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## **Active Data Guard in Oracle Database 11g**

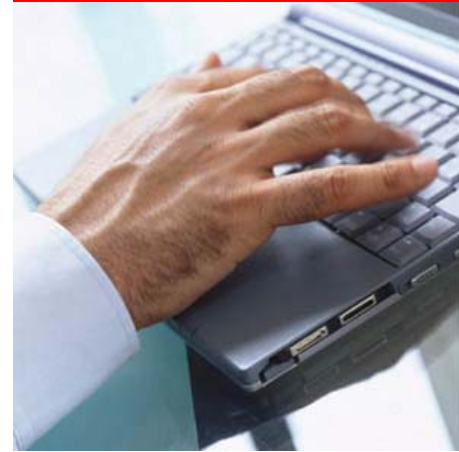
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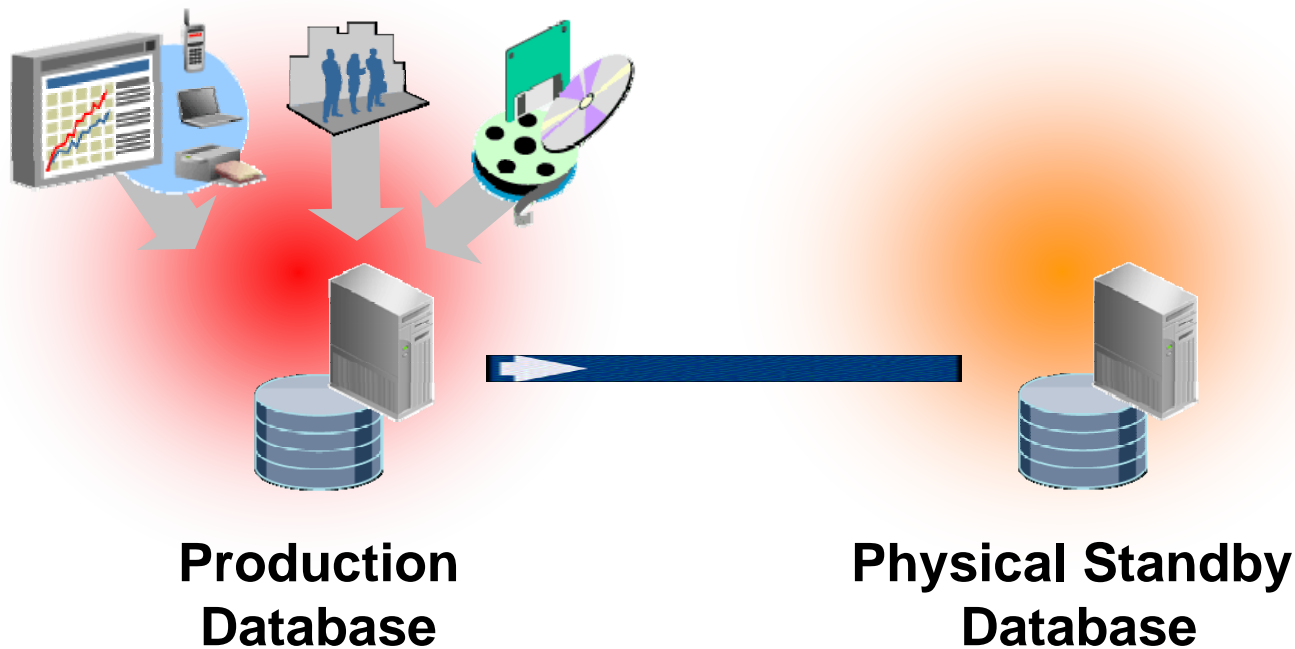
# Agenda



