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Oracle Streams Replication and Advanced Queuing: What's New in Oracle Database 11g

Patricia McElroy
Principal Product Manager

Alan Downing
Senior Director, Streams Development



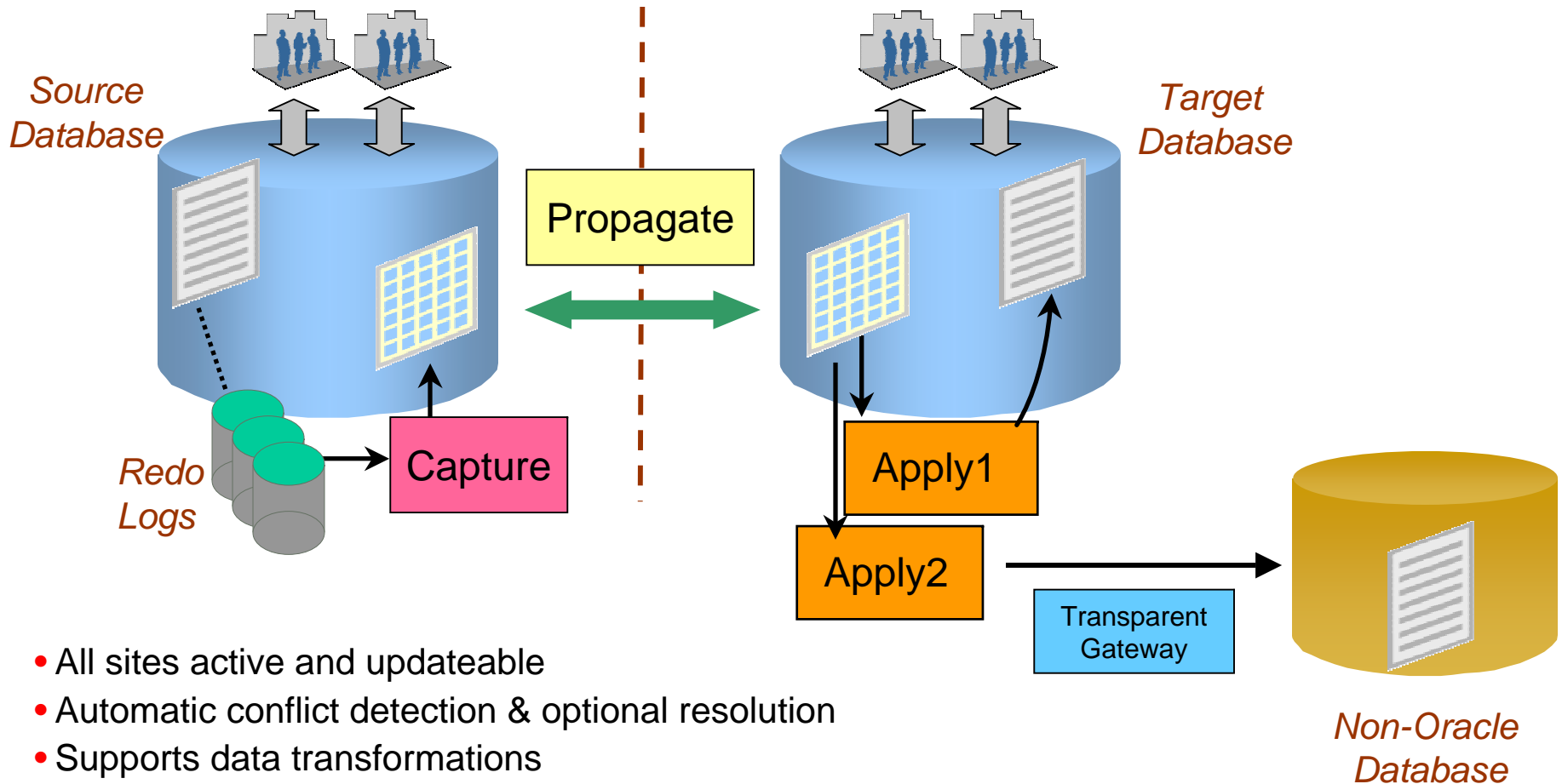
What is Oracle Streams?

- Simple solution for information sharing
- Provides
 - replication
 - data warehouse loading and simple ETL
 - database migration
 - application upgrade
 - message queuing
 - event management and notification

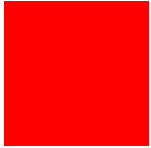
Oracle Streams: Replication



Streams Capture & Apply

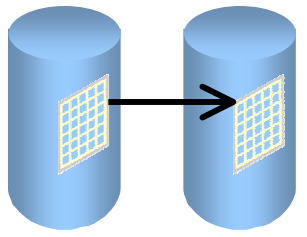


- All sites active and updateable
- Automatic conflict detection & optional resolution
- Supports data transformations
- Flexible configurations – n-way, hub & spoke, ...
- Database platform / release / schema structure can differ
- Provides HA for applications where update conflicts can be avoided or managed

