Best Practices for High Availability and Performance Tuning for Oracle GoldenGate Microservices

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Program Agenda

1 Microservices Architecture

2 Overview of Oracle Active Data guard / FSFO

3 Overview of new Grid Infrastructure Bundled Agent (XAG)

4 Configuration for GoldenGate with RAC and Data Guard

5 Summary

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Oracle GoldenGate 12.3 New Features

New GoldenGate Services Architecture

REST interfaces for Configuration, Administration and Monitoring with included HTML5 Web applications
Deploy at cloud scale with fully secure HTTPS interfaces and Secure Web Sockets for streaming data

Parallel Apply

Highly scalable client side apply engine with gains of over 5x throughput on Oracle

Automatic Conflict Detection and Resolution (CDR)

Conflict detection and resolution built directly into Oracle Database Kernel

Oracle Database Sharding Support

Embedded & fully automated active-active replication within and across Database Shards

Cloud

Integrated UI for Design, Development, Management and Monitoring for GoldenGate Cloud Service

Expanded Oracle Database 12.2 Support

Long identifiers, Expanded SCN, Local Undo for PDBs, Top-level VARRAYs, REFs.
Procedural replication of Advanced Queues, Virtual Private Database, Online Redefinition, ….

Enhanced Big Data and NoSQL Support

Sample adapters for Oracle NoSQL, MongoDB. Support for Hive Metadata

Heterogeneous Enhancements

Generic JDBC Support. MySQL DDL replication. Remote capture and apply for z/OS

# New Services Architecture for Cloud and Large-scale Deployments
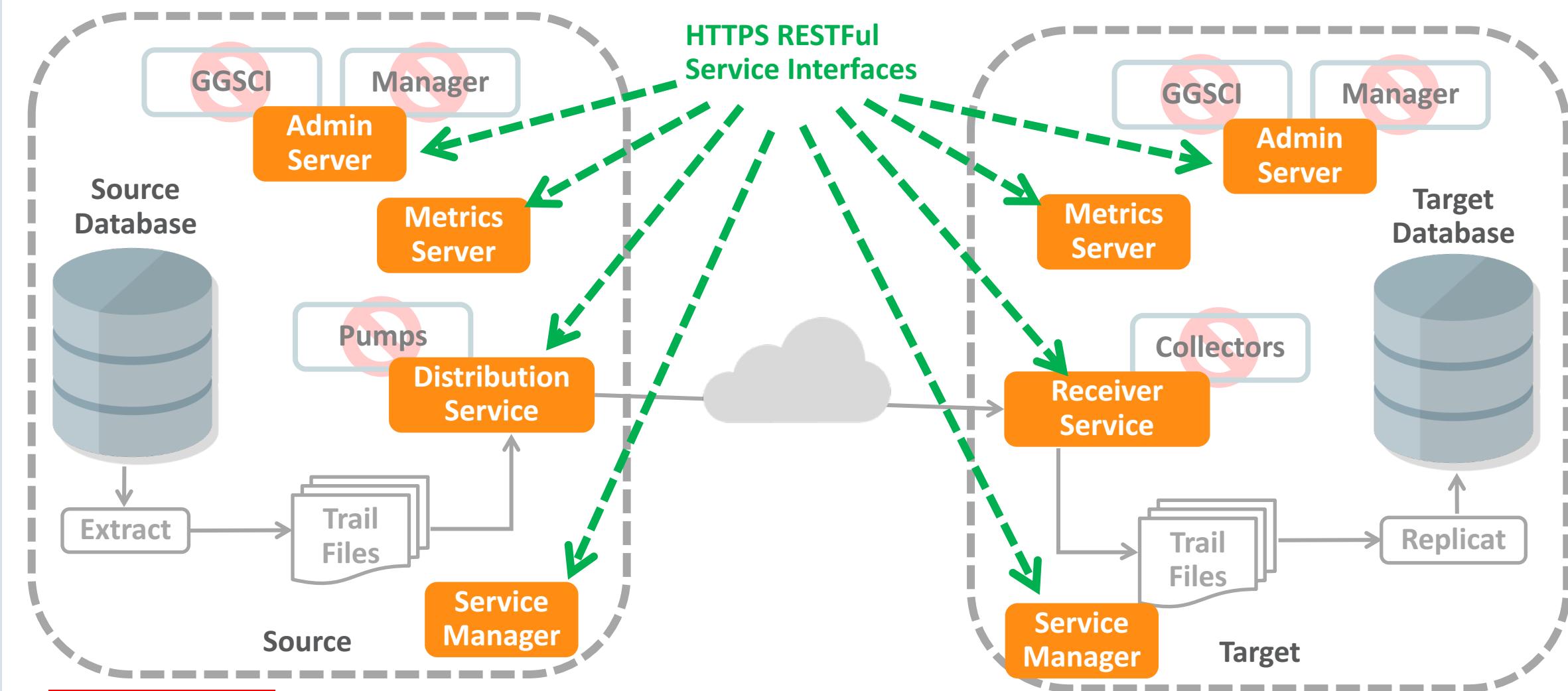
How Oracle GoldenGate Works – Microservices Architecture

Capture: committed transactions are captured (and can be filtered) as they occur by reading the <u>transaction logs</u>. **As of** V.11.2.1, GoldenGate offers two options for capture for Oracle; Classic & Integrated Capture

Trail: stages and queues data for routing.

Distribution Server/Receiver: distributes data for routing to target(s).

Route: data is compressed, encrypted for routing to target(s).

Delivery: applies data with transaction integrity. **New** with GoldenGate 12c, Integrated Delivery.

