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Data Guard/Active Data Guard 12c

A Technical Overview

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Program Agenda – What's New in 12c

- Active Data Guard

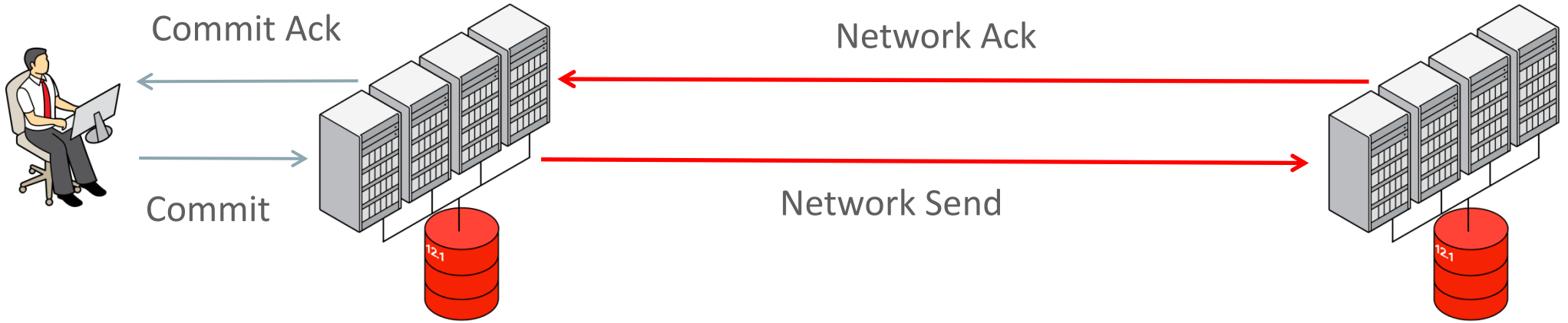
Active Data Guard

Advanced Capabilities in an Option License for Oracle Database 12c

Data Protection	High Availability	Performance and ROI
Zero data loss at any distance	Automatic block repair	Offload read-only
Real-time cascade	Automated rolling database maintenance	Offload read-mostly
	Transparent failover for in-flight transactions	Offload incremental backups
	Service management for replicated databases	Offload network compression
		Intelligent load balancing for replicated databases

