



An Oracle White Paper
August 2012

Oracle GoldenGate 11g Release 2 New Features Overview

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Executive Overview

With the ever growing trend for businesses to run on transactional software, competitive advantages come when end users can access integrated data, analyze it and make real-time decisions without system interruption or downtime. This demand for low-latency data is compounded by the exponential growth in transactional data volumes and an increasingly heterogeneous enterprise IT environment, creating a need for data integration and replication solutions that are easy to implement and have little to no impact on business-critical applications.

Oracle GoldenGate 11g Release 2 improves businesses' ability to manage transactional processing in complex and critical environments. This is accomplished through new features such as GoldenGate Integrated Capture which supports all Oracle Database and Oracle Exadata compression types; intelligent Conflict Detection and Resolution for customers who use or plan to use Oracle GoldenGate for Active-Active or Multi-Master implementations; expanded globalization capability for international customers including multi-byte support and character set conversions; improved security with added support for the industry encryption standard Federal Information Protection Standard (FIPS); faster performance with reduction of acknowledgement messages during data replication; improved extensibility with event markers for handling custom business processes; enhanced manageability and monitoring for customers wishing to take advantage of Oracle Enterprise Manager; expanded heterogeneity with new real-time capture support for IBM i-Series (AS/400) and delivery support for Postgres.

Introduction

Oracle GoldenGate 11g Release 2 is the most feature rich, robust, and flexible data replication product on the market today. The key new features include:

- Integrated Capture
- Intelligent Conflict Detection and Resolution
- Improved Globalization
- Improved Security and Performance
- Improved Extensibility
- Enhanced Manageability and Monitoring
- Expanded Heterogeneity

Written for business project owners, key stakeholders, and the entire IT organization, this white paper provides an overview of the new features in Oracle GoldenGate 11g Release 2.

For customers who are new to or unfamiliar with Oracle GoldenGate and want to learn more about the product, please visit the Oracle GoldenGate product website at www.oracle.com/goto/goldengate for more information.

Integrated Capture

The Integrated Capture mechanism relies on Oracle's internal log parsing and processing to capture DML transactions. By moving closer to the Oracle database engine, Oracle GoldenGate can take advantage of new Oracle Database features and functionality more quickly.

With Integrated Capture, Oracle GoldenGate now supports all flavors of compression used by Oracle Database and Oracle Exadata, including support for Exadata Hybrid Columnar Compression (EHCC), OLTP, and Segment compression. Integrated Capture also adds distributed transaction support for XA (distributed) and PDML (parallel DML) transactions on Oracle RAC. Finally, XML Object Relational and XML Binary data types are supported along with LOB full and partial reads (selective update) from the redo log. Oracle GoldenGate licensing remains the same for Integrated Capture. Table 1 below highlights the new supported features with Integrated Capture.

TABLE 1. INTEGRATED CAPTURE SUPPORTED FEATURES

CATEGORY	DESCRIPTION
Exadata	Capture support for EHCC compression
Compression	Capture support for OLTP, Segment compression
Distributed Transactions	XA-RAC, PDML
RAC	Simplified RAC management
New Data Types	XML Object Relational, XML Binary
LOB	Full and Partial read from REDO log
REDO Processing	Multi-threaded support
Deployment	Source and Downstream capture support
DDL	Captures tables created with column level password specification
Others	Support IOT with MAPPING table option

Integrated Capture is available for Oracle Database only and does not replace the existing Capture component on the other supported database platforms. Table 2 below breaks down features of the existing Capture as well as Integrated Capture based on Oracle Database version. The existing Capture will now be referred to as Classic Capture to better differentiate the two modules on the Oracle Database.