Source
Oracle & Non-Oracle
Database(s)

Capture

Delivery

Trail Files

Trail Files

Dist. Service

Receiver Service

LAN / WAN / Internet Over TCP/IP

Receiver Service

Dist. Service

Trail Files

Trail Files

Delivery

Capture

Target
Oracle & Non-Oracle
Database(s)

Bi-directional

Administer GoldenGate with Variety of Clients

Command Line, Browsers, Programmatic RESTful Interfaces
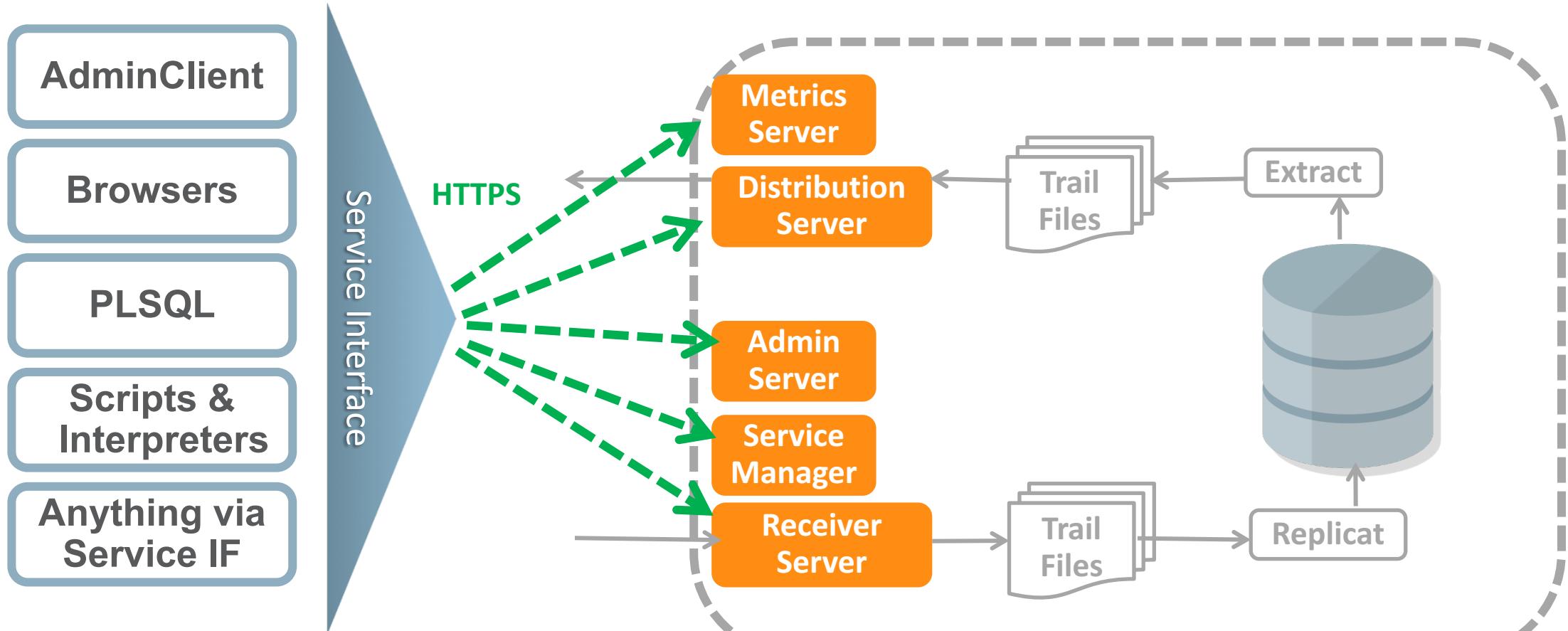
Solutions For Everyone

Administrators

- Simple to use Web interface

- Get up and running quickly

- Much lower learning curve

Traditionalists

- Command Line access via adminclient – run anywhere

- Similar GoldenGate commands as in GGSCI

- Interaction the same as previous releases

DevOps

- Uses RESTful APIs

- Run anywhere

- Roll your own monitoring

- Automate common activities

Microservices Architecture: Browser Based Client

Program Agenda with Highlight

1 ▶ Microservices Architecture

2 ▶ Overview of Oracle Active Data Guard / FSFO

3 ▶ Overview of new Grid Infrastructure Bundled Agent (XAG)

4 ▶ Configuration for GoldenGate with RAC and Data Guard

5 ▶ Summary

Oracle Active Data Guard
Disaster Recovery and Read-Only Offload to an Active Standby

