Grid Control 10.2.0.5: Streams Management

Patricia McElroy
Distinguished Product Manager, Streams
Managing Streams with Grid Control

Document Structure

• This document is a presentation on managing and monitoring an Oracle Streams configuration using Oracle Enterprise Manager Grid Control 10.2.0.5

• This document is a sequence of two-slide units
  • First slide of the unit presents a topic, through a screenshot
  • Next slide in the unit (tagged “Notes”) elaborates on the topic / screenshot with additional text
Grid Control 10.2.0.5
Simplified Management, Fine-Grained Monitoring

• Wizards to configure replication
• Monitor Streams components by database or by path
  • Database: Streams components on specific database
  • Path: Streams components in path from source to target (across databases)
• Streams metrics for EM alerts notification
  • Default thresholds for Latency, Process Status, or Errors
  • Additional metrics(threshold) available for alerting.
• Automated Workflows for common Streams/DBA actions
Grid Control 10.2.0.5
Simplified Management, Fine-Grained Monitoring

- Oracle Enterprise Manager (EM) Grid Control 10.2.0.5 simplifies Streams configuration and monitoring, with enhanced wizards and Streams management pages. Monitoring can be performed at the individual component level at a database or end-to-end (path from source to target) for the configuration. Alerts are enabled “out of the box” based on process status/errors and latency.
Streams Configuration Wizards

Oracle recommends that, prior to performing Streams Replication on databases in your configuration, you create a Streams Administrator user.

### Setup Streams Replication
- **Replicate Whole Database**
  - Setup replication for the whole database.
- **Replicate Schemas**
  - Setup replication for selected schemes by excluding tables.
- **Replicate Tablespaces**
  - Setup replication for a selected set of table spaces.
- **Replicate Tables**
  - Setup replication for selected tables and specifying the rules.

### Setup Downstream Capture
Create downstream capture processes that can be used in replication by other databases.

### Create Advanced Queue
Create Advanced Queues that can be used by replication processes or any other processes.

### Host Credentials
Operating System login credentials of the machine that runs the selected database:
- **Username**: [Enter]
- **Password**: [Enter]

[Save as Preferred Credential]
Streams Configuration Wizards

• Configuring Streams Replication is simple with Enterprise Manager. You can choose to configure replication between a source and target database for specific tables, schemas, or the entire database. You can even choose to configure at the replication at the granularity of tablespaces: Streams is configured for each table within the tablespace and initial data load (instantiation) is performed using transportable tablespaces.

• Configuring at the schema level is an easy way to get all of the tables in one or more schemas replicated. If there are tables that you don’t want to replicate, the wizard allows you to exclude them automatically.

• The wizards can even help you configure capture at another database so that capture processing is offloaded from the production database. The Setup Downstream Capture wizard walks you thru the steps to configure the log transport as well as the replication configuration.
Setup Replication for Schema **TEST4**

Setup Wizard

**Setup Streams Replication: Object Selection**
Select the list of schemas that should be included in the replication process. You can also exclude some of the tables from a schema using the exclude table options below.

- **Include Schemas**
  - Optionally enter a schema name to filter the data that is displayed in your results set.
  - **Search**
    - Schema

- **Exclude Tables**
  - To exclude certain tables from the schemas that will be configured for replication, click the Exclude Tables button. This will allow you to exclude certain tables from the schemas listed in the above table.
Setup Replication for Schema TEST4

Setup Wizard

- The wizard consists of 5 steps with a status bar at the top to show where you are in the process.
- The first page of the wizard sets up the source database options. In particular, the page allows you to choose what to replicate. In this example, the TEST4 schema will be replicated in its entirety. A search box exists to filter the list of database schemas available. To eliminate specific tables in the schema from replication, open the Exclude Tables section and ADD the table to the list.
Identify TARGET Database

Setup Wizard

Setup Streams Replication: Destination Options

Select the destination database and specify the Streams Administrator credentials with which you want to configure Streams Replication.

