Contents

1 Introduction
   Overview  1-2
   Course Goals  1-3
   Course Agenda: Day 1  1-4
   Course Agenda: Day 2  1-5
   Course Agenda: Day 3  1-6
   Course Agenda: Day 4  1-7
   Course Agenda: Day 5  1-8
   Introductions  1-9
   Your Learning Center  1-10
   Your Lab Environment  1-11

2 Installing Oracle Solaris 11 by Using an Interactive Installer
   Objectives  2-2
   Workflow Orientation  2-3
   Lesson Agenda  2-4
   Importance of Working from a Plan  2-5
   Planning for an Oracle Solaris 11 OS Installation  2-6
   Identifying Network Configuration Options  2-8
   Installation Process  2-9
   Methods for Installing an Oracle Solaris 11 Operating System  2-10
   Differences Between LiveCD GUI and Text Installers  2-11
   Identifying Pre-installation Tasks  2-12
   Identifying System Requirements  2-13
   Identifying Additional Installation Considerations  2-14
   Checking Device Drivers  2-15
   Quiz  2-16
   Lesson Agenda  2-19
   Installing Oracle Solaris 11 Using an Interactive Installer  2-20
   Preparing for the Installation  2-21
   Performing the Installation  2-22
   Installing Oracle Solaris 11 by Using the LiveCD with GUI Installer  2-23
   Introducing the LiveCD Desktop  2-25
   Initiating the Installation with LiveCD  2-26
   Welcome Screen  2-27
Selecting a Disk    2-28
Setting the Time Zone, Date, and Time    2-29
Providing User Information    2-30
Reviewing Installation Specifications    2-31
Monitoring the Installation    2-32
Verifying the Installation    2-33
Reviewing the Installation Log    2-34
Rebooting the System    2-37
Login Screen    2-38
Practice 2-1 Overview: Installing Oracle Solaris 11 by Using the GUI Installer on the LiveCD    2-39
Installing Oracle Solaris 11 by Using the Text Installer    2-40
Initiating the Installation with Text Installer    2-41
"Welcome to Oracle Solaris" Screen    2-42
Selecting a Disk    2-43
Selecting an Fdisk Partition    2-44
Selecting a Network    2-45
Manually Configuring the Network    2-46
DNS Name Service    2-47
Alternate Name Service    2-48
Selecting the Time Zone: Regions    2-49
Setting the Time Zone: Locations    2-50
Selecting the Time Zone    2-51
Setting the Date and Time    2-52
Providing User Information    2-53
Reviewing Installation Summary    2-54
Monitoring the Installation    2-55
Verifying the Installation    2-56
Reviewing the Installation Log    2-57
Rebooting the System    2-58
Login Screen    2-59
Practice 2-2 Overview: Installing Oracle Solaris 11 Using the Text Installer    2-60
Lesson Agenda    2-61
Verifying the Operating System Installation    2-62
Checking the Login Username    2-63
Checking the Login Password    2-64
Using the First Time Login Assistant (LiveCD GUI)    2-65
Selecting a Login Session (LiveCD GUI)    2-66
Selecting a Language (LiveCD GUI)    2-67
Accessing a Terminal Window from Gnome (LiveCD GUI)    2-68
Verifying the Host Name    2-69
3 Updating and Managing Software Packages

