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Oracle GoldenGate Performance Tuning for Oracle Database Integration

CON7773

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ORACLE

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Program Agenda

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

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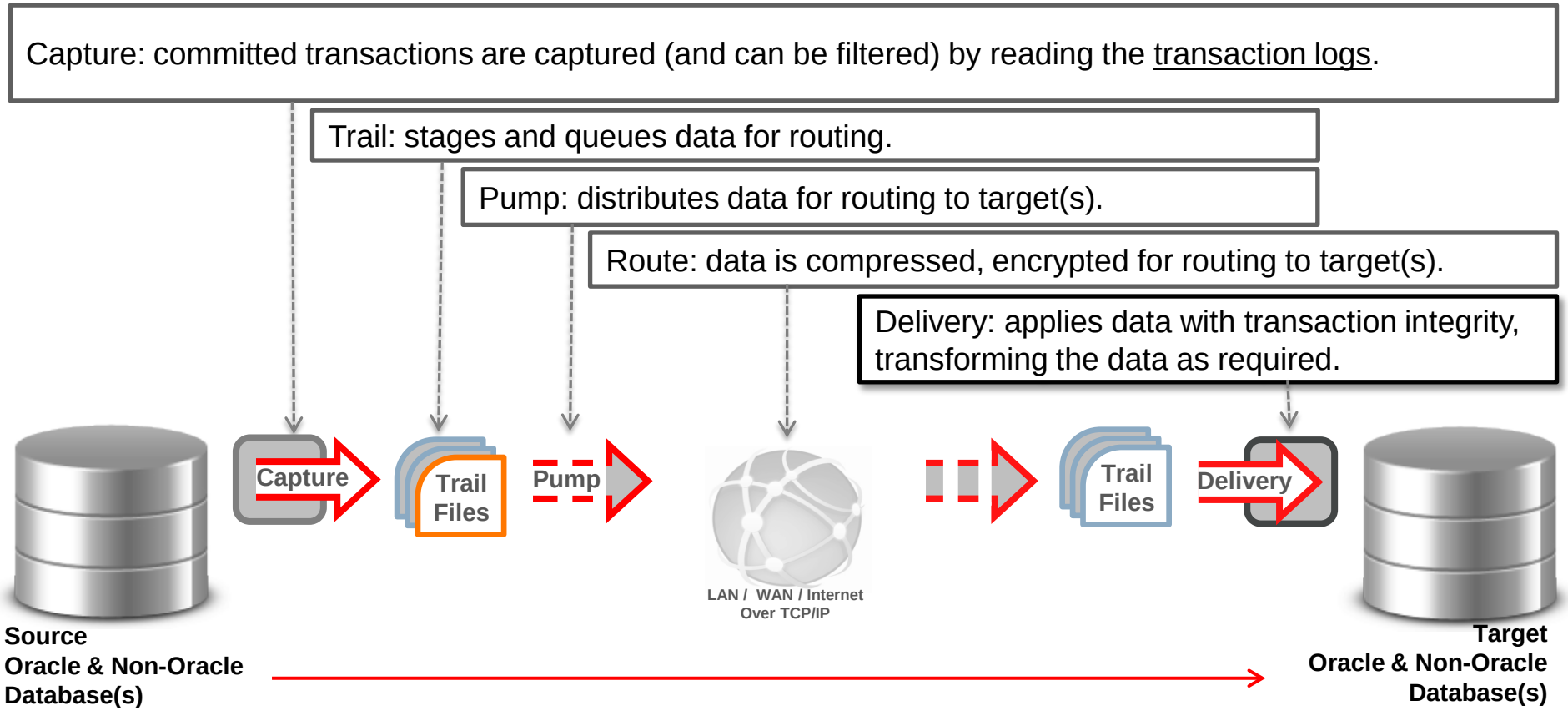
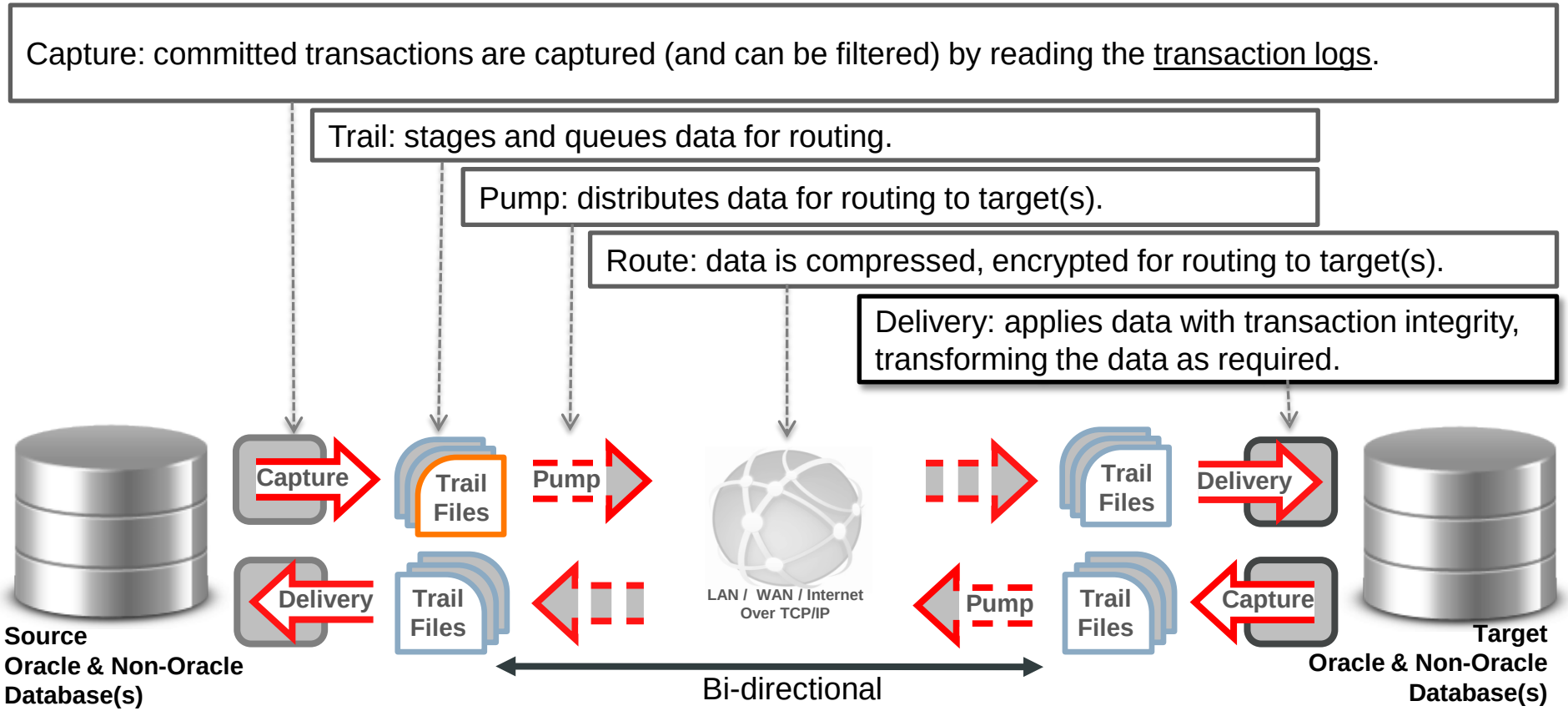
How Oracle GoldenGate Works



