Database and Application Migration UGO(UGO) 25.1.0

Service Overview

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1 What is UGO?

Database and Application Migration UGO, referred to as UGO, is a professional cloud service focused on heterogeneous database schema migration. It can automatically convert the DDL, DML and DCL statements in source databases into SQL statements compatible with Huawei Cloud databases such as GaussDB and RDS. With the functions of database evaluation, object migration, and automatic syntax conversion, UGO can help you evaluate your reconstruction workload in advance, improve the conversion rate, and minimize the costs of database migration.

Functions

Table 1-1 Functions

Function	Description	Reference
Database evaluation	UGO collects basic information and performance data of a source database, as well as SQL statements of specific object types, and provides an overview of the source database. Based on the analysis of factors such as compatibility and object complexity, UGO provides an analysis report on the compatibility and reconstruction cost of the source and target databases, helping you select a suitable target database and evaluate migration workloads.	**Evaluation Project**
Object migration	After the database evaluation is complete and the target database is confirmed, you can start to migrate database objects with a few clicks. In this module, UGO guides you to make a conversion plan and design a solution to automatically convert syntax. For objects that fail to be converted or migrated, you can edit and batch modify them to simplify manual reconstruction. Each modification is recorded, so that you can view and roll back historical modifications.	**Migration Project**

Function	Description	Reference
SQL audit	SQL audit helps users detect SQL standardization, design rationality, and performance issues hidden in code at the development phase. More than 200 audit rules are preset for various SQL statements such as DML, DDL, and PL/SQL. You can adjust the risk level, threshold, and suggestion in a rule and create a custom audit template by combining multiple rules. GaussDB and MySQL databases can be audited. You can use a single statement, upload code files in batches (SQL statements are automatically extracted), or directly connect to the database to audit SQL statements. UGO also prevents inappropriate SQL statements from flowing into the production environment.	**SQL Audit**

Billing

UGO is available for commercial use and is free for all users.

Solution

In heterogeneous database migration, UGO is used for schema migration and syntax conversion and **Data Replication Service (DRS)** for online data migration. UGO and DRS form a complete end-to-end heterogeneous database migration solution, helping you migrate data from mainstream commercial databases to Huawei Cloud databases easily and smoothly.

You can use UGO and DRS to migrate heterogeneous databases with complex stored procedures and functions to Huawei Cloud.
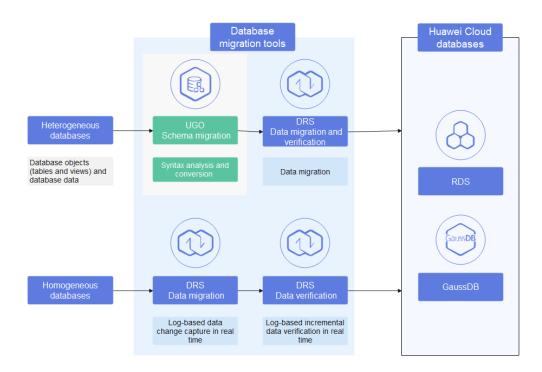
Figure 1-1 Database migration solution

2 Functions

Source Database Profiling

UGO efficiently collects database metadata such as various database object types and abstracts various types of information from them. This provides a sufficient data basis for accurate and quick analysis of important information such as application scenarios and user operation habits of the source database.

Target Database Compatibility Analysis

UGO uses a source database profile as the input to analyze the syntax compatibility of core database object types based on the selected destination database type. UGO analysis results include native compatibility, conversion compatibility, partial compatibility, and incompatibility. It then classifies and collects the analyses, lists the most incompatible syntax points, and provides reconstruction suggestions.

Workload Evaluation

UGO has incorporated extensive experience in migration and reconstruction through numerous real-world user service scenarios. It evaluates migration workloads based on factors such as the amount of code involved, the conversion rate, and how hard it will be to reconstruct incompatible features.

Database Schema Migration

UGO maximizes semantic equivalence for SQL syntaxes in source and target databases and then applies the converted SQL statements to the target database. Objects that are incompatible with the syntax and cannot be converted are marked as failed and a failure cause is provided. Manual correction is supported too. If needed, you can manually modify objects on UGO and then apply those modified statements to the target database in one-click.

