region-specific projects.

Figure 12-5 Permissions



i. The authorization takes effect after 15 to 30 minutes. After the authorization takes effect, create the task again.

13 Constraints

13.1 Constraints on Migration Tasks

To ensure that data migration tasks run properly, DRS has certain constraints on different data flow scenarios.

MySQL Serving as the Source

To the Cloud

- From MySQL to MySQLL
- From MySQL to DDM
- From MySQL to GaussDB(for MySQL)

From the Cloud

- From MySQL to MySQL

MySQL Schema and Logic Table Serving as the Source

- From MySQL Schema and Logic Table to DDM

MongoDB Serving as the Source

- From MongoDB to DDS
- From MongoDB to GeminiDB Mongo

DDS Serving as the Source

- From DDS to MongoDB

Redis Serving as the Source

- From Redis to GeminiDB Redis

Cluster Redis Serving as the Source

- From Cluster Redis to GeminiDB Redis

GeminiDB Redis Serving as the Source

- From GeminiDB Redis to Redis
- From GeminiDB Redis to Cluster Redis

13.2 Constraints on Synchronization Tasks

To ensure that data synchronization tasks run properly, DRS has certain constraints on different data flow scenarios.

MySQL Serving as the Source

To the Cloud

- From MySQL to MySQL
- From MySQL to GaussDB(for MySQL)
- From MySQL to PostgreSQL
- From MySQL to GaussDB Primary/Standby
- From MySQL to GaussDB Distributed
- From MySQL to GaussDB(DWS)

From the Cloud

- From MySQL to MySQL
- From MySQL to Kafka
- From MySQL to CSS/ES
- From MySQL to Oracle

Self-built -> Self-built

- From MySQL to Kafka
- From MySQL to CSS/ES
- From MySQL to GaussDB Primary/Standby

PostgreSQL Serving as the Source

To the Cloud

- From PostgreSQL to PostgreSQL
- From PostgreSQL to GaussDB(DWS)
- From PostgreSQL to GaussDB Primary/Standby
- From PostgreSQL to GaussDB Distributed

From the Cloud

- From PostgreSQL to PostgreSQL
- From PostgreSQL to Kafka

Self-built -> Self-built

- From PostgreSQL to Kafka

Oracle Serving as the Source

To the Cloud

- From Oracle to MySQL
- From Oracle to GaussDB(for MySQL)
- From Oracle to PostgreSQL
- From Oracle to GaussDB Primary/Standby
- From Oracle to GaussDB Distributed
- From Oracle to DDM
- From Oracle to GaussDB(DWS)

Self-built -> Self-built

- From Oracle to Kafka
- From Oracle to GaussDB Primary/Standby
- From Oracle to GaussDB Distributed

DDM Serving as the Source

To the Cloud

- From DDM to MySQL
- From DDM to GaussDB(DWS)
- From DDM to DDM

From the Cloud

- From DDM to MySQL
- From DDM to Oracle
- From DDM to Kafka

DB2 for LUW Serving as the Source

To the Cloud

- From DB2 for LUW to GaussDB Primary/Standby
- From DB2 for LUW to GaussDB Distributed
- From DB2 for LUW to GaussDB(DWS)

Self-built -> Self-built

- From DB2 for LUW to GaussDB Primary/Standby
- From DB2 for LUW to GaussDB Distributed

TiDB Serving as the Source

To the Cloud

- From TiDB to GaussDB(for MySQL)

Microsoft SQL Server Serving as the Source

To the Cloud

- From Microsoft SQL Server to GaussDB(DWS)
- From Microsoft SQL Server to GaussDB Primary/Standby
- From Microsoft SQL Server to GaussDB Distributed
- From Microsoft SQL Server to Microsoft SQL Server

MongoDB Serving as the Source

To the Cloud

- From MongoDB to DDS

DDS Serving as the Source

From the Cloud

- From DDS to MongoDB
- From DDS to Kafka

MariaDB Serving as the Source

To the Cloud

- From MariaDB to MariaDB

From the Cloud

- From MariaDB to MariaDB

GaussDB(for MySQL) Serving as the Source

To the Cloud

- From GaussDB(for MySQL) to GaussDB(for MySQL)

From the Cloud

- From GaussDB(for MySQL) to MySQL
- From GaussDB(for MySQL) to GaussDB(DWS)
- From GaussDB(for MySQL) to Kafka
- From GaussDB(for MySQL) to CSS/ES
- From GaussDB(for MySQL) to Oracle

GaussDB Primary/Standby Serving as the Source

From the Cloud

- From GaussDB Primary/Standby to MySQL
- From GaussDB Primary/Standby to Oracle
- From GaussDB Primary/Standby to GaussDB(DWS)

- From GaussDB Primary/Standby to Kafka
- From GaussDB Primary/Standby to GaussDB Distributed
- From GaussDB Primary/Standby to GaussDB Primary/Standby

Self-built -> Self-built

- From GaussDB Primary/Standby to Oracle
- From GaussDB Primary/Standby to Kafka
- From GaussDB Primary/Standby to GaussDB Primary/Standby

GaussDB Distributed Serving as the Source

From the Cloud

- From GaussDB Distributed to MySQL
- From GaussDB Distributed to Oracle
- From GaussDB Distributed to GaussDB(DWS)
- From GaussDB Distributed to Kafka
- From GaussDB Distributed to GaussDB Distributed
- From GaussDB Distributed to GaussDB Primary/Standby

Self-built -> Self-built

- From GaussDB Distributed to Oracle
- From GaussDB Distributed to Kafka
- From GaussDB Distributed to GaussDB Distributed

13.3 Constraints on DR Tasks

To ensure that data disaster recovery tasks run properly, DRS has certain constraints on different data flow scenarios.

