ORACLE University

Integrated Cloud Applications & Platform Services

Oracle GoldenGate 12c: Fundamentals for Oracle

Activity Guide

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Course Practice Environment: Security Credentials

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Course Practice Environment: Security Credentials

For OS usernames and passwords, see the following:

- If you are attending a classroom-based or live virtual class, ask your instructor or LVC producer for OS credential information.
- If you are using a self-study format, refer to the communication that you received from Oracle University for this course.

For product-specific credentials used in this course, see the following table:

Oracle RDBMS and Oracle GoldenGate-Specific Credentials		
Product/Application	**Username**	**Password**
Database (Both CDB and PDB)	SYS	oracle
Database (Both CDB and PDB)	SYSTEM	oracle
Database	C##OGG_ADMIN	oracle_4U
Database	C##OGG_ADMIN@euro	oracle_4U
Database	C##OGG_ADMIN@amer	oracle_4U
Database PDB AMER	WEST	oracle_4U
Database PDB EURO	EAST	oracle_4U
Microservices Wallet Certificate (lesson 11)	N/A	Password123#
OGGMA_FIRST deployment administrator (lesson 11)	admin	oracle
OGGMA_SECOND deployment administrator (lesson 14)	admin	oracle

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Practices for Lesson 1: Introduction

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Practices for Lesson 1: Overview

In this practice, you become familiar with the lab environment that you use for the duration of the class.

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Practice 1-1: Verifying the Lab Environment

In this practice, you become familiar with the course lab environment. You check the Oracle RDBMS installation, the Linux OS environment, the environment variables, and aliases.

Tasks

1. Log in to your assigned virtual machine (VM).
2. Verify that a local copy of the activity guide is available on your VM.
3. View alias definitions that are set up for your VM.
4. Verify that the Oracle Listener is up.
5. Verify an instance of Oracle RDBMS is up and running.
6. Identify the environment variables that are configured.

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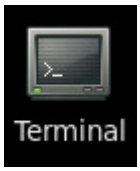
Practice Solution 1-1: Verifying the Lab Environment

In this practice solution, the steps to verify the lab environment are listed.

Tasks

1. Log in to your assigned virtual machine (VM).
2. Verify that a local copy of the activity guide is available on your VM.
3. View alias definitions that are set up for your VM.
   a. Double-click the terminal icon on the VM desktop.



   b. Run the `alias` command.

```
[oracle@hostname]$ alias
alias ggsci='rlwrap ./ggsci'
alias l.='ls -d .* --color=auto'
alias ll='ls -l --color=auto'
alias ls='ls --color=auto'
alias oggsrc='export OGG_HOME=/u01/ogg/oggsrc; cd
/u01/ogg/oggsrc'
alias oggtrg='export OGG_HOME=/u01/ogg/oggtrg; cd
/u01/ogg/oggtrg'
alias rman='rlwrap rman'
alias sqlplus='rlwrap sqlplus'
alias vi='vim'
alias which='alias | /usr/bin/which --tty-only --read-alias --
show-dot --show-tilde'
```

4. Verify that the Oracle Listener is up.
   a. In a terminal, run the `lsnrctl status` command to display the status of the Oracle Listener.

```
[oracle@hostname]$ lsnrctl status

LSNRCTL for Linux: Version 12.2.0.1.0 - Production on 22-JAN-
2018 17:11:49

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Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=edvmr1p0.us.oracle.com
)(PORT=1521)))
```

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```
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 12.2.0.1.0
- Production
Start Date                22-JAN-2018 16:33:49
Uptime                    0 days 0 hr. 38 min. 0 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/12.2.0/db_1/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/edvmr1p0/listener/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edvmr1p0.us.oracle.com
)(PORT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
Services Summary...
Service "58810cec6f8b6480e0531e10ed0acc8c.us.oracle.com" has 1
instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
Service "5884f9ce04927329e0531e10ed0a7d6c.us.oracle.com" has 1
instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
Service "amer.us.oracle.com" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
Service "euro.us.oracle.com" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
Service "orcl.us.oracle.com" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
Service "orclXDB.us.oracle.com" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
The command completed successfully
```

Note: If the listener is down, use the `lsnrctl start` command to start the Oracle Listener.

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5. Verify an instance of Oracle RDBMS is up and running.
   a. In a terminal, enter the following command:

      `ps -ef | grep pmon`

```
[oracle@hostname]$ ps -ef | grep pmon
oracle    3163     1  0 16:33 ?        00:00:00 ora_pmon_orcl
oracle    5541  5429  0 17:12 pts/0    00:00:00 grep pmon
```

      Note: If the `ora_pmon_orcl` process is not displayed in the output, it means Oracle RDBMS is not started. You need to connect to Oracle RDBMS as `sysdba` and start it.

6. Identify the environment variables that are configured.
   a. In a terminal, enter `printenv` to print all the environment variables. The output below has been edited to display the most relevant environment variables for this course.

```
[oracle@hostname]$ printenv
HOSTNAME=edvmr1p0
SHELL=/bin/bash
USER=oracle
LD_LIBRARY_PATH=:/u01/app/oracle/product/12.2.0/db_1/lib
ORACLE_SID=orcl
PWD=/home/oracle
JAVA_HOME=/usr/java/jdk1.8.0_144
HOME=/home/oracle
LOGNAME=oracle
ORACLE_HOME=/u01/app/oracle/product/12.2.0/db_1
```

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Practices for Lesson 2: Oracle GoldenGate Architecture

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Practices for Lesson 2: Overview

Practices Overview

In these practices, you will use pen and paper (OK, a word processor is also fine!) to jot down ideas about implementing an Oracle GoldenGate solution for a company that approached you as an Oracle replication consultant.

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Practice 2-1: Designing an Oracle GoldenGate Replication Solution

Overview

In this practice, you design a replication solution for Vehement Capital Corp.

Assumptions

Vehement Capital Corp is a large financial company headquartered in the US but with a strong European presence and a large office in Perth, Australia. The amount of revenue generated by the European operations (with regional headquarters based in Lausanne, Switzerland) is approximately the size of the revenue generated in the US. The Australian operation is smaller but crucial for the worldwide future development of Vehement Capital Corp, which aims to become the main financial partner for the mining industry.

While the American and European headquarters both run largely on Oracle solutions for their IT needs, the Perth office is traditionally an IBM shop running the DB2 database. In addition, several of the European local offices based in France, Italy, UK, Belgium, and the Netherlands joined Vehement Capital Corp through a series of acquisitions, and they keep their data stored in Microsoft SQL Server databases.

The Vehement Capital Corp CTO, Ms. Alice Burns, is the main force behind a company-wide data warehousing initiative. She wants to consolidate all OLTP data generated by the various subsidiaries into a centralized star schema populated in near real time so that Mr. Jong, the Chief Financial Officer, can make better financial decisions that rely on up-to-date data. Also, the IT department is trying to deal with noticeable latency that occurs when European colleagues connect to Oracle databases located in the US and vice versa, when the US-based workforce needs access to European data. Ideally, US workers should connect to US-based servers and European workers should connect to Europe-based servers, but all data should be available at any point in time over both sides of “the pond.”

Tasks

1. The situation presents a lot of opportunities for an Oracle GoldenGate solution. Write down your proposal and how you think you could address the IT needs of Vehement Capital Corp.

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Solution 2-1: Designing an Oracle GoldenGate Replication Solution

Overview

There are no clear and defined solutions. In general terms, have you considered the following?

- The heterogeneous nature of a product such as Oracle Goldengate, which is able to replicate in near real-time data stored in all major database architectures currently available.
- The ability given by Oracle GoldenGate to transform data in transit so that operational data can be adjusted to become analytical data while replication is taking place.
- Among the different topologies supported by Oracle GoldenGate, an active-active multi-master configuration could be a good fit to solve the latency issues raised by the Vehement Capital Corp IT department.

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Practices for Lesson 3: Installing Oracle GoldenGate

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Practices for Lesson 3: Overview

Overview

In this practice, you install the Oracle GoldenGate software to be used with both the `AMER` and `EURO` databases. The software zip file is already downloaded and staged. You also use the GoldenGate command-line interface (GGSCI).

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Practice 3-1: Installing Oracle GoldenGate

In this practice, you install Oracle GoldenGate twice: once for the `amer` database and again for the `euro` database. Each database has administrative users, such as `system`, as well as other users created specifically for this course. The data tables that you create and populate in the `AMER` database are owned by the `WEST` user. Conversely, the data tables in the `EURO` database are owned by the `EAST` user.

In the practices for this course, even though you work with only one VM, there are two host names defined in the `/etc/hosts` file: `easthost` and `westhost`. You should be able to ping both hosts, and you should use those names in place of `localhost` so that you can clearly indicate to yourself the source and target hosts.

Tasks

1. In a terminal window, locate and unzip the staged Oracle GoldenGate installation files from `/home/oracle/Software`.
2. Install OGG for the `amer` database by using the following details.

Window/Page Description	Choices or Values
Software location	**`/u01/ogg/oggsrc`**
Port	**`7809`**

3. Install OGG for the `euro` database by using the following details.

Window/Page Description	Choices or Values
Software location	**`/u01/ogg/oggtrg`**
Port	**`7909`**

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Practice 3-2: Setting the Stage

In this practice, you perform a few steps that will make it easier to understand and complete the rest of the practices in this course.

Tasks

1. Open four terminal tabs and title them as follows:
   - SQLPLUS_WEST@AMER
   - GGSCI_SOURCE
   - SQLPLUS_EAST@EURO
   - GGSCI_TARGET
2. In the `SQLPLUS_WEST@AMER` tab, log in to `sqlplus` as the `west` user.
3. In the `SQLPLUS_WEST@AMER` tab and logged in to `sqlplus` as the `west` user, run the `~/labs/lab/les03/source_database.sql` script to create the source database tables.
4. In the `SQLPLUS_WEST@AMER` tab and logged in to `sqlplus` as the `west` user, run the `~/labs/lab/les03/seed_database.sql` script to populate the source database tables.
5. In the `SQLPLUS_EAST@EURO` tab, log in to `sqlplus` as the `east` user.
6. In the `SQLPLUS_EAST@EURO` tab and logged in to `sqlplus` as the `east` user, run the `~/labs/lab/les03/target_database.sql` script to create the target database tables.
7. In the `GGSCI_SOURCE` tab, start `ggsci` and ensure that the manager is running on port `7809`.
8. In the `GGSCI_TARGET` tab, start `ggsci` and ensure that the manager is running on port `7909`.

Note: Leave these four terminal tabs open for the rest of the practices in this course.

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Practice 3-3: Using the GGSCI

In this practice, you execute a few ggsci commands and access online help for all ggsci commands.

Tasks

1. In either the `GGSCI_SOURCE` or `GGSCI_TARGET` tab, ensure that `ggsci` is running and invoke a help summary of all the GGSCI commands.
2. View help for a specific command.
3. View your command history.
4. View an informational summary of all processes.

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Practice Solution 3-1: Installing Oracle GoldenGate

In this practice solution, the steps to install Oracle GoldenGate are given. You perform the installation twice: once for the `amer` database and again for the `euro` database. Each database has administrative users, such as `system`, as well as other users created specifically for this course. The data tables that you create and populate in the `AMER` database are owned by the `WEST` user. Conversely, the data tables in the `EURO` database are owned by the `EAST` user.

In the practices for this course, even though you work with only one VM, there are two host names defined in the `/etc/hosts` file: `easthost` and `westhost`. You should be able to ping both hosts, and you should use those names in place of `localhost` so that you can clearly indicate to yourself the source and target hosts.

Tasks

1. In a terminal window, locate and unzip the staged Oracle GoldenGate installation files from `/home/oracle/Software`.
   a. Ensure you are logged in to your assigned VM.
   b. To open a terminal window, double-click the terminal icon located on the desktop.
   c. Set the current directory to `/home/oracle/Software`.

```
[oracle@hostname /]$ cd /home/oracle/Software
[oracle@hostname Software]$
```

   d. List the contents of the `Software` directory and ensure that the zipped installation files exist.

```
[oracle@hostname Software]$ ls
123010_fbo_ggs_Linux_x64_services_shiphome.zip  jdk-8u144-linux-
x64.rpm 123010_fbo_ggs_Linux_x64_shiphome.zip
linuxx64_12201_database.zip
database rlwrap-0.42-1.el6.x86_64.rpm
```

   e. Unzip the installation files. Enter "`A`" for `All` to replace the `OGG_WinUnix_Rel_Notes_12.3.0.1.pdf` file.

```
[oracle@hostname Software]$ unzip
  123010_fbo_ggs_Linux_x64_shiphome.zip
```

2. Install OGG for the `amer` database by using the following details.

Window/Page Description	Choices or Values
Software location	**/u01/ogg/oggsrc**
Port	**7809**

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a. In the terminal window where you have unzipped the installation software, navigate to `fbo*/Disk1`.

```
[oracle@hostname Software]$ cd fbo_ggs_Linux_x64_shiphome/Disk1
```

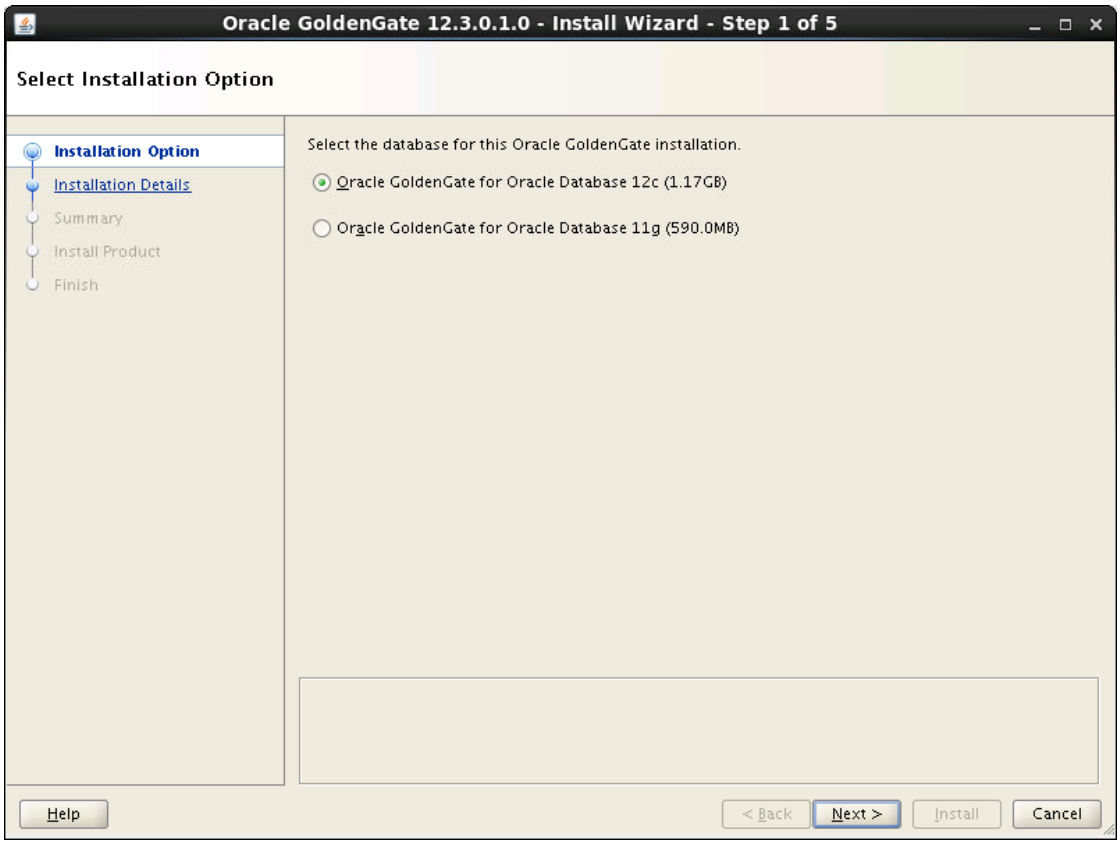
b. List the contents of `Disk1` and ensure the installer file exists.

```
[oracle@hostname Disk1]$ ls
install  response  runInstaller  stage
```

c. Run `runInstaller` to launch the GUI.

```
[oracle@hostname Disk1]$ ./runInstaller
Starting Oracle Universal Installer...
```

d. At the Installation Option window, accept the default of Oracle 12c. Click **Next**.



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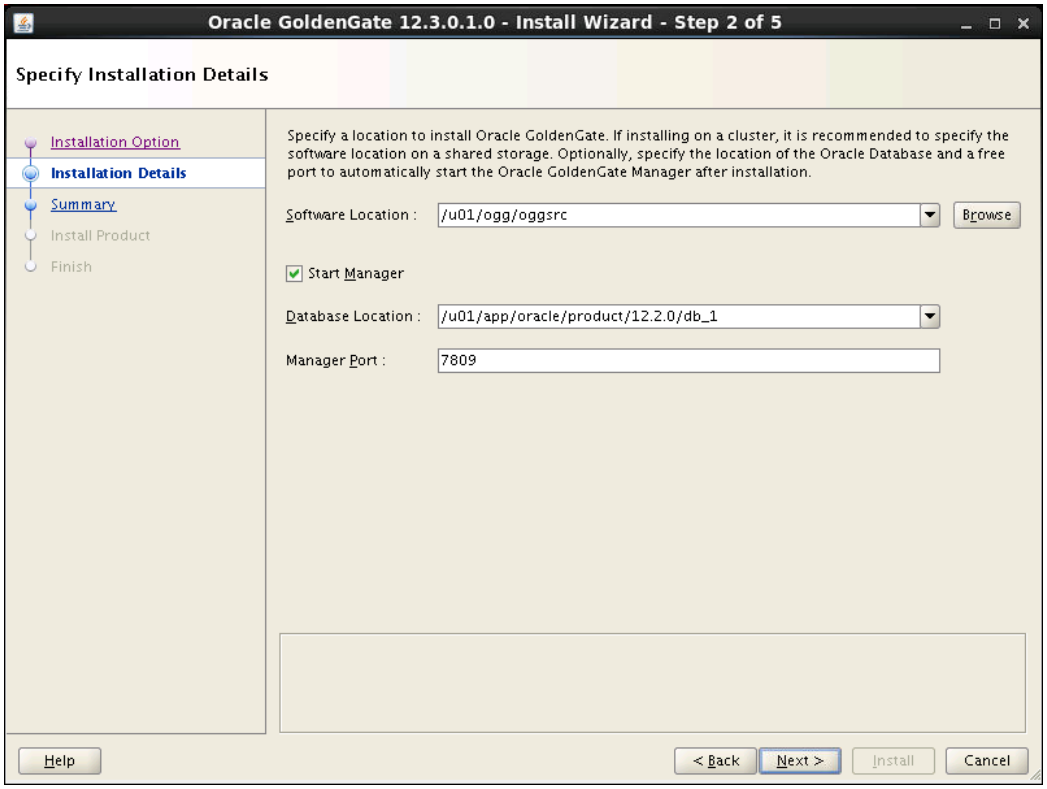
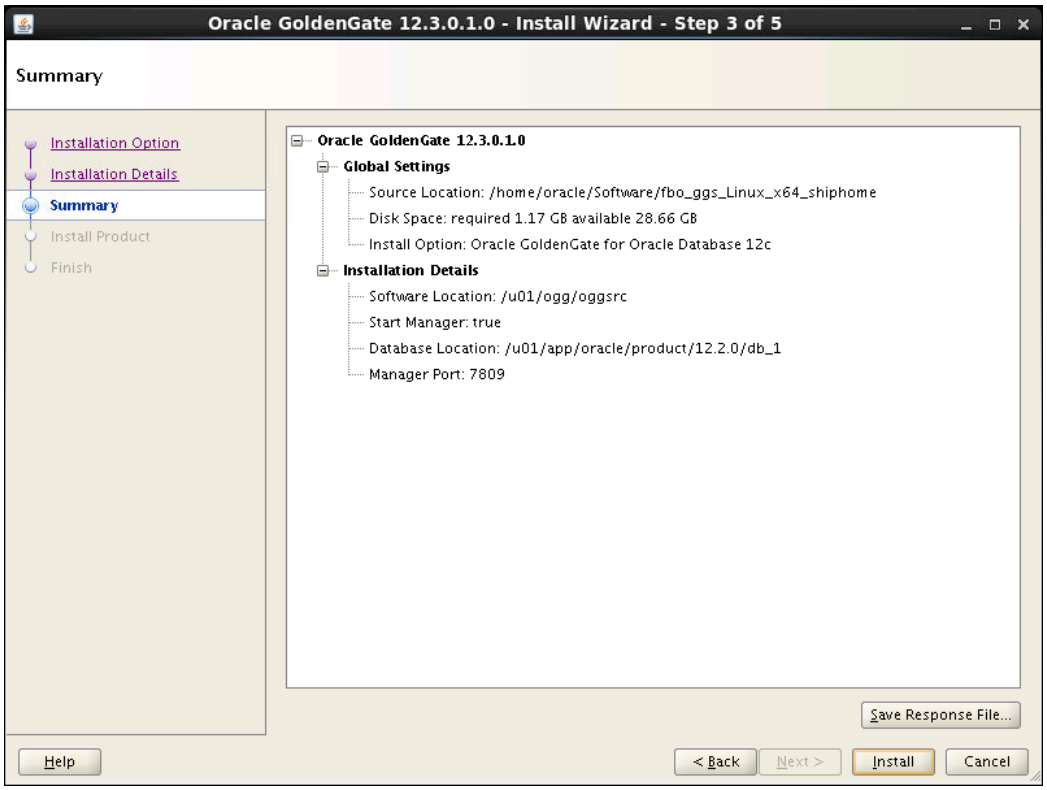
e. In the Installation Details window, change the software location to **`/u01/ogg/oggsrc`**, leave the Database Location as its default, and ensure Manager Port is **7809**. Click **Next**.



f. In the Summary window, click **Install**. It takes about a minute.



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g. In the Finish window, click **Close**.

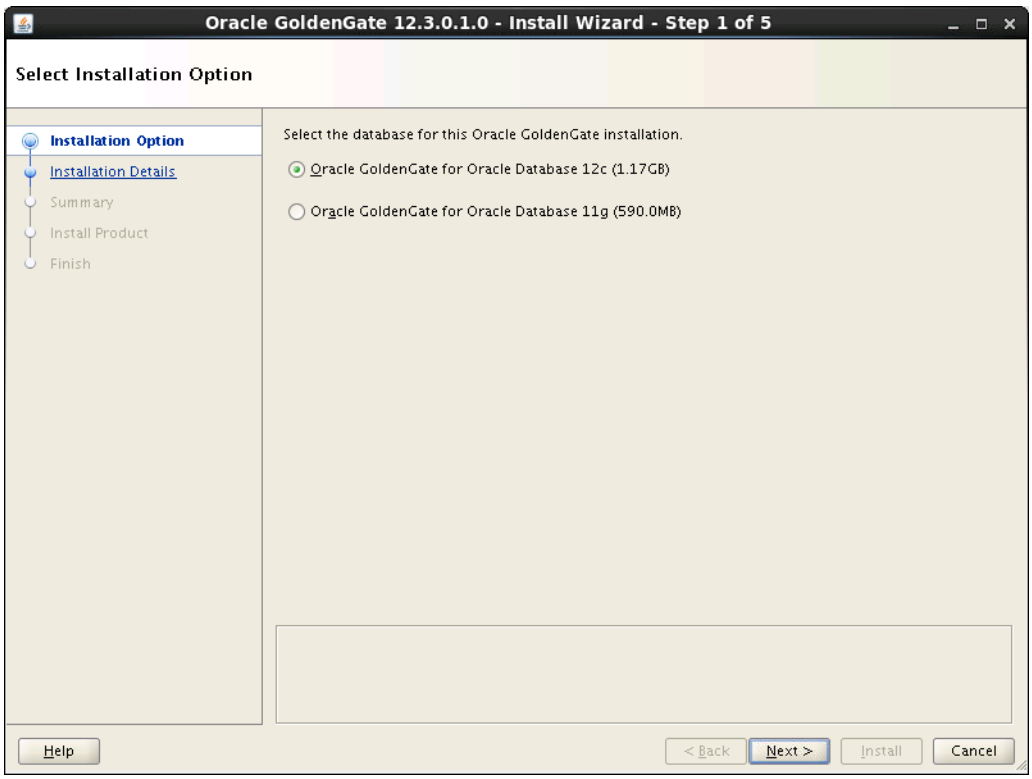
3. Install OGG for the `euro` database by using the following details.

Window/Page Description	Choices or Values
Software location	**`/u01/ogg/oggtrg`**
Port	**`7909`**

a. At the OS prompt, rerun **`runInstaller`** to launch the GUI a second time.

```
[oracle@hostname Disk1]$ ./runInstaller
Starting Oracle Universal Installer...
```

b. In the Installation Option window, accept the default of Oracle 12c. Click **Next**.



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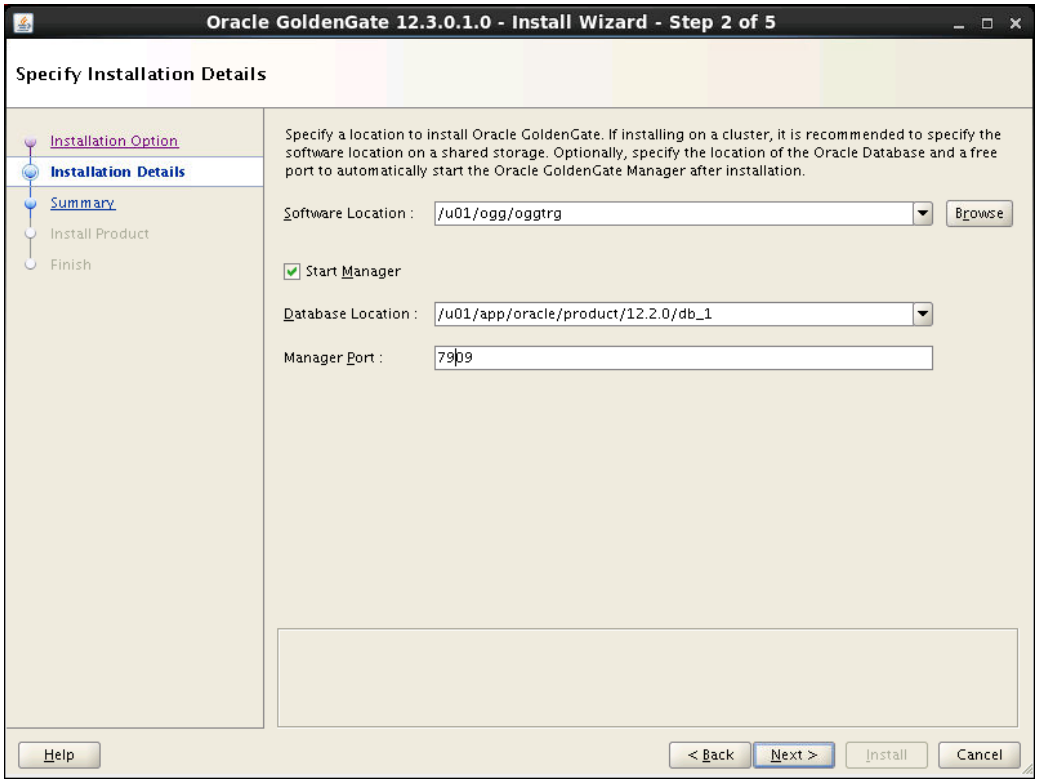
c. In the Installation Details window, change the software location to **`/u01/ogg/oggtrg`**, leave the Database Location at its default, and change Manager Port to **7909**. Click **Next**.



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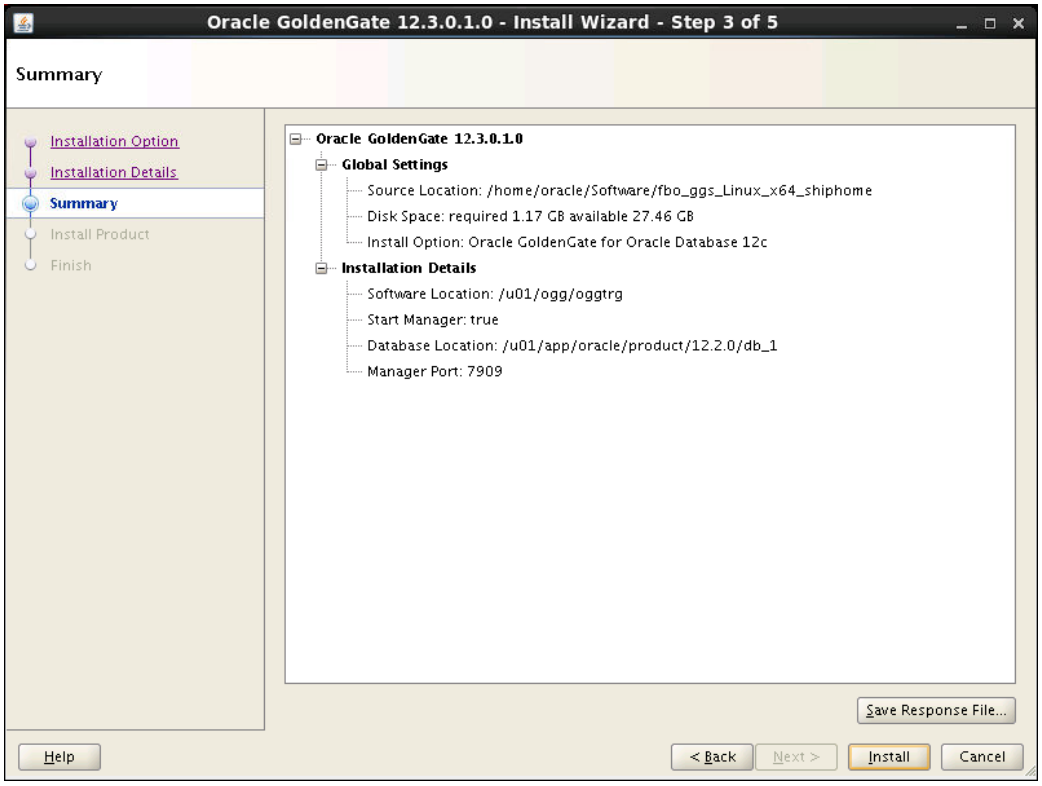
d. In the Summary window, click **Install**. It takes about a minute.



e. In the Finish window, click **Close**.

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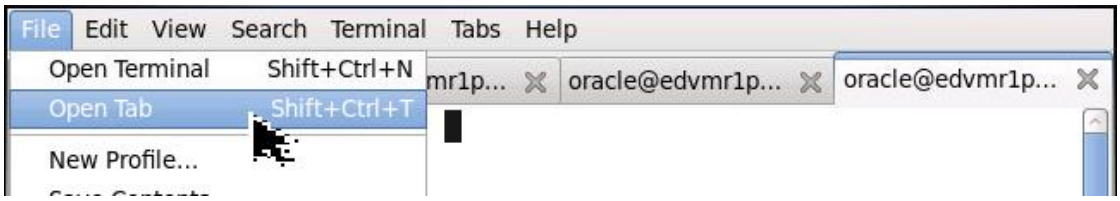
Practice Solution 3-2: Setting the Stage

In this practice solution, the steps to set up the course lab environment that will make it easier to understand and complete the rest of the practices in this course are listed.

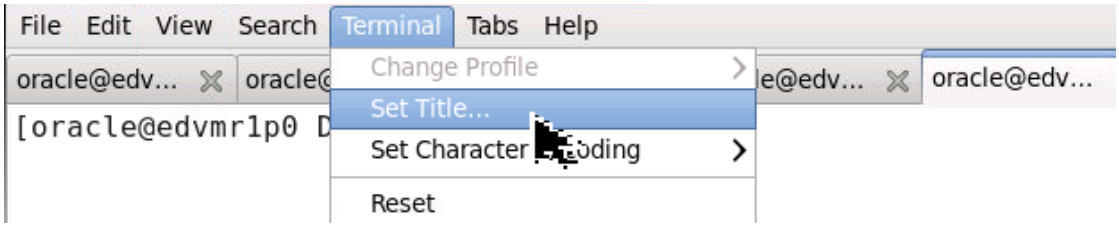
Tasks

1. Open four terminal tabs and title them as follows:
   - `SQLPLUS_WEST@AMER`
   - `GGSCI_SOURCE`
   - `SQLPLUS_EAST@EURO`
   - `GGSCI_TARGET`

   a. In the already open terminal window, click **File > Open Tab** four times so that you have five open tabs.



   b. From the Terminal menu, select **Terminal > Set Title** for each one of the tabs.



   c. Set the name of the terminal tabs from left to right to be `SQLPLUS_WEST@AMER`, `GGSCI_SOURCE`, `SQLPLUS_EAST@EURO`, and `GGSCI_TARGET`. Leave these terminal tabs open for the entire course.

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2. In the `SQLPLUS_WEST@AMER` tab, log in to `sqlplus` as the `west` user.
   a. Log in to `sqlplus` as the `west` user. Use your password sheet to look up the password for the **`WEST`** user in the **`AMER`** database.

```
[oracle@hostname Disk1]$ sqlplus west@amer

SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 22 18:43:28
2018

Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Fri Sep 22 2017 04:49:42 +00:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production

SQL>
```

3. In the `SQLPLUS_WEST@AMER` tab and logged in to `sqlplus` as the `west` user, run the `~/labs/lab/les03/source_database.sql` script to create the source database tables.
   a. Run the script file.

```
SQL> @/home/oracle/labs/lab/les03/source_database.sql
```

4. In the `SQLPLUS_WEST@AMER` tab and logged in to `sqlplus` as the `west` user, run the `~/labs/lab/les03/seed_database.sql` script to populate the source database tables.
   a. Run the script file.

```
SQL> @/home/oracle/labs/lab/les03/seed_database.sql
```

5. In the `SQLPLUS_EAST@EURO` tab, log in to `sqlplus` as the `east` user.
   a. Log in to `sqlplus` as the `east` user. Use your password sheet to look up the password for the **`EAST`** user in the **`EURO`** database.

```
[oracle@hostname Disk1]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 22 18:53:37
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
```

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```
Last Successful login time: Fri Sep 22 2017 04:23:23 +00:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL>
```

6. In the `SQLPLUS_EAST@EURO` tab and logged in to `sqlplus` as the `east` user, run the `~/labs/lab/les03/target_database.sql` script to create the target database tables.
   a. Run the script file.

```
SQL> @/home/oracle/labs/lab/les03/target_database.sql
```

7. In the `GGSCI_SOURCE` tab, start `ggsci` and ensure that the manager is running on port `7809`.
   a. Enter `oggsrc` to set the current directory. (This is an alias.)

```
[oracle@hostname Disk1]$ oggsrc
[oracle@hostname oggsrc]$
```

   b. Enter `ggsci`.

```
[oracle@hostname oggsrc]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:31:13
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.

GGSCI (hostname) 1>
```

   c. Enter `view param mgr`.

```
GGSCI (hostname) 1> view param mgr

PORT 7809

GGSCI (hostname) 2>
```

8. In the `GGSCI_TARGET` tab, start `ggsci` and ensure that the manager is running on port `7909`.
   a. Enter `oggtrg` to set the current directory. (This is an alias.)

```
[oracle@hostname Disk1]$ oggtrg
[oracle@hostname oggtrg]$
```

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b. Enter `ggsci`.

```
[oracle@hostname oggtrg]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:31:13
Operating system character set identified as UTF-8.

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rights reserved.

GGSCI (hostname) 1>
```

c. Enter `view param mgr`.

```
GGSCI (hostname) 1> view param mgr

PORT 7909



GGSCI (hostname) 2>
```

Note: Leave these four terminal tabs open for the rest of the practices in this course.

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Practice Solution 3-3: Using the `GGSCI`

In this practice solution, the steps to execute a few **`ggsci`** commands and access online help for all **`ggsci`** commands are listed.

Tasks

1. In either the `GGSCI_SOURCE` or `GGSCI_TARGET` tab, ensure that `ggsci` is running and invoke a help summary of all the GGSCI commands.
   a. In a `ggsci` terminal, enter `help`.

```
GGSCI (hostname) 2> help
```

2. View help for a specific command.
   a. Enter `help add trandata`.

```
GGSCI (hostname) 3>help add trandata
```

3. View your command history.
   a. Enter `history`.

```
GGSCI (hostname) 4> history

GGSCI Command History

    1: view param mgr
    2: help
    3: help add trandata
    4: history


GGSCI (hostname) 5>
```

4. View an informational summary of all processes.
   a. Enter `info all`.

```
GGSCI (hostname) 5> info all

Program     Status      Group       Lag at Chkpt  Time Since
Chkpt

MANAGER     RUNNING


GGSCI (hostname) 6>
```

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Practices for Lesson 4: Preparing the Environment and Configuring Classic Extract

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Practices for Lesson 4: Overview

Overview

In these practices, you perform the tasks to prepare the course environment for configuring Oracle GoldenGate. You also configure integrated Extract.

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Practice 4-1: Preparing the Environment

In this practice, you perform the tasks required to prepare an environment before configuring Oracle GoldenGate.

Tasks

1. View the value for the `ENABLE_GOLDENGATE_REPLICATION` database parameter and set it to `TRUE`.
2. View the values for supplemental logging and forced logging at the database level.
3. Enable supplemental logging at the database level.
4. Set the database to forced logging mode.
5. Confirm that supplemental logging and forced logging are enabled at the database level.
6. Log in to the database and enable supplemental logging at the schema level for the `WEST` schema in the source database.
7. Verify that supplemental logging is enabled for each table in the `WEST` schema.
8. Execute the **`dbms_goldengate_auth.grant_admin_privilege`** stored package to grant the necessary privileges to the **`C##OGG_ADMIN`** common user.
9. Reconfigure the manager with the following information:

Window/Page Description	Choices or Values

Source	`DynamicPortList 20000-20099`
	`PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2`
	`Autostart Extract E*`
	`AUTORESTART Extract *, WaitMinutes 1, Retries 3`

Target	`DynamicPortList 20100-20199`
	`PurgeOldExtracts ./dirdat/pe*, UseCheckPoints, MinKeepHours 2`
	`Autostart Replicat R*`
	`AUTORESTART Replicat *, WaitMinutes 1, Retries 3`

10. Stop and start the managers to read the updated parameters.
11. Configure a wallet on the source and target and create the following user aliases:

user	alias
C##OGG_Admin@amer	oggadmin_amer
C##OGG_Admin@euro	oggadmin_euro
C##OGG_Admin	oggadmin_root

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Practice 4-2: Configuring Integrated Extract

In this practice, you configure the primary Extract process and add a local trail file. You then create a secondary Extract and create a remote trail file.

Tasks

1. Create the primary Extract parameter file `extwest.prm` with the following parameters:

```
Extract extwest
UserIdAlias oggadmin_root
TranlogOptions IntegratedParams (max_sga_size 256)
ExtTrail ./dirdat/ew
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
Table AMER.WEST.ACCOUNT;
Table AMER.WEST.ACCOUNT_TRANS;
Table AMER.WEST.BRANCH;
Table AMER.WEST.BRANCH_ATM;
Table AMER.WEST.TELLER;
Table AMER.WEST.TELLER_TRANS;
```

2. Log in to the database and register the integrated Extract.
3. Create the Extract group.
4. Create a local trail file `ew` and link it to the `extwest` Extract.
5. View the `dirdat` directory to check if any files are created.
6. Create a secondary Extract parameter file `pwest` with the following parameters:

```
Extract pwest
UserIdAlias oggadmin_root
rmthost easthost, mgrport 7909
rmttrail ./dirdat/pe
Table AMER.WEST.*;
```

7. Create the data pump group.
8. Create the remote Extract trail file.
9. Start the two Extract processes `extwest` and `pwest`.
10. View the status of all processes. Both the processes should display Status as "`RUNNING`." If you see either "`STOPPED`" or "`ABENDED`," view the report log (`View Report <extract_name>`), fix the error, and restart the process.
11. Look in the source and target `./dirdat` directory and see if any local and remote trail files are created.
12. Also look in the source `./dirrpt` directory to see if any reports are created.

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Practice Solution 4-1: Preparing the Environment

In this practice solution, the steps to perform the tasks required to prepare an environment before configuring Oracle GoldenGate are listed.

Tasks

1. View the value for the `ENABLE_GOLDENGATE_REPLICATION` database parameter and set it to `TRUE`.
   a. In the untitled terminal, log in to `sqlplus` as `sysdba`.

```
[oracle@hostname Disk1]$ sqlplus / as sysdba
SQL*Plus: Release 12.2.0.1.0 Production on Tue Jan 23 19:21:05
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL>
```

   b. Enter `show parameter enable_goldengate`.

```
SQL> show parameter enable_goldengate
NAME                                  TYPE        VALUE
------------------------------------ ----------- ---------------
enable_goldengate_replication        boolean     FALSE
SQL>
```

   c. Enter `alter system set enable_goldengate_replication=true scope=both`.

```
SQL> alter system set enable_goldengate_replication=true
      scope=both;
System altered.
SQL>
```

   d. Verify the parameter is set.

```
SQL> show parameter enable_goldengate
NAME                                   TYPE       VALUE
------------------------------------ ----------- ---------------
enable_goldengate_replication        boolean     TRUE
SQL>
```

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2. View the values for supplemental logging and forced logging at the database level.
   a. In the same terminal where you are logged in to `sqlplus` as `sysdba`, enter `SELECT supplemental_log_data_min, force_logging FROM v$database;`

```
SQL> SELECT supplemental_log_data_min, force_logging FROM
v$database;
SUPPLEME FORCE_LOGGING
-------- ---------------------------------------
NO   NO
SQL>
```

3. Enable supplemental logging at the database level.
   a. In the same terminal where you are logged in to `sqlplus` as `sysdba`, enter `ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;`

```
SQL> ALTER DATABASE ADD SUPPLEMENTAL LOG DATA;
Database altered.
SQL>
```

4. Set the database to forced logging mode.
   a. In the same terminal where you are logged in to `sqlplus` as `sysdba`, enter `ALTER DATABASE FORCE LOGGING;`

```
SQL> ALTER DATABASE FORCE LOGGING;
Database altered.
SQL>
```

   b. To ensure that the redo and archive logs contain supplemental log data, switch the logs by entering `ALTER SYSTEM SWITCH LOGFILE;`

```
SQL> ALTER SYSTEM SWITCH LOGFILE;
System altered.
SQL>
```

5. Confirm that supplemental logging and forced logging are enabled at the database level.
   a. Enter `SELECT supplemental_log_data_min, force_logging FROM v$database;`

```
SQL> SELECT supplemental_log_data_min, force_logging FROM
v$database;
SUPPLEME FORCE_LOGGING
-------- ---------------------------------------
YES  YES
SQL>
```

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b. Execute the **dbms_goldengate_auth.grant_admin_privilege** stored package that grants the **C##OGG_ADMIN** user the necessary privileges to operate as a GoldenGate administrator.

```
SQL> exec
dbms_goldengate_auth.grant_admin_privilege('C##OGG_ADMIN',contai
ner=>'all');

PL/SQL procedure successfully completed.
SQL>
```

6. Log in to the database and enable supplemental logging at the schema level for the `WEST` schema in the source database.

a. In the `GGSCI_SOURCE` terminal, enter `DBLogin UserID c##OGG_Admin@amer, Password <password>`. Use your password sheet to look up the password for the **C##OGG_ADMIN** user in the **AMER** database.

```
GGSCI (hostname) 2> DBLogin UserID c##OGG_Admin@amer, Password
     *********
Successfully logged into database AMER.

GGSCI (hostname as c##OGG_Admin@orcl/AMER) 3>
```

b. Enter `add schematrandata west`. (The output below has been truncated here for display.)

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 3> add schematrandata
west

2018-01-23 19:42:50  INFO    OGG-01788  SCHEMATRANDATA has been
added on schema "west".

...
Oracle Goldengate marked following column as key columns on
table WEST.TELLER_TRANS: TELLER_NUMBER, TRANS_NUMBER,
TELLER_TRANS_TS.

GGSCI (hostname as c##OGG_Admin@orcl/AMER) 4>
```

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7. Verify that supplemental logging is enabled for each table in the `WEST` schema.
   a. Ensure that you are connected to the database in the `GGSCI_SOURCE` terminal and enter `info schematrandata west`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 4> info
schematrandata west


2018-01-23 19:43:49  INFO    OGG-06480  Schema level
supplemental logging, excluding non-validated keys, is enabled
on schema "WEST".
2018-01-23 19:43:49  INFO    OGG-01980  Schema level
supplemental logging is enabled on schema "WEST" for all
scheduling columns.
2018-01-23 19:43:49  INFO    OGG-10462  Schema "WEST" have 6
prepared tables for instantiation.
```

8. Reconfigure the manager with the following information:

Window/Page Description	Choices or Values
Source	DynamicPortList 20000-20099 PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2 Autostart Extract E* AUTORESTART Extract *, WaitMinutes 1, Retries 3
Target	DynamicPortList 20100-20199 PurgeOldExtracts ./dirdat/pe*, UseCheckPoints, MinKeepHours 2 Autostart Replicat R* AUTORESTART Replicat *, WaitMinutes 1, Retries 3

   a. In the `GGSCI_SOURCE` terminal, exit and start `ggsci` again.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 5> exit
[oracle@hostname oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:31:13
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1>
```

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b. If you prefer using a graphic editor rather than vi, in the `GGSCI_SOURCE` terminal, enter `set editor gedit` to set the editor to be **`gedit`**. This step is optional, as the default editor for **`GGSCI`** is **`vi`**.

```
GGSCI (hostname) 1> set editor gedit
GGSCI (hostname) 2>
```

c. Enter `view param mgr`.

```
GGSCI (hostname) 2> view param mgr
PORT 7809
GGSCI (hostname) 3>
```

d. Enter `edit param mgr`.

```
GGSCI (hostname) 3> edit param mgr
GGSCI (hostname) 4>
```

e. Enter the following text in the file. You can copy this text from the `~/lab/les04/source_mgr.txt` file.

```
DynamicPortList 20000-20099
PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2
Autostart Extract E*
AUTORESTART Extract *, WaitMinutes 1, Retries 3
```

f. Save and close the editor.

g. Enter `view param mgr`.

```
GGSCI (hostname) 4> view param mgr
PORT 7809
DynamicPortList 20000-20099
PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2
Autostart Extract E*
Autorestart Extract *, WaitMinutes 1, Retries 3
GGSCI (hostname) 5>
```

h. In the `GGSCI_TARGET` terminal, enter `set editor gedit` if you prefer **`gedit`** over **`vi`**.

```
GGSCI (hostname) 6> set editor gedit
GGSCI (hostname) 7>
```

i. Enter `view param mgr`.

```
GGSCI (hostname) 7> view param mgr
PORT 7909
GGSCI (hostname) 8>
```

j. Enter `edit param mgr`.

```
GGSCI (hostname) 7> edit param mgr
GGSCI (hostname) 8>
```

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k. Enter the following text in the file.

```
DynamicPortList 20100-20199
PurgeOldExtracts ./dirdat/pe*, UseCheckPoints, MinKeepHours 2
Autostart Replicat R*
AUTORESTART Replicat *, WaitMinutes 1, Retries 3
```

l. Save and close the editor.

m. Enter `view param mgr`.

```
GGSCI (hostname) 9> view param mgr
PORT 7909
DynamicPortList 20100-20199
PurgeOldExtracts ./dirdat/pe*, UseCheckPoints, MinKeepHours 2
Autostart Replicat R*
Autorestart Replicat *, WaitMinutes 1, Retries 3
GGSCI (hostname) 10>
```

9. Stop and start the managers to read the updated parameters.

a. In the `GGSCI_SOURCE` terminal, enter `stop mgr`. You will be prompted to confirm the request.

```
GGSCI (hostname) 5> stop mgr
Manager process is required by other GGS processes.
Are you sure you want to stop it (y/n)?y
Sending STOP request to MANAGER ...
Request processed.
Manager stopped.
GGSCI (hostname) 6>
```

b. Enter `start mgr`.

```
GGSCI (hostname) 6> start mgr
Manager started.
GGSCI (hostname) 7>
```

c. In the `GGSCI_TARGET` terminal, enter `stop mgr`. You will be prompted to confirm the request.

```
GGSCI (hostname) 10> stop mgr
Manager process is required by other GGS processes.
Are you sure you want to stop it (y/n)?y
Sending STOP request to MANAGER ...
Request processed.
Manager stopped.
GGSCI (hostname) 11>
```

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d. Enter `start mgr`.

```
GGSCI (hostname) 11> start mgr
Manager started.
GGSCI (hostname) 12>
```

10. Configure a wallet on the source and target and create the following user aliases:

user	alias
C##OGG_Admin@amer	oggadmin_amer
C##OGG_Admin@euro	oggadmin_euro
C##OGG_Admin	oggadmin_root

a. In the `GGSCI_SOURCE` terminal, enter `Create Wallet`.

```
GGSCI (hostname) 7> Create Wallet
Created wallet at location 'dirwlt'.
Opened wallet at location 'dirwlt'.
GGSCI (hostname) 8>
```

b. Enter `Add CredentialStore`.

```
GGSCI (hostname) 8> Add CredentialStore
Credential store created in /u01/ogg/oggsrc/dircrd/.
GGSCI (hostname) 9>
```

c. Enter `alter CredentialStore Add User c##OGG_Admin@amer Password <password> Alias oggadmin_amer`. Use your password sheet to look up the password for the `C##OGG_Admin` user in the **AMER** database.

```
GGSCI (hostname) 9> alter CredentialStore Add User
c##OGG_Admin@amer Password <password> Alias oggadmin_amer
Credential store in /u01/ogg/oggsrc/dircrd/ altered.
GGSCI (hostname) 10>
```

d. Enter `alter CredentialStore Add User C##OGG_Admin@euro Password <password> Alias oggadmin_euro`. Use your password sheet to look up the password for the `C##OGG_Admin` user in the **EURO** database.

```
GGSCI (hostname) 10> alter CredentialStore Add User
c##OGG_Admin@euro Password <password> Alias oggadmin_euro
Credential store in /u01/ogg/oggsrc/dircrd/ altered.
GGSCI (hostname) 11>
```

e. Enter `alter CredentialStore Add User c##OGG_Admin Password <password> Alias oggadmin_root`. Use your password sheet to look up the password for the `C##OGG_Admin` user in the **ORCL** container database.

```
GGSCI (hostname) 11> alter CredentialStore Add User c##OGG_Admin
Password <password> Alias oggadmin_root
```

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```
Credential store in /u01/ogg/oggsrc/dircrd/ altered.
GGSCI (hostname) 12>
```

f. Enter `info CredentialStore`.

```
GGSCI (hostname) 12> info CredentialStore
Reading from /u01/ogg/oggsrc/dircrd/:
Default domain: OracleGoldenGate
  Alias: oggadmin_euro
  Userid: c##OGG_Admin@euro

  Alias: oggadmin_amer
  Userid: c##OGG_Admin@amer

  Alias: oggadmin_root
  Userid: c##OGG_Admin
GGSCI (hostname) 13>
```

g. Enter `DBLogin UserIDAlias oggadmin_euro`.

```
GGSCI (hostname) 13> DBLogin UserIDAlias oggadmin_euro
Successfully logged into database EURO.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 14>
```

h. Enter `DBLogin UserIDAlias oggadmin_amer`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 14> DBLogin
UserIDAlias oggadmin_amer
Successfully logged into database AMER.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 15>
```

i. In the `GGSCI_TARGET` terminal, enter `Create Wallet`.

```
GGSCI (hostname) 12> Create Wallet
Created wallet at location 'dirwlt'.
Opened wallet at location 'dirwlt'.
GGSCI (hostname) 13>
```

j. Enter `Add CredentialStore`.

```
GGSCI (hostname) 13> Add CredentialStore
Credential store created in /u01/ogg/oggtrg/dircrd/.
GGSCI (hostname) 14>
```

k. Enter `alter CredentialStore Add User c##OGG_Admin@amer Password <password> Alias oggadmin_amer`.

```
GGSCI (hostname) 14> alter CredentialStore Add User
c##OGG_Admin@amer Password <password> Alias oggadmin_amer
Credential store in /u01/ogg/oggtrg/dircrd/ altered.
GGSCI (hostname) 15>
```

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l. Enter `alter CredentialStore Add User c##OGG_Admin@euro Password <password> Alias oggadmin_euro`.

```
GGSCI (hostname) 15> alter CredentialStore Add User
c##OGG_Admin@euro Password <password> Alias oggadmin_euro
Credential store in /u01/ogg/oggtrg/dircrd/ altered.
GGSCI (hostname) 16>
```

m. Enter `alter CredentialStore Add User c##OGG_Admin Password <password>  Alias oggadmin_root`.

```
GGSCI (hostname) 16> alter CredentialStore Add User c##OGG_Admin
Password <password> Alias oggadmin_root
Credential store in /u01/ogg/oggtrg/dircrd/ altered.
GGSCI (hostname) 17>
```

n. Enter `info CredentialStore`.

```
GGSCI (hostname) 17> info CredentialStore
Reading from /u01/ogg/oggtrg/dircrd/:
Default domain: OracleGoldenGate
  Alias: oggadmin_euro
  Userid: c##OGG_Admin@euro

  Alias: oggadmin_amer
  Userid: c##OGG_Admin@amer

  Alias: oggadmin_root
  Userid: c##OGG_Admin
GGSCI (hostname) 18>
```

o. Enter `DBLogin UserIDAlias oggadmin_amer`.

```
GGSCI (hostname) 18> DBLogin UserIDAlias oggadmin_amer
Successfully logged into database AMER.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 19>
```

p. Enter `DBLogin UserIDAlias oggadmin_euro`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 19> DBLogin
UserIDAlias oggadmin_euro
Successfully logged into database EURO.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 20>
```

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Practice Solution 4-2: Configuring Integrated Extract

In this practice solution, the steps to configure the primary Extract process and add a local trail file are listed. Also, the steps to create a secondary Extract and a remote trail file are listed.

