Oracle Solaris 11 System Administration

Activity Guide

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Chapter 1

Practices for Lesson 1

Practices Overview

Your project assignment is divided into multiple phases, which are listed in the Test Activities Checklist. The checklist topics are synchronized with the lesson practices.

Scenario

Your company plans to move to Oracle Solaris 11 during the next year. Because the company is a Fortune 500 company with thousands of both internal and external users who rely on being able to access, submit, modify, and store data on an as-needed basis, it is imperative that the transition to the new operating system is seamless to the end-user community.

As a new system administrator who is responsible for administering the Oracle Solaris 11 OS after it goes live, you are tasked with helping to test all aspects of the product's functionality. Your test activities range from installing the OS, to verifying network and zones configurations, to basic troubleshooting.

A list of the test activities is provided in the following checklist. Your senior system administrator will give you complete details about each test activity when it is time to complete each task.

√	Test Activities Checklist
	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
	Test the software update and package management functionality from both the command line and the GUI.
	Test the services functionality in Oracle Solaris 11.
	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris 11 zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task-scheduling functionality.
	Troubleshoot specific system issues.

Practices Infrastructure

This section presents an architectural view of the equipment and platforms for the course practices.

Multiple virtual machines (VMs) are configured on a private internal network (192.168.0). Each VM can communicate with other VMs on the same private network only (see Figure 1). Internet access is not configured from these VMs.
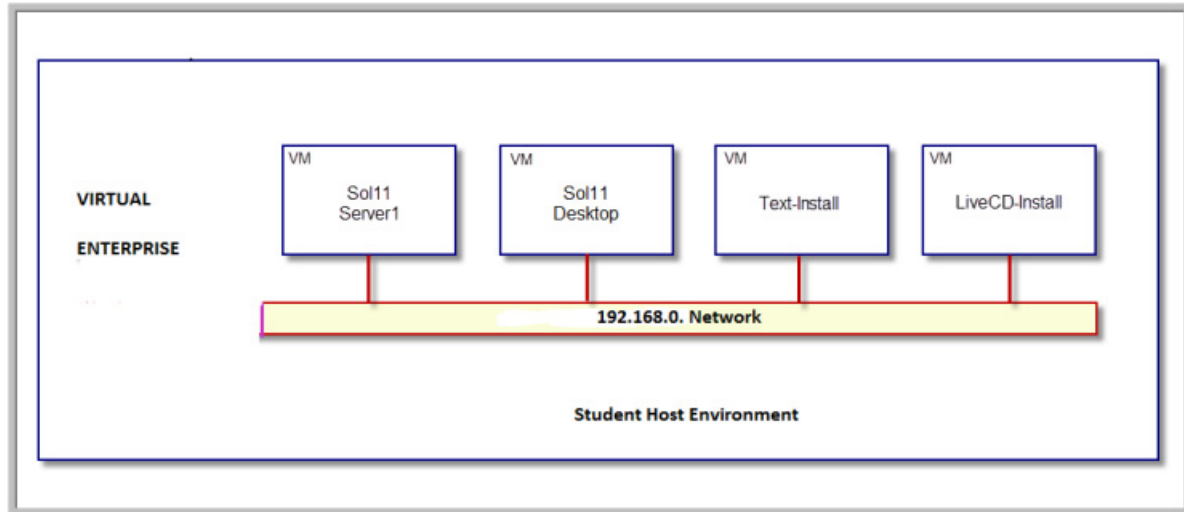
Figure 1: Practice Network Topology

Your practice environment is based on the Oracle VM VirtualBox virtualization software. The VirtualBox is a cross-platform virtualization application. Figure 2 shows the configured virtual machines. The Oracle Solaris 11 OS is installed on all virtual machines except the Text-Install and LiveCD-Install VMs, because they are used for OS installation.
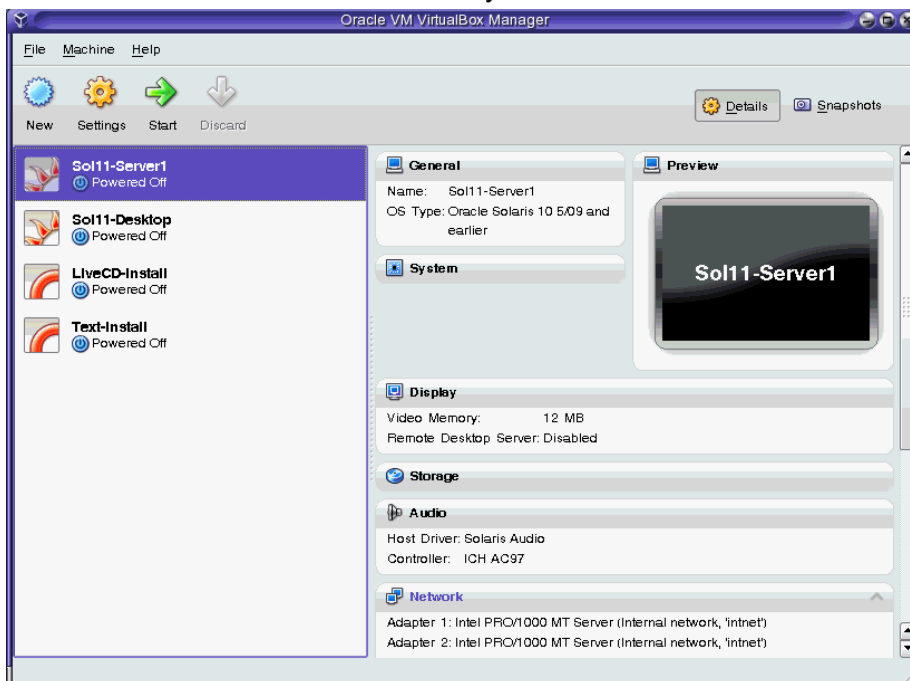
Figure 2: Oracle VM VirtualBox Manager

Practices for Lesson 1: Introduction

All the VMs are configured with 2 GB of memory with the exception of the Text-Install VM, which has 1 GB of memory. Most of the host machines have a total of 8 GB of RAM to work with. That is, you should not have more than three VMs running at any given time during the practices to avoid system overload.

All the student files are located in the `/opt/ora` directory. This directory contains mostly scripts that you may be directed to use to establish start- or end-state of a particular practice.

The following list briefly describes the virtual machines:

- **Sol11-Server1:** This VM provides network services, such as DNS, DHCP, and IPS used by other VMs in this virtual network. This VM should always be up and running. This VM also serves as a general purpose server. You use the command-line tools here.
- **Sol11-Desktop:** A general-purpose user machine with the GUI and other features normally available on a network client machine. Most of the facilities available in Sol11-Server1 are available in this VM.
- **LiveCD-Install:** The VM for Oracle Solaris 11 installation using Live CD mode
- **Text-Install:** The VM for Oracle Solaris 11 installation in command-line interactive (CLI) mode

Logging In to the Practice Environment

When you first log in to the practice environment, you are prompted to provide a login and password for the host system:

- **Userid:** `root`
- **Password:** `oracle`

Once you have gained access to the host system, the user account and password for each virtual machine is:

- **User account:** `oracle`
- **Password:** `oracle1`
- **Administrator privileges:** As the `oracle` user, use `su -` to switch to administrator (root) role. The password is `oracle1`. The `oracle` user switches to root because root is configured as a role by default. The first username created on the system (during the OS installation) is the initial privileged user who can assume the administrator role. This can be verified in the `/etc/user_attr` file.
- The following students have been created for you on Sol11-Server1 and Sol11-Desktop to use in the practices: They all have `oracle1` as the default password.

Account Name	User ID	Group	Name	Assigned Shell
jholt	60005	10	john holt	bash
jmoose	60006	10	jerry moose	bash
panna	60007	10	poly anna	bash
sstudent	60008	10	super student	sh (bourne shell)

Note: The Sol11-Server1 VM must be started *before* the Sol11-Desktop VM is started. The *Sol11-Server1 must always be running* to perform the practices in this guide.

Task 1: Becoming Familiar with Your Practice Environment

1. On your host system, start the Oracle VM VirtualBox Manager by double-clicking its icon on your desktop.

2. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Server1 virtual machine to start it. Alternatively, you can select the Sol11-Server1 VM and click the Start button.
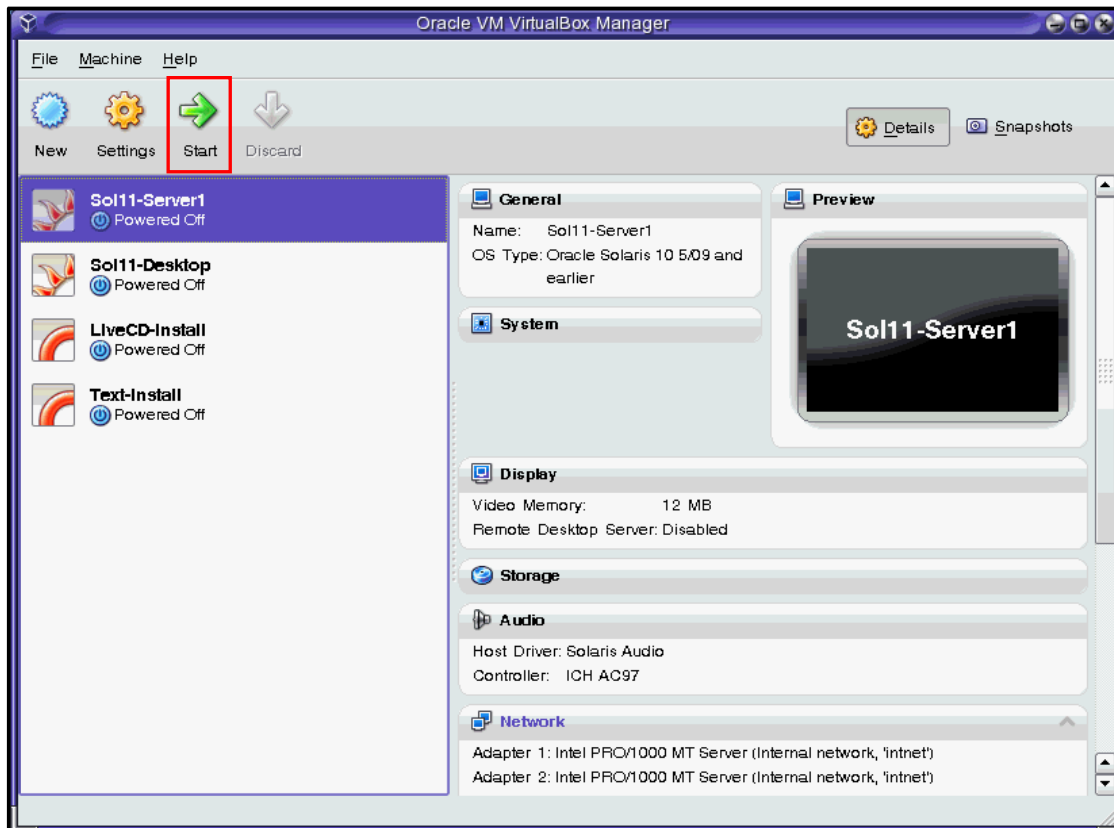
3. Once the Sol11-Server1 VM is powered on, at the command prompt, log in as the user `oracle` with the password `oracle1`.

   ```
   s11-server1 console login: oracle
   Password: oracle1
   oracle@s11-server1:~$
   ...
   oracle@s11-server1:~$ su –
   Password: oracle1
   ...
   root@s11-server1:~#
   ```

4. Start the Sol11-Desktop. When the Username login screen appears, enter `oracle` for the username and click the Log In button.

Practices for Lesson 1: Introduction

Note: It might take a few minutes for the Username login screen to appear.

5. When the Password login screen appears, enter the password `oracle1` and click the Log In button.

6. Open a terminal window by right-clicking on the desktop and selecting Open Terminal. In the terminal window, run the `su -` command to assume the administrator privileges. The password is `oracle1`.

```
oracle@s11-desktop:~$ su –
Password: oracle1
Oracle Corporation    SunOS 5.11    11.0        November 2011
root@s11-desktop:~#
```

Practices for Lesson 1: Introduction

7. At times, you may need to power off a VM and close its window. You may also need to shut down a VM to comply with the maximum recommended number of VMs running simultaneously, which is currently limited to three VMs.

You now practice shutting down a VM by using the Sol11-Desktop VM. To shut down the VM, click the "close" button (X) on the top-right corner of the VM window.
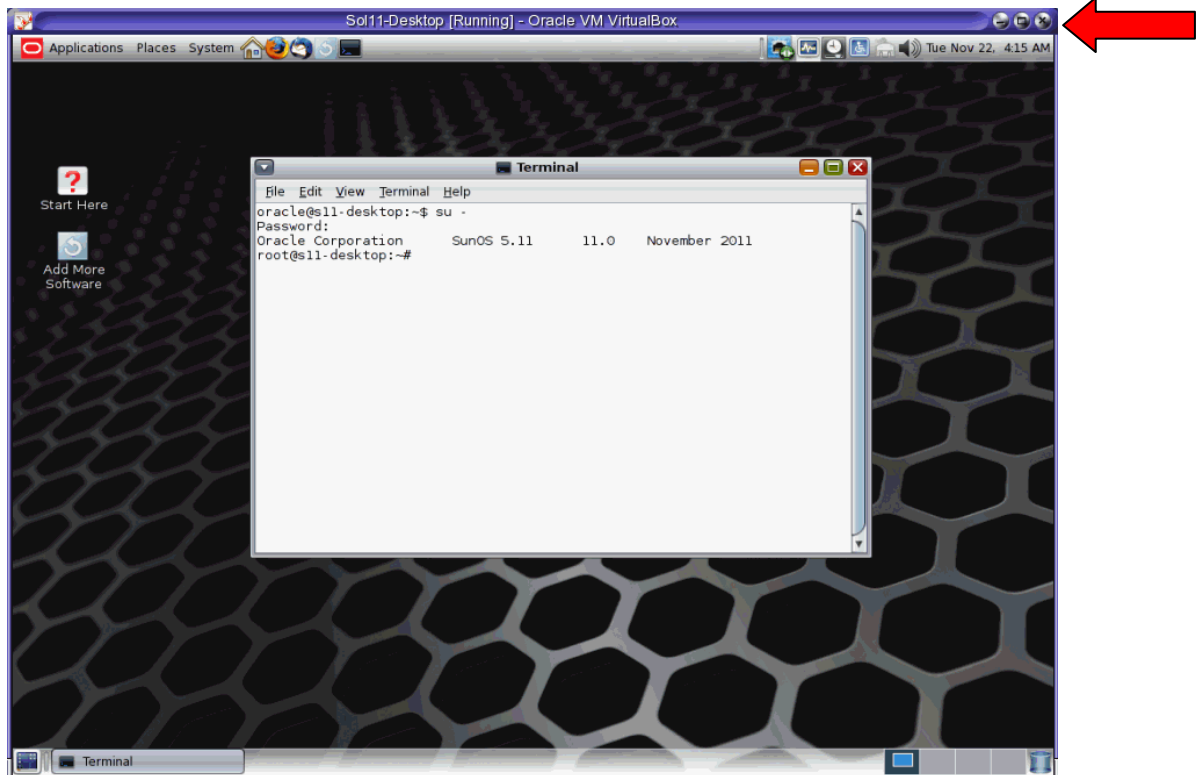
8. When the Close Virtual Machine dialog box appears, select "Power off the machine" and click OK.

Practices for Lesson 1: Introduction

Note: You can verify that the VM is shut down by checking the status that appears under the VM's name in the Oracle VM VirtualBox Manager. The status for the Sol11-Desktop should be "Powered Off." The status for the Sol11-Server1 should be "Running."
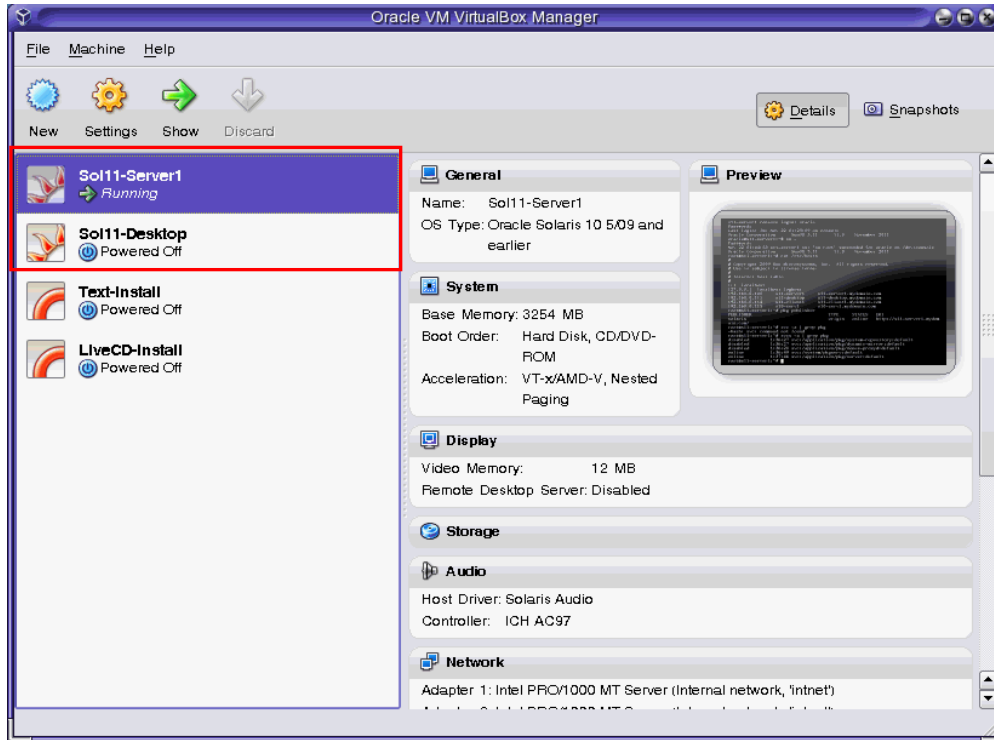
Practices for Lesson 2: Installing Oracle Solaris 11 Using an Interactive Installer

Chapter 2

Practices for Lesson 2

Practices Overview

In these practices, you are presented with a plan for installing the Oracle Solaris 11 operating system by using an interactive installer, and then you implement that plan. After completing the installation, you verify the operating system installation.

Your first test activity is to install the Oracle Solaris 11 OS on two test machines, both of which are x86-based. Because your system administration duties include supporting desktop users, you first test installing the OS on a host by using the LiveCD installer. You then test installing the OS on a host by using the text installer. You must verify the success of both installations by checking the installation logs, and then you reboot the system.

When you install the Oracle Solaris 11 OS by using the LiveCD installer, you must first download the Oracle Solaris 11 LiveCD install image from the following location:

http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html

The LiveCD installation download is in ISO image format, which can be burned to a CD/DVD or used directly within Oracle VM Server or other virtualization software.

When you install the Oracle Solaris 11 OS by using the text installer, you must first download the Oracle Solaris 11 text install image from the following location:

http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html.

The text installation download is in ISO image format, which can be burned to a CD/DVD or used directly within Oracle VM Server or other virtualization software.

These tasks have already been done for you:

- The OS images have been downloaded and saved for both the install types. You can find ISO images in the /opt/ora/iso directory.

- System requirements have been checked and met.

- The device drivers have been verified.

- Disk c3t0d0 would be the boot disk. You install the OS on this disk.

Practice 2-1: Installing Oracle Solaris 11 by Using the GUI Installer on the LiveCD

Overview

In this practice, you install the Oracle Solaris 11 operating system by using the GUI installer on the LiveCD. Your primary tasks are as follows:

- Launch the GUI.
- Install the OS.
- Verify the installation by reviewing the installation log.
- Reboot the system.
- Power off the VM.

LiveCD Installation Configuration Details

During the OS installation process, use the configuration data that follows to complete the LiveCD installation. Note that the disk number may differ depending on your system's configuration.

- Keyboard layout: Use *your local keyboard layou*t.
- Language: *Use your local language*.
- Disk: `c3t0d0`
- Disk Partition: `Use the whole disk`.
- Time Zone, Date and Time: *Click the city closest to your install location*.
- Locale:
  - Language: Set to your preference.
  - Territory: Set to your preference.
- User account:
  - Real name: `oracle`
  - Log-in name: `oracle`
  - User password: `oracle1`
  - Computer name: `solaris-live`

Tasks

1. Log in to the host machine and launch the Oracle VirtualBox Manager. You will be using the following VM for this task:

   • **LiveCD-Install:** The VM for Oracle Solaris 11 installation using Live CD mode.
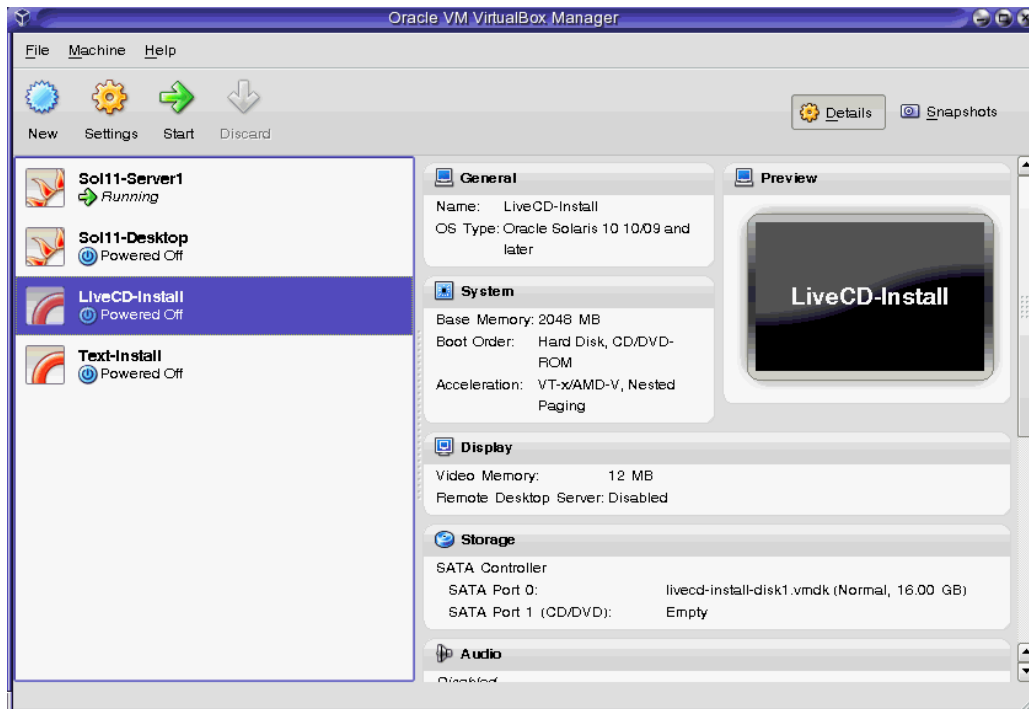
2. In the Oracle VM VirtualBox Manager window, click the LiveCD virtual machine. It is important that the LiveCD VM be in the Powered Off state at this time.

3. Click the Settings button.

4. Select the System tab. If the Base Memory is not 2048 MB, set it to 2048 MB and click the OK button.

.
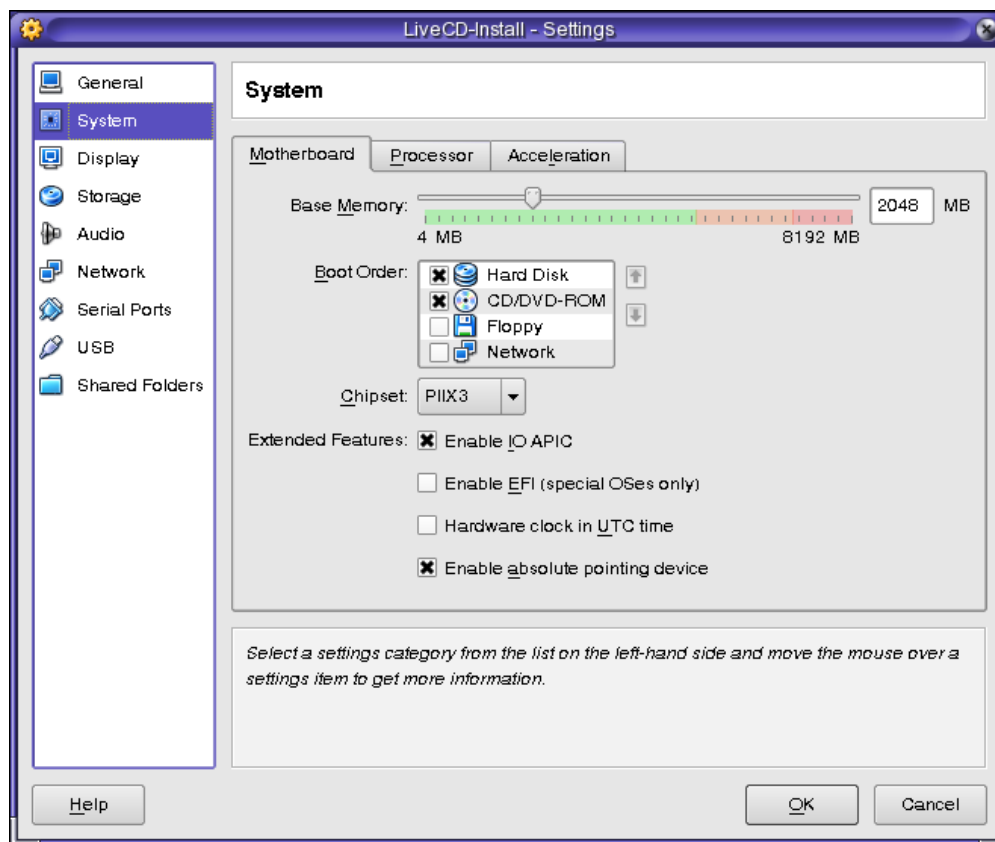
5. In the Oracle VM VirtualBox Manager window, verify that the LiveCD-Install virtual machine is still selected and then click the Settings button again.

6. Select the Storage tab. Verify that the `sol-11-1111-live-x86.iso` ISO image is mounted on the DVD. If it is not mounted, select Empty Disk (CD/DVD) and then search for the ISO image in the `/opt/ora/iso` folder. Select the ISO image and then click the OK button.

7. In the Oracle VM VirtualBox Manager window, click the Start button. This will boot the LiveCD-Install virtual machine from the LiveCD installer on the DVD to begin the OS installation. When the GRUB Menu is displayed, the system will automatically use the highlighted default entry. You do not need to take any action.

8. After the LiveCD image has been prepared, you are asked to select the keyboard layout and language. Make the selections based on your local environment. Note that when navigating through the installation, the F2 key usually works and is the hint that is displayed by default in the user interface. Esc-2 keys would be the fallback.

Note: It takes several minutes for the system to configure devices and to launch the LiveCD desktop GUI login screen. When the console login prompt appears, ignore it. You do not need to enter anything at this time.

9. When the LiveCD desktop is initialized, double-click the Install Oracle Solaris icon to begin the OS installation.

10. The Welcome screen appears. Read the welcome statement and then click Next to continue.

    Caution: The Release Notes button is a link to Oracle website. Do not click this button to access the Release Notes because you don't have access to the Internet.

11. The Disk screen appears. You will see one available disk (16.00 GB) which will be selected by default. Select "Use the whole disk" and click Next.

12. The "Time Zone, Date and Time" page appears. Select a city near you on the map or set your time zone below. Next, if necessary, set the date and time and then click Next.

13. The Users page appears. Enter the following and then click Next:

    - Real name: `oracle`

    - Log-in name: `oracle`

    - User password: `oracle1`

    - Computer name: `solaris-live`

14. The Installation summary page appears. Review the information and, if it is correct, click Install.

15. The Installing page appears. The installation takes about 20 minutes to complete.

16. After the LiveCD installation has completed, the Finished page appears. Take a moment to review the Oracle Solaris installation log.

17. After you have reviewed the installation log, click Reboot to start the newly installed software.

18. After the login screen has appeared, close the virtual machine by selecting the close button (x) in the top-right corner of the window.

19. When the Close Virtual Machine dialog box appears, select "Power off the machine" and click OK.

Practice 2-2: Installing Oracle Solaris 11 by Using the Text Installer

Overview

In this practice, you install the Oracle Solaris 11 operating system by using the text installer. Your primary tasks are as follows:

- Launch the installer.
- Manually configure the network.
- Install the OS.
- Verify the installation by reviewing the installation log.
- Reboot the system.

Text Installation Configuration Details

During the OS installation process, use the configuration data that follows to complete the text install installation.

Note: The text installer program may direct you to use the F2 key to move to the next step in the installation process. If F2 does not work, try using the Esc-2 key.