Destination Database: STR11LCZ.us.oracle.com

Streams Administrator: streamsadmin

Password: ********
Identify TARGET Database

Setup Wizard

• The 2nd step configures the destination database. Choose the destination database using the flashlight to identify the list of databases available. Provide the streams administrator schema and login password for the destination database.
Replication Options

Setup Wizard

Directory Path
Specify existing directories or directory objects to be used for datapump export and import. They will be used to move data between source and destination databases during initial setup. If directories option is selected, Enterprise Manager will create temporary directory objects that will be deleted after replication is setup.

- Specify Directory objects
  - Source Database
  - Destination Database

Advanced Options

Options
- Capture, Propagate and Apply data manipulation language (DML) changes
  This option is used in only table rule setup
- Capture, Propagate and Apply data definition language (DDL) changes
  Select to configure an Oracle Streams replication environment that maintains both DML and DDL changes
- Setup bi-directional replication
  If selected then a capture and apply process is configured at both source and destination databases

Processes

Capture Process
- Local Capture
  Select this option to creeslise the capture processes on the current database
- Downstream Capture
  Select this option to use the capture processes running on either database

Downstream Database
Select name of the downstream database from which you want to use the capture process

Log Parameter
Select the log parameter that will be used for sending data to the downstream database using logminer process. This parameter is set during the creation of downstream capture process

Select an existing Streams Capture process, or specify a new name and a new capture process will be created. The Capture process runs in the source database in case of local capture and in the downstream database in case of downstream capture.
Replication Options

Setup Wizard

• The 3rd step configures the replication options. Datapump export/import is used to instantiate the data (ie, copy the data) from the source to the target database. While the wizard automatically chooses a directory on both the source and destination databases, you can specify another directory, if you choose. Alternatively, you can choose an existing database directory object by clicking on the “Specify Directory objects” check box.

• By default, the wizard configures uni-directional replication. To choose bi-directional replication or control other replication options, open the “Advanced Options” section of this page.

• It is also possible to explicitly name or choose an existing capture, propagation, and apply process in the Advanced Options.
Replication Options (continued)

Setup Wizard

Capture Name: Enter a name for the capture process; if it is left blank then setup process will create a default name while performing the setup.

Propagation Process:
Select an existing Streams Propagation process, or specify a new name and a new propagation process will be created. The Propagation process runs in the source database in case of local capture and in the downstream database in case of downstream capture.

Propagation Name: Enter a name for the propagation process; if it is left blank then setup process will create a default name while performing the setup.

Apply Process:
Select an existing Streams Apply process, or specify a new name and a new apply process will be created. The Apply process runs in the destination database.

Apply Name: Enter a name for the apply process; if it is left blank then setup process will create a default name while performing the setup.

Home | Targets | Deployments | Alerts | Compliance | Jobs | Reports | Setup | Preferences | Help | Logout
Replication Options (continued)

Setup Wizard

• The previous slide continues the display of the Advanced Options for the wizard. This section can be used to explicitly identify a new name or an existing name for the capture, propagation, or apply process. If the name is left blank, the setup process will create a name for the process.
Schedule Job

Setup Wizard

Setup Streams Replication: Schedule Job
You can choose to run the setup immediately or schedule the setup to run later.

Start

- Immediately
- Later

Date: Mar 23, 2009
(Timezone: Mar 23, 2009)

Time: 10:00 AM/PM

Home | Targets | Deployments | Alerts | Compliance | Jobs | Reports | Setup | Preferences | Help | Logout

Oracle
Schedule Job

Setup Wizard

- The 4th step controls when to perform the actual setup. If “Later” is chosen with a specific date/time, an EM job is scheduled to perform the work.
Replication Setup Review

Setup Wizard

Setup Streams Replication: Review

Review the summary results and click the submit button to start the replication setup process. Setup process will be started as the Enterprise Manager job. You can also edit the configuration parameters by using the edit script option.

