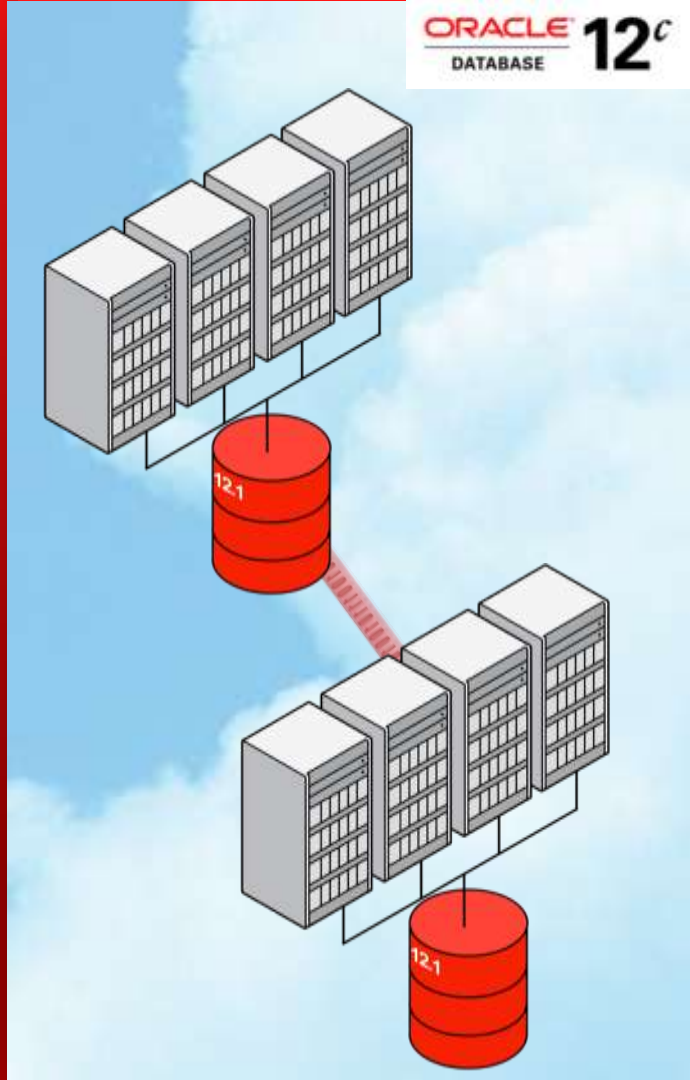
ORACLE

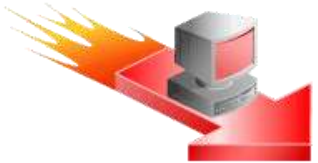
Maximize Availability With Oracle Database 12c



Oracle Database 12c

Extreme Availability

- Oracle Database 12c introduces significant new (HA) capabilities that
  - Drastically cut down planned and unplanned downtime
  - Eliminate compromises between HA and Performance
  - Tremendously boost operational productivity
- These take Availability to unprecedented new levels
  - Next-generation Maximum Availability Architecture (MAA)
  - Optimized for Oracle



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Maximum Availability Architecture

Production Site

RAC
– *Scalability*
– *Server HA*

Flashback
– *Human error correction*

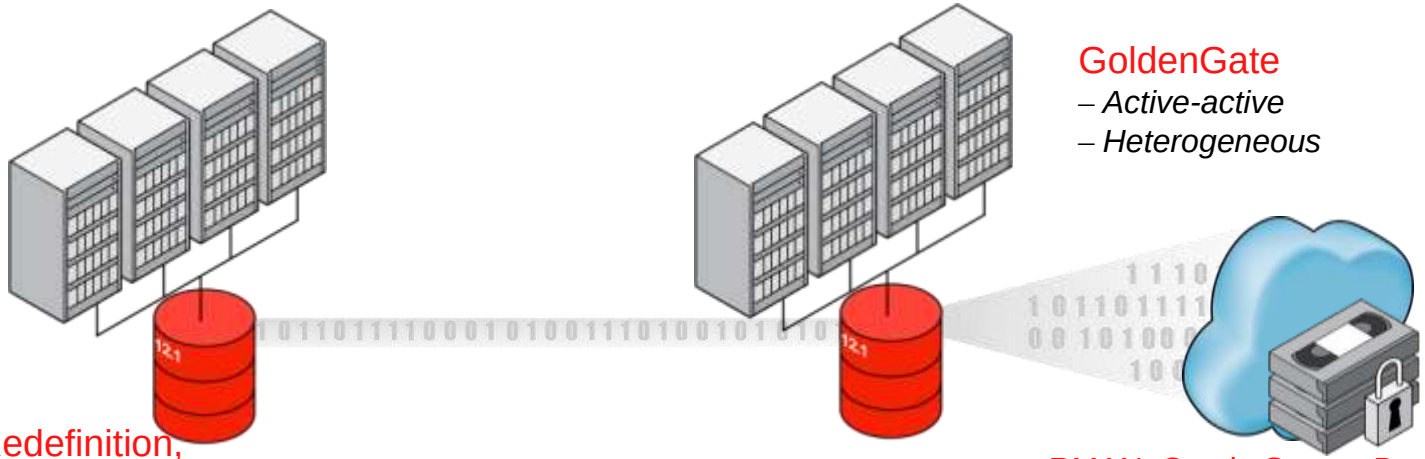
Application Continuity
– *Application HA*

Global Data Services
– *Service Failover / Load Balancing*

Active Replica

Active Data Guard
– *Data Protection, DR*
– *Query Offload*

GoldenGate
– *Active-active*
– *Heterogeneous*



Edition-based Redefinition, Online Redefinition, Data Guard, GoldenGate
– *Minimal downtime maintenance, upgrades, migrations*

RMAN, Oracle Secure Backup
– *Backup to tape / cloud*

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Oracle Database 12c
High Availability Key New Features

- Application Continuity
- Global Data Services
- Data Guard Enhancements
- RMAN Enhancements
- Flex ASM
- Other HA Enhancements
- GoldenGate Update

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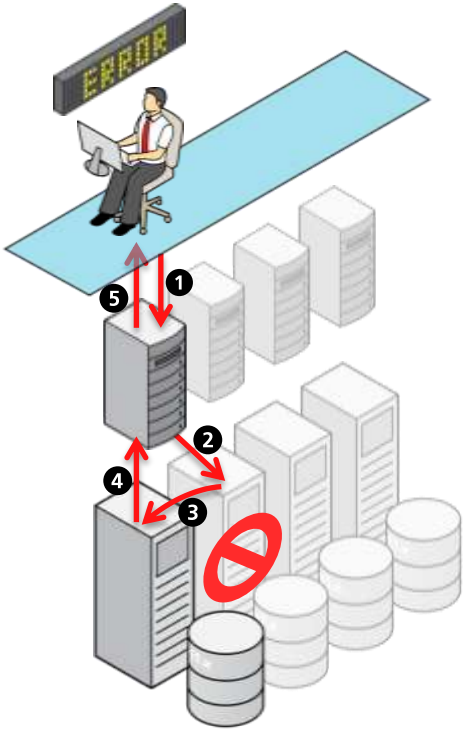
In-Flight Work: Dealing With Outages

Current Situation



End User

Application Servers

Database Servers

- Database outages can cause in-flight work to be lost, leaving users and applications in-doubt
- Often leads to
  - User pains
  - Duplicate submissions
  - Rebooting mid-tiers
  - Developer pains

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Solving Application Development Pains

New in Oracle Database 12c

Transaction Guard	Application Continuity
A reliable protocol and API that returns the outcome of the last transaction	Safely attempts to replay in-flight work following outages and planned operations

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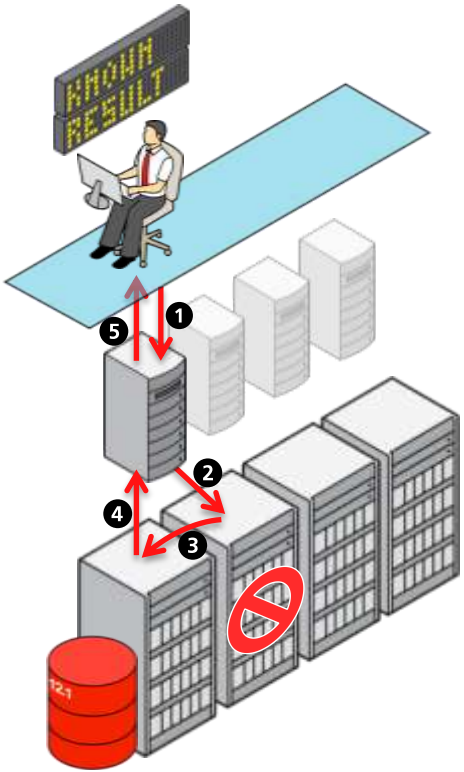
Transaction Guard