- Keyboard layout: *Use your local keyboard layout*.
- Language: *Use your local language*.
- Installation menu: `Install Oracle Solaris`
- Disk: `c3t0d0`
- Fdisk Partitions: `Use the whole disk`.
- Network:
  - Computer name: `solaris-text`
  - Ethernet network configuration: `manually`
  - IP address: `192.168.0.250`
- Time zone: *Use your local region*.
  - Region: Use your region.
  - Location: Use your location.
  - Time zone: Use your time zone.
- Date and time: *Set to current date and time*.
- Root password: `oracle1`
- User information:
  - Your real name: *your name*
  - Username: `oracle`
  - User password: `oracle1`

Tasks

1. Log in to the host machine and launch the Oracle VM VirtualBox Manager. In this task you will be using the following VM:

   - **Text-Install:** The VM for Oracle Solaris 11 installation in command-line interactive (CLI) mode.
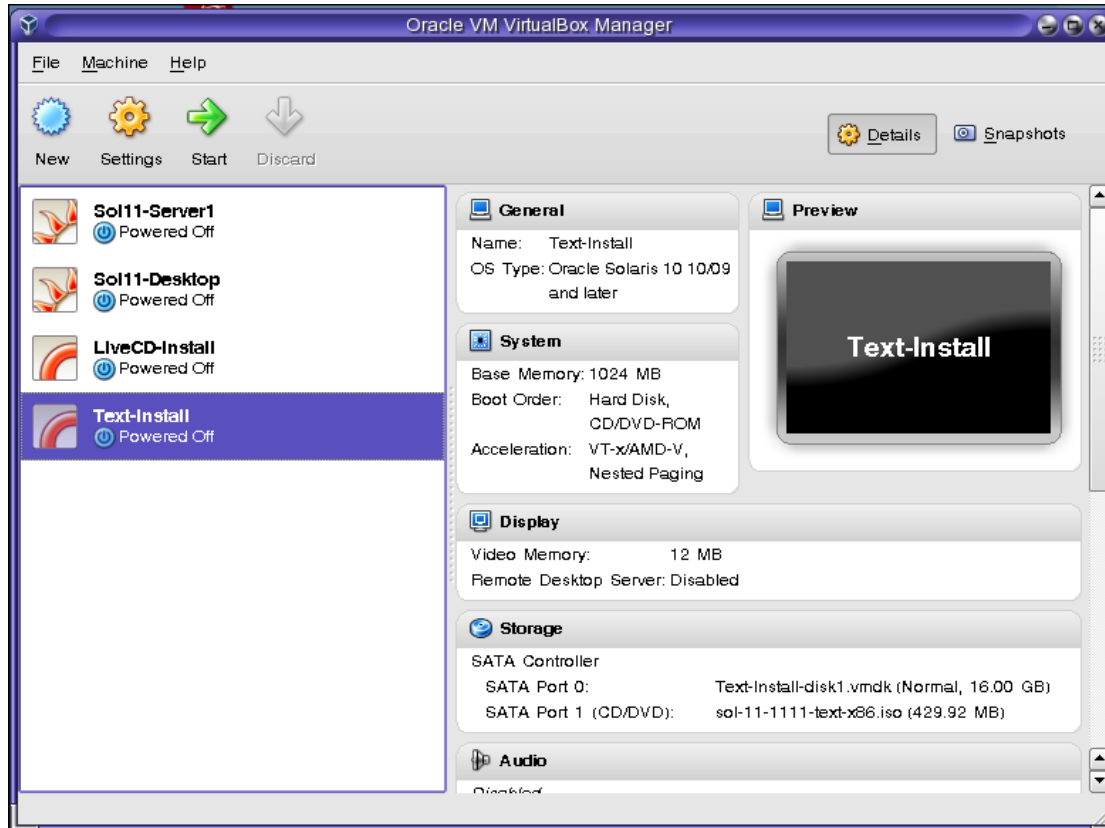
2. In the Oracle VM VirtualBox Manager window, click the Text-Install virtual machine. It is important that the Text-Install VM be in the Powered Off state at this time.

3. Click the Settings button.

4. On the System tab, if the Base Memory value for this VM is larger than the recommended 1 GB, change it to 1024 MB and click the OK button.
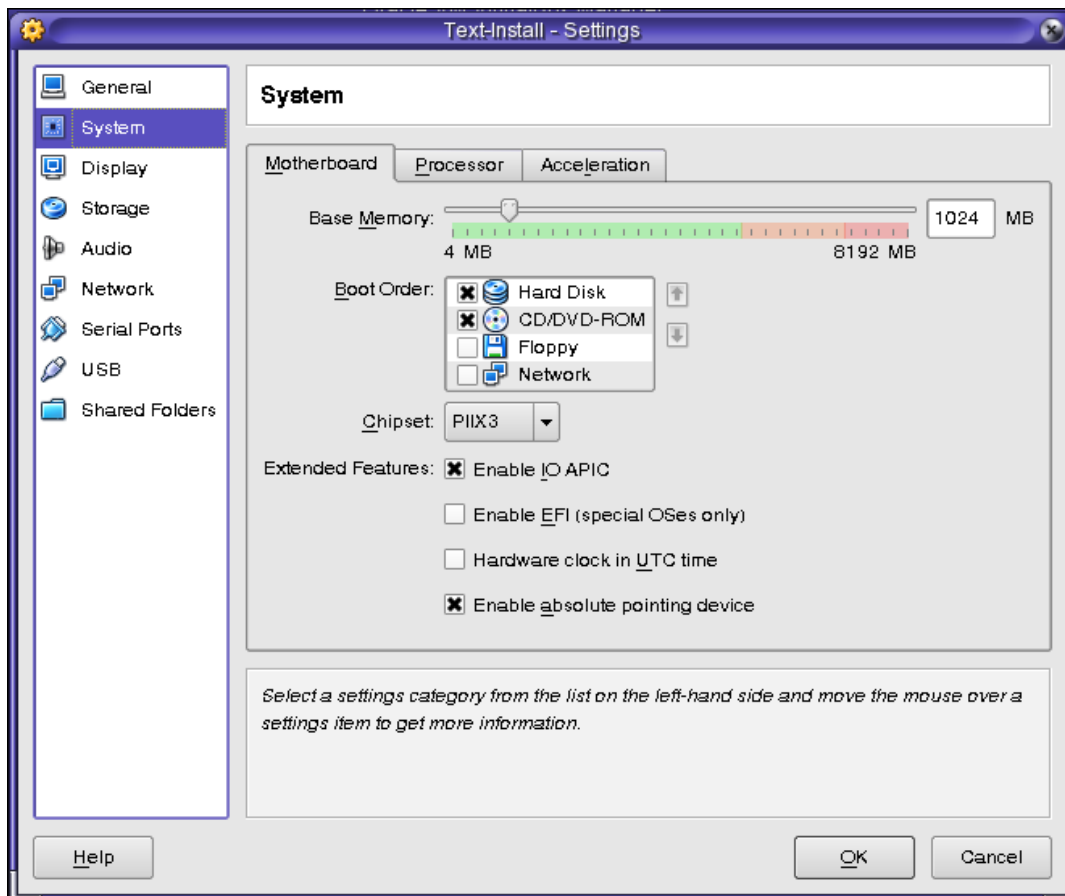
5. In the Oracle VM VirtualBox Manager window, verify that the Text-Install virtual machine is still selected and then click the Settings button again.

6. Select the Storage tab. Verify that the `sol-11-1111-text-x86.iso` ISO image is mounted in the DVD. If not, under SATA Controller, select Empty Disk and then search for the ISO image in the `/opt/ora/iso` folder. Select the ISO image and then click the OK button.

7. In the Oracle VM VirtualBox Manager window, click the Start button. This will boot the Text-Install virtual machine from the text installer on the DVD to begin the OS installation.

8. After the text install image has been prepared, you are asked to select the keyboard layout and language. Set these based on your local environment.

9. When the installation menu appears, select option #1, Install Oracle Solaris, to begin the OS installation.

10. The "Welcome to Oracle Solaris" screen appears. Read the welcome statement and then press F2 to continue.

11. The Disks screen appears. The device is selected by default. Press F2 to accept the default.

12. The Fdisk Partitions screen appears. The "Use the whole disk" option is selected by default. Press F2 to accept the default.

13. The Network screen appears. Part of the Computer Name is entered for you: `solaris`. After `solaris`, enter the following: **`-text`**. The Computer Name should read: `solaris-text`.

Practices for Lesson 2: Installing Oracle Solaris 11 Using an Interactive Installer

14. Move the selection box to Manually in the "Select how the wired ethernet network connection is configured" section. Press F2 to continue.

15. The Manually configure: `net0` screen appears. Enter `192.168.0.250` for the IP address. Press F2 to continue.

16. The DNS Name Service screen appears. Select "Do not configure DNS" and press F2 to continue.

17. The Alternate Name Service screen appears. Ensure that None is highlighted and then press F2 to continue.

18. The Time Zone: Regions screen appears. Select a region that contains your time zone and then press F2.

19. The Time Zone: Locations screen appears. Select a location that contains your time zone and then press F2.

20. The Time Zone screen appears. Select your time zone and then press F2.

21. The "Date and Time" screen appears. Edit the date and time as necessary and then press F2.

22. The Users screen appears. Enter the following and then press F2:

- Root password: **oracle1**

- Your real name: *your name*

- Your username: **oracle**

- User password: **oracle1**

23. The Installation Summary screen appears. Review the information and, if it is correct, press F2 to start the Install.

24. The Installing Oracle Solaris screen appears. The installation takes about 10 to 15 minutes to complete.

25. After the installation has completed, the Installation Complete screen appears. Press F4 to view the installation log. Check the log for error messages.

    Notice that the installation log is available at `/var/sadm/system/logs/install_log` after reboot.

26. After you have reviewed the installation log and verified that the installation has completed successfully, press F3 to return to the Installation complete screen.

27. When the Installation Complete screen appears, press F8 to reboot and start the newly installed software. The reboot takes a few minutes to complete.

    Note: If the F8 key does not work, press the F9-Quit key. This returns you to the installation menu. From the menu, select option 5 to reboot.

    Note: The system may display an `ocm` service error message, which you can ignore.

28. When the console login prompt appears, close the virtual machine by selecting the close button (x) in the top-right corner of the window.

29. When the Close Virtual Machine dialog box appears, select "Power off the machine" and click OK.

Practice 2-3: Verifying the Operating System Installation

Overview

In this practice, you verify the operating system installation. Your primary tasks are as follows:

- Verify login information.
- Verify the system's host name.
- Display basic system information.
- Display a system's release information.
- Display the boot disk configuration.
- Display installed memory size.
- Display network information.

Assumptions

You have successfully installed the operating system on the Text-Install machine.

Tasks

1. Log in to the host machine and launch the Oracle VM VirtualBox Manager.
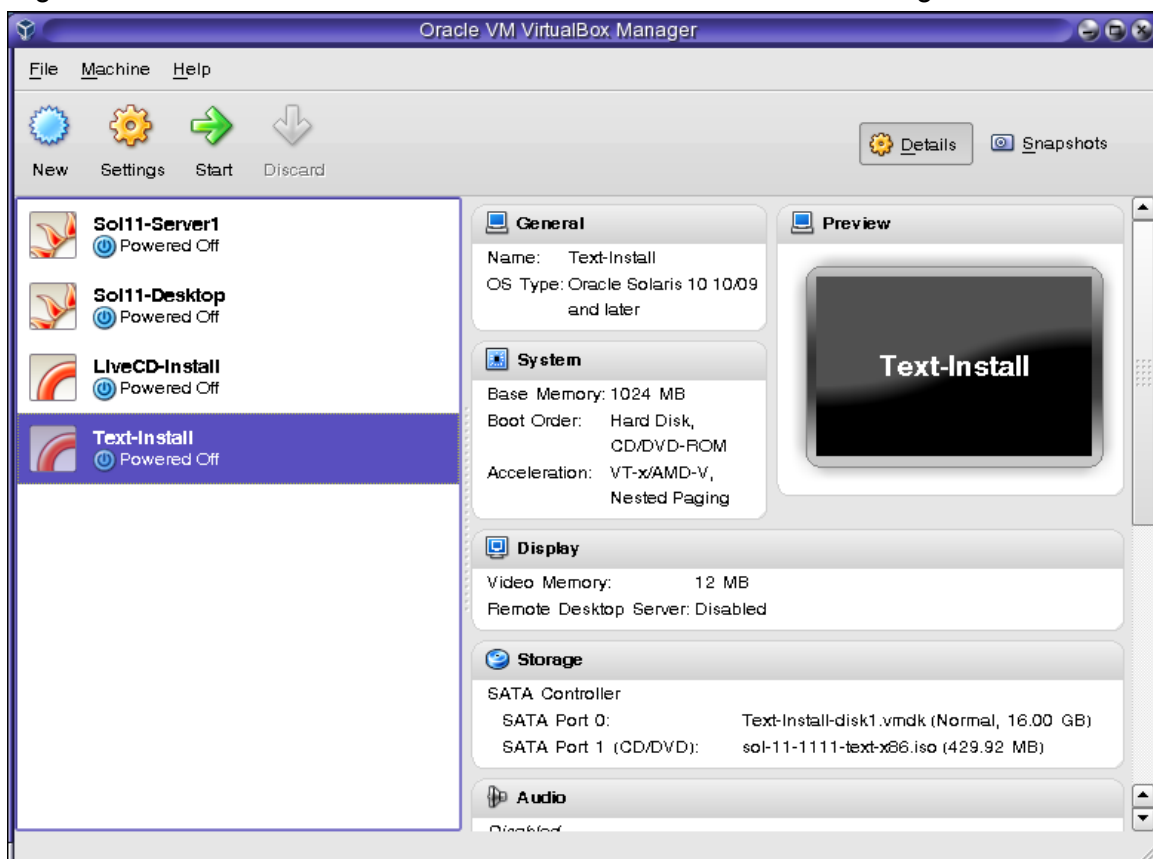
2. In the Oracle VM VirtualBox Manager window, double-click the Text-Install virtual machine to start it.

3. Enter the username `oracle` and press Enter.

4. Enter the password `oracle1` and press Enter. The user prompt appears.
   Note: The system may display a `send mail` message, which you can ignore.

5. Verify the host name. It should be solaris-text.

```
$ hostname
solaris-text
```

6. Display basic information about the system.

```
$ uname –a
SunOS solaris-text 5.11 11.0 i86pc i386 i86pc
```

7. Display the operating system release information.

```
$ cat /etc/release
                    Oracle Solaris 11 11/11 X86
      Copyright (c) 1983, 2011, Oracle and/or its affiliates.
                      All rights reserved.
                   Assembled 18 October 2011
```

8. Switch to the root role. Display the disk configuration information.

```
oracle@solaris-text:~$ su –
Password:
root@solaris-text:~# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c3t0d0 <ATA-VBOX HARDDISK-1.0 cyl 2085 alt 2 hd 255 sec 63>
          /pci@0,0/pci8086,2829@d/disk@0,0
Specify disk (enter its number):0
selecting c3t0d0
[disk formatted]
/dev/dsk/c3t0d0s0 is part of active ZFS pool rpool. Please see zpool (1M).


FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        fdisk      - run the fdisk program
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show vendor, product and revision
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> verify
```

Practices for Lesson 2: Installing Oracle Solaris 11 Using an Interactive Installer

```
Primary label contents:


Volume name = <          >
ascii name  = <ATA-VBOX HARDISK-1.0 cyl 2085 alt 2 hd 255 sec 63>
pcyl        = 2087
ncyl        = 2085
acyl        =    2
bcyl        =    0
nhead       =  255
nsect       =   63
Part       Tag    Flag     Cylinders        Size           Blocks
  0       root     wm      1 - 2084        15.96GB    (2084/0/0) 33479460
  1 unassigned     wm      0                0         (0/0/0)           0
  2     backup     wu      0 - 2086        15.99GB    (2085/0/0) 33527655
  3 unassigned     wm      0                0         (0/0/0)           0
  4 unassigned     wm      0                0         (0/0/0)           0
  5 unassigned     wm      0                0         (0/0/0)           0
  6 unassigned     wm      0                0         (0/0/0)           0
  7 unassigned     wm      0                0         (0/0/0)           0
  8       boot     wu      0 -    0        7.84MB     (1/0/0)       16065
  9 unassigned     wm      0                0         (0/0/0)           0

format> q

root@solaris-text:~#
```

9. Determine the amount of installed system memory.

```
root@solaris-text:~# prtconf | grep Memory
Memory size: 1024 Megabytes
```

10. Display the network connection configuration service to verify that the network service is online.

```
root@solaris-text:~# svcs network/physical
disabled   15:35:29 svc:/network/physical:nwam
online     15:35:09 svc:/network/physical:upgrade
online     15:35:09 svc:/network/physical:default
```

11. Display the network interface information.

```
root@solaris-text:~# ipadm show-addr
ADDROBJ          TYPE        STATE       ADDR
lo0/v4           static      ok          127.0.0.1/8
net0/v4          static      ok          192.168.0.250/24
lo0/v6           static      ok          ::1/128
net0/v6          addrconf    ok          fe80::a00:27ff:fe5e:a05e/10
```

Note that the network interface net0/v4 has been assigned the IPv4 address 192.168.0.250/24. This was the IP address you provided during the network configuration for the installation.

12. Close the virtual machine by selecting the close button (x) in the top-right corner of the window.
13. When the Close Virtual Machine dialog box appears, select "Power off the machine" and click OK.

You can now mark off the installation task that you just completed.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
	Test the software update and package management functionality from both the command line and the GUI.
	Test the services functionality in Oracle Solaris 11.
	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris 11 zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Practices for Lesson 3: Updating and Managing Software Packages

Chapter 3

Practices for Lesson 3

Practices Overview

In these practices, you are presented with a plan for updating the Oracle Solaris 11 operating system by using the Image Packaging System (IPS) and asked to implement that plan. After you have completed the update, you are asked to review the software packages that are on the system by using both the command line and Package Manager GUI.

> **Note:** In the lab environment, your virtual machine client cannot access the default repository on the Oracle website for software update services. For purposes of training, the Sol11-Server1 virtual machine has been set up as a local repository.

After installing a new operating system, it is common practice to ensure that you have the latest software updates (for example, packages) for the operating system. As part of your on-going software management activities, your next task is to update the Oracle Solaris 11 OS by installing the new packages that were not part of the OS. These packages may address software bugs or add new functionality. You will run through this management process by using both the command-line and Package Manager (GUI) options. After you perform the software update, you will verify that the new package has become part of the OS on your machine and is available for use.

Keep an eye on your progress by checking your Test Activities Checklist. Currently, you are testing the software update and package management functionality.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
	Test the software update and package management functionality from both the command-line and the GUI.
	Test the services functionality in Oracle Solaris 11.
	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris 11 zones functionality.
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	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

These tasks have already been done for you:

- The IPS repository has been downloaded from http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html.
- The local repository has been set up on Sol11-Server1.

Note: Your output displays might differ slightly from those shown in the guide, especially the storage units, number of packages, and process information.

Practice 3-1: Verifying Access to the IPS Server

Overview

Because you have a local package repository set up on Sol11-Server1, you must verify access to the repository. By default, clients are configured to use the default Oracle repository http://pkg.oracle.com/solaris/release/; however, this URL is inaccessible from this virtual setup. In this task, you verify that the desktop client can access the http://s11-server1.mydomain.com/ local repository. To ensure that your IPS publisher is set up correctly, your senior system administrator has asked you to run the following scripts: `ips_config`, which configures both IPS and the publisher on `s11-server1`, and `setpub`, which sets the publisher to solaris on the `s11-desktop`. You are told when to run the scripts in the steps that follow.

Tasks

1. Verify that the Sol11-Server1 VM is running. If not, double-click it to start it before performing the next step.

    Note: The Sol11-Server1 VM needs to be running during the practices. *Do not* start any VMs *before* first starting the S11-Server1 VM.

2. Log in as user `oracle`. Use the password `oracle1`.

3. Run the `su -` command to assume administrator privileges. The password is `oracle1`.

4. Change directories to `/opt/ora/scripts` and then run the `ips_config` script.

    ```
    root@s11-server1:`# cd /opt/ora/scripts
    root@s11-server1:`# ./ips_config | more
    ```

5. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.

6. Log in to the Sol11-Desktop virtual machine as user `oracle`. Use the password `oracle1`.

7. Right-click the desktop background and open a terminal window.

8. In the terminal window, run the `su -` command to assume administrator privileges. The password is `oracle1`.

    ```
    oracle@s11-desktop:~$ su -
    Password:
    Oracle Corporation     SunOS 5.11      11.0        November 2011
    root@s11-desktop:~#
    ```

9. Change directories to `/opt/ora/scripts` and then run the `setpub` script.

    ```
    root@s11-desktop:~# cd /opt/ora/scripts
    root@s11-desktop:~# ./setpub
    ```

10. Determine the host name and domain of this client.

    ```
    root@s11-desktop:~# hostname
    s11-desktop
    root@s11-desktop:~# nslookup s11-desktop
    Server:         192.168.0.100
    Address:        192.168.0.100#53

    Name: s11-desktop.mydomain.com
    Address: 192.168.0.111
    ```

11. Verify that this client can access the DNS service by resolving the IPS server host name.

```
root@s11-desktop:~# nslookup s11-server1
Server:          192.168.0.100
Address:         192.168.0.100#53


Name: s11-server1.mydomain.com
Address: 192.168.0.100
```

12. Verify that you have connectivity to the IPS server.

```
root@s11-desktop:~# ping s11-server1
s11-server1 is alive
root@s11-desktop:~#
```

13. List the current package publishers.

```
root@s11-desktop:~# pkg publisher
PUBLISHER                 TYPE    STATUS   URI
solaris                   origin  online   http://s11-server1.mydomain.com/
root@s11-desktop:~#
```

14. Test the client access to the IPS server by opening the http://s11-server1.mydomain.com URL in the Firefox browser.

Practices for Lesson 3: Updating and Managing Software Packages
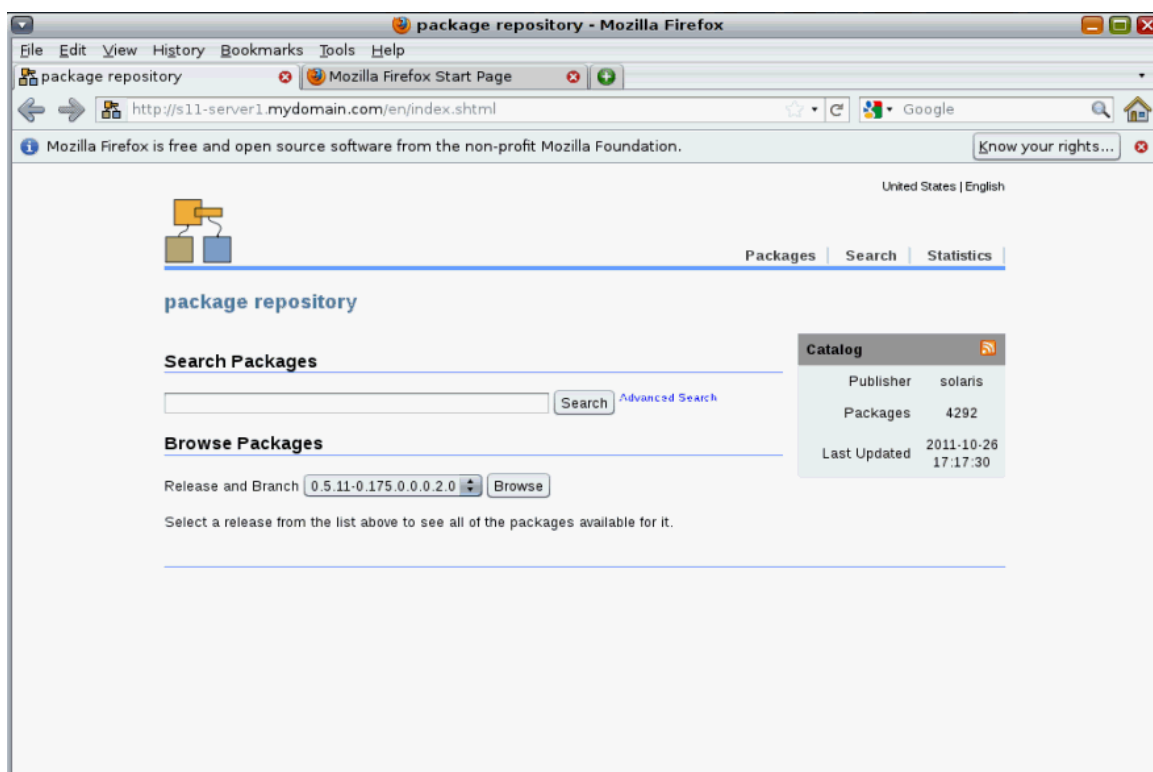
15. Using the package repository browser, search for the `entire` package:
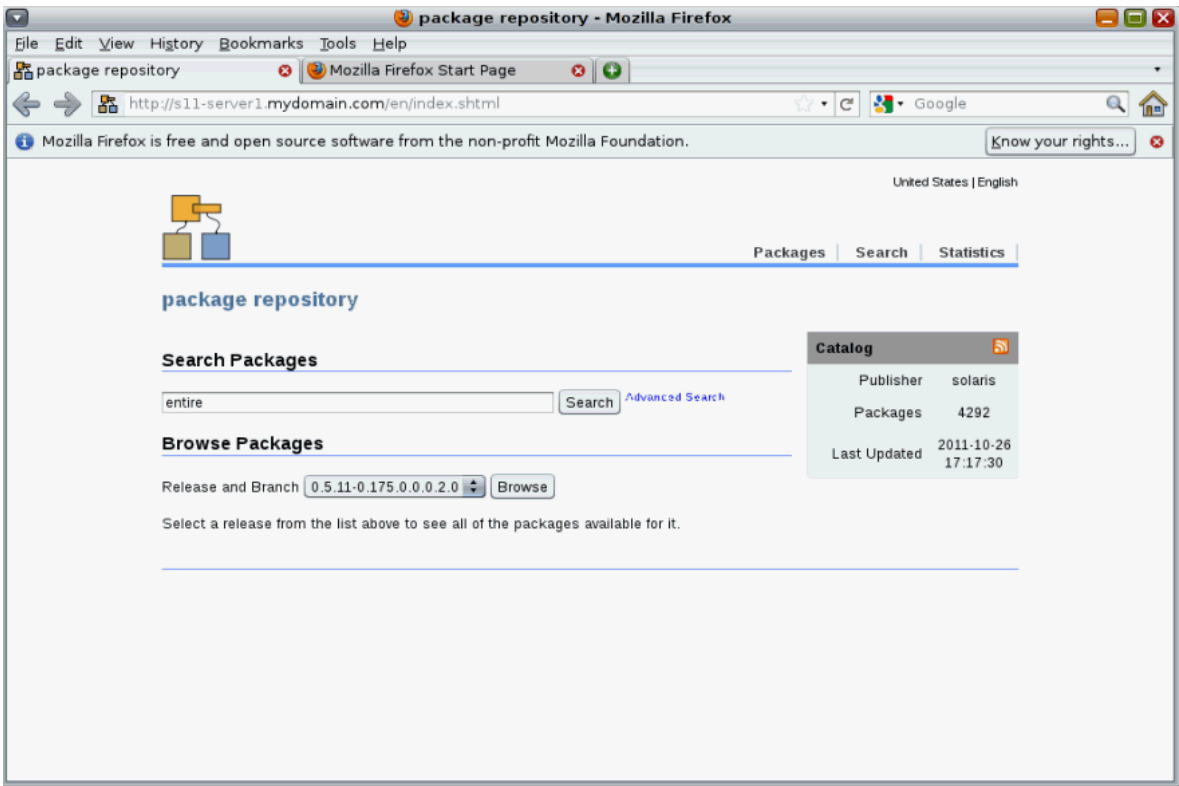
16. Package Manager should display the information about the `entire` package.
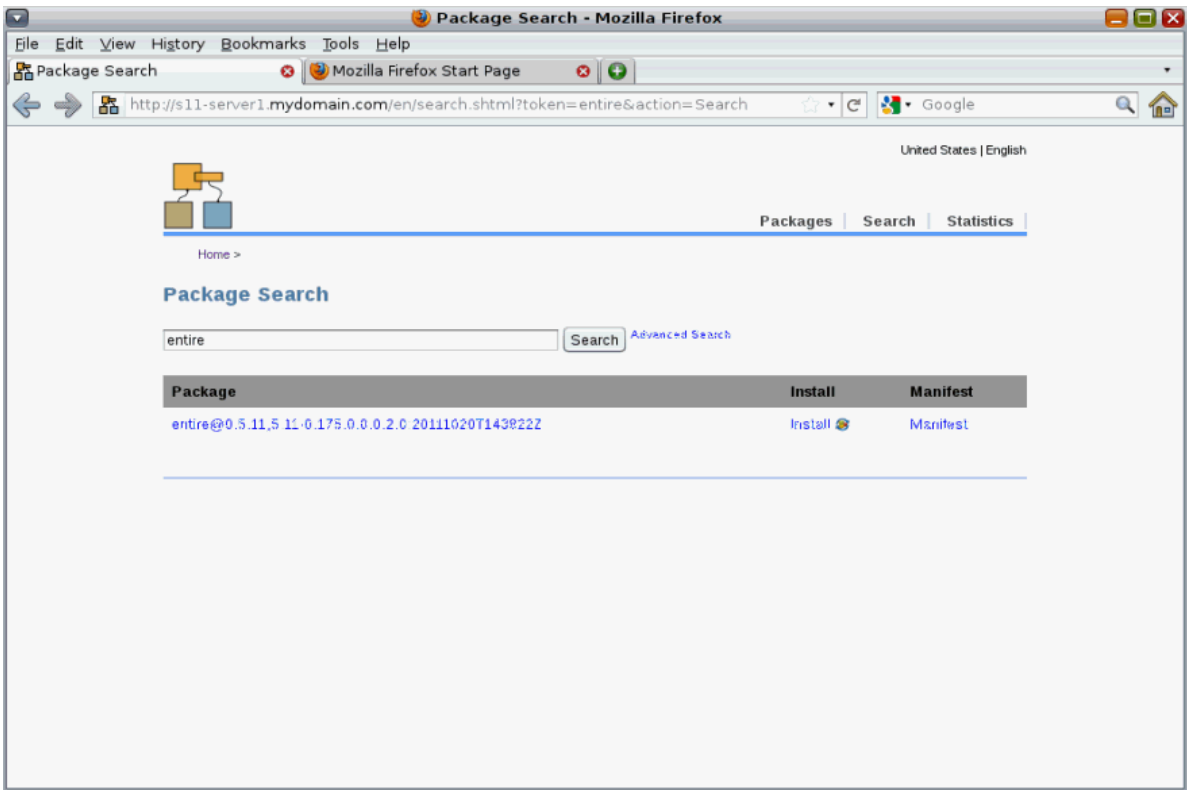
17. You have completed using Package Manager. Close the Firefox browser.

