Oracle GoldenGate (OGG)
Overview

Joachim Jaensch
Principal Sales Consultant
Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle’s products remains at the sole discretion of Oracle.
Agenda

1. Data Replication with Oracle
2. Architecture and supported Platforms
3. Configuration and Command Line Interface
4. New Features in 11gR2 & 12c
5. Integrated Capture
6. Integrated Apply
7. Coordinated Apply
8. Healthcheck
Data Replication with Oracle

Review
Data Replication with Oracle (1)

- **Oracle 8.1** – **Materialized Views** replace Snapshots, CDC (Trigger)
- **Oracle 9.2** – **Oracle Streams** (Replication, Message Queuing, CDC)
- **Oracle 10.2** – Autotuning Streams Pool, Buffered Messaging, EM Support Simplified APIs, Declarative Transformation
- **Oracle 11.1** – Combined Capture & Apply Streams Advisor & Topology Synchronous Capture Transparent Data Encryption Support Split and Merge of a Streams Destination LCR Tracking
- **Oracle 11.2** – Compressed Tables Capture & Apply SecureFile LOBs, Statement DML Handlers, Keep Column Declarative Rule-Based Transformation, Automatic Split and Merge of a Streams Destination

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"Oracle Streams will continue to be supported, but will not be actively enhanced."

**Oracle 12.1** – „Oracle Streams is deprecated …“
Data Replication with Oracle (2)

2009
OGG 10.4 – Übernahme von GoldenGate durch Oracle

2010
OGG 11.1 – DDL Support Enhanced, Embedded XML in UDTs
Extract API for Oracle ASM, TDE & TSE, New Monitor

2012
OGG 11.2 – Integrated Capture, Enhanced Conflict Detection & Resolution
Globalization, Security & Performance, Extensibility,
Manageability & Monitoring, Expanded Heterogeneity


2013
OGG 12.1 – Integrated Replicat, Coordinated Replicat, Oracle Multitenant Database Support,
E-Business Suite Platform Migrations

„Oracle GoldenGate 12c Release 1 New Features Overview“ White Paper, October 2013
What Replication means

Database 1  Database 2
Primary (Source) Database  Secondary (Target) Database

Source Database changes should be also made at the Target Database.

Initial Load

<table>
<thead>
<tr>
<th>SCOTT.EMP</th>
<th>SCOTT.EMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCOTT.DEPT</td>
<td>SCOTT.DEPT</td>
</tr>
</tbody>
</table>

(DML) Replication

<table>
<thead>
<tr>
<th>INSERT ...</th>
<th>INSERT ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPDATE ...</td>
<td>UPDATE ...</td>
</tr>
<tr>
<td>DELETE ...</td>
<td>DELETE ...</td>
</tr>
</tbody>
</table>

(DDL) Replication (optional)

<table>
<thead>
<tr>
<th>CREATE TABLE ...</th>
<th>CREATE TABLE ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALTER TABLE ...</td>
<td>ALTER TABLE ...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Replication Components

1. **Track Changes** at Source Database

2. **Propagate Changes** to Target Database

3. **Run Changes** at Target Database

- **Trigger based**
- **Redolog based**
- **Journal based**

- **Proprietary DB, OS** or **TCP/IP**

- **Depends from Target DB** or **Relational DB: Run SQL**

/* Diagram */

Primary (Source) Database

Secondary (Target) Database
Oracle Replication Components Terminology

1. Track Changes
   - Capture
   - Extract

2. Propagate Changes
   - Propagation
   - Extract (Remote File)
   - Datapump

3. Run Changes
   - Apply
   - Replicat
   - Delivery

Primary (Source) Database | Secondary (Target) Database
Replication Methods

Synchronous Replication

• Changes on Source Site occur immediately at all Target Sites
• Very stable Environment required
• Transactions pending (cannot completed) if Network down
• In most Cases not acceptable (Performance degradation!)

Asynchronous Replication

• Deferred Transactions (DML)
• Propagated in regular Intervalls (periodically synchronized)
  → Snapshot Replication (No permanent Connection)
• Continuous Propagation (nearly instantaneous synchronized)
  → Real-Time Replication (Permanent Connection!)
Oracle GoldenGate

Architecture
Capture: committed transactions are captured (and can be filtered) as they occur by reading redo logs.

Trail: stages and queues data for routing.

Pump: distributes data for routing to target(s).

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

Delivery: applies data with transaction integrity, transforming the data as required.

GoldenGate: Logical Replication

Source
Oracle & Non-Oracle Database(s)

Capture
Trail Files

Trail: stages and queues data for routing.

