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Oracle Massive Open Online Courses Union  
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OCM  
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# 讲师：崔旭

网名：DBstyle

海量数据学院首席讲师，院长兼总经理，Oracle ACE，中国OCM之家(OCMH)发起人，同时创办了Oracle慕课联盟(OMOOCU)，用互联网+的形式推广线上免费课程。获得Oracle 10g 11g 12c OCM认证。从业10年以上，资深Oracle数据库专家，51CTO认证讲师，在数据库领域有丰富的经验。拥有Oracle数据库，SQL Server数据库，RHCE, F5, Cisco等十余种相关技术认证。曾任职于北京神州泰岳软件股份有限公司、北京电信发展有限公司，云和恩墨的恩墨学院教学总监。负责运维全国各省客户的海量数据库，负责高可用数据库的部署实施、故障处理、性能优化，教育培训等工作。现任海量数据学院首席讲师兼院长，为多家大中型企业和多所国家211工程高等学校，提供过Oracle相关课程培训以及技术分享活动。讲课富有亲和力和感染力，擅长理论联系实际，通过华丽的操作将枯燥的技术展现出来，使学员理解技术在真实生产中的应用。至今培养OCP和OCM数千人，培训经验丰富，致力于推广和分享ORACLE技术。技术博客地址：<http://www.dbstyle.net>



ORACLE® Certified Master

Oracle Database 12c Administrator

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# **Oracle Database 12c Certified Master**

## **— Section 3 Data Guard**

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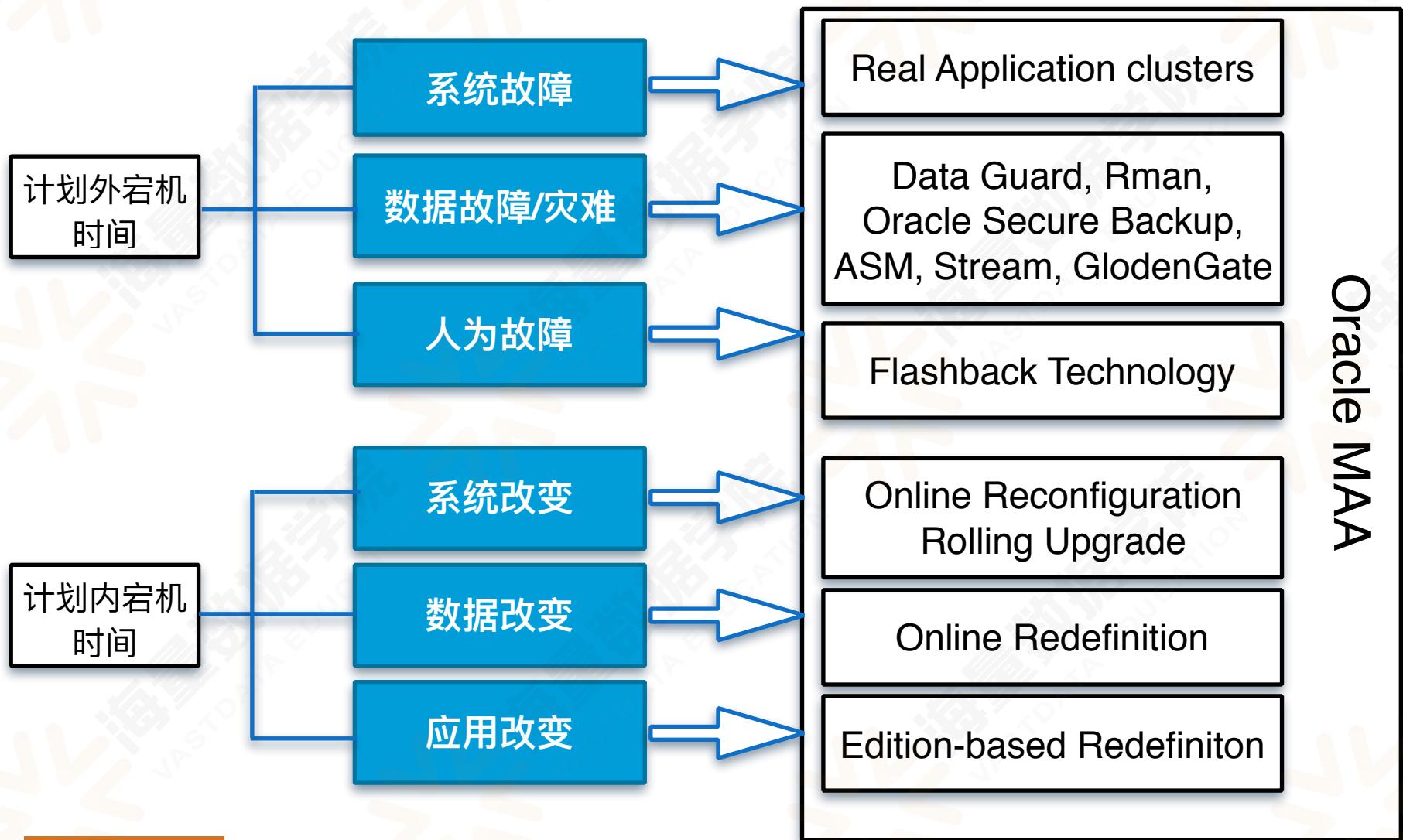
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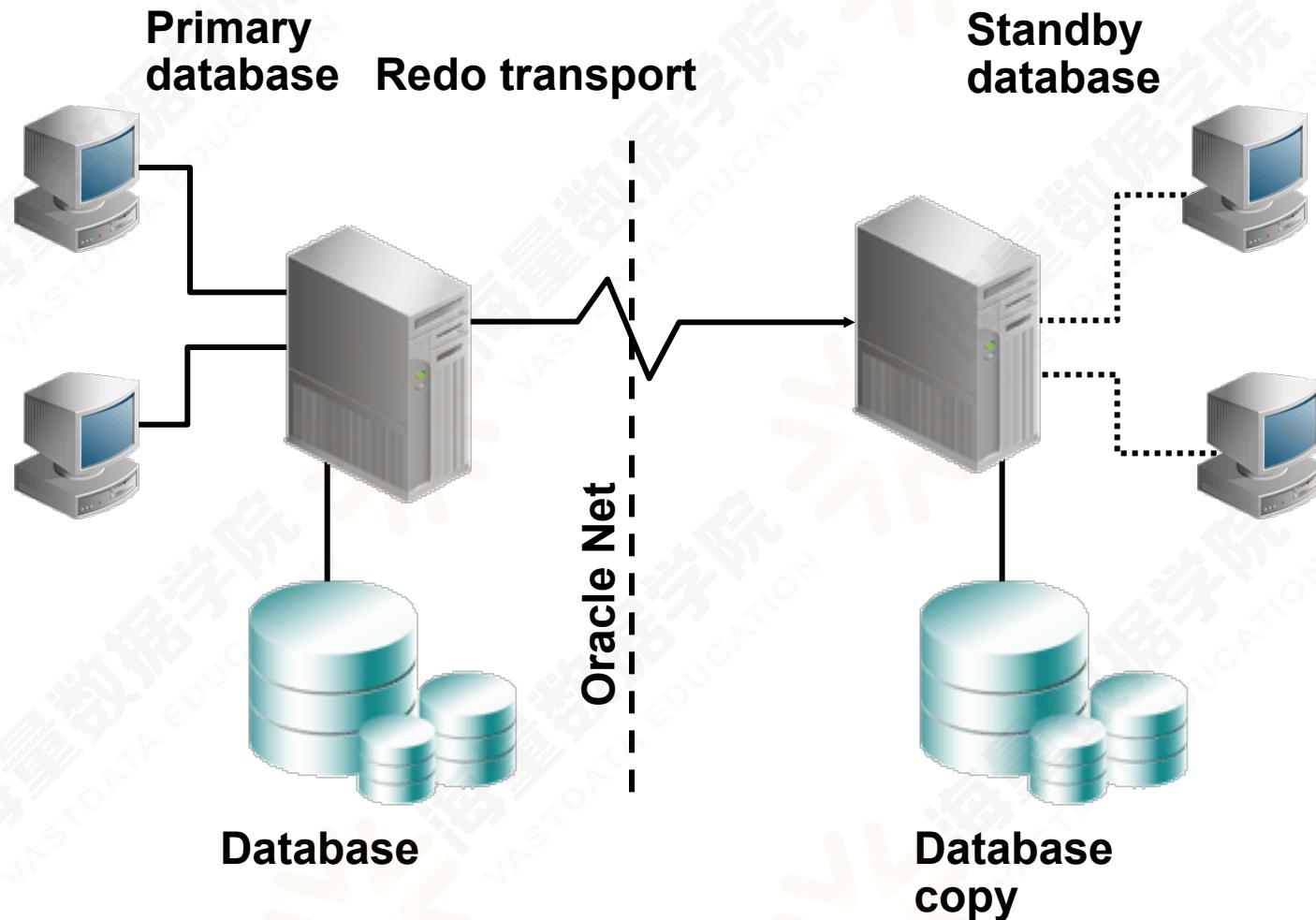
# *Examination time*

- |   |       |         |
|---|-------|---------|
| 1. General Database and Network Administration, and Backup Strategy | ..... | 120 min |
| 2. Data and Performance Management                                  | ..... | 90 min  |
| 3. Data Guard   | ..... | 90 min  |
| 4. Grid Infrastructure and Real Application Clusters                | ..... | 90 min  |

# Oracle MAA 架构



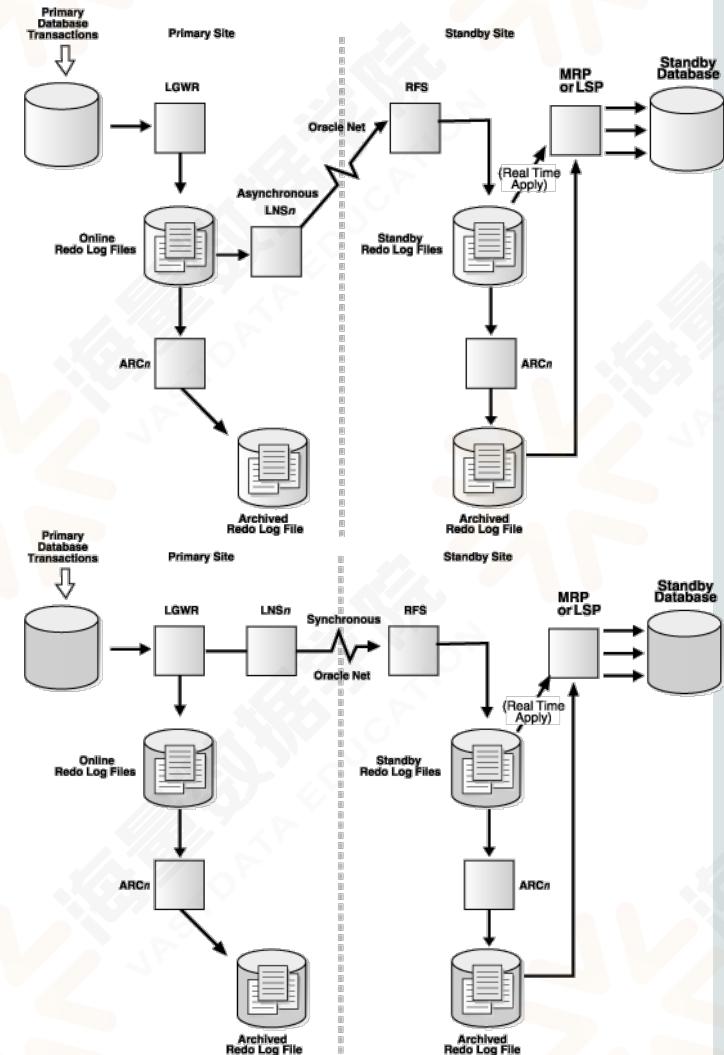
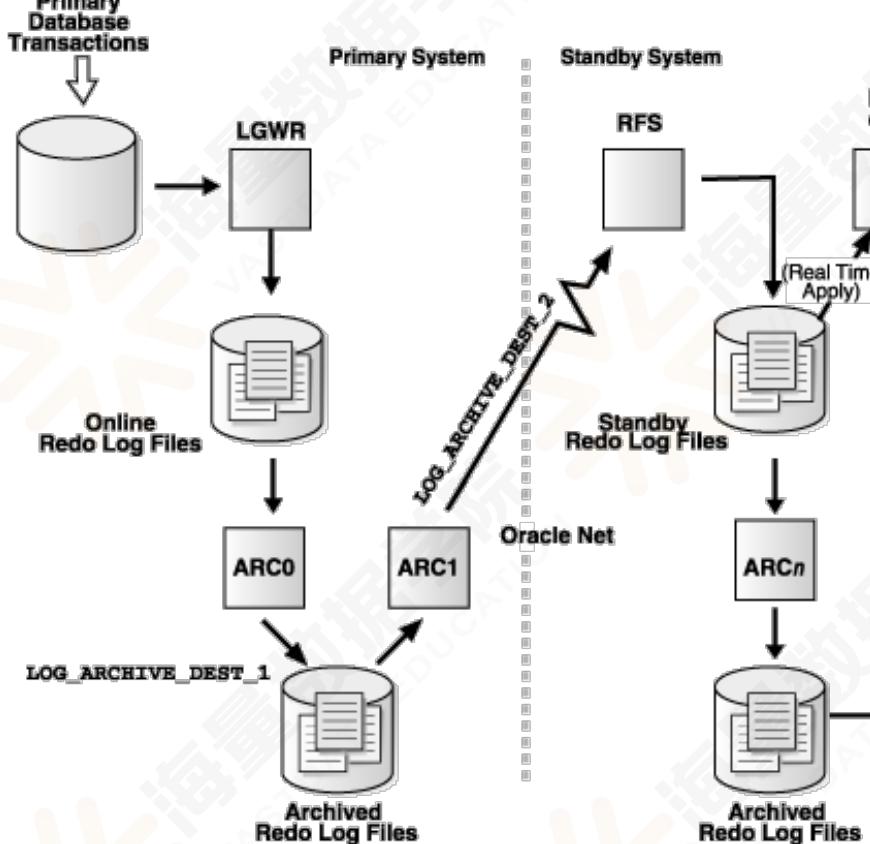
# What Is Oracle Data Guard?



# *Oracle Data Guard*架构

- 日志发送 (*Redo Send*)
- 日志接收 (*Redo Receive*)
- 日志应用 (*Redo Apply*)

# Oracle Data Guard 架构



# Oracle Data Guard 架构

- 重要进程
- *Standby Log File (SRL)* 与 *Online Redo Log (ORL)* 比较
- 自动裂缝监测和解决
- 实时应用 (*Real-Time Apply*)
- 实时查询 (*Real-Time Query*)
- 快照数据库
- 角色转换

- *SYSDG Administration Privilege*
- *Far Sync Standby Database*
- *New Options for Cascaded Standby Databases*
- *Automated Rolling Upgrades using DBMS\_ROLLING-Package*
- *Online Movement of Online Datafiles*
- *Multitenant Database Support*

# *Far Sync Standby Database*

- *A Far Sync Standby Database is a cascading Standby Database which acts as a Redo Log Repository for a Terminal Database. It does not contain any Datafiles. Only Log Transport Services are active on a Far Sync Standby Database. The Advantage of a Far Sync Standby Database is that it can be a local ArchiveLog Repository for the Primary Database acting in Maximum Protection Mode where the Physical or Logical Standby Database can be on a far remote Site.*

# Real-Time Cascading

- *It is now possible to forward Redo in Real-Time Mode from the first to the cascaded Standby Database. So the Redo Record is forwarded to the cascaded Standby Database once written into a Standby RedoLog of the first Standby Database.*
- *Non Real-Time Cascading means that the whole Log Sequence is transferred to the terminal Standby Database(s) after a Log Switch on the Primary Database.*

# *Online Movement of Online Datafiles*

- *Physical Standby Database is in Active Data Guard Mode (opened READ ONLY and Managed Recovery is running):*
- *It is now possible to online move a Datafile while Managed Recovery is running, ie. the Physical Standby Database is in Active Data Guard Mode. You can use this Command to move the Datafile*

```
SQL> alter database move datafile <File#> to  
'<Destination>' [keep];
```

- > *The 'keep'-Option will also keep the original Datafile, without this Option the File gets automatically deleted once the move completed.*
- *The Destination can also be an ASM Diskgroup, of course if you want to move a Datafile to ASM or from one Diskgroup to another*

# *Types of Standby Databases*

## *— Physical standby database:*

- Is identical to the primary database on a block-for-block basis*
- Is synchronized with the primary database through application of redo data received from the primary database*
- Can be used concurrently for data protection and reporting*

## *— Logical standby database*

- Shares the same schema definition*
- Is kept synchronized with the primary database by transforming the data in the redo received from the primary database into SQL statements and then executing the SQL statements*
- Can be used concurrently for data protection, reporting, and database upgrades*

# *Types of Standby Databases*

## *— Snapshot standby database:*

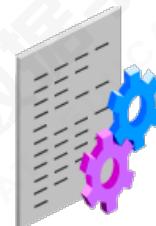
- *Is a fully updatable standby database*
- *Is created by converting a physical standby database*
- *Can be used for updates, but those updates are discarded before the snapshot standby database is converted back into a physical standby database*
- *Can be used for testing*



# *Types of Data Guard Services*

*Data Guard provides three types of services:*

- *Redo transport services*
- *Apply services*
  - *Redo Apply*
  - *SQL Apply*
- *Role management services*



# *Role Transitions: Switchover and Failover*

*Oracle Data Guard supports two role-transition operations:*

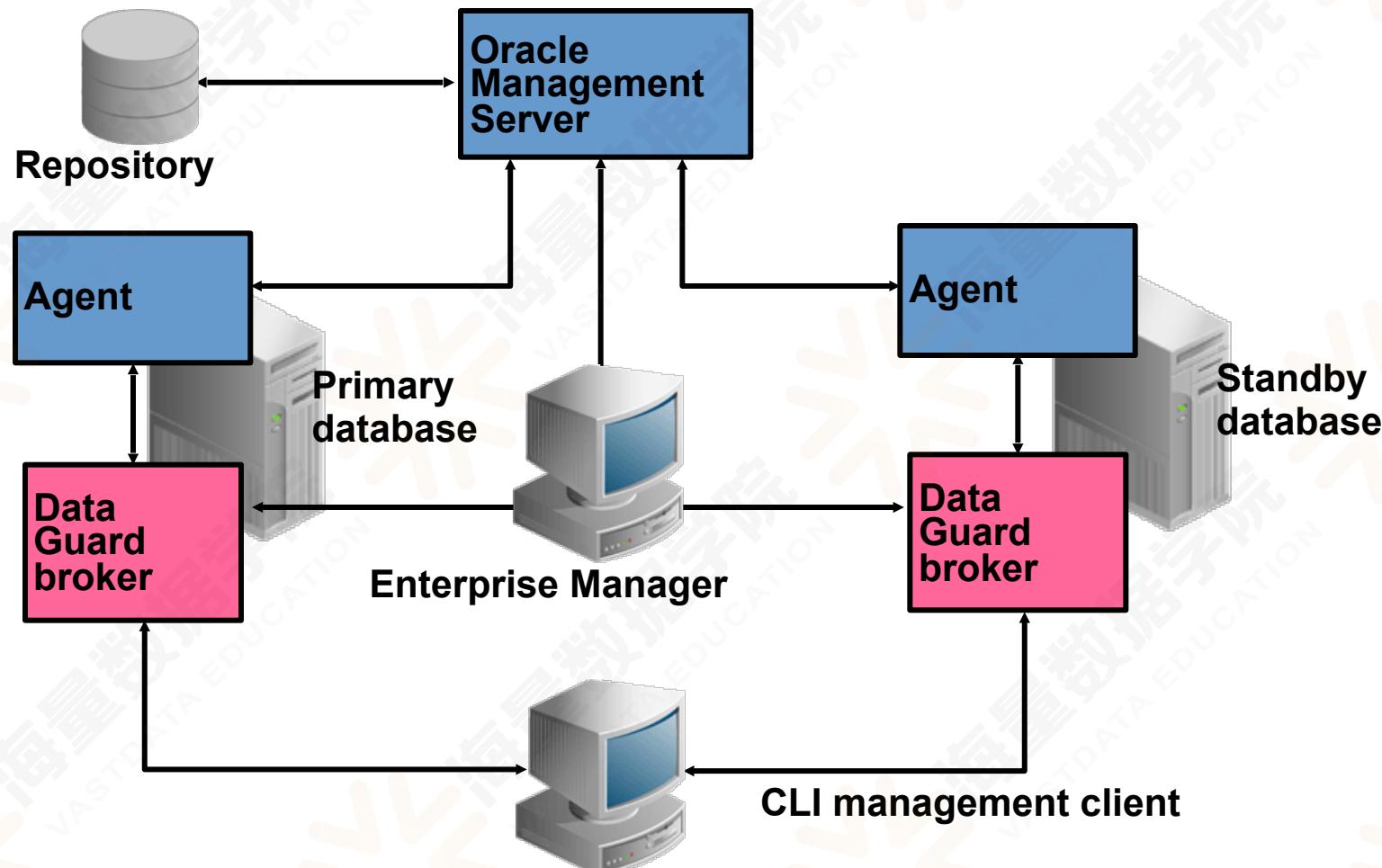
- *Switchover*

- *Planned role reversal*
- *Used for OS or hardware maintenance*

- *Failover*

- *Unplanned role reversal*
- *Emergency use*
- *Zero or minimal data loss (depending on choice of data-protection mode)*
- *Can be initiated automatically when fast-start failover is enabled*

# Oracle Data Guard Broker Framework



# *Choosing an Interface for Administering a Data Guard Configuration*

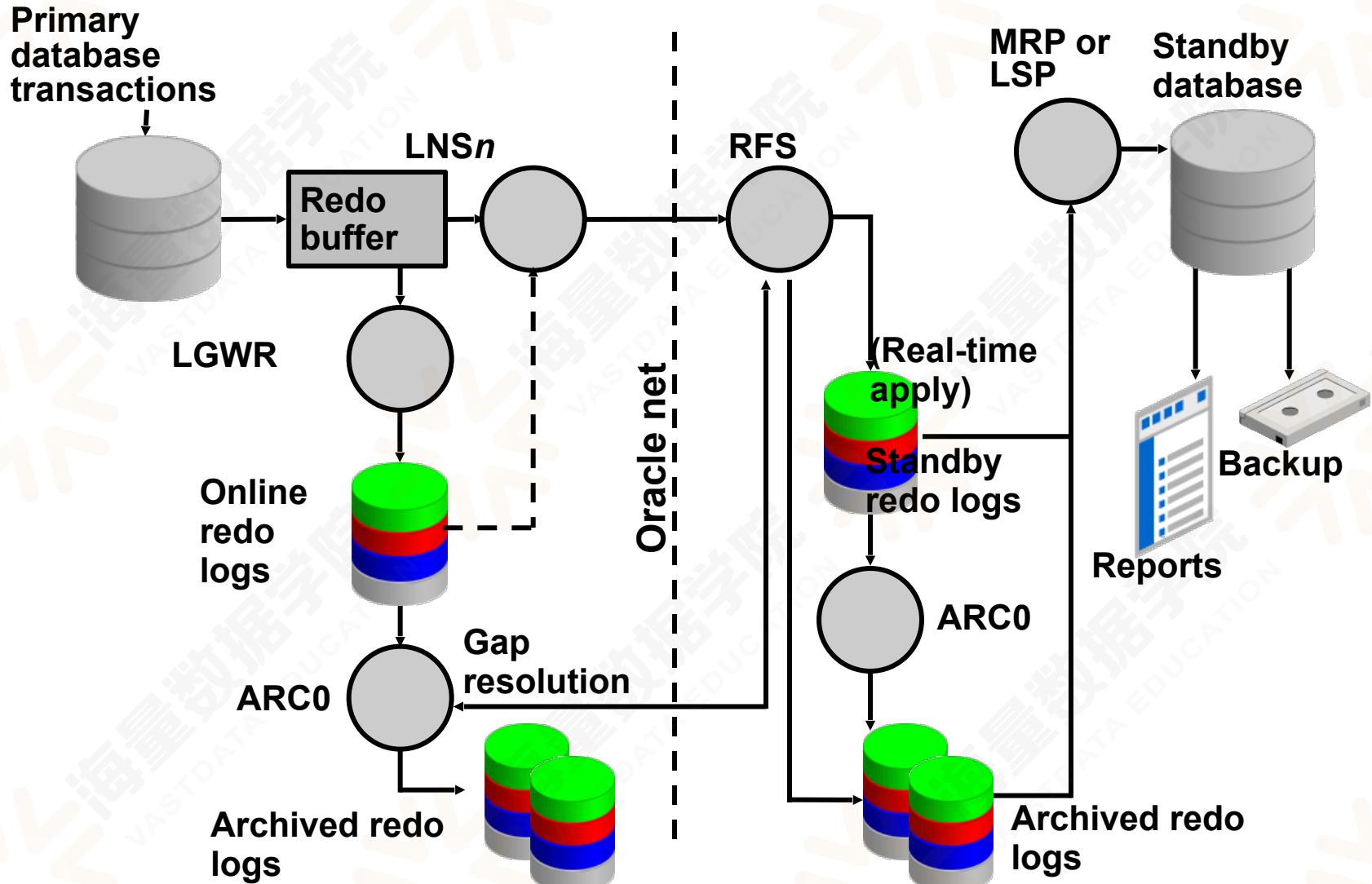
## *— Data Guard broker configuration:*

- *DGMGRL command-line interface*
- *Enterprise Manager Grid Control*
- *SQL commands to query data dictionary views*

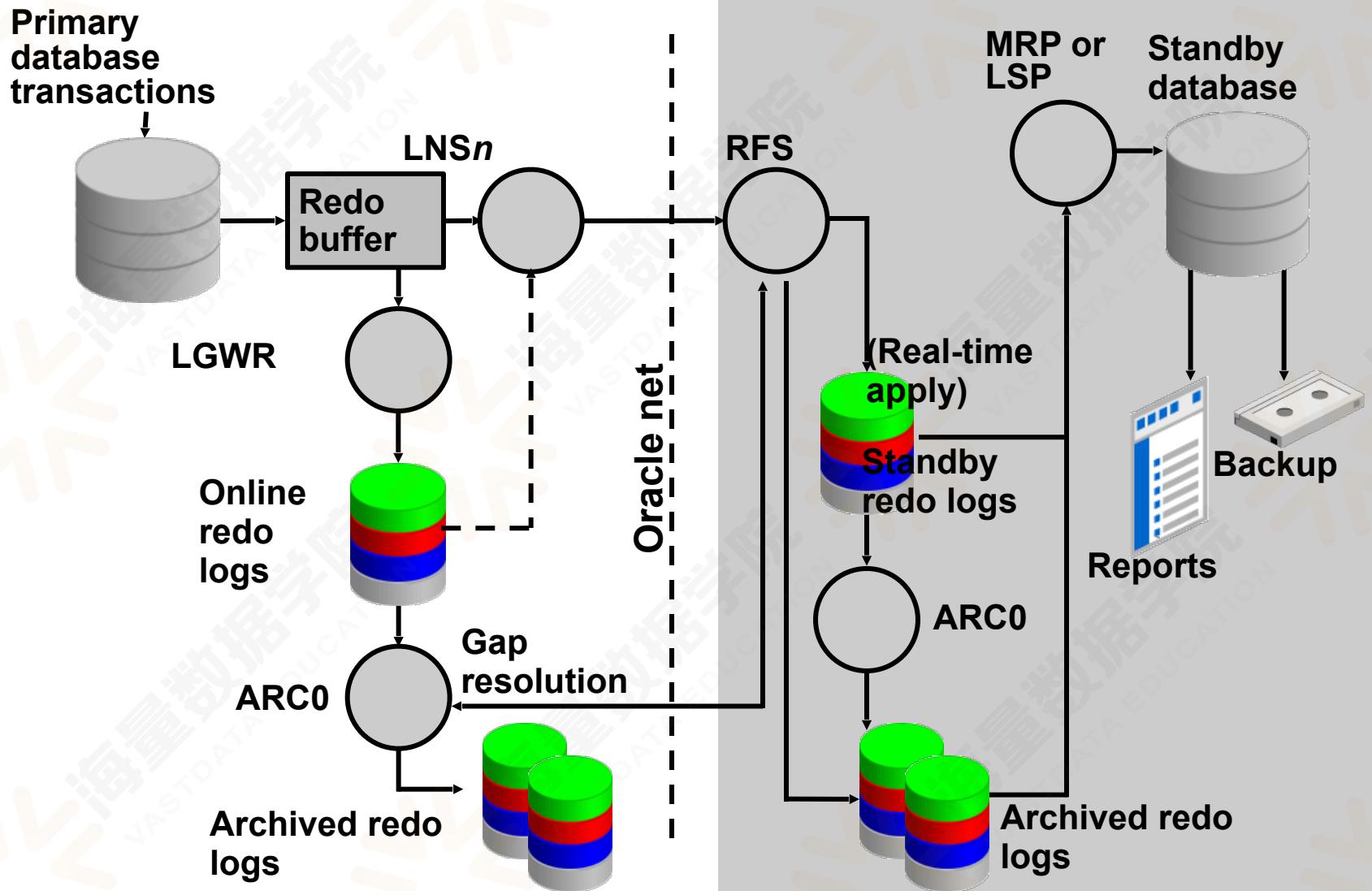
## *— Non–Data Guard broker configuration:*