Practice 3-2: Managing Software Packages by Using the Command-Line Interface

Overview

In this practice, you work with the CLI commands to perform common software package management tasks, such as adding, removing, and searching for packages. You also learn how to perform a "dry run" (or test run) on package installations where you see the changes that will occur on the system when a package is installed, without actually installing the package.

Your primary tasks are as follows:

- Search for a package.
- Perform a dry run on the package installation.
- Install a package.
- Verify the package installation.
- Display information about the package and its contents.
- Uninstall a package.

Your senior system administrator determined that your organization needs a utility package called `apptrace` to provide the tracing facility for multiple Oracle applications, for example, Oracle Financials. Now, you need to check if this package is already installed on your system. If it is not, you need to check if it is available in the local repository. When you know that it is available in the repository, you need to perform a dry run to make sure it can be installed successfully. Then, you install the package and verify its installation. At a later stage, you remove this package from this system because your organization decided to use another Oracle Solaris 11 utility called `DTrace` instead. Therefore, you will uninstall the package.

Tasks

1. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Server1 virtual machine icon to start it (if it is not already started).
2. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Desktop virtual machine icon to start it (if it is not already started).
3. When the login prompt appears, log in as follows:
   - Username: `oracle`
   - Password: `oracle1`
4. Switch to `root` privileges.

```
oracle@s11-desktop:~$ su –
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

5. In a terminal window on the Sol11-Desktop virtual machine, determine if the `apptrace` software package is currently installed.

```
root@s11-desktop:~# pkg list apptrace
pkg list: no packages matching 'apptrace' installed
```

6. Search the IPS package repository for the `apptrace` software package.

```
root@s11-desktop:~# pkg search apptrace
INDEX           ACTION VALUE                              PACKAGE
pkg.description set    Apptrace utility for application tracing,
including shared objects pkg:/developer/apptrace@0.5.11-0.175.0.0.0.2.1
...
```

Note the `apptrace` package is available on the IPS server, which is s11-server1 in our case.

7. Display detailed information about the `apptrace` package from the remote repository by using the `-r` option

```
root@s11-desktop:~# pkg info -r apptrace
          Name: developer/apptrace
       Summary: Apptrace Utility
   Description: Apptrace utility for application tracing,
including shared objects
      Category: Development/System
         State: Not installed
     Publisher: solaris
...
...
...
```

Note the package `apptrace` is available on the remote repository by showing the state as "`Not installed`".

8. Perform a "dry run" on the `apptrace` package installation.

```
root@s11-desktop:~# pkg install -nv apptrace
              Packages to install:              1
          Estimated space available:        25.51 GB
      Estimated space to be consumed:         15.85 MB
              Create boot environment:            No
       Create backup boot environment:            No
              Rebuild boot archive:            No
...
...
...
```

The dry run shows that one package will be installed. The package installation will not affect the boot environment. No currently installed packages will be changed. Note that an FMRI is the fault management resource identifier. The FMRI is the identifier for this package. The FMRI includes the package publisher, name, and version. The `pkg` command uses FMRIs, or portions of FMRIs, to operate on packages.

9. Install the `apptrace` package.

```
root@s11-desktop:~# pkg install apptrace
              Packages to install:     1
         Create boot environment:    No
    Create backup boot environment: No

DOWNLOAD                              PKGS        FILES     XFER (MB)
Completed                             1/1        10/10      0.1/0.1

PHASE                                           ACTIONS
Install Phase                                    29/29

PHASE                                             ITEMS
Package State Update Phase                         1/1
Image State Update Phase                           2/2
```

This shows the package installation was successful.

10. Verify the `apptrace` package installation.

```
root@s11-desktop:~# pkg verify -v apptrace
PACKAGE                              STATUS
pkg://solaris/developer/apptrace        OK
```

11. Remove the `apptrace` package from the system image on your host.

```
root@s11-desktop:~# pkg uninstall apptrace
             Packages to remove:     1
        Create boot environment:    No
   Create backup boot environment:   No

PHASE                                           ACTIONS
Removal Phase                                    26/26

PHASE                                             ITEMS
Package State Update Phase                         1/1
Package Cache Update Phase                         1/1
Image State Update Phase                           2/2
```

At this time, your organization decided to use a different package instead. Therefore, you were asked to remove it from the system.

12. Verify that the `apptrace` package has been removed.

```
root@s11-desktop:~# pkg list apptrace
pkg list: no packages matching 'apptrace' installed

Verification of package removal is complete.
```

Practice 3-3: Managing Software Packages by Using Package Manager

Overview

In this practice, you work with Package Manager to perform common software package management tasks, such as adding, removing, and searching for packages. You also learn how to perform a "dry run" on package installations, where you see the changes that will occur on the system when a package is installed, without actually installing the package.

Your primary tasks are as follows:

- Launch Package Manager.
- Search for a package.
- Perform a dry run on the package installation.
- Install a package.
- Verify the package installation.
- Display information about the package and its contents.
- Uninstall a package.

In order to prepare for a more comprehensive business application, your senior system administrator has asked you to install a package called `dialog`. After successfully installing the package, you are asked to verify its functionality.

Tasks

1. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Server1 virtual machine icon to start it (if it is not already started).
2. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Desktop virtual machine icon to start it (if it is not already started).
3. When the login prompt appears, log in as follows:
   - Username: `oracle`
   - Password: `oracle1`
4. Right-click on the desktop to open a terminal window.
5. Switch to `root` privileges.

```
oracle@s11-desktop:~$ su –
Oracle Corporation     SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

6. On the desktop background, double-click the Add More Software icon.
7. In the File menu, select Manage Publishers.
8. In the Manage Publisher dialog box, verify that the package publisher you verified in Practice 3-1 is enabled. Also, verify that the Origin points to the IPS server. Click OK.

9. In the Package Manager search field, enter `dialog` and press Enter.
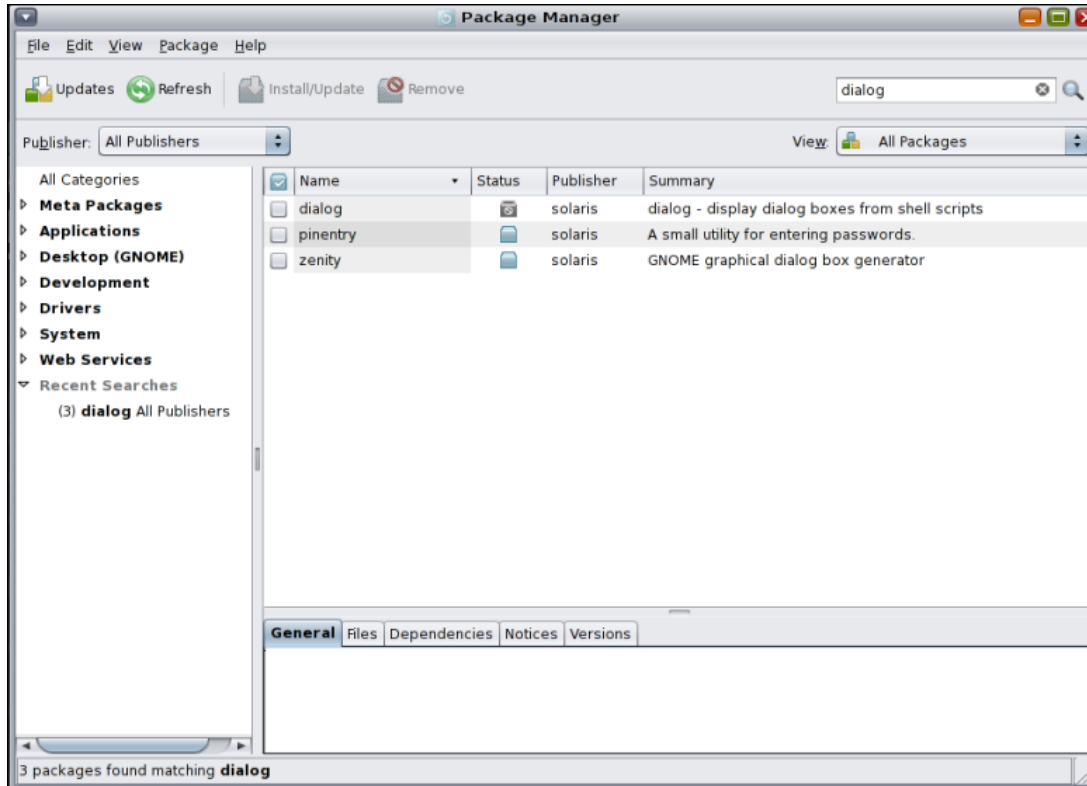
Note that the status icon indicates that the `dialog` package is not currently installed on this system.

Practices for Lesson 3: Updating and Managing Software Packages

10. Select the `dialog` package. Note the contents of the General tab at the bottom of the display. This information is derived from the `dialog` manifest.

Practices for Lesson 3: Updating and Managing Software Packages
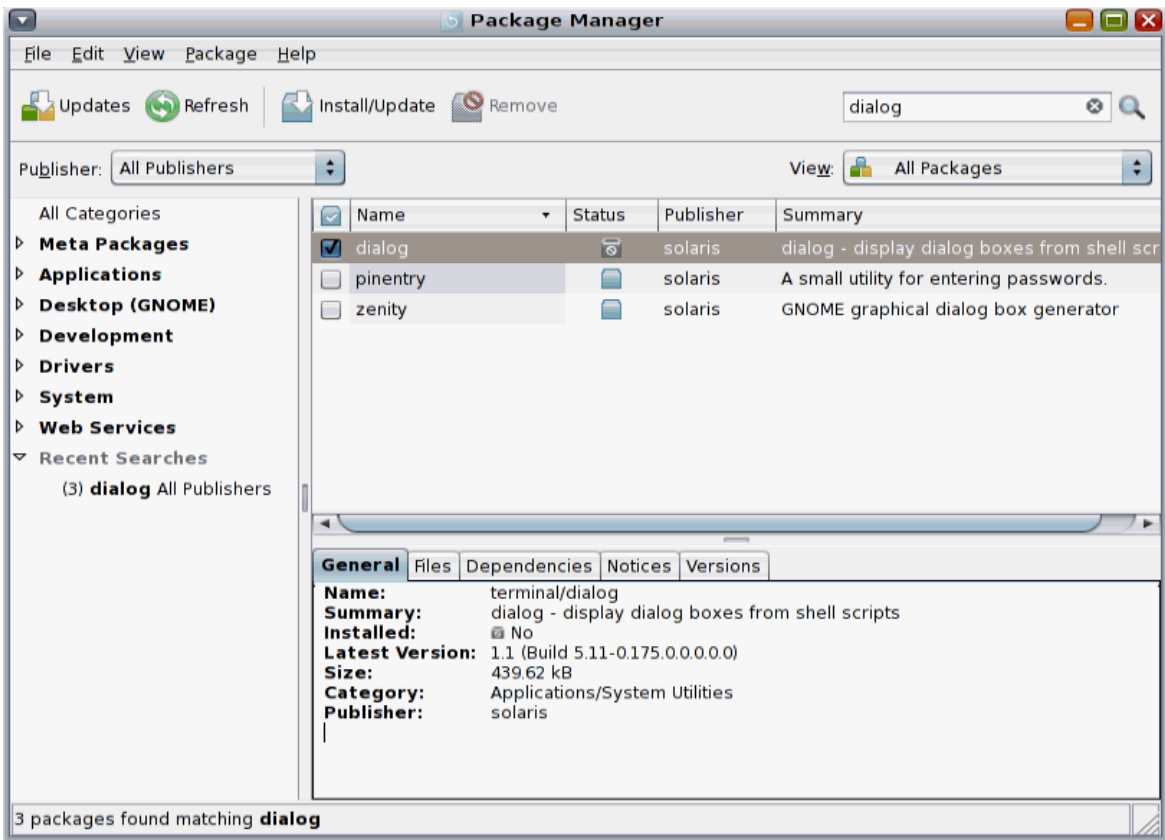
11. Click the Files tab to view the files called out in the `dialog` manifest.
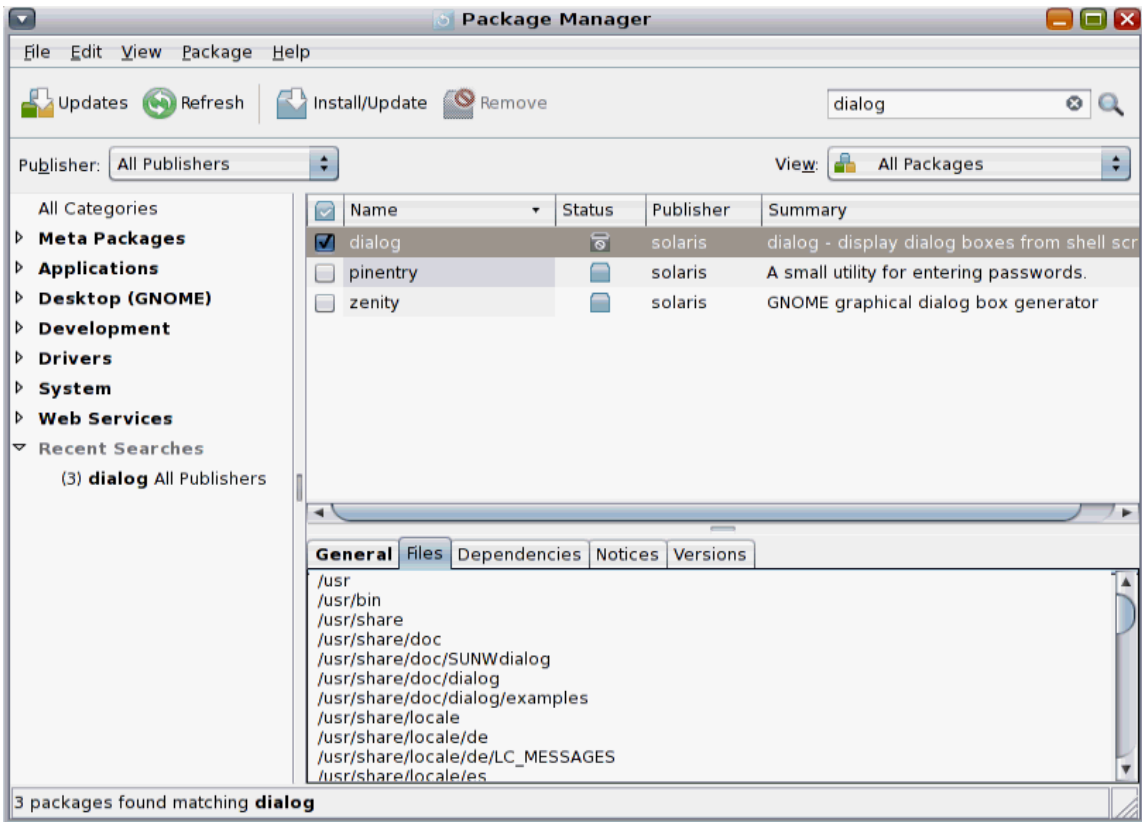
12. Click the Dependencies tab.
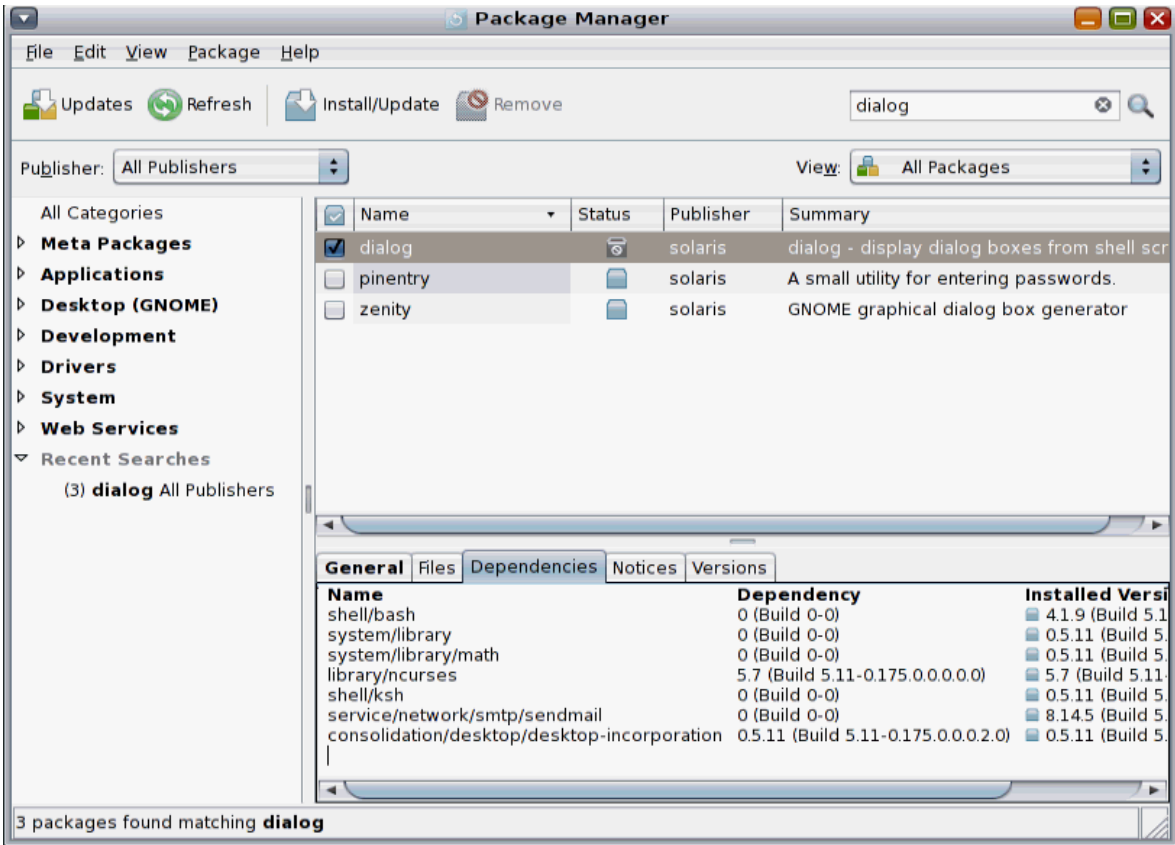
13. Click the Notices tab.
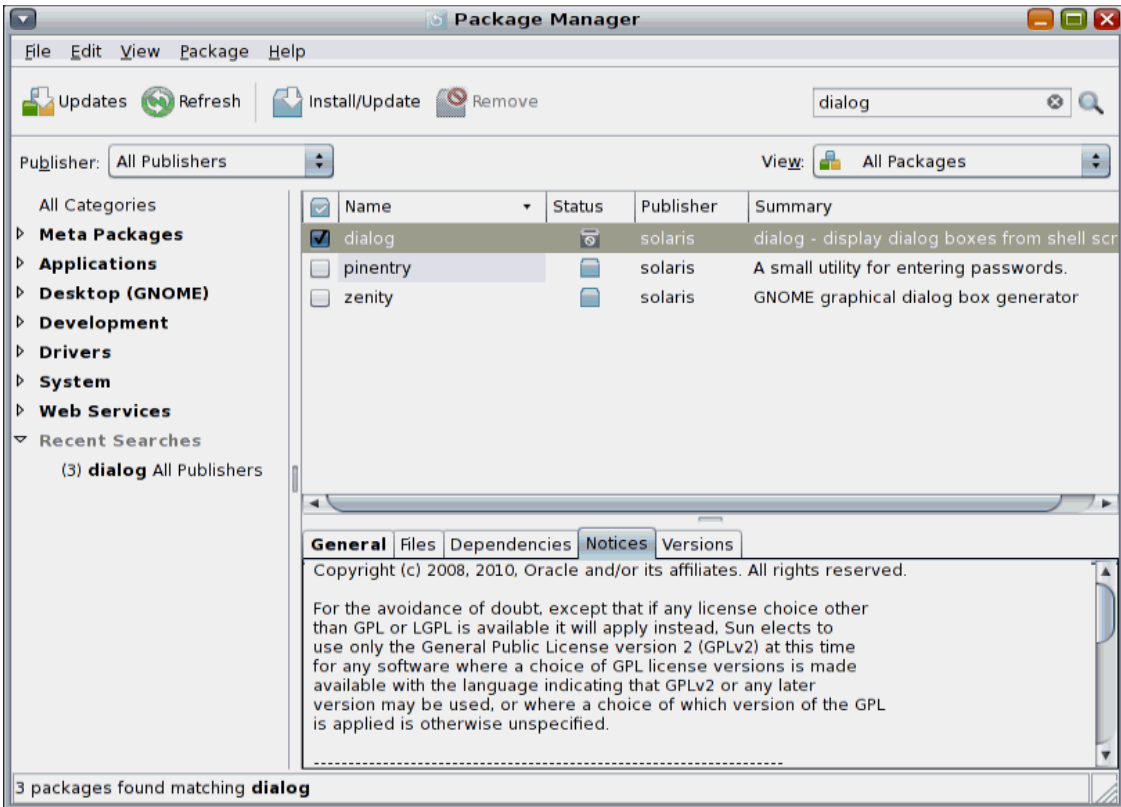
14. Click the Versions tab.
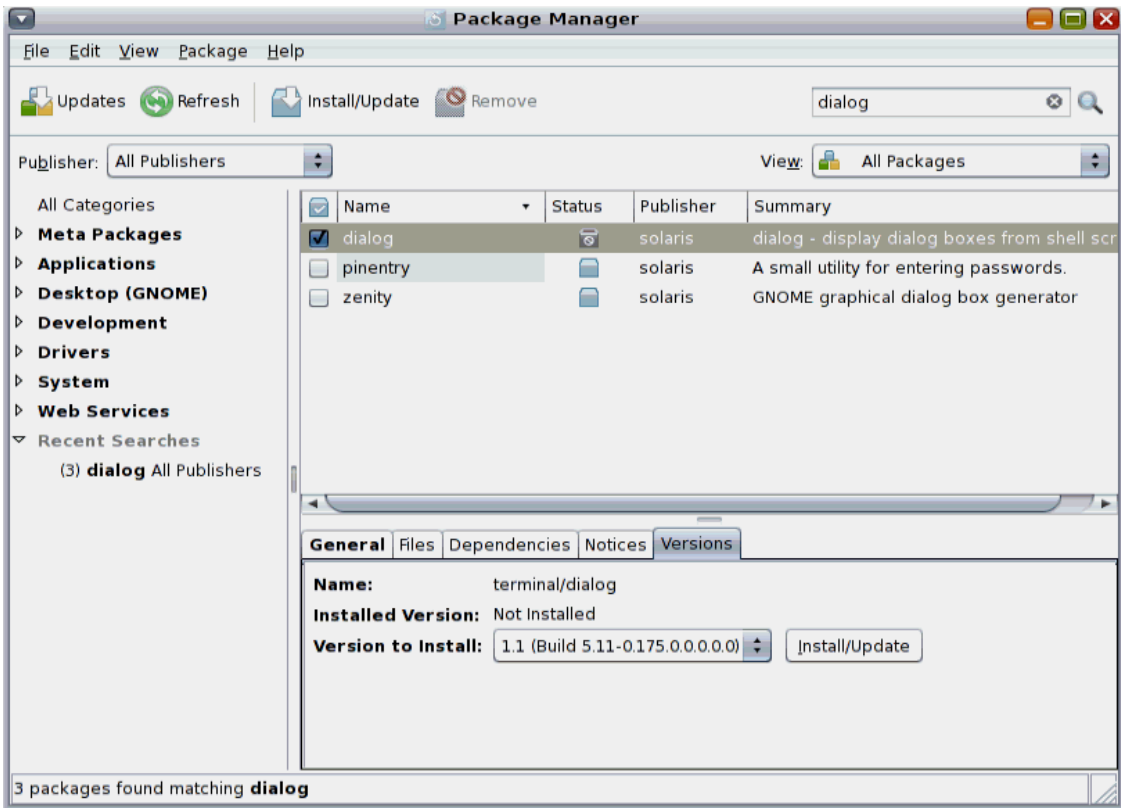
15. Select the package. Click the Install/Update button. Then click Proceed in the Install Confirmation dialog box.

Practices for Lesson 3: Updating and Managing Software Packages
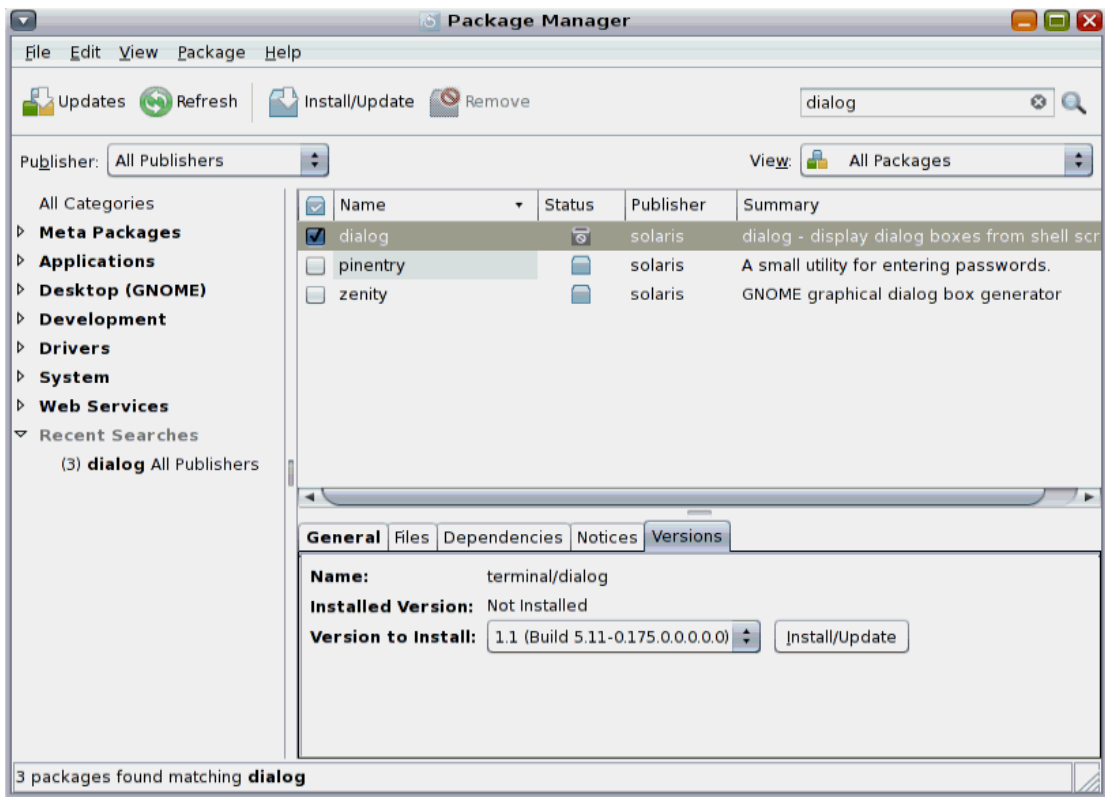
16. Verify that the `dialog` package installed successfully. Close the Install/Update dialog box.
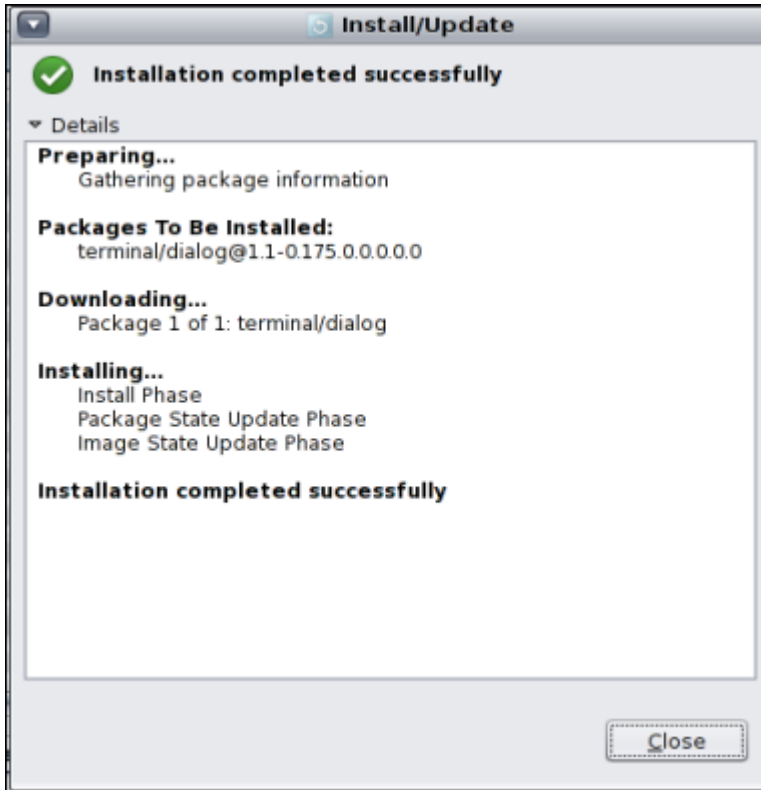
17. Close Package Manager by clicking on the X in the top-right corner.

