Oracle GoldenGate Performance Tuning for Oracle Database Integration

CON7773

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Program Agenda

1. Oracle GoldenGate Overview
2. Diagnostic Tools
3. Performance Recommendations
4. Q&A
Program Agenda

1. Oracle GoldenGate Overview
2. Diagnostic Tools
3. Performance Recommendations
4. Q&A
How Oracle GoldenGate Works

Capture: committed transactions are captured (and can be filtered) by reading the transaction 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.

Source Oracle & Non-Oracle Database(s)

LAN / WAN / Internet Over TCP/IP

Target Oracle & Non-Oracle Database(s)
How Oracle GoldenGate Works

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Bi-directional data transfer over LAN/WAN/Internet using TCP/IP.
Also Known As

• Capture = Extract
  – Integrated Capture
  – Integrated Extract

• Delivery = Replicat
  – Integrated Delivery
  – Integrated Replicat
  – Integrated Apply
Logmining Server Architecture

Oracle Database

Logmining Server (Database Capture Process)

- **Reader**: Reads logfile and splits into regions
- **Preparer**: Scans regions of logfiles and prefilters based on extract parameters
- **Builder**: Merges prepared records in SCN order
- **Capture**: Formats Logical Change Records (LCRs) and passes to GoldenGate Extract

**Extract**

- Requests LCRs from logmining server
- Performs Mapping and Transformations
- Writes Trail File
Integrated Replicat

• Introduced in GoldenGate 12.1.2
• Integrated Replicat for Oracle target databases only
  – Database releases: 12.1 and 11.2.0.4
• Leverages database parallel apply servers via inbound server for automatic dependency aware parallel apply
• Minimal changes to Replicat configuration
• Single replicat, no need to use @RANGE or THREAD or other manual partitioning
Integrating Replicat Architecture Diagram

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 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.
Parallel Apply Processing

Key Features

• Dependency scheduling based on Primary Key, Unique Index, and Foreign Key constraints at target database
  – Supplemental logging at source needed for these columns
  – Trail file must record these columns

• Ordering of transaction commit in apply is configurable

• COMMIT_SERIALIZATION
  – FULL: commit transactions in same order as committed at source database.
  – DEPENDENT_TRANSACTIONS: commit dependent transactions in correct dependency order (default)
BATCHSQL

• BATCHSQL supported via inbound server

• Parallelism for BATCHSQL supported
  – Use BATCHTRANSOPS to tune batch size (default is 50)

• On error in BATCHSQL,
  – Batched transaction rolled back
  – Apply in normal mode (non-batched) via inbound server

• Larger batch sizes can cause more transaction dependency waits between apply servers
BATCHSQL Improves Replicat Throughput

Changes per second

- FULL
- DEPENDENT_TRANSACTIONS
- COMMIT_SERIALIZATION

BATCHSQL using default settings

- no BATCHSQL
- BATCHSQL
Integrated Replicat Performance

• Integrated Replicat 24% faster than 6 manually configured parallel (and Foreign Keys disabled) Classic Replicats
  – 129,000 vs. 96,000 DMLs/sec
  – OLTP style workload (modified Swingbench)

• Integrated Replicat greatly simplifies configuration without manual partitioning
  – No need to understand workload (PK/UI/FK constraints)
  – Foreign Key constraints enabled
  – No split transaction semantics
  – Autotunes apply parallelism based on workload
Replicat Performance Comparison

BATCHSQL Enabled

Row Changes per second

- Workload
- Classic - 3 Reps
- Classic - 6 Reps
- Integrated
Program Agenda

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Monitoring Latency Automatically

Latency Monitoring

• Monitor latency with Manager parameters (mgr.prm):
  – LAGINFO{SECONDS | MINUTES | HOURS}
  – LAGREPORT{MINUTES | HOURS}
  – LAGCRITICAL{SECONDS | MINUTES | HOURS}
  – Monitor ggserr.log for latency information

• Database queries of V$GOLDENGATE_CAPTURE or V$GG_APPLYCOORDINATOR
Monitoring GoldenGate Latency