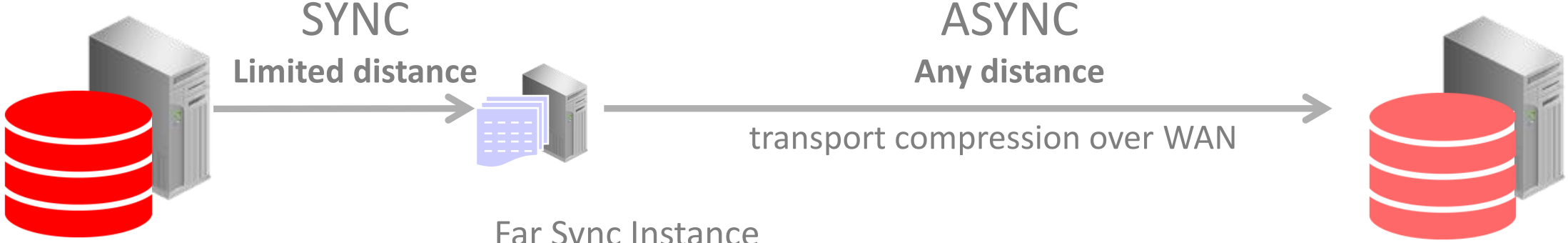
The Zero Data Loss Challenge

Trade-off Performance for Protection



Active Data Guard Far Sync

Zero Data Loss Protection at Any Distance



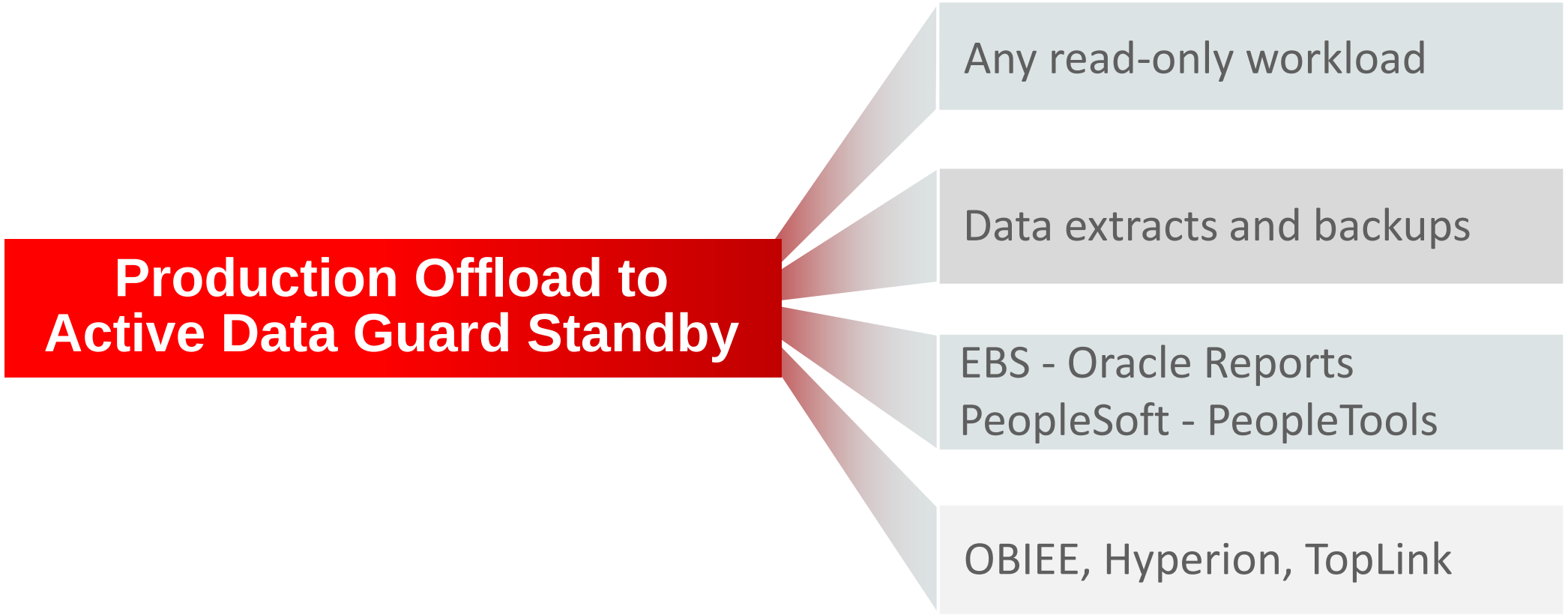
Primary Database
- Production copy

Far Sync Instance
- Oracle control file and log files
- No database files
- No media recovery
- Offload transport compression
- Supports up to thirty remote destinations

Active Standby Database
- Zero data loss failover target
- DR and reporting instance
- Open read-only
- Continuous Oracle validation
- Manual or automatic failover

