

Oracle Database 19c: Backup and Recovery

Duration:
5 days

In this course, students learn how to perform backup and recovery based on the related Oracle Database architecture components. Various backup, failure, restore, and recovery scenarios are provided so that students learn to evaluate their own recovery requirements and develop an appropriate strategy for backup and recovery procedures. This course includes an interactive workshop, with scenarios that provide participants with opportunities to diagnose and recover from several failure situations.

Course Objectives

Upon completion of this course, the student should be able to:

- Describe the Oracle Database architecture components related to backup and recovery operations.
- Plan effective backup and recovery procedures.
- Describe Oracle Database backup methods and recovery operations that can be used to resolve database failure.
- Configure the database for recoverability.
- Use Recovery Manager (RMAN) to create backups and perform recovery operations.
- Use the Data Recovery Advisor to diagnose and repair failures.
- Use Oracle Flashback Technologies to recover from human error.
- Perform an encrypted database backup and restore.
- Perform tablespace point-in-time recovery.

Benefits To You

The student benefits by gaining a deeper understanding of possibly the most important job of a DBA - backup and recovery. The concepts and architecture that support backup and recovery, along with implementation steps in various ways and situations, are presented in detail.

Students gain knowledge of the Recovery Manager (RMAN) command-line interface for various backup, failure, restore, and recovery scenarios, including data duplication.

Prerequisites

Oracle Database 19c: Administration Workshop

Audience

- Oracle Database Administrator
- Data Warehouse Administrator
- Support Engineer
- Technical Consultant
- Technical Administrator

Hands-On Lessons

Extensive hands-on practices and workshop scenarios provide the student with experience in a realistic technical environment. This course includes an interactive workshop that provide participants with opportunities to diagnose and recover from several failure scenarios, based on backup and recovery case studies. After completing this course, students should be able to evaluate their own recovery requirements and develop an appropriate strategy for backup and recovery procedures.

Course Topics

1. Introduction

- Assessing Your Recovery Requirements
- Categories of Failure
- Data Failures
- Oracle Data Protection Solutions
- Assisting with Overview and Advice
- Integrated Oracle Recovery Manager (RMAN)
- Oracle Database Backup Cloud Module
- Oracle Secure Backup
- Oracle Data Guard: Overview
- Physical Standby Database: Redo Apply Architecture
- Oracle Active Data Guard
- Logical Standby Database: SQL Apply Architecture
- Oracle Maximum Availability Architecture: Robust and Integrated Data Protection
- Practice Overview: Exploring the Course Environment

2. Getting Started

- Naming the Core Components of an Oracle Database Server
- Oracle Database Server Architecture: Overview
- Database Storage Architecture: Review
- Naming Logical and Physical Database Structures
- Process Architecture: Review
- Process Structures
- Reviewing Processes
- Reviewing Database Writer Process (DBWn)
- Reviewing Log Writer Process (LGWR)
- Reviewing Checkpoint Process (CKPT)
- Reviewing System Monitor Process (SMON)
- Reviewing Process Monitor (PMON)
- Reviewing Archiver Processes (ARCn)
- Identifying Processes
- Database Log Mode
- Oracle DBA Tools
- Separation of DBA Duties
- Connecting to RMAN and a Target Database
- Using SQL in RMAN
- Performing Restore and Recovery of a Database in NOARCHIVELOG Mode
- Practice Overview: Getting Started

3. Configuring for Recoverability

- Types of RMAN Commands
- Job Commands: Example
- Configuring Persistent Settings for RMAN
- Viewing Persistent Settings
- Managing Persistent Settings
- Specifying a Retention Policy
- Recovery Window Retention Policy: Example
- Using a Fast Recovery Area

- Configuring the Fast Recovery Area
- Sizing the Fast Recovery Area
- Fast Recovery Area Space Management
- Multiplexing Control Files
- Control File Autobackups
- Best Practice: Multiplexing Redo Log Files
- Multiplexing the Redo Log
- Creating Archived Redo Log Files
- Configuring ARCHIVELOG Mode
- Practice Overview: Configuring for Recoverability