- *SQL commands*

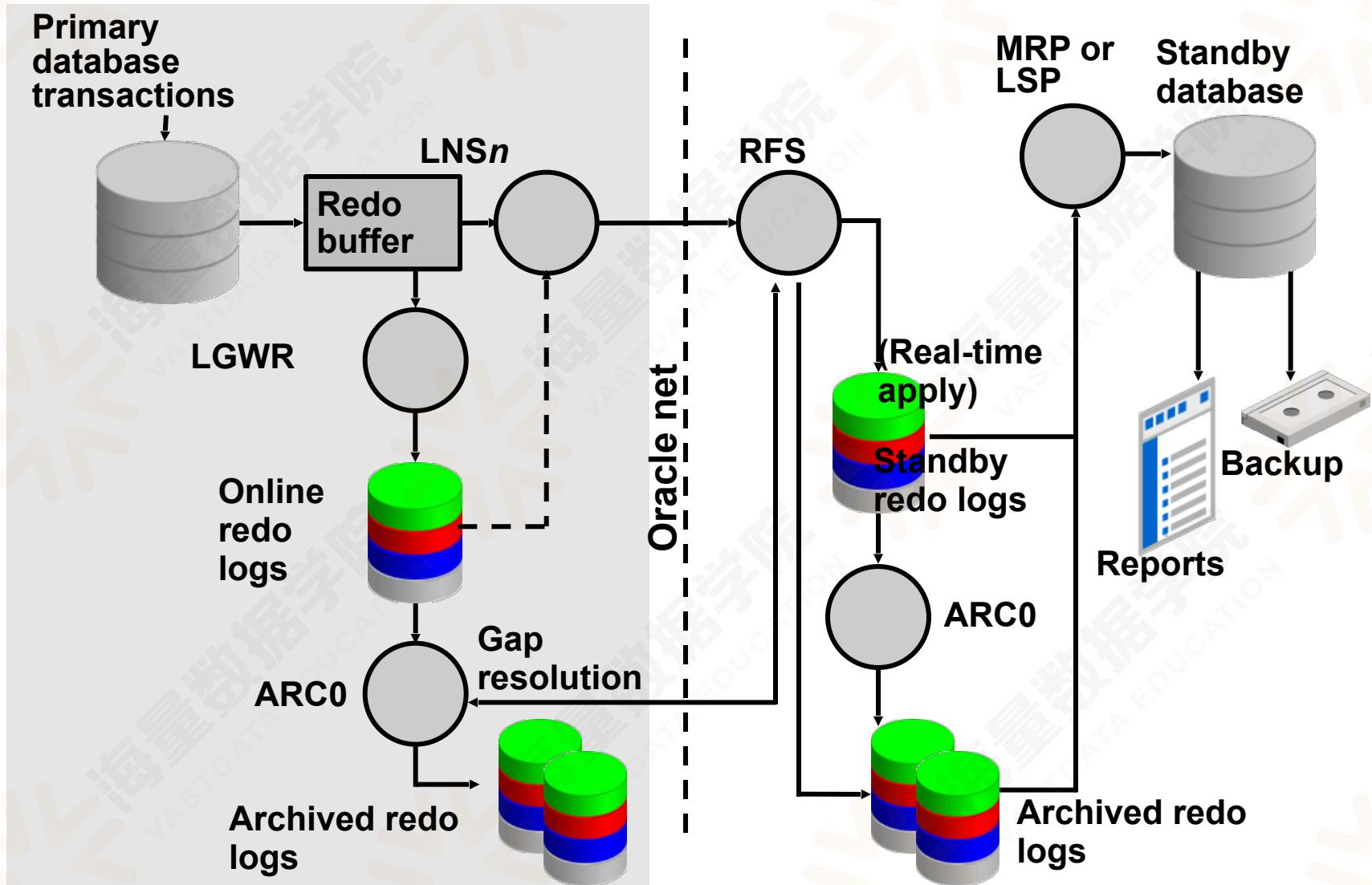
# Oracle Data Guard: Architecture (Overview)



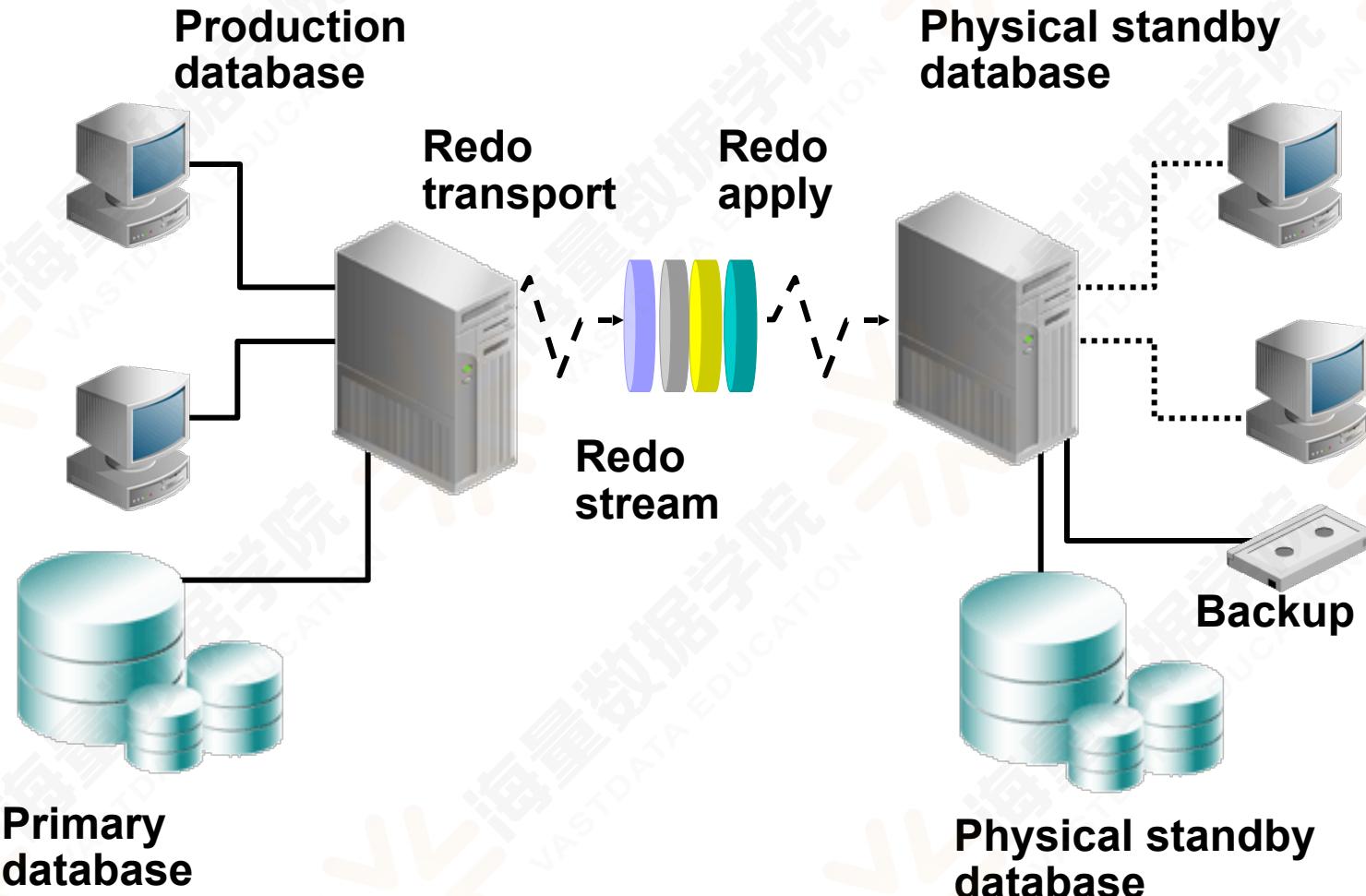
# Primary Database Processes



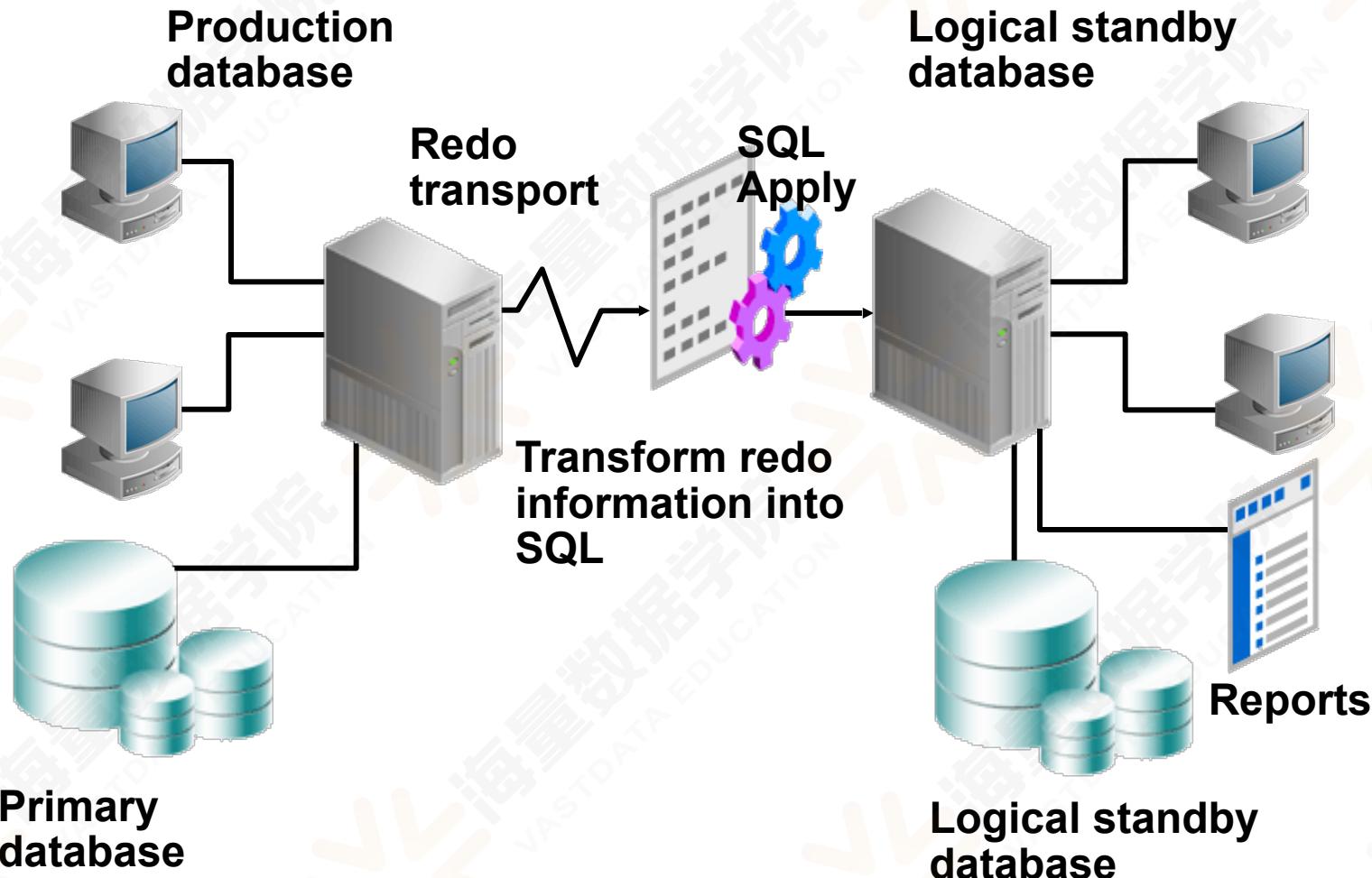
# Standby Database Processes



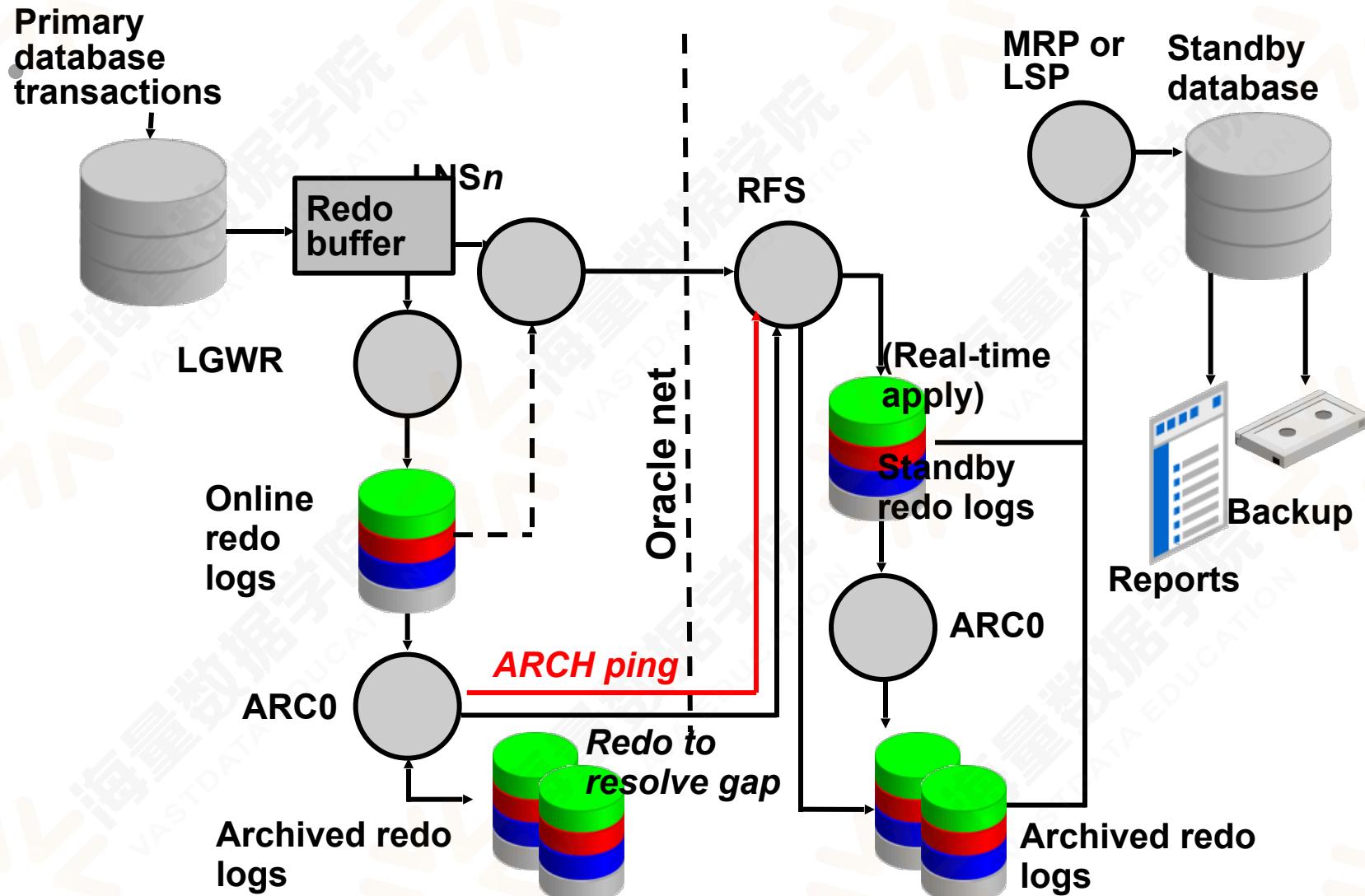
# *Physical Standby Database: Redo Apply Architecture*



# *Logical Standby Database: SQL Apply Architecture*



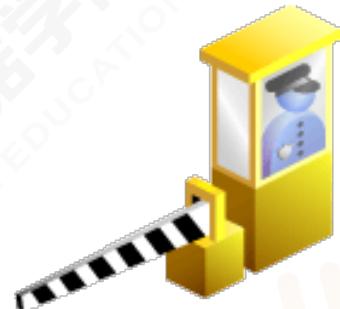
# Automatic Gap Detection and Resolution



# *Data Protection Modes*

*Select the mode to balance cost, availability, performance, and data protection:*

- Maximum protection
- Maximum availability
- Maximum performance



# *Data Guard Operational Requirements: Hardware and Operating System*

*Primary database systems and standby database systems  
may have different:*

- CPU architectures*
- Operating systems*
- Operating system binaries (32-bit or 64-bit)*
- Oracle Database binaries (32-bit or 64-bit)*

*Many restrictions exist.*

# *Data Guard Operational Requirements: Oracle Database Software*

- The same release of Oracle Database Enterprise Edition must be installed for all databases except when you perform a rolling database upgrade by using a logical standby database.*
- If any database uses ASM or OMF, all databases should use the same combination.*

# *Benefits of Implementing Oracle Data Guard*

*Oracle Data Guard provides the following benefits:*

- Continuous service during disasters or crippling data failures*
- Complete data protection against corruption and data loss*
- Elimination of idle standby systems*
- Flexible configuration of your system to meet requirements for business protection and recovery*
- Centralized management*

# *Steps to Create a Physical Standby Database*

1. *Prepare the primary database.*
2. *Set parameters on the physical standby database.*
3. *Configure Oracle Net Services.*
4. *Start the standby database instance.*
5. *Execute the DUPLICATE TARGET DATABASE FOR STANDBY FROM ACTIVE DATABASE RMAN command.*
6. *Start the transport and application of redo.*

# *Preparing the Primary Database*

- *Enable FORCE LOGGING at the database level.*
- *Create a password file if required.*
- *Create standby redo logs.*
- *Set initialization parameters.*
- *Enable archiving.*

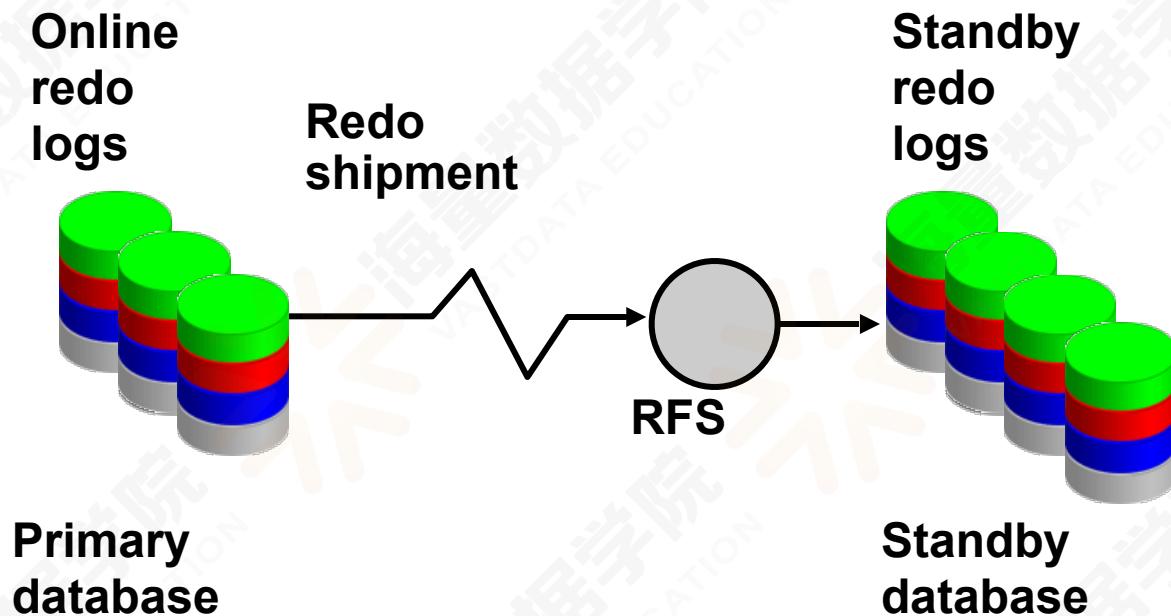
```
SQL> SHUTDOWN IMMEDIATE;  
SQL> STARTUP MOUNT;  
SQL> ALTER DATABASE ARCHIVELOG;  
SQL> ALTER DATABASE OPEN;
```

# FORCE LOGGING Mode

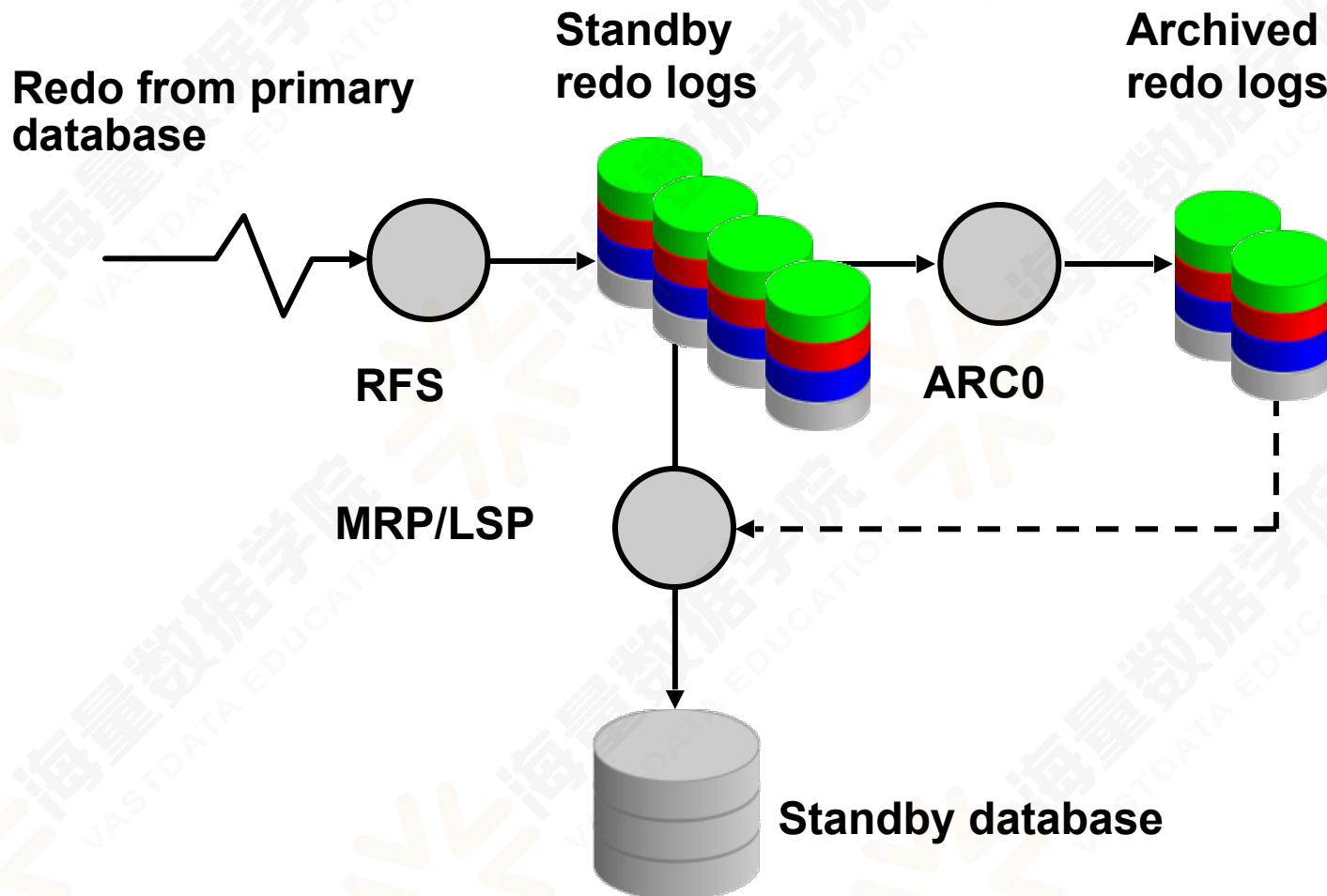
- FORCE LOGGING *mode is recommended to ensure data consistency.*
- FORCE LOGGING *forces redo to be generated even when NOLOGGING operations are executed.*
- *Temporary tablespaces and temporary segments are not logged.*
- FORCE LOGGING *is recommended for both physical and logical standby databases.*
- *Issue the following command on the primary database:*

```
SQL> ALTER DATABASE FORCE LOGGING;
```

# Configuring Standby Redo Logs



# *Creating Standby Redo Logs*



# *Using SQL to Create Standby Redo Logs*

*Create standby redo logs on the primary database to assist role changes:*

```
SQL> ALTER DATABASE ADD STANDBY LOGFILE  
  2  '/u01/app/oracle/oradata/orcl/srl01.log'  
  3  SIZE 50M;  
Database altered.
```

or

```
SQL> ALTER DATABASE ADD STANDBY LOGFILE  
  2  '+DATA' SIZE 52428800;  
Database altered.
```

# Viewing Standby Redo Log Information

*View information about the standby redo logs:*

```
SQL> SELECT group#, type, member FROM v$logfile
  2 WHERE type = 'STANDBY';
GROUP# TYPE      MEMBER
-----
 4 STANDBY /u01/app/oracle/oradata/pc01prmy/srl01.log
 5 STANDBY /u01/app/oracle/oradata/pc01prmy/srl02.log
 6 STANDBY /u01/app/oracle/oradata/pc01prmy/srl03.log
 7 STANDBY /u01/app/oracle/oradata/pc01prmy/srl04.log

SQL> SELECT group#, dbid, thread#, sequence#, status
  2 FROM v$standby_log;
GROUP# DBID          THREAD#  SEQUENCE# STATUS
-----
 4 2581955083        1        44 ACTIVE
 5 UNASSIGNED         1          0 UNASSIGNED
 6 UNASSIGNED         1          0 UNASSIGNED
 7 UNASSIGNED         0          0 UNASSIGNED
```

# *Setting Initialization Parameters on the Primary Database to Control Redo Transport*

Parameter Name	Description
LOG_ARCHIVE_CONFIG	Specifies the unique database name for each database in the configuration Enables or disables sending and receiving of redo
LOG_ARCHIVE_DEST_n	Controls redo transport services
LOG_ARCHIVE_DEST_STATE_n	Specifies the destination state
ARCHIVE_LAG_TARGET	Forces a log switch after the specified number of seconds
LOG_ARCHIVE_TRACE	Controls output generated by the archiver process

# *Setting LOG\_ARCHIVE\_CONFIG*

*Specify the DG\_CONFIG attribute to list the DB\_UNIQUE\_NAME for the primary database and each standby database in the Data Guard configuration.*

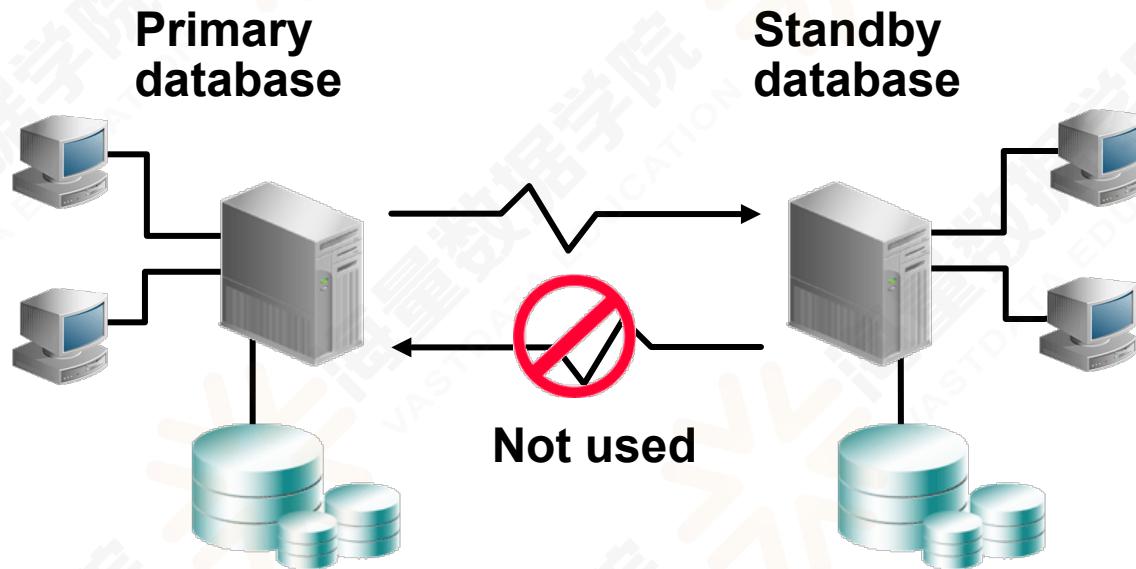
```
LOG_ARCHIVE_CONFIG='DG_CONFIG=(pc01prmy,pc01sby1)'
```