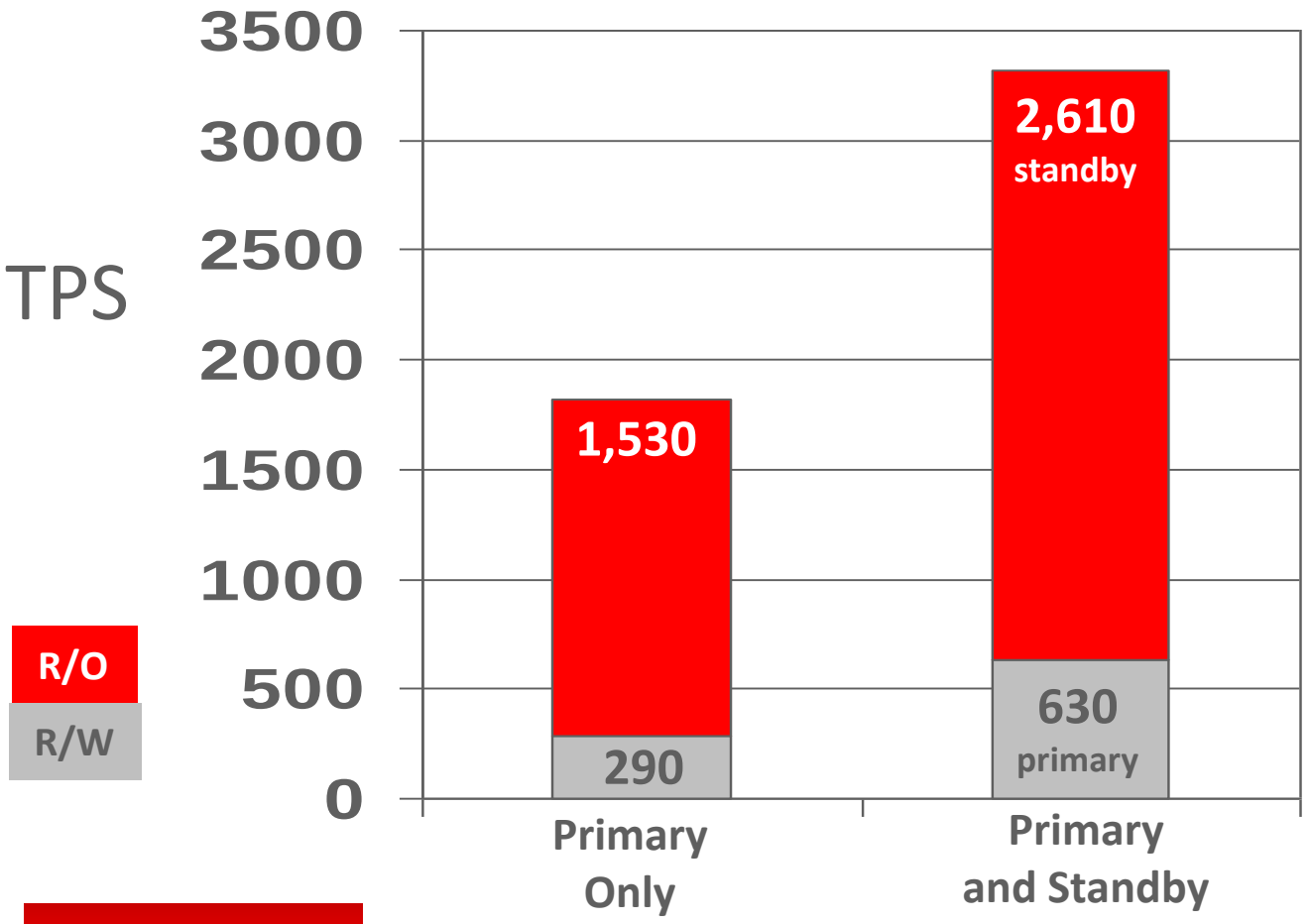
Offload Read-Only Workloads

Increase Performance and ROI – Standby is a Production System



Standby Offload Increases Performance for all Workloads

Bring Idle Capacity Online



- Double read-write throughput
- Increase read-only throughput by 70%
- Eliminate contention between read-write and read-only workloads

Offload Read-Mostly Workloads to an Active Standby

- DML on global temporary tables with Oracle Database 12c
  - Set by default on an Active Data Guard standby database
- Unique Global or Session Sequences with Oracle Database 12c
  - Available for reports running on an Active Data Guard standby
- Incidental writes using DML redirection and database links
  - Updates are made to the primary and replicated to the standby database

Writing to Global Temporary Tables (GTT)

Active Data Guard DML

- DML on global temporary tables now supported on Active Data Guard
  - DDL to create temporary tables must be issued on the primary database
  - Applications that are read-only but that require DML to global temp tables can be offloaded to an Active Data Guard standby database
- Enabled by a new initialization parameter in Oracle Database 12c

```
TEMP_UNDO_ENABLED
```

  - Separates undo for temporary tables from undo for persistent tables
    - Hence any temporary undo is not logged in redo logs
  - Set by default on an Active Data Guard standby database

Sequences

Extending GTT Usefulness

- Sequences now supported on Active Data Guard
  - Applications have access to sets of unique identifiers
  - Both Global and Session (new) sequences available
    - Global - sequence is unique across all databases in the configuration
    - Session - sequence is unique to a session
- DDL to create the sequence must be issued on the primary database

