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  Configure Oracle GoldenGate Classic Compute Node 10-2
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Preface

This guide describes how to use Oracle GoldenGate 19c Microservices on the Oracle Cloud Infrastructure Marketplace.

Audience

This guide is intended for the person or persons who are responsible for operating Oracle GoldenGate and maintaining its performance. This audience typically includes, but is not limited to, systems administrators and database administrators.

Documentation Accessibility

For information about Oracle’s commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Related Information

The Oracle GoldenGate Product Documentation Libraries are found at https://docs.oracle.com/en/middleware/goldengate/index.html

For additional information on Oracle GoldenGate, refer to, https://www.oracle.com/middleware/technologies/goldengate.html

Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><em>italic</em></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
</tbody>
</table>
Prerequisites

Ensure to go through the following prerequisites before using Oracle GoldenGate on Marketplace.

**Supported Browsers**

Oracle Cloud Infrastructure supports the latest desktop versions of Google Chrome, Microsoft Edge, Internet Explorer 11, Safari, Firefox, and Firefox ESR. Note that Mobile browsers as well as private browsing mode is not supported for Firefox, Internet Explorer, or Edge.

**Create an SSH/RSA Key**

To work with the Oracle Cloud Infrastructure once the Oracle GoldenGate Compute Node is built, you have to provide a SSH Public Key during the interview process that will allow you to login to the node once built.

In order to build your SSH keys, perform the following steps:

1. Open a Terminal window and start the key generation program by the following command:

   ```
   $ ssh-keygen Generating public/private rsa key pair.
   ```

2. Enter the path to store this file. By default, this gets saved in your home directory under a hidden folder called .ssh. Change this default location, if required.

   ```
   Enter file in which to save the key (/Users/johndoe/.ssh/id_rsa): <Return>
   ```

3. Enter a passphrase for using your key.

   ```
   Enter passphrase (empty for no passphrase): <passphrase>
   ```

4. Re-enter the passphrase to confirm it.

   ```
   Enter same passphrase again: <passphrase>
   ```

5. Check the results.

   The key fingerprint (a colon separated series of 2 digit hexadecimal values) is displayed. Check if the path to the key is correct. In the above example, the path is /Users/johndoe/.ssh/id_rsa.pub. You have now created a public or private key pair.
Part I

Getting Started with Oracle GoldenGate Microservices on Oracle Cloud Marketplace

This part helps you to get started with Oracle GoldenGate Microservices on Oracle Cloud Marketplace.

This part contains the following chapters:

• Getting Started with Marketplace
• Deploying Oracle GoldenGate Microservices on Oracle Cloud Marketplace
• Getting Started with Oracle GoldenGate Microservices
• Connecting to Data Resources
• Removing Oracle GoldenGate Instance
• Troubleshooting
Getting Started with Marketplace

This chapter provides an introduction to Oracle GoldenGate Microservices on the Oracle Cloud Marketplace.

Topics:
• Overview
• Resources
• Product Comparison
• Core Functionality
• Cross Cloud Functionality

Overview

Oracle GoldenGate Microservices on the Oracle Cloud Marketplace is the cloud-based version of Oracle GoldenGate and provides the same benefits, scalability, security, and robustness that you can rely on for enterprise replication.

Resources

The Oracle GoldenGate Microservices image on Oracle Cloud Marketplace and it contains the latest Oracle GoldenGate Microservices release along with Oracle Database Client software for all supported versions of Oracle Database.

For supported Oracle Database platforms for Oracle GoldenGate Microservices, see the latest certification matrix.

All the software on the Oracle GoldenGate Microservices Compute node is installed under the /u01/app directory structure.

Product Comparison

Oracle GoldenGate Microservices on Marketplace is a product offering that enables you to quickly set up and run on Oracle Cloud and leverages the scalability, reliability and manageability of Oracle GoldenGate. It provides a migration path for Oracle GoldenGate Cloud Service (OGGCS) and Oracle Data Integration Platform Cloud (DIPC) to a fully functional platform of Oracle GoldenGate.

The following table provides a comparison between Oracle GoldenGate on Marketplace, Oracle GoldenGate Cloud Service (GGCS), and Oracle Data Integration Platform Cloud (DIPC):
### Core Functionality

Oracle GoldenGate Microservices on Marketplace offers a lot of core functionality that is similar or expanded to Oracle GoldenGate Classic which is used in Oracle GoldenGate Cloud Service (GGCS) and Oracle Data Integration Platform Cloud (DIPC).

The following table provides a comparison of all the core functionalities:

#### Table 1-1  GoldenGate Core Functionality

<table>
<thead>
<tr>
<th>Functionality</th>
<th>GG on Marketplace</th>
<th>GGCS (Gen 1)</th>
<th>DIPC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioned on OCI Compute</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Downloadable Agent</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Microservices</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Oracle Database Support</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote Capture/Apply</td>
<td>Yes (mandatory)</td>
<td>Yes (mandatory)</td>
<td>Yes (optional)</td>
</tr>
<tr>
<td>Mandatory OCI DBaaS</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Remote Administration</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

1. Oracle Databases On-premises, Autonomous, Exa*, DBaaS are all supported
2. Remote Capture/Apply is mandatory from within the OCI Marketplace; however Remote Capture is not supported for Autonomous Data Warehouse and Autonomous Transaction Processing
Cross Cloud Functionality

Oracle GoldenGate Microservices is designed for large scale, cloud based architectures and Oracle GoldenGate Microservices on Marketplace is a key to many cloud-based solutions. By using Oracle GoldenGate from the Oracle Cloud Marketplace, you can replicate data from on-premises to the Oracle Cloud, between data points within the Oracle Cloud, or even between third party clouds.

The following table provides a matrix on cross cloud support for replication by using Oracle GoldenGate on the Oracle Cloud Marketplace:

Table 1-2  GoldenGate Cross-Cloud Support

<table>
<thead>
<tr>
<th>Technology</th>
<th>Remote Capture</th>
<th>Remote Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle Cloud</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Amazon Web Services (AWS)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Microsoft Azure</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Google Cloud</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Deploying Oracle GoldenGate Microservices on Oracle Cloud Marketplace

This chapter helps you to deploy Oracle GoldenGate Microservices from Oracle Cloud Marketplace.

Topics:
• Overview
• Prerequisites
• Finding Oracle GoldenGate within the Oracle Cloud Marketplace
• Deploying Oracle GoldenGate Microservices
• Accessing Oracle GoldenGate Microservices
• Obtaining the Oracle GoldenGate Administrator Password

Overview

Oracle GoldenGate is the industry’s premier replication tool and this replication platform supports a wide range of Oracle and other heterogeneous platforms. The addition of the Microservices Architecture allows this premier replication tool to scale out to the cloud and provide a secure, flexible and scalable replication platform.

By using Oracle GoldenGate Microservices on Oracle Cloud Marketplace, replication from on-premises to cloud and cloud-to-cloud platforms can easily be established and managed.

Prerequisites

By using Oracle GoldenGate Microservices on Marketplace, you can deploy Oracle GoldenGate in an off-box architecture, which means you can run and manage your Oracle GoldenGate deployment from a single location.

Here are the prerequisites required to deploy Oracle GoldenGate Microservices:
• Oracle Cloud Account
• Have access to assigned Oracle Cloud Tenant
• Compute node resources within Oracle Cloud Tenant
• Local SSH/RSA Key
Finding Oracle GoldenGate within the Oracle Cloud Marketplace

To launch Oracle GoldenGate Microservices from Oracle Cloud Marketplace follow these steps:

1. Log in to Oracle Cloud Marketplace.
2. From the Oracle Cloud Marketplace home page, use the search box under Applications and search for the keyword GoldenGate.
3. From the search results, select Oracle GoldenGate.

Deploying Oracle GoldenGate Microservices

After finding Oracle GoldenGate Microservices listing in Oracle Cloud Marketplace, you can deploy Oracle GoldenGate using the provided Stack Listing. This TerraForm Stack prompts you for specific information and then builds the Oracle Cloud Infrastructure Compute Node with the desired hardware settings, Oracle Database Client, Oracle GoldenGate Microservices and up to two default deployments.

Following steps help you to deploy Oracle GoldenGate Microservices on Oracle Cloud Marketplace using the Stack Listing. Once you have found Oracle GoldenGate from the search results on Oracle Cloud Marketplace:

1. From the application page, select Get App.
2. Select OCI Region or Login using your Single Sign-On credentials.
   - OCI Region – Select the desired region and click Create Stack.
3. Provide the OCI tenant details.
4. Sign-in to the Identity provider.
5. On the Oracle GoldenGate 19c for Oracle page, provide the following information:
   - Select Version - It provides a list of versions that are available in the listing. It is set to Oracle GoldenGate 19c Microservices Edition by default.
   - Select Compartment - Specifies the compartment where the compute node will be built. It is generally the location that you have access to build the compute node.
   - Terms of Use - This checkbox is selected by default. Oracle recommends to review the licenses before proceeding.
   - Launch Stack - It launches the stack in the OCI environment.
6. Fill in the required Stack information:
   - Name - Name of the Stack. It has a default name and provides a datetime stamp. You can edit this detail, if required.
   - Description - Description that you provide while creating the Stack.
   - Create In Compartment – It defaults to the compartment you have selected on the Oracle GoldenGate 19c for Oracle page.
• Tags (optional) – Tags are a convenient way to assign a tracking mechanism but are not mandatory. You can assign a tag of your choice for easy tracking. You have to assign a tag for some environments for cost analysis purposes.

