

The Oracle logo is centered on a dark gray background. It features the word "ORACLE" in a white, bold, sans-serif typeface. The letters are closely spaced, and the overall design is clean and modern. The top of the image shows a decorative border with orange, black, and yellow geometric patterns.

ORACLE

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SAN FRANCISCO





THT6126

How to Monitor Lag with the Oracle GoldenGate Heartbeat Table

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Our Goal



Show how to implement a lag management policy using a heartbeat table.

Oracle GoldenGate Replication Lag Analysis

- Customers need **Heartbeat Tables** to capture **lag statistics** across source and target databases to assess the performance of replication.
- Prior to the 12.2.0.1.0 release, heartbeat tables were **not officially supported** by Oracle Corporation. An Oracle Support document ([Doc ID 1299679.1](#)) described an implementation of heartbeat tables proposed by the Oracle GoldenGate A-Team.
- Starting with [12.2.0.1.0](#), heartbeat tables are **officially supported**. The **GGSCI** utility was enhanced with new commands to configure the heartbeat tables.
- In [12.3.0.1.0](#), within a **Microservices Architecture (MA)** deployment, the **Oracle GoldenGate Administration Server** supports heartbeat table configuration.
- In [19c](#) onward, the Replicat tracks the current restart position of Extract with automatic heartbeat tables. This helps **regenerate the trail files** from the source database, if required, and minimizes the redo log retention period of the source database. Additionally, by tracking the most recent Extract restart position, the tomb-stone tables for Automatic Conflict Detection and Resolution (**ACDR**) tables can be purged more frequently.

How can a Oracle GoldenGate Heartbeat Table be created ?

- **ggsci** with Classic Architecture
- **adminclient** with Microservices Architecture
- **Browser** using Administration Server with Microservices Architecture
- **RESTful API** using Microservices Architecture

Heartbeat Mechanism Works Across All Data Capture and Data Apply

- Each Extract, Data Pump in **Classic Architecture** or Path in **Microservices Architecture**, and Replicat carry timestamps that are recorded in heartbeat tables using a UTC format.
- The database scheduler updates a record in one heartbeat table at predefined intervals (default one minute.) For **Oracle Database**, the **database job is created automatically**; for all other supported databases, you create background jobs to update the heartbeat timestamp using the database specific scheduler functionality.
- The heartbeat tables are stored in the Oracle **GoldenGate administrative account** and are not defined in the Extract or Replicat parameter files.
- As part of the replication lag setup, the Oracle RDBMS exposes heartbeat and heartbeat history views, which can be queried and graphed for analysis.

Heartbeat Lag Management Setup is Easy in Oracle GoldenGate Classic Architecture

1. Specify the Oracle GoldenGate administration schema in the **GLOBALS** file using the **GGSCHEMA** parameter. If you change **GLOBALS**, you must restart the manager process.
2. In **GGSCI**, use **DBLOGIN** to connect using the administration username or credential for the source database.
3. Enter the **ADD HEARTBEATTABLE** command.
4. Repeat the same steps for the target environment.
5. Stop and restart any running groups (extracts and replicats).

Heartbeat Lag Management Setup is Easy in Oracle Microservices Architecture Deployment

Click the "Application Navigation" icon and then select "Configuration."

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Oracle GoldenGate Administration Server 19.1.0.0.1 for Oracle 12c (oggma_second)

admin

Security

Overview

Configuration

Profile

Diagnosis

Debug Log

Administrator

Database

Key Management

Parameter Files

Tasks

Credentials

+

↺

Search in table

Domain	Alias	User ID	Action
OracleGoldenGate	oggadmin	C##OGG_ADMIN	<div><div>🗑️</div><div>✎</div><div>☰</div></div>
OracleGoldenGate	oggadmin_amer	C##OGG_ADMIN@amer	<div><div>🗑️</div><div>✎</div><div>☰</div></div>
OracleGoldenGate	oggadmin_euro	C##OGG_ADMIN@euro	<div><div>🗑️</div><div>✎</div><div>☰</div></div>

For connecting to a database and managing Checkpoint Tables, Transaction Information and Heartbeat Table, please click:

☰

Log in Database

Under the "Action" column, click the icon to connect to the source database.