18. Now you can use the `dialog` command to use the functionality of the `dialog` package.

```
root@s11-desktop:~# dialog
cdialog (ComeOn Dialog!) version 1.1-20100428
Copyright 2000-2007,2008 Thomas E. Dickey
This is free software; see the source for copying conditions.  There is
NO warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR
PURPOSE.


* Display dialog boxes from shell scripts *

Usage: dialog <options> { --and-widget <options> }
where options are "common" options, followed by "box" options

Special options:
  [--create-rc "file"]
Common options:
  [--ascii-lines] [--aspect <ratio>] [--backtitle <backtitle>]
  [--begin <y> <x>] [--cancel-label <str>] [--clear] [--colors]
  [--column-separator <str>] [--cr-wrap] [--date-format <str>]
  [--default-item <str>] [--defaultno] [--exit-label <str>]
  [--extra-button] [--extra-label <str>] [--help-button]
  [--help-label <str>] [--help-status] [--ignore] [--input-fd <fd>]
  [--insecure] [--item-help] [--keep-tite] [--keep-window]
  [--max-input <n>] [--no-cancel] [--no-collapse] [--no-kill]
```

Practices for Lesson 3: Updating and Managing Software Packages

```
  [--no-label <str>] [--no-lines] [--no-ok] [--no-shadow] [--nook]
  [--ok-label <str>] [--output-fd <fd>] [--output-separator <str>]
  [--print-maxsize] [--print-size] [--print-version] [--quoted]
  [--scrollbar] [--separate-output] [--separate-widget <str>] [--
shadow]
  [--single-quoted] [--size-err] [--sleep <secs>] [--stderr] [--stdout]
  [--tab-correct] [--tab-len <n>] [--time-format <str>] [--timeout
<secs>]
  [--title <title>] [--trace <file>] [--trim] [--version] [--visit-
items]
  [--yes-label <str>]
Box options:
  --calendar      <text> <height> <width> <day> <month> <year>
  --checklist     <text> <height> <width> <list height> <tag1> <item1>
<status1>...
  --dselect       <directory> <height> <width>
  --editbox       <file> <height> <width>
  --form          <text> <height> <width> <form height> <label1> <l_y1>
<l_x1> <item1> <i_y1> <i_x1> <flen1> <ilen1>...
  --fselect       <filepath> <height> <width>
  --gauge         <text> <height> <width> [<percent>]
  --infobox       <text> <height> <width>
  --inputbox      <text> <height> <width> [<init>]
  --inputmenu     <text> <height> <width> <menu height> <tag1>
<item1>...
  --menu          <text> <height> <width> <menu height> <tag1>
<item1>...
  --mixedform     <text> <height> <width> <form height> <label1> <l_y1>
<l_x1> <item1> <i_y1> <i_x1> <flen1> <ilen1> <itype>...
  --mixedgauge    <text> <height> <width> <percent> <tag1> <item1>...
  --msgbox        <text> <height> <width>
  --passwordbox   <text> <height> <width> [<init>]
  --passwordform  <text> <height> <width> <form height> <label1> <l_y1>
<l_x1> <item1> <i_y1> <i_x1> <flen1> <ilen1>...
  --pause         <text> <height> <width> <seconds>
  --progressbox   <height> <width>
  --radiolist     <text> <height> <width> <list height> <tag1> <item1>
<status1>...
  --tailbox       <file> <height> <width>
  --tailboxbg     <file> <height> <width>
  --textbox       <file> <height> <width>
  --timebox       <text> <height> <width> <hour> <minute> <second>
  --yesno         <text> <height> <width>

Auto-size with height and width = 0. Maximize with height and width = -1.
Global-auto-size if also menu_height/list_height = 0.
root@s11-desktop:~#
```

Note: This display tells you that you can use this package with many commands with the required options.

19. Use the `dialog` command.

```
root@s11-desktop:~# dialog --infobox welcome 3 11
```

Note that the package name is `dialog`. Here, you are creating a box with the text `welcome` in it. The size of the box is 3 characters high and 11 characters wide.

20. After you press the Enter key, the following window will pop up. This window is created by your command.
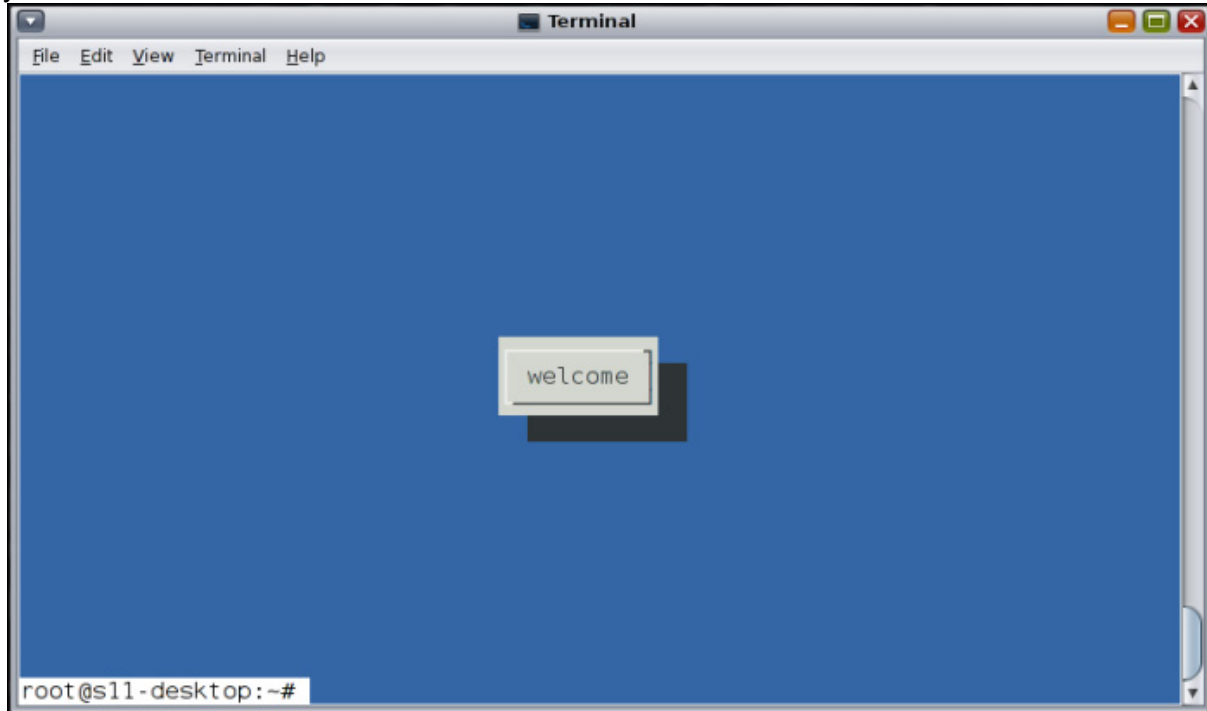
21. Use the `clear` command to clear the screen.

The preceding steps have verified the functionality of the `dialog` package that you installed using Package Manager.

Practice 3-4: Administering Boot Environments

Overview

In this practice, you begin by administering two boot environments (BEs) using `beadm` commands. In addition to the current boot environment, you create another BE and administer it using Package Manager.

Your primary tasks are as follows:

- List the boot environments on the system.
- Create a new boot environment.
- Activate an existing inactive boot environment.
- Reboot the system.
- Delete the new boot environment.

Tasks

1. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Server1 virtual machine icon to start it (if it is not already started).
2. In the Oracle VM VirtualBox Manager window, double-click the Sol11-Desktop virtual machine icon to start it (if it is not already started).
3. When the login prompt appears, log in as follows:

    - Username: `oracle`
    - Password: `oracle1`

4. Switch to `root` privileges.

```
oracle@s11-desktop:~$ su –
Oracle Corporation    SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
```

5. In a terminal window on the Sol11-Desktop virtual machine, list the current BEs.

```
root@s11-desktop:~# beadm list
BE       Active Mountpoint Space Policy Created
--       ------ ---------- ----- ------ -------
solaris NR     /          4.67G static 2011-11-19 22:14
```

6. Create a new BE and call it `solaris-1`.

```
root@s11-desktop:~# beadm create solaris-1
```

7. List the current BEs.

```
root@s11-desktop:~# beadm list
BE         Active Mountpoint Space Policy Created
--         ------ ---------- ----- ------ -------
solaris    NR     /                4.67G static 2011-11-19 22:14
solaris-1  -      -                180.00K static 2011-11-23 21:53
```

The `Active` column indicates whether the boot environment is active now (`N`) and active on reboot (`R`). Note here that ZFS created `solaris-1` as a ZFS snapshot of the `solaris` BE, and the new BE does not occupy the same amount of space as the `solaris` BE. You can learn more about this in the *Oracle Solaris 11 Advanced System Administration* course.

8. Open the Package Manager utility (Add More Software icon from the desktop) and select Manage Boot Environments on the File menu. Select `solaris-1` by highlighting it.
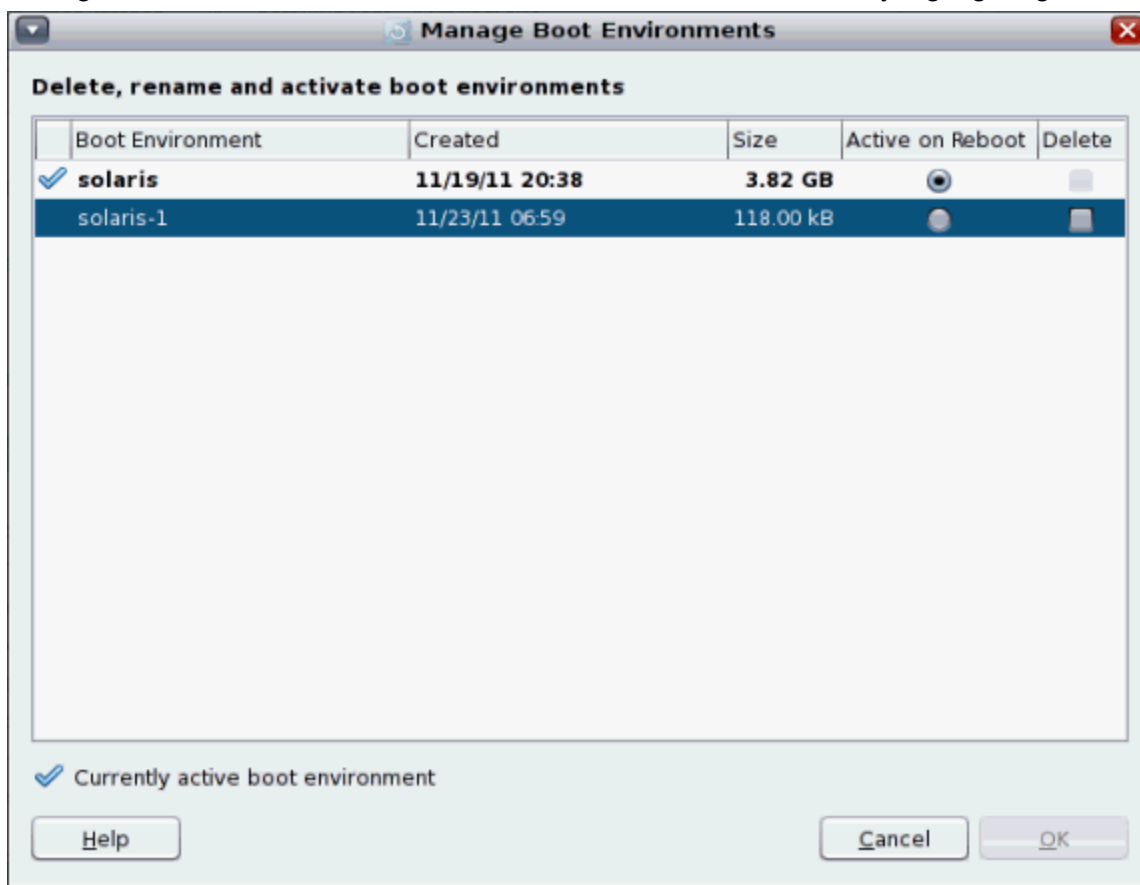
9. Select the "Active on Reboot" option for the `solaris-1` BE and click OK.

10. In the Boot Environment Confirmation window, click OK to confirm your change. Close Package Manager.
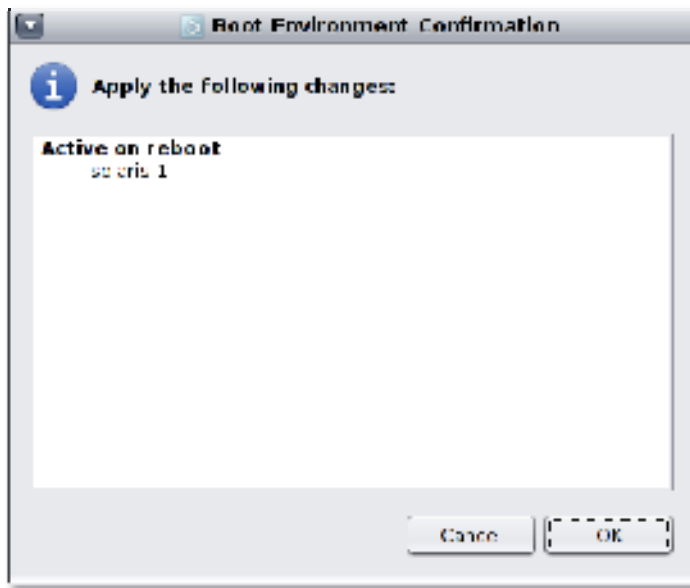
11. List the current BEs and note the space utilization of the `solaris-1` BE.

```
root@s11-desktop:~# beadm list
BE        Active Mountpoint Space Policy Created
--        ------ ---------- ----- ------ -------
solaris   N      /                3.79M static 2011-11-19 22:14
solaris-1 R      -                4.67G static 2011-11-23 21:53
root@s11-desktop:~#


Now that the solaris-1 BE has been activated, it occupies about the same space as
solaris originally occupied
```

12. Reboot the Sol11-Desktop virtual machine by using the `init 6` command.

```
root@s11-desktop:~# init 6
```

13. Notice that `solaris-1` is now the default boot entry in the GRUB menu.

```
GNU GRUB  version 0.97  (639K lower / 2096064K upper memory)

┌────────────────────────────────────────────────────────────────────┐
│ Oracle Solaris 11 11/11                                              │
│ solaris-1                                                            █│
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
└────────────────────────────────────────────────────────────────────┘

      Use the ↑ and ↓ keys to select which entry is highlighted.
      Press enter to boot the selected OS, 'e' to edit the
      commands before booting, or 'c' for a command-line.


   The highlighted entry will be booted automatically in 25 seconds.
```

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After Sol11-Desktop has rebooted, log in as the `oracle` user and assume administrator privileges.

14. In a terminal window, list the current BEs.

```
root@s11-desktop:~# beadm list
BE        Active Mountpoint Space  Policy Created
--        ------ ---------- -----  ------ -------
solaris   -      -          12.24M static 2011-11-19 22:14
solaris-1 NR     /          4.86G  static 2011-11-23 21:53
root@s11-desktop:
```

Note that the solaris-1 image is now active as displayed by the flags.

15. Go back to the previous BE by activating the solaris BE. Display the list of BEs. Note that solaris is pending activation on reboot.

```
root@s11-desktop:~# beadm activate solaris
root@s11-desktop:~# beadm list
BE        Active Mountpoint Space  Policy Created
--        ------ ---------- -----  ------ -------
solaris   R      -          4.69G   static 2011-11-19 22:14
solaris-1 N      /          121.36M static 2011-11-23 21:53
```

16. Using the init 6 command, reboot the Sol11-Desktop virtual machine. After Sol11-Desktop has rebooted, log in as the oracle user and su to root.

17. Verify that the solaris BE is now active.

```
root@s11-desktop:~# beadm list
BE        Active Mountpoint Space   Policy Created
--        ------ ---------- -----   ------ -------
solaris   NR     /          4.87G   static 2011-11-19 22:14
solaris-1 -      -          121.39M static 2011-11-23 21:53
```

18. Destroy the solaris-1 BE and then verify that it has been removed.

```
root@s11-desktop:~# beadm destroy solaris-1
Are you sure you want to destroy solaris-1? This action cannot be
undone(y/[n]): y
root@s11-desktop:~# beadm list
BE        Active Mountpoint Space   Policy Created
--        ------ ---------- -----   ------ -------
solaris   NR     /          4.87G   static 2011-11-19 22:14
```

The next time you reboot the system, you will see only the solaris BE present on the GNU GRUB menu.

Practices for Lesson 4: Administering Services

Chapter 4

Practices for Lesson 4

Practices Overview

In these practices, you learn how to administer the Service Management Facility (SMF) services as well as how to boot and shut down a system.

According to the test plan, the time has come for you to test the SMF services. You have been tasked with running a number of commands to test the SMF functionality. You also explore the service dependency relationships, and then you explore various boot and shutdown processes. Check your progress on the checklist as you begin your work with services.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
√	Test the software update and package management functionality from both the command-line and the GUI.
	Test the services functionality in Oracle Solaris 11.
	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris 11 zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Practice 4-1: Administering Services

Overview

In this practice, you work with SMF services to accomplish the following tasks:

- Enable and disable services.
- Display the services.
- Explore the service dependencies.

Tasks

1. Verify that the Sol11-Server1 virtual machine is running. If it is not, start it at this time.
2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.
3. Log in to the virtual machine Sol11-Desktop as user oracle. Use the password oracle1.
4. Right-click the desktop background and open a terminal window.
5. In the terminal window, run the su - command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0       November 2011
root@s11-desktop:~#
```

6. Determine if the cron process and the service are running.

```
root@s11-desktop:~# pgrep -fl cron
   784 /usr/sbin/cron
root@s11-desktop:~# svcs cron
STATE          STIME    FMRI
online         12:41:36 svc:/system/cron:default
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
online         12:41:36 svc:/system/cron:default
               12:41:36      784 cron
root@s11-desktop:~#


Note the -p option displays the processes included in the service.
```

7. Check the `cron` service dependencies. Determine what services `cron` is dependent on as well as other services that are dependent on `cron`.

```
root@s11-desktop:~# svcs -d cron
STATE          STIME    FMRI
online          6:38:51 svc:/system/filesystem/local:default
online          6:38:28 svc:/milestone/name-services:default


At this time, both the required services, system/local and name-services, are up.

root@s11-desktop:~# svcs -D cron
STATE          STIME    FMRI
online          6:39:13 svc:/milestone/multi-user:default
root@s11-desktop:~#


The multi-user service is up and running.
```

At this time, both the required services, `system/local` and `name-services`, are up.

The `multi-user` service is up and running.

8. Disable one of the services on which `cron` is dependent.

```
root@s11-desktop:~# svcadm disable name-services
root@s11-desktop:~# svcs -d cron
STATE          STIME    FMRI
disabled        6:47:42 svc:/milestone/name-services:default
online          6:38:51 svc:/system/filesystem/local:default
root@s11-desktop:~#


Note that name-services is disabled.
```

Note that `name-services` is disabled.

9. Check the impact on the `cron` service.

```
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
online          6:38:53 svc:/system/cron:default
                6:38:52     784 cron


root@s11-desktop:~# svcadm refresh cron
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
online          6:48:38 svc:/system/cron:default
                6:38:52     784 cron


Note that the cron service is still online. In this case refresh didn't refresh the cron
state.
```

Note that the `cron` service is still `online`. In this case `refresh` didn't refresh the `cron` state.

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```
root@s11-desktop:~# svcadm disable cron
root@s11-desktop:~# svcadm enable cron
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
offline         6:49:06 svc:/system/cron:default


Now you can see the modified service state.
```

10. Get more details about the `cron` service.

```
root@s11-desktop:~# svcs -x cron
svc:/system/cron:default (clock daemon (cron))
 State: offline since November 28, 2011 06:49:06 AM MDT
Reason: Service svc:/milestone/name-services:default is disabled.
   See: http://sun.com/msg/SMF-8000-GE
   See: cron(1M)
   See: crontab(1)
   See: /var/svc/log/system-cron:default.log
Impact: This service is not running.


Now you can obtain more details from this display as to why the cron service is offline.
```

11. Check the `multi-user` service as well.

```
root@s11-desktop:~# svcs multi-user
STATE          STIME    FMRI
online          6:39:13 svc:/milestone/multi-user:default
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
offline         6:49:06 svc:/system/cron:default
root@s11-desktop:~# svcadm disable multi-user
root@s11-desktop:~# svcadm enable multi-user
root@s11-desktop:~# svcs -p cron
STATE          STIME    FMRI
offline         6:49:06 svc:/system/cron:default
root@s11-desktop:~# svcs multi-user
STATE          STIME    FMRI
offline         7:12:56 svc:/milestone/multi-user:default


Note the multi-user service is also offline.
```

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12. Bring the services back up.

```
root@s11-desktop:~# svcadm enable name-services
root@s11-desktop:~# svcadm enable cron
root@s11-desktop:~# svcs cron
STATE          STIME    FMRI
online          7:49:50 svc:/system/cron:default
root@s11-desktop:~# svcadm enable multi-user
root@s11-desktop:~# svcs multi-user
STATE          STIME    FMRI
online          7:49:51 svc:/milestone/multi-user:default
root@s11-desktop:~#


This concludes exploring the service dependencies.
```

Practices for Lesson 4: Administering Services

Practice 4-2: Administering SMF Notifications

Overview

In this practice, you work with the Simple Mail Transfer Protocol (SMTP) service. This facility offers the convenience of getting notified in case a service changes state, for example, from enabled to disabled. This facility is very useful because a system administrator can resolve the problem with the service soon after being notified. The following tasks demonstrate the usefulness of this utility:

- Verifying the installation of required packages
- Configuring the SMF notification
- Examining a service in maintenance

Tasks

1. Verify that the Sol11-Server1 virtual machine is running.
2. Log in to the virtual machine Sol11-Server1 as user `oracle`. Use the password `oracle1`.
3. In the terminal window, run the `su -` command to assume administrator privileges.

```
oracle@s11-server1:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-server1:~#
```

4. Determine if the `solaris` publisher is configured for the right IPS server.

```
root@s11-server1:~# pkg publisher
PUBLISHER      TYPE      STATUS    URI
solaris        origin    online    http://s11-server1.mydomain.com/


You are verifying this information before you attempt to install the required packages.
```

5. Using the command `pkg install`, attempt to install the required `smtp-notify` package

```
root@s11-server1:~# pkg install service/fault-management/smtp-
notify
Refreshing catalog


Refreshing catalog 1/1 solaris


Creating Plan


No updates necessary for this image.
root@s11-server1:~#


Although you know that the required package is already installed, you could check if it is
already installed as you did in the practices for Lesson 3. This approach covers the
situations where you may have to install the package.
```

6. Using the commands `svcs` and `ps`, verify that the `smtp-notify` service is online.

```
root@s11-server1:~# svcs smtp-notify
STATE          STIME    FMRI
online         Nov 28   svc:/system/fm/smtp-notify:default
root@s11-server1:~# ps -ef | grep smtp-notify
noaccess  1060    1   0 Nov 28  ?    0:00 /usr/lib/fm/notify/smtp-
notify


These two commands confirm that the smtp-notify service is up and running.
```

7. Using the command `svccfg`, configure the `notify` option on a global basis.

```
root@s11-server1:~# svccfg -s svc:/system/svc/global:default
setnotify -g from-online mailto:root@localhost


When you configure the notify option at the global level by using this global service,
SMF will notify you (the administrator) if any service moves from online state to any
other state.
```

8. Using the command `pkg install`, attempt to install the `apache-22` package.

```
root@s11-server1:~# pkg install apache-22
Creating Plan


No updates necessary for this image.
root@s11-server1:~#


Once again, you attempt to install the apache package; however, it is already installed
on your system. You will use the apache package to test the notify configuration.
```

9. Check if the `apache22` service is up. If not, use the command `svcadm` to enable it.

```
root@s11-server1:~# svcs apache22
STATE          STIME    FMRI
disabled       Nov 28   svc:/network/http:apache22
root@s11-server1:~# svcadm enable apache22
root@s11-server1:~# svcs apache22
STATE          STIME    FMRI
online         12:00:47 svc:/network/http:apache22
```

10. Using the `vi` editor, modify the indicated row in the apache service configuration file.

```
root@s11-server1:~# vi /etc/apache2/2.2/httpd.conf
…
…
…
# configuration directives that give the server its instructions.
# See <URL:http://httpd.apache.org/docs/2.2> for detailed
information.
```

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```
# In particular, see
# <URL:http://httpd.apache.org/docs/2.2/mod/directives.html>
# for a discussion of each configuration directive.
# configuration, error, and log files are kept.
#


#ServerRoot "/usr/apache2/2.2"
SrverRoot "/usr/apache2/2.2"
…
…
…
```

Comment out the original ServerRoot setting. Add a line with the keyword SrverRoot misspelled as indicated.

Note that you are deliberately corrupting the apache service configuration file so that it is moved from an online state to a maintenance state. This will enable you to test the notify mechanism.

11. Using the command svcadm, restart the apache service.

```
root@s11-server1:~# svcadm restart apache22
root@s11-server1:~# Nov 28 12:04:20 s11-server1 svc.startd[11]:
network/http:apache22 failed fatally: transitioned to maintenance
(see 'svcs –xv' for details)
<output omitted>
root@s11-server1:~# svcs apache22
STATE          STIME    FMRI
maintenance    12:04:20 svc:/network/http:apache22
```

When you restarted the apache22 service, SMF refreshed the corrupted configuration. Because the modified row had invalid settings, SMF placed the apache service in maintenance state.

12. Using the command mail, read the mail sent to you as the administrator. You will see two sets of messages. The first message is about the apache22 service moving to the maintenance state and the second message is from the smtp service with the service's "from-state" and "to-state" transition information. After viewing the first message, press Enter at the "?" to display the next message. To exit mail, use the q command.

```
root@s11-server1:~# mail
From noaccess@localhost.mydomain.com Mon Nov 28 12:04:23 2011
Date: Mon, 28 Nov 2011 12:04:23 -0600 (MST)
From: No Access User <noaccess@s11-server1.mydomain.com>
Message-Id: <201110051804.p95I4No8009910@s11-
server1.mydomain.com>
Subject: Fault Management Event: s11-server1:SMF-8000-YX
To: root@s11-server1.mydomain.com
```

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```
Content-Length: 765


SUN-MSG-ID: SMF-8000-YX, TYPE: defect, VER: 1, SEVERITY: major
EVENT-TIME: Mon Nov 28 12:04:23 MST 2011
PLATFORM: VirtualBox, CSN: 0, HOSTNAME: s11-server1
SOURCE: software-diagnosis, REV: 0.1
EVENT-ID: 04ebd3d-de53-edb9-9b1c-f5ffec7910a8
DESC: A service failed – a start, stop or refresh method failed.
AUTO-RESPONSE: The service has been placed into the maintenance
state.
IMPACT: svc:/network/http:apache22 is unavailable
REC-ACTION: Run 'svcs –xv svc:/network/http:apache22' to
determine the generic reason why the service failed, the location
of any logfiles, and list of other services impacted. Please
refer to the associated reference document at
http://sun.com/msg/SMF-8000-YX for the latest service procedures
and policies regarding this diagnosis.


? <Press Enter to see the second message>
From noaccess@localhost.mydomain.com Mon Nov 28 12:04:23 2011
Date: Mon, 28 Nov 2011 12:04:23 -0600 (MST)
From: No Access User <noaccess@s11-server1.mydomain.com>
Message-Id: <201110051804.p95I4No8009910@s11-
server1.mydomain.com>
Subject: s11-server1: svc:/network/http:apache22 online->offline
To: root@s11-server1.mydomain.com
Content-Length: 233


HOSTNAME: s11-server1
TIMESTAMP: Mon Nov 28 12:04:23 2011
FMRI: svc:/network/http:apache22
FROM-STATE: online
TO-STATE: offline
DESCRIPTION: The indicated service has transitioned to the
offline state
REASON: a restart was requested


? q
root@s11-server1:~#
```

Now you can see that SMF (SMTP service) sent this notification stating that the
apache22 service has been moved from online to offline state.

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13. Using the command `svccfg`, display the configured notifications.

```
root@s11-server1:~# svccfg -s svc:/system/svc/global:default
listnotify
    Event: from-online (source: svc:/system/svc/global:default)
        Notification Type: smtp
            Active: true
            to: root@localhost
```

14. Using the command `svccfg`, delete the configured notifications. Confirm the deletion.

```
root@s11-server1:~# svccfg -s svc:/system/svc/global:default
delnotify -g all
root@s11-server1:~# svccfg -s svc:/system/svc/global:default
listnotify
```

Now there should be no notifications configured.

15. Using the `vi` editor, modify the file `/etc/apache2/2.2/httpd.conf` and undo the changes.

```
root@s11-server1:~# vi /etc/apache2/2.2/httpd.conf
…
…
…
# configuration directives that give the server its instructions.
# See <URL:http://httpd.apache.org/docs/2.2> for detailed
information.
# In particular, see
# <URL:http://httpd.apache.org/docs/2.2/mod/directives.html>
# for a discussion of each configuration directive.
# configuration, error, and log files are kept.
#

ServerRoot "/usr/apache2/2.2"
…
…
…
…
```

Undo the change you made in step 10.

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16. Using the command `svcadm`, restart the `apache22` service and disable the service.

```
root@s11-server1:~# svcadm restart apache22
root@s11-server1:~# svcadm disable apache22
root@s11-server1:~# svcs apache22
STATE          STIME    FMRI
disabled       12:00:47 svc:/network/http:apache22


You are disabling the apache22 service because you will not need it.
```

Practices for Lesson 4: Administering Services

Practice 4-3: Booting and Shutting Down the System

Overview

In this practice, you work with boot and shutdown procedures. During the boot process, all SMF services are brought up. While you shut down the system, all services are brought down.

You accomplish the following tasks:

- Boot an X86/64 host.
- Shut down an X86/64 host.

Scenario

Your senior system administrator wants you to determine the services that are started in single-user mode. You are asked to create a `tar` bundle of all the service logs for your review. Therefore, you boot in to single-user mode, which is used for system maintenance or any other function you want to perform without users logged in.

