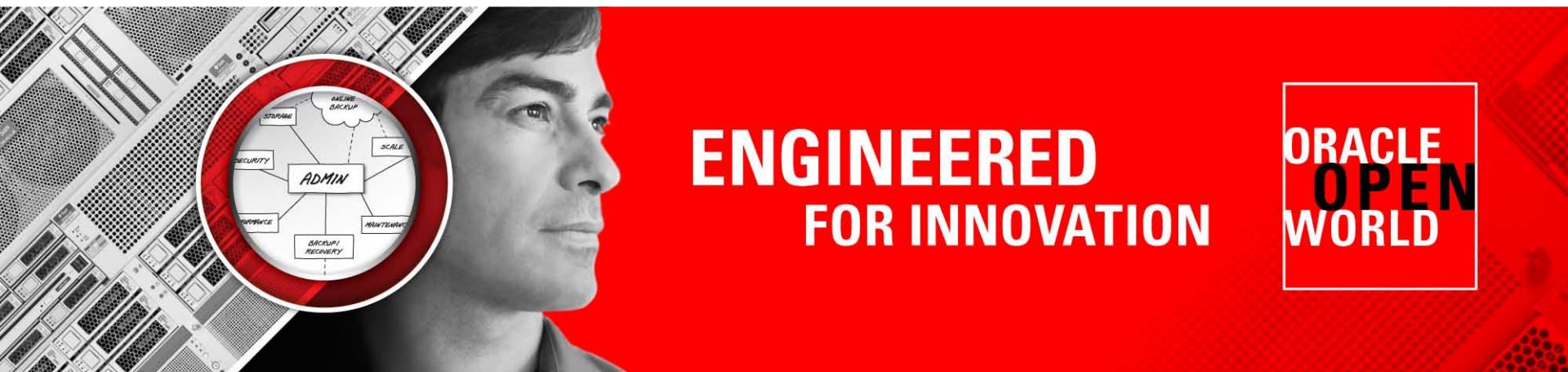


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Active Data Guard

Lessons Learned from Real Life Implementations

Today's Panel

ORACLE®

Joseph Meeks
Director, Product Management

MetLife

Asha V Santosh
Lead Database Administrator

PAYCHEX®

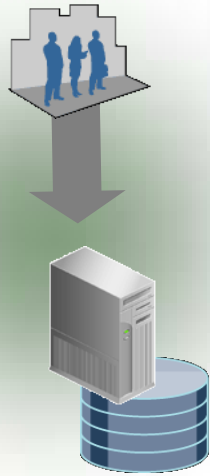
Lisa Garczynski
Senior Database Administrator



ORACLE®

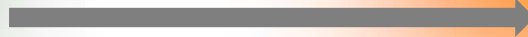
Oracle Data Guard

Oracle's Data Protection Solution



Production Database

Continuous Redo
Shipment and Apply



Standby Database

Data Guard = Best Oracle Data Protection

- Redo based physical replication
 - End-to-end Oracle validation, isolates the standby from corruption
 - Unique ability to detect silent corruptions
- Choice of synchronous (zero data loss) or asynchronous
 - Direct from memory
 - Lowest replication latency
 - Best performance

Data Guard = Most Flexible Recovery Options

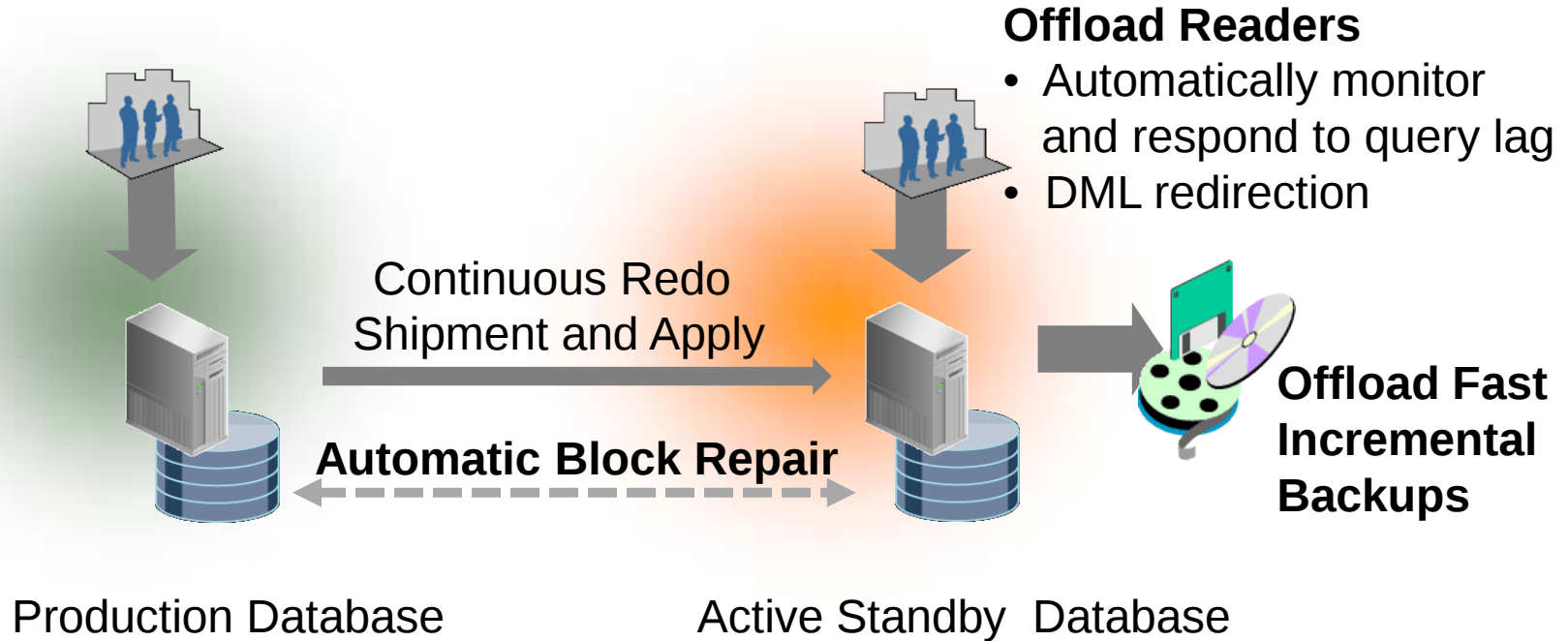
- Automatic database failover
- Automatic application failover to new primary database
- Use standby to repair primary – exact physical replica
 - Automatic repair of corrupt blocks*
 - Extract good copies of user damaged data
 - Flashback standby and use Oracle Data Pump to extract data
 - Use RMAN on standby to surgically repair primary...
 - Backup and restore single data file
- Use RMAN incremental of primary to quickly resync standbys

* Active Data Guard 11g

ORACLE

Active Data Guard = More than Data Protection

High Performance, Return On Investment, Confidence



Query Consistency while Applying Redo

Unique to Active Data Guard

- No compromising on ACID properties
 - No dirty reads: only committed changes are visible on standby
 - Query SCN is the highest SCN visible to readers
 - `v$database.current_scn` on standby
- Standby queries yield identical results to Primary at a given System Change Number (SCN)
- Extends Oracle's Consistent Read (CR) technology
 - Undo is applied to data to produce consistent snapshot

Active Data Guard...