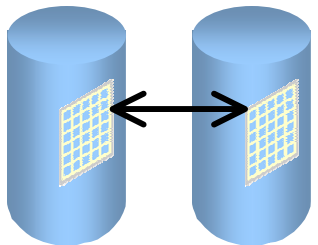


Hub & Spoke Examples

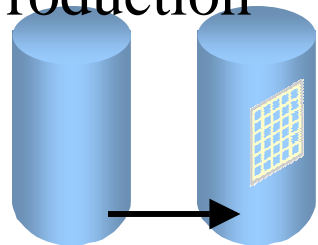
Reporting



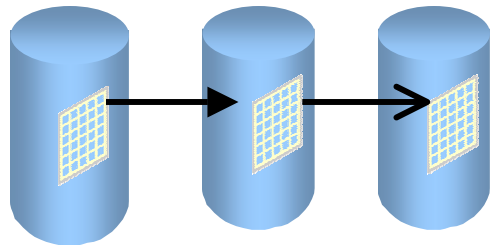
Updatable



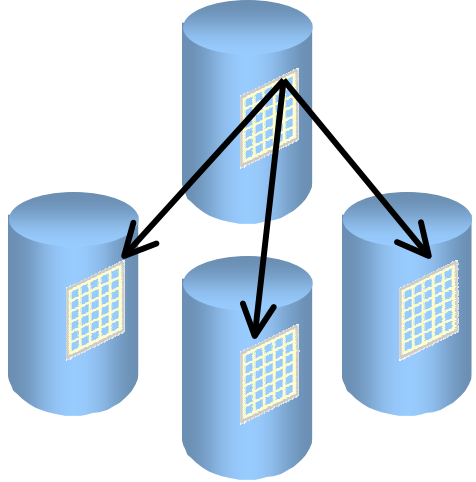
Offload
Production



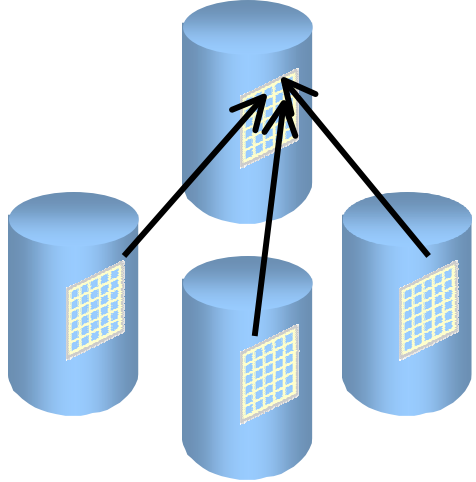
Cascade



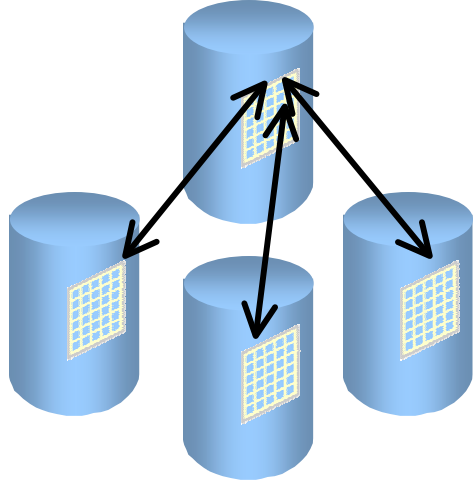
Disseminate



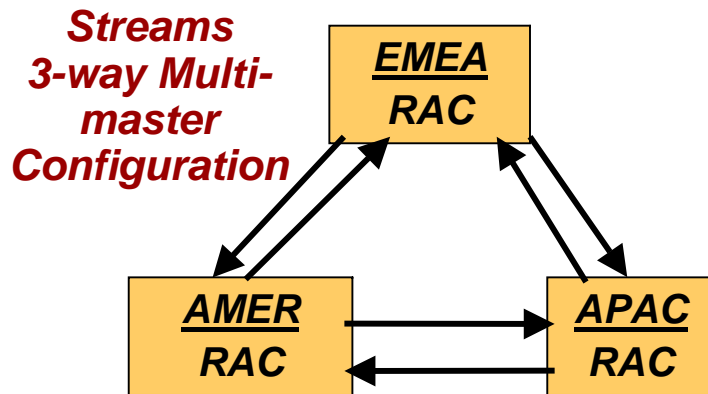
Consolidate



Bidirectional



N-way Multimaster Replication



Each Database

3 queues: 1 for each process

1 capture (local changes)

2 apply processes

- changes from each of the other source databases

- Real-time data replication useful to provide site autonomy and balancing usage
- Geographically distinct locations, frequently across WAN
- Consistent data available at each database
- Updates at each database shared directly with each of the other databases
- Automatic conflict detection, customizable conflict resolution



Streams is Flexible

- Streams is used to solve a wide variety of customer business needs
 - Replication
 - Auditing
 - Data transformation
 - Extend database functionality by combining with other Oracle features
- Customization during capture, propagation, and apply
 - Data transformation
 - User-defined apply processing
 - Integration with Oracle Streams Advanced Queuing



Oracle Streams: Replication New Features

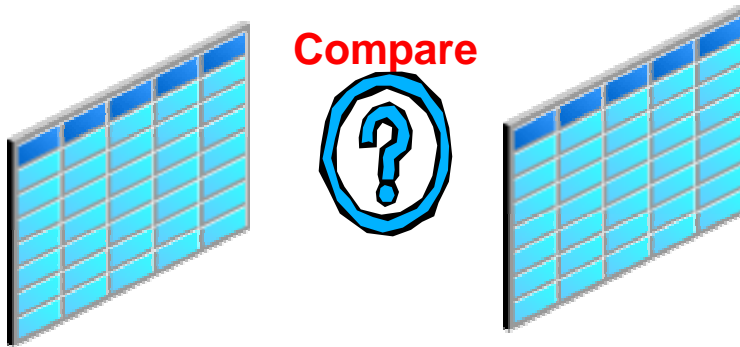




Getting Started...

- Documentation: 2Day+ Data Replication and Integration
 - Replication using Streams , Materialized Views
 - Advanced Queuing
 - Table Data Comparison
- Facilitate Streams knowledge ramp-up
- Provides basic conceptual information
- Cookbook style examples of common configurations

Data Everywhere: But Is It Consistent?