Pump
Trail Files

LAN / WAN / Internet Over TCP/IP

Uni or Bi-directional

Delivery
Trail Files

Target
Oracle & Non-Oracle Database(s)
Real-Time Data Integration & Transactional Replication

**PERFORMANCE:**
Low-impact Real-Time Data Integration and Replication

**FLEXIBLE:**
Open, Modular Architecture Heterogeneous including Cloud and Big Data

**RELIABLE:**
Maintains, Transactional Integrity Resilient against Failures
Oracle GoldenGate Flexible Deployment Models

Uni-Directional

Bi-Directional

Peer-to-Peer

Broadcast

Consolidation

Data Distribution

OEP
BAM
BPM

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Oracle GoldenGate

Heterogeneous Support
## OGG 12c – Supported Platforms

<table>
<thead>
<tr>
<th>Databases</th>
<th>OS and Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oracle GoldenGate Capture (Extract):</strong></td>
<td>Linux (Oracle, Red-Hat)</td>
</tr>
<tr>
<td>▪ Oracle</td>
<td>Sun Solaris</td>
</tr>
<tr>
<td>▪ IBM DB2 for v 11.1 on z/OS 2.1</td>
<td>HP NonStop</td>
</tr>
<tr>
<td>▪ IBM DB2 System i</td>
<td>HP-UX</td>
</tr>
<tr>
<td>▪ Microsoft SQL Server for 2012 &amp; 2014</td>
<td>HP OpenVMS</td>
</tr>
<tr>
<td>▪ Sybase ASE, 15.7</td>
<td>IBM AIX</td>
</tr>
<tr>
<td>▪ Teradata 14.10 and 15.0</td>
<td>IBM System z / System i</td>
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<td>▪ Enscribe</td>
<td>zLinux</td>
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<tr>
<td>▪ SQL/MP</td>
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<tr>
<td>▪ SQL/MX</td>
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<tr>
<td>▪ MySQL 5.6 and Community Edition</td>
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<tr>
<td>▪ MySQL NDB Cluster 7.1, 7.2 and 7.3</td>
<td></td>
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<tr>
<td>▪ Informix IDS SEE 11.7 and 12.1</td>
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<tr>
<td>▪ JMS message queues</td>
<td></td>
</tr>
<tr>
<td><strong>Oracle GoldenGate Apply (Replicat, Delivery):</strong></td>
<td></td>
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<tr>
<td>▪ All listed above, plus:</td>
<td></td>
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<tr>
<td>▪ TimesTen, Netezza &amp; Greenplum</td>
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<tr>
<td>▪ PostgreSQL</td>
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<tr>
<td>▪ ETL product</td>
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</tbody>
</table>

Stand: Version 12.1.2.1
# OGG 12c – Supported Databases

<table>
<thead>
<tr>
<th>Databases</th>
<th>Oracle GoldenGate Capture:</th>
<th>Oracle GoldenGate Integrated Capture &amp; Delivery:</th>
<th>Oracle GoldenGate Delivery:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Oracle 12c</td>
<td>New</td>
<td>Integrated Capture</td>
</tr>
<tr>
<td></td>
<td>IBM DB2 LUW 10.1 &amp; 10.5</td>
<td>New</td>
<td>Integrated Dynamic Delivery</td>
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<tr>
<td></td>
<td>IBM DB2 for z/OS</td>
<td>New</td>
<td>Coordinated Deliver</td>
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<td>IBM DB2 for i/Series</td>
<td>New</td>
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<td>Microsoft SQL Server 2008, 2012</td>
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<td>Sybase ASE 15.7</td>
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<td>Teradata</td>
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</table>
Oracle GoldenGate
Configuration & Command Line Interface
OGG – Process Configuration

- OGG Processes Configuration by Parameters
  - 1 Parameter-File per Process

- OGG processes:
  - Manager,
  - Capture (Extract, Primary Capture),
  - Data Pump (Secondary Capture),
  - Apply (Replicat, Delivery)

- Parameter-Files located in the ./dirprm Subdirectory
  - File-Extension: prm

- Special Parameter-File: GLOBAL
  - Located in the OGG_Home Directory

Oracle® GoldenGate Reference for Oracle GoldenGate for Windows and UNIX 12c (12.1.2) E29392-08 May 2015
http://docs.oracle.com/goldengate/1212/gg-winux/GWURF.pdf
OGG – Parameter-Files – Overview

Capture processes write to **remote Trails**

No **Datapump** processes
OGG – MANAGER Parameter-File (Primary DB: ORAP)

PORT 7816

PURGEOLDEXTRACTS \dirdat\*, USECHECKPOINTS, MINKEEPHOURS 1, FREQUENCYMINUTES 30

LAGCRITICALMINUTES 5
LAGREPORTMINUTES 60
LAGINFOMINUTES 0

Further parameters exist (e.g. for automatic start / restart of OGG processes)