• Click Next.

7. Fill in the required details to configure variables. This information is required to build the compute node with Oracle GoldenGate Microservices.

• Name for New Resources -
  a. Display name – Display name used to identify all new OCI resources.
  b. Host DNS Name – Name of the Domain Name Service for the new compute node.

• Network Settings -
  a. Create New Network – Select this check box if you wish to create a new network resource.
     – If you select this check box, the Create New Network wizard appears allowing you to add and edit the new network information.
     – If you do not select this check box, the Create New Network wizard does not appear and the compute node is created with the existing network options in the VCN.
  b. Network Compartment (optional) – Compartment for new or existing network resources.

• Use Existing Network -
  a. VCN (optional) – Existing VCN to use for the newly created instance if you are not creating a new network.
  b. Subnet (optional) – Existing subnet to use for the newly created instance if you are not creating a new network. The subnet that you have selected must match the same Availability Domain set in the Instance Settings.

• Instance Settings -
  a. Availability Domain – It specifies the availability domain for the newly created Oracle GoldenGate Instance. It must match the Subnet that you have selected in the Use Existing Network settings.
  b. Compute Shape – Shape of new compute instance. Supported shapes are VM.Standard2.4, VM.Standard2.8, VM.Standard2.16 and VM.Standard2.24.
  c. Assign Public IP – This option indicates if the newly created VM should have a public IP address. This option is selected by default. If you clear this checkbox, no public ip address will be assigned preventing public access to the compute node.

**Note:**

If you are using a private IP address to access the compute node, you have to setup an IPSec VPN or FastConnect connection. Refer to [OCI documentation](#) for more details.
d. Custom Volume Sizes - Select this checkbox to customize the size of the new block storage volumes that are built for the compute node. Block Storage (Custom Volume Sizes)
   i. Boot Volume Size – Default value is 50GB
   ii. Swap Volume Size – Default value is 256GB
   iii. Trails Volume Size – Default value is 512GB
   iv. Deployments Volume Size – Default value is 128GB

• Create OGG Deployments -
  a. Deployment 1 – Name (mandatory) – Name of the first Oracle GoldenGate Microservices deployment.
  b. Deployment 1 – Database (mandatory) – Oracle Database version for deployment 1. Supported Oracle Database versions are:
     – Oracle 11g – Used for Oracle Database 11.2.0.4
     – Oracle 12c – Used for Oracle Database 12.1.x and 12.2.x
     – Oracle 18c – Used for Oracle Database 18.x
     – Oracle 19c – Used for Oracle Database 19.x
  c. Deployment 2 – Name (optional) – Name of the second Oracle GoldenGate deployment
  d. Deployment 2 – Database (optional) – Oracle Database version for deployment 2. Supported Oracle Database versions are:
     – Oracle 11g – Used for Oracle Database 11.2.0.4
     – Oracle 12c – Used for Oracle Database 12.1.x and 12.2.x
     – Oracle 18c – Used for Oracle Database 18.x
     – Oracle 19c – Used for Oracle Database 19.x

• Shell Access -
  a. SSH Public Key - Public Key for allowing SSH access as the 'opc' user.
  b. Click Next.

8. On the Review page, review the information you provided and then click Create.
9. After clicking Create, you are navigated to the Stacks Job Details page. Through this you can monitor the creation of the compute node.
10. Upon completion you can now view the Oracle GoldenGate Microservices compute node under Instances tab.

Accessing Oracle GoldenGate Microservices

To access your new Oracle GoldenGate deployment, log in to the Oracle GoldenGate Service Manager. For this, you need to identify the public IP address of the compute node where Oracle GoldenGate Microservices is running. The following steps help you to identify the public IP address:

1. Log in to your Oracle Cloud Console.
2. Select Compute, Instances.
3. Select the hyperlink name of the compute node. The public IP Address is listed under Primary VNIC Information.

Obtaining the Oracle GoldenGate Administrator Password

After obtaining the public IP address, you have to obtain the password for the Oracle GoldenGate Administrator Account (oggadmin). You can do this by using SSH to access the compute node and obtain the password to the administrator account.

To access the compute node where Oracle GoldenGate Microservices is running, you can access the node through the opc account using SSH. For more information on how to access a node using the opc account refer to Connecting to an Instance.

A public SSH key is specified as a part of the deployment process and you can use the private key when you are connecting to the Oracle GoldenGate instance. The following example illustrates how you connect to the Oracle GoldenGate compute node:

```
ssh -i <private-key-filename> opc@<public-id-address>
```

After connecting to the Oracle GoldenGate compute node, find the `/home/opc/ogg-credentials.json` file. This json file contains the user name and password for the Oracle GoldenGate Microservice environment.

The user name and password available in the `~/ogg-credentials.json` file, can be used either with the Admin Client (using SSH) or with the Service Manager Web UI. These credentials provide elevated access to Service Manager and other deployments. Oracle recommends you to change the password for the security user after your first login.
Getting Started with Oracle GoldenGate Microservices

After deploying Oracle GoldenGate Microservices on the Oracle Cloud Marketplace, you can access the latest release of Oracle GoldenGate.

Before you can start using Oracle GoldenGate Microservices, there are a few tasks that you must perform to ensure that your environment is complete and ready to replicate your data. Before you begin data replication, you must perform the following tasks:

Topics:

- Configuring Source or Target Database for Replication
- Changing Default Administrator Password
- Creating User Accounts
- Establishing Connectivity
- Updating Network Related Files
- Creating Database Credentials
- Adding SchemaTranData
- Enabling Checkpoint Table
- Implementing Heartbeat Monitoring
- Configuring Capture Support
- Configuring Apply Support

Configuring Source or Target Database for Replication

Before you can begin replicating, you should prepare the source or target database to support Oracle GoldenGate. To prepare your database, follow the steps listed in Preparing the Database for Oracle GoldenGate section of Using Oracle GoldenGate for Oracle Database guide. The steps listed in the Using Oracle GoldenGate for Oracle Database guide helps you how to enable logging, enable kernel parameters, flashback query and server resources.

Changing Default Administrator Password

Changing passwords for critical accounts, such as oggadmin, is the first priority in securing your Oracle GoldenGate Microservices deployment. To change the password for oggadmin, you must first change it in both Service Manager and Administration Server. The following sections guide you to do this with Service Manager and Administration Server.

- Using Service Manager
Using Service Manager

After logging into the Oracle GoldenGate Microservices Service Manager as the Administrator for the deployments, you have to change the password for the Security Role user. In order to do this, perform the following steps:

1. Navigate to the Service Manager login page. You can reach the Service Manager page by using the public IP address that you obtained when you performed a look up of the compute node information for the environment.

   https://<public_ip_address>

2. Login using the oggadmin user and the password credentials located in the /home/opc/ogg-credentials.json file.

3. Once you have logged into the Service Manager, use the menu icon present on the top left corner to open the menu.

4. Select Administrator option from the menu.

5. From the Users screen, select the pencil icon under Action option.

6. Update the password and info sections for the oggadmin user and click Submit.

7. Upon successful reset, the current user will be logged out. Log in again to the Service Manager by using the new password.

   **Note:**
   
   Passwords must be 8 to 30 characters long and must contain at least 1 uppercase, 1 lowercase, 1 numeric, and 1 special character. Special characters such as ‘$’, ‘^’, or ‘?’ are not allowed.

Using Administration Server

After changing the Oracle GoldenGate Microservices Service Manager security role user password, you need to change the password of the security role user in the underlying deployments. In order to do this, perform the following steps:

1. From the Service Manager page, select the port number for the Administration Server in the deployment. This navigates you to the login page for that deployment.

2. Log in using the oggadmin user and the password available in the following location:

   /home/opc/ogg_credentials.json

3. Post log in, use the menu icon present in the top left corner to open the menu section.

4. From the menu, select the Administrator option.

5. From the Users screen, select the pencil icon under Action option.
6. Update the password and info sections for the oggadmin user and click Submit.

7. After successfully resetting the password, the current user will be logged out. Log in again to the Administration Server using the new password.

Note:

Passwords must be 8 to 30 characters long and contain at least 1 uppercase, 1 lowercase, 1 numeric, and 1 special character. Special characters such as '$', '^', or '?' are not allowed.