Tasks

1. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.
2. Log in to virtual machine Sol11-Desktop as user `oracle`. Use the password `oracle1`.
3. Right-click the desktop background and open a terminal window.
4. In the terminal window, run the `su -` command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

5. Issue the command `init 6` to reboot the desktop.

```
root@s11-desktop:~# init 6
root@s11-desktop:~#
```

6. When the GRUB menu is displayed, press the space bar to stop the clock

```
GNU GRUB  version 0.97  (639K lower / 2096064K upper memory)

┌────────────────────────────────────────────────────────────────────┐
│ Oracle Solaris 11 11/11                                            █ │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
│                                                                      │
└────────────────────────────────────────────────────────────────────┘

    Use the ↑ and ↓ keys to select which entry is highlighted.
    Press enter to boot the selected OS, 'e' to edit the
    commands before booting, or 'c' for a command-line.


 The highlighted entry will be booted automatically in 27 seconds.
```

ORACLE
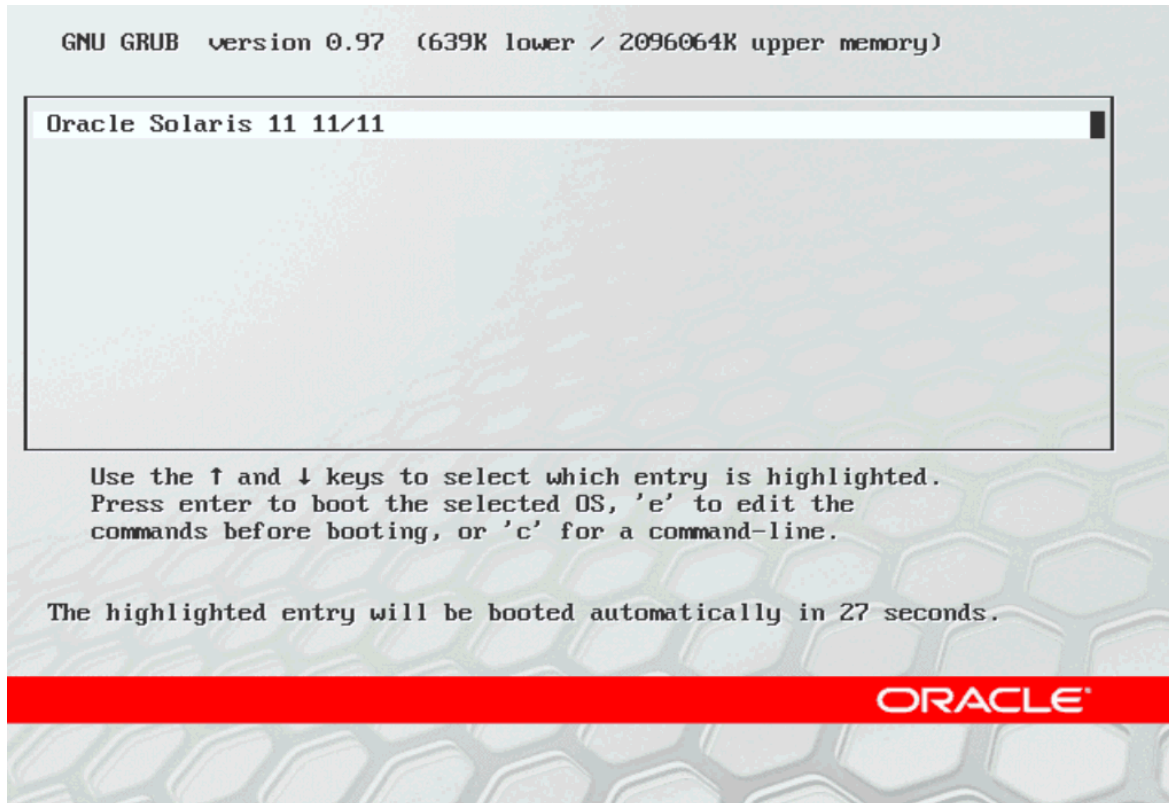
7. With the GRUB menu entry selected, enter e to edit the entry. Now the GRUB menu should look like the screenshot below. Select the kernel entry and press E to edit it.

```
  GNU GRUB  version 0.97  (639K lower / 2096064K upper memory)

┌────────────────────────────────────────────────────────────────────┐
│ bootfs rpool/ROOT/solaris                                            │
│ kernel$ /platform/i86pc/kernel/amd64/unix -B $ZFS-BOOTFS,console=grap→ █ │
│ module$ /platform/i86pc/amd64/boot_archive                           │
│                                                                      │
│                                                                      │
│                                                                      │
└────────────────────────────────────────────────────────────────────┘

    Use the ↑ and ↓ keys to select which entry is highlighted.
    Press 'b' to boot, 'e' to edit the selected command in the
    boot sequence, 'c' for a command-line, 'o' to open a new line
    after ('O' for before) the selected line, 'd' to remove the
    selected line, or escape to go back to the main menu.
```

ORACLE

8. At the end of the kernel command, enter a space and `-s` to boot into single-user mode. Press Enter to return to the GRUB menu.

```
[ Minimal BASH-like line editing is supported.  For the first word, TAB
  lists possible command completions.  Anywhere else TAB lists the possible
  completions of a device/filename.  ESC at any time exits. ]


<console=graphics -s█
```

ORACLE

9. From the GRUB menu, press B to boot. Now you can view the command-line interface, which shows that you are in single-user mode.

```
WARNING: cpu0: failed to update microcode from version 0x0 to 0xa07

SunOS Release 5.11 Version 11.0 64-bit
Copyright (c) 1983, 2011, Oracle and/or its affiliates. All rights reserved.
Booting to milestone "milestone/single-user:default".
Hostname: s11-desktop
Requesting System Maintenance Mode
SINGLE USER MODE

Enter user name for system maintenance (control-d to bypass): █
```
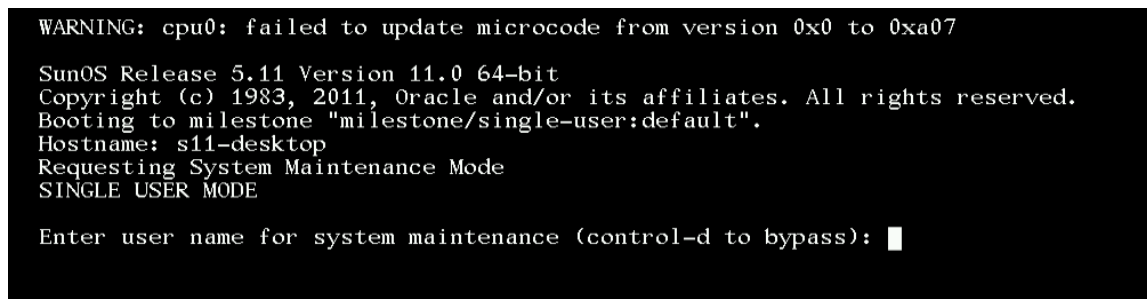
10. Enter the user ID `root` and password `oracle1` to log in. After successful login, use the `who -r` command to view the current run level `S`.

```
root@s11-desktop:~# who -r
.      run-level S Nov 28 06:09    S     0  0
```
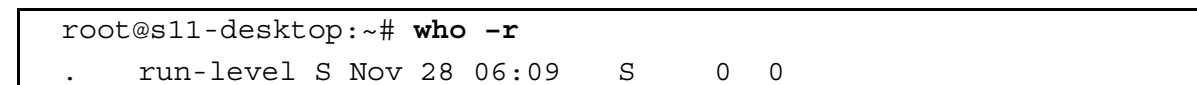
11. Use the `tar` command to create a copy of the service logs.

```
root@s11-desktop:~# tar cvf log.tar /var/svc/log
<output not shown>


Here, you created a tar bundle of all the system service logs. You booted the system
into single-user mode so that you can determine the start state of the services running in
single-user mode.
```

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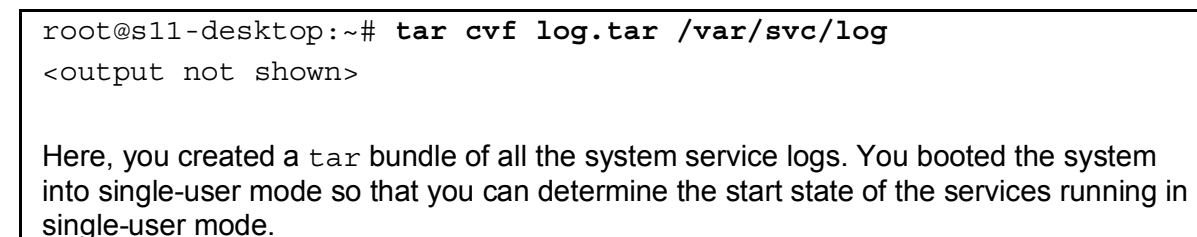
12. Press Ctrl + D. This step takes you into system maintenance mode. Press Ctrl + D again. You see the console login prompt briefly and then you are sent to the login screen.

13. On the login screen, use `oracle` and the password `oracle1` to log in.

14. Right-click on the desktop to open a terminal window and then run the `su –` command.

15. Use the `who –r` command to verify that you are now in multi-user mode (run-level `3`).

```
root@s11-desktop:~# who –r
.      run-level 3 Nov 28 06:11   3    0  S
```

16. Use the command `who` to check the users currently on the system. If there are many users on the system, you may consider contacting them to have them log off the system. If it's okay to shut down the system, reboot the system.

```
root@s11-desktop:~# who
oracle vt/7            Nov 28 06:24:34      (:0)
oracle pts/1           Nov 28 06:24:34      (:0.0)


root@s11-desktop:~# shutdown -i6 -g0


Shutdown started.  Monday, November 28 06:23:09 AM MST
Do you want to continue? (y or n): y
<output omitted>


Note that the option –i6 is the run level 6, which is used for rebooting the system. The
option –g0 refers to the grace period, which is zero seconds in this case. You can also
use init 6 to reboot the system.


From this point, the system reboots and returns you to the login prompt.
```

Practices for Lesson 4: Administering Services

Practices for Lesson 5: Setting Up and Administering Data Storage

Chapter 5

Practices for Lesson 5

Practices Overview

In these practices, you are presented with a plan for administering the Oracle Solaris 11 data storage facilities. These practices provide you with experience in working with ZFS facilities (for example, pools, file systems, snapshots, and clones). Although ZFS storage can be set up on a variety of storage media, only local storage is used in this class. You work with the following topics in the practices:

- Administering ZFS storage pools
- Administering ZFS file systems
- Administering ZFS snapshots and clones

As a supplemental topic, a practice is included to demonstrate ZFS pool creation with disk slices. This technique is invaluable in the situations where you are short of disk storage and you need to create ZFS pools on individual slices.

Your company is very excited about the move to the ZFS storage system and its dynamic storage capabilities. The testing you have been asked to do for this part of the plan will reveal how relatively simple it is to set up and manage data storage by using a variety of ZFS storage pool types and ZFS file systems.

Your organization uses Oracle Enterprise Resource Planning (ERP) software. You are asked to create one pool for HR and one pool to store all Oracle Financials documentation. Within Oracle Financials, you create a subfile system for Accounts Receivable (AR) documentation. For AR, you create a snapshot backup as of Friday and a clone from this snapshot. The purpose of this clone is to allow you to make changes in your AR production file system because the snapshot is read-only. In addition, you don't want to modify the AR production file system.

Take a moment to see where you are in the test activities checklist. You are ready to test the data storage functionality.

√	**Test Activities Checklist**
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
√	Test the software update and package management functionality from both the command-line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris 11 zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practices for Lesson 5: Setting Up and Administering Data Storage

Practice 5-1: Administering ZFS Storage Pools

Overview

In this practice, you work with ZFS storage pools in the following tasks:

- Creating different types of ZFS pools
- Querying the pool attributes

Tasks

1. Verify that the Sol11-Server1 virtual machine is running. If it is not, start it at this time.

2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.

3. Log in to the Sol11-Desktop virtual machine as user `oracle`. Use the password `oracle1`.

4. Right-click the desktop background and open a terminal window.

5. In the terminal window, run the `su -` command to assume administrator privileges. Use the password `oracle1`.

```
oracle@s11-desktop:~$ su –
Password:
Oracle Corporation    SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
```

6. Determine if there are any existing ZFS pools.

```
root@s11-desktop:~# zpool list
NAME    SIZE   ALLOC    FREE    CAP  DEDUP  HEALTH  ALTROOT
rpool  31.8G  5.84G    25.9G   18%  1.00x  ONLINE  -
root@s11-desktop:~#
```

Note that `rpool` is the default ZFS pool created during OS install. The purpose of this pool is to provide ZFS as the root file system.

7. To determine the local disks that are available for new pools, display all the mount points.

```
root@s11-desktop:~# df -h
Filesystem           Size   Used Available Capacity   Mounted on
rpool/ROOT/solaris   31G   3.3G      25G     12%       /
/devices              0K    0K       0K      0%       /devices
/dev                  0K    0K       0K      0%       /dev
ctfs                  0K    0K       0K      0%       /system/contract
proc                  0K    0K       0K      0%       /proc
mnttab                0K    0K       0K      0%       /etc/mnttab
swap                 1.7G  1.4M     1.7G      1%       /system/volatile
objfs                 0K    0K       0K      0%       /system/object
sharefs               0K    0K       0K      0%       /etc/dfs/sharetab
/usr/lib/libc/libc_hwcap1.so.1
                     29G   3.3G      25G     12%       /lib/libc.so.1
fd                    0K    0K       0K      0%       /dev/fd
rpool/ROOT/solaris/var
                     31G   185M      25G      1%       /var
swap                 1.7G   48K     1.7G      1%       /tmp
ora                  426G   53G      373G    13%       /opt/ora
rpool/export         31G    32K      25G      1%       /export
rpool/export/home    31G    36K      25G      1%       /export/home
rpool/export/home/oracle
                     31G   5.5M      25G      1%       /export/home/oracle
rpool                31G    39K      25G      1%       /rpool
ora                  426G   53G      373G    13%       /mnt/sf_ora
/export/home/oracle  25G   5.5M      25G      1%       /home/oracle
root@s11-desktop:~#
```

8. Check the disk being used by `rpool`.

```
root@s11-desktop:~# zpool status
  pool: rpool
 state: ONLINE
 scan: none requested
config:

    NAME         STATE     READ WRITE CKSUM
    rpool        ONLINE       0     0     0
      c3t0d0s0   ONLINE       0     0     0

errors: No known data errors
root@s11-desktop:~#


Notice that slice 0 of the disk c3t0d0 is being used by rpool. So you can assume that
this disk is in use.
```

9. You now find out which storage disks are available on your system.

```
root@s11-desktop:~# format
Searching for disks...done

AVAILABLE DISK SELECTIONS:
       0. c3t0d0 <ATA-VBOX HARDDISK  -1.0  cyl 4174 alt 2 hd 255 sec 63>
          /pci@0,0/pci8086,2829@d/disk@0,0
       1. c3t2d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@2,0
       2. c3t3d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@3,0
       3. c3t4d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@4,0
       4. c3t5d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@5,0
       5. c3t6d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@6,0
       6. c3t7d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
           /pci@0,0/pci8086,2829@d/disk@7,0
       7. c3t8d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@6,0
       8. c3t9d0 <ATA-VBOX HARDDISK  -1.0  cyl 1022 alt 2 hd 64 sec 32>
           /pci@0,0/pci8086,2829@d/disk@7,0

Specify disk (enter its number): ^C
```

Because the `format` command lists all the local hard disks available, you can now choose any disk except `c3t0d0` (because you determined it's being used by `rpool`).

Note that disk addresses on your virtual machine may differ from the ones shown in this example.

10. Now you are ready to create some ZFS pools. Using disk `c3t2d0`, create a simple pool with one disk.

```
root@s11-desktop:~# zpool create oraclehr c3t2d0
root@s11-desktop:~# zpool status oraclehr
  pool: oraclehr
 state: ONLINE
 scan: none requested
config:

    NAME           STATE     READ WRITE CKSUM
    oraclehr       ONLINE       0     0     0
      c3t2d0       ONLINE       0     0     0

errors: No known data errors
```

As demonstrated by the display, you can tell that the `oraclehr` pool is using the disk `c3t2d0`.

11. Create a ZFS mirror pool by using disks `c3t3d0` and `c3t4d0` if they are available. Note that you determined in step 8 that these disks are available.

```
root@s11-desktop:~# zpool create oracledocs mirror c3t3d0 c3t4d0
root@s11-desktop:~# zpool status oracledocs
  pool: oracledocs
 state: ONLINE
  scan: none requested
config:

      NAME          STATE     READ WRITE CKSUM
      oracledocs    ONLINE       0     0     0
        mirror-0    ONLINE       0     0     0
          c3t3d0    ONLINE       0     0     0
          c3t4d0    ONLINE       0     0     0

errors: No known data errors
root@s11-desktop:~#
```

Remember: The purpose of creating a mirror pool is to provide data redundancy.

12. Check the input/output activity of the `oraclehr` pool.

```
root@s11-desktop:~# zpool iostat oraclehr
              capacity     operations    bandwidth
pool        alloc  free   read  write   read  write
----------  -----  -----  -----  -----  -----  -----
oraclehr      85K  1008M      0     10  9.07K  51.9K
root@s11-desktop:~#
```

Here, you see the total storage for the pool as well as read/write operation information.

13. Create a `raidz` pool called `oraclereq` by using the next three available disks. Then view the status of the new pool.

```
root@s11-desktop:~# zpool create oraclereq raidz c3t5d0 c3t6d0
c3t7d0
root@s11-desktop:~# zpool status oraclereq
  pool: oraclereq
 state: ONLINE
  scan: none requested
config:

      NAME          STATE     READ WRITE CKSUM
      oraclereq     ONLINE       0     0     0
```

```
        raidz1-0  ONLINE       0      0      0
          c3t5d0  ONLINE       -      -      -
          c3t6d0  ONLINE       -      -      -
          c3t7d0  ONLINE       -      -      -

errors: No known data errors
root@s11-desktop:~#
```

Here, you created the `raidz` pool, as indicated by the `status` command. The display shows `raidz1-0` as the name of the virtual device in the pool. The redundancy is `raidz1`, meaning that `raidz` level `1` is maintaining single parity. The digit `0` represents the first virtual device.

The reason your HR analyst wanted you to create a `raidz` pool as opposed to a mirror pool is that `raidz` can provide redundancy at a lower cost compared to a mirrored pool. Note that writing to a `raidz` pool is slower because of calculating and writing parity data compared to mirroring.

14. Delete the `raidz` pool and then verify that the pool has been removed.

```
root@s11-desktop:~# zpool destroy oraclereq
root@s11-desktop:~# zpool list
NAME             SIZE   ALLOC   FREE    CAP   DEDUP   HEALTH  ALTROOT
oracledocs       1008M    85K  1008M    0%   1.00x   ONLINE  -
oraclehr         1008M    85K  1008M    0%   1.00x   ONLINE  -
rpool            31.8G   5.84G  25.9G   18%   1.00x   ONLINE  -

root@s11-desktop:~#
```

Note: Your display may be slightly different as far as the storage allocation is concerned.

The `oraclereq` pool has been deleted.

The purpose of creating the `raidz` pool was so that you could see the difference between a mirror pool and a `raidz` pool. They both provide redundancy and should be used based on the specific business requirements.

Practice 5-2: Administering ZFS File Systems

Overview

In this practice, you work with creating ZFS file systems in the ZFS storage pools.

Tasks

1. Verify that the Sol11-Server1 virtual machine is running. If it is not, start it at this time.
2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.
3. Log in to the Sol11-Desktop virtual machine as user `oracle`. Use the password `oracle1`.
4. Right-click the desktop background and open a terminal window.
5. In the terminal window, run the `su -` command to assume primary administrator privileges. Use the password `oracle1`.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation     SunOS 5.11     11.0     November 2011
root@s11-desktop:~#
```

6. Create a ZFS file system called `financials` within the `oracledocs` pool and then view the file systems in the pool.

```
root@s11-desktop:~# zfs create oracledocs/financials
root@s11-desktop:~# zfs list -r oracledocs
NAME                    USED   AVAIL   REFER   MOUNTPOINT
oracledocs              124K    976M    32K   /oracledocs
oracledocs/financials    31K    976M    31K   /oracledocs/financials
root@s11-desktop:~#
```

   You just created the file system called `financials` in the `oracledocs` pool as a descendent file system of `oracledocs`. Your company plans to store Oracle Financials application documentation in the `oracledocs` documentation pool.

7. Because the Oracle Financials application is large, you may want to create a separate file system for the Accounts Receivable documentation. You may call it `ar`. Create the file system and then verify that it has been created.

```
root@s11-desktop:~# zfs create oracledocs/financials/ar
root@s11-desktop:~# zfs list -r oracledocs
NAME                       USED   AVAIL   REFER   MOUNTPOINT
oracledocs                 164K    976M    32K   /oracledocs
oracledocs/financials       63K    976M    32K   /oracledocs/financials
oracledocs/financials/ar    31K    976M    31K   /oracledocs/financials/ar
root@s11-desktop:~#
```

Practice 5-3: Administering ZFS Snapshots and Clones

Overview

In this practice, you work with ZFS storage pools in the following tasks:

- Creating ZFS snapshots
- Creating ZFS clones
- Deleting the ZFS components

Tasks

1. Verify that the Sol11-Server1 virtual machine is running. If it is not, start it at this time.

2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.

3. Log in to the Sol11-Desktop virtual machine as user `oracle`. Use the password `oracle1`.

4. Right-click the desktop background and open a terminal window.

5. In the terminal window, run the `su -` command to assume primary administrator privileges. Use the password `oracle1`.

```
oracle@s11-desktop:~$ su –
Password:
Oracle Corporation    SunOS 5.11      11.0          November 2011
root@s11-desktop:~#
```

6. Using the command `zfs snapshot`, create a ZFS snapshot of the `ar` file system you created in Practice 5-2 and then verify that it has been created. Then verify that the `listsnapshots` property has been set to `on` for the `oracledocs` pool.

```
root@s11-desktop:~# zfs snapshot oracledocs/financials/ar@friday
root@s11-desktop:~# zfs list -rt all oracledocs
NAME                            USED    AVAIL   REFER   MOUNTPOINT
oracledocs                      167K    976M    32K     /oracledocs
oracledocs/financials            63K    976M    32K     /oracledocs/financials
oracledocs/financials/ar         31K    976M    31K     /oracledocs/financials/ar
oracledocs/financials/ar@friday    0       -    31K
```

Note that a snapshot is created by appending the `@` sign to the file system name, together with the name of the snapshot. The best practice is that you name it something meaningful (`Friday`, `Nov11`, `TSmith`, and so on) that can remind you of the backup day, date, or owner. The option `-t all` is used to include the snapshots in the displayed output. Without this option, the snapshots are not displayed. To see the results of not using this option, run the following command:

```
root@s11-desktop:~# zfs list -r oracledocs
NAME                            USED    AVAIL   REFER   MOUNTPOINT
oracledocs                      167K    976M    32K     /oracledocs
oracledocs/financials            63K    976M    32K     /oracledocs/financials
oracledocs/financials/ar         31K    976M    31K     /oracledocs/financials/ar
```

Next, verify that the `listsnapshots` property has been turned on.

```
oracle@s11-desktop:~# zpool get listsnapshots oracledocs
NAME            PROPERTY        VALUE         SOURCE
oracledocs   listsnapshots  off          default
```

As displayed here, the `listsnapshots` property is off by default. Now, turn it on.

```
oracle@s11-desktop:~# zpool set listsnapshots=on oracledocs
oracle@s11-desktop:~# zpool get listsnapshots oracledocs
NAME            PROPERTY        VALUE         SOURCE
oracledocs   listsnapshots  on           default
```

Now, when you display the descendent file systems of the `oracledocs` pool, the snapshots are included.

```
root@s11-desktop:~# zfs list -r oracledocs
NAME                             USED   AVAIL   REFER   MOUNTPOINT
oracledocs                       170K    976M     32K   /oracledocs
oracledocs/financials             63K    976M     32K   /oracledocs/financials
oracledocs/financials/ar          31K    976M     31K   /oracledocs/financials/ar
oracledocs/financials/ar@friday    0       -      31K
root@s11-desktop:~#
```

Now you know two ways to display the snapshots in case you run into a similar situation.

Note: You can learn more about ZFS properties in the *Oracle Solaris 11 Advanced System Administration* course.

7. Using the command `zfs clone`, create a clone from the snapshot and then verify that it has been created.

```
root@s11-desktop:~# zfs clone oracledocs/financials/ar@friday \
oracledocs/financials/ar/fridayclone
root@s11-desktop:~# zfs list -rt all oracledocs

NAME                             USED   AVAIL   REFER   MOUNTPOINT
oracledocs                       247K    976M     32K   /oracledocs
oracledocs/financials            101K    976M     32K
/oracledocs/financials
oracledocs/financials/ar          69K    976M     32K
/oracledocs/financials/ar
oracledocs/financials/ar@Friday   19K      -      31K   -
oracledocs/financials/ar/fridayclone  18K  976M   31K
/oracledocs/financials/ar/fridayclone
root@s11-desktop:~#
```

The snapshot `oracledocs/financials/ar@friday` is not mounted, as displayed in the `MOUNTPOINT` column. Because it is not mounted, it is not accessible. On the other hand, its clone `oracledocs/financials/ar/fridayclone` is mounted, which makes it accessible.

> The clone `fridayclone` is read/write, meaning that it is modifiable as opposed to the snapshot `oracledocs/financials/ar@friday`, which is read-only.

8. Because you won't be using the clone in this class, destroy it and then verify that it has been deleted.

```
root@s11-desktop:~# zfs destroy
oracledocs/financials/ar/fridayclone
root@s11-desktop:~# zfs list -rt all oracledocs


NAME                          USED   AVAIL  REFER  MOUNTPOINT
oracledocs                    210K   976M    32K   /oracledocs
oracledocs/financials          83K   976M    32K   /oracledocs/financials
oracledocs/financials/ar       51K   976M    32K   /oracledocs/financials/ar
oracledocs/financials/ar@friday 19K    -     31K   -
root@s11-desktop:~#
```

> The clone is not displayed because it has been deleted.

9. Because you won't be using the snapshot either, you can destroy it, too, and then verify that it has been deleted.

```
root@s11-desktop:~# zfs destroy oracledocs/financials/ar@friday
root@s11-desktop:~# zfs list -rt all oracledocs


NAME                         USED   AVAIL  REFER   MOUNTPOINT
oracledocs                   173K   976M    32K    /oracledocs
oracledocs/financials         63K   976M    32K    /oracledocs/financials
oracledocs/financials/ar      31K   976M    31K    /oracledocs/financials/ar
root@s11-desktop:~#
```

> The snapshot is not displayed because it has been deleted.

10. At this time, you can destroy the file systems recursively. Then verify that the file systems have been deleted.

```
root@s11-desktop:~# zfs destroy -r oracledocs
root@s11-desktop:~# zfs list -r oracledocs


NAME         USED   AVAIL   REFER  MOUNTPOINT
oracledocs   96.5K  976M     32K  /oracledocs
root@s11-desktop:~#
```

> No file systems are listed other than the initial file system for the pool.

---

11. At this time, delete the `oraclehr` and `oracledocs` pools.

```
root@s11-desktop:~# zpool destroy oraclehr
root@s11-desktop:~# zpool destroy oracledocs

root@s11-desktop:~# zpool list
NAME    SIZE   ALLOC   FREE    CAP  DEDUP   HEALTH  ALTROOT
rpool  31.8G  5.84G  25.9G    18%  1.00x   ONLINE  -
root@s11-desktop:~#

The oraclehr and oracledocs pools have been deleted. You have only rpool left.
```

Practice 5-4: Administering ZFS Pools by Using Disk Slices

Overview

In this practice, you work with ZFS storage pools in the following tasks:

- Formatting a disk
- Creating a ZFS pool
- Examining the pool's configuration
- Creating a ZFS file system
- Deleting the pool

Tasks

1. Verify that the Sol11-Server1 virtual machine is running. If it is not, start it at this time.
2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.
3. Log in to the Sol11-Desktop virtual machine as user `oracle`. Use the password `oracle1`.
4. Right-click the desktop background and open a terminal window.
5. In the terminal window, run the `su -` command to assume primary administrator privileges. Use the password `oracle1`.

```
oracle@s11-desktop:~$ su –
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

6. Use the command `format` to enter the disk-formatting process. Follow the directions to format the disk.

```
root@s11-desktop:~# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c3t0d0 <ATA-VBOX HARDDISK-1.0 cyl 4174 alt 2 hd 255 sec 63>
          /pci@0,0/pci8086,2829@d/disk@0,0
       1. c3t2d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@2,0
       2. c3t3d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@3,0
       3. c3t4d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@4,0
       4. c3t5d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@5,0
       5. c3t6d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@6,0
       6. c3t7d0 <ATA-VBOX HARDDISK-1.00GB>
          /pci@0,0/pci8086,2829@d/disk@7,0
       7. c3t8d0 <ATA-VBOX HARDDISK-1.0 cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@8,0
```

```
       8. c3t9d0 <ATA-VBOX HARDDISK-1.0 cyl 1022 alt 2 hd 64 sec 32>
          /pci@0,0/pci8086,2829@d/disk@9,0
```

Select an available disk (with the exception of the first one, because it is the boot disk). Enter its number (for example, 8).

```
Specify disk (enter its number): 8
selecting c3t9d0
[disk formatted]
No Solaris fdisk partition found.

FORMAT MENU:
        disk      - select a disk
        type      - select (define) a disk type
        partition - select (define) a partition table
        current   - describe the current disk
        format    - format and analyze the disk
        fdisk     - run the fdisk program
        repair    - repair a defective sector
        label     - write label to the disk
        analyze   - surface analysis
        defect    - defect list management
        backup    - search for backup labels
        verify    - read and display labels
        save      - save new disk/partition definitions
        inquiry   - show disk ID
        volname   - set 8-character volume name
        !<cmd>    - execute <cmd>, then return
        Quit
```

Enter p to partition the disk.

```
format> p
WARNING - This disk may be in use by an application that has
          modified the fdisk table. Ensure that this disk is
          not currently in use before proceeding to use fdisk.
```

Note: Based on the type of label on the disk (for example, EFI), it may take you directly to the partitioning menu. In that case, you don't have to use fd for fdisk partitioning. Consult your instructor if needed.