- **Oracle Active Data Guard**
- Other Key Data Guard 11g Enhancements

# Traditional Physical Standby Databases

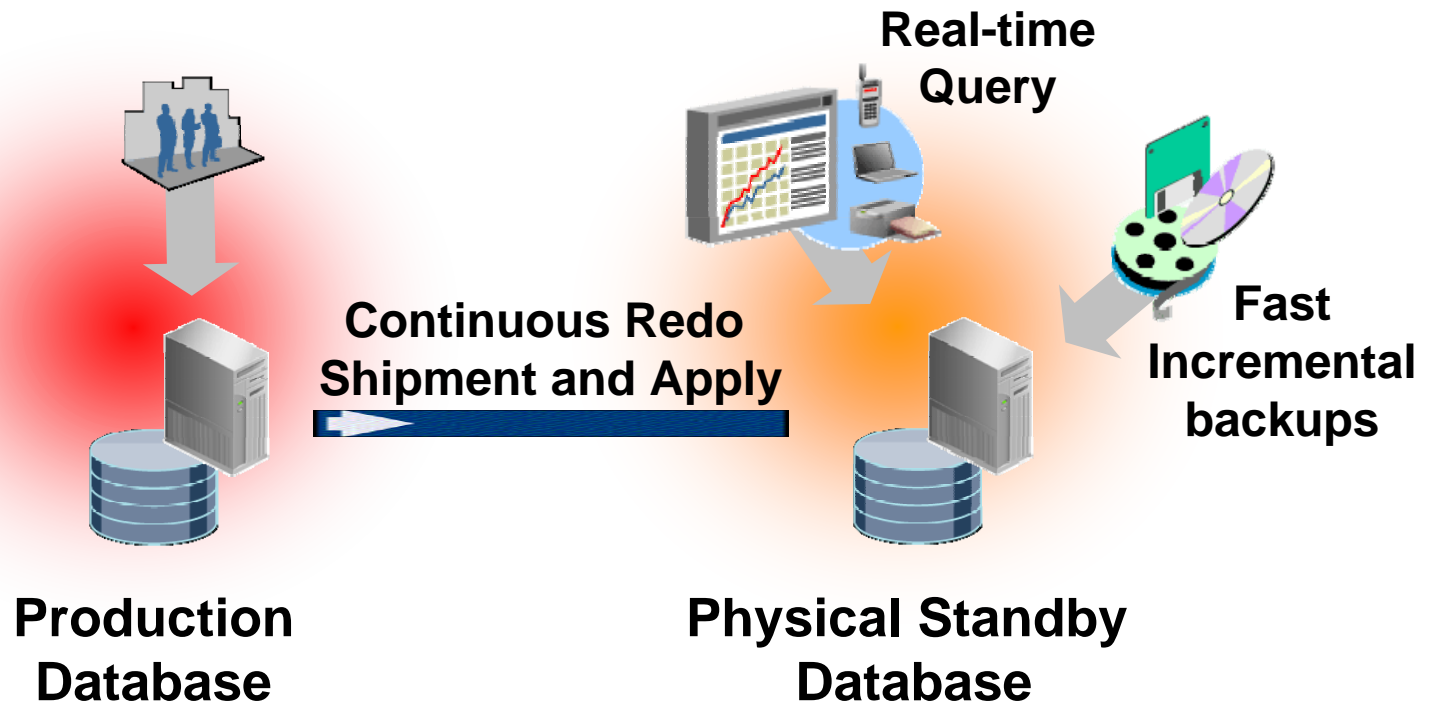
## Investment in Disaster Recovery



- Applications, backups, reports run on production only

# Active Data Guard 11g

## Investment in Improved Quality of Service



- Offload read-only queries to an up-to-date physical standby
- Perform fast incremental backups on a physical standby

# What's New

## Data Guard 11g

- Recovery (redo apply) must be stopped to open a standby read-only
  - Same functionality as previous Data Guard releases
- Redo Apply has exclusive access to data files – reads not allowed
- Not possible to guarantee read consistency while redo apply is active

## Data Guard 11g with the Active Data Guard Option

- Physical Standby is open read-only while redo apply is active
- Read consistency is guaranteed
- Redo apply is not adversely affected by read-only workload

# Active Data Guard Use Case Examples

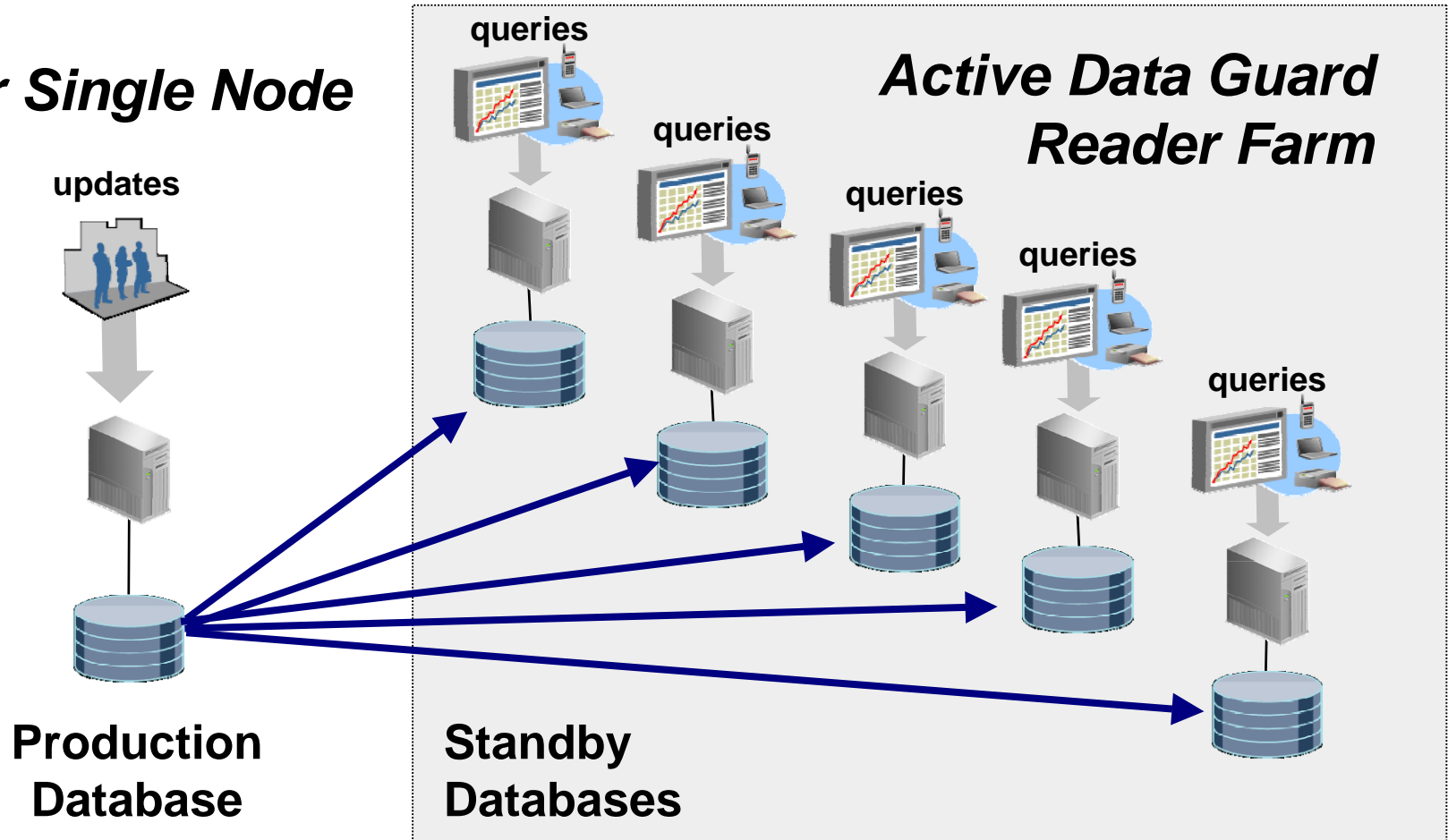
- **Telecommunications**
  - Field service technicians access to service schedules and customer inquiries to check status of service requests
- **Healthcare**
  - Fast access to up-to-date medical records
- **Financial**
  - Ad-hoc queries, reports, transaction histories, market prices, archived information
- **Transportation**
  - Package tracking, queries, schedule information
- **Web-business**
  - Catalog browsing, customer order inquiry, scale-out performance using reader farms