TABLE 2. CLASSIC CAPTURE AND INTEGRATED CAPTURE FEATURES PER ORACLE DATABASE VERSION

	VERSION	DESCRIPTION
CLASSIC CAPTURE	8i	Only supported in 10.0 and earlier versions of OGG
	9i	Only supported in 11.1 and earlier versions of OGG
	10.1	Only supported in 11.1 and earlier versions of OGG
	10.2	Supported
	11.1.0.7	TDE/TSE Fetch support for SecureFiles, ADTs, VARRAYS, Nested Tables, Object Tables
	11.2.0.2	TDE/TSE Fetch support for SecureFiles, ADTs, VARRAYS, Nested Tables, Object Tables
	11.2.0.3	TDE/TSE Fetch support for SecureFiles, ADTs, VARRAYS, Nested Tables, Object Tables
INTEGRATED CAPTURE	8i	Not supported
	9i	Not supported
	10.1	Not supported
	10.2*	Supported
	11.1.0.7*	Supports TDE/TSE
	11.2.0.2*	TDE/TSE, XA-RAC, Compression, SecureFiles Fetch support for ADTs, VARRAYS, Nested Tables, Object Tables
	11.2.0.3	TDE/TSE, XA-RAC, Compression, XML Object Relational, XML Binary, SecureFiles Fetch support for ADTs, VARRAYS, Nested Tables, Object Tables
* Supported for Downstream Capture model only		

Integrated Capture leverages the Oracle Database's log parsing and processing architecture. This allows Integrated Capture to have seamless traversal of different branches of the redo log, parallelism in mining and transforming redo records, and transparent mining of different threads in a RAC environment. It also allows new enhancements in Oracle Database to be reflected immediately in the product. It's comprised of low-level database processes to mine and transform the redo logs.

Two different deployment models can be configured with Integrated Capture. The conventional Local capture model (Figure 1) configures Integrated Capture to run locally on the source database server. The Downstream capture model (Figure 2) allows Integrated Capture to run on a separate server as long as that server is of the same platform type as the source database.

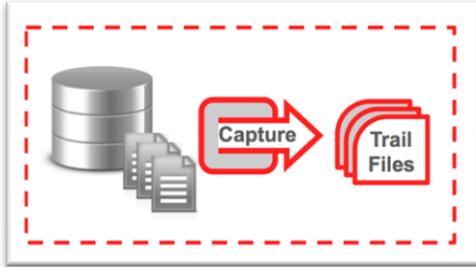


Figure 1. Local Model

When deploying Integrated Capture in a Downstream capture model, two options are available.

- To employ real-time database synchronization, a downstream mining database is created on a secondary server to capture changes from a single source database. Standby redo logs are created on the downstream mining database server and the source database redo changes are shipped continuously to the mining database using Oracle's Data Guard redo log transport. Online redo log changes are applied to the standby redo logs, which are then captured immediately by Integrated Capture to keep the downstream mining database in real-time synch with the source database.
- To capture changes from multiple source databases, archive logs are sent over to the secondary server from the various source databases and processed by their respective Integrated Capture process. This is similar to the archive log only option available today.

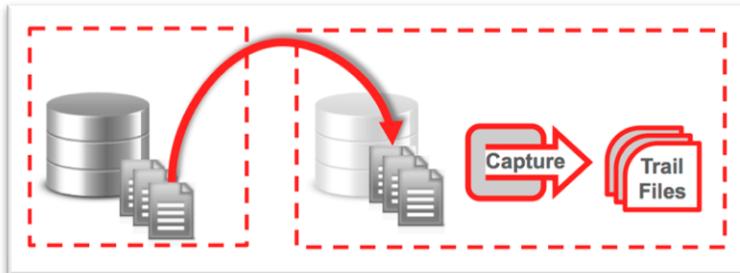


Figure 2. Downstream Model

The Downstream capture model can also be used to enable mining of earlier versions of the database in either real-time or archive log mode. The database where the downstream capture is being performed must be Oracle Database 11g Release 11.2.0.3 or higher; however, the source logs may be from an Oracle Database 10g Release 2 or higher database as long as the source database platform types match that of the downstream mining database.

Customers may choose the option they prefer based on their requirements.

Intelligent Conflict Detection and Resolution

Oracle pioneered conflict detection and resolution in early versions of Oracle replication with products such as Oracle Streams. The same innovation used in earlier products, has now been made available to Oracle GoldenGate. This provides Oracle GoldenGate conflict detection and resolution with a more complete framework that is more automated, and easier to implement than ever before. This is key when setting up conflict detection and resolution in complex environments using Active-Active and Multi-Master configurations.