Enter `fd` for fdisk partitioning.

```
format> fd
No fdisk table exists. The default partition for the disk is:

  a 100% "SOLARIS System" partition


Type "y" to accept the default partition,  otherwise type "n" to
edit the partition table.
y
```

On x86 platforms, you can create multiple fixed disk partitions in which you can install different operating systems (for example, Windows, Linux, and Solaris).

Enter `p` to partition the disk.

```
format> p
PARTITION MENU:
        0      - change `0' partition
        1      - change `1' partition
        2      - change `2' partition
        3      - change `3' partition
        4      - change `4' partition
        5      - change `5' partition
        6      - change `6' partition
        7      - change `7' partition
        select - select a predefined table
        modify - modify a predefined partition table
        name   - name the current table
        print  - display the current table
        label  - write partition map and label to the disk
        !<cmd> - execute <cmd>, then return
        Quit
```

Enter `p` for print (the current table).

```
partition> p
Current partition table (default):
Total disk cylinders available: 1021 + 2 (reserved cylinders)
```

```
Part    Tag     Flag    Cylinders       Size            Blocks
  0 unassigned   wm     0               0           (0/0/0)         0
  1 unassigned   wm     0               0           (0/0/0)         0
  2     backup   wu     0 - 1020     1021.00MB      (1021/0/0)2091008
  3 unassigned   wm     0               0           (0/0/0)         0
  4 unassigned   wm     0               0           (0/0/0)         0
  5 unassigned   wm     0               0           (0/0/0)         0
  6 unassigned   wm     0               0           (0/0/0)         0
  7 unassigned   wm     0               0           (0/0/0)         0
  8       boot   wu     0 -   0        1.00MB       (1/0/0)      2048
  9 unassigned   wm     0               0           (0/0/0)         0
```

Enter m for modify.

```
partition> m
Select partitioning base:
        0. Current partition table (default)
        1. All Free Hog
```

Enter 1 for All Free Hog to format the disk fresh.

```
Choose base (enter number) [0]? 1


Part    Tag     Flag    Cylinders       Size            Blocks
  0       root   wm     0               0           (0/0/0)         0
  1       swap   wu     0               0           (0/0/0)         0
  2     backup   wu     0 - 1020     1021.00MB      (1021/0/0)2091008
  3 unassigned   wm     0               0           (0/0/0)         0
  4 unassigned   wm     0               0           (0/0/0)         0
  5 unassigned   wm     0               0           (0/0/0)         0
  6        usr   wm     0               0           (0/0/0)         0
  7 unassigned   wm     0               0           (0/0/0)         0
  8       boot   wu     0 -   0        1.00MB       (1/0/0)      2048
  9 alternates   wm     0               0           (0/0/0)         0


Do you wish to continue creating a new partition
table based on above table[yes]? <enter>
```

Press the Enter key to accept the default partition 6 for any remaining un-allocated space.

```
Free Hog partition[6]? <enter>


Enter size of partition '0' [0b, 0c, 0.00mb, 0.00gb]: 200mb
```

```
Enter size of partition '1' [0b, 0c, 0.00mb, 0.00gb]: 100mb
Enter size of partition '3' [0b, 0c, 0.00mb, 0.00gb]: 200mb
Enter size of partition '4' [0b, 0c, 0.00mb, 0.00gb]: 200mb
Enter size of partition '5' [0b, 0c, 0.00mb, 0.00gb]: 200mb
Enter size of partition '7' [0b, 0c, 0.00mb, 0.00gb]: 100mb


Part       Tag    Flag   Cylinders       Size            Blocks
 0        root    wm      1 - 200      200.00MB    (200/0/0)  409600
 1        swap    wu    201 - 300      100.00MB    (100/0/0)  204800
 2      backup    wu      0 -1020     1021.00MB    (1021/0/0)2091008
 3 unassigned    wm    301 - 500      200.00MB    (200/0/0)  409600
 4 unassigned    wm    501 - 700      200.00MB    (200/0/0)  409600
 5 unassigned    wm    701 - 900      200.00MB    (200/0/0)  409600
 6         usr    wm    901 - 920       20.00MB    (20/0/0)    40960
 7 unassigned    wm    921 -1020      100.00MB    (100/0/0)  204800
 8        boot    wu      0 -    0       1.00MB    (1/0/0)      2048
 9  alternates    wm      0               0       (0/0/0)         0

Okay to make this the current partition table[yes]? <enter>
Enter table name (remember quotes): foster


Ready to label disk, continue? y
partition> p
Current partition table (foster):
Total disk cylinders available: 1021 + 2 (reserved cylinders)

Part       Tag    Flag   Cylinders       Size            Blocks
 0 unassigned    wm      1 - 200      200.00MB    (200/0/0)  409600
 1 unassigned    wm    201 - 300      100.00MB    (100/0/0)  204800
 2      backup    wu      0 -1020     1021.00MB    (1021/0/0)2091008
 3 unassigned    wm    301 - 500      200.00MB    (200/0/0)  409600
 4 unassigned    wm    501 - 700      200.00MB    (200/0/0)  409600
 5 unassigned    wm    701 - 900      200.00MB    (200/0/0)  409600
 6 unassigned    wm    901 - 920       20.00MB    (20/0/0)    40960
 7 unassigned    wm    921 -1020      100.00MB    (100/0/0)  204800
 8        boot    wu      0 -    0       1.00MB    (1/0/0)      2048
 9 unassigned    wm      0               0       (0/0/0)         0
```

7. Use the command `q` to quit to the previous menu.

```
partition> q
FORMAT MENU:
        disk       - select a disk
        type       - select (define) a disk type
        partition  - select (define) a partition table
        current    - describe the current disk
        format     - format and analyze the disk
        fdisk      - run the fdisk program
        repair     - repair a defective sector
        label      - write label to the disk
        analyze    - surface analysis
        defect     - defect list management
        backup     - search for backup labels
        verify     - read and display labels
        save       - save new disk/partition definitions
        inquiry    - show disk ID
        volname    - set 8-character volume name
        !<cmd>     - execute <cmd>, then return
        quit
format> q
```

8. Using the command `zpool`, create a pool called `slicepool` with three disk slices.

```
root@s11-desktop:~# zpool create slicepool c3t9d0s0 c3t9d0s3
c3t9d0s4
invalid vdev specification
use '-f' to override the following errors:
/dev/dsk/c3t9d0s0 overlaps with /dev/dsk/c3t9d0s2


You need to use -f option to override the error. The reason for this error is that slice 2 is
a copy of the whole disk.


root@s11-desktop:~# zpool create -f slicepool c3t9d0s0 c3t9d0s3
c3t9d0s4
'slicepool' successfully created, but with no redundancy; failure
of one device will cause loss of the pool
```

9. Using the command `zpool status`, display the configuration of the `slicepool`.

```
root@s11-desktop:~# zpool status slicepool
  pool: slicepool
 state: ONLINE
  scan: none requested
config:


        NAME         STATE     READ WRITE CKSUM
        slicepool    ONLINE       0     0     0
          c3t9d0s0   ONLINE       0     0     0
          c3t9d0s3   ONLINE       0     0     0
          c3t9d0s4   ONLINE       0     0     0


errors: No known data errors


root@s11-desktop:~# zpool list
NAME        SIZE   ALLOC   FREE  CAP  DEDUP  HEALTH  ALTROOT
rpool      31.8G   5.84G  25.9G  18%  1.00x  ONLINE  -
slicepool   585M    137K   585M   0%  1.00x  ONLINE  -
```

10. Using the command `zfs`, create a file system called `docs` in `slicepool`. Then verify the creation of the file system.

```
root@s11-desktop:~# zfs create slicepool/docs
root@s11-desktop:~# zfs list -r /slicepool
NAME            USED  AVAIL  REFER  MOUNTPOINT
slicepool       130K   553M    32K  /slicepool
slicepool/docs   31K   553M    31K  /slicepool/docs
```

11. Using the `vi` editor, create a file called `custlist` to contain the indicated data.

```
root@s11-desktop:~# cd /slicepool/docs
root@s11-desktop:/slicepool/docs# vi custlist
root@s11-desktop:/slicepool/docs# cat custlist
Fancy Motors Ltd
Superior TV Services
…
…
```

12. Using the command `zfs`, destroy the `docs` file system. Destroy `slicepool` also. Confirm the deletion of the pool and the file system.

```
root@s11-desktop:/slicepool/docs# cd
root@s11-desktop:~# zfs destroy slicepool/docs
root@s11-desktop:~# zpool destroy slicepool
root@s11-desktop:~# zpool list
NAME    SIZE   ALLOC    FREE   CAP   DEDUP   HEALTH   ALTROOT
rpool  31.8G   5.84G   25.9G   18%   1.00x   ONLINE   -

root@s11-desktop:~# zpool status
  pool: rpool
 state: ONLINE
  scan: none requested
config:

    NAME           STATE    READ WRITE CKSUM
    rpool          ONLINE      0     0     0
      c3t0d0s0     ONLINE      0     0     0

errors: No known data errors
root@s11-desktop:~#
```

Practices for Lesson 5: Setting Up and Administering Data Storage

Practices for Lesson 6: Administering Oracle Solaris Zones

Chapter 6

Practices for Lesson 6

Practices Overview

In these practices, you are presented with a plan for administering Oracle Solaris zones. These practices provide experience in working with a zone, which is an example of Oracle operating system–based virtualization. The following activities are covered:

- Examining the zone configuration
- Administering the zone

Start State for the Practice

As an administrator user, in Sol11-Server1, execute the `lab6_setup` script in the `/opt/ora/scripts` directory. The script creates three zones for you to use during the practices that follow. The script takes about 10 minutes to run.

To execute the `lab6_setup` script, run the following commands:

```
cd /opt/ora/scripts
./lab6_setup
```

Scenario

Your company would like to use Oracle virtualization techniques with the benefit of positioning their product testing in separate independent partitions. As part of your testing activities, you are asked to examine a sample zone's configuration and evaluate its components. A zone called `QA` has been created for your evaluation. The `qadocs` folder is created in the global zone and shared in the `QA` zone so that it can be updated from any zone. The purpose of this zone is to offer a test bed where all the quality assurance testing for your company can be performed.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
√	Test the data storage functionality of Oracle Solaris 11.
	Inspect the Oracle Solaris zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practice 6-1: Determining an Oracle Solaris Zone's Configuration

Overview

In this practice, you work with an Oracle Solaris zone in the following activities:

- Examining the configuration of the current zones
- Determining the current zone resource utilization

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them at this time.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.

```
oracle@s11-server1:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-server1:~#
```

3. Using the `zoneadm` command, check the current zones on the system.

```
root@s11-server1:~# zoneadm list -cv
  ID NAME            STATUS      PATH                    BRAND     IP
   0 global          running     /                       solaris   shared
   1 QA              running     /zones/QA               solaris   shared
   2 grandmazone     running     /zones/grandmazone      solaris   excl
   3 choczone        running     /zones/choczone         solaris   excl



Can you tell how many zones are running on the system? A total of four, including the
global zone
Which zones are using a shared IP? The global zone and QA zone
Which zone is using an exclusive (dedicated) network interface? The zones grandma
and choczone
```

4. Using the `zonecfg` command, review the configuration of the `QA` zone.

```
root@s11-server1:~# zonecfg -z QA info
zonename: QA
zonepath: /zones/QA
brand: solaris
autoboot: true
file-mac-profile:
bootargs:
pool:
limitpriv:
scheduling-class:
ip-type: shared
hostid:
fs-allowed:
[max-lwps: 500]
fs:
        dir: /local/qadocs
        special: rpool/qadocs
        raw not specified
        type: lofs
        options: []
net:
        address: 192.168.0.200
        allowed-address not specified
        physical: net0
        defrouter not specified
rctl:
        name: zone.max-lwps
        value: (priv=privileged,limit=500,action=deny)
```

As you learned during the lecture, the `QA` personnel can use the file system `qadocs` from the global zone and the `QA` zone. It is being shared from the global zone.

Note the network interface configuration. Because the physical interface is shared with the global zone and specified in the zone configuration, the IP address is displayed here.

How many `lwps` (lightweight processes) are allowed to run in this zone? *500*

5. Log in to the QA zone and check the network configuration of the zone. Exit the QA zone when you have finished inspecting its network configuration.

```
root@s11-server1:~# zlogin QA
[Connected to zone 'QA' pts/1]
Oracle Corporation    SunOS 5.11      11.0        November 2011


Note: After issuing the following command, if nothing is displayed, wait a minute or so
and repeat the command.


root@qazone:~# ipadm show-addr
ADDROBJ             TYPE       STATE          ADDR
lo0/?               from-gz    ok             127.0.0.1/8
net0/?              from-gz    ok             192.168.0.200/24
lo0/?               from-gz    ok             ::1/128


root@qazone:~# exit
logout


[Connection to zone 'QA' pts/1 closed]
```

Can you find the network interface and the IP information for the QA zone? *Yes. It is*
`net0/?` and it is configured with the `192.168.0.200` IP address.

6. Review the configuration of the grandmazone zone.

```
root@s11-server1:~# zonecfg -z grandmazone info | more
zonename: grandmazone
zonepath: /zones/grandmazone
brand: solaris
autoboot: true
bootargs:
file-mac-profile:
pool:
limitpriv:
scheduling-class:
ip-type: exclusive
hostid:
fs-allowed:
net:
        address not specified
        allowed-address not specified
        physical: vnic1
        defrouter not specified
anet:
```

Practices for Lesson 6: Administering Oracle Solaris Zones

```
          linkname: net0
          lower-link: auto
          allowed-address not specified
          configured-allowed-address: true
          defrouter not specified
          allowed-dhcp-cids not specified
          link-protection: mac-nospoof
          mac-address: random
          auto-mac-address: 2:8:20:af:f3:ca
          mac-prefix not specified
          mac-slot not specified
          vlan-id not specified
          priority not specified
          rxrings not specified
          txrings not specified
          mtu not specified
          maxbw not specified
          rxfanout not specified
```

Can you tell from this output whether the `grandmazone` zone is using a shared NIC or an exclusive NIC? *Exclusive NIC (as mentioned in the `ip-type` section)*

Note the `net` section. The physical NIC is defined as `vnic1`. This is an example of a virtual network interface created for the zone.

7. Examine the network configuration that is visible from the global zone.

```
root@s11-server1:~# ipadm show-addr
ADDROBJ          TYPE       STATE      ADDR
lo0/v4           static     ok         127.0.0.1/8
lo0/?            static     ok         127.0.0.1/8
net0/v4          static     ok         192.168.0.100/24
net0/?           static     ok         192.168.0.200/24
lo0/v6           static     ok         ::1/128
lo0/?            static     ok         ::1/128
net0/v6          addrconf   ok         fe80::a00:27ff:fee2:9336/10
```

Note the network interface name and the IP address for the `QA` zone. What is the name of the network interface created for the `QA` zone? *It is `net0/?`, which is a virtual interface to `net0`.*

Note that no `vnic1` information is displayed for the `grandmazone` because `vnic1` is created at the data link layer. You will be able to see this information from within the zone.

8. Log in to the `grandmazone` zone by using the `zlogin` command. Display the IP address by using the `ipadm` command. Exit `grandmazone` when you have finished.

```
root@s11-server1:~# zlogin grandmazone
[Connected to zone 'grandmazone' pts/1]
Oracle Corporation      SunOS 5.11       11.0        November 2011
root@grandmazone:~# ipadm show-addr
ADDROBJ          TYPE        STATE          ADDR
lo0/v4           static      ok             127.0.0.1/8
vnic1/v4         static      ok             192.168.1.100/24
lo0/v6           static      ok             ::1/128
vnic1/v6         addrconf    ok             fe80::8:20ff:fedb:568e/10


Note: If nothing is displayed after you issue the preceding command, wait a minute or so
and repeat the command.


root@grandmazone:~# exit
logout


[Connection to zone 'grandmazone' pts/1 closed]


Note the network interface name and the IP address for grandmazone. What is the
name of the network interface that is created? It is vnic1/v4 with the IP address of
192.168.1.100.


This VNIC is part of the virtual network that is already created for this demonstration.
```

9. Check the connectivity to the `QA` zone from the global zone.

```
root@s11-server1:~# ping 192.168.0.200
192.168.0.200 is alive


Success! You are able to connect to the QA zone from the global zone.
```

10. Check the resource utilization of all the zones from the global zone by using the `zonestat` command to collect information during three intervals of five seconds each.

```
root@s11-server1:~# zonestat -r summary 5 3
Collecting data for first interval...
Interval: 1, Duration: 0:00:05
SUMMARY                  Cpus/Online: 1/1   PhysMem: 2047M  VirtMem: 3071M
                      ---CPU----  --PhysMem-- --VirtMem-- --PhysNet--
            ZONE  USED %PART  USED %USED  USED %USED PBYTE %PUSE
         [total]  0.10 10.7% 1394M 68.0% 1661M 54.0%     0 0.00%
        [system]  0.01 1.23%  968M 47.3% 1260M 41.0%     -     -
          global  0.08 8.76%  256M 12.5%  257M 8.39%     0 0.00%
              QA  0.00 0.22% 54.2M 2.64% 45.6M 1.48%     0 0.00%
        choczone  0.00 0.23% 58.2M 2.84% 48.4M 1.57%     0 0.00%
      grandmazone  0.00 0.30% 56.5M 2.76% 48.5M 1.58%    0 0.00%
...
...
root@s11-server1:~#


Here you see the total resource utilization of the system. Resource utilization is broken
down by the individual zones and system (general overhead). How much virtual
memory is being used by the zone named grandmazone? 48.5M or 1.58% of the
total
Which zone is using the CPU the most? The global zone, which has 8.76% usage
```

This concludes the review of the zone configuration.

Practices for Lesson 6: Administering Oracle Solaris Zones

Practice 6-2: Administering an Oracle Solaris Zone

Overview

In this practice, you work with ZFS storage pools in the following activities:

- Logging in to the zone
- Logging out of the zone
- Booting the zone
- Halting the zone

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them at this time.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges. Check the OS release information.

```
oracle@s11-server1:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-server1:~# cat /etc/release
                          Oracle Solaris 11 11/11 X86
  Copyright (c) 1983, 2011, Oracle and/or its affiliates. All rights reserved.
                          Assembled 18 October 2011
root@s11-server1:~#


Note the OS release information. You will need it subsequently.
```

3. Check whether the QA zone is running, and then log in to it. Also check the host name.

```
root@s11-server1:~# zoneadm list -v
  ID NAME            STATUS      PATH                      BRAND     IP
   0 global          running     /                         solaris   shared
   1 QA              running     /zones/QA                 solaris   shared
   2 grandmazone     running     /zones/grandma            solaris   excl
   3 choczone        running     /zones/choczone           solaris   excl

root@s11-server1:~# zlogin QA
[Connected to zone 'QA' pts/1]
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@qazone:~# hostname
qazone


You are logged in to the QA zone.
```

4. Obtain the OS release information in the zone. Compare it with the OS release information that you displayed for the global zone in step 2.

```
root@qazone:~# cat /etc/release
                        Oracle Solaris 11 11/11 X86
  Copyright (c) 1983, 2011, Oracle and/or its affiliates. All rights reserved.
                        Assembled 18 October 2011
```

Is the OS release information the same as from the global zone? *Yes*

5. Check the memory available in the zone.

```
root@qazone:~# prtconf | grep Mem
prtconf: devinfo facility not available
Memory size: 2048 Megabytes
```

6. Log out of the zone. Confirm that the QA zone is still running. Also check the host name.

```
root@qazone:~# exit
logout

[Connection to zone 'QA' pts/1 closed]
root@s11-server1:~# zoneadm list -v
  ID NAME             STATUS     PATH                       BRAND      IP
   0 global           running    /                          solaris    shared
   1 QA               running    /zones/QA                  solaris    shared
   2 grandmazone      running    /zones/grandma             solaris    excl
   3 choczone         running    /zones/choczone            solaris    excl
root@s11-server1:~# hostname
s11-server1
```

You are out of the QA zone and back in the global zone.

7. Reboot the zone to see any zone identification change. Log back in to the zone.

```
root@s11-server1:~# zoneadm -z QA reboot
```
Note: If you receive a warning about no matching subnet found, you can ignore it.

```
root@s11-server1:~# zoneadm list -v
  ID NAME             STATUS     PATH                       BRAND      IP
   0 global           running    /                          solaris    shared
   2 grandmazone      running    /zones/grandma             solaris    excl
   3 choczone         running    /zones/choczone            solaris    excl
   4 QA               running    /zones/QA                  solaris    shared
root@s11-server1:~# zlogin QA
[Connected to zone 'QA' pts/1]
Oracle Corporation      SunOS 5.11      11.0      November 2011
```

You are in the new instance of the QA zone. Note that the zone ID has been incremented.

8. Examine the ZFS file systems that are available in the zone. When you have finished reviewing the data, exit the QA zone.

```
root@qazone:~# zpool list
NAME     SIZE   ALLOC   FREE    CAP  DEDUP  HEALTH  ALTROOT
rpool   31.8G  11.0G   20.8G   34%   1.00x  ONLINE  -
root@qazone:~# zfs list
NAME                         USED   AVAIL   REFER  MOUNTPOINT
rpool                        370M   20.2G    31K   /rpool
rpool/ROOT                   370M   20.2G    31K   legacy
rpool/ROOT/solaris           370M   20.2G   341M   /
rpool/ROOT/solaris/var       24.3M  20.2G   23.3M  /var
rpool/export                 96.5K  20.2G    32K   /export
rpool/export/home            64.5K  20.2G    32K   /export/home
rpool/export/home/oracle1    32.5K  20.2G   32.5K  /export/home/oracle1


root@qazone:~# exit
logout


[Connection to zone 'QA' pts/1 closed]
```

Note that you have visibility to the root pool. What is the zone-related information?

The details for the file systems `/export` *and zone root (*`/`*)*

9. Halt the QA zone and boot it to check its status.

```
root@s11-server1:~# zoneadm -z QA halt
root@s11-server1:~# zoneadm list -iv
  ID NAME            STATUS     PATH                      BRAND      IP
   0 global          running    /                         solaris    shared
   2 grandmazone     running    /zones/grandma            solaris    excl
   3 choczone        running    /zones/choczone           solaris    excl
   - QA              installed  /zones/QA                 solaris    shared
```

Note that there is no zone ID assigned to the QA zone, because it has been halted.

```
root@s11-server1:~# zoneadm -z QA boot
```
Note: If you receive a warning about no matching subnet found, you can ignore it.

```
root@s11-server1:~# zoneadm list -v
  ID NAME            STATUS     PATH                      BRAND      IP
   0 global          running    /                         solaris    shared
   2 grandmazone     running    /zones/grandma            solaris    excl
   3 choczone        running    /zones/choczone           solaris    excl
   5 QA              running    /zones/QA                 solaris    shared
```

After booting, the QA zone is moved to the `running` state and it has an ID.

10. Execute the following script to remove the configuration created at the beginning of the practice. Confirm the results.

```
root@s11-server1:~# cd /opt/ora/scripts
root@s11-server1:/opt/ora/scripts# ./lab6_reset


When the system prompts you for confirmation of zone uninstallation, indicate "yes."


root@s11-server1:/opt/ora/scripts# cd
root@s11-server1:~# zoneadm list -civ
  ID NAME            STATUS     PATH                         BRAND      IP
   0 global          running    /                            solaris    shared

Only the global zone should be running at this time.
```

Practices for Lesson 6: Administering Oracle Solaris Zones

Practices for Lesson 7: Administering a Physical Network

Chapter 7

Practices for Lesson 7

Practices Overview

In these practices, you are presented with a plan for administering the Oracle Solaris 11 physical network. These practices provide you experience in working with the network facilities. The following activities are covered:

- Monitoring datalinks
- Working with the network configuration
- Verifying network operation

Scenario

Your company would like you to examine the Oracle Solaris 11 physical network facilities. Based on the transaction volume of the business applications, you may have to modify the network configuration. To be able to accomplish this objective, you configure and administer the network components.

Now take a look at your progress in the test activities checklist.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
√	Test the data storage functionality of Oracle Solaris 11.
√	Inspect the Oracle Solaris zones functionality.
	Inspect the Oracle Solaris 11 network configuration.
	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practice 7-1: Manually Configuring the Network Interface

Overview

In this practice, you work with the Oracle Solaris 11 network. This includes the following activities:

- Inspecting the datalinks
- Inspecting the network service
- Configuring the network interface
- Disabling the network interface
- Enabling the network interface
- Deleting the network interface

Task 1: Inspecting the Datalinks

1. Verify that the Sol11-Server1 virtual machine is running. If the virtual machine is not running, start it.

2. Double-click the Sol11-Desktop icon to launch the Sol11-Desktop virtual machine.

3. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

4. Right-click on the desktop and open a terminal window. Assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

5. Use the `dladm` command to determine the physical links that are available.

```
root@s11-desktop:~# dladm show-phys
LINK            MEDIA           STATE       SPEED   DUPLEX      DEVICE
net1            Ethernet        unknown     1000    full        e1000g1
net2            Ethernet        unknown     0       unknown     e1000g2
net0            Ethernet        up          1000    full        e1000g0
net3            Ethernet        unknown     0       unknown     e1000g3

Note the naming conventions: Physical link names are prefixed with net.

Is the net3 link up at this time? No, it is in unknown state.
```

Practices for Lesson 7: Administering a Physical Network

6. Use the `dladm` command to determine the datalinks that are available.

```
root@s11-desktop:~# dladm show-link
LINK              CLASS     MTU     STATE     OVER
net1              phys      1500    unknown   --
net2              phys      1500    unknown   --
net0              phys      1500    up        --
net3              phys      1500    unknown   --


Note the naming conventions: At the datalink layer, the link names are the same as at
the physical layer.
```

7. Use the command `svcs network/physical` to verify that the network service is running.

```
root@s11-desktop:~# svcs network/physical
STATE           STIME       FMRI
disabled        3:14:14     svc:/network/physical:nwam
online          3:14:36     svc:/network/physical:upgrade
online          3:14:43     svc:/network/physical:default


The default instance of the network/physical service is up and running.
```

Task 2: Configuring the Network Interface

1. Use the `ipadm` command to look at the IP interface information.

```
root@s11-desktop:~# ipadm show-if
IFNAME      CLASS       STATE       ACTIVE OVER
lo0         loopback    ok          yes     --
net0        ip          ok          yes     --

Note that net3 is not included in this display.
```

2. Using the `ipadm` command, display the IP addresses.

```
root@s11-desktop:~# ipadm show-addr
ADDROBJ         TYPE        STATE       ADDR
lo0/v4          static      ok          127.0.0.1/8
net0/_a         static      ok          192.168.0.111/24
lo0/v6          static      ok          ::1/128

Note that net3 is not included in this display.
```

Practices for Lesson 7: Administering a Physical Network

3. Using the `ipadm` command, create a new interface `net3`. Display the results.

```
root@s11-desktop:~# ipadm create-ip net3
root@s11-desktop:~# ipadm show-if

IFNAME      CLASS      STATE      ACTIVE OVER
lo0         loopback   ok         yes    --
net0        ip         ok         yes    --
net3        ip         down       no     --
```

Is the newly created interface up? *No*

4. After creating the interface, use the `ipadm create-addr` command to assign an IP address to this interface. Display the interfaces.

```
root@s11-desktop:~# ipadm create-addr -T static \
-a 192.168.0.203/24 net3/v4
root@s11-desktop:~# ipadm show-if
IFNAME      CLASS      STATE      ACTIVE OVER
lo0         loopback   ok         yes    --
net0        ip         ok         yes    --
net3        ip         ok         yes    --
```

Note that the new `net3` interface is up now.

5. Use the `ipadm show-addr` command to display the newly assigned IP address.

```
root@s11-desktop:~# ipadm show-addr
ADDROBJ         TYPE      STATE      ADDR
lo0/v4          static    ok         127.0.0.1/8
net0/_a         static    ok         192.168.0.111/24
net3/v4         static    ok         192.168.0.203/24
lo0/v6          static    ok         ::1/128
```

Note that the newly added IP address for `net3` appears correctly in the list.

Practices for Lesson 7: Administering a Physical Network

Task 3: Administering the Network Interface

1. Using a UNIX editor, such as `vi`, make the entry for `server2` in the `/etc/hosts` file as indicated in bold in the following text.

```
root@s11-desktop:~# vi /etc/hosts
root@s11-desktop:~# cat /etc/hosts

#
# Copyright 2009 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#
# Internet host table
#
::1 s11-desktop localhost
127.0.0.1 s11-desktop localhost loghost
192.168.0.203    s11-server2
root@s11-desktop:~#
```

2. Use the `ping` command to verify the connectivity with `s11-server2`.

```
root@s11-desktop:~# ping s11-server2
s11-server2 is alive
```

Why are you able to ping the IP address `192.168.0.203` by using the alias `s11-server2`? *Because the cross reference is in the* `/etc/hosts` *file*

Note: This file acts as a naming service.

3. Look at the current state of all the network interfaces.

```
root@s11-desktop:~# ipadm show-addr
ADDROBJ         TYPE     STATE     ADDR
lo0/v4          static   ok        127.0.0.1/8
net0/_a         static   ok        192.168.0.111/24
net3/v4         static   ok        192.168.0.203/24
lo0/v6          static   ok        ::1/128
```

All of them are up (`ok`) as displayed by the `STATE` column.

4. Use the `ipadm down-addr` command to take the new interface out of service. Display the results.

```
root@s11-desktop:~# ipadm down-addr net3/v4
root@s11-desktop:~# ipadm show-addr
ADDROBJ         TYPE     STATE     ADDR
lo0/v4          static   ok        127.0.0.1/8
net0/_a         static   ok        192.168.0.111/24
net3/v4         static   down      192.168.0.203/24
lo0/v6          static   ok        ::1/128
```

In this instance, for training purposes, you are learning how to bring an interface down.