MA Deployment: Heartbeat Management

1

Click the plus sign (+) beside "Heartbeat" and expand the following fields to see defaults.

2

Heartbeat Frequency (in seconds)
Retention Time (in days)
Purge Frequency (in days)
Click "Submit" to create the heartbeat

3

The objects created by Oracle GoldenGate include tables, views, and jobs for the scheduler running inside the Oracle RDBMS.

The screenshot displays the Oracle GoldenGate Administration Console interface. On the left, a dark sidebar contains the 'Diagnosis' and 'Administrator' tabs. The main content area is titled 'Checkpoint + [magnifying glass icon]' and includes a 'Search in table' input field. Below this is a table with two columns: 'Checkpoint Table' and 'Action'. The table contains one entry: 'EURO.EAST.CHKPT' with a trash icon in the 'Action' column. Further down, the 'Trandata + [magnifying glass icon]' section is visible, with radio buttons for 'Schema' (selected), 'Table', and 'Procedure', and a 'Search for Schema' input field. The 'Heartbeat + [magnifying glass icon]' section is highlighted with a red box. It features a red box around the plus icon and a tooltip that says 'Add Heartbeat'. Below this, three configuration fields are shown: 'Frequency (in seconds)' with a slider from 1 to 300 and a text input set to 60; 'Retention Time (in days)' with a slider from 1 to 199 and a text input set to 30; and 'Purge Frequency' with a slider from 1 to 199 and a text input set to 1. At the bottom of this section are 'Cancel' and 'Submit' buttons, with the 'Submit' button highlighted by a red box.

Heartbeat Table Objects

Tables

GG_HEARTBEAT
GG_HEARTBEAT_SEED
GG_HEARTBEAT_HISTORY

Procedures

GG_UPDATE_HB_TAB
GG_PURGE_HB_TAB

Views

GG_LAG
GG_LAG_HISTORY

Jobs

GG_UPDATE_HEARTBEATS
GG_PURGE_HEARTBEATS

Accessing Heartbeat Statistics Using Database Views

- GG_LAG shows current lag.
- GG_LAG_HISTORY shows history of lag.

GG_LAG_HISTORY Columns

```
23:26:16 SQL> desc GG_HEARTBEAT_HISTORY
```

Name	Null?	Type
LOCAL_DATABASE		VARCHAR2(512)
HEARTBEAT_RECEIVED_TS		TIMESTAMP(6)
REMOTE_DATABASE		VARCHAR2(512)
INCOMING_EXTRACT		VARCHAR2(128)
INCOMING_ROUTING_PATH		VARCHAR2(4000)
INCOMING_REPLICAT		VARCHAR2(128)
INCOMING_HEARTBEAT_TS		TIMESTAMP(6)
INCOMING_EXTRACT_TS		TIMESTAMP(6)
INCOMING_ROUTING_TS		TIMESTAMP(6)
INCOMING_REPLICAT_TS		TIMESTAMP(6)
OUTGOING_EXTRACT		VARCHAR2(128)
OUTGOING_ROUTING_PATH		VARCHAR2(4000)
OUTGOING_REPLICAT		VARCHAR2(128)
OUTGOING_HEARTBEAT_TS		TIMESTAMP(6)
OUTGOING_EXTRACT_TS		TIMESTAMP(6)
OUTGOING_ROUTING_TS		TIMESTAMP(6)
OUTGOING_REPLICAT_TS		TIMESTAMP(6)
INCOMING_REPLICAT_LW_CSN		VARCHAR2(128)
INCOMING_EXTRACT_HEARTBEAT_CSN		VARCHAR2(128)
INCOMING_EXTRACT_RESTART_CSN		VARCHAR2(128)
INCOMING_EXTRACT_RESTART_TS		TIMESTAMP(6)

Starting in Oracle GoldenGate 19.1, the Heartbeat Table has been extended to include information about the source Extract process for recovery purposes.

The BSN is the native database begin sequence number that identifies the oldest uncommitted transaction that is held in Extract memory.