# *Setting LOG\_ARCHIVE\_DEST\_n*

- Specify LOG\_ARCHIVE\_DEST\_n parameters for:*
  - Local archiving
  - Standby database location
- Include (at a minimum) one of the following:*
  - LOCATION: Specifies a valid path name
  - SERVICE: Specifies a valid Oracle Net Services name referencing a standby database
- Include a LOG\_ARCHIVE\_DEST\_STATE\_n parameter for each defined destination.*

```
LOG_ARCHIVE_DEST_2=
'SERVICE=pc01sby1
VALID_FOR=(ONLINE_LOGFILES, PRIMARY_ROLE)
DB_UNIQUE_NAME=pc01sby1
LOG_ARCHIVE_DEST_STATE_2=ENABLE
```

# Specifying Role-Based Destinations



```
log_archive_dest_2 =  
'service=pc01sby1 async  
valid_for=  
(online_logfile,  
 primary_role)  
db_unique_name=pc01sby1'
```

```
log_archive_dest_2 =  
'service=pc01prmy async  
valid_for=  
(online_logfile,  
 primary_role)  
db_unique_name=pc01prmy'
```

# Combinations for VALID\_FOR

Combination	Primary	Physical	Logical
ONLINE_LOGFILE, PRIMARY_ROLE	Valid	Ignored	Ignored
ONLINE_LOGFILE, STANDBY_ROLE	Ignored	Ignored	Valid
ONLINE_LOGFILE, ALL_ROLES	Valid	Ignored	Valid
STANDBY_LOGFILE, STANDBY_ROLE	Ignored	Valid	Valid
STANDBY_LOGFILE, ALL_ROLES	Ignored	Valid	Valid
ALL_LOGFILES, PRIMARY_ROLE	Valid	Ignored	Ignored
ALL_LOGFILES, STANDBY_ROLE	Ignored	Valid	Valid
ALL_LOGFILES, ALL_ROLES	Valid	Valid	Valid

# Defining the Redo Transport Mode

*Use the attributes of LOG\_ARCHIVE\_DEST\_n:*

— SYNC and ASYNC

- *Specify that network I/O operations are to be performed synchronously or asynchronously when using LGWR.*
- *ASYNC is the default.*

— AFFIRM and NOAFFIRM

- *Ensure that redo was successfully written to disk on the standby destination.*
- *NOAFFIRM is the default when ASYNC is specified; AFFIRM is the default when SYNC is specified.*

# *Setting Initialization Parameters on the Primary Database*

- Specify parameters when standby databases have disk or directory structures that differ from the primary database.*
- Use parameters when the primary database is transitioned to a standby database.*

Parameter Name	Description
DB_FILE_NAME_CONVERT	Converts primary database file names
LOG_FILE_NAME_CONVERT	Converts primary database log file names
STANDBY_FILE_MANAGEMENT	Controls automatic standby file management

# *Specifying Values for DB\_FILE\_NAME\_CONVERT*

- DB\_FILE\_NAME\_CONVERT *must be defined on standby databases that have different disk or directory structures from the primary.*
- *Multiple pairs of file names can be listed in the DB\_FILE\_NAME\_CONVERT parameter.*
- DB\_FILE\_NAME\_CONVERT *applies only to a physical standby database.*
- DB\_FILE\_NAME\_CONVERT *can be set in the DUPLICATE RMAN script.*

```
DB_FILE_NAME_CONVERT = ('/oracle1/dba/' ,  
                        '/ora1/stby_dba/' ,  
                        '/oracle2/dba/' ,  
                        '/ora2/stby_dba/' )
```

# *Specifying Values for LOG\_FILE\_NAME\_CONVERT*

- LOG\_FILE\_NAME\_CONVERT *is similar to* DB\_FILE\_NAME\_CONVERT.
- LOG\_FILE\_NAME\_CONVERT *must be defined on standby databases that have different disk or directory structures from the primary.*
- LOG\_FILE\_NAME\_CONVERT *applies only to a physical standby database.*
- LOG\_FILE\_NAME\_CONVERT *can be set in the DUPLICATE RMAN script.*

```
LOG_FILE_NAME_CONVERT = ('/oracle1/logs/','  
                          '/ora1/stby_logs/')
```

# *Specifying a Value for STANDBY\_FILE MANAGEMENT*

- STANDBY\_FILE MANAGEMENT *is used to maintain consistency when you add or delete a data file on the primary database.*
  - MANUAL (*default*)
    - *Data files must be manually added to the standby database.*
  - AUTO
    - *Data files are automatically added to the standby database.*
    - *Certain ALTER statements are no longer allowed on the standby database.*
- STANDBY\_FILE MANAGEMENT *applies to physical standby databases only, but can be set on a primary database for role changes.*

**STANDBY\_FILE MANAGEMENT = auto**

# Example: Setting Initialization Parameters on the Primary Database

```
DB_NAME=pc01prmy
DB_UNIQUE_NAME=pc01prmy
LOG_ARCHIVE_CONFIG='DG_CONFIG=(pc01prmy,pc01sby1)'
CONTROL_FILES='/u01/app/oracle/oradata/pc01prmy/control1.ctl',
 '/u01/app/oracle/oradata/pc01prmy/control2.ctl'
LOG_ARCHIVE_DEST_2=
'SERVICE=pc01sby1
VALID_FOR=(ONLINE_LOGFILES,PRIMARY_ROLE)
DB_UNIQUE_NAME=pc01sby1'
LOG_ARCHIVE_DEST_STATE_2=ENABLE
REMOTE_LOGIN_PASSWORDFILE=EXCLUSIVE
LOG_ARCHIVE_FORMAT=log%t_%s_%r.arc
```

# *Creating an Oracle Net Service Name for Your Physical Standby Database*

*Use Oracle Net Manager to update the  
tnsnames.ora file:*

```
PC01SBY1 =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)
        (HOST = edbvr6p2.us.oracle.com)
        (PORT = 12001)))
    )
  (CONNECT_DATA =
    (SERVICE_NAME = pc01sby1.us.oracle.com)
  )
)
```

# *Creating a Listener Entry for Your Standby Database*

*Use Oracle Net Manager to configure an entry for your standby database in the listener.ora file:*

```
SID_LIST_LISTENER1 =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = pc01sby1.us.oracle.com)
      (ORACLE_HOME = /u01/app/oracle/product/
11.2.0/dbhome_1)
      (SID_NAME = pc01sby1)
    )
  )
```

# *Copying Your Primary Database Password File to the Physical Standby Database Host*

1. *Copy the primary database password file to the \$ORACLE\_HOME/dbs directory on the standby database host.*
2. *Rename the file for your standby database: orapw<SID>.*

# *Creating an Initialization Parameter File for the Physical Standby Database*

*Create an initialization parameter file containing a single parameter:*

```
DB_NAME=pc01sby1
```

# *Creating Directories for the Physical Standby Database*

1. *Create the audit trail directory in \$ORACLE\_BASE/admin:*

```
[oracle@edbvr6p2-orcl ~]$ cd /u01/app/oracle/admin  
[oracle@edbvr6p2-orcl admin]$ ls  
orcl  
[oracle@edbvr6p2-orcl admin]$ mkdir pc01sby1  
[oracle@edbvr6p2-orcl admin]$ cd pc01sby1  
[oracle@edbvr6p2-orcl orclsby1]$ mkdir adump
```

2. *Create a directory for the data files in the \$ORACLE\_BASE/oradata directory:*

```
[oracle@edbvr6p2-orcl oradata]$ mkdir pc01sby1  
[oracle@edbvr6p2-orcl oradata]$ ls  
orcl pc01sby1
```

# *Starting the Physical Standby Database*

*Start the physical standby database in NOMOUNT mode:*

```
SQL> startup nomount pfile=$HOME/dbs/  
initpc01sby1.ora  
ORACLE instance started.
```

Total System Global Area	150667264 bytes
Fixed Size	1298472 bytes
Variable Size	92278744 bytes
Database Buffers	50331648 bytes
Redo Buffers	6758400 bytes

# *Setting FAL\_CLIENT and FAL\_SERVER Initialization Parameters*

## *— Fetch archive log (FAL):*

- Provides a client/server mechanism for resolving gaps detected in the range of archived redo logs that are generated at the primary database and received at the standby database
- Is applicable for physical standby databases only
- Process is started only when needed, and shuts down as soon as it is finished

*— FAL\_CLIENT: Specifies the FAL client name that is used by the FAL service. It is no longer required.*

*— FAL\_SERVER: Specifies the FAL server for a standby database*

```
FAL_CLIENT = 'pc01sby1'
FAL_SERVER = 'pc01prmy'
```

# *Creating an RMAN Script to Create the Physical Standby Database*

*Create an RMAN script to create the physical standby database:*

```
run {
    allocate channel prmy1 type disk;
    allocate channel prmy2 type disk;
    allocate channel prmy3 type disk;
    allocate channel prmy4 type disk;
    allocate auxiliary channel stby type disk;

    duplicate target database for standby
        from active database
```

*Note: The script continues in the next slide.*



# *Creating an RMAN Script to Create the Physical Standby Database*

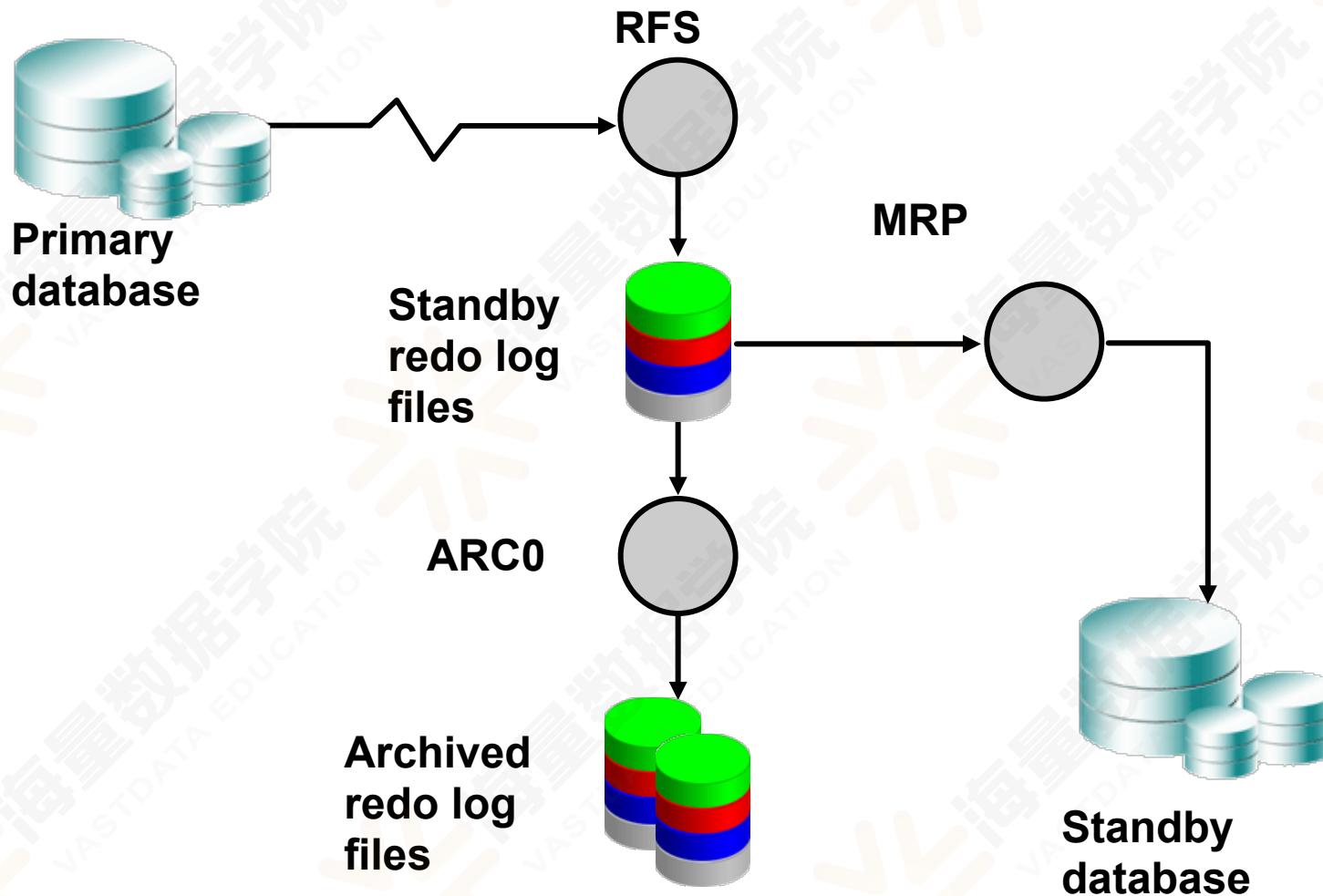
```
spfile
parameter_value_convert 'pc01prmy' , 'pc01sby1'
set db_unique_name='pc01sby1'
set db_file_name_convert='/pc01prmy/' , '/pc01sby1/'
set log_file_name_convert='/pc01prmy/' , '/pc01sby1/'
set control_files=
  '/u01/app/oracle/oradata/pc01sby1.ctl'
set log_archive_max_processes='5'
set fal_client='pc01sby1'
set fal_server='pc01prmy'
set standby_file_management='AUTO'
set log_archive_config='dg_config=(pc01prmy,pc01sby1)'
set log_archive_dest_2='service=pc01prmy ASYNC
  valid_for=(ONLINE_LOGFILE,PRIMARY_ROLE)
  db_unique_name=pc01prmy';
}
```

# *Creating the Physical Standby Database*

1. *Invoke RMAN and connect to the primary database and the physical standby database.*
2. *Execute the RMAN script to create the physical standby database.*

```
RMAN> connect target sys/oracle_4U
RMAN> connect auxiliary sys/oracle_4U@pc01sby1
RMAN> @cr_phys_standby
```

# Enabling Real-Time Apply

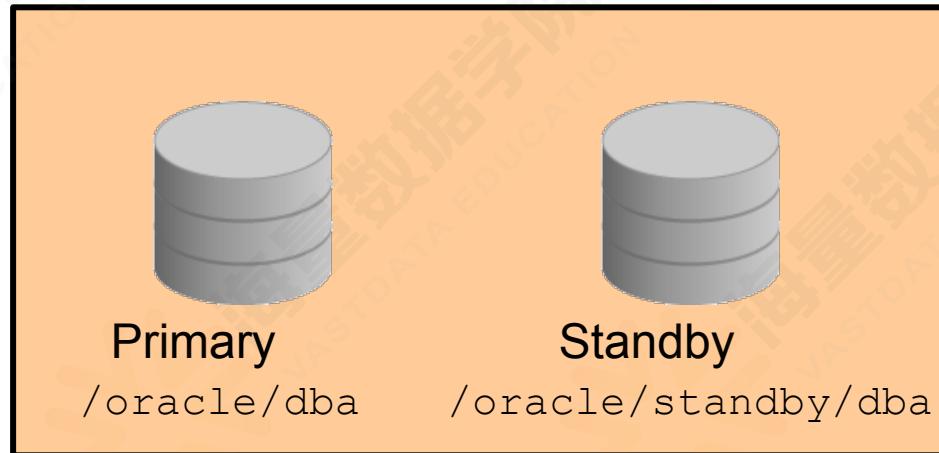


# *Starting Redo Apply*

*Execute the following command on the standby database to start Redo Apply:*

```
SQL> ALTER DATABASE
  2  RECOVER MANAGED STANDBY DATABASE
  3  USING CURRENT LOGFILE
  4  DISCONNECT FROM SESSION;
```

# *Special Note: Standby Database on the Same System*



- *Standby database data files must be at a different location.*
- *Each database instance must archive to different locations.*
- *Service names must be unique.*
- *This standby database does not protect against disaster.*

# *Preventing Primary Database Data Corruption from Affecting the Standby Database*

- Oracle Database processes can validate redo data before it is applied to the standby database.*
- Corruption detection checks occur on the primary database during redo transport and on the standby database during redo apply.*
- Implement lost write detection by setting DB\_LOST\_WRITE\_PROTECT to TYPICAL on the primary and standby databases.*

# Oracle Data Guard Broker: Features

- *The Oracle Data Guard broker is a distributed management framework.*
- *The broker automates and centralizes the creation, maintenance, and monitoring of Data Guard configurations.*
- *With the broker, you can perform all management operations locally or remotely with easy-to-use interfaces:*
  - *Oracle Enterprise Manager Grid Control*
  - *DGMGRL (a command-line interface)*

# Data Guard Broker: Components

— Client-side:

- Oracle Enterprise Manager Grid Control
- DGMGRL (command-line interface)

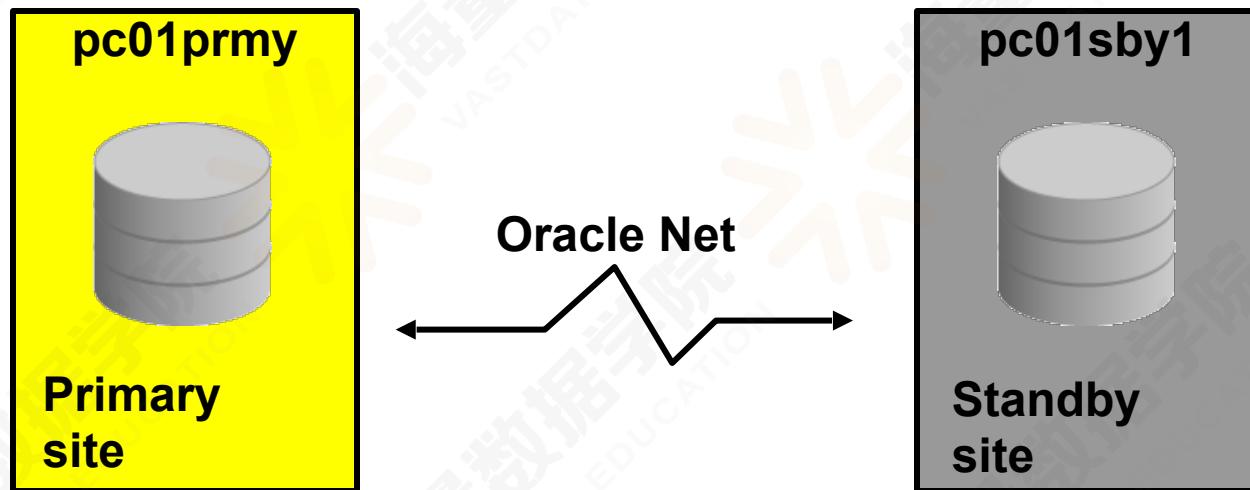
— Server-side: Data Guard monitor

- DMON process
- Configuration files



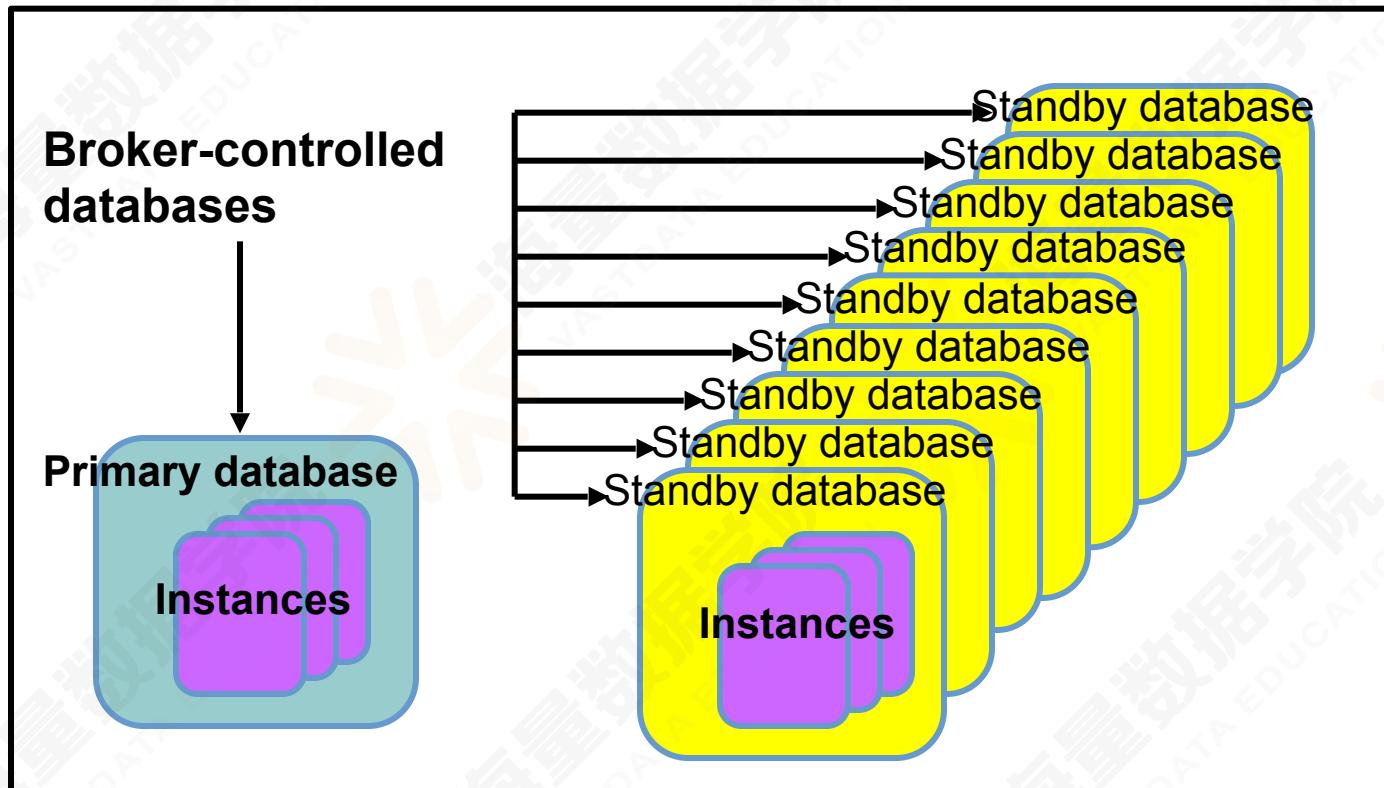
# Data Guard Broker: Configurations

*The most common configuration is a primary database at one location and a standby database at another location.*



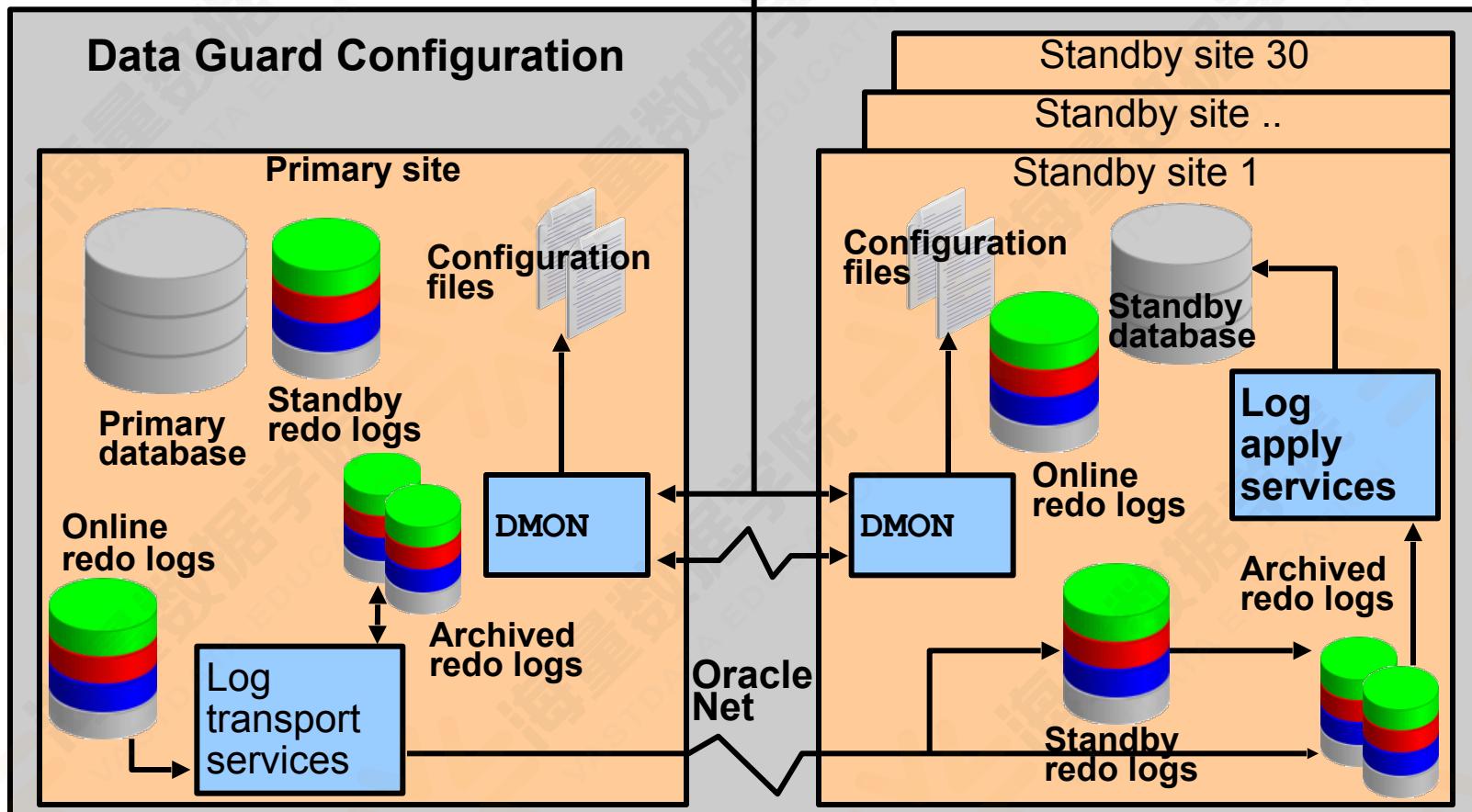
# Data Guard Broker: Management Model

Data Guard Broker Configuration



# Data Guard Broker: Architecture

Graphical user interface  
or  
command-line interface



# *Data Guard Monitor: DMON Process*

- Server-side background process*
- Part of each database instance in the configuration*
- Created when you start the broker*
- Performs requested functions and monitors the resource*
- Communicates with other DMON processes in the configuration*
- Updates the configuration file*
- Creates the drc<SID> trace file in the location set by the DIAGNOSTIC\_DEST initialization parameter*
- Modifies initialization parameters during role transitions as necessary*

# *Benefits of Using the Data Guard Broker*

- Enhances the high-availability, data protection, and disaster protection capabilities inherent in Oracle Data Guard by automating both configuration and monitoring tasks*
- Streamlines the process for any one of the standby databases to replace the primary database and take over production processing*
- Enables easy configuration of additional standby databases*
- Provides simplified, centralized, and extended management*
- Automatically communicates between the databases in a Data Guard configuration by using Oracle Net Services*
- Provides built-in validation that monitors the health of all databases in the configuration*

# Comparing Configuration Management With and Without the Data Guard Broker

	<b>With the Broker</b>	<b>Without the Broker</b>
General	Manage databases as one	Manage databases separately
Creation of the standby database	Use Grid Control wizards	Manually create files
Configuration and management	Configure and manage from single interface	Set up services manually for each database
Monitoring	<ul style="list-style-type: none"><li>• Monitor continuously</li><li>• Unified status and reports</li><li>• Integrate with EM events</li></ul>	Monitor each database individually through views
Control	Invoke role transitions with a single command	Coordinate sequences of multiple commands across database sites for role transitions

# Data Guard Broker Interfaces

- *Command-line interface (CLI):*

- *Is started by entering DGMGRL at the command prompt where the Oracle server or an Oracle client is installed*
- *Enables you to control and monitor a Data Guard configuration from the prompt or in scripts*

- *Oracle Enterprise Manager Grid Control:*

- *Provides wizards to simplify creating and managing standby databases*

# *Using the Command-Line Interface of the Data Guard Broker*

```
DGMGRL> connect sys/oracle_4U
Connected.
DGMGRL> show configuration verbose

Configuration - DGConfig1

Protection Mode: MaxPerformance
Databases:
  pc01prmy - Primary database
  pc01sby1 - Physical standby database

Fast-Start Failover: DISABLED

Configuration Status:
  SUCCESS
```

# Using Oracle Enterprise Manager 10g Grid Control

The screenshot shows the Oracle Enterprise Manager 10g Grid Control interface. The top navigation bar includes links for Home, Targets, Hosts, Databases, Middleware, Web Applications, Services, Systems, Groups, and All Targets. The main content area is titled "Database Instance: pc01prmy.us.oracle.com". The "Availability" tab is selected, displaying sections for High Availability Console and Maximum Availability Architecture (MAA) Advisor. Below these are links for Backup/Recovery (Setup, Backup Settings, Recovery Settings, Recovery Catalog Settings) and Manage (Schedule Backup, Manage Current Backups, Backup Reports, Manage Restore Points, Perform Recovery, View and Manage Transactions). The Data Guard section contains links for Setup and Manage, Performance, Verify Configuration, and Add Standby Database. A callout box with a black border and pink background points to the "Setup and Manage" link in the Data Guard section, with the text: "Click ‘Setup and Manage’ to access the Data Guard pages."