Latency Monitoring

- *ggseerr.log example:*

  2014-01-22 18:09:00  WARNING OGG-00947  Oracle GoldenGate Manager for Oracle, mgr.prm:  Lag for EXTRACT EXT_1A is 00:01:40 (checkpoint updated 00:00:04 ago)

- GoldenGate Management Pack
  - Stand alone tool or 12c Oracle Enterprise Manager plug-in
Process Report File

• List Active Parameters

replicat rep_1a
userid soesmall password ********
discardfile ./dirrpt/rep_1a.dsc, append, megabytes 20
REPORTCOUNT EVERY 1 MINUTES, RATE
ASSUMETARGETDEFS
MAP SOESMALL.*, TARGET SOESMALL.*

• Identifies Table Resolution on first Change Record

2014-09-19 18:57:15 INFO OGG-06506 Wildcard MAP resolved (entry DEMO.*): MAP "DEMO"."ORDERS",TARGET "DEMO"."ORDERS", COMPARECOLS ( ON UPDATE ALL, ON DELETE ALL).
2014-09-19 18:57:15 INFO OGG-06511 Using following columns in default map by name: ORDER_NUMBER, PART_NUMBER, STATUS, DELIVERY_DATE.
2014-09-19 18:57:15 INFO OGG-06510 Using the following key columns for target table DEMO.ORDERS: ORDER_NUMBER.
Process Report Statistics

• Monitor throughput per process
  – `REPORTCOUNT EVERY {SECONDS | MINUTES | HOURS}, RATE`
  – Aggressive monitoring can impact process throughput.

Example: `REPORTCOUNT EVERY 1 MINUTES, RATE`

```
... 161274630 records processed as of 2014-08-18 17:09:25 (rate 116689, delta 119052)
... 168513536 records processed as of 2014-08-18 17:10:25 (rate 116854, delta 120647)
... 175639392 records processed as of 2014-08-18 17:11:25 (rate 116930, delta 118764)
```
## Extract Report File
### SEND EXTRACT, LOGSTATS

### REDO Log Statistics

<table>
<thead>
<tr>
<th>Queue Name</th>
<th>Size</th>
<th>Write Operations</th>
<th>Read Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>AsyncReader 1 Buffers</td>
<td>4</td>
<td>38980</td>
<td>38777</td>
</tr>
<tr>
<td>AsyncReader 1 Results</td>
<td>8</td>
<td>38978</td>
<td>38975</td>
</tr>
<tr>
<td>IXAsyncTrans Buffers</td>
<td>300</td>
<td>23026144</td>
<td>85138</td>
</tr>
<tr>
<td>IXAsyncTrans Results</td>
<td>316</td>
<td>23026144</td>
<td>85856</td>
</tr>
</tbody>
</table>

### CACHE OBJECT MANAGER statistics

- **CACHE MANAGER VM USAGE**
  - vm current = 19.57M
  - vm anon queues = 19.57M
  - vm anon in use = 0
  - vm files = 0
  - vm used max = 19.57M => CACHE BALANCED

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**Important Notes:**
- **TRANLOGOPTIONS**
  - READAHEADCOUNT 4 (default)
  - ASYNCTRANSPROCESSING 300 (default)
Monitoring Integrated Capture

Streams Performance Advisor (SPADV)

• Refer to *Oracle Database PL/SQL Packages and Types Reference* for UTL_SPADV usage

• Example real-time statistics:

    PATH 2 RUN_ID 15 RUN_TIME 2014-FEB-21 22:32:17 CCA N
    |<C> OGG$CAP_EXT_1A 305260 305245 790813 LMR 0% 53.3% 33.3% "CPU + Wait for CPU" LMP (2) 0% 0% 146.7% "CPU + Wait for CPU" LMB 73.3% 0% 6.7% "CPU + Wait for CPU"
    CAP 20% 0% 73.3% "CPU + Wait for CPU" |<Q> "STREAMSADMIN"."OGG$Q_EXT_1A" 0.01 0.01 0 |<E> EXT_1A 304027 80076708 790813 20% 6.7% 73.3% "CPU + Wait for CPU" |<B> NO BOTTLENECK IDENTIFIED