Tasks

1. Create the primary Extract parameter file `extwest.prm` with the following parameters:

```
Extract extwest
UserIdAlias oggadmin_root
TranlogOptions IntegratedParams (max_sga_size 256)
ExtTrail ./dirdat/ew
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
Table AMER.WEST.ACCOUNT;
Table AMER.WEST.ACCOUNT_TRANS;
Table AMER.WEST.BRANCH;
Table AMER.WEST.BRANCH_ATM;
Table AMER.WEST.TELLER;
Table AMER.WEST.TELLER_TRANS;
```

   a. In the `GGSCI_SOURCE` terminal, enter `view param extwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 15> view param
extwest
ERROR: PARAM file extwest does not exist.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 16>
```

   b. Enter `edit param extwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 16> edit param
extwest
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 17>
```

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c. Enter the following content in the file. You can copy from the `~/labs/lab/les04/extwest.txt` file.

```
Extract extwest
UserIdAlias oggadmin_root
TranlogOptions IntegratedParams (max_sga_size 256)
ExtTrail ./dirdat/ew
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
Table AMER.WEST.ACCOUNT;
Table AMER.WEST.ACCOUNT_TRANS;
Table AMER.WEST.BRANCH;
Table AMER.WEST.BRANCH_ATM;
Table AMER.WEST.TELLER;
Table AMER.WEST.TELLER_TRANS;
```

d. Save and close the editor.

e. Enter `view param extwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 17> view param
extwest
Extract extwest
UserIDAlias oggadmin_root
TranlogOptions IntegratedParams (max_sga_size 256)
ExtTrail ./dirdat/ew
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
Table AMER.WEST.ACCOUNT;
Table AMER.WEST.ACCOUNT_TRANS;
Table AMER.WEST.BRANCH;
Table AMER.WEST.BRANCH_ATM;
Table AMER.WEST.TELLER;
Table AMER.WEST.TELLER_TRANS;
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 18>
```

2. Log in to the database and register the integrated Extract.

a. In the `GGSCI_SOURCE` terminal, enter `DBLogin UserIDAlias oggadmin_root`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 18> DBLogin
UserIDAlias oggadmin_root
Successfully logged into database CDB$ROOT.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 19>
```

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b. Enter `Register Extract extwest database container (amer)`. Wait till the command is executed.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 19> Register
Extract extwest database container (amer)
2018-01-23 21:36:12  INFO    OGG-02003  Extract EXTWEST
successfully registered with database at SCN 6550137.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 20>
```

3. Create the Extract group.

a. In the `GGSCI_SOURCE` terminal, enter `DBLogin UserIDAlias oggadmin_amer`.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 20> DBLogin
UserIDAlias oggadmin_amer
Successfully logged into database AMER.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 21>
```

b. Enter `add extract extwest, integrated tranlog, begin now`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 21> add extract
extwest, integrated tranlog, begin now
EXTRACT (Integrated) added.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 22>
```

4. Create a local trail file `ew` and link it to the `extwest` Extract.

a. In the `GGSCI_SOURCE` terminal, enter `add exttrail ./dirdat/ew, extract extwest, megabytes 10`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 22> add
exttrail ./dirdat/ew, extract extwest, megabytes 10
EXTTRAIL added.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 23>
```

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5. View the `dirdat` directory to check if any files are created.
   a. Open a file browser and navigate to `/u01/ogg/oggsrc/dirdat`. Confirm that no files are created yet.

6. Create a secondary Extract parameter file `pwest` with the following parameters:

```
Extract pwest
UserIdAlias oggadmin_root
rmthost easthost, mgrport 7909
rmttrail ./dirdat/pe
Table AMER.WEST.*;
```

   a. In the `GGSCI_SOURCE` terminal, enter `edit param pwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 23> edit param pwest
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 24>
```

   b. Enter the following content in the file. You can copy from `~/labs/lab/les04/pwest.txt`.

```
Extract pwest
UserIdAlias oggadmin_root
rmthost easthost, mgrport 7909
rmttrail ./dirdat/pe
Table AMER.WEST.*;
```

   c. Save and close the editor.

7. Create the data pump group.
   a. In the `GGSCI_SOURCE` terminal, enter `add extract pwest, exttrailsource ./dirdat/ew`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 24> add extract
pwest, exttrailsource ./dirdat/ew
EXTRACT added.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 25>
```

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8. Create the remote Extract trail file.
   a. In the `GGSCI_SOURCE` terminal, enter `add rmttrail ./dirdat/pe, extract pwest, megabytes 10`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 25> add
rmttrail ./dirdat/pe, extract pwest, megabytes 10
RMTTRAIL added.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 26>
```

9. Start the two Extract processes `extwest` and `pwest`.
   a. In the `GGSCI_SOURCE` terminal, enter `start extwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 26> start extwest
Sending START request to MANAGER ...
EXTRACT EXTWEST starting
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 27>
```

   b. Enter `start pwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 27> start pwest
Sending START request to MANAGER ...
EXTRACT PWEST starting
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 28>
```

10. View the status of all processes. Both the processes should display Status as "`RUNNING`." If you see either "`STOPPED`" or "`ABENDED`," view the report log (`View Report <extract_name>`), fix the error, and restart the process.
   a. Enter `info all`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 28> info all
Program     Status      Group       Lag at Chkpt  Time Since
Chkpt
MANAGER     RUNNING
EXTRACT     RUNNING     EXTWEST     00:00:00      00:00:00
EXTRACT     RUNNING     PWEST       00:00:00      00:00:09
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 29>
```

   b. To view report for `extwest`, enter `view report extwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 29> view report
extwest
```

   c. To view report for `pwest`, enter `view report pwest`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 30> view report pwest
```

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11. Look in the source and target `./dirdat` directory and see if any local and remote trail files are created. Note that it may require some time before the trail files are written to disk.
    a. Open a file browser and navigate to `/u01/ogg/oggsrc/dirdat`.

    b. Navigate to `/u01/ogg/oggtrg/dirdat`.

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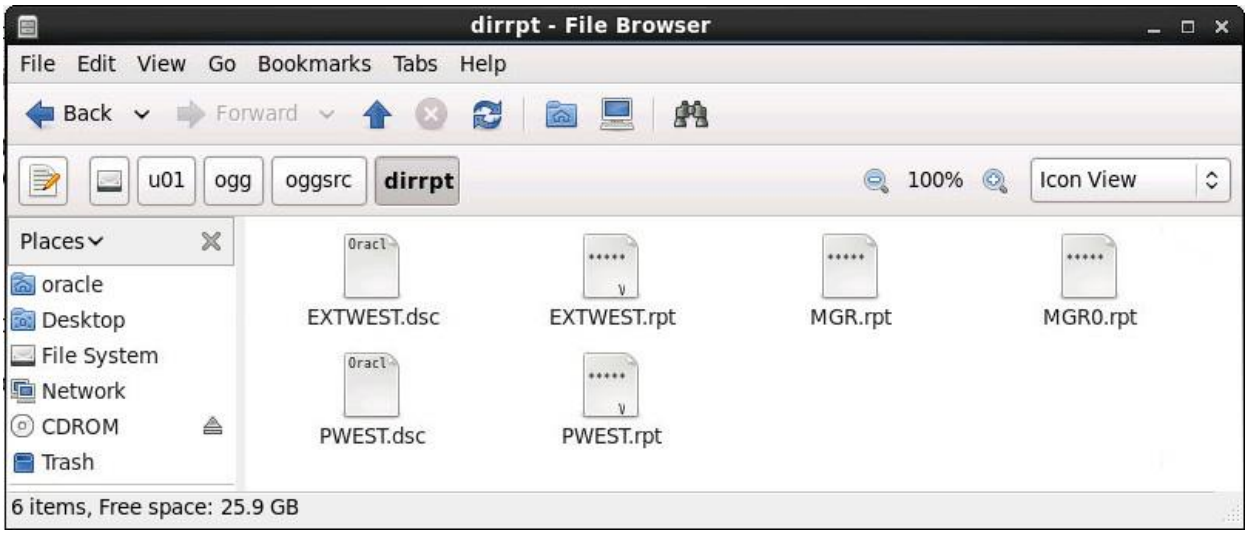
12. Also look in the source `./dirrpt` directory to see if any reports are created.

    a. Open a file browser and navigate to `/u01/ogg/oggsrc/dirrpt`.



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Practices for Lesson 5: Configuring Initial Load

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Practices for Lesson 5: Overview

Overview

In these practices, you set up the initial load of data by using two different methods: Bulk Load and File to Replicat.

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Practice 5-1: Configuring Initial Load by Using File to Replicat Method

In this practice, you configure initial load for two tables: Account and Branch.

Task

1. Create an Extract `eftor` by using the following parameters.

```
SourceIsTable
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTFILE ./dirdat/account.dat, purge
table amer.west.account;
RMTFILE ./dirdat/branch.dat, purge
table amer.west.branch;
```

2. Create a Replicat `lacct` for the account table by using the following parameters:

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
AssumeTargetDefs
ExtFile ./dirdat/account.dat
Map amer.west.account, target euro.east.account;
```

3. Create a Replicat `lbranch` for the branch table by using the following parameters:

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
AssumeTargetDefs
ExtFile ./dirdat/branch.dat
Map amer.west.branch, target euro.east.branch;
```

4. Run the extract process from the OS prompt.
5. View the remote trail file content.
6. Run the `lacct` replicat from the OS prompt.
7. Confirm that the data is replicated in the `Account` table.
8. Run the `lbranch` replicat from the OS prompt.
9. Confirm that the data is replicated in the `Branch` table.
10. Truncate the `Account` and `Branch` tables.

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Practice 5-2: Configuring Initial Load by Using Bulk Load Method

In this practice, you configure a bulk initial load from the source tables to the target tables.

Tasks

1. Create an Extract `eini` on the source by using the following parameters:

```
Extract eini
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTTASK replicat, GROUP rini
TABLE AMER.WEST.ACCOUNT;
TABLE AMER.WEST.ACCOUNT_TRANS;
TABLE AMER.WEST.BRANCH;
TABLE AMER.WEST.TELLER;
TABLE AMER.WEST.TELLER_TRANS;
TABLE AMER.WEST.BRANCH_ATM;
```

2. Create a Replicat `rini` on the target by using the following parameters.

```
REPLICAT rini
USERIDALIAS oggadmin_euro
BULKLOAD
MAP AMER.WEST.*, TARGET EURO.EAST.*;
```

3. Run the extract and confirm that the process worked successfully.

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Practice Solution 5-1: Configuring Initial Load by Using File to Replicat Method

In this practice solution, the steps to configure initial load for two tables, Account and Branch, are listed.

Task

1. Create an Extract `eftor` by using the following parameters:

```
SourceIsTable
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTFILE ./dirdat/account.dat, purge
table amer.west.account;
RMTFILE ./dirdat/branch.dat, purge
table amer.west.branch;
```

   a. In the `GGSCI_SOURCE` terminal, enter `edit params eftor`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 31> edit params eftor
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 32>
```

   b. Enter the following content in the file. You can copy from `~/labs/lab/les05/eftor`.

```
SourceIsTable
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTFILE ./dirdat/account.dat, purge
table amer.west.account;
RMTFILE ./dirdat/branch.dat, purge
table amer.west.branch;
```

   c. Save and close the editor.

   d. Enter `view params eftor`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 33> view params eftor

SourceIsTable
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTFILE ./dirdat/account.dat, purge
table amer.west.account;
RMTFILE ./dirdat/branch.dat, purge
table amer.west.branch;

GGSCI (hostname as c##OGG_Admin@orcl/AMER) 34>
```

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2. Create a Replicat `lacct` for the account table by using the following parameters:

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/account.dat
Map amer.west.account, target euro.east.account;
```

a. In the `GGSCI_TARGET` terminal, enter `edit params lacct`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 20> edit params lacct
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 21>
```

b. Enter the following content in the file. You can copy from `~/labs/lab/les05/lacct`.

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/account.dat
Map amer.west.account, target euro.east.account;
```

c. Save and close the editor.

d. Enter `view params lacct`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 21> view params lacct

SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/account.dat
Map amer.west.account, target euro.east.account;

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 22>
```

3. Create a Replicat `lbranch` for the `branch` table by using the following parameters:

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/branch.dat
Map amer.west.branch, target euro.east.branch;
```

a. In the `GGSCI_TARGET` terminal, enter `edit params lbranch`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 23> edit params
lbranch
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 24>
```

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b. Enter the following content in the file. You can copy from `~/labs/lab/les05/lbranch`.

```
SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/branch.dat
Map amer.west.branch, target euro.east.branch;
```

c. Save and close the editor.

d. Enter `view params lbranch`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 25> view params
lbranch

SpecialRun
End Runtime
UserIdAlias oggadmin_euro
ExtFile ./dirdat/branch.dat
Map amer.west.branch, target euro.east.branch;

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 26>
```

4. Run the extract process from the OS prompt.

a. In the untitled terminal, enter `oggsrc` at the OS prompt. (You might have to exit **sqlplus** if you are logged in.)

```
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@hostname Disk1]$ oggsrc
[oracle@hostname oggsrc]$
```

b. Enter `./extract paramfile dirprm/eftor.prm reportfile dirrpt/eftor.rpt`.

```
[oracle@hostname oggsrc]$ ./extract paramfile dirprm/eftor.prm
reportfile dirrpt/eftor.rpt
[oracle@hostname oggsrc]$
```

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c. To view the report, enter `more dirrpt/eftor.rpt`. The output below is edited for proper display.

```
[oracle@hostname oggsrc]$ more dirrpt/eftor.rpt
2018-01-24 01:21:37  INFO    OGG-01017  Wildcard resolution set
to IMMEDIATE bec
ause SOURCEISTABLE is used.

...
Output to ./dirdat/account.dat:

From Table AMER.WEST.ACCOUNT:
       #                   inserts:      1000
       #                   updates:         0
       #                   deletes:         0
       #                  discards:         0

Output to ./dirdat/branch.dat:

From Table AMER.WEST.BRANCH:
       #                   inserts:        40
       #                   updates:         0
       #                   deletes:         0
       #                  discards:         0


REDO Log Statistics
  Bytes parsed                    0
  Bytes output                84893

[oracle@hostname oggsrc]$
```

5. View the remote trail file content.

a. In the untitled terminal, enter `oggtrg`.

```
[oracle@hostname oggsrc]$ oggtrg
[oracle@hostname oggtrg]$
```

b. Enter `strings ./dirdat/account.dat`. The output below is edited.

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```
[oracle@hostname oggtrg]$ strings ./dirdat/account.dat | more
uri:hostname::u01:ogg:oggsrc:6
./dirdat/account.dat7
,.........................................
Linux1
hostname2
3.8.13-26.2.1.el6uek.x86_643
##2 SMP Fri Feb 21 12:07:53 PST 20144
x86_642
ORCL2
orcl3
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
PL/SQL Release 12.2.0.1.0 - Production
CORE 12.2.0.1.0 Production
TNS for Linux: Version 12.2.0.1.0 - Production
NLSRTL Version 12.2.0.1.0 - Production
12.2.0.1.09
GMT3
?Version 12.3.0.1.0
OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO4
AMER
AMER.US.ORACLE.COMZ
AMER.WEST.ACCOUNT
ACCOUNT_NUMBER
ACCOUNT_BALANCE@
452.86Z
5669.63Z
6894.66Z
4931.14Z
4732.5Z
8951.1Z
...

3207.17Z
1571.48Z
9908.84Z
4976.37Z
[oracle@hostname oggtrg]$
```

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6. Run the `lacct` replicat from the OS prompt.
   a. In the untitled terminal, enter `./replicat paramfile dirprm/lacct.prm reportfile dirrpt/lacct.rpt`.

```
[oracle@hostname oggtrg]$ ./replicat paramfile dirprm/lacct.prm
reportfile dirrpt/lacct.rpt
[oracle@hostname oggtrg]$
```

7. Confirm that the data is replicated in the `Account` table.
   a. In the `SQLPLUS_EAST@EURO` terminal, confirm that you are logged in to `sqlplus` as the `east` user and enter `select count(*) from account;`.

```
SQL> select count(*) from account;
  COUNT(*)
----------
      1000
SQL>
```

8. Run the `lbranch` replicat from the OS prompt.
   a. In the untitled terminal, enter `./replicat paramfile dirprm/lbranch.prm reportfile dirrpt/lbranch.rpt`.

```
[oracle@hostname oggtrg]$ ./replicat paramfile
dirprm/lbranch.prm reportfile dirrpt/lbranch.rpt
[oracle@hostname oggtrg]$
```

9. Confirm that the data is replicated in the `Branch` table.
   a. In the `SQLPLUS_EAST@EURO` terminal, confirm that you are logged in to `sqlplus` as the `east` user and enter `select count(*) from branch;`.

```
SQL> select count(*) from branch;
  COUNT(*)
----------
     40
SQL>
```

10. Truncate the `Account` and `Branch` tables.
    a. In the `SQLPLUS_EAST@EURO` terminal, enter `truncate table account;`.

```
SQL> truncate table account;
Table truncated.
SQL>
```

    b. In the `SQLPLUS_EAST@EURO` terminal, enter `truncate table branch;`.

```
SQL> truncate table branch;
Table truncated.
SQL>
```

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Practice Solution 5-2: Configuring Initial Load by Using Bulk Load Method

In this practice solution, the steps to configure a bulk initial load from the source tables to the target tables are listed.

Tasks

1. Create an Extract `eini` on the source by using the following parameters:

```
Extract eini
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTTASK replicat, GROUP rini
TABLE AMER.WEST.ACCOUNT;
TABLE AMER.WEST.ACCOUNT_TRANS;
TABLE AMER.WEST.BRANCH;
TABLE AMER.WEST.TELLER;
TABLE AMER.WEST.TELLER_TRANS;
TABLE AMER.WEST.BRANCH_ATM;
```

   a. In the `GGSCI_SOURCE` terminal, enter `Add Extract eini, SourceIsTable`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 34> Add Extract eini,
SourceIsTable
EXTRACT added.
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 35>
```

   b. Enter `edit params eini`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 35> Edit params eini
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 36>
```

   c. Enter the following content in the file. You can copy from `~/labs/lab/les05/eini`.

```
Extract eini
UserIdAlias oggadmin_root
RMTHOST easthost, MGRPORT 7909
RMTTASK replicat, GROUP rini
TABLE AMER.WEST.ACCOUNT;
TABLE AMER.WEST.ACCOUNT_TRANS;
TABLE AMER.WEST.BRANCH;
TABLE AMER.WEST.TELLER;
TABLE AMER.WEST.TELLER_TRANS;
TABLE AMER.WEST.BRANCH_ATM;
```

   d. Save the file and close the editor.

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2. Create a Replicat `rini` on the target by using the following parameters:

```
REPLICAT rini
USERIDALIAS oggadmin_euro
BULKLOAD
MAP AMER.WEST.*, TARGET EURO.EAST.*;
```

   a. In the `GGSCI_TARGET` terminal, enter `Add Replicat rini, SpecialRun`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 26> Add Replicat
rini, SpecialRun
REPLICAT added.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 27>
```

   b. Enter `edit params rini`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 27> edit params rini
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 28>
```

   c. Enter the following content in the file. You can copy from `~/labs/lab/les05/rini`.

```
REPLICAT rini
USERIDALIAS oggadmin_euro
BULKLOAD
MAP AMER.WEST.*, TARGET EURO.EAST.*;
```

   d. Save the file and close the editor.

3. Run the extract and confirm that the process worked successfully.

   a. In the `GGSCI_SOURCE` terminal, enter `start extract eini`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 36> start extract
eini
Sending START request to MANAGER ...
EXTRACT EINI starting
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 37>
```

   b. Enter `info extract eini`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 37> info extract eini
EXTRACT    EINI      Last Started 2018-01-24 08:35   Status
STOPPED
Checkpoint Lag       Not Available
Log Read Checkpoint  Table AMER.WEST.TELLER
                     2018-01-24 08:35:38  Record 800
Task                 SOURCEISTABLE
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 38>
```

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c. In the `SQLPLUS_EAST@EURO` terminal, enter `select count(*) from account;`.

```
SQL> select count(*) from account;
  COUNT(*)
----------
      1000
SQL>
```

d. In the `SQLPLUS_EAST@EURO` terminal, enter `select count(*) from branch;`.

```
SQL> select count(*) from branch;
  COUNT(*)
----------
     40
SQL>
```

e. In the `SQLPLUS_EAST@EURO` terminal, enter `select count(*) from teller;`.

```
SQL> select count(*) from teller;
  COUNT(*)
----------
       800
SQL>
```

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Practices for Lesson 6: Configuring Integrated Replicat

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Practices for Lesson 6: Overview

Overview

In these practices, you configure an integrated Replicat. You then run some scripts to generate activity in the database and test the replication process.

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Practice 6-1: Configuring Integrated Replicat

In this practice, you configure an integrated Replicat.

Tasks

1. Create `reast` Replicat.
   a. Create `reast` with the following parameters:

```
Replicat reast
UserIdAlias oggadmin_euro
DBOPTIONS Integratedparams(parallelism 6)
AssumeTargetDefs
DiscardFile ./dirrpt/rpdw.dsc, Purge
Map amer.west.*, target euro.east.*;
```

   b. Log in to database and add the Replicat.
   c. Start the Replicat.
   d. Confirm that the Replicat is running.

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Practice 6-2: Generating Activity and Testing Replication

In this practice, you generate some activity in the source database and verify the target database is updated.

Tasks

1. On the `GGSCI_SOURCE` tab, view the status of the `extwest` Extract and the `pwest` Data Pump Extract. Note the RBA numbers for both the Extracts.
2. On the `SQLPLUS_WEST@AMER` tab, from the `~/labs/lab/les06/` directory, run the transaction generator script. Note the before count for the `BRANCH` table.
3. Return to the `GGSCI_SOURCE` tab and verify the results.
4. On the `GGSCI_TARGET` tab, view the Replicat statistics. Note that the RBA in `EURO` is now pretty close to the RBA in `AMER`.
5. Check the records count for the `BRANCH` table in the source and target databases.
6. View statistics for the two `extwest` and `pwest` Extracts and the `reast` Replicat.

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Practice Solution 6-1: Configuring Integrated Replicat

In this practice solution, the steps to configure integrated Replicat are listed.

Tasks

1. Create `reast` Replicat with the following parameters:

```
Replicat reast
UserIdAlias oggadmin_euro
DBOPTIONS Integratedparams(parallelism 6)
AssumeTargetDefs
DiscardFile ./dirrpt/rpdw.dsc, Purge
Map amer.west.*, target euro.east.*;
```

   a. In the GGSCI_TARGET terminal, enter `edit param reast`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 28> edit param reast
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 29>
```

   b. Enter the following content in the file. You can copy from `~/labs/lab/les06/reast`.

```
Replicat reast
UserIdAlias oggadmin_euro
DBOPTIONS Integratedparams(parallelism 6)
AssumeTargetDefs
DiscardFile ./dirrpt/rpdw.dsc, Purge
Map amer.west.*, target euro.east.*;
```

   c. Save the file and close the editor.

2. Log in to database and add the Replicat.

   a. In the `GGSCI_TARGET` terminal, if you are not already connected to the database, enter `DBLogin UserIdAlias oggadmin_euro`.

   b. Enter `Add Replicat reast Integrated exttrail ./dirdat/pe`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 29> Add Replicat
reast Integrated exttrail ./dirdat/pe
REPLICAT (Integrated) added.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 30>
```

3. Start the Replicat.

   a. In the `GGSCI_TARGET` terminal, enter `start replicat reast`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 30> start replicat
reast
Sending START request to MANAGER ...
REPLICAT REAST starting
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 31>
```

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4. Confirm that the Replicat is running.
   a. In the `GGSCI_TARGET` terminal, enter `info all`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 31> info all
Program     Status      Group       Lag at Chkpt  Time Since
Chkpt
MANAGER     RUNNING
REPLICAT    RUNNING     REAST       00:00:00      00:00:05
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 32>
```

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Practice Solution 6-2: Generating Activity and Testing Replication

In this practice solution, the steps to generate some activity in the source database and verify the target database is updated are listed.

Tasks

1. On the `GGSCI_SOURCE` tab, view the status of the `extwest` Extract and the `pwest` Data Pump Extract. Note the RBA number.
   a. In the `GGSCI_SOURCE` tab, enter `info ER *`.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 38> info ER *
EXTRACT    EXTWEST   Last Started 2018-01-23 23:06   Status
RUNNING
Checkpoint Lag       00:00:00 (updated 00:00:01 ago)
Process ID           19848
Log Read Checkpoint  Oracle Integrated Redo Logs
                     2018-01-24 09:22:28
                     SCN 0.6774074 (6774074)
EXTRACT    PWEST     Last Started 2018-01-23 21:50   Status
RUNNING
Checkpoint Lag       00:00:00 (updated 00:00:01 ago)
Process ID           18806
Log Read Checkpoint  File /u01/ogg/oggsrc/dirdat/ew000000000
                     First Record  RBA 1391
```

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2. On the SQLPLUS_WEST@AMER tab, from the ~/labs/lab/les06/ directory, run the transaction generator script. Note the before count for the BRANCH table.

   a. In the SQLPLUS_WEST@AMER tab, run the script file.

```
[oracle@hostname Disk1]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 24 09:24:31
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Tue Jan 23 2018 18:47:24 +00:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> @/home/oracle/labs/lab/les06/trans_branch.sql

'THEBEFORECOUNTFORWEST.BRANCHIS'||COUNT(*)
-----------------------------------------------------------------
------------
The BEFORE count for west.branch is 40
1 row created.
1 row created.
1 row created.
1 row created.
Commit complete.
1 row updated.
1 row updated.
Commit complete.
1 row deleted.
0 rows deleted.
Commit complete.
SQL>
```

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3. Return to the `GGSCI_SOURCE` tab and view the Extract info again.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 39> !
info ER *

EXTRACT    EXTWEST   Last Started 2018-01-23 23:06   Status
RUNNING
Checkpoint Lag       00:00:00 (updated 00:00:00 ago)
Process ID           19848
Log Read Checkpoint  Oracle Integrated Redo Logs
                     2018-01-24 09:26:55
                     SCN 0.6774813 (6774813)
EXTRACT    PWEST     Last Started 2018-01-23 21:50   Status
ABENDED
Checkpoint Lag       00:00:00 (updated 00:01:08 ago)
Log Read Checkpoint  File /u01/ogg/oggsrc/dirdat/ew000000000
                     First Record  RBA 1907
```

4. On the `GGSCI_TARGET` tab, view the Replicat info. Note that the RBA in `EURO` is now pretty close to the RBA in `AMER`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 32> info ER *

REPLICAT   REAST     Last Started 2018-01-24 09:00   Status
RUNNING
INTEGRATED
Checkpoint Lag       00:00:00 (updated 00:00:04 ago)
Process ID           27599
Log Read Checkpoint  File /u01/ogg/oggtrg/dirdat/pe000000000
                     2018-01-24 10:17:36.000149  RBA 1967
```

5. Check the records count for the `BRANCH` table in the source and target databases.

   a. In the `SQLPLUS_WEST@AMER` tab, enter `select count(*) from branch;`.

```
SQL> select count(*) from branch;
  COUNT(*)
----------
     43
SQL>
```

   b. In the `SQLPLUS_EAST@EURO` tab, enter `select count(*) from branch;`.

```
SQL> select count(*) from branch;
  COUNT(*)
----------
     43
SQL>
```

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6. View statistics for the two `extwest` and `pwest` Extracts and the `reast` Replicat.

   a. In the `GGSCI_SOURCE` tab, enter `stats extwest.`

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 40> stats extwest
```

   b. In the `GGSCI_SOURCE` tab, enter `stats pwest.`

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 41> stats pwest
```

   c. In the `GGSCI_TARGET` tab, enter `stats reast.`

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 33> stats reast
```

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Practices for Lesson 7: Managing Extract Trail and Files

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Practices for Lesson 7: Overview

Practices Overview

In this practice, you use the `logdump` utility to look at records in an Oracle GoldenGate trail file.

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Practice 7-1: Using the `logdump` Utility

In this practice, you identify the file header record, identify the trail record and its header area, use the header and detail attributes when displaying a record, and use the `logdump` help feature.

Tasks

1. Invoke the `logdump` utility at the source database.
2. Issue the `help` command to display a list of all commands available in `logdump`.
3. In `logdump`, open a trail file.
4. Identify the file headers.
5. Turn on the `FILEHEADER ON` option and view the record again.
6. Scroll the record and review the detail on the trail, the machine being used, the Extract that produced the trail, the database information, and so on.
7. View the first next records.
8. Position back to **`RBA 0`** in the file, set the header and detail attributes to on, and view the same trail record again. Note the difference in the display from the output in the last step.
9. Exit `logdump`.
10. Restart `logdump`. What do you notice?

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Practice Solution 7-1: Using the `logdump` Utility

In this practice solution, the steps to identify the file header record, identify the trail record and its header area, use the header and detail attributes when displaying a record, and use the `logdump` help feature are listed.

Tasks

1. Invoke the `logdump` utility at the source database.
   a. In the `GGSCI_SOURCE` terminal, exit to the OS prompt.

```
GGSCI (hostname as c##OGG_Admin@orcl/AMER) 42> exit
[oracle@hostname oggsrc]$
```

   b. Enter `./logdump`.

```
[oracle@hostname oggsrc]$ ./logdump
Oracle GoldenGate Log File Dump Utility for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
Logdump 1 >
```

2. Issue the `help` command to display a list of all commands available in `logdump`.
   a. At the `Logdump` prompt, enter `help`. Note that similar to GGSCI, there is no good way to make `help` or any other command pause.

```
Logdump 1 >help
```

3. In `logdump`, open a trail file.
   a. At the `Logdump` prompt, enter `open dirdat/ew000000000`.

```
Logdump 2 >open dirdat/ew000000000
Current LogTrail is /u01/ogg/oggsrc/dirdat/ew000000000
Logdump 3 >
```

4. Identify the file headers.
   a. At the `Logdump` prompt, enter `n` to view the first n records that also contain the file header information.

```
Logdump 3 >n

2018/01/23 23:06:20.480.491 FileHeader          Len  1383 RBA 0
Name: *FileHeader*
 3000 02fe 3000 0008 4747 0d0a 544c 0a0d 3100 0002 |
0...0...GG..TL..1...
 0006 3200 0004 2000 0000 3300 0008 02f2 89ad 0d02 | ..2...
...3........
 f7eb 3400 0026 0024 7572 693a 6564 766d 7231 7030 |
..4..&.$uri:hostname
 3a3a 7530 313a 6f67 673a 6f67 6773 7263 3a45 5854 |
::u01:ogg:oggsrc:EXT
```

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```
 5745 5354 3600 0016 0014 2e2f 6469 7264 6174 2f65 |
WEST6....../dirdat/e
 7730 3030 3030 3030 3030 3700 0001 0338 0000 0400 |
w0000000007....8....
 0000 0039 ff00 0800 0000 0000 0000 003a 0000 8107 |
...9...........:....

Logdump 4 >
```

5. Turn on the `FILEHEADER ON` option and view the records again. Scroll the record and review the detail on the trail, the machine being used, the Extract that produced the trail, the database information, and so on.
   a. At the `Logdump` prompt, enter `fileheader on`.

```
Logdump 4 >fileheader on
Logdump 5 >
```

   b. Enter `pos 0`.

```
Logdump 5 >pos 0
Reading forward from RBA 0
Logdump 6 >
```

   c. Enter `n`. Scroll and review the details.

```
Logdump 6 >n

2018/01/23 23:06:20.480.491 FileHeader          Len  1383 RBA 0
Name: *FileHeader*
 3000 02fe 3000 0008 4747 0d0a 544c 0a0d 3100 0002 |
0...0...GG..TL..1...
 0006 3200 0004 2000 0000 3300 0008 02f2 89ad 0d02 | ..2...
...3........
 f7eb 3400 0026 0024 7572 693a 6564 766d 7231 7030 |
..4..&.$uri:hostname
 3a3a 7530 313a 6f67 673a 6f67 6773 7263 3a45 5854 |
::u01:ogg:oggsrc:EXT
 5745 5354 3600 0016 0014 2e2f 6469 7264 6174 2f65 |
WEST6....../dirdat/e
 7730 3030 3030 3030 3030 3700 0001 0338 0000 0400 |
w0000000007....8....
 0000 0039 ff00 0800 0000 0000 0000 003a 0000 8107 |
...9...........:....

GroupID x30 '0' TrailInfo        Info x00  Length  766
 3000 02fe 3000 0008 4747 0d0a 544c 0a0d 3100 0002 |
0...0...GG..TL..1...
 0006 3200 0004 2000 0000 3300 0008 02f2 89ad 0d02 | ..2...
...3........
```

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```
 f7eb 3400 0026 0024 7572 693a 6564 766d 7231 7030 |
..4..&.$uri:hostname
 3a3a 7530 313a 6f67 673a 6f67 6773 7263 3a45 5854 |
::u01:ogg:oggsrc:EXT
 5745 5354 3600 0016 0014 2e2f 6469 7264 6174 2f65 |
WEST6....../dirdat/e
 7730 3030 3030 3030 3030 3700 0001 0338 0000 0400 |
w0000000007....8....
 ...

GroupID x33 '3' ProducerInfo     Info x00  Length  118
 3300 0076 3000 0009 0007 4558 5457 4553 5431 0000 |
3..v0.....EXTWEST1..
 0200 0332 0000 0200 0c33 0000 0200 0334 0000 0200 |
...2.....3.....4....
 0035 0000 0200 0136 0000 0200 0037 0000 4100 3f56 |
.5.....6.....7..A.?V
 6572 7369 6f6e 2031 322e 332e 302e 312e 3020 4f47 | ersion
12.3.0.1.0 OG
 4743 4f52 455f 3132 2e33 2e30 2e31 2e30 5f50 4c41 |
GCORE_12.3.0.1.0_PLA
 5446 4f52 4d53 5f31 3730 3732 312e 3031 3534      |
TFORMS_170721.0154

GroupID x34 '4' ContinunityInfo  Info x00  Length    8
 3400 0008 3000 0004                               | 4...0...
Logdump 7 >
```

d. Enter `n` again.

```
Logdump 7 >n

2018/01/24 09:25:54.383.697 Metadata            Len 93 RBA 2782
Name: AMER
 3000 5900 0100 0200 0100 0200 3700 0100 0400 0000 |
0.Y.........7.......
 0000 0200 0400 0100 0000 0300 0200 0000 0400 0500 |
....................
 0300 474d 5405 0014 0010 0000 0014 1414 1414 1414 |
..GMT...............
 1414 1414 1411 1414 1403 0014 0012 0041 4d45 522e |
...............AMER.
 5553 2e4f 5241 434c 452e 434f 4d                  |
US.ORACLE.COM
Logdump 8 >
```

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6. Position back to **RBA 0** in the file, set the header and detail attributes to on, and view the same trail record again. Note the difference in the display from the output in the last step.

   a. At the `Logdump` prompt, enter `pos 0`.

```
Logdump 8 >pos 0
Reading forward from RBA 0
Logdump 9 >
```

   b. Enter `ghdr on`.

```
Logdump 9 >ghdr on
Logdump 10 >
```

   c. Enter `detail on`.

```
Logdump 10 >detail on
Logdump 11 >
```

   d. Enter `n`.

```
Logdump 11 >n

2018/01/23 23:06:20.480.491 FileHeader          Len  1383 RBA 0
Name: *FileHeader*
 3000 02fe 3000 0008 4747 0d0a 544c 0a0d 3100 0002 |
0...0...GG..TL..1...
 0006 3200 0004 2000 0000 3300 0008 02f2 89ad 0d02 | ..2...
...3.........
 f7eb 3400 0026 0024 7572 693a 6564 766d 7231 7030 |
..4..&.$uri:hostname
 3a3a 7530 313a 6f67 673a 6f67 6773 7263 3a45 5854 |
::u01:ogg:oggsrc:EXT
 5745 5354 3600 0016 0014 2e2f 6469 7264 6174 2f65 |
WEST6....../dirdat/e
 7730 3030 3030 3030 3030 3700 0001 0338 0000 0400 |
w0000000007....8....
 0000 0039 ff00 0800 0000 0000 0000 003a 0000 8107 |
...9...........:....

GroupID x30 '0' TrailInfo        Info x00  Length  766
 3000 02fe 3000 0008 4747 0d0a 544c 0a0d 3100 0002 |
0...0...GG..TL..1...
 0006 3200 0004 2000 0000 3300 0008 02f2 89ad 0d02 | ..2...
...3.........
 f7eb 3400 0026 0024 7572 693a 6564 766d 7231 7030 |
..4..&.$uri:hostname
 3a3a 7530 313a 6f67 673a 6f67 6773 7263 3a45 5854 |
::u01:ogg:oggsrc:EXT
 5745 5354 3600 0016 0014 2e2f 6469 7264 6174 2f65 |
WEST6....../dirdat/e
```

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```
...

GroupID x33 '3' ProducerInfo     Info x00  Length  118
 3300 0076 3000 0009 0007 4558 5457 4553 5431 0000 |
3..v0.....EXTWEST1..
 0200 0332 0000 0200 0c33 0000 0200 0334 0000 0200 |
...2.....3.....4....
 0035 0000 0200 0136 0000 0200 0037 0000 4100 3f56 |
.5.....6.....7..A.?V
 6572 7369 6f6e 2031 322e 332e 302e 312e 3020 4f47 | ersion
12.3.0.1.0 OG
 4743 4f52 455f 3132 2e33 2e30 2e31 2e30 5f50 4c41 |
GCORE_12.3.0.1.0_PLA
 5446 4f52 4d53 5f31 3730 3732 312e 3031 3534      |
TFORMS_170721.0154

GroupID x34 '4' ContinunityInfo  Info x00  Length    8
 3400 0008 3000 0004                               | 4...0...
Logdump 12 >
```

e. Enter `n`. Note the difference in the display from the output in the last step. The trail record header area and details on the columns have been added to the display.

```
Logdump 12 >n

_____________________________________________________________________
___
Hdr-Ind    :     E  (x45)     Partition  :     .  (x00)
UndoFlag   :     .  (x00)     BeforeAfter:     A  (x41)
RecLength  :    93  (x005d)   IO Time    : 2018/01/24
09:25:54.383.697
IOType     :   170  (xaa)     OrigNode   :     1  (x01)
TransInd   :     .  (x03)     FormatType :     R  (x52)
SyskeyLen  :     0  (x00)     Incomplete :     .  (x00)
DDR/TDR Idx:   (001, 000)     AuditPos   : 38937416
Continued  :     N  (x00)     RecCount   :     1  (x01)

2018/01/24 09:25:54.383.697 Metadata            Len 93 RBA 1391
Name: AMER
*
DDR Version: 1
Database type: ORACLE
Character set ID: UTF-8
National character set ID: UTF-16
Locale: neutral
```

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```
Case sensitivity: 14 14 14 14 14 14 14 14 14 14 14 14 11 14 14
14
TimeZone: GMT
Global name: AMER.US.ORACLE.COM
*
Logdump 13 >
```

7. Exit `logdump`.
   a. At the `Logdump` prompt, enter `exit`.

```
Logdump 13 >exit
[oracle@hostname oggsrc]$
```

8. Restart `logdump`. What do you notice?
   a. At the OS prompt for the `oggsrc` directory, enter `./logdump`.

```
[oracle@hostname oggsrc]$ ./logdump
Oracle GoldenGate Log File Dump Utility for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
Logdump 13 >
```

   b. Notice that the history and the last prompt number is preserved in `~/logdump.hst`, but the session information (for example, which trail file) is not preserved. That is, you can display the commands you ran in the last session to open a trail file, but the file is not currently opened. Prove this by entering `n`.

```
Logdump 13 >n
Error: Logtrail not opened
Logdump 14 >
```

   c. Exit `logdump` again.

```
Logdump 14 >exit
[oracle@hostname oggsrc]$
```

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Practices for Lesson 8: Parameters for Classic Architecture Configuration

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Practices for Lesson 8: Overview

Overview

In these practices, you modify the existing Manager and Extract processes by using more advanced parameters.

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Practice 8-1: Modifying Source Manager Parameters

In this practice, you modify the source Manager parameters file.

Tasks

1. Open the source Manager parameters file and:
   - Identify the parameter that makes Extract groups automatically start when the Manager process is started.
   - Identify the parameter that makes Extract groups automatically restart after abending. Manager should retry the operation three times, waiting one minute between each attempt.
2. Modify the source Manager parameters file to do the following:
   - Report the current lag for each Extract/Replicat group every hour to the application log file.
   - Write an informational message to the application log file if the lag for any Extract/Replicat group exceeds 30 minutes.
   - Write a critical message to the application log file if the lag for any Extract/Replicat group exceeds 45 minutes.
3. Activate the changes by bouncing (stopping, and starting, or restarting) the Manager process.
4. Verify that the Manager has restarted.

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Practice 8-2: Modifying the Target Manager Parameters

In this practice, you modify the target Manager parameters file.

Tasks

1. Modify the target Manager parameters file to do the following:
   - Report the current lag for each Extract/Replicat group every hour to the application log file.
   - Write an informational message to the application log file if the lag for any Extract/Replicat group exceeds 30 minutes.
   - Write a critical message to the application log file if the lag for any Extract/Replicat group exceeds 45 minutes.
2. Activate the changes by bouncing (stopping, and starting, or restarting) the Manager to have the changes take effect.
3. Verify that the Manager has started.

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Practice 8-3: Modifying the Extract Parameters

In this practice, you modify the `extwest` Extract parameters file.

Tasks

1. Modify the Extract parameters file to do the following:
   - Control whether or not statistics generated by the `REPORT` parameter are reset when a new process report is created.
   - Generate interim runtime statistics in a process report. Set this parameter to report at one minute after midnight daily.
   - Force report files to age on a regular schedule, instead of when a process starts. Set this report rollover parameter to occur at one minute after midnight daily.
   - Report a count of transaction records processed since startup. Set this report parameter to occur every 60 seconds and report the number of operations per second and the change in rate.
   - Write a message to the report file after processing every 1000 records.

2. Activate the changes by stopping, and starting, or restarting the Extract to have the changes take effect.
3. Verify that the Extract has started.

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Practice Solution 8-1: Modifying Source Manager Parameters

In this practice solution, the steps to modify the source Manager parameters file are listed.

Tasks

1. Open the source Manager parameters file and:
   - Identify the parameter that makes Extract groups automatically start when the Manager process is started.
   - Identify the parameter that makes Extract groups automatically restart after abending. Manager should retry the operation three times, waiting one minute between each attempt.

   a. In the `GGSCI_SOURCE` terminal, ensure `ggsci` is running.

```
[oracle@hostname oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:31:13
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1>
```

   b. Enter `view param mgr`.

```
GGSCI (hostname) 1> view param mgr
PORT 7809
DynamicPortList 20000-20099
PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2
Autostart Extract E*
Autorestart Extract *, WaitMinutes 1, Retries 3
GGSCI (hostname) 2>
```

   c. The line `Autostart Extract E*` makes Extract groups automatically start when the Manager process is started.

   d. The line `Autorestart Extract *, WaitMinutes 1, Retries 3` makes Extract groups automatically restart after abending. Manager should retry the operation three times, waiting one minute between each attempt.

2. Modify the source Manager parameters file to do the following:
   - Report the current lag for each Extract/Replicat group every hour to the application log file.
   - Write an informational message to the application log file if the lag for any Extract/Replicat group exceeds 30 minutes.

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- Write a critical message to the application log file if the lag for any Extract/Replicat group exceeds 45 minutes.

a. Set the editor to gedit (optional).

```
GGSCI (hostname) 2> set editor gedit
GGSCI (hostname) 3>
```

b. Enter `edit param mgr`.

```
GGSCI (hostname) 3> edit param mgr
GGSCI (hostname) 4>
```

c. In the `mgr` file, enter `LagReportHours 1` to report current lag.

d. Enter `LagInfoMinutes 30` to write an informational message.

e. Enter `LagCriticalMinutes 45` to write a critical message.

f. Save and close the file.

g. Enter `view param mgr`.

```
GGSCI (hostname) 4> view param mgr
PORT 7809
DynamicPortList 20000-20099
PurgeOldExtracts ./dirdat/*, UseCheckPoints, MinKeepHours 2
Autostart Extract E*
Autorestart Extract *, WaitMinutes 1, Retries 3
LagReportHours 1
LagInfoMinutes 30
LagCriticalMinutes 45
GGSCI (hostname) 5>
```

3. Activate the changes by bouncing (stopping, and starting, or restarting) the Manager process.

a. Enter `stop mgr`.

```
GGSCI (hostname) 5> stop mgr
Manager process is required by other GGS processes.
Are you sure you want to stop it (y/n)?y
Sending STOP request to MANAGER ...
Request processed.
Manager stopped.
GGSCI (hostname) 6>
```

b. Enter `start mgr`.

```
GGSCI (hostname) 6> start mgr
Manager started.
GGSCI (hostname) 7>
```

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4. Verify that the Manager has restarted.
   a. Enter `info mgr`.

```
GGSCI (hostname) 7> info mgr
Manager is running (IP port hostname.7809, Process ID 30971).
GGSCI (hostname) 8>
```

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Practice Solution 8-2: Modifying the Target Manager Parameters

In this practice solution, the steps to modify the target Manager parameters file are listed.

Tasks

1. Modify the target Manager parameters file to do the following:
   - Report the current lag for each Extract/Replicat group every hour to the application log file.
   - Write an informational message to the application log file if the lag for any Extract/Replicat group exceeds 30 minutes.
   - Write a critical message to the application log file if the lag for any Extract/ Replicat group exceeds 45 minutes.

   a. In the `GGSCI_TARGET` terminal, enter `edit param mgr`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 34> edit param mgr
```

   b. In the `mgr` file, enter `LagReportHours 1` to report current lag.

   c. Enter `LagInfoMinutes 30` to write an informational message.

   d. Enter `LagCriticalMinutes 45` to write a critical message.

   e. Save and close the file.

   f. Enter `view param mgr`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 35> view param mgr

PORT 7909
DynamicPortList 20100-20199
PurgeOldExtracts ./dirdat/pe*, UseCheckPoints, MinKeepHours 2
Autostart Replicat R*
Autorestart Replicat *, WaitMinutes 1, Retries 3
LagReportHours 1
LagInfoMinutes 30
LagCriticalMinutes 45

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 36>
```

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2. Activate the changes by bouncing (stopping, and starting, or restarting) the Manager to have the changes take effect.
   a. Enter `stop mgr`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 37> stop mgr
Manager process is required by other GGS processes.
Are you sure you want to stop it (y/n)?y
Sending STOP request to MANAGER ...
Request processed.
Manager stopped.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 37>
```

   b. Enter `start mgr`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 37> start mgr
Manager started.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 38>
```

3. Verify that the Manager has started.
   a. Enter `info mgr`.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 38> info mgr
Manager is running (IP port hostname.7909, Process ID 31105).
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 39>
```

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Practice Solution 8-3: Modifying the Extract Parameters

In this practice, you modify the `extwest` Extract parameters file.

Tasks

1. Modify the `extwest` Extract parameters file to do the following:
   - Control whether or not statistics generated by the `REPORT` parameter are reset when a new process report is created.
   - Generate interim runtime statistics in a process report. Set this parameter to report at one minute after midnight daily.
   - Force report files to age on a regular schedule, instead of when a process starts. Set this report rollover parameter to occur at one minute after midnight daily.
   - Report a count of transaction records processed since startup. Set this report parameter to occur every 60 seconds and report the number of operations per second and the change in rate.
   - Write a message to the report file after processing every 1000 records.

   a. In the `GGSCI_SOURCE` terminal, enter `edit param extwest`.

```
GGSCI (hostname) 8> edit param extwest
GGSCI (hostname) 9>
```

   b. After the `UPDATERECORDFORMAT COMPACT` parameter, enter `StatOptions ResetReportStats` to control whether or not statistics generated by the `REPORT` parameter are reset when a new process report is created.

   c. Enter `Report At 00:01` to generate interim runtime statistics in a process report.

   d. Enter `ReportRollover At 00:01` to force report files to age on a regular schedule.

   e. Enter `ReportCount Every 60 Seconds, Rate` to report a count of transaction records processed since startup.

   f. Enter `ReportCount Every 1000 Records` to write a message to the report file after processing every 1000 records.

   g. Save and close the file.

   h. Enter `view param extwest`.

```
GGSCI (hostname) 9> view param extwest
Extract extwest
UserIDAlias oggadmin_root
TranlogOptions IntegratedParams (max_sga_size 256)
ExtTrail ./dirdat/ew
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
StatOptions ResetReportStats
Report At 00:01
ReportRollover At 00:01
ReportCount Every 60 Seconds, Rate
```

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```
ReportCount Every 1000 Records
Table AMER.WEST.ACCOUNT;
Table AMER.WEST.ACCOUNT_TRANS;
Table AMER.WEST.BRANCH;
Table AMER.WEST.BRANCH_ATM;
Table AMER.WEST.TELLER;
Table AMER.WEST.TELLER_TRANS;
GGSCI (hostname) 10>
```

2. Activate the changes by stopping, and starting, or restarting the Extract to have the changes take effect.
   a. Enter `stop Extract extwest`.

```
GGSCI (hostname) 10> stop Extract extwest !
Sending FORCESTOP request to EXTRACT EXTWEST ...
Request processed.
GGSCI (hostname) 11>
```

   b. Enter `start Extract extwest`. The Extract should start automatically because you set the **`AUTORESTART`** parameter in the manager. If the Extract was, in fact, automatically started by the manager, the message "**`EXTRACT EXTWEST is already running`**." will display on your screen.

```
GGSCI (hostname) 11> start Extract extwest
Sending START request to MANAGER ...
EXTRACT EXTWEST starting
GGSCI (hostname) 12>
```

3. Verify that the Extract has started.
   a. Enter `info Extract extwest`.

```
GGSCI (hostname) 12> info Extract extwest
EXTRACT    EXTWEST   Last Started 2018-01-24 14:07   Status
RUNNING
Checkpoint Lag       00:00:00 (updated 00:00:04 ago)
Process ID           31437
Log Read Checkpoint  Oracle Integrated Redo Logs
                     2018-01-24 14:07:07
                     SCN 0.6818060 (6818060)
GGSCI (hostname) 13>
```

Note: In your environment, dates and SCN will be different, reflecting your Extract and database status.

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Practices for Lesson 9: Data Selection and Filtering

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Practices for Lesson 9: Data Selection and Filtering

Practices Overview

In these practices, you will configure filters to exclude rows that are matched by the filters; then you will map columns that are named differently in the source and in the target, and finally you will trigger the execution of a stored procedure from the Replicat process running on the target side of replication.

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Practice 9-1: Configuring Filters in Extract and Replicat Groups

Overview

In this practice, you configure two filters, one in the Extract and one in the Replicat. You then insert data in the table being filtered, making sure that the filters excluded those rows that were matching the filters.

Tasks

1. Stop and delete the currently defined Extract and Replicat groups.
   - You can run the **`reset.sh`** script in **`/home/oracle/labs/lab/les09,`** which will stop and delete Extract, pump, and Replicat groups for you. If you use the script, you can skip the tasks below and resume from task 2. Alternatively, you can manually run **`GGSCI`** in both source and target environments and stop and delete the Extract/Replicat groups. Open a new terminal shell window by clicking the terminal icon ( ) located in the panel at the top of your graphical desktop. Enter **`oggsrc`** (the alias that will change directory to the source Oracle GoldenGate instance). Launch **`GGSCI`**, log in to the AMER database by using the wallet alias, and stop all Extract groups. The exclamation point (!) requests **`GGSCI`** to force stop the processes.