Source Database
- Host Name: 140.07.25.29
- Host Username: sadatnow
- Database: STR11LCZ.US.ORACLE.COM
- Database Version: 11.1.0.7.0
- Username: streamsadmin
- Datapump Directory Path: /u01/app/oracle/product/11.1.0/11.1.0.7/sidb/rdbms/log/
- Replication Type: Replicate Schemas
- Bidirectional replication enabled: No
- DML changes enabled: Yes
- DDL changes enabled: Yes
- Capture Name: CAPTURE_TEST4

Destination Database
- Host Name: 140.07.25.32
- Database: STR11LCZ.US.ORACLE.COM
- Database Version: 11.1.0.7.9
- Username: streamsadmin
- Datapump Directory Path: /u01/app/oracle/product/11.1.0/11.1.0.7/sidb/rdbms/log/
- Apply Name: APPLY_TEST4
Replication Setup Review

Setup Wizard

• The final step allows a review of the selections from the previous pages. If necessary, you can return to previous pages to change selections using the Back button. You can also view the generated script using the Edit Scripts button.

• The script can be edited or saved to a file from the Edit Scripts button as well.

• Once you are satisfied with your selections, click the Submit button. An EM job is submitted, and tracked via the normal EM job system.
Monitoring with Grid Control
Monitoring with Grid Control

• The database home page of Grid Control includes an entry point to Streams monitoring with a display of the number of Streams components in the High Availability section of the page. This section consists of a state indicator followed by the number of components in that state. The green checkmark indicates that the processes are enabled and running. The exclamation mark in the yellow triangle is a warning – indicating that there is a WARNING alert. Clicking on the number takes you to the Streams Overview page.

• At the bottom of this page are the EM Alerts for the database. Streams alerts based on process status, latency, and process errors are automatically configured. Additional metrics are available for alerting as well from the All Metrics link in the Related Links area (not pictured above).
## Streams Metrics

### Metric and Policy Settings

<table>
<thead>
<tr>
<th>Metric</th>
<th>Comparison Operator</th>
<th>Warning Threshold</th>
<th>Critical Threshold</th>
<th>Corrective Actions</th>
<th>Collection Schedule</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Streams Apply - (% Messages in Waiting State)</td>
<td>&gt;</td>
<td>75</td>
<td>90</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams Apply - (% Spilled Messages)</td>
<td>&gt;</td>
<td>60</td>
<td>80</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams Capture - (% Spilled Messages)</td>
<td>&gt;</td>
<td>60</td>
<td>80</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams - Latency (seconds)</td>
<td>&gt;</td>
<td>300</td>
<td>900</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams Process Errors</td>
<td>&gt;</td>
<td>0</td>
<td></td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams Process Status</td>
<td>=</td>
<td>DISABLED</td>
<td>ABORTED</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
<tr>
<td>Streams Prop - (% Messages in Waiting State)</td>
<td>&gt;</td>
<td>75</td>
<td>90</td>
<td>None</td>
<td>Every 5 Minutes</td>
<td></td>
</tr>
</tbody>
</table>
Streams Metrics

• Metrics and Alerts for Streams are configured from the EM Metric and Policy Settings page. Warning and Critical Thresholds can be modified to match customer business requirements.

• The Metric and Policy Settings page displays all metrics in alphabetical order. This page has been altered to highlight only the Streams metrics with preset thresholds.
Grid Control Streams Management

- For databases with no existing Streams components, the entry point to Streams is on the Data Movement tab. Clicking on Setup takes you to the wizards page.
- Clicking on Manage Replication when no components exist, directs you to the Setup page. If Streams components exist, then clicking Manage Replication goes to the Overview page of Streams.
Streams Overview
Streams Overview

• The Streams Overview page summarizes information about Streams for the current database as well as across databases. Under the Current Database Summary, each component type is listed with an status indicator flag followed by the number of components of the status. For the current database (db1), there is a single capture, propagation, and apply process – and each of those components is up and running (green check in from of the number). Clicking on the number link for capture takes you to the Capture component page. The Streams Pool Size in Megabytes along with the percent of the Streams pool used with a status indicator. The green check associated with the Streams Pool Size Used metric indicates that the metric is within the acceptable range for the Streams Pool size alert threshold. Clicking on the linked number associated with the Streams Pool Size(MB) takes you to a page where you can modify the size of the Streams Pool.

