

Contents

1 ASM Overview

- Objectives 1-2
- What Is Oracle ASM? 1-3
- Oracle ACFS 1-4
- ASM: Features and Benefits 1-5
- ASM: Software Installation 1-6
- Oracle ASM Components 1-7
- ASM Components: ASM Instance 1-8
- ASM Instance Primary Processes 1-10
- ASM Instance Designs 1-11
- ASM Components: ASM Disk Group 1-14
- ASM Components: Failure Groups 1-15
- ASM Components: ASM Disks 1-16
- ASM Components: ASM Files 1-17
- ASM Files: Extents and Striping 1-18
- ASM Files: ASM File Mirroring 1-19
- ASM Clients 1-21
- ASM Utilities 1-22
- Quiz 1-23
- Summary 1-24

2 Administering ASM Instances

- Objectives 2-2
- Operating with Different Releases of Oracle ASM and Database Instances Simultaneously 2-3
- Managing ASM with ASMCA 2-4
- Starting and Stopping ASM Instances by Using ASMCA 2-5
- Starting and Stopping ASM Instances by Using ASMCMD 2-6
- Starting and Stopping ASM Instances by Using srvctl 2-7
- Starting and Stopping ASM Instances By Using SQL*Plus 2-8
- Starting and Stopping ASM Instances 2-10
- ASM Initialization Parameters 2-11
- ASM_DISKGROUPS 2-12
- Disk Groups Mounted at Startup 2-13
- ASM_DISKSTRING 2-14

ASM_POWER_LIMIT 2-16
INSTANCE_TYPE 2-17
MEMORY_TARGET 2-18
Adjusting ASM Instance Parameters in SPFILEs 2-19
Starting and Stopping the Node Listener 2-20
ASM System Privileges 2-21
Using Separate OS Groups for Oracle ASM users 2-23
Authentication for Accessing ASM Instances 2-24
ASMCMD and Authentication 2-25
Password-Based Authentication for ASM 2-26
Managing the ASM Password File 2-27
Managing a Shared Password File in a Disk Group 2-28
ASM Dynamic Performance Views 2-30
ASM Dynamic Performance Views Diagram 2-31
Quiz 2-33
Summary 2-35
Practice 2: Overview 2-36

3 Flex ASM

Objectives 3-2
Flex ASM: Overview 3-3
Oracle ASM Flex Configurations 3-4
ASM Instance Changes 3-6
ASM Network 3-7
Configuring ASM Network: Example 3-8
ASM Listeners 3-9
ADVM Proxy 3-11
Managing Flex ASM Instances 3-12
Stopping, Starting, and Relocating Flex ASM Instances 3-13
Setting the Cardinality for Flex ASM Instances 3-14
Monitoring Flex ASM Connections 3-15
Relocating an ASM Client 3-16
Flex ASM Deployment: Example 3-17
Oracle Cluster Domain: Overview 3-18
The IOS Instance 3-21
The ASM_IO_PROCESSES Initialization Parameter 3-22
Managing IOserver 3-23
Quiz 3-25
Summary 3-27
Practice 3: Overview 3-28

4 Administering ASM Disk Groups Part I

| | |
|--|------|
| Objectives | 4-2 |
| Disk Group: Overview | 4-3 |
| Creating a New Disk Group with ASMCMD | 4-5 |
| Creating an ASM Disk Group with ASMCA | 4-6 |
| Creating an ASM Disk Group: Advanced Options | 4-7 |
| Creating a Disk Group with Enterprise Manager | 4-8 |
| Creating a Disk Group with SQL*Plus | 4-9 |
| Disk Group Attributes | 4-11 |
| Viewing Disk Group Attributes | 4-15 |
| Compatibility Attributes | 4-16 |
| Features Enabled by Disk Group Compatibility Attributes | 4-17 |
| Specifying Content Type for a Disk Group | 4-19 |
| Support for 4 KB Sector Disk Drives | 4-21 |
| Supporting 4 KB Sector Disks | 4-22 |
| ASM Support for 4 KB Sector Disks | 4-23 |
| Sector Size Validations | 4-24 |
| Using the SECTOR_SIZE Clause | 4-25 |
| ASM Extended Support for 4K Sector Size | 4-26 |
| Specifying Disk Logical and Sector Sizes in a Disk Group | 4-27 |
| Possible Sector Size/Logical Sector Size Combinations | 4-28 |
| Disk Group Sector Size Guidelines | 4-29 |
| Viewing ASM Disk Groups | 4-30 |
| Viewing ASM Disk Information | 4-32 |
| Extending an Existing Disk Group | 4-34 |
| Dropping Disks from an Existing Disk Group | 4-35 |
| REBALANCE POWER 0 | 4-36 |
| V\$ASM_OPERATION | 4-37 |
| Adding and Dropping in the Same Command | 4-38 |
| Undropping Disks in Disk Groups | 4-39 |
| Replacing Disks in Disk Groups | 4-40 |
| Renaming Disk Groups | 4-41 |
| Renaming Disks in Disk Groups | 4-43 |
| Resizing Disks in Disk Groups | 4-44 |
| Mounting and Dismounting Disk Groups | 4-45 |
| Viewing Connected Clients | 4-46 |
| Dropping Disk Groups | 4-47 |
| ASM Disk Group Rebalance: Review | 4-48 |
| Priority Ordered Rebalance | 4-49 |
| Tuning Rebalance Operations | 4-50 |
| Quiz | 4-52 |