5. Use the `ipadm up-addr` command to bring up the new interface. Display the results.

```
root@s11-desktop:~# ipadm up-addr net3/v4
root@s11-desktop:~# ipadm show-addr
ADDROBJ          TYPE     STATE     ADDR
lo0/v4           static   ok        127.0.0.1/8
net0/_a          static   ok        192.168.0.111/24
net3/v4          static   ok        192.168.0.203/24
lo0/v6           static   ok        ::1/128

When you need to bring this interface up, this is how you can do it.
```

6. Use the `ipadm delete-addr` command to delete the IP address for the newly created network interface. Confirm the results.

```
root@s11-desktop:~# ipadm delete-addr net3/v4
root@s11-desktop:~# ipadm show-addr
ADDROBJ          TYPE     STATE     ADDR
lo0/v4           static   ok        127.0.0.1/8
net0/_a          static   ok        192.168.0.111/24
lo0/v6           static   ok        ::1/128


root@s11-desktop:~# ipadm show-if
IFNAME      CLASS      STATE     ACTIVE OVER
lo0         loopback   ok        yes    --
net0        ip         ok        yes    --
net3        ip         down      no     --

Notice that the net3 interface still exists because you have not deleted it yet.
```

7. Use the `ipadm delete-ip` command to delete the network interface. Confirm the results.

```
root@s11-desktop:~# ipadm delete-ip net3
root@s11-desktop:~# ipadm show-if
IFNAME      CLASS      STATE     ACTIVE OVER
lo0         loopback   ok        yes    --
net0        ip         ok        yes    --

You have now deleted the IP address associated with net3, as well as the network
interface. You should not see net3 in the list.
```

This completes the network configuration procedure.

Practice 7-2: Verifying Network Operation

Overview

In this practice, you verify that the network is operational. This includes the following activities:

- Verifying the connectivity between two hosts
- Checking the connectivity to the DNS server
- Monitoring the transaction traffic between two hosts
- Checking the traffic load on one network interface

Tasks

1. Verify that the Sol11-Server1 virtual machine is running.
2. Verify that the Sol11-Desktop virtual machine is running. If it is not, start it now.
3. If you have not already done so, log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.
4. If you have not already done so, right-click on the desktop and open a terminal window. Run the `su -` command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

5. Check whether you have connection to the DNS server.

```
root@s11-desktop:~# nslookup 192.168.0.100
Server:    192.168.0.100
Address:   192.168.0.100#53
100.0.168.192.in-addr.arpa     name = s11-server1.mydomain.com.


In the current environment, the DNS has been defined for you on the s11-server1
virtual machine.
```

6. Check the network interfaces, IP addresses, and their current status.

```
root@s11-desktop:~# ipadm show-addr
ADDROBJ        TYPE     STATE     ADDR
lo0/v4         static   ok        127.0.0.1/8
net0/_a        static   ok        192.168.0.111/24
lo0/v6         static   ok        ::1/128

root@s11-desktop:~# ipadm show-if
IFNAME      CLASS      STATE     ACTIVE OVER
lo0         loopback   ok        yes    --
net0        ip         ok        yes    --
root@s11-desktop:~#
```

7. Check the connectivity from `s11-desktop` to `s11-server1`.

```
root@s11-desktop:~# ping -s 192.168.0.100
PING 192.168.0.100: 56 data bytes
64 bytes from s11-server1.mydomain.com (192.168.0.100): icmp_seq=0. time=1.143 ms
64 bytes from s11-server1.mydomain.com (192.168.0.100): icmp_seq=1. time=0.724 ms
64 bytes from s11-server1.mydomain.com (192.168.0.100): icmp_seq=2. time=1.639 ms
^C
----192.168.0.100 PING Statistics----
3 packets transmitted, 3 packets received, 0% packet loss
…


Press Ctrl + C to stop the continuous display.


Assuming that your application analysts are using the s11-desktop virtual machine
and updating transactions on the s11-server1 virtual machine (192.168.0.100),
you can check the connectivity between the two machines. If you use the -s option, you
can also monitor sporadic connectivity problems.
```

8. Check the network traffic on the `net0` network interface.

```
root@s11-desktop:~# netstat -I net0 -i 5
     input    net0      output          input   (Total)    output
packets errs   packets errs   colls  packets errs   packets errs   colls
418      0      455      0      0      494      0      531      0      0
0        0      0        0      0      0        0      0        0      0
0        0      0        0      0      0        0      0        0      0
3        0      3        0      0      3        0      3        0      0
2        0      2        0      0      2        0      2        0      0
0        0      0        0      0      0        0      0        0      0
^C
root@s11-desktop:~#


Press Ctrl + C to stop the continuous display.
```

Practices for Lesson 7: Administering a Physical Network

Practices for Lesson 7: Administering a Physical Network

Practices for Lesson 8: Setting Up and Administering User Accounts

Chapter 8

Practices for Lesson 8

Practices Overview

In these practices, you are presented with a plan for setting up and administering user accounts. In addition, these practices provide you experience in working with the initialization files that are used to customize your environment. The following activities are covered:

- Setting up user accounts
- Maintaining user accounts
- Managing the site and user initialization files
- Exploring shell metacharacters and user quotas

Scenario

Your company would like to evaluate the user account functionality in Oracle Solaris 11. You are asked to create and manage new accounts. Two new employees have joined the IT department and you are asked to create accounts for them. Based on the corporate conventions and personal preference, you modify their account attributes. Finally, you customize their environments to assist them with their preferences. You work with the two new groups listed in Table 8-1. Then you create and manage two accounts as listed in Table 8-2.

Group Name	Group ID
support	110
itgroup	120

Table 8-1: Group Specifications

User Account Name	Password	Shell	User ID	Primary Group	Secondary Group	Comments
dkumar	Mypass1	default	1002	support	itgroup	Undefined Password
tshane	Mypass1 Newpass1	korn	1005	support		Set password at next login

Table 8-2: User Specifications

Now check your progress. You have completed inspecting the Oracle Solaris 11 network configuration.

√	**Test Activities Checklist**
√	Install the Oracle Solaris 11 OS and test both the text installer and the LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.

√	Test the services functionality in Oracle Solaris 11.	
√	Test the data storage functionality of Oracle Solaris 11.	
√	Inspect the Oracle Solaris zones functionality.	
√	Inspect the Oracle Solaris 11 network configuration.	
	Set up users and test the user administration features of Oracle Solaris 11.	
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.	
	Inspect system processes and test the task scheduling functionality.	
	Troubleshoot specific system issues.	

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practices for Lesson 8: Setting Up and Administering User Accounts

Practice 8-1: Setting Up User Accounts

Overview

In this practice, you create the new user accounts, work with their passwords, and verify the account attributes in the sitewide initialization files. This practice includes the following activities:

- Setting account defaults
- Adding a group
- Adding a user
- Mounting the user's home directory
- Setting a password to expire immediately
- Verifying the user account setup

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the oracle user. Use oracle1 as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

4. Check whether the accounts default file exists. If it does not, create the account defaults by using the useradd –D command.

```
root@s11-desktop:~# ls /usr/sadm/defadduser
/usr/sadm/defadduser: No such file or directory

root@s11-desktop:~# useradd -D
group=staff,10  project=default,3  basedir=/export/home
skel=/etc/skel  shell=/usr/bin/bash  inactive=0
expire=  auths=  profiles=  roles=  limitpriv=
defaultpriv=  lock_after_retries=
```


5. Modify the value of `defshell` to `/bin/ksh`. Display the current account defaults by using the `useradd -D` command.

> The purpose of this step is to demonstrate to you that these defaults can be changed for all the new users that you create.
>
> ```
> root@s11-desktop:~# useradd -D -s /bin/ksh
> group=staff,10  project=default,3  basedir=/export/home
> skel=/etc/skel  shell=/bin/ksh  inactive=0
> expire=  auths=  profiles=  roles=  limitpriv=
> defaultpriv=  lock_after_retries=
> ```
>
> Can you tell what the previously available default shell was? *It was /usr/bin/bash.*

6. Because the `bash` shell is more popular, useful, and feature-rich, by using the following commands, change the default shell value back to `bash`. The preceding steps were shown for demonstration purposes.

> ```
> root@s11-desktop:~# useradd -D -s /usr/bin/bash
> group=staff,10  project=default,3  basedir=/export/home
> skel=/etc/skel  shell=/usr/bin/bash  inactive=0
> expire=  auths=  profiles=  roles=  limitpriv=
> defaultpriv=  lock_after_retries=
> ```

7. Create the groups called `support` and `itgroup` according to the specifications.

> ```
> root@s11-desktop:~# groupadd -g 110 support
> root@s11-desktop:~# groupadd -g 120 itgroup
> root@s11-desktop:~# grep support /etc/group
> support::110:
> root@s11-desktop:~# grep itgroup /etc/group
> itgroup::120:
> ```
>
> As you learned in the lecture for this lesson, the groups are added in `/etc/group`.

8. Now you are ready to create the users `dkumar` and `tshane`. Use the `useradd` command and specify the user attributes listed in the specifications.

> ```
> root@s11-desktop:~# useradd -u 1002 -g support -G itgroup \
> -d /export/home/dkumar -m -c "dileep kumar" dkumar
> 80 blocks
> root@s11-desktop:~# useradd -u 1005 -g support \
> -d /export/home/tshane -m -c "tom shane" -s /bin/ksh tshane
> 80 blocks
> ```
>
> What shell is assigned to `dkumar`? *The default bash shell*
> How do you know? *From the output of the command useradd -D (after you set it back to bash) in step 6*

9. Verify the creation of the `dkumar` and `tshane` users in the `/etc/passwd` file.

```
root@s11-desktop:~# grep dkumar /etc/passwd
dkumar:x:1002:110:dileep kumar:/home/dkumar:/usr/bin/bash
root@s11-desktop:~# grep tshane /etc/passwd
tshane:x:1005:110:tom shane:/home/tshane:/bin/ksh
```

Based on what you learned in the lecture, can you determine what these fields represent for each user? *Yes*

10. Check whether the new users have entries in `/etc/shadow`. Then create new passwords for the users based on the specifications provided at the beginning of this practice.

```
root@s11-desktop:~# grep dkumar /etc/shadow
dkumar:UP:::::::
root@s11-desktop:~# grep tshane /etc/shadow
tshane:UP:::::::
```

Note that when a new user is created, the account is flagged with `UP` for "undefined password."

```
root@s11-desktop:~# passwd dkumar
New Password: Mypass1
Re-enter new Password: Mypass1
passwd: password successfully changed for dkumar

root@s11-desktop:~# passwd tshane
New Password: Mypass1
Re-enter new Password: Mypass1
passwd: password successfully changed for tshane
```

Check how the password entries for these users have changed in `/etc/shadow`.

```
root@s11-desktop:~# grep dkumar /etc/shadow
dkumar:$5$x0aftZOd$d8hbuX/rb9vS485/9OlH63EkPbLzL8eDtFL/LVtbAp3:15309::::::
root@s11-desktop:~# grep tshane /etc/shadow
tshane:$5$iJM6uDL8$1C28YFeERBKOFkA.eE3JCJEjLKkp4r.HBdGqiA7Ql96:15309::::::
```

Now you see valid information for the users. One field is `15168` for both users. Can you tell what it represents? *It represents the date that the password was last modified, which is recorded as the number of days from January 1, 1970, to the modification date.*

11. Check the group membership for the users.

```
root@s11-desktop:~# grep support /etc/group
support::110:
root@s11-desktop:~# grep itgroup /etc/group
itgroup::120:dkumar


Looking at these displays, note that dkumar appears for itgroup, which was the
secondary group that you specified for dkumar during user creation. So where can you
find an entry that associates dkumar (or tshane for that matter) to the primary group?
Refer to step 8 for the answer.


root@s11-desktop:~# id –G dkumar
110 120
root@s11-desktop:~# id –G tshane
110


Here you can see very clearly the primary groups and the secondary groups (if any).
```

12. Using the zfs list command, verify the home directories of the new users.

```
root@s11-desktop:~# zfs list -r /rpool
NAME                        USED   AVAIL   REFER   MOUNTPOINT
rpool                       5.90G  25.4G    39K    /rpool
rpool/ROOT                  3.83G  25.4G    31K    legacy
rpool/ROOT/solaris          3.83G  25.4G   3.27G   /
rpool/ROOT/solaris/var       474M  25.4G    184M   /var
rpool/dump                  1.03G  25.4G   1.00G   -
rpool/export                5.60M  25.4G    32K    /export
rpool/export/home           5.57M  25.4G    38K    /export/home
rpool/export/home/dkumar      35K  25.4G    35K    /export/home/dkumar
rpool/export/home/oracle    5.47M  25.4G   5.47M   /export/home/oracle
rpool/export/home/tshane      35K  25.4G    35K    /export/home/tshane
rpool/swap                  1.03G  25.4G   1.00G   -


Note: These ZFS file systems (directories) were created for you automatically when you
created the users.
```

13. Expire `tshane`'s password. Now, on the next login, `tshane` is forced to create a new password.

```
root@s11-desktop:~# passwd -f tshane
passwd: password information changed for tshane
```

The `passwd` command is the main command to manage passwords. Here the `-f` option is used to expire `tshane`'s password. Check the impact of this command on the contents of the `/etc/shadow` file.

```
root@s11-desktop:~# grep tshane /etc/shadow
tshane:$5$iJM6uDL8$1C28YFeERBKOFkA.eE3JCJEjLKkp4r.HBdGqiA7Ql96:0::::::
```

Can you tell what information was changed in `/etc/shadow`? *Yes, the "last change" date. It is set to zero, indicating that the password has expired.*
Confirm it.

```
root@s11-desktop:~# su - oracle
Oracle Corporation      SunOS 5.11      11.0      November 2011
```

Note: If you try to log in to the `tshane` account as an administrator user, you are not prompted for a password. Therefore, you must first switch to a non-administrator user, that is, `oracle`.

Use the passwords listed in the specifications at the beginning of the practice.

```
oracle@s11-desktop:~$ su - tshane
Password: Mypass1
su: Password for user 'tshane' has expired
New Password: Newpass1
Re-enter new Password: Newpass1
su: password successfully changed for tshane
Oracle Corporation      SunOS 5.11      11.0      November 2011
tshane@s11-desktop:~$
```

Switch back to the `oracle` user and assume administrator privileges.

```
tshane@s11-desktop:~$ exit
oracle@s11-desktop:~$ exit
root@s11-desktop:~#
```

How can you tell if `tshane`'s password expired on the first login? *By examining the first system message after login (for example, by using the `su` command, which is similar to logging in)*

```
root@s11-desktop:~# grep tshane /etc/shadow
tshane:$5$4tG/o2y5$U4ufGa.PTJb/BpsR88q/sY1B/ButPtFHFINF3D0Qnk9:15309::::::
root@s11-desktop:~#
```

Do you see any change in `tshane`'s entry in `/etc/shadow`? *Yes. The "last change" date is modified*.

Practices for Lesson 8: Setting Up and Administering User Accounts

Practice 8-2: Maintaining User Accounts

Overview

In this practice, you administer the new accounts and the groups. This practice includes the following activities:

- Modifying a user account
- Deleting a user account
- Modifying a group
- Deleting a group

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

4. Use the `usermod` command to modify `tshane`'s primary group to `staff`. Confirm the change.

```
root@s11-desktop:~# usermod -u 1005 -g staff tshane
Found user in files repository.
root@s11-desktop:~# grep tshane /etc/passwd
tshane:x:1005:10:tom shane:/home/tshane:/bin/ksh
```

What field in this entry was changed? *The group 10 for staff*

Where is this group defined? *In the /etc/group file*

5. Use the `usermod` command to modify `dkumar`'s default shell to `korn`. Confirm the change.

```
root@s11-desktop:~# usermod -s /bin/ksh dkumar
Found user in files repository.
root@s11-desktop:~# grep 1002 /etc/passwd
dkumar:x:1002:110:dileep kumar:/home/dkumar:/bin/ksh
```

Which field in this entry represents the modified shell? *The last field, /bin/ksh*

6. Delete the `tshane` account, because this employee has left the company.

```
root@s11-desktop:~# userdel -r tshane
Found user in files repository.
```

You can use the `-r` option to delete `tshane`'s home directory along with the account.

Note: Do not issue the following command. You are shown this command only for information purposes.

```
root@s11-desktop:~# userdel tshane
Found user in files repository.
```

This command deletes *only* the account and not its home directory. You can use this command if you want to preserve `tshane`'s home directory. This would be the situation where Tom Shane has left the company and you want to save Tom's work in his home directory.

7. Modify the group name from `itgroup` to `hitech` based on an organizational change. Confirm the change.

```
root@s11-desktop:~# groupmod -n hitech itgroup
Found group in files repository.
root@s11-desktop:~# grep itgroup /etc/group
root@s11-desktop:~# grep hitech /etc/group
hitech::120:dkumar
root@s11-desktop:~# id –G dkumar
110 120
root@s11-desktop:~#
```

Is the new group in place? *Yes, it is.*

8. Delete the `support` group. Confirm that it is deleted. Inspect its impact.

```
root@s11-desktop:~# groupdel support
Found group in files repository.
root@s11-desktop:~# grep support /etc/group
root@s11-desktop:~# grep 110 /etc/group
```

You confirmed that the `support` group is deleted. However, when this group was active, the `dkumar` account was assigned to this group. Now check the impact on the `dkumar` account.

```
root@s11-desktop:~# id –G dkumar
110 120
```

Note that the system still shows `dkumar` as assigned to the primary group `110` although group 110 is deleted.

```
root@s11-desktop:~# grep dkumar /etc/passwd
```

```
dkumar:x:1002:110:dileep kumar:/home/dkumar:/bin/ksh
```

You see the same result in the `/etc/passwd` file.

```
root@s11-desktop:~# usermod -u 1002 -g 10 dkumar
Found user in files repository.
```

Because the system was showing an invalid group, you want to change `dkumar`'s assignment to a valid group. This time, you take this corrective action after deleting the group. The recommended practice is to reassign accounts to a valid group, and then delete the group.

```
root@s11-desktop:~# id –G dkumar
10 120
```

Is the system displaying a valid primary group for the `dkumar` account? *Yes*

Practice 8-3: Managing User Initialization Files

Overview

In this practice, you work with multiple types of initialization files. This practice includes the following activities:

- Setting up site initialization files
- Setting up user initialization files
- Customizing user work environments

Task 1: Setting Up System-Wide Initialization Files

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
```

4. Use the `more` command to view the site initialization file `/etc/profile`.

```
root@s11-desktop:~# more /etc/profile
#
#
#
# Copyright 2010 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#

# The profile that all logins get before using their own
.profile.

trap ""  2 3
export LOGNAME PATH

if [ "$TERM" = "" ]
then
     if /bin/i386
     then
          TERM=sun-color
...
...
...
The purpose of this display is for you to become familiar with the contents of
/etc/profile.
```

5. Use the `vi` editor (or any other UNIX editor) to modify `/etc/profile` to add an `alias` entry at the end.

```
root@s11-desktop:~# vi /etc/profile
root@s11-desktop:~# cat /etc/profile
...
...
...
                echo "You have mail."
                ;;
         esac
     fi
esac


umask 022
trap  2 3
alias c=clear


```

You added the last line to define an alias called `c`. The standard command to clear the screen is `clear`, and you created an alias `c` for it to save typing time.

6. Use the `source` command to have the system read this file and make the configuration available. Confirm that it works by typing `c` to clear the screen.

```
root@s11-desktop:~# source /etc/profile
Oracle Corporation     SunOS 5.11      11.0      November 2011


Alternatively, you can use . /etc/profile to source the changes.


root@s11-desktop:~# c


This should clear the screen, demonstrating that the alias has been successfully
configured in the site initialization file /etc/profile.

```

Alternatively, you can use `. /etc/profile` to source the changes.

```
root@s11-desktop:~# c
```

This should clear the screen, demonstrating that the alias has been successfully configured in the site initialization file `/etc/profile`.

7. Log in as the `dkumar` user and use the `c` command to confirm that it works for any user in any shell.

```
root@s11-desktop:~# su - dkumar
Oracle Corporation     SunOS 5.11      11.0      November 2011
dkumar@s11-desktop:~$ c


Did the c command work for you as dkumar? Yes
Now run the ps command to see what shell dkumar is using.


dkumar@s11-desktop:~$ ps
```

Did the `c` command work for you as `dkumar`? *Yes*
Now run the `ps` command to see what shell `dkumar` is using.

```
  PID TTY          TIME CMD
 1558 pts/1        0:00 ksh
 1580 pts/1        0:00 ps
```

As you can see from the output of the `ps` command, `dkumar` is using the `korn` shell (as compared to `administrator` using `bash`). By running the `c` command in both the `bash` and `korn` shells and as both an administrator and a user, you have verified that the alias is available to any user in any shell.

Return to the administrator account.
```
dkumar@s11-desktop:~$ exit
root@s11-desktop:~#
```

Task 2: Setting Up User Initialization Files

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.
2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.
3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
```

4. Log in to Dileep Kumar's account by using the `su` command. Modify `.profile` to add an alias to `cl`. This file resides in your home directory and can help you to customize only your environment. If this file does not exist, you can create it by using the `vi` editor.

```
dkumar@s11-desktop:~$ id
uid=1002(dkumar) gid=10(staff)


You are signed in as dkumar.


dkumar@s11-desktop:~$ ls -a
.          .bashrc          .sh_history       local.login
..         .profile         local.cshrc       local.profile


The -a option is used to check hidden files (files that start with . ). For example, this
could be .profile, which may or may not exist.


Now modify .profile by entering the contents shown by the following cat command.


dkumar@s11-desktop:~$ vi .profile
```

```
dkumar@s11-desktop:~$ cat .profile
…
…
…
alias cl=clear
export cl
dkumar@s11-desktop:~$ source /home/dkumar/.profile
dkumar@s11-desktop:~$ cl
dkumar@s11-desktop:~$ exit
root@s11-desktop:~#
```

Did the alias `cl` clear the screen for you? *Yes*

These are very similar steps, except in this case, you modified `.profile` instead of `/etc/profile`. The `.profile` resides in your home directory.

Experimental Note: Suppose that in your `.profile`, you defined the alias `c` to execute another command (other than `clear`), such as `ls`. Which alias `c` is executed in this case? This is something for you to experiment with.

Task 3: Customizing the User Work Environment

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11     11.0      November 2011
root@s11-desktop:~#
```

4. Use the `useradd -D` command to display the defaults for new users.

```
root@s11-desktop:~# useradd -D
group=staff,10  project=default,3  basedir=/export/home
skel=/etc/skel  shell=/usr/bin/bash  inactive=0
expire=  auths=  profiles=  roles=  limitpriv=
defaultpriv=  lock_after_retries=
```

Note that the `skel` keyword is pointing to `/etc/skel` as a default skeleton directory.

5. Examine the `/etc/skel` directory for its contents.

```
root@s11-desktop:~# cd /etc/skel
root@s11-desktop:/etc/skel# ls
local.cshrc  local.login  local.profile
root@s11-desktop:/etc/skel# more local.profile
#
# Copyright (c) 1991, 2010, Oracle and/or its affiliates. All
rights reserved.
#
#
#
stty istrip
PATH=/usr/bin:/usr/ucb
export PATH

Because this file is supposed to serve as a default initial file for the new users, it has
very minimal configuration. The objective is that individual users can modify it to
customize their environments.
```

6. Create a new user with a home directory.

```
root@s11-desktop:/etc/skel# cd
root@s11-desktop:~# useradd -u 1010 -g 10 \
-d /export/home/jpebble  -m -s /bin/bash -c "jane pebble" jpebble
80 blocks

You created a new user jpebble with a home directory by using the -m option and
assigning bash as the default shell.
```

7. Check jpebble's home directory to see whether you have `local.profile` created for you.

```
root@s11-desktop:~# su - jpebble
Oracle Corporation    SunOS 5.11     11.0       November 2011
jpebble@s11-desktop:~$ pwd
/home/jpebble
jpebble@s11-desktop:~$ ls
local.cshrc  local.login  local.profile


Why is local.profile created for the jpebble account? Because this is in the
/etc/skel directory, which, as you saw in step 4, is the default directory for all new
users.
```

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8. Use the `vi` command to modify `local.profile`.

```
jpebble@s11-desktop:~$ vi local.profile
jpebble@s11-desktop:~$ cat local.profile
#
# Copyright (c) 1991, 2010, Oracle and/or its affiliates. All
rights reserved.
#
#
#
stty istrip
PATH=/usr/bin:/usr/ucb
export PATH
alias p='echo $PATH'
export p


jpebble@s11-desktop:~$ source local.profile
```

Add the last two lines to define an alias called `p` to display the contents of the `PATH` variable. Why do you have to export it? *To make it available in your entire environment*

Note: After issuing the `source` command, you may see the following message, which can be safely ignored: `cannot read entire /usr/lib/locale/en_US.UTF-8/LC_CTYPE/ldterm.dat file.`

9. Check whether your new alias works.

```
jpebble@s11-desktop:~$ p
/usr/bin:/usr/ucb
jpebble@s11-desktop:~$ echo $PATH
/usr/bin:/usr/ucb
jpebble@s11-desktop:~$ exit
logout
root@s11-desktop:~#
```

Do you have to source `local.profile`? *Yes, this would make the changes effective.*

How is this method of using `local.profile` different from using `.profile`? *This method serves, quite similarly, the same function.*

The advantage of using `local.profile` is that the system administrator can modify this in one place, that is, in the `/etc/skel` directory to include aliases, variables, and so on. It is effective for all new users. When a new user is created, the user does not have to customize `local.profile` too much.

Practice 8-4: Exploring Shell Metacharacters and User Quotas

Overview

In this practice, you work with the Bash shell metacharacters, as well as create user storage quotas. This practice includes the following activities:

- Exploring shell metacharacters
- Creating disk quotas for users
- Monitoring the quotas

Task 1: Exploring Shell Metacharacters

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

4. Check permissions on `dkumar`'s home directory to see whether it is accessible by other users.

```
root@s11-desktop:~# ls -ld /export/home/dkumar
drwxr-xr-x 2 dkumar    10         9 Dec 1 06:47
/export/home/dkumar
```

   Yes, others have `r-x` permissions, meaning that they can `cd` into this directory.
   Note: You must have an `execute` permission on a directory before you can `cd` into it.

5. Log in as `jpebble`. Use the `cd ~/docs` command to go directly to the `docs` directory.

```
oracle@s11-desktop:~$ su - jpebble
Oracle Corporation    SunOS 5.11    11.0    November 2011
jpebble@s11-desktop:~$ pwd
/home/jpebble
jpebble@s11-desktop:~$ mkdir docs
jpebble@s11-desktop:~$ cd ~/docs
jpebble@s11-desktop:~/docs$ pwd
/home/jpebble/docs
```

   The purpose of this demonstration is to use the tilde `~` metacharacter, which represents the user's home directory path.

6. As the `jpebble` user, use the `cd ~dkumar` command to go to `dkumar`'s home directory.

```
jpebble@s11-desktop:~/docs$ cd ~dkumar
jpebble@s11-desktop:/home/dkumar$ pwd
/home/dkumar
```

You used the `cd ~dkumar` command as a shortcut to go directly to `dkumar`'s home directory. This method saves time as compared to using the absolute directory path.

Return to `jpebble`'s home directory.

```
jpebble@s11-desktop:/home/dkumar$ cd
jpebble@s11-desktop:~$
```

7. Use the `cd –` command to switch between two directories.

```
jpebble@s11-desktop:~$ pwd
/home/jpebble
jpebble@s11-desktop:~$ cd /tmp
jpebble@s11-desktop:/tmp$ pwd
/tmp
jpebble@s11-desktop:/tmp$ cd -
/home/jpebble
jpebble@s11-desktop:~$ cd -
/tmp
jpebble@s11-desktop:/tmp$ cd -
/home/jpebble
jpebble@s11-desktop:~$
```

The `cd -` command is also a shortcut metacharacter. It can help you to switch between two directories.

8. Use the file substitution character `*` to find files that match the partial specifications.

```
jpebble@s11-desktop:~$ cd /usr/demo/SOUND/sounds

jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls s*
spacemusic.au   splat.au
jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls f*
fastbusy.au   flush.au
jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls *1.au
touchtone.1.au
```

Notice how this works. You can use the `*` metacharacter to display the matching files (for example, `s*` for all files starting with `s`).

9. Use the ? file-substitution metacharacter to find files that match the partial specifications.

```
jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls touchtone.?.au
touchtone.0.au  touchtone.2.au  touchtone.4.au  touchtone.6.au  touchtone.8.au
touchtone.1.au  touchtone.3.au  touchtone.5.au  touchtone.7.au  touchtone.9.au

The ? metacharacter substitutes only one character.
```

10. Use the [] metacharacter to find files that match the partial specifications.

```
jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls [cf]*
chirp.au   computer.au   crash.au    fastbusy.au
clink.au   cowbell.au    cuckoo.au   flush.au

Can you explain what this metacharacter does? It matches the files that start with c or f.
```

11. Use the [] metacharacter to find files that match the partial specifications. After completion of the command, log out of the jpebble user account.

```
jpebble@s11-desktop:/usr/demo/SOUND/sounds$ ls [c-f]*
chirp.au   computer.au   crash.au    dialtone.au   drip.au  flush.au
clink.au   cowbell.au    cuckoo.au   doorbell.au   fastbusy.au

Can you explain what this metacharacter does? It matches the files that start with c
through f.


jpebble@s11-desktop:/usr/demo/SOUND/sounds$ exit
logout
root@s11-desktop:~#
```

Task 2: Creating Disk Quotas for Users

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the oracle user. Use oracle1 as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
.
```

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4. Set a quota of 2 MB of storage for dkumar.

```
root@s11-desktop:~# zfs set quota=2M rpool/export/home/dkumar
root@s11-desktop:~# zfs get quota rpool/export/home/dkumar
NAME                        PROPERTY   VALUE   SOURCE
rpool/export/home/dkumar    quota      2M      local


root@s11-desktop:~# zfs userspace rpool/export/home/dkumar
TYPE          NAME     USED    QUOTA
POSIX User    dkumar   9K      none
POSIX User    root     1.50K   none
```

Why does the QUOTA column for dkumar show none? *Because the quota is set at the directory level and not at the user level*

```
root@s11-desktop:~# zfs list /export/home/dkumar
NAME                        USED   AVAIL   REFER   MOUNTPOINT
rpool/export/home/dkumar    37K    1.96M    37K   /export/home/dkumar


root@s11-desktop:~# df -h /export/home/dkumar
Filesystem          Size   Used Available Capacity Mounted on
rpool/export/home/dkumar
                    2.0M   37K     2.0M        2% /export/home/dkumar
```

Note the space available for dkumar as displayed by multiple commands.