ORACLE Enterprise Manager 10g Grid Control

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | All Targets

Home Targets

Database Instance: pc01prmy.us.oracle.com

Home Performance Availability Server Schema Data Movement Software and Support

High Availability Console  
Maximum Availability Architecture (MAA) Advisor

Backup/Recovery

Setup  
Backup Settings  
Recovery Settings  
Recovery Catalog Settings

Manage  
Schedule Backup  
Manage Current Backups  
Backup Reports  
Manage Restore Points  
Perform Recovery  
View and Manage Transactions

Data Guard

Setup and Manage  
Performance  
Verify Configuration  
Add Standby Database

Click “Setup and Manage” to access the Data Guard pages.

# Data Guard Overview Page

Database Instance: pc01prmy.us.oracle.com > Logged in As SYS

## Data Guard

Page Refreshed February 25, 2010 11:50:54 PM EST

View Data Real Time: Manual Refresh

### Overview

Data Guard Status: ✓ Normal  
Protection Mode: Maximum Performance  
Fast-Start Failover: Disabled

### Primary Database

Name: pc01prmy  
Host: EDBVR6P1  
Data Guard Status: ✓ Normal  
Current Log: 56  
Properties: Edit

### Standby Progress Summary

Transport lag is the time difference between the primary last update and the standby last received redo.  
Apply lag is the time difference between the primary last update and the standby last applied redo.

Host	Transport Lag	Apply Lag
pc01sby1.us.oracle.com	0	0
pc01sby3	0	0

### Standby Databases

Add Standby Database

Select	Name	Host	Data Guard Status	Role	Real-time Query	Last Received Log	Last Applied Log	Estimated Failover Time
<input checked="" type="radio"/>	pc01sby1	EDBVR6P2	✓ Normal	Physical Standby	Disabled	55	55	< 1 second
<input type="radio"/>	pc01sby3	EDBVR6P2	✓ Normal	Logical Standby	N/A	55	55	< 1 second

# *Benefits of Using Enterprise Manager*

- Enables you to manage your configuration by using a familiar interface and event-management system*
- Automates and simplifies the complex operations of creating and managing standby databases through the use of wizards*
- Performs all Oracle Net Services configuration changes that are necessary to support redo transport services and log apply services*
- Provides a verify operation to ensure that redo transport services and log apply services are configured and functioning properly*
- Enables you to select a new primary database from a set of viable standby databases*

# Data Guard Broker: Requirements

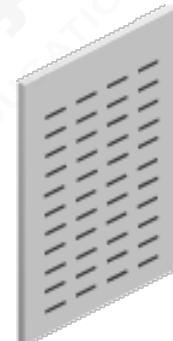
- Oracle Database Enterprise Edition
- Single-instance or multi-instance environment
- COMPATIBLE parameter: Set to 10.2.0.1.0 or later for primary and standby databases
- Oracle Net Services network files: Must be configured for the primary database and any existing standby databases. Enterprise Manager Grid Control configures files for new standby databases.
- GLOBAL\_DBNAME attribute: Set to a concatenation of db\_unique\_name\_DGMGRl.db\_domain

# Data Guard Broker: Requirements

- DG\_BROKER\_START *initialization parameter: Set to TRUE*
- *Primary database: ARCHIVELOG mode*
- *All databases: MOUNT or OPEN mode*
- DG\_BROKER\_CONFIG\_FILEn: *Configured for any RAC databases*

# *Data Guard Broker and the SPFILE*

- You must use a server parameter file (SPFILE) for initialization parameters.
- Using the SPFILE enables the Data Guard broker to keep its configuration file and the database SPFILE consistent.
- If you use the broker, use Enterprise Manager Grid Control or DGMGRL to update database parameter values.



# Data Guard Monitor: Configuration File

- *The broker configuration file is:*
  - Automatically created and named using a default path name and file name when the broker is started
  - Managed automatically by the DMON process
- *The configuration file and a copy are created at each managed site with default names:*
  - dr1<db\_unique\_name>.dat
  - dr2<db\_unique\_name>.dat
- *Configuration file default locations are operating system specific:*
  - Default location for UNIX and Linux: ORACLE\_HOME / dbs
  - Default location for Windows: ORACLE\_HOME\database
- *Use DG\_BROKER\_CONFIG\_FILEn to override the default path name and file name.*

# Data Guard Broker: Log Files

- The broker log files contain information recorded by the DMON process.
- There is one file for each instance in the broker configuration.
- Broker log files are created in the same directory as the alert log and are named `drc<$ORACLE_SID>.log`.

# *Creating a Broker Configuration*

1. *Invoke DGMGRL and connect to the primary database.*
2. *Define the configuration, including a profile for the primary database.*
3. *Add standby databases to the configuration.*
4. *Enable the configuration, including the databases.*

# *Defining the Broker Configuration and the Primary Database Profile*

```
DGMGRL> CREATE CONFIGURATION 'DGConfig1' AS
> PRIMARY DATABASE IS pc01prmy
> CONNECT IDENTIFIER IS pc01prmy;
Configuration "DGConfig1" created with primary database
  "pc01prmy"
DGMGRL>
```

# *Adding a Standby Database to the Configuration*

```
DGMGRL> ADD DATABASE pc01sby1 AS  
> CONNECT IDENTIFIER IS pc01sby1;  
Database "pc01sby1" added  
DGMGRL>
```

# *Enabling the Configuration*

```
DGMGRL> ENABLE CONFIGURATION;  
Enabled.  
DGMGRL> SHOW CONFIGURATION  
  
Configuration - DGConfig1  
  
Protection Mode: MaxPerformance  
Databases:  
  pc01prmy - Primary database  
  pc01sby1 - Physical standby database  
  
Fast-Start Failover: DISABLED  
  
Configuration Status:  
SUCCESS
```



# *Changing Database Properties and States*

- To alter a database property:

```
DGMGR> EDIT DATABASE pc01sby1  
> SET PROPERTY LogXptMode='SYNC' ;
```

- To alter the state of the standby database:

```
DGMGR> EDIT DATABASE pc01sby1 SET STATE='APPLY-OFF' ;
```

- To alter the state of the primary database:

```
DGMGR> EDIT DATABASE pc01prmy  
> SET STATE='TRANSPORT-OFF' ;
```

# *Managing Redo Transport Services by Using DGMGRL*

*Specify database properties to manage redo transport services:*

- DGConnectIdentifier
- LogXptMode
- LogShipping

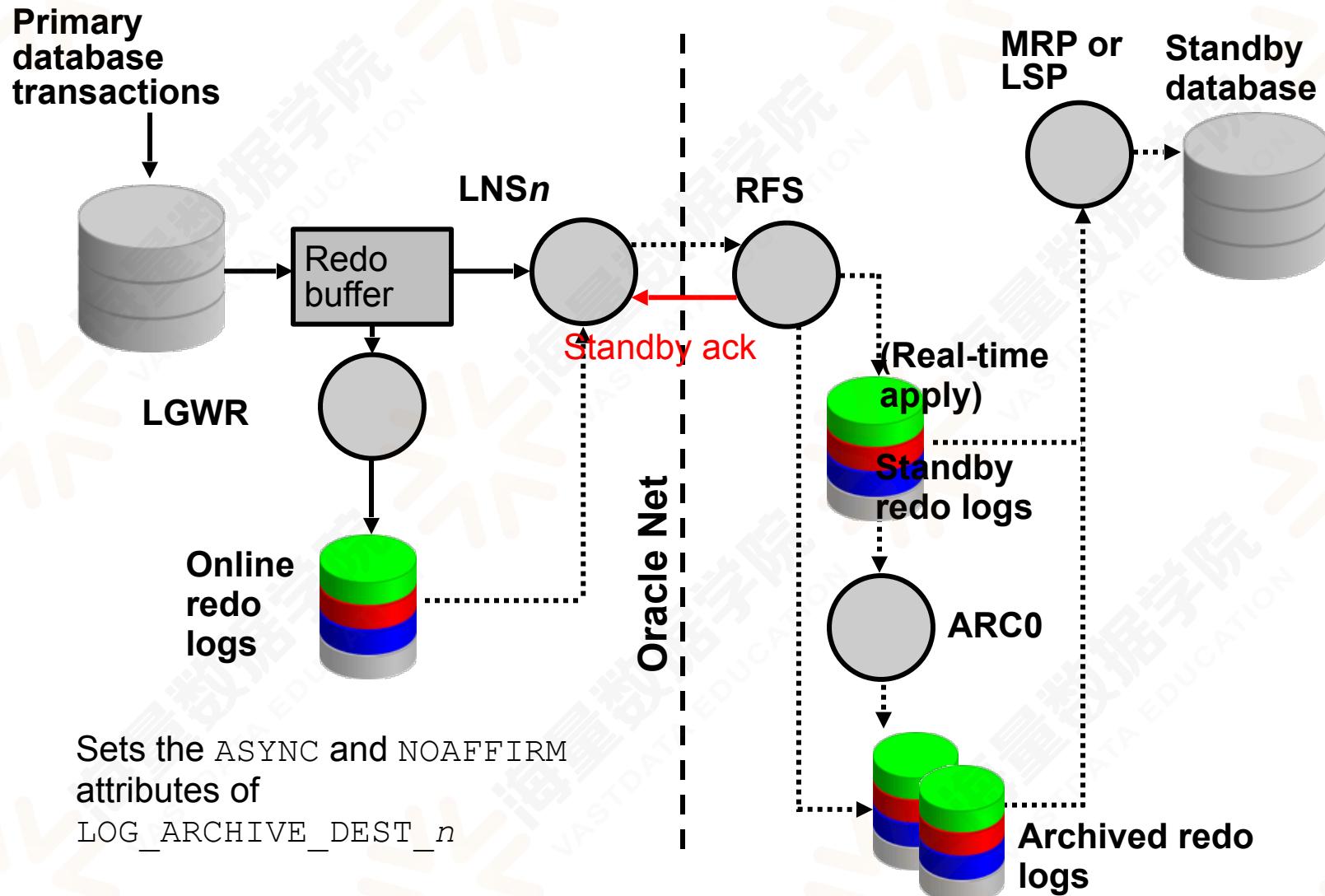
# *Specifying the Connection Identifier by Using the DGConnectIdentifier Property*

- DGConnectIdentifier:
  - *Specifies the connection identifier that is used by the broker to connect to a database and redo transport services*
  - *Is set when a database is either added to the Data Guard broker configuration to the value specified in the optional CONNECT IDENTIFIER CLAUSE, or is extracted from the SERVICE attribute of the LOG\_ARCHIVE\_DEST\_n initialization parameter*
- *The DGConnectIdentifier value is used to set the FAL\_SERVER and FAL\_CLIENT initialization parameters.*

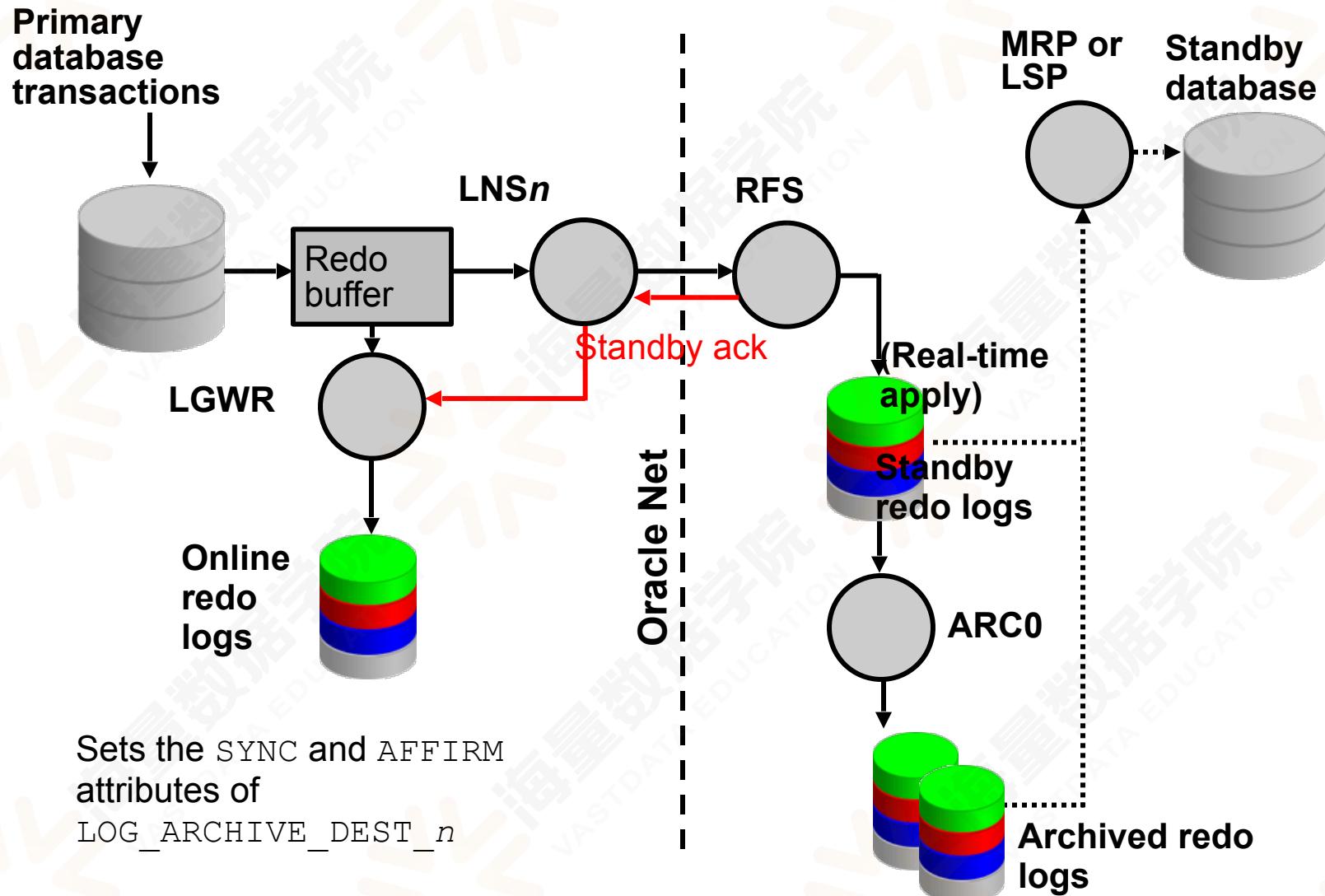
# *Managing the Redo Transport Service by Using the LogXptMode Property*

- The redo transport service must be set up for the chosen data protection mode.*
- Use the LogXptMode property to set the redo transport services:*
  - ASYNC
    - Sets the ASYNC and NOAFFIRM attributes of LOG\_ARCHIVE\_DEST\_n*
    - Required for maximum performance mode*
  - SYNC
    - Sets the SYNC and AFFIRM attributes of LOG\_ARCHIVE\_DEST\_n*
    - Required for maximum protection and maximum availability modes*

# *Setting LogXptMode to ASYNC*



# *Setting LogXptMode to SYNC*



# *Controlling the Shipping of Redo Data by Using the LogShipping Property*

- LogShipping *controls whether redo transport services can send redo data to a specified standby database.*
- LogShipping *is applicable only when the primary database state is set to TRANSPORT-ON.*

# *Disabling Broker Management of the Configuration or Standby Database*

- Disable broker management of the configuration:

```
DGMGRL> DISABLE CONFIGURATION;
```

- Disable broker management of a standby database:

```
DGMGRL> DISABLE DATABASE 'pc01sby1' ;
```

# *Removing the Configuration or Standby Database*

- Remove a standby database from the configuration:

```
DGMGR> REMOVE DATABASE 'pc01sby1' [PRESERVE  
DESTINATIONS] ;
```

- Remove the configuration:

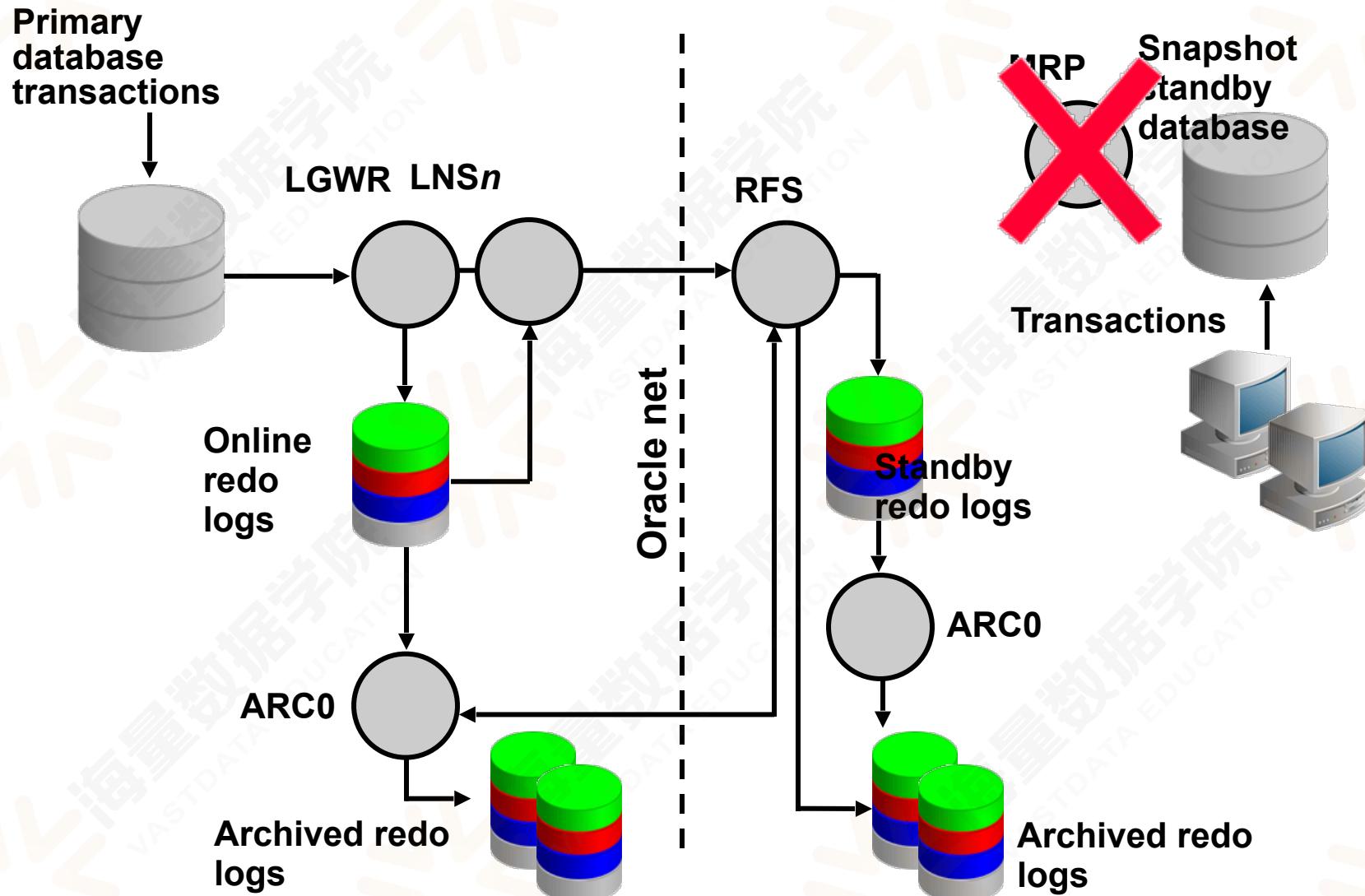
```
DGMGR> REMOVE CONFIGURATION [PRESERVE DESTINATIONS] ;
```

# *Snapshot Standby Databases: Overview*

- A *snapshot standby database* is a fully updatable standby database created by converting a physical standby database.
- Snapshot standby databases receive and archive—but do not apply—redo data from a primary database.
- When the physical standby database is converted, an implicit guaranteed restore point is created and Flashback Database is enabled.



# Snapshot Standby Database: Architecture



# *Converting a Physical Standby Database to a Snapshot Standby Database*

*To convert a physical standby database to a snapshot standby database:*

```
DGMGRL> CONVERT DATABASE pc01sby1
>TO SNAPSHOT STANDBY;

Converting database "pc01sby1" to a Snapshot Standby
database, please wait...

Database "pc01sby1" converted successfully
```



# *Activating a Snapshot Standby Database: Issues and Cautions*

*When activating a snapshot standby database, be aware of:*

- Potential data loss with a corrupted log file*
- Lengthy conversion of the snapshot standby database to a primary database in the event of a failure of the primary database*

# *Snapshot Standby Database: Target Restrictions*

*A snapshot standby database cannot be:*

- The only standby database in a maximum protection configuration*
- The target of a switchover*
- A fast-start failover target*

# *Viewing Snapshot Standby Database Information*

*View the database role by querying V\$DATABASE:*

```
SQL> SELECT database_role FROM v$database;  
DATABASE_ROLE  
-----  
SNAPSHOT STANDBY
```

# *Using DGMGRL to View Snapshot Standby Database Information*

*View snapshot standby information by using the SHOW CONFIGURATION and SHOW CONFIGURATION VERBOSE commands:*

```
DGMGRL> show configuration
Configuration - DGConfig1

Protection Mode: MaxPerformance
Databases:
pc01prmy - Primary database
pc01sby1 - Snapshot standby database
pc01sby3 - Logical standby database

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

# *Using DGMGRL to View Snapshot Standby Database Information*

*View snapshot standby information by using the SHOW DATABASE and SHOW DATABASE VERBOSE commands:*

```
DGMGRL> show database pc00sby1
```

```
Database - pc01sby1
```

```
Enterprise Manager Name: pc01sby1.us.oracle.com
```

```
Role: SNAPSHOT STANDBY
```

```
Intended State: APPLY-OFF
```

```
Transport Lag: 0 seconds
```

```
Apply Lag: 42 seconds
```

```
Instance(s) :
```

```
pc01sby1
```

```
Database Status:
```

```
SUCCESS
```



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# *Converting a Snapshot Standby Database to a Physical Standby Database*

*Convert the snapshot standby database back to a  
physical standby database:*

```
DGMGRL> CONVERT DATABASE pc01sby1  
>TO PHYSICAL STANDBY;
```

# Oracle Active Data Guard

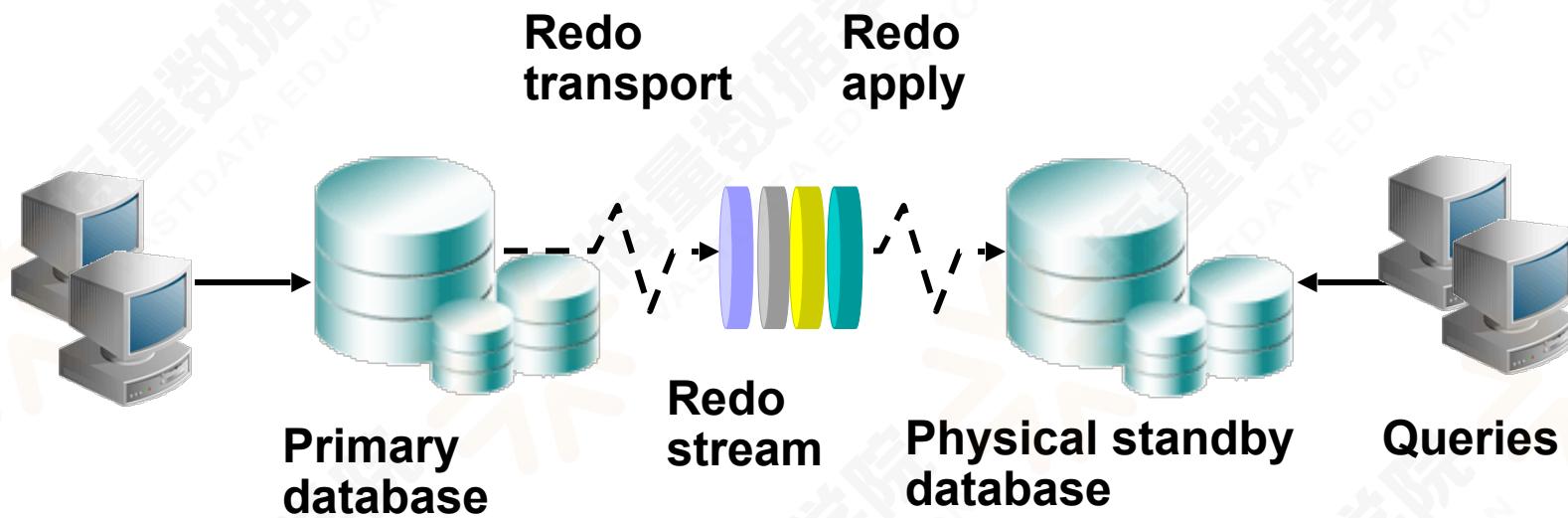
- Is an option for Oracle Database 11g Enterprise Edition
- Enhances quality of service by offloading resource-intensive activities from a production database to a standby database
- Includes the following features:
  - Real-time query
  - RMAN block change tracking on a physical standby database

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# Using Real-Time Query



# Enabling Real-Time Query

1. Verify that real-time query mode is not enabled:

```
DGMGRL> show database pc01sby1
```

2. Open the database for read-only access:

```
SQL> ALTER DATABASE OPEN READ ONLY;  
Database altered.
```

3. Verify that real-time query mode is now enabled:

```
DGMGRL> show database pc01sby1
```

# *Disabling Real-Time Query*

1. *Shut down the standby database instance.*
2. *Restart the standby database instance in MOUNT mode.*

# Checking the Standby's Open Mode

- A physical standby database opened in read-only mode:

```
SQL> SELECT open_mode FROM V$DATABASE;  
OPEN_MODE  
-----  
READ ONLY
```

- A physical standby database opened in real-time query mode:

```
SQL> SELECT open_mode FROM V$DATABASE;  
OPEN_MODE  
-----  
READ ONLY WITH APPLY
```

# *Understanding Lag in an Active Data Guard Configuration*

- A standby database configured with real-time apply can lag behind the primary database as a result of:*
  - Insufficient CPU capacity*
  - High network latency*
  - Limited bandwidth*
- Queries on the standby database need to return current results and/or be within an established service level.*
- Ways to “manage” the standby database lag and take necessary action:*
  - Configure Data Guard configuration with a maximum data lag that will trigger an error when it is exceeded.*
  - Monitor the redo apply lag and take action when the lag is unacceptable.*

# Monitoring Apply Lag:

## V\$DATAGUARD\_STATS

- *Apply lag: This is the difference, in elapsed time, between when the last applied change became visible on the standby and when that same change was first visible on the primary.*
- *The apply lag row of the V\$DATAGUARD\_STATS view reflects statistics that are computed periodically and to the nearest second.*

```
SQL> SELECT name, value, datum_time, time_computed
  2> FROM v$dataguard_stats
  3> WHERE name like 'apply lag';

NAME          VALUE        DATUM_TIME        TIME_COMPUTED
-----  -----
apply lag    +00 00:00:00  27-MAY-2009 08:54:16  27-MAY-2009 08:54:17
```

# Monitoring Apply Lag:

## V\$STANDBY\_EVENT\_HISTOGRAM

- View histogram of apply lag on a physical standby database.
- Use to assess value for STANDBY\_MAX\_DATA\_DELAY.
- Use to focus on periods of time when the apply lag exceeds desired levels so that issue can be resolved.