See also „Oracle GoldenGate Reference for Oracle GoldenGate for Windows and UNIX 12c (12.1.2)“
OGG – EXTRACT Parameter-File (Primary DB: ORAP)

EXTRACT ex2orap

-- Database Connection Information
USERID OGGADMIN@orap, PASSWORD OGGADMIN

-- Send data to remote host
RMHOST localhost, MGRPORT 7817

-- Send data to remote trail named my
RMTTRAIL d:\ogg1212c_tar\dirdat\re

-- Source table (Oracle) for Replication
TABLE JJAENSC.GG_HEARTBEAT_TABLE;

Process Type / Name
User ID / Password
Remote Host
Remote Trail
Table Name

User ID / Password

Prevent Looping
Get Before Images

Unidirectional

Bi-Directional
OGG – REPLICAT Parameter-File (Secondary DB: ORAS)

REPLICAT re2oras
-- Database Connection Information
USERID ggadmin, PASSWORD GGADMIN

-- Throw error records to discard file
DISCARDFILE .\dirrpt\re3oras.dsc, purge

-- Map Source Table (Oracle) to Target Table (Oracle)
MAP JJAENSC.GG_HEARTBEAT_TABLE, TARGET JJAENSC.GG_HEARTBEAT_TABLE;

Unidirectional

Bi-Directional

C. D. & R.

REPLICAT re2oras
-- Database Connection Information
USERID GGADMIN@oras, PASSWORD GGADMIN

-- Throw error records to discard file
DISCARDFILE .\dirrpt\re2oras.dsc, purge

-- Map Source Table to Target Table with Conflict Detection and Resolution
MAP JJAENSC.GG_HEARTBEAT_TABLE, TARGET JJAENSC.GG_HEARTBEAT_TABLE,
COMPARECOLS (ON UPDATE ALL),
RESOLVECONFLICT (UPDATEROWEXISTS, (DEFAULT, USEMAX(CURRENT_TIME)));

Process Type / Name
UserID / Password
Discard File
Mapping Table Name
OGG – MyOracleSupport Note: 1321696.1

Oracle GoldenGate Best Practice - sample parameter files (Doc ID 1321696.1)

Modified: Nov 13, 2012  Type: WHITE PAPER  Status: PUBLISHED  Priority: 3

Oracle GoldenGate Best Practice
May 2011

Oracle GoldenGate Best Practice
May 2011

Oracle GoldenGate sample parameter files

http://support.oracle.com
OGG – Command Line Interface

• GGSCI – GoldenGate Software Command Interface
  • Configuring, Administration & Monitoring GoldenGate Processes
OGG – Commands & Command-Files

- OGG Environment Configuration by GoldenGate Commands
  - Processes (Extract, Data Pump, Replicat)
  - Trail-Files (local, remote)
  - etc.

- OBEY-Files
  - Flat-Files with Commands (usually more than one)
  - Located in the OGG_HOME Directory
  - File-Extension: oby
  - Execution: obey <file_name>.oby
OGG – OBEY-Files: EXTRACT (ORAP) and REPLICAT (ORAS)

**Setup ORAP.oby**

-- Database login to primary database
DBLOGIN USERID ggadmin@orap PASSWORD GGADMIN

-- Add table level supplemental log group for heartbeat table (PK)
ADD TRANDATA jjaensc.GG_HEARTBEAT_TABLE

-- Verify supplemental log group was created
INFO TRANDATA jjaensc.gg_heartbeat_table

-- Add log-based change extract process
ADD EXTRACT ex2orap, TRANLOG, BEGIN now

-- Add remote trail to extract process
ADD RMTTRAIL d:\ogg_1212_tar\dirdat\rt, EXTRACT ex2orap

Unidirectional only:

**ORAP:** Extract process

**ORAS:** Replicat process

**Setup ORAS.oby**

-- Database Login to secondary database
DBLOGIN USERID GGADMIN@oras, PASSWORD GGADMIN

-- Add a specific checkpoint table
ADD CHECKPOINTTABLE GGADMIN.GG_CHKPT1

-- Add change replicat process
ADD REPLICAT re2oras, EXTTRAIL d:\ogg1212_tar\dirdat\rt, CHECKPOINTTABLE GGADMIN.GG_CHKPT1
Oracle GoldenGate
Additional OGG Software
Further Oracle GoldenGate Software Components

1. **OEM Management Pack for Oracle GoldenGate** (Additional License)
   - GoldenGate Director
   - GoldenGate Monitor
   - Plug-In for Oracle Enterprise Manager

2. **Oracle GoldenGate Veridata** (Additional License)