Demos

Demo: Configuring heartbeat table
for GoldenGate 19c Classic
Architecture

Demo: Configuring heartbeat table for
GoldenGate 19c Microservices Architecture



Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 1

Create a Database Schema Owner for the heartbeat table.

```
[oracle@edvmr1p0 oggsrsrc]$ sqlplus sys@amer as sysdba
SQL*Plus: Release 12.2.0.1.0 Production on Thu Aug 29 00:30:14 2019
Copyright (c) 1982, 2016, Oracle. All rights reserved.
Enter password:
Connected to:
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Production
SQL> create user ggadmin identified by oracle_4U;
User created.
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 2

Grant privileges to the source Schema Owner.

```
SQL> grant resource to ggadmin;
```

Grant succeeded.

```
SQL> grant unlimited tablespace to ggadmin;
```

Grant succeeded.

```
SQL> grant connect to ggadmin;
```

Grant succeeded.

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 3

Create the target schema owner and assign privileges.

```
SQL> conn sys@euro as sysdba
Enter password:
Connected.
SQL> create user ggadmin identified by oracle_4U;

User created.

SQL> grant resource to ggadmin;

Grant succeeded.

SQL> grant unlimited tablespace to ggadmin;

Grant succeeded.

SQL> grant connect to ggadmin;

Grant succeeded.
```


Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 4

Create the source GLOBALS file and specify the GGSCHEMA parameter

```
/u01/ogg/oggsrc  
[oracle@edvmr1p0 oggsrc]$ vi GLOBALS  
[oracle@edvmr1p0 oggsrc]$ cat GLOBALS  
ggschema ggadmin
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 5

Create the target GLOBALS file and specify the GGSCHEMA parameter.

```
[oracle@edvmr1p0 oggtrg]$ pwd
/u01/ogg/oggtrg
[oracle@edvmr1p0 oggtrg]$ vi GLOBALS
[oracle@edvmr1p0 oggtrg]$ cat GLOBALS
ggschema ggadmin
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 6

Confirm the credential for the source database.

```
[oracle@edvmrlp0 oggsrcl]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 19.1.0.0.1 OGGCORE_19.1.0.0.0_PLATFORMS_190524.2201_FBO
Linux, x64, 64bit (optimized), Oracle_12c on May 25 2019 12:43:32
Operating system character set identified as UTF-8.

Copyright (C) 1995, 2019, Oracle and/or its affiliates. All rights reserved.

GGSCI (edvmrlp0) 1> info credentialstore

Reading from credential store:

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
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 7

Login using the source credential.

```
GGSCI (edvmr1p0) 2> dblogin useridalias oggadmin_amer  
Successfully logged into database AMER.
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 8

Create the source heartbeat table objects.

```
GGSCI (edvmr1p0 as c##ogg_admin@orcl/AMER) 3> add heartbeattable
```

```
2019-08-29 00:50:57 INFO OGG-14001 Successfully created heartbeat seed table "ggadmin"."GG_HEARTBEAT_SEED".
2019-08-29 00:50:57 INFO OGG-14089 Successfully tracking extract restart position with heartbeat table "ggadmin"."GG_HEARTBEAT_SEED".
2019-08-29 00:50:58 INFO OGG-14032 Successfully added supplemental logging for heartbeat seed table "ggadmin"."GG_HEARTBEAT_SEED".
2019-08-29 00:50:58 INFO OGG-14000 Successfully created heartbeat table "ggadmin"."GG_HEARTBEAT".
2019-08-29 00:50:58 INFO OGG-14089 Successfully tracking extract restart position with heartbeat table "ggadmin"."GG_HEARTBEAT".
2019-08-29 00:50:58 INFO OGG-14033 Successfully added supplemental logging for heartbeat table "ggadmin"."GG_HEARTBEAT".
2019-08-29 00:50:58 INFO OGG-14016 Successfully created heartbeat history table "ggadmin"."GG_HEARTBEAT_HISTORY".
2019-08-29 00:50:58 INFO OGG-14089 Successfully tracking extract restart position with heartbeat table "ggadmin"."GG_HEARTBEAT_HISTORY".
2019-08-29 00:50:58 INFO OGG-14086 Successfully disabled partitioning for heartbeat history table "ggadmin"."GG_HEARTBEAT_HISTORY".
```


Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 9

Create the source heartbeat table objects.