   Note: The reset.sh may not delete all groups. Verify they have been deleted and delete them manually if needed.

```
[oracle@ hostname ~]$ oggsrc
[oracle@ hostname oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1> dblogin useridalias oggadmin_root
Successfully logged into database CDB$ROOT.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2> stop er * !

Sending FORCESTOP request to EXTRACT EXTWEST ...
Request processed.
Sending FORCESTOP request to EXTRACT PWEST ...
Request processed.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 3>
```

   - Delete all Extract groups, again using the exclamation mark to force the command.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 3> delete er * !
Deleted EXTRACT EINI.
Deleted EXTRACT EXTWEST.
```

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```
Deleted EXTRACT PWEST.
```

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- Unregister the **EXTWEST** Extract from the database.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 4> unregister
extract extwest database
2018-02-07 22:25:38  INFO    OGG-01750  Successfully
unregistered EXTRACT EXTWEST from database.
```

- The `info all` command should show only the manager running.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 4> info all
Program     Status      Group       Lag at Chkpt  Time Since
Chkpt
MANAGER     RUNNING
```

- Leave the terminal shell open and repeat the same steps for the target instance. Open a new terminal shell window by clicking the terminal icon ( ) located in the panel at the top of your graphical desktop. Enter **oggtrg** (the alias that will change directory to the target Oracle GoldenGate instance). Launch **GGSCI**, log in to the EURO database by using the wallet alias, and stop all Replicat groups. The exclamation point (!) requests **GGSCI** to force stop the processes.

```
[oracle@hostname ~]$ oggtrg
[oracle@hostname oggtrg]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
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GGSCI (hostname) 1> dblogin useridalias oggadmin_euro
Successfully logged into database EURO.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 2> stop er * !

Sending FORCESTOP request to REPLICAT REAST ...
Request processed.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 3>
```

- Delete all Replicat groups, again using the exclamation mark to force the command.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 3> delete er * !
2018-02-07 23:00:33  INFO    OGG-02529  Successfully
unregistered REPLICAT REAST inbound server OGG$REAST from
database.
Deleted REPLICAT REAST.
Deleted REPLICAT RINI.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4>
```

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2. Create a replication loop that implements one filter on the capture side and one filter on the apply side.

   a. In the terminal shell window running on the source **GGSCI** (**c##OGG_Admin@orcl/CDB$ROOT**), create the **ESTRM** Extract.

   GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 5> **edit param estrm**

```
Extract estrm
ExtTrail ./dirdat/es
UserIdAlias oggadmin_root
LOGALLSUPCOLS
TRANLOGOPTIONS INTEGRATEDPARAMS (MAX_SGA_SIZE 128)
UPDATERECORDFORMAT COMPACT
SOURCECATALOG AMER
Table west.account, FILTER (account_balance > 20000);
```

Note: Using the **SOURCECATALOG** parameter instructs **GGSCI** to use the **PDB AMER**. The **TABLE** parameter needs only to specify the schema (**WEST**) and the object (**ACCOUNT**), leaving out the **PDB**. The **WHERE** clause for the **TABLE** command specifies to replicate only those accounts whose **ACCOUNT_BALANCE** is greater than $ 20,000.

   b. Register the **ESTRM** Extract with the database.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 6> REGISTER
EXTRACT estrm DATABASE CONTAINER (AMER)

2018-02-08 20:06:31  INFO    OGG-02003  Extract ESTRM
successfully registered with database at SCN 12327431.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 7>
```

Note: In your environment, the SCN will be different.

   c. Add the Extract and its corresponding trail file.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 7> add extract
estrm, integrated tranlog, begin now
EXTRACT (Integrated) added.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 8> add exttrail
./dirdat/es, Extract estrm, megabytes 10
```

   d. Edit the parameter file for the PSTRM Data Pump Extract:

   GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9> **edit param pstrm**

```
Extract pstrm
RmtHost easthost, Mgrport 7909, Compress
RmtTrail ./dirdat/rs
Passthru
Table amer.west.account;
```

Note: Very simple Data Pump Extract. In pass-through mode (configured by **PASSTHRU**), the Extract process does not look up table definitions from the database or from a data-definitions file.

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e. Save the parameter file and add the Data Pump, connecting it to the `./dirdat/es` trail file.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 10> add extract
pstrm, exttrailsource ./dirdat/es
EXTRACT added.
```

f. Add the remote trail file and start the Extract and the Data Pump.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 11> add rmttrail
./dirdat/rs, extract pstrm, megabytes 10
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 12> start er *
Sending START request to MANAGER ...
EXTRACT ESTRM starting
Sending START request to MANAGER ...
EXTRACT PSTRM starting
```

g. Select the terminal shell window where GGSCI is connected to the target instance (**c##OGG_Admin@orcl/EURO**). Edit the parameter file for the **RSTRM** Replicat.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4> edit param rstrm
```

```
Replicat rstrm
DiscardFile ./dirrpt/rstrm.dsc, Purge
UserIDAlias oggadmin_euro
Map amer.west.account, target euro.east.account, FILTER
(ACCOUNT_NUMBER > 2000);
```

Note: Simple Replicat. The **FILTER** command instructs the Replicat process to disregard rows that contain an **ACCOUNT_NUMBER** column whose value is less than 2,000.

h. Save the parameter file and add the Replicat, connecting it to the `./dirdat/rs` trail file.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 5> add replicat
rstrm, Integrated exttrail ./dirdat/rs
REPLICAT (Integrated) added.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 6>
```

i. Start the `RSTRM` Replicat group and check the status of running processes.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 6> start rstrm
REPLICAT RSTRM starting
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 7> info all
Program     Status      Group       Lag at Chkpt  Time Since
Chkpt
MANAGER     RUNNING
REPLICAT    RUNNING     RSTRM       00:00:00      00:00:07
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 8>
```

3. Check the combined action of Extract plus Replicat filters. The Extract filter will allow replication for rows that carry an **ACCOUNT_BALANCE** greater than $ 20,000. The Replicat filter will store into the target database only those rows that carry an **ACCOUNT_NUMBER** greater than 2,000.

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a. Open a new terminal shell window by clicking the terminal icon ( ) located in the panel at the top of your graphical desktop. Launch **sqlplus** connecting to the **WEST** user in the **AMER** database. Insert a row into the **ACCOUNT** table that is not filtered out by the filter criteria, a row where **ACCOUNT_NUMBER** is greater than 2,000 and **ACCOUNT_BALANCE** is greater than 20,000.

```
[oracle@hostname ~]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Thu Feb 8 23:45:47
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Thu Feb 08 2018 22:56:00 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> insert into account (account_number,account_balance) values
(2100,22000);
1 row created.
SQL> commit;
Commit complete.
```

b. Select the terminal window where **GGSCI** is connected to the replication source environment and enter the "**stats estrm**" command to see if the insert has been recorded by the **ESTRM** Extract.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 13> stats estrm
Sending STATS request to EXTRACT ESTRM ...
Start of Statistics at 2018-02-08 23:53:22.
Output to ./dirdat/es:
Extracting from AMER.WEST.ACCOUNT to AMER.WEST.ACCOUNT:

*** Total statistics since 2018-02-08 23:50:14 ***
    Total inserts                                 1.00
    Total updates                                 0.00
    Total deletes                                 0.00
    Total discards                                0.00
    Total operations                              1.00
.. Many Lines omitted..
```

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c. Do the same for the **GGSCI** window connected to the replication target environment. Enter the "**stats rstrm**" command to see if the insert has been recorded by the **RSTRM** Replicat.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 8> stats rstrm

Sending STATS request to REPLICAT RSTRM ...
Start of Statistics at 2018-02-08 23:59:10.
Integrated Replicat Statistics:

    Total transactions                                  1.00
    Redirected                                          0.00
    Replicated procedures                               0.00
    DDL operations                                      0.00
    Stored procedures                                   0.00
    Datatype functionality                              0.00
    Event actions                                       0.00
    Direct transactions ratio                           0.00%

Replicating from AMER.WEST.ACCOUNT to EURO.EAST.ACCOUNT:

*** Total statistics since 2018-02-08 23:45:33 ***
    Total inserts                                 1.00
    Total updates                                 0.00
    Total deletes                                 0.00
    Total discards                                0.00
    Total operations                              1.00
.. Many Lines omitted..
```

d. Now, insert a row that will pass the Extract filter but will be rejected by the Replicat filter and check the statistics for both Extract and Replicat. So insert a row that contains an account balance greater than $ 20,000 but an account number less than 2,000 (which will be rejected by the Replicat). Select the terminal shell window where `sqlplus` is running connected to the `AMER.WEST` schema and insert the row.

```
SQL> insert into account (account_number,account_balance) values
(1100,22000);
1 row created.
SQL> commit;
Commit complete.
```

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e. Check the stats for the replication source. Select the terminal shell window where **GGSCI** runs connected as **c##OGG_Admin@orcl/CDB$ROOT** and enter the "**stats estrm**" command. You should see that the insert count has been incremented.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 14> stats estrm
Sending STATS request to EXTRACT ESTRM ...
Start of Statistics at 2018-02-09 00:06:21.
Output to ./dirdat/es:
Extracting from AMER.WEST.ACCOUNT to AMER.WEST.ACCOUNT:

*** Total statistics since 2018-02-08 23:50:14 ***
    Total inserts                                2.00
    Total updates                                0.00
    Total deletes                                0.00
    Total discards                               0.00
    Total operations                             2.00
*** Daily statistics since 2018-02-09 00:00:00 ***
    Total inserts                                1.00
    Total updates                                0.00
    Total deletes                                0.00
    Total discards                               0.00
    Total operations                             1.00
.. Many Lines omitted..
```

f. Check the stats for the replication target. There should not be an increment in the insert count, as the row was discarded by the Replicat filter. Select the terminal shell window where **GGSCI** runs connected to the replication target and enter "**stats rstrm.**"

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 9> stats rstrm
Sending STATS request to REPLICAT RSTRM ...
Start of Statistics at 2018-02-09 00:13:10.
Integrated Replicat Statistics:
     Total transactions                                    1.00
     Redirected                                            0.00
     Replicated procedures                                 0.00
     DDL operations                                        0.00
     Stored procedures                                     0.00
     Datatype functionality                                0.00
     Event actions                                         0.00
     Direct transactions ratio                             0.00%
Replicating from AMER.WEST.ACCOUNT to EURO.EAST.ACCOUNT:
*** Total statistics since 2018-02-08 23:45:33 ***
     Total inserts                                   1.00
     Total updates                                   0.00
.. Many Lines omitted..
```

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g. Continue inserting rows at will to check how the filters allow rows to be replicated or discarded. Only rows that are not filtered by both criteria will replicate.

This last step concludes practice 9-1. Continue with practice 9-2.

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Practice 9-2: Mapping Different Column and Table Names Between Source and Target

Overview

In this practice, you create two tables, one in the source database (`AMER.WEST`) and a similar one (but with naming differences) in the target database (`EURO.EAST`). You then use the Oracle GoldenGate facilities to ensure replication between the two objects mapping different table and column names.

Preliminary Tasks

In the source environment, create a **`CUSTOMER`** table with the columns listed below:

```
Name                           Null?    Type
------------------------------ -------- ----------------------------
 C_CUST_ID                     NOT NULL NUMBER(12)
 C_NAME                        NOT NULL VARCHAR2(50)
 C_MIDDLE_NAME                          VARCHAR2(50)
 C_FAMILY_NAME                 NOT NULL VARCHAR2(50)
 C_FULL_NAME                   NOT NULL VARCHAR2(255)
 C_DOB                         NOT NULL DATE
 C_NATIONALITY                 NOT NULL VARCHAR2(50)
 C_EMAIL                                VARCHAR2(255)
```

In the target environment, create a **`CUSTMER`** table (notice the missing o in the table name) with the columns listed below:

```
Name                           Null?    Type
------------------------------ -------- ----------------------------
 CUST_ID                       NOT NULL NUMBER(12)
 NAME                          NOT NULL VARCHAR2(50)
 MIDDLE_NAME                            VARCHAR2(50)
 SURNAME                       NOT NULL VARCHAR2(50)
 FULL_NAME                     NOT NULL VARCHAR2(255)
 DATE_OF_BIRTH                 NOT NULL DATE
 NATIONALITY                   NOT NULL VARCHAR2(50)
 EMAIL                                 VARCHAR2(255)
```

In the **`/home/oracle/labs/lab/les09`** folder, you find the **`src_customer.sql`** and **`trg_customer.sql`** files, which create the source and the target tables.

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Tasks

1. Create the **CUSTOMER** table in **AMER.WEST** and the **CUSTMER** table in **EURO.EAST**.

   a. Reuse a terminal shell window left open from the previous practice. Exit from either **sqlplus** or **GGSCI** and change directory to `/home/oracle/labs/lab/les09`. Launch **sqlplus** connecting as **WEST@AMER** and run the **src_customer.sql** script. Exit **sqlplus**.

```
[oracle@hostname ~]$ cd /home/oracle/labs/lab/les09
[oracle@hostname les09]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 11:59:05
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Sat Feb 10 2018 11:25:57 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> @src_customer
Table created.
Index created.
Table altered.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@hostname les09]$
```

   b. Launch **sqlplus** again, this time connecting as **EAST@EURO**, and run the **trg_customer.sql** script. Exit `sqlplus`.

```
[oracle@hostname les09]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 12:10:50
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Sat Feb 10 2018 11:27:04 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> @trg_customer
Table created.
Index created.
Table altered.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@eg18009 les09]$
```

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2. Stop and delete currently running Extract and Replicat groups.
   a. Reuse an open terminal shell window, exit from either **sqlplus** or **GGSCI,** and enter **oggsrc** to change directory to the source Oracle Goldengate instance. Use the "**dblogin** " command to log in to the Oracle replication source and enter the "**stop er * !**" command followed by "**delete er ***!" to stop and delete old Extract groups. Unregister the **ESTRM** Extract group.

```
[oracle@eg18009 ~]$ oggsrc
[oracle@eg18009 oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1> dblogin useridalias oggadmin_root
Successfully logged into database CDB$ROOT.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2> stop er * !
..Omitted Lines..
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 3> delete er * !
..Omitted Lines..
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 4> unregister
extract estrm database

2018-02-10 12:21:59  INFO    OGG-01750  Successfully
unregistered EXTRACT ESTRM from database.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 4>
```

   b. Leave the **GGSCI** session open. Reuse an open terminal shell window, exit from either **sqlplus** or **GGSCI,** and enter **oggtrg** to change directory to the target Oracle Goldengate instance. Use the "**dblogin** " command to log in to the Oracle replication source and enter the "**stop er * !**" command followed by "**delete er ***!" to stop and delete old Replicat groups.

```
[oracle@eg18009 ~]$ oggtrg
[oracle@eg18009 oggtrg]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates.
GGSCI (hostname) 1> dblogin useridalias oggadmin_euro
Successfully logged into database EURO.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 2>
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 2> stop er * !
```

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```
Sending FORCESTOP request to REPLICAT RSTRM ...
Request processed.

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 3> delete er * !
2018-02-10 12:40:50  INFO    OGG-02529  Successfully
unregistered REPLICAT RSTRM inbound server OGG$RSTRM from
database.
Deleted REPLICAT RSTRM.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4>
```

c. Leave the **GGSCI** session open.

3. Create primary and data pump Extract processes that will carry out the mapping. Since the transformations occur on the client side, you must use the `DEFGEN` utility to create a target definition file containing all the information necessary to the source side of replication to perform the required mapping. The data pump Extract will perform the mapping task. Note that the data pump transforms the source table into the target table and transmits to the Replicat an already transformed version of the `CUSTOMER` table in `CUSTMER`. The Replicat process will map `euro.east.custmer` from the source side into `euro.east.custmer` on the target side. This passage can be counterintuitive, as all Replicat processes you have encountered so far were mapping `AMER.WEST` objects into `EURO.EAST` objects.

   a. Select the terminal shell window where **GGSCI** runs connected as **c##OGG_Admin@orcl/CDB$ROOT**. Create the parameter file for the EMAP Extract and exit the editor, saving the parameter file. This is a simple Extract process that only replicates the **CUSTOMER** table. Register the Extract with the database and add the Extract to **GGSCI**. Add the exttrail.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 4> edit param
emap
```

```
Extract emap
UserIdAlias  oggadmin_root
LOGALLSUPCOLS
TRANLOGOPTIONS INTEGRATEDPARAMS (MAX_SGA_SIZE 128)
UPDATERECORDFORMAT COMPACT
Exttrail ./dirdat/mp
SOURCECATALOG AMER
Table west.customer;
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 5> REGISTER
EXTRACT emap DATABASE CONTAINER (AMER)
2018-02-10 11:12:47  INFO    OGG-02003  Extract EMAP
successfully registered with database at SCN 12992745.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 7> add extract
emap, integrated tranlog, begin now
EXTRACT (Integrated) added.
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 8> add exttrail
./dirdat/mp, extract emap, megabytes 10
```

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```
EXTTRAIL added.

GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9>
```

b. Create a `defgen` parameter that will be run through the `defgen` utility to create the mapping file `./dirdef/usr_tgt.def`. This parameter file instructs **DEFGEN** on what to reverse-engineer from the target database. Leave the editor, saving the **DEFGEN** parameters.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9> edit param defgen
```

```
defsfile ./dirdef/usr_tgt.def, purge
UserIdAlias  oggadmin_euro
SOURCECATALOG EURO
Table east.custmer;
```

c. Open a new terminal shell window and enter the alias `oggsrc` to change directory to the source Oracle GoldenGate instance. Run the `DEFGEN` utility from the OS prompt, passing as a parameter the `defgen.prm` parameter file.

```
[oracle@eg18009 ~]$ oggsrc
[oracle@eg18009 oggsrc]$ ./defgen paramfile ./dirprm/defgen.prm
```

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```
***********************************************************************
        Oracle GoldenGate Table Definition Generator for Oracle
      Version 12.3.0.1.2
OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005
   Linux, x64, 64bit (optimized), Oracle 12c on Dec  8 2017
09:21:49
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
                    Starting at 2018-02-10 13:17:54
***********************************************************************
*
Operating System Version:
Linux
Version #2 SMP Thu Jan 18 11:31:28 PST 2018, Release 4.1.12-
112.14.13.el6uek.x86_64
Node: eg18009.us.oracle.com
Machine: x86_64
                         soft limit   hard limit
Address Space Size   :    unlimited    unlimited
Heap Size            :    unlimited    unlimited
File Size            :    unlimited    unlimited
CPU Time             :    unlimited    unlimited

Process id: 5059
***********************************************************************
*
**            Running with the following parameters
**
***********************************************************************
*
defsfile ./dirdef/usr_tgt.def, purge
UserIdAlias  oggadmin_euro
SOURCECATALOG EURO
Table east.custmer;
Default source catalog name EURO will be used for table
specification east.custmer.
Retrieving definition for EURO.EAST.CUSTMER.
Definitions generated for 1 table in ./dirdef/usr_tgt.def.
```

d. If you are curious, display the content of the generated file on your screen, entering the cat **./dirdat/usr_tgt.def** command. This file will be read by the data pump Extract to perform the mapping between source and target tables.

e. Select the window where GGSCI runs connected to the source Oracle Goldengate instance. Edit the parameter file for the **PMAP** data pump Extract. This is where the mapping magic occurs. Pay attention to the **COLMATCH** and **COLMAP** keywords.

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```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9> edit param
pmap
```

```
Extract pmap
RmtHost easthost, Mgrport 7909, Compress
RmtTrail ./dirdat/vv
TargetDefs ./dirdef/usr_tgt.def
UserIdAlias oggadmin_root
COLMATCH PREFIX C_
Map amer.west.customer, target euro.east.custmer, COLMAP
(USEDEFAULTS, SURNAME = C_FAMILY_NAME, DATE_OF_BIRTH = C_DOB);
```

Note: With **COLMATCH**, you can map between tables that are similar in structure but have different column names for the same sets of data. **COLMATCH** provides a more convenient way to map columns of this type than does using a **COLMAP** clause in individual **TABLE** or **MAP** statements. In your case, the generic **COLMATCH** command forces the mapping of tables that are prefixed by **C_** to corresponding tables without prefix. The **COLMAP** statement in the parameter file is specific to the **C_FAMILY_NAME** and **C_DOB** columns defined in the **CUSTOMER** table.

f. Save the parameter file for the PMAP Extract and leave the editor. Add the data pump Extract. Add the RMTTRAIL for that data pump.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 10> add extract
pmap, exttrailsource ./dirdat/mp
EXTRACT added.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 11> add rmttrail
./dirdat/vv, extract pmap, megabytes 10
RMTTRAIL added.
```

g. Start both Extract groups by using the "`start er *`" command. Enter "`info all`" to assess the situation.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 11> start er *

Sending START request to MANAGER ...
EXTRACT EMAP starting
Sending START request to MANAGER ...
EXTRACT PMAP starting

GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 16> info all

Program     Status      Group       Lag at Chkpt  Time Since
Chkpt

MANAGER     RUNNING
EXTRACT     RUNNING     EMAP        00:00:00      01:04:49
EXTRACT     RUNNING     PMAP        00:00:00      00:32:24
```

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4. Create the Replicat process, start the Replicat, and simulate some database activity to verify that the configured mapping works.

   a. Select the window where GGSCI is running connected to the target replication environment (**c##OGG_Admin@orcl/EURO**). Configure the **RMAP** Replicat. Note the **MAP** statement, which refers to an already mapped version of the **AMER.WEST** CUSTOMER table into **EURO.EAST.CUSTMER**. That mapping occurred in the data pump Extract. Save the parameter file for **RMAP** and add the integrated Replicat. Start the Replicat group and check its status by using "**info all**."

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4> edit param rmap
```

```
Replicat rmap
Discardfile ./dirrpt/rmap.dsc, purge
UserIdAlias oggadmin_euro
Map euro.east.custmer, Target euro.east.custmer;
```

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4> add replicat rmap,
integrated exttrail ./dirdat/vv
REPLICAT (Integrated) added.
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 5> start rmap

Sending START request to MANAGER ...
REPLICAT RMAP starting

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 33> info all
Program     Status      Group       Lag at Chkpt  Time Since

MANAGER     RUNNING
REPLICAT    RUNNING     RMAP        00:00:00      00:00:53
```

   b. Select a terminal shell window where **sqlplus** is connected to **AMER.WEST**. The **/home/oracle/labs/lab/les09** folder contains a **customer.sql** file that inserts 99 rows into the **CUSTOMER** table. Execute that script to generate database activity on the **CUSTOMER** table.

```
SQL> show user
USER is "WEST"
SQL> @/home/oracle/labs/lab/les09/customer.sql

1 row created.
..Many Omitted Lines..
1 row created.
Commit complete.
SQL>
```

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c. Check the row in the source database where **C_CUST_ID** is equal to 2. In particular, select the **C_FAMILY_NAME** and **C_DOB** columns.

```
SQL> select c_family_name, c_dob from customer where
c_cust_id=2;
C_FAMILY_NAME                            C_DOB
---------------------------------------- ---------
Boyer                                    07-JUL-50
SQL>
```

d. Select the window where **sqlplus** is connected to **EURO.EAST**. Check the same row in the replicated environment. *Mutatis mutandis*, the column names are now SURNAME and DATE_BIRTH, but they carry the same values, thanks to the mapping performed by Oracle GoldenGate.

```
SQL> show user
USER is "EAST"
SQL> select surname,date_of_birth from custmer where cust_id =
2;

SURNAME                              DATE_OF_B
---------------------------------- ---------
Boyer                                07-JUL-50
```

This last step concludes practice 9-2. Continue on with practice 9-3.

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Practice 9-3: Invoking Stored Procedures from Replicat Processes

Overview

In this practice, you use `SQLEXEC` as a stand-alone statement at the root level of a parameter file to execute an SQL-stored procedure or query.

As a stand-alone statement, `SQLEXEC` executes independently of a `TABLE` or `MAP` statement during Oracle GoldenGate processing. Stand-alone `SQLEXEC` can therefore be used to invoke a stored procedure (or to execute a query), which performs, for instance, preliminary steps to prepare the target database for the incoming replicated rows. In this practice, you use `SQLEXEC` to lift the primary key constraint of a target table so that you can replicate duplicates without incurring the duplicate key error given by the constraint violation..

Preliminary tasks

You must create the `COUNTRY` table in both source and target environments and upload a stored procedure on the target environment.

Tasks

1. Create the necessary objects in both source and target databases.
   a. Open or reuse a terminal shell window. Change directory to **/home/oracle/labs/lab/les09** and launch **sqlplus** connecting to the **AMER.WEST** database. Execute the `country.sql` script that creates the **COUNTRY** table. Exit **sqlplus**.

```
[oracle@eg18009 ~]$ cd /home/oracle/labs/lab/les09
[oracle@eg18009 les09]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 16:05:23
Copyright (c) 1982, 2016, Oracle.  All rights reserved.

Enter password: ********
Last Successful login time: Sat Feb 10 2018 16:04:17 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> @country.sql
Table created.
Table altered.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@eg18009 ~]$
```

   b. Launch **sqlplus** connecting to the **EURO.EAST** database. Execute the **country.sql** script that creates the **COUNTRY** table and the **constraints_disable.sql** script that creates the stored procedure, which disables the primary key constraint for the **COUNTRY** table. Leave **sqlplus** running.

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```
[oracle@eg18009 les09]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 16:12:15
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Sat Feb 10 2018 15:47:56 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> @country.sql

Table created.
Table altered.
SQL> @constraints_disable.sql

Procedure created.
SQL>
```

2. Create a simple primary Extract group and a data pump Extract to replicate the **COUNTRY** table.
   a. Reuse an open and not currently used terminal shell window. Enter the **oggsrc** alias at the OS prompt to initialize the source **GGSCI** environment. Launch **GGSCI** and enter the **dblogin** command to log in to the Oracle RDBMS.

```
[oracle@eg18009 ~]$ oggsrc
[oracle@eg18009 oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1> dblogin useridalias oggadmin_root
Successfully logged into database CDB$ROOT.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2>
```

   b. Edit the parameter file for the `ECOUN` primary Extract group.

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```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2> edit param
ecoun
```

```
Extract ecoun
UserIdAlias  oggadmin_root
LOGALLSUPCOLS
TRANLOGOPTIONS INTEGRATEDPARAMS (MAX_SGA_SIZE 128)
UPDATERECORDFORMAT COMPACT
Exttrail ./dirdat/cp
SOURCECATALOG AMER
Table west.country;
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 5> REGISTER
EXTRACT ecoun DATABASE CONTAINER (AMER)
2018-02-10 16:36:25  INFO    OGG-02003  Extract ECOUN
successfully registered with database at SCN 13173696.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 7> add extract
ecoun, integrated tranlog, begin now
EXTRACT (Integrated) added.
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 8> add exttrail
./dirdat/cp, extract ecoun, megabytes 10
EXTTRAIL added.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9>
```

c. Edit the parameter file for the **PCOUN** data pump Extract.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9> edit param
pcoun
```

```
Extract pcoun
RmtHost easthost, Mgrport 7909, Compress
RmtTrail ./dirdat/cs
Passthru
Table amer.west.country;
```

d. Save the parameter file and add the Data Pump, connecting it to the `./dirdat/cp` trail file.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 10> add extract
pcoun, exttrailsource ./dirdat/cp
```

e. Add the remote trail file and start the Extract and the Data Pump.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 11> add rmttrail
./dirdat/cs, extract pcoun, megabytes 10
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 12> start ecoun
Sending START request to MANAGER ...
EXTRACT ECOUN starting
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 13> start pcoun
Sending START request to MANAGER ...
```

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f. Enter the "**info all**" command to check the various Extract processes.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 14> info all
Program     Status      Group       Lag at Chkpt  Time Since

MANAGER     RUNNING
EXTRACT     RUNNING     ECOUN       00:00:00      00:10:03
EXTRACT     RUNNING     EMAP        00:00:00      00:00:00
EXTRACT     RUNNING     PCOUN       00:00:00      00:00:45
EXTRACT     RUNNING     PMAP        00:00:00      00:00:04
```

g. Leave the terminal shell window open, running **GGSCI**. Open or reuse a different terminal shell window, enter the **oggtrg** alias at the OS prompt to initialize, and change the directory to the target **GGSCI** instance. Launch **GGSCI**, log in to the **EURO.EAST** database, and edit the parameter file for the **RCOUN** Replicat, where **SQLEXEC** will call the stored procedure that disables the primary key constraints for the **COUNTRY** table.

```
[oracle@eg18009 ~]$ oggtrg
[oracle@eg18009 oggtrg]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (eg18009 hostname) 1> dblogin useridalias oggadmin_euro
Successfully logged into database EURO.

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 2> edit param rcoun
```

```
Replicat rcoun
DiscardFile ./dirrpt/rcoun.dsc, Purge
UserIDAlias oggadmin_euro
SQLEXEC 'CALL east.CONSTRAINTS_DISABLE ()'
Map amer.west.country, target euro.east.country;
```

h. Add and start the **RCOUN** integrated Replicat.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 3> Add replicat
rcoun, Integrated exttrail ./dirdat/cs
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4> start rcoun
Sending START request to MANAGER ...
REPLICAT RCOUN starting
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 7>
```

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i. Use the "**info all**" command to check the situation of your Replicat groups.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 7> info all
Program     Status      Group       Lag at Chkpt  Time Since

MANAGER     RUNNING
REPLICAT    RUNNING     RCOUN       00:00:00      00:00:03
REPLICAT    RUNNING     RMAP        00:00:00      00:00:08
```

3. Insert duplicate data and verify that there is no referential integrity error on the replication target. The replication framework put in place for this practice replicates only DML statements, so the `TRUNCATE` statement that you will use to empty the **COUNTRY** table is not executed on the replication target (`EURO.EAST`). When you truncate the `COUNTRY` table and reload it for the second time, the `TRUNCATE` statement has effect only on `AMER.WEST`. Reloading the table for the second time would cause a primary key constraint violation on the target system. Because the Replicat process executes the stored procedure that disables primary key constraints before applying the changes to the `COUNTRY` table, no constraint violation occurs.

   a. Open a new terminal shell window, change directory to **/home/oracle/labs/lab/les09,** and launch **sqlplus** connecting to the **AMER.WEST** database. Execute the `country_insert.sql` script that loads data into the country table. Verify the number of rows inserted by the script by using "**select count(*)**."

```
[oracle@eg18009 ~]$ cd /home/oracle/labs/lab/les09
[oracle@eg18009 les09]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Sat Feb 10 2018 18:39:32 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production

SQL> @country_insert.sql
1 row created.
..Many lines omitted..
1 row created.

Commit complete.
SQL> select count(*) from country;

  COUNT(*)
----------
       235
SQL>
```

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b. Select the window that you left open, where **sqlplus** is connected to the replication target (**EAST@EURO**), and verify that 235 rows were replicated for the **COUNTRY** table.

```
SQL> show user
USER is "EAST"
SQL> select count(*) from country;

  COUNT(*)
----------
       235
SQL>
```

c. Select again the **sqlplus** instance running connected to the replication source (**WEST@AMER**). Truncate the country table and reload it, executing the **country_insert.sql** script again.

```
SQL> show user
USER is "WEST"
SQL> truncate table country;
Table truncated.
SQL> select count(*) from country;

  COUNT(*)
----------
     0
SQL> @country_insert.sql
1 row created.
..Many lines omitted..
1 row created.

Commit complete.
SQL> select count(*) from country;

  COUNT(*)
----------
       235
SQL>
```

d. Select again the window where **sqlplus** is connected to the replication target (**EAST@EURO**) and verify that the **COUNTRY** table now contains a double number of rows (470). All rows are now duplicated, and no referential integrity error was raised. You can also verify that the **CONSTRAINTS_DISABLE** stored procedure was executed by examining the report for the **RCOUN** Replicat.

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```
SQL> show user
USER is "EAST"
SQL> select count(*) from country;

  COUNT(*)
----------
       470
SQL>
```

e. Select the **GGSCI** session connected to the replication target (**c##OGG_Admin@orcl/EURO**) and enter the "**view report rcoun**" command to verify that **CONSTRAINTS_DISABLE** was executed by the Replicat.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 8> view report rcoun

***********************************************************************
*
                 Oracle GoldenGate Delivery for Oracle
    Version 12.3.0.1.2
OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
   Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
01:06:26

Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
..Many Omitted Lines..
2018-02-10 18:35:28  INFO    OGG-02679  The Replicat process
logged on to database EURO and can only apply to that database.
SQLEXEC 'CALL east.CONSTRAINTS_DISABLE ()'

Executing SQL statement...

2018-02-10 18:35:29  INFO    OGG-00893  SQL statement executed
successfully.

Map amer.west.country, target euro.east.country;
..Many Omitted Lines..
```

This last step concludes practice 9-3 and all practices for lesson 9. Please run the `reset.sh` script located in /home/oracle/labs/lab/les09 to reset the environment for the next practice.

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Practices for Lesson 10: Data Transformation and Configuration Options

Overview

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Practices for Lesson 10: Data Transformation and Configuration Options

Practices Overview

In these practice, you will use the EVENTACTIONS event marker system in Oracle GoldenGate to trigger and for end-of-day job to be executed on the target system.

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Practice 10-1: Triggering and Executing End-of-Day Job (Database Backup) via an EVENTACTIONS Command

Overview

In this practice, you will create a table in both replication source and target, and you will store a specific string in that table. The appearance of that specific string in the table used to synchronize source and target will trigger an event action that will force the target to perform a database backup.

Assumptions

You had run the **reset.sh** script located in **/home/oracle/labs/lab/les09** at the end of practice 9, and no Extract or Replicat groups are currently configured in your environment.

Tasks

1. Create a table called **EVENT_TRIGGER** in both the source and target database environments.
   a. Reuse an open terminal shell window and exit from either **GGSCI** or **sqlplus**. Launch **sqlplus** connecting to the **AMER.WEST** database and create the **EVENT_TRIGGER** table. You can find the SQL script that creates the table in **/home/oracle/labs/lab/les10**.

```
[oracle@hostname ~]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Sat Feb 10 2018 18:50:17 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production

SQL> create table event_trigger (id number not null primary key,
trigger_type varchar2(255));

Table created.
SQL>
```

   b. Create the same table in the target database environment. Reuse an open terminal shell window and exit from either **GGSCI** or **sqlplus**. Launch **sqlplus** connecting to the **EURO.EAST** database and create the **EVENT_TRIGGER** table.

```
[oracle@eg18009 ~]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Sat Feb 10 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.

Enter password: *********
```

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```
Last Successful login time: Sat Feb 10 2018 18:38:22 +11:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production

SQL> create table event_trigger (id number not null primary key,
trigger_type varchar2(255));

Table created.
SQL>
```

2. Create a primary and a data pump Extract process in GGSCI (`oggsrc`).
   a. Reuse an open and not currently used terminal shell window. Enter the **`oggsrc`** alias at the OS prompt to initialize the source **`GGSCI`** environment. Launch **`GGSCI`** and enter the **`dblogin`** command to log in to the Oracle RDBMS.

```
[oracle@eg18009 ~]$ oggsrc
[oracle@eg18009 oggsrc]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (hostname) 1> dblogin useridalias oggadmin_root
Successfully logged into database CDB$ROOT.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2>
```

   b. Edit the parameter file for the `EUEVT` primary Extract group.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 2> edit param
euevt
```

```
Extract euevt
UserIdAlias  oggadmin_root
LOGALLSUPCOLS
TRANLOGOPTIONS INTEGRATEDPARAMS (MAX_SGA_SIZE 128)
UPDATERECORDFORMAT COMPACT
Exttrail ./dirdat/zp
SOURCECATALOG AMER
Table west.*;
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 5> REGISTER
EXTRACT euevt DATABASE CONTAINER (AMER)
2018-02-10 22:54:12  INFO    OGG-02003  Extract EUEVT
successfully registered with database at SCN 13566705.
```

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```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 7> add extract
euevt, integrated tranlog, begin now
EXTRACT (Integrated) added.
```

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 8> add
exttrail ./dirdat/zp, extract euevt, megabytes 10
EXTTRAIL added.
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9>
```

c. Edit the parameter file for the **PUEVT** data pump Extract.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 9> edit param
puevt
```

```
Extract puevt
RmtHost easthost, Mgrport 7909, Compress
RmtTrail ./dirdat/ys
Passthru
Table amer.west.*;
```

d. Save the parameter file and add the Data Pump, connecting it to the `./dirdat/zp` trail file.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 10> add extract
puevt, exttrailsource ./dirdat/zp
```

e. Add the remote trail file and start the Extract and the Data Pump.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 11> add
rmttrail ./dirdat/ys, extract puevt, megabytes 10
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 12> start euevt
Sending START request to MANAGER ...
EXTRACT EUEVT starting
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 13> start puevt
Sending START request to MANAGER ...
```

f. Enter the "**info all**" command to check the various Extract processes.

```
GGSCI (hostname as c##OGG_Admin@orcl/CDB$ROOT) 14> info all
Program     Status      Group       Lag at Chkpt  Time Since
Chkpt


MANAGER     RUNNING
EXTRACT     RUNNING     EUEVT       00:00:00      00:00:07
EXTRACT     RUNNING     PUEVT       00:00:00      00:00:04
```

g. Leave the terminal shell window open, running **GGSCI**.

3. Configure the `FILTER` and `EVENTACTIONS` on the data apply side (Replicat).

a. Open or reuse a different terminal shell window, enter the **oggtrg** alias at the OS prompt to initialize, and change directory to the target **GGSCI** instance. Launch **GGSCI**, log in to the **EURO.EAST** database, and edit the parameter file for the **RUEVT** Replicat, where the combination of **FILTER** and **EVENTACTIONS** will work their magic to trigger a database backup.

```
[oracle@eg18009 ~]$ oggtrg
```

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```
[oracle@eg18009 oggtrg]$ ggsci
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017
00:51:03
Operating system character set identified as UTF-8.
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
GGSCI (eg18009 hostname) 1> dblogin useridalias oggadmin_euro
Successfully logged into database EURO.

GGSCI (hostname as c##OGG_Admin@orcl/EURO) 2> edit param ruevt
```

```
Replicat ruevt
DiscardFile ./dirrpt/ruevt.dsc, Purge
UserIDAlias oggadmin_euro
MAP amer.west.event_trigger, TARGET euro.east.event_trigger,
FILTER(ON INSERT, @streq(TRIGGER_TYPE,'PERFORM BACKUP')),
EVENTACTIONS (SHELL '/home/oracle/rman/rman_bck.sh', REPORT);
```

Note: Tthe filter operates on row insertion and uses the **@streq** function on the **TRIGGER_TYPE** column to look for the string "**PERFORM BACKUP**." If the filter captures the required string, the event action is triggered. In your environment, you have an **rman** directory under **/home/oracle,** which stores the shell script that performs a database backup. By the way, there is also a cron job that backs up your Oracle database every night at 4:40 AM.

b. Add and start the **RUEVT** integrated Replicat.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 3> Add replicat
ruevt, Integrated exttrail ./dirdat/ys
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 4> start ruevt
Sending START request to MANAGER ...
REPLICAT RUEVT starting
GGSCI (eg18009.us.oracle.com as c##OGG_Admin@orcl/EURO) 5>
```

c. Use the "**info all**" command to check the situation of your Replicat group.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 6> info all
Program     Status      Group       Lag at Chkpt  Time Since

MANAGER     RUNNING
REPLICAT    RUNNING     RUEVT       00:00:00      00:00:00
```

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4. Store the triggering string in the **EVENT_TRIGGER** table and verify that the data apply side of replication does, in fact, perform a database backup.

   a. Select again the **sqlplus** instance running connected to the replication source (**WEST@AMER**.) Insert the string "**PERFORM BACKUP**" in the **EVENT_TRIGGER** table and commit your transaction.

```
SQL> show user
USER is "WEST"
SQL>
SQL> insert into event_trigger values (1,'PERFORM BACKUP');
1 row created.

SQL> commit;

Commit complete.

SQL>
```

   b. The best way to find out if the event action worked, rather than waiting for the backup to complete, is to view the report for the **RUEVT** Replicat in **GGSCI**. Select the **GGSCI** session connected to the replication target (**c##OGG_Admin@orcl/EURO**) and enter the "**view report ruevt**" command to verify that the OS shell executed the command that triggers the RMAN backup.

```
GGSCI (hostname as c##OGG_Admin@orcl/EURO) 7> view report ruevt
***********************************************************************
                 Oracle GoldenGate Delivery for Oracle
    Version 12.3.0.1.2 OGGCORE_12.3.0.1.0_PLATFORMS_171208.0005_FBO
   Linux, x64, 64bit (optimized), Oracle 12c on Dec  9 2017

Copyright (C) 1995, 2017, Oracle and/or its affiliates. All rights reserved.
.. Many lines omitted..
2018-02-10 23:10:26  INFO    OGG-06505  MAP resolved (entry
amer.west.event_trig
ger): MAP "AMER"."WEST"."EVENT_TRIGGER", TARGET euro.east.event_trigger,
FILTER(
ON INSERT, @streq(TRIGGER_TYPE,'PERFORM BACKUP')), EVENTACTIONS (SHELL
'/home/or
acle/rman/rman_bck.sh', REPORT).

2018-02-10 23:10:28  INFO    OGG-02756  The definition for table
AMER.WEST.EVENT
_TRIGGER is obtained from the trail file.
2018-02-10 23:10:31  INFO    OGG-01286  Executing shell command
'/home/oracle/rm
an/rman_bck.sh' due to SHELL event for target table EURO.EAST.EVENT_TRIGGER in
f
ile /u01/ogg/oggtrg/dirdat/ys000000000, RBA 1933.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output: ''.
```

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```
2018-02-10 23:10:31  INFO    OGG-05301  Shell command output: 'Recovery
Manager:
 Release 12.2.0.1.0 - Production on Sat Feb 10 23:10:31 2018'.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output: ''.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output: 'Copyright (c)
198
2, 2017, Oracle and/or its affiliates.  All rights reserved.'.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output:
''.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output:
'RMAN> connect tar
get *'.

2018-02-10 23:10:31  INFO    OGG-05301  Shell command output:
'2> sql 'alter sys
tem archive log current';'.
```

c. Clearly, the **RUEVT** Replicat invoked the shell script that performed the database backup. Another way to check is to look for the backup file dates in the directory **/u02/oracle/backups/ORCL**. A simple “ls -l” command on that directory will tell you if there are recent files stored there by **RMAN**.

Note**:** This last step concludes practice 10-1 and all practices for lesson 10. Please run the **reset.sh** script to clean up the environment for the next practices. The `reset.sh` script can be found in **/home/oracle/labs/lab/les10**.

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Practices for Lesson 11: Installing Oracle GoldenGate Microservices Architecture

Overview

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Practices for Lesson 11: Installing Oracle GoldenGate Microservices Architecture

Practices Overview

In these practices, you will initially install the Oracle GoldenGate 12.3 for Oracle Microservices Architecture software. You will then use the **`oggca.sh`** utility to configure and start the Service Manager and the other MA components. Finally, you will verify that both installation and configuration succeeded by using your browser and the **`adminclient`** shell.

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Practice 11-1: Installing the Oracle GoldenGate Microservices Architecture Software

Overview

In this practice, you install the Oracle GoldenGate 12.3 for Oracle Microservices Architecture software.

Assumptions

The Oracle GoldenGate core services in both source and target environments have been shut down gracefully. The Oracle GoldenGate GGSCI manager process has been stopped for both source and target Oracle GoldenGate instances.

Tasks

1. Reset your lab environment.

   a. Open a new terminal shell window by clicking the terminal icon ( ). Change directory to **/home/oracle/labs/lab/les11** and run the **reset.sh** script. Wait until the message "`########  Reset script for practice 11 finished ######`" appears on your terminal shell.

```
[oracle@hostname ~]$ cd labs/lab/les11
[oracle@hostname les11]$ ./reset.sh
Oracle GoldenGate Command Interpreter for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:31:13
Operating system character set identified as UTF-8.
… Many lines omitted for brevity…
########    Reset script for practice 11 finished  ##########
[oracle@hostname les11]$
```

   You are welcome to type the content of the `reset.sh` script to check how the environment is prepared for the new lab.

   b. Make sure the environment variable **OGG_HOME** is configured for your environment.

```
[oracle@hostname les11]$ echo $OGG_HOME
/u01/app/ogg/oggma
```

   If the **OGG_HOME** environment variable is undefined, define it by typing:

```
[oracle@hostname les11]$ export OGG_HOME=/u01/app/ogg/oggma
```

   c. Better yet, modify the `.bashrc` file in your home directory (`/home/oracle`) to include the `OGG_HOME` variable.

   d. Make sure that the `PATH` variable includes the `${OGG_HOME}/bin` entry. Use the echo command to display the content of the `PATH` variable:

```
[oracle@hostname les11]$  echo $PATH
```

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If you do not see `OGG_HOME/bin` as part of `PATH`, modify your `.bashrc` file and include the command:

```
export PATH=${PATH}:${OGG_HOME}/bin
```

At the bottom of the .bashrc file. Source .bashrc to force the shell to read the newly defined variables:

```
[oracle@hostname ~] $ source .bashrc
```

e. Use the `echo` command again to display the content of the `PATH` and `OGG_HOME` environment variables, making sure they reflect your changes.

f. Change directory to **`/home/oracle/Software/fbo_ggs_Linux_x64_services_shiphome/Disk1`**. Launch the **`runInstaller`** shell script.

```
[oracle@hostname les11]$  cd
/home/oracle/Software/fbo_ggs_Linux_x64_services_shiphome/Disk1
[oracle@hostname Disk1]$ ./runInstaller
Starting Oracle Universal Installer...
Checking Temp space: must be greater than 120 MB.   Actual 28705 MB
Passed
Checking swap space: must be greater than 150 MB.   Actual 14335 MB
Passed
Checking monitor: must be configured to display at least 256 colors.
Actual 16777216    Passed
Preparing to launch Oracle Universal Installer from
/tmp/OraInstall2018-01-01_08-55-15PM. Please wait ...
[oracle@eg18009 Disk1]$
```

2. Follow the steps presented by the Oracle Installer to install the product.

   a. In step 1, select "**`Oracle GoldenGate for Oracle Database 12c (733.0MB)`**" and click "**`Next>`**."

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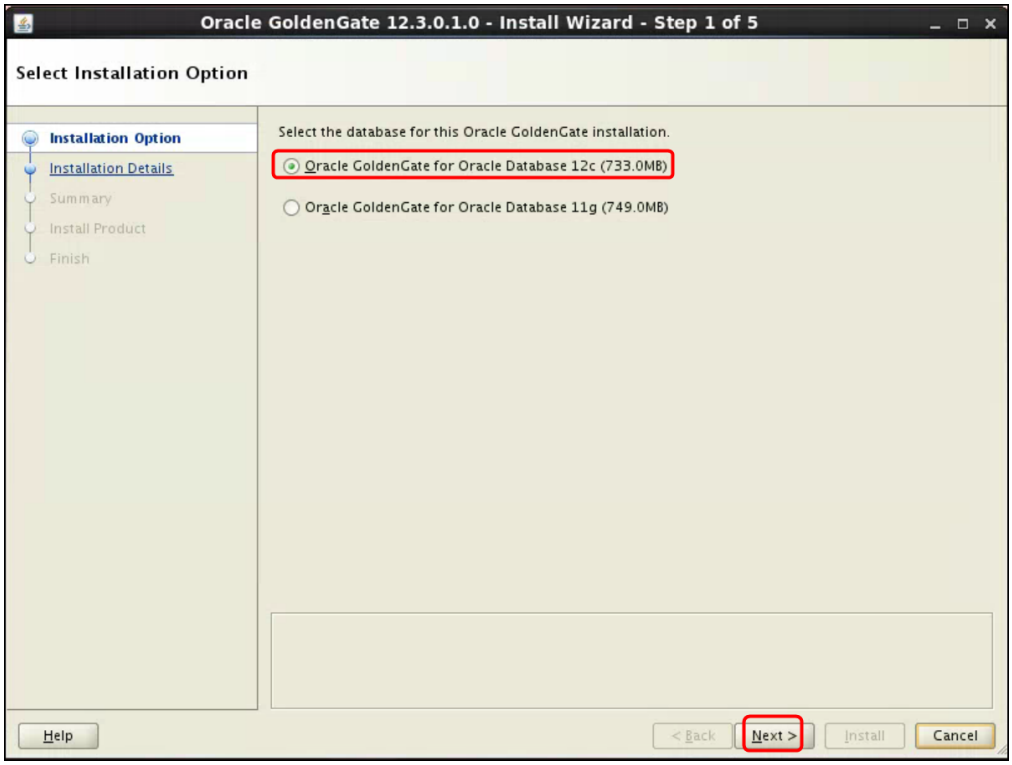
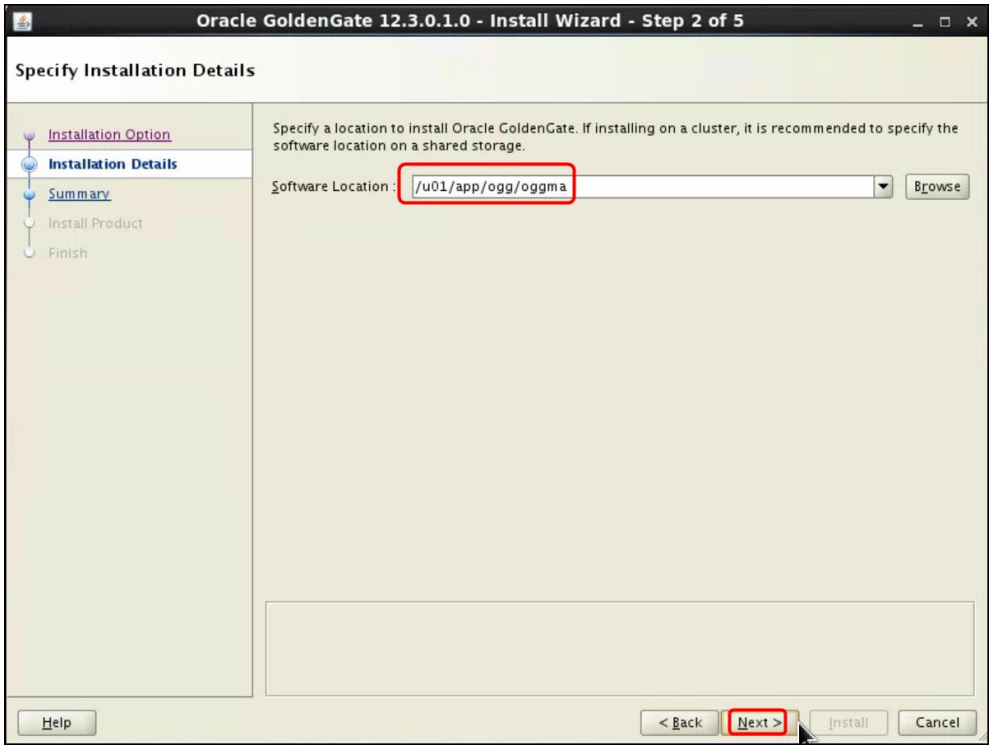


b. In step 2, verify that the installer picks up the **`OGG_HOME`** environment variable and displays its content in the "**`Software Location`**" field. The correct value for **`OGG_HOME`** is: "**`/u01/app/ogg/oggma`**." Click "**`Next>`**" to proceed to the next screen.



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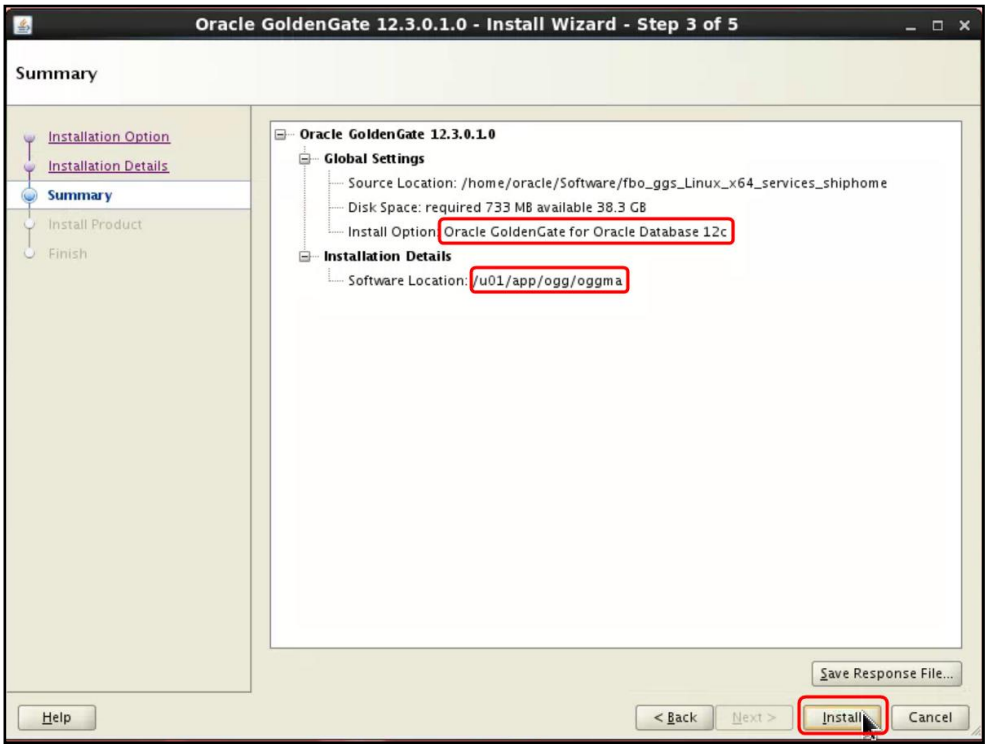
c. Step 3 displays a summary of the options selected so far. Verify that the database release chosen is Oracle Database 12c and that the software location is "**/u01/app/ogg/oggma**." Click "**Install**" to continue.



d. The installer proceeds with the installation, displaying the progress. Wait until the last page of the installer (page five) shows the message "**The installation of Oracle GoldenGate was successful**" and then click the "**Close**" button.

e. Select the terminal shell window you used to launch the Oracle GoldenGate installer and display the content of the **OGG_HOME** directory.

```
[oracle@hostname Disk1]$ ls $OGG_HOME
bin          deinstall    include  inventory  jlib  OPatch    oui
cfgtoollogs  diagnostics  install  jdk        lib   oraInst.loc  srvm
[oracle@hostname Disk1]$
```

This last step concludes practice 11-1. Leave the terminal shell window open and continue on with practice 11-2.

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Practice 11-2: Configuring Oracle Wallet and Client and Server Certificates

Overview

In this practice, you create the Oracle wallets to contain the certificates to handle SSL/TLS security for MA secure deployments.

Assumptions

You have successfully installed the Oracle GoldenGate 12.3 for Oracle Microservices Architecture software.

Tasks

In production environments, you purchase SSL/TLS certificates from a reputable certificate authority such as Thawte or digicert, companies that provide services such as verifying the authenticity of secure websites on behalf of a web browser. For testing and development purposes, however, you can create and use your own self-signed certificates.

If you create your own self-signed certificates, your web browser will not be able to verify the authenticity of the signing entity, and you will have to deal with a security exception—basically, you will have to allow the browser to operate in an insecure environment.

In order to create your own security infrastructure to be able to implement secured MA deployments, three steps are required:

1. Create a self-signed root certificate
2. Create server certificates
3. Create a Distribution Server user certificate

In your lab environment, all MA servers run on the same server, so you will only create one server certificate. In more complex environments, where MA servers are likely to run in different host computers, you will have to create one server certificate per host.

The utility used to create wallets and certificates is the **`orakpi`** utility, found in **`$OGG_HOME/bin`**.

You are encouraged to go through the wallet/certificate creation procedure step by step. There is a bash shell script in the **`~/labs/lab/les11`** directory, called **`create_certs.sh`**, which accepts one parameter, the MA password, and creates the necessary wallet and certificates for you.

If you don't want to execute all steps required to complete practice 11-2 one by one, you could display the content of the **`create_certs.sh`** script on your screen and examine the various commands prior to executing the script. Look up the password used to secure the wallet from your password sheet for this course. Execute the script by entering:

```
./create_certs.sh <password>
```

Alternatively, execute all steps as indicated below.

1. Create a self-signed root certificate.

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a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment.

b. Create the **/home/oracle/wallet_dir** directory, which will be used to store your wallets and certificates.