```
SQL> SELECT * FROM V$STANDBY_EVENT_HISTOGRAM  
2> WHERE NAME = 'apply lag' AND COUNT > 0;
```

NAME	TIME	UNIT	COUNT	LAST_TIME_UPDATED
apply lag	0	seconds	79681	06/18/2009 10:05:00
apply lag	1	seconds	1006	06/18/2009 10:03:56
apply lag	2	seconds	96	06/18/2009 09:51:06
apply lag	3	seconds	4	06/18/2009 04:12:32
apply lag	4	seconds	1	06/17/2009 11:43:51
apply lag	5	seconds	1	06/17/2009 11:43:52

```
6 rows selected
```

# *Setting a Predetermined Service Level for Currency of Standby Queries*

- STANDBY\_MAX\_DATA\_DELAY *session parameter*: Specifies a session-specific limit for the amount of time (in seconds) allowed to elapse between when changes are committed on the primary and when those same changes can be queried on the standby database

```
ALTER SESSION  
SET STANDBY_MAX_DATA_DELAY = {INTEGER|NONE}
```

- If the limit is exceeded, an error message is returned:

ORA-3172 STANDBY\_MAX\_DATA\_DELAY has been exceeded

- This setting is ignored for the SYS user.

# *Configuring Zero Lag Between the Primary and Standby Databases*

- Certain applications have zero tolerance for any lag.*
- Query on the standby database must return the same result as though it were executed on the primary database.*
- Enforce by setting STANDBY\_MAX\_DATA\_DELAY to 0.*
- The standby database must have advanced to a value equal to that of the current SCN on the primary database at the time the query was issued.*
- Results are guaranteed to be the same as the primary database, else ORA-3172 error is returned to the query.*
- The primary database must operate in maximum availability or maximum protection mode.*
- SYNC must be specified for redo transport.*
- Real-time query must be enabled.*

# *Setting STANDBY\_MAX\_DATA\_DELAY by Using an AFTER LOGON Trigger*

*Create an AFTER LOGON trigger that:*

- Is database role aware
  - It uses DATABASE\_ROLE, a new attribute in the USERENV context.
  - SQL and PL/SQL clients can retrieve the database role programmatically using the SYS\_CONTEXT function.
  - It enables you to write role-specific triggers.*
- Sets STANDBY\_MAX\_DATA\_DELAY when the application logs on to a real-time query-enabled standby database*
- Allows for configuration of a maximum data delay without changing the application source code*

# *Example: Setting STANDBY\_MAX\_DATA\_DELAY by Using an AFTER LOGON Trigger*

```
CREATE OR REPLACE TRIGGER sla_logon_trigger
  AFTER LOGON
  ON APP.SCHEMA
BEGIN
  IF (SYS_CONTEXT('USERENV', 'DATABASE_ROLE')
      IN ('PHYSICAL STANDBY'))
    THEN execute immediate
      'alter session set standby_max_data_delay=5';
  ENDIF;
END;
```

# Forcing Redo Apply Synchronization

- *The ALTER SESSION SYNC WITH PRIMARY command:*
  - *Performs a blocking wait on the standby database upon execution*
  - *Blocks the application until the standby database is in sync with the primary database as of the time this command is executed*
- *When the ALTER SESSION SYNC WITH PRIMARY command returns control, the session can continue to process queries without having to wait for standby redo apply.*
- *An ORA-3173 Standby may not be synced with primary error is returned if redo apply is not active or is canceled before the standby database is in sync with the primary database as of the time this command is executed.*

# *Creating an AFTER LOGON Trigger for Synchronization*

- Use an AFTER LOGON trigger to force a wait for synchronization between primary and standby databases.
- Use for dedicated connection only.
- This ensures that the reporting application starts with the current data without requiring a change to the application source code.

```
CREATE TRIGGER adg_logon_sync_trigger
AFTER LOGON ON user.schema
BEGIN
    IF (SYS_CONTEXT('USERENV', 'DATABASE_ROLE') IN
        ('PHYSICAL STANDBY'))
    THEN
        execute immediate 'alter session sync with primary';
    END IF;
END;
```

# *Supporting Read-Mostly Applications*

- *Read-mostly applications are predominantly read-only applications, but require limited read-write database access.*
- *Active Data Guard supports the read-only portion of read-mostly applications if writes are redirected to the primary database or a local database.*
- *Redirection of read-write workload does not require application code changes.*
- *Writes can be transparently redirected to the primary database if the application adheres to the following:*
  - *Modified objects must not be qualified by a schema name.*
  - *SQL commands must be issued directly from the client, not in stored procedures.*

# *Example: Transparently Redirecting Writes to the Primary Database*

— Application characteristics:

- Executes as user U
- Reads table U.R (R) and writes to table U.W (W)
- User S has S.R synonym for U.R and S.W synonym for U.W@primary.

— Create an AFTER LOGON trigger on the standby database:

```
CREATE TRIGGER adg_logon_switch_schema_trigger
AFTER LOGON ON u.schema
BEGIN
  IF (SYS_CONTEXT('USERENV', 'DATABASE_ROLE')
      IN ('PHYSICAL STANDBY'))
  THEN
    execute immediate
      'alter session set current_schema = S';
  END IF;
END;
```

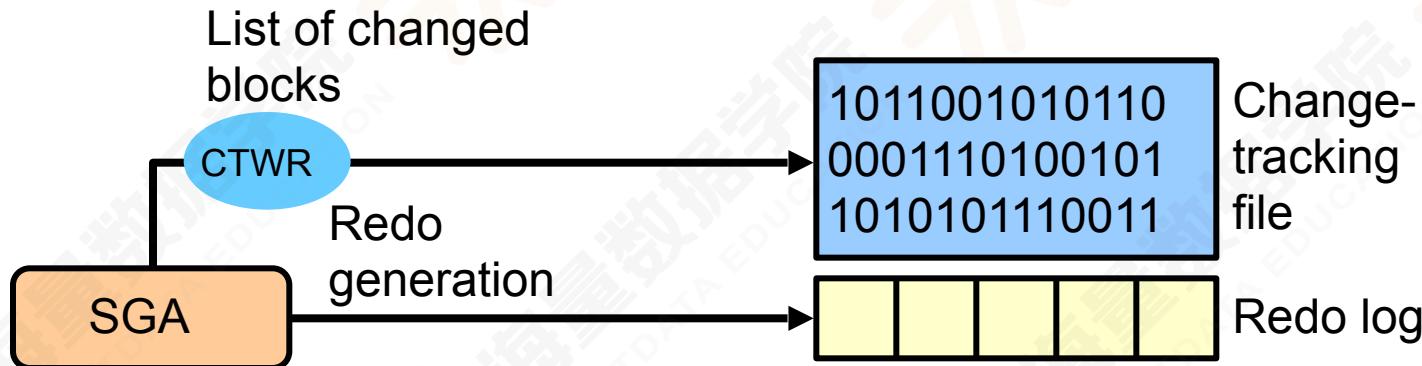
# *Enabling Block Change Tracking on a Physical Standby Database*

- Enable block change tracking on a physical standby database for fast incremental backups.*
- Data file blocks that are affected by each database update are tracked in a block change tracking file.*
- The block change tracking file is a binary file used by RMAN to record changed blocks to improve incremental backup performance.*



# Creating Fast Incremental Backups

- Block change tracking optimizes incremental backups:
  - Tracks the blocks that have changed since the last backup
- Oracle Database has integrated change tracking:
  - A change tracking file is used.
  - Changed blocks are tracked as redo is generated.
  - Database backup automatically uses the changed-block list.



# Enabling Block Change Tracking

ORACLE Enterprise Manager 10g

Grid Control

Home Targets Deployment

Hosts | Databases | Application Servers | Web Applications | Services | Systems | Groups | All Targets

Database Instance: pc02sby1 >

## Backup Settings

Device Backup Set **Policy**

### Backup Policy

Automatically backup the control file and server parameter file (SPFILE) with every backup and database structure.

Autobackup Disk Location

An existing directory or diskgroup name where the control file and server parameter file will be backed up to the flash recovery area location.

Optimize the whole database backup by skipping unchanged files such as read-only and offline datafiles that

Enable block change tracking for faster incremental backups

Block Change Tracking File

Specify a location and file, otherwise an Oracle managed file will be created in the database area.

```
ALTER DATABASE
{ENABLE|DISABLE} BLOCK CHANGE TRACKING
[USING FILE '...']
```

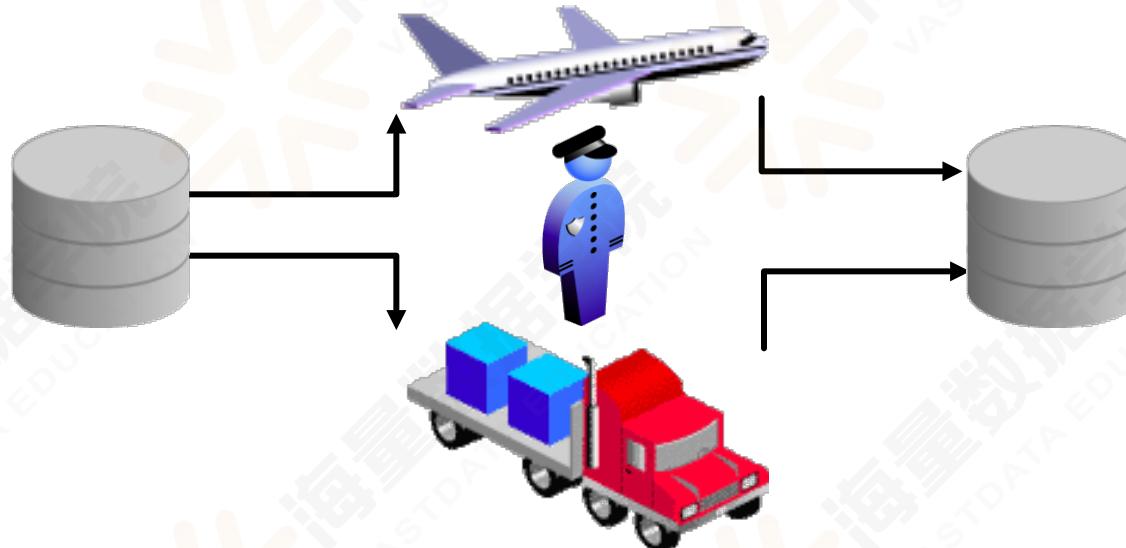
# Monitoring Block Change Tracking

```
SQL> SELECT filename, status, bytes  
2   FROM v$block_change_tracking;
```

```
SQL> SELECT file#, avg(datafile_blocks) ,  
2           avg(blocks_read) ,  
3           avg(blocks_read/datafile_blocks)  
4           * 100 AS PCT_READ_FOR_BACKUP ,  
5           avg(blocks)  
5   FROM v$backup_datafile  
6  WHERE used_change_tracking = 'YES'  
7  AND incremental_level > 0  
8  GROUP BY file#;
```

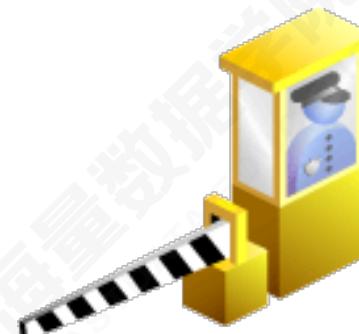
# Data Protection Modes and Redo Transport Modes

- A data protection mode requires a specific redo transport mode.
- A redo transport mode alone does not define a data protection mode.



# Data Protection Modes

- Three data protection modes:
  - Maximum protection
  - Maximum availability
  - Maximum performance
- Help to balance data availability and system performance



# Maximum Protection Mode

- Maximum protection mode ensures zero data loss in the event of a failure of the primary database, the network, or all standby databases.
- The primary database shuts down if a fault prevents it from writing its redo stream to at least one synchronized standby database.
- Redo data must be written to both the local online redo log and the standby redo log on at least one synchronized standby database.
- Configuration requirements: At least one standby database must have a standby redo log, and that standby database destination must be configured with the SYNC and AFFIRM redo transport attributes.

# Maximum Availability Mode

- Maximum availability mode ensures zero data loss without compromising the availability of the primary database.
- Redo data must be written to both the local online redo log and the standby redo log on at least one synchronized standby database.
- The primary database does not shut down if it cannot write to at least one synchronized standby database.
- If no synchronized standby databases are available, the primary database operates in an unsynchronized mode until at least one standby database is synchronized.
- Configuration requirements: At least one standby database must have a standby redo log, and that standby database destination must be configured with the SYNC and AFFIRM redo transport attributes.

# Maximum Performance Mode

- Maximum performance mode is the default level of data protection.
- This mode provides the highest possible level of data protection without affecting the performance of the primary database.
- Transactions can commit as soon as the redo data is written to the local online redo log.
- Redo data is shipped to the standby database asynchronously with respect to the commitment of the transactions that create the redo data.
- Configuration requirements:
  - Standby redo log on at least one standby database
  - At least one standby database that is configured with the ASYNC and NOAFFIRM redo transport attributes

# Comparing Data Protection Modes

Mode	Risk of Data Loss	Transport	If no acknowledgment is received:
Maximum Protection	Zero data loss Double failure protection	SYNC	Stall primary until an acknowledgement is received
Maximum Availability	Zero data loss	SYNC	Stall primary until threshold period expires, then resume processing
Maximum Performance	Potential for minimal data loss	ASYNC	Primary never waits for standby acknowledgement

# *Setting the Data Protection Mode by Using DGMGRL*

1. *Configure standby redo logs.*
2. *Set the LogXptMode property (if necessary).*
  - *Maximum protection:* SYNC
  - *Maximum availability:* SYNC
  - *Maximum performance:* ASYNC
3. *Set the data protection mode.*

```
DGMGRL> EDIT DATABASE 'pc01sby1' SET PROPERTY  
'LogXptMode'='SYNC';  
Property "LogXptMode" updated  
DGMGRL> EDIT CONFIGURATION SET PROTECTION MODE AS  
MAXAVAILABILITY;  
Succeeded.
```

# Setting the Data Protection Mode

**ORACLE Enterprise Manager 10g**  
Grid Control

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups |

Database Instance: pc01prmy.us.oracle.com >

**Data Guard**

Page Refreshed March 2, 2010 7:28:10 PM EST

**Overview**

Data Guard Status	✓ Normal
Protection Mode	<u>Maximum Performance</u>
Fast-Start Failover	Disabled

**Primary Database**

Name	pc01prmy
Host	EDBVR6P1
Data Guard Status	✓ Normal
Current Log	30
Properties	<u>Edit</u>

**Standby Databases**

Edit Remove Switchover Failover Convert

Select	Name	Host	Data Guard Status	Role
<input checked="" type="radio"/>	pc01sby1	EDBVR6P2	✓ Normal	Physical Standby

Click the Protection Mode link.

# Setting the Data Protection Mode

**ORACLE Enterprise Manager 10g** Grid Control

Home Targets Deployments Alerts Compliance Jobs Reports

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | All Targets

Database Instance: pc01prmy.us.oracle.com > Data Guard > Logged in As SYS

**Change Protection Mode: Select Mode**

Data Guard provides multiple protection modes. Higher protection modes reduce data loss but may affect performance of the primary database. When changing to maximum protection or maximum availability, a SYSDBA connection is required to the primary database and all standby databases to determine if standby redo log files are needed.

Maximum Protection  
Provides the highest level of data protection. No data will be lost. Possible primary database downtime if connectivity to the standby database is lost. Requires the SYNC redo transport mode to be set on at least one standby database.

Maximum Availability  
Provides very high data protection. No primary database downtime if connectivity to the standby database is lost but data may diverge. Requires the SYNC redo transport mode to be set on at least one standby database.

Maximum Performance  
No performance impact on the primary database. Provides high data protection with the ASYNC redo transport mode. Can also be used with the ARCH redo transport mode.

[Home](#) | [Targets](#) | [Deployments](#) | [Alerts](#) | [Compliance](#) | [Jobs](#) | [Reports](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

# Role Management Services

- In a Data Guard configuration, a database operates in one of two mutually exclusive roles:
  - Primary role
  - Standby role (Physical, Logical, Snapshot subtypes)
- With role management services, you can change these roles dynamically.



# *Role Transitions: Switchover and Failover*

## *— Switchover*

- Planned role transition*
- Used for operating-system or hardware maintenance*
- Manually invoked on primary database*

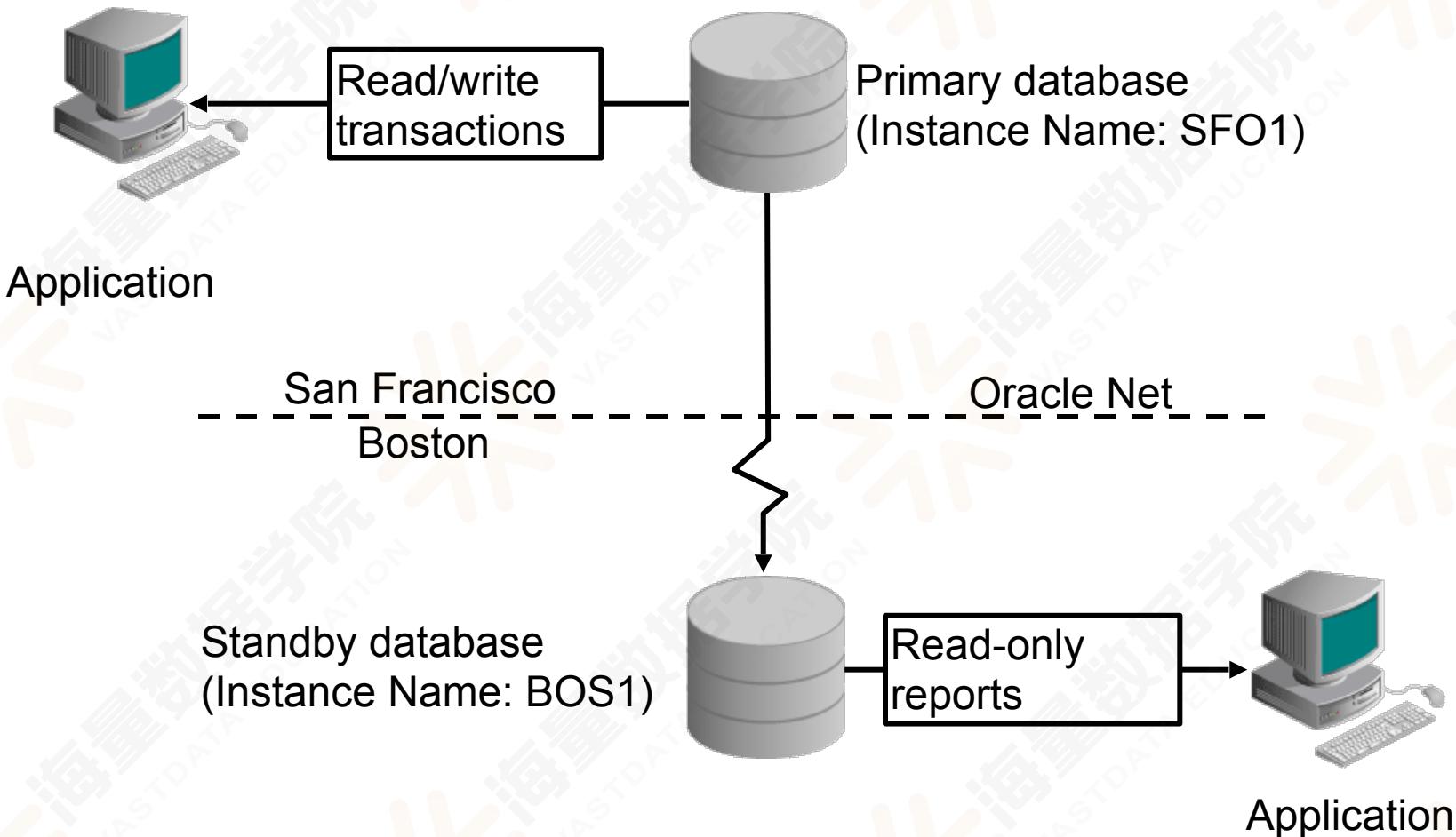
## *— Failover*

- Unplanned role transition*
- Used in an emergency*
- Minimal or no data loss (depending on the data-protection mode)*
- Fast-start failover can be enabled for automatic failover*
- Initiated at standby database*

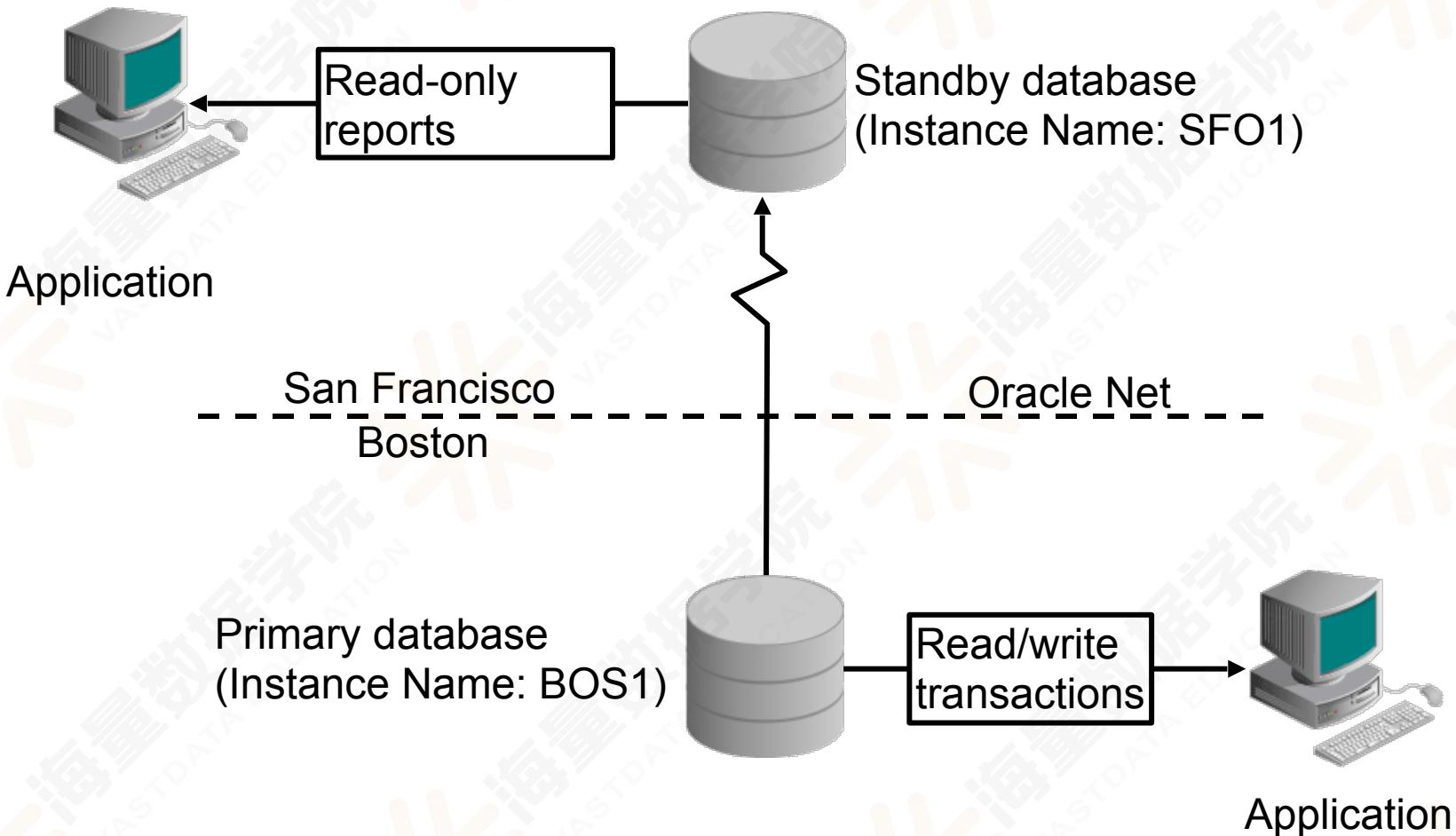
# *Switchover*

- *Transitions the roles of the primary and standby databases*
- *Requires no resetting of the online redo logs of the new primary database*
- *Incurs no data loss*

# Switchover: Before



# Switchover: After



# *Preparing for a Switchover*

*To prepare for the switchover operation, verify that:*

- Network connectivity exists between the primary database and all standby database locations*
- State of the primary database is TRANSPORT-ON and state of the standby database is APPLY-ON*
- Standby database properties are set on the primary database*
- Standby redo log files are configured on the primary database*
- LogXptMode is set to SYNC on the current primary database if the configuration protection mode is set to maximum availability or maximum protection*

# *Performing a Switchover by Using DGMGRL*

*After verifying the conditions required for a switchover, execute the SWITCHOVER command:*

```
DGMGRL> SWITCHOVER TO 'pc01sby1';
Performing switchover NOW, please wait...
New primary database "pc01sby1" is opening...
Operation requires shutdown of instance "pc01prmy" on
database "pc01prmy"
Shutting down instance "pc01prmy"...
ORA-01109: database not open
Database dismounted.
ORACLE instance shut down.
Operation requires startup of instance "pc01prmy" on
database "pc01prmy"
Starting instance "pc01prmy"...
ORACLE instance started.
Database mounted.
Switchover succeeded, new primary is "pc01sby1"
```

# Performing a Switchover by Using Enterprise Manager

Database Instance: pc01prmy.us.oracle.com > Logged in As SYS

Data Guard

Page Refreshed March 2, 2010 8:03:59 PM EST

View Data Real Time: Manual Refresh

**Overview**

Data Guard Status	✓ Normal
Protection Mode	Maximum Performance
Fast-Start Failover	Disabled

**Primary Database**

Name	pc01prmy
Host	EDBVR6P1
Data Guard Status	✓ Normal
Current Log	30
Properties	<a href="#">Edit</a>

**Standby Progress Summary**

Transport lag is the time difference between the primary last update and the standby last received redo. Apply lag is the time difference between the primary last update and the standby last applied redo.

seconds

Transport Lag

Apply Lag

pc01sbyp1.us.oracle.com

Select the database and click Switchover.

Add Standby Database

Edit Remove Switchover Failover Convert

Select Name	Host	Data Guard Status	Role	Real-time Query	Last Received Log	Last Applied Log	Estimated Failover Time
pc01sbyp1	EDBVR6P2	✓ Normal	Physical Standby	Disabled	29	29	< 1 second

# Performing a Switchover by Using Enterprise Manager

## Confirmation: Switchover to pc01sby1

Are you sure you want to switchover to pc01sby1?

A switchover will cause the primary and standby databases to switch roles. The switchover operation cannot be cancelled.

Any active sessions connected to the primary database will be closed automatically during the switchover operation.

[Browse Primary Database Sessions](#)

### Monitoring Settings and Jobs

Monitoring settings and jobs can optionally be swapped between the primary and standby databases as part of the role change operation.

Swap Monitoring Settings

The current Enterprise Manager monitoring settings (including metric thresholds) for the primary and standby databases will be swapped after the role change, overriding all settings for each database with the values from the other database. If more granular monitoring standard swapping is desired, de-select this option and use the Monitoring Standards interface to create monitoring templates prior to the role change and apply them afterwards.

Transfer Jobs

[► Job Transfer Details](#)

No

Yes

Click Yes to confirm.

# Performing a Switchover by Using Enterprise Manager

Logged in As SYS

## Processing: Switchover

### Switching over to pc01sby1

This process takes some time. The page automatically returns to the Data Guard overview page upon completion.  
Click on the alert log link to view progress details in a new browser window. View alert log: [pc01prmy pc01sby1](#)



- ➡ Performing role change
- Restarting new standby database
- Waiting for switchover to complete
- Transferring jobs
- Transferring monitoring settings

 TIP This process cannot be cancelled. It will continue even if the browser window is closed.

[Home](#) | [Targets](#) | [Deployments](#) | [Alerts](#) | [Compliance](#) | [Jobs](#) | [Reports](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

# *Considerations When Performing a Switchover to a Logical Standby Database*

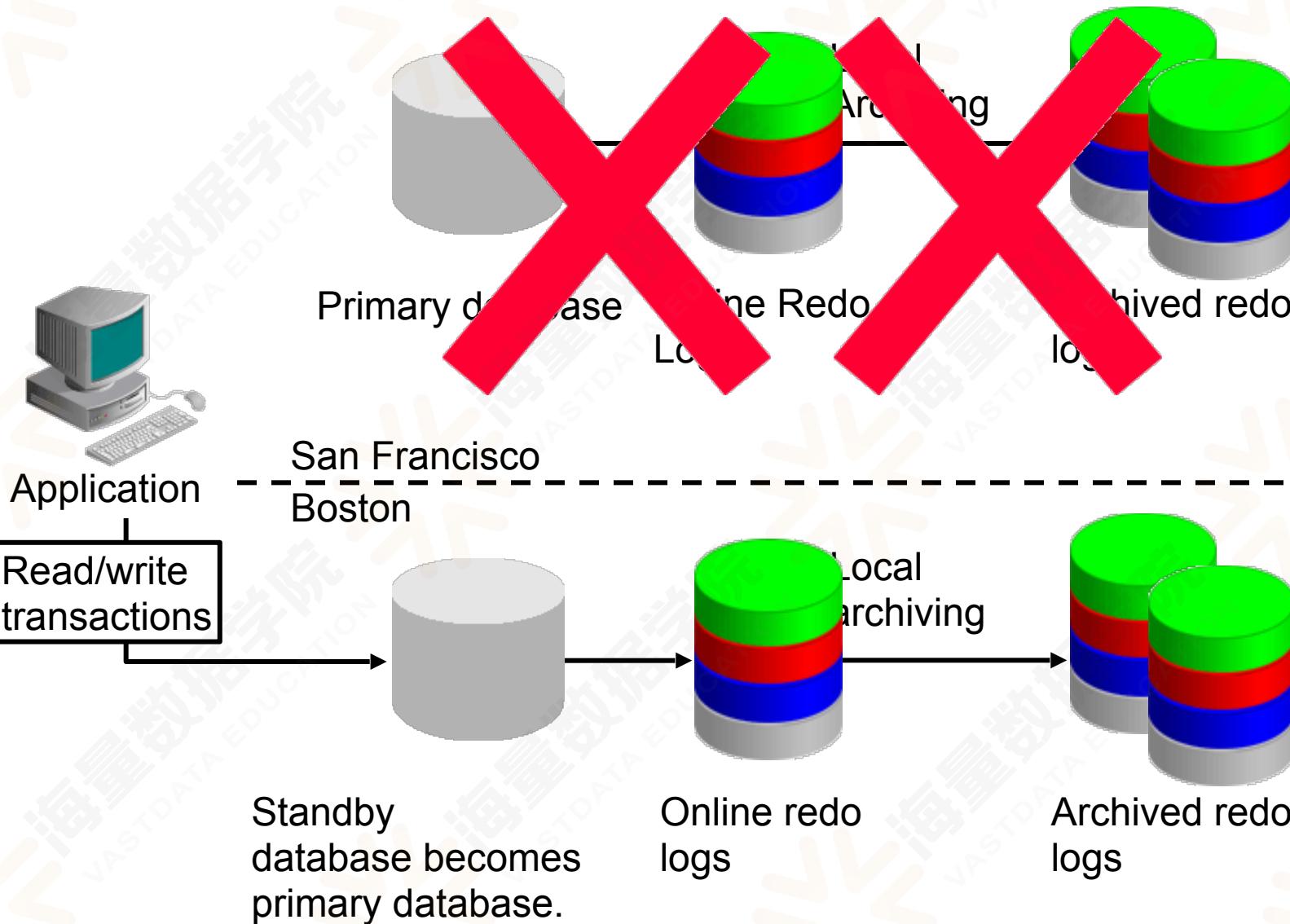
- The switchover operation does not cause a shutdown of the primary database instance.*
- Although there is no need to terminate user sessions, termination is recommended.*
- The logical standby database may not have all data.*
- Switchover to a logical standby database invalidates and disables all physical and snapshot standby databases in the broker managed Data Guard configuration.*

# *Situations That Prevent a Switchover*

*You cannot perform a switchover if:*

- Archived redo log files are unavailable.*
- Point-in-time recovery is required.*
- The production database is not open and cannot be opened.*

# Failover



# *Types of Failovers*

- *Manual failover: Invoked by the DBA*
  - *Complete: Attempts to minimize data loss by applying all available redo on the standby database*
  - *Immediate: No additional data is applied on the standby database*
- *Fast-start failover: Invoked automatically by the Data Guard broker*

# *Failover Considerations*

- The old primary database is disabled from the Data Guard configuration.*
- Data loss is possible.*
- Failover should be used only in an emergency.*
- When choosing a standby database to fail over to, you should:*
  - Choose a physical standby database when possible*
  - Choose the standby database that is most current*

# *Performing a Manual Failover by Using DGMGRL*

1. *Execute the FAILOVER command to initiate the failover operation on the standby database host:*