Read-write Workload

Observer

Real-time Reporting

Fast Incremental Backups

Data Guard

SYNC / ASYNC

Primary Database

Primary Site

Active Standby Database

Standby Site
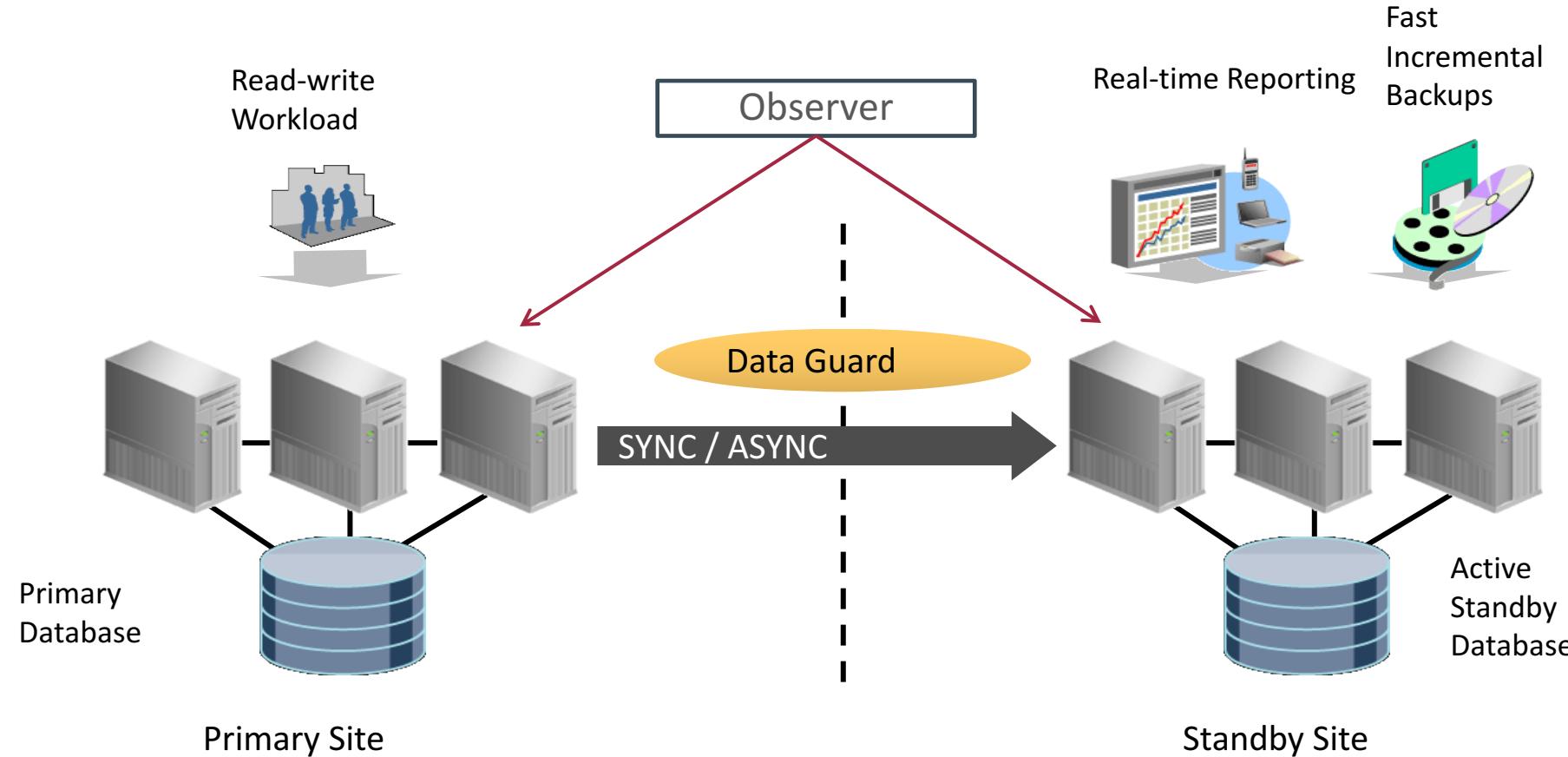
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Oracle Data Guard Concepts

- Switchover: Planned role transition from a primary database to one of its standby databases.
  - DGMGRL > SWITCHOVER TO CHICAGO
    - Requires connectivity to both primary and standby databases
    - Ensures all redo has shipped
    - Orderly transition (both databases agree on everything)
- Failover: Unplanned activity
  - DGMRL > FAILOVER TO CHICAGO
    - No connectivity with primary
    - New primary becomes the source of truth

Program Agenda with Highlight

1. Microservices Architecture

2. Overview of Oracle Active Data Guard / FSFO

3. **Overview of new Grid Infrastructure Bundled Agent (XAG)**

4. Configuration for GoldenGate with RAC and Data Guard

5. Summary

Oracle Grid Infrastructure Bundled Agent (XAG)

- Clusterware specific to managing GoldenGate resources
  - XAG allows you to register a GoldenGate instance with CRS to provide HA
- It solves the key process related issue of ensuring availability of the GoldenGate instance in the face of failures.
    - Loss of instance (RAC node failover)
    - Loss of primary database (Data Guard Failover integration)
- Use AGCTL for registering and starting/stopping resources

Oracle Grid Infrastructure Bundled Agent (XAG)

- Support coming in GoldenGate 12.3.0.1.2 (not yet available)

- New version of XAG for GoldenGate Microservices will be made available at*

  http://www.oracle.com/technetwork/database/database-technologies/clusterware/downloads/index.html

- Install outside of Grid Infrastructure ORACLE_HOME and make sure OS user PATH finds this XAG before the GI installed version

* The current version of XAG (v8) does not support GoldenGate Microservices Architecture

Oracle Grid Infrastructure Bundled Agent (XAG)
High Level Configuration Steps

- Create OGG deployment using oggca.sh (similar to DBCA)

- Choose to 'Integrated with XAG' (see next slide)

- Register Service Manager and deployment with XAG
  - Creates the CRS resources and all dependencies with file system, role based service

- XAG queries the GoldenGate Service Manager for health of the deployment

- XAG interacts directly with Service Manager, no longer running GGSCI and parsing the output from commands
  - More integrated, simpler and robust