```
[oracle@hostname ~]$ mkdir ~/wallet_dir
```

c. Create the **root_ca** automatic login wallet. Replace every occurrence of ***<password>*** with the password that you can look up from the password sheet for this course.

Note: All commands in this practice (11-2) should be entered in one line, even if they are displayed over multiple lines for space reasons.

```
[oracle@hostname ~]$ orapki wallet create -wallet
~/wallet_dir/root_ca -auto_login –pwd <password>
```

d. Create a new self-signed certificate for the root user and add it to the **root_ca** wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/root_ca -dn "CN=RootCA" -keysize 2048 -self_signed
-validity 7300 -pwd <password>
```

e. Export the root user certificate to a .**pem** file.

```
[oracle@hostname ~]$ orapki wallet export -wallet
~/wallet_dir/root_ca -dn "CN=RootCA" -cert
~/wallet_dir/rootCA_Cert.pem –pwd <password>
```

2. Create a server certificate for your server. The server certificate is signed with the root certificate. This provides a common trust point because the server considers any certificate signed by the same root certificate as the server's certificate authentication.

a. Enter the command "**hostname -f**" to display the hostname of your computer including the domain name. You will be using the hostname part to name the wallet file, but you will use the hostname + domain name as the Common Name (CN) for your certificate.

```
[oracle@hostname ~]$ hostname -f
eg18009.us.oracle.com
```

Note: **eg18009** is just an example. You must replace every occurrence of the string **eg18009** in all commands below with the hostname returned by the **hostname -f** command executed in your environment.

b. Create an automatic login server wallet for your server.

```
[oracle@hostname ~]$ orapki wallet create -wallet
~/wallet_dir/eg18009 -auto_login –pwd <password>
```

c. Add a Certificate Signing Request (CSR) to the server's wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/eg18009 -dn "CN=eg18009.us.oracle.com" -keysize
2048 -pwd <password>
```

Note: Remember again to replace the hostname and the hostname + domain name for the **CN** entry with the hostname and domain name of your environment.

d. Export the Certificate Signing Request (CSR) to a .**pem** file.

```
[oracle@hostname ~]$ orapki wallet export -wallet
~/wallet_dir/eg18009 -dn "CN=eg18009.us.oracle.com" -request
~/wallet_dir/eg18009_req.pem –pwd <password>
```

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e. Using the CSR, create a signed server or client certificate and sign it using the root certificate. Assign a unique serial number (in this case 20) to the server certificate.

```
[oracle@hostname ~]$ orapki cert create -wallet
~/wallet_dir/root_ca -request ~/wallet_dir/eg18009_req.pem  -
cert  ~/wallet_dir/eg18009_Cert.pem -serial_num 20 -validity 365
-pwd <password>
```

f. Add the root certificate into the client's or server's wallet as a trusted certificate.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/eg18009 -trusted_cert -cert
~/wallet_dir/rootCA_Cert.pem -pwd <password>
```

g. Add the server certificate as a user certificate into the server's wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/eg18009 -user_cert -cert
~/wallet_dir/eg18009_Cert.pem -pwd <password>
```

3. Create a Distribution Server User Certificate. To replicate data to an SSL/TLS secured target Oracle GoldenGate MA deployment, you must create a wallet with a client certificate for the Distribution Server. As in the case for the server certificate, the client certificate for the Distribution Server is signed by the root certificate, which provides a common trust point because the server considers any certificate signed by the same root certificate as the server's certificate authentication.

a. Create the **dist_client** automatic login client wallet.

```
[oracle@hostname ~]$ orapki wallet create -wallet
~/wallet_dir/dist_client -auto_login -pwd <password>
```

b. Add a CSR to the wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/dist_client -dn "CN=eg18009.us.oracle.com" -keysize
2048 -pwd <password>
```

Note: Remember to replace the CN entry with your hostname + domain name.

c. Export the CSR to a **.pem** file.

```
[oracle@hostname ~]$ orapki wallet export -wallet
~/wallet_dir/dist_client -dn "CN=eg18009.us.oracle.com" -request
~/wallet_dir/dist_client_req.pem -pwd <password>
```

d. Using the CSR, create a signed client certificate and sign it by using the root certificate. Assign a unique serial number (in this case 30) to your certificate.

```
[oracle@hostname ~]$ orapki cert create -wallet
~/wallet_dir/root_ca -request ~/wallet_dir/dist_client_req.pem
-cert  ~/wallet_dir/dist_client_Cert.pem -serial_num 30 -
validity 365 -pwd <password>
```

e. Add the root certificate as a trusted certificate into the client's wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/dist_client -trusted_cert -cert
~/wallet_dir/rootCA_Cert.pem -pwd <password>
```

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f. Add the client certificate as a user certificate into the client's or server's wallet.

```
[oracle@hostname ~]$ orapki wallet add -wallet
~/wallet_dir/dist_client -user_cert -cert
~/wallet_dir/dist_client_Cert.pem -pwd <password>
```

4. Verify your security environment. In the **wallet_dir** directory, you should have three subdirectories, corresponding to each wallet you created:
   - root_ca
   - dist_client
   - <hostname>

   Each wallet should contain two certificates. You can use the command "**orapki wallet display -wallet**" to print the content of a wallet to your screen. For example:

```
[oracle@hostname ~]$ orapki wallet display -wallet
wallet_dir/dist_client -pwd <password>
Oracle PKI Tool : Version 12.2.0.1.0
Copyright (c) 2004, 2016, Oracle and/or its affiliates. All
rights reserved.

Requested Certificates:
User Certificates:
Subject:        CN=eg18009.us.oracle.com
Trusted Certificates:
Subject:        CN=RootCA
```

   a. Enter the information given above to display the content of each wallet created in the previous steps.

   b. Verify that each wallet contains two entries, a user certificate and a trusted certificate.

   This last step concludes practice 11-2. Leave the terminal shell window open and continue on with practice 11-3.

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Practice 11-3: Using `oggca.sh` to Configure the Service Manager and a Deployment

Overview

In this practice, you use the `oggca.sh` utility to configure the Service Manager and the first MA deployment.

Assumptions

You have successfully installed the Oracle GoldenGate 12.3 for Oracle Microservices Architecture software, and you have created the Oracle wallets for the Server certificate and the Distribution Server certificate.

Tasks

1. Launch the `oggca.sh` utility.
   a. Select the terminal shell window left open from the previous practice. Have the shell display the hostname of your computer, which you will need to configure your MA environment.

```
[oracle@hostname Disk1 ~]$ hostname -f
eg18009.us.oracle.com
```

   Note: Your hostname will be different from the one shown above. Write down your hostname as you will have to enter that fully qualified hostname in the first step of **`oggca.sh`**.

   b. Make sure that the **`OGG_HOME/bin`** directory is included in the **`PATH`** environment variable and launch the **`oggca.sh`** utility.

```
[oracle@hostname Disk1 ~]$ echo $PATH
/usr/lib64/qt-
3.3/bin:/usr/NX/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin
:/usr/sbin:/sbin:/u01/app/oracle/product/12.2.0/db_1/bin:/u01/ap
p/ogg/oggma/bin:/home/oracle/bin
[oracle@ hostname Disk1]$ oggca.sh &
[1] 30117
```

   Note: The process ID of `oggca.sh`, the forked process running, will be different in your environment.

2. The `oggca.sh` utility first page is displayed on screen.
   a. You must select:
      – "**`Create New Service Manager`**"
      – **`/u01/app/ogg/oggma_deploy`** as the deployment home directory
      – Your fully qualified hostname, which you determined in step 1, as the "**`Listening hostname/address`**"
      – **`9001`** as the port number where the Service Manager will accept TCP/IP connections

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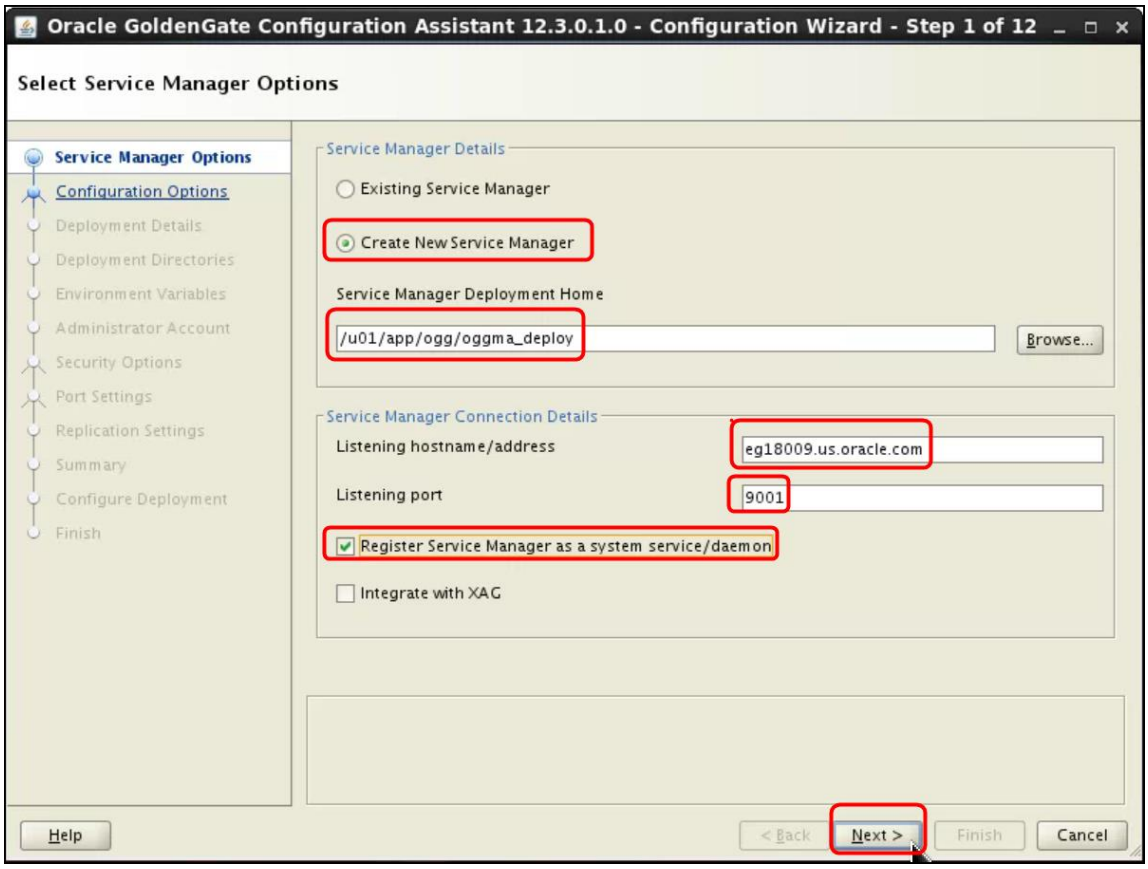
– "**`Register Service Manager as a system/service/daemon`**"

Click "**`Next>`**" to proceed with the installation.



b. In step 2, just select "**`Add new GoldenGate deployment`**" and click "**`Next>`**" to continue.

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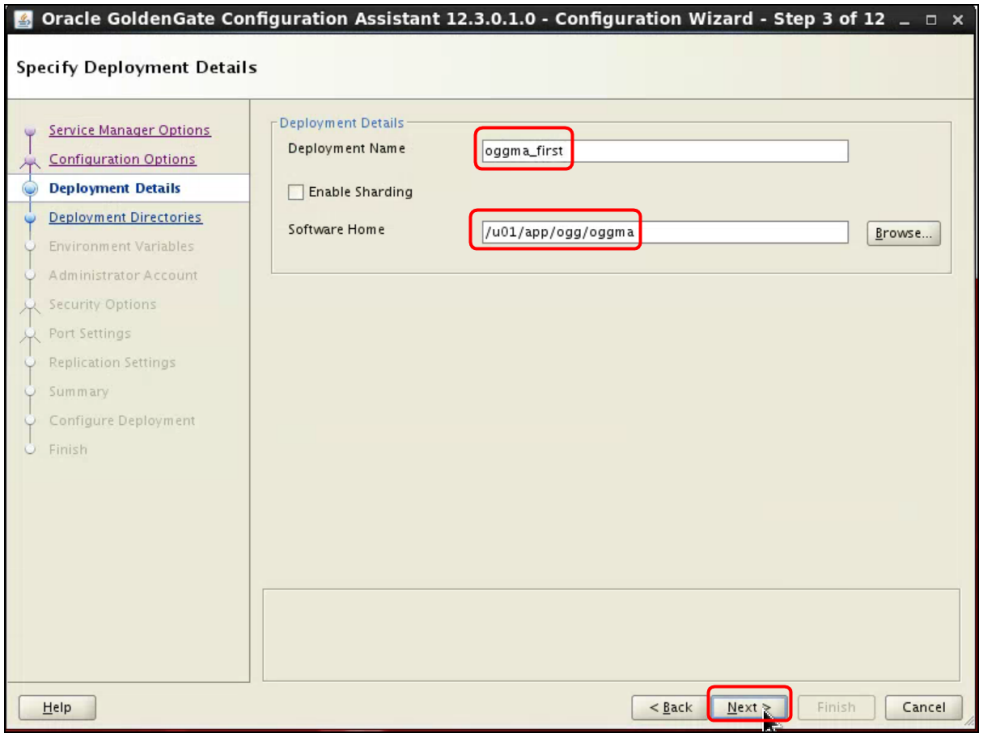
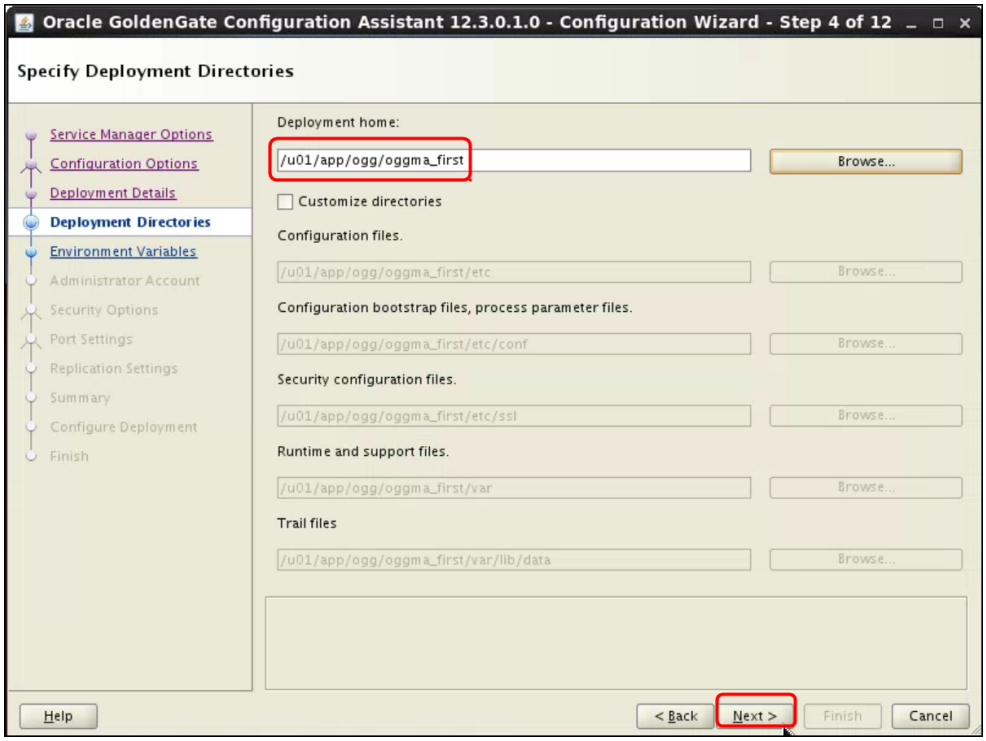
c. In step 3, enter "**oggma_first**" as the deployment name. Make sure **oggca.sh** picked up the correct **OGG_HOME** (**/u01/app/ogg/oggma**). Leave "**Enable Sharding**" unselected. Click "**Next>**" to continue.



d. Step 4 is about configuring the deployment home directory. Enter "**/u01/app/ogg/oggma_first**" as the deployment home directory and leave the "**Customize directories**" check box unselected, to accept the default directory placement. Click "**Next>**" to continue.



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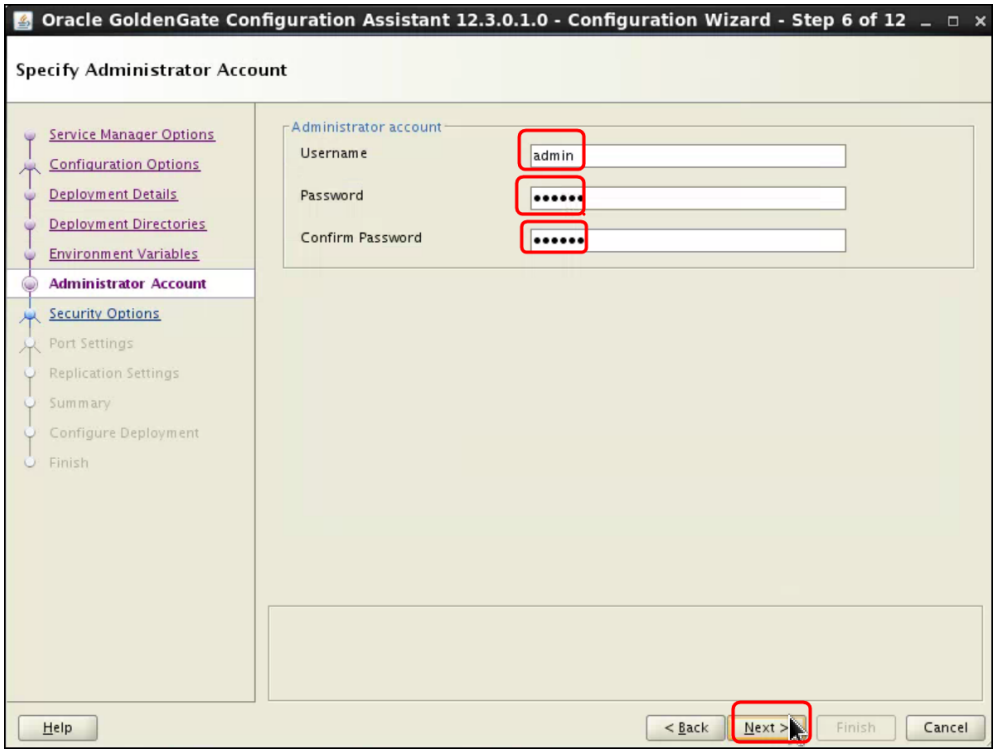
e. In step 5, verify that the environment variables:
   - ORACLE_HOME
   - LD_LIBRARY_PATH
   - TNS_ADMIN
   - ORACLE_SID

are correctly defined and point to the right directories. Click "**Next>**" after you are satisfied that the environment variables are correct.

f. In step 6, you configure the administrator user for the MA deployment. Enter "**admin**" as the user and refer to the password sheet that accompanies this course to look up the password for the **admin** user. Click "**Next>**" to continue.



g. Step 7 allows you to choose between secure and unsecure deployment. Select the "**SSL / TLS security**" check box, and in the "**Use existing Wallet**" field, enter the wallet location for your server (in this example **/home/oracle/wallet_dir/eg18009**, but replace the wallet name with the hostname of your server). Also, enter the wallet location for your client Distribution Server wallet in the client section in the "**Use Existing Wallet**" field. The wallet location should be "**/home/oracle/wallet_dir/dist_client**." Click "**Next>**" to continue.

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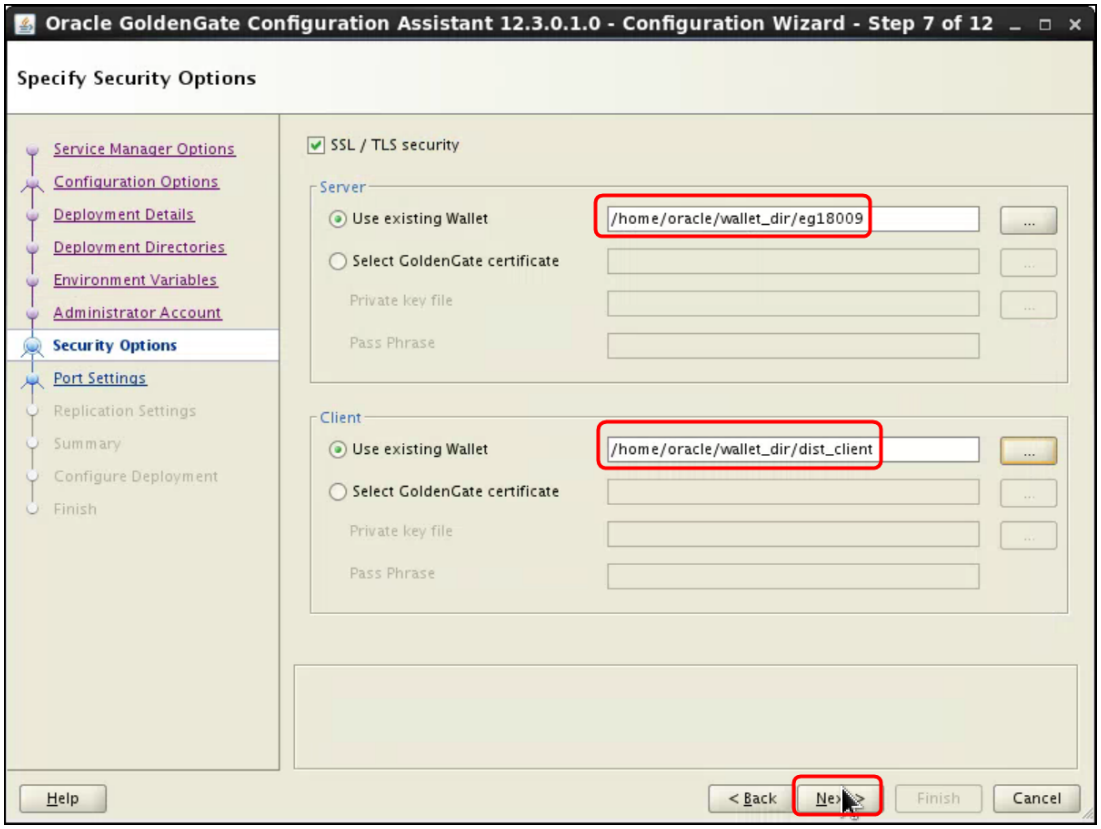
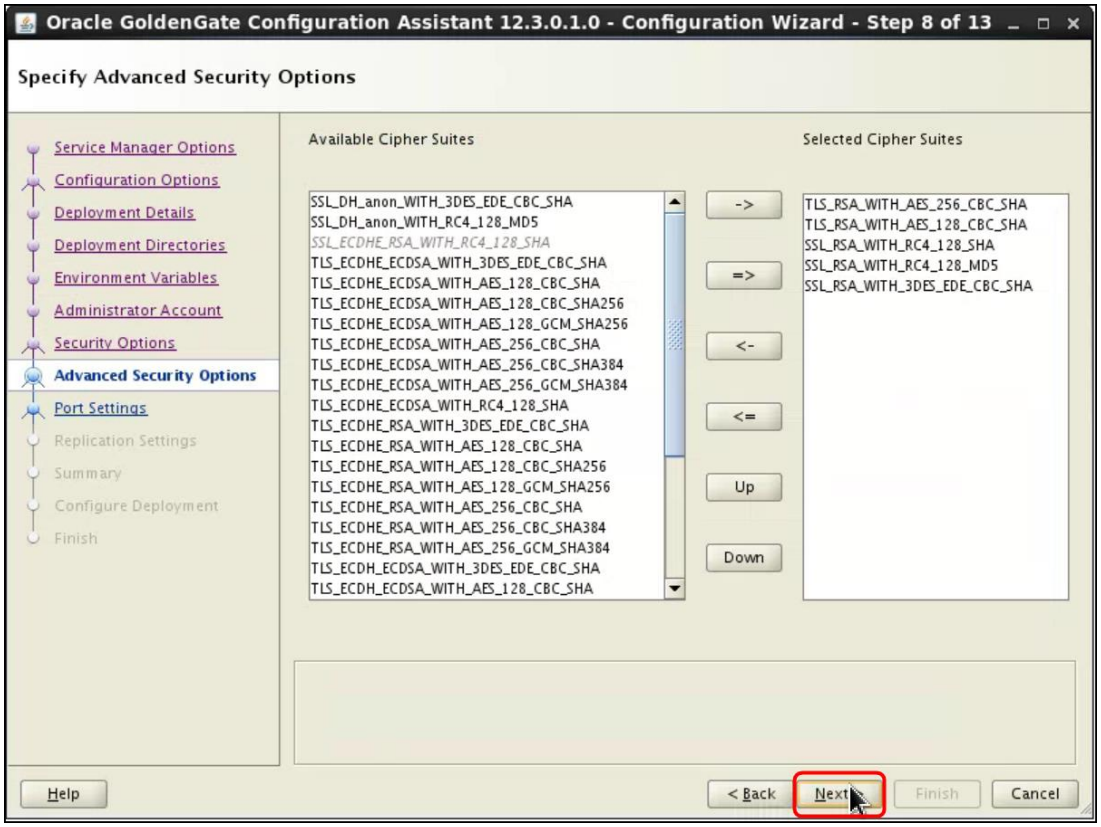


h. In step 8, accept the default security ciphers and click “Next>” to continue.



i. In step 9, you configure the TCP/IP port for the various MA servers. Leave the “**`Enable Monitoring`**” check box unselected and assign the port **`9002`** to the

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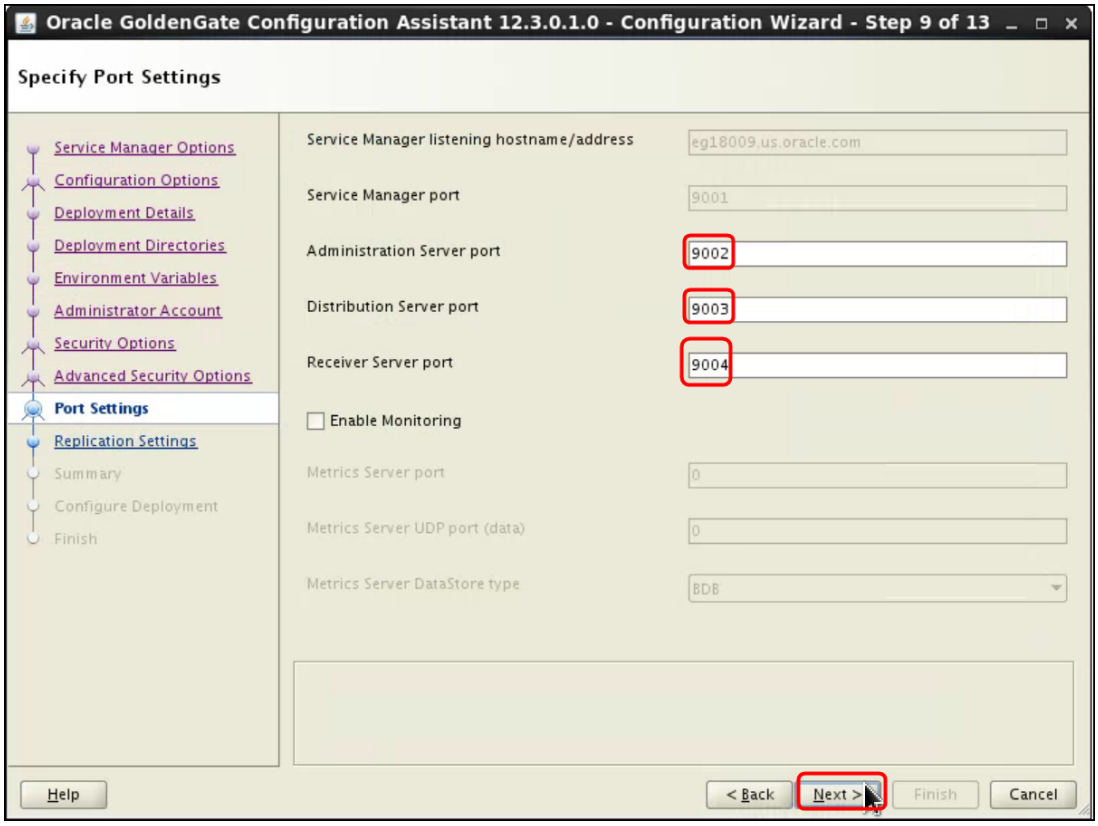
Administration Server, the port **9003** to the Distribution Server, and the port **9004** to the Receiver Server. Click "**Next>**" to continue.



j. Step 10 asks you to configure the Oracle RDBMS schema used by Oracle GoldenGate to perform replication. Enter the "**C##OGG_ADMIN**" schema, which you have been using throughout these practices to perform replication. Click "**Next>**" to proceed.

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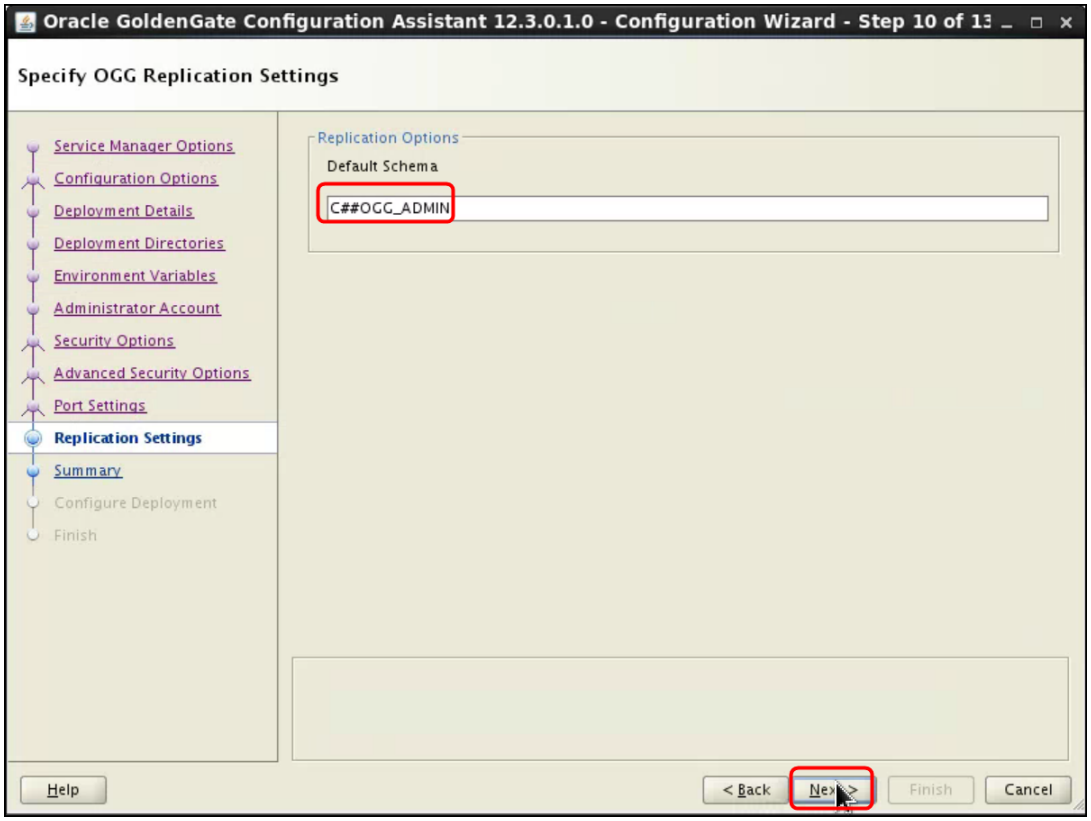

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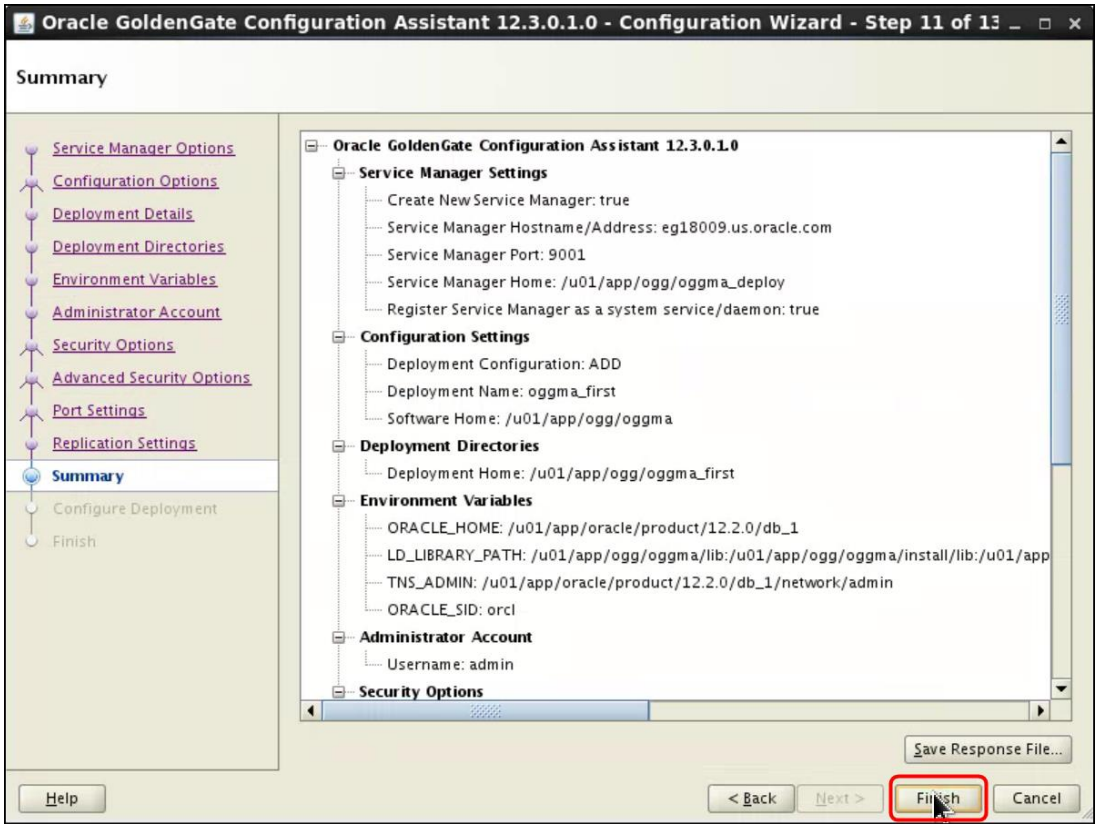
k. Step 11 displays a summary of all options configured so far. Verify that everything is in order and click finish to complete the configuration.



l. `oggca.sh` performs the steps that are necessary to configure the MA deployment, showing its progress on screen.

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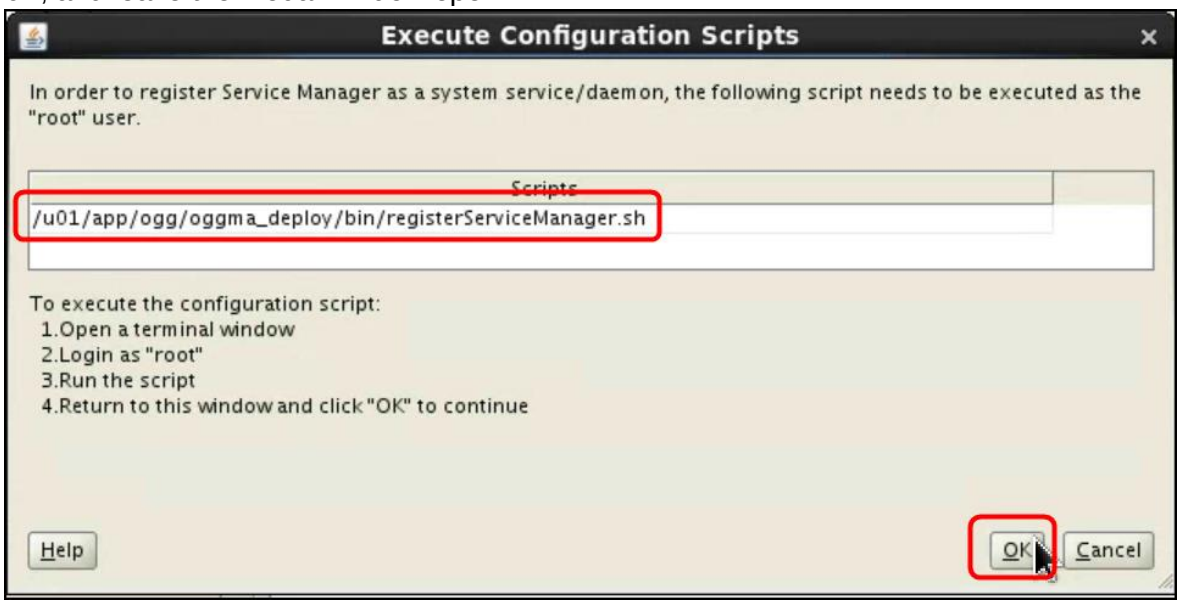
m. **`oggca.sh`** displays a modal window that asks to run a script connected as root. Copy the script location and name by selecting it with your mouse and **`CTRL-C`**. Do not click **`OK`**, and leave the modal window open.



n. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Enter the **`su`** command followed by a dash (**`-`**) to gain root access to your computer. Look up on the password sheet the password for the **`root`** user. Paste the script location and name (**`CTRL+SHIFT+v`**) in the shell window and press enter to execute the script.

```
[oracle@hostname ~]$ su -
Password: ******
[root@hostname ~]#
/u01/app/ogg/oggma_deploy/bin/registerServiceManager.sh
-----------------------------------------------------
     Oracle GoldenGate Install As Service Script
-----------------------------------------------------
OGG_HOME=/u01/app/ogg/oggma
OGG_CONF_HOME=/u01/app/ogg/oggma_deploy/etc/conf
OGG_USER=oracle
Running OracleGoldenGateInstall.sh...
[root@hostname ~]#
```

o. Leave the root shell by entering the **`exit`** command. Type exit again to terminate the terminal shell window.

p. Select the modal window displayed by **`oggca.sh`** and click "**`OK`**" to dismiss it.

q. Wait until you see the message "**`The configuration of the Oracle GoldenGate Deployment was successful`**." Click "**`Close`**" to terminate **`oggca.sh`**.

This last step concludes practice 11-3. Leave the terminal shell window you used to launch **`oggca.sh`** open and continue on with practice 11-4.

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Practice 11-4: Verifying the Successful Installation and Configuration of the MA Implementation

Overview

In this practice, you connect to the Service Manager by using initially your Internet browser and subsequently the `adminclient` utility to verify that the MA configuration performed using **`oggca.sh`** has been successful.

Assumptions

You have successfully completed practice 11-2.

Tasks

1. Modify your environment to set the required environment variables for your MA deployment.

   a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Change directory to the oracle account default directory (**`cd ~`**) and edit the **`.bashrc`** file. Add the environment variables **`OGG_HOME`**, **`OGG_ETC_HOME`**, and **`OGG_VAR_HOME`**. Your deployment directory is **`/u01/app/ogg/oggma_first`**, so the environment variables will be set as:

   – **`OGG_ETC_HOME=/u01/app/ogg/oggma_first/etc`**

   – **`OGG_VAR_HOME=/u01/app/ogg/oggma_first/var`**

   while **`OGG_HOME`**, the directory where the MA software resides, will be set to **`/u01/app/ogg/oggma`**.

   Note: In the example the editor used **`vi`**; you can use **`gedit`** instead if you prefer a graphical editor. Also note that the file name **`bashrc`** is prefixed with a dot (.), which makes it a hidden file in Linux. Add the lines in bold in the code box below.

```
[oracle@hostname ~]$ cd ~
[oracle@hostname ~]$ vi .bashrc
```

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```
# .bashrc

# Source global definitions
if [ -f /etc/bashrc ]; then
        . /etc/bashrc
fi
ORACLE_HOME=/u01/app/oracle/product/12.2.0/db_1
export ORACLE_HOME

TNS_ADMIN=${ORACLE_HOME}/network/admin
LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:${ORACLE_HOME}/lib
ORACLE_SID=orcl
JAVA_HOME=/usr/java/jdk1.8.0_144
export ORACLE_HOME PATH ORACLE_SID TNS_ADMIN LD_LIBRARY_PATH
JAVA_HOME
GG_EURO_HOME=/u01/app/oracle/product/gg_euro
GG_AMER_HOME=/u01/app/oracle/product/gg_amer
export GG_EURO_HOME  GG_AMER_HOME
PATH=${PATH}:${ORACLE_HOME}/bin:/bin
export PATH
OGG_HOME=/u01/app/ogg/oggma
OGG_ETC_HOME=/u01/app/ogg/oggma_first/etc
OGG_VAR_HOME=/u01/app/ogg/oggma_first/var
export OGG_HOME OGG_ETC_HOME OGG_VAR_HOME
# User specific aliases and functions
alias sqlplus='rlwrap sqlplus'
alias ggsci='rlwrap ./ggsci'
alias oggsrc='cd /u01/ogg/oggsrc'
alias oggtrg='cd /u01/ogg/oggtrg'
alias rman='rlwrap rman'
```

Leave the editor, saving the file.

b. Source the file to force the shell to set the newly defined environment variables.

```
[oracle@hostname ~]$ source .bashrc
```

c. Display the values for the new environment variables to make sure you have correctly defined them.

```
[oracle@hostname ~]$ echo $OGG_HOME $OGG_ETC_HOME $OGG_VAR_HOME
/u01/app/ogg/oggma /u01/app/ogg/oggma_first/etc
/u01/app/ogg/oggma_first/var
```

2. Verify the status of the MA configuration by using your Firefox browser.

a. Launch the Firefox browser by clicking its icon ( ) located in the panel at the top of your graphical desktop. Enter the URL: **https://<hostname+domain_name>:9001** in the browser address field. The host name and the domain name are found by

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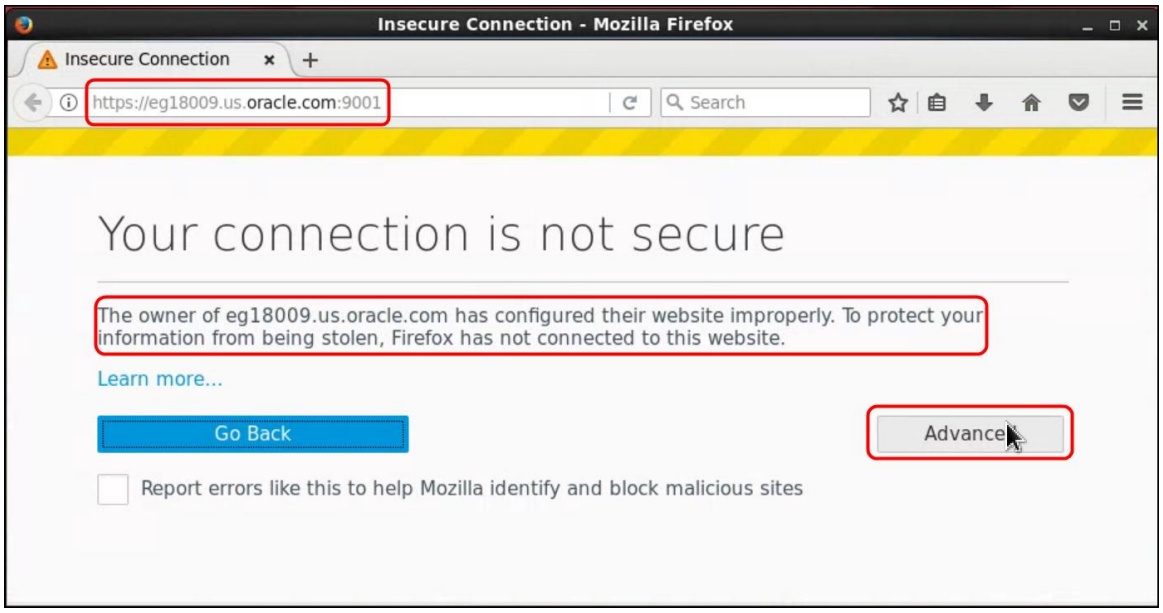
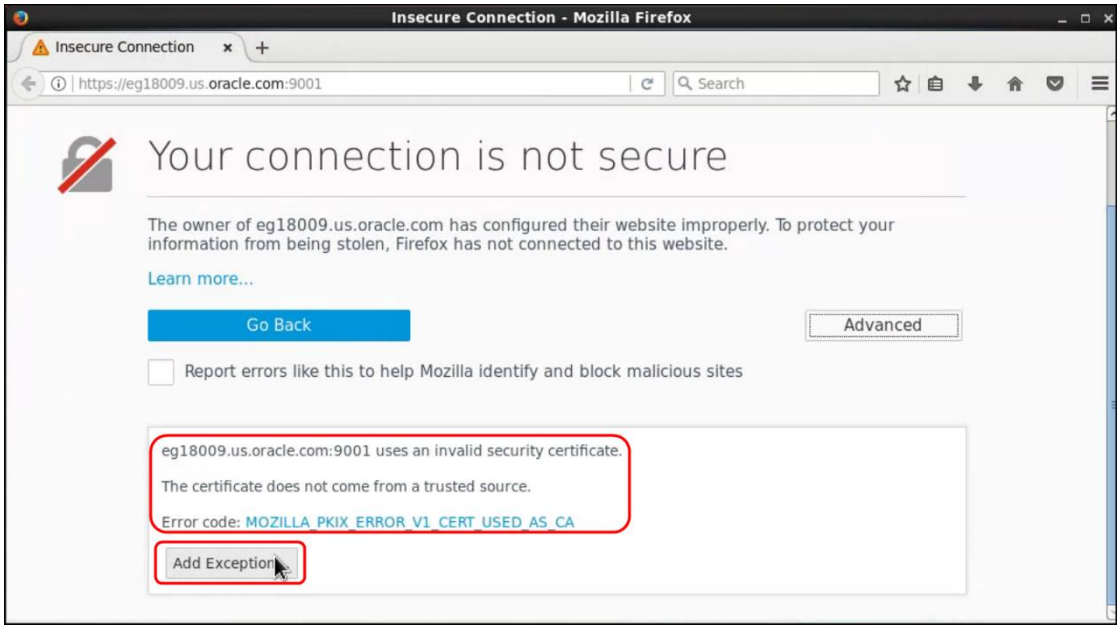
entering "**`hostname -f`**" in a terminal shell, and **`9001`** is the TCP/IP port you assigned to the Service Manager for socket connections via the **`oggca.sh`** utility. Since you are operating with self-signed certificates, the Firefox browser cannot authenticate the veracity of your certificates and displays a connection warning. Click the "**`Advanced`**" button to continue.



b. The browser displays the reason the connection is considered insecure; basically, it complains about the certificate not being originated from a trusted source. Click the "**`Add Exception`**" button to add the security exception and connect to the web application anyway.



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c. The browser asks you to confirm the exception. Make sure the “Permanently store this exception” check box is selected and click the “Confirm Security Exception” to continue.

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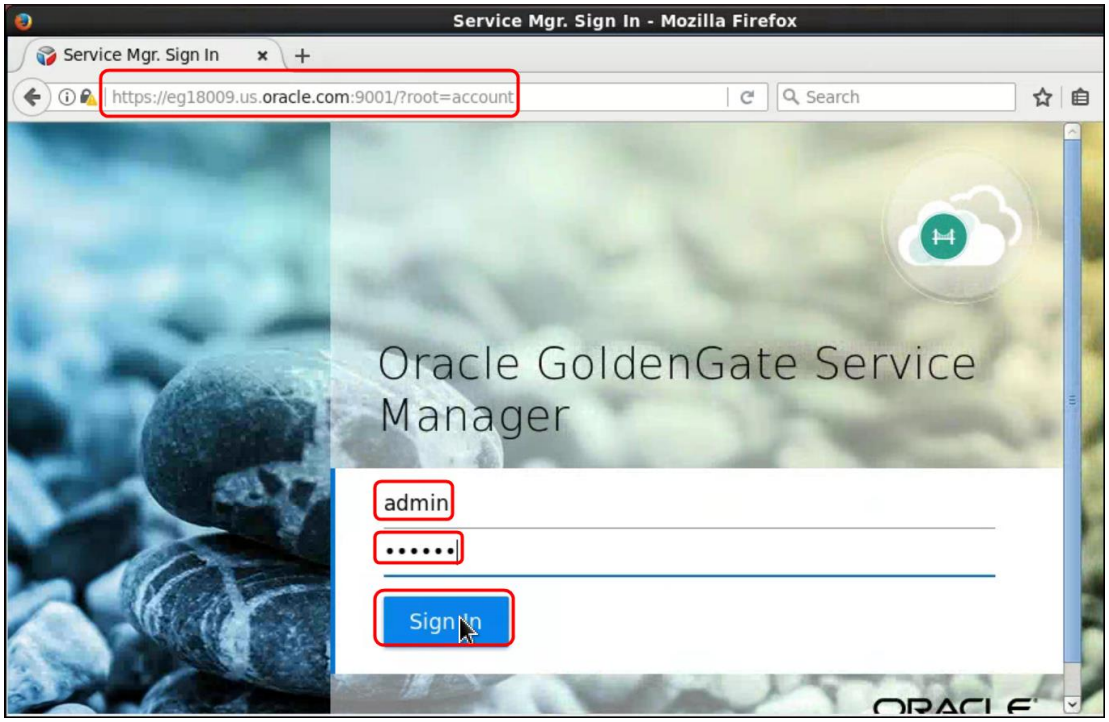
d. The “Service Manager Sign In” page is displayed. Enter “admin” as the username and enter the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click “Sign In” to advance to the next page.



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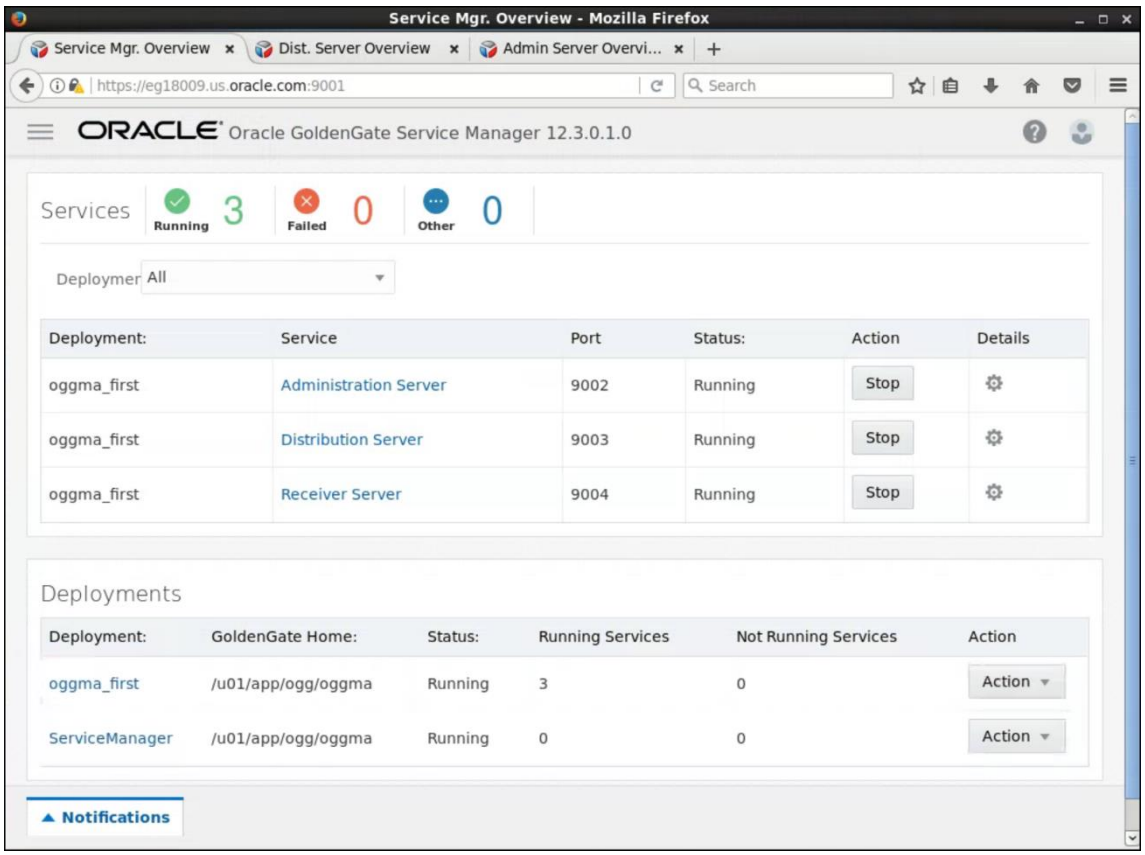
e. The Service Manager Overview page is displayed. The three services you configured using `oggca.sh` are running, and there are no failed services.