– LMR in flow control, and LMP is 0% idle with high CPU
– Confirm with *top/CPU stats* and increase Capture Parallelism
Monitoring Integrated Replicat
Streams Performance Advisor (SPADV)

• Refer to *Oracle Database PL/SQL Packages and Types Reference* for UTL_SPADV usage

• Example real-time statistics:

```
PATH 1 RUN_ID 16 RUN_TIME 2014-JAN-12 10:33:59 CCA Y |<R> REP_1A 1375 520424 0 0% 62.5% 37.5% |<Q> "SOESMALL"."OGGQ$REP_1A" 1375 0.01 5001 |<A> OGG$REP_1A 715 715 -1 APR 31.3% 68.8% 0% "" APC 100% 0% 0% "" APS (7) 68.8% 0% 481.3% "free buffer waits" |<B> OGG$REP_1A APS 1219 22693 93.8% "free buffer waits"
```

– Replicat (REP_1a) in flow control, as is APR so look downstream
– APS high waits on *free buffer waits*
– Confirm database contention with AWR reports and remove it
Performance Data Gathering

• Automatic Workload Repository (AWR)
  – SQL used to apply replicated data, so important to gather and analyze
  – If using DBFS database, gather AWR for it

• I/O performance data (iostat)
  – Gather for disks database AND trail file locations
  – Make sure there are enough resources BEFORE increasing parallelism

• CPU statistics (top)
  – Need to see if any processes limited by CPU

• Oracle GoldenGate integrated healthcheck (MOS 1448324.1)
  – Structured HTML file on general integrated GoldenGate health
Replication Statistics (GoldenGate, XStream)

- Replication System Resource Usage
- Replication SGA Usage
- GoldenGate Capture
- GoldenGate Capture Rate
- GoldenGate Apply Coordinator
- GoldenGate Apply Server
- GoldenGate Apply Coordinator Rate
- GoldenGate Apply Reader and Server Rate
- XStream Capture
- XStream Capture Rate
- XStream Apply Reader
- XStream Apply Coordinator
- XStream Apply Server
- XStream Apply Coordinator Rate
- XStream Apply Reader and Server Rate
- Table Statistics by DML Operations
- Table Statistics by Conflict Resolutions
- Replication Large Transaction Statistics
- Replication Long Running Transaction Statistics

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### AWR Replication Example

#### GoldenGate Apply Coordinator Rate

- GoldenGate Apply Coordinator rate information ordered by Replicat Name and Apply Name in ascending order.
- Apply name prefixed with a * indicates process (re)started between Begin and End snapshots.

<table>
<thead>
<tr>
<th>Replicat Name</th>
<th>Apply Name</th>
<th>Txns Received/sec</th>
<th>Txns Applied/sec</th>
<th>Txns Rolled Back/sec</th>
<th>Unassigned Complete Txn/sec</th>
<th>Total Errors/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>REP_1A</td>
<td>*OGG$REP_1A</td>
<td>8696.50</td>
<td>8696.50</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

---

#### GoldenGate Apply Reader and Server Rate

- GoldenGate Apply Reader and Server rate information ordered by Replicat Name and Apply Name in ascending order.
- Apply name prefixed with a * indicates process (re)started between Begin and End snapshots.
- Time Per Msg values are in centiseconds.