Objectives  3-2
Workflow Orientation  3-3
Lesson Agenda  3-4
Planning for an Oracle Solaris 11 OS Software Update  3-5
Software Update Plan  3-6
Software Update Process: Overview  3-7
Installing and Managing Packages  3-10
Updating the Operating System  3-11
Introducing Boot Environments  3-12
New Boot Environment Creation: Example  3-13
Introducing Boot Environments  3-14
Introducing the IPS Interfaces  3-15
Implementing the Software Update Plan  3-16
Quiz  3-17
Lesson Agenda  3-20
Updating the Oracle Solaris 11 Operating System  3-21
Performing the Update with the Command-Line Interface (CLI)  3-22
Performing the Update with Package Manager  3-23
Monitoring the Update with Package Manager  3-26
Rebooting the System  3-27
Practice 3-1 Overview: Verifying Access to the IPS Server  3-28
Lesson Agenda  3-29
Managing Software Packages  3-30
Listing Package State Information with the CLI  3-31
Displaying Package Information with the CLI  3-33
Displaying the Contents of a Package with the CLI  3-34
Updating an Installed Package with the CLI  3-35
Installing a Package with the CLI  3-36
Run Levels  4-13
SMF Milestones  4-14
Oracle Solaris Boot Design  4-15
Boot PROM for SPARC Systems  4-16
Boot PROM Initialization Sequence  4-17
BIOS and GRUB Initialization Sequence for x86 Systems  4-19
Boot Process  4-20
How Oracle Solaris Boot Archives Are Managed  4-22
Implementing the Services Administration Plan  4-23
Quiz  4-24
Lesson Agenda  4-26
Administering SMF Services  4-27
Listing Services Information  4-28
Displaying the Status of a Service Instance  4-29
Identifying Service States  4-30
Setting Up Service State Transition Notifications  4-31
Installing the smtp-notify Package  4-32
Enabling the smtp-notify:default Service  4-33
Configuring Service State Transition Notifications  4-34
Service State Transition Notification: Example  4-35
Managing Service State Transition Notifications  4-37
Displaying the Service Dependents  4-38
Displaying the Dependencies of a Service  4-39
Disabling a Service  4-40
Enabling a Service  4-41
Refreshing and Restarting a Service  4-42
Practice 4-1 and Practice 4-2 Overview: Administering Services and Administering
SMF Notifications  4-43
Lesson Agenda  4-44
Booting a System  4-45
Booting a SPARC-Based System  4-46
Booting a SPARC System to Run Level 3 (Multiuser-Server Milestone)  4-47
Booting a SPARC System to Run Level S (Single-User Milestone)  4-48
Booting an x86 System  4-49
Booting an x86 System to Run Level 3 (Multiuser-Server Milestone)  4-50
Booting an x86 System to Run Level S (Single-User Milestone)  4-51
Fast Reboot  4-52
Initiating a Fast Reboot of a SPARC-Based System  4-53
Initiating a Fast Reboot of an x86-Based System  4-54
Shutting Down a System  4-55
Determining Who Is Logged In to a System  4-56
5 Setting Up and Administering Data Storage

Objectives 5-2
Workflow Orientation 5-3
Lesson Agenda 5-4
Planning for Data Storage Management 5-5
What Is ZFS? 5-6
ZFS Storage Pools 5-7
ZFS File Systems 5-8
ZFS Snapshots 5-9
ZFS Clones 5-10
Determining Your ZFS Storage Pool Requirements 5-11
ZFS Storage Pool Components 5-12
ZFS Storage Pool Components: Disks 5-13
ZFS Storage Pool Components: Slices 5-15
ZFS Storage Pool Components: Files 5-16
ZFS Storage Pool Components: Virtual Devices 5-17
Virtual Devices and Dynamic Striping 5-18
ZFS Storage Pool Data Redundancy 5-21
Mirrored Storage Pool Configuration: Examples 5-22
RAID-Z Storage Pool Configuration: Examples 5-23
Determining ZFS File System Configuration Requirements 5-24
Identifying Data Backup and Restore Requirements 5-26
Implementing the Data Storage Management Plan 5-27
Quiz 5-28
Lesson Agenda 5-31
Creating ZFS Storage Pools 5-32
Creating a Basic Storage Pool 5-33
Determining Local Storage Disk Availability 5-34
Creating a Mirrored Storage Pool 5-35
Creating a RAID-Z Storage Pool 5-36
Default Mount Point for Storage Pools 5-37
Destroying a ZFS Storage Pool 5-38
ZFS Storage Pool Properties 5-39
Displaying Pool Properties 5-40
Querying ZFS Pool Status 5-43
Displaying Basic Pool Usage Information 5-44
Displaying Specific Pool Statistics  5-45
Viewing Pool I/O Statistics  5-47
Determining the Health Status of a Pool  5-50
Displaying Pool Command History  5-56
Quiz  5-57
Practice 5-1 Overview: Administering ZFS Storage Pools  5-62
Lesson Agenda  5-63
Administering ZFS File Systems  5-64
Creating a ZFS File System  5-65
Destroying a ZFS File System  5-67
Renaming a ZFS File System  5-69
Querying ZFS Properties  5-72
ZFS Properties  5-73
Types of Native ZFS Properties  5-74
Identifying Native ZFS Properties  5-75
Listing Basic ZFS Information  5-76
Mounting and Unmounting ZFS File Systems  5-78
Mounting ZFS File Systems  5-79
Unmounting a ZFS File System  5-81
Quiz  5-82
Practice 5-2 Overview: Administering ZFS File Systems  5-85
Lesson Agenda  5-86
Administering ZFS Snapshots and Clones  5-87
Creating a ZFS Snapshot  5-88
Destroying a ZFS Snapshot  5-90
Displaying a ZFS Snapshot  5-91
Snapshot Space Accounting  5-93
Creating a ZFS Clone  5-95
Relationship of Clone and Snapshot  5-96
Destroying a ZFS Clone  5-97
Quiz  5-98
Practices 5-3 and Practice 5-4 Overview: Administering ZFS Snapshots and
   Clones and Administering ZFS Pools with Disk Slices  5-99
Summary  5-100