Note: Occasionally, a server could be seen as not running. The solution is to locate the process using the `ps` command from the OS and kill the process (which is hung and unable to communicate with the Service Manager). Example: The Distribution Server is seen by the Service manager as `STOPPED`. Open a terminal shell window and enter the following command to find the process ID for the Distribution Server:

```
[oracle@hostname ~]$ ps -ef | grep distsrvr
```

Then use the `kill -9` command to terminate the hung process. Restart the Distribution Server by clicking the "`Start`" button in the Service Manager Overview page.

The Service Manager is considered a deployment, but with the characteristic of not having any running services associated to it.

f. Feel free to explore the various servers by clicking on the links. Note that the first time you connect to an MA server you will have to add the Firefox security exception for that server.

3. Use the `adminclient` utility to verify the MA configuration. There will be a complete practice dedicated to `adminclient` —here you only launch it to connect to the Service Manager and to display information about the running servers.

a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Enter "**`adminclient`**" at the shell prompt to launch the `adminclient` utility.

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```
[oracle@hostname ~]$ adminclient
Oracle GoldenGate Administration Client for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All rights
reserved.
Linux, x64, 64bit (optimized) on Jul 21 2017 07:16:02
Operating system character set identified as UTF-8.

OGG (not connected) 1>
```

b. Connect to the Service Manager by using the "**connect**" command, followed by the Service Manager URL and the user you want to connect as (admin). When prompted, enter the password for admin.

```
OGG (not connected) 1> connect https://localhost:9001 as admin
Password for 'admin' at 'https://eg18009.us.oracle.com:9001': ******
Using default deployment 'oggma_first'

OGG (https://eg18009.us.oracle.com:9001 oggma_first) 2>
```

c. Enter the command "`info all`" to display an overview of the configured servers. Note that "**info all**" is also a **GGSCI** command.

```
OGG (https://eg18009.us.oracle.com:9001 oggma_first) 2> info all
Program     Status    Group       Lag at Chkpt  Time Since Chkpt

ADMINSRVR   RUNNING
DISTSRVR    RUNNING
RECVSRVR    RUNNING

OGG (https://eg18009.us.oracle.com:9001 oggma_first) 3>
```

d. The output shows that the three configured MA servers (Administration Server, Distribution Server, and Receiver Server) are up and running. Enter "**exit**" to leave **adminclient**.

```
OGG (https://eg18009.us.oracle.com:9001 oggma_first) 3> exit
[oracle@hostname ~]$
```

This last step concludes practice 11-3 and all practices for lesson 11. Close the terminal shell window but leave the Firefox browser running for practice 12-1.

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Practices for Lesson 12: Oracle GoldenGate Microservices Architecture—Administration Server

Overview

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Practices for Lesson 12: Overview

Practices Overview

In these practices, you will add one Extract and one Replicat group to the MA deployment by using the MA Administration Server embedded web application.

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Practice 12-1: Adding an Extract Group by Using the Administration Server Web Application

Overview

In this practice you use the Administration Server web GUI to add an Extract group to your MA deployment.

Note: Before running adding the extract, run the `seed_database.sql` script for both the west and east schemas. You can follow the following steps:

```
1. [oracle@edvmr1p0 labs]$ sqlplus west/oracle_4U@amer
2. SQL> @/home/oracle/labs/lab/les03/seed_database
3. [oracle@edvmr1p0 labs]$ sqlplus east/oracle_4U@euro
4. SQL> @/home/oracle/labs/lab/les03/seed_database
```

Assumptions

You have completed successfully the practices for lesson 11, and you have a configured deployment (`oggma_first`) with three servers running (Administration Server, Distribution Server, and Receiver Server).

Tasks

1. Access the Administration Server web GUI.
   a. Select the Firefox window left open after practice 11-3. If the window is not open, click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**<hostname+domain_name>:9002**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**hostname -f**". If this is the first time you are accessing the Admin Server, you will have to add the security exception to your Firefox browser in order to access web application. The "Admin Server Sign In" page appears. Enter "**admin**" as the user and the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click "**Sign In**" to advance to the next page.

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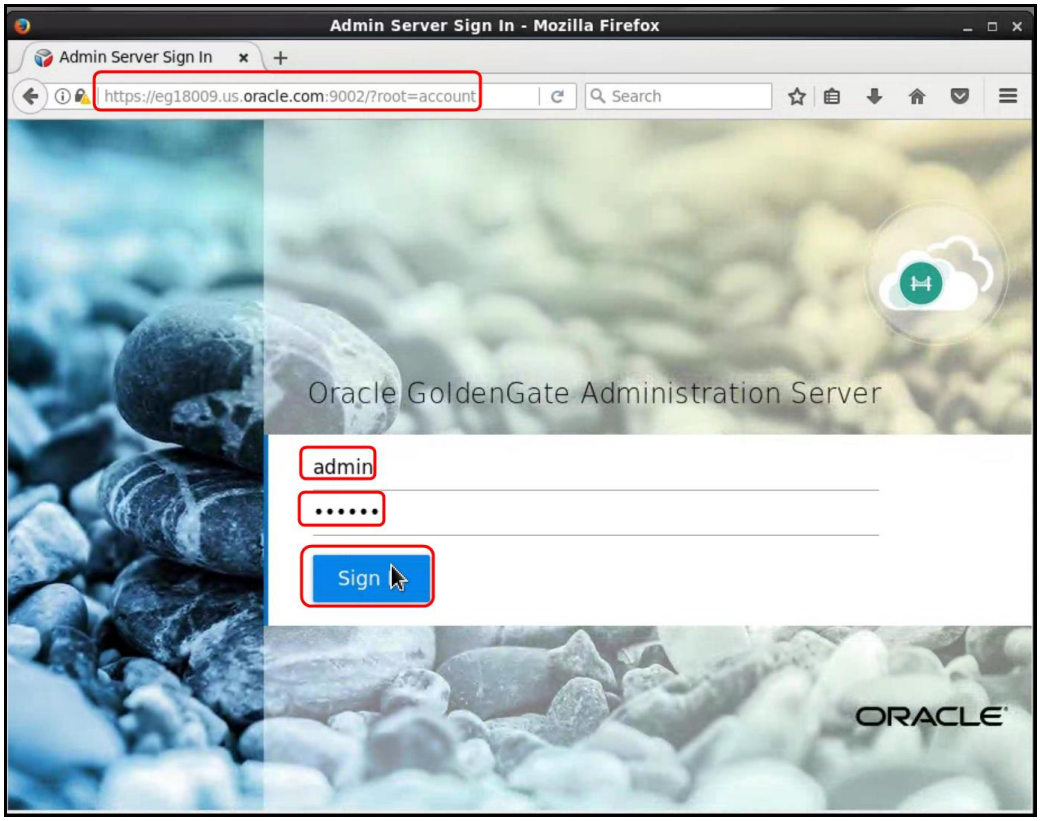

b. The Admin Server Overview page is displayed.

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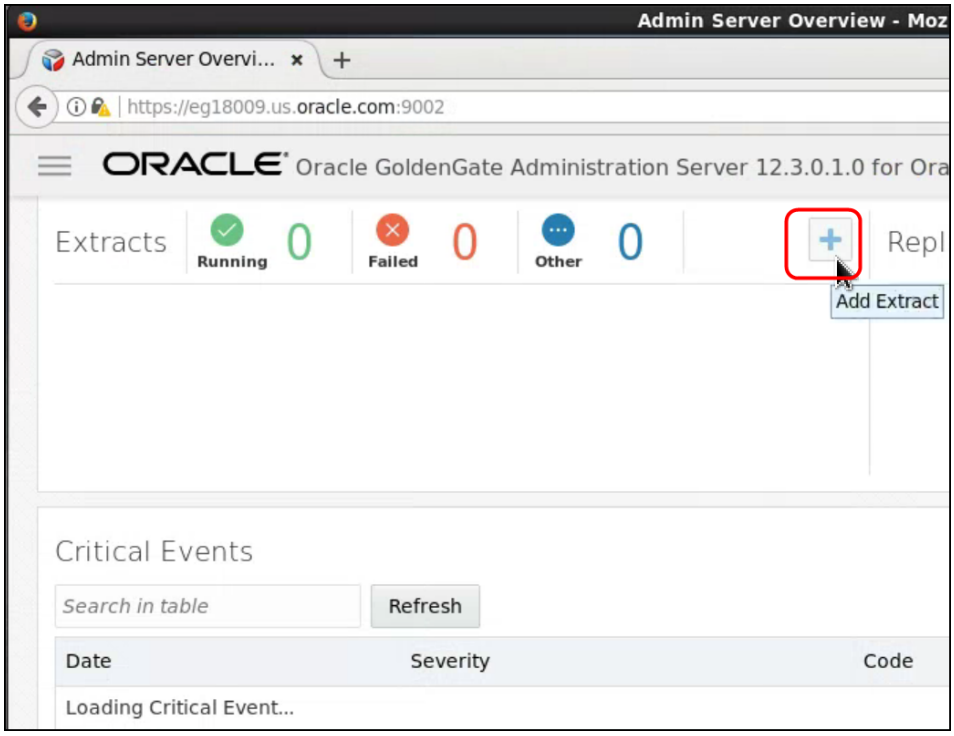
2. Add your first Extract group, `maex1`.

   a. In the Extract section (left) of the Admin Server overview page, click the plus (+) sign to create a new Extract.



   b. The "**`Add Extract`**" page is displayed. Accept the default selection for "**`Integrated Extract`**" and click "**`Next>`**" to proceed.

   c. In the "Extract Options" page enter:

      – **`maex1`** as the process name

      – "**`MA first extract`**" as the description

      – Accept the default intent (**`unidirectional`**).

      Click the "**`Create new credential`**" arrow, which provokes the appearance of new fields in the form. Enter:

      – "**`OracleGoldenGate`**" as the credential domain

      – **`oggadmin`** as the credential alias

      – "**`C##OGG_ADMIN`**" as the database user ID

      – Look up the password from the password sheet **`for C##OGG_ADMIN`** and enter it in the password field.

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– Click “**`Submit`**” to create the new credential.

d. Click the “Create new credential” arrow, which provokes the disappearance of the additional fields used to enter credential information. Fill in the remaining fields, in particular:

– Credential Domain: You can use the dropdown list, which should show “OracleGoldenGate.”

– Credential Alias: The dropdown list displays “oggadmin”—select that value.

– Accept the default for “Begin” (Now.)

– Enter “me” as the trail name.

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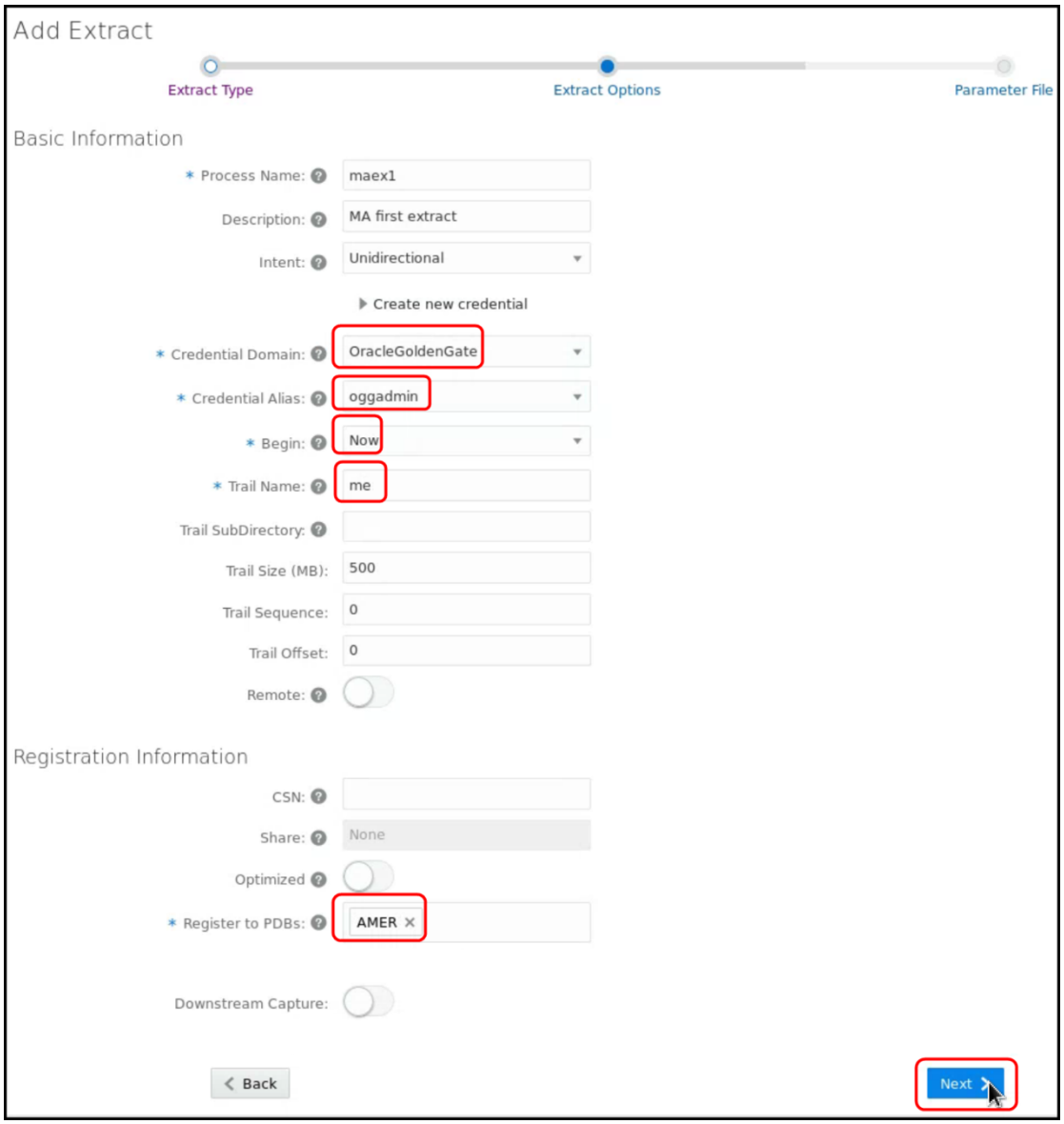
Under the "**Registration Information**" section, select "**AMER**" for "**Register to PDBs**"—again, the dropdown list should display "**AMER**" and "**EURO**" as valid options for that field. Click "**Next>**" to continue adding the Extract group.



The PDB does not display if the `dbms_goldengate_auth.grant_admin_privilege(C##_ADMIN,CONTAINER=> 'ALL')` command was not run in Practice 4-2.

e. The Parameter File page is displayed. A few parameters are set by default (the Extract name [**maex1**], the **useridalias [oggadmin],** and the exttrail name [**me**]). You must add four more parameters to the parameter file:

- **TranlogOptions IntegratedParams (max_sga_size 256)**
- **LOGALLSUPCOLS**
- **UPDATERECORDFORMAT COMPACT**
- **table amer.west.*;**

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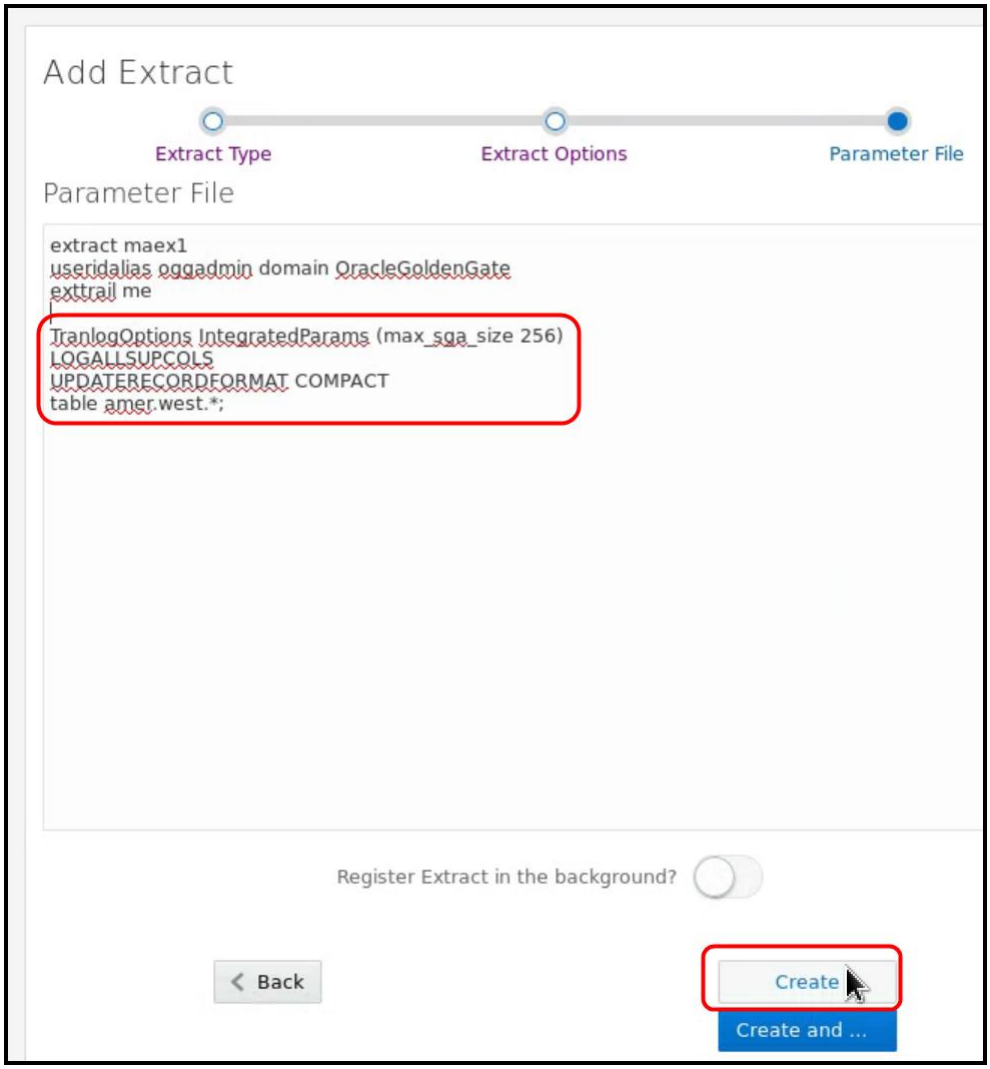
Add the parameters listed above and click "**`Create`**" to add the Extract group.



3. Start the Extract group just added.
   a. After you create the Extract, the Admin Server overview window is displayed again. In the Extract section, you can now see the `maex1` Extract, which you just added. The yellow exclamation point icon indicates that the Extract is not running.

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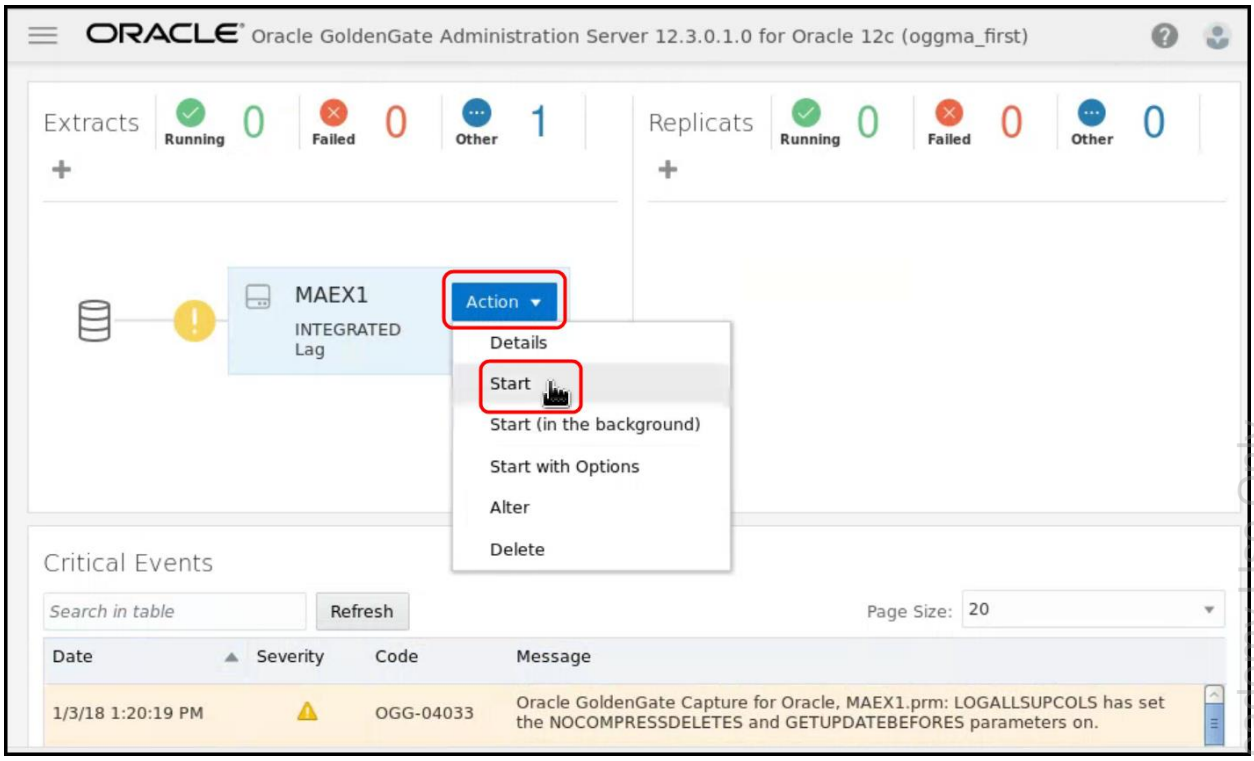
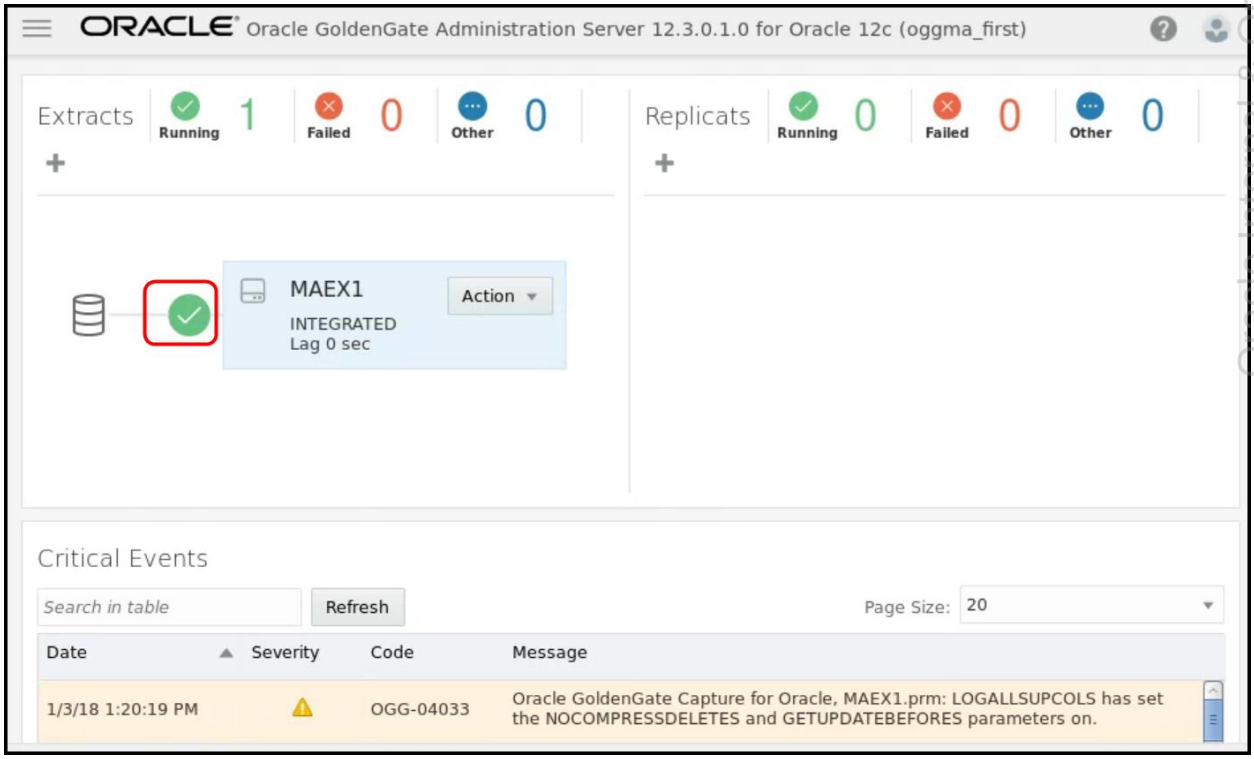
You can click the "**Action**" button and then "**Start**" from the dropdown list to start the Extract.



b. Click "**OK**" on the "**Confirm Action Window,**" and the Extract starts. The Admin Server overview window gives you a visual feedback by showing a green tick sign close to the **maex1** box representing the Extract.



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This last step concludes practice 12-1. Leave the Firefox window you used to add your first Extract group open and continue on with practice 12-2.

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Practice 12-2: Adding a Replicat Group by Using the Administration Server Web Application

Overview

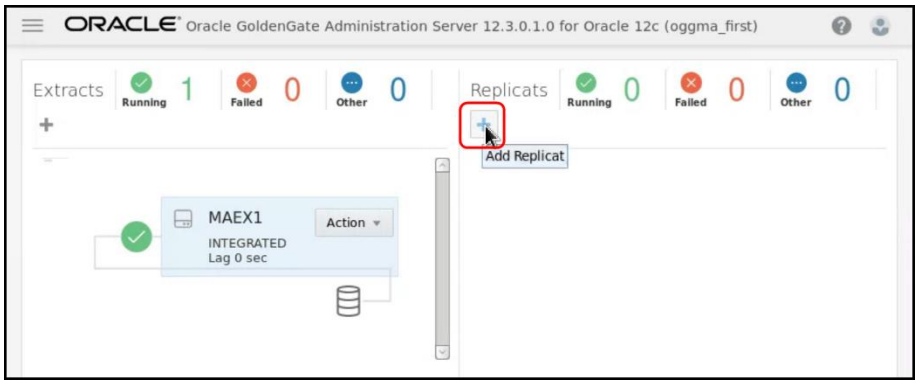
In this practice, you create a Replicat group by using the Administration Server web GUI.

Assumptions

You have successfully completed practice 12-1.

Tasks

1. Add a Replicat group.
   a. Select the Firefox window displaying the Admin Server overview page. In the Replicat's section, click the plus (+) sign to add a Replicat group.



   b. The "**`Add Replicat`**" page appears. Accept the default for Replicat type (Integrated Replicat) and click "**`Next>`**" to continue adding your Replicat.
   c. In the "Replicat Options" page enter:
      – **`mare1`** as the process name
      – "**`ma first replicat`**" as the description
      – Accept the default intent (**`unidirectional`**).

      Click the "**`Create new credential`**" arrow, which provokes the appearance of new fields in the form. Enter:
      – "**`OracleGoldenGate`**" as the credential domain
      – **`oggadmin_euro`** as the credential alias
      – "**`C##OGG_ADMIN@euro`**" as the database user ID
      – Look up the password from the password sheet **`for C##OGG_ADMIN@euro`** and enter it in the password field.

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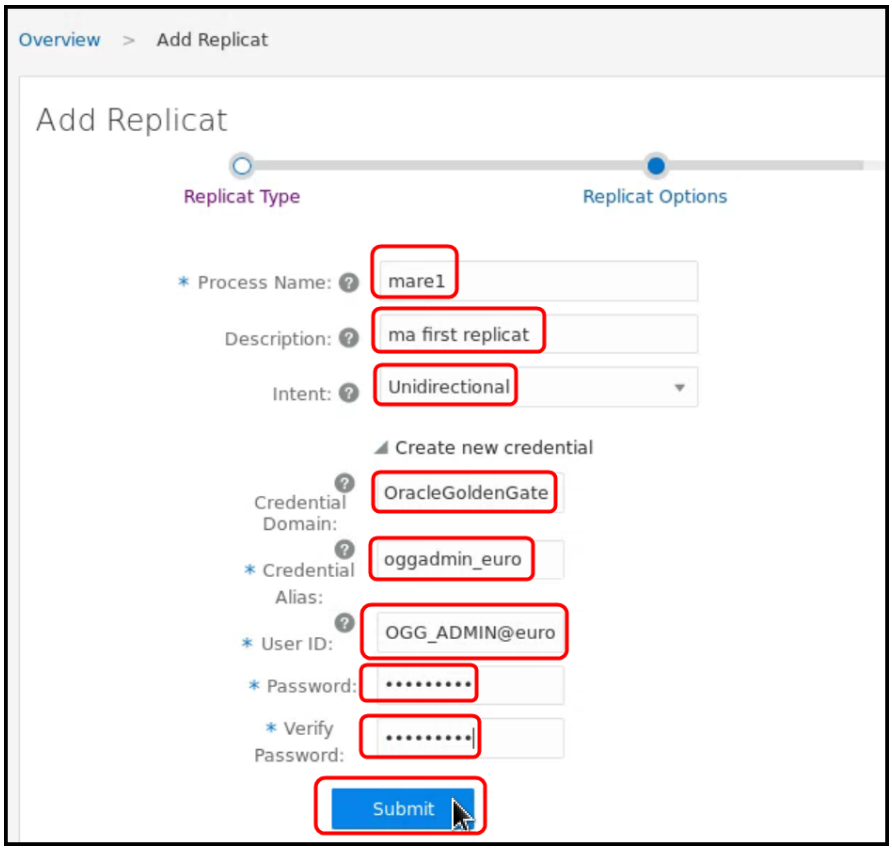
– Click “**`Submit`**” to create the new credential.



d. Click the “Create new credential” arrow, which provokes the disappearance of the additional fields used to enter credential information. Fill in the remaining fields, in particular:

– Credential Domain: You can use the dropdown list, which should show “OracleGoldenGate.”

– Credential Alias: The dropdown list displays “oggadmin_euro”—select that value.

– Accept the default for “Begin” (Position in Log).

– Enter “mr” as the trail name.

– Click “Next>” to continue adding your Replicat group.

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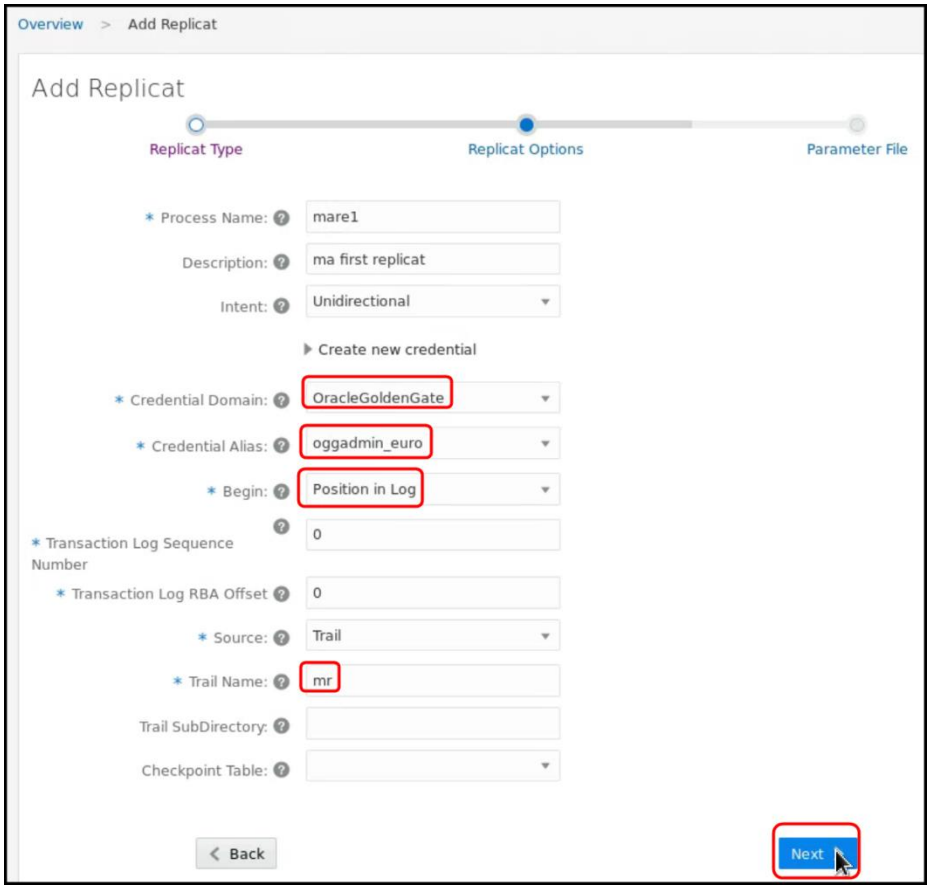

e. The Parameter File page is displayed. A few parameters are set by default (the Replicat name [**mare1**] and the **useridalias [oggadmin_euro]**). The **MAP** parameter is too generic, and you must replace it. You must erase the line that starts with **MAP** and add four more parameters to the parameter file:

- **DBOPTIONS Integratedparams(parallelism 6)**
- **AssumeTargetDefs**
- **DiscardFile mare1.dsc, Purge**
- **Map amer.west.*, target euro.east.*;**

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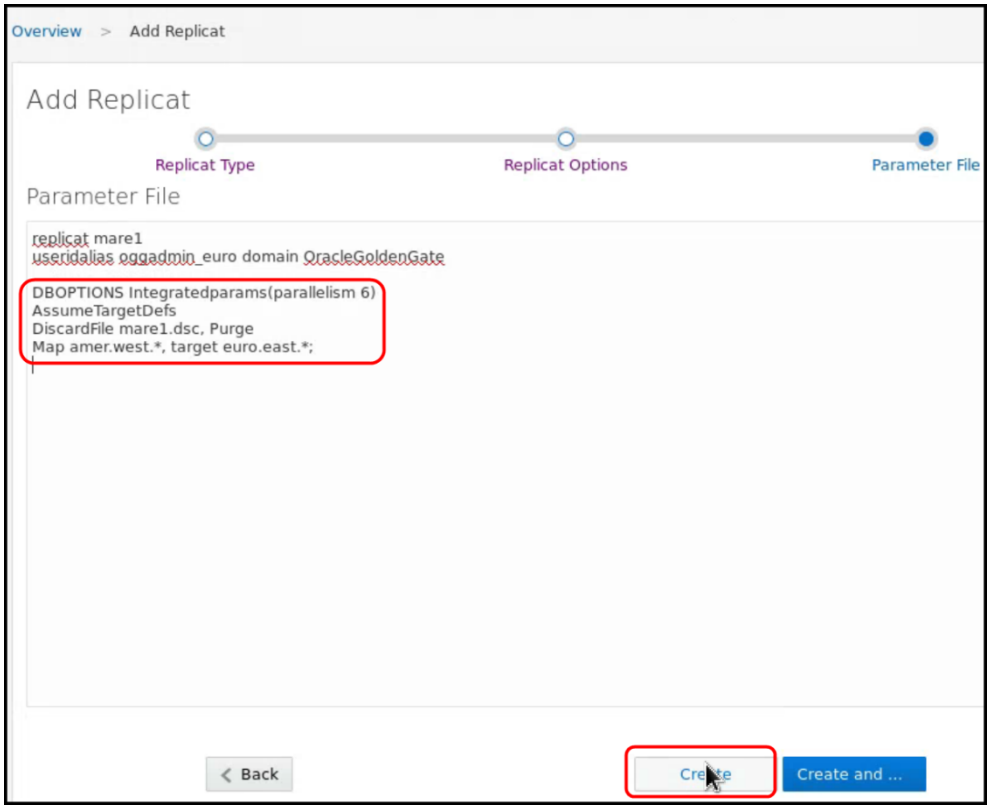
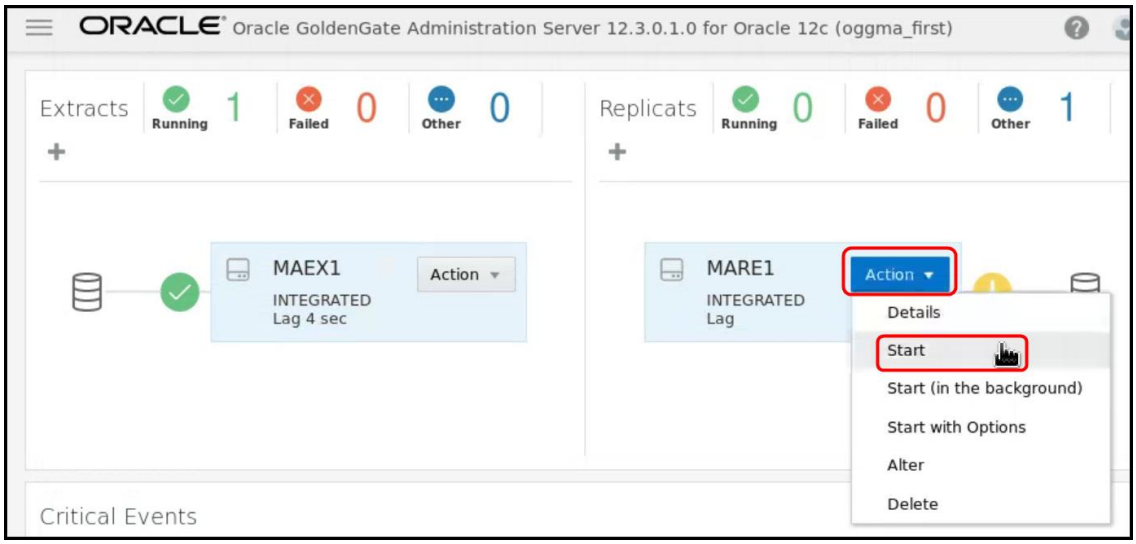
Add the parameters listed above and click "**Create**" to add the Replicat group.



2. Start the Replicat you have just added.

   a. After you create the Replicat, the Admin Server overview window is displayed again. In the Replicat section, you can now see the **mare1** Replicat, which you just added. The yellow exclamation point icon indicates that the Replicat is not running.

   You can click the "**Action**" button and then "**Start**" from the dropdown list to start the Replicat.



   b. Click "**OK**" on the "**Confirm Action Window,**" and the Replicat starts. The Admin Server overview window gives you a visual feedback by showing a green tick sign close to the **mare1** box representing the Replicat.

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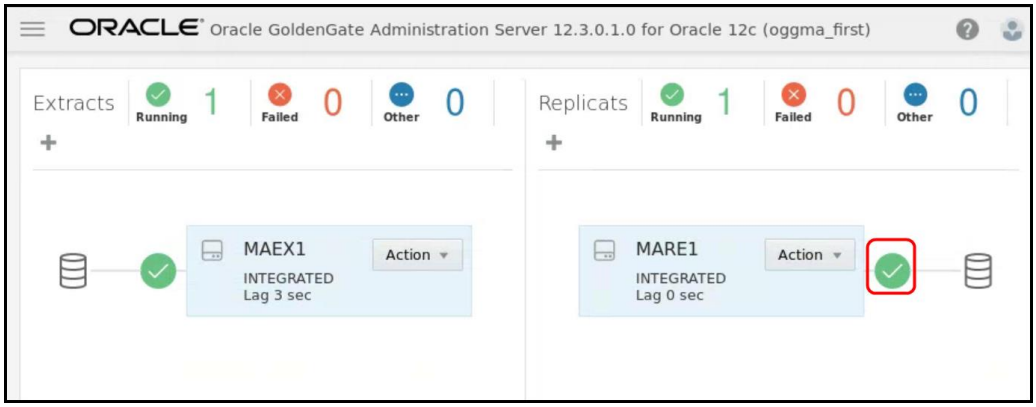
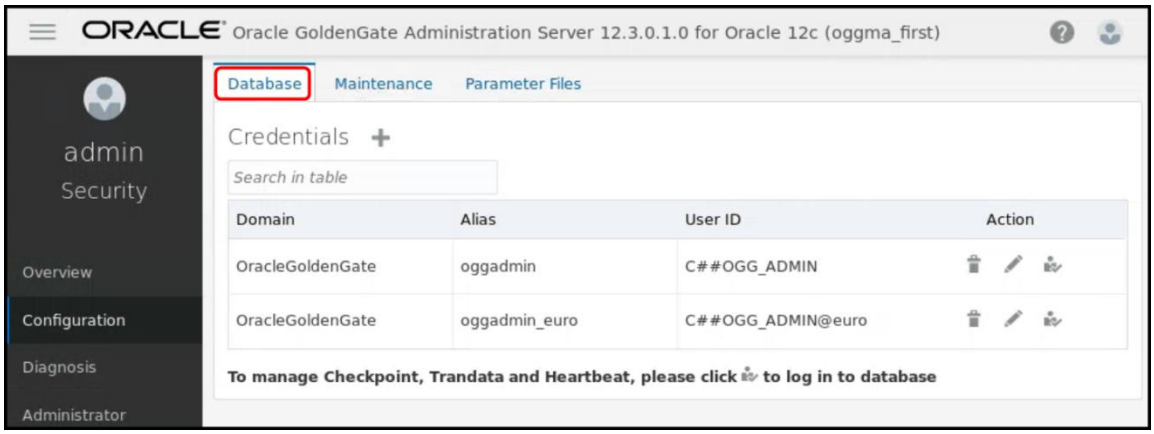


3. Verify the database credentials you entered while defining Extract and Replicat.

   a. Click the menu icon in the left top portion of the Admin Server overview page. The "**`admin Security`**" menu appears on the left side of the overview page. Click "**`Configuration`**" to display the configuration page. Under the "**`Database`**" tab, you can access the database credentials added while configuring the Extract and Replicat processes.



   b. Feel free to navigate around the application. For example, click the "Parameter Files" tab and explore the parameter files that configure the **`maex1`** and **`mare1`** processes.

In this practice you configured an Extract and a Replicat group. They are not connected yet, so if you insert data in the source database no replication will occur to the target database. In order to establish a data path between Extract and Replicat, you need to connect to the Distribution Server, which will be covered in the next lesson.

This last step concludes practice 12-2 and all practices for lesson 12. Leave the Firefox browser running for practice 13-1.

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Practices for Lesson 13: Oracle GoldenGate Microservices Architecture – Distribution Server

Overview

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Practices for Lesson 13: Overview

Practices Overview

In these practices, you will connect the data capture side of your replication (**`maex1`** Extract) with the apply side of your replication (**`mare1`** Replicat) by creating a data path connecting to the Distribution Server. You will then generate some database activity and verify that the data stored in the source database is propagated to the target database.

The last practice for this lesson involves writing a filter that includes certain rows in the `BRANCH` table and excludes others. You will create this filter, and you will test it to make sure that replication does not occur for those rows that should be filtered out.

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Practice 13-1: Creating a Data Path by Using the Distribution Server

Overview

In this practice, you connect to the Distribution Server and create a data path that connects the **`maex1`** Extract to the **`mare1`** Replicat.

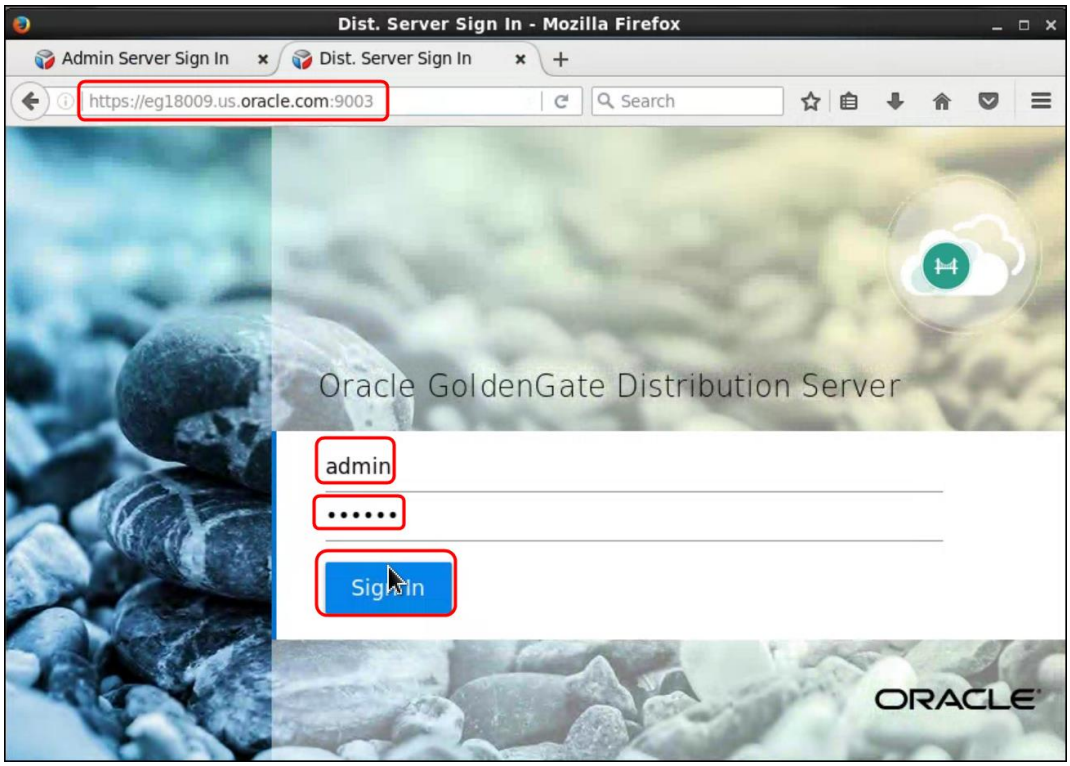
Assumptions

You have successfully completed practice 12.

Tasks

1. Connect to the Distribution Server.

   a. Launch the Firefox browser by clicking its icon ( ) located in the panel at the top of your graphical desktop, if you don't have an already open browser in your desktop. Enter the URL: **`https://<hostname+domain_name>:9003`** in the browser address field. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". If this is the first time you are accessing the Distribution Server, you will have to add the security exception to your Firefox browser in order to access web application. **`9003`** is the TCP/IP port you had assigned to the Distribution Server for socket connections. The "Distribution Server Sign In" page is displayed. Enter "**`admin`**" as the username and the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click "Sign In" to advance to the next page.



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2. Create a new data path.

   a. The Distribution Server Overview page is displayed, showing zero paths configured. Click the plus (+) sign to the right of the overview page to add a distribution path.

   b. The “Add Path” page is displayed. There are several fields you must fill in, in particular:
      - Path name—**`path01`**.
      - Description—**`ma first path`**.
      - Select the **`maex1`** Extract from the dropdown list in the first of the three fields comprising the source information.
      - Select **`me`** as the trail file (the field is automatically set after you choose the **`maex1`** Extract).
      - Select **`wss`** as the protocol to be used from the dropdown list.
      - Select your hostname + domain name as the target host.
      - Select **`9004`** as the host port.
      - Select **`mr`** as the remote trail file. You configured this trail file when you created the **`mare1`** Replicat parameters.

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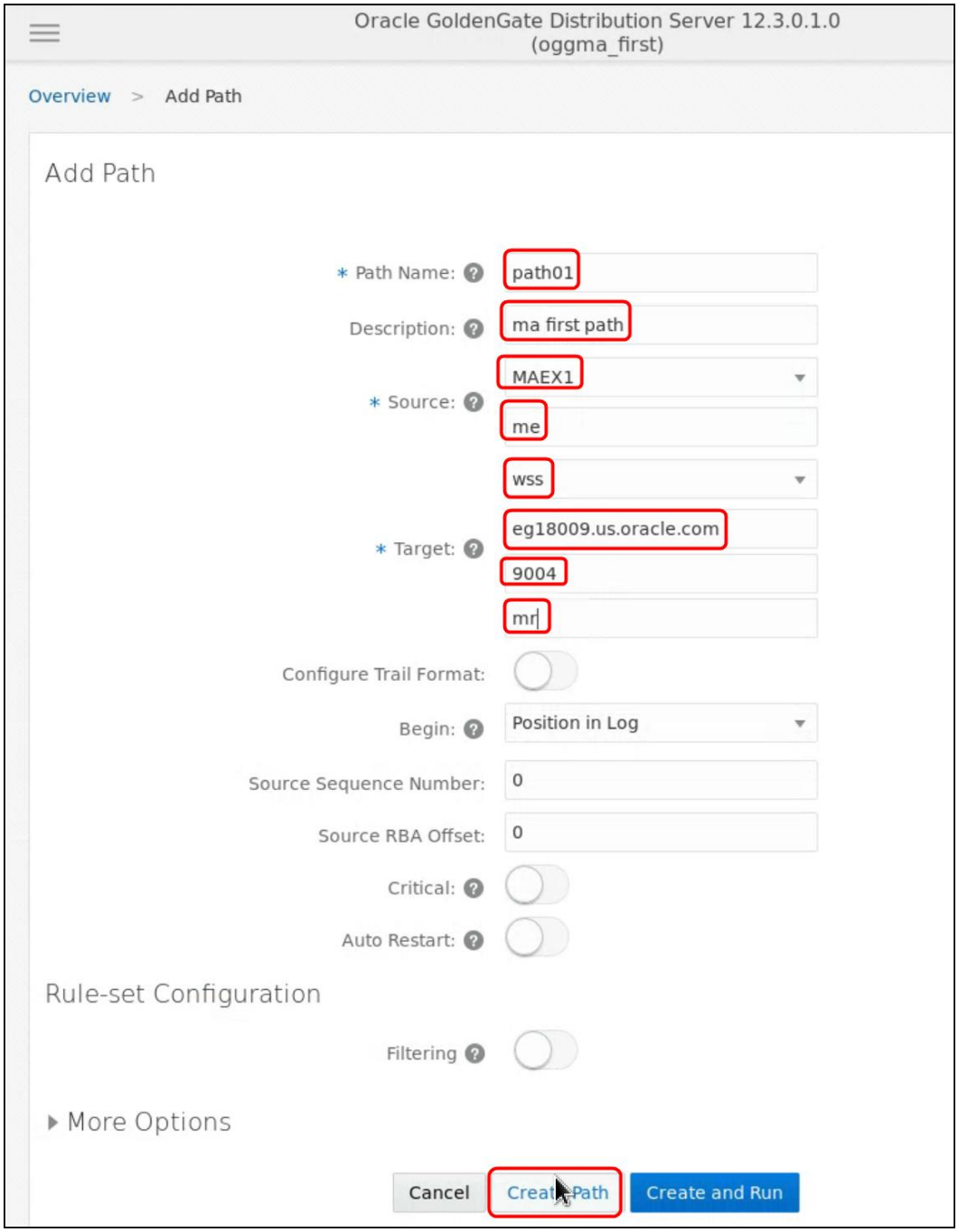
Click "**`Create Path`**" to add the data path.



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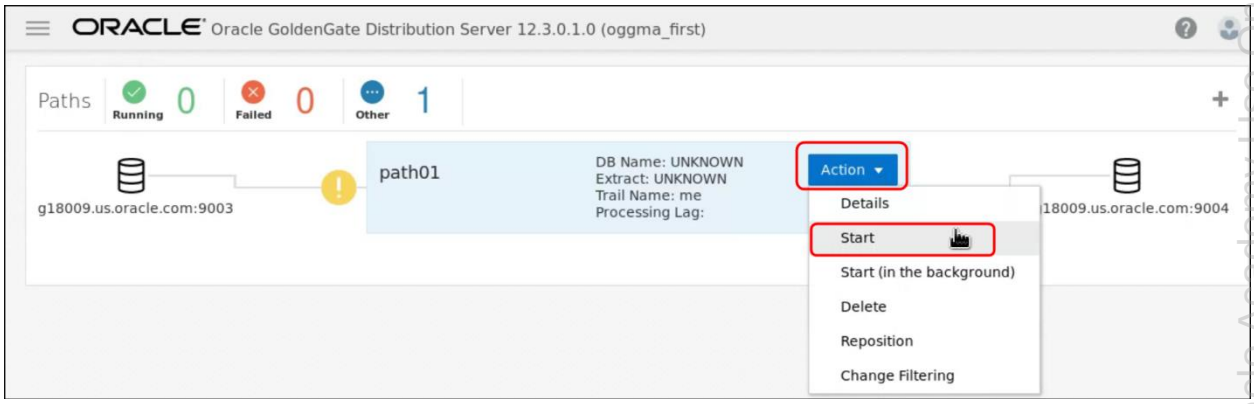
c. After you add the path, the Distribution Server overview page is displayed again. The yellow exclamation point icon beside the newly created path means that the path has been created, but not started.

d. Click "**`Action`**" and select "**`Start`**" to start the data path.



e. Click "**`OK`**" to confirm starting the path when the confirmation window appears. The Distribution Server overview page should now display a green icon, and the DB name and the Extract name are shown inside the pictorial representation of the data path.

This last step concludes practice 13-1. Leave the Firefox window you used to add your first data path open and continue on with practice 13-2.

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Practice 13-2: Generating Database Activity and Verifying that Replication Occurs

Overview

In this practice, you run an `sql` script that performs four transactions inserting, updating, and deleting rows in the source database. You then verify that those four transactions are replicated to the target database (EURO.)

Assumptions

You have successfully completed practice 13-1.

Tasks

1. Connect to the **AMER** database as the "**west**" user.

   a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Change directory to "**/home/oracle/labs/lab/les13**" where the `trans.sql` script resides. Feel free to use the shell cat command to display the content of that file on your screen (optional). Launch **sqlplus** connecting to the source database (**AMER**) by using the "**west**" user. Enter the **sqlplus** command "**set echo on**" to display each command stored in the **trans.sql** script and invoke the script by using the **@** sign.

   Note: To prevent 3 constraint violations, try entering the following commands before running the script:

   ```
   sqlplus west/oracle_4U@amer
   select count(*) from branch;
   ```

   Note: If there are 43 records, then you can try the following:

   ```
   delete from branch where branch_number > 99
   commit;
   conn east/oracle_4U@euro
   select count(*) from branch;
   ```

   Note: If there are more than 40 records, then you can try the following:

   ```
   delete from branch where branch_number > 99;
   commit;
   ```

   Note: 0 records may be committed

   ```
   [oracle@hostname ~]$ cd labs/lab/les13
   [oracle@hostname les13]$ sqlplus west@amer
   SQL*Plus: Release 12.2.0.1.0 Production on Thu Jan 4 18:40:15 2018
   Copyright (c) 1982, 2016, Oracle.  All rights reserved.
   Enter password: *********
   Last Successful login time: Thu Jan 04 2018 18:15:34 +11:00
   Connected to:
   ```

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```
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production
SQL> set echo on
SQL> @trans
SQL> SELECT 'The BEFORE count for west.branch is '||count(*) FROM
west.branch;
'THEBEFORECOUNTFORWEST.BRANCHIS'||COUNT(*)
----------------------------------------------------------------
The BEFORE count for west.branch is 43
…Many lines omitted for the sake of brevity…
SQL> DELETE FROM west.branch WHERE branch_number=112;
1 row deleted.

SQL> COMMIT;
Commit complete.
SQL>
```

b. Leave the `sqlplus` shell by entering the "exit" command.

```
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@hostname les13]$
```

2. Access the Distribution Server and verify that the transactions were replicated.

   a. Select the Firefox window displaying the Distribution Server overview page. If the session has expired, log in again, providing the correct credentials. Click "**Action**" and select "**Details**" to display the **Path Information** page.