• There are 2 possible Performance views: component and path. In this slide, the component level view displays charts indicating the performance latency of the Streams components of the database DB1 for the last hour. Throughput statistics can also be displayed via the Statistics pull-down menu. The path level view displays charts for latency and throughput for the top 5 paths monitored with Grid Control.
Monitor Streams by Database

1 active transaction for capture
Monitor Streams by Database

• The database home page of Grid Control includes an entry point to Streams monitoring with a display of the number of Streams components in the High Availability section of the page. This section consists of a state indicator followed by the number of components in that state. The green checkmark indicates that the processes are enabled and running. The exclamation mark in the yellow triangle is a warning – indicating that there is a WARNING alert. Clicking on the number takes you to the Streams Overview page.

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Monitor Streams by Database

1 active transaction for capture
Monitor Streams by Database

• Clicking on the component name goes directly to the statistics page for the component. Clicking on the latency or throughput links goes to the metric collection page for that metric. Clicking on the links in the final column (Current transactions active/spilled) goes to the page showing the active or spilled transactions for the component (shown at bottom of slide). Capture can only show active transactions. Apply can show active or spilled transactions. Spilled transactions for apply are large or long-running transactions that have spilled to disk to free up memory. The threshold at which a transaction spills to disk (count of change records in the transaction) is managed as an apply parameter (TXN_LCR_SPILL_THRESHOLD).

• The View Transaction Details button (Active Streams Transactions List display) sets up an ad-hoc LogMiner session at the source database to review the source transaction.
Automated Workflow
Create Source LogMiner Session

Oracle Enterprise Manager 10g
Grid Control

Query Time Range
- Time Range
- SCN Range
  - Start SCN: 22324267
  - End SCN: 22324918

TIP: The oldest SCN available on disk is 20108078 View Archived Logs
TIP: Earlier start times are available by restoring archived logs

Overview
LogMiner allows you to:
- Browse transactions by time or SCN range
- Query fastest by table name
- View results by transaction summary or record
- LogMiner is fully integrated with Flashback Transaction to:
  - Show dependent transactions
  - Undo a transaction along with dependent transactions

Query Filter
- View All Transactions
- View DDL Only
  - Table
  - DB User

Advanced Query
- Additional LogMiner Columns
  - WHERE XIDUSHN=27 AND XIDS=19 AND XIDSCN=546

Additional columns may be specified using a WHERE clause (example: WHERE MACHINE_NAME = 'myhost' AND DBMS_LOGMNR_REM_VALUE = 'SCOTT.DEPT.LOC' = 'BOSTON') Click on the info icon for the column names.
Automated Workflow
Create Source LogMiner Session

• Clicking on View Transaction Details displays a page with information to automatically set-up of a LogMiner session at the source database. Notice that the screen is pre-populated with the SCN and transaction id information from the previous page. The Advanced Query section can be used to further filter the information from the v$logmnr_contents view.

• Typically all you need to do on this page is click the Continue button.
Automated Workflow
Review Source Transaction

### LogMiner Results

**Summary**
- Matching Transactions: 1
- Matching Redo Records: 7
- Query Filter: where XIDUSN='27' and XIDSRT='8' and XIDSN='546'
- Total Time: 5 seconds

The results show transactions containing redo records that matched the query filter. Transactions may contain other redo records. Click on a Transaction ID to view all of the redo records in a transaction. The results can be filtered further by searching the SQL redo.

#### Transaction Results

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>SCN</th>
<th>Operation</th>
<th>Schema</th>
<th>Table</th>
<th>SQL Redo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500800022020011</td>
<td>22324267</td>
<td>START</td>
<td></td>
<td></td>
<td>set transaction read write;</td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324267</td>
<td>DELETE</td>
<td>TEST1</td>
<td>BLOTAB</td>
<td>delete from &quot;TEST1&quot;. &quot;BLOTAB&quot; where &quot;INDEX_COL&quot; = 1 and ROWID = 'AAAAePAAAHAHAAMACTAAA';</td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324267</td>
<td>INTERNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324267</td>
<td>INTERNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324918</td>
<td>INTERNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324918</td>
<td>UPDATE</td>
<td>TEST2</td>
<td>BLOTAB</td>
<td>update &quot;TEST2&quot;. &quot;BLOTAB&quot; set &quot;BLOB_COL&quot; = NULL where &quot;INDEX_COL&quot; = 101 and ROWID = 'AAAAeYAAAAAFkWABk';</td>
</tr>
<tr>
<td>1500800022020011</td>
<td>22324918</td>
<td>INTERNAL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Automated Workflow
Review Source Transaction