- From MySQL to MySQL (Single-Active DR)
- From MySQL to GaussDB(for MySQL) (Single-Active DR)
- From DDM to DDM (Single-Active DR)
- From GaussDB(for MySQL) to GaussDB(for MySQL) (Single-Active DR)
- From MySQL to MySQL (Dual-Active DR)
- From GaussDB(for MySQL) to GaussDB(for MySQL) (Dual-Active DR)

14 Accessing DRS

Procedure

If you have not registered a Huawei ID and enabled Huawei Cloud services, follow the instructions provided in **Registering a HUAWEI ID and Enabling HUAWEI CLOUD Services** to register an account at Huawei Cloud official website. After the registration is successful, you can access all Huawei Cloud services, including DRS, RDS, and DDS.

If you have registered a Huawei ID and enabled Huawei Cloud services, you can log in to the management console and **access your DRS**.

15 Related Services

RDS

DRS can migrate data from your databases to the RDS databases in the cloud. For more information about RDS, see **Relational Database Service User Guide**.

Supported network types during migration to RDS:

- VPC
- VPN
- Direct Connect
- Public network

DDS

DRS can migrate data from your databases to the DDS databases in the cloud. For more information about DDS, see **Document Database Service User Guide**.

Supported network types during migration from MongoDB databases to DDS:

- VPC
- VPN
- Direct Connect
- Public network

DDM

DRS helps you migrate data from your databases to Distributed Database Middleware (DDM) in the cloud. For more information about DDM, see **Distributed Database Middleware Service User Guide**.

Supported network types during migration to DDM:

- VPC
- VPN
- Direct Connect
- Public network

GaussDB(for MySQL)

DRS can migrate data from your databases to GaussDB(for MySQL) on the current cloud. For more information about GaussDB(for MySQL), see **GaussDB(for MySQL) User Guide**.

Supported network types during migration to GaussDB(for MySQL) on the current cloud:

- VPC
- VPN
- Direct Connect
- Public network

GaussDB

DRS can migrate data from your databases to GaussDB on the current cloud. For more information about GaussDB, see **GaussDB User Guide**.

Supported network types during migration to GaussDB on the current cloud:

- VPC
- VPN
- Direct Connect
- Public network

IAM

Identity and Access Management (IAM) manages permissions for DRS.

Only users with the DRS administrator permissions can use DRS. To apply for DRS administrator permissions, you can contact the security administrator or apply for a user with DRS administrator permissions.

For more information about IAM, see **Identity and Access Management User Guide**.

CTS

Cloud Trace Service (CTS) provides records of operations on cloud service resources, enabling you to query, audit, and backtrack operations.

For more information about CTS, see **Cloud Trace Service User Guide**.

Cloud Eye

Cloud Eye is an open monitoring platform that helps you monitor DRS resources in real time. It reports alarms promptly to ensure that services are running properly.

For more information about Cloud Eye, see **Cloud Eye User Guide**.

OBS

Object Storage Service (OBS) provides data storage capabilities that are massive, secure, highly reliable, and low-cost.

For more information about OBS, see **OBS Browser+ Operation Guide**.

DCC

Dedicated Computing Cluster (DCC) provides dedicated, physically isolated computing resource pools on Huawei Cloud, allowing you to use physical computing devices and resources exclusively.

DRS can use physical resources provided by DCC to create instances to migrate or synchronize data in real time.

For more information about DCC, see **Dedicated Computing Cluster User Guide**.

Simple Message Notification

Simple Message Notification (SMN) can push notifications based on Huawei Cloud users' requirements. End users can receive notifications through HTTP, HTTPS, and applications. You can also integrate application functions through SMN to reduce system complexity.

For more information about SMN, see **Simple Message Notification User Guide**.

Enterprise Management

You can create enterprise projects based on the enterprise organization structure. Then you can manage resources across different regions by enterprise project, grant different permissions to user groups, and add them to enterprise projects.

For more information about Enterprise Management, see **Enterprise Management User Guide**.

16 Basic Concepts

VPC

VPC-based migration refers to a real-time migration that the source and destination databases are in the same VPC or two VPCs that can communicate with each other. No additional network services are required.

VPN

VPN-based migration refers to a real-time migration where the source and destination databases are in the same VPN network. The VPN establishes a secure, encrypted communication tunnel that complies with industry standards between your data centers and the cloud platform. Through this tunnel, DRS seamlessly migrates data from the data center to the cloud.

Currently, only IPsec VPN is supported.

Direct Connect

Direct Connect enables you to establish a dedicated network connection from your data center to the cloud platform. With Direct Connect, you can use a dedicated network connection to connect your data center to VPCs to enjoy a high-performance, low-latency, and secure network.

Replication Instance

A replication instance refers to an instance that performs the migration task. It exists in the whole lifecycle of a migration task. DRS uses the replication instance to connect to the source database, read source data, and replicate the data to the destination database.

Migration Log

A migration log refers to the log generated during database migration. Migration logs are classified into the following levels: warning, error, and info.

Synchronization Instance

A synchronization instance refers to an instance that facilitates the synchronization process. It exists in the whole lifecycle of a synchronization task.

DRS uses the synchronization instance to connect to the source database, read source data, and synchronize the data to the destination database.

Synchronization Log

A synchronization log refers to the log generated during database synchronization. Synchronization logs are classified into the following levels: warning, error, and info.

Task Check

Before starting a migration task, you need to check whether the source and destination databases have met all migration requirements. If any check item fails, rectify the fault and check the task again. Only when all check items are successful the task can start.

To the Cloud

DRS requires that either the source or destination database is on the current cloud. **To the cloud** means that the destination database must be on the current cloud.

Out of the Cloud

DRS requires that either the source or destination database is on the current cloud. **Out of the cloud** means that the source database must be on the current cloud.

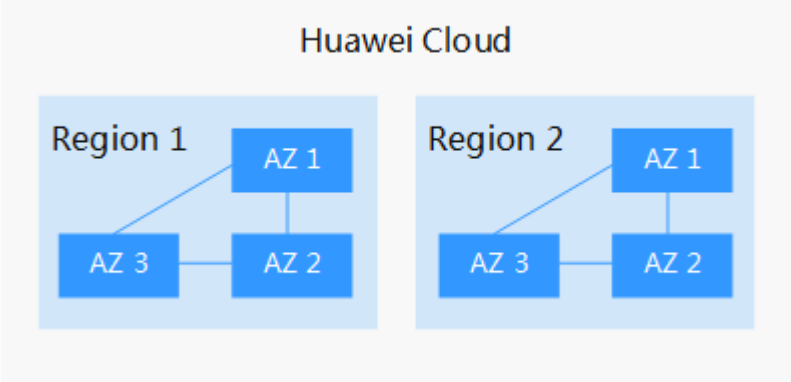
Region and AZ

A region and availability zone (AZ) identify the location of a data center. You can create resources in a specific region and AZ.