3. **Oracle GoldenGate Application Adapters for Java and Flat File**
   - e.g. Oracle GoldenGate Adapter for Oracle Coherence

4. **Oracle GoldenGate for Big Data** (Additional License)
Oracle GoldenGate Monitor 12.1.3 - Architecture
OGG Monitor – New Action Folders

Data and Alerts View ➔ Host

New action folder (Always visible)

GoldenGate Processes

- Configuring
- Controlling
- Viewing

OGG Monitor – New Action Folders

Data and Alerts View ➔ Host
OGG Monitor – New Process Buttons

Data and Alerts View → Capture: EXCDB12P

Start – Stop – Kill
(Visible in process view only)
Oracle GoldenGate OEM Plug-In

Same functionality as the GoldenGate Monitor
OGG – Veridata Architecture

Compare Source with Target

Source Database

Target Database

Veridata Agent

Veridata Web Server

Command Line (Vericom)

Veridata Repository

JDBC

HTTP

Ensuring Data Consistency with Oracle GoldenGate Veridata, White Paper, July 2013
Oracle GoldenGate

New features in 11gR2 and 12cR1
OGG Version 11gR2 – New Features Summary

- Integrated Capture
- Enhanced Conflict Detection & Resolution
- Globalization
- Security & Performance
- Extensibility
- Manageability & Monitoring
- Expanded Heterogeneity
DOJO No. 6 – Oracle GoldenGate 11gR2

http://www.oracle.com/webfolder/technetwork/de/community/dojo/index.html
Oracle GoldenGate
Conflict Detection and Resolution
**Active-Active with Conflict Avoidance - Logical Separation**

**Key benefits:**

- Both environments share transaction load
- Logically separated by connection (Application, Region, etc.)
- No special configuration required
Active-Active with Conflict Avoidance - Logically Routed

Key benefits:

• Both environments share transaction load
• Logically routed via Router/Application server
• No special configuration required
Active-Active With Data Conflicts

- Transactions originated from anywhere and balanced across systems
- Switchovers, migrations, new access paths have no transaction limitations
- Must Detect and possibly resolve conflicts
Active-Active Considerations

Loop Detection
• Detecting if GoldenGate or the Application performed the operation

Conflict Detection
• Detecting if an update occurred on both the source & target before the changes were applied by GoldenGate
• For accurate detection of conflicts, all records must have a unique, not-null identifier

Conflict Resolution
• Determining business rules on how to handle collisions
• Timestamp and Site priority are most common

Database Generated Values
• The range of values must be different on each system, with no chance of overlap
Overview:

• Robust framework to code Conflict Detection rules for all DML.

• Options to use pre-built methods to resolve conflicts (Default methods)
  • OVERWRITE, IGNORE, DISCARD, USEMAX and USEMIN

• Supported datatypes
  • NUMERIC, DATE, TIMESTAMP, CHAR/NCHAR, VARCHAR/ NVARCHAR
Enhanced Conflict Detection & Resolution

Example

Syntax for 11gR1 CDR

MAP source.Order, TARGET target.Order,
    REPERROR (21000, DISCARD),

    SQLEXEC (ID lookup, ON UPDATE,
        QUERY "select count(*) conflict from Order where ID = ? and &
        Modified_TS > ?",
        PARAMS (p1 = ID, p2 = Modified_TS), BEFOREFILTER, ERROR
        REPORT, TRACE ALL),

    FILTER (lookup.conflict = 0, ON UPDATE, RAISEERROR 21000);

7 Lines of Code & SQL

Syntax for 12c CDR

MAP source.Order, TARGET target.Order,
    RESOLVECONFLICT (UPDATEROWEXISTS,
        (DEFAULT, USEMAX (Modified_TS)) ;

3 Lines of Code, Automatically Resolved
Conflict Resolution Options

- **Insert**:
  - INSERTROWEXISTS
    - Overwrite
    - Ignore
    - Discard
    - USEMIN,USEMAX

- **Update**
  - UPDATEROWMISSING
    - Overwrite
    - Ignore
    - Discard
  - UPDATEROWEXISTS
    - Overwrite
    - Ignore
    - Discard
    - USEMIN,USEMAX
    - USEDELTA

- **Delete**
  - DELETESROWMISSING
    - Ignore
    - Discard
  - DELETESROWEXISTS
    - Overwrite
    - Ignore
    - Discard
OGG Version 12cR1 – New Features Summary

- Optimized for Oracle Database 12c
- Integrated Delivery for the Oracle Database
- Coordinated Delivery for All Databases
- Improved Ease of Use
- More Secure & Expanded Heterogeneity
- Enhanced High Availability
- Expanded Oracle Application and Technology Support
OGG Version 12cR1 – New Features