# Oracle Grid Infrastructure Bundled Agent (XAG)
Service Manager Creation
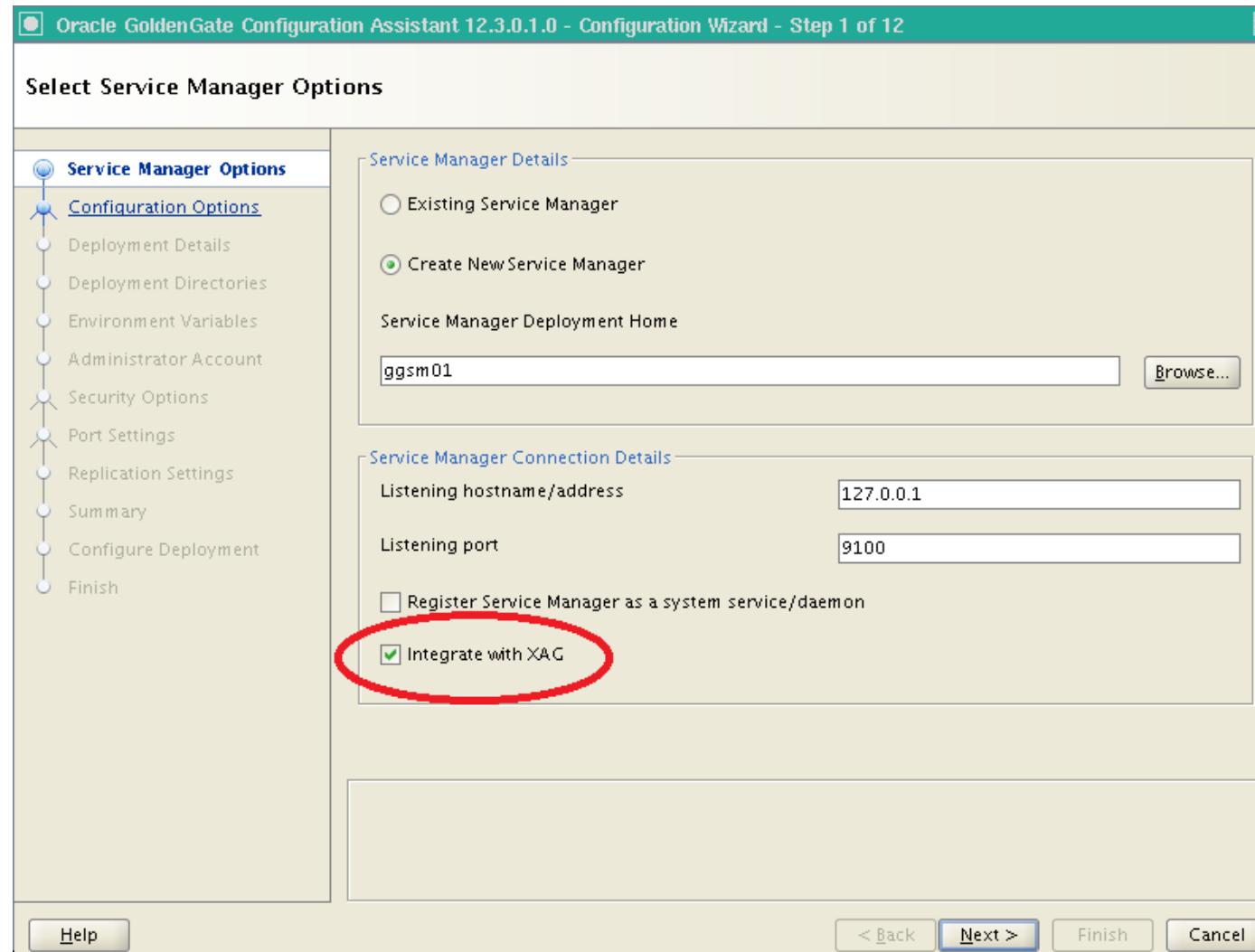
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Sample Deployment

Observer

Primary Database

Standby Database

Integrated Extract

Logmining Server

Redo Transport
(SYNC or ASYNC)

Trail and other OGG Files
In DBFS

Bidirectional
GoldenGate Replication

Redo Transport

OCI Connection

File I/O

Warehouse

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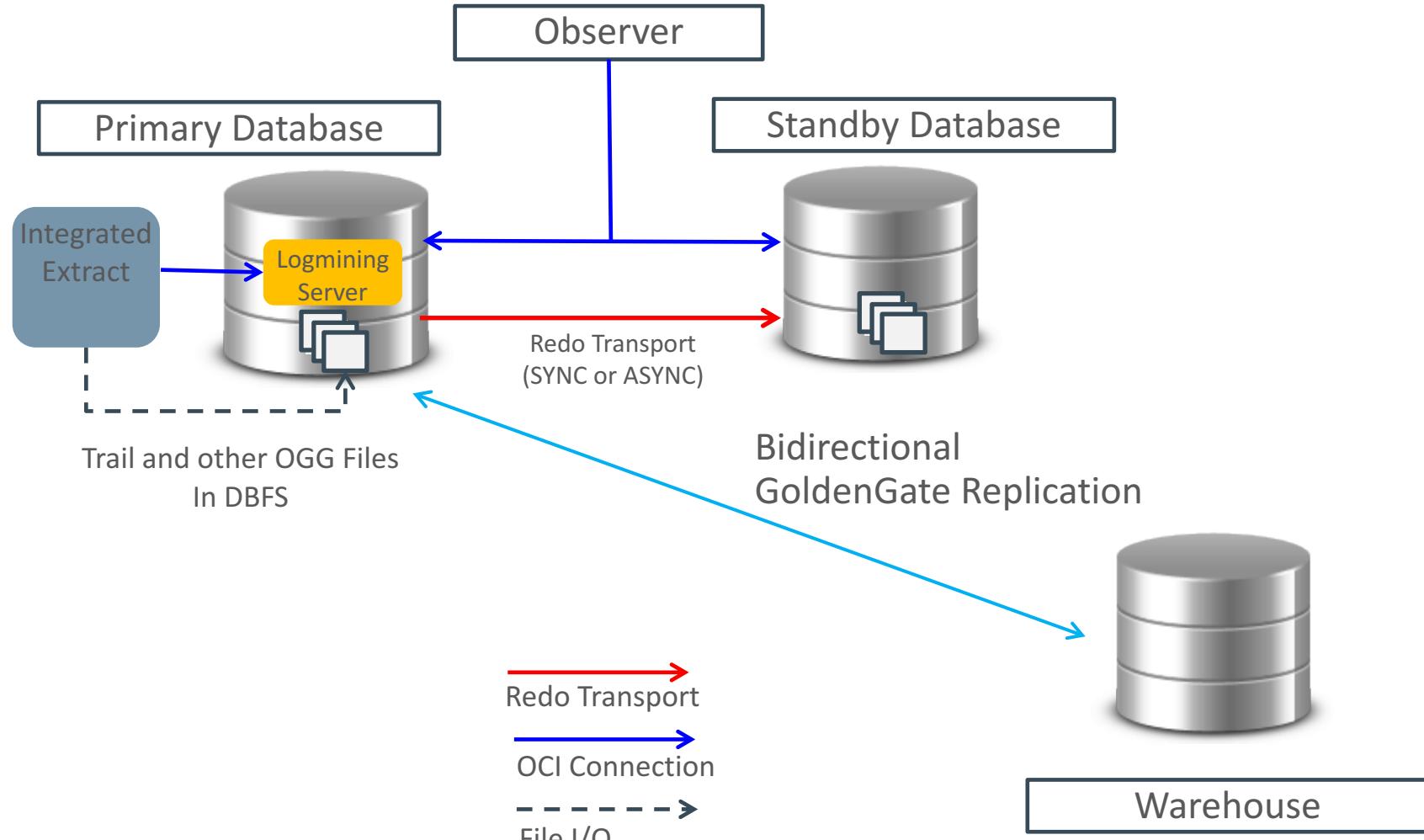
Sample Deployment – Post Role Transition