Creating User Accounts

In order to secure your Oracle GoldenGate Microservices deployment, you have to add user accounts for Oracle GoldenGate Users. Oracle GoldenGate Users should be assigned privileges based on functional roles that they are expected to perform. These roles are:

- Security
- Administrator
- Operator
- User

Oracle GoldenGate users only have access permissions according to their defined access levels. For more information on how Oracle GoldenGate Security Framework is used, refer to Securing Oracle GoldenGate guide.

Topics:

- Using Service Manager
- Using Administration Server

Using Service Manager

After logging into the Oracle GoldenGate Microservices Service Manager as the administrator for the deployments, you have to create a new user with the role of Administrator, Operator, or User to administer the architecture. Users with the security role can administer the entire architecture.

1. Navigate to the Service Manager login page. You can reach the Service Manager page by using the public IP address that you obtained when you looked up the compute node information for the environment.

   https://<public_ip_address>

2. Log in using the oggadmin user and the password credentials located in the /home/opc/ogg_credentials.json file.

3. Click the menu icon present on the top left corner to open the menu section.

4. Select the Administrator option from the menu.
5. On the Users screen, select the plus (+) icon to add a new user.
6. Fill in all the required fields.
7. Click Submit to create the new user.

Using Administration Server

After logging into the Oracle GoldenGate Microservices Administration Server as the Administrator, for the specified deployment, you have to create a new user with the role of Administrator, Operator, or User to administer the deployment. To do this, perform the following steps:

1. Log in to the Administration Service using the Security Role User (oggadmin) credentials.
2. After logging in to the Administration Service, click the menu icon present in the top left corner to open the menu.
3. From the menu, select the Administrator option.
4. From the Users screen, select the plus (+) icon, to create a new user.
5. Fill in the details for all the required fields and click Submit.

Note:

Passwords must be 8 to 30 characters long and contain at least 1 uppercase, 1 lowercase, 1 numeric, and 1 special character. Special characters such as '$', '⁺', or '?' are not allowed.

Establishing Connectivity

The Oracle GoldenGate Microservice on Marketplace compute node acts as a hub where you can manage your connections to source and target database. To do this, establish a network connection between the compute node and your source and target database. The compute node is pre-configured with the Oracle Database Client software and is ready to use.

In most cases, you have to provide sqlnet.ora and a tnsnames.ora file in the TNS_ADMIN directory, to be able to establish connection between source or target database and the compute node. On a deployment basis, the TNS_ADMIN directory has been established as /u02/deployments/<deployment>/etc.

To ensure network connectivity from the deployment, you have to set up certain additional things in the deployment home. Oracle recommends the location to be /u02/deployments/<deployment>/etc. To create this, as per Oracle Client release, perform the following steps.

1. Connect to the Oracle GoldenGate Marketplace Compute Node as the opc user.

   $ ssh -i <private key> opc@<public_ip_address>
2. **Navigate to** `/u02/deployments/<deployment>/etc`

   ```bash
   $ cd /u02/deployments/<deployment>/etc
   ```

3. **Copy the existing files** `sqlnet.ora` and `tnsnames.ora` **to the TNS_ADMIN directory.** Add or update these two files on the compute node.

   **Note:**
   - If you are using Oracle Autonomous products, the `tnsnames.ora` file is included in your `Client_Credentials.zip` file. You have to edit this `tnsnames.ora` file.
   - If you want your networking directory structure to be consistent with other Oracle products, you must append `/network/admin` to the directory structure. For this you have to change the environment variable `TNS_ADMIN`. For more information on Local Naming Parameters, refer to Database Net Services Reference.

---

**Chapter 3
Updating Network Related Files**

The Oracle GoldenGate on Marketplace Compute Node comes pre-configured with Oracle Client installed. In order to establish network configuration between the compute node and the source or target systems within your architecture, you have to add or update the network related files in the Oracle Client.

You can find these files in the `TNS_ADMIN` location and the recommended location is `/u02/deployments/<deployment>/etc`. You have to add or update the network files such as `sqlnet.ora` and `tnsnames.ora` on the compute node.

To update the files,

1. **Connect to the Oracle GoldenGate Marketplace Compute Node, using opc user credentials.**

   ```bash
   $ ssh -i <private key> opc@<public_ip_address>
   ```

2. **Change directories to the location** `/u02/deployments/<deployment>/etc`

   ```bash
   $ cd /u02/deployments/<deployment>/etc
   ```

3. **Edit `sqlnet.ora` and `tnsnames.ora` files.**

   **Note:**
   If you want the networking directory structure to be consistent with other Oracle products, you must append `/network/admin` to the directory structure. For this you have to change the environment variable `TNS_ADMIN`. For more information on Local Naming Parameters, refer to Database Net Services Reference.
The following is an example of sqlnet.ora file:

NAMES.DIRECTORY_PATH = (TNSNAMES, ONAMES, HOSTNAME)
NAMES.DEFAULT_DOMAIN = ora.com

The following is an example of a connection within the tnsnames.ora file:

TEST =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = test2)(PORT = 1521))
    )
  (CONNECT_DATA =
    (SERVER = DEDICATED)
    (SERVICE_NAME = test)
  )
)

Creating Database Credentials

Use the credential store to store and use database credentials for the source and target databases for Oracle GoldenGate Microservices. Use the tnsnames.ora file to connect to the required database.

To create database credentials, perform the following tasks:

1. Log in to the Administration Server and configure the database credentials.
2. Open the context menu in the top left corner of the Overview page.
3. From the context menu, select Configuration.
4. From the Database tab, click the plus (+) icon to add a new credential.
5. Provide the following information and click Submit:
   - Credential Domain: [Defaults to OracleGoldenGate]
   - Credential Alias: [Name of the Alias]
   - User ID: ggadmin@<tnsnames_reference>
   - Password: [Password for ggadmin]
   - Verify Password: [Password for ggadmin]
6. Test the connection to the database by clicking on the database icon, after adding the credential.

Adding SchemaTrandata

After adding the credential for connecting to the source database, you must enable supplemental logging on the source schema. The following steps are used to add SchemaTrandata to the source schema:

1. Login to the ServiceManager console.
2. From the SeviceManager main page, select the hyperlink for the port number associated with the Administration Service.

3. Open the context menu present on the top left corner of the Overview page.

4. From the context menu select Configuration.

5. From the Database tab, select the database icon to log the source user to the database.

6. Under Transaction Information select the plus (+) icon.

7. Ensure that you select the Schema option, provided the selected Schema Name should have schema trandata added.

8. Click Submit.

> **Note:**

If your source database is multitenant and you are connecting to the root using a c## user, from Oracle Database 12.1 and later, you have to specify the PDB database with the schema. i.e. `<pdb>.<schema>`.

### Checking Tables with Added SchemaTrandata

After adding transactional data to a schema, you must validate the tables. You can do this by following the below steps:

1. Log in to the Service Manager console.

2. From the Service Manager main page, select the hyperlink for the port number associated with the Administration Service.

3. Open the context menu present on the top left corner of the Overview page.

4. From the context menu select Configuration.

5. From the Database tab, select the database icon to log the source user to the database.

6. From the Transaction Information select the search icon.

7. Ensure that you select the Schema option and provide the Schema Name that you need to verify.

8. Click the search icon.

### Enabling Checkpoint Table

Checkpoint tables contain the data necessary for tracking the progress of the Replicat as it applies transactions to the target system. Regardless of the Replicat that is being used, it is a best practice to enable the checkpoint table for the target system.

In order to do this, follow the below steps:

1. Login to the Service Manager.

2. From the Service Manager main page, select the hyperlink for the port number associated with the Administration Service.
Implementing Heartbeat Monitoring

The Automatic Heartbeat table is a key way to monitor latency within the Oracle GoldenGate framework. Heartbeat tables provide you a way to gauge the end-to-end throughput within the configuration and identify any potential bottlenecks in the network.

To implement the Automatic Heartbeat table, you should perform the following steps on both source and target database:

1. Log in to the ServiceManager.
2. From the ServiceManager main page, select the hyperlink for the port number associated with the Administration Service.
3. Open the context menu available on the top left corner of the Overview page.
4. From the context menu, select Configuration.
5. From the first tab - Database, select the database icon, to log in to the database.
6. From Heartbeat section, select the plus ( + ) icon.
7. Adjust the Frequency, Retention, and Purge Frequency for the heartbeat table.
8. Click Submit.

For more information on the Automatic Heartbeat functionality, refer to Monitoring Oracle GoldenGate Processing documentation.

Configuring Capture Support

Before you can begin replication, you have to setup the capture process. The capture process is also known as Extract. Oracle GoldenGate Microservices supports three type of Extracts. They are:

- Classic Extract
- Integrated Extract
- Initial Load Extract
To decide on which type of capture to use, refer to Deciding Which Capture Method to Use section of Using Oracle GoldenGate for Oracle Database Guide.