<table>
<thead>
<tr>
<th>Replicat Name</th>
<th>Apply Name</th>
<th>Reader LCRs/sec</th>
<th>Server LCRs Applied/sec</th>
<th>Server Dequeue Time/msg</th>
<th>Server Apply Time/msg</th>
<th>Total LCRs Retried/sec</th>
<th>Total Txn Retried/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>REP_1A</td>
<td>*OGG$REP_1A</td>
<td>52660.91</td>
<td>44774.55</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

---

Reader LCRs/sec includes COMMIT LCRs.
GoldenGate Database Views

• Configuration Views
  – DBA_GOLDENGATE_PRIVILEGES
  – DBA_GOLDENGATE_SUPPORT_MODE
  – DBA_CAPTURE, DBA_CAPTURE_PARAMETERS
  – DBA_GOLDENGATE_INBOUND
  – DBA_GG_INBOUND_PROGRESS
  – DBA_APPLY, DBA_APPLY_PARAMETERS
  – DBA_APPLY_REPERROR_HANDLERS
  – DBA_APPLY_HANDLE_COLLISIONS
  – DBA_APPLY_DML_CONF_HANDLERS

• Run Time Views
  – V$GOLDENGATE_CAPTURE
  – V$GG_APPLY_RECEIVER
  – V$GG_APPLY_READER
  – V$GG_APPLY_COORDINATOR
  – V$GG_APPLY_SERVER
  – V$GOLDENGATE_TABLE_STATS
  – V$GOLDENGATE_CAPABILITIES
OGG HealthCheck Script

• SQL script that creates structured formatted HTML
  – For specific DB release

• Summary
  – Overview information
  – Advice and Warnings of potential issues with configuration

• Analysis
  – Correlate with other configuration to identify discrepancies
  – Performance Recommendations
  – Detail view information for diagnostic purposes

• Statistics
  – Runtime state of Streams processing
OGG HealthCheck Usage

• Gather healthCheck at
  – Periodically to provide baselines and snapshots over time
  – Whenever an error occurs/performance worsens
  – At intervals during problem times
  – When the problem has been resolved

• Download HealthCheck via MOS Note 1448324.1
Navigation Aids For Quick Access

Oracle GoldenGate Integrated Extract/Replicat Health Check (v3.1.18) for GGA1.US.ORACLE.COM on Instance=GGA1 generated: 2014-07-08 12:16:55

Configuration: Database Queue Administrators Bundle
Extract: Configuration Capture Statistics
Replicat: Configuration Apply Statistics
Analysis: History Notifications Objects Checks Performance Wait Analysis Topology
Statistics: Statistics Queue Capture Apply Apply_Errors

----------------------------------------
== Summary =============================
----------------------------------------
++ Summary Overview ++

<table>
<thead>
<tr>
<th>DBID</th>
<th>Name</th>
<th>PLATFORM_NAME</th>
<th>Host</th>
<th>Version</th>
<th>INSTANCE</th>
<th>CDB</th>
<th>Database Role</th>
<th>CURRENT_SCN</th>
<th>MIN_</th>
</tr>
</thead>
<tbody>
<tr>
<td>723272336</td>
<td>GGA1</td>
<td>Linux x86 64-bit</td>
<td>scac07adm05.us.oracle.com</td>
<td>12.1.0.2.0</td>
<td>1</td>
<td>NO</td>
<td>PRIMARY</td>
<td>1833215639</td>
<td></td>
</tr>
</tbody>
</table>

Summary of GoldenGate Integrated Extracts configured in database (ConfigDetails StatsDetails)
## Integrated Extract Summary Example

<table>
<thead>
<tr>
<th>Current Time</th>
<th>Extract Name</th>
<th>Capture Name</th>
<th>Capture User</th>
<th>Capture Type</th>
<th>RealTime</th>
<th>Capture Version</th>
<th>Required Checkpoint SCN</th>
<th>OGG Capture Protocol</th>
<th>LOGMINER_ID</th>
<th>Status</th>
<th>Current Capture State</th>
<th>Capture Lag</th>
<th>Redo Mined MB</th>
<th>Sent to Extract Mb</th>
<th>Pr Stt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-04-24 08:15:51</td>
<td>EXT_1A</td>
<td>OGGSCAP_EXT_1A</td>
<td>STREAMSADMIN</td>
<td>LOCAL</td>
<td>YES</td>
<td>12.1.0.2.0</td>
<td>2277992</td>
<td>V2</td>
<td>19</td>
<td>ENABLED</td>
<td>WAITING FOR CLIENT REQUESTS</td>
<td>588874</td>
<td>38054.768</td>
<td>36513.467</td>
<td>2011-08-1</td>
</tr>
</tbody>
</table>