- Supports all data and storage types
- Allows additional TEMPFILES for sorts
- Allows internal temporary table transformations
 - Star queries, WITH clause sub-query, GROUPING SET, etc
- Supports DML redirection to primary using a public database link

What Can I Offload to Active Data Guard?

- Any application compatible with a read-only database
 - See My Oracle Support Note 1206774.1 to pre-screen SQL modules that can use Active Data Guard Standby
 - Use DML redirection to accommodate read-mostly applications
- Oracle E-Business Suite 12.1.3 – Oracle Reports
- PeopleSoft - PeopleTools 8.51
- Oracle Business Intelligence Enterprise Edition – OBIEE
- Oracle TopLink applications

Why is Query Offload So Important?

Seeking Utopia

- Active/Active Disaster Recovery
 - A replicated database environment where workload can be distributed so that primary and standby systems are fully utilized
- Consequence: Service level is impacted at failover time
 - If you do not have idle capacity equal to what has failed, something has to give

What Query Offload Means in a DR Context

Real World Disaster Recovery

- Continuous validation of production readiness
- Deployment options – Pick one
 1. Accept lower service level if primary fails
 2. Limit resource utilization or add capacity so that all workloads can run on a single system should either fail
 3. Identify workloads that can be deferred at failover time
 4. Add a second standby database if needed for DR capacity
 - Extra benefit of continuous protection after failover

TANSTAAFL*

** There ain't no such thing as a free lunch*

But Active Data Guard has its Advantages...

Every replication solution will ...

Add overhead...Data Guard is lowest

Increase complexity...Data Guard is the simplest

Have limits to what can be replicated...
Data Guard has none

Implementation Presentations

MetLife

www.oracle.com/technetwork/database/focus-areas/availability/metlife-513964.pdf

PAYCHEX[®]

www.oracle.com/technetwork/database/focus-areas/availability/paychex-513965.pdf



MetLife's 11gR2 Active Data Guard Implementation Story

MetLife



**DR Solution and Reporting
Better together**



Asha V Santosh
Lead DBA, MetLife

Agenda

MetLife



- Who are We ?
- MetLife's Oracle Footprint.
- Active Data Guard and PeopleSoft
- Active Data Guard and OBIEE
- Active Data Guard and Hyperion
- Summary

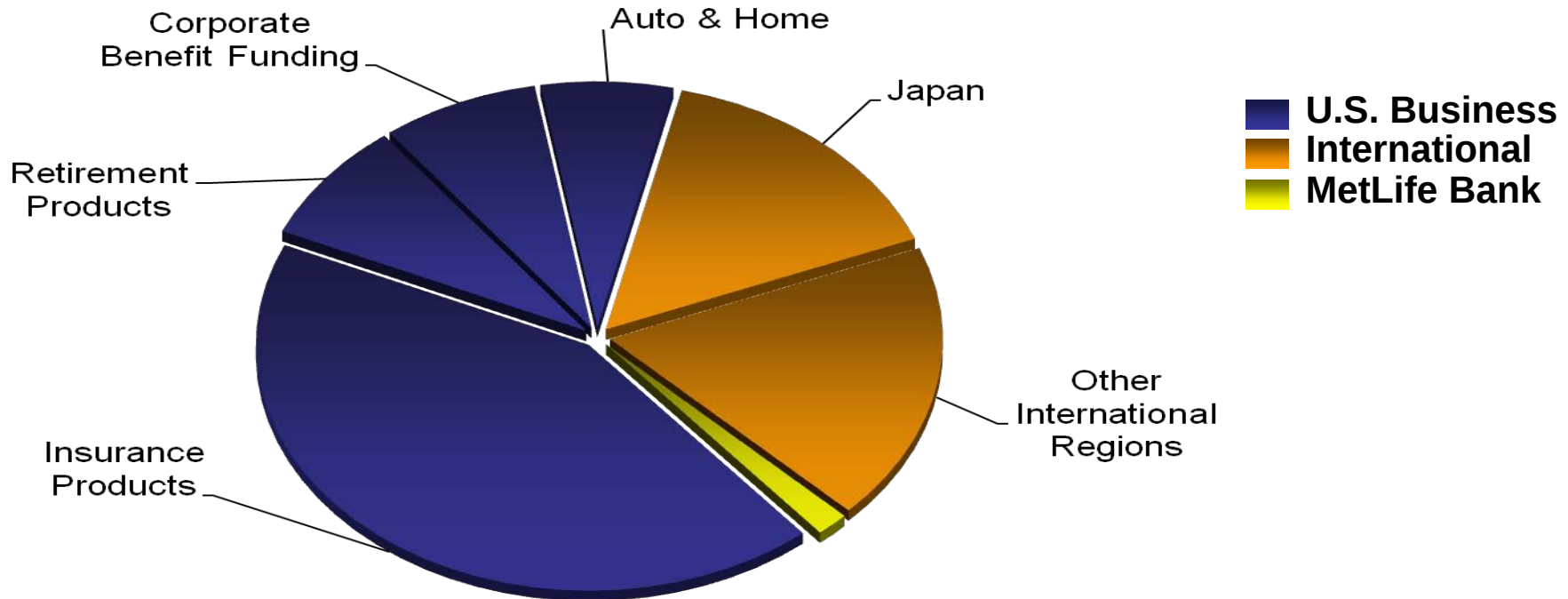
Who Are We?



- MetLife, Inc. (NYSE: MET) is a leading global provider of insurance, annuities and employee benefit programs
- 90 million customers in more than 60 countries
- 2010 total revenues of \$52.7 billion
- 46th on the FORTUNE 500^{®1}
- Over \$770 billion² in total assets
- 66,800 employees²
- Founded in 1868

A Diverse and Global Company

MetLife 2Q 2011 Premiums, Fees & Other Revenues of \$11.8 Billion*



*Excludes the Corporate & Other component of Banking, Corporate & Other. The non-GAAP measure used above (premiums, fees and other revenues) should not be viewed as a substitute for the most directly comparable GAAP measure (GAAP premiums, fees and other revenues). Premiums, fees and other revenues, as presented, is GAAP premiums, fees and other revenues minus \$59 million in adjustments related to universal life and investment-type product policy fees.