• There are 2 ways to view the information returned: summary information, or Redo Record. The above is a View by Redo Record. This slide shows the DML changes made by transaction id 27.8.546: a DELETE from the TEST1.BLOBTAB table and an UPDATE to the TEST2.BLOBTAB table.
## Manage Process Parameters

### Example: Apply Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Set by user</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARALLELISM</td>
<td>1</td>
<td>NO</td>
</tr>
<tr>
<td>STARTUP_SECONDS</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>TRACE_LEVEL</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>TIME_LIMIT</td>
<td>INFINITE</td>
<td>NO</td>
</tr>
<tr>
<td>TRANSACTION_LIMIT</td>
<td>INFINITE</td>
<td>NO</td>
</tr>
<tr>
<td>MAXIMUM_SCN</td>
<td>INFINITE</td>
<td>NO</td>
</tr>
<tr>
<td>WRITE_ALERT_LOG</td>
<td>Y</td>
<td>NO</td>
</tr>
<tr>
<td>DISABLE_ON_LIMIT</td>
<td>N</td>
<td>NO</td>
</tr>
<tr>
<td>DISABLE_ON_ERROR</td>
<td>Y</td>
<td>NO</td>
</tr>
<tr>
<td>COMMIT.Serialization</td>
<td>FULL</td>
<td>NO</td>
</tr>
<tr>
<td>ALLOW_DUPLICATE_ROWS</td>
<td>N</td>
<td>NO</td>
</tr>
<tr>
<td>TXN_LCR_SPILL_THRESHOLD</td>
<td>10000</td>
<td>NO</td>
</tr>
<tr>
<td>PRESERVE_ENCRYPTION</td>
<td>Y</td>
<td>NO</td>
</tr>
<tr>
<td>RTRIM_ON_IMPLICIT_CONVERSION</td>
<td>Y</td>
<td>NO</td>
</tr>
</tbody>
</table>
Manage Process Parameters

Example: Apply Parameters

• Parameters for both capture and apply can be modified using the Edit Parameters Action for the component.
Monitor Streams Activity by Path

11g Database

<table>
<thead>
<tr>
<th>Select Path/Component Name</th>
<th>Type Status State</th>
<th>Bottleneck (Seconds)</th>
<th>Throughput (Messages/Sec)</th>
<th>Component Database</th>
</tr>
</thead>
<tbody>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STR1LCY US</td>
<td>CREATING LQR</td>
<td>7</td>
<td>1345.62</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STR1LCY US</td>
<td>ENQUEUED</td>
<td>0</td>
<td>3697.07</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STR1LCY US</td>
<td>DEQUEUED ENQUEUED</td>
<td>0</td>
<td>1341.79</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>ENQUEUED</td>
<td>0</td>
<td>1411.03</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>DEQUEUED</td>
<td>7</td>
<td>1345.62</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>PAUSED FOR FLOW CONTROL</td>
<td>-1</td>
<td>0</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>PRERADING</td>
<td>4</td>
<td>231.97</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>ENQUEUED</td>
<td>2</td>
<td>538.7</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>DEQUEUED</td>
<td>2</td>
<td>230.13</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>ENQUEUED</td>
<td>324.93</td>
<td>STREAMING US.ORACLE.COM</td>
<td></td>
</tr>
<tr>
<td>STREAMING US.ORACLE.COM=&gt;STREAMING US</td>
<td>IDLE</td>
<td>4</td>
<td>231.97</td>
<td>STREAMING US.ORACLE.COM</td>
</tr>
</tbody>
</table>
Monitor Streams Activity by Path

11g Database

- Path monitoring uses the 11g Streams Performance Advisor feature to discover the topology, collect statistics, and provide analysis of the Streams path. It is possible to monitor 10g databases by path as long as using an 11.1.0.7 database to perform the monitoring functions. The 11g database does not need to be a source or target database in a Streams configuration. Refer to MyOracle Support Note 784021.1 for further details on this.