# Active Data Guard 11g

Scale-out Query Performance to Web-Scale\*

*Or Single Node*



*DR included \**

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# Active Data Guard – Licensing

- A Database Option for Oracle Enterprise Edition
- Active Data Guard license is required when using either:
  - Real-time Query
  - RMAN block-change tracking on a standby database
- Active Data Guard is 100% compatible with new Data Guard functionality included with Oracle Database 11g Enterprise Edition

# Enabling Active Data Guard

- SQL\*Plus
  - If redo apply is running, stop redo apply
    - **SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE CANCEL;**
  - Open the standby database read-only
    - **SQL> ALTER DATABASE OPEN;**
  - Start redo apply
    - **SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE USING CURRENT LOGFILE DISCONNECT;**
- DGMGRL & Enterprise Manager
  - Stop redo apply, open read-only, restart redo apply

# Data Guard Broker & Enterprise Manager

- Data Guard Broker CLI

- Stop redo apply with the following command

- ```
EDIT DATABASE 'RTQ' SET STATE='APPLY-OFF'
```

- Open standby read-only via SQL\*Plus

- ```
SQL> alter database open read only;
```

- Restart redo apply via broker CLI

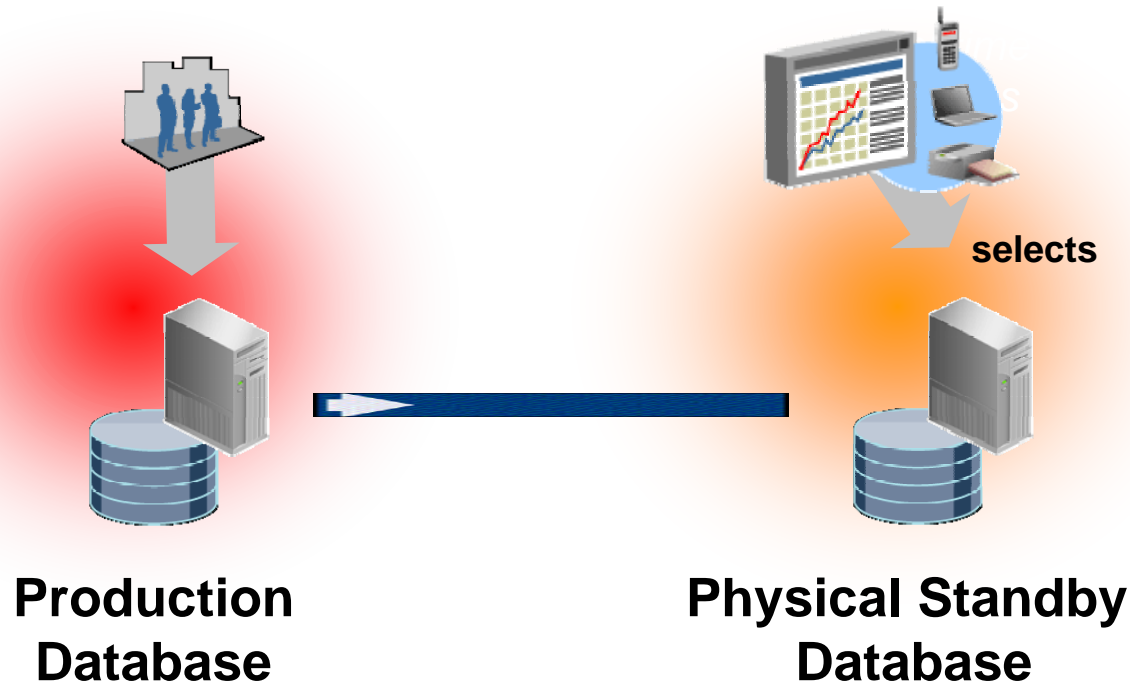
- ```
EDIT DATABASE 'RTQ' SET STATE='APPLY-ON'
```

- Oracle Enterprise Manager 10g

- Stop redo apply within Data Guard GUI
  - Open standby in read-only mode in Advanced Startup Options
  - Restart redo apply within Data Guard GUI