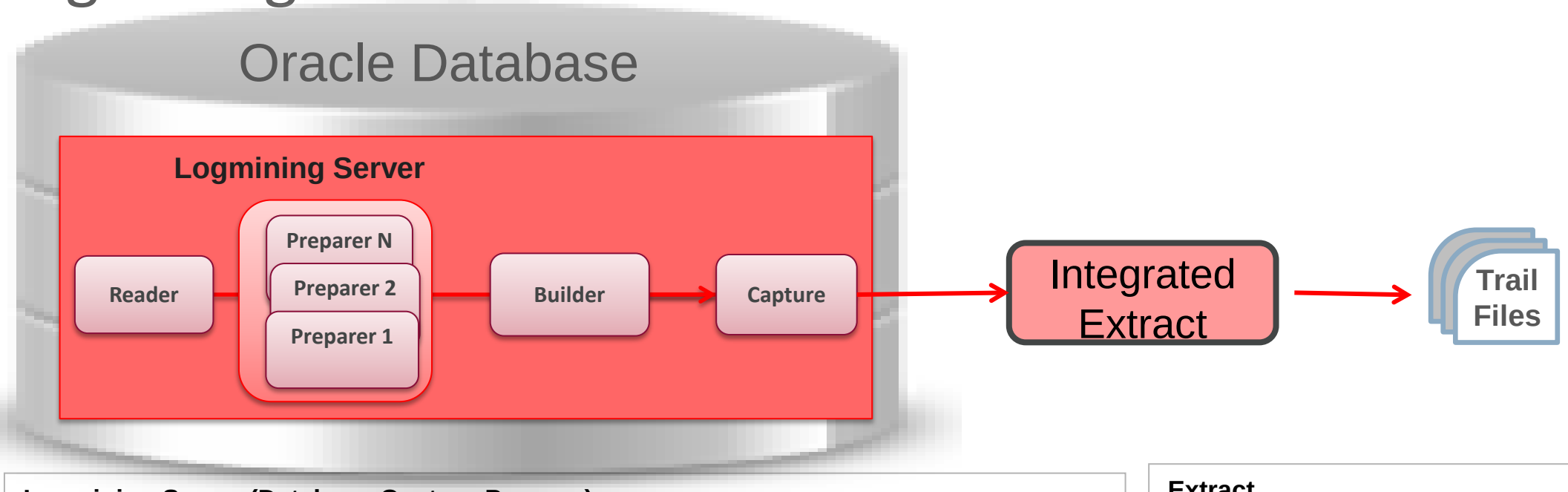
How Oracle GoldenGate Works



Also Known As

- Capture = Extract
  - Integrated Capture
  - Integrated Extract
- Delivery = Replicat
  - Integrated Delivery
  - Integrated Replicat
  - Integrated Apply

Logmining Server Architecture



Logmining Server (Database Capture Process)

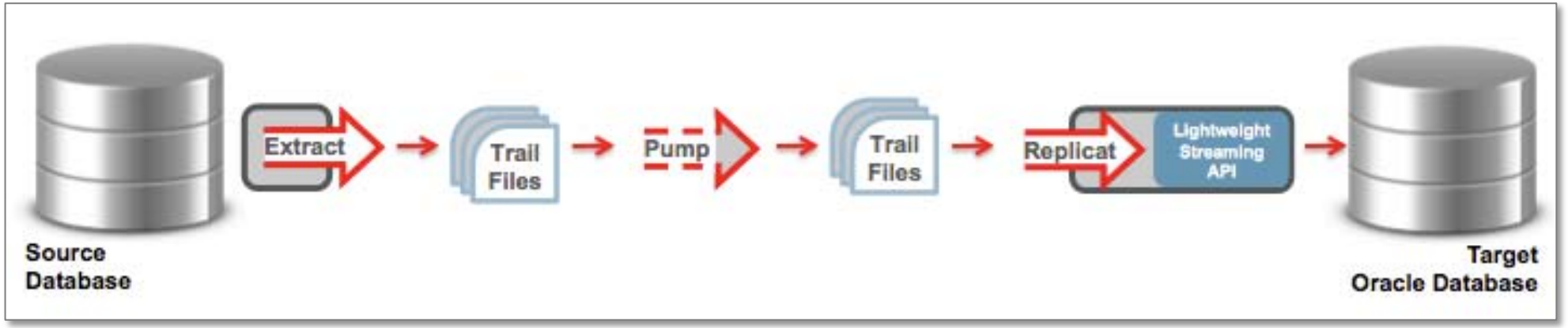
- **Reader**: Reads logfile and splits into regions
- **Preparer**: Scans regions of logfiles and prefilters based on extract parameters
- **Builder**: Merges prepared records in SCN order
- **Capture**: Formats Logical Change Records(LCRs) and passes to GoldenGate Extract

Extract

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

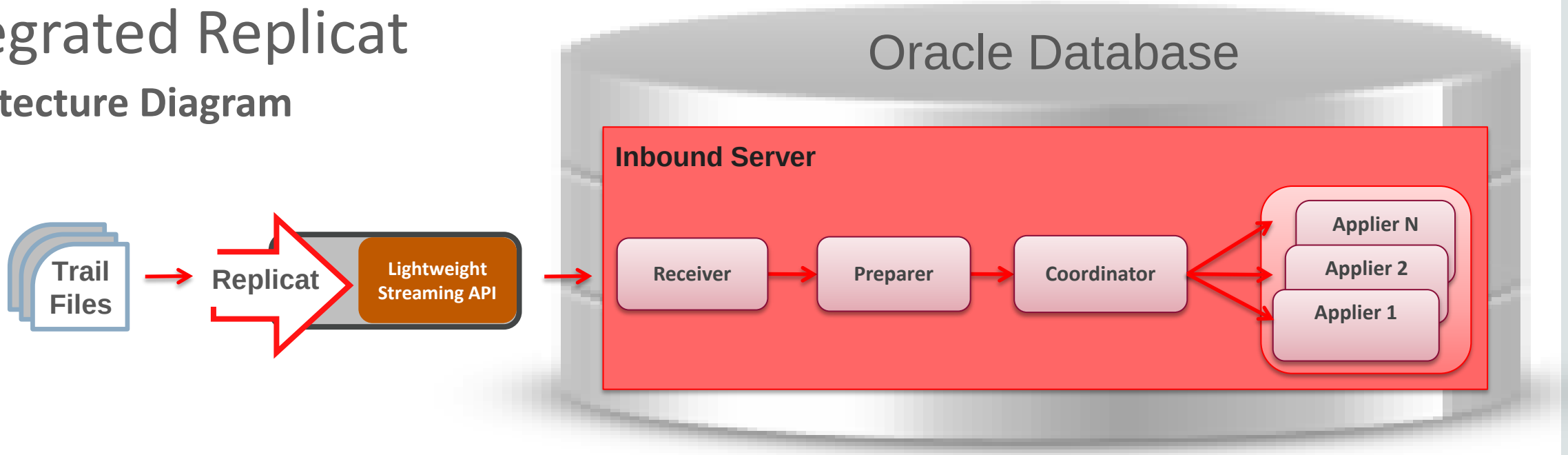
Integrated Replicat

- 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



Integrated 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 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.