Market Leadership

- Largest life insurer in the United States, Mexico, Russia, Chile and Argentina¹
- Clients include over 90 of the top 100 FORTUNE 500®²
- Largest provider of group employee benefits in the U.S.³
- Leading market positions in Japan, Korea and Brazil⁴
- Top five positions in over 25 markets⁵
- Growing presence in India and China

¹Based on life insurance in force according to A.M. Best (U.S.); Based on direct premium according to EstadisticAMIS (Mexico); Based on premiums according to Federal Board of Insurance Supervision (Russia); Based on combined direct premium according to Superintendencia de Valores y Seguros (Chile); Based on combined direct premium according to Superintendencia de Seguros de la Nacion (Argentina); ²Issue Date: 5/23/2011; ³LIMRA and MetLife Research; ⁴Nikkei (Japan); Financial Supervisory Service (Korea); SUSEP (Brazil); ⁵AXCO

MetLife's Oracle Footprint

- Oracle® RDBMS on AIX and Linux
- PeopleSoft Financial 9.1/8.8
- DR using Oracle Data Guard
 - Traditional and active physical standby
- Reporting using a logically replicated environment
- Advanced compression (Oracle 11g Release 2)
- OBIEE financial and gap analytics
- Hyperion planning and budgeting

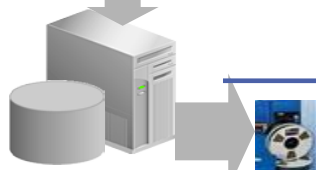
MetLife Architecture before ADG

Standbys Only Used for Disaster Recovery

Production
Site

PeopleSoft
Financial Online App
Erp Financial

PeopleSoft
Near Real-time (NRT)
Financial reporting,
Erp reporting



Shareplex
Logical
replication



Data Guard

Data Guard

Remote
DR Site

Standby
Database



Standby
Database



Why Consider Active Data Guard

- Considerable volume of read-only workload
 - PeopleSoft, OBIEE, Hyperion, other applications
- Existing Data Guard standby databases
 - Minimal cost
- Active Data Guard offers an ideal opportunity
 - Harness standby system capacity
 - Eliminate separate reporting instances
 - Low cost, utilizes infrastructure in place for DR
 - Simpler to implement than other replication options

PeopleSoft 8.5.1 with Active Data Guard 11g

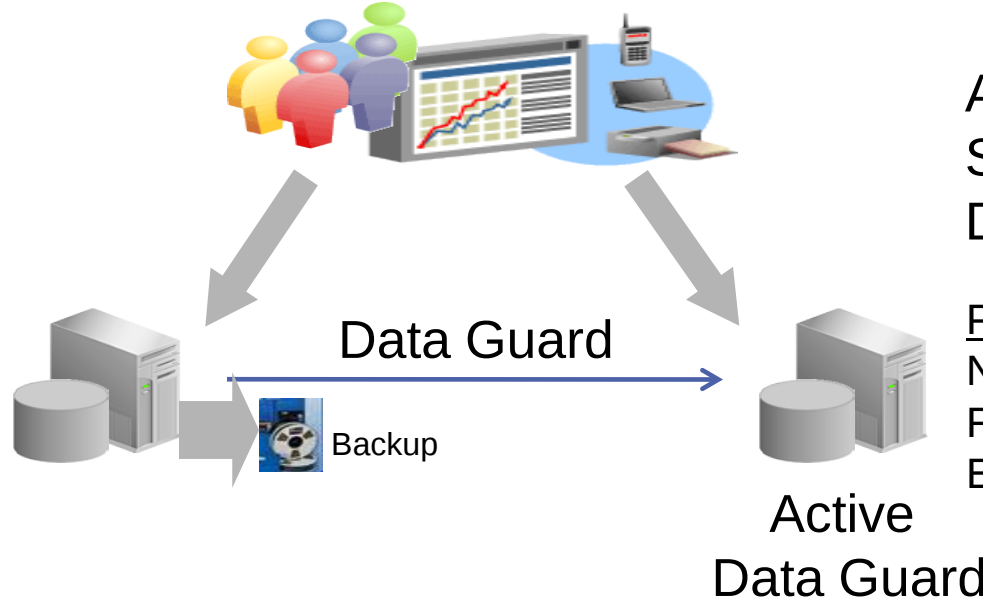
Same App server supports both OLTP
and reporting user population

Primary
Database

PeopleSoft
Financial Online App
Erp Financial

Active
Standby
Database

PeopleSoft
Near Real-time (NRT)
Financial reporting,
Erp reporting



PeopleSoft and ADG – Implementation

Three step configuration:

- Configure a standby DB in the App server and Process Scheduler configuration files
- Mark components as R/O so that these components get redirected to the STANDBY DB
- Mark Process Scheduler processes as R/O so that these components get redirected to the STANDBY DB

PeopleSoft / PT 8.51 App Server Configuration

In the app server and process scheduler configuration files – configure as standby DB

Configuring a Standby DB

- In PT8.51 specify an optional STANDBY database in addition to the current PRIMARY database designation in the Application Server configuration file

- PT8.51 Application Server config file

- [Startup]