To build any of these Extracts, perform the following steps in Oracle GoldenGate Microservices:

1. Login to the Service Manager console.
2. From the Service Manager main page, select the hyperlink for the port number associated with the Administration Service.
3. From the Overview page, under Extracts, select the plus (+) icon. Add Extract wizard appears.
4. In the Add Extract wizard, select the Extract Type and then click Next.
5. Provide the details for the Extract in the Extract Options and then Click Next.
6. In the Parameter File option, provide the details needed for Extract to run.
7. Click Create and Run.

Note:
The Classic Extract is still available for use but has been deprecated as of Oracle GoldenGate 18c release. Additionally, there is no capture support for Autonomous Database or Autonomous Transaction Processing platforms.

Configuring Apply Support

The apply process for replication is simple to configure; however, the apply process is also known as Replicat. There are five types of Replicates supported by the Oracle GoldenGate Microservices and these Replicates are:

- Integrated Replicat
- Non-Integrated Replicat
- Coordinated Replicat
- Parallel Integrated Replicat
- Parallel Non-Integrated Replicat

To decide on which Replicat to use, refer to Deciding Which Apply Method to Use section of Using Oracle GoldenGate for Oracle Database Guide.

To build any of these Replicats you can perform the following steps with Oracle GoldenGate Microservices:

1. Log in to the Administration Server.
2. From the Overview page, under Replicats, select the plus (+) icon and Add Replicat wizard is displayed.
3. In the Add Replicat wizard, select the Replicat Type and then click Next.
4. On the Replicat Options, provide the details for the Replicat and then click Next.
5. In the Parameter File, provide the details needed for the Replicat to run.
6. Click Create and Run.

**Note:**

You can use only the Non-Integrated Replicat or Non-Integrated Parallel Replicat for replication to Autonomous Data Warehouse and Autonomous Transaction Processing.
Connecting to Data Resources

Learn about different methods of connecting Oracle GoldenGate data sources and targets. It includes the following connection types:

- Connecting to Oracle Database (on-premises)
- Connecting to Oracle Database as a Service (DBaaS)
- Connecting to Oracle Autonomous Data Warehouse/Autonomous Transaction Processing

Connecting to Oracle Database (on-premises)

You can use Oracle GoldenGate Microservices on Marketplace to remotely capture from and apply data to on-premises Oracle database resources. This allows you to enable replication and centrally manage the replication processes.

Use Cases for Replication
You can use Oracle GoldenGate Microservices to replicate data between data resources in the following use cases:

- Migrations
- Data Distribution
- Real-Time Data Warehousing
- Operational Reporting

Replicating Data from On-premises
Prerequisites

Ensure that the following are set up before you begin replication:

- Oracle GoldenGate Microservices
- Source Database
- Target Database

To move data from on-premises to the cloud or from on-premises to on-premises, perform the following tasks:

- Configure Oracle Database for Replication
- Configure Oracle GoldenGate Microservices Compute Node

Configure Oracle Database for Replication

To prepare your Database as a Service (DBaaS) instance for replication, perform the following tasks:

1. Configure Logging Properties
   - Enable Supplemental Logging
2. Enable Oracle GoldenGate within the Oracle Database
   - Update parameter for `enable_goldengate_replication`

For more details, refer to Preparing the Database for Oracle GoldenGate documentation.

Configure Oracle GoldenGate Microservices Compute Node

To connect the Microservices Compute Node to the on-premises databases, edit the `tnsnames.ora` file and point the entry to your database resources.

By default, the environment variable `TNS_ADMIN` is pre-configured for each deployment. But the files `tnsnames.ora` or `sqlnet.ora` are not readily available on the compute node. You need to create the files or copy them from an existing file. You can locate the files `tnsnames.ora` or `sqlnet.ora` in the pre-configured location as illustrated in the below table:

<table>
<thead>
<tr>
<th>Oracle Database Version</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle 11g</td>
<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
<tr>
<td>Oracle 12c</td>
<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
<tr>
<td>Oracle 18c</td>
<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
<tr>
<td>Oracle 19c</td>
<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
</tbody>
</table>

**Note:**
- If you are using Oracle Autonomous products, the `tnsnames.ora` file is included in your `Client_Credentials.zip` file. You have to edit this `tnsnames.ora` file.
- If you want your networking directory structure to be consistent with other Oracle products, you must append `/network/admin` to the directory structure. For this you have to change the environment variable `TNS_ADMIN`. For more information on Local Naming Parameters, refer to Database Net Services Reference.

Connecting to Oracle Database as a Service (DBaaS)

You can use Oracle GoldenGate Microservices on Marketplace to remotely capture and apply data to Oracle Cloud Infrastructure (OCI) Database as a Service (DBaaS) resources. This allows you to enable replication in a scalable fashion, centralize the point of management, and enable replication between cloud services.

**Replicating Data to OCI Database as a Service Prerequisites**

Ensure you have the following prerequisites before replicating data from on-premises:
- Oracle GoldenGate Microservices on Marketplace
- Source Database
• Oracle Cloud Infrastructure (OCI) Database as a Service (DBaaS) Instance

To move data from on-premises to the cloud or from on-premises-to-on-premises, perform the following tasks:

• Configure Oracle Database for Replication
• Configure Oracle GoldenGate Microservices Compute Node

Configure Oracle Database for Replication

To prepare your Database as a Service (DBaaS) instance for replication, perform the following tasks:

1. Configure Logging Properties
   • Enable Supplemental Logging
2. Enable Oracle GoldenGate within the Oracle Database
   • Update parameter for enable_goldengate_replication

For more details, refer to Preparing the Database for Oracle GoldenGate documentation.

Configure Oracle GoldenGate Microservices Compute Node

To establish connection from the Oracle GoldenGate Microservices Compute Node to your on-premises database, you must edit the tnsnames.ora file and point the entry to your database resources.

By default, the environment variable TNS_ADMIN is pre-configured for each deployment. But the files tnsnames.ora or sqlnet.ora are not readily available on the compute node. You need to create the files or copy them from an existing file. You can locate the files tnsnames.ora or sqlnet.ora in the pre-configured location as illustrated in the below table:

<table>
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<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
<tr>
<td>Oracle 19c</td>
<td>/u02/deployments/&lt;deployment&gt;/etc</td>
</tr>
</tbody>
</table>
Note:

- If you are using Oracle Autonomous products, the tnsnames.ora file is included in your Client_Credentials.zip file. You can use this tnsnames.ora file or copy its contents to your tnsnames.ora file located in $ORACLE_HOME/network/admin.
- If you want your networking directory structure to be consistent with other Oracle products, you must append /network/admin to the directory structure. For this you have to change the environment variable TNS_ADMIN. For more information on Local Naming Parameters, refer to Database Net Services Reference.

Connecting to Oracle Autonomous Data Warehouse/Autonomous Transaction Processing

You can replicate data to Oracle Autonomous Data Warehouse Cloud Service (ADWCS) or Autonomous Transaction Processing (ATP) by using Oracle GoldenGate Microservices on Oracle Cloud Marketplace. The steps described in this section, streamlines the approach for making a remote connection to Oracle Autonomous Database Warehouse Cloud Service (ADWCS).

For more information, refer to Replicating Data to the Autonomous Database section of Using Oracle GoldenGate for Oracle Database guide.

Use Cases for Replicating to Autonomous Database

Use Oracle GoldenGate Microservices to replicate data to the Autonomous Data Warehouse for:

- Real-time Data Warehousing
- Operational Reporting

Replicating Data to Autonomous Data Warehouse

Prerequisites:

You have to have the following prerequisites:

- Oracle Autonomous Data Warehouse Cloud Service
- Your source database

To deliver data to the Autonomous Database using Oracle GoldenGate Microservices, perform the following tasks:

- Configure the Autonomous Data Warehouse for Replication
- Autonomous Database Client Credentials
- Configure Oracle Goldengate Microservices for Replication
Configure the Autonomous Data Warehouse for Replication

Unlock the Pre-created Oracle GoldenGate User (ggadmin)

Perform the following steps to configure the Autonomous Data Warehouse for Replication:

1. Unlock and change the password for the pre-created Oracle GoldenGate user (ggadmin) within the Autonomous Data Warehouse. Use any SQL client tool to unlock the account. For more details, refer to About Connecting to an Autonomous Data Warehouse Instance section of Using Oracle Autonomous Data Warehouse guide.

   SQL> select * from dba_users order by username;
   SQL> alter user ggadmin identified by <password> account unlock;

2. Check whether the parameter enable_goldengate_replication is set to true. If not, then modify the parameter.

   SQL> select * from v$parameter where name = 'enable_goldengate_replication';
   SQL> alter system set enable_goldengate_replication = 'true' scope=both;

Create Target Schema

Complete the following steps to create schema and target objects that can be used in replication. This schema and associated objects does not support DDL replication.