- Regions are divided from the dimensions of geographical location and network latency. Public services, such as Elastic Cloud Server (ECS), Elastic Volume Service (EVS), Object Storage Service (OBS), Virtual Private Cloud (VPC), Elastic IP (EIP), and Image Management Service (IMS), are shared within the same region. Regions are classified as universal regions and dedicated regions. A universal region provides universal cloud services for common tenants. A dedicated region provides services of the same type only or for specific tenants.
- An AZ contains one or multiple physical data centers. Each AZ has independent cooling, fire extinguishing, moisture-proof, and electricity facilities. Within an AZ, computing, network, storage, and other resources are logically divided into multiple clusters. AZs within a region are interconnected using high-speed optical fibers to allow you to build cross-AZ high-availability systems.

Figure 16-1 shows the relationship between regions and AZs.

Figure 16-1 Region and AZ

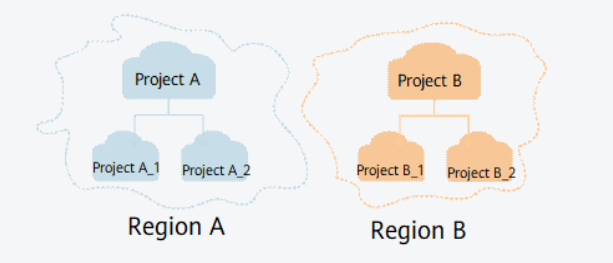


Huawei Cloud provides services in many regions around the world. You can select a region and AZ as needed. For more information, see **Huawei Cloud Global Regions**.

Project

A project corresponds to a region. Projects group and isolate resources (including compute, storage, and network resources) across physical regions. Users can be granted permissions in a default project to access all resources in the region associated with the project. If you need more refined access control, create subprojects under a default project and create resources in subprojects. Then you can assign users the permissions required to access only the resources in the specific subprojects.

Figure 16-2 Project isolating model



Account Entrustment

DRS will entrust your account to the administrator to implement some functions. For example, if you enable scheduled startup tasks, DRS will automatically entrust your account to DRS administrator **op_svc_rds** during the task creation to implement automated management on the scheduled tasks.

Account entrustment can be implemented in the same region only.

Temporary Accounts

To ensure that your database can be successfully migrated to RDS for MySQL DB instances, DRS automatically creates temporary accounts **drsFull** and **drsIncremental** in the destination database during full migration and incremental

migration, respectively. After the migration task is complete, DRS automatically deletes the temporary account.

NOTICE

- Do not use the drsFull and drsIncrementa accounts created by users as the accounts for database connections for a DRS task.
- Attempting to delete, rename, or change the passwords or permissions for temporary accounts will cause task errors.

High Availability

If the primary host of a replication instance or a synchronization instance fails, it automatically fails over to the standby host, preventing service interruption and improving the success rate of migration.

If a replication or synchronization instance fails, the system will automatically restart the instance and retry the task. In this case, the task status changes to **Fault rectification**. If the replication or synchronization instance is still faulty after being restarted, the system automatically creates an instance. After the instance is created, the system retries the task again. The high availability management applies to the following tasks:

- Full migration
- Incremental migration
- Full synchronization
- Incremental synchronization

A Change History

Released On	Description
2024-02-28	This issue is the sixtieth official release, which incorporates the following changes: • Supported full synchronization and incremental synchronization for real-time synchronization from Microsoft SQL Server to GaussDB. • Supported DDL type selection for real-time synchronization from GaussDB Primary/Standby to Oracle. • Supported a DR cluster serving as the source database for a self-built synchronization task from GaussDB Primary/Standby. • Supported sharding mode selection for real-time synchronization from Oracle. • Supported LOB length comparison in value comparison for real-time synchronization from Oracle to GaussDB. • Supported self-managed MySQL for **Source DB From** for a workload replay task from MySQL to the cloud.

Released On	Description
2023-12-30	This issue is the fifty-ninth official release, which incorporates the following changes: ● Supported task resetting and resuming for data subscription. ● Supported task parameter changing for real-time synchronization. ● Supported real-time synchronization from MySQL to MariaDB. ● Supported real-time synchronization from MariaDB to MySQL. ● Supported real-time synchronization from MariaDB to GaussDB(for MySQL). ● Supported object file importing, flow control, task pausing and task resetting for real-time synchronization from PostgreSQL to GaussDB. ● Supported DNS server configuration for real-time migration from MySQL to MySQL and from Redis to GeminiDB Redis.
2023-11-30	This issue is the fifty-eighth official release, which incorporates the following changes: ● Supported ultra-large specifications for real-time synchronization. ● Supported progress details viewing for real-time synchronization. ● Supported PostgreSQL 15 for DRS real-time synchronization. ● Supported real-time synchronization from Microsoft SQL Server to Kafka. ● Supported real-time synchronization from OceanBase (MySQL-compatible) to GaussDB(for MySQL). ● Supported direction exchange for dual-active DR. Changed the following content: ● The following data flow scenarios meet the commercial use standards. – Real-time synchronization from MySQL to GaussDB Primary/Standby – Real-time synchronization from MySQL to GaussDB Distributed – Real-time synchronization from DDS to Kafka – Real-time synchronization from GaussDB Primary/Standby to MySQL – Real-time synchronization from GaussDB Primary/Standby to GaussDB Distributed – Real-time synchronization from GaussDB Distributed to MySQL – Real-time synchronization from GaussDB Distributed to GaussDB Primary/Standby