- ;=====

- ; Database Signon settings

- ;=====

- DBName=F9ADGP

- DBType=ORACLE

- UserId=onlinewrite ←-----Primary Accessid

- UserPswd=sysadm2pass

- ConnectId=people

- ConnectPswd=peop1epass

- ServerName=

- StandbyDBName=F9ADGP_SISC

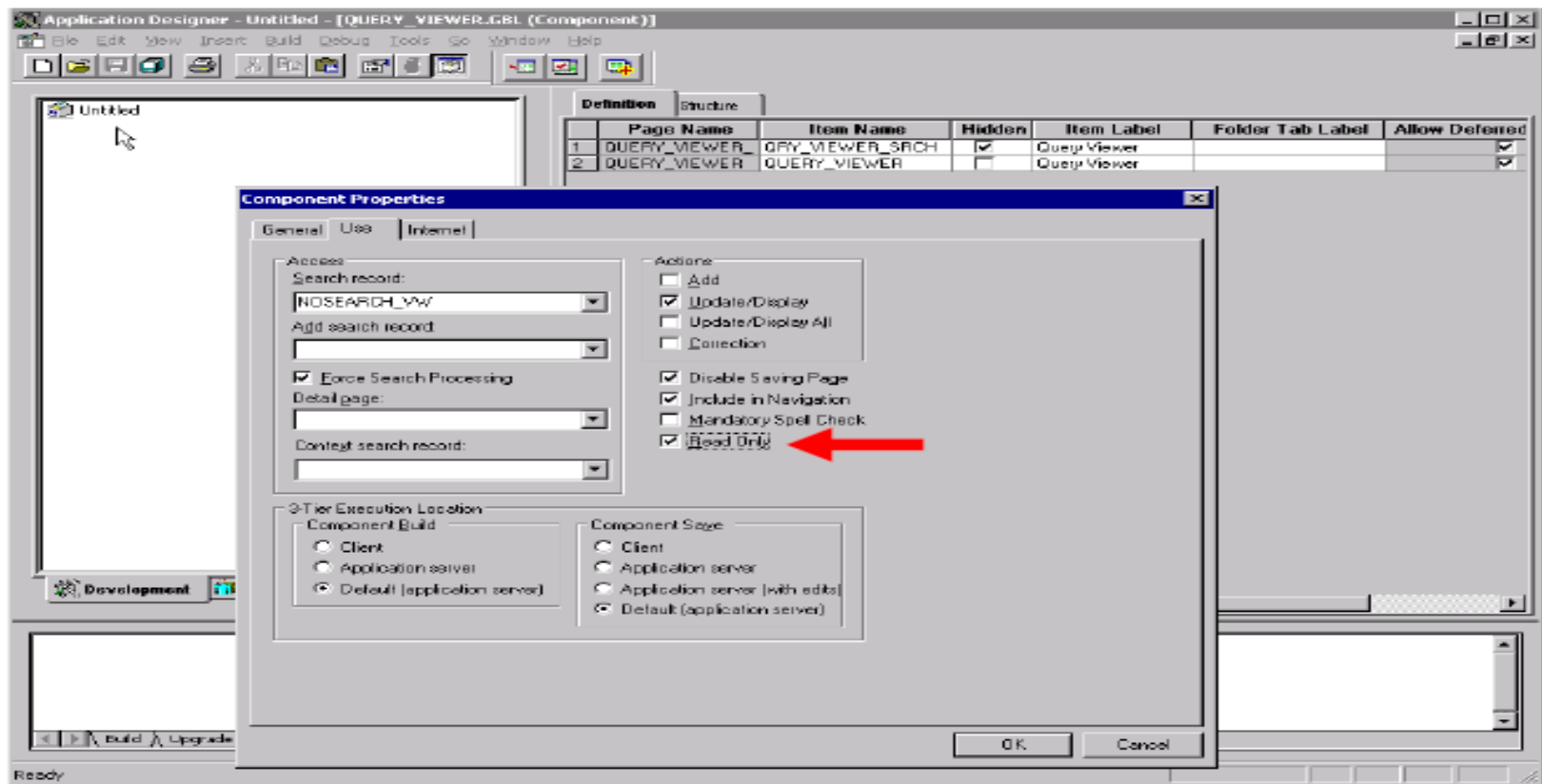
- StandbyDBType=ORACLE

- StandbyUserId=reporting ←-----Secondary Accessid

- StandbyUserPswd=reportingpass

- *Note: New Standby DB entries*

Marking Each Component as Read-Only



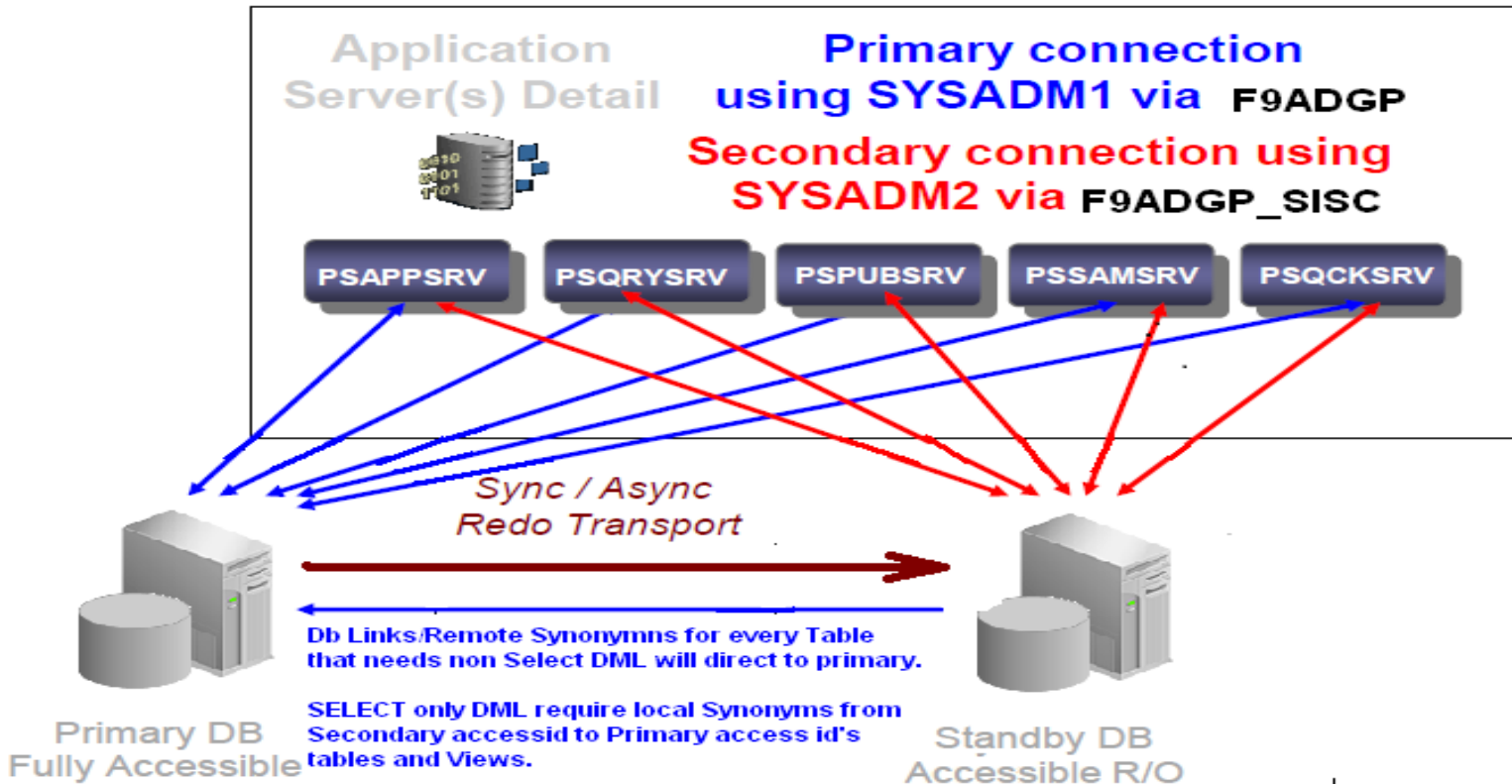
PeopleSoft Database Configuration

Database

- Standby open and ready for read-only connections
- Create a connect string in OID or TNSNAMES dedicated for the active standby DR database
 - F9ADGP - For non PeopleSoft users connecting for writes (connects to Production).
 - F9ADGS - For non PeopleSoft users connecting for reads – (connects to standby) .
 - F9ADGP_RISC (for **PeopleSoft Financial Online App**)
 - F9ADGP_SISC (for **PeopleSoft Financial Reporting App**)