# Active Data Guard 11g

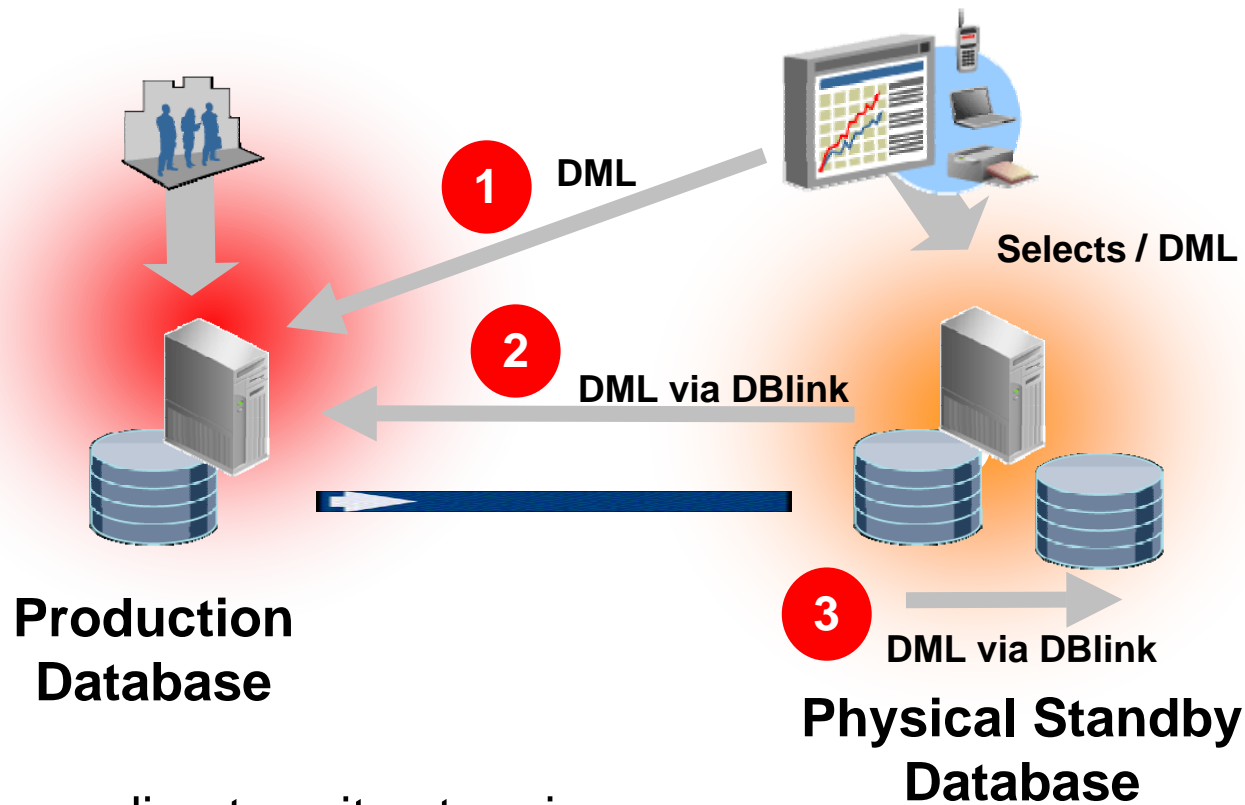
## Read-Only Application Model



- Application directs read-only selects to the standby

# Active Data Guard 11g

## Three Read-Mostly Application Models



1. Application redirects writes to primary
2. Writes redirected to primary via database link
3. Writes redirected to a separate database via a database link

# Redirecting Writes at the Database Level

- If writes must be persistent and available to all client applications accessing the database
  - Redirect writes to the primary database
  - Writes will be protected by the standby
  - Writes available to all production application users
- Otherwise . . .
  - Use a second, local database for best performance
    - Zero impact on primary performance

# Creating DBlinks for the Standby

- DBlinks used by the standby to redirect writes are created on the primary and propagated to the standby via redo
  - On the Primary

```
SQL> CREATE DATABASE LINK rtq_prmy USING 'rtq';
```

- On the standby

```
SQL> insert into emp@rtq_prmy values (999,'SMITH','GEEK',999,sysdate,1,0,30);
1 row created.
SQL> select * from emp where empno=999;
```

| EMPNO | ENAME | JOB  | MGR | HIREDATE  | SAL | COMM |
|-------|-------|------|-----|-----------|-----|------|
| 999   | SMITH | GEEK | 999 | 23-OCT-07 | 1   | 0    |



# Determining Query Latency

- From Primary (requires database link)
  - Create database link to Active Data Guard Standby and use the query below