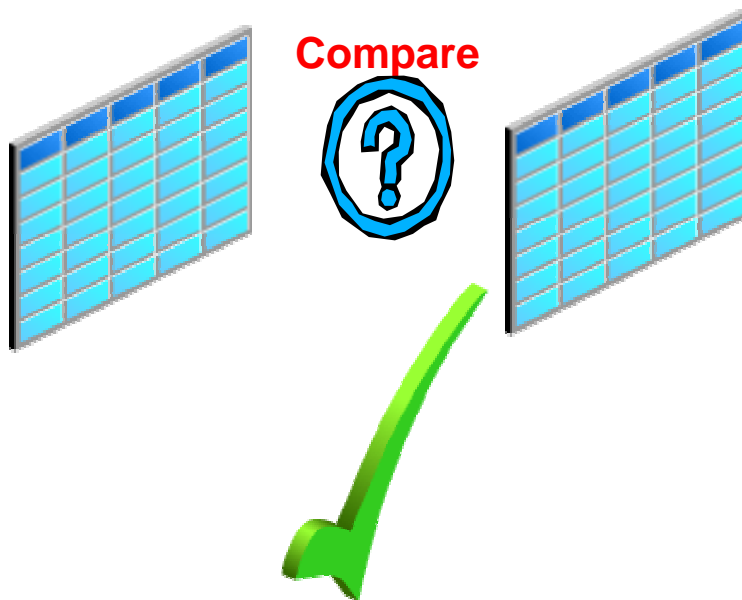
The Challenge:

- Multiple copies of tables across systems
- Validate that data is consistent
- Minimize system resources for determination

The Solution:

- **DBMS_COMPARISON** package

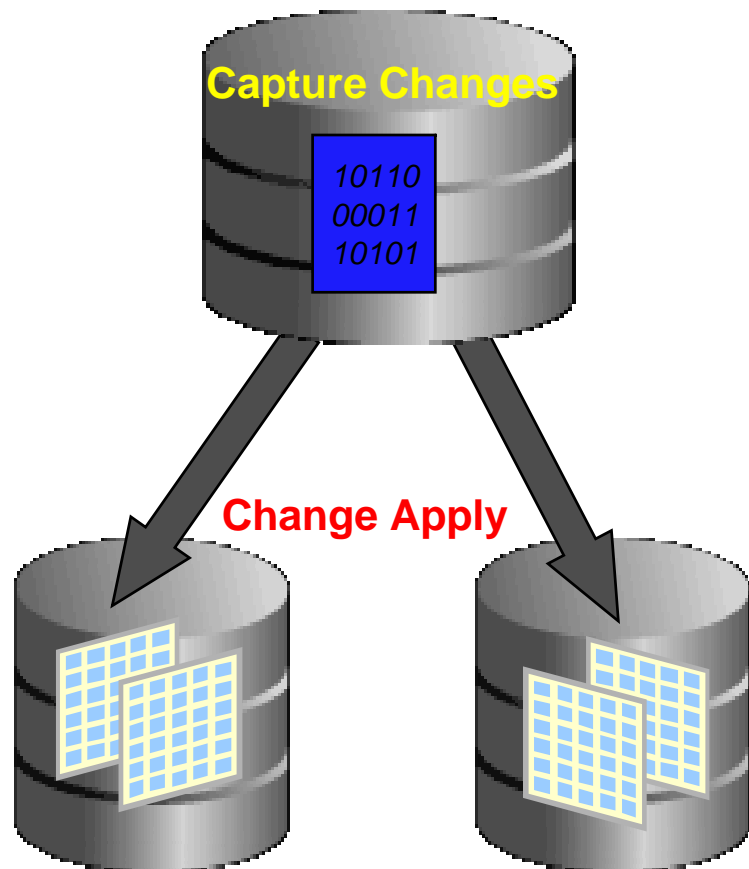
Data Comparison



DBMS_COMPARISON

- Consistency Check Modes
 - Identify tables differ
 - Identify differing rows by key value
- Compare data between live sources
 - Compare 11.1 with 10.1, 10.2 or 11.1
 - Table, View, Materialized View
- Recheck capability
 - In-flight data
 - Rows that are different
- Converge feature
 - Identify “truth” database (local or remote) for rows that are different

Understanding a Streams Environment



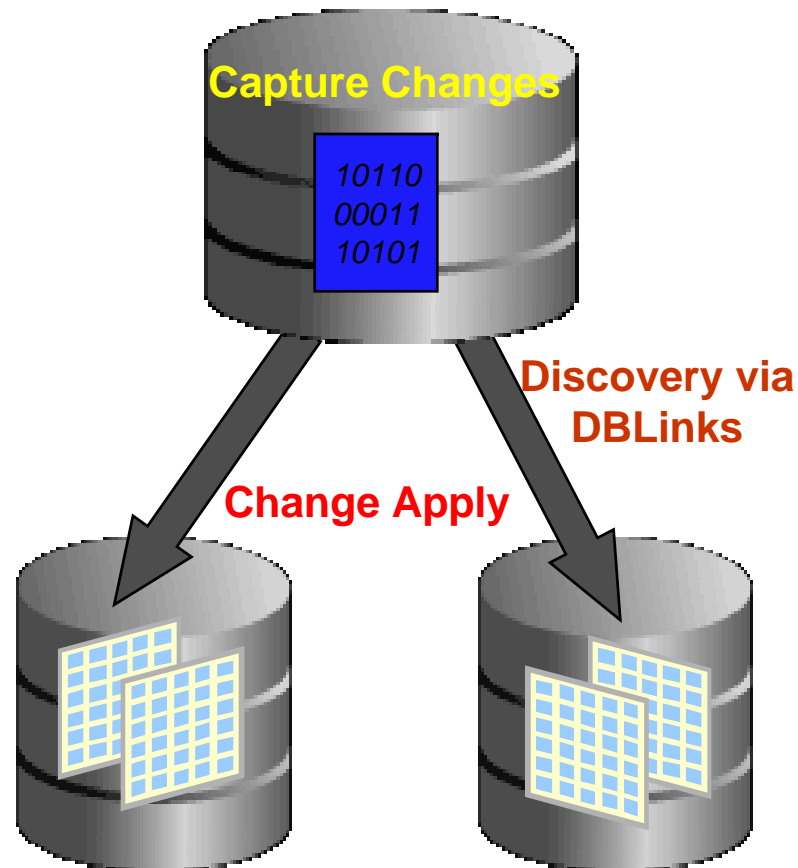
The Challenge:

- Identify configuration
 - Many replicated databases
 - Identify replication components and relationships between databases
- Monitor flow
 - Statistics and rates
 - Analysis of statistics
 - Identify limiting component

The Solution:

- Streams Performance Advisor
- DBMS_STREAMS_ADVISOR** package

Streams Performance Advisor



ANALYZE_CURRENT_PERFORMANCE

- Auto-discovery of streams topology on multiple databases
- Automatic performance analysis across all databases
- **Per-Component Analysis:**
 - Throughput and latency
 - Aborted or Enabled
- **Per-Stream Analysis:**
 - Time-based analysis of each component (waits, CPU, etc.) using ASH
- **Bottleneck components**
 - Top wait events of bottleneck
- Integrated with ADDM
- Stream errors are integrated with Server-generated Alerts



UTLSPADV

Performance Advisor based STRMMON

Collect_stats

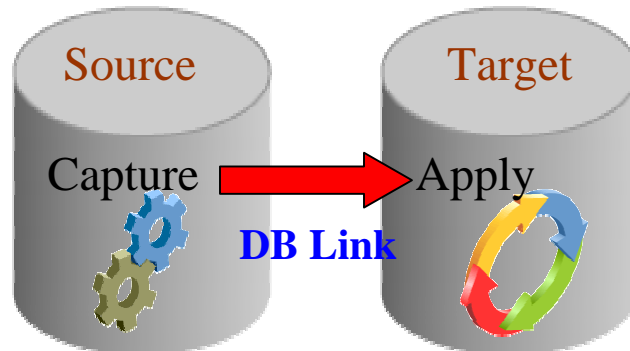
- Run Streams Performance Advisor periodically
- Store statistics permanently in user tables
- User configurable thresholds for top event, idle, flow control analysis

Show_stats

- Display results from collect_stats
- Configurable output selection

Performance Optimizations

Combined Capture and Apply



- Faster Capture processing
 - Capture directly from redo buffer, eliminating disk I/O
- Faster Apply processing
 - Internal optimizations
- Combined Capture and Apply
 - Automatically invoked if single publisher and subscriber for queue
 - Direct communication between capture and apply processes
 - Normal Streams configuration: no special commands or setup
- 11g Streams performance white paper available on OTN



Split and Merge of Streams

Challenge

- With hub&spoke configurations, when one destination is unavailable, queue spill impacts performance for other destinations

Solution

- Split the queue between live and down destinations
- Merge queues after recovery
- Maintains high performance for all replicas
- Automated, fast “catch-up” for unavailable replica