Global Sequences

Active Data Guard

- Sequences created using the default CACHE and NOORDER options can be accessed from an Active Data Guard standby database
- When first accessed by the standby, the primary allocates a unique range of sequence numbers
- When all sequences within a range have been used, the standby requests another range of numbers
- Each range assigned to a standby is unique – thus there is a unique stream of identifiers across the entire Data Guard configuration

Session Sequences

Active Data Guard

- A sequence specifically designed for use with global temporary tables that have session visibility
  - A unique range of sequence numbers only within a session
  - Session sequences are not persistent - the state of the session sequences accessed during a session is lost when the session terminates
- To create a session sequence:

```
SQL> CREATE SEQUENCE … SESSION;
```

Benefits: Temporary Undo and Sequences

Increase Return on Investment in Standby Databases

- Reporting and other applications that are generally read-only but require non-persistent write access to the database can be run on an Active Data Guard standby using global temporary tables
- Reduces redo volume if also enabled on the primary database
  - Temporary undo is not logged in redo
  - Improves primary database performance
  - Reduce network bandwidth consumption - less redo for Data Guard to ship
  - Less standby I/O
- Applications that are read-only and require generation of unique sequences can be offloaded to Active Data Guard standby

Make Physical Corruption Transparent to Users

Demonstrations: Automatic Block Repair

Active Data Guard - Primary Auto Block Repair

Active Data Guard - Standby Auto Block Repair

http://www.oracle.com/technetwork/database/features/availability/demonstrations-092317.html

Active Data Guard Rolling Upgrades

New Automation makes it Simpler to Reduce Planned Downtime

Start

Switchover

Finish

DBMS_Rolling PL/SQL Package replaces forty two manual steps

Active Data Guard Rolling Upgrades

Supported using DBMS_ROLLING

Oracle Database 12.1.0.1 onward

- Change XML-CLOB to Binary XML
- Add Partitioning to Non-Partitioned Tables
- Change Basicfile LOBs to Securefile LOBs
- Alter table to be OLTP-compressed

Oracle Database 12.1.0.2 onward

- Database rolling upgrades
- New patch sets, e.g. 12.1.0.2 to 12.1.0.3
- New releases, e.g. 12.1.0.2 to 12.2

Data Guard 12c New Features Summary

- Data Guard
  - SYSDG Role for Data Guard specific operations
  - Multitenent Database Standbys
  - Default Real Time Apply
  - Transparent Online Data file movement
  - Single SQL*Plus Switchover command
  - No Primary instance shutdown for switchover
  - FastSync (SYNC NOAFFIRM)
  - Enhanced Extended Datatype Support for upgrades
  - Logical Standby support for additional data types
  - DBMS_SCHEDULER support for Rolling Upgrades
  - Broker VALIDATE DATABASE capability
  - Enhanced Broker configuring with RedoRoutes
  - Broker Resumable switchover
  - New Broker Observer properties and capabilities
  - Broker support of Cascading Redo destinations