New/Enhanced Functionality
- Integrated Replicat
- Coordinated Replicat
- Integrated Extract

New Database Support
- Oracle Database 12c
  - CDB / PDB
  - Large VARCHAR2
- MySQL 5.6
- Sybase 15.7
- DB2 LUW 10.1
- MySQL NDB Cluster 7.1 and 7.2
- Informix IDS SEE 11.7 and 12.1

Security
- Simplified Database Permissions
- Credential Store
- Wallet

Easy of Use
- New Database Integration Point
- Automatic Discard
- Improved SHOWSYNTAX
- Improved Initial Load
- Schema Wildcards
Oracle GoldenGate
Preparation for Cloud
Move Data **To**, and **From** Public Cloud-based Systems

**Restricted**
- Restricted network ports established between cloud and on-premises

**Secure**
- SOCKS 5 Compliance to enable secure communication

**Proxies**
- Support HTTP Proxy Tunnel to enable communication over http://

Supports enterprises that utilize both cloud-based and on-premises system to host their database systems
Oracle GoldenGate for On-Premises - Cloud Integration

**Unidirectional**
Query Offloading
Zero-Downtime Migration
Data Integration Cloud or On-Premise

**Bi-Directional**
Active-Active for Multi-Master/HA
Cloud or On-Premises

**Big Data Delivery**
Real/Time and Batch Delivery
Structured Data to Data Reservoir

**Data Distribution**
via Messaging

**Cloud Apps Integration**
## Many Differentiated Cloud Services Available Now

### FY15
- Java Cloud
- Messaging Cloud
- Developer Cloud
- Documents Cloud
- Business Intelligence Cloud
- Integration Cloud
- Process Cloud
- Mobile Cloud
- MW Upper Stack Certification on JCS
- Storage Cloud – Object and Block Storage

### FY16

#### H1
- Java SE Cloud
- SOA Cloud
- Internet of Things Cloud
- Application Builder Cloud
- Big Data Preparation Cloud
- Compute Cloud - Dedicated Compute
- Storage Cloud – Archive Storage
- Storage Cloud – Cloud Data Transfer
- Cloud Service for Node.JS
- Sites Cloud
- Cloud Services on Exalogic

#### H2
- IDM Cloud
- **Golden Gate Cloud**
- Coherence Cloud
- Many more...

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Many More Coming in FY16…
Oracle GoldenGate
Multitenant Database 12c
Neu in 12c: Multitenant Databases

Oracle 12c Container Database

Non-Consolidated

Oracle Database

Multitenant

Oracle 12c Container Database

PDB1
PDB2
PDB3

Oracle Databases
Oracle Multitenant Databases 12c & OGG 12c

Common User-ID: C##....

MOS Note 1634589.1 : FAQ - Oracle GoldenGate on Oracle 12c cdb/pdb

PDB User-IDs
Multitenant Container Database Support

- **Multitenant Container Database (CDB)**
  - Idea is to use common pool of resources to handle multiple databases (known as containers)
    - SGA, Background Processes
    - **One stream of redo**
    - One UNDO
- **Containers with user data are called Pluggable Database (PDB)**
  - PDBs can be unplugged from one CDB and plugged into another CDB
  - ALL PDBs share a common redo stream
- **CDB$ROOT is a special container**
  - CDB$ROOT cannot be unplugged or plugged
  - Contains common metadata
  - **Extract must be configured at CDB$ROOT**
- **Common User**
  - Only common user can access CDB$ROOT
  - Username must start with `C##`, for example `C##GGADMIN`
Specifying Pluggable DBs

• **Object Name**
  • Two part name: SCHEMA.TABLE
  • Three part name: CONTAINER.SCHEMA.TABLE

• **No default schema is allowed in three part names**
  • User must specify SCHEMA part when specifying CONTAINER part
  • We continue to allow default schema if CONTAINER part is not used

• **Three part and two part names cannot coexist in the same Trail file or source definition file** (defgen)
OGG on Container Database

- **Extract (Capture)**
  - Only supported in Integrated Extract mode
  - Can mine multiple PDBs with a single Extract because they have a single redo log stream
  - Automatic support for DDL without Trigger (works across all PDBs)
  - Can write changes from multiple PDBs in a single trail file
    - Three part names distinguish between PDBs

- **Replicat (Delivery, Apply)**
  - Supported only at a PDB level, one Replicat cannot write to multiple PDBs
    - Connect to the target PDB and apply changes associated with the PDB
    - Can read trail file with changes from multiple PDBs
    - Three part names distinguish between PDBs
  - Possible to deploy so that
    - A single Extract captures “n” PDBs into a single trail file
    - “n” Replicats read the same trail file and apply to “n” PDBs at the target
Oracle GoldenGate
Integrated Processes (Oracle only)
Oracle GoldenGate – New Integrated Processes