3 Highlights

Easy to Use

The entire process of one-stop migration of heterogeneous databases is visible to you. You can migrate schemas from a source database to a target database just as prompted on the GUI even unfamiliar with database syntax.

Low Risk

The metadata of the source database is used to generate a source database profile that gives you a clear and complete understanding of the database you are about to migrate. A syntax compatibility report is generated based on the target database. Warnings are provided for potentially incompatible or only partially compatible syntax points, so you can identify migration reconstruction points in advance and evaluate the reconstruction workload. These reports help you visualize and quantify the process.

Low Cost

Automatic database object collection and syntax conversion allow you to migrate compatible objects in one-click, minimizing the workforce required for syntax reconstruction. In addition, error tracing and locating capabilities are provided for objects that fail to be converted or migrated, helping you quickly identify the root cause.

High Conversion Rate

Hundreds of millions of SQL statement conversions have verified the knowledge base of syntax differences among tens of thousands of databases. Additionally, implementing highly automatic conversion from mainstream databases to GaussDB is possible through the use of various conversion configuration parameters.

High Security

User operations and sensitive information are protected to maximize user data and operation security. The entire progress is manageable, visible, and controllable.

4 Application Scenarios

Financial/Internet Industry

UGO is suitable for migrating bank's core transaction services and Internet transaction services from traditional commercial databases to cloud databases.

Advantages:

- High syntax conversion rate

  UGO supports automated syntax conversion from mainstream commercial databases to cloud databases. By training hundreds of millions of code samples in massive service scenarios, the syntax conversion rate of UGO reaches the excellence level in the industry, greatly reducing migration costs and improving efficiency.

- Exception locating and reconstruction suggestions

  UGO automatically locates objects that fail to convert and analyzes the root causes, and provides manual reconstruction suggestions for syntax that cannot be adapted to heterogeneous databases based on the DBA knowledge base.

Government/Large Enterprises

UGO is suitable for migrating operating businesses and operational businesses of government organizations and enterprises. Government organizations and enterprises have complex scenarios. During the migration from traditional commercial databases to cloud databases, they demand solutions that best suit their needs and businesses.

Advantages:

- Target database recommendation

  Target database type and specifications are recommended based on the source database service running scenarios. This helps resolve the difficulties in database selection.

- Migration verification

  All migrated objects are automatically replayed in the target database for reconstruction verification, ensuring that the objects in the source database are equivalent to those in the target database.

5 Basic Concepts

Source Database

Source database is the database to be migrated.

Target Database

Target database is the database that receives the data migrated from the source database. It can be a Huawei Cloud GaussDB or RDS database.

Compatibility Analysis

The entire syntax tree of the source database is analyzed, so you can learn what differences there are in the syntaxes of the source and target databases. You can learn how compatible the two databases are and what the expected migration success rate will be for the objects migrated.

Database Evaluation

Database evaluation includes a syntax compatibility analysis, target database recommendation, syntax reconstruction workload evaluation, and migration risk identification for the object collection of the source database. The database evaluation allows you to identify how feasible the migration will be and what risks may be involved.

Schema Migration

The database objects (tables, indexes, views, stored procedures, and functions) are converted to match the syntax of the target database. These converted objects are then added to the target database.

Source Database Profiling

The metadata of the source database is extracted and analyzed in multiple ways, such as the number of objects, type distribution, and complexity, to abstract the database information. This provides data basis for further accurate and quick analysis of important information, such as the application scenarios and user operation habits of the source database.

6 Supported Database Versions

Constraints

- To use some source and destination database engines, submit an application by choosing **Service Tickets > Create Service Ticket** in the upper right corner of the console.
- When selecting GaussDB as the target database type, you need to **create a GaussDB database compatible with the source database**.

Supported Source Database Types and Versions

Table 6-1 lists source database types and versions supported by UGO.