Preserve and Retrieve COMMIT Outcome



End User

Application Servers

Database Servers

- API that supports known commit outcome for every transaction
- Without Transaction Guard, upon failures – transaction retry can cause logical corruption
- With Transaction Guard, applications can deal gracefully with error situations, vastly improving end-user experience
- Used transparently by Application Continuity

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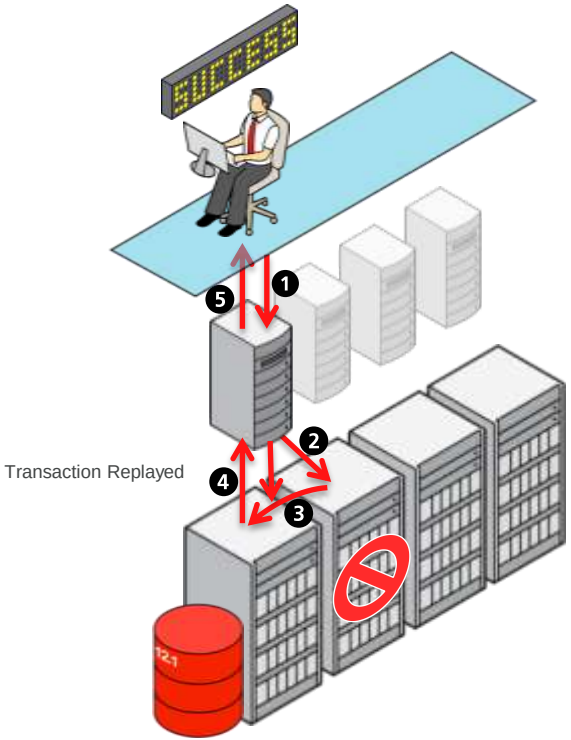
Application Continuity

Masks Unplanned/Planned Outages



- Replays in-flight work on recoverable errors
- Masks many hardware, software, network, storage errors and outages when successful
- Improves end-user experience and productivity without requiring custom app development

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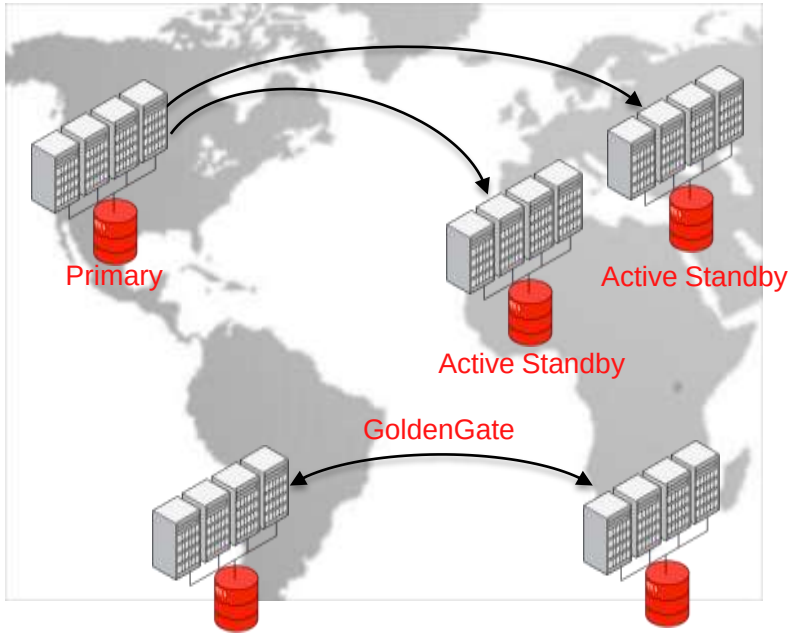
Databases in Replicated Environments

Challenges



- No seamless way to efficiently use all the databases
- No automated load balancing and fault tolerance

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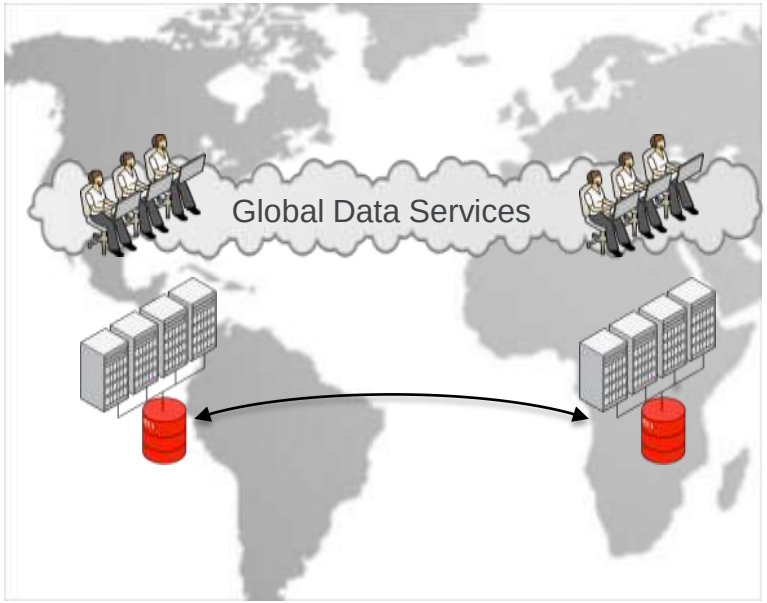
Global Data Services

Load Balancing and Service Failover for Replicated Databases



- Extends RAC-style service *failover, load balancing* (within and across data centers), and *management* capabilities to a set of replicated databases
- Takes into account network latency, replication lag, and service placement policies
- Achieve higher availability, improved manageability and maximize performance

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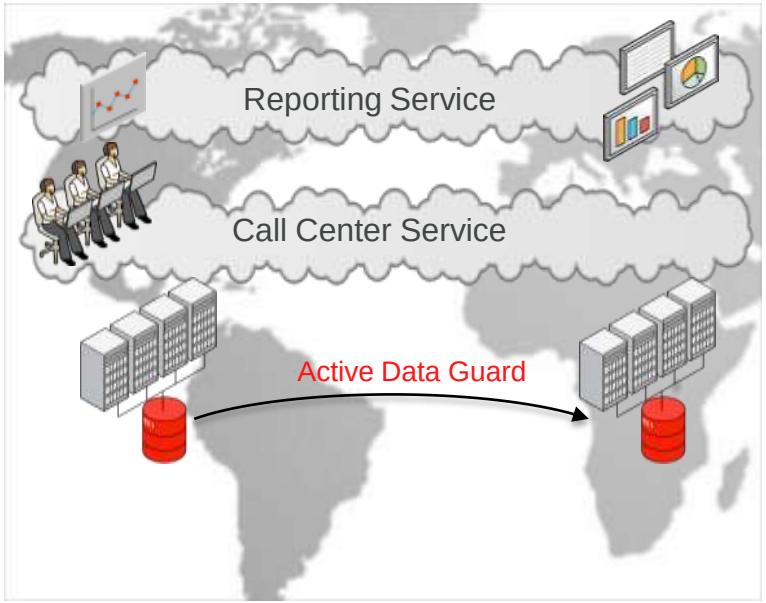
Global Data Services

Active Data Guard Example



- Reporting client routed to ‘best’ database
  - Based on location, response time, data, acceptable data lag
  - Reports will automatically run on least loaded server
- Reporting client failover
  - If preferred database not available, will route to another database in same region or a remote database
- Global service migration
  - Automatically migrates services based on failover/switchover - if primary database is down, start Call Center service on the new primary

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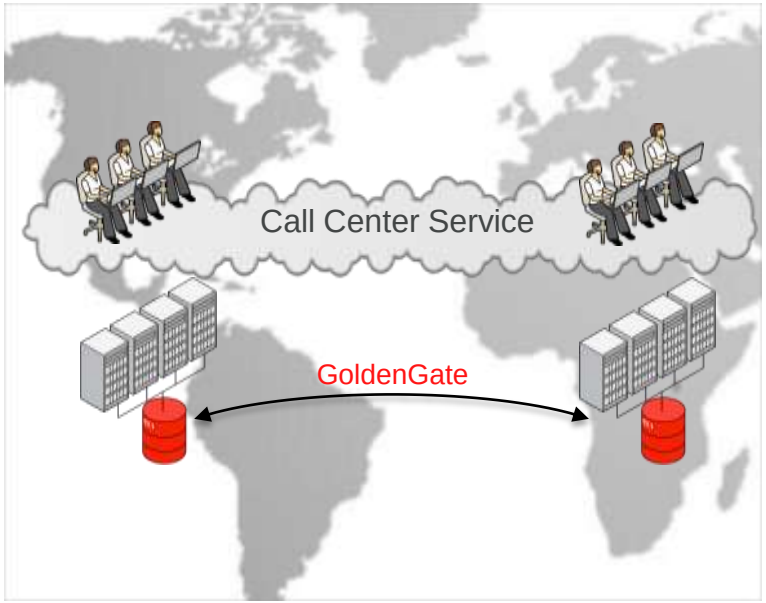
Global Data Services

