

Oracle Database 11g: Managing Oracle on Linux for DBAs

Student Guide

D55650GC10

Edition 1.0

January 2009

D57875

ORACLE®

Authors

Curt Elsbernd
Jenny Tsai

**Technical Contributors
and Reviewers**

Maria Billings
Harald Van Breederode
Mark Fallon
Al Flournoy
Mark Fuller
Joel Goodman
Gwen Lazenby
Andrei Ristea
Matt Taylor
Branislav Valny
Chris Wensley

Editors

Vijayalakshmi Narasimhan
Raj Kumar

Publishers

Veena Narasimhan
Sujatha Nagendra

Copyright © 2009, Oracle. All rights reserved.

Disclaimer

This document contains proprietary information and is protected by copyright and other intellectual property laws. You may copy and print this document solely for your own use in an Oracle training course. The document may not be modified or altered in any way. Except where your use constitutes "fair use" under copyright law, you may not use, share, download, upload, copy, print, display, perform, reproduce, publish, license, post, transmit, or distribute this document in whole or in part without the express authorization of Oracle.

The information contained in this document is subject to change without notice. If you find any problems in the document, please report them in writing to: Oracle University, 500 Oracle Parkway, Redwood Shores, California 94065 USA. This document is not warranted to be error-free.

Restricted Rights Notice

If this documentation is delivered to the United States Government or anyone using the documentation on behalf of the United States Government, the following notice is applicable:

U.S. GOVERNMENT RIGHTS

The U.S. Government's rights to use, modify, reproduce, release, perform, display, or disclose these training materials are restricted by the terms of the applicable Oracle license agreement and/or the applicable U.S. Government contract.

Trademark Notice

Oracle is a registered trademark of Oracle Corporation and/or its affiliates. Other names may be trademarks of their respective owners.

Contents

Preface

1 Introduction

- Objectives 1-2
- Questions About You 1-3
- Course Objectives 1-4
- Prerequisite and Follow-on Courses 1-5
- Suggested Course Schedule 1-6

2 Review of Linux Basics

- Objectives 2-2
- Linux Basics 2-3
- Linux Directory Structure 2-4
- Navigating the Linux File System 2-5
- File Permissions and Security 2-6
- User File Creation Mask 2-7
- File Security Attributes 2-8
- Setting Permission and Ownership 2-9
- SETUID and SETGID Bits 2-11
- Common Linux Commands and Programs: Manipulating Files and Directories 2-12
- Common Linux Commands and Programs: Viewing and Searching Files 2-14
- Quiz 2-16
- Additional Linux Commands 2-17
- Choosing a Shell 2-18
- Environment and Shell Variables 2-19
- Setting Environment Variables 2-20
- Bash Shell Scripting 2-21
- Bash Shell Scripting: Environment Variables 2-22
- Quiz 2-24
- Redirecting Input and Output 2-25
- Quiz 2-27
- Bash Shell Scripting: Conditions 2-28
- Bash Shell Scripting: `case` 2-29
- Bash Shell Scripting: `while` 2-30
- Bash Shell Scripting: In-List Syntax of `for` 2-31

Bash Shell Scripting: Controlled Loop Syntax of `for` 2-32
Summary 2-33
Practice 2 Overview: Working with Linux 2-34

3 Preparing Linux for Oracle

Objectives 3-2
Linux Distribution: Overview 3-3
Supported Linux Distributions 3-4
Linux Kernel 3-5
Verifying the Kernel 3-6
Interpreting the Linux Kernel Version Number 3-7
A Tainted Linux Kernel 3-9
Checking for a Tainted Kernel 3-10
`/proc` System 3-11
Using the `/proc` System 3-12
Setting Kernel Parameters 3-13
Linux Packages 3-16
Managing Packages with `rpm` 3-17
Managing Packages with `yum` 3-19
Required Software 3-21
Linux Patches 3-22
Using the `oracle-validated` RPM 3-23
Quiz 3-24
Creating Groups 3-25
Creating and Viewing a Group 3-27
Creating the Oracle Software Owner 3-28
Quiz 3-30
The `nobody` User 3-31
Summary 3-32
Practice 3 Overview: Preparing Linux for Oracle 3-33

4 Installing Oracle on Linux

Objectives 4-2
Installing Oracle Database Software 4-3
Setting Environment Variables Preinstallation 4-4
Optimal Flexible Architecture 4-5
OFA Characteristics 4-6
Mount Points 4-8
`ORACLE_HOME` and `ORACLE_BASE` 4-9
Creating Oracle Directories 4-10

- Quiz 4-11
- Installing New Releases 4-12
- Managing Multiple Versions 4-13
- Setting Oracle Environment Variables 4-15
- Performing a Silent or Suppressed Installation 4-17
- Oracle Patch Utility 4-18
- Oracle `relink` Utility 4-20
- Troubleshooting 4-21
- Summary 4-22
- Practice 4 Overview: Installing Oracle on Linux 4-23