Classic Capture *

Integrated Capture

GoldenGate 11.2.0.3

Classic Apply

Classic Capture *

Integrated Capture V2

GoldenGate 12.1.2.0

Classic Apply *

Integrated Apply **

** DB Versions: 11.2.0.4 / 12.1.2.0

* Data Type Limitations

* Data Type Limitations
Integrated Capture & Integrated Replicat for Oracle Databases

New in 11.2.0.4

New in 12.1.0.1
Integrated Replicat

- Integrated Replicat for **Oracle target databases only**
  - 12.1.0.1 and 11.2.0.4

- Leverages database parallel apply servers for automatic dependency aware parallel apply

- Minimal changes to GoldenGate configuration
  - Single parameter file for all tables
  - Single process with minimal configuration to distribute load
Integrated Replicat - Architecture

- **Replicat**
  - Reads the trail file
  - Constructs logical change records (LCRs)
  - Transmits LCRs to Oracle Database via the Lightweight Streaming API

- **Inbound Server (Database Apply Process)**
  - **Receiver**: Reads LCRs
  - **Preparer**: Computes the dependencies between the transactions (primary key, unique indexes, foreign key), grouping transactions and sorting in dependency order.
  - **Coordinator**: Coordinates transactions, maintains the order between applier processes.
  - **Applier**: Performs changes for assigned transactions, including conflict detection and error handling.
Integrated Extract - Overview

• Integrated Extract was introduced in Oracle GoldenGate 11.2

• Oracle GoldenGate 12.1.2 enhances the feature

• With Oracle GoldenGate 12.1.2
  • By default, all newly created extracts will be integrated extract
  • Upgrading from old IE you can use TRANLOGOPTION _LCRCAPTUREPROTOCOL V2
  • _LCRCAPTUREPROTOCOL V2 provides better performance by
    • Streamlined for improved performance (V2 as fast or faster than Classic Extract)
    • Drastic improvement in LOB performance
    • Reduced overhead on database
    • Available when the mining server is 11.2.0.3 BP 14 and higher or Oracle 12c
OGG – Integrated Capture Modes

1. Source Capture:
   - Source database and Integrated Capture process are in the same machine

2. Downstream Capture:
   - Source database and Integrated Capture process are in a different machine
Integrated Extract – DDL Trigger Removal

• **Requirements:**
  • Database must be running Oracle Database 12c (12.1.0.1), 11.2.0.4 and later versions.
  • DDL Trigger Removal is required for CDB

• **Behavior**
  • Integrated Extract running against Oracle Database 12c or 11.2.0.4 will automatically run in this mode
    • **No need to run DDL setup scripts**
    • **DDL trigger can remain enabled**
  • Integrated Extract running against Oracle Database 11g Release 11.2.0.3 will get metadata gathered from DDL trigger
  • **Classic Extract will continue to require existence of DDL trigger**
Integrated Extract & Integrated Replicat (Oracle only)

• **Integrated Extract**
  • Oracle GoldenGate 12.1.2: the source database can be 11.1 or 11.2 or above. ... the MINING database has to be version newer than the source database, but must be 11.2.0.3 BP 6 or higher.
  • Same as OGG 11.2.1.
  • If the source database is Oracle DB 12.1, then OGG 12.1.2 must be used.
  • For Oracle Database 12c with CDB setup, integrated extract is required.

• **Integrated Replicat**
  • Target database has to be Oracle Database 12.1.0.1 and 11.2.0.4.
  • The source database (Extract) can be other databases but have to include required supplemental logging information for dependency calculation.
    • Oracle GoldenGate 11.1.1 and 11.2.1 versions or non Oracle source databases, use 2 parameters:
    • GETUPDATEBEFORES and NOCOMPRESSDELETES, these are required.
    • For Oracle GoldenGate 12.1.2 use LOGALLSUPCOLS and UPDATERECORDFORMAT COMPACT.
Oracle GoldenGate
Coordinated Replicat
Prior to OGG 12c - High Volume Replication

Customer defined split

Trail Files

GoldenGate Delivery

Delivery

SQL

Delivery

SQL

Delivery

SQL

Delivery

SQL

Target Oracle and Non-Oracle Databases

**REP1.PRM**
MAP sales.acct1, TARGET sales.acct1;

**REP2.PRM**
MAP sales.acct2, TARGET sales.acct2;

**REP3.PRM**
MAP sales.acct3, TARGET sales.acct3;
Coordinated Replicat for (Non-Oracle) Databases

Single replication process for customer
Customer Defines Split
Trail Files

GoldenGate coordinates thread for barrier operations

GoldenGate Replicat
Thread SQL
Thread SQL
Thread SQL
Thread SQL

Target (Non-Oracle) Database

REP.PRM
MAP sales.acct1, TARGET sales.acct1, THREAD(2);
MAP sales.acct2, TARGET sales.acct2, THREAD(3);
MAP sales.acct3 TARGET sales.acct3, THREADANGE(4-9);
Replicat Coordination