GoldenGate Example



- Call Center Client connections and requests transparently routed to the *closest* / *best* database
  - Runtime load balancing metrics give client real-time information on which database to issue next request
- If a database fails, its global services restarted on another replica

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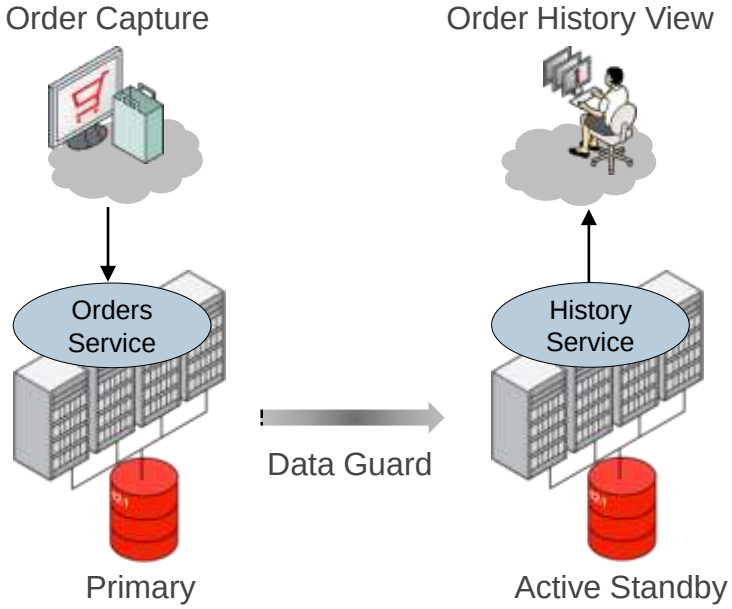
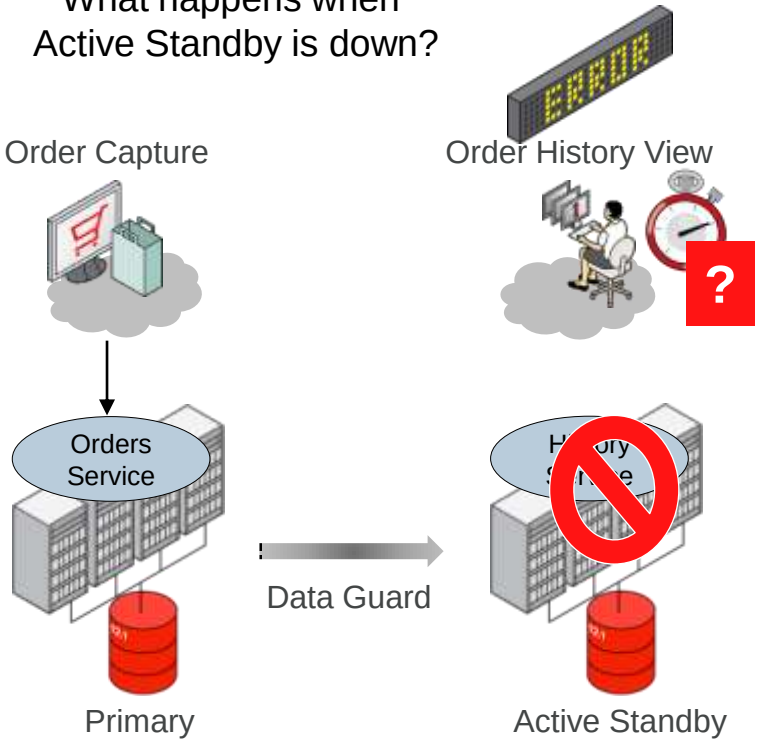
Global Data Services

Use Case: Active Data Guard without GDS

Critical E-Commerce App accessing
Active Data Guard Standby



What happens when
Active Standby is down?



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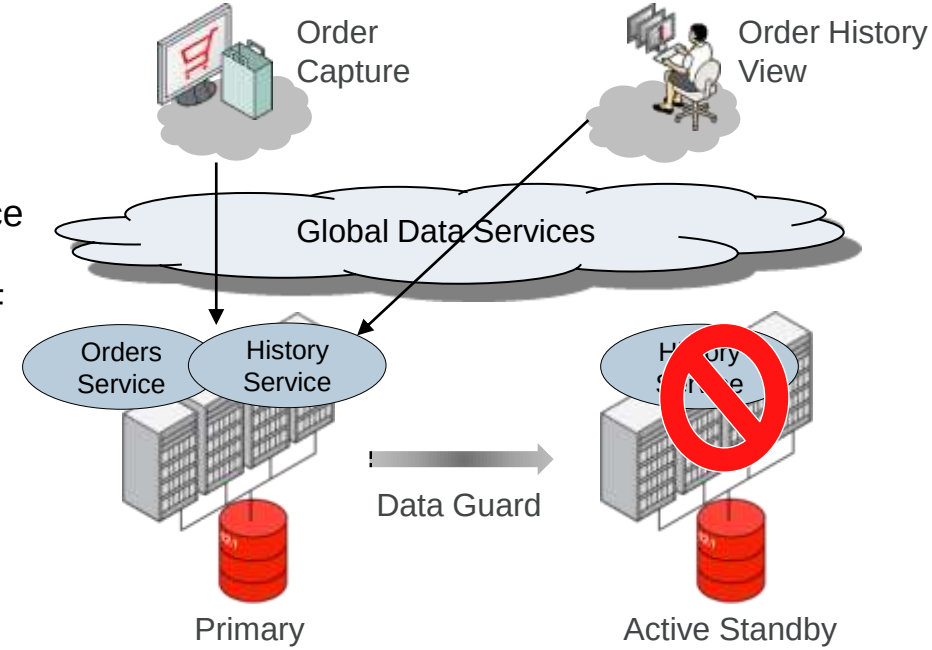
Global Data Services

Use Case: Active Data Guard with GDS: All HA

When Active Standby is down …

- GDS fails over History Service to primary, redirects connection through FAN/FCF



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Global Data Services: Concepts

- **GDS Region:** Group of databases and clients in close network proximity, e.g., East, West
- **GDS Pool:** Databases that offer a common set of global services, e.g., HR, Sales
- **Global Service:** Database Service provided by multiple databases with replicated data
  - Local service + {region affinity, replication lag, database cardinality}
- **Global Service Manager (GSM):** Provides main GDS functionality: service management and load balancing
  - Clients connect to GSM instead of database listener
  - At least one GSM per region or multiple GSMs for High Availability
  - All databases/services register to all GSM Listeners
- **GDS Catalog:** stores all metadata, enables centralized global monitoring & management
  - Global service configuration stored in GDS Catalog
- **GDSCTL:** Command-line Interface to administer GDS