Additional Implementation Details

PeopleSoft Active Data Guard Standby Database Setup



PeopleSoft Workload Moved to Active Data Guard

- Query Viewer - queries were run from Query Viewer component and confirmed through SQL trace and the DB to be running on the standby
- Tree Viewer - trees viewed from Tree Viewer component were confirmed through SQL trace and the DB to be running on the standby
- Query Manager component set to Read Only in AppDesigner. Remote synonyms for PSQRY% tables were created on primary DB
- Materialized view created and exploded on the primary DB and replicated to the standby. Corresponding view created in AppDesigner

Other Applications that also Connect to DR

Other applications that read from the Financial reporting database

- BI publisher
- Nightly ETL data extract for OBIEE
- Hyperion

OBIEE Database Implementation Details

- Standby open and ready for read-only connections
- Create a connect string in OID or TNSNAMES dedicated for the active standby DR database
- Use that connect string to extract the nightly ETL load (Using Informatica and DAC scheduler) to OBIEE
- All BI publisher (part of OBIEE) that used to read from finance production directly now reads from standby using the same connect string to query financial data.

OBIEE and Active Data Guard

Three step configuration:

- Disable temporary table creation. This prevents Oracle BI EE from issuing DML statement while connecting to standby database.
- Create the first connection pool to connect to the standby database as most of the queries go through here.
- All Scripts that modify database content must specify the primary database connection pool explicitly.

OBIEE- Configuration

Disable
temporary table
creation in
standby

Database - StandbyDemo

General | Features | Connection Pools | Display Folders

Name: F9ADGS

Data source definition

Database: Oracle 10g R2/11g

☐ CRM metadata tables ☐ Virtual Private Database

Persist connection pool

not assigned Set... Clear

☐ Allow populate queries by default

☐ Allow direct database requests by default

Description:

OK Cancel Help

OBIEE- First Connection Pool to Standby

Connection pool
to standby
database

The screenshot shows the 'Connection Pool - Standby Connection' dialog box with the following settings:

- Name:** F9ADGS
- Call interface:** Default (OCI 10g/11g)
- Maximum connections:** 10
- ☐ Analytic Workspace
- ☐ Require fully qualified table names
- Data source name:** F9ADGP
- ☒ Shared logon
 - User name:** xcb
 - Password:** [masked]
- ☒ Enable connection pooling
 - Timeout:** 5 (minutes)
- ☒ Use multithreaded connections
- ☐ Execute queries asynchronously
- ☒ Parameters supported
- Isolation level:** Default
- Description:** [empty text area]

Buttons at the bottom: OK, Cancel, Help.

OBIEE- Connection Pool for Write Back

“Write-Back”
connection pool
points to the
primary

The screenshot shows the 'Connection Pool - Primary Connection' dialog box with the 'Write Back' tab selected. The 'Name' field is highlighted with a green arrow and contains the text 'F9ADGP'. Other fields include 'Call interface' set to 'Default (OCI 10g/11g)', 'Maximum connections' set to '10', 'Data source name' set to 'F9ADGP', 'User name' set to 'xclb', and 'Password' set to 'ccc'. The 'Enable connection pooling' checkbox is checked, and the 'Timeout' is set to '5' minutes. The 'Isolation level' is set to 'Default'.

Field	Value
Name	F9ADGP
Call interface	Default (OCI 10g/11g)
Maximum connections	10
Data source name	F9ADGP
User name	xclb
Password	ccc
Timeout	5 (minutes)
Isolation level	Default

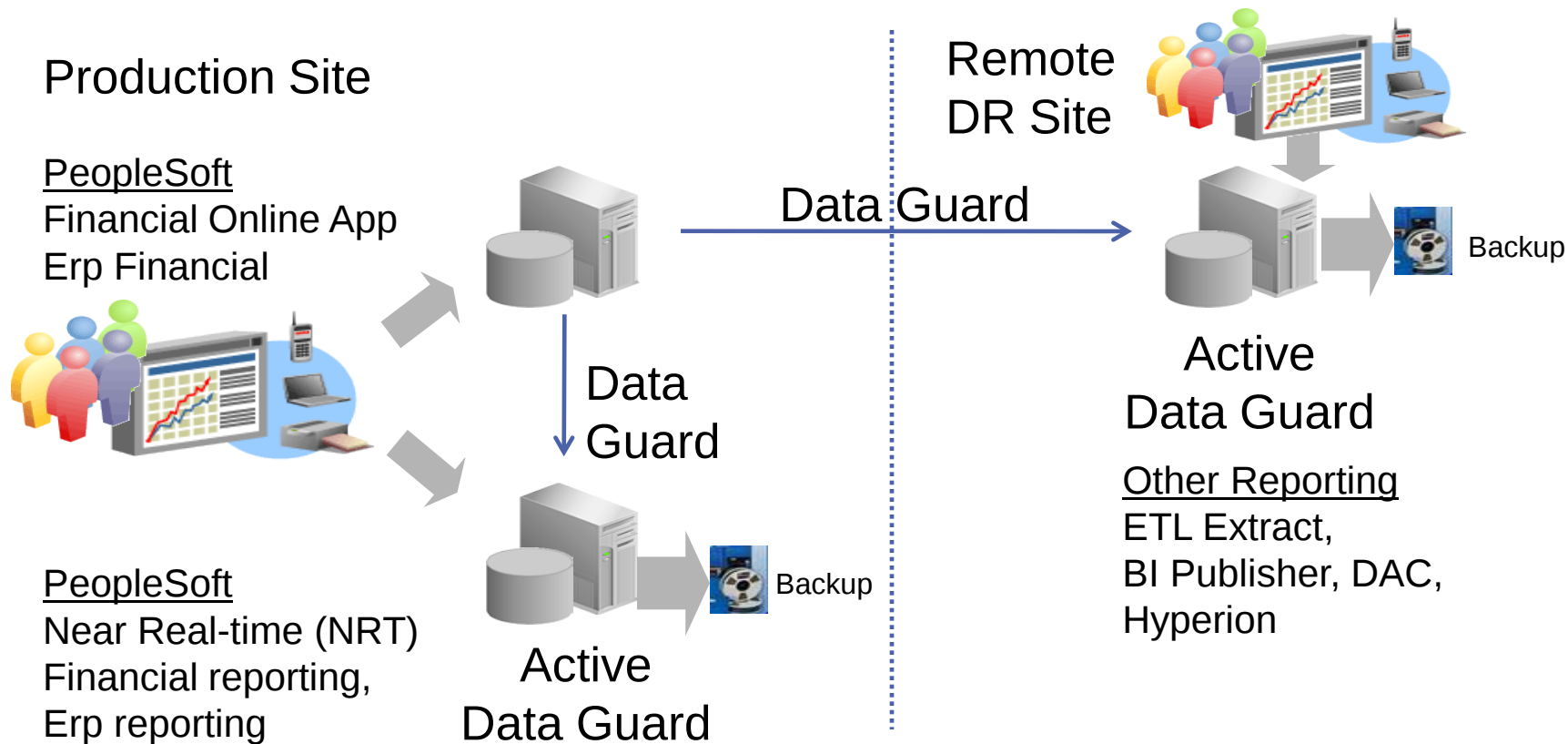
Hyperion Implementation Details

Financial Reporting

- Standby open and ready for read-only connections
- Create a connect string in OID or TNSNAMES dedicated for standby DR database
- Use that connect string to extract the nightly ETL load (Using Hyperion's FDM tool) to Hyperion database.
- All packaged queries that previously read from finance production, now read from active standby using the same connect string to query financial data.