Table 6-1 Source database types and versions

Source DB Engine	Source DB Version
Oracle	10g, 11g, 12c, 18c, 19c, and 21c
MySQL	5.5, 5.6, 5.7, and 8.0
PostgreSQL	10, 11, 12, 13, 14, and 15
GoldenDB	-
Microsoft SQL Server	2012, 2014, 2016, 2017, 2019, and 2022

☐ NOTE

The source database type can be PostgreSQL, GoldenDB, or Microsoft SQL Server, which are available only for whitelisted users.

Supported Data Flows and Target Database Versions

Table 6-2 lists data flows supported by UGO and target database types and versions.

Table 6-2 Supported data flows and target database types and versions

Source DB Engine	Target DB Type and Version
Oracle	RDS for MySQL 5.7
	RDS for PostgreSQL 11, 12, 13, and 14
	TaurusDB
	GaussDB Centralized V2.0 (A-compatible mode) 2.7 Enterprise Edition, 3.1 Enterprise Edition, 3.2 Enterprise Edition, 3.3 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
	GaussDB Distributed V2.0 (Oracle-compatible mode) 2.7 Enterprise Edition, 3.2 Enterprise Edition, 3.3 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
MySQL	GaussDB Centralized V2.0 (B-compatible mode) 2.7 Enterprise Edition, 3.1 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition
	GaussDB Centralized V2.0 (M-compatible mode) 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
	GaussDB Distributed V2.0 (MySQL-compatible mode) 2.7 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition
PostgreSQL	GaussDB Centralized V2.0 (A-compatible mode) 3.1 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition

Source DB Engine	Target DB Type and Version
	GaussDB Distributed V2.0 (Oracle-compatible mode)
	3.2 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
GoldenDB	GaussDB Centralized V2.0 (B-compatible mode)
	8.0 Enterprise Edition and 8.100 Enterprise Edition
	GaussDB Centralized V2.0 (M-compatible mode)
	8.200 Enterprise Edition and 9.0 Enterprise Edition
	GaussDB Distributed V2.0 (MySQL-compatible mode)
	8.0 Enterprise Edition and 8.100 Enterprise Edition
Microsoft SQL Server	GaussDB Centralized V2.0 (A-compatible mode)
	3.1 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
	GaussDB Distributed V2.0 (Oracle-compatible mode)
	3.2 Enterprise Edition, 8.0 Enterprise Edition, 8.100 Enterprise Edition, 8.200 Enterprise Edition, and 9.0 Enterprise Edition
	TaurusDB
	RDS for PostgreSQL
	11, 12, 13, 14, and 15

📖 **NOTE**

- Currently, GaussDB V2.0-8.0 Enterprise Edition, V2.0-8.100 Enterprise Edition, V2.0-8.200 Enterprise Edition, and V2.0-9.0 Enterprise Edition as the target database are available only for trustlisted users.
- When GaussDB is used as the destination database, its versions earlier than V2.0-2.7 are not displayed on UGO. If GaussDB V2.0-2.1 or V2.0-2.2 Enterprise Edition is used, migrate it to V2.0-2.7 Enterprise Edition. Instances of GaussDB in versions earlier than V2.0-2.1 cannot be migrated by UGO, so you need to upgrade the version.

7 Constraints

Table 7-1 lists the constraints for UGO.

Table 7-1 Function constraints

Function	Constraints
Object collection scope	Only database objects related to user services are collected. For details about other objects that are not collected, see section **Which Schemas in Source Databases Are Ignored for Migration?** in *Usage Guide*.
Impact on the source database	UGO occupies some database session connections and source database resources during object collection. To prevent UGO from affecting services of the source database, you are advised to export objects from the source database to the test database. UGO can then connect to a test database for collection, evaluation, and conversion. If this type of data collection is necessary, perform it during off-peak hours.
No incremental data migration performed	UGO converts database schemas based on the collected data. Any schema changes after the data is collected will not be migrated. After the migration, the changes must be synchronized between the source and target databases, or, the changed functions will be affected.
Migration and verification	UGO is used to reduce costs and improve migration efficiency. After database objects are migrated, strict tests must be performed to ensure that the functions and performance of the migrated objects on the target database meet service requirements. Otherwise, the target database cannot be used to replace the source database.