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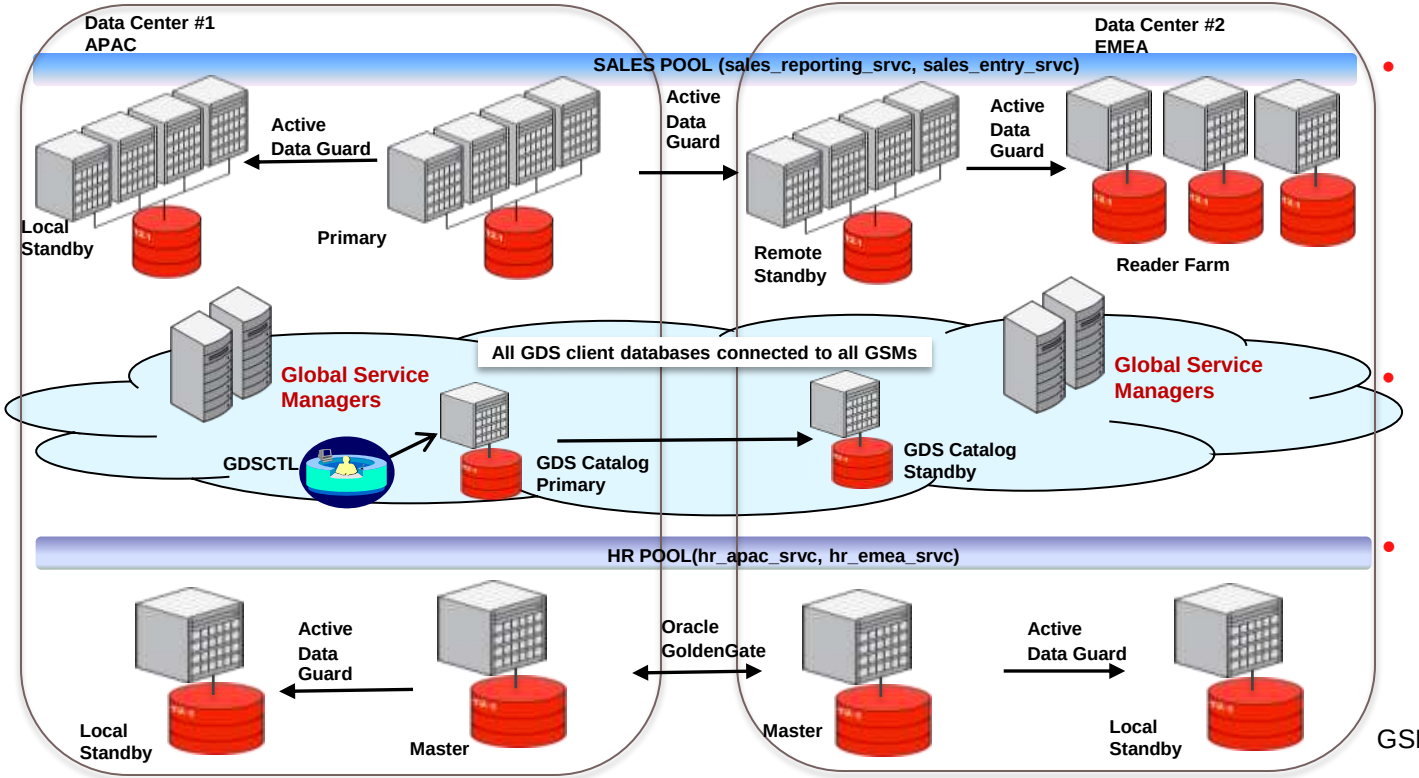
Global Data Services: Summary

Globally Replicated, High Availability Architecture



- GDS Framework dynamically balances user requests across multiple replicated sites
  - Based on location, load, and availability
- Provides global availability
  - Supports automatic service failover
- GDS integrates disparate databases into a unified data cloud

GSM - Global Service Manager

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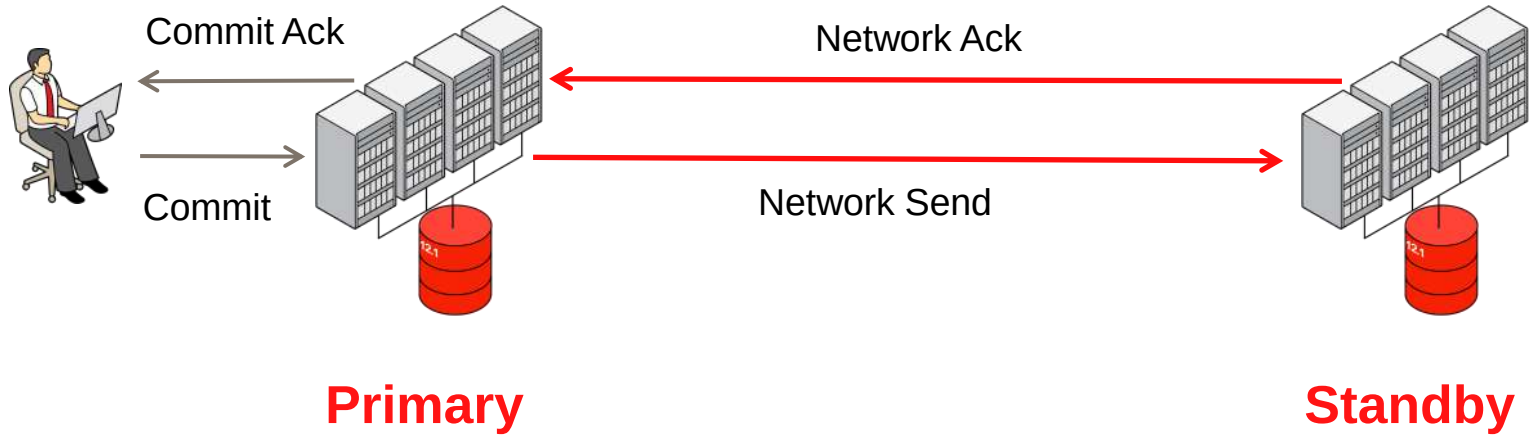
Zero Data Loss Challenge

Synchronous Communication Leads To Performance Trade-Offs



The longer the distance, the larger the performance impact

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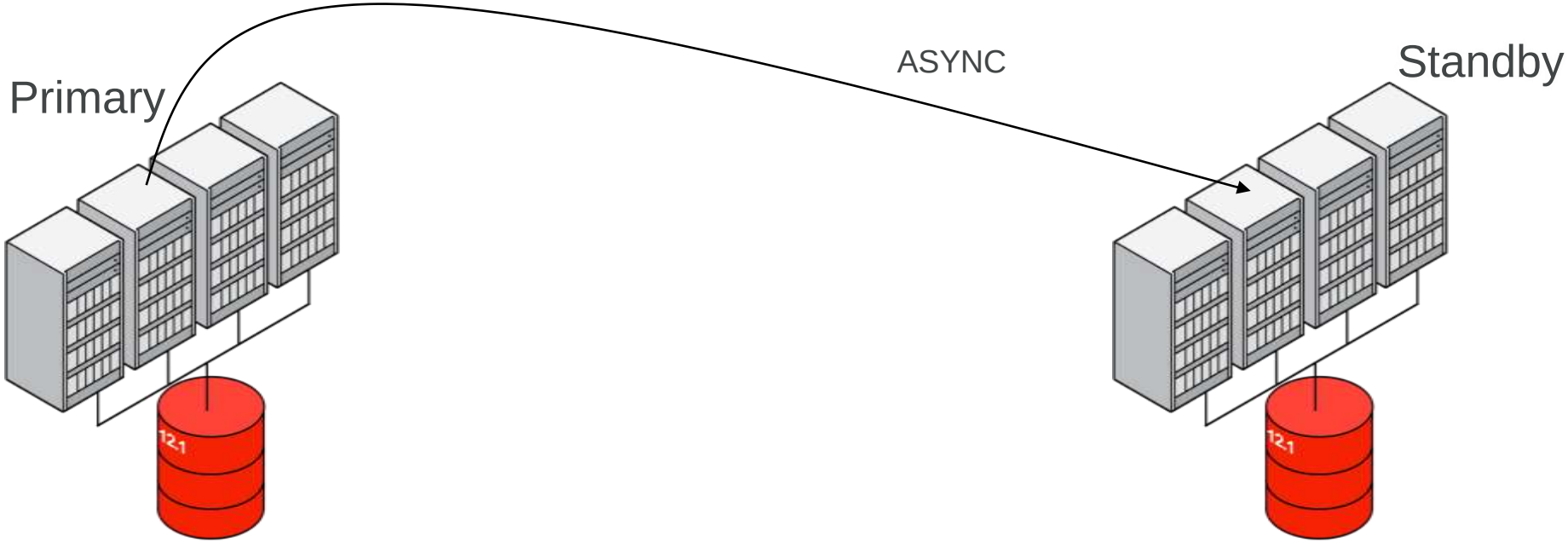
Data Guard Async – Today

Some Data Loss Exposure Upon Disaster



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Active Data Guard Far Sync – New in 12.1

Zero Data Loss For Async Deployments

- Far Sync: light-weight Oracle instance: standby control file, standby redo logs, archived redo logs, no data files
- Receives redo synchronously from primary, forwards redo asynchronously in real-time to standby
- Upon Failover: Async standby transparently obtains last committed redo from Far Sync and applies: zero data loss failover
- Second Far Sync Instance can be pre-configured to transmit in reverse direction after failover/switchover
- Terminal standbys required to be Active Data Guard Standbys