1. Create a new application user/schema. This user/schema stores the target objects for replication.

   Note:
   appadmin is an example user.

   SQL> create user appadmin identified by ********
   SQL> grant create session, resource, create view, create table to appadmin;
   SQL> alter user appadmin quota unlimited on data;

2. Connect to the Oracle Autonomous Data Warehouse Cloud database as user/schema and create your application tables.

Autonomous Database Client Credentials

Obtain the Autonomous Database Client Credentials

To establish connection to your Autonomous Database, you must download the client credential files from the Autonomous Database Service Console. For more information see Downloading Client Credentials section of Using Oracle Autonomous Data Warehouse guide.
Perform the following steps to obtain the Oracle Autonomous Data Warehouse Cloud account details:

1. Log into your Oracle Autonomous Data Warehouse Cloud account.
2. From the Instance page, click the menu option for the Autonomous Database instance and select Service Console.
3. Log into the Service Console using the admin username and its associated password.
4. In the Service Console, click the Administration tab.
5. Click Download Client Credentials.
6. Enter a password to secure your credentials zip file and click Download.
7. Save the credentials zip file to your local system.

**Move Client Credentials to Oracle GoldenGate Compute Node**

In order to establish a connection from Oracle GoldenGate to the Autonomous Data Warehouse, you need to move the client credentials to Oracle GoldenGate Compute Node. The following steps will illustrate how to move the credential zip file from your machine to Oracle GoldenGate Compute Node.

1. Connect to the Oracle GoldenGate Classic Compute Node using SSH and OPC user credentials.
   
   ```
   ssh -i <private_key> opc@<public_ip_address>
   ```

2. Create a staging directory and grant the essential permissions and then exit the session.
   
   ```
   $ mkdir stage
   $ exit
   ```

3. Copy the credentials zip file to the Oracle GoldenGate Classic Compute Node.
   
   ```
   $ scp ./<credential_file>.zip opc@<public_ip_address>:~/stage
   ```

4. Connect to the Oracle GoldenGate Classic Compute Node.
   
   ```
   ssh -i <private_key> opc@<public_ip_address>
   ```

5. Verify whether the credentials zip file is available in the stage location.
   
   ```
   $ cd ~/stage
   $ ls -ltr
   ```
Configure Oracle Goldengate Compute Node with Autonomous Client Credentials

After moving the ADWC Client Credentials to the Oracle GoldenGate Compute Node, you have to install the necessary files and ensure you have a connection to the Autonomous Data Warehouse. The following steps will help you configure the required SQL*Net components:

1. Login to the Oracle GoldenGate Classic Compute Node using SSH and the OPC user credentials.

   ssh -i <private_key> opc@<public_ip_address>

2. Unzip the client credentials file into a temporary directory.

   unzip ./<credential_file>.zip -d ./client_credentials

3. Copy the sqlnet.ora and tnsnames.ora files to the location of your TNS_ADMIN.

   $ cd ~/stage/client_credentials
   $ cp ./sqlnet.ora /u02/deployments/oracle<##>/network/admin
   $ cp ./tnsnames.ora /u02/deployments/oracle<##>/network/admin

   **Note:** If you want your networking directory structure to be consistent with other Oracle products, you must append /network/admin to the directory structure. For this you have to change the environment variable TNS_ADMIN. For more information on Local Naming Parameters, refer to Database Net Services Reference.

4. Edit the sqlnet.ora file and replace the directory parameter with the location of the information pointing to, where the client credentials were unzipped.

   $ cd /u02/deployments/<deployment>/etc
   $ vi ./sqlnet.ora

   Change /network/admin to /home/opc/stage/client_credentials.

5. For testing purposes, set the TNS_ADMIN and ORACLE_HOME environment variables at the operating system level.

   **Note:** The Oracle GoldenGate Deployment(s) use the ORACLE_HOME and TNS_ADMIN environment variables that are set per deployment.

   $ export ORACLE_HOME=/u01/app/client/<oracle version>
   $ export TNS_ADMIN=/u02/deployments/oracle<##>/network/admin
6. Test the connection to Autonomous Data Warehouse by connecting to one of the entries in the tnsnames.ora file.

   $ cd $ORACLE_HOME/bin
   $ ./sqlplus appadmin/**********@orcladw_low

Configure Oracle Goldengate Microservices for Replication

Perform the following steps for establishing a successful connection to the Autonomous Data Warehouse with Oracle GoldenGate Microservices.

Add Oracle GoldenGate Credential to connect to Autonomous Data Warehouse

To add Oracle GoldenGate Credential details, to connect to Autonomous Data Warehouse:

1. Login to the Service Manager using the password for oggadmin.
2. From the Service Manager main page, select the hyperlink for the port number associated with the Administration Service.
3. Open the context menu in the top left corner of the Overview page.
4. From the context menu select Configuration.
5. From the Database tab, click the plus (+) icon, to add a new credential.
6. Provide the following information and click Submit.

   Credential Domain: [Defaults to OracleGoldenGate]
   Credential Alias: [Name of the Alias]
   User ID: ggadmin@<adw_tnsnames_reference>
   Password: [Password for ggadmin]
   Verify Password: [Password for ggadmin]

7. Test the connection to the Autonomous Data Warehouse by clicking the "Log in Database" icon after the credential has been added.
Removing Oracle GoldenGate Instance

To remove the Oracle GoldenGate Instance from your Oracle Cloud environment, follow these steps:

1. Log in to your Oracle Cloud Account.
2. Select Resource Manager, Stacks from the menu.
   You can get a list of stacks that are built in your compartment.
3. Click the link of the stack that you want to remove.
4. In the Stack, from the TerraForm Action drop-down list select Destroy.
   This permanently removes your Oracle GoldenGate Instance.
5. Delete the stack (optional).
6 Troubleshooting

This chapter helps you in troubleshooting the problems that occur when you deploy Oracle GoldenGate Microservices on Oracle Cloud Marketplace.

Topics:

- Logdump
- Enable Debug Logging for Oracle GoldenGate Microservices

Logdump

The logdump utility is used to open, control the display, navigate through a file, search, filter, view and save data that is stored in the trail or extract file. This is a key utility in troubleshooting issues related to data within an Oracle GoldenGate environment.

For more information on how to use Logdump to its potential, please refer to the Logdump Reference for Oracle GoldenGate documentation.

Enable Debug Logging for Oracle GoldenGate Microservices

You can enable debug logging in the Oracle GoldenGate Microservices framework, which enables you to diagnose all the processes happening in a particular service. It can be enabled for any of the HTML5 development services. The following steps help you to enable debugging for the services.

1. Log in to Distribution Service or any service HTML5 pages.
2. Open the context menu to display options for that page.
4. Click the Enable Debug Log toggle switch, to enable it.
Part II

Getting Started with Oracle GoldenGate Classic on Oracle Cloud Marketplace

The Oracle GoldenGate Classic Architecture provides the processes and files required to effectively move data across a variety of topologies. These processes and files form the main components of the Classic Architecture. You can find Oracle GoldenGate Classic Architecture under the same marketplace listing as the Microservices Architecture on Oracle Cloud Marketplace. You can use Oracle GoldenGate Classic as an optional architecture to Microservices architecture. Oracle GoldenGate Classic Architecture helps you to enable the heterogeneous nature of the Oracle GoldenGate product and align all the heterogeneous and Big Data platforms.

This part provides the high level steps used for building an Oracle Cloud Infrastructure Compute Node that supports Oracle GoldenGate Classic Architecture platforms. It contains the following chapters:

• Deploying Oracle GoldenGate Classic Architecture for Oracle Database
• Accessing Oracle GoldenGate Classic Compute Node
• Getting Started with Oracle GoldenGate Classic Architecture for Oracle Database
• Connecting to Data Resources for Oracle GoldenGate Classic
Deploying Oracle GoldenGate Classic Architecture for Oracle Database

By using Oracle GoldenGate Classic Architecture on Marketplace, you can deploy Oracle GoldenGate in an off-box architecture, which means you can run and manage your Oracle GoldenGate deployment from a single location.

Here are the prerequisites required to deploy Oracle GoldenGate Classic:

• Oracle Cloud Account
• Have access to compute node resources within Oracle Cloud

Finding Oracle GoldenGate within the Oracle Cloud Marketplace

To launch Oracle GoldenGate Classic from Oracle Cloud Marketplace follow these steps:

1. Log in to Oracle Cloud Marketplace.
2. From the Oracle Cloud Marketplace home page, use the search box under Applications and search for the keyword GoldenGate.
3. From the search results, select Oracle GoldenGate.