MetLife Active Data Guard Architecture

Dual Active Standbys – Capacity for both Reporting and DR



Compromises with Active Data Guard

Compared to Logical Replication

- Access
 - No read-write access to the reporting (standby) environment
- Flexibility
 - Reporting specific trees need to exist in the operational (primary) environment
 - Non-PS schemas need to be relocated to the operational (primary) or another database
- Tuning
 - Reporting specific tuning needs to exist in the operational (primary) environment and must be tested to ensure there is no impact to functionality or performance of either primary or standby

Advantages of Offload to Active Data Guard

- 37% cost reduction due to fewer PS reporting environments (e.g. HW, capacity, software licensing)
- Reduction in maintenance required to support PS environments (e.g. tuning, refreshes, upgrades)
- Reduction in batch trail processing/maintenance
- PeopleSoft reporting can be done from one central URL/environment, additional login/navigation is not required
- Ability long term to off-load additional read only processes to the standby DB to conserve resources on the primary DB
- Continuous validation that DR systems are ready to support production
- Added automatic block corruption repair – a feature of Active Data Guard

References

- Active Data Guard Configuration Reference in PeopleBooks
http://download.oracle.com/docs/cd/E18083_01/pt851pbr0/eng/psbooks/tadm/book.htm?File=tadm/htm/tadm13.htm#H4064
- Configuring Oracle BI EE server with Active Data Guard
<http://www.oracle.com/technetwork/middleware/bi-enterprise-edition/overview/biee-activedataguard-130935.pdf>

Paychex Active Data Guard Implementation

**Lisa Garczynski
Sr. Database Administrator**

Oracle Open World
October 2011

About Paychex, Inc.

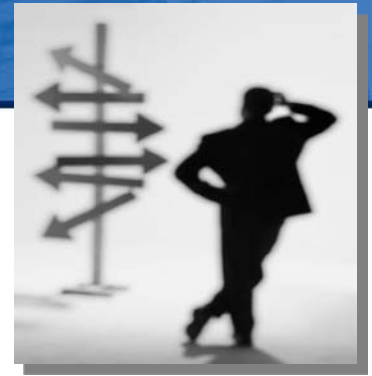


- Paychex Inc, is a leading provider of payroll, human resources, and benefits outsourcing solutions to approximately 564,000 small and medium sized businesses.
- Fiscal 2011 highlights (ended May 31, 2011):
 - \$2 billion revenue;
 - \$0.8 billion pre-tax income;
 - \$0.5 billion net income
- *Computerworld* list of “Top 100 Best Places to Work in IT”.

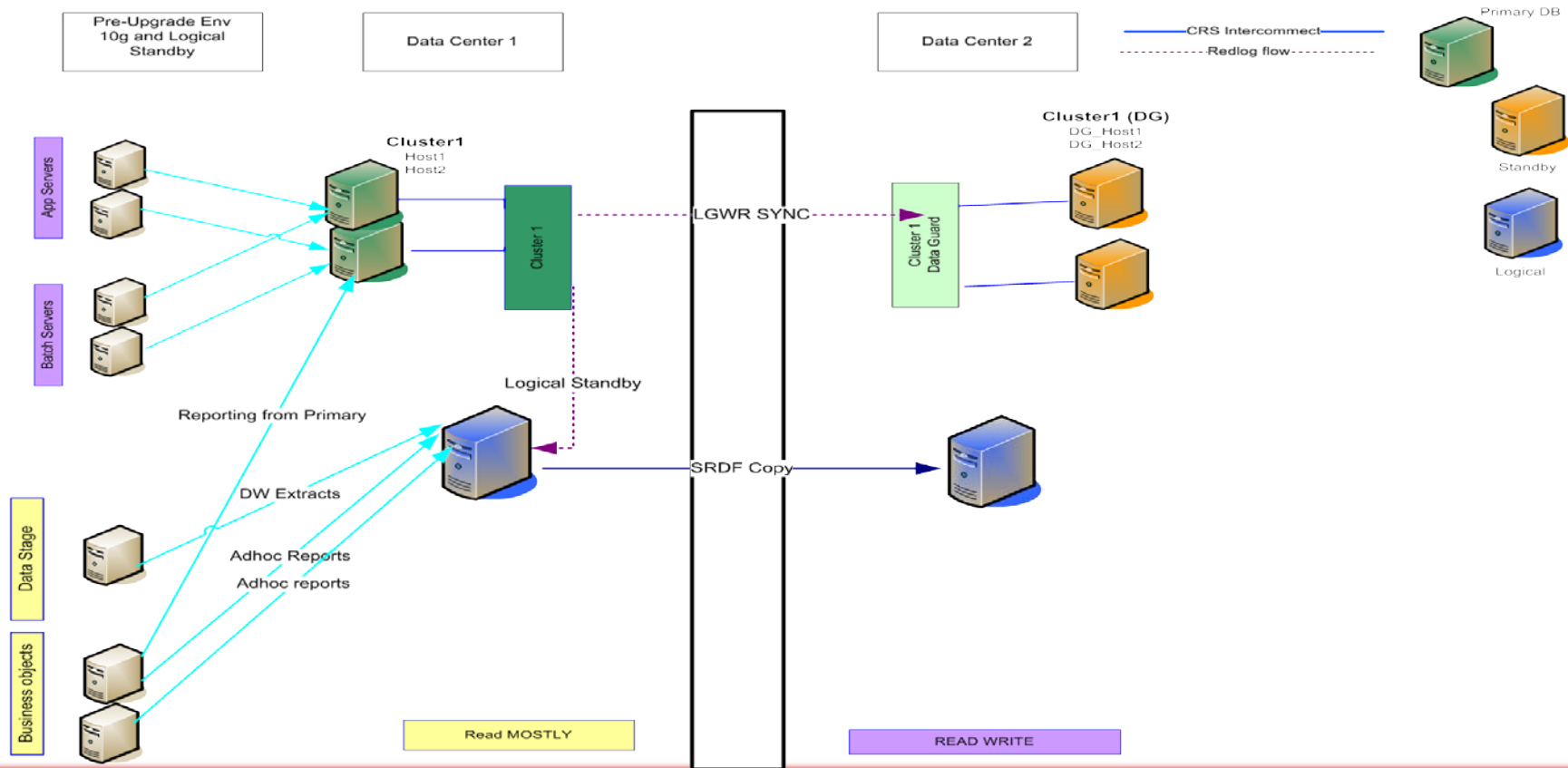
Why Upgrade to 11g Release 2?