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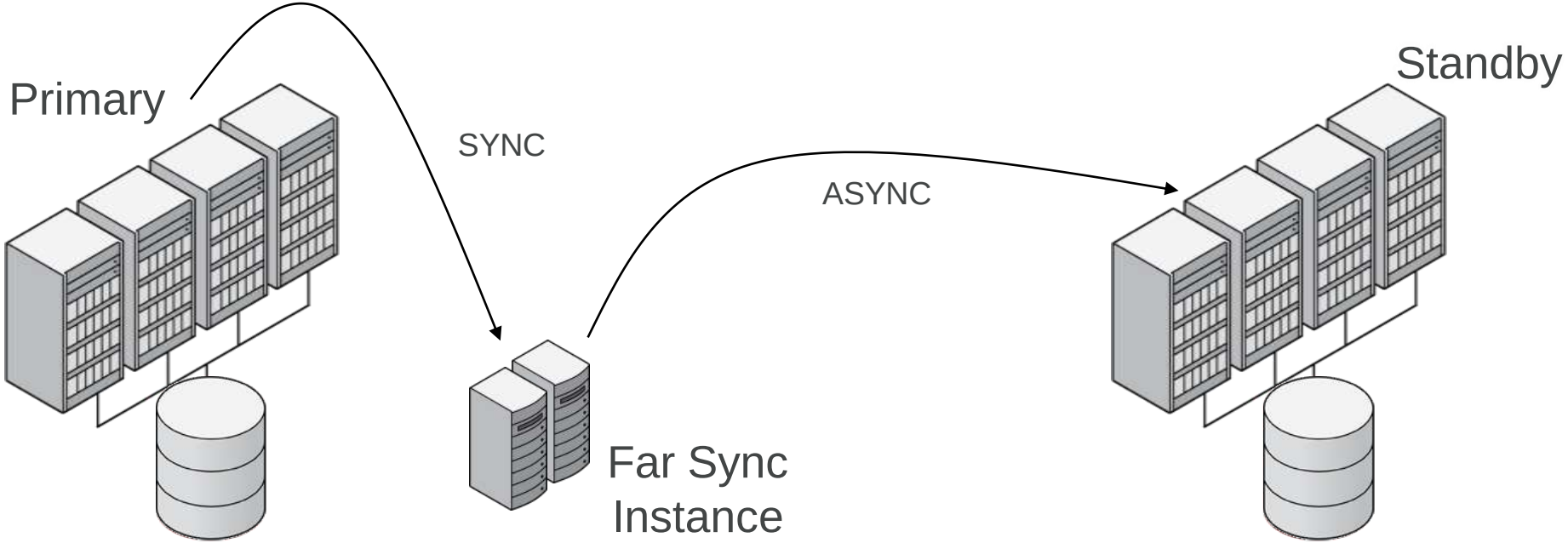
Active Data Guard Far Sync

Operational Flow



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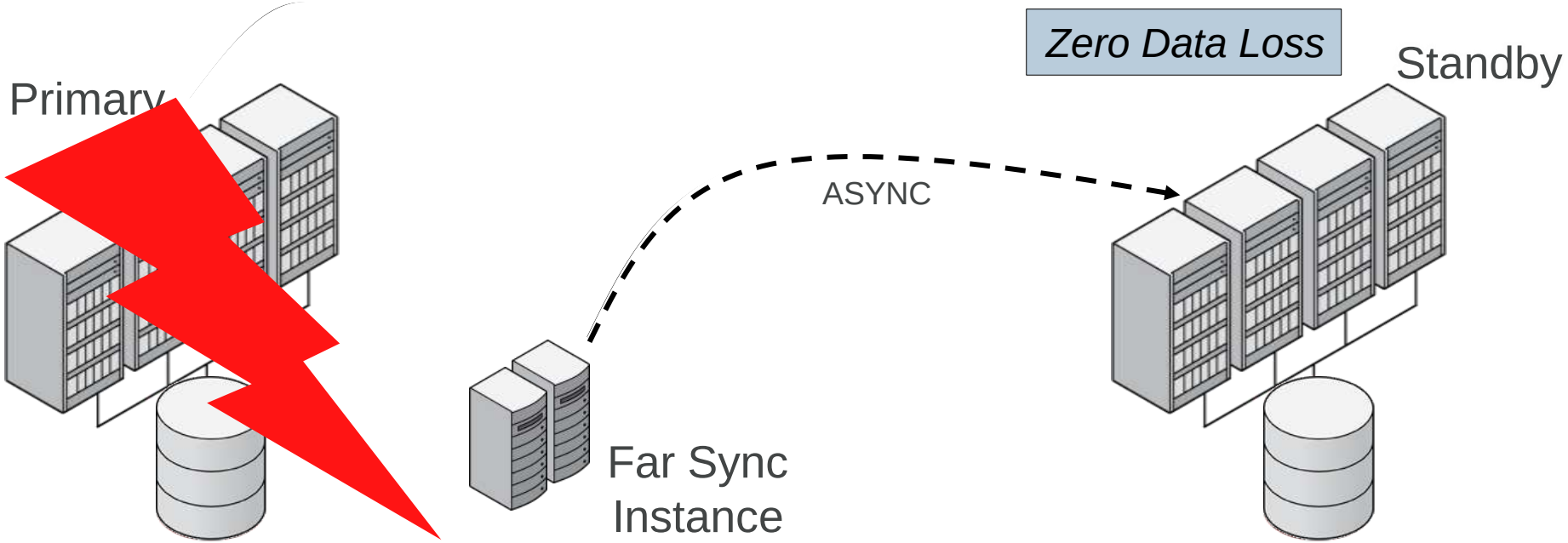
Active Data Guard Far Sync

Operational Flow (contd.)



No Compromise Between Availability and Performance!

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Active Data Guard Far Sync

Benefits

- Best data protection, least performance impact
- Low cost and complexity
- Best way to implement a near DR + Far DR model
- Relevant to existing Data Guard ASYNC configurations
- Data Guard Failover? No Problem! Just do it – No Data Loss!

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Active Data Guard Real-Time Cascading

Eliminates Propagation Delay

- In 11.2, Standby 1 waits till log switch before forwarding redo from archived logs to Standby 2

- In 12.1, Standby 1 forwards redo to Standby 2 in real-time, as it is received: no propagation delay for a log switch
- Standby 2 (Active Data Guard Standby) is up-to-date for offloading read-only queries and reports

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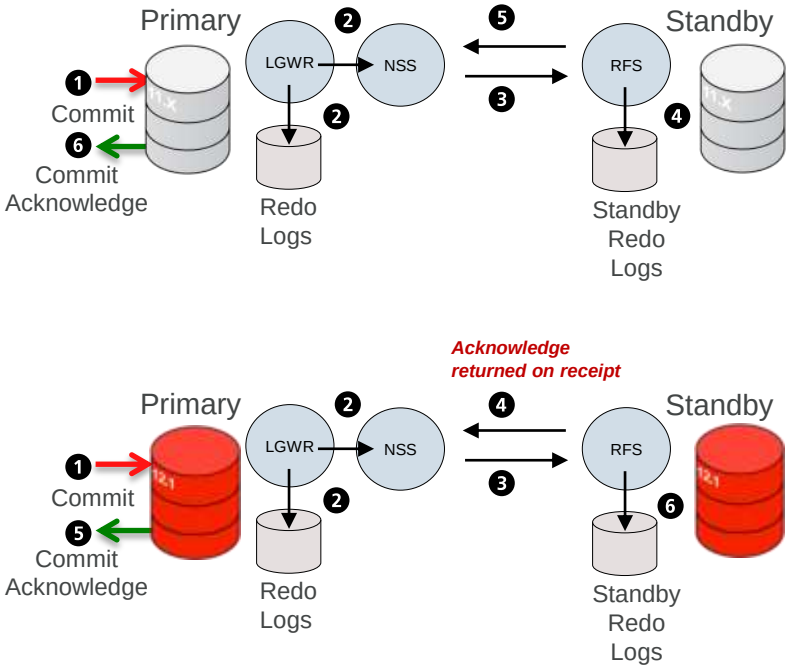
Data Guard Fast Sync

Reduced Primary Database Impact for Maximum Availability



- For SYNC transport: remote site acknowledges received redo before writing it to standby redo logs
- Reduces latency of commit on primary
- Better DR – increased SYNC distance
- If network round-trip latency less than time for local online redo log write, synchronous transport will not impact primary database performance

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Data Guard

Other New Features in Oracle Database 12c

1

Rolling Upgrade With Active Data Guard

- Automate complexity through simple PL/SQL Package: `DBMS_ROLLING` (12.1.0.1 onwards), with simple Init, Build, Start, Switchover, Finish procedures
- Additional Data Type Support: XML OR, Binary XML, Spatial, Image, Oracle Text, DICOM, ADTs (simple types, varrays), …

2

DML on Global Temporary Tables

- Temporary undo is not logged in redo logs
- Enables DML on global temporary tables on Active Data Guard: more reporting support
- Set by default on Active Data Guard standby

4

Validate Role Change Readiness

- Ensure Data Guard configuration ready for switchover with automated health checks – verify no log gaps, perform log switch, detects any inconsistencies, ensures online log files cleared on standby, …