Launching Oracle GoldenGate Classic

The following steps help you to launch Oracle GoldenGate Classic on Oracle Cloud Marketplace using the TerraForm stack:

1. From the application page, select Get App.
2. Select OCI Region or Login using your OCI account login credentials.
   • OCI Region – Select the OCI Region for which want to install the compute node and click Create Stack.
3. In the Sign In to the Cloud Tenant page, provide the OCI tenant details.
4. Sign-in to the Identity provider.
5. On the Oracle GoldenGate 19c for Oracle page, provide the following information:
   • Select Version - It provides a list of versions that are available in the listing.
   • Select Compartment - Specifies the compartment where the compute node will be built. It is generally the location that you have access to build the compute node.
   • Terms of Use - This checkbox is selected by default. Oracle recommends to review the licenses before preceeding.
• Launch Stack - It launches the stack in the OCI environment.

6. Fill in the Stack Information, which includes name of the stack, description and tags. The details of compartment to create in is pre-populated and it is not editable. Click Next.

7. Fill in the required configuration variables that are used to build the compute node for Oracle GoldenGate Classic.
   • Name for New Resources
     a. Display Name – Display name used to identify all new OCI resources.
     b. Host DNS Name – Name of the Domain Name Service for the new compute node.
   • Network Settings
     a. Create New Network – Select this check box if you wish to create a new network resource.
     – If you select this check box, the Create New Network wizard appears allowing you to add and edit the new network information.
     – If you do not select this check box, the Create New Network wizard does not appear and the compute node is created with the existing network options in the VCN.
     b. Network Compartment (optional) – Compartment for new or existing network resources.
     c. VCN (optional) – Existing VCN to use for the newly created instance if you are not creating a new network.
     d. Subnet (optional) – Existing subnet to use for the newly created instance if you are not creating a new network.
   • Instance Settings
     a. Compute Shape – Shape of new compute instance. Supported shapes are VM.Standard2.4, VM.Standard2.8, VM.Standard2.16 and VM.Standard2.24.
     b. Assign Public IP – Select this check box to indicate if the new VM should have a public IP address.
     c. Availability Domain – The availability domain for the new Oracle GoldenGate instance.
     d. Custom Volume Sizes – Select this check box to customize the size of new block storage volumes.
   • SSH Public Key - Public Key used for allowing SSH access as the opc user

8. Click Next.

9. On the Review page, review the information you provided and then click Create.

10. After clicking Create, you are navigated to the Stacks Job Details page. From this page, you can monitor the creation of compute node.

11. Once you see the build successful message from the Job Details page, you can now view the Oracle GoldenGate Classic compute node under the Instances tab.
Accessing Oracle GoldenGate Classic Compute Node

To access your new Oracle GoldenGate deployment, log in to the compute node and access Oracle GoldenGate Software Command Interface (GGSCI). For this, you need to identify the public IP address of the compute node where Oracle GoldenGate Classic is running. The following steps help you to identify the public IP address:

1. Log in to your Oracle Cloud Console.
2. Select Compute, Instances.
3. Select the hyperlink name of the compute node. The public IP Address is listed under Primary VNIC Information.

Running GGSCI

Oracle GoldenGate Classic allows you to quickly access any of the Oracle GoldenGate environments without the need of setting up environment variables per installation.
A custom utility called `ggsci` is available in the `/usr/local/bin` directory, which helps you to ensure correct environment variables are created in the environment. But for using this you have to set a mandatory parameter. For example, for Oracle Database 19c:

```
-bash-4.2$ ./ggsci oracle19
```

Oracle GoldenGate Command Interpreter for Oracle
Version 19.1.0.0.1 OGGE_19.1.0.0.0_PLATFORMS_190524.2201_FBO
Linux, x64, 64bit (optimized), Oracle 19c on May 25 2019 15:07:20
Operating system character set identified as UTF-8.

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```
GGSCI (ogg19ccis) 1>
```

If you did not mention the Oracle Database version in the command, then it displays the usage information with the required details as shown below:

```
-bash-4.2$ ./ggsci
Usage: ./ggsci <oracle-version>
Example: ./ggsci oracle11, oracle12, oracle18, oracle19
```
Creating Oracle GoldenGate Subdirectories

You can configure Oracle GoldenGate Classic after setting the environment variables. To create the subdirectories needed for Oracle GoldenGate, navigate to the Oracle GoldenGate home and access Oracle GoldenGate Software Command Interface (GGSCI). Create the subdirectories as described in Installing Oracle GoldenGate User Guide.

$ cd $OGG_HOME
$ ./ggsci
GGSCI> create subdirs

After creating the sub-directories, you can find them in /home/opc/oracle<##> directory. Although they appear in the /home/opc/oracle<##> location, the contents are written to /u02/deployments/<directory>. This gives you some tolerance if something had happened to the Oracle GoldenGate Compute Node.
Getting Started with Oracle GoldenGate Classic Architecture for Oracle Database

After deploying Oracle GoldenGate Classic on the Oracle Cloud Marketplace, you can access the latest release of Oracle GoldenGate Classic.

Before you can start using Oracle GoldenGate Classic, there are a few tasks that you must perform to ensure that your environment is complete and ready to replicate your data. Before you begin data replication, you must perform the following tasks:

Topics:
- Configuring Source or Target Database for Replication
- Establishing Connectivity with Oracle GoldenGate Classic
- Updating Network Related Files for Oracle GoldenGate Classic
- Creating Database Credentials for Oracle GoldenGate Classic
- Adding SchemaTranData for Oracle GoldenGate Classic
- Creating Checkpoint Table for Oracle GoldenGate Classic
- Enabling Heartbeat Table for Oracle GoldenGate Classic
- Configuring Capture Support for Oracle GoldenGate Classic
- Configuring Apply Support for Oracle GoldenGate Classic

Configuring Source or Target Database for Replication

Before you can begin replicating, you should prepare the source or target database to support Oracle GoldenGate. To prepare your database, follow the steps listed in Preparing the Database for Oracle GoldenGate section of Using Oracle GoldenGate for Oracle Database guide. The steps listed in the Using Oracle GoldenGate for Oracle Database guide helps you how to enable logging, enable kernel parameters, flashback query and server resources.

Establishing Connectivity with Oracle GoldenGate Classic

The Oracle GoldenGate Classic on Marketplace compute node acts as a hub where you can manage your connections to source and target database. To do this, establish a network connection between the compute node and your source and target database. The compute node is pre-configured with the Oracle Database Client software and is ready to use.

You have to provide sqlnet.ora and tnsnames.ora files in the TNS_ADMIN directory, to establish connection between source or target database and the compute node. On a deployment basis, the TNS_ADMIN directory has been established as /u02/deployments/<deployment_name>.
Updating Network Related Files for Oracle GoldenGate Classic

The Oracle GoldenGate on Marketplace Compute Node comes pre-configured with Oracle Client installed. In order to establish network configuration between the compute node and the source or target systems within your architecture, you have to add or update the network related files in the Oracle Client.

You can find these files in the TNS_ADMIN location and the recommended location is /u02/deployment/oracle<##>/network/admin. To create this structure per Oracle Client release, perform the following steps:

1. Connect to the Oracle GoldenGate Marketplace Compute Node, using opc user credentials.
2. Change directories to the location /u02/deployment/oracle<##>.
3. Create the directory structure for TNS_ADMIN
   
   mkdir -p ./network/admin

   **Note:**
   If you want the networking directory structure to be consistent with other Oracle products, you must append /network/admin to the directory structure. For this you have to change the environment variable TNS_ADMIN. For more information on Local Naming Parameters, refer to Database Net Services Reference.

4. Copy the existing sqlnet.ora and tnsnames.ora files to the admin directory. You have to add or update these files on the compute node.

   The following is an example of sqlnet.ora file:

   NAMES.DIRECTORY_PATH= (TNSNAMES, ONAMES, HOSTNAME)
   NAMES.DEFAULT_DOMAIN = ora.com

   The following is an example of tnsnames.ora file:

   TEST =
   (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = test2)(PORT = 1521))
    )
   )
   (CONNECT_DATA =
    (SERVER = DEDICATED)
    (SERVICE_NAME = test)
   )
   )
Creating Database Credentials for Oracle GoldenGate Classic

Use the credential store to store and use database credentials for the source and target databases for Oracle GoldenGate Classic. Use the tnsnames.ora file to connect to the required database.

To create database credentials, perform the following tasks:

1. Login to the Oracle GoldenGate Compute Node.
   
   $ ssh -i <private key> opc@<public_ip_address>

2. Navigate to /usr/local/bin and execute ggsci.
   
   $ cd /usr/local/bin
   $ ggsci oracle<##>

3. Add the credential store to the configuration.
   
   ggsci> add credentialstore

4. Alter the credentialstore to add the required login credentials.
   
   ggsci > alter credentialstore add user <user_id>@<tnsnames_string> password ******** alias <alias_name> domain OracleGoldenGate

5. Login to the database to test the connection.
   
   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate

Adding SchemaTrandata for Oracle GoldenGate Classic

After adding the credential for connecting to the source database, you must enable supplemental logging on the source schema. The following steps are used to add SchemaTrandata to the source schema:

1. Login to the Oracle GoldenGate Compute Node
   
   $ ssh -i <private key> opc@<public_ip_address>

2. Execute GGSCI.
   
   $ cd /usr/local/bin
   $ ./ggsci oracle<##>

3. Connect to the source database using the credential store alias.
   
   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate
4. Add supplemental logging to the schema using schematrandata.

    ggsci > add schematrandata <schema>

**Note:**
If your source database is multitenant and you are connecting to the root using a c## user, from Oracle Database 12.1 and later, you have to specify the PDB database with the schema. i.e. `<pdb>.<schema>`.

---

### Creating Checkpoint Table for Oracle GoldenGate Classic

Checkpoint tables contain the data necessary for tracking the progress of the Replicat as it applies transactions to the target system. Regardless of the Replicat that is being used, it is a best practice to enable the checkpoint table for the target system.

**Note:**
You can predetermine a default checkpoint table name by ensuring the parameter `CHECKPOINTTABLE <table name>` in the `GLOBALS` file.

To create a checkpoint table, follow these steps:

1. Login to the Oracle GoldenGate Compute Node.

    $ ssh -i <private key> opc@<public_ip_address>

2. Execute GGSCI.

    $ cd /usr/local/bin
    $ ./ggsci oracle<##>

3. Connect to the target database using the credential store alias.

    ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate

4. Add checkpoint table.

    ggsci > add checkpointtable <schema>.checkpointtable

---

### Enabling Heartbeat Table for Oracle GoldenGate Classic

The Automatic Heartbeat table is a key way to monitor latency within the Oracle GoldenGate framework. Heartbeat tables provide you a way to gauge the end-to-end throughput within the configuration and identify any potential bottlenecks in the network. For a multitenant database you have to create a heartbeat table in each PDB to which OGG can apply data.
To implement the Automatic Heartbeat table, perform the following steps:

1. Login to the Oracle GoldenGate Compute Node.

   $ ssh -i <private key> opc@<public_ip_address>

2. Execute GGSCI.

   $ cd /usr/local/bin
   $ ./ggsci oracle<##>

3. Connect to the source or target database using the credential store alias.

   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate


   ggsci > add heartbeatable

For more information on the Automatic Heartbeat functionality, refer to Monitoring Oracle GoldenGate Processing documentation.

Configuring Capture Support for Oracle GoldenGate Classic

Before you can begin replication, you have to setup the capture process. The capture process is also known as Extract. Oracle GoldenGate Classic supports three type of Extracts. They are:

• Classic Extract
• Integrated Extract
• Initial Load Extract

To decide on which type of capture to use, refer to Deciding Which Capture Method to Use section of Using Oracle GoldenGate for Oracle Database Guide.

To build any of these Extracts, perform the following steps in Oracle GoldenGate Classic:

1. Login to the Oracle GoldenGate Compute Node.

   $ ssh -i <private key> opc@<public_ip_address>

2. Execute GGSCI.

   $ cd /usr/local/bin
   $ ./ggsci oracle<##>

3. Connect to the source database using the credential store alias.

   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate

4. Add an Extract
Configuring Apply Support for Oracle GoldenGate Classic

The apply process for replication is simple to configure; however, the apply process is also known as Replicat. There are five types of Replicats supported by Oracle GoldenGate Classic and these Replicats are:

- Integrated Replicat
- Classic Replicat
- Coordinated Replicat
- Parallel Replicat in Integrated Mode
- Parallel Replicat in Non-Integrated Mode

To decide on which Replicat to use, refer to Deciding Which Apply Method to Use section of Using Oracle GoldenGate for Oracle Database Guide.

To build any of these Replicats perform the following steps with Oracle GoldenGate Classic:

1. Login to the Oracle GoldenGate Compute Node.
   
   $ ssh -i <private key> opc@<public_ip_address>

2. Execute GGSCI.
   
   $ cd /usr/local/bin
   $ ./ggsci oracle<##>

3. Connect to the source database using the credential store alias.
   
   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate

4. Add a Replicat
• For Classic Replicat:
  
  `ggsci > add replicat <replicat_name>, exttrail ./dirdat/ab, checkpointtable <schema>.<checkpointtable>
  `  

• For Coordinated Replicat:

  `ggsci > add replicat <replicat_name>, coordinated [maxthreads <number>], exttrail ./dirdat/ab, checkpointtable <schema>.<checkpointtable>
  `  

• For Parallel Replicat in Non-Integrated Mode:

  `ggsci > add replicat <replicat_name>, parallel, exttrail ./dirdat/ab, checkpointtable <schema>.<checkpointtable>
  `  

**Note:**

You can use only Classic Replicat or Parallel Replicat in Non-Integrated mode for replication to Autonomous Data Warehouse and Autonomous Transaction Processing.
Connecting to Data Resources for Oracle GoldenGate Classic

Learn about different methods of connecting Oracle GoldenGate data sources and targets. It includes the following connection types:

- Connecting to Oracle Database (on-premises) for Oracle GoldenGate Classic
- Connecting to Oracle Database as a Service for Oracle GoldenGate Classic
- Connecting to Oracle Autonomous Data Warehouse/Autonomous Transaction Processing

Connecting to Oracle Database (on-premises) for Oracle GoldenGate Classic

You can use Oracle GoldenGate Classic on Marketplace to remotely capture from and apply data to on-premises Oracle database resources. This allows you to enable replication and centrally manage the replication processes.

Use Cases for Replication
You can use Oracle GoldenGate Classic to replicate data between data resources in the following use cases:

- Migrations
- Data Distribution
- Real-Time Data Warehousing
- Operational Reporting

Replicating Data from On-premises
Prerequisites

Ensure that the following are set up before you begin replication:

- Oracle GoldenGate Classic
- Source Database
- Target Database

To move data from on-premises to the cloud or from on-premises to on-premises, perform the following tasks:

- Configure Oracle Database for Replication
- Configure Oracle GoldenGate Classic Compute Node
Configure Oracle Database for Replication

To prepare your on-premise Oracle database(s) for replication, perform the following tasks:

1. Configure Logging Properties
   - Enable Supplemental Logging

2. Enable Oracle GoldenGate within the Oracle Database
   - Update parameter for enable_goldengate_replication

For more details, refer to Preparing the Database for Oracle GoldenGate documentation.

Configure Oracle GoldenGate Classic Compute Node

To establish connection from the Oracle GoldenGate Classic Compute Node to your on-premises database, you must edit the tnsnames.ora file and point the entry to your database resources.

By default, the environment variable TNS_ADMIN is pre-configured for each deployment. But the files tnsnames.ora or sqlnet.ora are not readily available on the compute node. You need to create the files or copy them from an existing file. You can locate the files tnsnames.ora or sqlnet.ora in the pre-configured location as illustrated in the below table:

<table>
<thead>
<tr>
<th>Oracle Database Version</th>
<th>Directory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oracle 11g</td>
<td>/u02/deployments/oracle&lt;##&gt;/network/admin</td>
</tr>
<tr>
<td>Oracle 12c</td>
<td>/u02/deployments/oracle&lt;##&gt;/network/admin</td>
</tr>
<tr>
<td>Oracle 18c</td>
<td>/u02/deployments/oracle&lt;##&gt;/network/admin</td>
</tr>
<tr>
<td>Oracle 19c</td>
<td>/u02/deployments/oracle&lt;##&gt;/network/admin</td>
</tr>
</tbody>
</table>

**Note:**

- If you are using Oracle Autonomous product client credentials, then you have to edit the tnsnames.ora file.
- If you want your networking directory structure to be consistent with other Oracle products, you must append /network/admin to the directory structure. For this you have to change the environment variable TNS_ADMIN. For more information on Local Naming Parameters, refer to Database Net Services Reference.
Connecting to Oracle Database as a Service for Oracle GoldenGate Classic

You can use Oracle GoldenGate Classic on Marketplace to remotely capture and apply data to Oracle Cloud Infrastructure (OCI) Database as a Service (DBaaS) resources. This allows you to enable replication in a scalable fashion, centralize the point of management, and enable replication between cloud services.

Replicating Data to OCI Database as a Service

Prerequisites

Ensure you have the following prerequisites before replicating data from on-premises:

• Oracle GoldenGate Classic on Marketplace
• Source Database
• Oracle Cloud Infrastructure (OCI) Database as a Service (DBaaS) Instance

To move data from on-premises to the cloud or from on-premises-to-on-premises, perform the following tasks:

• Configure Oracle Database for Replication
• Configure Oracle GoldenGate Classic Compute Node

Configure Oracle Database for Replication

To prepare your on-premise Oracle database(s) for replication, perform the following tasks:

1. Configure Logging Properties
   • Enable Supplemental Logging
2. Enable Oracle GoldenGate within the Oracle Database
   • Update parameter for enable_goldengate_replication

For more details, refer to Preparing the Database for Oracle GoldenGate documentation.

Configure Oracle GoldenGate Classic Compute Node

To establish connection from the Oracle GoldenGate Classic Compute Node to your on-premises database, you must edit the tnsnames.ora file and point the entry to your database resources.

By default, the environment variable TNS_ADMIN is pre-configured for each deployment. But the files tnsnames.ora or sqlnet.ora are not readily available on the compute node. You need to create the files or copy them from an existing file. You can locate the files tnsnames.ora or sqlnet.ora in the pre-configured location as illustrated in the below table:
## Table 10-2  Oracle Database Client directories

<table>
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<tr>
<td>Oracle 19c</td>
<td>/u02/deployments/oracle&lt;##&gt;/network/admin</td>
</tr>
</tbody>
</table>

### Note:
- If you are using Oracle Autonomous product client credentials, then you have to edit the `tnsnames.ora` file.
- If you want your networking directory structure to be consistent with other Oracle products, you must append `/network/admin` to the directory structure. For this you have to change the environment variable `TNS_ADMIN`. For more information on Local Naming Parameters, refer to Database Net Services Reference.

### Connecting to Oracle Autonomous Data Warehouse/Autonomous Transaction Processing

You can replicate data to Oracle Autonomous Data Warehouse Cloud Service (ADWCS) or Autonomous Transaction Processing (ATP) by using Oracle GoldenGate Classic on Oracle Cloud Marketplace. The steps described in this section, streamlines the approach for making a remote connection to Oracle Autonomous Database Warehouse Cloud Service (ADWCS).

For more information, refer to Replicating Data to the Autonomous Database section of Using Oracle GoldenGate for Oracle Database guide.

#### Use Cases for Replicating to Autonomous Database
Use Oracle GoldenGate Classic to replicate data to the Autonomous Data Warehouse for:
- Real-time Data Warehousing
- Operational Reporting

#### Replicating Data to Autonomous Data Warehouse

### Prerequisites:
You have to have the following prerequisites:
- Oracle GoldenGate Classic
- Oracle Autonomous Data Warehouse Cloud Service
• Your source database

To deliver data to the Autonomous Database using Oracle GoldenGate Classic, perform the following tasks:

• Configure the Autonomous Data Warehouse for Replication
• Autonomous Database Client Credentials
• Configure Oracle Goldengate Classic for Replication

Configure the Autonomous Data Warehouse for Replication

Unlock the Pre-created Oracle GoldenGate User (ggadmin)

Perform the following steps to configure the Autonomous Data Warehouse for Replication:

1. Unlock and change the password for the pre-created Oracle GoldenGate user (ggadmin) within the Autonomous Data Warehouse. Use any SQL client tool to unlock the account.
   For more details, refer to About Connecting to an Autonomous Data Warehouse Instance section of Using Oracle Autonomous Data Warehouse guide.

   SQL> select * from dba_users order by username;
   SQL> alter user ggadmin identified by <password> account unlock;

2. Check whether the parameter enable_goldengate_replication is set to true. If not, then modify the parameter.

   SQL> select * from v$parameter where name = 'enable_goldengate_replication';
   SQL> alter system set enable_goldengate_replication = 'true' scope=both;

Create Target Schema

Complete the following steps to create schema and target objects that can be used in replication. This schema and associated objects does not support DDL replication.

1. Create a new application user/schema. This user/schema stores the target objects for replication.

   **Note:**
   appadmin is an example user.

   SQL> create user appadmin identified by ********
   SQL> grant create session, resource, create view, create table to appadmin;
   SQL> alter user appadmin quota unlimited on data;

2. Connect to the Oracle Autonomous Data Warehouse Cloud database as user/schema and create your application tables.
Autonomous Database Client Credentials

Obtain the Autonomous Database Client Credentials

To establish connection to your Autonomous Database, you must download the client credential files from the Autonomous Database Service Console. For more information see Downloading Client Credentials section of Using Oracle Autonomous Data Warehouse guide.

**Note:**
If you do not have administrator access to the Autonomous Database ask your service administrator to download and provide the credential files to you. Once you have the credential files for your Autonomous Database, you should upload the zip file to the Oracle GoldenGate Compute Node.

Perform the following steps to obtain the Oracle Autonomous Data Warehouse Cloud account details:

1. Log into your Oracle Autonomous Data Warehouse Cloud account.
2. From the Instance page, click the menu option for the Autonomous Database instance and select Service Console.
3. Log into the Service Console using the admin username and its associated password.
4. In the Service Console, click the Administration tab.
5. Click Download Client Credentials.
6. Enter a password to secure your credentials zip file and click Download.
7. Save the credentials zip file to your local system.

Move Client Credentials to Oracle GoldenGate Compute Node

In order to establish a connection from Oracle GoldenGate to the Autonomous Data Warehouse, you need to move the client credentials to Oracle GoldenGate Compute Node. The following steps will illustrate how to move the credential zip file from your machine to Oracle GoldenGate Compute Node.

1. Connect to the Oracle GoldenGate Classic Compute Node using SSH and OPC user credentials.

   ```
   ssh -i <private_key> opc@<public_ip_address>
   ```

2. Create a staging directory and grant the essential permissions and then exit the session.

   ```
   $ mkdir stage
   $ exit
   ```
3. Copy the credentials zip file to the Oracle GoldenGate Classic Compute Node.

   $ scp ./<credential_file>.zip opc@<public_id_address>:~/stage

4. Connect to the Oracle GoldenGate Classic Compute Node.

   ssh -i <private_key> opc@<public_ip_address>

5. Verify whether the credentials zip file is available in the stage location.

   $ cd ~/stage
   $ ls -ltr

Configure Oracle Goldengate Compute Node with Autonomous Client Credentials

After moving the ADWC Client Credentials to the Oracle GoldenGate Compute Node, you have to install the necessary files and ensure you have a connection to the Autonomous Data Warehouse. The following steps will help you configure the required SQL*Net components:

1. Login to the Oracle GoldenGate Classic Compute Node using SSH and the OPC user credentials.

   ssh -i <private_key> opc@<public_ip_address>

2. Unzip the client credentials file into a temporary directory.

   unzip ./<credential_file>.zip -d ./client_credentials

3. Copy the sqlnet.ora and tnsnames.ora files to the location of your TNS_ADMIN.

   $ cd ~/stage/client_credentials
   $ cp ./sqlnet.ora /u02/deployments/oracle<##>/network/admin
   $ cp ./tnsnames.ora /u02/deployments/oracle<##>/network/admin

   Note:
   If you want your networking directory structure to be consistent with other Oracle products, you must append/network/admin to the directory structure. For this you have to change the environment variable TNS_ADMIN. For more information on Local Naming Parameters, refer to Database Net Services Reference.

4. Edit the sqlnet.ora file and replace the directory parameter with the location of the information pointing to, where the client credentials were unzipped.

   $ cd /u02/deployments/<deployment>/etc
   $ vi ./sqlnet.ora

   Change ?/network/admin to /home/opc/stage/client_credentials.
5. For testing purposes, set the `TNS_ADMIN` and `ORACLE_HOME` environment variables at the operating system level.

![Note:]

The Oracle GoldenGate Deployment(s) use the `ORACLE_HOME` and `TNS_ADMIN` environment variables that are set per deployment.