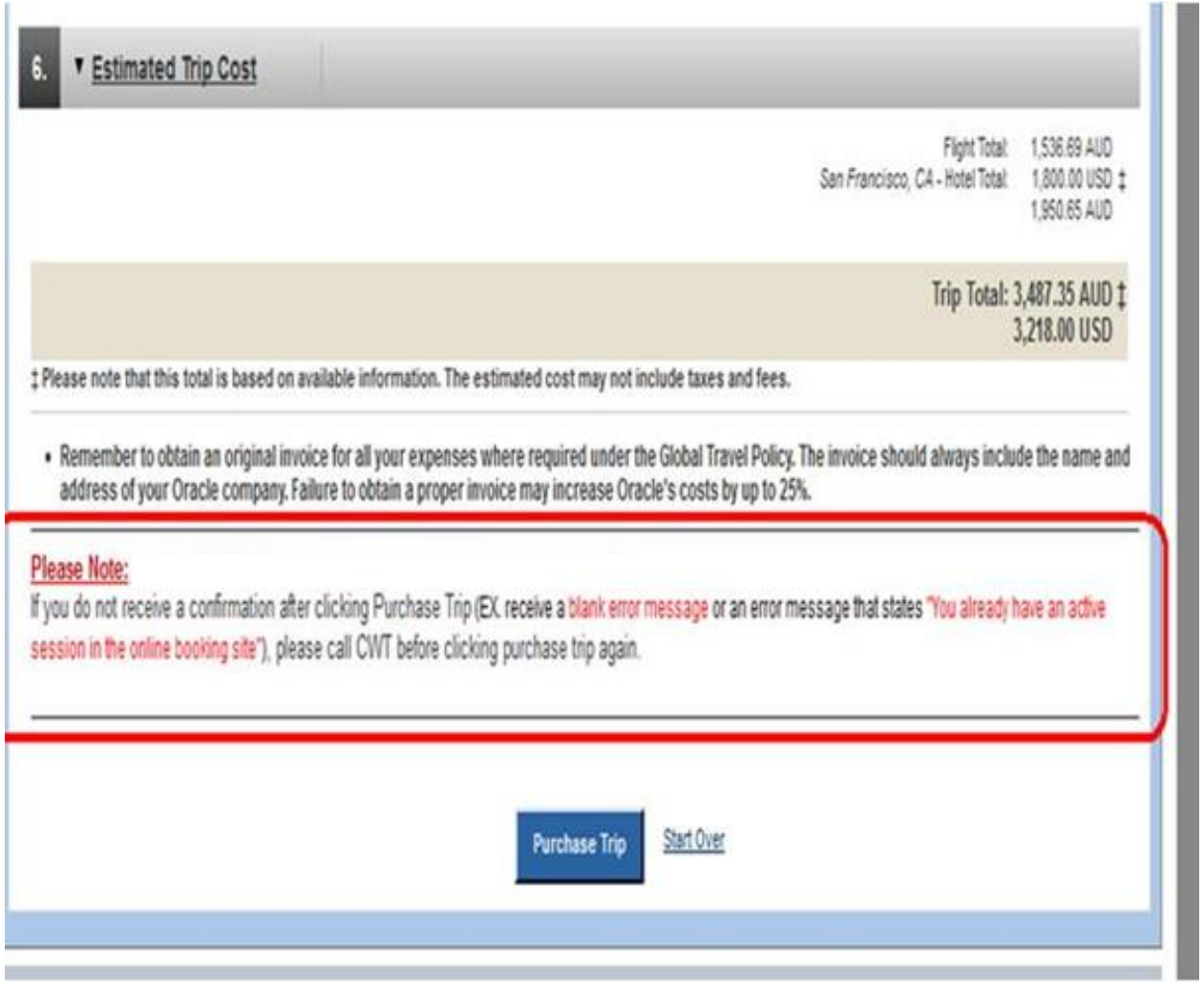
- Active Data Guard
  - Real Time Cascading Redo destinations
  - Wan Distance Zero Data Loss with Far Sync
  - Global Temporary Table DML on a standby
  - Sequences (global and session) on a standby
  - DBMS_ROLLING automated rolling upgrades
  - Support for Oracle Application Continuity
  - Support for Oracle Global Data Services

In-Flight Transactions

Database outages cause in-flight work to be lost, leaving users and applications in-doubt