3

Unique Sequences

- Primary allocates a unique range of sequence numbers to each Standby
- Enables more flexible reporting choices for Active Data Guard

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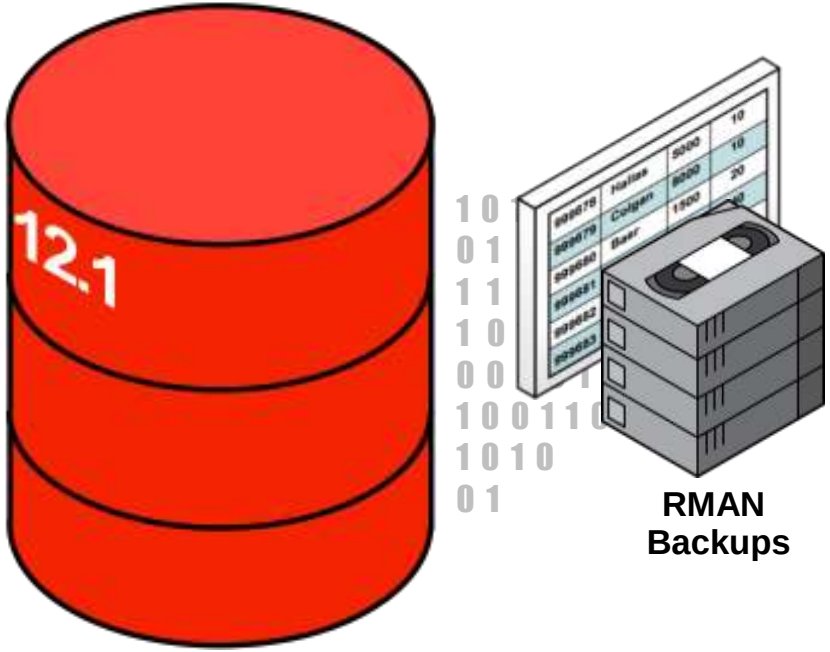
Fine-grained Table Recovery From Backup



- Simple **`RECOVER TABLE`** command to recover one or more tables (most recent or older version) from an RMAN backup
- Eliminates time and complexity associated with manual restore, recover & export
  - Enables fine-grained point-in-time recovery of individual tables instead of the contents of the entire tablespace

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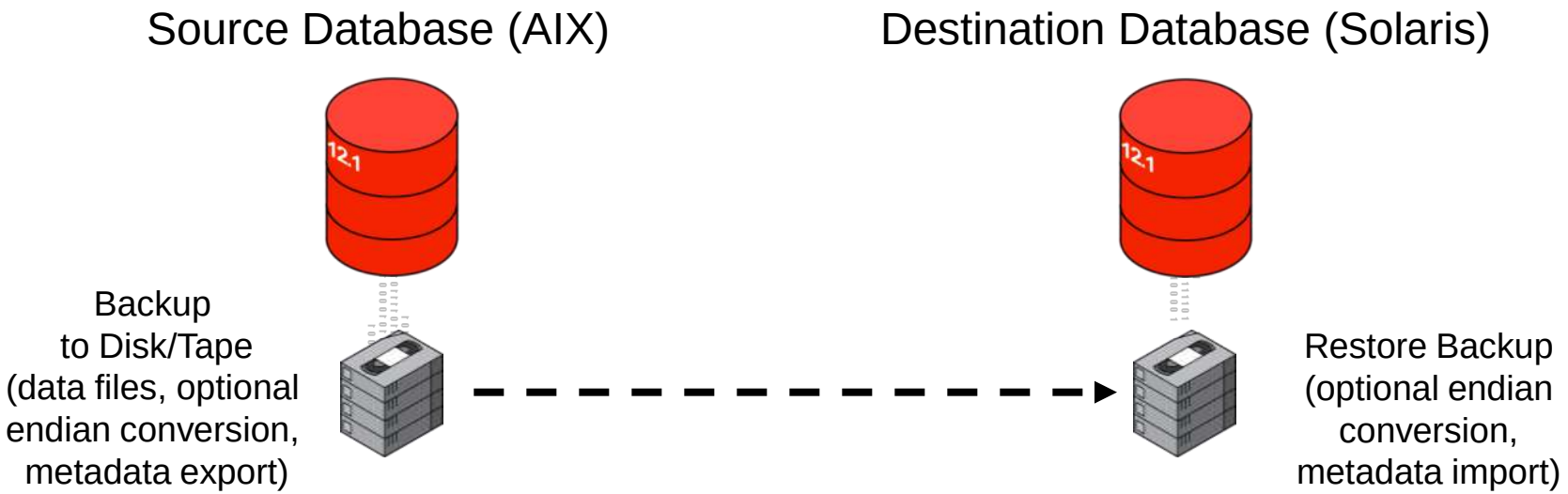
Cross-Platform Backup & Restore

Simplified Platform Migration



- Simplifies procedure for platform migration
- Minimize read-only impact with multiple incremental backups

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Oracle Multitenant Backup & Restore

Fine-Grained Backup & Recovery to Support Consolidation

- Backup and recover specific pluggable databases with new PLUGGABLE DATABASE keywords:
  RMAN> BACKUP PLUGGABLE DATABASE <PDB1>, <PDB2>;
- Familiar **BACKUP DATABASE** command backs up CDB, including all PDBs
- PDB Complete Recovery
  - **RESTORE PLUGGABLE DATABASE <PDB>;**
  - **RECOVER PLUGGABLE DATABASE <PDB>;**
- PDB Point-in-Time Recovery
  - **RMAN> RUN {**
  - **SET UNTIL TIME 'SYSDATE-3';**
  - **RESTORE PLUGGABLE DATABASE <PDB>;**
  - **RECOVER PLUGGABLE DATABASE <PDB>;**
  - **ALTER PLUGGABLE DATABASE <PDB> OPEN RESETLOGS; }**
- Familiar **RECOVER DATABASE** command recovers CDB, including all PDBs

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Better Performance

Other New Features in Oracle Database 12c

- Enhanced Multi-section Backup capability: now supports image copies and incremental backups
- More efficient synchronization of standby database using simple RMAN command: **`RECOVER DATABASE … FROM SERVICE`**
- Enhanced Active Duplicate
  - Cloning workload moved to destination server via auxiliary channels, relieving resource bottlenecks on source
  - Cloning can now use RMAN compression and multi-section capability to further increase performance

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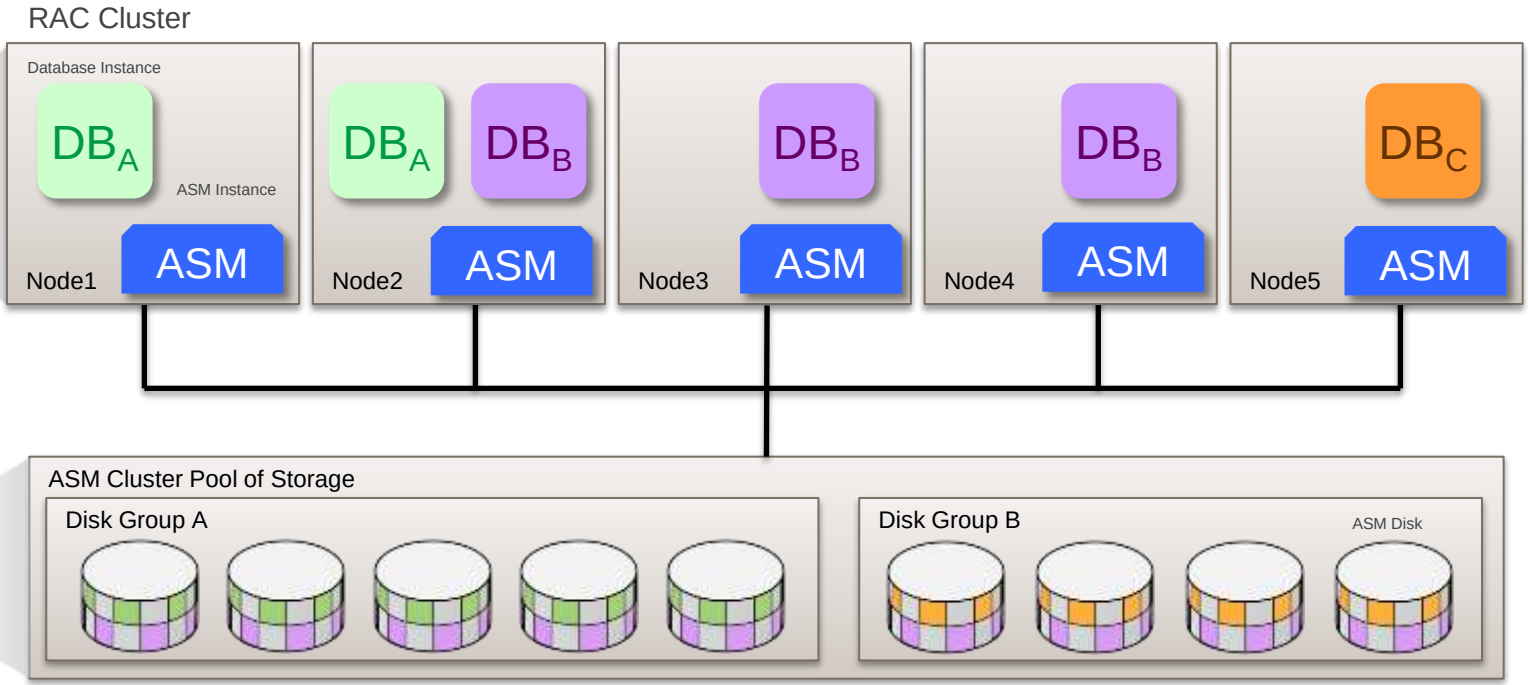
Automatic Storage Management (ASM) Overview