```
2019-08-29 00:50:58 INFO OGG-14023 Successfully created heartbeat lag view "ggadmin"."GG_LAG".
2019-08-29 00:50:58 INFO OGG-14024 Successfully created heartbeat lag history view "ggadmin"."GG_LAG_HISTORY".
2019-08-29 00:50:58 INFO OGG-14003 Successfully populated heartbeat seed table with "ORCL:AMER".
2019-08-29 00:50:58 INFO OGG-14004 Successfully created procedure "ggadmin"."GG_UPDATE_HB_TAB" to update the heartbeat tables.
2019-08-29 00:50:58 INFO OGG-14017 Successfully created procedure "ggadmin"."GG_PURGE_HB_TAB" to purge the heartbeat history table.
2019-08-29 00:50:58 INFO OGG-14005 Successfully created scheduler job "ggadmin"."GG_UPDATE_HEARTBEATS" to update the heartbeat tables.
2019-08-29 00:50:58 INFO OGG-14018 Successfully created scheduler job "ggadmin"."GG_PURGE_HEARTBEATS" to purge the heartbeat history table.
GGSCI (edvmr1p0 as c##ogg_admin@orcl/AMER) 4>
```

It creates nine objects !!!

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step10

Confirm the credential for the target database.

```
[oracle@edvmrlp0 oggtrg]$ ggsci

Oracle GoldenGate Command Interpreter for Oracle
Version 19.1.0.0.1 OGGCORE_19.1.0.0.0_PLATFORMS_190524.2201_FBO
Linux, x64, 64bit (optimized), Oracle 12c on May 25 2019 12:43:32
Operating system character set identified as UTF-8.

Copyright (C) 1995, 2019, Oracle and/or its affiliates. All rights reserved.


GGSCI (edvmrlp0) 1> info credentialstore

Reading from credential store:

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
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 11

Create the target heartbeat table objects.

```
GGSCI (edvmrlp0) 2> dblogin useridalias oggadmin_euro  
Successfully logged into database EURO.
```

It creates nine objects !!!

```
GGSCI (edvmrlp0 as c##ogg_admin@orcl/EURO) 3> add heartbeattable
```

```
2019-08-29 01:10:01 INFO      OGG-14001 Successfully created heartbeat seed table ""ggadmin"."GG_HEARTBEAT_SEED"".
2019-08-29 01:10:01 INFO      OGG-14089 Successfully tracking extract restart position with heartbeat table ""ggadmin"."GG_HEARTBEAT_SEED"".
2019-08-29 01:10:01 INFO      OGG-14032 Successfully added supplemental logging for heartbeat seed table ""ggadmin"."GG_HEARTBEAT_SEED"".
2019-08-29 01:10:01 INFO      OGG-14000 Successfully created heartbeat table ""ggadmin"."GG_HEARTBEAT"".
2019-08-29 01:10:01 INFO      OGG-14089 Successfully tracking extract restart position with heartbeat table ""ggadmin"."GG_HEARTBEAT"".
2019-08-29 01:10:01 INFO      OGG-14033 Successfully added supplemental logging for heartbeat table ""ggadmin"."GG_HEARTBEAT"".
2019-08-29 01:10:01 INFO      OGG-14016 Successfully created heartbeat history table ""ggadmin"."GG_HEARTBEAT_HISTORY"".
2019-08-29 01:10:01 INFO      OGG-14089 Successfully tracking extract restart position with heartbeat table ""ggadmin"."GG_HEARTBEAT_HISTORY"".
2019-08-29 01:10:01 INFO      OGG-14086 Successfully disabled partitioning for heartbeat history table ""ggadmin"."GG_HEARTBEAT_HISTORY"".
2019-08-29 01:10:01 INFO      OGG-14023 Successfully created heartbeat lag view ""ggadmin"."GG_LAG"".
2019-08-29 01:10:01 INFO      OGG-14024 Successfully created heartbeat lag history view ""ggadmin"."GG_LAG_HISTORY"".
2019-08-29 01:10:01 INFO      OGG-14003 Successfully populated heartbeat seed table with "ORCL:EURO".
2019-08-29 01:10:01 INFO      OGG-14004 Successfully created procedure ""ggadmin"."GG_UPDATE_HB_TAB"" to update the heartbeat tables.
2019-08-29 01:10:01 INFO      OGG-14017 Successfully created procedure ""ggadmin"."GG_PURGE_HB_TAB"" to purge the heartbeat history table.
2019-08-29 01:10:01 INFO      OGG-14005 Successfully created scheduler job ""ggadmin"."GG_UPDATE_HEARTBEATS"" to update the heartbeat tables.
2019-08-29 01:10:01 INFO      OGG-14018 Successfully created scheduler job ""ggadmin"."GG_PURGE_HEARTBEATS"" to purge the heartbeat history table.
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 12

Stop and restart the Extracts.