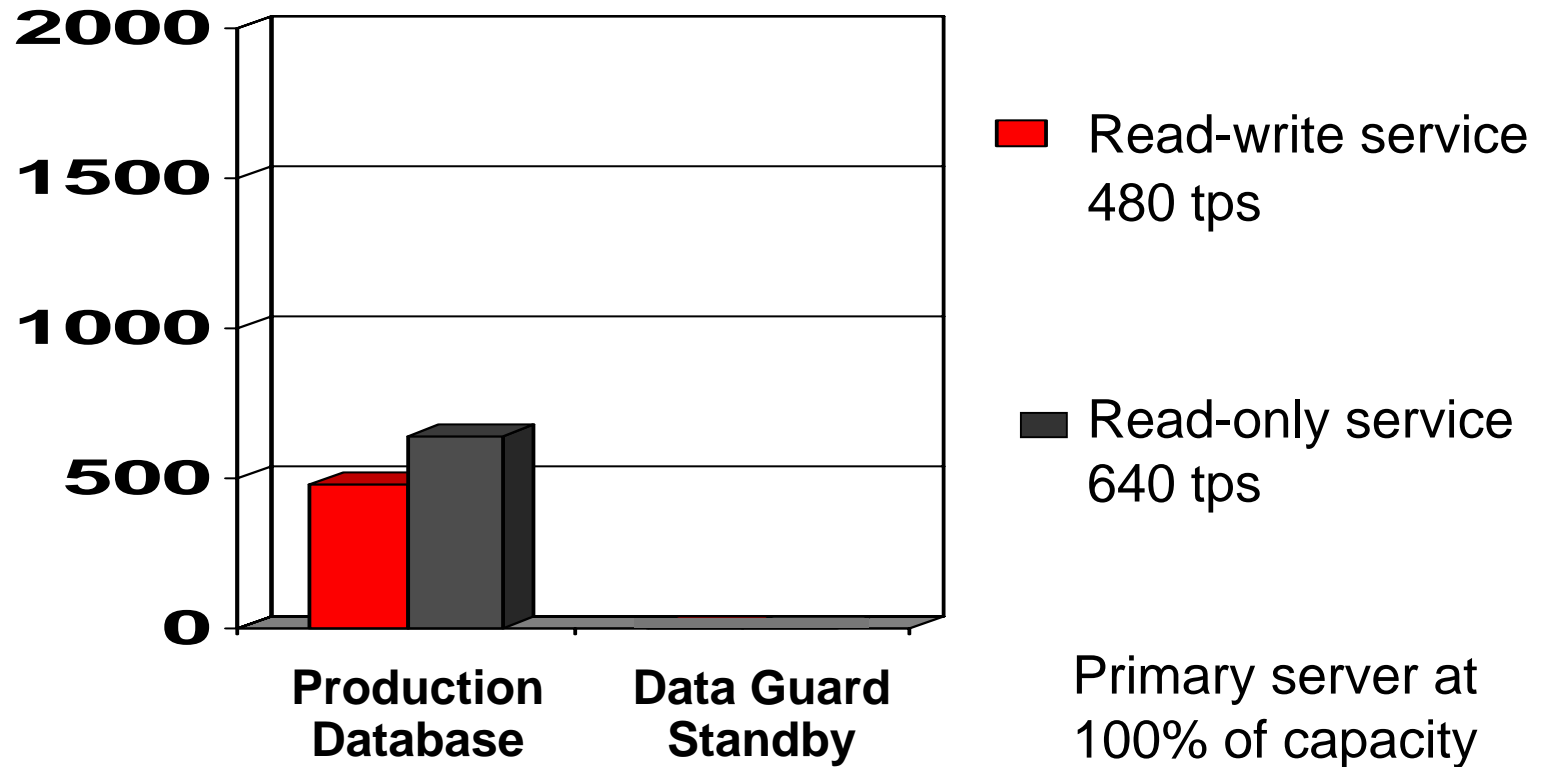
```
select scn_to_timestamp((select current_scn from  
v$database))-scn_to_timestamp((select current_scn  
from v$database@adg)) from dual;
```

- If you do not wish to connect to the Primary - determine the value for APPLY LAG for a “best estimate”
  - Use Enterprise Manager monitoring
  - Query **V\$DATAGUARD\_STATS**

```
select value,unit,time_computed from  
v$dataguard_stats where name='apply lag';
```