Parallel Apply Processing

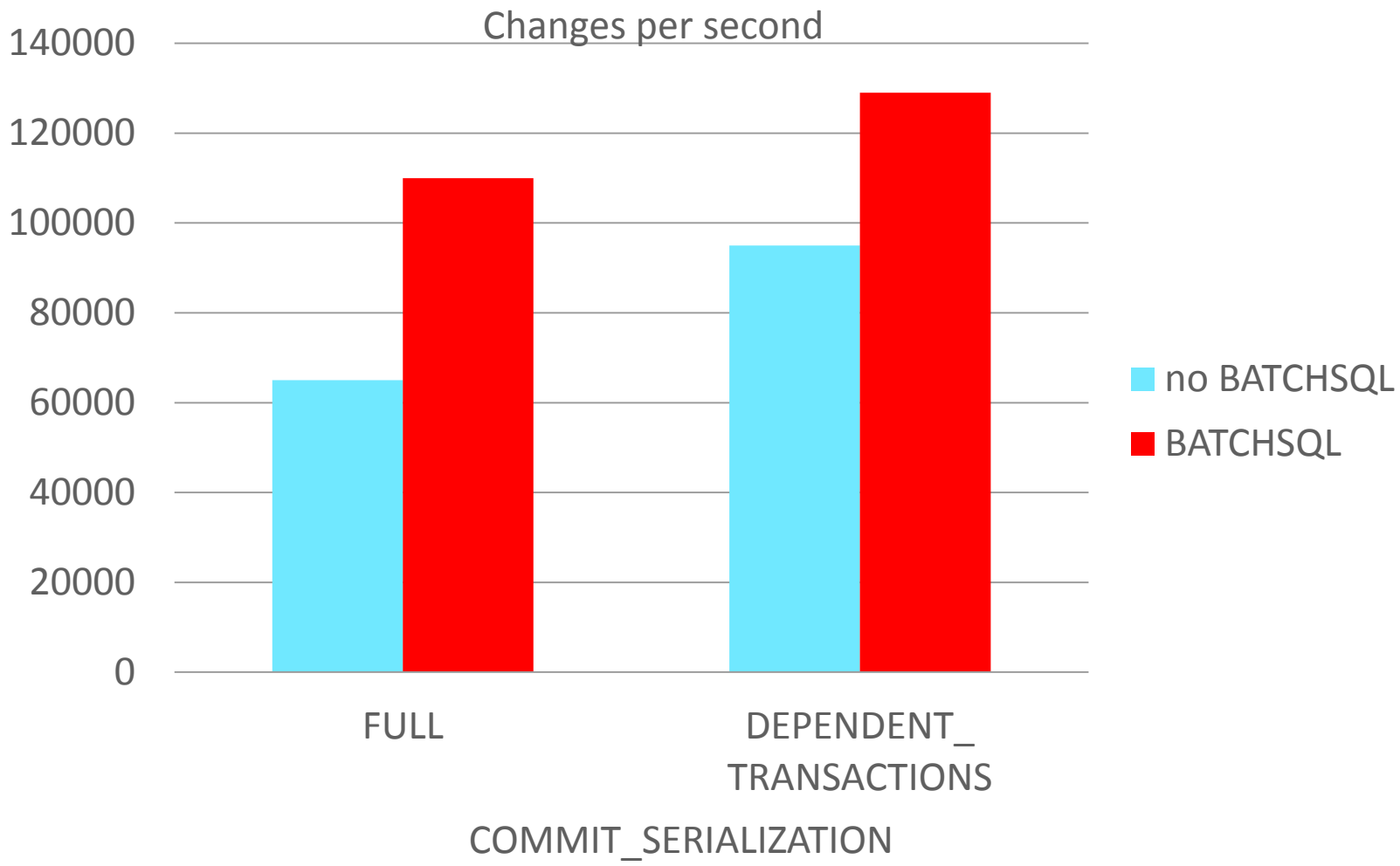
Key Features

- 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



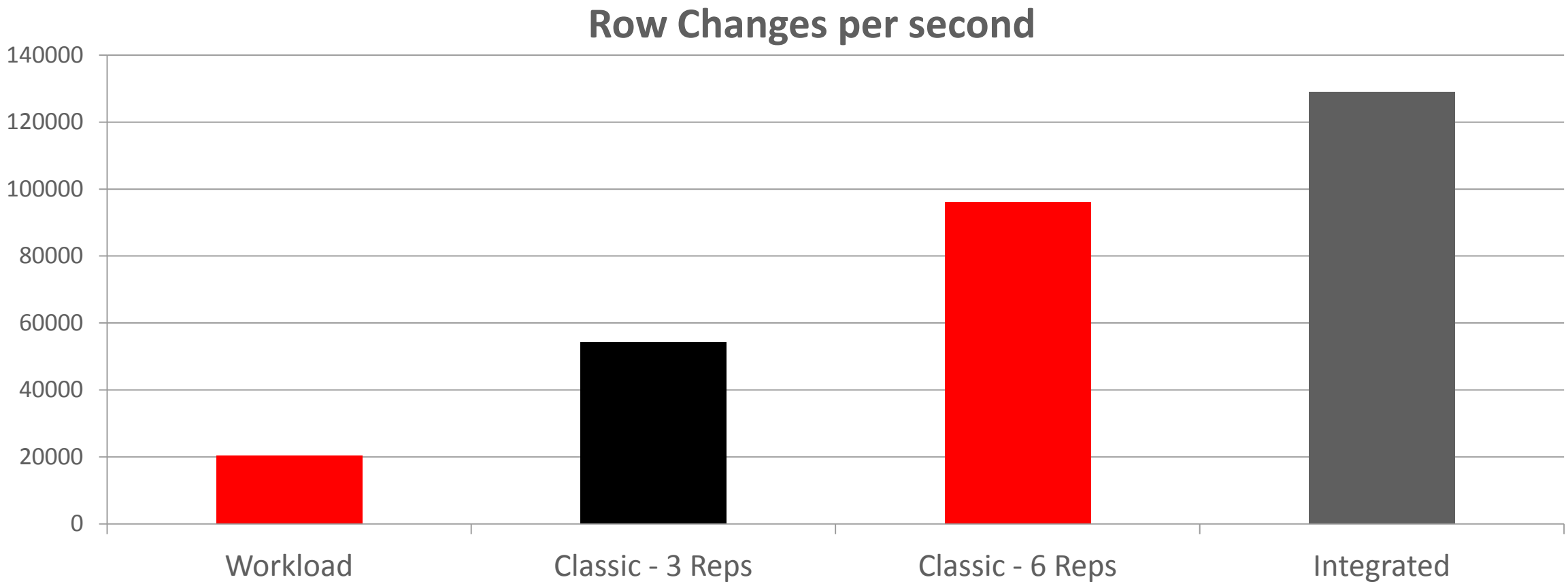
BATCHSQL using default settings

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



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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_APPLY_COORDINATOR

Monitoring GoldenGate Latency

Latency Monitoring

- *ggserr.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

...

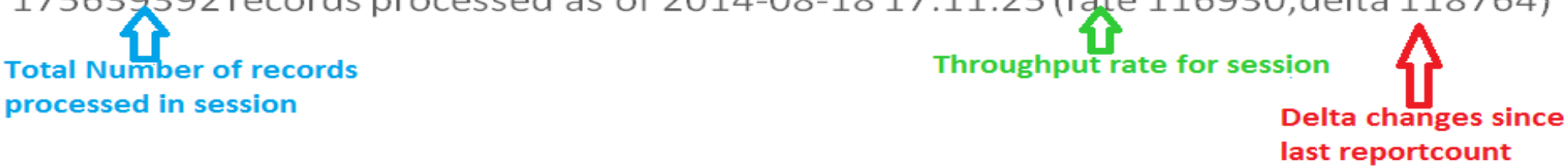
161274630 records processed as of 2014-08-18 17:09:25 (rate 116689,delta 119052)

...

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
  Bytes parsed                     0
  Bytes output            22040161688
```

TRANLOGOPTIONS _READAHEADCOUNT 4 (default)

		-- Write Operations			-- Read Operations		
Queue Name	Size	Count	Waited	Signaled	Count	Waited	Signaled
AsyncReader 1 Buffers	4	38980	0	0	38980	38777	38648
AsyncReader 1 Results	8	38978	0	0	38975	16	10
IXAsyncTrans Buffers	300	23026144	0	0	23026144	85138	85856
IXAsyncTrans Results	316	23026144	0	0	23025845	12	14

TRANLOGOPTIONS ASYNCTRANSPROCESSING 300 (default)

