Oracle Database 19c: Data Guard Administration Workshop

Oracle Database

DURATION	MODULES	COURSE CODE
5 Days	**19 Lectures**	**—**

Course Overview

This course teaches you how to use Oracle Data Guard. Expert Oracle University instructors will demonstrate how this solution protects your Oracle database against planned and unplanned downtimes.

What You Will Learn

Introduction to Oracle Data Guard

- Objectives
- What Is Oracle Data Guard?
- Types of Standby Databases
- Types of Data Guard Services
- Role Transitions: Switchover and Failover
- Oracle Data Guard Broker Framework
- Choosing an Interface for Administering a Data Guard Configuration
- 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
- Data Guard Operational Requirements: Hardware and Operating System
- Data Guard Operational Requirements: Oracle Database Software
- Benefits of Implementing Oracle Data Guard
- Quiz
- Summary
- Practice 1: Overview

Oracle Net Services in a Data Guard Environment

- Objectives
- Oracle Net Services Overview
- Configuring Oracle Net Services in a Data Guard Environment
- Understanding Name Resolution
- Local Naming Configuration Files
- Connect-Time Failover: Planning for Role Reversal
- Listener Configuration: listener.ora
- Dynamic Service Registration
- Static Listener Entries: listener.ora
- Optimizing Oracle Net for Data Guard
- Quiz
- Summary
- Practice 2: Overview

Creating a Physical Standby Database by Using SQL and RMAN Commands

- Objectives
- Steps to Create a Physical Standby Database
- Preparing the Primary Database
- FORCE LOGGING Mode
- Database Nologging Enhancements
- Configuring Standby Redo Logs
- Standby Redo Log Usage
- Using SQL to Create Standby Redo Logs
- Viewing Standby Redo Log Information
- Setting Initialization Parameters on the Primary Database to Control Redo Transport
- Setting LOG_ARCHIVE_CONFIG
- Setting LOG_ARCHIVE_DEST_n
- Specifying Role-Based Destinations
- Combinations for VALID_FOR
- Defining the Redo Transport Mode
- Setting Initialization Parameters on the Primary Database
- Specifying Values for DB_FILE_NAME_CONVERT
- Specifying a Value for STANDBY_FILE_MANAGEMENT
- Specifying a Value for FAL_SERVER
- Example: Setting Initialization Parameters on the Primary Database
- Creating an Oracle Net Service Name on Primary for Your Physical Standby Database
- Creating a Listener Entry for Your Standby Database
- Copying Your Primary Database Password File to the Physical Standby Database Host
- Creating an Initialization Parameter File for the Physical Standby Database
- Creating Directories for the Physical Standby Database
- Starting the Physical Standby Database
- Creating an RMAN Script to Create the Physical Standby Database
- Creating the Physical Standby Database

- Real-Time Apply (Default)
- Starting Redo Apply in Real Time
- Preventing Primary Database Data Corruption from Affecting the Standby Database
- Detecting Lost Writes with DBMS_DBCOMP.DBCOMP
- DBMS_DBCOMP.DBCOMP Usage Cases
- Creating a Physical Standby Database by Using Enterprise Manager
- Using the Add Standby Database Wizard
- Creating a Data Guard Standby by Using DBCA
- Example: Physical Standby Creation
- Creating a Physical Standby by Using SQL
- Standby Database on the Same System
- Quiz
- Summary
- Practice 3: Overview

Managing Physical Standby Files After Structural Changes on the Primary Database

- Objectives
- Scenario 1: Adding a Data File or Creating a Tablespace
- Action Required on Physical Standby
- Scenario 2: Using Transportable Tablespaces with a Physical Standby Database
- Action Required on Physical Standby
- Scenario 3: Renaming a Data File in the Primary Database
- Action Required on Physical Standby
- Scenario 4: Adding or Dropping a Redo File Group
- Action Required on Physical Standby
- Scenario 5: NOLOGGING or Unrecoverable Operations
- Action Required on Physical Standby
- Scenario 6: Resetting the TDE Master Encryption Key
- Scenario 7: Refreshing the Password File
- Scenario 8: Controlling PDB Replication
- Example: ENABLED_PDBS_ON_STANDBY
- Scenario 9: Instantiating a PDB on a Standby
- Quiz
- Summary
- Practice 4: Overview