6 Administering Oracle Solaris Zones

Objectives  6-2
Workflow Orientation  6-3
Lesson Agenda  6-4
Planning for Oracle Solaris Zones  6-5
Oracle Solaris Zone Technology: Overview  6-6
Zones Server Consolidation: Example 6-7
Oracle Solaris Zones: Requirements and Restrictions 6-8
Global and Non-Global Zones and How They Work 6-9
Branded Zones 6-10
Zone IP Network Connectivity 6-11
Network Virtualization with Zones 6-12
Resource Management 6-13
Zone Resource Management 6-14
Allocating System Resources to a Zone 6-16
Non-Global Zone Configuration Process: Overview 6-17
Identifying Non-Global Zone States 6-19
Implementing the Oracle Solaris Zones Plan 6-21
Quiz 6-22
Lesson Agenda 6-26
Determining an Oracle Solaris Zone Configuration 6-27
Displaying the Current Zones Configuration on the System 6-28
Determining the Current Zone Configuration 6-29
Displaying a Zone Configuration 6-30
Displaying Zone Network Information 6-32
Determining a Zone’s Resource Utilization 6-33
Quiz 6-35
Practice 6-1 Overview: Determining an Oracle Solaris Zone’s Configuration 6-37
Lesson Agenda 6-38
Administering an Oracle Solaris Zone 6-39
Delegated Administration for Zones 6-40
Logging In to a Zone 6-41
Exiting a Non-Global Zone 6-42
Shutting Down a Non-Global Zone 6-43
Starting Up a Zone 6-44
Halting a Zone 6-45
Quiz 6-46
Practice 6-2: Administering an Oracle Solaris Zone 6-48
Summary 6-49

7 Administering a Physical Network
Objectives 7-2
Workflow Orientation 7-3
Lesson Agenda 7-4
Planning for Network Management 7-5
TCP/IP Protocol Architecture Model 7-6
How TCP/IP Handles Data Communications 7-9
Networking Stack  7-10
IPv4 Addressing   7-12
IPv6 Addressing   7-14
Unicast, Multicast, and Broadcast Addressing   7-16
Subnets, Netmasks, and Subnet Masks   7-17
Implementing the Network Management Plan   7-18
Quiz   7-19
Lesson Agenda   7-22
Determining Datalink Availability   7-23
Determining Which Physical Links Are Available   7-24
Determining Which Datalinks Are Available   7-25
Verifying That the Network Service Is Running   7-27
Lesson Agenda   7-28
Configuring a Network Interface   7-29
Displaying Network Interface Configuration Information   7-30
Displaying Network Interface IP Address Information   7-31
Creating a Network Interface   7-32
Assigning an IP Address to the Network Interface   7-33
Verifying the IP Address Assignment   7-34
Lesson Agenda   7-35
Administering a Network Interface   7-36
Taking Down a Network Interface   7-37
Bringing Up a Network Interface   7-38
Deleting an IP Address for a Network Interface   7-39
Deleting a Network Interface   7-40
Summary of ipadm Commands   7-41
Practice 7-1 Overview: Manually Configuring the Network Interface   7-42
Lesson Agenda   7-43
Verifying Network Operation   7-44
Checking Connection to the DNS Server   7-45
Examining the Status of All Network Interfaces   7-46
Checking Network Connectivity and Response Times   7-50
Checking Network Interface Traffic Status   7-51
Quiz   7-52
Practice 7-2: Verifying Network Operation   7-53
Summary   7-54