4. Using the RMAN Recovery Catalog

- RMAN Repository Data Storage: Comparison of Options
- Storing Information in the Recovery Catalog
- Reasons to Use a Recovery Catalog
- Creating the Recovery Catalog: Three Steps
- Configuring the Recovery Catalog Database
- Creating the Recovery Catalog Owner
- Creating the Recovery Catalog
- Managing Target Database Records in the Recovery Catalog
- Registering a Database in the Recovery Catalog
- Unregistering a Target Database from the Recovery Catalog
- Recovery Catalog Resynchronization: Concepts
- Manually Resynchronizing the Recovery Catalog
- Using RMAN Stored Scripts
- Executing RMAN Stored Scripts
- Maintaining RMAN Stored Scripts
- Backing Up the Recovery Catalog
- Creating and Using Virtual Private Catalogs
- Creating a Virtual Private Catalog
- Managing Virtual Private Catalogs
- Upgrading Virtual Private Catalogs 4
- Practice Overview: Using the RMAN Recovery Catalog

5. Backup Strategies and Terminology

- Backup Solutions: Overview
- Backup Terminology
- Balancing Backup and Restore Requirements
- Comparing Backup Strategies
- Option 1: Full and Incremental Backups
- Option 2: Incrementally Updated Disk Backups
- Option 3: Offloading Backups to Physical Standby Database in Data Guard Environment
- Backing Up Read-Only Tablespaces
- Data Warehouse Backup and Recovery: Best Practices
- Additional Backup Terminology
- Creating Backup Sets 5-14 Creating Image Copies
- Creating a Whole Database Backup
- Practice Overview: Developing a Backup Strategy
- Case Study 1: How to Protect an OLTP Database
- Case Study 2: How to Protect a DSS Database

- Case Study 3: How to Protect the Recovery Catalog Database

6. Performing Backups

- RMAN Backup Types
- Incrementally Updated Backups
- Incrementally Updated Backups: Example 6-6 Fast Incremental Backup
- Maintaining the Block Change Tracking File
- Monitoring Block Change Tracking
- Automatic Disk-to-Disk Backup and Recovery
- Oracle-Suggested Backup
- Reporting on Backups
- Using Dynamic Views
- Managing Backups: Cross-Checking and Deleting
- Practice Overview: Creating Incremental Backups

7. Improving Your Backups

- Saving Backup Space with Unused Block Compression
- Compressing Backups
- Using RMAN Backup Compression
- Using a Media Manager
- Configuring Backup and Restore for Very Large Files
- Backing Up and Restoring Very Large Files
- Creating RMAN Multisection Backups
- Creating Proxy Copies
- Creating Duplexed Backup Sets by Using BACKUP COPIES
- Creating Backups of Backup Sets
- Archival Backups: Concepts
- Creating Archival Backups with RMAN
- Managing Archival Database Backups
- Backing Up Recovery Files
- Backing Up the Control File to a Trace File
- Cataloging Additional Backup Files
- Practice Overview: Backing Up Additional Files

8. Using RMAN-Encrypted Backups

- RMAN-Encrypted Backups
- Comparing OSB and RMAN Encryption
- Creating RMAN-Encrypted Backups
- What Is TDE?
- Using Transparent-Mode Encryption
- Backing Up the Keystore
- Configuring RMAN Encryption
- Using Password-Mode Encryption
- Using Dual-Mode Encryption
- RMAN-Encrypted Backups: Considerations
- Restoring Encrypted Backups
- Practice Overview: Using RMAN-Encrypted Backups