### Integrated Extract Key Parameters

<table>
<thead>
<tr>
<th>Capture Name</th>
<th>Extract Name</th>
<th>PARALLELISM</th>
<th>MAX_SGA_SIZE</th>
<th>EXCLUDETAG</th>
<th>EXCLUDEUSER</th>
<th>GETAPPLEOPS</th>
<th>GTREPLICATES</th>
<th>CHECKPOINT_FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGGSCAP_EXT_1A</td>
<td>EXT_1A</td>
<td>2048</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Integrated Extract Logminer Session Info

<table>
<thead>
<tr>
<th>Capture Name</th>
<th>Available Chunks</th>
<th>Delivered Chunks</th>
<th>Ready to Send Chunks</th>
<th>Builder WorkSize</th>
<th>Prepared WorkSize</th>
<th>Used Memory</th>
<th>Max Memory</th>
<th>Used Memory Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGGSCAP_EXT_1A</td>
<td>256915</td>
<td>53</td>
<td>256862</td>
<td>26528</td>
<td>20768</td>
<td>1521601024</td>
<td>2146435072</td>
<td>70.889683263617</td>
</tr>
</tbody>
</table>
Performance Recommendation Example

++ Performance Checks ++
++
++ Note: Performance only checked for enabled processes!
++ Aborted and disabled processes will not report performance warnings!

+ WARNING: Extract EXT3_I is slow to request changes (73287 chunks available) from capture OGGSCAP_EXT3_I
+ Use the following command to obtain Extract wait statistics
SEND extract EXT3_I, LOGSTATS
+ Output of above command is written to extract report file
+
+ The WAITING FOR CLIENT REQUESTS state is an indicator to investigate the extract process rather than the logmining server when there are chunks available from capture.
+ If Integrated Extract is V2 and wait statistics from SEND extract... LOGSTATS are high,
+ add the following line to the extract parameter file and restart extract:
TRANLOGOPTIONS _READAHEADCOUNT 64
+
+ See My Oracle Support article 1063123.1 for instructions on additional troubleshooting of the extract process, if needed.
## Integrated Replicat Summary

Summary of GoldenGate Integrated Replicats configured in this database([ConfigDetails](#) [StatsDetails](#))

<table>
<thead>
<tr>
<th>Current Time</th>
<th>Replicate Name</th>
<th>Server Name</th>
<th>Apply User</th>
<th>Status</th>
<th>Registered</th>
<th>Last DDL Time</th>
<th>Current Receiver State</th>
<th>Current Coordinator State</th>
<th>Active Server Count</th>
<th>Unassigned Complete Txns</th>
<th>Low Watermark Message Create Time</th>
<th>High Watermark Message Create Time</th>
</tr>
</thead>
</table>

Integrated Replicat key parameters ([Details](#))

<table>
<thead>
<tr>
<th>APPLY_NAME</th>
<th>Replicate Name</th>
<th>PARALLELISM</th>
<th>MAX_PARALLELISM</th>
<th>COMMIT.Serialization</th>
<th>EAGER_SIZE</th>
<th>BATCHSQL</th>
<th>BATCH_SQL_MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG$R41INT</td>
<td>R41INT</td>
<td>4</td>
<td>8</td>
<td>DEPENDENT_Transactions</td>
<td>9500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Autotuned Server Count
## Integrated Replicat
### Apply Reader

++ APPLY Reader Statistics ++

<table>
<thead>
<tr>
<th>Apply Name</th>
<th>Captured or User-Enqueued L</th>
<th>Proc</th>
<th>STATE</th>
<th>Total Messages Dequeued</th>
<th>Total Messages Spilled</th>
<th>SGA Used MB</th>
<th>SGA Allocated MB</th>
<th>Oldest Transaction</th>
<th>Total LCRs with Dependencies</th>
<th>Total LCRs with WM Dependency</th>
<th>Total in-Memory LCRs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG$A_DWS</td>
<td>Captured LCRS</td>
<td>AS01</td>
<td>DEQUEUE MESSAGES</td>
<td>10841474</td>
<td>0</td>
<td>1372</td>
<td>1477</td>
<td>5.13.89091</td>
<td>264522</td>
<td>33</td>
<td>77055</td>
</tr>
</tbody>
</table>
### Integrated Replicat