8 Security

8.1 Compliance Description

Data Compliance

UGO needs to access your data, including database connections and schema information.

1. Connection information includes the database IP address, port number, username, and password, and SSL certificate and password.

2. UGO only accesses and obtains required schema information about the source database, which is displayed on the console. Table data in the source database is not accessed.

There are a wide range of security measures, such as authentication, encrypted storage, and internal data isolation, to ensure data security. After you delete related projects after the migration, UGO will delete data related to the projects.

Service Compliance

You understand and agree that your use of this service complies with laws and regulations, including but not limited to legal compliance requirements for data content, data transfer, and cross-border data transfer. UGO only provides a standard service when requested 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.

9 Permission Management

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

With IAM, you can use your Huawei Cloud account to create IAM users, and assign permissions to the users to control their access to specific resources. For example, you can grant software developers in your enterprise permissions to use UGO resources but not permissions needed to delete them 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 UGO resources.

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

IAM can be used for free. You pay only for the resources in your account. For more information about IAM, see **What Is IAM?**

UGO Permissions

By default, new IAM users do not have any 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 they belong to and can perform specified operations on cloud services based on those permissions.

UGO is a project-level service deployed in specific physical regions. To assign UGO permissions to a user group, select a project (ap-southeast-3) in a specific region (AP-Singapore) to apply the permission changes. If all projects are selected, the permissions will take effect for the user group in all region-specific projects. When accessing UGO, you need to switch to a region where you have been authorized to use this service.

You can grant users permissions by using roles and policies.

- Roles: A type of coarse-grained authorization mechanism that defines permissions related to users responsibilities. This mechanism provides only a limited number of service-level roles for authorization. There may be dependencies involved between different roles. If these dependencies are not taken into account, you may be unable to properly assign the permissions as

intended. Roles are not ideal 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.

Table 9-1 and **Table 9-2** illustrate all the built-in roles and policies of the UGO.

Table 9-1 Built-in roles

Role	Description	Supported
Tenant Administrator	Admin permissions of tenants. Tenants with these permissions can access and perform resources of tenants except IAM.	Yes
Tenant Guest	Read-only permissions of tenants. Tenants with these permissions can query all objects of all tenants except IAM.	Yes

Table 9-2 UGO system policies

Policy Name	Description	Supported
UGO FullAccess	All permissions	Yes
UGO ReadOnlyAccess	Read-only permissions	Yes
UGO CommonOperations	SQL conversion permission	Optional

Table 9-3 lists the common operations supported by each system-defined policy or role of UGO. Select the policies or roles as required.

Table 9-3 Common operations supported by each system policy

Operation	UGO FullAccess	UGO ReadOnlyAccess	UGO CommonOperations
Creating a project	√	x	x
Querying a tag	√	√	x
Querying quota	√	√	x
Obtaining the project list	√	√	x
Deleting a project	√	x	x
Starting a migration project	√	x	x
Viewing project details	√	√	x
Converting SQL statements	√	x	√

Table 9-4 lists common UGO operations and corresponding actions. You can refer to this table to create custom permission policies.

Table 9-4 Common operations and supported actions

Operation	Action	Type
Evaluation project: obtaining the evaluation project list	ugo:evaluationJob:list	ReadOnly
Migration project: obtaining the migration project list	ugo:migrationJob:list	ReadOnly
Querying a tag	ugo:tag:getTags	ReadOnly
Adding, modifying, or deleting a tag	ugo:tag:operateTags	ReadWrite
Querying quota	ugo:jobs:getQuotas	ReadOnly
Shared: querying project details	ugo:jobs:getDetails	ReadOnly