Released On	Description
2023-10-30	This issue is the fifty-seventh official release, which incorporates the following changes: ● Supported partition table synchronization in the incremental phase for real-time synchronization with DB2 for LUW serving as the source database. ● Added the requirement for uploading the JDBC driver package when testing the connection for real-time synchronization with DB2 for LUW serving as the source database. ● Added support for upgrading task specifications in a DRS multi-specification task. ● Added support for downloading the replay report for a DRS workload replay task.
2023-09-30	This issue is the fifty-sixth official release, which incorporates the following changes: ● Supported synchronization position resetting for tasks from MySQL to GaussDB(DWS). ● Added support for workload replay from MySQL to MySQL, MySQL to GaussDB(for MySQL), and GaussDB(for MySQL) to GaussDB(for MySQL).
2023-08-30	This issue is the fifty-fifth official release, which incorporates the following changes: ● Supported selecting whether to migrate incremental accounts and permissions during real-time migration from MySQL to MySQL. ● Supported customizing DROP PARTITION and RENAME COLUMN for incremental DDL synchronization from MySQL to MySQL. ● Supported COMMENT ON for incremental DDL synchronization from PostgreSQL to PostgreSQL. ● Supported DRS task filtering by DB instance ID or database IP address.
2023-07-30	This issue is the fifty-fourth official release, which incorporates the following change: ● Supported AZ selection for DRS migration, synchronization, and DR tasks.

Released On	Description
2023-06-30	This issue is the fifty-third official release, which incorporates the following changes: • Supported full synchronization and incremental synchronization for real-time synchronization from DDM to MySQL and DDM to Oracle. • Supported the selection of synchronization object types for real-time synchronization from MySQL to GaussDB. • Supported the object name mapping for real-time synchronization from GaussDB to GaussDB. • Supported database-level synchronization and schema-level synchronization for real-time synchronization from GaussDB to Kafka. • Supported data filtering for real-time synchronization from DB2 for LUW to GaussDB. • Supported Oracle 21c for DRS real-time synchronization.
2023-05-30	This issue is the fifty-second official release, which incorporates the following changes: • Supported task import for creating migration and synchronization tasks in batches. • Supported out-of-cloud synchronization from DDS to Kafka. • Supported GaussDB(DWS) 8.2.0. • Supported DDL type selection for synchronization tasks from Oracle to GaussDB.

Released On	Description
2023-04-30	This issue is the fifty-first official release, which incorporates the following changes: ● Supported real-time migration and synchronization of DDS 4.2. ● Supported specification upgrade in single-node MySQL-to-Kafka synchronization tasks. ● Supported the selection of synchronization object types for synchronization from MySQL to Kafka. ● Supported full data read from the standby database for synchronization from GaussDB(for MySQL) to GaussDB(for MySQL). ● Supported the full mode for to-the-cloud synchronization from MySQL to MySQL. ● Supported the incremental mode for real-time synchronization from Oracle to MySQL and from Oracle to GaussDB(DWS). ● Supported the full and full+incremental modes for real-time synchronization from GaussDB Distributed to MySQL. ● Supported PostgreSQL 13 and 14 for to-the-cloud real-time synchronization from Oracle to PostgreSQL. ● Supported quick diagnosis if a DRS connection test fails. ● Supported MariaDB synchronization (including to and from the cloud). Changed the following content: ● The following data flow scenarios meet the commercial use standards. – Real-time synchronization from Oracle to GaussDB Primary/Standby – Real-time synchronization from Oracle to GaussDB Distributed – Real-time synchronization from GaussDB(for MySQL) to GaussDB(for MySQL) – Real-time synchronization from GaussDB Primary/Standby to GaussDB Primary/Standby – Real-time synchronization from GaussDB Distributed to GaussDB Distributed – Real-time synchronization from GaussDB(for MySQL) to GaussDB(for MySQL) ● The following data flow scenarios are in the open beta test phase. – Real-time synchronization from MySQL to GaussDB Primary/Standby

Released On	Description
	– Real-time synchronization from DB2 for LUW to GaussDB Primary/Standby – Real-time synchronization from DB2 for LUW to GaussDB Distributed – Real-time synchronization from Microsoft SQL Server to GaussDB Primary/Standby – Real-time synchronization from Microsoft SQL Server to GaussDB Distributed – Real-time synchronization from Microsoft SQL Server to GaussDB(DWS)
2023-03-30	This issue is the fiftieth official release, which incorporates the following changes: ● Supported to-the-cloud synchronization from GaussDB(for MySQL) to GaussDB(for MySQL). ● Supported out-of-cloud synchronization from PostgreSQL to PostgreSQL. ● Supported task type selection for synchronization from GaussDB(for MySQL) to CSS/ES. ● Supported specification upgrade for real-time DR from MySQL to MySQL. ● Supported to-the-cloud migration from cluster Redis to GeminiDB Redis. ● Supported the source MongoDB 4.4 for to-the-cloud migration from MongoDB to DDS. Changed the following content: ● On the DRS task creation page, changed **Single** and **Primary/Standby** to **Single-AZ** and **Dual-AZ** in the **DRS Task Type** area.
2023-02-28	This issue is the forty-ninth official release, which incorporates the following changes: ● Supported the source MongoDB 3.6 for to-the-cloud migration from MongoDB to DDS. ● Supported the sorting of row comparison results in ascending or descending order by **Source Database Table Rows** or **Destination Database Table Rows**. ● Supported specification upgrade in single-node MySQL-to-GaussDB(DWS) synchronization tasks. ● Supported out-of-cloud migration from GeminiDB Redis to single-node, master/standby, or cluster Redis.