Using Oracle Active Data Guard: Supported Workloads in Read-Only Standby

- Objectives
- Oracle Active Data Guard
- Using Real-Time Query
- Enabling Real-Time Query
- Disabling Real-Time Query
- Checking the Standby’s Open Mode
- Understanding Lag in an Active Data Guard Configuration
- Monitoring Apply Lag: V$DATAGUARD_STATS

- Monitoring Apply Lag: V$STANDBY_EVENT_HISTOGRAM
- Allowed Staleness of Standby Query Data
- Configuring Zero Lag Between the Primary and Standby Databases
- Setting STANDBY_MAX_DATA_DELAY by Using an AFTER LOGON Trigger
- Example: Setting STANDBY_MAX_DATA_DELAY by Using an AFTER LOGON Trigger
- Forcing Redo Apply Synchronization
- Creating an AFTER LOGON Trigger for Synchronization
- DDL on Global Temporary Tables
- DML on Global Temporary Tables
- DML/DDL on Private Temporary Tables
- Creating a Private Temporary Table
- Support for Global Sequences
- Support for Session Sequences
- Benefits: Temporary Undo and Sequences
- DML Operations on Active Data Guard Standby Databases
- Configuring Automatic Redirection of DML operations
- Example: Performing DML on a Physical Standby
- PL/SQL Operations on Active Data Guard Standby Databases
- IM Column Store in an Active Data Guard Standby Database
- Quiz
- Summary
- Practice 5: Overview

Using Oracle Active Data Guard: Far Sync and Real-Time Cascading

- Objectives
- Oracle Active Data Guard
- Oracle Data Guard: Far Sync
- Far Sync: Redo Transport
- Far Sync: Alternate Redo Transport Routes
- Far Sync Instance Creation by Using RMAN
- Far Sync Instance Creation by Using SQL
- Benefits: Far Sync
- Far Sync: Alternate Design
- Real-Time Cascade
- Traditional Multi-Standby Database Architecture
- Benefits: Real-Time Cascade
- Quiz
- Summary
- Practice 6: Overview

Creating and Managing a Snapshot Standby Database

- Objectives
- Snapshot Standby Databases: Overview
- Snapshot Standby Database: Architecture
- Converting a Physical Standby Database to a Snapshot Standby Database

- Activating a Snapshot Standby Database: Issues and Cautions
- Snapshot Standby Database: Target Restrictions
- Viewing Snapshot Standby Database Information
- Snapshot Standby Space Requirements
- Activating a Snapshot Standby Database: Issues and Cautions
- Quiz
- Summary
- Practice 7: Overview

Creating a Logical Standby Database

- Objectives
- Benefits of Implementing a Logical Standby Database
- Logical Standby Database: SQL Apply Architecture
- SQL Apply Process: Architecture
- Preparing to Create a Logical Standby Database
- Unsupported Objects
- Unsupported Data Types
- Identifying Internal Schemas
- Checking for Unsupported Tables
- Checking for Tables with Unsupported Data Types
- SQL Commands That Do Not Execute on the Standby Database
- Unsupported PL/SQL-Supplied Packages
- Ensuring Unique Row Identifiers
- Adding a Disabled Primary Key RELY Constraint
- Creating a Logical Standby Database by Using SQL Commands
- Step 1: Create a Physical Standby Database
- Step 2: Stop Redo Apply on the Physical Standby Database
- Step 3: Prepare the Primary Database to Support Role Transitions
- Step 4: Build a LogMiner Dictionary in the Redo Data
- Step 5: Transition to a Logical Standby Database
- Step 6: Open the Logical Standby Database
- Step 7: Verify That the Logical Standby Database Is Performing Properly
- Creating a Logical Standby Database by Using Enterprise Manager
- Using the Add Standby Database Wizard
- Securing Your Logical Standby Database
- Automatic Deletion of Redo Log Files by SQL Apply
- Managing Remote Archived Log File Retention
- Creating SQL Apply Filtering Rules
- Deleting SQL Apply Filtering Rules
- Viewing SQL Apply Filtering Settings
- Using DBMS_SCHEDULER to Create Jobs on a Logical Standby Database
- Quiz
- Summary
- Practice 8: Overview