```
CACHE OBJECT MANAGER statistics

CACHE MANAGER VM USAGE
vm current      =  19.57M   vm anon queues =  19.57M
vm anon in use =       0    vm file        =       0
vm used max     =  19.57M   ==> CACHE BALANCED
```

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$CAP_EXT_1A 305260 305245 790813 LMR 0% 53.3% 33.3% "CPU + Wait
for CPU" LMP (2) 0% 0% 146.7% "CPU + Wait for CPU" LMB 73.3% 0% 6.7% ""
CAP 20% 0% 73.3% "CPU + Wait for CPU" |<Q>
"STREAMSADMIN"."OGG$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:

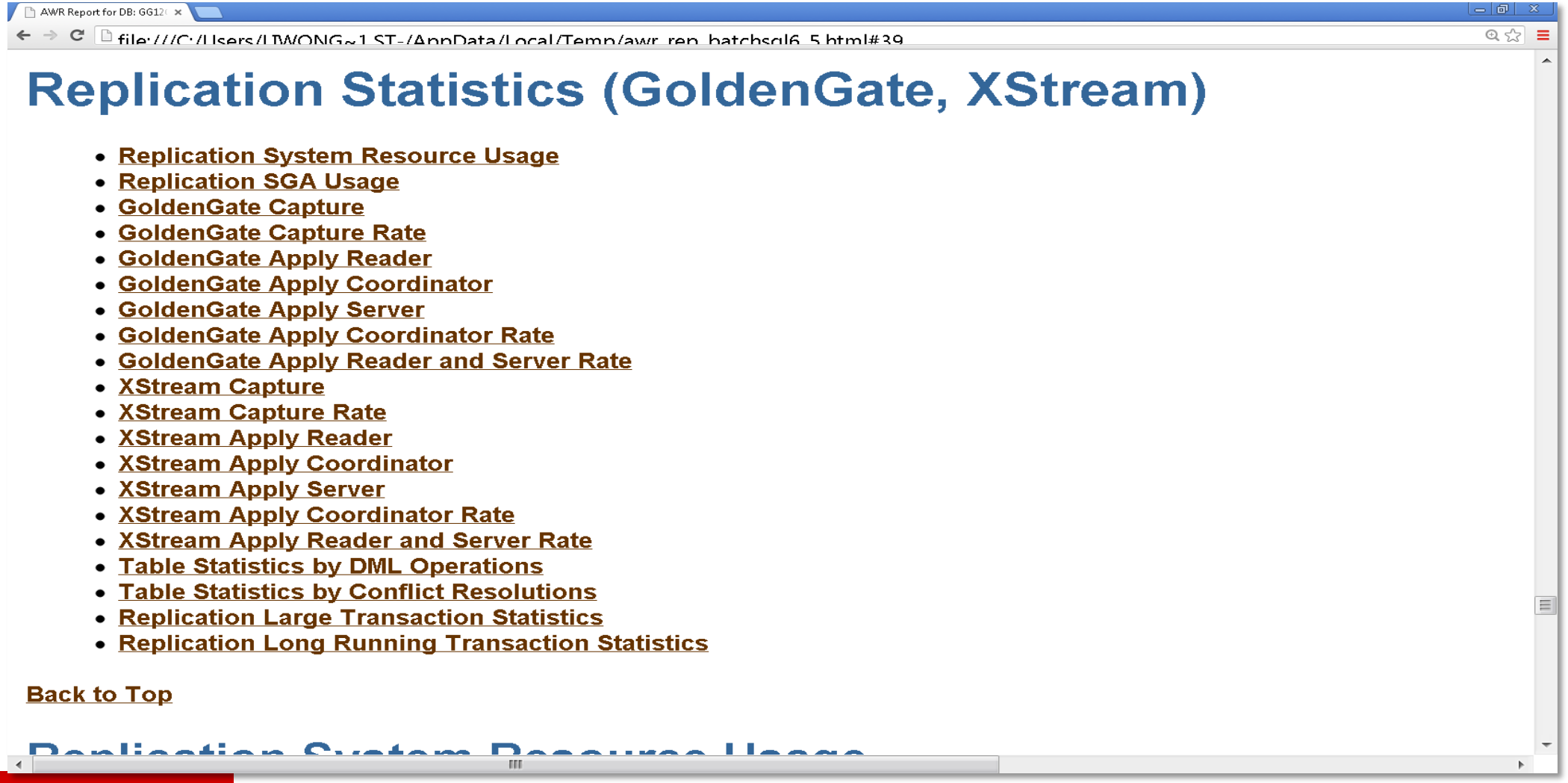
```
PATH 1 RUN_ID 16 RUN_TIME 2014-JAN-12 10:33:59 CCA Y |<R> REP_1A 1375
520424 0 0% 62.5% 37.5% |<Q> "SOESMALL"."OGGQ$REP_1A" 1375 0.01 5001
|<A> OGG$REP_1A 715 715 -1 APR 31.3% 68.8% 0% "" APC 100% 0% 0% "" APS
(7) 68.8% 0% 481.3% "free buffer waits" |<B> OGG$REP_1A APS 1219 22693
93.8% "free buffer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