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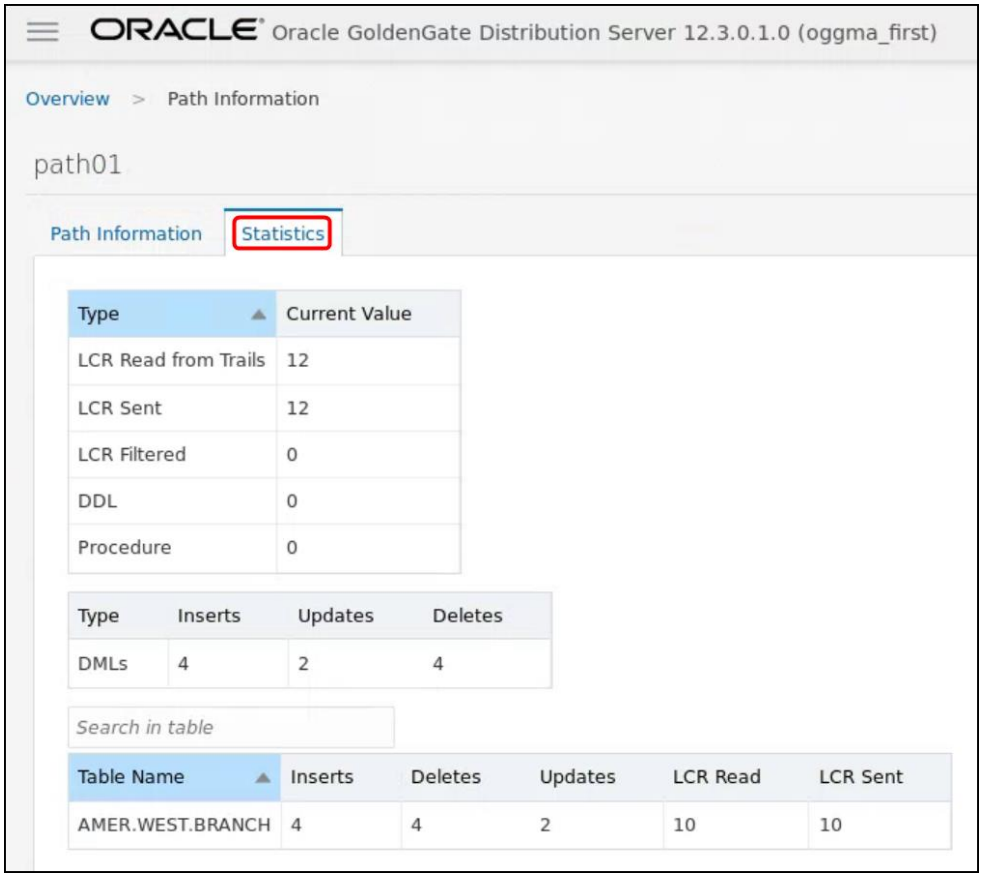
b. In the **`Path Information`** page, click the "**`Statistics`**" tab to display the statistics related to the **`path01`** path.



Note: The counts may not match. If the records are deleted, then the following counts occur:

```
4    Inserts
2    Updates
7    Deletes
```

3. Verify the replication statistics as displayed by the **`mare1`** Replicat group. Use the Administration Server to navigate to the Replicat detail page.

   a. Select the Firefox browser window and add a browsing tab (or spawn a new browser window if you prefer). Enter the URL: https://<hostname + domain_name>:9002 in the address bar to access the "Administration Server Sign In" page. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". Provide the credentials and click "Sign In" to access the Administration Server overview page.

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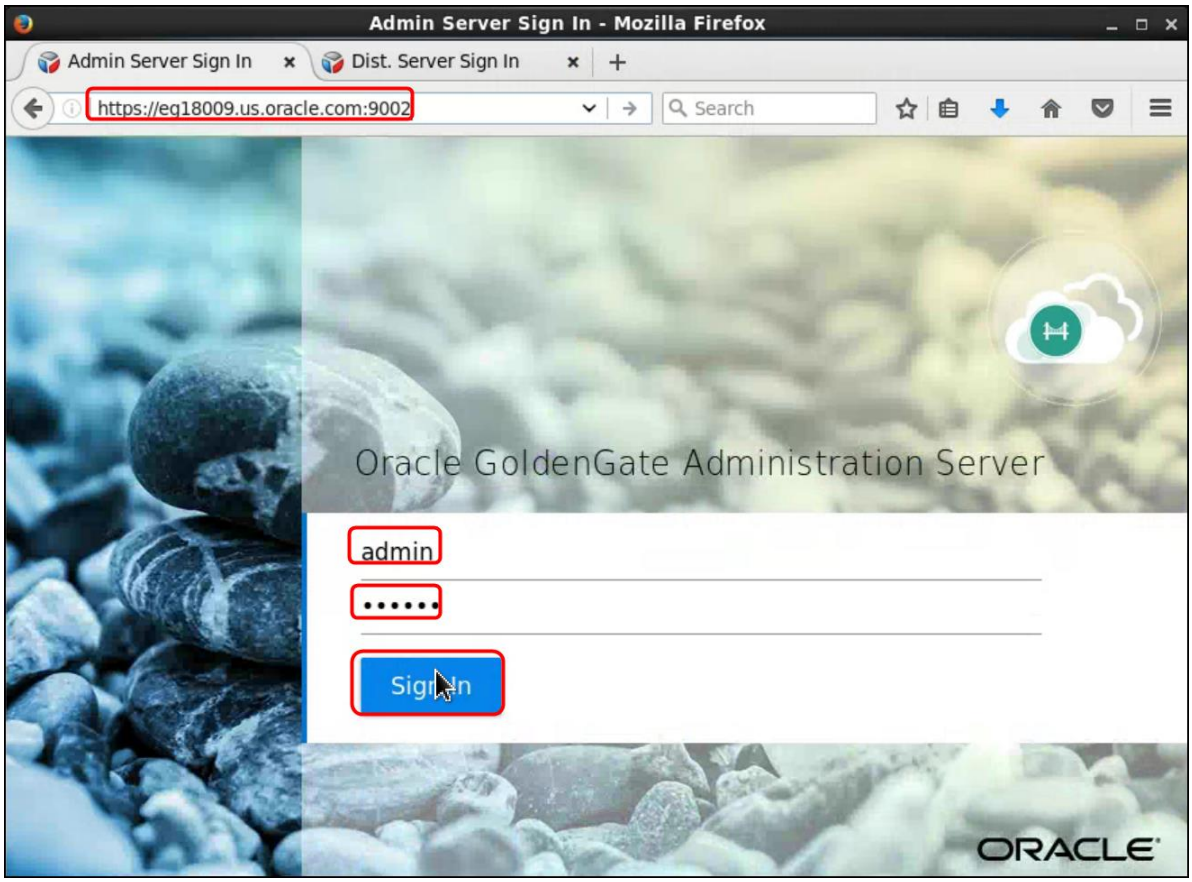
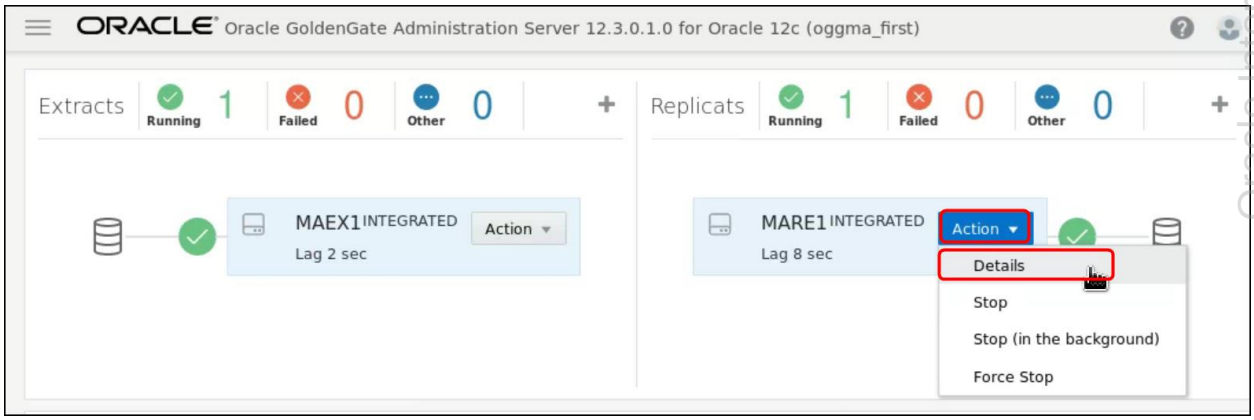
Note: You may not need to provide credentials if your previous Distribution Server session has not expired. In this case, after you enter the Admin Server URL you access directly the Administration Server page, and no credentials are required.



b. The Admin Server overview page is displayed. On the Replicat side (to the right of the page), select "**`Action`**" for the **`MARE1`** Integrated Replicat and "**`Details`**" to access the "**`Process Information`**" page.



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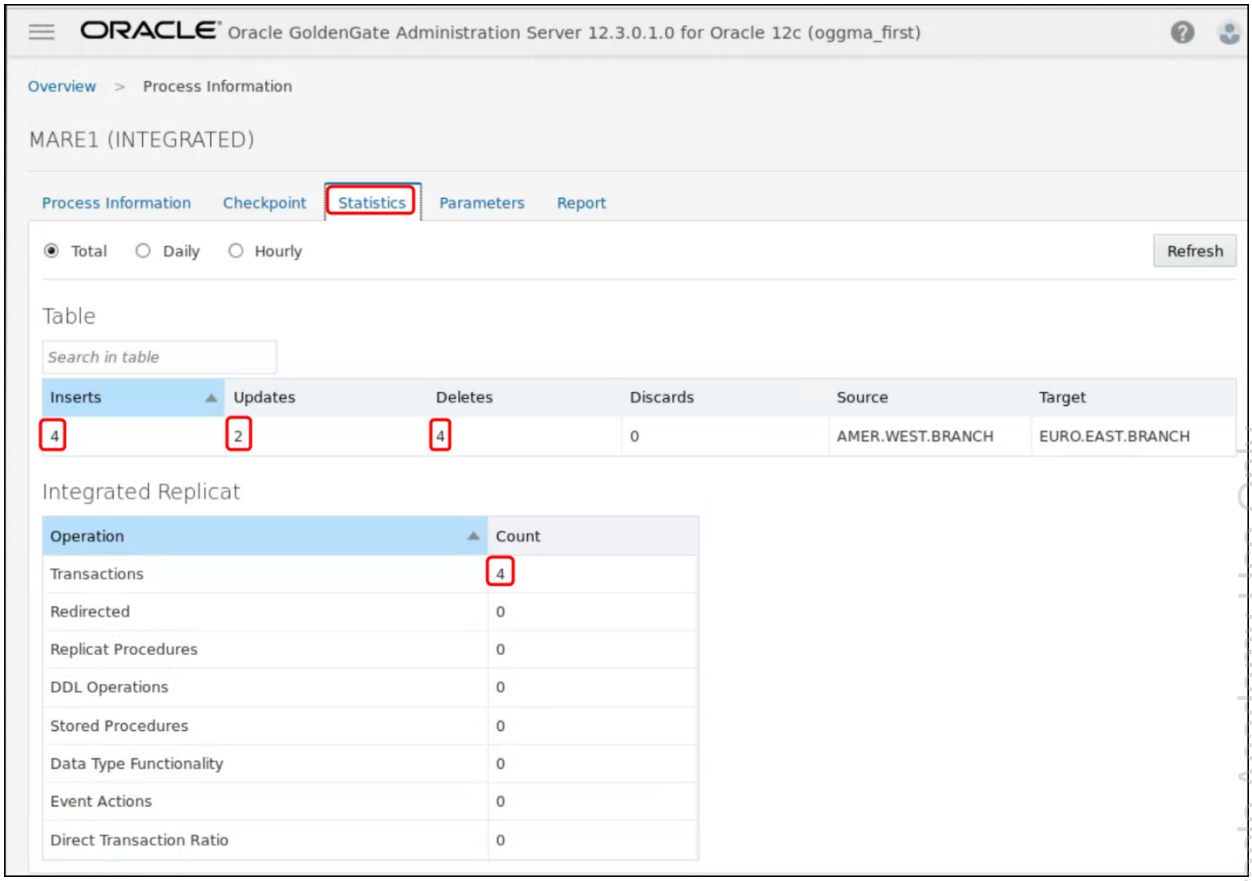
c. In the "**`Process Information`**" page, click the "Statistics" tab to access the detailed statistics for the **`mare1`** Replicat group.



This last step concludes practice 13-2. Leave the Firefox window open and continue on with practice 13-3.

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Practice 13-3: Creating a Path Filter and Verifying That Rows Are Actually Filtered

Overview

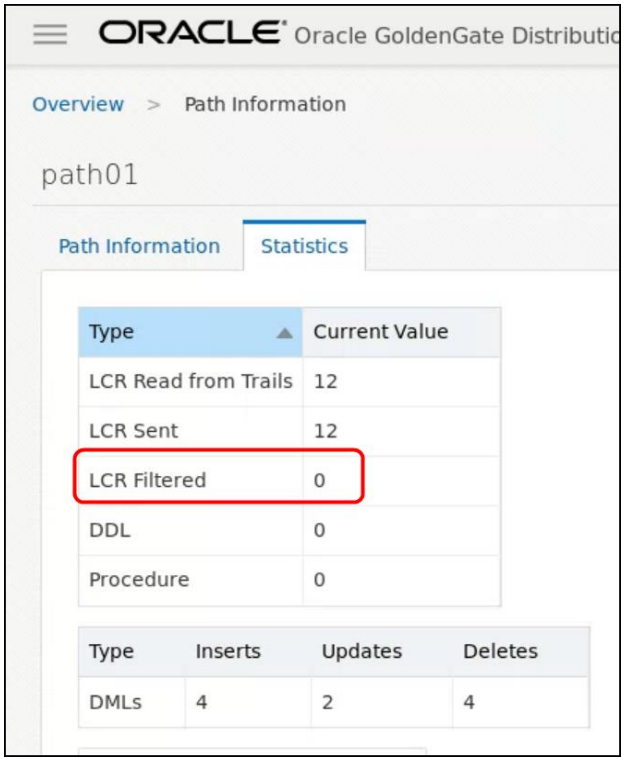
In this practice, you will create a filter associated to path01, which will allow for replication of only of those branch numbers less than 4000. You will then insert a branch row in the `BRANCH` table whose branch number is 4000 and verify that the row containing the value 4000 for branch number is filtered out (not replicated) in the target database.

Assumptions

You have successfully completed practices 13-1 and 13-2.

Tasks

1. Connect to the Distribution Server and verify the statistics for the **`path01`** path.
   a. Use your browser to connect to the Distribution Server (URL: **`https://<hostname + domain_name>:9003`**). If your session did not expire, you will land on the Distribution Server Overview page. If the session did expire, you will have to re-enter the credentials for the "**`admin`**" user. After the Overview page is displayed, click the "**`Action`**" button on the right side of the **`path01`** path and then click "**`Details`**" to display the Path Information page.
   b. Click the "**`Statistics`**" tab to show the statistics for **`path01`**. Note that the **`LCR Filtered`** value is set to **`0`**.



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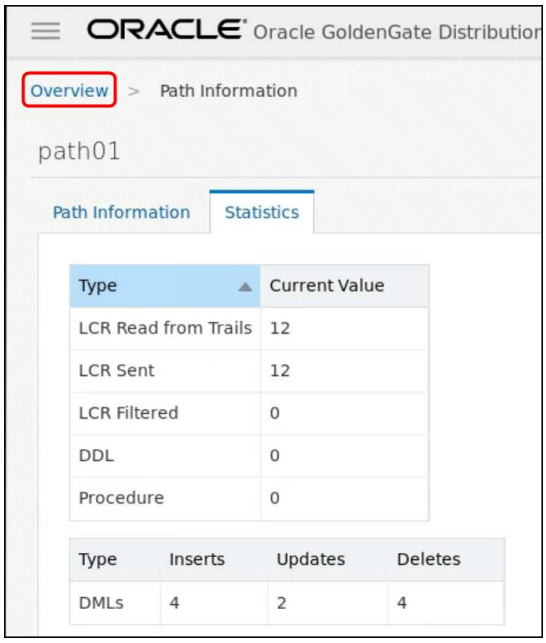
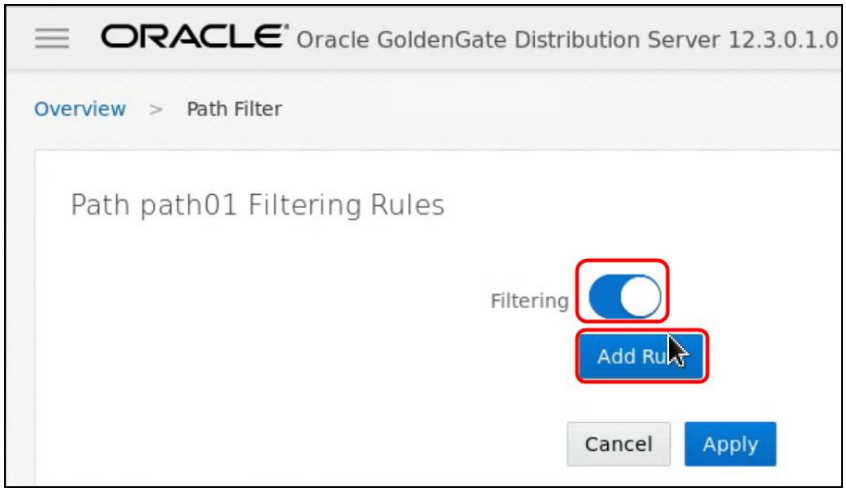
2. Display the Overview page and add a filtering rule for **`path01`**.

   a. Click the "**`Overview`**" link on the top left side of the "**`Path Information`**" page to display the Distribution Server Overview page again.



   b. In the Overview page, click the "**`Action`**" button on the right side of the **`path01`** path and then click "**`Change Filtering`**" to display the "**`Path Filter`**" page. Enable filtering and click the "**`Add Rule`**" button.



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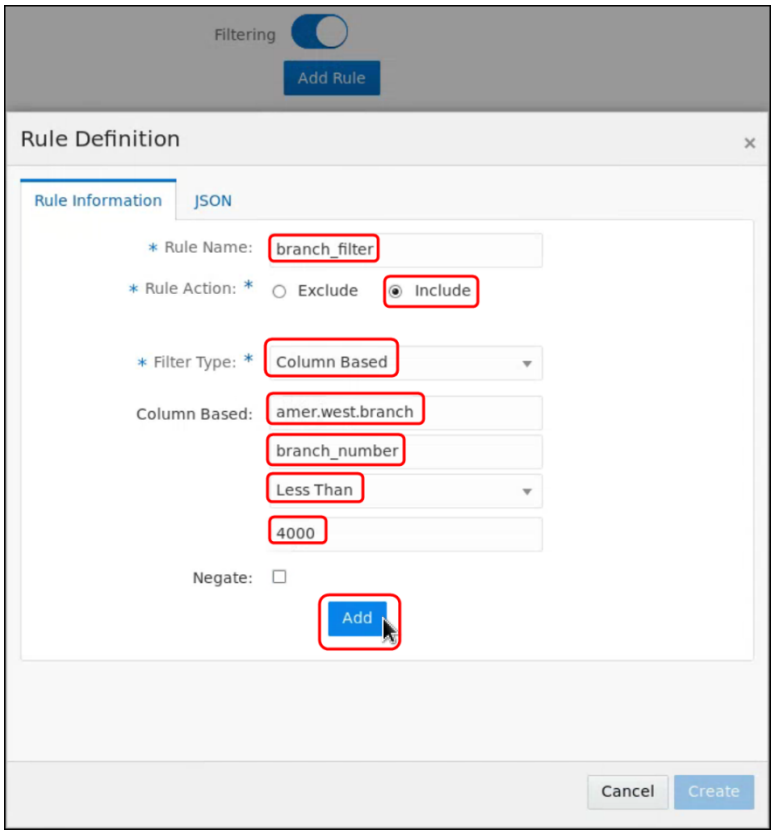
c. The “Rule Definition” modal window appears. Under the “Rule Information” tab, enter the following:

- **`branch_filter`** as the rule name.
- “**`Include`**” as the rule action.
- Select “**`Column Based`**” from the dropdown list as filter type.
- **`amer.west.branch`** as the table name.
- **`brunch_number`** as the column name.
- Select “**`Less Than`**” from the … dropdown list.
- **`4000`** as the value.

  Click “**`Add`**” to add the new rule.

  On the **Rule Definition** window, click **Create**.



The rule entered means that only those branch rows for which **`BRANCH_NUMBER`** is less than **`4000`** will be replicated to the target database.

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d. The rule is added to the “Path Filter” page. Click “Apply” to activate the rule.

e. The Distribution Server Overview page is displayed again. You can now see that **`path01`** reports a “**`Filter By`**” condition.

3. Add a row to the **`WEST.BRANCH`** table with a value of **`5000`** for its **`BRANCH_NUMBER`** column and verify that the row is not replicated to the target.

   a. Open a new terminal shell window or reuse one if still active. Connect to the **`AMER`** database as the user “**`west`**” and add a branch with a **`BRANCH_NUMBER`** of **`5000`**.

```
[oracle@hostname ~]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 10 23:32:21 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Wed Jan 10 2018 17:55:55 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production
SQL> insert into west.branch values (5000,3456);
1 row created.
SQL> commit;
Commit complete.
SQL>
```

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b. Open a new terminal shell window, this time use **sqlplus** to connect to the **EURO** database as the "**east**" user. Enter the SQL select command to display all branches that have a branch number greater than **4000**. You are expecting not to find any branch, as the filter rule for **path01** should have filtered out the branch with a branch number of **5000**, which you entered in the **AMER** database.

```
[oracle@eg18009 ~]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 10 23:38:57 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password:
Last Successful login time: Tue Jan 09 2018 22:08:33 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production
SQL> select * from east.branch where branch_number > 4000;

no rows selected
SQL>
```

As expected, no rows were found with a branch number greater than 4000. The filter worked.

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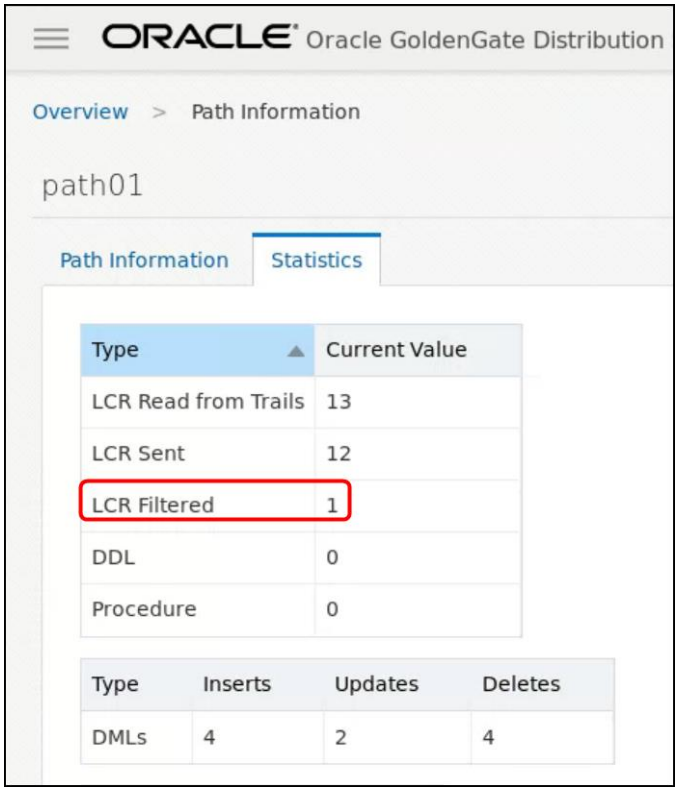
4. Verify that the LCR Filtered counter has been incremented in the statistics page for **`path01`**.

   a. Select the browser window and access the Overview page for the Distribution Server. Click the "**`Action`**" button on the right side of the **`path01`** path and then click "**`Details`**" to display the Path Information page. Click the "**`Statistics`**" tab to display the counters for **`path01`**. The LCR Filtered counter has been incremented.



This last step concludes practice 13-3 and all practices for lesson 13. Leave the Firefox window open for practice 14-1.

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Practices for Lesson 14: Oracle GoldenGate Microservices Architecture—Receiver Server and Performance Metrics Server

Overview

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Practices for Lesson 14: Overview

Practices Overview

In these practices, you will connect to the Receiver Server and assess the statistics of your data path. Subsequently, you will stop data capture and apply processes together with their data path and, through the `oggca.sh` facility, remove the deployment used so far. You will then configure a different deployment, this time including a Performance Metrics Server. After having re-configured data capture and apply processes and a data path, you will generate database activity and look at the various graphs generated by the Performance Metrics Server.

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Practice 14-1: Accessing the Receiver Server to Display Path Statistics

Overview

In this practice, you will connect to the Receiver Server and display statistics related to the **`path01`** data path.

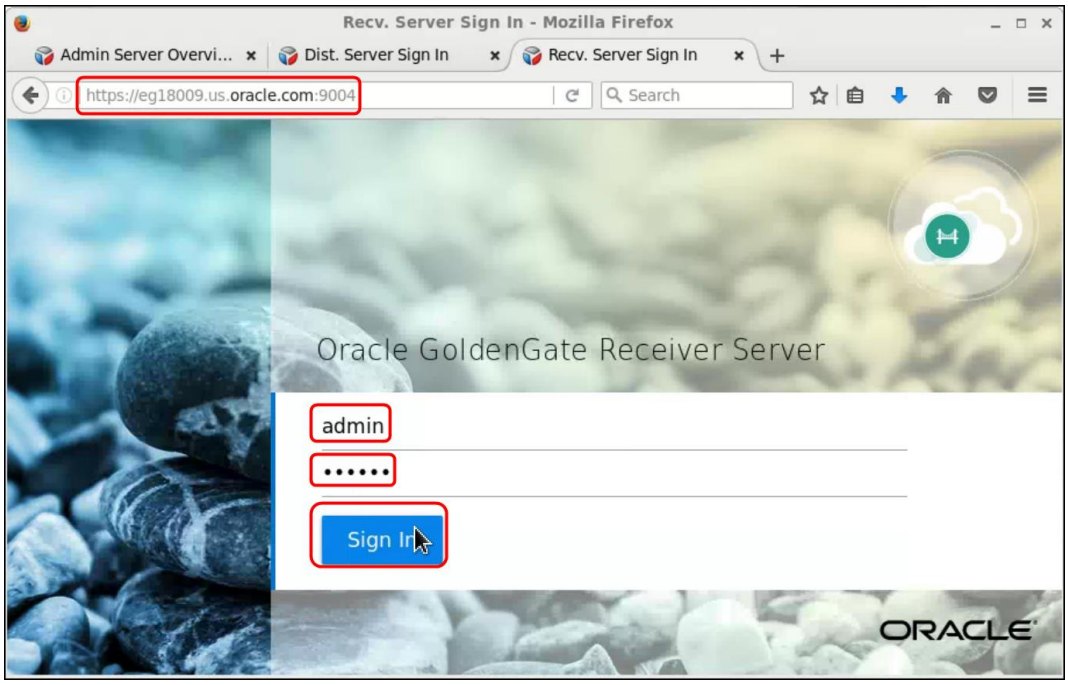
Assumptions

You have successfully completed practice 13, and the **`oggma_first`** deployment is running (all servers are running on ports 9001,9002,9003, and 9004).

Tasks

1. Connect to the Receiver Server.

   a. Launch the Firefox browser by clicking its icon ( ) located in the panel at the top of your graphical desktop, if you don't have an already open browser in your desktop. Enter the URL: **`https://<hostname+domain_name>:9004`** in the browser address field. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". If this is the first time you are accessing the Receiver Server, you will have to add the security exception to your Firefox browser in order to access web application, the same way you did in practice 11-4, task 2a. **`9004`** is the TCP/IP port you had assigned to the Receiver Server by using **`oggca.sh`** for socket connections. The "Receiver Server Sign In" page is displayed. Enter "**`admin`**" as the username and the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click "**`Sign In`**" to advance to the next page.



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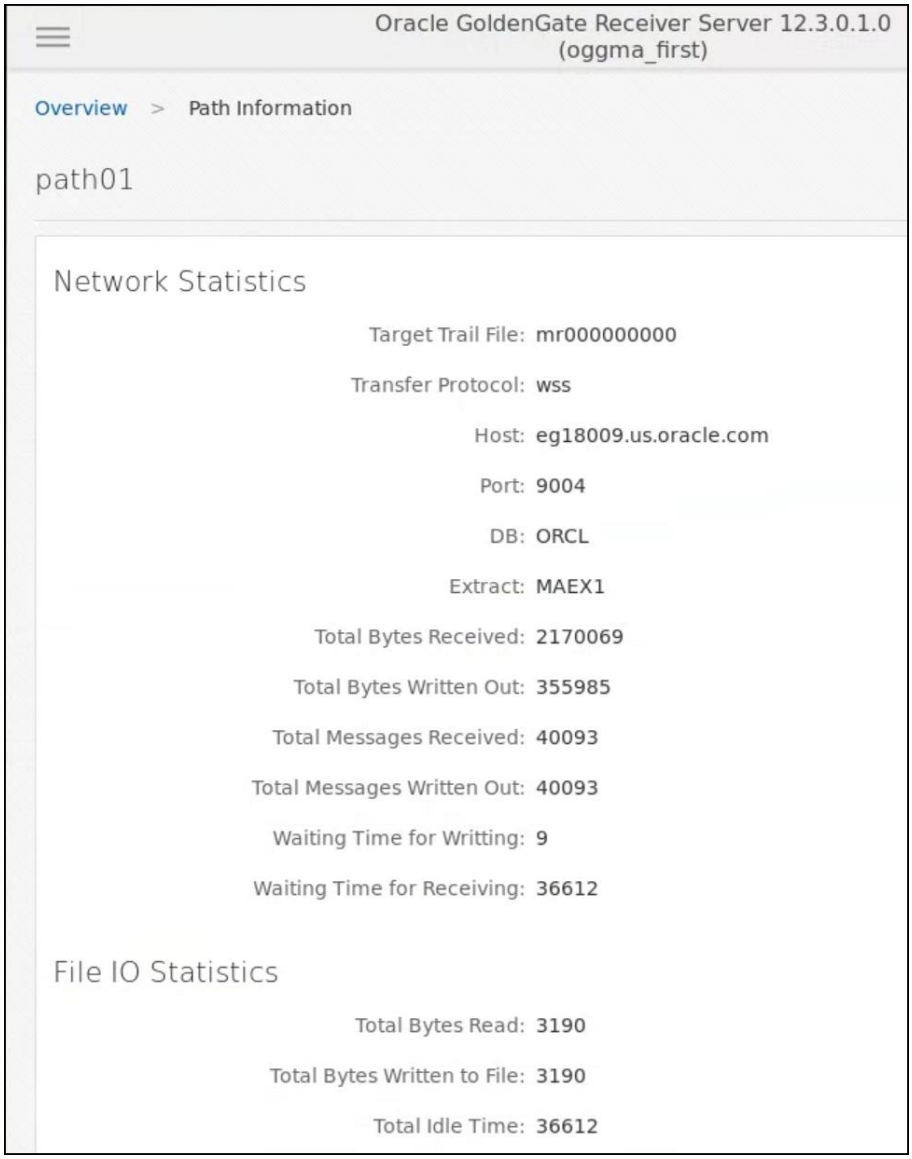
2. Access the statistics page for the **`path01`** data path.

   a. In the Receiver Server Overview page, click the "**`Action`**" button close to **`path01`** and then click "**`Details.`**"

   b. The "**`Path Information`**" page for the **`path01`** path is displayed. Look at the various statistics displayed. Dismiss the browser window when you are done.



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This last step concludes practice 14-1. Leave the Firefox window open and continue on with practice 14-2.

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Practice 14-2: Stopping Data Capture and Apply by Using the Admin Server

Overview

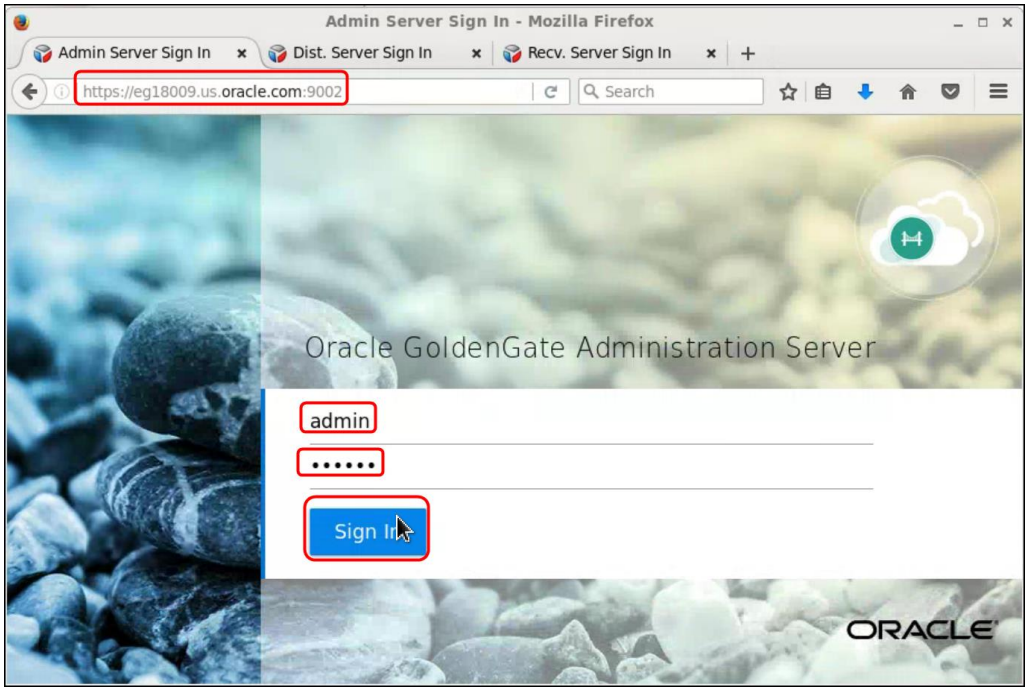
In this practice, you will use the Administration Server to stop Extract and Replicat process groups.

Assumptions

You have successfully completed practice 13, and the **`oggma_first`** deployment is running (all servers are running on ports 9001, 9002, 9003, and 9004).

Tasks

1. Connect to the Administration Server
   a. Select the Firefox window left open after practice 14-1. If the window is not open, click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**`<hostname+domain_name>:9002`**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". The "Admin Server Sign In" page appears. Enter "**`admin`**" as the user and the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click "**`Sign In`**" to advance to the next page.



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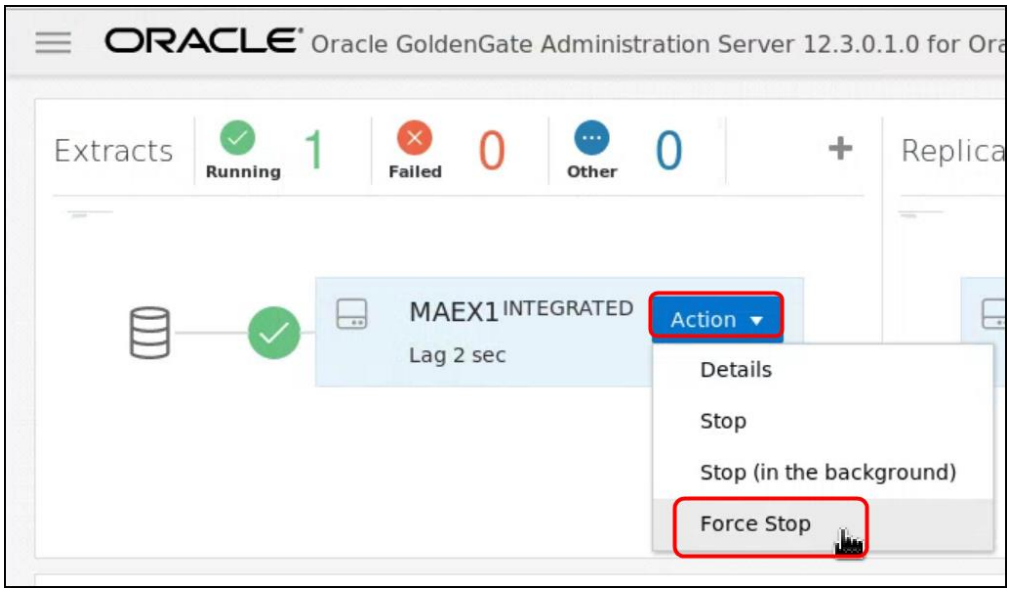
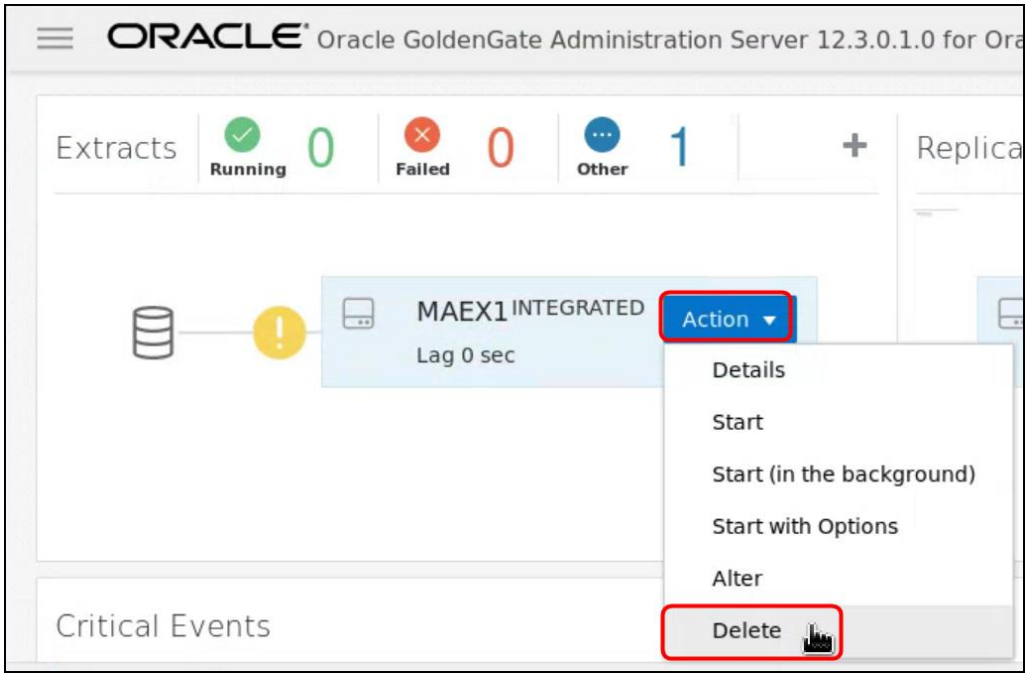
2. Stop the "**maex1**" Extract group.
   a. In the Administration Server overview page, click the "**Action**" button next to the "**maex1**" integrated Extract group and then click "**Force Stop**."



   b. The Administration Server overview page is displayed again.
3. Delete the "**maex1**" Extract group.
   a. Click the "**Action**" button next to the "**maex1**" integrated Extract group and then click "**Delete**."



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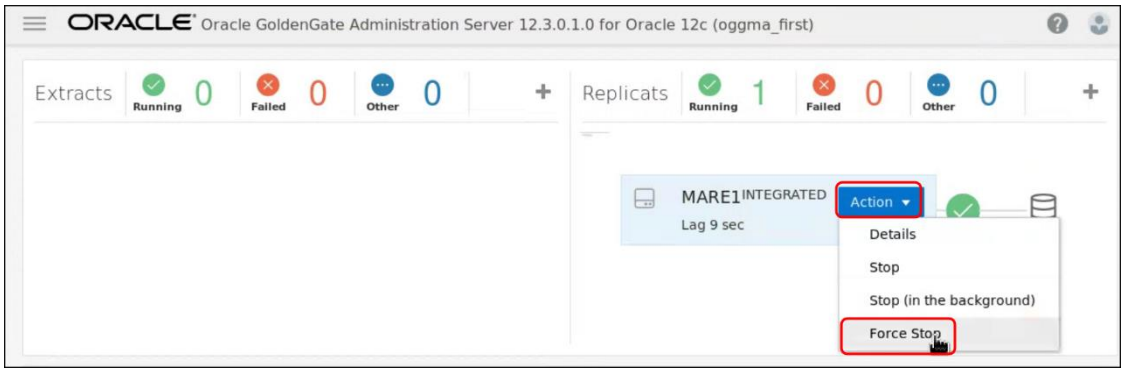
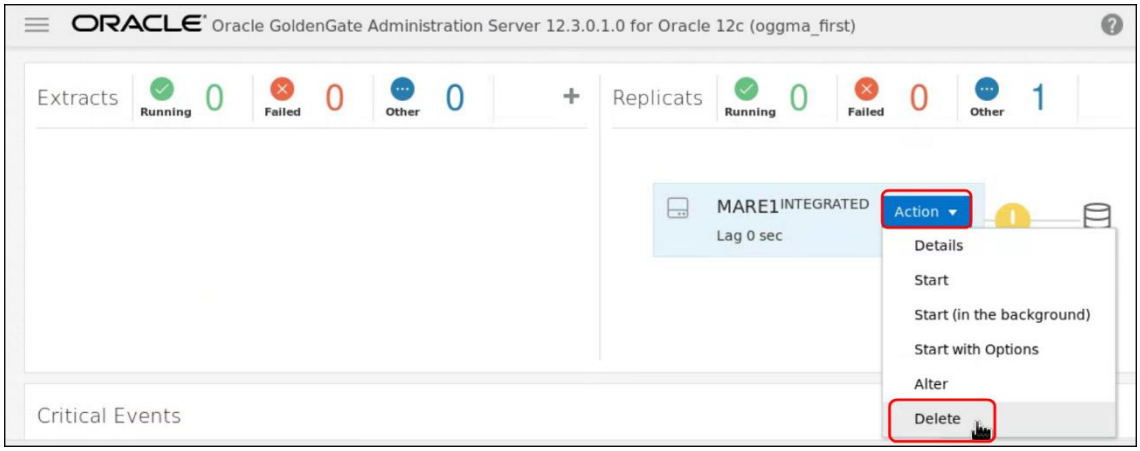
4. Stop the "**mare1**" Replicat group.
   a. Click the "**Action**" button next to the "**mare1**" Replicat group and then click "**Force Stop**."



5. Delete the "**mare1**" Replicat group.
   a. Click the "**Action**" button next to the "**mare1**" integrated Replicat group and then click "**Delete**."



This last step concludes practice 14-2. Leave the Firefox window open and continue on with practice 14-3.

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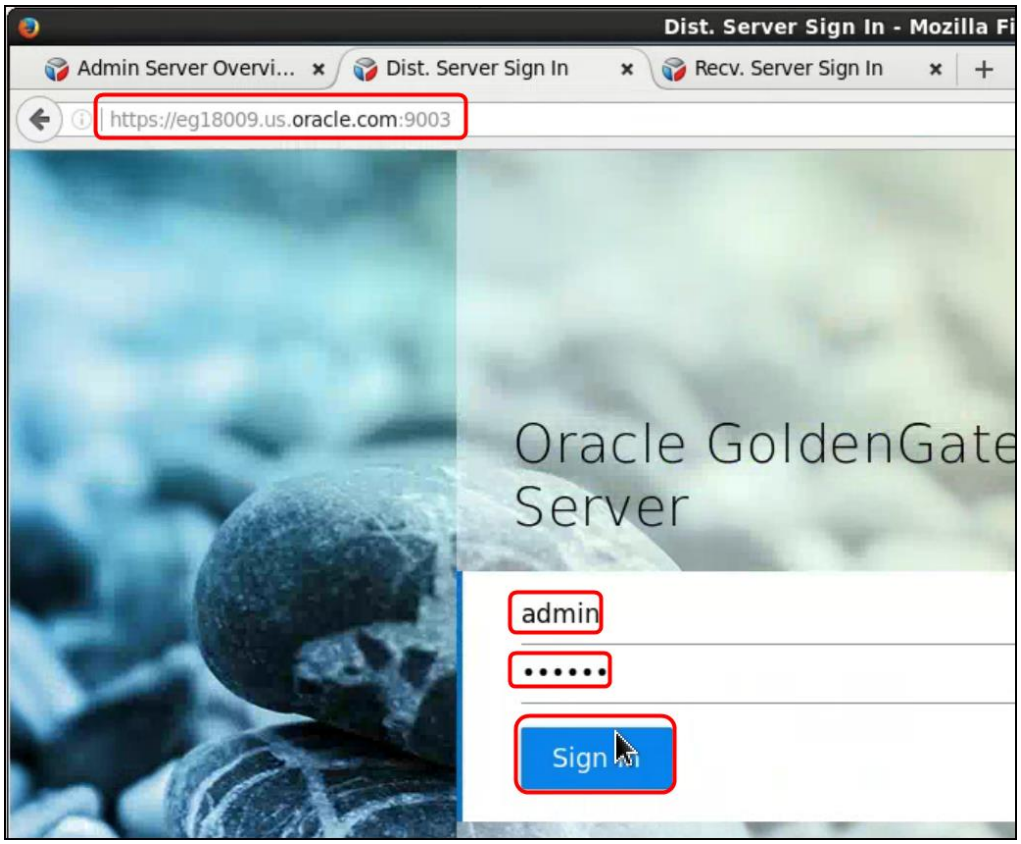
Practice 14-3: Stopping the `path01` Data Path by Using the Distribution Server

Overview

In this practice, you will use the Distribution Server to stop the **`path01`** data path.

Tasks

1. Connect to the Distribution Server.
   a. Select the Firefox window left open after practice 14-1. If the window is not open, click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**`<hostname+domain_name>:9003`**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". The "Distribution Server Sign In" page appears. Enter "**`admin`**" as the user and the password you had assigned to the admin user in practice 11-2. Look up the password in the password sheet if needed. Click "**`Sign In`**" to advance to the next page.



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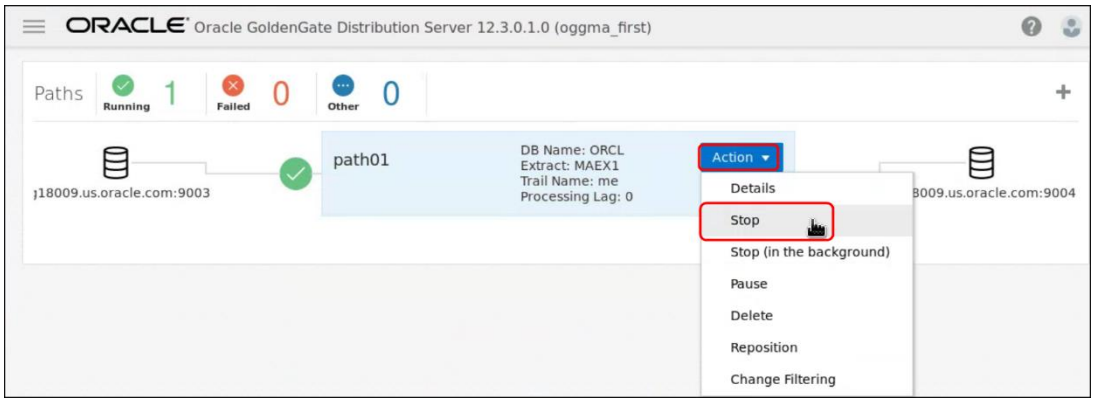
2. Stop the **`path01`** data path.

   a. In the Distribution Server overview page, click the "**`Action`**" button next to the "**`path01`**" path and then click "**`Stop`**."



3. Delete the **`path01`** path.

   a. In the Distribution Server overview page, click the "**`Action`**" button next to the "**`path01`**" path and then click "**`Delete`**."

This last step concludes practice 14-3. Leave the Firefox window open and continue on with practice 14-4.

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Practice 14-4: Uploading a Stored Procedure to the Oracle RDBMS to Generate Database Activity

Overview

In this practice, you upload a script that creates a sequence (**trans_seq**) and a stored procedure (**db_activity**) that you will use to generate heavy database activity so you can test the Performance Metrics Server.

Tasks

1. Open a shell terminal.

   a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment, if you don't already have an open terminal shell window.

   b. Change directory to "**/home/oracle/labs/lab/les14.**" Launch **sqlplus** connecting to the **AMER** database as the "**west**" user.

```
[oracle@hostname ~]$ cd ~/labs/lab/les14
[oracle@hostname les14]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 8 17:28:57
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Mon Jan 08 2018 13:50:48 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL>
```

   c. Run the script **db_activity.sql,** which will upload the sequence and the stored procedure. The script attempts to drop the sequence, which if not there provokes the error message "**ORA-02289: sequence does not exist**." You can safely disregard that message.

```
SQL> @db_activity
DROP SEQUENCE "WEST"."TRANS_SEQ"
                   *
ERROR at line 1:
ORA-02289: sequence does not exist

Sequence created.

Procedure created.
SQL>
```

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d. Leave `sqlplus` by entering the “exit” command.

```
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.2.0.1.0 - 64bit Production
[oracle@eg18009 les14]$
```

This last step concludes practice 14-4. Leave the terminal shell window open and continue on with practice 14-5.

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Practice 14-5: Removing the `oggma_first` Deployment by Using `oggca.sh`

Overview

In this practice, you will use the **`oggca.sh`** facility to remove the **`oggma_first`** deployment, which you have used up until now.

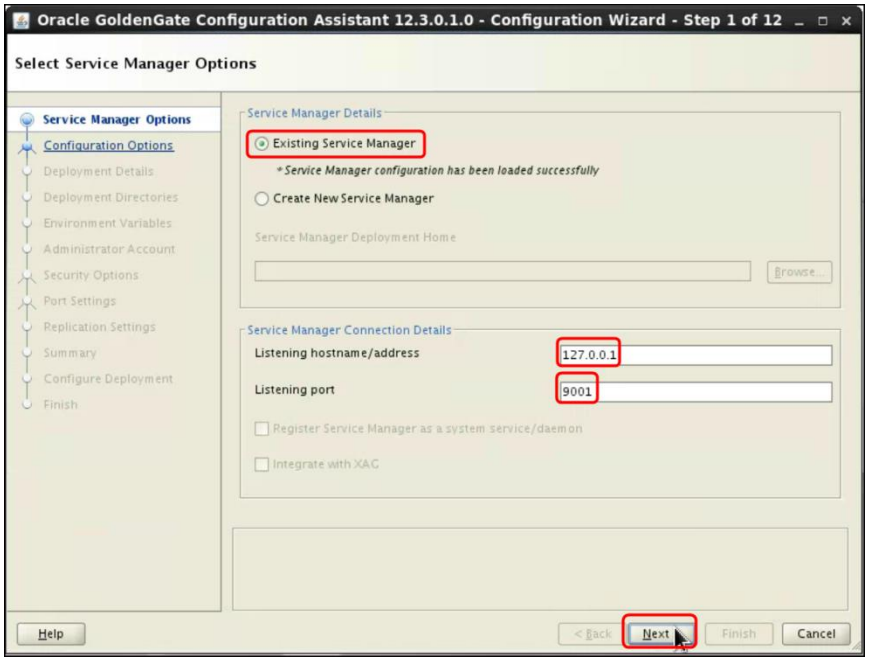
Tasks

1. Launch the **`oggca.sh`** utility and remove the **`oggma_first`** deployment.
   a. Reuse the terminal shell window left open at the end of the previous practice or open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment.
   b. Make sure that the **`OGG_HOME/bin`** directory is included in the **`PATH`** environment variable and launch the **`oggca.sh`** utility.

```
[oracle@hostname ~]$ echo $PATH
/usr/lib64/qt-
3.3/bin:/usr/NX/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin
:/usr/sbin:/sbin:/u01/app/oracle/product/12.2.0/db_1/bin:/u01/ap
p/ogg/oggma/bin:/home/oracle/bin
[oracle@ hostname Disk1]$ oggca.sh &
[1] 2217
```

   Note: The process ID of the forked process running, **`oggca.sh,`** will be different in your environment.

   c. The **`oggca.sh`** utility starts. In step 1, accept the default "**`Existing Service Manager`**" and the default for "**`Listening hostname/address`**" (**`127.0.01`**) and the default port 9001. Click "**`Next>`**" to proceed to step 2.