Current State

One to One Mapping of ASM Instances to Servers

Shared Disk Groups

Wide File Striping



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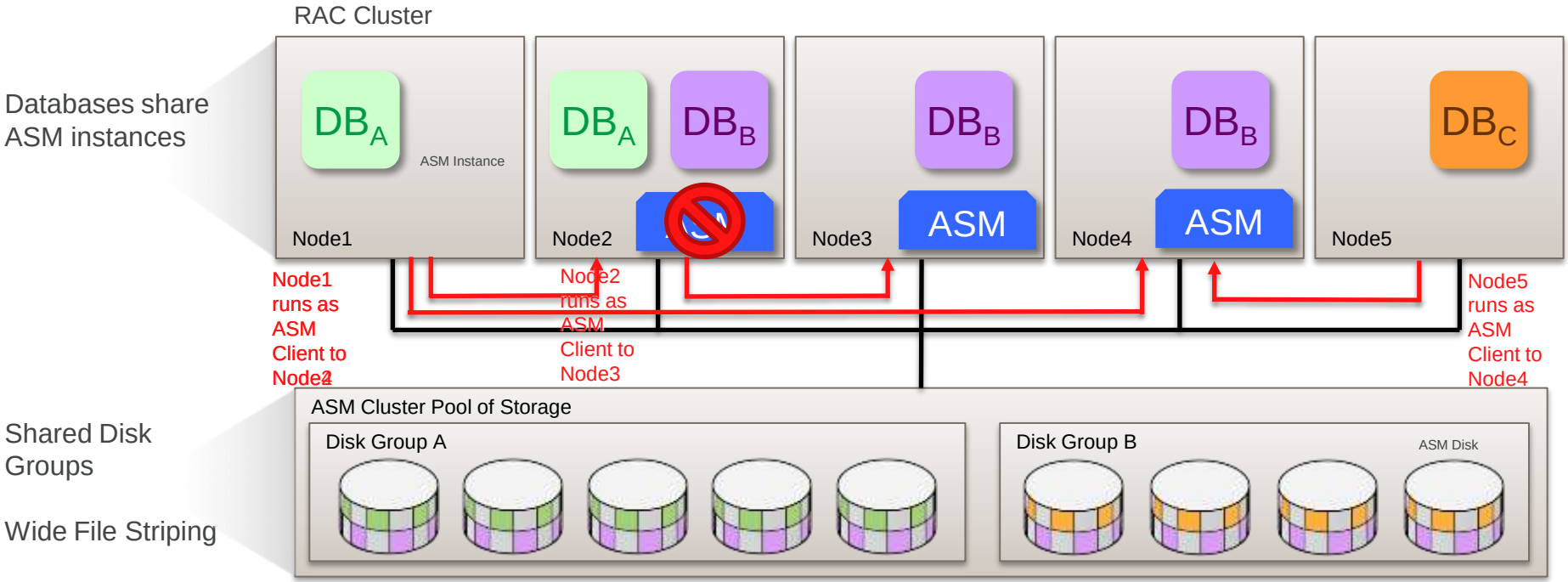
Flex ASM: Eliminate 1:1 Server Mapping

New: ASM Storage Consolidation in Oracle Database 12c



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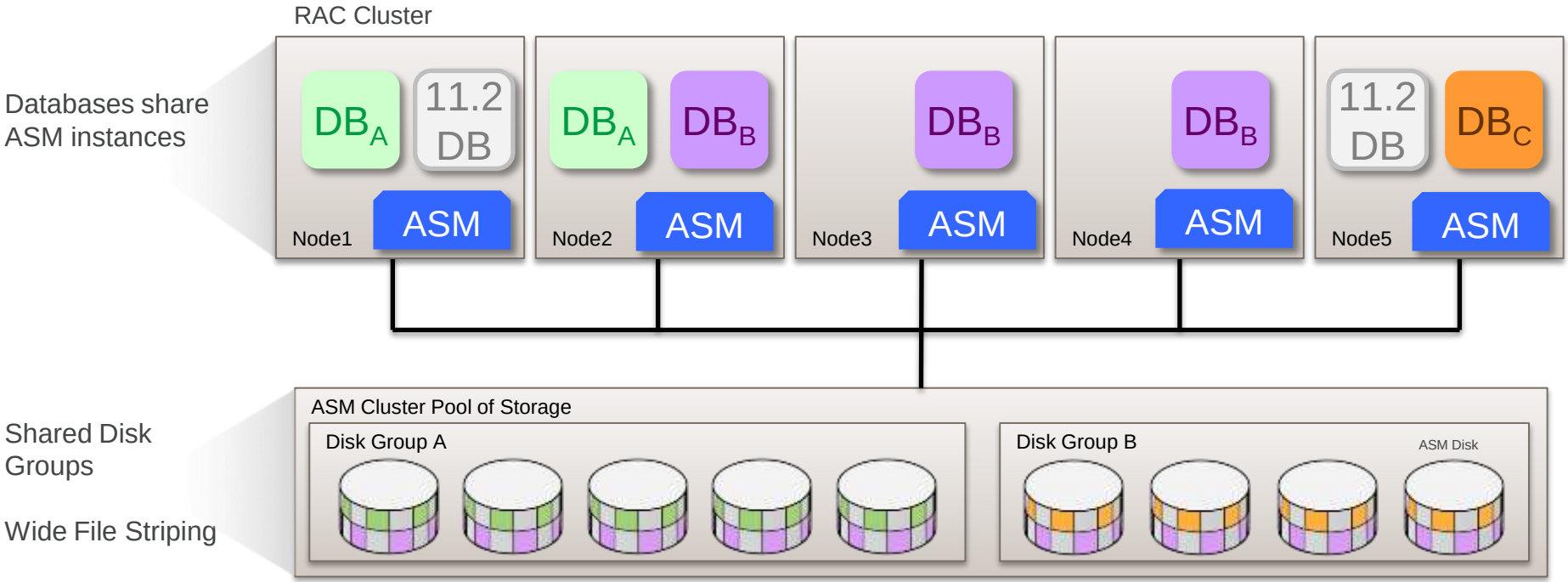
Flex ASM: Supporting Oracle Database 11g

Previous Database Versions Will Host Local ASM Instance



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Other HA Enhancements

1

Online Datafile Move

- Relocate a datafile while users are actively accessing data: `ALTER DATABASE MOVE DATAFILE …`
- Maintains data availability during storage migration

2

Online Redefinition Enhancements

- Improved `sync_interim_table` performance
- Ability to redefine table with VPD policies
- Improved resilience of `finish_redef_table`
- Better handling of multi-partition redefinition

4

Separation of Duties

- `SYSDG` / `SYSBACKUP`: Data Guard & RMAN specific administrative privileges
- No access to user data: enforce security standards throughout the enterprise

3

Additional Online Operations

- Drop index online / Alter index unusable online / Alter index visible / invisible online
- Drop constraint online / Set unused column online
- Online move partition: `ALTER TABLE … MOVE PARTITION … ONLINE`