```
DGMGRL> FAILOVER TO 'pc01sby1' [IMMEDIATE] ;
```

2. *Reset the protection mode (if necessary).*
3. *Reinstate the primary database to serve as a standby database in the configuration.*
4. *Reinstate or re-create other disabled standby databases in the configuration.*

# *Reenabling Disabled Databases by Using DGMGRL*

- *Disabled databases must be reinstated or re-created to reenable broker management.*
- *Reinstate a database using REINSTATE DATABASE:*

```
DGMGRL> REINSTATE DATABASE pc01prmy;
```

- *If you cannot reinstate a database, re-create it from a copy of the primary database and then reenable the database by using ENABLE DATABASE:*

```
DGMGRL> ENABLE DATABASE pc01prmy;
```

# Performing a Failover by Using Enterprise Manager

Database Instance: pc01prmy.us.oracle.com > Logged in As SYS

## Data Guard

Page Refreshed March 2, 2010 8:03:59 PM EST View Data Real Time: Manual Refresh

### Overview

Data Guard Status	✓ Normal
Protection Mode	Maximum Performance
Fast-Start Failover	Disabled

### Primary Database

Name	pc01prmy
Host	EDBVR6P1
Data Guard Status	✓ Normal
Current Log	30
Properties	Edit

### Standby Progress Summary

Transport lag is the time difference between the primary last update and the standby last received redo. Apply lag is the time difference between the primary last update and the standby last applied redo.

seconds

Transport Lag

Apply Lag

### Standby Databases

Select the database and click Failover.

Add Standby Database

	Edit	Remove	Switchover	Failover	Convert										
Select Name	pc01sbyp1	Host	EDBVR6P2	Data Guard Status	✓ Normal	Role	Physical Standby	Real-time Query	Disabled	Last Received Log	29	Last Applied Log	29	Estimated Failover Time	< 1 second

# Performing a Failover by Using Enterprise Manager

## Confirmation: Failover to pc01sby1

Are you sure you want to failover to pc01sby1?

A failover will cause the standby database to become the primary database. The failover operation cannot be cancelled.

### Select Failover Option

Complete

All available redo data will be applied on the standby database, thereby minimizing data loss. Oracle recommends this type of failover.

Immediate

No additional redo data will be applied on the standby database; data may be lost. This is the fastest type of failover.

### Monitoring Settings and Jobs

Monitoring settings and jobs can optionally be swapped between the primary and standby databases as part of the role change operation.

Swap Monitoring Settings

The current Enterprise Manager monitoring settings (including metric thresholds) for the primary and standby databases will be swapped after the role change, overriding all settings for each database with the values from the other database. If more granular monitoring standard swapping is desired, de-select this option and use the Monitoring Standards interface to create monitoring templates prior to the role change and apply them afterwards.

Transfer Jobs

 [Job Transfer Details](#)

# *Performing a Failover by Using Enterprise Manager*

## Processing: Failover

### Failing over to pc02sby1

This process takes some time. The page automatically returns to the Data Guard overview page upon completion.

Click on the alert log link to view progress details in a new browser window. View alert log: [pc02prmy.us.oracle.com\\_pc02sby1](http://pc02prmy.us.oracle.com_pc02sby1)



➡ Performing failover  
Waiting for failover to complete

 **TIP** This process cannot be cancelled. It will continue even if the browser window is closed.

# Performing a Failover to a Physical Standby Database

## Data Guard

Page Refreshed February 15, 2008 5:52:40 PM EST

### Overview

Data Guard Status	✓ Normal
Protection Mode	<u>Maximum Performance</u>
Fast-Start Failover	<u>Disabled</u>

### Primary Database

Name	<u>pc02sby1</u>
Host	<u>edt3r17p0.us.oracle.com</u>
Data Guard Status	✓ Normal
Current Log	<u>3</u>
Properties	<u>Edit</u>

### Standby Databases

Edit Remove Switchover Failover

Select	Name	Host	Data Guard Status	Role
<input checked="" type="radio"/>	<u>pc02prmy.us.oracle.com</u>	<u>edt3r17p2.us.oracle.com</u>	<u>Database must be reinstated</u>	Physical Standby
<input type="radio"/>	<u>pc02sby2</u>	<u>edt3r17p0.us.oracle.com</u>	✓ Normal	Logical Standby

### Standby Progress Summary

The transport lag is the time difference  
The apply lag is the time difference



The physical standby database needs to be reinstated.



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# Performing a Failover to a Logical Standby Database

## Data Guard

Page Refreshed February 15, 2008 6:33:43 PM EST

### Overview

Data Guard Status	✓ Normal
Protection Mode	<u>Maximum Performance</u>
Fast-Start Failover	<u>Disabled</u>

### Primary Database

Name	<u>pc02sby2</u> ←
Host	<u>edt3r17p0.us.oracle.com</u>
Data Guard Status	✓ Normal
Current Log	6
Properties	<u>Edit</u>

### Standby Progress Summ

The transport lag is the time difference  
The apply lag is the time difference

6.0

The logical standby database is now the primary database.  
The physical standby database is disabled.

### Standby Databases

Edit Remove Switchover Failover

Select	Name	Host	Data Guard Status	Role
<input checked="" type="radio"/>	<u>pc02prmy.us.oracle.com</u>	<u>edt3r17p2.us.oracle.com</u>	<u>Database must be reinstated</u>	Logical Standby
<input type="radio"/>	<u>pc02sby1</u>	<u>edt3r17p0.us.oracle.com</u>	<u>Disabled</u>	Physical Standby



# *Using Flashback Database in a Data Guard Configuration*

*— Flashback Database provides the following in a Data Guard configuration:*

- An alternative to restoring and recovering the primary database*
- A way to reinstate the primary database that was disabled as part of a failover to any standby database operation*
- An alternative to delaying the application of redo to protect against user errors or logical corruptions*

*— Flashback Database is used by the following features in a Data Guard configuration:*

- Fast-start failover*
- Snapshot standby*

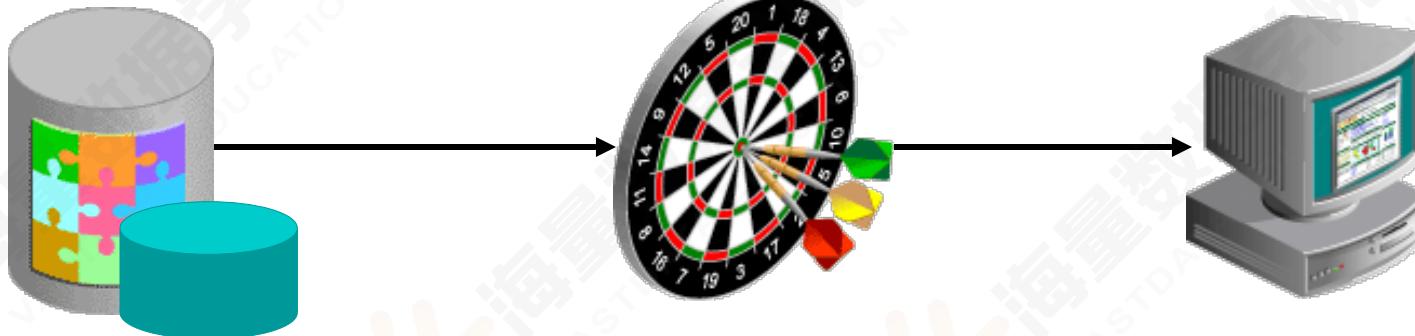
# *Overview of Flashback Database*

## *The Flashback Database operation:*

- Works like a “rewind” button for the database
- Can be used when users make logical data corruptions



# Configuring Flashback Database



1. Configure the fast recovery area.

2. Set the retention target.

3. Enable Flashback Database.

```
SQL> ALTER SYSTEM SET  
  2> DB_FLASHBACK_RETENTION_TARGET=2880 SCOPE=BOTH;  
SQL> ALTER DATABASE FLASHBACK ON;
```

# Configuring Flashback Database by Using Enterprise Manager

Verify that the database is in ARCHIVELOG mode:

Database Instance: pc01prmy.us.oracle.com > Logged in As SYS

**Recovery Settings**

(Show SQL) (Revert) (Apply)

**Instance Recovery**

The fast-start checkpointing feature is enabled by specifying a non-zero desired mean-time to recover (MTTR) value, which will be used to set the FAST\_START\_MTTR\_TARGET initialization parameter. This parameter controls the amount of time the database takes to perform crash recovery for a single instance. When fast-start checkpointing is enabled, Oracle automatically maintains the speed of checkpointing so that the requested MTTR is achieved. Setting the value to 0 will disable this functionality.

Current Estimated Mean Time To Recover (seconds) 19

Desired Mean Time To Recover  Minutes

**Media Recovery**

The database is currently in ARCHIVELOG mode. In ARCHIVELOG mode, hot backups and recovery to the latest time are possible, but you must provide space for archived redo log files. If you change the database to ARCHIVELOG mode, you should perform a backup immediately. In NOARCHIVELOG mode, only cold backups are possible and data may be lost in the event of database corruption.

ARCHIVELOG Mode\*

# Configuring Flashback Database by Using Enterprise Manager

## Set the flash recovery area and enable Flashback Database:

This database is using a flash recovery area. The chart shows space used by each file type that is not reclaimable by Oracle. Performing backups to tertiary storage is one way to make space reclaimable. Usable Flash Recovery Area includes free and reclaimable space.

Flash Recovery Area Location  

Flash Recovery Area Size  GB 

Flash Recovery Area Size must be set when the location is set.

Non-reclaimable Flash Recovery Area (GB) **1.64**

Reclaimable Flash Recovery Area (MB) **5**

Free Flash Recovery Area (GB) **3.35**

Enable Flashback Database\*

Flashback Database can be used for fast database point-in-time recovery, as it returns the database to a prior point-in-time without restoring files. Flashback is the preferred point-in-time recovery method in the recovery wizard when appropriate. The flash recovery area must be set to enable flashback database.

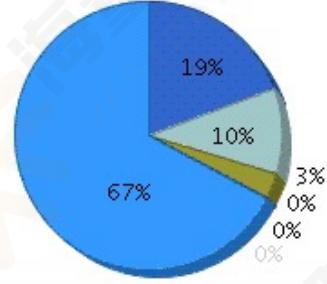
Flashback Retention Time  Hours 

Current size of the flashback logs(GB) **n/a**

Lowest SCN in the flashback data **n/a**

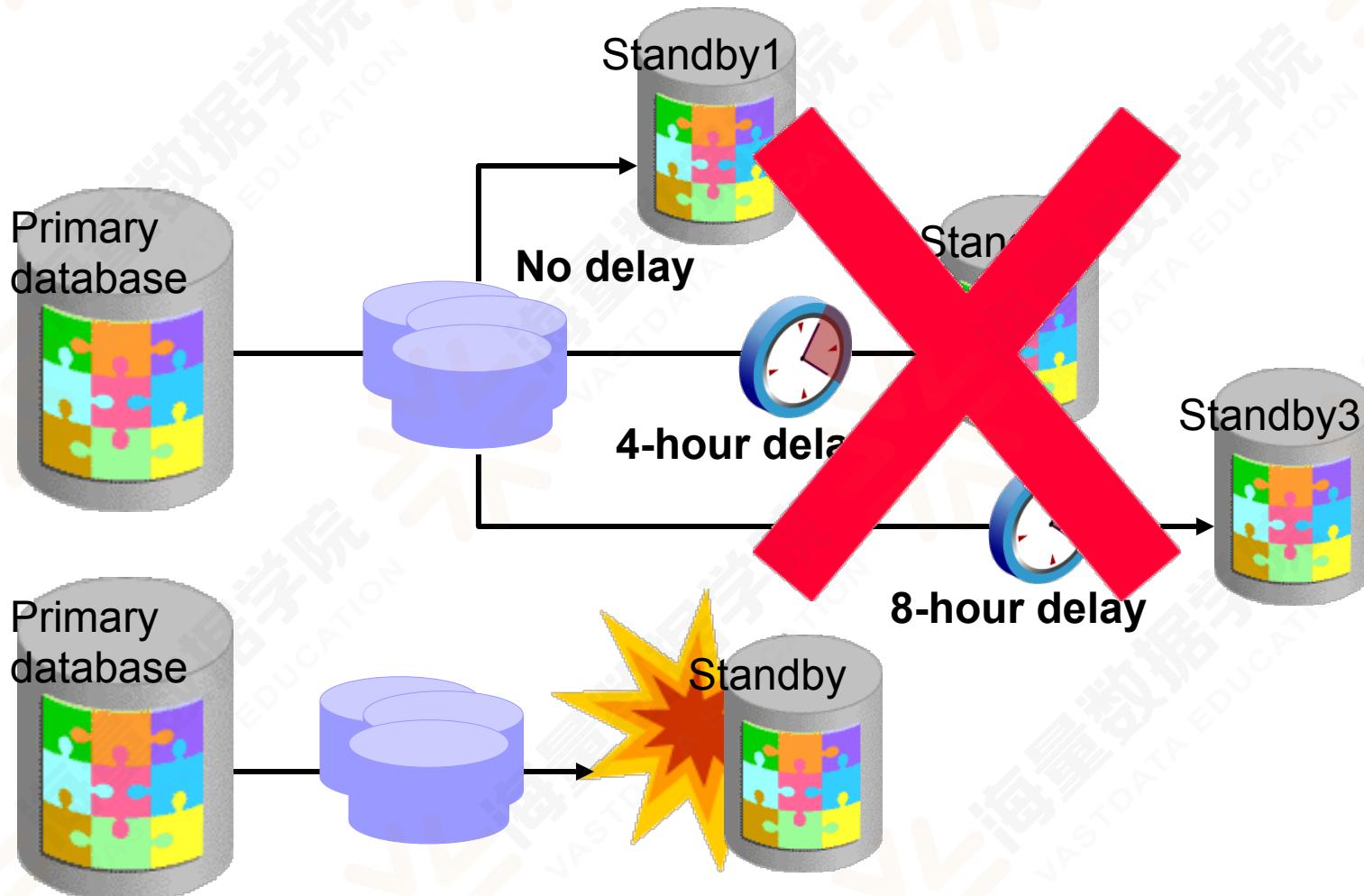
Flashback Time **n/a**

**Flash Recovery Area Usage**

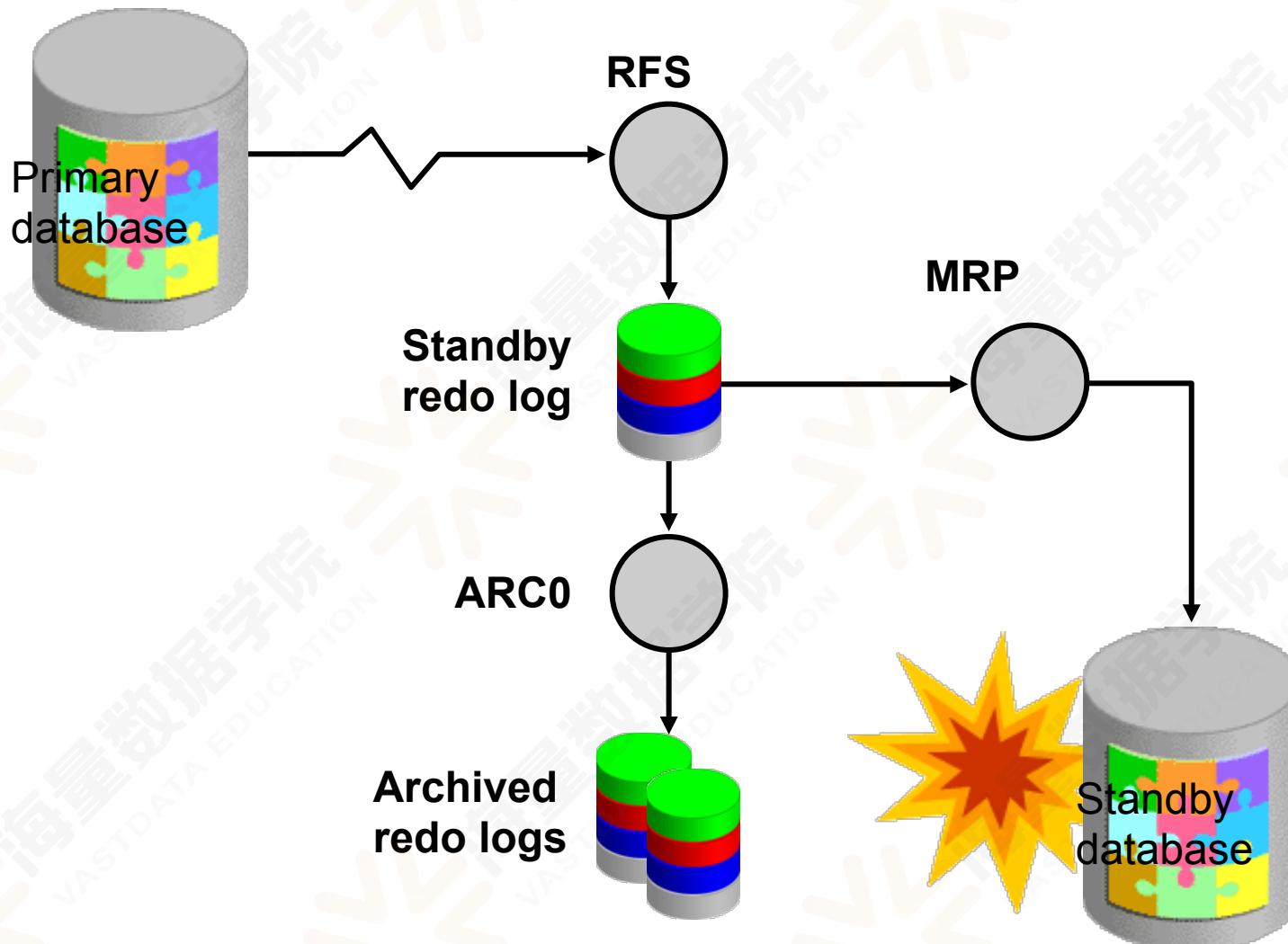


File Type	Size (GB)	Percentage
Backup Piece	0.97GB	19.3%
Archived Redo Log	0.52GB	10.3%
Redo Log	0.15GB	3%
Control File	0.01GB	0.2%
Image Copy	0GB	0%
Flashback Log	0GB	0%
Usable	3.36GB	67.1%

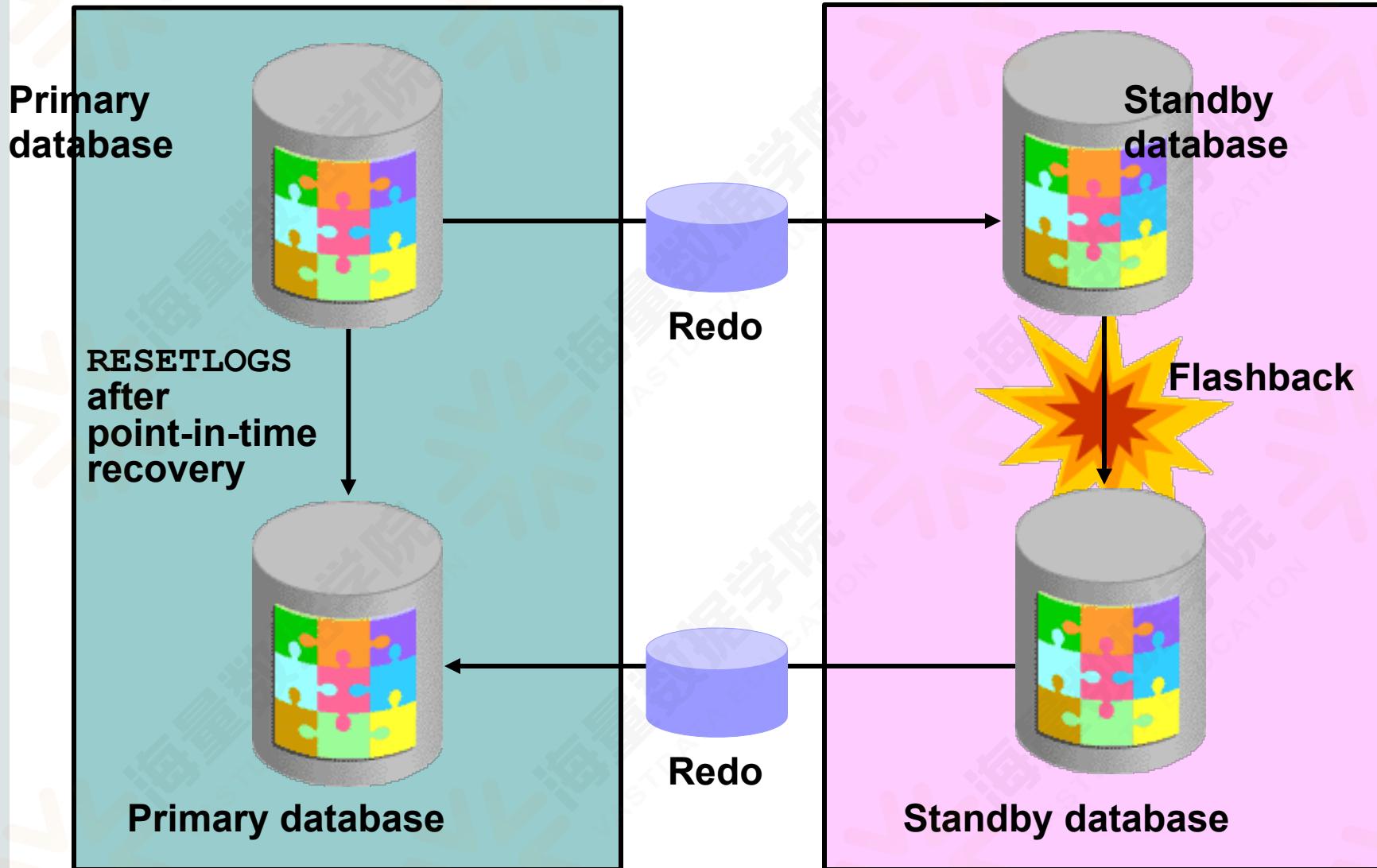
# Using Flashback Database Instead of Apply Delay



# Using Flashback Database and Real-Time Apply



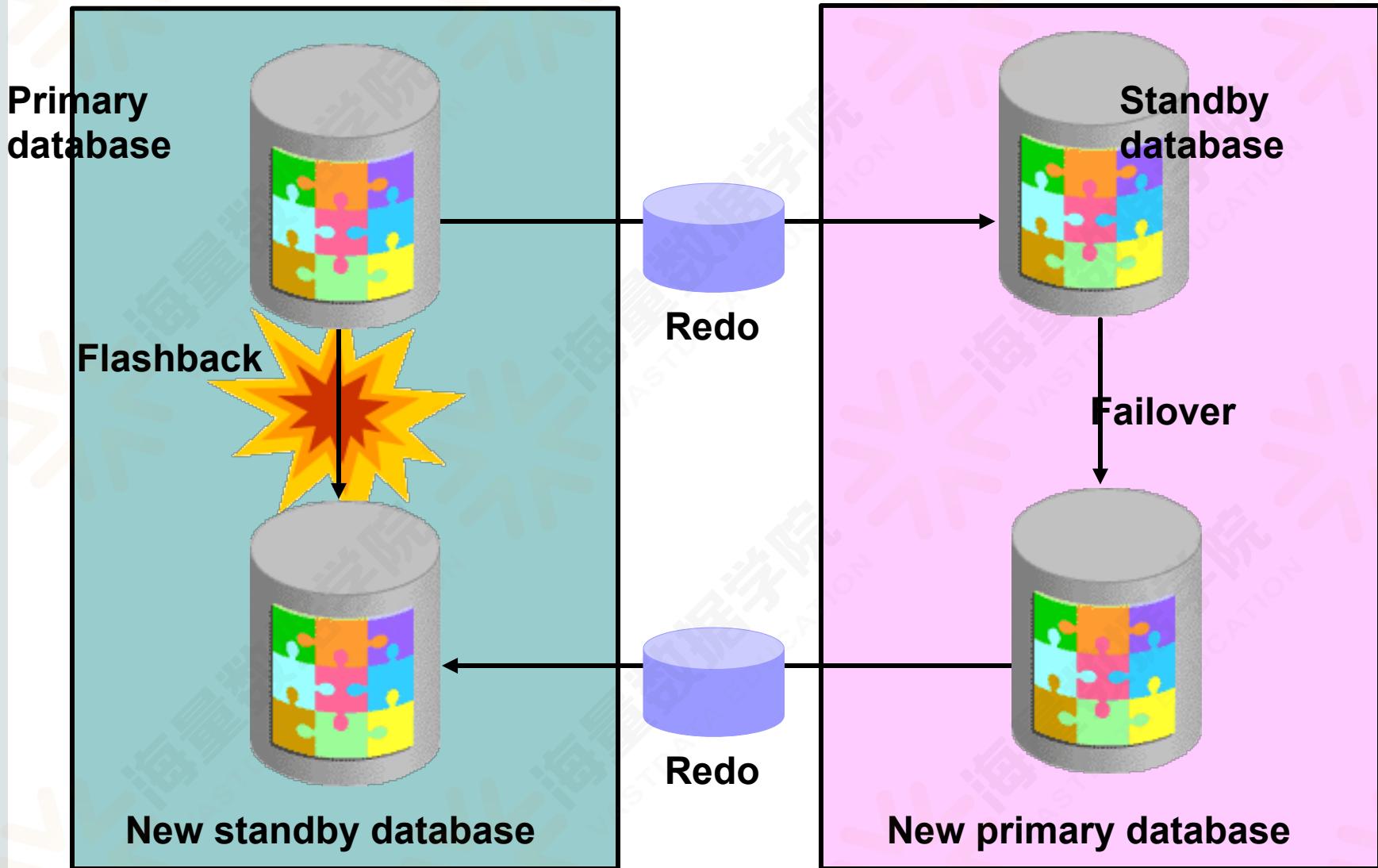
# Using Flashback Database After RESETLOGS



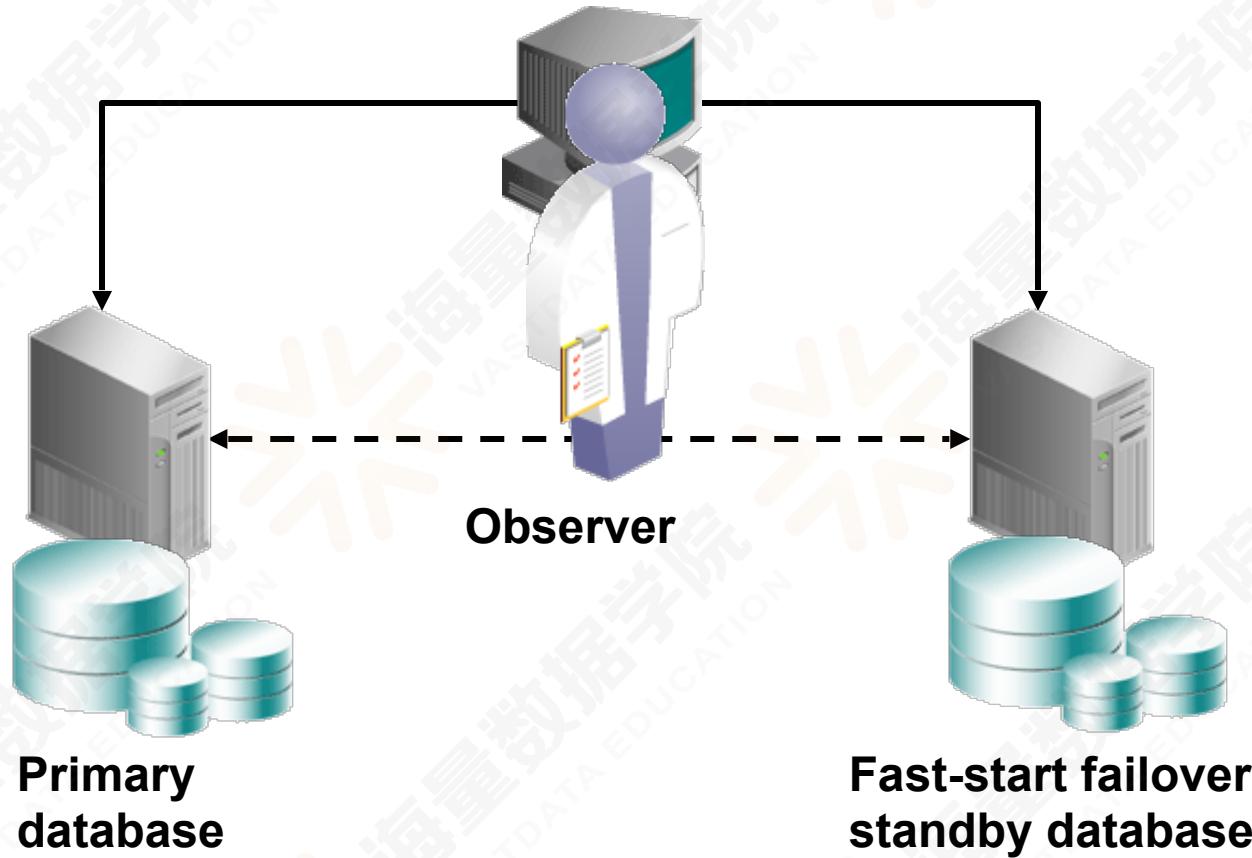
# *Flashback Through Standby Database Role Transitions*

- Use Flashback Database to flash back a database to a point in time before a switchover or failover.*
- Primary and standby databases retain their current roles when you flash back through physical standby switchovers or failovers.*
- Database roles are flashed back when you flash back through logical standby switchovers or failovers.*
- Flashback Database can be used to undo a physical database activation.*

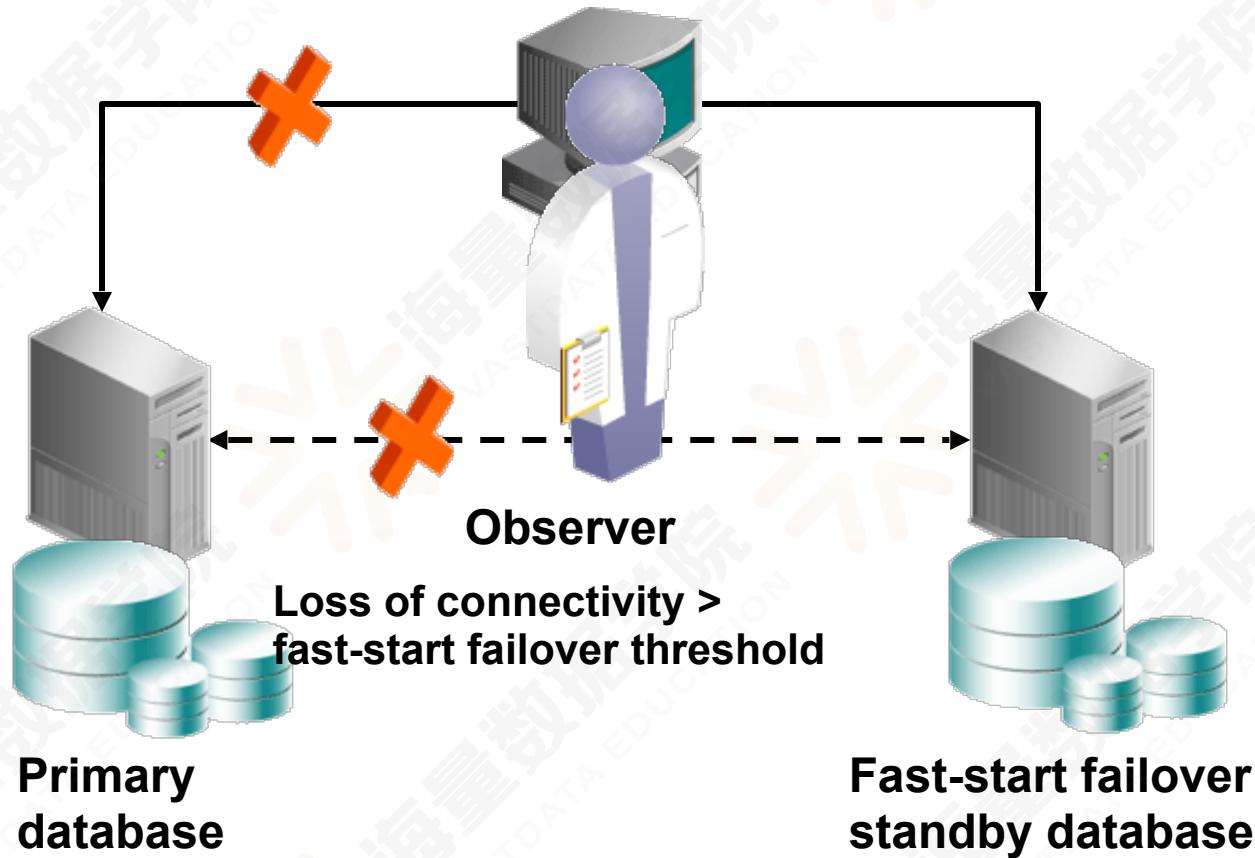
# Using Flashback Database After Failover



# Fast-Start Failover: Overview



# When Does Fast-Start Failover Occur?



# *Installing the Observer Software*

- *The observer is a separate OCI client-side component that monitors the availability of the primary database.*
- *Install observer software on a different computer from the primary and standby databases.*
- *Manage the observer by using Oracle Enterprise Manager or DGMGRL commands.*



**Observer**

# *Fast-Start Failover Prerequisites*

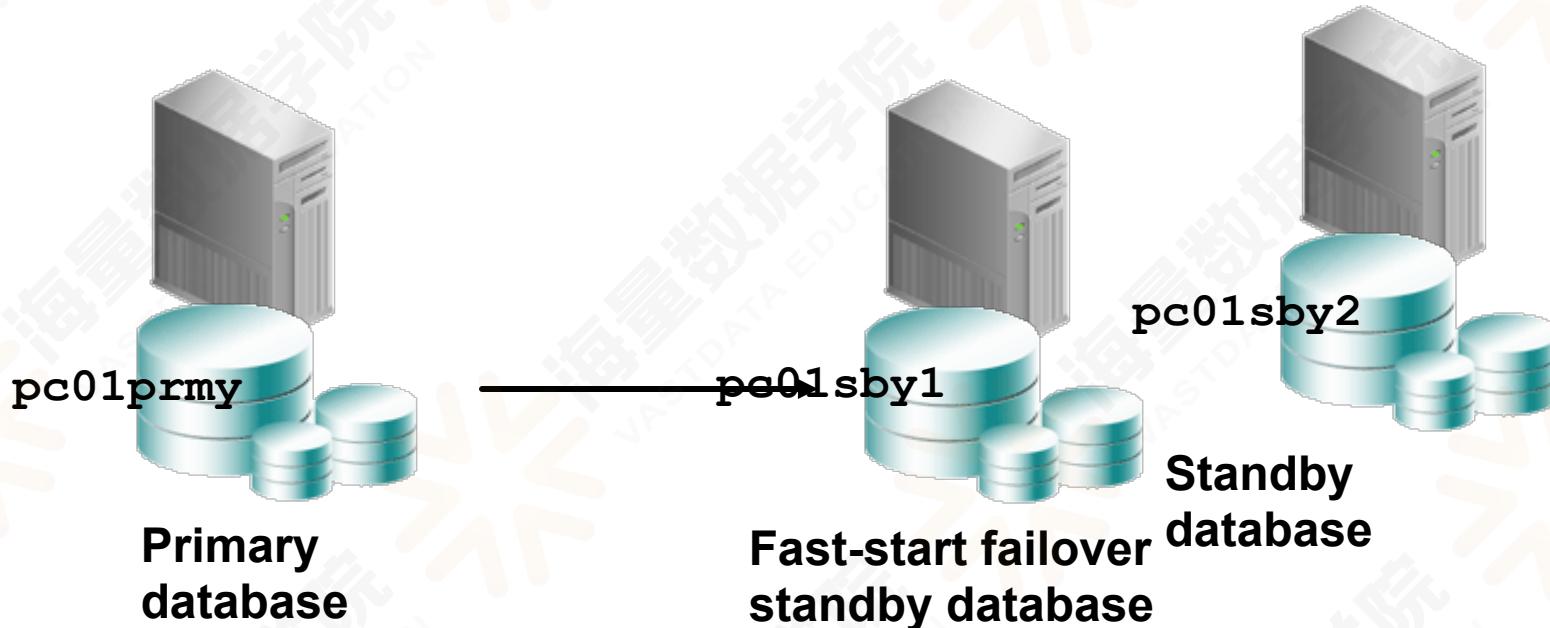
*The following prerequisites must be met to enable fast-start failover:*

- Configuration must be in maximum availability or maximum performance mode.*
- LogXptMode property of target must be set as follows:*
  - SYNC in maximum availability mode*
  - ASYNC in maximum performance mode*
- Flashback Database must be enabled on the primary database and target standby database.*
- Configure tnsnames.ora entries for the observer.*
- Create a static service name so that the observer can automatically restart databases.*

# *Configuring Fast-Start Failover*

1. *Specify the target standby database.*
2. *Set the protection mode.*
3. *Set the FastStartFailoverThreshold property.*
4. *Set additional database properties.*
5. *Set additional fast-start failover conditions.*
6. *Enable fast-start failover.*
7. *Start the observer.*
8. *Verify the configuration.*

# *Step 1: Specify the Target Standby Database*