Summary 4-54
Practice 4: Overview 4-55

5 Administering ASM Disk Groups Part II

Objectives 5-2
Managing Capacity in Disk Groups 5-3
Capacity Calculation: Example 5-6
Partner Status Table 5-8
Partner Disks 5-10
ASM Recovery from Read I/O Errors 5-12
ASM Recovery from Write I/O Errors 5-13
Proactively Validating Data Integrity 5-14
Proactive Content Checking During Rebalance 5-15
On-Demand Scrubbing 5-16
Errors During Scrubbing 5-17
Checking the Consistency of Disk Group Metadata 5-18
ASM Fast Mirror Resync 5-19
Controlling the Resources Used by Resync 5-20
Resync Checkpoint and Auto-Restart 5-21
Resync Time Estimate 5-22
Dealing with Transient Failure on a Failure Group 5-23
Even Read 5-24
Preferred Read Failure Groups: Best Practice 5-25
Viewing ASM Disk Statistics 5-26
Performance, Scalability, and Manageability Considerations for Disk Groups 5-28
Quiz 5-29
Summary 5-31
Practice 5: Overview 5-32

6 Flex ASM Disk Groups

Objectives 6-2
ASM Database-Oriented Storage Management 6-3
ASM Flex Disk Group Characteristics 6-4
DB-Oriented Storage Management with ASM File Groups 6-5
ASM File Group Considerations 6-6
Oracle ASM Quota Groups 6-7
ASM File Groups Deployment: Example 6-8
Oracle ASM File Group Properties 6-9
ASM File Group Administration by Using SQL 6-11
Using ASMCMD to Manage File Groups and Quota Groups 6-12
New ASM File Group Dynamic Views 6-13