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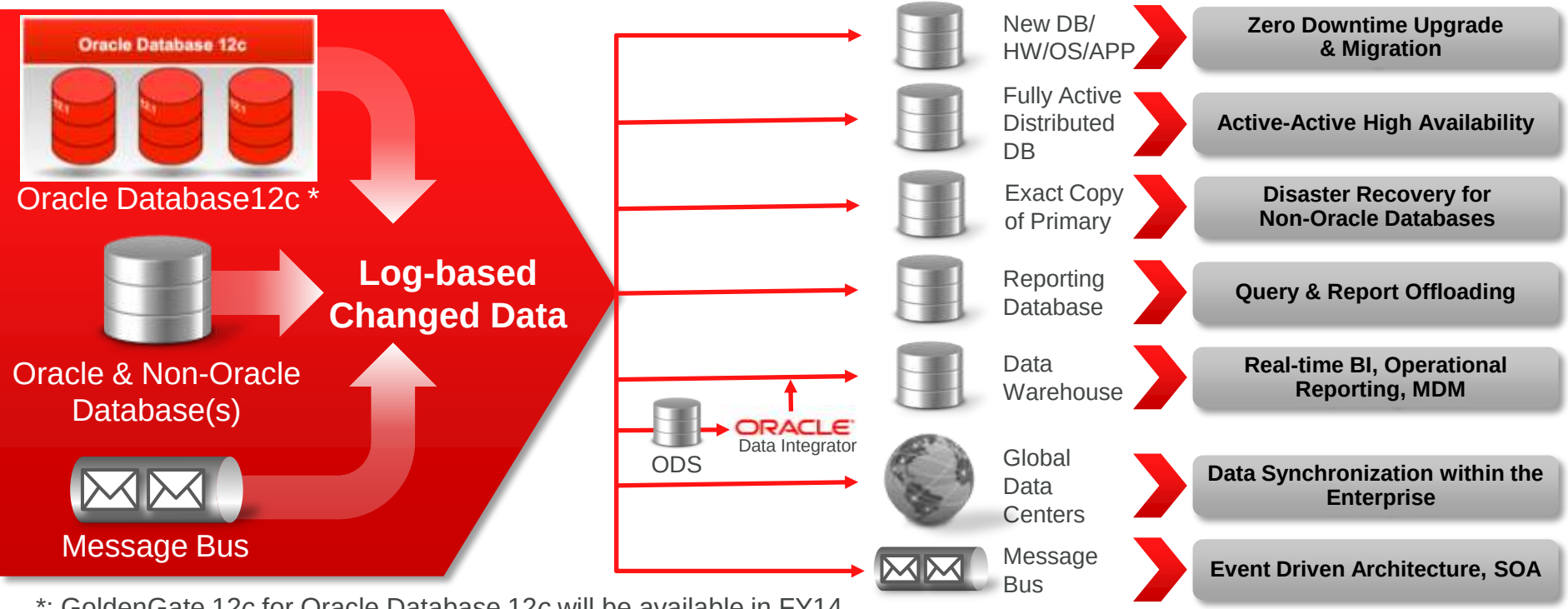
Oracle GoldenGate 12*c**

Low-Impact, Real-Time Data Integration & Transactional Replication



*: GoldenGate 12*c* for Oracle Database 12*c* will be available in FY14

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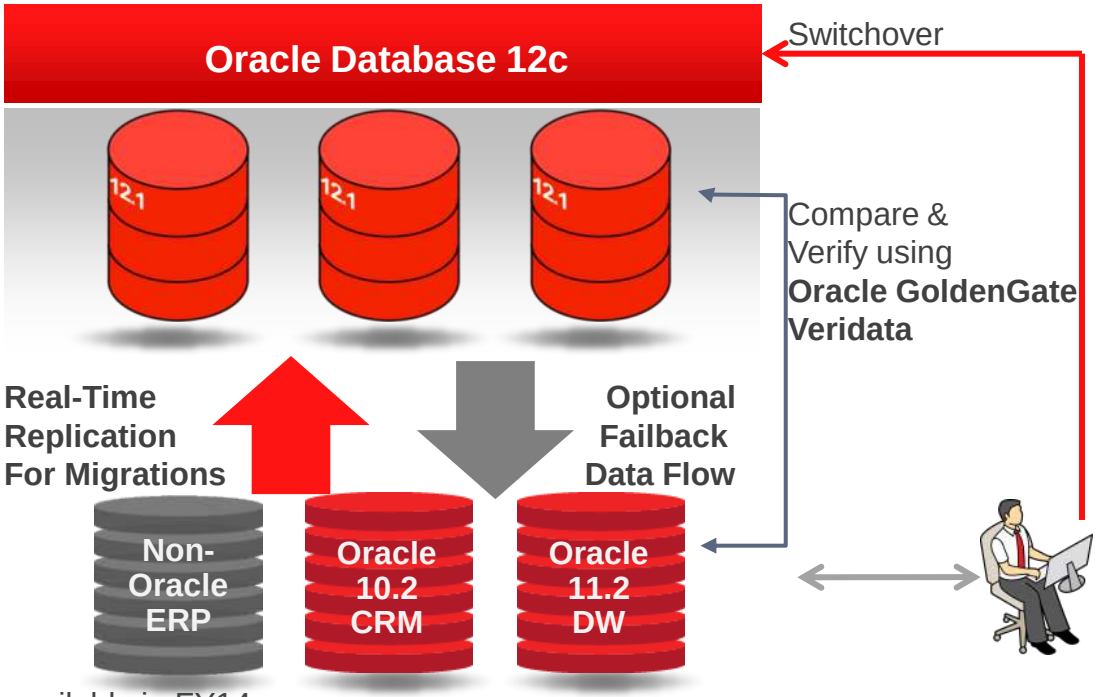
GoldenGate Zero Downtime Migration/Upgrade

Seamless Migration and Upgrades to Oracle Database 12c*

- Consolidate/migrate/ maintain systems without downtime
- Minimize risk with failback option
- Validate data before switchover
- Use Active-Active replication for phased user migration



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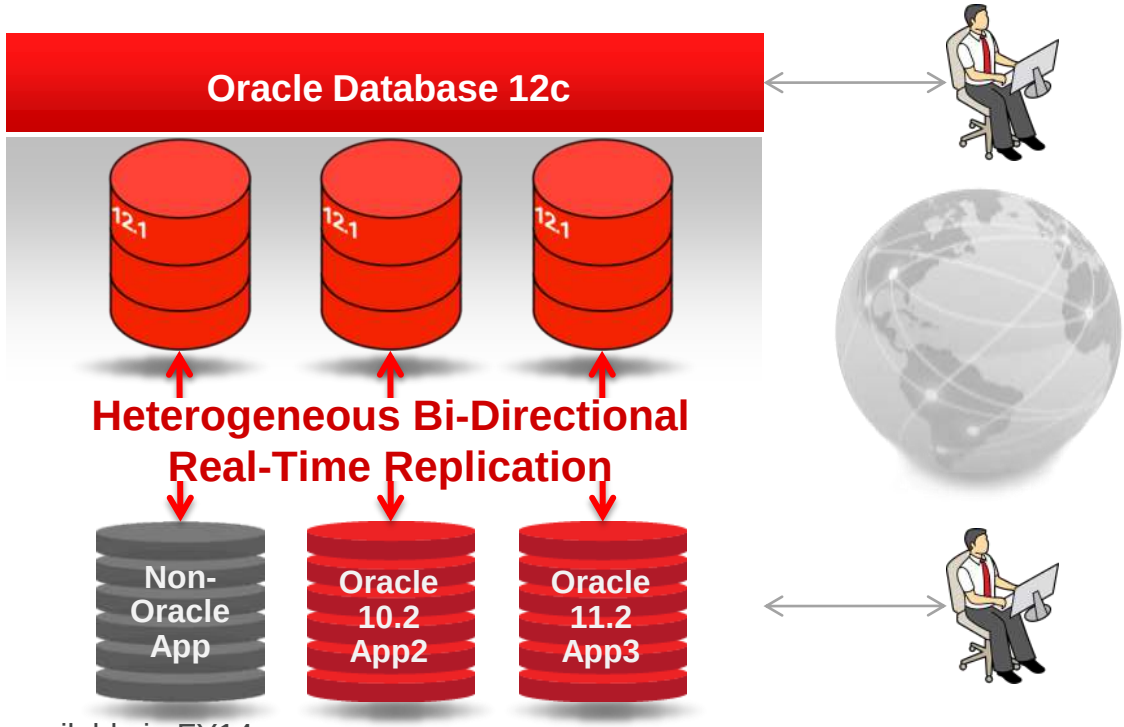
Oracle GoldenGate for Active-Active Databases

Increase ROI on Existing Servers & Synchronize Data

- Utilize secondary systems for transactions
- Enable continuous availability during unplanned & planned outages
- Synchronize data across global data centers
- Use intelligent conflict detection & resolution



*: GoldenGate 12*c* for Oracle Database 12*c* will be available in FY14

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Oracle Database 12c

Extreme Availability: Summary

- Oracle Database 12c offers a tremendously sophisticated set of high availability (HA) capabilities
- These capabilities
  - Further reduce downtime
  - Significantly improve productivity
  - Eliminate traditional compromises

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