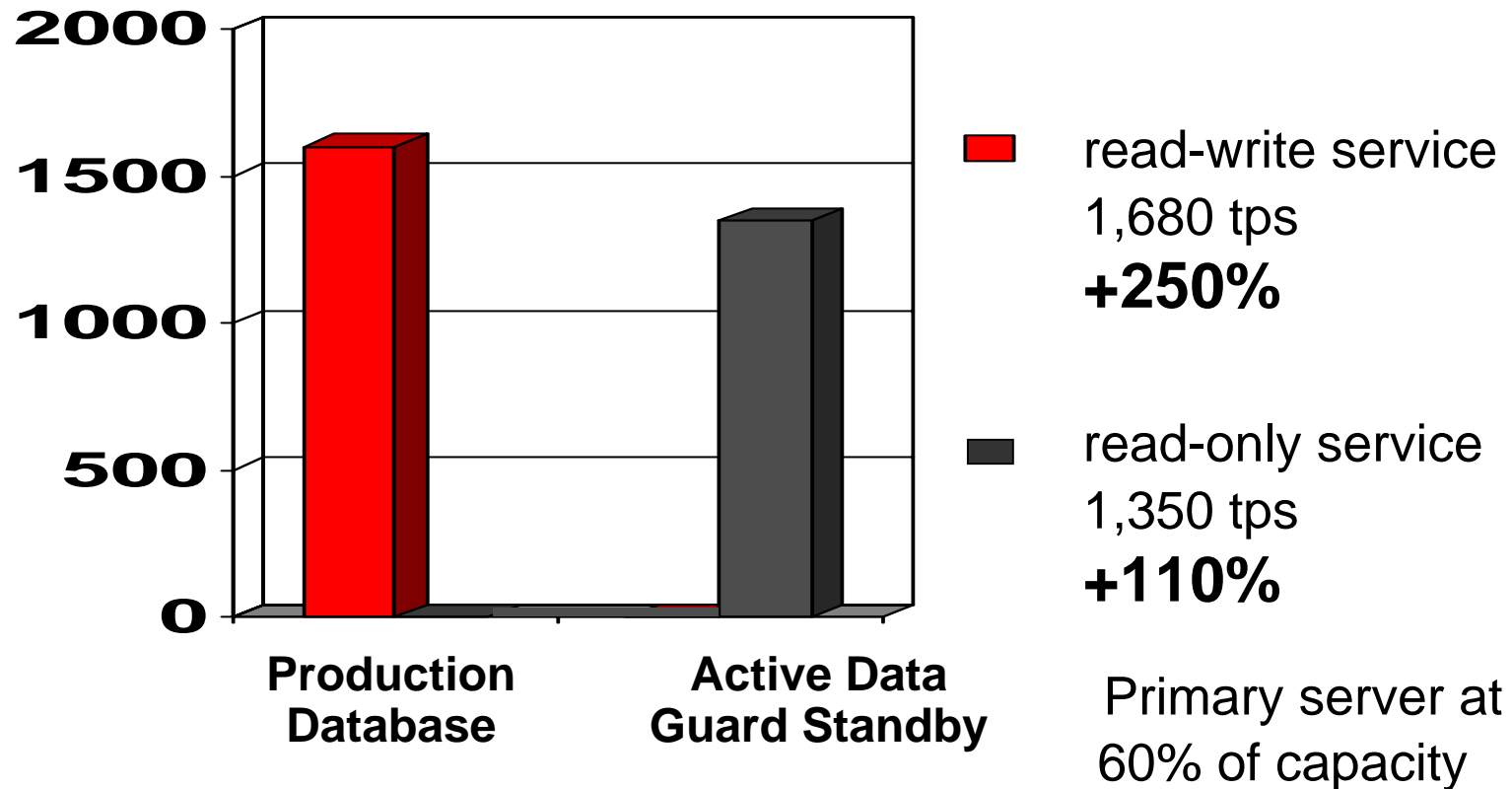
# Yesterday's Paradigm

All Workloads Run on Production



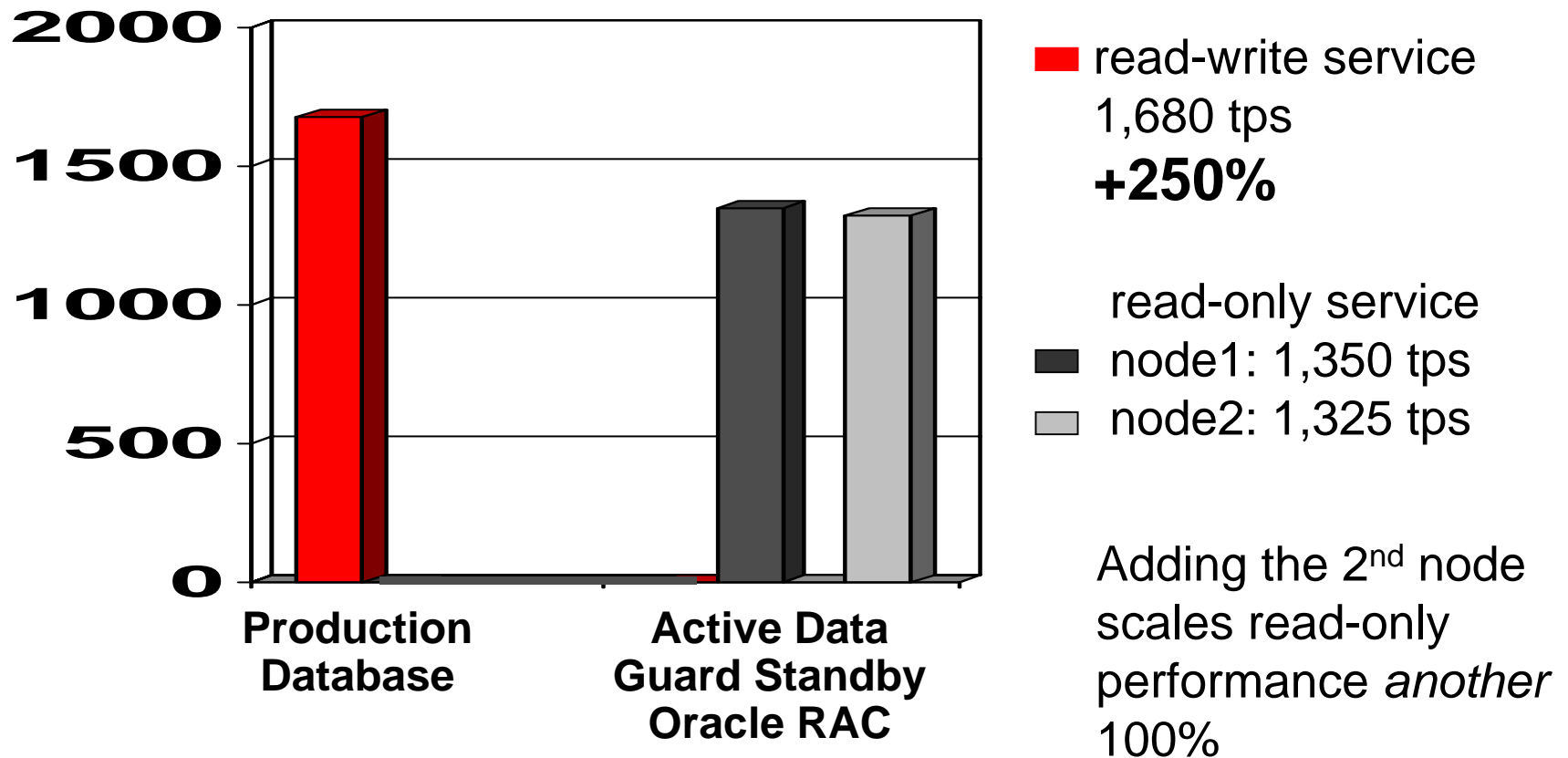
# Active Data Guard 11g

Easily Optimize Performance for All Workloads



# Active Data Guard 11g

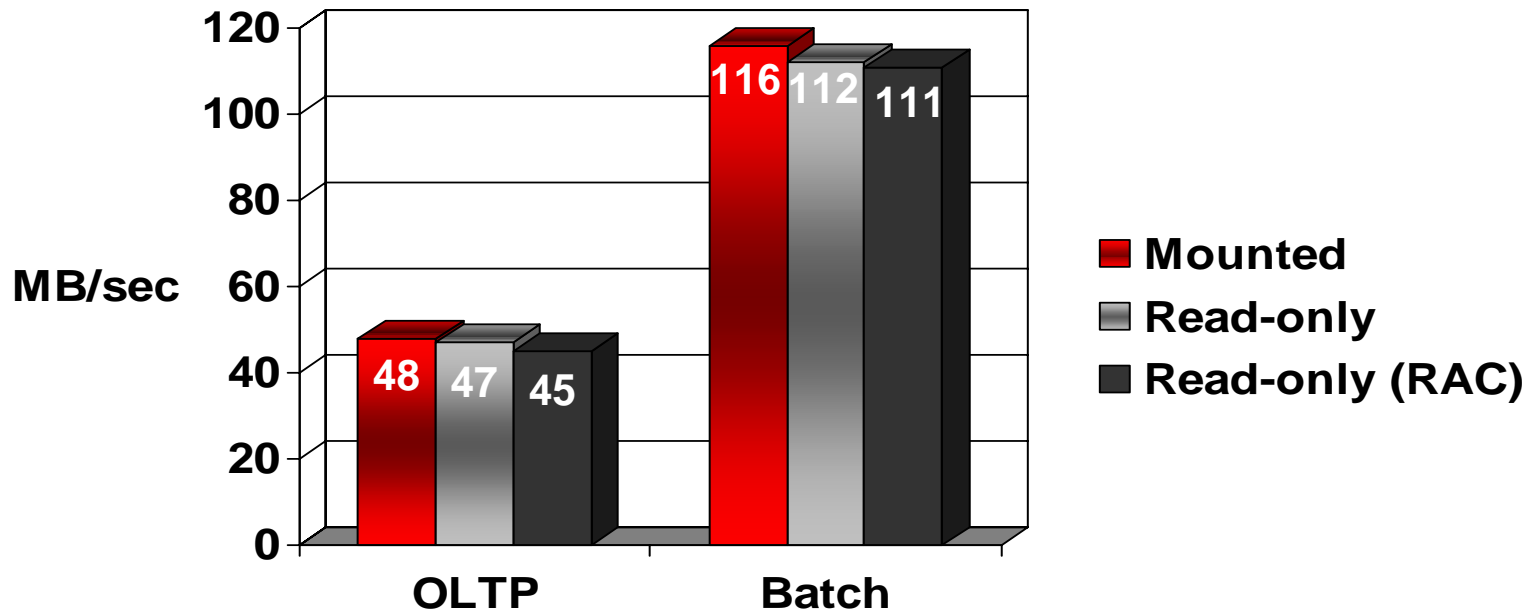
## Scale Read Performance by Adding Standby Nodes



Full Demo. <http://www.oracle.com/technology/deploy/availability/demonstrations.html>

