Database and Application Migration UGO

Service Overview

Issue 01

Date 2024-03-08





Copyright © Huawei Technologies Co., Ltd. 2024. All rights reserved.

No part of this document may be reproduced or transmitted in any form or by any means without prior written consent of Huawei Technologies Co., Ltd.

Trademarks and Permissions

HUAWEI and other Huawei trademarks are trademarks of Huawei Technologies Co., Ltd. All other trademarks and trade names mentioned in this document are the property of their respective holders.

Notice

The purchased products, services and features are stipulated by the contract made between Huawei and the customer. All or part of the products, services and features described in this document may not be within the purchase scope or the usage scope. Unless otherwise specified in the contract, all statements, information, and recommendations in this document are provided "AS IS" without warranties, guarantees or representations of any kind, either express or implied.

The information in this document is subject to change without notice. Every effort has been made in the preparation of this document to ensure accuracy of the contents, but all statements, information, and recommendations in this document do not constitute a warranty of any kind, express or implied.

Huawei Technologies Co., Ltd.

Address: Huawei Industrial Base

Bantian, Longgang Shenzhen 518129

People's Republic of China

Website: https://www.huawei.com

Email: support@huawei.com

Security Declaration

Vulnerability

Huawei's regulations on product vulnerability management are subject to the *Vul. Response Process.* For details about this process, visit the following web page:

https://www.huawei.com/en/psirt/vul-response-process

For vulnerability information, enterprise customers can visit the following web page:

https://securitybulletin.huawei.com/enterprise/en/security-advisory

Contents

1 What is UGO?	1
2 Application Scenarios	3
3 Supported Databases	4
4 Highlights	7
5 Functions	8
6 Billing	9
7 Security	
7.1 Compliance Description	10
8 Permissions Management	11
9 Constraints	17
10 Relationship Between UGO and Other Services	19
11 Basic Concepts	21
12 Change History	22

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.

In heterogeneous database migration, UGO is for schema migration and syntax conversion, and **Data Replication Service (DRS)** is for data online 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.

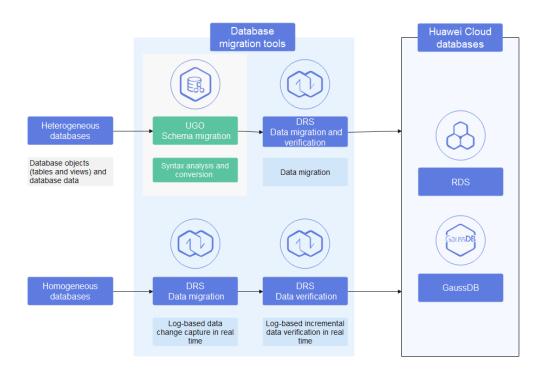


Figure 1-1 Database migration solution

2 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 automatic 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 industry-leading level, 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.

3 Supported Databases

Constraints

- To use some migration flows, 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.

Software Requirements

Table 3-1 lists the types and versions of the source and target databases supported by UGO.

Table 3-1 Database types and versions

Source DB Engine	Source DB Version	Target DB Type and Version
Oracle	10g, 11g, 12c, 18c, 19c, and 21c	RDS for MySQL 5.7
		RDS for PostgreSQL 11, 12, 13, 14, and Enhanced Edition
		GaussDB(for MySQL) 8.0
		GaussDB Primary/Standby 2.7 Enterprise Edition, 3.1 Enterprise Edition, 3.2 Enterprise Edition, 3.3 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition

Source DB Engine	Source DB Version	Target DB Type and Version
		GaussDB Distributed 2.7 Enterprise Edition, 3.2 Enterprise Edition, 3.3 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition
MySQL	5.5, 5.6, 5.7, and 8.0	GaussDB Primary/Standby
		2.7 Enterprise Edition, 3.1 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition
		GaussDB Distributed
		2.7 Enterprise Edition, 3.2 Enterprise Edition, 8.0 Enterprise Edition, and 8.100 Enterprise Edition
PostgreSQL	10, 11, 12, 13, 14,	GaussDB Primary/Standby
NOTE To use PostgreSQL as the source database type, submit an	and 15	3.1 Enterprise Edition, 3.2 Enterprise Edition, and 8.0 Enterprise Edition
application.		GaussDB Distributed
		3.2 Enterprise Edition and 8.0 Enterprise Edition
GoldenDB NOTE	-	GaussDB Primary/Standby 8.0 Enterprise Edition
To use GoldenDB as the source database type, submit an application.		GaussDB Distributed 8.0 Enterprise Edition
Microsoft SQL Server	2012, 2014, 2016,	GaussDB Primary/Standby
NOTE To use Microsoft SQL Server as the source database type, submit an application.	2017, and 2019	3.1 Enterprise Edition, 3.2 Enterprise Edition, and 8.0 Enterprise Edition
		GaussDB Distributed
		3.2 Enterprise Edition and 8.0 Enterprise Edition
		GaussDB(for MySQL) 8.0

MOTE

- **Primary/standby GaussDB 2.7 Enterprises Edition** includes primary/standby GaussDB 2.1 enterprise edition, primary/standby GaussDB 2.2 enterprise edition, and primary/standby GaussDB 2.7 enterprise edition.
- **Distributed GaussDB 2.7 Enterprises Edition** includes distributed GaussDB 2.1 enterprise edition, distributed GaussDB 2.2 enterprise edition, and distributed GaussDB 2.7 enterprise edition.

4 Highlights

Easy to Use

Wizard-based, visualized guidance runs through the entire migration process. You can perform database structure migration and verification without professional database syntax knowledge, which significantly lowers the knowledge requirements.

Two core functions, database evaluation and object migration, as well as automatic syntax conversion allows for one-stop heterogeneous database migration.

Low Risk

The current usage information of the source database can be obtained through source database analysis and profiling. UGO can recommend target databases based on the source database information and evaluate their compatibility and migration risks, helping you identify possible reconstruction points in advance. UGO can help you visualize the migration process and quantify migration capability.

Low Cost

UGO can automatically collect and convert data, and trace and locate errors of objects that fail to convert, reducing labor costs.

High Conversion Rate

By training hundreds of millions of code samples in massive service scenarios, UGO achieves an industry-leading conversion rate for mainstream commercial databases.

High Security

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

5 Functions

Source Database Profiling

Source database profiling uses massive service scenarios as samples and key database metrics as features for training to abstract the database information, providing the data basis for further accurate and quick analysis of important information such as application scenarios and user operation habits of the source database.

Target Database Compatibility Analysis

Compatibility analysis is carried out on 14 core object types based on the source database profiling and the conversion rate of the UGO kernel to the target database. The compatibility analysis includes compatible and incompatible objects. For the objects not supported, UGO lists the top features and provides reconstruction suggestions. Through continuous kernel construction in the past few years and training with hundreds of millions of samples, UGO delivers high syntax conversion rate.

Workload Evaluation

The migration labor cost in massive service scenarios is used as a baseline workload. The accumulated migration workload of large numbers of service scenarios in automated migration is used as the input. The evaluated migration workload is based on the amount of code, the conversion rate, and on how hard it is to reconstruct incompatible features.

Database Schema Migration

Schema migration uses pre-migration evaluation as input and guidance. Before the conversion, you can filter the objects to migrate. After the conversion is complete, you can mark the failed objects and failure causes. Failed objects can be corrected according to the failure causes. After the correction, you can perform the verification test. If the verification fails, you can correct the objects and submit for verification again until all objects are successfully verified and the entire migration process is complete.

6 Billing

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

7 Security

7.1 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.

8 Permissions 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, specify the scope as region-specific projects and select projects 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 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 8-1 and Table 8-2 illustrate all the built-in roles and policies of the UGO.

Table 8-1 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 8-2 UGO system policies

Policy Name	Description	Supported
UGO FullAccess	All permissions	Yes
UGO ReadOnlyAcce ss	Read-only permissions	Yes
UGO CommonOper ations	SQL conversion permission	Optional

Table 8-3 lists the common operations supported by each system-defined policy or role of UGO. Select the policies or roles as required.