Operation	Action	Type
Evaluation project: testing source database connectivity	ugo:evaluationJob:testConnection	ReadWrite
Evaluation project: testing the network stability of the source database	ugo:evaluationJob:testNetworkConnection	ReadWrite
Evaluation project: pre-checking	ugo:evaluationJob:preCheck	ReadWrite
Evaluation project: creating an evaluation project	ugo:evaluationJob:create	ReadWrite
Evaluation project: stopping evaluation	ugo:evaluationJob:stopEvalProject	ReadWrite
Evaluation project: resuming evaluation	ugo:evaluationJob:resumeEvalProject	ReadWrite
Evaluation project: re-evaluating	ugo:evaluationJob:reanalyze	ReadWrite
Evaluation project: running differentiation analysis	ugo:evaluationJob:collectDiffAnalysis	ReadWrite
Evaluation project: Performing an incremental evaluation	ugo:evaluationJob:startDeltaEvaluation	ReadWrite
Evaluation task: confirming the target database	ugo:evaluationJob:updateEvalProject	ReadWrite
Evaluation project: reselecting and evaluating objects	ugo:evaluationJob:analyzeType	ReadWrite
Evaluation project: Editing SQL	ugo:evaluationJob:saveSQL	ReadWrite
Evaluation project: deleting an evaluation project	ugo:evaluationJob:delete	ReadWrite
Migration task: testing the target database connectivity	ugo:migrationJob:testConnection	ReadWrite
Migration project: creating a migration project	ugo:migrationJob:create	ReadWrite

Operation	Action	Type
Conversion plan of the migration project: skipping conversion or undoing skip	ugo:migrationJob:skipObjects	ReadWrite
Conversion plan of the migration project: editing conversion configuration	ugo:migrationJob:updateConfig	ReadWrite
Conversion plan of the migration project: editing application configuration	ugo:migrationJob:updateCategory	ReadWrite
Conversion plan of the migration project: setting the user password	ugo:migrationJob:setPassword	ReadWrite
Conversion plan of the migration project: mapping tablespaces	ugo:migrationJob:updateTableSpaceMapping	ReadWrite
Syntax conversion of the migration project: starting or resuming the conversion	ugo:migrationJob:startConvert	ReadWrite
Syntax conversion of the migration project: pausing the conversion	ugo:migrationJob:stopConvert	ReadWrite
Object correction of the migration project: updating status	ugo:migrationJob:updateFailedStatus	ReadWrite
Object correction of the migration project: skipping migration or undoing skip	ugo:migrationJob:skipVerification	ReadWrite
Object correction of the migration project: retuning the conversion	ugo:migrationJob:reconvert	ReadWrite
Object correction of the migration project: replacing SQL statements in the bulk update	ugo:migrationJob:updateBulk	ReadWrite

Operation	Action	Type
Object correction of the migration project: comparing, ignoring, or saving the SQL modifications	ugo:migrationJob:updateSQL	ReadWrite
Verification of the migration project: starting the migration	ugo:migrationJob:startVerify	ReadWrite
Verification of the migration project: stopping the migration	ugo:migrationJob:stopVerify	ReadWrite
Migration project: deleting a migration project	ugo:migrationJob:delete	ReadWrite
Converting SQL statements	ugo:sqlStatement:convert	ReadWrite

10 Relationship Between UGO and Other Services

VPC Endpoint Service

UGO uses a VPC endpoint service as a proxy to connect to the target database. In this way, you can access your target database securely.

When you create a migration project, in addition to the UGO FullAccess permission, you need the VPC Endpoint Administrator or Tenant Administrator permission. A VPC endpoint service is automatically created and deleted by UGO when you create or delete a migration project.

The VPC endpoint service is free. UGO adds a whitelist to control permissions of the VPC endpoint service to ensure secure access to the target database. You can also view the VPC endpoint service of the target database on the VPC Endpoint console. To ensure that UGO functions are available, do not delete the VPC endpoint service of the target database before its migration project is complete.

Data Replication Service (DRS)

UGO migrates heterogeneous database schemas, such as tables, views, and stored procedures, to the cloud, resolving the incompatibility problem of database syntax conversion.

DRS supports database data synchronization in milliseconds. It supports data transmission and migration between homogeneous and heterogeneous databases, simplifying data transmission between databases and reducing data transmission costs.

You can use UGO and DRS to migrate heterogeneous databases with complex stored procedures and functions to Huawei Cloud.

Identity and Access Management (IAM)

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

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

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

Cloud Trace Service (CTS)

Cloud Trace Service (CTS) records operations related to UGO, facilitating additional queries, audits, and retrievals.

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