# Redo Apply Performance

## With Active Data Guard Enabled



- No significant performance impact when open read-only

# Agenda

- Oracle Active Data Guard
- Other Key Data Guard 11g Enhancements

# Fast-Start Failover

*Automatic Failover From Database Outages*

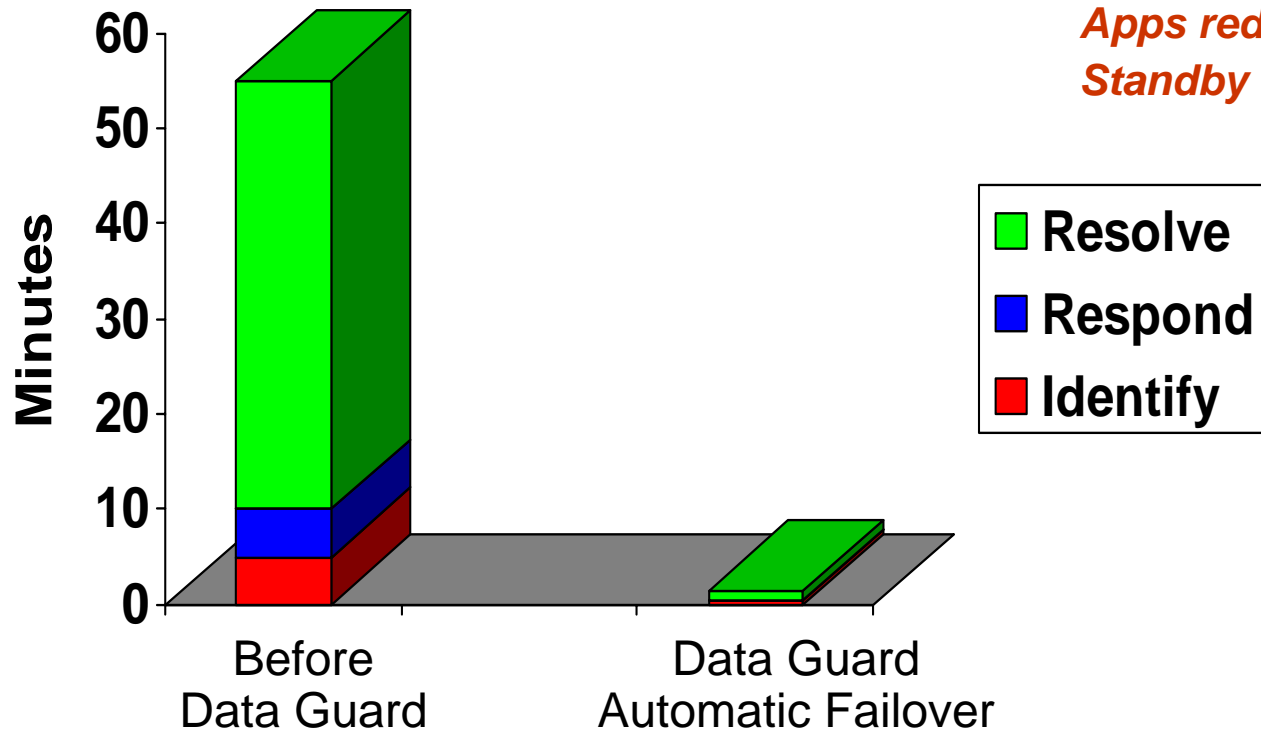


- With Fast-Start Failover
  - Failover in seconds – standby is already synchronized
  - Zero data loss