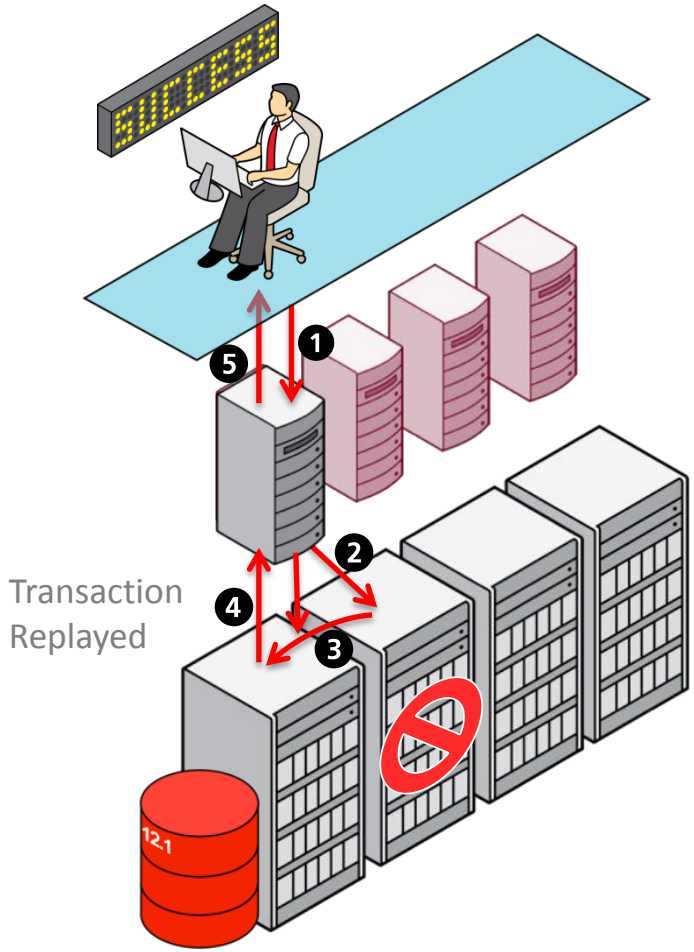
- Restart applications and mid-tiers
- User frustration
- Cancelled work
- Duplicate submissions
- Errors even when planned
- Developer pains

Sorry. Internal Server Error - 500 Error
We are currently experiencing an issue with our servers on coolcar.com. Please come back later.



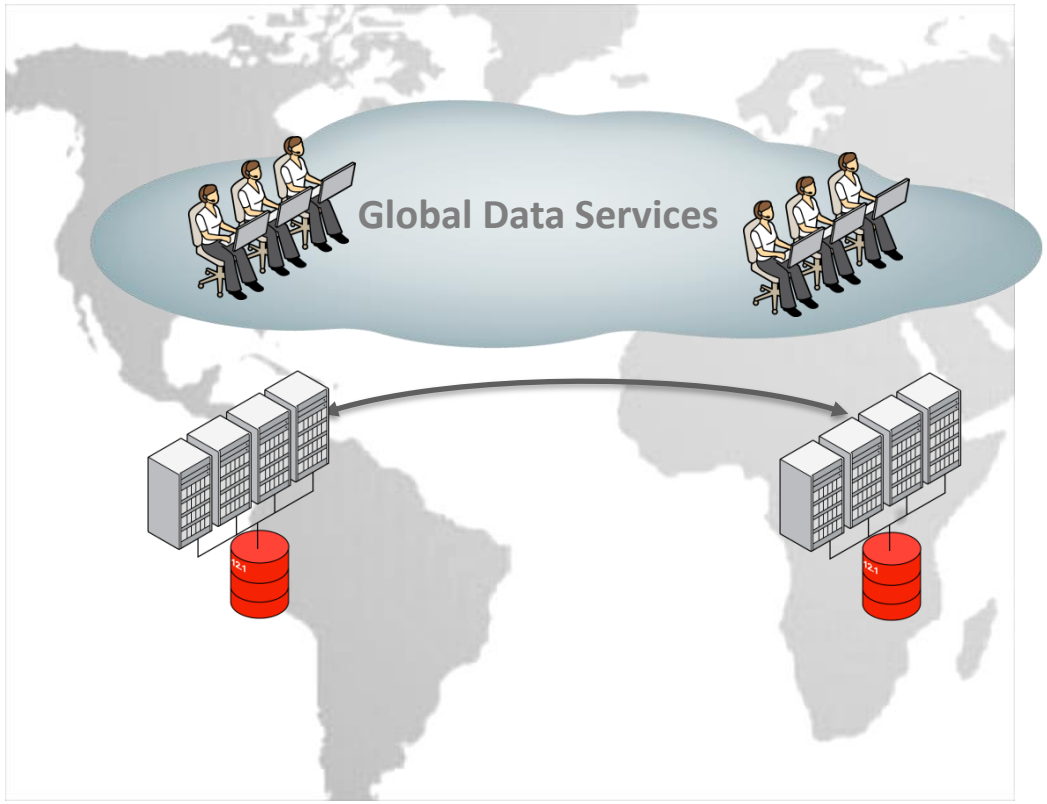
Application Continuity with Oracle Database 12c