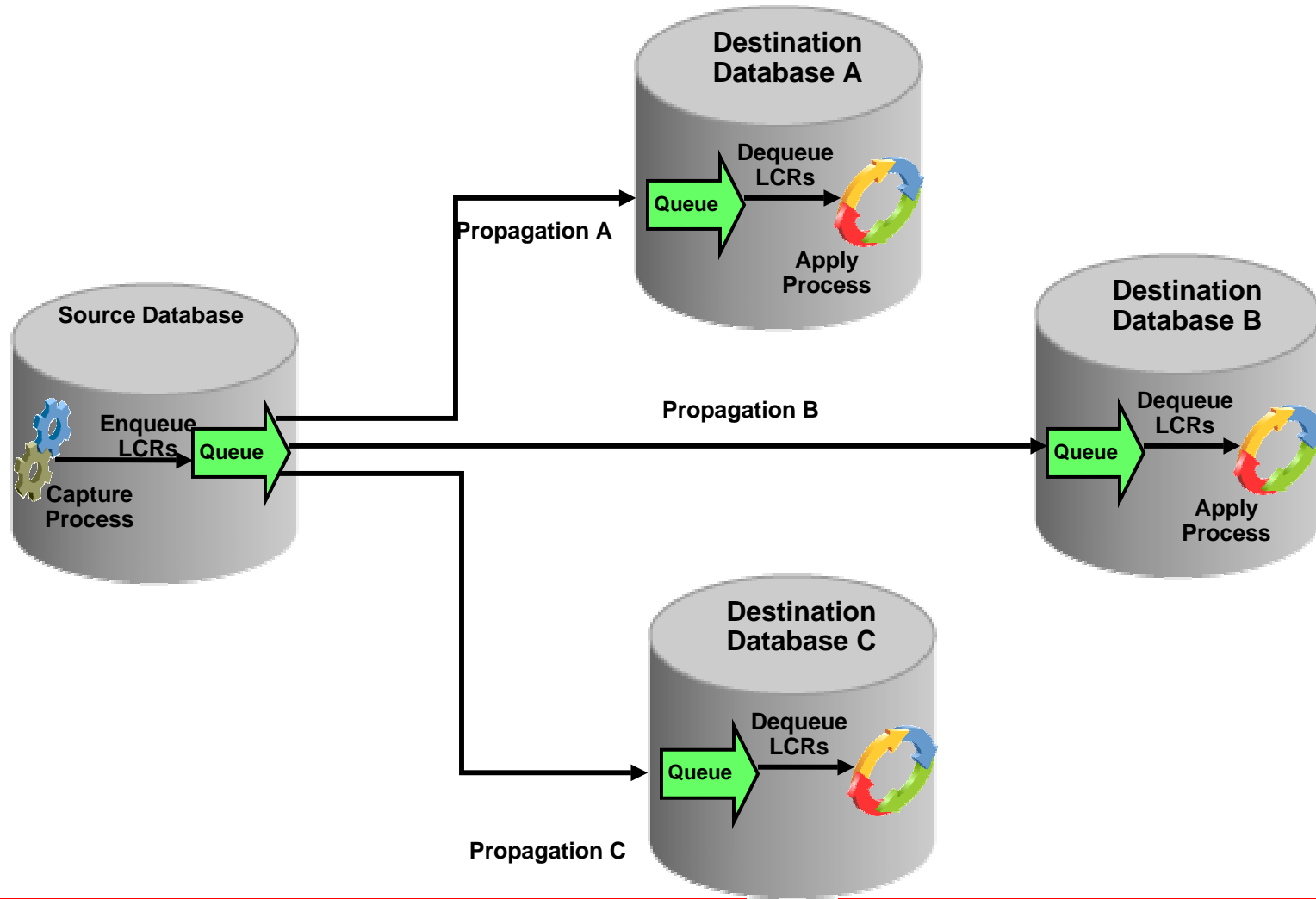


Split and Merge of Streams

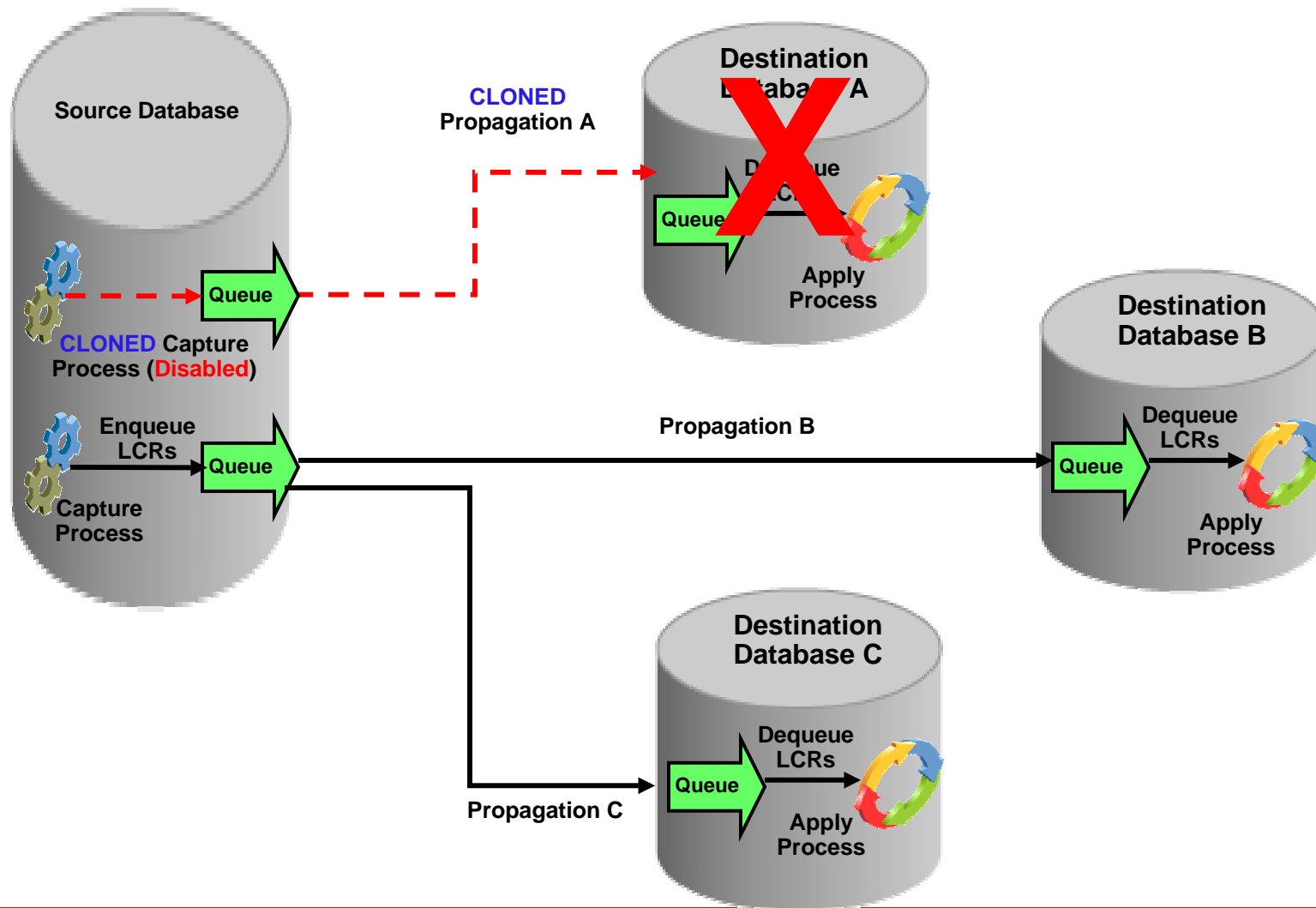
DBMS_STREAMS_ADM package

- **Split_streams**
 - Use for slow/unavailable subscriber
 - Clones queue, capture, propagation
 - Threshold for automatic merge
- **Merge_streams**
 - Merge cloned stream back to original configuration