Observer

(OLD) Primary Database

(NEW) Primary Database

LogMining Server

LogMining Server

Integrated Extract

Trail/Checkpoint/BR Files In DBFS

Bidirectional GoldenGate Replication

Warehouse

Redo Transport

OCI Connection

File I/O
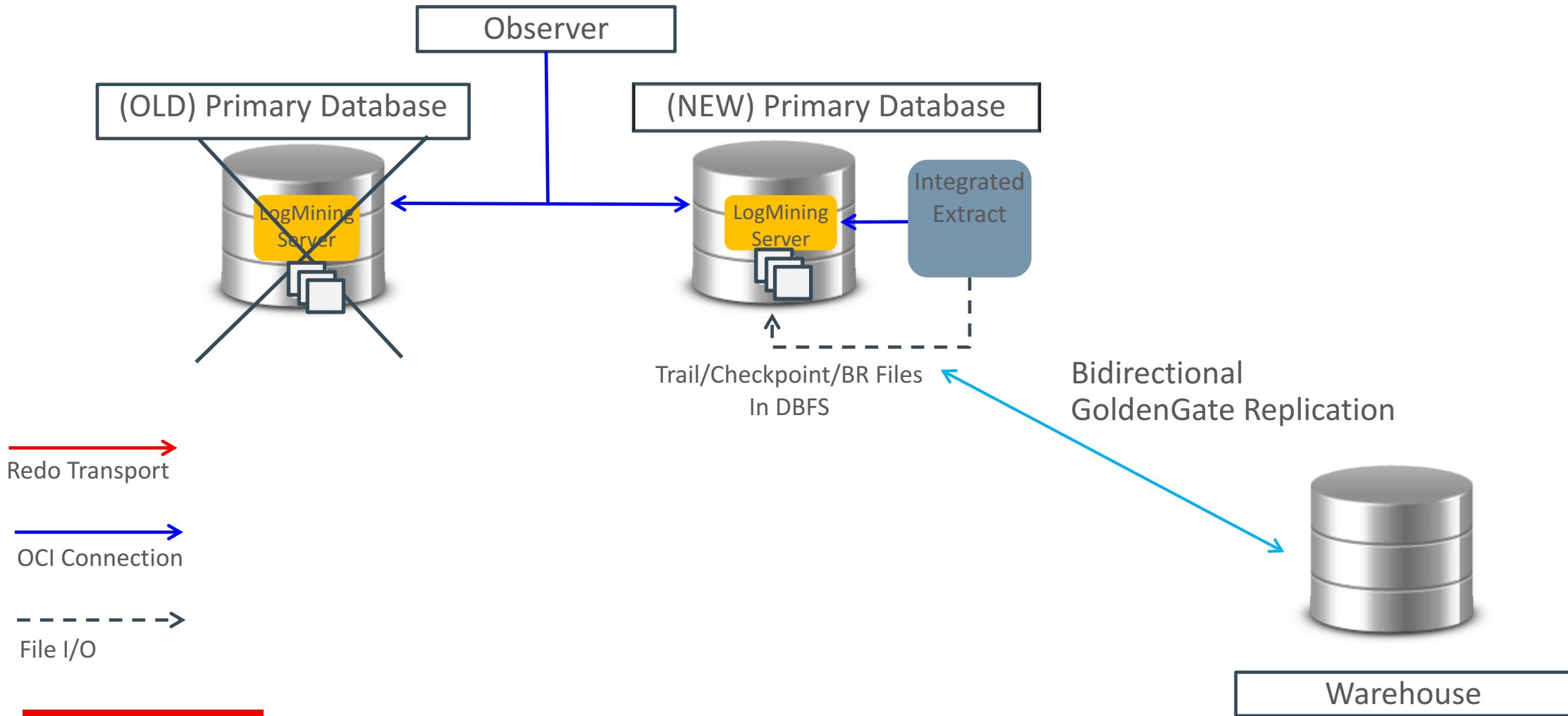
Database Connectivity

- Make all OGG components connect to database using Role-Based Services
  - Declarative way to specify a service should be published only when the database has a specific role
  - Publish a service only when database has the PRIMARY role

- Create role-based service (12c syntax):

```
srvctl add service -db GGS2PRMY -service oggserv -role PRIMARY
      -preferred GGS21 -available GGS22

srvctl add service -db GGS2STBY -service oggserv -role PRIMARY
      -available GGS21
```

GoldenGate Configuration
File System & Hostname Requirements

- Consistency of GoldenGate data and metadata ensured with DBFS

    - Store trail and checkpoint data on DBFS to guarantee consistency on role transitions

    - DBFS offers integrated hands off automatic file system mounting, replicated through Data Guard

- Provides flexible routing of trail data post role transition

    - Use a Virtual Hostname to identify the TARGET host machine

        - Transferred between primary and standby on role transition

    - Use the virtual hostname when creating a Distribution Server path

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Create DBFS CRS Resource

- DBFS is mounted on RAC node that will run GoldenGate

- Create CRS action script (MOS note 1054431.1)
  - Must contain START, STOP, CHECK functions

- Create CRS resource:

```
crsctl add resource dbfs_mount -type cluster_resource \
  -attr "ACTION_SCRIPT=$ACTION_SCRIPT, CHECK_INTERVAL=30,RESTART_ATTEMPTS=10, \
    START_DEPENDENCIES='hard(ora.$DBNAME.db)pullup(ora.$DBNAME.db)',\
    STOP_DEPENDENCIES='hard(ora.$DBNAME.db)', SCRIPT_TIMEOUT=300"
```