Released On	Description
2023-01-30	This issue is the forty-eighth official release, which incorporates the following changes: ● Supported PostgreSQL 14 for real-time synchronization with PostgreSQL serving as the source. ● Supported DB2SECURITYLABEL data for real-time synchronization with DB2 for LUW serving as the source. ● Supported ElasticSearch 7.10 for real-time synchronization from MySQL to CSS/ES and from GaussDB(for MySQL) to CSS/ES. ● Supported start point setting for incremental synchronization from MySQL to Kafka and from GaussDB(for MySQL) to Kafka. ● Supported object searching using regular expressions. ● Supported real-time synchronization from Microsoft SQL Server to Microsoft SQL Server (to the cloud).
2022-12-30	This issue is the forty-seventh official release, which incorporates the following changes: ● Supported multiple specifications for real-time synchronization from MySQL to CSS/ES. ● Supported the topic and partition policies for real-time synchronization from Oracle to Kafka. ● Supported the progress viewing for online migration from MySQL to GaussDB(for MySQL). ● A synchronization task can be created by specifying DN connection information when the source is self-built GaussDB distributed. ● Supported the full+incremental mode for real-time synchronization from MySQL to Kafka and synchronization from GaussDB(for MySQL) to Kafka. ● Supported monitoring information viewing for real-time synchronization from MySQL to Kafka and synchronization from GaussDB to Kafka.

Released On	Description
2022-11-30	This issue is the forty-sixth official release, which incorporates the following changes: ● After DRS interconnects with LTS and log reporting to LTS is enabled, all logs generated by DRS instances will be uploaded to LTS for management. ● Supported real-time synchronization from Microsoft SQL Server to GaussDB primary/standby (to the cloud) ● Supported real-time synchronization from Microsoft SQL Server to GaussDB distributed (to the cloud) ● Supported real-time migration from GeminiDB Redis to Redis (from the cloud) ● Supported specification upgrade in single-node MySQL synchronization tasks. Changed the following content: ● The following data flows meet the commercial use standards. – Real-time synchronization from Oracle to GaussDB primary/standby – Real-time synchronization from Oracle to GaussDB distributed – Real-time synchronization from MongoDB to DDS – Real-time synchronization from GaussDB primary/standby to Oracle – Real-time synchronization from GaussDB primary/standby to GaussDB(DWS) – Real-time synchronization from GaussDB primary/standby to Kafka – Real-time synchronization from GaussDB distributed to Oracle – Real-time synchronization from GaussDB distributed to GaussDB(DWS) – Real-time synchronization from GaussDB distributed to Kafka

Released On	Description
2022-10-30	This issue is the forty-fifth official release, which incorporates the following changes: ● Added support for selecting the synchronization object type during real-time synchronization from Microsoft SQL Server to GaussDB (DWS). ● Added the GTID status pre-check for the source database when MySQL is used as the source in migration and synchronization. ● In DDM DR scenarios, you can connect to the source database by entering an IP address. ● DRS supports workload replay of MySQL.
2022-08-30	This issue is the forty-fourth official release, which incorporates the following changes: ● The WE8ISO8859P15 character set is supported when the source database is an Oracle database for data synchronization. ● Real-time synchronization from PostgreSQL to Kafka supports multiple specifications. ● Abnormal data policies can be set for data synchronization from MySQL to GaussDB(DWS). ● When you perform a full MySQL migration, you cannot take a snapshot for your databases.
2022-07-30	This issue is the forty-third official release, which incorporates the following changes: ● Optimized the description of **Last Backup Migration** on the **Backup Migration** page. ● Added verification of out-of-line storage of primary key columns when PostgreSQL is the source database for data synchronization. ● Added support for synchronizing different table objects to different topics when **Synchronization Object** is set to **Import object file** for Oracle to Kafka synchronization. ● Supported synchronization of MySQL JSON data to GaussDB(DWS). ● If a task fails to be created, DRS retains the task for three days by default. After three days, the task automatically stops.

Released On	Description
2022-06-30	This issue is the forty-second official release, which incorporates the following changes: ● Supported flow control for real-time migrations between MongoDB and DDS. ● Supported real-time migration from Redis to GeminiDB Redis to the cloud. ● Supported periodic row comparison for real-time synchronization from MySQL to GaussDB(DWS). ● Added support for skipping DDL operations during real-time synchronization from MySQL to GaussDB(DWS).
2022-05-30	This issue is the forty-first official release, which incorporates the following changes: ● Real-time synchronization from MongoDB to DDS (to the cloud) ● Real-time synchronization from Microsoft SQL Server to GaussDB(DWS) (to the cloud) ● Real-time synchronization from TiDB to GaussDB(for MySQL) ● Real-time synchronization from DB2 for LUW to GaussDB(DWS) (to the cloud) ● During real-time migration from MongoDB to DDS, the destination database can be set to read-only or read/write. ● Supported multiple specifications for real-time synchronization from GaussDB primary/standby to Kafka and from GaussDB ditributed to Kafka. ● Supported column mapping for real-time synchronization from MySQL to CSS/ES. Changed the following content: ● The following meets the commercial use standards. – Real-time synchronization from DDM to Oracle – Real-time synchronization from MySQL to Oracle – Real-time synchronization from GaussDB(for MySQL) to MySQL – Real-time synchronization from GaussDB(for MySQL) to GaussDB(DWS) – Real-time synchronization from GaussDB(for MySQL) to Kafka – Real-time synchronization from GaussDB(for MySQL) to Oracle – Real-time synchronization from GaussDB(for MySQL) to CSS/ES – Real-time synchronization from PostgreSQL to Kafka

Released On	Description
2022-04-30	This issue is the fortieth official release, which incorporates the following changes: ● Supported task cloning for real-time synchronization from MySQL to CSS/ES. ● Supported task cloning for real-time synchronization from PostgreSQL to PostgreSQL. ● Supported SSL for the source database that is DB2 for LUW 10.5 or later. ● Supported dual-active DR tasks that are billed on the yearly/monthly basis. Changed the following content: ● Optimized the page for configuring migration from Mongos to DDS. ● Adjusted the length and character range of tag keys and tag values.