Table 8-3 Common operations supported by each system policy

Operation	UGO FullAccess	UGO ReadOnlyAccess	UGO CommonOperatio ns
Creating a project	√	х	х
Querying a tag	√	✓	х
Querying quota	√	✓	х
Obtaining the project list	√	✓	х
Deleting a project	√	х	х
Starting a migration project	✓	х	х
Viewing project details	✓	✓	х
Converting SQL statements	√	х	√

Table 8-4 lists common UGO operations and corresponding actions. You can refer to this table to create custom permission policies.

Table 8-4 Common operations and supported actions

Operation	Action	Туре
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

Operation	Action	Туре
Shared: querying project details	ugo:jobs:getDetails	ReadOnly
Evaluation project: testing source database connectivity	ugo:evaluationJob:testConne ction	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:stopEvalP roject	ReadWrite
Evaluation project: resuming evaluation	ugo:evaluationJob:resumeEv alProject	ReadWrite
Evaluation project: re- evaluating	ugo:evaluationJob:reanalyze	ReadWrite
Evaluation project: running differentiation analysis	ugo:evaluationJob:collectDiff Analysis	ReadWrite
Evaluation project: Performing an incremental evaluation	ugo:evaluationJob:startDelta Evaluation	ReadWrite
Evaluation task: confirming the target database	ugo:evaluationJob:updateEv alProject	ReadWrite
Evaluation project: reselecting and evaluating objects	ugo:evaluationJob:analyzeTy pe	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:testConnec tion	ReadWrite

Operation	Action	Туре
Migration project: creating a migration project	ugo:migrationJob:create	ReadWrite
Conversion plan of the migration project: skipping conversion or undoing skip	ugo:migrationJob:skipObject s	ReadWrite
Conversion plan of the migration project: editing conversion configuration	ugo:migrationJob:updateConf ig	ReadWrite
Conversion plan of the migration project: editing application configuration	ugo:migrationJob:updateCat egory	ReadWrite
Conversion plan of the migration project: setting the user password	ugo:migrationJob:setPasswor d	ReadWrite
Conversion plan of the migration project: mapping tablespaces	ugo:migrationJob:updateTabl eSpaceMapping	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:updateFail edStatus	ReadWrite
Object correction of the migration project: skipping migration or undoing skip	ugo:migrationJob:skipVerific ation	ReadWrite
Object correction of the migration project: retuning the conversion	ugo:migrationJob:reconvert	ReadWrite

Operation	Action	Туре
Object correction of the migration project: replacing SQL statements in the bulk update	ugo:migrationJob:updateBul k	ReadWrite
Object correction of the migration project: comparing, ignoring, or saving the SQL modifications	ugo:migrationJob:updateSQL	ReadWrite
Migrate &Verify of the migration project: starting the migration	ugo:migrationJob:startVerify	ReadWrite
Migrate &Verify 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

9 Constraints

Table 9-1 shows the constraints designed to ensure the stability and security of UGO.

Table 9-1 Function constraints

Function	Constraints
Pre-migration	Database service commands, such as SQL*Plus command PROMPT, are not supported.
	 There are some dynamic constraints in target databases, such as RDS for MySQL and GaussDB(for MySQL). For example, the total size of all Varchar columns cannot exceed 64,000.
Object	System objects starting with SYS_PLSQL are not collected.
collection	Objects containing back quotes and blank characters cannot be collected, parsed, evaluated, converted, or migrated.
	Deleted objects starting with BIN\$ are not collected.
	Oracle nested tables are not collected.
	Schema objects within the user permission scope are not collected.
	 For details about other objects that are not collected, see Which of Schemas in the Oracle Databases Are Ignored for Migration?
SQL conversion	For command line and online converter usage scenarios, you need to input SQL according to the source database syntax documentation. Because current SQL Parser or Identifier checks the syntax of input SQL with respect to source database syntax documentation, it cannot match with source database engine functionality completely due to certain dynamic behavior.

Function	Constraints
Maximum number of connections to the source database	UGO occupies session connections of the source database. If the number of connections occupied by UGO exceeds the upper limit of connections to the source database, some workloads will be unable to access the source database. It will affect source database functions.
Source database object collection	Collecting objects using UGO occupies source database resources. You are advised to do this operation 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.