DB Oracle 12c: GoldenGate AWR report



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

Replicat Name	Apply Name	Txns Received/sec	Txns Applied/sec	Txns Rolled Back/sec	Unassigned Complete Txn/sec	Total Errors/sec
REP_1A	*OGG$REP_1A	8696.50	8696.50	0.00	0.00	0.00

Back to Replication Statistics (GoldenGate, XStream)
Back to Top

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

Replicat Name	Apply Name	Reader LCRs/sec	Server LCRs Applied/sec	Server Dequeue Time/msg	Server Apply Time/msg	Total LCRs Retried/sec	Total Txn Retried/sec
REP_1A	*OGG$REP_1A	52660.91	44774.55	0.00	0.00	0.00	0.00

Back to Replication Statistics (GoldenGate, XStream)

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 ++

DBID	Name	PLATFORM_NAME	Host	Version	INSTANCE	CDB	Database Role	CURRENT_SCN	MIN_
723272336	GGA1	Linux x86 64-bit	scac07adm05.us.oracle.com	12.1.0.2.0	1	NO	PRIMARY	1833215639	

Summary of GoldenGate Integrated Extracts configured in database (ConfigDetails StatsDetails

Integrated Extract Summary Example

Current Time	Extract Name	Capture Name	Capture User	Capture Type	RealTime Mine?	Capture Version	Required Checkpoint SCN	OGG Capture Protocol	LOGMINER_ID	Status	Current Capture State	Capture Lag seconds	Redo Mined MB	Sent to Extract Mb	Pr St T
2014-04-24 08:15:51	EXT_1A	OGG$CAP_EXT_1A	STREAMSADMIN	LOCAL	YES	12.1.0.2.0	2277992	V2	19	ENABLED	WAITING FOR CLIEN T REQUESTS	588874	38054.768	36515.467	201- 08:1

Integrated Extract key parameters (Details)

Capture Name	Extract Name	PARALLELISM	MAX_SGA_SIZE	EXCLUDETAG	EXCLUDEUSER	GETAPPLOPS	GETREPLICATES	CHECKPOINT_FREQUENCY
OGG$CAP_EXT_1A	EXT_1A	2	2048			Y	N	

Integrated Extract Logminer session info (Details)

Capture Name	Available Chunks	Delivered Chunks	Ready to Send Chunks	Builder WorkSize	Prepared WorkSize	Used Memory	Max Memory	Used Memory Percent
OGG$CAP_EXT_1A	256915	53	256862	26528	20768	1521601024	2146435072	70.889683263617

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 OGG$CAP_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

Autotuned Server Count

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

Current Time	Replicat Name	Server Name	Apply User	Status	Registered	Last DDL Time	Current Receiver State	Current Coordinator State	Active Server Count	Unassigned Complete Txns	Low Watermark Message Create Time	High Waterma Messag Create Time
2014-08-07 11:18:34	R41INT	OGG$R41INT	GGDIRECT12	ATTACHED	2014-08-06 16:04:36	2014-08-06 17:56:52	Waiting for message from client	IDLE	5	0	2014-08-07 11:18:30	2014-08- 11:18:30

Integrated Replicat key parameters (Details)

APPLY_NAME	Replicat Name	PARALLELISM	MAX_PARALLELISM	COMMIT_SERIALIZATION	EAGER_SIZE	BATCHSQL	BATCH_SQL_MODE
OGG$R41INT	R41INT	4	8	DEPENDENT_TRANSACTIONS	9500		

Integrated Replicat

Apply Reader

Barrier needed

++ APPLY Reader Statistics ++

Apply Name	Captured or User-Enqueued L	Proc	STATE	Total Messages Dequeued	Total Messages Spilled	SGA Used MB	SGA Allocated MB	Oldest Transaction	Total LCRs with Dependencies	Total LCRs with WM Dependency	Total in-Memory LCRs
OGG$A_DWS	Captured LCRS	AS01	DEQUEUE MESSAGES	10841474	0	1372	1477	5.13.89091	264522	33	77055