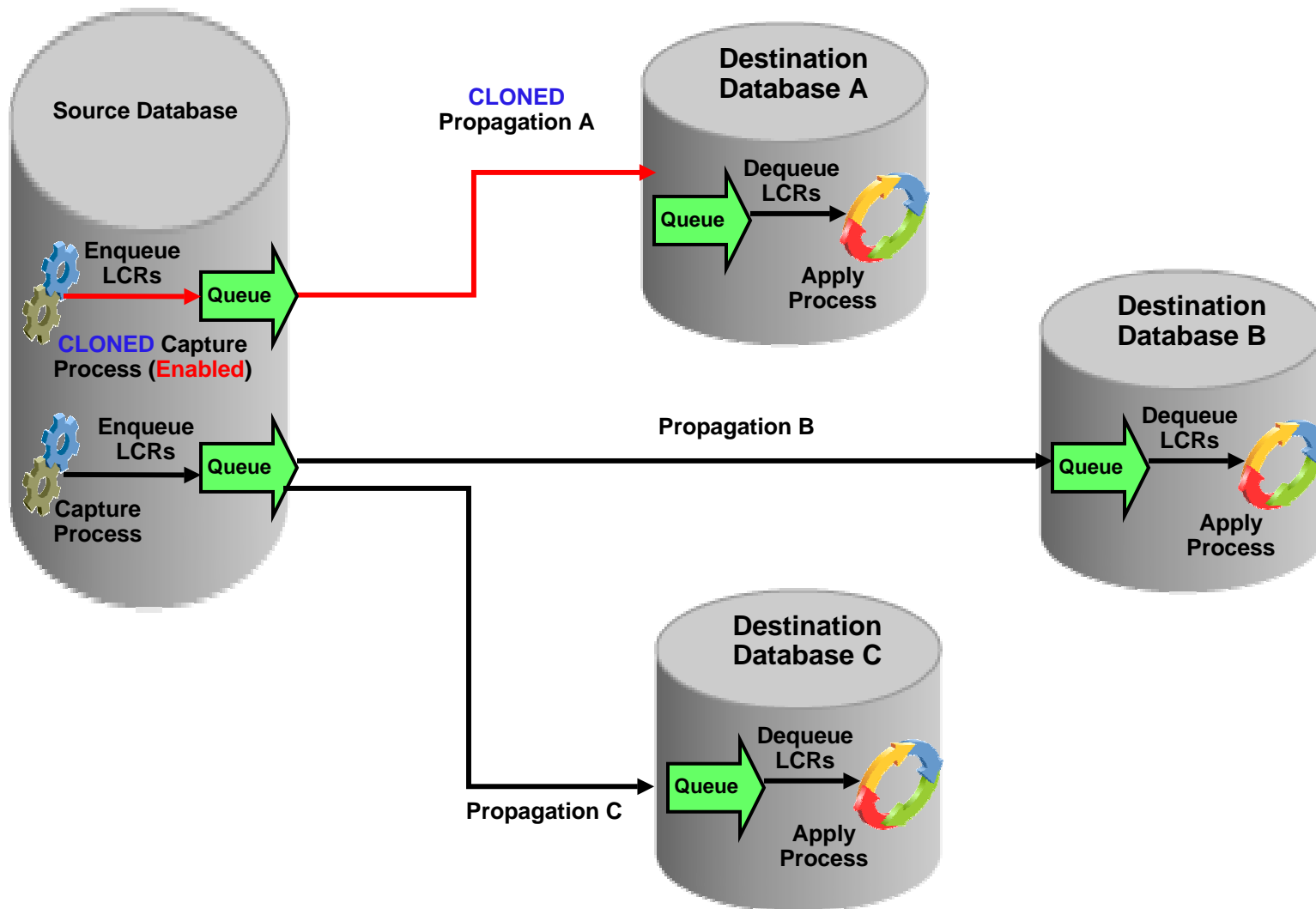
Streams: Hub with 3 Spokes



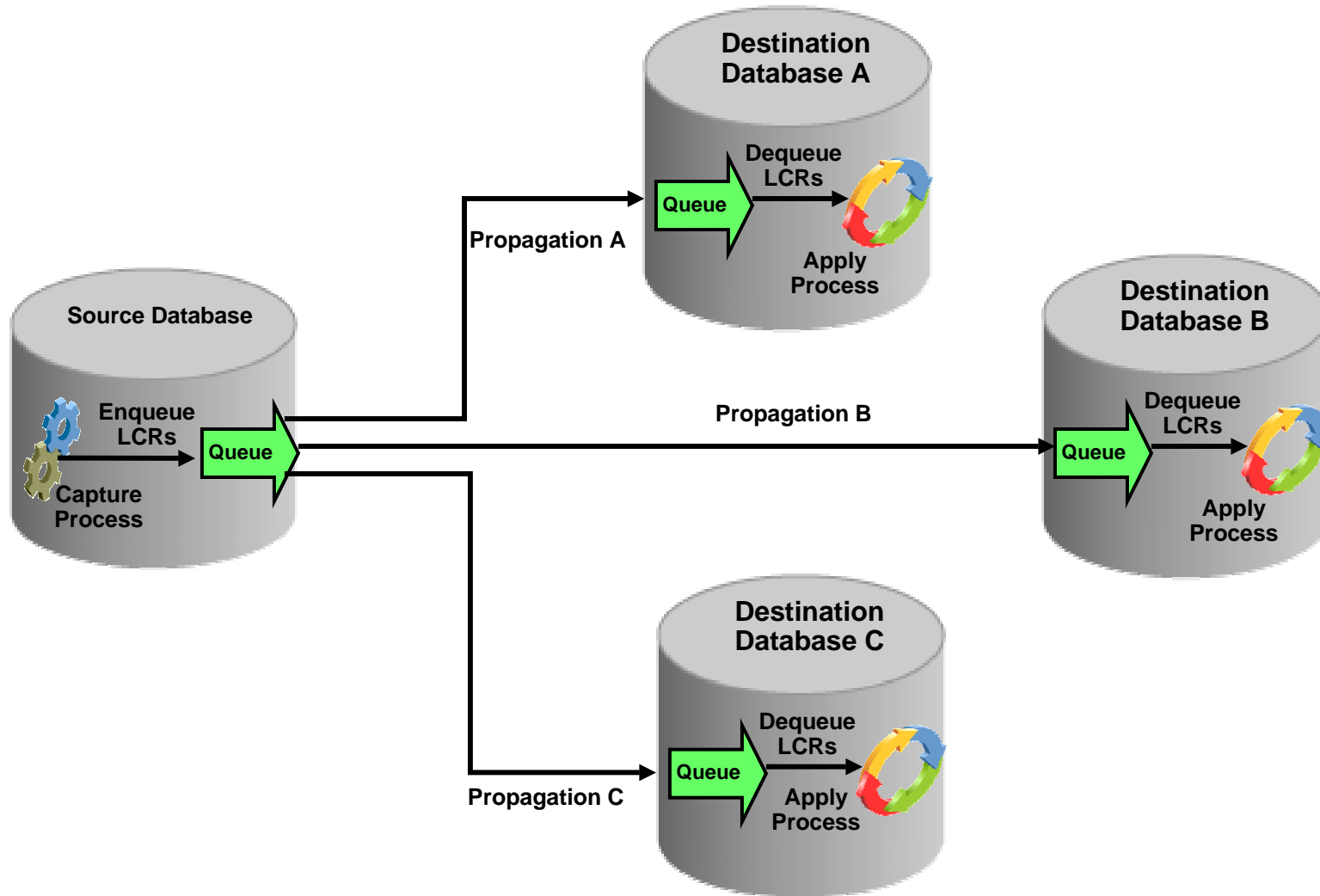
Split Streams: Site A Unavailable



Split Streams: Site A Available



Merge Streams: Original Configuration





Diagnosability

- **Improved error messages:**
 - ORA-1403 -> ORA-26786 or ORA-26787
 - DML and Error Handlers need to handle these new exceptions
 - More Detail added to many error messages
- **Cross-database LCR tracking**
 - Trace Streams messages from start to finish

```
DBMS_STREAMS_ADM.SET_MESSAGE_TRACKING('mylabel')
```

```
V$STREAMS_MESSAGE_TRACKING
```



Additional Supported Data Types

- **XMLType**
 - Storage CLOB (BasicFile)
- **Transparent Data Encryption (TDE)**