Setting up conflict detection and resolution will take less time to implement as there are now pre-built functions to identify the conditions under which an error occurs and how to handle the record when the condition occurs. Error conditions handled include inserts into a target table where the row already exists (INSERTROWEXISTS), updates or deletes to target table rows that exist, but the original source data (before columns) do not match the existing data in the target row (UPDATEROWEXISTS, DELETEROWEXISTS), and updates or deletes where the row does not exist in the target database table (UPDATEROWMISSING, DELETEROWMISSING). For each of these conditions a method to handle the error is specified. These methods include applying the change directly (overwrite), ignore the error (ignore), ignore the error and copy the change to the discard file (discard). Resolution can also be based on the value of a specific column called the resolution column and apply to a subset of columns in the row. For example, in many active/active configurations, resolution is determined based on a timestamp column. USEMAX applies the change if the resolution column value on the incoming change is greater than the existing rows value. Similarly, USEMIN applies the change if the resolution column value on the incoming change is less than the existing row's value. A special case method for computing the change delta (USEDELTA) made to a row at the source is provided to increment the target row's column value by that delta. A range of columns can be specified for each resolution. If the range DEFAULT is specified, it includes all columns that are not already included in another range. Data types supported include NUMERIC, DATE, TIMESTAMP, CHAR/NCHAR, and VARCHAR/NVARCHAR. Conflict detection and resolution is used the same way in all supported environments, which includes the following database platforms: Oracle, DB2 for z/OS & LUW (Linux, Unix, Windows), SQL Server, MySQL, Sybase, SQL/MX, Teradata, and PostgreSQL.

Table 3 below shows an example of configuring conflict detection and resolution in an earlier version of Oracle GoldenGate and an example of what it looks like with Oracle GoldenGate 11g Release 2.

Table 3. Conflict Detection & Resolution Example

Syntax for 11g Release 1 CDR	Syntax for 11g Release 2 CDR
<pre>MAP source.Order, TARGET target.Order, REPERROW (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);</pre> <p><u>7 Lines of Code & SQL</u></p>	<pre>MAP source.Order, TARGET target.Order, RESOLVECONFLICT (UPDATEROWEXISTS, (DEFAULT, USEMAX (Modified_TS)));</pre> <p><u>3 Lines of Code, Automatically Resolved</u></p>

Globalization

Expanding the commitment for enhancing support for international implementations, Oracle GoldenGate can now map and transform the data from databases using multi-byte/Unicode character sets.

Enhancements have been made in Oracle GoldenGate 11g Release 2 when deploying in non-ASCII environments. This includes support for character set conversions between Oracle and non-Oracle databases of different character sets, database object names with any characters such as European accent, multi-byte, white space, and symbols as long as the database supports them. Database-like object-level case sensitivity support has also been added, which includes Oracle, DB2 for z/OS & LUW (Linux, Unix, Windows), and SQL/MX case sensitive object names as well as mapping case sensitive from/to case insensitive data stores.

Example use-case:

- Replicates object name with mixed case-sensitivity on Oracle, DB2 for z/OS & LUW (Linux, Unix, Windows) and SQL/MX
 - schema.table, “schema”.table, schema.”table” and “schema.”table” are all different tables.
- Replicating between case-sensitive and case-insensitive databases.
 - The source database is case-sensitive Sybase database and the target is Oracle database but case-insensitive table or case-sensitive table.
- Replicating locale sensitive case-insensitive non-English locale database.
 - Case-insensitive table name i1 and I1 are not the same in a Turkish DB2 database.
- Replicating table and column names with European and multi-byte characters.
 - Table and column name with space “account no”
 - Table and column name with European character “ä”
 - Table and column name with Chinese, Japanese and Korean ideographic characters
 - User and schema names with above characters

Automatic conversions of transactional data across different character set environments have also been added to Oracle GoldenGate 11g Release 2. Character set conversions are automatically handled through the replicat process and are supported between two different character sets of CHAR/VARCHAR/CLOB columns as well as between CHAR/VARCHAR/CLOB and NCHAR/NVARCHAR/NCLOB columns.

Example use-case:

The target database character set must be a superset or equivalent of the source database character set.