Oracle Data Guard Broker: Overview

- Objectives
- Oracle Data Guard Broker: Features
- Data Guard Broker: Components
- Data Guard Broker: Configurations
- Data Guard Broker: Management Model
- Data Guard Broker: Architecture
- Data Guard Monitor: DMON Process
- Benefits of Using the Data Guard Broker
- Comparing Configuration Management With and Without the Data Guard Broker
- Data Guard Broker Interfaces
- Broker Controlled Database Initialization Parameters
- Using the Command-Line Interface of the Data Guard Broker
- Using Oracle Enterprise Manager Cloud Control
- Data Guard Overview Page
- Benefits of Using Enterprise Manager
- Quiz
- Summary

Creating a Data Guard Broker Configuration

- Objectives
- Data Guard Broker: Requirements
- Data Guard Broker and the SPFILE
- Data Guard Monitor: Configuration File
- Data Guard Broker: Log Files
- Creating a Broker Configuration
- Clear Redo Transport Network Locations on Primary
- Connecting to the Primary Database with DGMGRL
- Defining the Broker Configuration and the Primary Database Profile
- Adding a Standby Database to the Configuration
- Adding a Far Sync to the Configuration
- Enabling the Configuration
- Broker Support for Complex Redo Routing
- Defining RedoRoutes by Using DGMGRL
- RedoRoutes Usage Guidelines
- How to Read Redo Routing Rules
- Far Sync Example with RedoRoutes
- Changing Database Properties and States
- Managing Redo Transport Services by Using DGMGRL
- Managing the Redo Transport Service by Using the LogXptMode Property
- Setting LogXptMode to ASYNC
- Setting LogXptMode to FASTSYNC
- New Commands to Set, Modify, and Display the Initialization Parameters:
- The EDIT DATABASE SET PARAMETER Command

- The EDIT DATABASE RESET PARAMETER Command
- The EDIT DATABASE FAR_SYNC RESET PARAMETER Command
- The EDIT RECOVERY_APPLIANCE SET PARAMETER Command
- The EDIT RECOVERY_APPLIANCE RESET PARAMETER Command
- The SET TRACE_LEVEL Command
- Example: SET TRACE_LEVEL command
- The EDIT FAR_SYNC SET PARAMETER Command
- Data Guard Broker Deprecated and Desupported Properties
- Export Broker Configuration
- Import Broker Configuration
- Disabling Broker Management of the Configuration or Standby Database
- Removing the Configuration or Standby Database
- Quiz
- Summary
- Practice 10: Overview

Monitoring a Data Guard Broker Configuration

- Objectives
- Monitoring the Data Guard Configuration by Using Enterprise Manager Cloud Control
- Viewing the Data Guard Configuration Status
- Monitoring Data Guard Performance
- Viewing Log File Details
- Enterprise Manager Metrics and Alerts
- Data Guard Metrics
- Managing Data Guard Metrics
- Viewing Metric Value History
- Viewing Data Guard Diagnostic Information
- Using Monitorable Database Properties to Identify a Failure
- Using the SHOW CONFIGURATION DGMGRL Command to Monitor the Configuration
- Using the SHOW DATABASE VERBOSE DGMGRL Command to Monitor the Configuration
- The VALIDATE DATABASE DATAFILE Command
- New Data Guard Broker Commands: VALIDATE DATABASE SPFILE
- New Data Guard Broker Commands: VALIDATE NETWORK CONFIGURATION
- New Data Guard Broker Commands: VALIDATE STATIC CONNECT IDENTIFIER
- Miscellaneous New Data Guard Broker Commands: SET ECHO and SHOW ALL
- Viewing Standby Redo Log Information in V$LOGFILE
- Viewing Standby Redo Log Information in V$STANDBY_LOG
- Viewing Standby Redo Log Information in V$LOGFILE
- Viewing Standby Redo Log Information in V$STANDBY_LOG
- Identifying Destination Settings
- Viewing Standby Redo Log Information in V$STANDBY_LOG
- Viewing Redo Transport Errors by Querying V$ARCHIVE_DEST
- Evaluating Redo Data by Querying V$DATAGUARD_STATS
- Viewing Data Guard Status Information by Querying V$DATAGUARD_STATUS
- Monitoring Redo Apply by Querying V$DATAGUARD_PROCESS

- Monitoring SQL Apply by Querying V$LOGSTDBY_TRANSACTION
- Quiz
- Summary
- Practice 11: Overview