Released On	Description
2022-03-30	This issue is the thirty-ninth official release, which incorporates the following changes: ● Supported data filtering and column filtering for real-time synchronization from MySQL to CSS/ES and from GaussDB(for MySQL) to CSS/ES. ● Supported single incremental mode for real-time synchronization from MySQL to GaussDB(DWS). ● Supported DB2 for LUW 10.1 and 11.1 as the source and GaussDB as the destination during synchronization. ● Displayed the progress details of real-time full migrations from MongoDB to DDS and from DDS to MongoDB. ● Supported suspending, resetting, and cloning real-time migration tasks from MongoDB to DDS and from DDS to MongoDB. ● Supported Oracle as the source during real-time synchronization. The accumulated number of operations on each table can be displayed. ● Supported suspending, resetting, and cloning real-time synchronization tasks from DDS to MongoDB. ● Supported account-level comparison for MySQL and GaussDB(for MySQL) databases during real-time DR. ● Supported multiple specifications for some real-time DR tasks. ● Supported yearly/monthly billing for some DR tasks. ● Supported real-time out-of-cloud synchronization from GaussDB distributed to GaussDB primary/standby. Changed the following content: ● Changed the length of the WHERE condition for data filtering to 512 characters. ● Supported disable task delay notification.

Released On	Description
2022-02-28	This issue is the thirty-eighth official release, which incorporates the following changes: ● Supported users to enter multiples of a parameter value when they change parameters during comparison in the MySQL migration and DR scenarios. ● Optimized the GUI elements of the DRS backup migration function. ● Supported specifying the replication slot name for real-time synchronization from GaussDB to Kafka and from PostgreSQL to Kafka. ● Supported exporting snapshots during the synchronization of PostgreSQL databases. ● Supported multiple specifications for some real-time synchronization tasks. ● Supported stopping tasks in batches.
2022-01-30	This issue is the thirty-seventh official release, which incorporates the following changes: ● Real-time synchronization from DB2 for LUW to GaussDB supported DB2 for LUW 10.5 and 11.5 and large objects. ● During real-time migration from MongoDB to DDS, the destination can be DDS 4.2. ● Supported PostgreSQL to Kafka synchronization (out of the cloud and self-built to self-built) ● Supported importing objects from files during PostgreSQL to PostgreSQL synchronization. ● Supported SSL for synchronization from MySQL to CSS/ES and GaussDB(for MySQL) to CSS/ES. ● Supported migrating Microsoft SQL Server 2019 backups to the cloud. Changed the following content: ● Put MySQL to CSS/ES synchronization into commercial user.

Released On	Description
2021-12-31	This issue is the thirty-sixth official release, which incorporates the following changes: ● Added the description about the impact of DRS on databases. ● Supported DDLs during PostgreSQL incremental synchronization. ● Supported JSON during synchronization from GaussDB to Kafka. ● Supported rate limiting for real-time migration and synchronization from MySQL to GaussDB(for MySQL). ● Supported real-time synchronization from MySQL to GaussDB primary/standby in the cloud. ● DRS supports real-time synchronization from GaussDB primary/standby to MySQL. ● Supported real-time synchronization tasks billed on a yearly/monthly basis. ● Supported Oracle-to-DDM synchronization in the scenario where the destination has more columns than the source. ● Supported pausing and resetting MySQL to GaussDB(DWS) synchronization tasks. ● Supported pausing and resetting PostgreSQL to PostgreSQL synchronization tasks. Changed the following content: ● Moved the Send Notifications option to the task confirmation page. ● The real-time synchronization of GaussDB as the source did not support database-level synchronization.

Released On	Description
2021-11-30	This issue is the thirty-fifth official release, which incorporates the following changes: ● Supported real-time synchronization from GaussDB primary/standby to GaussDB(DWS). ● Supported real-time synchronization from GaussDB(for MySQL) to MySQL. ● Supported real-time synchronization from GaussDB(for MySQL) to GaussDB(DWS). ● Supported real-time synchronization from DB2 for LUW to GaussDB primary/standby. ● Supported real-time synchronization from DB2 for LUW to GaussDB distributed. ● Supported re-editing and suspending real-time synchronization from PostgreSQL to GaussDB(DWS). ● Supported real-time synchronization from GaussDB distributed to GaussDB(DWS) in full+incremental mode. ● Supported adding field types to additional columns during MySQL to GaussDB(for MySQL) data processing. Changed the following content: ● The following data flow types are in the open beta test phase. – Real-time synchronization from PostgreSQL to GaussDB(DWS) – Real-time synchronization from DDM to MongoDB – Real-time synchronization from GaussDB primary/standby to Oracle – Real-time synchronization from GaussDB primary/standby to Kafka – Supported real-time synchronization from GaussDB primary/standby to GaussDB distributed. – Supported real-time synchronization from GaussDB primary/standby to GaussDB primary/standby. – Real-time synchronization from GaussDB distributed to MySQL – Real-time synchronization from GaussDB(for MySQL) to Kafka – Real-time synchronization from GaussDB(for MySQL) to Oracle – Real-time synchronization from GaussDB(for MySQL) to CSS/ES – Real-time synchronization from self-built MySQL to CSS/ES – Real-time DR from MySQL to GaussDB(for MySQL) – Real-time DR from DDM to DDM.

Released On	Description
2021-09-30	This issue is the thirty-fourth official release, which incorporates the following changes: ● Added the description of the product architecture and principles. ● Supported real-time synchronization from DDM to DDM. ● Supported real-time synchronization from MySQL to Oracle. ● Supported real-time synchronization from GaussDB(for MySQL) to Oracle. ● Supported real-time synchronization from GaussDB(for MySQL) to ElasticSearch. ● DRS supports real-time incremental synchronization of MongoDB. ● Supported real-time synchronization from self-built MySQL to Elasticsearch. ● Supported object-level and row-level comparisons during MySQL to GaussDB distributed real-time synchronization. ● Supported DDL filtering in the following scenarios: MySQL to MySQL, MySQL to GaussDB(for MySQL), MySQL to GaussDB(DWS), and MySQL to PostgreSQL synchronization. ● Supported task cloning for MySQL real-time synchronization. ● Added account migration progress statistics to the progress details in real-time migration and real-time disaster recovery scenarios. Changed the following content: ● The following scenarios meet the commercial user standard. – Real-time synchronization from Oracle to DDM – Real-time synchronization from Oracle to PostgreSQL – Real-time synchronization from DDM to Kafka – Real-time synchronization from DDM to GaussDB(DWS) – Real-time synchronization from PostgreSQL to PostgreSQL – Single-active disaster recovery from GaussDB(for MySQL) to GaussDB(for MySQL)