```
GGSCI (edvmr1p0) 2> stop extract *
```

```
Sending STOP request to EXTRACT EXTWEST ...  
Request processed.
```

```
Sending STOP request to EXTRACT PWEST ...  
Request processed.
```

```
GGSCI (edvmr1p0) 3> info all
```

Program	Status	Group	Lag at Chkpt	Time Since Chkpt
MANAGER	RUNNING			
EXTRACT	STOPPED	EXTWEST	00:00:00	00:00:30
EXTRACT	STOPPED	PWEST	00:00:00	00:00:29

```
GGSCI (edvmr1p0) 4> start extract *
```

```
Sending START request to MANAGER ...  
EXTRACT EXTWEST starting
```

```
Sending START request to MANAGER ...  
EXTRACT PWEST starting
```

```
GGSCI (edvmr1p0) 5> info all
```

Program	Status	Group	Lag at Chkpt	Time Since Chkpt
MANAGER	RUNNING			
EXTRACT	RUNNING	EXTWEST	00:00:00	00:00:01
EXTRACT	RUNNING	PWEST	00:00:00	00:00:02

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 13

Stop and restart the Replicat.

```
GGSCI (edvmr1p0) 2> stop reast
```

```
Sending STOP request to REPLICAT REAST ...  
Request processed.
```

```
GGSCI (edvmr1p0) 3> info all
```

Program	Status	Group	Lag at Chkpt	Time Since Chkpt
MANAGER	RUNNING			
REPLICAT	STOPPED	REAST	00:00:00	00:00:01

```
GGSCI (edvmr1p0) 4> start reast
```

```
Sending START request to MANAGER ...  
REPLICAT REAST starting
```

```
GGSCI (edvmr1p0) 5> info all
```

Program	Status	Group	Lag at Chkpt	Time Since Chkpt
MANAGER	RUNNING			
REPLICAT	RUNNING	REAST	00:00:00	00:00:02

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 14

Generate activity on source tables.

```
[oracle@edvmr1p0 oggtrg]$ sqlplus west@amer
```

```
SQL*Plus: Release 12.2.0.1.0 Production on Thu Aug 29 01:26:06 2019
```

```
Copyright (c) 1982, 2016, Oracle. All rights reserved.
```

```
Enter password:
```

```
ERROR:
```

```
ORA-28002: the password will expire within 2 days
```

```
Last Successful login time: Thu Aug 29 2019 00:23:32 +00:00
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Production
```

```
SQL> exec db_activity
```

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 15

Count the records in the source GG_HEARTBEAT_SEED table.

```
[oracle@edvmrlp0 oggsrvc]$ sqlplus ggadmin@amer

SQL*Plus: Release 12.2.0.1.0 Production on Thu Aug 29 01:35:39 2019

Copyright (c) 1982, 2016, Oracle. All rights reserved.

Enter password:
Last Successful login time: Thu Aug 29 2019 01:29:16 +00:00

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

SQL> select count(*) from gg_heartbeat_seed;
```

COUNT(*)
1

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 16

Display the structure of the source GG_HEARTBEAT_SEED table.