- The previous slide shows monitoring of both 10g and 11g databases by path. When a specific path is expanded, each component in the path is displayed from the source capture to the target apply in the appropriate order represented with an icon in the Type column: capture, queue, propagation sender, propagation receiver, queue, and apply. The status of each component is visible (up, down arrows) along with the current run State, Latency, and Throughput rates. The rightmost column identifies the database on which the component resides. Notice that both the components and component database are links. These links take you directly to the component or the component database, as appropriate. You can also use this page to directly manage each component by clicking the radio button in the Select column for the specific component, then choosing an Action (Enable/Disable, View Performance Analysis Data, View Statistics etc), and clicking the Go button for the Action.
### Component Level Statistics

<table>
<thead>
<tr>
<th>Name</th>
<th>Component Database</th>
<th>Path ID</th>
<th>Bottleneck</th>
<th>Latency (Seconds)</th>
<th>Message Apply Rate (Messages/Sec)</th>
<th>Transaction Apply Rate (Tnx/Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUMMY_APPLY</td>
<td>STR1LCY.US.ORACLE.COM</td>
<td>2</td>
<td>NO</td>
<td>0.1</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>APPLY$_STR1LCY_36</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>11</td>
<td>NO</td>
<td>31</td>
<td>1866.25</td>
<td>4.88</td>
</tr>
<tr>
<td>APPLY$_BMFTKT</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>12</td>
<td>NO</td>
<td>31</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>APPLY$_STR1LCY_3</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>1</td>
<td>NO</td>
<td>1026</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

### Session Level Statistics

<table>
<thead>
<tr>
<th>Name</th>
<th>Component Database</th>
<th>Type</th>
<th>Subcomponent Type</th>
<th>Idle (%)</th>
<th>Flow Control (%)</th>
<th>Top Wait Event (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPLY$_STR1LCY_36</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY READER</td>
<td>4.76</td>
<td>88.9</td>
<td>EVENT: CPU + Wait for CPU:8.33</td>
</tr>
<tr>
<td>APPLY$_BMFTKT</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY COORDINATOR</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>APPLY$_BMFTKT</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY SERVER</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>APPLY$_STR1LCY_36</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY SERVER</td>
<td>2.38</td>
<td>0</td>
<td>EVENT: log buffer space:11.9</td>
</tr>
<tr>
<td>APPLY$_STR1LCY_36</td>
<td>STR1LCZ.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY COORDINATOR</td>
<td>100</td>
<td>0</td>
<td>EVENT: log file switch (checkpoint incomplete): 8.33</td>
</tr>
<tr>
<td>DUMMY_APPLY</td>
<td>STR1LCY.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY READER</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>DUMMY_APPLY</td>
<td>STR1LCY.US.ORACLE.COM</td>
<td>APPLY</td>
<td>APPLY COORDINATOR</td>
<td>100</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Top Wait Events:**
- EVENT: CPU + Wait for CPU:8.33
- EVENT: log file switch (checkpoint incomplete): 8.33
- EVENT: CPU + Wait for CPU:71.43
Streams Performance Advisor View

• One of the actions for drill down is to View Performance Analysis Data. The focus in this slide is on the Apply tab of the Streams Performance Advisor page for the View Performance Analysis Data action. In the Component Level Statistics frame, the message and transaction rates are shown along with the latency (current time-message creation time at source).