Mask Unplanned/Planned Outages



- Replay in-flight work on recoverable errors
- Mask many hardware, software, network, storage errors and outages
- Improve end-user experience and productivity without requiring custom application development
- Included with Oracle RAC, RAC One Node and Active Data Guard

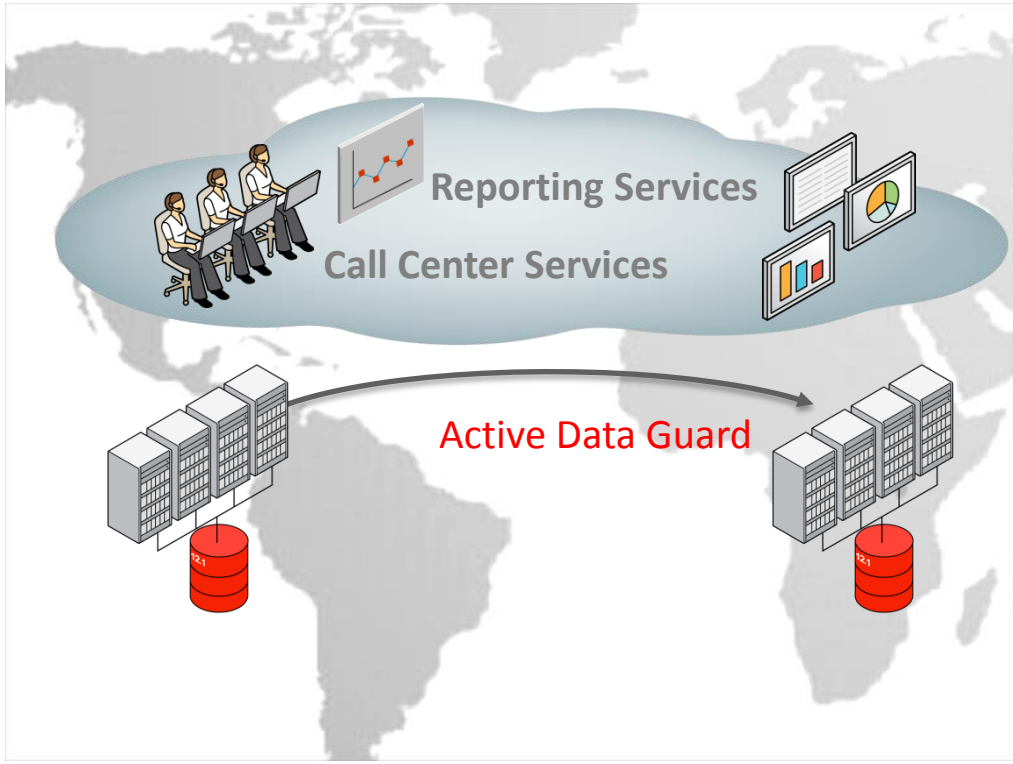
Global Data Services
Service Failover and Load Balancing for Replicated Databases



- Before Oracle 12*c*, a Database Service was designed to run within a single database
- A Global Database Service can run across multiple databases
  - Extends RAC-style service failover and load balancing across multiple databases within and across data centers
  - Supports Data Guard, GoldenGate, RAC, and non-RAC databases
  - Load balances based upon performance, network latency, replication lag, and service placement policies
- Achieves higher availability, improved manageability and optimal performance

Global Data Services

An Active Data Guard Example



- Global Services running across primary and standby
  - Reporting Service: read-only service available on primary and standby
  - Call Center Service: read-write service running on primary database
- Clients connecting to the Reporting Service are routed to either primary or standby database
  - Based on location, response time, data, acceptable data lag
  - Reports will automatically run on least loaded server
  - If preferred database not available, will route connections to another database
- Global service migration
  - Automatically migrates services based on failover/switchover. Will automatically start services on the most appropriate replica according to policies configured by the administrator
- Works similarly with GoldenGate – including support for GoldenGate configurations using active-active replication

Hardware and Software
Engineered to Work Together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