Configuring Data Protection Modes

- Objectives
- Data Protection Modes and Redo Transport Modes
- Data Protection Modes
- Maximum Protection Mode
- Maximum Availability Mode
- Maximum Performance Mode
- Comparing Data Protection Modes
- Setting the Data Protection Mode by Using Enterprise Manager
- Setting the Data Protection Mode by Using SQL
- Quiz
- Summary
- Practice 12: Overview

Optimizing and Tuning a Data Guard Configuration

- Objectives
- Monitoring Configuration Performance by Using Enterprise Manager Cloud Control
- Optimizing Redo Transport Services
- Setting the ReopenSecs Database Property
- Setting the NetTimeout Database Property
- Setting the DataGuardSyncLatency Property
- Optimizing Redo Transmission by Using Redo Transport Compression
- Compressing Redo Data by Setting the RedoCompression Property
- Delaying the Application of Redo
- Setting the DelayMins Database Property to Delay the Application of Redo
- Using Enterprise Manager to Delay the Application of Redo
- Optimizing SQL Apply
- Adjusting the Number of APPLIER Processes
- Adjusting the Number of PREPARER Processes
- Tuning Automatic Outage Resolution
- Diagnostic Tools in Active Data Guard (Read-Only) Standby Databases
- AWR Unified Management Framework Topology
- Remote Snapshot Configuration for ADG Database
- Quiz
- Summary
- Practice 13: Overview

Performing Role Transitions

- Objectives

- Role Management Services
- Role Transitions: Switchover and Failover
- Buffer Cache Preservation During Role Change
- Keeping Physical Standby Sessions Connected During Role Transition
- Switchover
- Switchover: Before
- Switchover: After
- Performing a Switchover by Using Enterprise Manager
- Validating Databases for Switchover by Using DGMGRL
- Performing a Switchover by Using DGMGRL
- Preparing for a Switchover Using SQL
- Performing a Switchover by Using SQL
- Considerations When Performing a Switchover to a Logical Standby Database
- Situations That Prevent a Switchover
- Failover
- Types of Failovers
- Failover Considerations
- Performing a Failover by Using Enterprise Manager
- Performing a Failover to a Physical Standby Database
- Performing a Manual Failover by Using DGMGRL
- Re-enabling Disabled Databases by Using DGMGRL
- Quiz
- Summary
- Practice 14: Overview

Using Flashback Database in a Data Guard Configuration

- Objectives
- Using Flashback Database in a Data Guard Configuration
- Overview of Flashback Database
- Configuring Flashback Database
- Configuring Flashback Database by Using Enterprise Manager
- 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
- Using Flashback Database After Failover
- Automatic Propagation of Restore Points to All Standby Databases
- Automatic Flashback on Physical Standby Databases
- Quiz
- Summary
- Practice 15: Overview

Enabling Fast-Start Failover

- Objectives
- Fast-Start Failover: Overview

- When Does Fast-Start Failover Occur?
- Installing the Observer Software
- Fast-Start Failover Prerequisites
- Configuring Fast-Start Failover
- Step 1: Specify the Target Standby Databases
- Dynamically Change Fast-start Failover Target
- Setting a Fast Start Failover Target Using NOWAIT Mode
- Step 2: Set the Protection Mode
- Step 3: Set the Fast-Start Failover Threshold
- Step 4: (Optional) Set Additional Fast-Start Failover Properties
- Setting the Lag-Time Limit
- Configuring the Primary Database to Shut Down Automatically
- Automatic Reinstatement After Fast-Start Failover
- Configuring Automatic Reinstatement of the Primary Database
- Setting a Connect Identifier for the Observer
- Setting an Observer Override
- Setting Observer Reconnection Frequency
- Step 5: Configure Additional Fast-Start Failover Conditions
- Configuring Fast-Start Failover Conditions
- Step 6: Enable Fast-Start Failover
- Configuring Fast-Start Failover in Observe-only Mode
- Step 7: Start the Observer
- Data Guard Broker Property: ConfigurationWideServiceName
- Multiple Observers Using a Single Configuration
- Master Observer and Backup Observers
- Starting Observers as Background Processes
- Step 8: Verify the Configuration
- Initiating Fast-Start Failover from an Application
- Viewing Fast-Start Failover Information
- Determining the Reason for a Fast-Start Failover
- Prohibited Operations After Enabling Fast-Start Failover
- Disabling Fast-Start Failover
- Disabling Fast-Start Failover Conditions
- Using the FORCE Option
- Stopping the Observer
- Performing Manual Role Changes
- Manually Reinstating the Database
- Using Enterprise Manager to Enable Fast-Start Failover
- Changing the Protection Mode and Disabling Fast-Start Failover
- Using Enterprise Manager to Disable Fast-Start Failover
- Using Enterprise Manager to Suspend Fast-Start Failover
- Moving the Observer to a New Host
- Quiz
- Summary
- Practice 16: Overview