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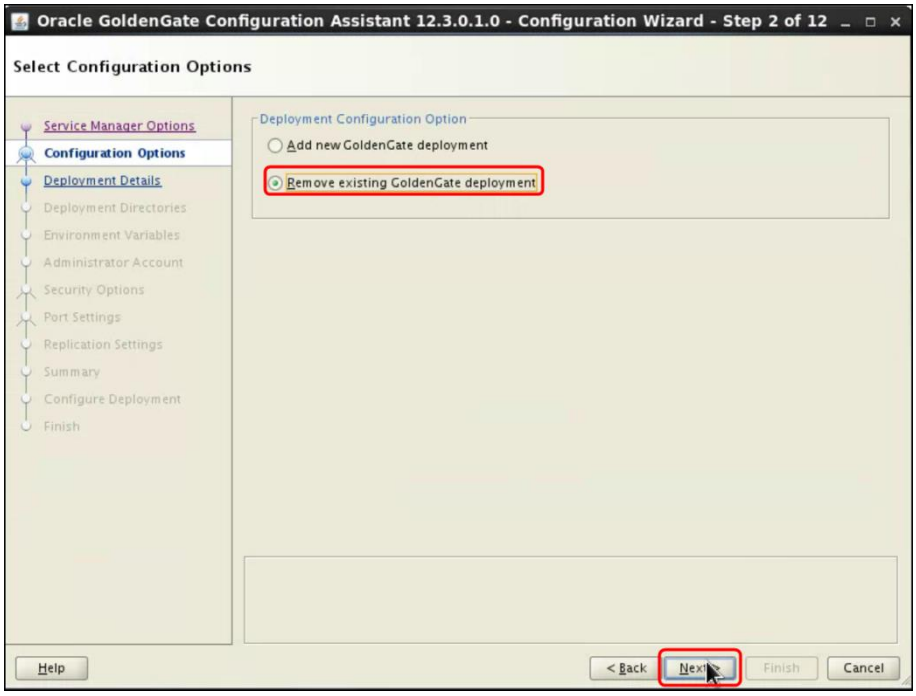
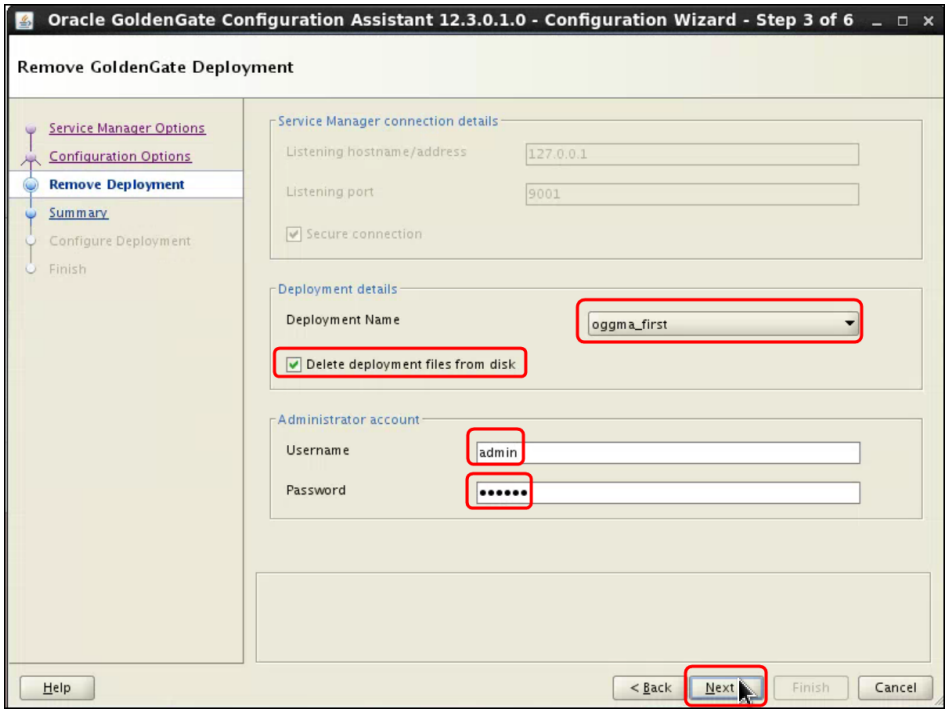
d. In step 2, select “Remove existing GoldenGate deployment” and click “Next>” to continue.



e. In step 3:

- Select **`oggma_first`** as the deployment name.
- Select “**`Delete deployment`** files from disk.”
- Enter “**`admin`**” as the administrator account username.
- Enter the password (look it up from the password sheet for this course if needed). Click “**`Next>`**” to continue.



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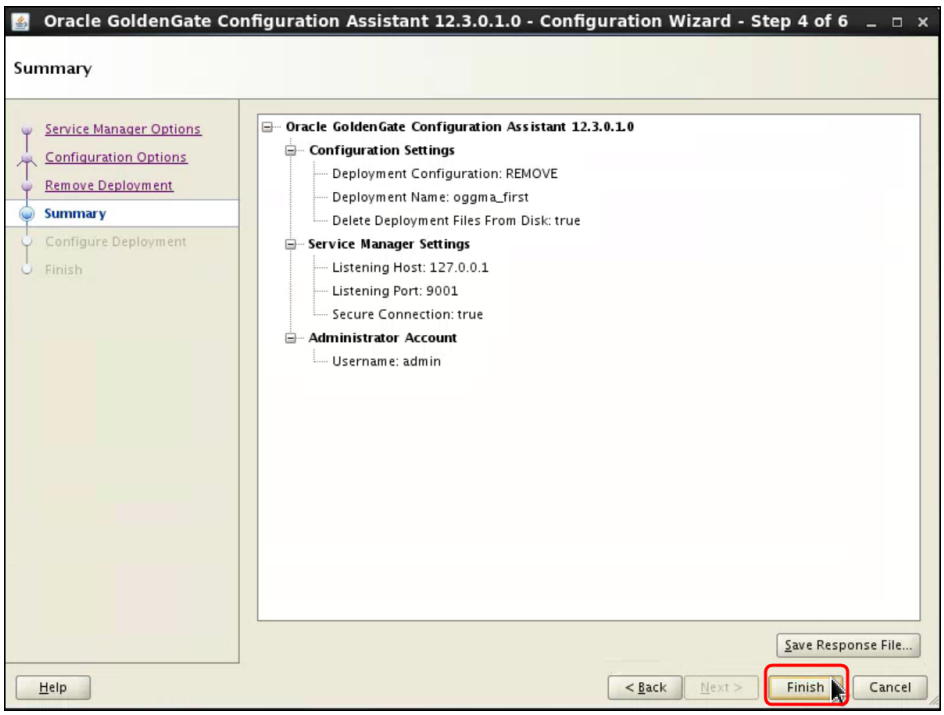
f. In step 4, verify the parameters you entered so far and click “Finish” to remove the deployment.



g. Step 5 shows the progress while removing the deployment. Step 6 shows the successful completion message. Click “**`Close`**” to dismiss **`oggca.sh`**.

This last step concludes practice 14-5. Leave the terminal shell window open and continue on with practice 14-6.

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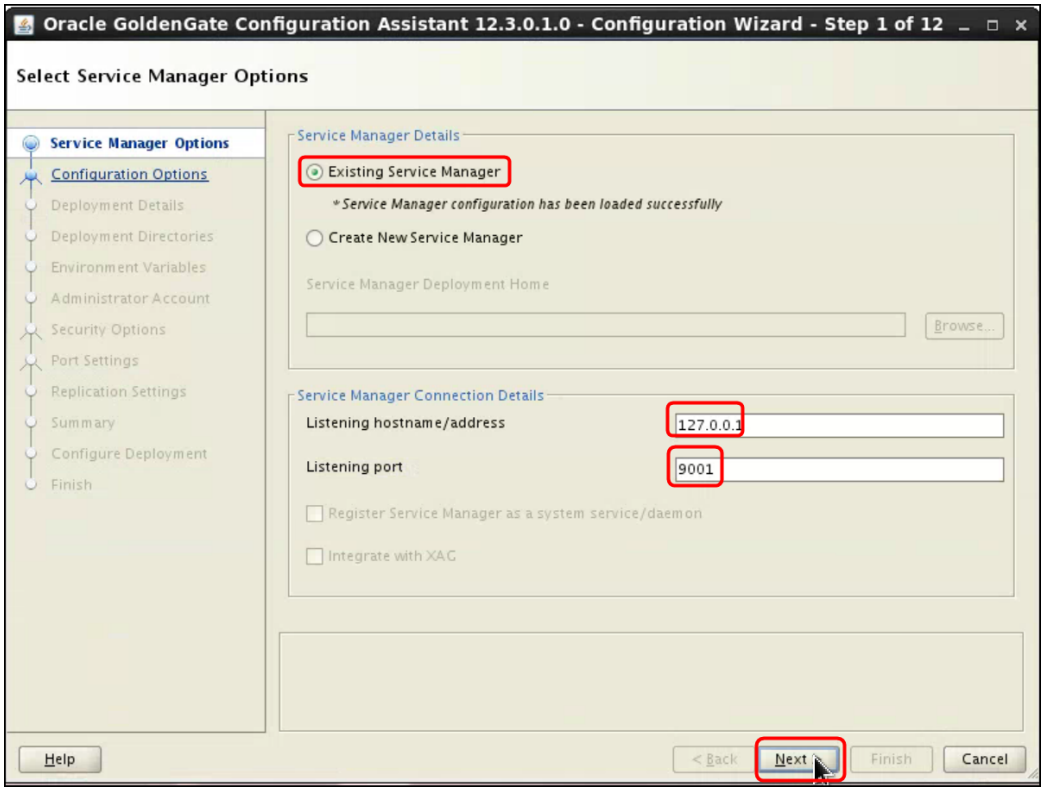
Practice 14-6: Configuring Your Second Deployment by Using `oggca.sh`

Overview

In this practice, you use `oggca.sh` again, this time to configure your second deployment, which will include a Performance Metrics Server.

Tasks

1. Launch the `oggca.sh` utility.
   a. Reuse the terminal shell window left open at the end of the previous practice and launch `oggca.sh` again.
   b. In step 1, accept all defaults (**`Existing Service Manager`**, **`127.0.0.1`**, and **`9001`**) and click "**`Next>`**" to proceed.



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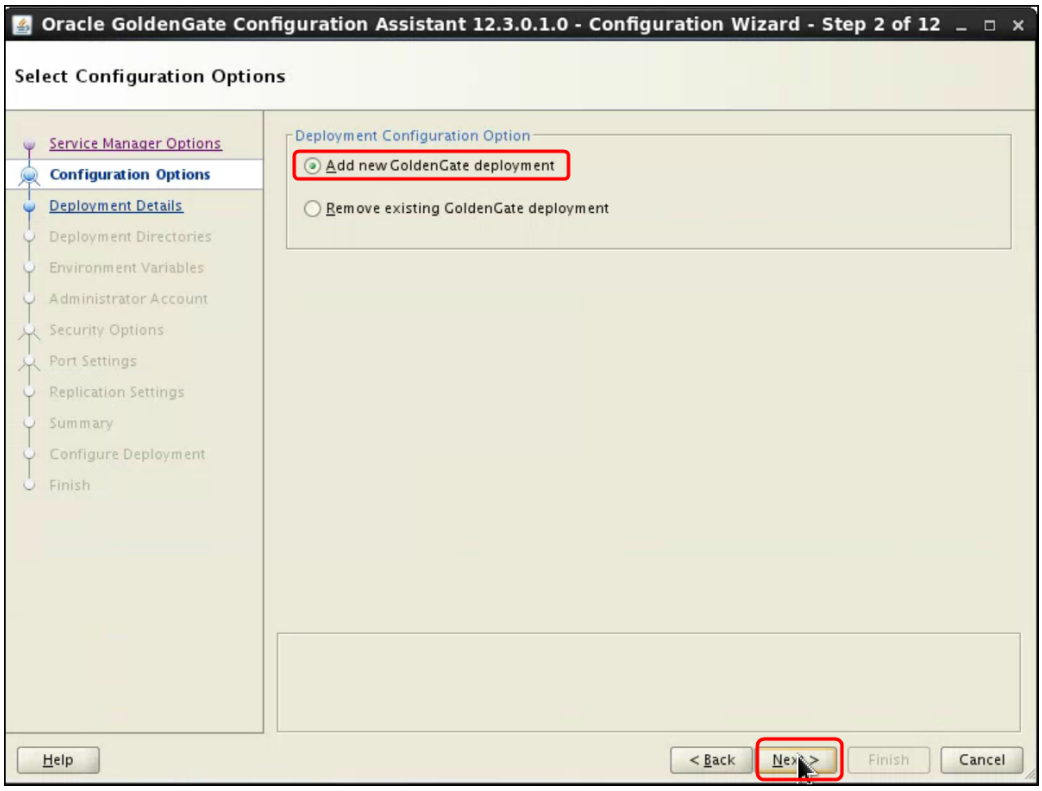
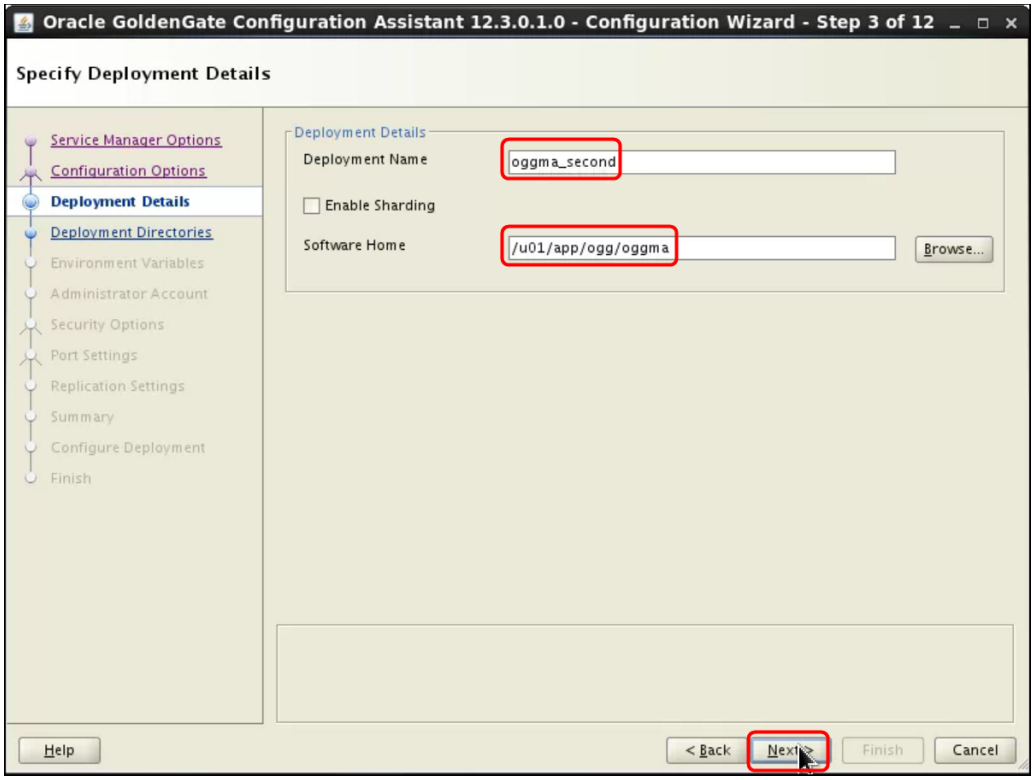
2. Configure the **oggma_second** deployment.

   a. In step 2, select "**Add new GoldenGate deployment**" and click "**Next>**."



   b. In step 3, enter "**oggma_second**" as the deployment name and accept the default for "**Software Home**" (**/u01/app/ogg/oggma**). Click "**Next>**" to continue.



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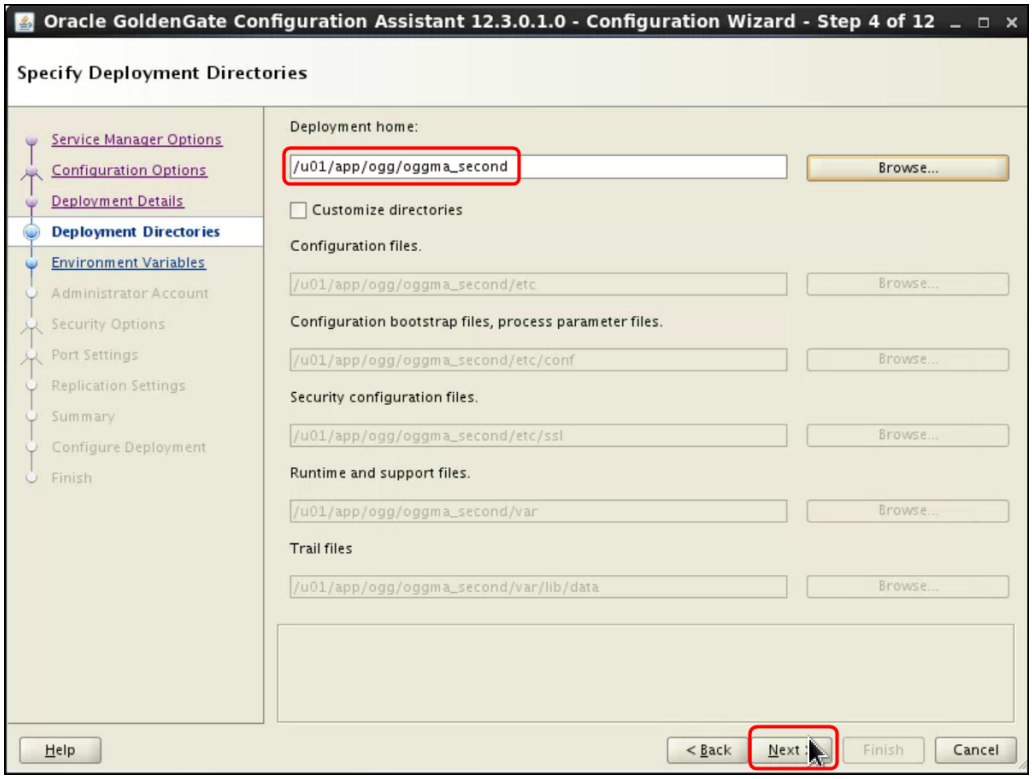
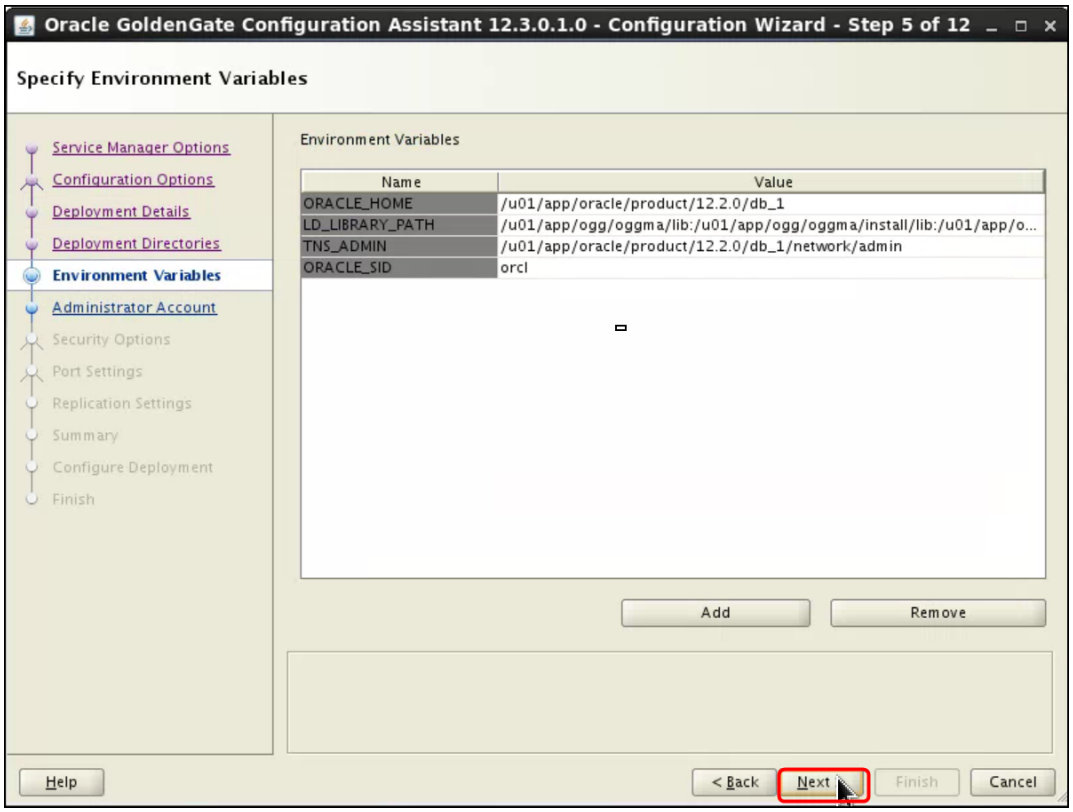
c. In step 4, enter the deployment home directory (**`/u01/app/ogg/oggma_second`**) in the "**`Deployment home`**" field. Leave the "**`Customize directories`**" check box unselected and click "**`Next>`**" to continue.



d. In step 5, verify the environment variable and click "Next>" to proceed to step 6.



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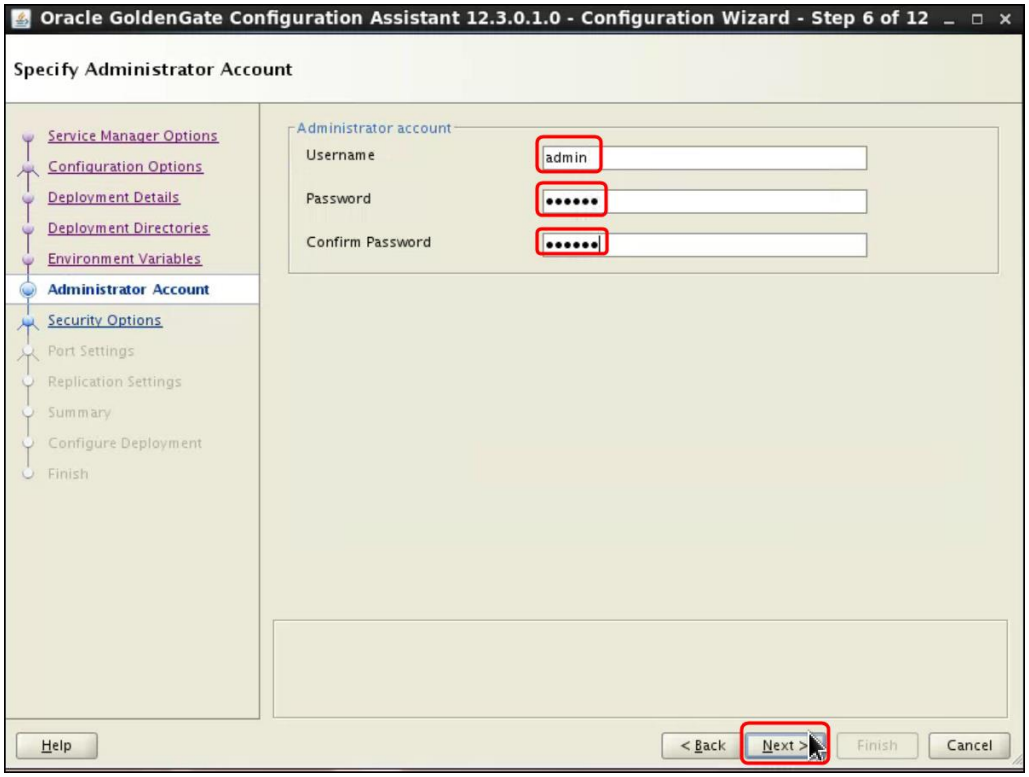
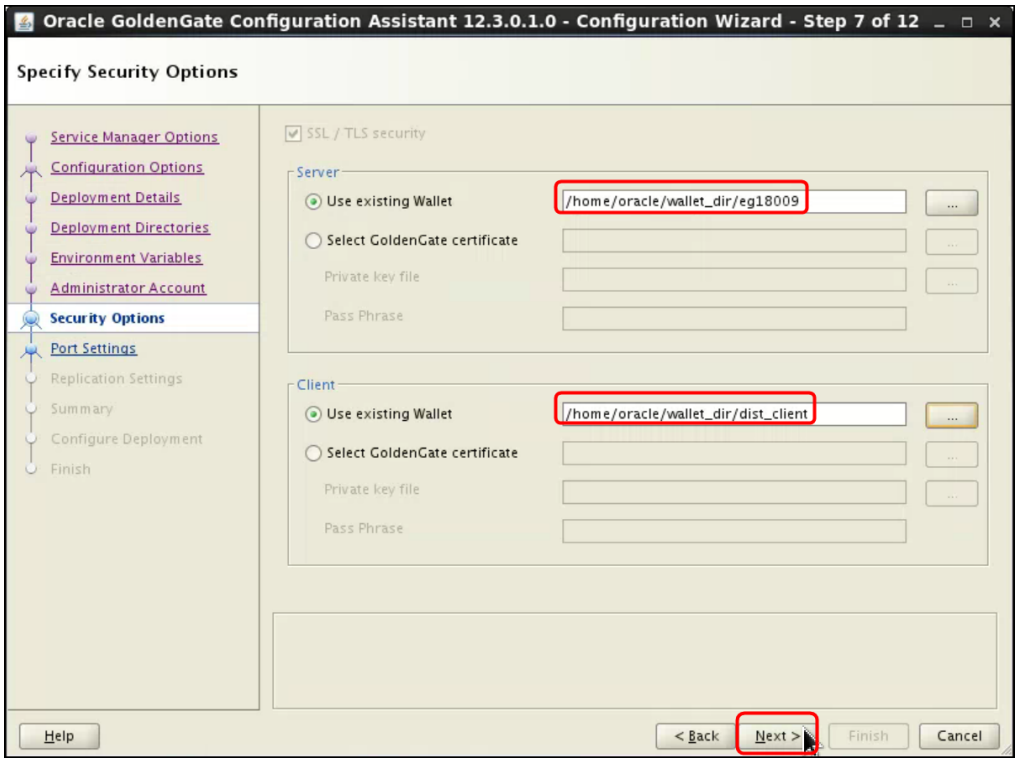
e. In step 6, enter "**admin**" as the administrator account username. Enter the password for admin twice (look it up from the password sheet for this course). Click "**Next>**."



f. In step 7, enter the wallet location for the server (**/home/oracle/wallet_dir/*<your hostname>***) and the Distribution Server client (**/home/oracle/wallet_dir/dist_client**). Click "**Next>**" to continue.



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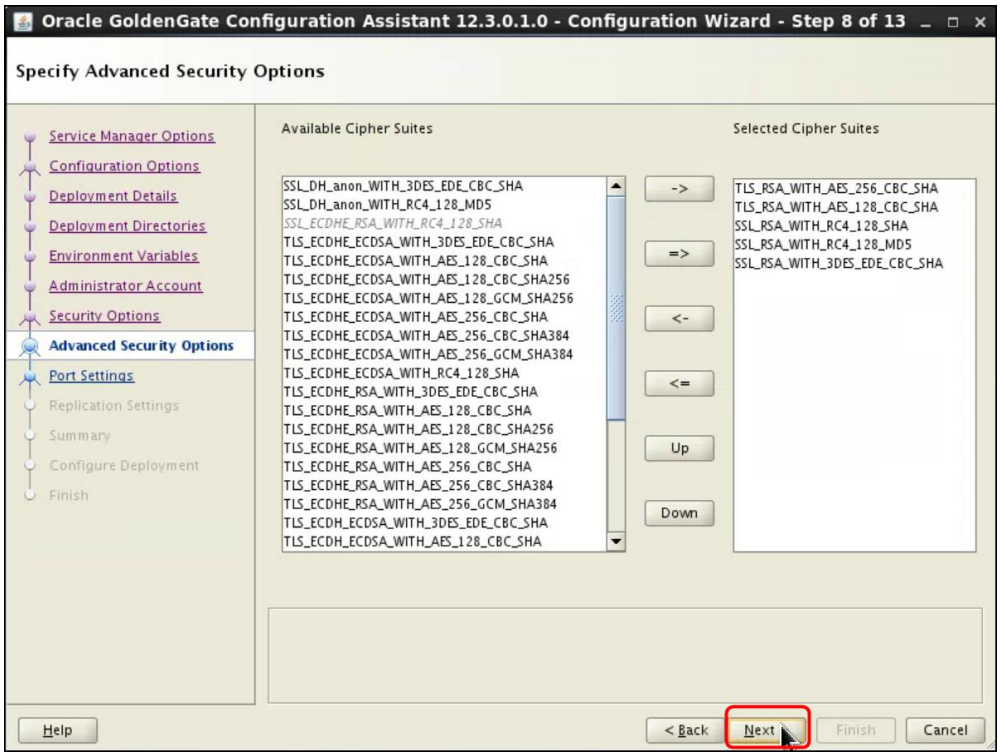
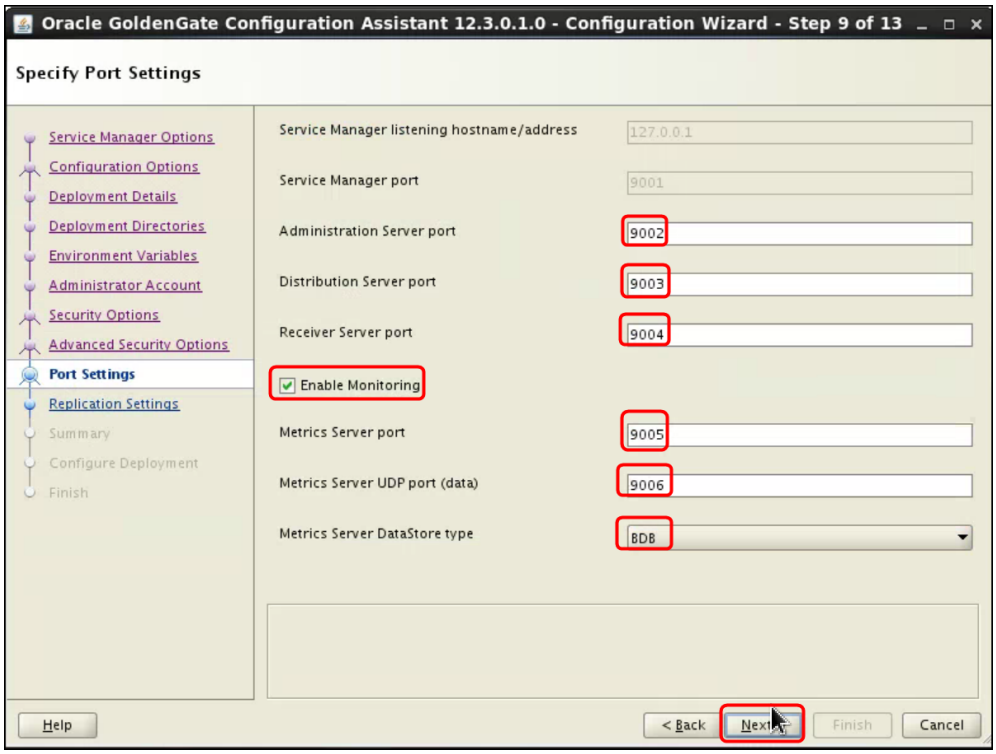
g. In step 8, accept the default cipher suites and click "**Next>**" to continue.



h. In step 9, enter **9002** as the Administration Server port. **oggca.sh** will automatically populate the other ports with increased numbers from 9002. Select the "**Enable Monitoring**" check box and assign **9005** as the Metrics Server port. The form will populate automatically the port for UDP data (**9006**). Select Berkeley DB (**BDB**) as the metrics datastore. Click "**Next>**" to continue.



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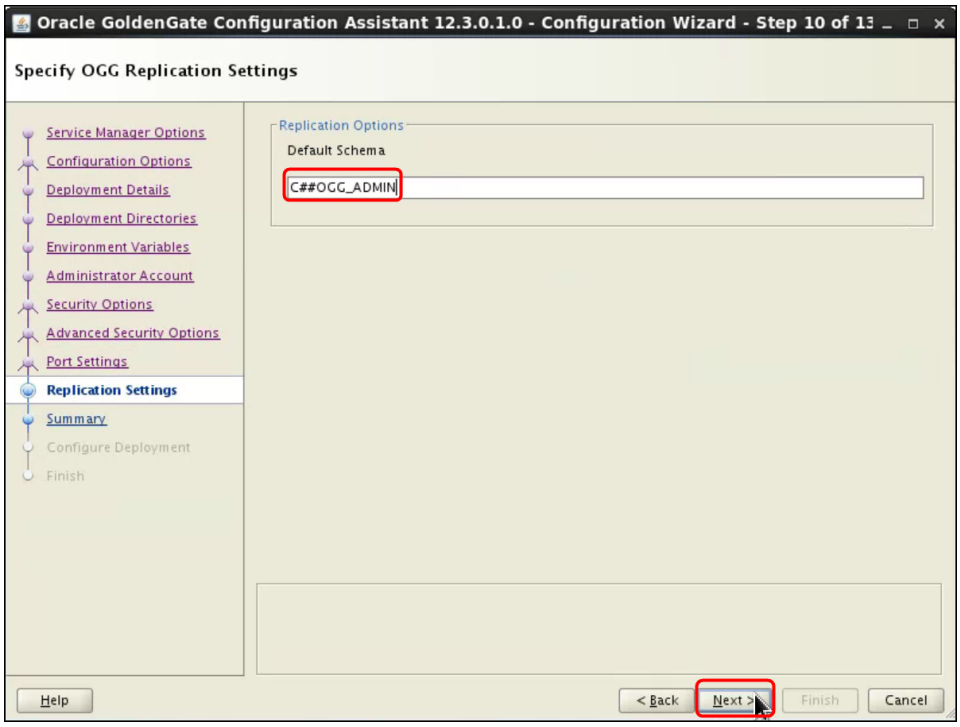
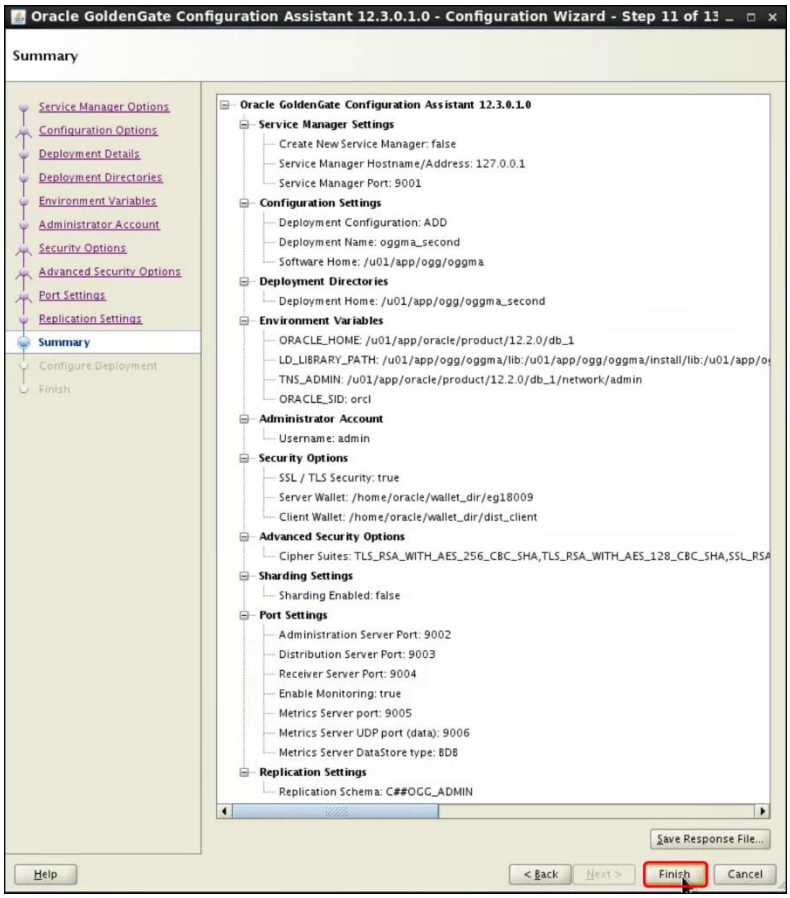
i. In step 10, enter "**C##OGG_ADMIN**" as the default database schema. Click "**Next>**."



j. In step 11, verify the options configured so far and click "**Finish**" to configure the deployment.



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k. Step 12 displays the task progress, and step 13 gives the feedback about the deployment (successful). Click "**`Close`**" to dismiss the window.

This last step concludes practice 14-6. Leave the terminal shell window open and continue on with practice 14-7.

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Practice 14-7: Exploring the Second Deployment and Creating an Extract Group, a Replicat Group, and a Path

Overview

In this practice, you connect to the Service Manager to verify the newly created second deployment (**oggma_second**) and then you connect to the Administration Server to add an Extract group (**maex2**) and a Replicat group (**mare2**). Finally, you connect to the Distribution Server to create a data path (**path02**).

Tasks

1. Modify your environment variables **OGG_ETC_HOME** and **OGG_VAR_HOME** to reflect the new MA deployment.

   a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Change directory to the oracle account default directory (**cd ~**) and edit the file **.bashrc**. Modify the environment variables **OGG_ETC_HOME** and **OGG_VAR_HOME**. Your deployment directory is **/u01/app/ogg/oggma_second**, so the environment variables will be set as:

   – **OGG_ETC_HOME=/u01/app/ogg/oggma_second/etc**

   – **OGG_VAR_HOME=/u01/app/ogg/oggma_second/var**

   Note: In the example the editor used **vi;** you can use **gedit** instead if you prefer a graphical editor. Also note that the file name **bashrc** is prefixed with a dot (.), which makes it a hidden file in Linux. Modify the lines in bold in the code box below.

```
[oracle@hostname ~]$ cd ~
[oracle@hostname ~]$ vi .bashrc
```

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```
# .bashrc

# Source global definitions
if [ -f /etc/bashrc ]; then
        . /etc/bashrc
fi
ORACLE_HOME=/u01/app/oracle/product/12.2.0/db_1
export ORACLE_HOME

TNS_ADMIN=${ORACLE_HOME}/network/admin
LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:${ORACLE_HOME}/lib
ORACLE_SID=orcl
JAVA_HOME=/usr/java/jdk1.8.0_144
export ORACLE_HOME PATH ORACLE_SID TNS_ADMIN LD_LIBRARY_PATH
JAVA_HOME
GG_EURO_HOME=/u01/app/oracle/product/gg_euro
GG_AMER_HOME=/u01/app/oracle/product/gg_amer
export GG_EURO_HOME  GG_AMER_HOME
PATH=${PATH}:${ORACLE_HOME}/bin:/bin
export PATH
OGG_HOME=/u01/app/ogg/oggma
OGG_ETC_HOME=/u01/app/ogg/oggma_second/etc
OGG_VAR_HOME=/u01/app/ogg/oggma_second/var
export OGG_HOME OGG_ETC_HOME OGG_VAR_HOME
# User specific aliases and functions
alias sqlplus='rlwrap sqlplus'
alias ggsci='rlwrap ./ggsci'
alias oggsrc='cd /u01/ogg/oggsrc'
alias oggtrg='cd /u01/ogg/oggtrg'
alias rman='rlwrap rman'
```

Leave the editor, saving the file.

b. Source the file to force the shell to set the newly defined environment variables.

```
[oracle@hostname ~]$ source .bashrc
```

c. Display the value for the new environment variables to make sure you have correctly defined them.

```
[oracle@hostname ~]$ echo $OGG_HOME $OGG_ETC_HOME $OGG_VAR_HOME
/u01/app/ogg/oggma /u01/app/ogg/oggma_second/etc
/u01/app/ogg/oggma_second/var
```

2. Connect to the Service Manager and verify that all servers are running.

a. Select an open Firefox window or click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**<hostname+domain_name>:9001**. If you do not remember the hostname

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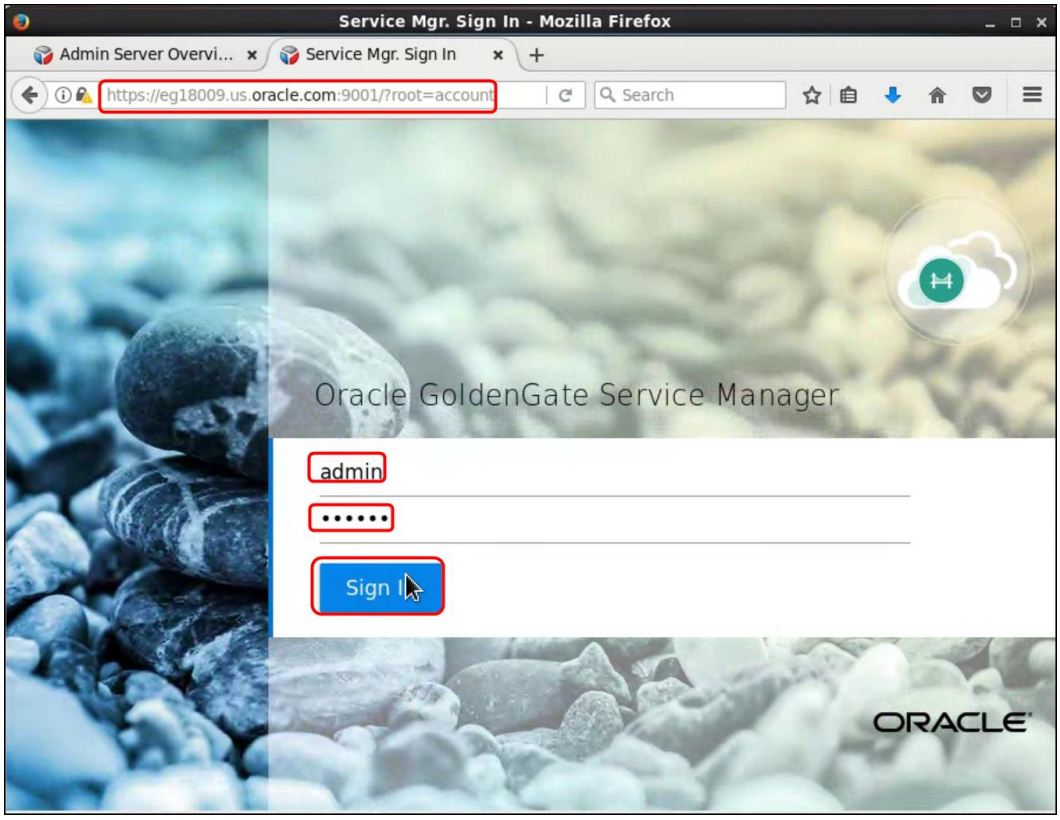
and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". The "Service Manager Sign In" page appears. Enter "**`admin`**" as the user and the password you had assigned to the admin user in practice 14-6. Look up the password in the password sheet if needed. Click "**`Sign In`**" to advance to the next page.



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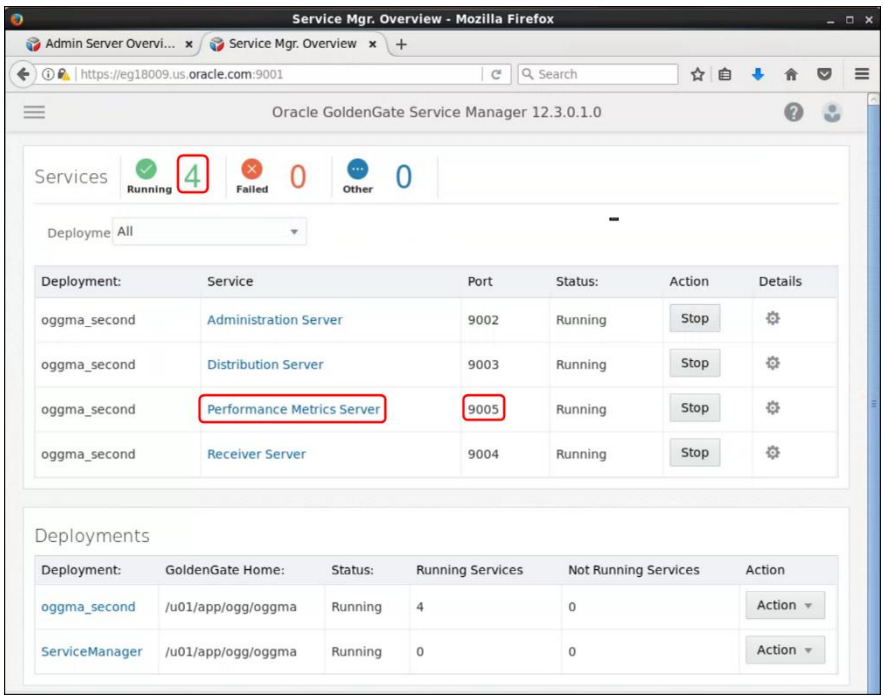
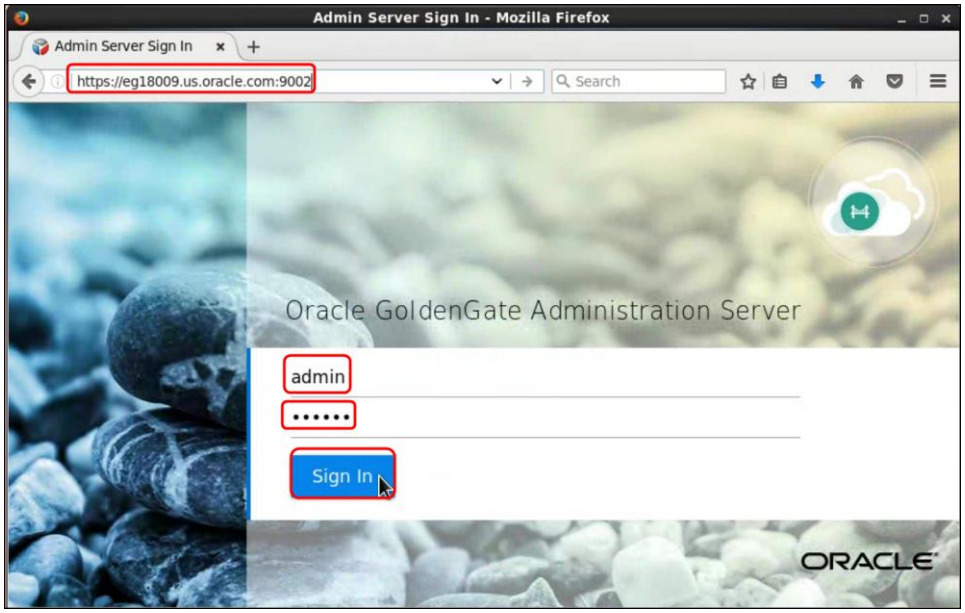
b. The Service Manager Overview page appears. You can now see four servers running; the Performance Metrics Server is listening on port **9005**.



3. Connect to the Administration Server.

a. Select the Firefox window. In the address bar of the Firefox browser, enter the URL: https://**<hostname+domain_name>:9002**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**hostname -f**". If this is the first time you are accessing the Admin Server, you will have to add the security exception to your Firefox browser in order to access web application. The "Admin Server Sign In" page appears. Enter "**admin**" as the user and the password you had assigned to the admin user in practice 14-6. Look up the password in the password sheet if needed. Click "**Sign In**" to advance to the next page.



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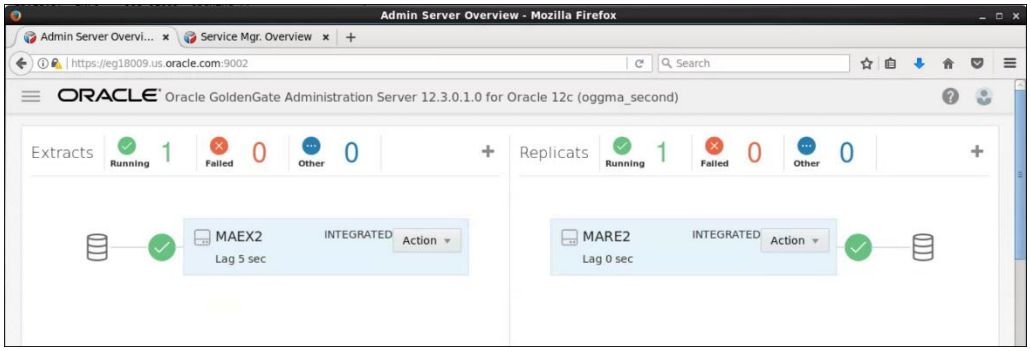
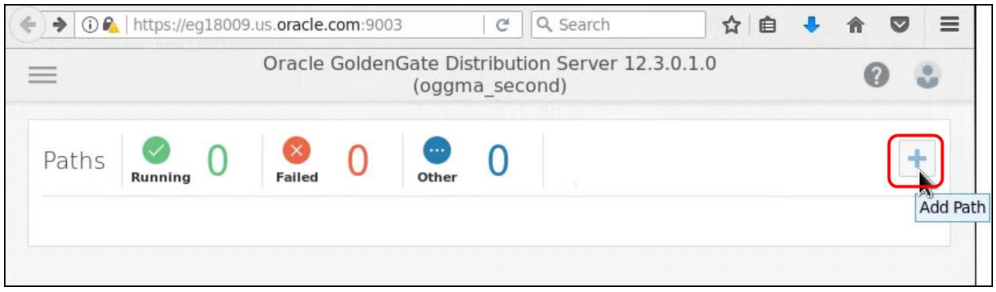
b. The Administration Server Overview page appears. You must add an Extract group (**maex2**) and a Replicat group (**mare2**). Repeat all the steps you followed during practice 12-1. You will have to click the "**Create new credential**" arrow and add the database credentials for **C##OGG_ADMIN** as **oggadmin** for the **OracleGoldenGate** domain when adding the Extract and **C##OGG_ADMIN@euro** as **oggadmin_euro** when adding the Replicat. Name the Extract **maex2** rather than **maex1** and enter "**ma second extract**" as the description. All other parameters remain the same (**mt** as the trail name for the Extract and **mr** as the trail name for the Replicat). Name the Replicat **mare2** rather than **mare1** and enter "**ma second replicat**" as the description. Apart from name and description, for both Extract and Replicat everything is the same as practice 12-1. When you have finished, the Administration Server Overview page will look like the screenshot below.



4. Connect to the Distribution Server (URL: **https://<hostname+domain_name>:9003**).

a. Provide the credentials for the "admin" user and sign in. The Distribution Server Overview page will show no paths defined. Click the plus sign (+) to add a data path.



b. Create a path following the very same steps provided in practice 13-1. Name the path "**path02**" rather than "**path01**" and enter the description "**ma second path**." All the other parameters remain the same (obviously the Extract group will be **maex2** rather than **maex1**, but the trail name will be the same (**mt**) for the source trail and **mr** for the target trail). When finished, the Distribution Server Overview page will look like the screenshot below.

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This last step concludes practice 14-7. Leave the terminal shell window open and continue on with practice 14-8.

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Practice 14-8: Causing Database Activity and Monitoring Through the Performance Metrics Server

Overview

In this practice, you will execute the stored procedure **db_activity**, previously uploaded to the database **AMER**, and connect to the Performance Metrics server to monitor the database activity.

Assumptions

The MA deployment **oggma_second** is up and running, all servers are running, and data capture and apply groups have been configured, together with the path connecting the trail files.

Tasks

1. Execute the **db_activity** stored procedure to generate database activity.
   a. Reuse an open terminal shell window or open a new terminal shell window by clicking the terminal icon (). Launch **sqlplus** connecting to the **AMER** database as the "**west**" user. Enter the "exec db_activity;" command to execute the stored procedure.