- Replicating between two different character set databases
 - Replicates DB2 for z/OS & LUW (Linux, Unix, Windows) multi-byte EBCDIC data to Oracle database.
 - Replicates Shift JIS database data to EUC Japanese database.
- Consolidating two or more different character set database data into one UNICODE database.
 - Consolidate ISO8859-1 Latin-1 and GBK Chinese databases into UTF-8 database.

Security and Performance

Oracle GoldenGate 11g Release 2 now supports Federal Information Protection Standard (FIPS) in addition to the default BLOWFISH encryption algorithms to provide secure data movement across systems and regions. FIPS compliant encryption can now be used for passwords, trail file data, and across the wire communications and includes using crypto algorithms and key management/storage.

In addition to improved security, this release also contains a number of performance improvements. IPv6 support was added with Oracle GoldenGate 11g Release 2. IPv6 improves the efficiency of the data transmissions and each packet in the stream is authenticated. The pump extract process takes advantage of the efficiencies in IPv6, which increases performance.

Prior to Oracle GoldenGate 11g Release 2, data communications between the pump extract and remote collector process were synchronous (Figure 3). This meant data sent from the pump extract to the remote collector process had to be followed with an acknowledgement message from the remote collector. The pump extract could only send out new data after the acknowledgement message was received. In Oracle GoldenGate 11g Release 2, the acknowledgement message can now be skipped for every data record sent (Figure 4). The remote collector does not send an acknowledgement message to the pump extract unless a data packet contains a flag requesting a response. An example flag would be the pump extract checkpointing or determining the appropriate write position in a trail file. Reducing the frequency of acknowledgement messages from the remote collector greatly improves performance of replicating transactions across geographically separated systems in high latency networks.

Prior to Oracle GoldenGate 11g Release 2

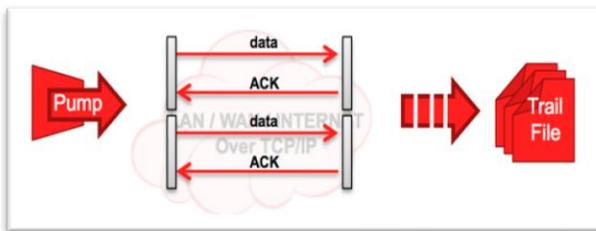


Figure 3. Synchronous

Oracle GoldenGate 11g Release 2

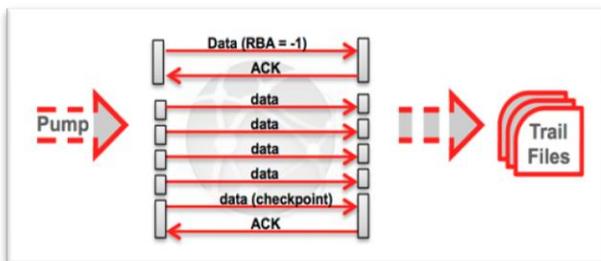


Figure 4. Asynchronous

Extensibility

Using event markers (EVENTACTIONS) enables Oracle GoldenGate processes to take a defined action based on an event record in the transaction log or in the trail file. Event markers are used by those customers who require non-standard processing based on special events in their environments. It simplifies methods to embed specific custom processing in the areas of error handling, alerts, and notification.

Beginning with Oracle GoldenGate 11g Release 2, event markers can now be triggered by DDL operations and variables can now be passed into system shell scripts.

Supported event actions include: TRACE, LOG, CHECKPOINT BEFORE, IGNORE, DISCARD, SHELL, ROLLOVER, REPORT ABORT, CHECKPOINT AFTER, FORCESTOP, SUSPEND, ABORT, and STOP.

Examples of when to use event markers include:

- Invoking a shell command that executes a data validation script.
- Activating tracing when a specific account number is detected.
- Capturing statistics.
- Establishing a point at which to start batch processing or end-of-day reporting procedures.

Manageability and Monitoring

As customers continue to expand the deployment of Oracle GoldenGate across their enterprise, managing and monitoring multiple deployments of Oracle GoldenGate is more critical than ever. Oracle GoldenGate Monitor was first released with Oracle GoldenGate Release 11.1.1.1 and is an advanced monitoring and alerting product designed specifically for Oracle GoldenGate deployments. The product is lightweight and uses simple SNMP integration. Its advanced monitoring, alerting, lag graphs, and historical repository make it a powerful asset when deploying multiple Oracle GoldenGate implementations across the enterprise.