```
SQL> desc gg_heartbeat_seed;
```

Name	Null?	Type
LOCAL_DATABASE		VARCHAR2(512)
HEARTBEAT_TIMESTAMP		TIMESTAMP(6)
REMOTE_DATABASE		VARCHAR2(512)
INCOMING_EXTRACT		VARCHAR2(128)
INCOMING_ROUTING_PATH		VARCHAR2(4000)
INCOMING_REPLICAT		VARCHAR2(128)
INCOMING_HEARTBEAT_TS		TIMESTAMP(6)
INCOMING_EXTRACT_TS		TIMESTAMP(6)
INCOMING_ROUTING_TS		TIMESTAMP(6)
INCOMING_REPLICAT_TS		TIMESTAMP(6)
OUTGOING_EXTRACT		VARCHAR2(128)
OUTGOING_ROUTING_PATH		VARCHAR2(4000)
OUTGOING_REPLICAT		VARCHAR2(128)
OUTGOING_HEARTBEAT_TS		TIMESTAMP(6)
OUTGOING_EXTRACT_TS		TIMESTAMP(6)
OUTGOING_ROUTING_TS		TIMESTAMP(6)
OUTGOING_REPLICAT_TS		TIMESTAMP(6)
INCOMING_REPLICAT_LW_CSN		VARCHAR2(128)
INCOMING_EXTRACT_HEARTBEAT_CSN		VARCHAR2(128)
INCOMING_EXTRACT_RESTART_CSN		VARCHAR2(128)
INCOMING_EXTRACT_RESTART_TS		TIMESTAMP(6)

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 17

Query the source GG_HEARTBEAT_SEED table several times.

```
SQL> set time on
01:40:21 SQL> select local_database, heartbeat_timestamp from gg_heartbeat_seed;
```

```
LOCAL_DATABASE
```

```
-----
```

```
HEARTBEAT_TIMESTAMP
```

```
-----
```

```
ORCL:AMER
```

```
29-AUG-19 01.39.58.228629 AM
```

```
01:40:28 SQL> select local_database, heartbeat_timestamp from gg_heartbeat_seed;
```

```
LOCAL_DATABASE
```

```
-----
```

```
HEARTBEAT_TIMESTAMP
```

```
-----
```

```
ORCL:AMER
```

```
29-AUG-19 01.42.58.229431 AM
```

The source record is updated minutely !!!

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 18

Count the records in the target GG_LAG_HISTORY view.

```
[oracle@edvmr1p0 oggsrvc]$ sqlplus ggadmin@euro
```

```
SQL*Plus: Release 12.2.0.1.0 Production on Thu Aug 29 01:47:02 2019
```

```
Copyright (c) 1982, 2016, Oracle. All rights reserved.
```

```
Enter password:
```

```
Last Successful login time: Thu Aug 29 2019 01:31:14 +00:00
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.2.0.1.0 - 64bit Production
```

```
SQL> select count(*) from gg_lag_history;
```

```
COUNT(*)
```

```
-----
```

```
25
```

A new target record is inserted for each update on the source !!!

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 19

Describe the structure of target GG_LAG_HISTORY view.

```
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
INCOMING_EXTRACT_RESTART_CSN		VARCHAR2(128)
INCOMING_EXTRACT_RESTART_TS		TIMESTAMP(6)
INCOMING_EXTRACT_RESTART_AGE		INTERVAL DAY(9) TO SECOND(6)
INCOMING_EXTRACT_HEARTBEAT_CSN		VARCHAR2(128)
INCOMING_REPLICAT_LW_CSN		VARCHAR2(128)

These columns are new with 19c !!!

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture, Step 20

Query target GG_LAG_HISTORY view.

```
SQL> select incoming_path, incoming_lag from gg_lag_history order by heartbeat_received_ts;
```

INCOMING_PATH	INCOMING_LAG
EXTWEST ==> PWEST ==> REAST	21.375689
EXTWEST ==> PWEST ==> REAST	5.102948
EXTWEST ==> PWEST ==> REAST	6.216693
EXTWEST ==> PWEST ==> REAST	6.299987
EXTWEST ==> PWEST ==> REAST	5.414448
EXTWEST ==> PWEST ==> REAST	5.878261
EXTWEST ==> PWEST ==> REAST	5.938818
EXTWEST ==> PWEST ==> REAST	5.976785
EXTWEST ==> PWEST ==> REAST	5.016398
EXTWEST ==> PWEST ==> REAST	6.087258
EXTWEST ==> PWEST ==> REAST	6.13898

This lag exceeds
21 seconds !!!

A pump extract is used with Classic Architecture.