- DBFS service will be managed by XAG

GoldenGate Configuration
Service Manager Creation
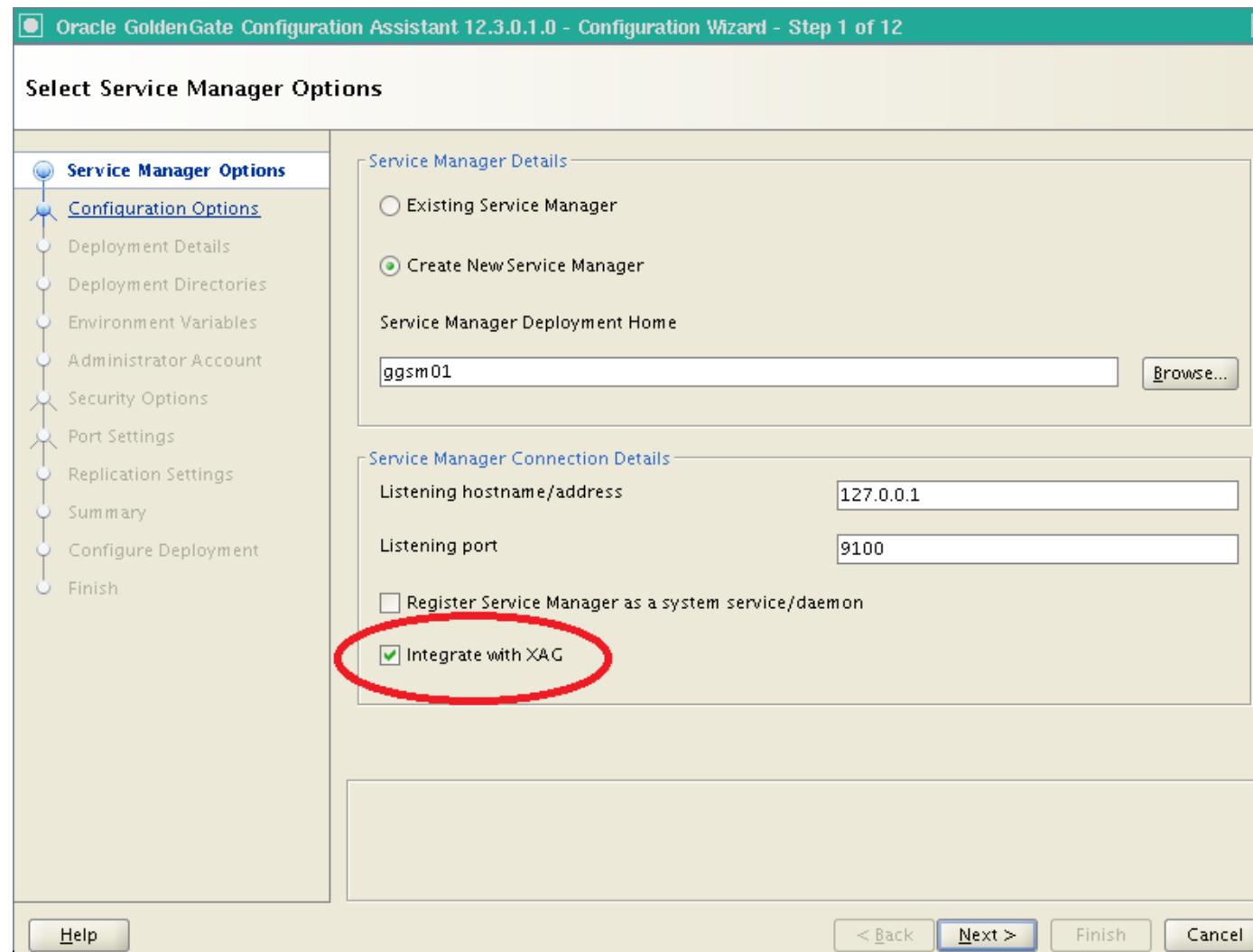
GoldenGate Configuration
Deployment Auto Start

- Each deployment is automatically enabled to auto start when Service Manager starts

- State of deployment is persistent across Service Manager restarts
  - If deployment was running when Service Manager was stopped, the deployment will be started automatically when Service Manager starts.

- Must enable GoldenGate Extract/Replicat auto start
  - Extract, Distribution Path and Replicat auto start is enabled with the Administration Server user interface

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GoldenGate Configuration
GoldenGate Process Auto Start and Auto Restart

GoldenGate Configuration
GoldenGate Process Auto Restart

- Auto restart tasks can also be created using `adminclient`:

```
OGG (not connected) 1> HELP SHOWSYNTAX *AUTORESTART*

Admin Client Command Summary:
  ADD AUTORESTART    - Create an autorestart rule.
  Syntax:
  | ADD AUTORESTART <rule-name> ( EXTRACT | REPLICAT | ER ) <group-name-wildcard>
  |                             [ RETRIES       <retries-number> ]
  |                             [ WAITSECONDS  <wait-number> ]
  |                             [ RESETSECONDS <reset-number> ]
  DELETE AUTORESTART - Remove an autorestart rule.
  Syntax:
  | DELETE AUTORESTART <rule-name>
  INFO AUTORESTART   - Returns information about autorestart rules.
  Syntax:
  | INFO AUTORESTART <rule-name-wildcard>
```

Register GoldenGate with Bundled Agent (XAG)

- ## Register with XAG at the primary (as root)

  agctl add goldengate GGPRMY --gg_home /u01/oracle/goldengate/gg123_MA --service_manager
  --config_home /mnt/dbfs/goldengate/deployments/ggsm01/etc/conf --port 9100
  --adminuser admin --user oracle --group oinstall --vipname xag.GG_MA1-vip.vip
  --filesystems dbfs_mount --db_services ora.ggdg.oggserv.svc --dataguard_autostart yes