Prioritized Rebalancing for File Groups 6-14

Summary 6-15

Practice 6: Overview 6-16

7 Administering ASM Files, Directories, and Templates

Objectives 7-2

ASM Clients 7-3

Interaction Between Database Instances and ASM 7-5

Accessing ASM Files By Using RMAN 7-6

Accessing ASM Files By Using XML DB 7-8

Accessing ASM Files By Using DBMS_FILE_TRANSFER 7-9

Accessing ASM Files By Using ASMCMD 7-10

Fully Qualified ASM File Names 7-11

Other ASM File Names 7-12

Single File Creation: Examples 7-15

Multiple File Creation: Example 7-16

Viewing ASM Aliases, Files, and Directories 7-17

Viewing ASM Files 7-20

ASM Directories 7-21

Managing ASM Directories 7-22

Managing Alias File Names 7-23

Disk Group Templates 7-24

Viewing Templates 7-25

Managing Disk Group Templates 7-26

Managing Disk Group Templates with ASMCMD 7-27

Using Disk Group Templates 7-28

ASM Access Control Lists 7-29

ASM File Access Control Available on Windows 7-30

ASM ACL Prerequisites 7-31

Managing ASM ACL with SQL Commands 7-32

Managing ASM ACL with ASMCMD Commands 7-33

Managing ASM ACL with Enterprise Manager 7-34

ASM ACL Guidelines 7-35

Quiz 7-36

Summary 7-38

Practice 7: Overview 7-39

8 Administering Oracle ACFS

Objectives 8-2

Oracle ACFS 8-3

ASM Files and Volumes 8-5

| | |
|---|------|
| ACFS and ADVM Architecture: Overview | 8-6 |
| ADVM and ACFS Processes | 8-8 |
| Oracle ACFS | 8-9 |
| Space Allocation | 8-10 |
| Striping Inside the Volume | 8-11 |
| Volume Striping: Example | 8-12 |
| Creating an ACFS Volume | 8-14 |
| Managing Dynamic Volumes with SQL*Plus | 8-15 |
| Creating an ACFS Volume with ASMCA | 8-16 |
| Creating the ACFS File System with ASMCA | 8-17 |
| Using ASMCMD for Dynamic Volumes | 8-18 |
| Linux-UNIX Extensions | 8-19 |
| ACFS Utilities for Multiple Environments | 8-20 |
| Configuration Settings for Database Files | 8-21 |
| ACFS Support for Database File Mapping Views | 8-22 |
| ACFS Cluster Resources | 8-24 |
| Implementing Node-Specific File System Dependencies | 8-26 |
| ACFS Snapshots | 8-27 |
| Managing ACFS Snapshots | 8-28 |
| Snapshots of Snapshots | 8-30 |
| ACFS Backups | 8-31 |
| ACFS Performance | 8-32 |
| ACFS Views | 8-33 |
| Summary | 8-34 |
| Practice 8: Overview | 8-35 |

9 ACFS/ADVM Enhancements

| | |
|--|------|
| Objectives | 9-2 |
| Oracle ACFS Automatic Resize | 9-3 |
| Oracle ACFS Scrubbing | 9-5 |
| Oracle ACFS Fragmentation | 9-6 |
| Oracle ACFS Defragger | 9-8 |
| Oracle ACFS Metadata Collection | 9-9 |
| Oracle ACFS Metadata Acceleration | 9-10 |
| Accelerator Volume Considerations | 9-11 |
| 4K Sector Support for Oracle ACFS and Metadata | 9-12 |
| 4K Sector and Metadata Support Considerations | 9-13 |
| Accelerator Volumes and Automatic Resize | 9-14 |
| Oracle ACFS Compression | 9-15 |
| Oracle ACFS Compression Management | 9-16 |
| ACFS Compression Commands | 9-17 |

Oracle ACFS Sparse Files 9-20
Oracle ACFS Loopback Devices 9-21
Quiz 9-22
Summary 9-23
Practice 9: Overview 9-24

A Oracle ASM Advanced Topics

Objectives A-2
High Availability NFS A-3
Configuring High Availability NFS A-4
Highly Available NAS Enhancements A-5
ASM Filter Driver: Overview A-6
Configuring the ASM Filter Driver A-7
Labeling Disks for ASM Filter Driver A-8
Migrating from ASMLib to ASMFD A-9
Unlabeling Disks and Deconfiguring ASMFD A-10
ACFS Encryption A-11
Encrypting ACFS File Systems A-14
Oracle ACFS Snapshot-Based Replication A-15
Snapshot Replication Basics A-16
ACFS Snapshot Replication Requirements A-17
ACFS Snapshot-Based Replication with ACFSUTIL A-19
Configuring SSH for Use with ACFS Replication A-20
Host Key Configuration for VIPs A-21
Configuring the Standby Site A-22
Configuring the Primary Site A-23
Snapshot-Based Replication Upgrade Prerequisites A-24
Snapshot Replication Considerations A-25
Using Replication in Conjunction with ACFS Security and Encryption A-26
Quiz A-27
Summary A-28

B Point-In-Time Database Clones

Objectives B-2
Overview of Creating Point-In-Time Database Clones B-3
Diagram of Create Point-In-Time Database Clones B-4
Phase One of Create Point-In-Time Database Clones B-5
Phase Two of Create Point-In-Time Database Clones B-6
Prepare Point-In-Time Database Clones: Connect to PDB B-7
Prepare Point-In-Time Database Clones: Prepare Mirror B-8
Split and Create Point-In-Time Database Clones B-9

| | |
|--|------|
| Check the Status of Point-In-Time Database Clones | B-10 |
| View Information About Point-In-Time Database Clones | B-11 |
| Drop the Point-In-Time Database Clone Mirror Copy | B-12 |
| Cleanup of Point-In-Time Database Clone Process | B-13 |
| Summary | B-14 |