Demos

Demo: Configuring heartbeat table for GoldenGate 19c Classic Architecture

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture



Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 1

Assign the schema owner for the GLOBALS file using oggca.sh.

Oracle GoldenGate Configuration Assistant 19.1.0.0.1 - Configuration Wizard - Step 10 of 13

Specify OGG Replication Settings

Replication Options

Default Schema

C##OGG_ADMIN

This is specified during the source and target deployments.

Help < Back Next > Finish Cancel

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 2

Verify the ggschema parameter is defined in the GLOBALS file.

```
[oracle@edvmr1p0 ~]$  
[oracle@edvmr1p0 ~]$ more $OGG_ETC_HOME/conf/ogg/GLOBALS  
ggschema C##OGG ADMIN  
[oracle@edvmr1p0 ~]$
```

The file is automatically created by oggca.sh !!!

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 3

Login into the target database using the credential.

ORACLE® Oracle GoldenGate Administration Server 19.1.0.0.1 for Oracle 12c (oggma_second)

admin Security

Overview

Configuration

Profile

Diagnosis

Debug Log

Administrator










Database

Key Management


Parameter Files

Tasks

Credentials + ↺

Domain	Alias	User ID	Action
OracleGoldenGate	oggadmin	C##OGG_ADMIN	  
OracleGoldenGate	oggadmin_amer	C##OGG_ADMIN@amer	  
OracleGoldenGate	oggadmin_euro	C##OGG_ADMIN@euro	  

For connecting to a database and managing Checkpoint Tables, Transaction Information and Heartbeat Table, please click:



Credential Domain: ?

OracleGoldenGate

Log in Database



Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 4

Verify that it turns blue once connected to the target database.

admin

Security

Overview

Configuration

Profile

Diagnosis

ORACLE® Oracle GoldenGate Administration Server 19.1.0.0.1 for Oracle 12c (oggma_second)

Database










Key Management

Parameter Files

Tasks

Credentials + ↺

Search in table


Domain	Alias	User ID	Action
OracleGoldenGate	oggadmin	C##OGG_ADMIN	  
OracleGoldenGate	oggadmin_amer	C##OGG_ADMIN@amer	  
OracleGoldenGate	oggadmin_euro	C##OGG_ADMIN@euro	  

OracleGoldenGate : oggadmin_euro





Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 5


Select the Add Heartbeat to create the target heartbeat table.


Checkpoint 

Checkpoint Table	Action
No data to display.	