```bash
$ export ORACLE_HOME=/u01/app/client/<oracle version>
$ export TNS_ADMIN=/u02/deployments/oracle<##>/network/admin
```

6. Test the connection to Autonomous Data Warehouse by connecting to one of the entries in the `tnsnames.ora` file.

```bash
$ cd $ORACLE_HOME/bin
$ ./sqlplus appadmin/**********@orcladw_low
```

### Configure Oracle Goldengate Classic for Replication

Perform the following steps for establishing a successful connection to the Autonomous Data Warehouse with Oracle GoldenGate Classic.

**Add Oracle GoldenGate Credential to connect to Autonomous Data Warehouse**

To add Oracle GoldenGate Credential details, to connect to Autonomous Data Warehouse:

1. Login to the Oracle GoldenGate Compute Node.
   ```bash
   $ ssh -i <private key> opc@<public_ip_address>
   ```

2. Navigate to `/usr/local/bin` and execute `ggsci`.
   ```bash
   $ cd /usr/local/bin
   $ ggsci oracle<##>
   ```

3. Add the credential store to the configuration.
   ```
   ggsci> add credentialstore
   ```

4. Alter the credentialstore to add the required login credentials.
   ```
   ggsci > alter credentialstore add user <user_id>@<tnsnames_string>
   password ******** alias <alias_name> domain OracleGoldenGate
   ```

5. Login to the autonomous database to test the connection.
   ```
   ggsci > dblogin useridalias <alias_name> domain OracleGoldenGate
   ```
Glossary