Integrated Replicat

Apply Servers Executing in Parallel

REPERROR Configuration

Apply Name	Process	SRVR	State	Total Transactions Assigned	Total Messages Applied	Message Sequence	LCR Retry Iteration	TXN Retry Iteration	Total LCRs Retried	Total TXNs Retried	Total TXNs Recorded	CURRENT_TXN	Elapsed Apply Time (cs)	Apply Time
OGG$REP_1A	AS02	1	EXECUTE TR ANSACTION	1996026	17869076	6	0	0	0	0	0	25.25.16888	172	
OGG$REP_1A	AS03	2	INACTIVE	1950191	17447490	11	0	0	0	0	0	37.13.8475	134	
OGG$REP_1A	AS04	3	EXECUTE TR ANSACTION	2071599	18549954	45	0	0	0	0	0	25.2.16888	160	
OGG$REP_1A	AS05	4	EXECUTE TR ANSACTION	2128114	19044641	31	0	0	0	0	0	33.3.8528	159	
OGG$REP_1A	AS06	5	EXECUTE TR ANSACTION	2149135	19233075	31	0	0	0	0	0	23.7.16869	149	
OGG$REP_1A	AS07	6	INACTIVE	2168994	19406949	11	0	0	0	0	0	22.14.16808	173	
OGG$REP_1A	AS08	7	EXECUTE TR ANSACTION	1976809	17693191	44	0	0	0	0	0	34.28.8528	144	
OGG$REP_1A	AS09	8	EXECUTE TR	2110265	18891703	12	0	0	0	0	0	9.27.9668	136	

Applying Large Transaction

Eager Apply Serializes Apply Processing

Apply server transactions ordered by server_id

Large transaction (131,311 LCRs so far) serializes Apply processing

Instance	Apply Name	Process	SRVR	State	Total Transactions Assigned	Total Messages Applied	CURRENT_TXN	Source Commit SCN	Dependent Transaction	Dependent Commit Position	Message Sequence	Apply Time
1	OGG$RWSR_RA	AS02	1	IDLE	39	76128	26.18.795627	0	28.30.957025	11011147442890	2	
1	OGG$RWSR_RA	AS03	2	IDLE	32	105608	14.14.916095	0	19.10.986363	11011147229634	2	
1	OGG$RWSR_RA	AS04	3	IDLE	27	65249	35.21.428245	0	25.16.810797	11011147439580	2	
1	OGG$RWSR_RA	AS05	4	EXECUTE TRANSACTION	54	168063	21.8.7182694	0	27.10.844939	11011147136371	131311	
1	OGG$RWSR_RA	AS06	5	IDLE	26	100341	33.27.1530005	0	26.18.795627	11011147443934	2	
1	OGG$RWSR_RA	AS07	6	IDLE	15	59856	10.28.8619802	0	10.26.8607120	11011145794624	9578	
1	OGG$RWSR_RA	AS08	7	IDLE	28	54035	28.30.957025	0	26.13.795162	11011147442010	2	
1	OGG$RWSR_RA	AS09	8	IDLE	28	69432	19.10.986363	0	25.15.811057	11011147172357	2	
1	OGG$RWSR_RA	AS0B	10	IDLE	23	52806	26.13.795162	0	35.21.428245	11011147440702	2	
1	OGG$RWSR_RA	AS0D	12	IDLE	26	69459	17.5.976310	0	22.6.2736687	11011147340492	2	
1	OGG$RWSR_RA	AS0E	13	IDLE	15	34320	22.6.2736687	0	14.14.916095	11011147279990	2	
1	OGG$RWSR_RA	AS0F	14	IDLE	15	7312422	25.16.810797	0	17.5.976310	11011147412129	2	

Wait Analysis

Wait events of last 30 minutes of each OGG background process

APPLY SERVER PROCESSES ++

APPLY_SERVER_NAME	EVENT_COUNT	TOTAL_COUNT	PERCENTAGE	BUSY	Wait Event
OGG$REP_1A - 1	1	1671	.1	YES	enq: FB - contention
	1	1671	.1	YES	enq: TX - contention
	1	1671	.1	YES	library cache lock
	4	1671	.2	YES	library cache: mutex X
	73	1671	4.4	YES	enq: TX - index contention
	75	1671	4.5	YES	buffer busy waits
	346	1671	20.7	YES	cell single block physical read
	531	1671	31.8	YES	
**********			----------		
TOTAL			61.8		
OGG$REP_1A - 10	44	1671	2.6	YES	buffer busy waits
	48	1671	2.9	YES	enq: TX - index contention
	187	1671	11.2	YES	cell single block physical read
	311	1671	18.6	YES	
**********			----------		
TOTAL			35.3		
OGG$REP_1A - 11	1	1671	.1	YES	enq: TX - contention

Points towards Buffer Cache / IO System for further investigation

Tips For Analyzing Healthcheck Output

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

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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_SERIALIZATION 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
  http://www.oracle.com/technetwork/database/availability/maa-gg-performance-1969630.pdf
- 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

Oracle Data Integration

Oracle Data Integration

ORCL DataIntegration

blogs.oracle.com/dataintegration

OracleGoldenGate

ORACLE®
Data Integration

http://www.oracle.com/us/products/middleware/data-integration/overview/index.html

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