 - PRESERVE_ENCRYPTION apply parameter controls behavior when destination columns are not encrypted
 - Default: Capture TDE=> Apply TDE



Synchronous Capture

- Available in all editions of Oracle Database 11g
- Efficient internal mechanism to immediately capture change
- Changes captured as part of the user transaction
 - DML only
 - LCRs enqueued persistently to disk
- When to use:
 - Replicate a few low activity tables of highly active source database
 - Capture from redo logs cannot be implemented

```
DBMS_CAPTURE_ADM.CREATE_SYNC_CAPTURE
```



Synchronous Capture

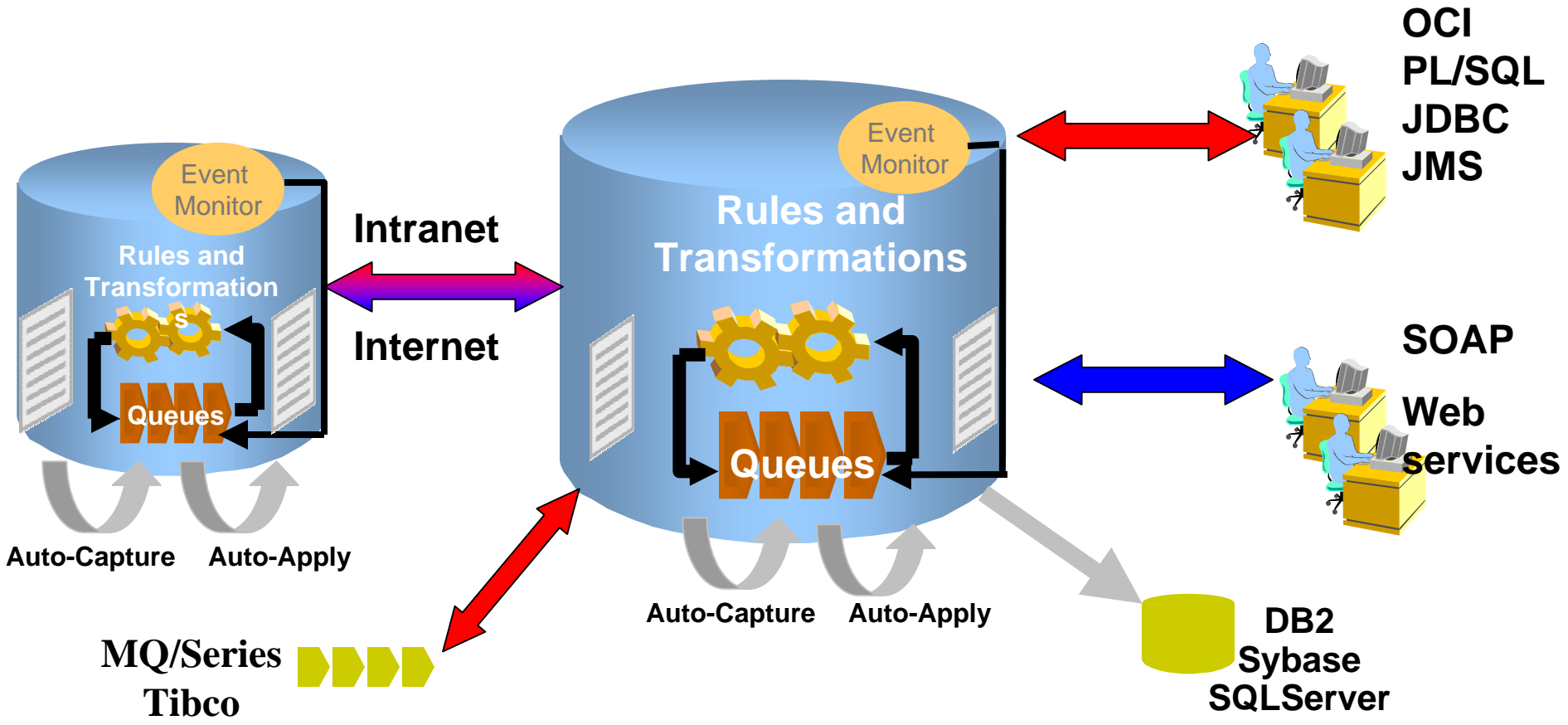
- DBMS_CAPTURE_ADM
 - CREATE_SYNC_CAPTURE
- DBMS_STREAMS_ADM
 - ADD_TABLE_RULES or ADD_SUBSET_RULES
 - Specify type as SYNC_CAPTURE
- Apply Setup
 - apply_captured=>>false