Transaction Information  

☒ Schema ☐ Table ☐ Procedure



Heartbeat 

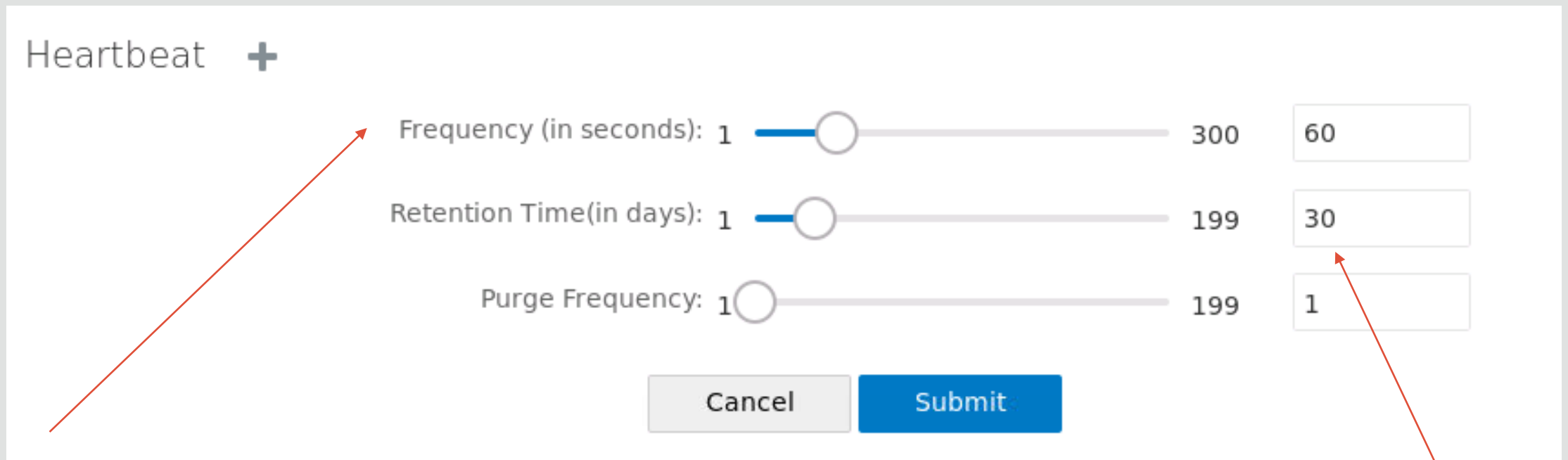
Add Heartbeat

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 6

Review the default options and submit them.

Heartbeat +

Frequency (in seconds):	1	<input type="range"/>	300	<input type="text" value="60"/>
Retention Time(in days):	1	<input type="range"/>	199	<input type="text" value="30"/>
Purge Frequency:	1	<input type="range"/>	199	<input type="text" value="1"/>





Use the same heartbeat frequency on all the databases to make diagnosis easier and a frequency of 30 to 60 seconds gives the best results for most workloads.

Adjust the retention period if space is an issue.

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 7

Login into the source database using the credential.

 Oracle GoldenGate Administration Server 19.1.0.0.1 for Oracle 12c (oggma_second)


admin
Security

Overview

Configuration

Profile

Diagnosis

Debug Log



Administrator










Database

Key Management


Parameter Files

Tasks

Credentials  

Domain	Alias	User ID	Action
OracleGoldenGate	oggadmin	C##OGG_ADMIN	  
OracleGoldenGate	oggadmin_amer	C##OGG_ADMIN@amer	  
OracleGoldenGate	oggadmin_euro	C##OGG_ADMIN@euro	  

Log in Database

For connecting to a database and managing Checkpoint Tables, Transaction Information and Heartbeat Table, please click: 

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 8

Create the source heartbeat table.

Heartbeat +

Frequency (in seconds): 1

300

60

Retention Time(in days): 1

199

30

Purge Frequency: 1

199

1

Cancel

Submit

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 9

Generate changes on the source database.

```
[oracle@edvmr1p0 ~]$ sqlplus west@amer

SQL*Plus: Release 12.2.0.1.0 Production on Fri Aug 30 02:48:30 2019

Copyright (c) 1982, 2016, Oracle. All rights reserved.

Enter password:
ERROR:
ORA-28002: the password will expire within 1 days

Last Successful login time: Thu Aug 29 2019 01:26:09 +00:00

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

SQL> exec db_activity;
```

Demo: Configuring heartbeat table for GoldenGate 19c Microservices Architecture, Step 10

Query the target GG_LAG_HISTORY view to monitor unusual lag.

```
[oracle@edvmrlp0 ~]$ sqlplus c##ogg_admin@euro

SQL*Plus: Release 12.2.0.1.0 Production on Fri Aug 30 02:55:26 2019

Copyright (c) 1982, 2016, Oracle. All rights reserved.

Enter password:
Last Successful login time: Fri Aug 30 2019 02:55:16 +00:00

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

SQL> col incoming_path for a55
SQL> select incoming_path, incoming_lag from gg_lag_history order by heartbeat_received_ts;
```

INCOMING_PATH	INCOMING_LAG
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	326.207425
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	269.429209
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	212.133692
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	152.154553
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	92.151665
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	32.160453
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	4.206932
MAEX2 ==> edvmrlp0:9003:path02 ==> MARE2	3.312814

8 rows selected. A path is used with Microservices Architecture.

Where can I learn more from Oracle University ?

- Oracle GoldenGate 12c: Fundamentals for Oracle (4 days)
- Oracle GoldenGate 12c: Advanced Configuration for Oracle (4 days)
- Oracle GoldenGate 12c: Troubleshooting and Tuning (4 days)
- Oracle GoldenGate 12c: Management Pack Overview (2 days)
- Oracle GoldenGate 12c: Veridata Essentials (1 day)
- Oracle GoldenGate 12c: Integrate Big Data (3 days)

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Thank You

Randall Richeson

Senior Principal Instructor
Oracle University



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