9. Diagnosing Failures

- Reducing Problem Diagnosis Time

- Automatic Diagnostic Workflow
- Automatic Diagnostic Repository
- ADR Command-Line Tool (ADRCI)
- V\$DIAG_INFO View
- Data Recovery Advisor
- Data Failure: Examples
- Data Recovery Advisor RMAN Command-Line Interface
- Listing Data Failures
- Advising on Repair
- Executing Repairs
- Classifying (and Closing) Failures
- Data Recovery Advisor Views
- What Is Block Corruption?
- Block Corruption Symptoms: ORA-01578
- How to Handle Corruption
- Setting Parameters to Detect
- Block Media Recovery
- Prerequisites for Block Media Recovery
- Recovering Individual Blocks
- Best Practice: Proactive Checks
- Checking for Block Corruption
- Automatic Block Repair: Primary Database
- Automatic Block Repair: Physical Standby Database
- Practice Overview: Diagnosing Database Failure

10. Restore and Recovery Concepts

- Understanding File Loss
- Data Repair Techniques
- Restoring and Recovering
- Using RMAN RESTORE and RECOVER Commands
- Instance Failure
- Understanding Instance Recovery
- Phases of Instance Recovery
- Tuning Instance Recovery
- Using the MTTR Advisor
- Media Failure
- Comparing Complete and Incomplete Recovery
- Complete Recovery Process
- Point-in-Time Recovery Process
- Recovery with RESETLOGS Option
- Practice Overview: Restore and Recovery Concepts
- Case Study

11. Performing Complete Recovery

- Ensuring Backups Are Available
- Restoring in NOARCHIVELOG Mode
- Recovery with Incremental Backups in NOARCHIVELOG Mode
- Performing Complete Recovery
- Review: Recovering Image Copies
- Recovering Image Copies: Example

- Performing a Fast Switch to Image Copies
- Using SET NEWNAME for Switching Files
- Using Restore Points
- Practice Overview: Performing Complete Recovery

12. Performing Point-in-Time Recovery

- Point-in-Time Recovery
- PITR Terminology
- Performing Point-in-Time Recovery
- When to Use TSPITR
- Tablespace Point-in-Time Recovery: Architecture
- Preparing for TSPITR
- Determining the Correct Target Time
- Determining the Tablespaces for the Recovery Set
- Identifying Objects That Will Be Lost
- Performing RMAN TSPITR
- Performing Fully Automated TSPITR
- Improving TSPITR Performance
- Performing RMAN TSPITR with an RMAN-Managed Auxiliary Instance
- Performing RMAN TSPITR by Using Your Own Auxiliary Instance
- Troubleshooting RMAN TSPITR
- Recovering Tables from Backups
- Table Recovery: Graphical Overview
- Prerequisites and Limitations
- Specifying the Recovery Point in Time
- Process Steps of Table Recovery
- Practice Overview: Performing Point-in-Time Recovery

13. Additional Recovery Operations

- Recovery from Loss of Server Parameter File
- Restoring the Server Parameter File from the Control File Autobackup
- Loss of a Control File
- Recovering from the Loss of All Control File Copies: Overview
- Restoring the Control File from Autobackup
- Restoring the SPFILE and the Control File
- Recovering NOLOGGING Database Objects
- Loss of a Redo Log File
- Log Group Status: Review
- Recovering from the Loss of a Redo Log Group
- Clearing a Log File
- Re-creating a Password Authentication File
- Recovering from a Lost Index Tablespace
- Recovering a Read-Only Tablespace
- Automatic Tempfile Recovery
- Restoring and Recovering the Database on a New Host
- Preparing to Restore the Database to a New Host
- Restoring the Database to a New Host
- Performing Disaster Recovery
- Restoring Encrypted Backups
- Practice Overview: Performing Additional Recovery Operations