Backup and Recovery Considerations in an Oracle Data Guard Configuration

- Objectives
- Using RMAN to Back Up and Restore Files in a Data Guard Configuration
- Offloading Backups to a Physical Standby
- Restrictions and Usage Notes
- Association and Accessibility of RMAN Backups
- Backup and Recovery of a Logical Standby Database
- Using the RMAN Recovery Catalog in a Data Guard Configuration
- Creating the Recovery Catalog
- Registering a Database in the Recovery Catalog
- Setting Persistent Configuration Settings
- Setting RMAN Persistent Configuration Parameters on the Primary Database
- Setting RMAN Persistent Configuration Parameters on the Physical Standby Database
- Setting RMAN Persistent Configuration Parameters on the Other Standby Databases
- Enabling Block Change Tracking on a Physical Standby Database
- Configuring Daily Incremental Backups
- Recovering from the Loss of a Data File on the Primary Database
- Using a Backup to Recover a Data File on the Primary Database
- Restoring and Recovering a Data File on the Primary Database Over the Network
- Automated Standby Synchronization from Primary Database
- Enhancements to Block Media Recovery
- Executing the RECOVER BLOCK Command
- Excluding the Standby Database
- Quiz
- Summary
- Practice 17: Overview

Enhanced Client Connectivity in a Data Guard Environment

- Objectives
- Connecting to the Appropriate Environment
- Understanding Client Connectivity in a Data Guard Configuration
- Preventing Clients from Connecting to the Wrong Database
- Managing Services
- Creating Services for the Data Guard Configuration Databases
- Connecting Clients to the Correct Database
- Creating the AFTER DB_ROLE_CHANGE Trigger for Role-Based Services
- Configuring Service Names in the tnsnames.ora File
- Configuring Role-Based Services Using Oracle Clusterware
- Adding Standby Databases to Oracle Restart Configuration
- Example: Configuring Role-Based Services
- Automatic Failover of Applications to a New Primary Database
- Client Failover: Components
- Data Guard Broker and Fast Application Notification (FAN)
- Automating Client Failover by Using Transaction Guard and Application Continuity

- What Is Transaction Guard?
- What Is Application Continuity?
- Data Guard and Application Continuity
- Using Application Continuity
- Configure Services on Single Instance Databases to Use Application Continuity
- Configuring Client: JDBC-Thin Driver
- Configuring Client: OCI Driver
- Configuring Client: ODP.NET Unmanaged Provider Driver
- Quiz
- Summary
- Practice 18: Overview

Patching and Upgrading Databases in a Data Guard Configuration

- Objectives
- Data Guard Standby-First Patch Apply
- Upgrading an Oracle Data Guard Broker Configuration
- Upgrading Oracle Database in a Data Guard Configuration with a Physical Standby Database
- Upgrading Oracle Database in a Data Guard Configuration with a Logical Standby Database
- Using SQL Apply to Upgrade the Oracle Database
- Requirements for Using SQL Apply to Perform a Rolling Upgrade
- Performing a Rolling Upgrade by Using SQL Apply
- Identifying Unsupported Data Types
- Case 1: Performing a Rolling Upgrade by Using an Existing Logical Standby Database
- Performing a Rolling Upgrade by Using an Existing Logical Standby Database
- Case 2: Performing a Rolling Upgrade by Creating a New Logical Standby Database
- Case 3: Performing a Rolling Upgrade by Using a Physical Standby Database
- Performing a Rolling Upgrade by Using a Physical Standby Database
- Rolling Upgrades Using DBMS_ROLLING and Active Data Guard
- DBMS_ROLLING: Concepts
- DBMS_ROLLING: Overview
- Database Rolling Upgrade: Specification and Compilation Stages
- Example: Specification Stage
- Example: Compilation Stage
- Database Rolling Upgrade: Execution Stage
- Rolling Upgrade Support for Multitenant Databases
- Quiz
- Summary