• The Session Level Statistics frame displays information about each apply subcomponent (Apply Reader, Coordinator, and Servers) along with percentage of time in the idle state or in flow control, and the top 3 wait events. For the highlighted Apply Server (red box), wait event time is spent on and waiting for CPU, followed by log buffer waits and log file switch. Normal database tuning recommendations can be used to resolve these wait events.
Session Information

• Alternatively, you can choose the View Statistics action from the Monitor Path page for the apply process which will bring you to the statistics for the specific apply process. From that statistics page for apply, you can drill down into the specific session of interest (apply reader, apply coordinator, apply server) to get to the standard EM database session views for current sql or activity as shown in this chart. In this slide the activity tab was chosen and you can see a lot of time is spent on the CPU along with redo log associated waits (file and buffer). You can drill down even further with ASH.
Managing Apply Errors

Automatic Conflict Detection

![Managing Apply Errors Diagram]

**Compare Values: APPLY$_STRM_3**

- **Old Value** shows the old column value in the row LCR. This is the column value for the row before the DML change.
- **New Value** shows the new column value in the row LCR. This is the column value for the row after the DML change.
- **Current Value** shows the column value in the row at the destination database. This is the row that will be modified by the raw LCR when the apply process applies the change.

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Column Type</th>
<th>Old Value</th>
<th>New Value</th>
<th>Current Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>SYS VARCHAR2</td>
<td>Accepted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORDER_NUMBER</td>
<td>SYS VARCHAR2</td>
<td>1028</td>
<td>1028</td>
<td>MAKEFAIL</td>
</tr>
<tr>
<td>DELIVERY_DATE</td>
<td>SYS DATE</td>
<td>20-SEP-08</td>
<td>1028</td>
<td></td>
</tr>
<tr>
<td>PART_NUMBER</td>
<td>SYS VARCHAR2</td>
<td>4455</td>
<td>4455</td>
<td></td>
</tr>
</tbody>
</table>
Managing Apply Errors

Automatic Conflict Detection

- An apply error occurs if the data in the row being updated at the target database does not match the source database. This is called a conflict – and can occur when the same row is updated in multiple databases around the same time. Streams identifies the conflict and, if there is no conflict resolution configured, writes the entire transaction to the error queue. This is an example of an 11g error message that identifies the name of the table, the primary key of the row, and the column(s) that conflict in the Error Message. The Message Number column identifies which LCR (Logical Change Record) caused the error. The Message Count column is the total number of LCRs in the transaction. You can use the View Error LCRs button for the transaction to drill down to the actual LCR.

- At the bottom of the slide, is the result of comparing the logical change record with the current database row value. The Old Value and New Value refer to the values within the LCR before the change (Old Value) and after (New Value) the change was made at the source. Current Value is the current value of the row in the target database.
Automatic Transformations

Edit Rule

Rule Name: "STREAMADMIN"."TEST1160"
Condition: 

Associated Transformation

Custom Rule Based Transformation

Declarative Rule Based Transformation

Add

Select Declarative Type

Step Number Description

Related Links

Create PL/SQL Functions
Automatic Transformations

• Adding a transformation to a rule is simple with Enterprise Manager. This example shows renaming the schema from TEST1 to an existing schema called OAK. Use the pull-down menu under Declarative Rule Based Transformation to choose an Oracle supplied transform for DML. In this case – to rename a schema. Click on Go. The Add transformation: Rename Schema page comes up prompting for the OLD (FROM) and NEW (TO) schema names. Use the step number to reconfigure the order in which transformations are performed. See the Streams documentation for further information on ordering of transformations.

• The list of all declarative transformations for a rule are visible on the EDIT RULE page (this page – left hand graphic)

• Custom transformations are pl/sql functions provided by the user. These can be registered to a particular rule using the Custom Rule Based Transformation block.
Streams Resources

- **Oracle Streams Technology Portal on OTN:**
  [http://otn.oracle.com/products/dataint/content.html](http://otn.oracle.com/products/dataint/content.html)

- **Oracle Streams Customer Success Stories on OTN:**

- **10.2 Oracle Streams Recommendations and Best Practices**
  - *Streams Configuration Best Practices* (10.2) on OTN
  - *Streams Performance Tuning Best Practices* (10.2) on OTN

- **MyOracle Support Notes**
  - 784021.1 - Streams and Enterprise Manager 10g Release 5 Grid Control
  - 556742.1 - Extended Datatype Support
Streams Resources

• These resources are available for further information about Oracle Streams and Best Practices. The MyOracle Support Note 784021.1 is specific to 10.2.0.5 Grid Control and Streams. Please review this note to obtain the Streams Performance Advisor patch that enables monitoring of 10g database.