- ## Register with XAG at the standby (as root)

  agctl add goldengate GGSTBY --gg_home /u01/oracle/goldengate/gg123_MA --service_manager
  --config_home /mnt/dbfs/goldengate/deployments/ggsm01/etc/conf --port 9100
  --adminuser admin --user oracle --group oinstall --vipname xag.GG_MA1-vip.vip
  --filesystems dbfs_mount --db_services ora.ggdg.oggserv.svc --dataguard_autostart yes
  --nodes stdby1

- ## Start Extract using Agent Control

  – agctl start goldengate ggprmy

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GoldenGate with Bundled Agent (XAG)
Example Commands

- Check GoldenGate status

  agctl status goldengate ggprmy

- Start GoldenGate

  agctl start goldengate ggprmy --node GGsourceNode1

- Stop GoldenGate

  agctl stop goldengate ggprmy

- Replocate GoldenGate to another RAC node

  agctl relocate goldengate ggprmy --node GGsourceNode2

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Data Guard – Bounded Data Loss (ASYNC)

- Data Guard in MaxPerformance(ASYNC) mode permits data loss on the standby

- Amount of data loss with FSFO controlled by FastStartFailoverLagLimit (default is 30seconds)

- Extract must only mine from redo already applied to Standby
  - Prevents data being replicated to a target database and then missing from the source after a data loss failover

- Add Integrated Extract parameter **`TRANLOGOPTIONS HANDLEDLFAILOVER`**
  - If FSFO is not enabled, specify **`TRANLOGOPTIONS FAILOVERTARGETDESTID n`**
  - Identifies which log archive destination of standby Extract must remain behind

Data Guard – Bounded Data Loss (ASYNC)
**Effects of TRANLOGOPTIONS HANDLEDLFAILOVER**

- After DG failover if new standby (old primary) cannot be queried for redo apply status, Extract abends with:

  `ERROR OGG-02077 Extract encountered a read error in the asynchronous reader thread and is abending: Query to retrieve applied SCN of the target standby database failed.`

- Can configure timeout to allow standby reinstatement after role transition
  - TRANLOGOPTIONS DLFAILOVER_TIMEOUT 300
  - If standby not available by the end of the timeout, Extract will abend.

- NOTE: During timeout period data is being replicated that has not yet been applied to standby, so there is temporary data divergence.