```
EDIT DATABASE pc01prmy
SET PROPERTY FastStartFailoverTarget = pc01sby1;
EDIT DATABASE pc01sby1
SET PROPERTY FastStartFailoverTarget = pc01prmy;
```

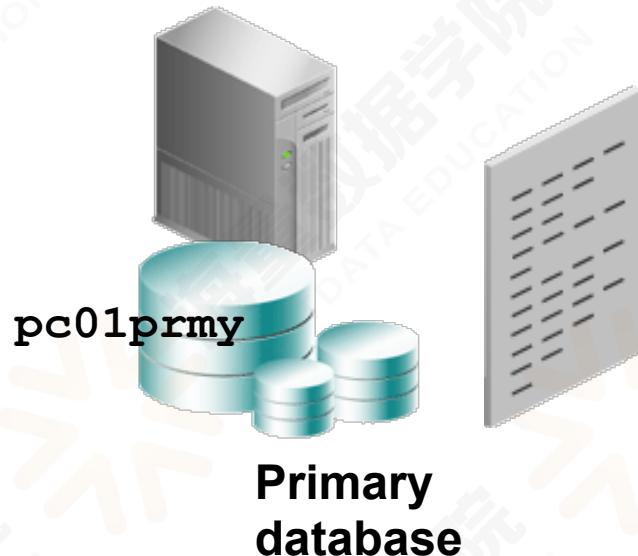
## Step 2: Set the Protection Mode

```
DGMGRL> EDIT DATABASE pc01prmy  
> SET PROPERTY LogXptMode=SYNC;  
DGMGRL> EDIT DATABASE pc01sby1  
> SET PROPERTY LogXptMode=SYNC;  
DGMGRL> EDIT CONFIGURATION  
> SET PROTECTION MODE AS MaxAvailability;
```

```
DGMGRL> EDIT DATABASE pc01prmy  
> SET PROPERTY LogXptMode=ASYNC;  
DGMGRL> EDIT DATABASE pc01sby1  
> SET PROPERTY LogXptMode=ASYNC;  
DGMGRL> EDIT CONFIGURATION  
> SET PROTECTION MODE AS MaxPerformance;
```



# *Step 3: Set the Fast-Start Failover Threshold*



```
EDIT CONFIGURATION  
SET PROPERTY FastStartFailoverThreshold =  
threshold-val;
```

# Step 4: Set Additional Fast-Start Failover Properties

- `FastStartFailoverLagLimit`: Establishes an acceptable length of time for the standby to fall behind the primary database with respect to applied redo
- `FastStartFailoverPmyShutdown`: Determines whether the primary database shuts down if redo generation has stalled and the primary database has lost connectivity with the observer and target standby database for a longer time than `FastStartFailoverThreshold`
- `FastStartFailoverAutoReinstate`: Determines whether the old primary database should be automatically reinstated if a fast-start failover was initiated because it lost connectivity with the observer and target standby database for a longer time than `FastStartFailoverThreshold`

# Setting the Lag-Time Limit

- Set the `FastStartFailoverLagLimit` property to configure a lag-time limit for a configuration in maximum performance mode:

```
DGMGRL> EDIT CONFIGURATION
```

```
> SET PROPERTY FastStartFailoverLagLimit = {n} ;
```

- Destinations that ship redo in ASYNC mode are acceptable fast-start failover target standby databases.
- Real-time apply is required on the target standby database.



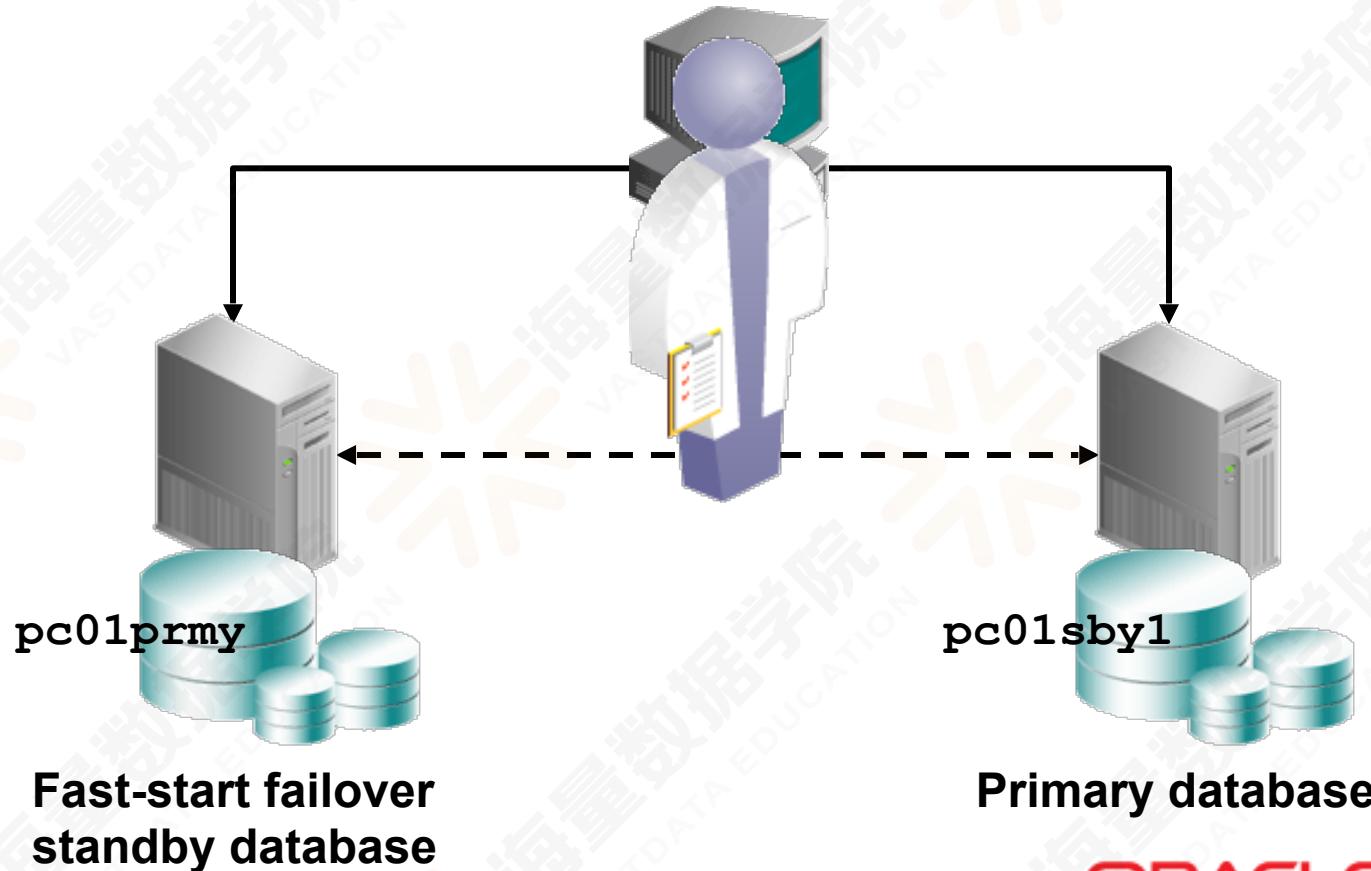
# *Configuring the Primary Database to Shut Down Automatically*

- Use `FastStartFailoverPmyShutdown` to control whether the primary database shuts down if redo generation stalls and the primary database loses connectivity with the observer and target standby database for a longer time than the value of `FastStartFailoverThreshold`.
- Default value: TRUE

```
DGMGRL> EDIT CONFIGURATION SET PROPERTY  
> FastStartFailoverPmyShutdown = {TRUE | FALSE} ;
```



# *Automatic Reinstatement After Fast-Start Failover*



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**DATABASE** **11g**

# Configuring Automatic Reinstatement of the Primary Database

- Use the `FastStartFailoverAutoReinstate` property to determine whether the old primary database should be automatically reinstated if a fast-start failover was initiated because of a loss of connectivity.
- Default value: TRUE

```
DGMGRL> EDIT CONFIGURATION SET PROPERTY  
> FastStartFailoverAutoReinstate = {TRUE | FALSE} ;
```

# *Setting a Connect Identifier for the Observer*

- Set the `ObserverConnectIdentifier` property to specify how the observer should connect to and monitor the primary and standby database:*

```
DGMGRL> EDIT DATABASE pc01prmy  
> SET PROPERTY ObserverConnectIdentifier = ' ';
```

- The default connect identifier is the value of the `DGConnectIdentifier` property.*



# Step 5: Configure Additional Fast-Start Failover Conditions

- Use ENABLE/DISABLE FAST\_START FAILOVER commands to specify conditions for fast-start failover:

```
ENABLE FAST_START FAILOVER CONDITION "value";
```

- Observer initiates a fast-start failover without waiting for FastStartFailoverThreshold to expire.
- Configurable conditions:
  - Conditions detectable through database health check
  - Errors raised by the Oracle server
- Use the SHOW FAST\_START FAILOVER command to obtain a list of valid conditions.

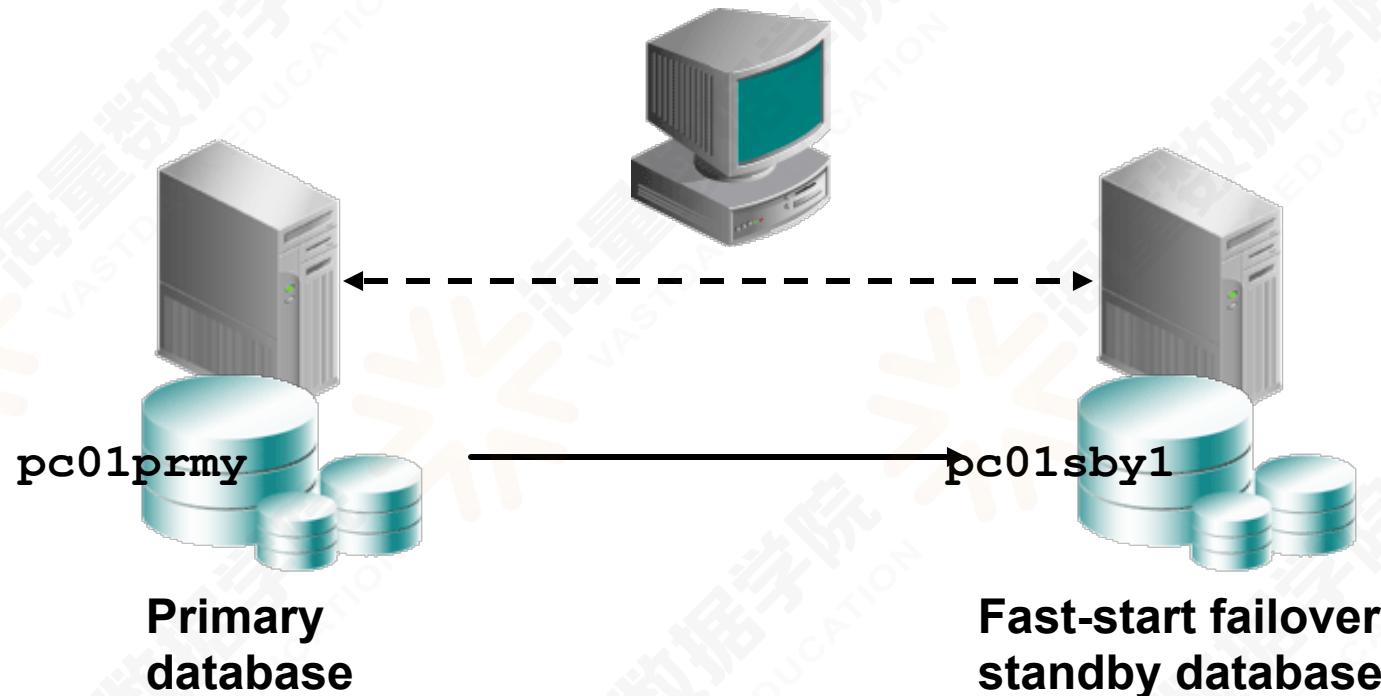


# Configuring Fast-Start Failover Conditions

— Specify additional conditions for a fast-start failover:

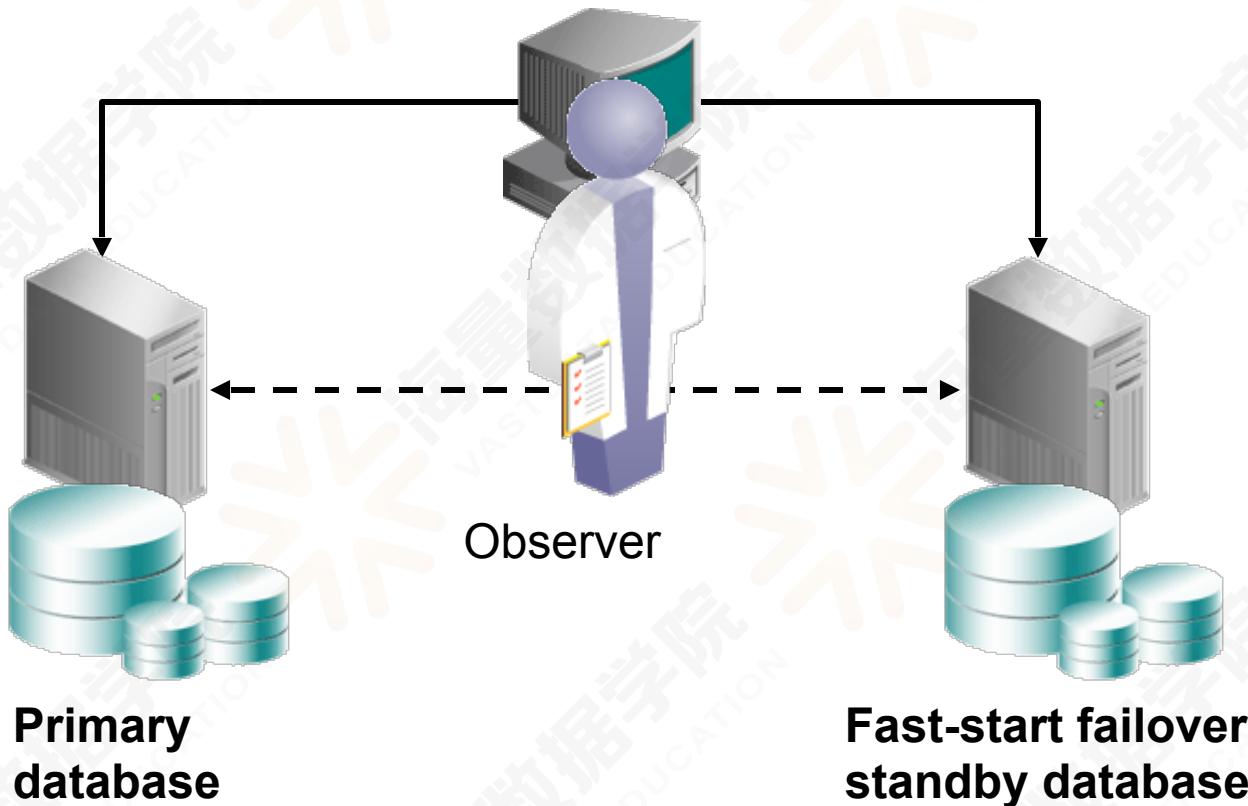
Health Condition	Default Value	Description
Datafile Offline	ENABLED	Data file offline due to a write error
Corrupted Controlfile	ENABLED	Corrupted control file
Corrupted Dictionary	ENABLED	Dictionary corruption of a critical database object
Inaccessible Logfile	DISABLED	LGWR unable to write to any member of a log group due to an I/O error
Stuck Archiver	DISABLED	Archiver unable to archive a redo log because the device is full or unavailable

# Step 6: Enable Fast-Start Failover