Beginning with Oracle GoldenGate 11g Release 2, Oracle GoldenGate Monitor is now integrated with Oracle Enterprise Manager 12c. Please refer to figures 5a and 5b to view a sample of the capabilities of Oracle GoldenGate Monitor in Oracle Enterprise Manager.

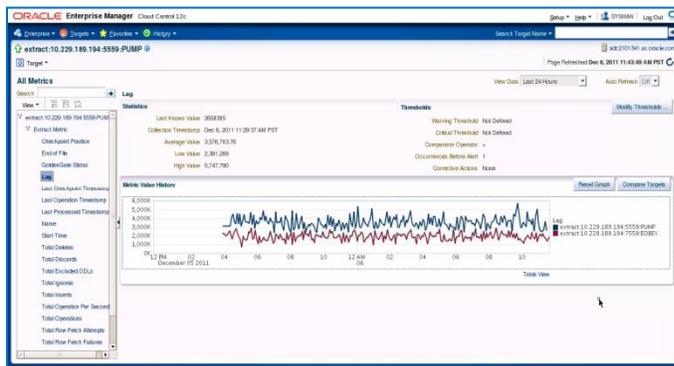


Figure 5a. Monitoring Oracle GoldenGate Lag using Oracle Enterprise Manager

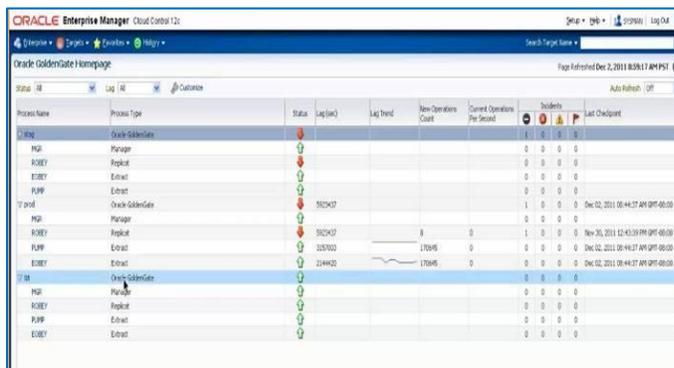


Figure 5b. Monitoring Oracle GoldenGate process health using Oracle Enterprise Manager

In addition to Oracle GoldenGate Monitor being integrated with Oracle Enterprise Manager, efficiencies have been implemented in Oracle GoldenGate 11g Release 2 to improve support for very large implementations. To accomplish this, process management has been improved by eliminating orphaned collector processes. Also, the upper limit on number of process groups (extract, pump, replicat) per deployment has been increased from 300 to 5000 and table statistic gathering has been enhanced to include total numbers of inserts, updates, and deletes, and all other operations.

Expanded Heterogeneity

Oracle GoldenGate 11g Release 2 brought enhancements to existing supported platforms such as: IBM i-Series, Oracle MySQL, Microsoft SQLServer, Sybase, Teradata, and IBM DB2 for z/OS & LUW (Linux, Unix, Windows) including expanded data type support. Table 4 below highlights the new enhancements.

TABLE 4. HETEROGENEITY ENHANCEMENTS

PLATFORM	DESCRIPTION
IBM i-Series (AS/400)	Capture support
Postgres	Delivery support
Teradata	Multi-byte DDL
SQL Server	CLR data types, Geometry, Geospatial data types
Sybase	Computed Columns New data types – BINGINT, Unsigned Integer, Optimized LOB
MySQL	MySQL 5.5, New data type – UINT64
IBM z/OS	Performance improvement during initial load

Summary

Oracle GoldenGate 11g Release 2 improves upon the real-time, heterogeneous data replication capabilities that customers have grown accustomed. With new features and capabilities such as Integrated Capture and enhancements to conflict detection and resolution, globalization, security and performance, extensibility, manageability and monitoring, and heterogeneity, Oracle GoldenGate 11g Release 2 is the most feature rich, robust, and flexible data replication product on the market today. Customers can continue to rely on Oracle GoldenGate for data integration and replication solutions in their most complex and critical environments.



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Features Overview

May 2012

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