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GoldenGate with RAC Node Failure
## Performance Metrics Server
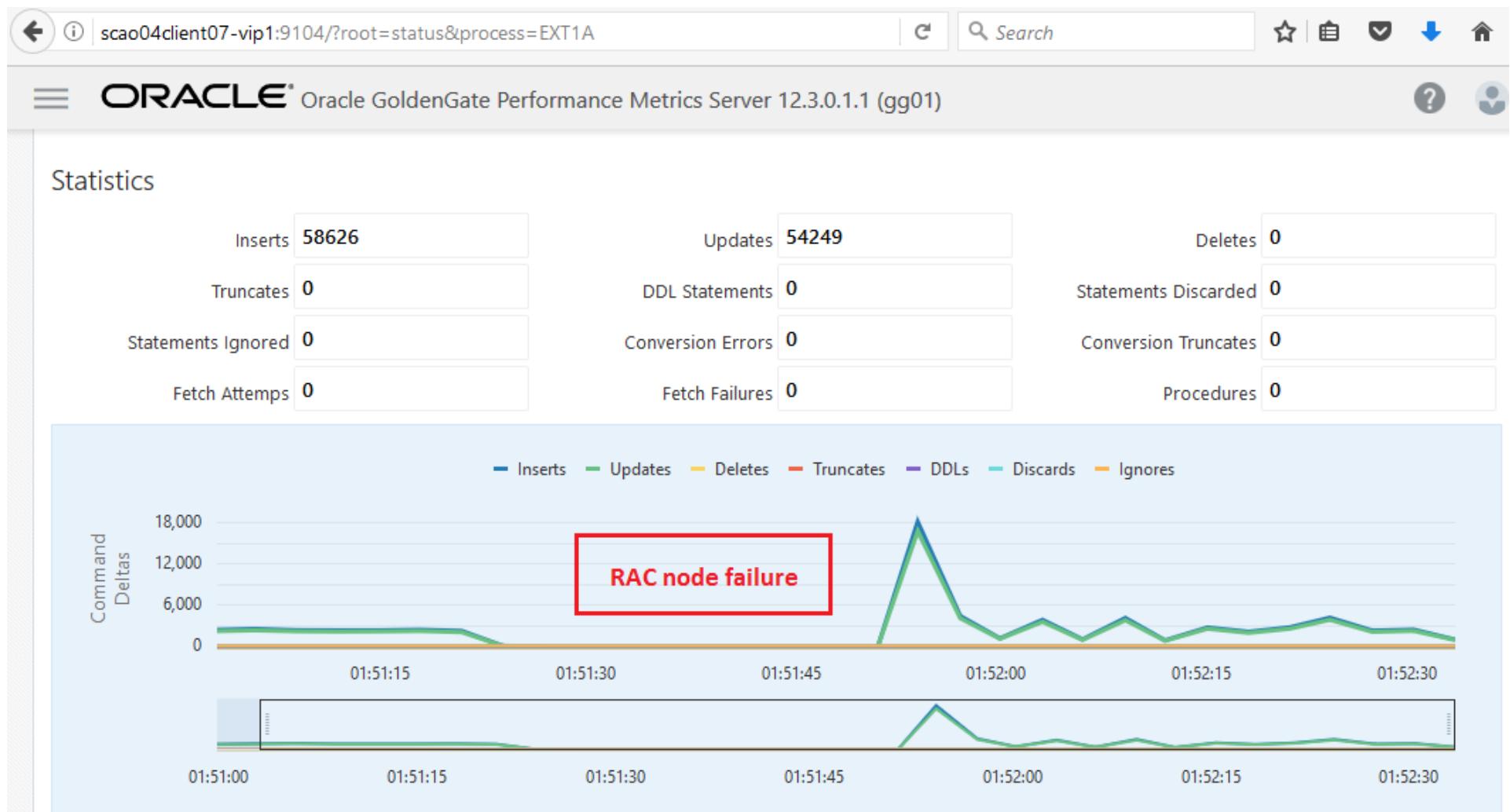
GoldenGate with Data Guard Role Transition
Target Receiver Server
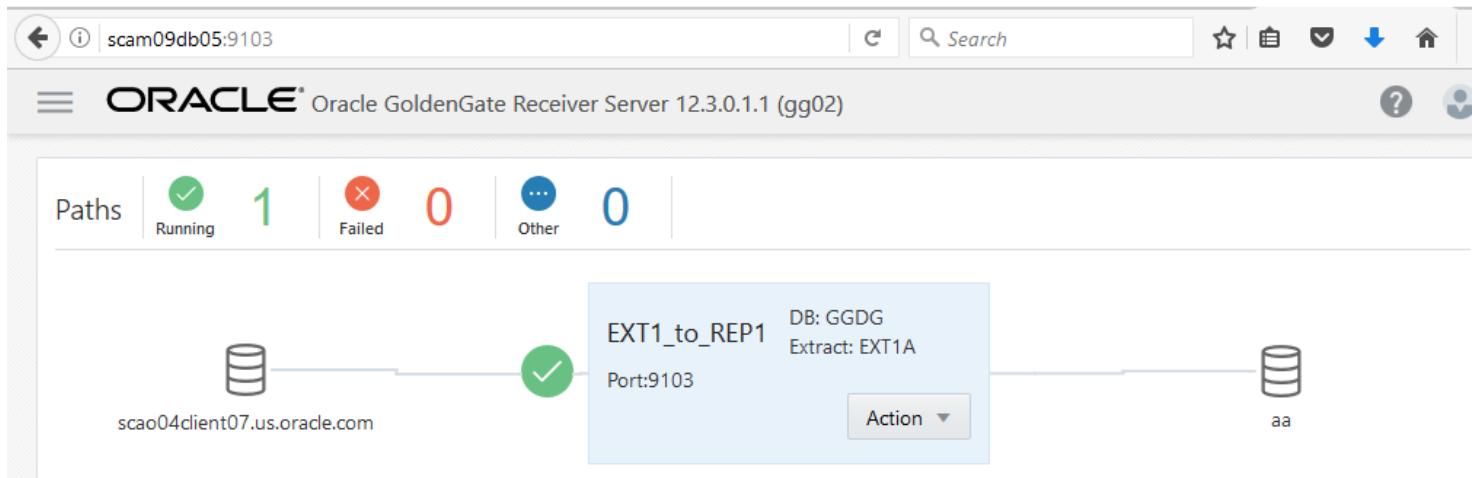
After a Data Guard role transition the target database Receiver Server automatically refreshes with new source host .
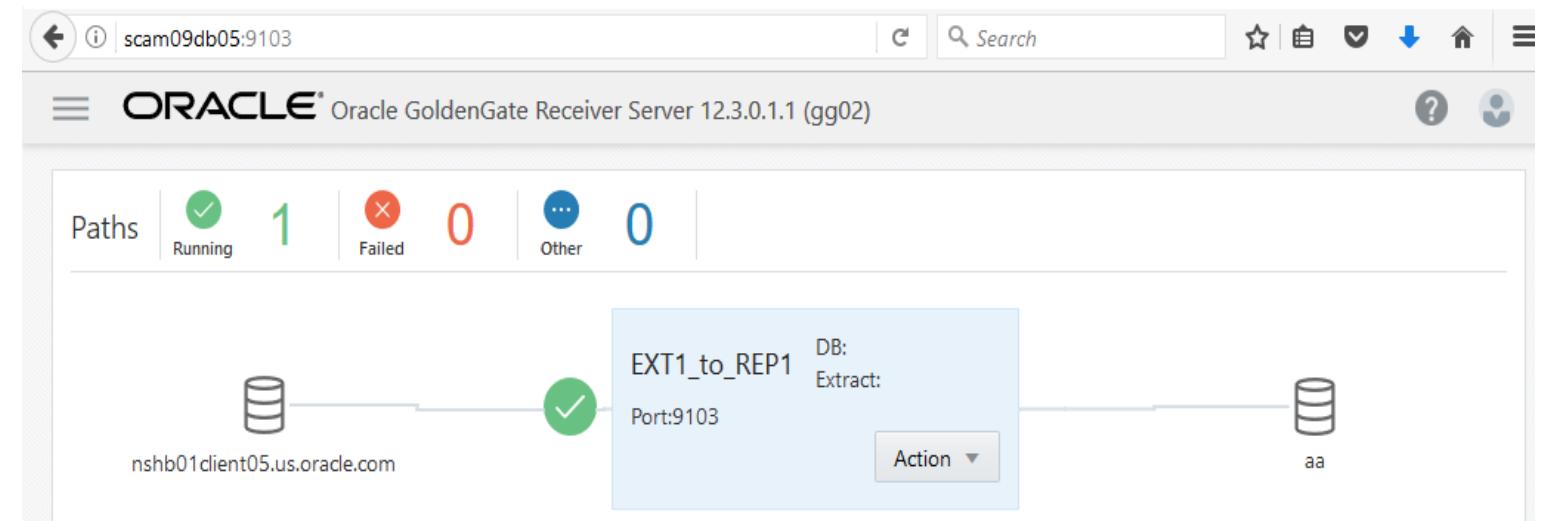
Configuration Recommendation Summary

- Bundled Agent installed outside of Grid Infrastructure install directory

- GoldenGate 12.3.0.1.2 and above

- GoldenGate Integrated Extract and Integrated Replicat

- Role-based services for GoldenGate database connectivity

- DBFS for GoldenGate shared file system

- Integrated Extract parameters
  - TRANLOGOPTIONS HANDLEDLFAILOVER
  - TRANLOGOPTIONS FAILOVERTARGETDESTID n
  - TRANLOGOPTIONS DLFAILOVER_TIMEOUT 300