• Without THREAD/THREADRANGE specification, transactions are applied by the lowest specified thread
  • That means that if a THREAD is not specified in a MAP it will default to THREAD(1), this will allow customers that are upgrading to not have to modify their parameter files.

• If the user specified COORDINATED in a map, it is applied with full barrier coordination.
  • MAP scott.deptTARGET nwagner.dept, COORDINATED;
  • Table DEPT is executed by the lowest (as no thread is specified) with full barrier synchronization

• On the other hand:
  • MAP scott.emp, TARGET nwagner.emp, THREAD(2);
  • Table EMP is executed by Thread 2 assuming no need for coordination.

• If a transaction touches both EMP and DEPT, it will get executed by the Barrier thread with Coordination.
Coordinated Reporting

- Each thread will continue to have its own report file
- GGSCI and monitoring infrastructure will get aggregated statistics from the Coordinator.
- Some statistics unique to Coordinated Replicat will be maintained by the Coordinator. e.g.
  - Coordinated-Statistics (total DDLs, PKs, etc.)
  - Average-Coordination-Time
  - Thread-Lag-Gap
## Coordinated vs. Integrated Replicat

<table>
<thead>
<tr>
<th>Coordinated Replicat</th>
<th>Integrated Replicat</th>
</tr>
</thead>
<tbody>
<tr>
<td>User Specified Partitioning</td>
<td>Automatic Scheduling</td>
</tr>
<tr>
<td>Split transaction Semantics</td>
<td>Does not split transactions</td>
</tr>
<tr>
<td>All databases</td>
<td>Oracle specific with version requirements</td>
</tr>
<tr>
<td>Continues to employ SQL generation and execution outside the database.</td>
<td>Apply is in the database server. Tight integration with Oracle database.</td>
</tr>
</tbody>
</table>
Oracle GoldenGate
Healthcheck Scripts
Oracle GoldenGate Healthcheck Scripts

Scripts available:
It is important to use the Integrated Extract / Replicat Healthcheck script for your Oracle database release.
You can download the scripts from the following links:

Integrated Capture and Integrated Replicat Health Check script for Oracle Database 12.1.0.1
→ icrhc_12101.sql

Integrated Capture and Integrated Replicat Health Check script for Oracle Database 11.2.0.4
→ icrhc_11204.sql

Integrated Capture Health Check script for Oracle Database 11.2.0.3
→ ichc_11203.sql

Oracle Support Note: 1448324.1 – GoldenGate Integrated Capture and Integrated Replicat Healthcheck Script
OGG Healthcheck (icrhc_12101.sql) Report

--- Summary Overview ---

<table>
<thead>
<tr>
<th>ISM</th>
<th>Name</th>
<th>PLATFORM_NAME</th>
<th>Host</th>
<th>Version</th>
<th>ENABLED</th>
<th>CDB</th>
<th>Database Size</th>
<th>CURRENT_SCN</th>
<th>MEASURED_CAPTURE_CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>7F7864E291DD</td>
<td>ORA11G</td>
<td>Microsoft Windows 64-bit</td>
<td>ISTAD</td>
<td>11.1.0.6</td>
<td>1</td>
<td>YES</td>
<td>38792</td>
<td>38792</td>
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</tr>
</tbody>
</table>

Summary of OggicEx Integrated Extracts configured in database (Current|Pending|Total)

<table>
<thead>
<tr>
<th>Current</th>
<th>Extract</th>
<th>Capture</th>
<th>Capture</th>
<th>Capture</th>
<th>RealTime</th>
<th>Current</th>
<th>OGG</th>
<th>LOGOWNER_ID</th>
<th>Status</th>
<th>Current</th>
<th>Capture</th>
<th>Captured</th>
<th>Rollup</th>
<th>Rollup</th>
<th>Source_DB Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/25/14 11:00:11</td>
<td>OSG0000000000</td>
<td>OGG0000000000</td>
<td>LOCAL</td>
<td>11:00:11</td>
<td>YES</td>
<td>37956</td>
<td>37956</td>
<td>2</td>
<td>ENABLED</td>
<td>8</td>
<td>14,113</td>
<td>1</td>
<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>

Integrated Extract parameters (Details)