Upgrade Drivers

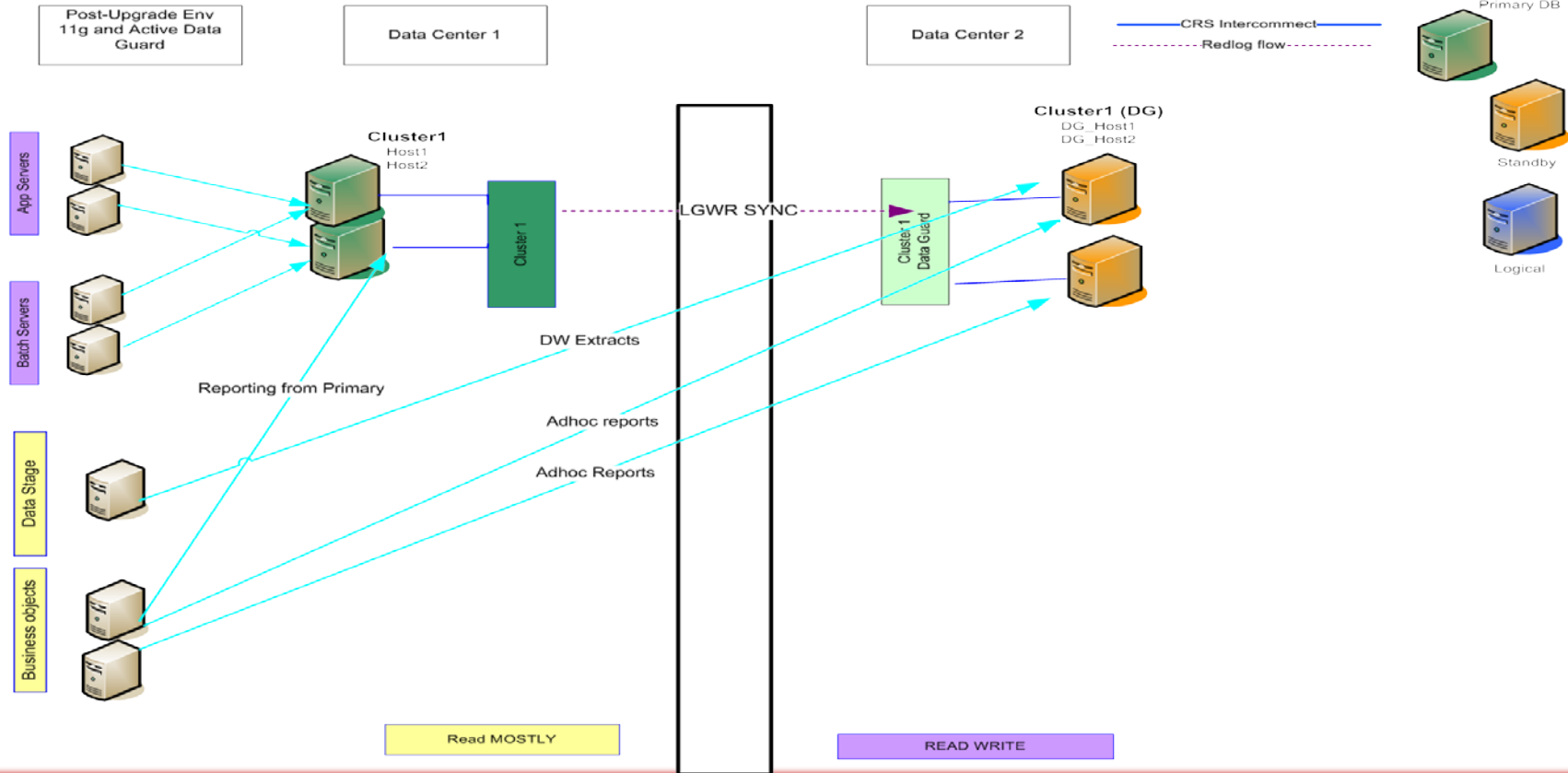
- Bring us up-to-date with Oracle Release
- Leverage disaster recovery hardware
- Cost reduction
- Database replay



Pre-11g Upgrade Architecture



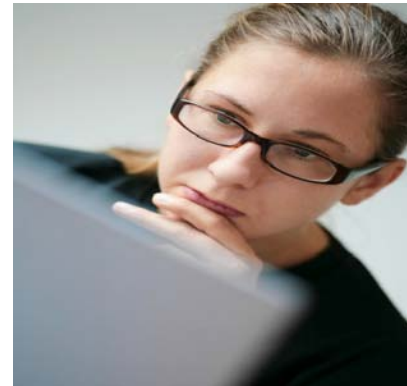
Post Upgrade Architecture



Analysis of Read-Only Activities

Business Objects

- Adhoc reporting uses logical standby.
- Some reports connected to primary database – due to lag issues on the logical standby.
- Reports that write to tables?
- Analyzed the workload.



Analysis of Read-Only Activities

- We used Data Stage for extracts to our data warehouse. The extracts need to write to tables.
- Remember, **YES !!** Active Data Guard is a true read-only database; you can't write to tables.
- So, the question is...will Active Data Guard work?

How Did We Do It?

Define Database Service Names

- ◆ Created database service names for each workload type, for example:
 - cluster1_reports, cluster1_adhoc, cluster1_app, cluster1_batch
- ◆ Modify init.ora parameter on primary and standby
 - On the **Primary** –
 - ALTER SYSTEM SET SERVICE_NAMES='cluster1_report, cluster1_app, cluster1_batch, db_unique_name' SCOPE=both sid='*';
 - On the **Active Data Guard Standby** -
 - ALTER SYSTEM SET SERVICE_NAMES='cluster1_adhoc, db_unique_name' SCOPE=both sid='*';

How Did We Do It (cont)?

Re-direct dml to primary to enable read-mostly activity

1. Created table on the primary.

- `CREATE my_schema.my_table (id number);`

2. Created a separate user, privileges for adhoc reporting.

- `CREATE USER adhoc_usr IDENTIFIED BY password;`
- `GRANT select, insert, update, delete ON my_schema.my_table TO myrole;`
- `GRANT connect, myrole TO adhoc_usr;`

3. Created a private database link from the standby to the primary.

- `CREATE DATABASE LINK mylink CONNECT TO link_user IDENTIFIED BY link_password USING 'primarydb';`

How Did We Do It (cont)?