Oracle Streams: Advanced Queuing





Oracle Streams





Streams Advanced Queuing (AQ) New Features

- **JMS/AQ performance improvements**
 - Direct Streams AQ support in JDBC
- **Scalable event notification**
 - Grouping notification by time
 - Multiple processes notification for scalability
- **Improved Manageability**
 - Scheduler support
 - Performance views



Scalable Event Notification

- EMON process set per instance
 - EMON (coordinator)
 - E000, E001, E002, E003
- Notification performed at originating instance



Optimized Propagation Scheduling

Challenge:

- Increase scheduling choices
- Simplify management

Solution:

- Migrate to Oracle Scheduler
 - Standard Oracle database schedule
 - Improved job processing control
 - Automatic job process management



Subscribing for Events

Challenge

- Identify subscriber registration
- Control notification

Solution:

- New views for managing registrations
- Notification Groups
 - Limit volume of notifications received
 - Control notification interval



Notification Groups

- Notification control by Time
 - At most 1 notification for that the time period
 - 2 formats: Summary or Last
 - Includes COUNT of notifications for time period
- Registration options
 - Type (Summary or Last)
 - Repeat count
 - Start time



Views for Monitoring Registrations

DBA_SUBSCR_REGISTRATIONS

- General Subscription Registrations
- Notification Group Information

V\$SUBSCR_REGISTRATION_STATS

- Run-time statistics for registrations
 - Number of notifications
 - Last notification, Last error information
 - Emon process servicing registration



Run-time Views for Persistent Queues

V\$PERSISTENT_QUEUES

- Statistics on enqueue/dequeue/browse of queue
- Elapsed time spent on rule evaluation, transformation

V\$PERSISTENT_SUBSCRIBERS

- Subscriber name
- Number of enqueued/dequeued/browsed
- Time for last enqueue and dequeue

V\$PERSISTENT_PUBLISHERS

- Publisher name
- Number of messages enqueued
- Time when last message enqueued



Messaging Gateway

- Improved scalability
 - Configure multiple agents to service workload
 - Distribute load between RAC instances
- Simplified configuration
- Scheduler support

Database HA Sessions From Oracle Development

Monday, Nov 12

•S291483 - The Fastest and the Most Cost-Effective Backup for Oracle Database: What's New in Oracle Secure Backup 10.2, 11:00 am - 12:00 pm, Moscone South 304

•S291492 - Oracle Database 11g: Next-Generation High Availability, 12:30 - 1:30 pm, Moscone South 103

•S291923 - Implementing Oracle Maximum Availability Architecture (MAA) at Allstate Insurance Using Oracle 10g RAC, ASM, Oracle Data Guard and Oracle Grid Control, 3:15 - 4:15 pm, Moscone South 304

•S291484 - Oracle Database 11g Data Repair Technologies: Comprehensive, Intelligent Recovery, 4:45 - 5:45 pm, Moscone South 304

Tuesday, Nov 13

•S290710 - Maximum Availability Architecture Best Practices: Oracle E-Business Suite 12, 12:15 - 1:15 pm, Marriott Salon 10 & 11

Wednesday, Nov 14

•S291915 - What's New in Oracle Data Guard 11g: Revolutionizing Data Protection and Availability, 9:45 - 10:45 am, Moscone South 304

Database HA Sessions From Oracle Development

Wednesday, Nov 14

- S291487 - Backup and Recovery Best Practices for Very Large Databases (VLDB), 11:15 am - 12:15 pm, Moscone South 304
- S291920 - Oracle Active Data Guard: How to Utilize Your Standby Databases for Production Workload - What They Didn't Print in the Manuals, 3:00 - 4:00 pm, Moscone South 304
- S291917 - Oracle Data Guard Tips and Tricks: Direct From Oracle Development, 4:30 - 5:30 pm, Moscone South 102

Thursday, Nov 15

- S291495 - Oracle Streams Replication and Advanced Queuing (AQ): What's New in Oracle Database 11g, 8:30 - 9:30 am, Moscone South 304
- S291499 - Best Practices for Implementing Replication with Oracle Streams in Oracle Database 10g and 11g, 10:00 - 11:00 am, Moscone South 304
- S291525 - Maximum Availability Architecture (MAA) Best Practices: Online Patching, Rolling Upgrades and Planned Maintenance with Minimal Downtime with Oracle Database, 11:30 am - 12:30 pm, Moscone South 104
- S290542 - Maximum Availability Architecture (MAA) Best Practices for Siebel 8.0, 2:30 pm - 3:30 pm, Marriott Salon 10 & 11



Database HA Demos From Oracle Development

Monday, Nov 12 – Thursday, Nov 15
Oracle DEMOgrounds, Moscone West

Oracle Active Data Guard

Oracle Streams: Replication and Advanced Queuing

Oracle Secure Backup

Recovery Manager (RMAN) and Flashback Technologies

Maximum Availability Architecture




Resources

- Collateral, best practices, sample code, white papers: <http://otn.oracle.com/products/dataint/>



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**QUESTIONS
ANSWERS**



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