<table>
<thead>
<tr>
<th>Capture</th>
<th>Extract</th>
<th>PARALLELISM</th>
<th>MAX_GSA_SIZE</th>
<th>EXCLUDETAG</th>
<th>EXCLUDERUSER</th>
<th>GETAPIFLOWS</th>
<th>GETTARGETS</th>
<th>CHECKPOINT_FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG0000000000</td>
<td>OGG0000000000</td>
<td>2</td>
<td>1000</td>
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</tbody>
</table>

Integrated Extract Logon user info (Details)

<table>
<thead>
<tr>
<th>Capture</th>
<th>Extract</th>
<th>Logon</th>
<th>Available</th>
<th>Denied</th>
<th>Ready to Read</th>
<th>Builder</th>
<th>Prepared</th>
<th>Used</th>
<th>Max Memory</th>
<th>Used Memory</th>
<th>Used Memory Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG0000000000</td>
<td>OGG0000000000</td>
<td>ISTAD</td>
<td>1</td>
<td>1</td>
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<td>467800</td>
<td>10497248</td>
<td>1</td>
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</tbody>
</table>

Summary of OggicEx Integrated Replicates configured in this database (Current|Pending|Total)

<table>
<thead>
<tr>
<th>Current</th>
<th>Register</th>
<th>Server_Name</th>
<th>Apply_User</th>
<th>Status</th>
<th>Current_Apply_Start</th>
<th>Unapplied_Complete_Time</th>
<th>LRM</th>
<th>Process_Startup_Time</th>
<th>Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/25/14 11:00:11</td>
<td>OGG0000000000</td>
<td>OGG0000000000</td>
<td>OGG0000000000</td>
<td>ISTAD</td>
<td>8/24</td>
<td>05/25/14 11:00:11</td>
<td>2014-05-25 11:00:11</td>
<td>2014-05-25 11:00:11</td>
<td>1</td>
</tr>
</tbody>
</table>

Integrated Replicates parameters (Details)

<table>
<thead>
<tr>
<th>APPLY_NAME</th>
<th>Register</th>
<th>PARALLELISM</th>
<th>MAX_PARALLELISM</th>
<th>COMMIT_SERIALIZATION</th>
<th>BATCH_SQL</th>
<th>OPTIMIZE_PROGRESS_TABLE</th>
<th>MAX_GSA_SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG0000000000</td>
<td>ISTAD</td>
<td>20</td>
<td>20</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

--- Outstanding items (Details) ---

No errors selected.

Count of Capture and Apply processes configured in database by purpose

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>Count</th>
<th>Process Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>GoldenGate Apply</td>
<td></td>
<td>APPLY</td>
</tr>
<tr>
<td>GoldenGate Capture</td>
<td></td>
<td>CAPTURE</td>
</tr>
<tr>
<td>0 errors selected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Oracle GoldenGate
Security Enhancements
Credential Store / Oracle Wallet

• **Background**
  • Oracle Wallet functionality now built into the OGG Installation

• **Credential Store**
  • OGG will have its own credential store, separate from the database

• **Parameter file changes**
  • Remove USERID, ASMUSER, etc
  • Replace with USERIDALIAS

• **Oracle Wallet**
Credential Store Usage Examples (1)

• Using aliases in parameter files

  • USERIDALIAS
    USERIDALIAS tkggu1 alias CREDENTIALGROUP source_db
    ...

  • ASMUSERALIAS
    TRANLOGOPTIONS ASMUSERALIAS asmalias CREDENTIALGROUP group
    ...

  • DEFAULTUSERPASSWORDALIAS
    DDLOPTION DEFAULTUSERPASSWORDALIAS defaultpwd
Credential Store Usage Examples (2)

• Setting up credential store on installation

  GGSCI> CREATE SUBDIRS
  GGSCI> ADD CREDENTIALSTORE
  GGSCI> ALTER CREDENTIALSTORE ADDALIAS ggadminalias USERID ggadmin PASSWORD ggadmin

• In extract.prm:

  USERIDALIAS ggadminalias
Oracle GoldenGate

Information
Resources

- Oracle Data Integrator
- Oracle GoldenGate
- Oracle Enterprise Data Quality
- Oracle Enterprise Metadata Management
- Oracle Data Services Integrator

Oracle Learning Stream (Middleware)

http://education.oracle.com/streams/middleware
Oracle GoldenGate YouTube Channel

- [youtube.com/oraclegoldengate](https://youtube.com/oraclegoldengate)
- **Features**
  - Product Overviews & Hands-On Labs
    - GoldenGate
    - Monitor
    - Veridata
  - Solution Overviews
    - Zero Downtime Upgrades
  - Case Studies
Hardware and Software
Engineered to Work Together