4. Modified the private synonyms of `adhoc_user` to point to the tables we needed to modify.
 - `CREATE OR REPLACE SYNONYM my_table FOR my_schema.my_table@mylink;`
5. Create `$ORACLE_HOME/network/admin/tnsnames.ora` entry on standby to point to primary.

Putting it all together

The report or extract runs ...

- `INSERT INTO my_table VALUES('12345');`
- `commit;` --> This commits on primary.
- `SELECT a.id, a.col2, a.col3`
`FROM mytab a`
`WHERE a.id in (SELECT b.id FROM my_table b);`

**** TEST THE PERFORMANCE OF YOUR QUERIES! ****

The execution plan will change by selecting
data over a database link.

SQL Performance

- Explain plans that need to write to a table won't work
 - **Unless PLAN_TABLE referenced is a synonym which points to the primary database.**
- dbms_xplan.display_cursor WILL work.
- ASH reporting is correct in 11.2.0.2.
- AWR reports are actually the workload from the primary (reading from SYSAUX tables)

SQL Performance, cont.

- Oracle Enterprise Manager Performance page can be misleading on ADG.
- Standby Statspack Note: 454848.1
- Profiles for SQL in Active Data Guard can be used, BUT they must be created in the primary and propagated to standby.

Results

- Gain.... 90 TB of storage... **RECLAIMED!**
- Bigger gain... reclaimed Fibre Adapter ports which could be used to balance SAN workload
- Biggest gain... reduction in SRDF hardware replication traffic.
- Logical standby requiring a lot of maintenance... **GONE!**



More Results



REPORTING

- Improved performance of reports
- More accurate reports due to zero lag (LGWR SYNC)
- Potential for moving additional reports off primary due to benefits and reliability of Data Guard reporting.
- Potential exists for tuning reporting with different init.ora settings – SGA/PGA/Parallel Query options.

Lessons Learned

- Auto-compile doesn't work.
- Plan additional resources for post-implementation support.
- Check logon trigger rules and auditing.
If they write to tables on login, they will need to be modified.



Lessons Learned

- Test reports early
- Compatible parameter
- Use Active Data Guard!
 - ◆ Will detect hidden corruptions on the standby
 - ◆ Data Guard and read-only queries for hot data
 - ◆ RMAN validation best for cold data



Another Active Data Guard User

Production on 11.2.0.2

- Over 32.4 Billion Oracle SQL queries per day
- MAA: Oracle RAC, Data Guard, Recovery Manager
- Offload to Active Data Guard standby
 - 2 to 4 hours of daily processing required for reports
 - 4 to 6 hours of daily processing required for ETL scripts
 - Resource intensive queries

Resources

- **Active Data Guard Hands-On Lab**
<http://www.oracle.com/technetwork/database/features/availability/data-guard-hol-176005.html>
- **Data Guard Hands-On Lab**
<http://www.oracle.com/technetwork/database/features/availability/data-guard-hol-basic-427660.html>
- **Active Data Guard Best Practices**
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-11gr1-activedataguard-1-128199.pdf>
- **Data Guard Demonstrations**
<http://www.oracle.com/technetwork/database/features/availability/demonstrations-092317.html>

Resources – part 2

- **E-Business Suite and Active Data Guard**
http://blogs.oracle.com/stevenChan/2011/01/adg_ebs12.html
- **PeopleTools 8.5.1 and Active Data Guard**
http://download.oracle.com/docs/cd/E18083_01/pt851pbr0/eng/psbooks/tadm/book.htm?File=tadm/htm/tadm13.htm#H4064
- **OBIEE and Active Data Guard**
<http://www.oracle.com/technetwork/database/features/availability/maa-wp-11g-biee-activedataguard-1-131999.pdf>
- **TopLink applications**
<http://www.oracle.com/technetwork/database/features/availability/maa-tech-wp-toplinkwithadg-130077.pdf>

Resources – part 3

- **Data Guard OTN portal**
<http://www.oracle.com/goto/dataguard>
- **OTN HA portal**
<http://www.oracle.com/goto/availability>
- **Maximum Availability Architecture (MAA)**
<http://www.oracle.com/goto/maa>
- **MAA Blogs**
<http://blogs.oracle.com/maa>
- **Oracle HA Customer Success Stories on OTN**
<http://www.oracle.com/technetwork/database/features/ha-casestudies-098033.html>

Key HA Sessions, Demos, Labs by Oracle Development

Monday, 3 Oct – Moscone South *

- 11:00a** Auto Detect, Prevent and Repair Data Corruptions, Rm 102
- 12:30p** Future of Oracle Exadata, Rm 104
- 12:30p** RMAN: Not Just for Backups Anymore, Rm 304
- 2:00p** Extreme Data Management, Moscone North Hall D
- 5:00p** Oracle High-Availability System Overview, Rm 104
- 5:00p** GoldenGate Product Update and Strategy, Intercontinental-Sutter

Tuesday, 4 Oct – Moscone South *

- 10:15a** Oracle Secure Backup - Best practices, Rm 304
- 11:45a** Oracle Exadata Technical Deep Dive, Rm 104
- 3:30p** RMAN & Data Guard: Seven Cool Tips from Oracle, Rm 304
- 3:30p** Consolidation on Oracle Exadata, Rm 103

Wednesday, 5 Oct – Moscone South *

- 10:15a** Oracle Active Data Guard - Lessons Learned, Rm 102
- 1:15p** Data Guard for Planned Maintenance, Rm 102
- 1:15p** Understanding Oracle RAC Internals, Rm 103
- 1:15p** Clone Oracle with CloneDB and Direct NFS, Rm 270

Thursday, 6 Oct – Moscone South *

- 9:00a** Exadata Backup and Recovery, Rm 304
- 10:30a** Deduplication and Compression for Backups, Rm 304
- 12:00p** Data Guard Switchover / Failover, Rm 103
- 3:00p** Configure, Size, Monitor Fast Recovery Area, Rm 304
- 3:00p** PeopleSoft with Active Data Guard, Moscone West 2022

Demos Moscone South DEMOGrounds

Mon & Tue 9:45a - 5:30p; **Wed** 9:00a - 4:00p

Maximum Availability Architecture (MAA)	Exadata
Active Data Guard	Oracle Secure Backup
Recovery Manager & Flashback	GoldenGate
Real Application Clusters	ASM

Hands-on Labs Marriott Marquis, Salon 14 / 15

Monday, Oct 3, 5:00 pm - 6:00 pm Oracle Active Data Guard

Tuesday, Oct 4, 10:15 am - 11:15 am Oracle Active Data Guard

**All session rooms at Moscone South unless otherwise noted*

**After Oracle OpenWorld, ref. <http://www.oracle.com/goto/availability>*

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Q&A

Hardware and Software

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