#### Apply Servers Executing in Parallel

<table>
<thead>
<tr>
<th>Apply Name</th>
<th>Process</th>
<th>SRVR</th>
<th>State</th>
<th>Total Transactions Assigned</th>
<th>Total Messages Applied</th>
<th>Message Sequence</th>
<th>LCR Retry</th>
<th>TXN Retry</th>
<th>Total LCRs Retried</th>
<th>Total TXNs Retried</th>
<th>Total TXNs Recorded</th>
<th>Elapsed Apply Time (cs)</th>
<th>Apply Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>OGG$REP_1A</td>
<td>AS02</td>
<td>1</td>
<td>EXECUTE TRANSATION</td>
<td>1996026</td>
<td>17869076</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25.25.16888</td>
<td>172</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS03</td>
<td>2</td>
<td>INACTIVE</td>
<td>1950191</td>
<td>17447490</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>37.13.8475</td>
<td>134</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS04</td>
<td>3</td>
<td>EXECUTE TRANSATION</td>
<td>2071599</td>
<td>18549954</td>
<td>45</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25.2.16888</td>
<td>160</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS05</td>
<td>4</td>
<td>EXECUTE TRANSATION</td>
<td>2128114</td>
<td>19044641</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>33.3.8528</td>
<td>159</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS06</td>
<td>5</td>
<td>EXECUTE TRANSATION</td>
<td>2149135</td>
<td>19233075</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23.7.16869</td>
<td>149</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS07</td>
<td>6</td>
<td>INACTIVE</td>
<td>2168994</td>
<td>19406949</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>22.14.16808</td>
<td>173</td>
</tr>
<tr>
<td>OGG$REP_1A</td>
<td>AS08</td>
<td>7</td>
<td>EXECUTE TRANSATION</td>
<td>1976809</td>
<td>17693191</td>
<td>44</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>34.28.8528</td>
<td>144</td>
</tr>
<tr>
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Applying Large Transaction
Eager Apply Serializes Apply Processing

Apply server transactions ordered by server_id

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## Wait Analysis

Wait events of last 30 minutes of each OGG background process

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<tr>
<th>APPLY_SERVER_NAME</th>
<th>EVENT_COUNT</th>
<th>TOTAL_COUNT</th>
<th>PERCENTAGE</th>
<th>BUSY</th>
<th>Wait Event</th>
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Points towards Buffer Cache / IO System for further investigation
## Tips For Analyzing Healthcheck Output

<table>
<thead>
<tr>
<th>Search For</th>
<th>Version</th>
<th>Use for</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables not supported</td>
<td>11.2.0.4 &amp; 12.1</td>
<td>NONE = cannot be captured (from redo) or fetched by OGG</td>
</tr>
<tr>
<td>GoldenGate Sessions</td>
<td>All</td>
<td>V$SESSION info for OGG foreground and background processes</td>
</tr>
<tr>
<td>Streams Pool Statistics</td>
<td>All</td>
<td>Separate sections for capture, logminer, and apply</td>
</tr>
<tr>
<td>GoldenGate Table Statistics</td>
<td>11.2.0.4 &amp; 12.1</td>
<td>Inserts, Updates, Deletes, wait dependencies, Reperror, Handle Collisions, CDR stats per table</td>
</tr>
<tr>
<td>Logminer Database Map</td>
<td>All</td>
<td>Queries for detailed information from Logminer tables</td>
</tr>
<tr>
<td>Standby Redo Log</td>
<td>All</td>
<td>Queries V$STANDBY_LOG</td>
</tr>
</tbody>
</table>
Program Agenda