14. Using Flashback Technologies

- Flashback Technologies Error Detection and Correction
- Review: Transactions and Undo
- Flashback Technology
- Preparing Your Database for Flashback
- Guaranteeing Undo Retention
- Using Flashback Technology to Query Data
- Flashback Query
- Flashback Version Query
- Flashback Table: Overview
- Flashback Table
- Flashback Table: Considerations
- Flashback Transaction Query
- Flashback Transaction Query: Considerations
- Flashback Transaction Backout
- Flashing Back a Transaction
- Best Practices: Undo-based Flashback Query, Flashback Table
- Flashback Drop and the Recycle Bin
- Recycle Bin
- Bypassing the Recycle Bin
- Using Flashback Data Archives
- Creating a Temporal History and Enabling Archiving
- How the Flashback Data Archive Works
- Collecting User Context in Temporal History
- Transparent Schema Evolution
- Full Schema Evolution
- Temporal Validity and History
- Using the PERIOD FOR Clause
- Filtering on Valid-Time Columns: Example
- Using DBMS_FLASHBACK_ARCHIVE
- Practice Overview: Using Flashback Technologies

15. Using Flashback Database

- Flashback Database: Continuous Data Protection
- Flashback Database
- Flashback Database Architecture
- Configuring Flashback Database
- Flashback Database: Examples
- Flashback Database Considerations
- Monitoring Flashback Database Information
- Guaranteed Restore Points
- Flashback Database and Guaranteed Restore Points
- Best Practices: Flashback Database
- Practice Overview: Flashback Database

16. Transporting Data

- Transporting Data Across Platforms
- Transporting Data with Minimum Downtime
- Transporting a Tablespace with Image Copies

- Determining the Endian Format of a Platform
- Using the RMAN CONVERT Command
- Transporting Data with Backup Sets
- Process Steps
- Transporting Inconsistent Tablespaces
- Database Transport: Using Data Files
- Database Transportation Procedure
- Database Transportation: Conversion
- Database Transportation: Example
- Database Transportation: Considerations
- Database Transport with Backup Sets
- Practice Overview: Transporting Data

17. Duplicating a Database

- Using a Duplicate Database
- Choosing Database Duplication Techniques
- Duplicating an Active Database with “Push”
- Comparing the “Push” and “Pull” Methods of Duplication
- Duplicating a Database with a Target Connection
- Duplicating a Database with Recovery Catalog Without Target Connection
- Duplicating a Database Without Recovery Catalog or Target Connection
- Creating a Backup-Based Duplicate Database
- Creating an Initialization Parameter File for the Auxiliary Instance
- Specifying New Names for Your Destination
- Using the SET NEWNAME Clauses
- Substitution Variables for SET NEWNAME
- Specifying Parameters for File Naming
- Starting the Instance in NOMOUNT Mode
- Ensuring That Backups and Archived Redo Log Files Are Available
- Allocating Auxiliary Channels
- Understanding the RMAN Duplication Operation
- Specifying Options for the DUPLICATE Command
- Using Additional DUPLICATE Command Options
- Practice Overview: Duplicating a Database

18. RMAN Troubleshooting and Tuning

- Interpreting RMAN Message Output
- Using the DEBUG Option
- Interpreting RMAN Error Stacks
- Processing an RMAN Command
- Troubleshooting with RMAN
- Is There a Problem?
- Diagnosing Performance Bottlenecks
- Diagnosing Performance Bottlenecks: Read Phase
- Is There a “Write” Problem?
- Diagnosing Performance Bottlenecks: Write or Copy Phase
- Using Dynamic Views to Diagnose RMAN Performance
- Monitoring RMAN Job Progress
- Identifying Backup and Restore Bottlenecks
- Asynchronous I/O Bottlenecks

- Synchronous I/O Bottlenecks
- Tuning RMAN Backup Performance
- Parallelization of Backup Sets
- Setting LARGE_POOL_SIZE
- RMAN Multiplexing
- Restore and Recovery Performance: Best Practices Quiz

19. Backup and Recovery Workshop

- Workshop Structure and Approach
- Business Requirements for the Workshop Database
- Diagnosing the Failures