```
DGMGRL> ENABLE FAST_START FAILOVER;
```

# Step 7: Start the Observer



```
DGMGRL> START OBSERVER;
```

# Step 8: Verify the Configuration

```
DGMGRL> show fast_start failover;
```

Fast-Start Failover: ENABLED

Threshold: 90 seconds  
Target: pc01sby1  
Observer: EDBVR6P2  
Lag Limit: 60 seconds  
Shutdown Primary: TRUE  
Auto-reinstate: TRUE

Configurable Failover Conditions

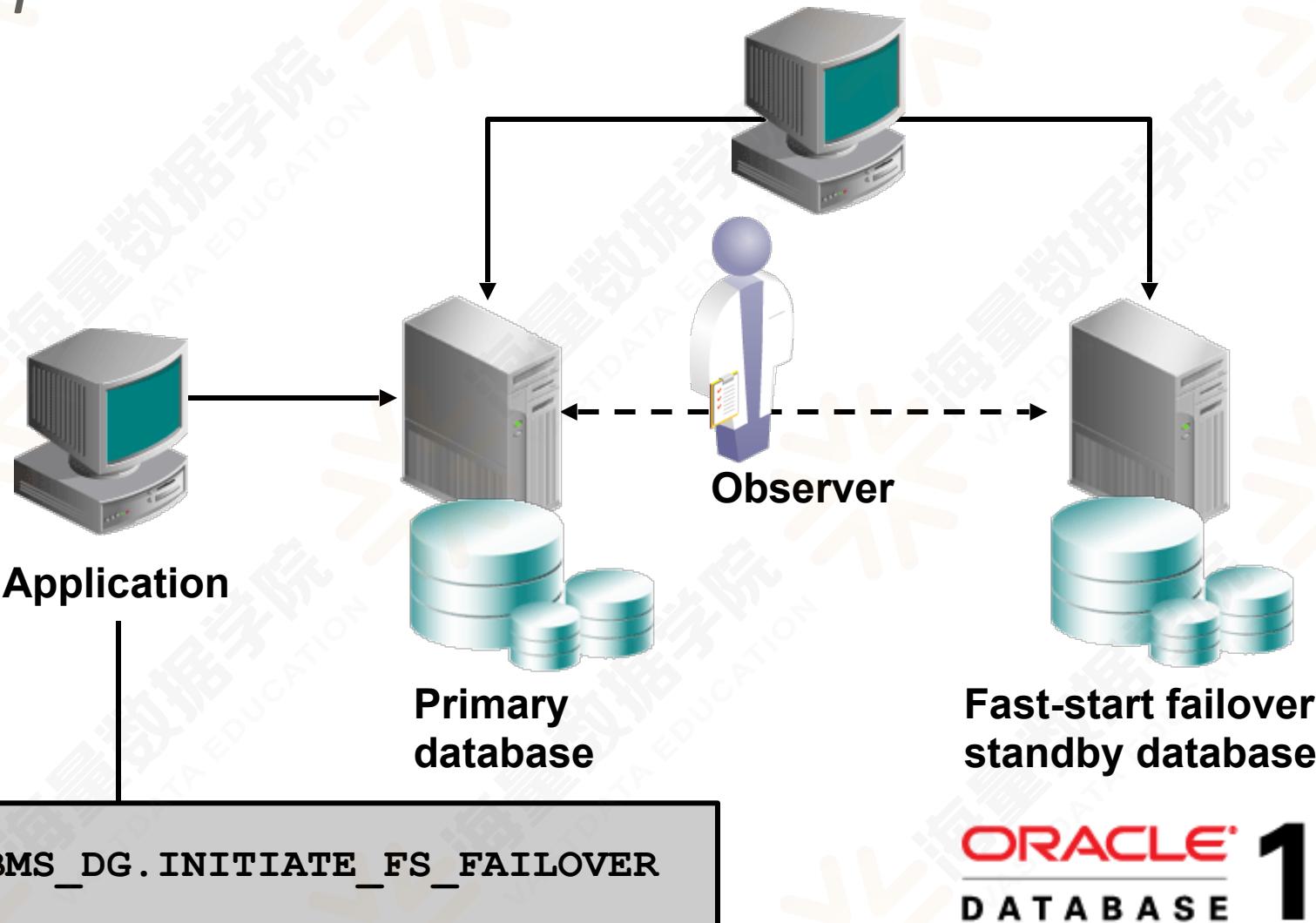
Health Conditions:

Corrupted Controlfile	YES
Corrupted Dictionary	YES
Inaccessible Logfile	NO
Stuck Archiver	NO
Datafile Offline	YES

Oracle Error Conditions:

(none)

# *Initiating Fast-Start Failover from an Application*



**ORACLE<sup>®</sup>**  
DATA BASE **11g**

# *Initiating Fast-Start Failover from an Application*

- DBMS\_DG package contains the INITIATE\_FS\_FAILOVER function that is used to initiate a fast-start failover from an application:

```
FUNCTION dbms_dg.initiate_fs_failover  
(condstr IN VARCHAR2) RETURN BINARY_INTEGER;
```

- The DBMS\_DG package is defined as an invoker's rights package to address privilege concerns.

# Viewing Fast-Start Failover Information

```
SELECT fs_failover_status as STATUS,
       fs_failover_current_target as CURR_TGET,
       fs_failover_threshold as THRESHOLD,
       fs_failover_observer_present as OBS_PRES,
       fs_failover_observer_host as OBS_HOST
  FROM v$database;
```

STATUS	CURR_TGET	THRESHOLD	OBS_PRES
TARGET UNDER LAG LIMIT pc01sby1		90	YES
OBS_HOST			
edbvr6p2.us.oracle.com			

# *Determining the Reason for a Fast-Start Failover*

*Determine the reason for fast-start failover by querying the V\$FS\_FAILOVER\_STATS view:*

```
SQL> SELECT last_failover_time, last_failover_reason  
2>   FROM v$fs_failover_stats;  
  
LAST_FAILOVER_TIME      LAST_FAILOVER_REASON  
-----  
-----  
03/02/2010 22:30:12    Primary Disconnected
```

# *Prohibited Operations After Enabling Fast-Start Failover*



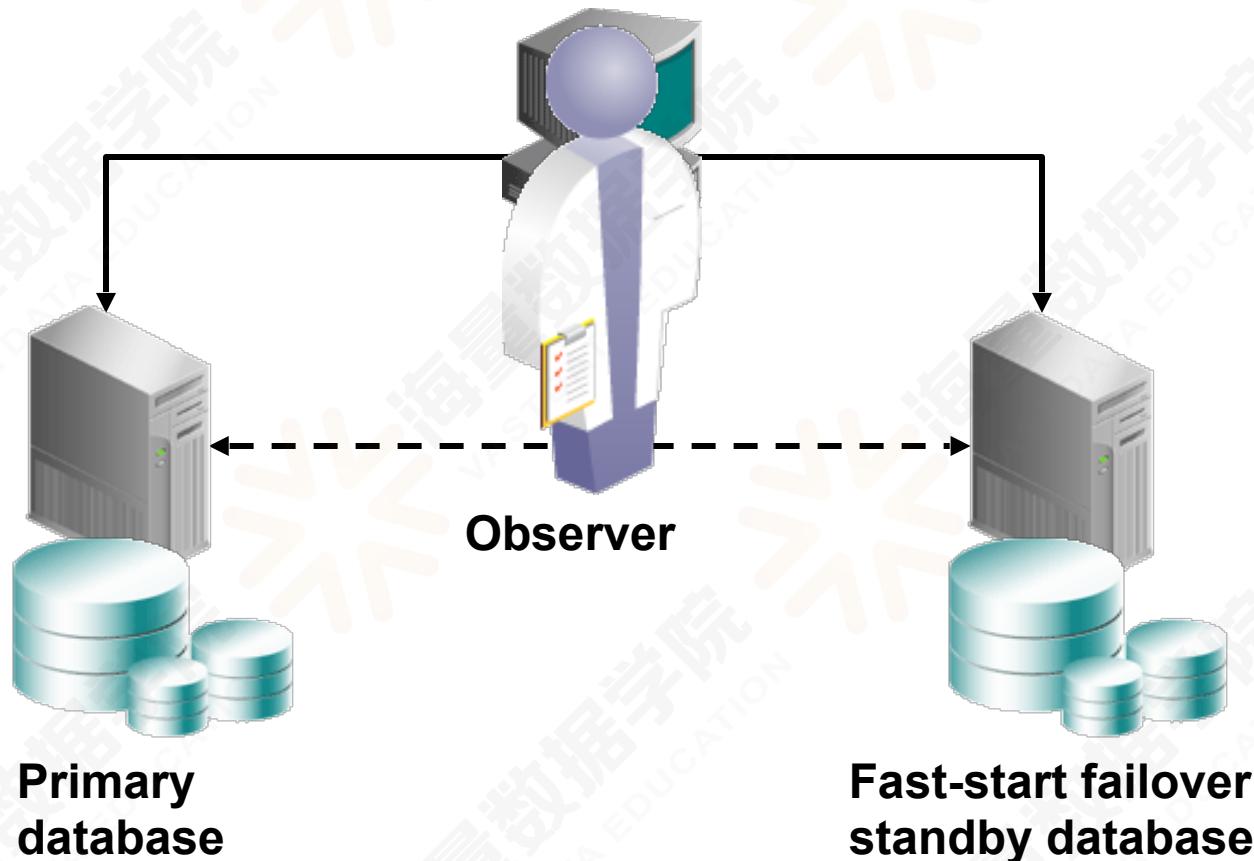
**Configuration  
Protection Mode**



**Disable or delete  
the fast-start failover  
standby database**

```
DGMGRL> EDIT DATABASE
> SET PROPERTY LogXptMode;
DGMGRL> EDIT DATABASE
> SET PROPERTY FastStartFailoverTarget;
```

# *Disabling Fast-Start Failover*



```
DGMGRL> DISABLE FAST_START FAILOVER [FORCE] ;
```

# *Disabling Fast-Start Failover Conditions*

*Remove specific conditions for which a fast-start failover should be performed:*

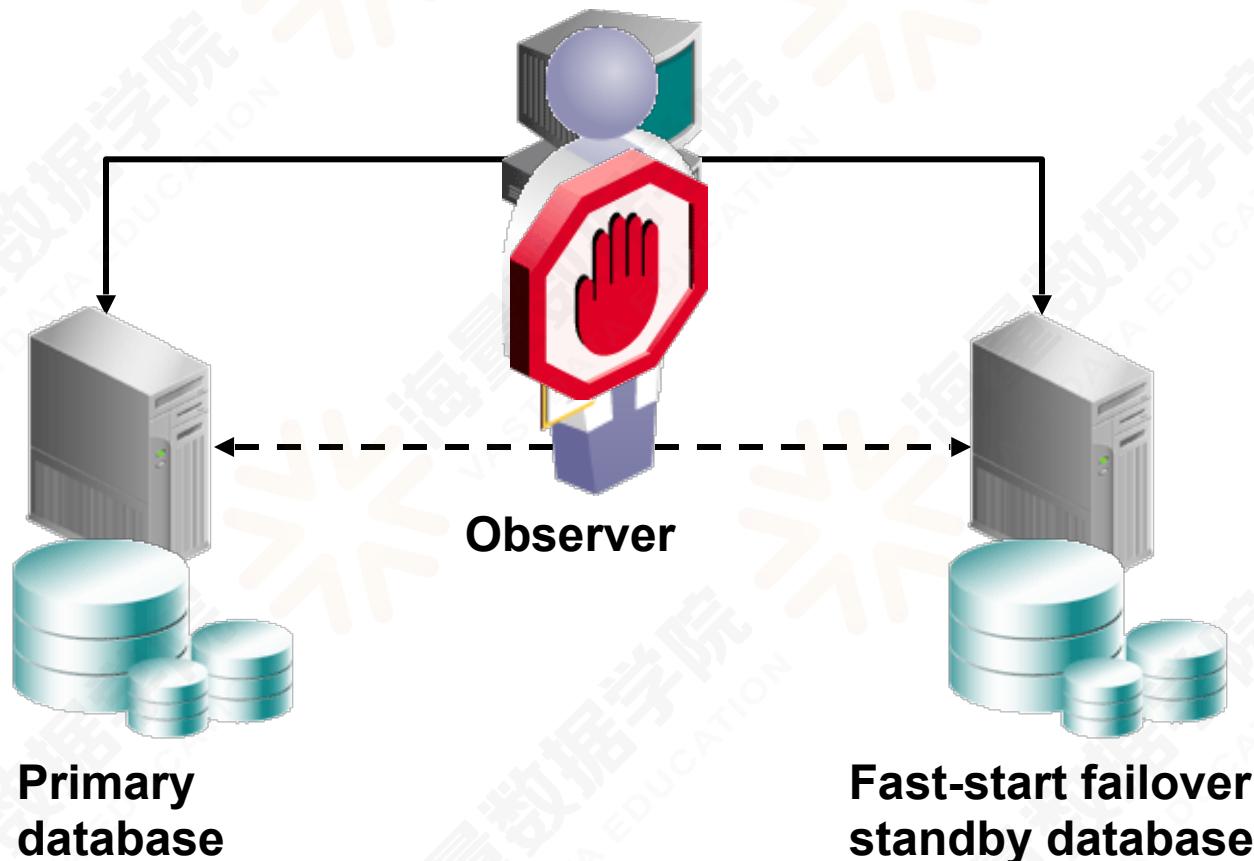
```
DGMGRL> DISABLE FAST_START FAILOVER CONDITION value;
```

# *Using the FORCE Option*

*Use the FORCE option in the following situations:*

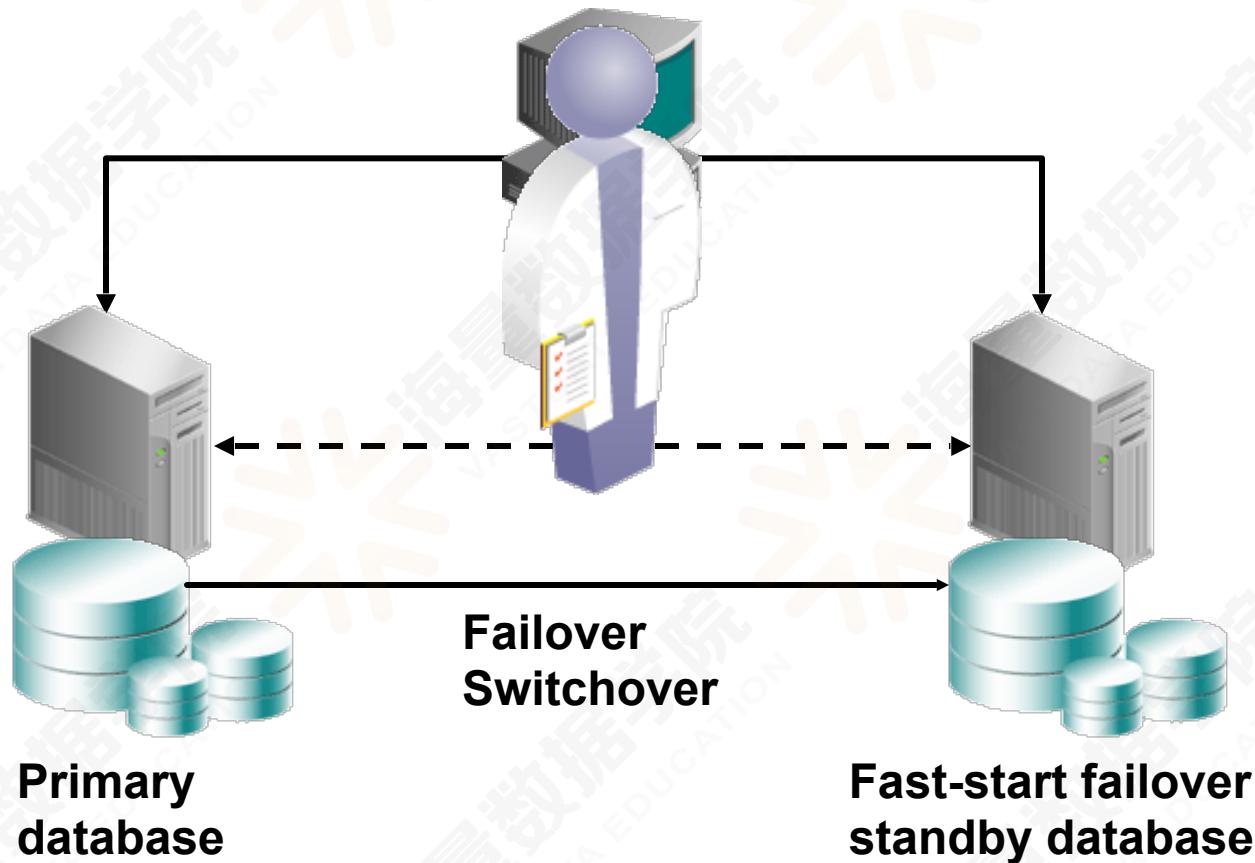
- When the fast-start failover environment is synchronized and the primary has lost connectivity to the observer and the target standby database*
- To prevent a fast-start failover from occurring on the target standby database*
- To conduct a manual failover when the fast-start failover environment is unsynchronized*

# *Stopping the Observer*

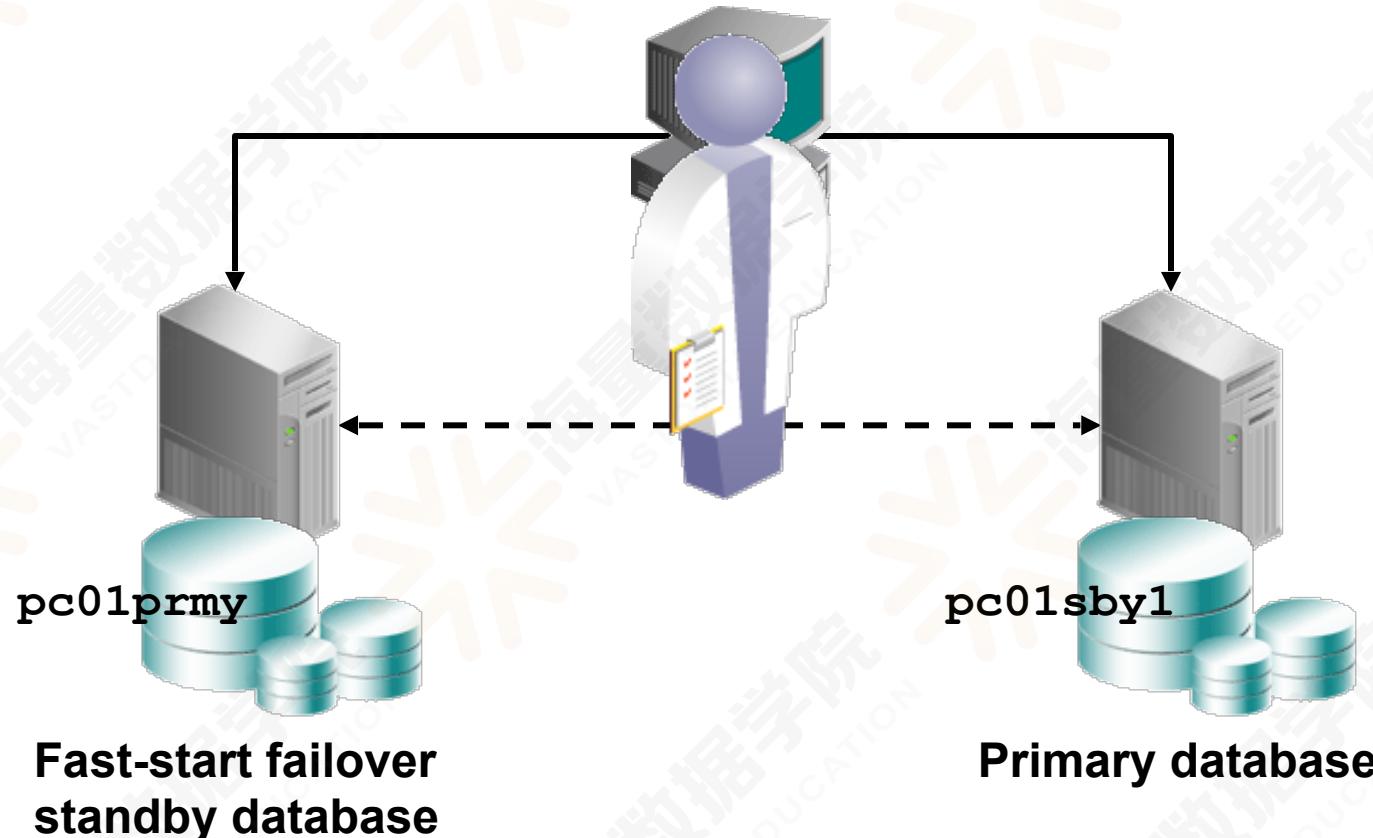


```
DGMGRL> STOP OBSERVER;
```

# Performing Manual Role Changes



# *Manually Reinstating the Database*



```
DGMGRL> REINSTATE DATABASE pc01prmy;
```

# Using Enterprise Manager to Enable Fast-Start Failover

Database Instance: pc01prmy.us.oracle.com >

Data Guard

Page Refreshed February 25, 2010 11:50:54 PM EST

View Data Real Time: Manual

**Overview**

Data Guard Status	✓ Normal
Protection Mode	Maximum Performance
Fast-Start Failover	Disabled

**Primary Database**

Name	pc01prmy
Host	EDBVR6P1
Data Guard Status	✓ Normal
Current Log	56
Properties	Edit

**Standby Progress Summary**

Transport lag is the time difference between the primary last update received redo. Apply lag is the time difference between the primary standby last applied redo.

Click Disabled to invoke the fast-start failover wizard.

Standby Databases

	<a href="#">Edit</a>	<a href="#">Remove</a>	<a href="#">Switchover</a>	<a href="#">Failover</a>	<a href="#">Convert</a>		
Select	Name	Host	Data Guard Status	Role	Real-time Query	Last Received Log	Last Applied Log
<input checked="" type="radio"/>	pc01sby1	EDBVR6P2	✓ Normal	Physical Standby	Disabled	55	55

# Using Enterprise Manager to Enable Fast-Start Failover

Database Instance: pc01prmy.us.oracle.com > Data Guard > Logged in As SYS

**i Information**  
There is currently no observer for this configuration, nor has one been specified.

**Fast-Start Failover: Configure** Cancel Continue

**Target Database Selection**  
Select a standby database to be the fast-start failover target. The redo transport mode for the selected database will be set to ASYNC (if not currently set to ASYNC).

Select	Name	Role	Redo Transport Mode
<input checked="" type="radio"/>	pc01sby1	Physical Standby	ASYNC

**Observer**  
Fast-start failover requires a Data Guard observer process. For highest availability, Oracle recommends that the observer be on a separate host from the primary and standby databases.  
 TIP Specify an alternate observer host to maximize observer availability.

i Observer Location Not Set Configure Observer  
i Alternate Observer Location Not Set

Select the database.

Click Configure Observer.

# Using Enterprise Manager to Enable Fast-Start Failover

**Fast-Start Failover: Configure Observer**

**Observer Location**

There is currently no observer for this configuration. Select the discovered host and Oracle Home where Enterprise Manager will start the observer.

**TIP** Specify an alternate observer location to enhance observer availability. If an unobserved condition is detected, Enterprise Manager will attempt to restart the observer on the original observer host, falling back to the alternate host if necessary.

Observer Host	<input type="text" value="edBVR6p2.us.oracle.com"/> 
Observer Oracle Home	<input type="text" value="/u01/app/oracle/product/11.2.0/dbhome_1"/> 
Alternate Observer Host	<input type="text"/> 
Alternate Observer Oracle Home	<input type="text"/> 

# Using Enterprise Manager to Enable Fast-Start Failover

Database Instance: pc01prmy.us.oracle.com > Data Guard > Logged in As SYS

## Fast-Start Failover: Enable Flashback Logging

Flashback logging is required to support fast-start failover, and will be enabled on the primary and standby databases.

TIP Flashback logging requires a flash recovery area.

**Primary Database**

The following parameters must be set to enable flashback logging on database pc01prmy.us.oracle.com. The database will be restarted.

Flash Recovery Area  Specifies the default storage area where archived redo log files (and other recovery-related files) reside.

Flash Recovery Area Size (MB)  Limit on the total space used by files created in the flash recovery area. The default value is twice the database size.

Flashback Retention Time  hours  The upper limit on how far back in time the database may be flashed back.

**Standby Database**

The following parameters must be set to enable flashback logging on database pc01sby1.us.oracle.com.

Flash Recovery Area  Specifies the default storage area where archived redo log files (and other recovery-related files) reside.

Flash Recovery Area Size (MB)  Limit on the total space used by files created in the flash recovery area. The default value is twice the database size.

Flashback Retention Time  hours  The upper limit on how far back in time the database may be flashed back.

# Using Enterprise Manager to Enable Fast-Start Failover

ORACLE Enterprise Manager 10g Grid Control

Home Targets Deployments Alerts Compliance Jobs Reports

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | All Targets

Logged in As SYS

## Confirmation: Enable Fast-Start Failover

Are you sure you want to enable fast-start failover to database pc01sby1.us.oracle.com?

Flashback logging will be enabled on the primary database, and the database will be restarted. Flashback logging will be enabled on database pc01sby1.us.oracle.com.

The observer will be started on host edBVr6p2.us.oracle.com.

Automatic observer restart will be enabled on observer host edBVr6p2.us.oracle.com. No alternate observer host has been specified.

[Home](#) | [Targets](#) | [Deployments](#) | [Alerts](#) | [Compliance](#) | [Jobs](#) | [Reports](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

# Using Enterprise Manager to Enable Fast-Start Failover

**ORACLE** Enterprise Manager 10g Grid Control

Home Targets Deployments Alerts Compliance Jobs Reports

Hosts | Databases | Middleware | Web Applications | Services | Systems | Groups | All Targets

Logged in As SYS

**Processing: Enable Fast-Start Failover**

Enabling fast-start failover to target database pc01sby1.us.oracle.com.

This process takes some time. The page automatically returns to the Data Guard overview page upon completion.  
Click on the alert log link to view progress details in a new browser window. View alert log: [pc01prmy](#)

 Preparing databases  
Restarting primary database  
Starting observer  
Enabling fast-start failover  
Waiting for process to complete

 **TIP** This process cannot be cancelled. It will continue even if the browser window is closed.

[Home](#) | [Targets](#) | [Deployments](#) | [Alerts](#) | [Compliance](#) | [Jobs](#) | [Reports](#) | [Setup](#) | [Preferences](#) | [Help](#) | [Logout](#)

# *Changing the Protection Mode and Disabling Fast-Start Failover*

The screenshot shows the Oracle Enterprise Manager 10g Grid Control interface. The top navigation bar includes 'Home', 'Targets' (which is highlighted in blue), and 'All Targets'. Below the navigation is a menu bar with links to 'Hosts', 'Databases', 'Application Servers', 'Web Applications', 'Services', 'Systems', 'Groups', and 'All Targets'. The main content area features a confirmation message with a warning icon. The message reads: 'Confirmation: Change Protection Mode' and 'If you change the protection mode from Maximum Availability, fast-start failover will be disabled. Do you want to change the protection mode to Maximum Performance?'. It also states: 'All standby databases with a log transport mode of SYNC will be changed to ASYNC.' A tip is provided: 'TIP The log transport mode for any database can be changed on the Edit Standby Role Properties page.'

**Confirmation: Change Protection Mode**

If you change the protection mode from Maximum Availability, fast-start failover will be disabled. Do you want to change the protection mode to Maximum Performance?

All standby databases with a log transport mode of SYNC will be changed to ASYNC.

TIP The log transport mode for any database can be changed on the Edit Standby Role Properties page.

# Using Enterprise Manager to Disable Fast-Start Failover

**Data Guard**  
Page Refreshed March 2, 2010 11:23:59 PM EST

**Overview**

Data Guard Status	✓ Normal
Protection Mode	<a href="#">Maximum Performance</a>
Fast-Start Failover	<a href="#">Enabled to pc01sby1.us.oracle.com</a>
Observer Location	EDBVR6P2

**Primary Database**

Name	pc01prmy
Host	EDBVR6P1
Data Guard Status	✓ Normal
Current Log	47
Properties	<a href="#">Edit</a>

Click the Enabled link to access the Change Mode page.

Database Instance: pc01prmy.us.oracle.com > Data Guard >

## Fast-Start Failover: Change Mode

Fast-start failover is currently enabled. Choose whether to edit fast-start failover properties or disable fast-start failover, then click Continue.

Edit properties

Change the fast-start failover target database and threshold, and start or restart the observer process.

Disable

Disable fast-start failover. Does not stop the observer unless the Stop Observer option is selected.

Stop observer

To temporarily suspend fast-start failover, select Disable but do not select the Stop Observer option.

# Using Enterprise Manager to Suspend Fast-Start Failover

Database Instance: pc01prmy.us.oracle.com > Data Guard >

## Fast-Start Failover: Change Mode

Fast-start failover is currently enabled. Choose whether to edit fast-start failover properties or disable fast-start failover, then click Continue.

Edit properties

Change the fast-start failover target database and threshold, and start or restart the observer process.

Disable

Disable fast-start failover. Does not stop the observer unless the Stop Observer option is selected.

Stop observer

To temporarily suspend fast-start failover, select Disable but do not select the Stop Observer option.



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# *Moving the Observer to a New Host*

*To move the fast-start failover observer to a new host:*

1. *Execute the STOP SERVER command to sever the link between the original observer and the broker configuration.*
2. *Execute the SHOW CONFIGURATION VERBOSE and SHOW DATABASE commands to verify that the observer is stopped.*
3. *Start the observer on your new host.*

# Data Guard三种保护模式

- 1. 最大保护模式
  - 1) 这种模式提供了最高级别的数据保护能力；
  - 2) 要求至少一个物理备库收到重做日志后，主库的事务才能够提交；
  - 3) 主库找不到合适的备库写入时，主库会自动关闭，防止未受保护的数据出现；
  - 4) 优点：该模式可以保证备库没有数据丢失；
  - 5) 缺点：主库的自动关闭会影响到主库的可用性，同时需要备库恢复后才能提交，对网络等客观条件要求非常的高，主库的性能会因此受到非常大的冲击。

# Data Guard三种保护模式

- 2. 最大可用性模式
  - 1) 该模式提供了仅次于“最大保护模式”的数据保护能力；
  - 2) 要求至少一个物理备库收到重做日志后，主库的事务才能够提交；
  - 3) 主库找不到合适的备库写入时，主库不会关闭，而是临时降低到“最大性能模式”模式，直到问题得到处理；
  - 4) 优点：该模式可以在没有问题出现的情况下，保证备库没有数据丢失，是一种折中的方法；
  - 5) 缺点：在正常运行的过程中缺点是主库的性能受到诸多因素的影响。

# Data Guard三种保护模式

- 3. 最大性能模式

- 1) 该模式是默认模式，可以保证主数据库的最高可用性；
- 2) 保证主库运行过程中不受备库的影响，主库事务正常提交，不因备库的任何问题影响到主库的运行；
- 4) 优点：避免了备库对主数据库的性能和可用性影响；
- 5) 缺点：如果与主库提交的事务相关的恢复数据没有发送到备库，这些事务数据将被丢失，不能保证数据无损失。



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