Released On	Description
2021-08-30	This issue is the thirty-third official release, which incorporates the following changes: ● Supported real-time synchronization from MySQL to ElasticSearch. ● Supported real-time synchronization from GaussDB primary/standby to GaussDB primary/standby. ● Supported real-time synchronization for PostgreSQL 13. ● Supported JSON-C message format in MySQL to Kafka synchronization scenario. ● Supported migration of permissions and accounts in MySQL to GaussDB(for MySQL) migration scenario. ● Supported exporting data comparison results. Changed the following content: ● The following scenarios are in the open beta test phase. – MySQL -> GaussDB distributed – Oracle -> GaussDB distributed – GaussDB distributed -> Oracle – GaussDB distributed -> GaussDB(DWS) – GaussDB distributed -> Kafka – GaussDB distributed -> GaussDB distributed ● DRS real-time migration does not support the following data flow types. If necessary, you can use the real-time synchronization instead. – Oracle->MySQL – Oracle->PostgreSQL – Oracle->GaussDB(for MySQL) ● Supported selecting DRS task exception notifications from the SMN topic.

Released On	Description
2021-08-03	This issue is the thirty-first official release, which incorporates the following changes: ● Supported real-time synchronization from GaussDB(for MySQL) to Kafka. ● Supported real-time synchronization from DDM to MySQL. ● Supported real-time synchronization from PostgreSQL to GaussDB distributed in the cloud. ● Supported real-time synchronization from PostgreSQL to GaussDB primary/standby in the cloud. ● Supported filtering out the DELETE operation during out-of-cloud synchronization from MySQL to Kafka. ● Supported column processing for real-time synchronization from MySQL to MySQL. ● Supported real-time migration from MySQL to GaussDB(for MySQL). The destination database can be set to **Read/Write** or **Read-only**. ● Supported user and permission synchronization and user comparison during PostgreSQL to PostgreSQL real-time synchronization. Changed the following content: ● Supported commercial use of Oracle to GaussDB(DWS) synchronization.
2021-07-05	This issue is the thirty-first official release, which incorporates the following changes: ● Supported out-of-cloud synchronization from DDM to Kafka. ● Supported flow control for MySQL to GaussDB(DWS) synchronization tasks. ● Added permissions, allowing users to perform all operations except deleting DB instances. Changed the following content: ● Charged fees for data transmission through a public network. ● Adjusted fees for migrating databases out of the cloud. ● Supported the commercial use of the following scenarios: – Real-time synchronization from DDM to RDS for MySQL – Real-time synchronization from MySQL to RDS for PostgreSQL – Real-time synchronization from MySQL to GaussDB(for MySQL)

Released On	Description
2021-05-31	This issue is the thirtieth official release, which incorporates the following changes: ● Supported real-time migration from MySQL to DDM and from MySQL schema and logic table to DDM in VPN and Direct Connect networks. ● Supported tables without primary keys synchronized from MySQL to GaussDB(DWS). ● Supported synchronization of some DDL operations during incremental synchronization from MySQL to GaussDB(DWS). ● Supported synchronization of some DDL operations during incremental synchronization from PostgreSQL to PostgreSQL. Changed the following content: ● Supported selecting DRS task exception notifications from the SMN topic.
2021-04-30	This issue is the twenty-ninth official release, which incorporates the following changes: ● Supported the following real-time synchronization scenarios: – From Oracle to DDM. – From DDM to GaussDB(DWS) – From GaussDB distributed to GaussDB(DWS) ● Supported real-time DR from DDM to DDM. Changed the following content: ● Supported the commercial use of the following scenarios: – Real-time migration from MySQL to DDM – Real-time migration from MySQL to GaussDB(for MySQL) – Real-time migration from Oracle to RDS for MySQL – Real-time migration from Oracle to GaussDB(for MySQL) – Real-time migration from MySQL schema and logic table to DDM – Real-time synchronization from MySQL to GaussDB(for MySQL) – Real-time synchronization from Oracle to GaussDB(for MySQL) – Real-time synchronization from MySQL to GaussDB(DWS) – Real-time synchronization from Oracle to RDS for MySQL

Released On	Description
2021-03-30	This issue is the twenty-eighth official release, which incorporates the following changes: ● Supported real-time synchronization from Oracle to GaussDB distributed. ● Supported real-time synchronization from MySQL to GaussDB(for MySQL). ● Supported real-time synchronization from PostgreSQL to GaussDB(DWS). ● Supported incremental synchronization of MySQL databases. ● Supported the pausing and resetting some synchronization tasks.
2021-01-30	This issue is the twenty-seventeenth official release, which incorporates the following changes: ● Supported real-time import, editing, and processing of files synchronized from Oracle to GaussDB(DWS). ● Supported the real-time disaster recovery (DR) of GaussDB(for MySQL). ● Supported exporting task information on the real-time disaster recovery page.
2020-12-30	This issue is the twenty-sixth official release, which incorporates the following changes: ● Supported real-time synchronization from MySQL to GaussDB(DWS).
2020-11-30	This issue is the twenty-fifth official release, which incorporates the following changes: ● Supported object editing and mapping during MySQL to GaussDB synchronization. ● Supported searching objects when the user selects objects. ● Supported setting the number of days after which an abnormal task can be automatically stopped.
2020-10-31	This issue is the twenty-fourth official release, which incorporates the following changes: ● Added a description about delay in the migration, synchronization, and DR scenarios. Changed the following content: ● Deleted the description of real-time migration of Microsoft SQL Server databases.