5 Managing Storage on Linux

- Objectives 5-2
- Oracle Database and I/O Configuration 5-3
- Oracle Database Storage Options 5-4
- Supported Linux I/O Modes 5-5
- Disks and Partitions 5-6
- Managing Partitions 5-8
- Managing Partitions Using `fdisk` 5-9
- Managing Partitions Using `parted` 5-10
- Logical Volume Manager Concepts 5-11
- Attached Storage 5-12
- Linux and File Systems 5-13
- File System Characteristics 5-14
- Recommended and Supported File Systems 5-16
- Automatic Storage Management 5-18
- Quiz 5-19
- `ext2` and `ext3` 5-20
- Oracle Cluster File System 2 5-21
- Directories and File Systems 5-22
- `mount` and `umount` 5-23
- `fstab` 5-24
- Monitoring Disk Usage and Free Space 5-26
- Quiz 5-27
- Verifying File System Integrity 5-28
- Summary 5-29
- Practice 5 Overview: Monitoring Storage 5-30

6 Using Oracle ASM on Linux

- Objectives 6-2

Automatic Storage Management 6-3
ASM: Key Features and Benefits 6-4
ASM Concepts 6-5
Automatic Storage Management Library Driver (ASMLib) 6-6
Installing and Configuring ASMLib 6-7
Quiz 6-9
Configuring Disks 6-10
Marking Disks As ASM Disks 6-11
Quiz 6-12
Creating an ASM Instance 6-13
ASM and ASMLib Installation and Configuration Summary 6-14
ASM Installation: Best Practices 6-15
Quiz 6-16
Disk Group: Best Practices 6-17
Summary 6-18
Practice 6 Overview: Installing and Configuring ASMLib and ASM 6-19

7 Automating Oracle on Linux

Objectives 7-2
Automating Tasks 7-3
Starting Oracle Processes After Reboot 7-4
Linux Startup Sequence 7-5
Linux Runlevels 7-7
Linux Runlevel Scripts 7-8
Quiz 7-10
Linux Services 7-11
Overview: Automating Startup and Shutdown 7-12
1. Creating a Service Script 7-13
Calling Oracle-Provided Scripts 7-15
oratab File 7-16
dbstart Script 7-17
dbshut Script 7-18
2. Setting dbora File Permission 7-19
3. Registering the Service 7-20
Quiz 7-21
Job Capabilities of DB Control and EM Grid Control 7-22
Linux Scheduling Tools 7-23
Scheduling a Backup with cron 7-25
Summary 7-26
Practice 7 Overview: Automating Tasks 7-27

8 Optimizing Linux for Oracle

Objectives 8-2

Basic Tuning Methodology 8-3

Key Areas to Monitor and Tune 8-4

Standard Measurement Tools 8-5

Linux Tools 8-7

Monitoring and Tuning CPU 8-9

Is the CPU a Bottleneck? 8-10

CPU Measurements 8-12

Measuring CPU Activity with `mpstat`, `sar`, and `vmstat` 8-14

Interpreting CPU Measurements 8-17

Reducing CPU Bottlenecks 8-18

Monitoring and Tuning Memory 8-19

Measuring Memory Usage 8-20

Measuring Total Memory 8-22

Measuring Memory Usage with `sar` and `vmstat` 8-24

Quiz 8-26

Interpreting Memory Measurements 8-27

Reducing Memory Bottlenecks 8-28

Monitoring and Tuning Disk I/O 8-29

Is Disk I/O a Bottleneck? 8-30

Disk I/O Measurements 8-31

Measuring Disk I/O with `iostat` 8-32

Measuring Disk I/O with `sar` 8-34

Interpreting Disk I/O Measurements 8-35

Reducing Disk I/O Bottlenecks 8-36

Basic Oracle Database Optimizations 8-37

Basic Linux Optimizations 8-39

Page Address Extensions (PAE) for 32-Bit Systems 8-40

Hugepages 8-41

Direct and Asynchronous I/O 8-42

Summary 8-43

Practice 8 Overview: Tuning Performance 8-44

9 Additional Linux Tips for DBAs

Objectives 9-2

Simple Shell Scripts to Simplify DBA Tasks 9-3

Locating `tnslsnr` Ports 9-4

Finding Files with `SETUID` or `SETGID` Set 9-5

Using `watch` Command 9-7
Adding Command History to SQL*Plus 9-8
Quiz 9-9
Capturing System Data Using Scripts 9-10
Using `iostat` to Capture I/O History 9-11
Finding Background Processes 9-13
Finding Server Processes 9-15
Killing Server Processes 9-16
Quiz 9-17
Killing Processes Using `pkill` 9-18
Querying Output in an Environment Variable 9-19
Summary 9-20
Practice 9 Overview: Additional Linux Tips for DBAs 9-21

10 Troubleshooting Oracle Issues on Linux

Objectives 10-2
Monitoring Alert Log with ADRCI 10-3
ORA-600 Errors 10-4
ORA-7445 Errors 10-5
Resolving ORA-600/ORA-7445 Errors 10-6
Process Hierarchy 10-8
`pstree` 10-9
Quiz 10-10
Viewing the Startup Environment for a Process 10-11
Viewing the Status of a Process 10-12
Viewing the Mapped Files for a Process 10-13
Tracking the Heap Size of a Process 10-14
Viewing Shared Memory 10-15
Viewing Shared Memory Segments Pre-11g 10-16
Viewing Shared Memory Segments in Oracle Database 11g 10-17
Viewing Semaphore Usage 10-18
Recovering from Database Crashes 10-19
Debugging a Core Dump 10-22
Viewing the Stack of a Running Process 10-24
Recording Shell Activity 10-25
`strace` 10-26
Summary 10-28
Practice Overview: Troubleshooting Oracle Issues on Linux 10-29