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.

1 1 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.

Database Evaluation

Database evaluation covers the compatibility analysis, target database recommendation, workload evaluation, and migration risk identification on the object collection of the source database to identify the feasibility and risks of migrating data from the source database to the target database.

Schema Migration

Based on the selected target database and source database, equivalent syntax conversion and migration are performed on the collected objects, including DDL, DML, and PL/SQL objects.

Source Database Profiling

Source database profiling uses massive service scenarios as samples and key database metrics as features for training to abstract the database information, providing the data basis for further accurate and quick analysis of important information such as application scenarios and user operation habits of the source database.

Compatibility Analysis

Compatibility analysis analyzes and evaluates the convertibility of the collected objects in the target database, and provides the analysis result based on the selected source and target databases and full syntax tree analysis of the source database.

12 Change History

Released On	Description
2024-03-01	Supported the migration of MySQL and Oracle to GaussDB 8.100 in Supported Databases .
2023-12-30	Deleted the target database GaussDB 1.4 2.0 Enterprise Edition in Supported Databases .
2023-11-30	Supported the migration of Oracle 10g and 21c in Supported Databases.
	 Added the migration from MySQL 5.6 to distributed GaussDB 2.7 Enterprise Edition in Supported Databases.
	Supported the migration of Microsoft SQL Server in Supported Databases. To migrate it, you need to submit an application.
2023-10-30	Added the migration from GoldenDB to primary/standby GaussDB in Supported Databases . To use it, you need to submit an application.
2023-09-30	Added the migration from Oracle to GaussDB 3.3 Enterprise Edition in Supported Databases . To use it, you need to submit an application.
2023-08-30	Deleted recommended target databases and their specifications.
	 Added the migration from MySQL or Oracle to GaussDB 8.0 Enterprise Edition in Supported Databases. To use it, you need to submit an application.
	Added a constraint that objects containing back quotes and blank characters cannot be collected, parsed, evaluated, converted, or migrated in Constraints.

Released On	Description
2023-03-30	Changed the GaussDB versions based on Huawei Cloud International website.
	 Added the migration from MySQL or Oracle to GaussDB 3.2 Enterprise Edition in Supported Databases. To use it, you need to submit an application.
	 Added the migration from PostgreSQL 10, 13, 14 and 15 to GaussDB 3.2 Enterprise Edition in Supported Databases. To use it, you need to submit an application.
2023-02-28	 Added the migration from Oracle to RDS for PostgreSQL 12, 13, and 14 in Supported Databases.
	 Added the migration from PostgreSQL 11 and 12 to Primary/Standby GaussDB 3.1 Enterprise Edition in Supported Databases.
2023-01-30	 Added the migration from MySQL to Primary/Standby GaussDB 3.1 Enterprise Edition in Supported Databases.
	 Added the migration from Oracle 10g to RDS for PostgreSQL 11 in Supported Databases.
	 Optimized Supported Databases. You do not need to submit an application when you migrate MySQL databases.
2022-12-30	 Added MySQL 5.6 as the source database in Supported Databases. If you want to migrate MySQL 5.6, submit an application.
	• Changed GaussDB 2.3 Enterprise Edition to GaussDB 2.7 Enterprise Edition in Supported Databases .
	 Deleted the TPS, QPS, and table complexity displayed in the source database profile in Functions.
2022-11-30	Added the target database Primary/Standby GaussDB 3.1 Enterprise Edition in Supported Databases .
2022-10-30	 Added the migration from MySQL to Primary/Standby GaussDB 2.3 Enterprise Edition in Supported Databases.
2022-09-30	Added constraints in Supported Databases. Undated Cause DR version number in Supported.
	 Updated GaussDB version number in Supported Databases.
2022-07-30	Added MySQL 8.0 as the source database, and Distributed GaussDB 2.7.T0710, Primary/Standby GaussDB 2.7.T0710, and GaussDB Primary/Standby 2021 as the target databases in Supported Databases .

Released On	Description
2022-06-30	Added DB2 for LUW and MySQL as the source databases in Supported Databases .
2022-05-30	This issue is the first official release.