Released On	Description
2020-09-30	This issue is the twenty-third official release, which incorporates the following changes: ● Optimized the minimum permissions of the destination database in the MySQL to GaussDB synchronization scenario. ● Supported incremental startup of the GaussDB to MySQL synchronization task. ● Added constraints on the migration of PostgreSQL. ● Added the description on the DR monitoring page, and the connection needs to be reset after the RDS DB instance is promoted to the primary DB instance.
2020-08-31	This issue is the twenty-second official release, which incorporates the following changes: ● Supported skipping data and pausing the synchronization from DDM to Oracle. ● Allowed users to specify the subnet where the instance resides when creating a migration, synchronization, or DR task.
2020-07-31	This issue is the twenty-first official release, which incorporates the following changes: ● Supported MySQL multi-table row filtering during synchronization. ● Allowed different users under the same tenant to manage their own DRS tasks, and the tasks are invisible to each other.
2020-04-30	This issue is the twentieth official release, which incorporates the following changes: ● Supported exception diagnosis for heterogeneous migration and synchronization. ● Supported resumable uploads by creating a synchronization task during Oracle to Kafka synchronization.
2020-03-31	This issue is the nineteenth official release, which incorporates the following changes: ● Supported MySQL to GaussDB(for MySQL) DR for the first time. ● Supported DDM to Oracle synchronization for the first time. ● Supported MySQL to PostgreSQL synchronization over public networks. ● Supported pausing tasks. ● Supported MySQL to GaussDB(DWS) synchronization for the first time.

Released On	Description
2020-02-29	This issue is the eighteenth official release, which incorporates the following changes: ● Supported pagination and querying for data synchronization. ● Added the flow control mode for disaster recovery. ● Supported forward and backward DR in multi-active DR. ● Supported the change of the flow control mode after the task is started. ● Supported resetting passwords. ● Disabled migration between self-built databases.
2020-01-30	This issue is the seventeenth official release, which incorporates the following changes: ● Supported MySQL 8.0 for the first time. ● Provided the quick comparison function. Users can directly create a comparison task in the task list. ● Supported alarm reporting for DR tasks. ● Supported forcing tasks to stop.
2019-12-30	This issue is the sixteenth official release, which incorporates the following changes: ● Provided migration progress details so that the user can monitor the migration progress. ● Supported batch primary/standby switchover in disaster recovery scenarios. ● Added an entry that allows users to directly access the data comparison page from the task list. ● Supported migrations between on-premises MySQL databases.
2019-11-30	This issue is the fifteenth official release, which incorporates the following changes: ● Supported renaming databases during Microsoft SQL Server backup and restoration. ● Supported disaster recovery between RDS DB instances or between self-built databases and RDS DB instances. ● Supported selecting the current cloud as the active during disaster recovery. ● Supported the Oracle RAC cluster for incremental migration between Oracle and MySQL. ● Supported synchronizing MySQL out of the cloud.

Released On	Description
2019-10-30	This issue is the fourteenth official release, which incorporates the following changes: ● Supported migration of specified database accounts. ● Supported checking backup files during backup migration. ● Supported tag management. ● Supported online multi-active DR.
2019-09-30	This issue is the thirteenth official release, which incorporates the following changes: ● Supported incremental migration from Oracle to MySQL databases. ● Supported full migration of triggers and events of PostgreSQL databases. ● Supported automatic reconnection and resumable data transfer when network faults occur during full migration of MySQL databases. ● Supported compute resources selection in the value comparison function of MySQL. ● Generated fees for MySQL migration and synchronization. ● Supported user comparison during the MySQL migration.
2019-08-30	This issue is the twelfth official release, which incorporates the following changes: ● Supported the overwrite policy when conflicts occur during MySQL synchronization. ● Supported controlling the database replication rate in the VPN and dedicate connect scenarios. ● Supported migration of Definer for MySQL. ● Supported migration of account permissions for MongoDB databases. ● Supported configuring multiple IP addresses for MongoDB cluster databases. ● Supported hyphens (-) in Microsoft SQL Server database names.
2019-07-30	This issue is the eleventh official release, which incorporates the following changes: ● Supported the snapshot mode for MySQL full migration. ● Canceled the retry function and supported the reset and resume functions for MySQL database migration and synchronization. ● Supported migrating and resetting account passwords.

Released On	Description
2019-06-30	This issue is the tenth official release, which incorporates the following changes: ● Supported migrating DDS databases out of the cloud. ● Canceled the binding of an EIP to the destination database when migrating data to the cloud through a public network. ● Supported resetting traffic flow during the migration or synchronization of MySQL databases.
2019-05-30	This issue is the ninth official release, which incorporates the following changes: ● Supported full migration from Oracle to MySQL databases. ● Optimized the parameter comparison function.
2019-04-30	This issue is the eighth official release, which incorporates the following changes: ● Supported full migration from Oracle to PostgreSQL databases. ● Supported VPN and Direct Connect in synchronization and out-of-cloud migration scenarios.
2019-03-30	This issue is the seventh official release, which incorporates the following changes: ● Supported online migration between DDS single-node instances. ● Displayed full migration progress by phase. ● Supported viewing subscription data online. ● Modified the consumption start time. ● Supported modifying subscription objects.
2019-02-28	This issue is the sixth official release, which incorporates the following changes: ● Supported online migration speed limitation for MySQL. ● Supported migration of MySQL Finance Edition instances. ● Supported filtering DROP DATABASE in MySQL to MySQL synchronization. ● Displayed mapping information in the synchronization scenario. ● Supported one-click confirmation of remarks.

Released On	Description
2019-01-30	This issue is the fifth official release, which incorporates the following changes: ● Supported database alias in full backup migration and the restoration of all databases. ● Supported the migration of DDS Enhanced Edition cluster instances. ● Supported beta version of sending MySQL data subscription information to the Kafka queue.
2019-01-19	This issue is the fourth official release, which incorporates the following changes: ● Supported editing the MySQL to MySQL synchronization task. ● Supported MySQL to PostgreSQL synchronization. ● Visualized data conflicts in data synchronization scenarios. ● Supported table mapping for MySQL to PostgreSQL synchronization.
2018-12-30	This issue is the third official release, which incorporates the following changes: ● Supported parameter comparison for MySQL migration. ● Supported incremental migrations from MongoDB replica sets to clusters. ● Optimized the synchronization mode and object. ● Supported Huawei Cloud Dedicated Computing Cluster (DCC).
2018-11-30	This issue is the second official release, which incorporates the following changes: ● Supported the migration of MySQL database accounts. ● Supported data synchronization. ● Classified check items. ● Supported selecting multiple .bak files during backup migration. ● Supported deleting tasks in batches.
2018-10-31	This issue is the first official release.