# Amazon.com Experience

## *Data Guard Fast-Start Failover*

### End-to End Failover Time\*



#### With Data Guard

*Database failover: 20 secs*

*Apps redirected: 2 mins*

*Standby site distance: 15 miles*

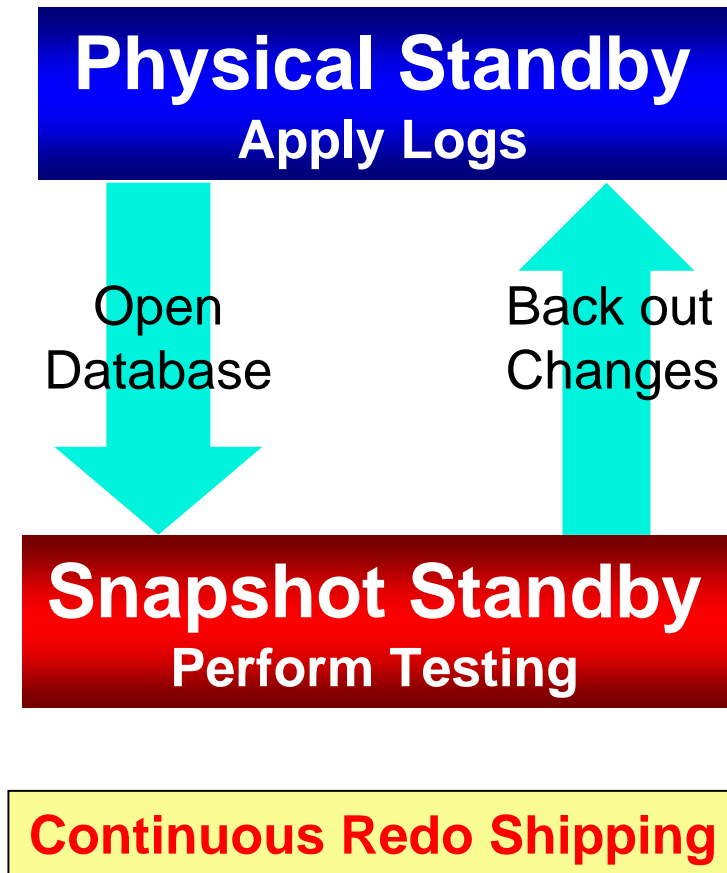


# Enhanced Fast-Start Failover

- Supports Maximum Performance (ASync) Mode
  - Automatic failover for long distance standby
  - Data loss exposure limited using Broker property **FastStartFailoverLagLimit** (*default = 30 secs*)
- Immediate fast-start failover for user-configurable health conditions
  - **ENABLE FAST\_START FAILOVER [CONDITION <value>];**
    - Condition examples:
      - Datafile Offline
      - Corrupted Controlfile
      - Corrupted Dictionary
      - Inaccessible Logfile
      - Stuck Archiver
      - Any explicit ORA-xyz error
- Apps can request fast-start failover using **DBMS\_DG.INITIALIZE\_FS\_FAILOVER**

# Snapshot Standby

*Combine Testing with DR*



- Convert Physical Standby to Snapshot Standby and open for writes by testing applications
  - **ALTER DATABASE CONVERT TO SNAPSHOT STANDBY;**
- Discard testing writes and catch-up to primary by applying logs
  - **ALTER DATABASE CONVERT TO PHYSICAL STANDBY;**
- Preserves zero data loss
  - But no real time query or fast failover
- No idle resources
- Similar to storage snapshots, but:
  - Provides DR at the same time
  - Uses single copy of storage

# Performance Improvements



- Faster Failover
  - Failover in seconds with Fast-Start Failover
- Faster Redo Transport
  - Optimized async transport for Maximum Performance Mode
  - Redo Transport Compression for gap fetching: new **compression** attribute for **log\_archive\_dest\_n**
- Faster Redo Apply
  - Parallel media recovery optimization
- Faster SQL Apply
  - Internal optimizations
- Fast incremental backup on physical standby database
  - Support for block change tracking

# Resources

- **Oracle.com:**  
<http://www.oracle.com/ha>
- **Oracle HA Technology Portal on OTN:**  
<http://www.oracle.com/technology/deploy/availability/>
- **Oracle HA Customer Success Stories on OTN:**  
[http://www.oracle.com/technology/deploy/availability/htdocs/HA\\_CaseStudies.html](http://www.oracle.com/technology/deploy/availability/htdocs/HA_CaseStudies.html)
- **Maximum Availability Architecture white papers:**  
<http://www.oracle.com/technology/deploy/availability/htdocs/maa.htm>
- **Article: “*Application-aware data protection: Databases*”, InfoStor, Nov 2007:**  
[http://www.infostor.com/display\\_article/311336/23/ARTCL/none/none/1/Application-aware-data-protection:-Databases/](http://www.infostor.com/display_article/311336/23/ARTCL/none/none/1/Application-aware-data-protection:-Databases/)



# Q & A

**QUESTIONS**  
**ANSWERS**

# For More Information

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