```
[oracle@eg18009 les14]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 8 20:56:22 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Mon Jan 08 2018 17:29:01 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production

SQL> exec db_activity;
```

   b. Leave the terminal shell window running in the background—do not stop the running stored procedure.

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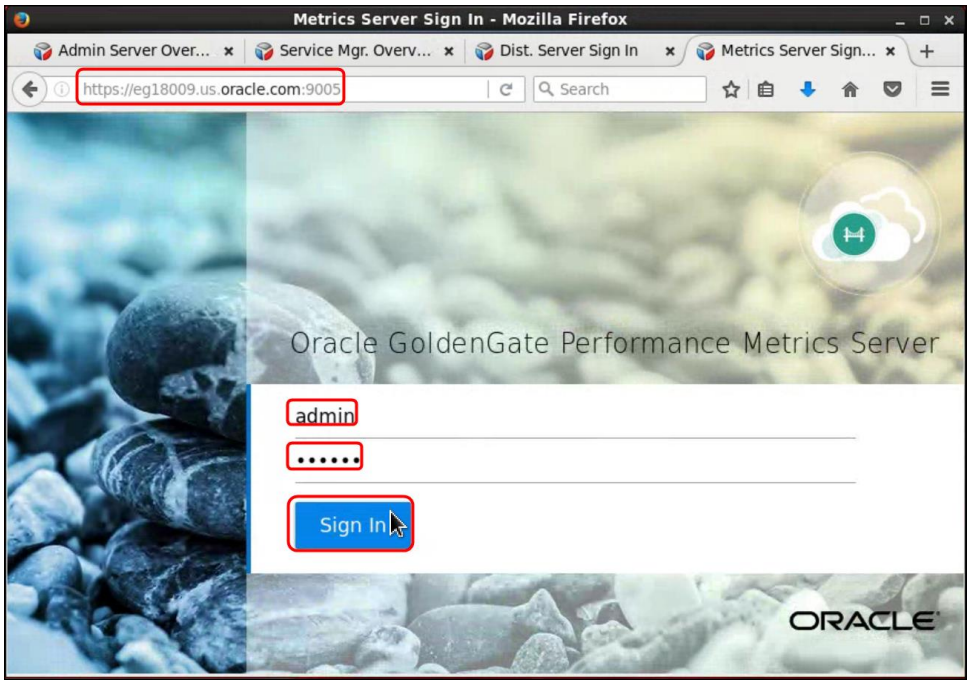
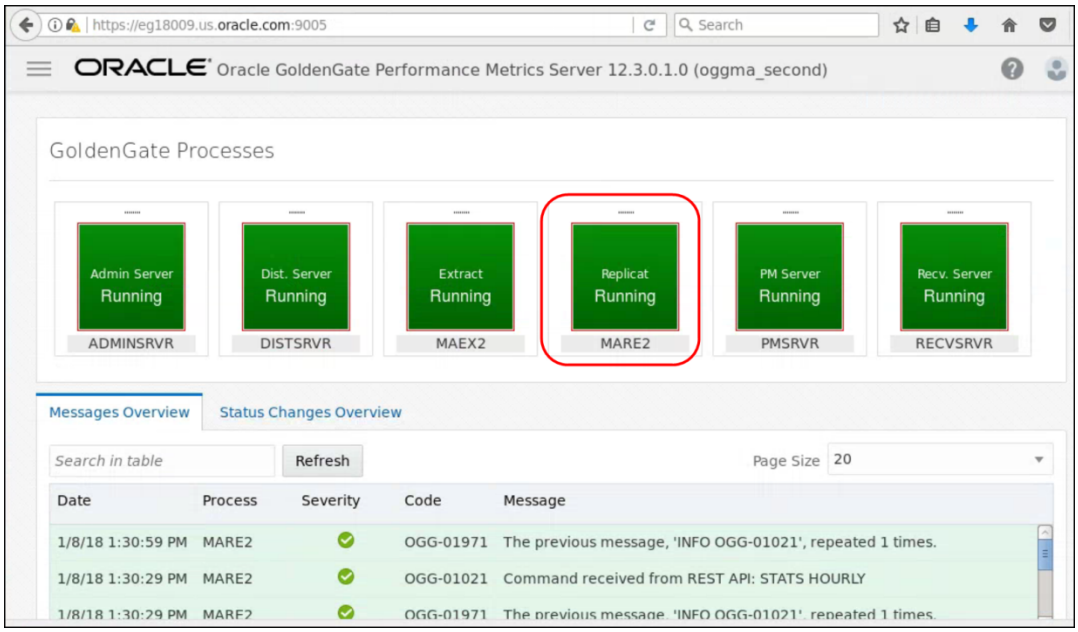
2. Connect to the Performance Metrics Server.

   a. Select a Firefox window. In the address bar of the Firefox browser, enter the URL: https://**<hostname+domain_name>:9005**. If this is the first time you are accessing the Performance Metrics Server, you will have to add the security exception to your Firefox browser in order to access web application. The "Performance Metrics Server Sign In" page appears. Enter "**admin**" as the user and the password you had assigned to the admin user in practice 14-6. Look up the password in the password sheet if needed. Click "**Sign In**" to advance to the next page.



   b. The Performance Metrics Overview page is displayed. Click the **mare2** Replicat icon to access the performance metrics accumulated so far for that process.



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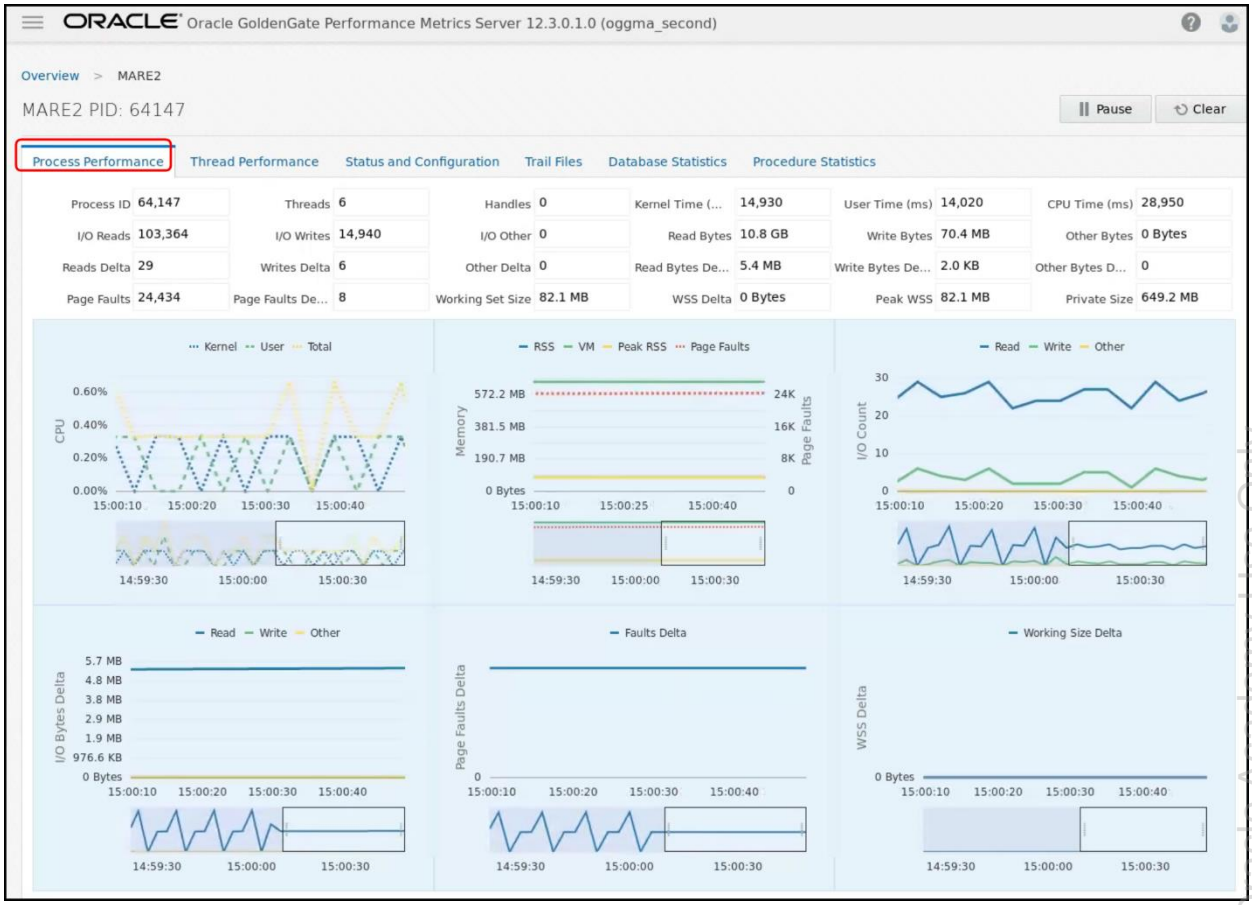
c. The **`mare2`** process detail page is displayed. The first tab is the "**`Process Performance`**" tab.



d. Feel free to explore the many pages accessible through the Performance Metrics Server. Click the various tabs shown in the detail page, but then explore also other processes (Extract, Path, etc.) and navigate through the tabs for each process.

This last step concludes practice 14-8 and all practices for lesson 14. Select **`sqlplus`**, the terminal shell window running where the stored procedure is being executed, and enter **`CTRL-C`** to stop it. Close the terminal shell window.

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Practices for Lesson 15: MA Admin Client

Overview

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Practices for Lesson 15: Overview

Practices Overview

In these practices, you will use the Admin Client facility to perform administrative tasks such as stopping replication groups, modifying parameters, restarting replication groups, and requesting statistics for specific components of your MA deployment.

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Practice 15-1: Setting Up the Environment and Launching `adminclient`

Overview

In this practice, you set up the required environment variables and launch **`adminclient`**, connecting to your MA deployment.

Assumptions

The **`oggma_second`** MA deployment that you configured in practice 14 is running. It consists of:

- One Extract group—**`maex2`**
- One Replicat group—**`mare2`**
- One path—**`path02`**
- One Service Manager
- Four MA servers—Administration Server, Distribution Server, Receiver Server, and Performance Metrics Server

Tasks

1. Set up the required environment variables to run **`adminclient`**.
   a. Reuse an open terminal shell window or open a new terminal shell window by clicking the terminal icon (). Enter the **`ls`** command to make sure that your MA deployment home directory for the oggma_second deployment is, in fact, **`/u01/app/ogg/oggma_second`**.

   ```
   [oracle@hostname ~]$ ls /u01/app/ogg/oggma_second
   etc  var
   [oracle@hostname ~]$
   ```

   b. Verify the environment variables **`OGG_HOME`**, **`OGG_VAR_HOME`**, and **`OGG_ETC_HOME`**. **`OGG_HOME`** should point to **`/u01/app/ogg/oggma`**, **`OGG_VAR_HOME`** to **`/u01/app/ogg/oggma_second/var`**, and **`OGG_ETC_HOME`** to **`/u01/app/ogg/oggma_second/etc`**. Use the **`echo`** command to print the values assigned to the environment variables.

   ```
   [oracle@hostname ~]$ echo $OGG_HOME
   /u01/app/ogg/oggma
   [oracle@hostname ~]$ echo $OGG_VAR_HOME
   /u01/app/ogg/oggma_second/var
   [oracle@hostname ~]$ echo $OGG_ETC_HOME
   /u01/app/ogg/oggma_second/etc
   ```

   If the environment variables are not set or they point to different directories, please refer to Practice 14-7, task 1a, to set the variables correctly.

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2. Connect to your MA deployment and verify that all components are running.
   a. Launch **adminclient**, connect to the **oggma_second** deployment, and enter the "**info all**" command.

```
[oracle@hostname ~]$ adminclient
Oracle GoldenGate Administration Client for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All rights
reserved.
Linux, x64, 64bit (optimized) on Jul 21 2017 07:16:02
Operating system character set identified as UTF-8.

OGG (not connected) 1> connect https://localhost:9001 as admin
Password for 'admin' at 'https://localhost:9001': ******
Using default deployment 'oggma_second'

OGG (https://localhost:9001 oggma_second) 2> info all
Program     Status      Group       Lag at Chkpt  Time Since Chkpt

ADMINSRVR   RUNNING
DISTSRVR    RUNNING
PMSRVR      RUNNING
RECVSRVR    RUNNING
EXTRACT     RUNNING     MAEX2       00:00:00      00:00:04
REPLICAT    RUNNING     MARE2       00:00:00      00:00:10

OGG (https://localhost:9001 oggma_second) 3>
```

This last step concludes practice 15-1. Leave **adminclient**, the terminal shell window running, open and continue on with practice 15-2.

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Practice 15-2: Stopping the MAEX2 Extract Group, Modifying its parameters, and Restarting it

Overview

In this practice, you use the **adminclient** "**STOP EXTRACT**" command to stop the **maex2** Extract group, and you modify the parameter file, adding a **REPORTCOUNT** parameter. You then restart the Extract group by using the "**START EXTRACT**" command.

Tasks

1. Stop the **maex2** Extract group and modify its parameter file.
   a. Enter the "**STOP EXTRACT**" command and wait for the feedback given by **adminclient**.

```
OGG (https://localhost:9001 oggma_second) 3> stop extract maex2
2018-01-15T01:17:59Z  INFO    OGG-00979  EXTRACT MAEX2 is down
(gracefully)

OGG (https://localhost:9001 oggma_second) 4>
```

   b. Edit the parameter file for the `maex2` Extract group. Add the parameter "**REPORTCOUNT EVERY 5 MINUTES,RATE**" and leave the editor, saving the parameter file.

Note: In this example, the default editor **vi** is used to edit the parameter file. Like **GGSCI**, **adminclient** supports defining a different editor, such as **gedit**, to perform editing operations. If you feel more comfortable with a graphical editor, please use the "**set editor gedit**" command prior to editing the file.

```
OGG (https://localhost:9001 oggma_second) 4> edit params maex2
```

```
extract maex2
useridalias oggadmin domain OracleGoldenGate
exttrail mt
TranlogOptions IntegratedParams (max_sga_size 256)
LOGALLSUPCOLS
UPDATERECORDFORMAT COMPACT
REPORTCOUNT EVERY 5 MINUTES,RATE
table amer.west.*;
```

2. Use the "**START EXTRACT**" command to restart the **maex2** Extract group.
   a. Start the **maex2** Extract group and note the feedback messages.

```
OGG (https://localhost:9001 oggma_second) 5> start extract maex2
2018-01-15T01:27:08Z  INFO    OGG-00975  EXTRACT MAEX2 starting
2018-01-15T01:27:08Z  INFO    OGG-15426  EXTRACT MAEX2 started

OGG (https://localhost:9001 oggma_second) 6>
```

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This last step concludes practice 15-2. Leave **`adminclient`**, the terminal shell window running, open and continue on with practice 15-3.

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Practice 15-3: Performing Database Activity and Accessing Path Statistics

Overview

In this practice, you will trigger some database activity using the `db_activity` stored procedure you have already used in practice 14, and you will use the `STATS DISTPATH` command to display statistics and metrics related to the `path02` path.

Tasks

1. Launch **`sqlplus`** connecting to the source database **`AMER`** and execute the **`db_activity`** stored procedure.

   a. Open a new terminal shell window by clicking the terminal icon ( ). Launch **`sqlplus`** and connect to the **`AMER`** database as the "**`west`**" user. Run the **`EXEC`** command to execute the **`db_activity`** stored procedure.

```
[oracle@hostname ~]$ sqlplus west@amer

SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 15 14:08:00 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Mon Jan 15 2018 11:44:04 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production

SQL> exec db_activity;
```

   Leave **`sqlplus`**, the terminal shell window running, open.

2. Check the statistics related to the **`path02`** data path.

   a. Activate the terminal shell window where **`adminclient`** is running, connected to the **`oggma_second`** deployment. Enter the "**`STATS DISTPATH path02`**" command and examine the output.

```
OGG (https://localhost:9001 oggma_second) 6> stats distpath
path02

 Total Statistics:
   LCRs Received: 929149
   LCRs Sent: 929149
   Inserts: 928952
   Updates: 122
   Deletes: 61
   DDLs: 0
   Procedures: 0
   Others: 14
```

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```
 Chunk Statistics:

 Table Statistics:
   Table: AMER.WEST.ACCOUNT
     LCRs Received: 309754
     LCRs Sent: 309754
     Inserts: 309693
     Updates: 0
     Deletes: 61
… Many Lines omitted for brevity…
Network Statistics:
     Local Address: eg18009.us.oracle.com:9003
     Remote Address: eg18009.us.oracle.com:9004
     Total Bytes Received: 1488756
     Total Bytes Sent: 127753872
     Total Msgs Received: 86811
     Total Msgs Sent: 90777
     Send Wait Time: 35
     Receive Wait Time: 11

OGG (https://localhost:9001 oggma_second) 7>
```

Use your mouse to scroll the display up and down and examine all different statistics (Hourly, Daily, Network, etc).

b. After you introduce the **REPORTCOUNT** parameter for the **maex2** Extract, you should be able to see the requested counter at the bottom of the report generated by **adminclient** for the **maex2** Extract. Enter the "**VIEW REPORT**" command for the **maex2** Extract and go to the bottom by pressing the space bar a few times. If more than 5 minutes have passed since you restarted the Extract after changing the parameter file, you should see the performance counters listed at the end of the report.

```
OGG (https://localhost:9001 oggma_second) 7> view report maex2
**************************************************************
*
                 Oracle GoldenGate Capture for Oracle
    Version 12.3.0.1.0
OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154_FBO
   Linux, x64, 64bit (optimized), Oracle 12c on Jul 21 2017
23:33:48
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
                    Starting at 2018-01-15 12:47:17
**************************************************************
*
…Many lines omitted for the sake of brevity…
```

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```
2018-01-15 12:47:21  INFO    OGG-06509  Using the following key
columns for source table AMER.WEST.ACCOUNT_TRANS:
ACCOUNT_NUMBER, TRANS_NUMBER, ACCOUNT_TRANS_TS.
1000 records processed as of 2018-01-15 12:52:20 (rate 3,delta
3)
1879 records processed as of 2018-01-15 12:57:20 (rate 3,delta
2)
2755 records processed as of 2018-01-15 13:02:20 (rate 3,delta
2)
```

Every 5 minutes, one row is appended to the report, detailing the additional records processed. Obviously, your environment will display different statistics and a variable number of rows, depending on how many minutes have elapsed since you restarted the **`maex2`** Extract, but you should be able to see the counters.

This last step concludes practice 15-3 and all practices for lesson 15. Select **`sqlplus`**, the terminal shell window running **`,`** where the stored procedure **`db_activity`** is being executed, and enter **`CTRL-C`** to stop it. Enter "**`exit`**" to leave **`adminclient`** and close all terminal shell windows.

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Practices for Lesson 16: Database Sharding Support, Metadata Encapsulation, Replication Lag Management, Invisible Column Support

Overview

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Practices for Lesson 16: Overview

Practices Overview

In these practices, you will:

1. Use the **`logdump`** utility to access the metadata information stored in the trail files.
2. Configure replication lag by using the MA Administration Server and assess the lag statistics produced.
3. Replicate invisible columns, checking how replication worked for the target.

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Practice 16-1: Using `logdump` to Identify DDR and TDR Records in Trail Files

Overview

In this practice, you edit a trail file by using **`logdump`** looking for metadata information.

Assumptions

All practices for lesson 15 have been successfully completed.

Tasks

1. Use **`logdump`** to edit a trail file produced by replication activity generated during practice 15.

   a. Open a new terminal shell window by clicking the terminal icon ( ) in the top panel of your desktop environment. Change directory to the location where MA stores the trail files (**`$OGG_VAR_HOME/lib/data`**). Enter the **`ls -l`** command to display the files in that directory.

```
[oracle@hostname ~]$ cd $OGG_VAR_HOME/lib/data
[oracle@hostname data]$ ls -l
total 57672
-rw-r----- 1 oracle oinstall 29521084 Jan 24 12:43 mr000000000
-rw-r----- 1 oracle oinstall 29521074 Jan 24 12:43 mt000000000
```

   Note: In your environment, the size and the date for the files will differ.

   b. Launch the **`logdump`** utility and open one of the files you listed in the previous step.

```
[oracle@hostname data]$ logdump

Oracle GoldenGate Log File Dump Utility for Oracle
Version 12.3.0.1.0 OGGCORE_12.3.0.1.0_PLATFORMS_170721.0154
Copyright (C) 1995, 2017, Oracle and/or its affiliates. All
rights reserved.
Logdump 1 > open mt000000000
Current LogTrail is
/u01/app/ogg/oggma_second/var/lib/data/mt000000000
Logdump 2 >
```

   Note: In this example, the trail file produced by the Extract was used (**`mt`**)—you could also open the trail file used by the Replicat (**`mr`**).

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2. Use the new **SCANFORMETADATA** (**SFMD**) command to look for metadata information.

   a. Enter the count command to check how many metadata entries the trail file stores.
   Note: Your counts may be different.

```
Logdump 2 > count
LogTrail /u01/app/ogg/oggma_second/var/lib/data/mt000000000 has
150045 records
Total Data Bytes           11395113
  Avg Bytes/Record               75
Delete                           10
Insert                       150010
Update                           20
Metadata Records                  4
Others                            1
Before Images                    10
After Images                 150030

Average of 150044 Transactions
    Bytes/Trans .....        123
    Records/Trans ...          1
    Files/Trans .....          1
```

Note: Your statistics will obviously be different. The important value is "**Metadata Records,**" which should have a value greater than zero.

   b. Enable extended header display (**ghdr on** command) and enter the scan for metadata command (**SFMD**), passing **DDR** as parameter, to display database information.

```
Logdump 3 >ghdr on
Logdump 4 >sfmd ddr

_____________________________________________________________________
Hdr-Ind    :     E  (x45)     Partition  :     .  (x00)
UndoFlag   :     .  (x00)     BeforeAfter:     A  (x41)
RecLength  :    93  (x005d)   IO Time    : 2018/01/23 22:26:40.994.523
IOType     :   170  (xaa)     OrigNode   :     1  (x01)
TransInd   :     .  (x03)     FormatType :     R  (x52)
SyskeyLen  :     0  (x00)     Incomplete :     .  (x00)
DDR/TDR Idx:   (001, 000)     AuditPos   : 154616336
Continued  :     N  (x00)     RecCount   :     1  (x01)

2018/01/23 22:26:40.994.523 Metadata            Len 93 RBA 1412
Name: AMER
 3000 5900 0100 0200 0100 0200 3700 0100 0400 0000 | 0.Y.........7.......
 0000 0200 0400 0100 0000 0300 0200 0000 0400 0500 | ....................
 0300 474d 5405 0014 0010 0000 0014 1414 1414 1414 | ..GMT...............
 1414 1414 1411 1414 1403 0014 0012 0041 4d45 522e | ...............AMER.
 5553 2e4f 5241 434c 452e 434f 4d                  | US.ORACLE.COM
Logdump 5 >
```

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Database information is clearly visible in the trail file (**AMER.US.ORACLE.COM**).

c. Scan now for metadata information related to tables (**TDR**). Type **n** (for next) to scan to the next metadata record.

```
Logdump 5 >sfmd tdr

_____________________________________________________________________
Hdr-Ind    :     E  (x45)     Partition  :     .  (x00)
UndoFlag   :     .  (x00)     BeforeAfter:     A  (x41)
RecLength  :   253  (x00fd)   IO Time    : 2018/01/23 22:26:40.994.524
IOType     :   170  (xaa)     OrigNode   :     2  (x02)
TransInd   :     .  (x03)     FormatType :     R  (x52)
SyskeyLen  :     0  (x00)     Incomplete :     .  (x00)
DDR/TDR Idx:   (001, 001)     AuditPos   : 154616336
Continued  :     N  (x00)     RecCount   :     1  (x01)

2018/01/23 22:26:40.994.524 Metadata             Len 253 RBA 1560
Name: AMER.WEST.ACCOUNT
 3040 f700 0000 0100 0200 0b00 0200 4000 0100 0600 | 0@............@.....
 0100 0200 0100 0200 0400 0000 0000 0300 0200 0000 | ....................
 0400 0200 0000 0500 0800 0000 0000 0000 0000 0600 | ....................
 0400 0000 0000 0700 0200 0000 0800 0400 0000 0000 | ....................
 0340 a700 0000 0200 5000 3c00 0e00 4143 434f 554e | .@......P.<...ACCOUN
 545f 4e55 4d42 4552 8600 0800 0000 0b00 0000 0800 | T_NUMBER............
 0000 0800 0000 0000 0000 0000 0000 ffff ffff 0200 | ....................
Logdump 6 > n
```

d. Enter **n** for next until you find the last metadata record. Leave the **logdump** utility, entering **exit** at the prompt.

Note: This last step concludes practice 16-1. Leave the terminal shell window open and continue on with practice 16-2.

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Practice 16-2: Configuring Replication Lag and Checking Lag Statistics

Overview

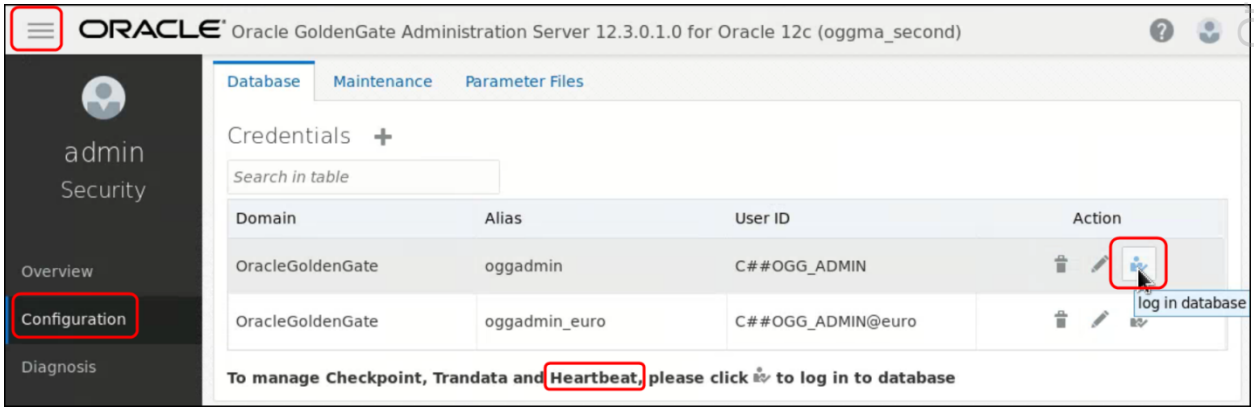
In this practice, you enable a heartbeat-based lag analysis infrastructure and cause some database activity to analyze lag statistics.

Assumptions

Your MA deployment is running.

Tasks

1. Connect to the Administration Server.
   a. Select an open Firefox window. If no Firefox windows are not open, click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**<hostname+domain_name>:9002**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**hostname -f**". The "Admin Server Sign In" page appears. Enter "**admin**" as the user and the password you assigned to the admin user in practice 14-6. Look up the password in the password sheet if needed. Click "**Sign In**" to advance to the next page.
   b. In the Administration Server Overview window, click the "**Application Navigation**" icon located at the top left corner of the window ( ). When the "**admin Security**" panel displays, click "**Configuration**" to access the configuration page. Under the "**Action**" column, look for the "**log in/log out database**" icon ( ). Such an icon acts as a toggle to log in to the database if you are not logged in—in this case the icon is gray—or log out from the database if you are currently logged in. If you are logged in, the icon is blue. If you are logged in the "**oggadmin**" database, log out. Click the "**log in database**" icon ( ) for the "**oggadmin_euro**" database to log in to that database. You must log in to the **oggadmin_euro** database in order to configure the heartbeat table.



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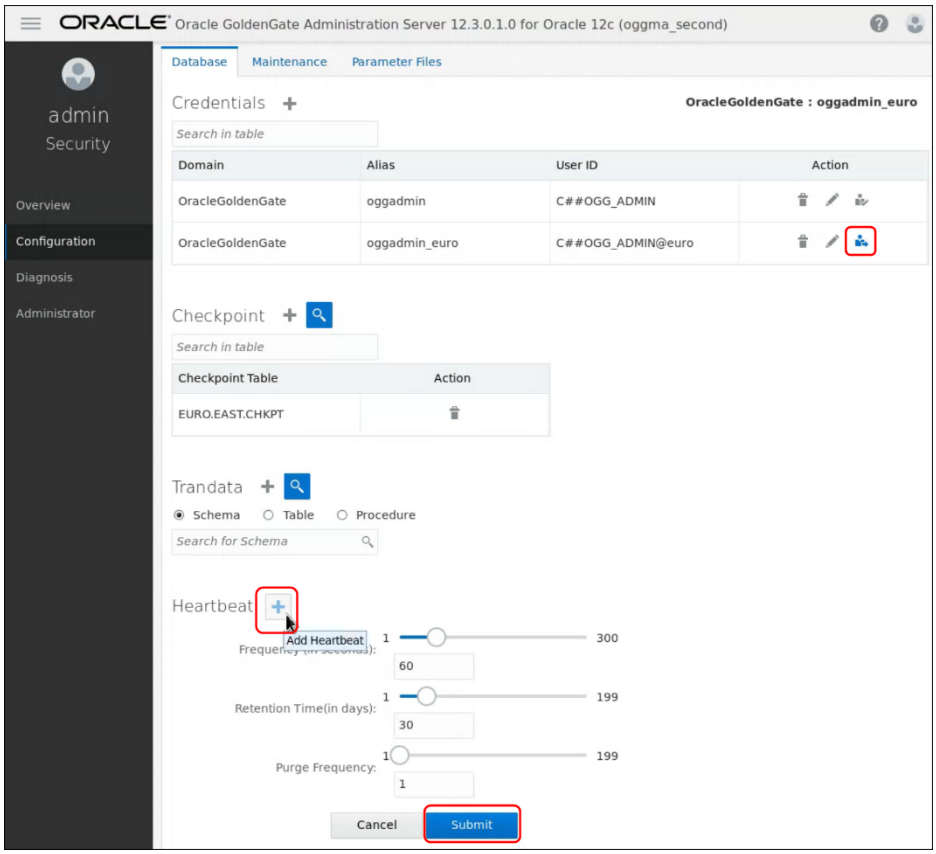
2. Configure the heartbeat table for the **`oggadmin_euro`** database.

   a. After you log in to the **`oggadmin_euro`** database, the "**`log in database`**" icon changes color and becomes blue, to give you a visual clue about being connected to the database. Click the plus sign (+) beside the **`Heartbeat`** label to expand the panel below. Accept all defaults (Frequency 60 seconds, Retention Time 1 day, and Purge Frequency 1 day) and click "**`Submit`**" to create the heartbeat table.



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3. Add database credentials for the AMER database. The alias will be **`oggadmin_amer`**.

   a. Click the plus sign (+) beside the Credentials label. In the panel that opens up below, enter the information shown below:

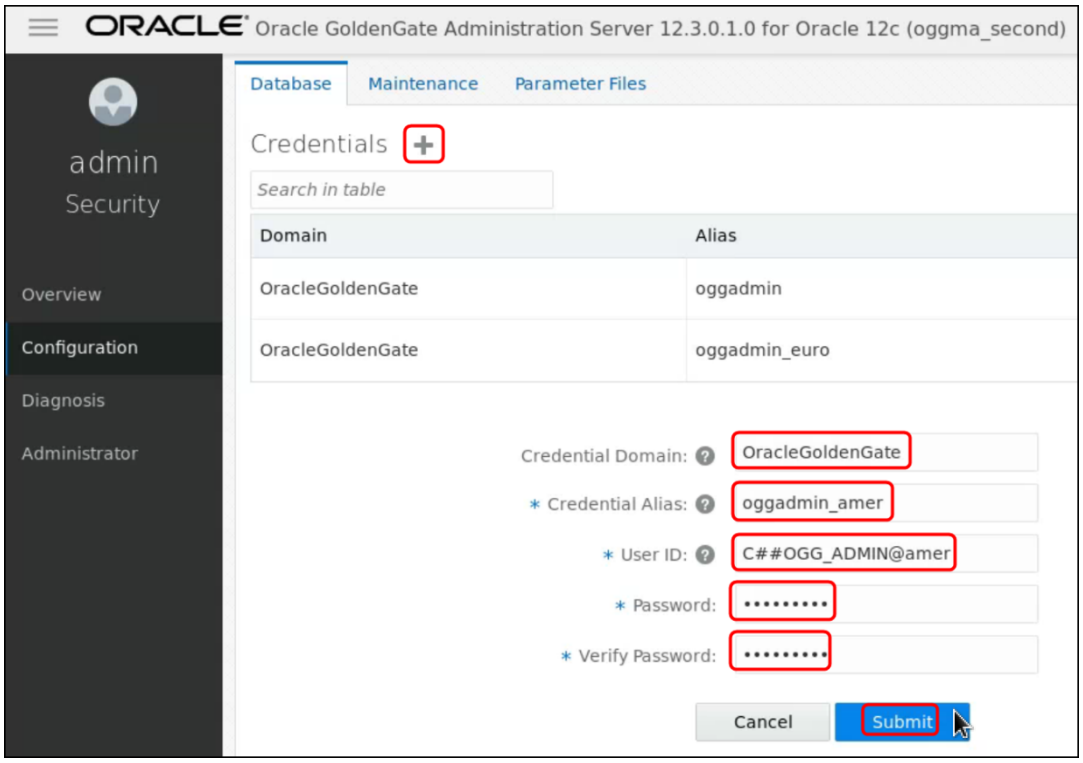
      – For **`Credential Domain`** enter "**`OracleGoldenGate.`**"

      – For **`Credential Alias`** enter "**`oggadmin_amer.`**"

      – For **`User ID`** enter "**`C##OGG_ADMIN@amer.`**"

      – For "**`Password`**" enter twice the password for the Oracle RDBMS user C##OGG_ADMIN defined in the AMER database. Use your password sheet if you don't remember it.

      – Click "**`Submit`**" to store the credentials for "**`oggadmin_amer`**."



   b. Connect to the **`oggadmin_amer`** database. Click the "**`log in database`**" icon for "**`oggadmin_amer`**"—it will turn blue after you do so.

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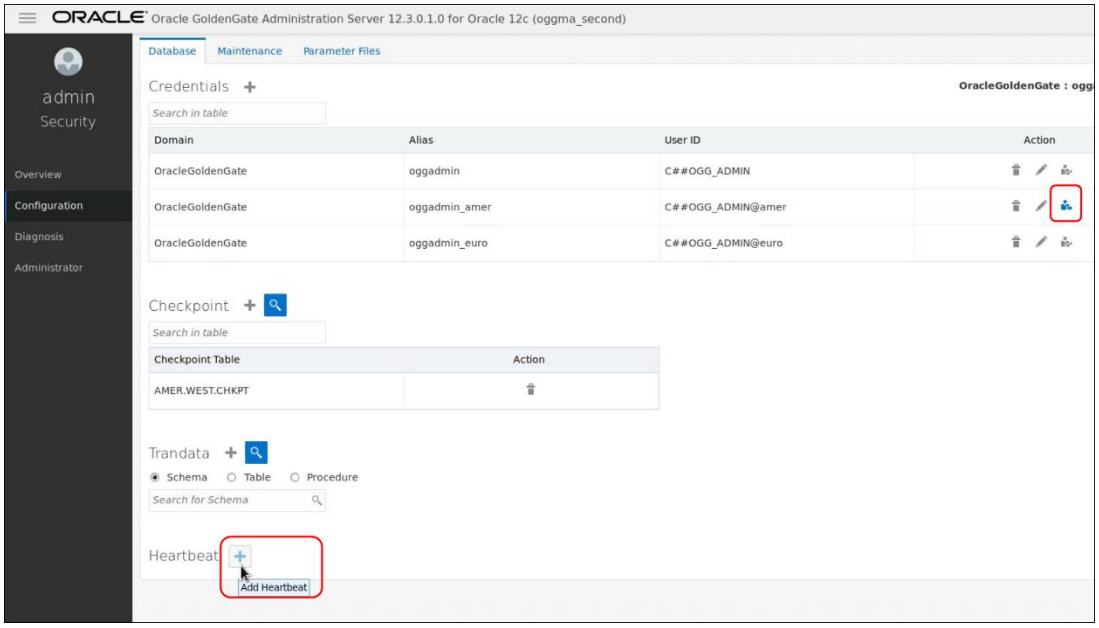
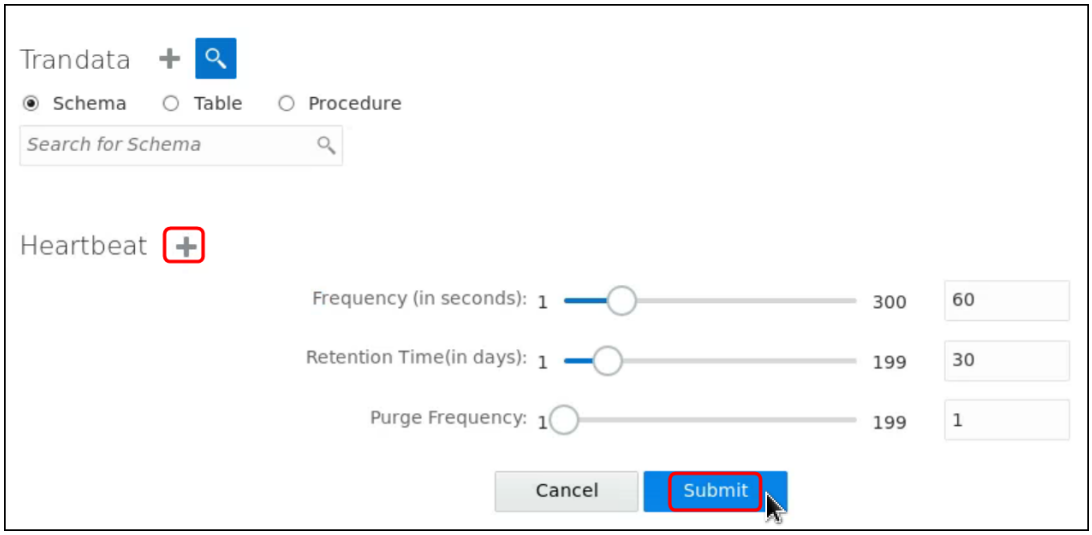
4. Create the heartbeat table for the **`oggadmin_amer`** database.

   a. The same way you created the heartbeat table for "**`oggadmin_euro`**," you create the heartbeat table for "**`oggadmin_amer`**." The "**`log in database`**" icon is shown in blue to mean that you are connected to "**`oggadmin_amer`**." Click the plus sign (+) beside the **`Heartbeat`** label to open the panel below it.



   b. Accept, once again, all defaults for the heartbeat table and click "**`Submit`**" to create it.



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5. Generate some activity on the source database (**AMER**) by running the **db_activity** stored procedure, which you have already run several times in previous practices.

   a. Open a new terminal shell window by clicking the terminal icon ( ) located at the top panel of your desktop environment. Launch `sqlplus` connecting to the **west** user in the **AMER** database. Execute the **db_activity** stored procedure.

```
[oracle@hostname ~]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 29 20:49:26 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Tue Jan 23 2018 22:26:32 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit
Production
SQL> exec db_activity;
```

   Leave the terminal shell window running the stored procedure open.

6. Using **sqlplus** or **SqlDeveloper** connect to the **oggadmin_euro** database and select the relevant columns from the **GG_LAG_HISTORY** view to examine lag statistics.

   a. Open a new terminal shell window by clicking the terminal icon ( ) located at the top panel of your desktop environment. Launch **sqlplus** connecting to the **C##OGG_ADMIN** user in the **EURO** database. Use the **DESC** (describe) command to see the structure of the **GG_LAG_HISTORY** view. Format the column length for **INCOMING_PATH** to 55 characters and select the incoming path and its associated lag, ordered by the timestamp of the received heartbeat to display a temporal sequence of your lag.

```
[oracle@eg18009 ~]$ sqlplus C##OGG_ADMIN@euro
SQL*Plus: Release 12.2.0.1.0 Production on Mon Jan 29 21:18:16 2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: ********
Last Successful login time: Mon Jan 29 2018 21:06:03 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Prod
SQL> desc gg_lag_history
 Name                                  Null?  Type
 ------------------------------------- ------ ----------------------
 LOCAL_DATABASE                               VARCHAR2(512)
 HEARTBEAT_RECEIVED_TS                        TIMESTAMP(6)
 REMOTE_DATABASE                              VARCHAR2(512)
 INCOMING_HEARTBEAT_AGE                       NUMBER
 INCOMING_PATH                                VARCHAR2(4000)
 INCOMING_LAG                                 NUMBER
 OUTGOING_HEARTBEAT_AGE                       NUMBER
 OUTGOING_PATH                                VARCHAR2(4000)
 OUTGOING_LAG                                 NUMBER
SQL> column incoming_path format a55
```

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```
SQL> select incoming_path,incoming_lag from gg_lag_history order by
HEARTBEAT_RECEIVED_TS;
```

b. The lag is displayed in **sqlplus**.

```
INCOMING_PATH                                          INCOMING_LAG
----------------------------------------------------- ------------
 MAEX2 ==> eg18009.us.oracle.com:9003:path02 ==> MARE2
12.227253
 MAEX2 ==> eg18009.us.oracle.com:9003:path02 ==> MARE2
6.559147
 MAEX2 ==> eg18009.us.oracle.com:9003:path02 ==> MARE2
5.706702
 MAEX2 ==> eg18009.us.oracle.com:9003:path02 ==> MARE2
4.720966
```

Note: In your environment, the path will be different (it will reflect the hostname of your computer), and obviously, the statistics will also be different. But you should obtain a similar output from the select statement issued against the **GG_LAG_HISTORY** view.

This last step concludes practice 16-2. Leave the terminal shell window open and continue on with practice 16-3.

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Practice 16-3: Replicating Invisible Columns

Overview

In this practice, you configure your replication environment in a way such that not only Data Manipulation Language (DML) statements are replicated but also Data Definition Language (DDL) statements are replicated as well. Once you can replicate the "**`CREATE TABLE`**" types of statements, you create a table that contains invisible columns, and you store some data into it. On the replication side, you will access the same table and verify that the values for the invisible column have been replicated.

Assumptions

Your MA deployment is running.

Tasks

1. Connect to the Administration Server and modify the parameter files for both Extract and Replicat.
   a. Select an open Firefox window. If no Firefox windows are open, click the Firefox icon ( ) located in the panel at the top of your graphical desktop. In the address bar of the Firefox browser, enter the URL: https://**`<hostname+domain_name>:9002`**. If you do not remember the hostname and domain name of your computer, open a terminal shell window and enter "**`hostname -f`**". The "Admin Server Sign In" page appears. Enter "**`admin`**" as the user and the password you had assigned to the admin user in practice 14-6. Look up the password in the password sheet if needed. Click "**`Sign In`**" to advance to the next page.
   b. In the Overview page, click the "**`Action`**" button in the left pane (**`MAEX2`** Extract). Click "**`Details,`**" and in the Details page, click the "**`Parameters`**" tab to access the parameters page. Click the pencil icon to enable editing, and add the "**`ddl include all`**" parameter just below the "**`exttrail mt`**" line. Click the "**`Apply`**" button to save your parameter file.

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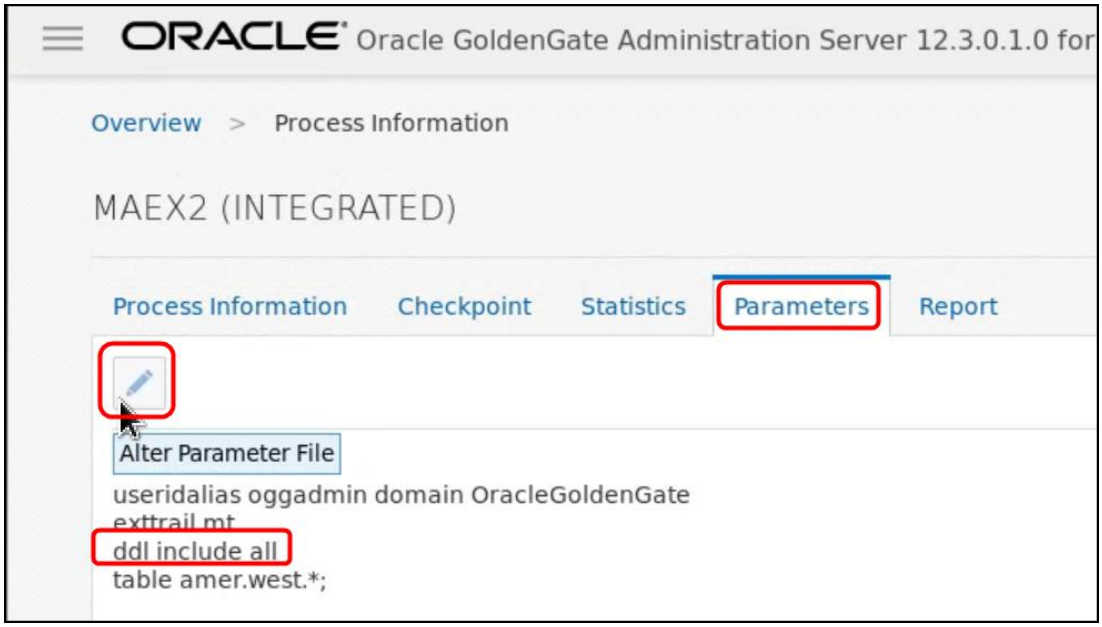
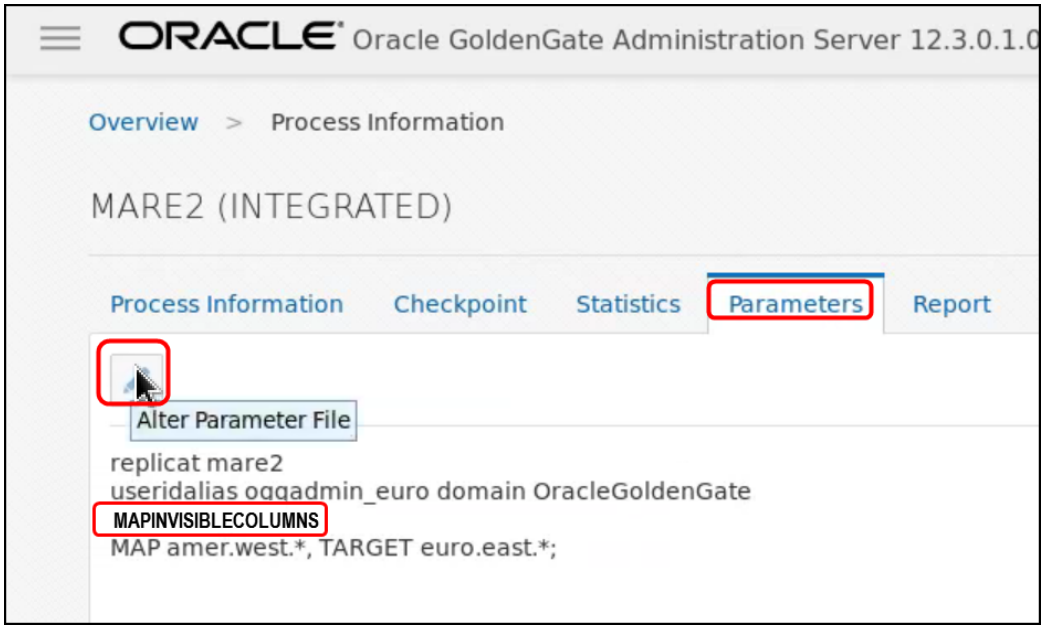


c. The "**`ddl include all`**" command instructs the Extract group to replicate DDL statements. Also, you must add the parameter "**`MAPINVISIBLECOLUMNS`**" to the **`MARE2`** Replicat group to ensure that invisible columns modified in the source database are replicated correctly onto the target database. Click the "**`Overview`**" link to access the Overview page, and then click the "**`Action`**" button for the **`MARE2`** Replicat group. Click "**`Details`**" to access the Details page. Click the "Parameters" tab to access the Parameters page and insert the "**`MAPINVISIBLECOLUMNS`**" command just below the line that reads: "**`useridalias oggadmin_euro domain OracleGoldenGate.`**" Click the "**`Apply`**" button to save the parameter file.



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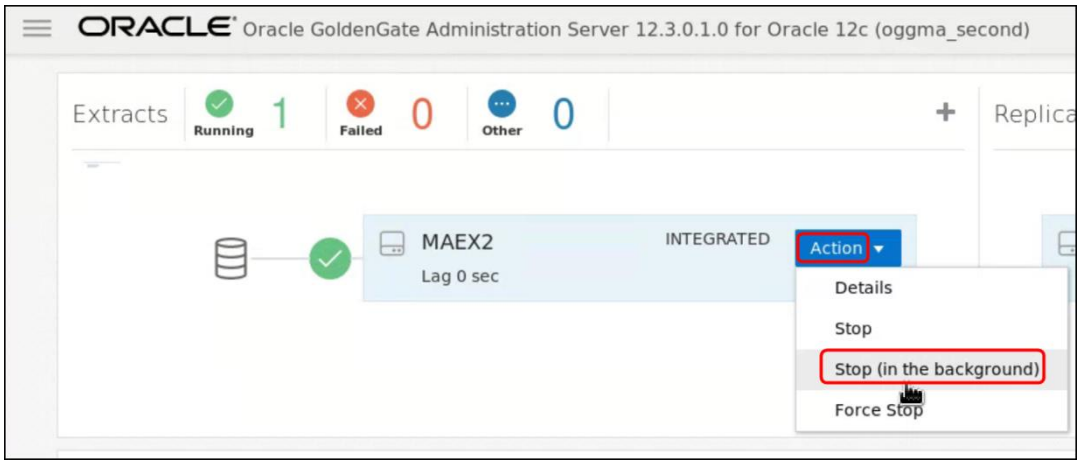
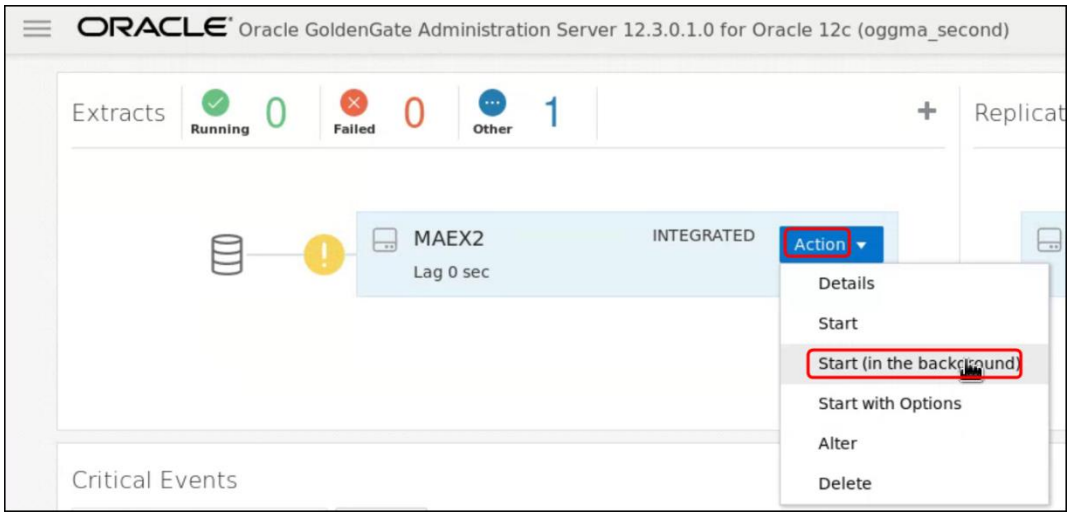
2. Stop and restart both Extract and Replicat groups so that the new parameters are taken into consideration by the replication loop.
   a. Click the "**Overview**" link to display the Overview page. Click the "Action" button for the MAEX2 Extract and then click "**Stop (in the background)**"—confirm your choice when the pop-up window appears.



   b. Stop the **MARE2** Replicat in the same manner, by choosing the "**Stop (in the background)**" option, and confirm your choice.
   c. Start the **MAEX2** Extract. In the Overview page, click the "**Action**" button for the **MAEX2** Extract; then click "**Start (in the background)**" and confirm your choice when the pop-up window appears.



   d. Start the **MARE2** Replicat in exactly the same manner, choosing "**Start (in the background)**" and confirming the choice when the pop-up window appears.
3. You have now a replication environment capable of replicating DDL statements. Use **sqlplus** to connect to the source database (**AMER**) and create a table containing an invisible column. Insert some data into it, and look at the target database (**EURO**) to verify that everything was replicated as intended.
   a. Open a new terminal shell window by clicking the terminal icon ( ) located at the top panel of your desktop environment. Launch **sqlplus** connecting to the **WEST** user in

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the **AMER** database. Create the **TEST_INV_COL** table as shown below (alternatively, run the **table_inv_col.sql** script located in **/home/oracle/labs/lab/les16**).

```
[oracle@hostname les16]$ sqlplus west@amer
SQL*Plus: Release 12.2.0.1.0 Production on Tue Jan 30 20:01:13
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Mon Jan 29 2018 23:21:48 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> create table test_inv_col (
  2  field1 number not null primary key,
  3  field2 number,
  4  field3 varchar2(40),
  5  field4 number invisible,
  6  field5 number);
Table created.
SQL>
```

b. Use the DESC (describe) command to display the table structure. As expected, `FIELD4`, being invisible, is not displayed.

```
SQL> desc test_inv_col
 Name                        Null?    Type
 --------------------------- -------- ----------------------------
-
 FIELD1                       NOT NULL NUMBER
 FIELD2                                NUMBER
 FIELD3                                VARCHAR2(40)
 FIELD5                                 NUMBER
SQL>
```

c. Insert some data into the **TEST_INV_COL** table. Note that in order to do so the complete list of columns must be specified in the insert statement. Commit your database change so that replication can occur. Select the row you just inserted.

```
SQL> insert into test_inv_col
(FIELD1,FIELD2,FIELD3,FIELD4,FIELD5) values
(1,20,'Trial',100,18);
1 row created.
SQL> commit;
Commit complete.
SQL> select * from test_inv_col;
```

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```
FIELD1     FIELD2 FIELD3                                  FIELD5
---------- ---------- ---------------------------------------- ----------
      1         20     Trial                                       18
SQL>
```

Note: The column **FIELD4** is not displayed, being invisible.

d. Open a new terminal shell window by clicking the terminal icon ( ) located at the top panel of your desktop environment. Launch **sqlplus** connecting to the **EAST** user in the **EURO** database. Verify that the **TEST_INV_COL** table has been created and select all rows from **TEST_INV_COL** to verify that replication occurred.

```
[oracle@hostname ~]$ sqlplus east@euro
SQL*Plus: Release 12.2.0.1.0 Production on Tue Jan 30 20:29:35
2018
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Enter password: *********
Last Successful login time: Tue Jan 30 2018 20:09:58 +11:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 -
64bit Production
SQL> select table_name from user_tables;

TABLE_NAME
-----------------------------------------------------------------
ACCOUNT
ACCOUNT_TRANS
BRANCH
TELLER
TELLER_TRANS
BRANCH_ATM
TEST_INV_COL

7 rows selected.
SQL> select * from test_inv_col;

    FIELD1     FIELD2 FIELD3                                  FIELD5
---------- ---------- ---------------------------------------- ----------
      1         20     Trial                                       18
SQL>
```

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e. If you specify the hidden field in your select statement, you will find the value for it. Verify that the value (**100**) stored in that column on the source database (**AMER**) has been correctly propagated by replication.

```
SQL> select field1,field2,field3,field4,field5 from
test_inv_col;

FIELD1     FIELD2     FIELD3                            FIELD4     FIELD5
---------- ---------- -------------------------------- ---------- ----------
1          20         Trial                             100        18
```

Note: This last step concludes practice 16-3 and all practices for lesson 16.

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