1. Oracle GoldenGate Overview
2. Diagnostic Tools
3. Performance Recommendations
4. Q&A
Database Configuration

• STREAMS_POOL_SIZE
  – Size appropriately for number of concurrent IE and IR processes
  – Minimum 1G per IE or IR process then add 25%
  – If IE or IR parameter MAX_SGA_SIZE configured, use sum of MAX_SGA_SIZE + 25%

• ENABLE_GOLDENGATE_REPLICATION
  – Set to TRUE for DB 11.2.0.4 and 12.1.0.2
  – Classic or Integrated Extract, Integrated or nonIntegrated Replicat

• For performance tuning, use the performance advisor available in $ORACLE_HOME/rdbms/admin/utlspadv.sql
Integrated Extract

Extract Parameters

• LOGALLSUPCOLS instructs extract to write supplemental logged columns to trail file

• UPDATERECORDFORMAT COMPACT
  – Single LCR with both BEFORE and AFTER images
  – COMPACT reduces the amount of data sent in LCR
Integrated Extract Parameters

TRANLOGOPTIONS INTEGRATEDPARAMS

- PARALLELISM controls number of preparers for processing logs
  - Enterprise Edition allows parallelism of preparers (default is set to 2)
  - Increase parallelism if preparers are CPU bound
    - Processes down the chain (Builder, Capture) must have bandwidth to handle more work
    - UTL_SPADV shows this information
  - Standard Edition does not allow parallelism. Parallelism = 1 only.

- MAX_SGA_SIZE controls amount of Streams Pool for specific extract
  - Minimum recommendation: 1000 (1G)
  - Maximum recommendation: 3500 (3.5G)
Integrated Replicat

Replicat Parameters

- GoldenGate parameter BATCHSQL improves apply performance in the majority of workloads
  - If wait dependencies are high between batched transaction, REDUCE the BATCHTRANSOPS value (default for IR is 50)
    Example: BATCHSQL BATCHTRANSOPS 12
  - Table Statistics in Healthcheck can identify specific tables incurring waits
Integrated Replication Parameters

DBOPTIONS INTEGRATEDPARAMS

• COMMIT_SERIALIZE default is DEPENDENT_TRANSACTIONS
  – Set to FULL, only if apply in source commit order is required

• EAGER_SIZE threshold to begin apply of large transactions default is 9500
  – Eager apply serializes apply processing
  – For medium sized large transactions (up to 25000 LCRs), set the threshold to higher value
  – DBOPTIONS INTEGRATEDPARAMS(EAGER_SIZE 25001)
  – Make sure that streams_pool_size is appropriate to avoid Waiting For Memory issues

• MAX_SGA_SIZE controls amount of memory for IR
  – Default is INFINITE (Apply allocates memory as needed and available)
Integrated Replication Parameters

DBOPTIONS INTEGRATEDPARAMS

- PARALLELISM controls minimum number of appliers
  - Default is 4
  - If PARALLELISM set to 1, apply parallelism is disabled.

- MAX_PARALLELISM controls maximum number of appliers
  - Default is 50 for OGG 12.1.2.1 (30 for OGG 12.1.2.0)

- Autotuning of apply parallelism is default
  - Computed over range of 5 intervals of PARALLELISM_INTERVAL(5) seconds
  - Unneeded processes marked INACTIVE, INACTIVE processes removed after 5 minutes
  - If MAX_PARALLELISM=PARALLELISM, autotuning is disabled.
Database Object Tuning

- GoldenGate uses SQL to apply changes
- AWR highlights SQL and SEGMENT issues
- ADDM recommendations as appropriate
Further Reading

MOS Notes

• MAA white paper Oracle GoldenGate Performance Best Practices

• Note 1557031.1 Recommended patches for Integrated Capture/Replicat

• Note 1448324.1 OGG Integrated Healthcheck Script

• Note 1485620.1 Best Practices Downstream Capture

• Note 1488668.1 GoldenGate Performance Data Gathering
Questions and Answers
Resources

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

Safe Harbor Statement

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Engineered to Work Together