8 Setting Up and Administering User Accounts
Objectives   8-2
Workflow Orientation   8-3
Lesson Agenda   8-4
Viewing the Default /etc/.login Site Initialization File 8-60
Modifying the System-Wide Initialization Files 8-62
User Initialization Files 8-63
Customizing the User’s Work Environment 8-65
Accessing the Initialization File Templates 8-66
Setting Environment Variables in the User Initialization Files 8-67
Practice 8-3: Managing User Initialization Files 8-68
Lesson Agenda 8-69
Using Shell Metacharacters and Configuring User Disk Quotas 8-70
Using Shell Metacharacters 8-71
Using the Tilde (~) Character 8-72
Using the Dash (–) Character 8-73
Using the Asterisk (*) Character 8-74
Using the Question Mark (?) Character 8-75
Using the Bracket ([]) Characters 8-76
Configuring User Disk Quotas 8-77
Setting Quotas for ZFS File Systems 8-78
Setting and Displaying a User Quota 8-79
Displaying General Space Usage 8-80
Identifying Individual User Space Usage 8-81
Removing User Quotas 8-82
Practice 8-4: Exploring Shell Metacharacters and User Quotas 8-83
Summary 8-84

9 Controlling Access to Systems and Files
Objectives 9-2
Workflow Orientation 9-3
Lesson Agenda 9-4
Planning for System and File Access Control 9-5
Controlling Access to Systems 9-6
Login and Password Security 9-7
Password Algorithms and the /etc/security/policy.conf File 9-8
/etc/security/crypt.conf File 9-9
Superuser Limiting and Monitoring 9-10
Controlling Access to Files 9-11
File Types 9-12
UNIX File Permissions 9-13
Interpreting File Permissions 9-14
Special File Permissions 9-15
File Permission Modes 9-17
Setting File Permissions in Symbolic Mode 9-18
10 Managing System Processes and Scheduling System Tasks

Objectives 10-2
Workflow Orientation 10-3
Lesson Agenda 10-4
Planning for System Processes Management 10-5
System Processes 10-6
Parent and Child Processes 10-7
Viewing the Parent/Child Process Relationship 10-8
Identifying the Process Subsystems 10-9
Identifying the Process States 10-10
Managing and Controlling Processes 10-11
Terminating Unwanted Processes 10-12
Scheduling Routine System Administration Tasks 10-14
Interpreting the crontab File Format 10-15
Displaying the Default root cron File 10-16
Introducing the crontab Files 10-18
Introducing the Default cron.deny File 10-19
Implementing the System Process Management Plan 10-20
Quiz 10-21
Lesson Agenda 10-24
Managing System Processes 10-25
Listing System Processes 10-26
Displaying Information About Processes 10-29
Displaying Active Process Statistics 10-30
11 Performing Basic System Monitoring and Troubleshooting

Objectives 11-2
Workflow Orientation 11-3
Lesson Agenda 11-4
Monitoring System Logs 11-5
syslogd Daemon 11-6
/etc/syslog.conf File 11-7
Interpreting the /etc/syslog.conf File Selector facility Field 11-8
Interpreting the /etc/syslog.conf File Selector level Field 11-10
Interpreting the /etc/syslog.conf File Action Field 11-11
Monitoring a syslog File in Real Time 11-12
Interpreting System Messages 11-13
Lesson Agenda 11-15
What Is a Core File? 11-16
Core File Generation: Advantages and Disadvantages 11-17
Lesson Agenda 11-18
Crash Dump Process: Overview 11-19
How and Where Crash Dump Files Are Saved 11-20
Crash Dump: Example 11-21
Lesson Agenda 11-22