5. Switch to dkumar's account and create some files to test the storage limit.

```
root@s11-desktop:~# su - dkumar
Oracle Corporation    SunOS 5.11    11.0       November 2011
dkumar@s11-desktop:~$ /usr/sbin/mkfile 1m \
/export/home/dkumar/crmindex
```

Exit the dkumar user account to go back to the administrator account.

```
dkumar@s11-desktop:~$ exit
root@s11-desktop:~# zfs list /export/home/dkumar
NAME                        USED    AVAIL   REFER   MOUNTPOINT
rpool/export/home/dkumar    1.04M    984K   1.04M   /export/home/dkumar


root@s11-desktop:~# ls -l /export/home/dkumar/crmindex
-rw-------   1 dkumar    staff    1048576 Dec  1 09:42
/export/home/dkumar/crmindex.
```

You needed to create a 1 MB file to store the CRM index information. The dkumar user is within the storage quota as monitored by the zfs and ls commands. As you can see, there are no issues in this case.

6. Create more files in dkumar's account to test the storage limit.

```
root@s11-desktop:~# /usr/sbin/mkfile 2m /export/home/dkumar/crmdoc
/export/home/dkumar/crmdoc: initialized 917504 of 2097152 bytes: Disc
quota exceeded
```

Here you have only 1 MB left in the quota. The system allocated the requested amount but initialized just enough storage to meet the quota. It can cause potential problems if you use up all the allocated space.

```
root@s11-desktop:~# ls -l /export/home/dkumar
total 4112
-rw-------   1 dkumar      staff      2097152 Dec  1 09:43 crmdoc
-rw-------   1 dkumar      staff      1048576 Dec  1 09:42 crmindex
...
...
...
root@s11-desktop:~#
```

7. Create another file in dkumar's account to test the storage limit.

```
root@s11-desktop:~# /usr/sbin/mkfile 2m /export/home/dkumar/crmreq
Could not open /export/home/dkumar/crmreq: Disc quota exceeded
```

This message is as expected.

```
root@s11-desktop:~# ls -l /export/home/dkumar
total 4112
-rw-------   1 dkumar      staff      2097152 Dec  1 09:43 crmdoc
-rw-------   1 dkumar      staff      1048576 Dec  1 09:42 crmindex
...
...
...
root@s11-desktop:~#
```

There is no change in this display because no new files were created.

8. Remove the quota set on dkumar's home directory.

```
root@s11-desktop:~# zfs set quota=none rpool/export/home/dkumar
root@s11-desktop:~# zfs get quota rpool/export/home/dkumar
NAME                      PROPERTY  VALUE  SOURCE
rpool/export/home/dkumar  quota     none   local
```

Now there is no quota set on dkumar's home directory.

Practices for Lesson 9: Controlling Access to Systems and Files

Chapter 9

Practices for Lesson 9

Practices Overview

In these practices, you are presented with a plan for controlling access to systems and files. In addition, these practices provide you experience in using Secure Shell. These practices cover the following activities:

- Controlling access to systems
- Controlling access to file systems
- Configuring and using the Secure Shell

Scenario

Your company would like to evaluate the security functionality in Oracle Solaris 11. You are asked to explore access to the operating system and the file systems. In addition, you look at the Secure Shell as the secure remote login method. Based on the nature of some business applications, you want to utilize this knowledge to configure the security measures.

Now check your progress. You have completed working with the user administration features.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and the LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
√	Test the data storage functionality of Oracle Solaris 11.
√	Inspect the Oracle Solaris zones functionality.
√	Inspect the Oracle Solaris 11 network configuration.
√	Set up users and test the user administration features of Oracle Solaris 11.
	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practice 9-1: Controlling Access to Systems

Overview

In this practice, you work with monitoring user accounts, passwords, and the superuser. This practice includes the following activities:

- Securing logins and passwords
- Changing the password algorithm
- Monitoring and restricting the superuser

Task 1: Securing Logins and Passwords

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0         November 2011
root@s11-desktop:~#
```

4. Use the `more` command to check the default password aging policy that is defined in the `/etc/default/passwd` file.

```
root@s11-desktop:~# more /etc/default/passwd
…
…
…
#
#
MAXWEEKS=
MINWEEKS=
PASSLENGTH=6
…
…
…
```

Note the default values of MAXWEEKS, MINWEEKS, and WARNWEEKS. Currently, they are all set to null. Refer to the lesson titled "Setting Up and Administering User Accounts" for definitions of these keywords. During the next step, add WARNWEEKS if it does not exist.

5. Using the `vi` editor, modify MAXWEEKS, MINWEEKS, and WARNWEEKS to the values shown. Add the WARNWEEKS entry if it does not exist already.

```
root@s11-desktop:~# vi /etc/default/passwd
root@s11-desktop:~# more /etc/default/passwd
…
…
…
#
#
MAXWEEKS=10
MINWEEKS=8
WARNWEEKS=1
PASSLENGTH=6
…
…
…
```

6. Create an account for the new employee named Sandy Beach by using the `useradd` command, with the following attributes:

```
root@s11-desktop:~# useradd -u 1008 -g staff -d \
/export/home/sbeach -m -c "sandy beach" -s /bin/bash sbeach
80 blocks
root@s11-desktop:~# grep sbeach /etc/shadow
sbeach:UP:::::::

Note sbeach's account is locked and no other information is populated.
```

7. Use the `passwd` command to create a password for sbeach. Review sbeach's password information in /etc/shadow.

```
root@s11-desktop:~# passwd sbeach
New Password: beach123
Re-enter new Password: beach123
passwd: password successfully changed for sbeach
root@s11-desktop:~# grep sbeach /etc/shadow
sbeach:$5$irLdELwe$5Y72cpuNPxHyE8tsbPHWZJGuPpUQ9mDTJNQRMiN.PWA:15
310:56:70:7:::

Now you see some password details. You know what 15310 is.
Note: Your output for this field may vary depending on when you create the user
account.
What are the values 56, 70, and 7? Refer to your edits in /etc/default/passwd in
step 5.
```

8. Use the `logins` command to inspect `sbeach`'s login status.

```
root@s11-desktop:~# logins -x -l sbeach
sbeach          1008    staff           10      sandy beach
                        /home/sbeach
                        /bin/bash
                        PS 120211 56 70 7
```

From a security perspective, you want to inspect the login details of one or more accounts. What does the `PS` line contain? Refer to the `/etc/default/passwd` edits in step 5.

9. Using the `passwd` command, delete the password information for `sbeach`. Check the password status by using the `logins` command and the `/etc/shadow` file.

```
root@s11-desktop:~# passwd -d sbeach
passwd: password information changed for sbeach
```

This command deletes any password status recorded in the `/etc/shadow` file.

Check whether there are any users whose password status information does not exist.

```
root@s11-desktop:~# logins -p
sbeach          1008    staff           10      sandy beach
root@s11-desktop:~# grep sbeach /etc/shadow
sbeach::15310:56:70:7:::
```

The `sbeach` account does not have a password, as displayed by the `-p` option of the `logins` command and verified by `/etc/shadow` contents.
Impact: Sandy will not be able to log in.

10. During a system maintenance window when you want to temporarily block any non-administrative users from logging in to the system, you can use the `init S` command to go into single user mode. To perform this task, first, log in to Sol11-Server1 and `su -` to assume administrator privileges. Next, switch to the `administrator` account by using the `init S` command. Then return to the multi-user mode by using the `init 3` command.

```
root@s11-server1:~# init S
svc.startd: The system is coming down for administration. Please
wait.
root@s11-server1:~# svc.startd: Killing user processes.
Requesting System Maintenance Mode
(See /lib/svc/share/README for more information.)
SINGLE USER MODE


Enter user name for system maintenance (control-d to bypass):
```

As you can see in the output, the `init S` command boots the system in single user mode and only administrative users are allowed.

When you have finished performing your system administration tasks, you can enable general user login by issuing the `init 3` command, which returns the system to multi-user mode. Based upon where you are, you may have to press <CTRL+D> two times: first to get to the maintenance prompt and second to switch to milestone all.

At the bypass prompt, press CTRL + D to continue. Log in to s11-server1, and then assume administrative privileges.

```
Enter user name for system maintenance (control-d to bypass):
<CTRL+D> svc.startd: Returning to milestone all.

s11-server1 console login: oracle
Password: <oracle1>
Last login: Fri Dec 2 03:06:41 on console
Oracle Corporation    SunOS 5.11      11.0       November 2011
oracle@s11-server1:~$ su –
Password: <oracle1>
Oracle Corporation    SunOS 5.11      11.0       November 2011
root@s11-server1:~#
```

To verify that you are in multi-user mode, run the `who -r` command.

```
root@s11-server1:~# who -r
.      run-level 3 Dec 2 03:06     3     2     S
```

In the output, you can see that the system is now in multi-user mode (run level 3).

11. Create the `loginlog` file to monitor failed login attempts.

```
root@s11-server1:~# ls /var/adm/loginlog
/var/adm/loginlog: No such file or directory
root@s11-server1:~# touch /var/adm/loginlog
root@s11-server1:~# chmod 600 /var/adm/loginlog
root@s11-server1:~# chgrp sys /var/adm/loginlog
```

You created the `loginlog` file, changed the permissions for the owner to be able to read and edit the file, and changed the group to `sys`. These permissions and the group assignment must be done so that the system can write to this file. You learn more about these permissions in the Practice 9-2.

12. You will now test the functionality of the `loginlog` file by logging out completely, and then logging back in as the `jmoose` user five times with the wrong password. After the fifth failed login attempt, you log back in as the administrator and check the contents of the `/var/adm/loginlog` file.

```
root@s11-server1:~# exit
logout
oracle@s11-server1:~$ exit
logout
s11-server1 console login: jmoose
Password: [enter incorrect password]
Login incorrect
s11-server1 console login: jmoose
<Repeat login steps with the incorrect password 4 more times>
Dec 2 16:24:51 s11-server1 login: REPEATED LOGIN FAILURES ON
dev/console, jmoose


s11-server1 console login:


As you see in the output, after five incorrect passwords, the system displays a
REPEATED LOGIN FAILURES warning message, which means that now the system is
writing to the loginlog file. Note that this will work only in a console window and will
not work from the desktop login.


Now log in to the s11-server1 console by using oracle as the username and
oracle1 as the password. Then use su - to assume administrative privileges. After you
are logged in, check the contents of the loginlog file.


root@s11-server1:~# cat /var/adm/loginlog
jmoose:/dev/console:Fri Dec 2 16:23:15 2011
jmoose:/dev/console:Fri Dec 2 16:23:24 2011
jmoose:/dev/console:Fri Dec 2 16:23:32 2011
jmoose:/dev/console:Fri Dec 2 16:23:42 2011
jmoose:/dev/console:Fri Dec 2 16:23:51 2011
```

13. Return to Sol11-Desktop. Now you will configure the system to monitor all failed login attempts. You do this by modifying the `/etc/default/login` file as follows:

```
root@s11-desktop:~# vi /etc/default/login
root@s11-desktop:~# more /etc/default/login
…
…
…
SYSLOG=YES
…
```

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```
…
…
SYSLOG_FAILED_LOGINS=0
…
…
…
```

You modify `syslog` to `yes` (if you have not already done so) and
`syslog_failed_logins` to `0` so that these directives are enforced by the system.

```
root@s11-desktop:~# touch /var/adm/authlog
root@s11-desktop:~# chmod 600 /var/adm/authlog
root@s11-desktop:~# chgrp sys /var/adm/authlog
```

As you did with the `loginlog` file, you create the `/var/adm/authlog` file and grant
right permissions.

```
root@s11-desktop:~# vi /etc/syslog.conf
root@s11-desktop:~# grep auth.notice /etc/syslog.conf
*.err;kern.notice;auth.notice                    /dev/sysmsg
auth.notice                                      /var/adm/authlog
…
…
#auth.notice               ifdef(`LOGHOST', /var/log/authlog,
@loghost)
```

You added the `auth.notice` line with the `/var/adm/authlog` file so that the
`syslogd` daemon can recognize this configuration and send notices to this destination.
Note: Use the Tab key to move the cursor to the correct space for the
`/var/adm/authlog` entry.

```
root@s11-desktop:~# svcadm refresh system/system-log
```

Refresh the system log service to make the changes effective.

14. Verify whether the failed login attempts are recorded in this file. Switch to the non-
administrator account `jholt`, and then try to log in to the `jmoose` account with an incorrect
password.

```
root@s11-desktop:~# su - jholt
Oracle Corporation    SunOS 5.11      11.0         November 2011


You must be a non-administrator user because if you su as an administrator user, the
system will not prompt you for a password.

jholt@s11-desktop:~$ su - jmoose
Password: [enter incorrect password]
```

```
su: Sorry
jholt@s11-desktop:~$ exit
logout
root@s11-desktop:~# cat /var/adm/authlog
Dec 2 16:57:27 s11-desktop su: [ID 810491 auth.crit] 'su jmoose'
failed for oracle on /dev/pts/1
```

Do you see a message recorded in the /var/adm/authlog file for a failed login attempt? *Yes, all the details are recorded*.

Task 2: Changing the Password Algorithm

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the oracle user. Use oracle1 as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

4. Use the tail command to view the available password encrypting algorithms in the /etc/security/crypt.conf file.

```
root@s11-desktop:~# tail /etc/security/crypt.conf
#
#ident    "%Z%%M%    %I%   %E% SMI"
#
# The algorithm name __unix__ is reserved.

1     crypt_bsdmd5.so.1
2a    crypt_bsdbf.so.1
md5   crypt_sunmd5.so.1
5     crypt_sha256.so.1
6     crypt_sha512.so.1…
```

These are all the algorithms that are available for password encryption.

5. Using the `vi` command, comment out the current default entry and add another entry for
   `CRYPT_DEFAULT=6`.

```
root@s11-desktop:~# vi /etc/security/policy.conf
root@s11-desktop:~# grep CRYPT_DEFAULT /etc/security/policy.conf
# and change CRYPT_DEFAULT= to another algorithm.  For example,
# CRYPT_DEFAULT=1 for BSD/Linux MD5.
# the policy present in Solaris releases set
#CRYPT_DEFAULT=__unix__,
#CRYPT_DEFAULT=5
CRYPT_DEFAULT=6


You modified the last entry.
```

6. Inspect, and then change `jholt`'s password to test the effects of the algorithm change
   from the previous step.

```
root@s11-desktop:~# grep jholt /etc/shadow
jholt:$5$xqnmxGK4$W9j4kAcYxeXrQuWoS2hqjZShOzaOfvggEccNlyRddHB:152
97::::::


In the password field, the second character tells you about the algorithm being used.
Change jholt's password now that you have changed the algorithm in the previous
step.


root@s11-desktop:~# passwd jholt
New Password: oracle1
Re-enter new Password: oracle1
passwd: password successfully changed for jholt
root@s11-desktop:~# grep jholt /etc/shadow
jholt:$5$ABL6xEPA$NZ6SOesHBOas7/kJPWsdUyMTzbBvWo4L6lmkqx4YX8B:153
10:56:70:7:::


Looking at the first two characters of the encrypted passwords in the previous two
password displays, did the encryption algorithm change? No, it still shows 5.
Did the password character string change? Yes
```

7. Use the `passwd` command to delete `jholt`'s password and confirm its deletion. Again
   change the password and check the password contents in the `/etc/shadow` file.

```
root@s11-desktop:~# passwd -d jholt
passwd: password information changed for jholt
root@s11-desktop:~# grep jholt /etc/shadow
jholt::15310:56:70:7:::


Does jholt have a password? No


root@s11-desktop:~# passwd jholt
```

LEFT MARGIN ROTATED

```
New Password: Newpass1
Re-enter new Password: Newpass1
passwd: password successfully changed for jholt
root@s11-desktop:~# grep jholt /etc/shadow
jholt:$6$peJpli9l$N.lDkvtuNInL42iV2Y7Pno6MJiI.CPWXSvFvs.vynTQx22u
9Ivnb.cwpYSyncXATQia/pXwfzwCn//LOTTw9n1:15310:56:70:7:::
```

Did the encryption algorithm change this time? *Yes*

Why? Because there was no password and a new password was created. This time, the system utilized the new encryption algorithm that you specified.

8. Change the default encryption back to 5.

Task 3: Monitoring and Restricting the Superuser (su log)

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11     11.0        November 2011
root@s11-desktop:~#
```

4. From your administrator login, switch user to `jholt` by using the `su` command. Then switch user to the `jmoose` account and enter an incorrect password.

```
root@s11-desktop:~# id
uid=0(root) gid=0(root)
root@s11-desktop:~# su - jholt
Oracle Corporation    SunOS 5.11     11.0        November 2011
jholt@s11-desktop:~$ su - jmoose
Password:
su: Sorry
jholt@s11-desktop:~$ exit
logout
root@s11-desktop:~#
```

Are you back to the administrator login? *Yes, the command prompt # tells you so.*

5. Use the `tail` command to examine the most current entries in the `/etc/default/su` file.

```
root@s11-desktop:~# tail /var/adm/sulog
SU 12/01 08:40 - pts/1 oracle-jmoose
SU 12/01 08:54 - pts/1 oracle-dkumar
SU 12/01 09:10 - pts/1 oracle-jpebble
SU 12/01 09:27 - pts/1 oracle-jpebble
SU 12/01 09:41 - pts/1 oracle-dkumar
SU 12/02 01:26 - pts/1 oracle-root
SU 12/02 07:46 + pts/1 oracle-jholt
SU 12/02 07:46 - pts/1 oracle-jmoose
SU 12/02 08:04 + pts/1 oracle-jholt
SU 12/02 08:05 - pts/1 oracle-jmoose
```

Can you match the entries for the `su` command used in step 4? *Yes, the last two entries*

Note that instead of `root`, it shows switching from `oracle` to `jholt`, because you are logged in as the `oracle` account, which has administration rights. In addition, note the `+` sign for successful login and the `-` sign for a failed login attempt. Refer to step 4.

6. Log out of Sol11-Desktop, shut it down, and then start it again. Log in as `jmoose` with `oracle1` as the password. Select `gnome` and select `USA and English` for keyboard layout and language, if prompted for Preferences. Right-click on the desktop and open a terminal window. Use the `su -` command to switch between users to create some entries in the `sulog`.

```
jmoose@s11-desktop:~$ su -
Password: oracle1
Roles can only be assumed by authorized users.
su: Sorry
jmoose@s11-desktop:~$ su - jholt
Password: [enter incorrect password]
su: Sorry


Switch to the administrator account through the oracle account.


jmoose@s11-desktop:~$ su - oracle
Password: oracle1
Oracle Corporation    SunOS 5.11    11.0    November 2011
oracle@s11-desktop:~$ su -
Password: oracle1
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

7. Examine the entries in `sulog`.

```
root@s11-desktop:~# tail /var/adm/sulog
SU 12/02 01:26 + pts/1 oracle-root
SU 12/02 07:46 + pts/1 oracle-jholt
SU 12/02 07:47 - pts/1 oracle-jmoose
SU 12/02 08:04 + pts/1 oracle-jholt
SU 12/02 08:05 - pts/1 oracle-jmoose
SU 12/02 08:23 - pts/1 jmoose-root
SU 12/02 08:24 - pts/1 jmoose-root
SU 12/02 08:25 - pts/1 jmoose-jholt
SU 12/02 08:25 + pts/1 jmoose-oracle
SU 12/02 08:26 + pts/1 jmoose-root
```

Now you can see more clearly. Can you match the entries since your fresh login as `jmoose`? *Yes, the last four entries match the commands in the previous step.*

But why does it tell you that you are switching from `jmoose` every time? Examine the following commands for the answer.

```
root@s11-desktop:~# whoami
root
root@s11-desktop:~# who am i
jmoose    pts/1          Dec 2 08:23 (:0.0)
```

The first command, `whoami`, shows your effective `userid` (switched to) and the next command tells you the original `userid` that you used to log in to the system. Now you should understand how the system records the `su` entries. Log out of the terminal and log out from the `jmoose` user account.

Practice 9-2: Controlling Access to Files

Overview

In this practice, you evaluate file permissions and any programs that pose a security risk, and inspect file access control. This practice includes the following activities:

- Protecting files with basic permissions
- Protecting programs with security risk
- Verifying file access control

Task 1: Protecting Files with Basic Permissions

The following activities are included in this task:
- Displaying file permissions
- Changing file ownership
- Changing group membership
- Changing file permissions in symbolic mode
- Changing file permissions in absolute mode
- Setting special file permissions in absolute mode

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.
2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.
3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

4. Use the `ls -al` command to display the contents of the `/usr/sbin` directory.

```
root@s11-desktop:~# cd /usr/sbin
root@s11-desktop:/usr/sbin# ls -al | more
total 20153
drwxr-xr-x  4 root   bin      397 Nov 19 20:51 .
drwxr-xr-x 29 root   sys       44 Nov 19 20:49 ..
-r-xr-xr-x  1 root   bin    12940 Oct 20 16:52 6to4relay
lrwxrwxrwx  1 root   root      10 Nov 19 20:49 accept -> cupsaccept
-r-xr-xr-x  1 root   bin    38764 Oct 20 16:52 acctadm
-r-xr-xr-x 82 root   bin    70600 Oct 20 16:52 add_drv
-r-xr-xr-x  1 root   bin     3126 Oct 20 16:53 addgnupghome
...
...
...
```

```
root@s11-desktop:/usr/sbin# cd
root@s11-desktop:~#
```

As you learned in the lecture, this output displays the permissions on the subdirectories and files in the /usr/sbin directory.

What does x represent? *It represents "execute."*

5. Use the su command to switch to the jmoose account. Use the touch command to create a file called design. Confirm that the file has been created.

```
root@s11-desktop:~# su - jmoose
Oracle Corporation      SunOS 5.11      11.0          November 2011
jmoose@s11-desktop:~$ pwd
/home/jmoose
jmoose@s11-desktop:~$ touch design
jmoose@s11-desktop:~$ ls -l design
-rw-r--r-- 1 jmoose staff        0 Dec 2 08:45 design
jmoose@s11-desktop:~$
```

Can you tell who owns the new design file? *The user jmoose owns the design file because it was created by jmoose.*

6. Use the exit command to return to the administrator account, and use the chown command to change the ownership of the design file from jmoose to jholt.

```
jmoose@s11-desktop:~$ exit
logout
root@s11-desktop:~# pwd
/root
root@s11-desktop:~# cd /export/home/jmoose
root@s11-desktop:/export/home/jmoose# chown jholt design
root@s11-desktop:/export/home/jmoose# ls -l design
-rw-r--r-- 1 jholt staff          0 Dec 2 08:45 design
```

What is the result of the chown command? *The design file is owned by jholt now, and previously it was owned by jmoose.*

7. Use the `su` command to switch to `jmoose`'s account and try to edit the `design` file. This will demonstrate the file ownership and permissions.

```
root@s11-desktop:/export/home/jmoose# su - jmoose
Oracle Corporation    SunOS 5.11      11.0        November 2011
jmoose@s11-desktop:~$ ls -l design
-rw-r--r-- 1 jholt staff         0 Dec 2 08:45 design
jmoose@s11-desktop:~$ vi design


Can jmoose edit the design file that resides in the home directory? Test it by using vi.
Hint: Look at the message in vi that says [read only]. Because you opened the vi
editor for testing, quit the vi now.
```

8. Return to the administrative account and check the available groups.

```
jmoose@s11-desktop:~$ exit
logout
root@s11-desktop:/export/home/jmoose# ls -l design
-rw-r--r-- 1 jholt staff         0 Dec 2 08:45 design
root@s11-desktop:/export/home/jmoose# tail /etc/group
...
...
...
pkg5srv::97:
vboxsf::100:
hitech::120:dkumar
root@s11-desktop:/export/home/jmoose#


Is the hitech group still available? Yes (If not, add it.)
```

9. Use the `chgrp` command to change the group for the `design` file to `hitech`. Confirm the change.

```
root@s11-desktop:/export/home/jmoose# chgrp hitech design
root@s11-desktop:/export/home/jmoose# ls -l design
-rw-r--r-- 1 jholt hitech        0 Dec 2 08:45 design
root@s11-desktop:/export/home/jmoose#


Which group owns the design file now? The hitech group
Option: As with the editing test of file ownership change, you may want to repeat those
steps to test the access permissions of jmoose (not a member of the hitech group).


Who has the execute permission? Nobody
```

10. Use the `chmod` command to change permissions in symbolic mode on the `design` file. Confirm the changes in permissions.

```
root@s11-desktop:/export/home/jmoose# chmod g+w design
root@s11-desktop:/export/home/jmoose# ls -l design
-rw-rw-r-- 1 jholt hitech        0 Dec 2 08:45 design
```

What does the letter `g` represent in this context? *It represents "group."*

```
root@s11-desktop:/export/home/jmoose# chmod a+x design
root@s11-desktop:/export/home/jmoose# ls -l design
-rwxrwxr-x 1 jholt hitech        0 Dec 2 08:45 design
```

Can you tell the result of the `+` sign? *Yes, it added the `execute` permission for the owner, group, and others.*

```
root@s11-desktop:/export/home/jmoose# chmod o=rwx design
root@s11-desktop:/export/home/jmoose# ls -l design
-rwxrwxrwx 1 jholt hitech        0 Dec 2 08:45 design
```

How did this option change the permission of `others`? *The = sign substituted the new permissions.*

11. Change the permissions by using the `chmod` command in absolute mode. Confirm the changes in permissions.

```
root@s11-desktop:/export/home/jmoose# chmod 700 design
root@s11-desktop:/export/home/jmoose# ls -l design
-rwx------ 1 jholt hitech        0 Dec 2 08:45 design
```

What permissions do `hitech` and `others` have? *None*

```
root@s11-desktop:/export/home/jmoose# cd ..
```

Check the permissions on the `jmoose` directory.

```
root@s11-desktop:/export/home# ls -ld jmoose
drwxr-xr-x 16 jmoose root    25 Dec  2 08:45 jmoose
root@s11-desktop:/export/home# chmod 754 jmoose
root@s11-desktop:/export/home# ls -ld jmoose
drwxr-xr-- 16 jmoose root    25 Dec  2 08:45 jmoose
```

How did the `4` in `754` change the permissions on the directory? *It changed the permissions to read-only.*

Practices for Lesson 9: Controlling Access to Systems and Files

12. Explore setting the special file permissions in absolute mode. Create a new file called `dbdesign` in `jmoose`'s account.

```
root@s11-desktop:/export/home# su - jmoose
Oracle Corporation    SunOS 5.11     11.0        November 2011
jmoose@s11-desktop:~$ touch dbdesign
jmoose@s11-desktop:~$ ls -l dbdesign
-rw-r--r-- 1 jmoose staff        0 Dec  2 09:04 dbdesign
jmoose@s11-desktop:~$ exit
```

13. Use the `chmod` command to set the special permissions as indicated. Confirm the permissions.

```
root@s11-desktop:/export/home# cd jmoose
root@s11-desktop:/export/home/jmoose# chmod 4555 dbdesign
root@s11-desktop:/export/home/jmoose# ls -l dbdesign
-r-sr-xr-x 1 jmoose staff        0 Dec  2 09:04 dbdesign
```

In this case, you configure the `setuid` permissions on `dbdesign` for `jmoose` (owner of the file). This special permission allows `jmoose` to gain superuser privilege.

What digit in `chmod 4555` represents `s` in the owner's permission set? *Digit 4*

```
root@s11-desktop:/export/home/jmoose# chmod 2551 design
root@s11-desktop:/export/home/jmoose# ls -l design
-r-xr-s--x 1 jholt hitech        0 Dec 2 08:45 design
```

Similarly, you granted `setgid` permissions to `jholt`. In this case, the `hitech` group members would be able to use superuser privilege.

What does `2` represent in the `chmod` command? *It represents `setgid`, which is represented by `s` in the group permission set.*

```
root@s11-desktop:/export/home/jmoose# cd ..
root@s11-desktop:/export/home# ls -ld jmoose
drwxr-xr-- 16 jmoose root        26 Dec  2 09:04 jmoose
root@s11-desktop:/export/home# chmod 1777 jmoose
root@s11-desktop:/export/home# ls -ld jmoose
drwxrwxrwt 20 jmoose root        26 Dec  2 09:04 jmoose
```

Here you set the sticky bit on `jmoose`'s home directory. Because the directory contains critical files, no other user can delete the contents of this directory.

What represents the sticky bit in the display? *The letter `t` at the end of the permission sets*

```
root@s11-desktop:/export/home# exit
logout
oracle@s11-desktop:~$
```

Task 2: Protecting Programs with Security Risk

The following activities are covered in this task:

- Finding files with special file permissions
- Disabling programs from using executable stacks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click on the desktop and open a terminal window. Assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11    11.0    November 2011
root@s11-desktop:~#
```

4. Use the `find` command to retrieve all files and directories with the `setuid` bit turned on. Use the `/var/tmp/suidrep` file to save the information.

```
root@s11-desktop:~# find / -perm -4000 -exec ls -ld {} \; >
/var/tmp/suidrep


The preceding command might take a minute to execute.


root@s11-desktop:~# more /var/tmp/suidrep

…
…
-r-sr-xr-x 1 jmoose staff    0 Dec  2 09:04 /home/jmoose/dbdesign
…
…
-r-sr-xr-x 1 root   bin 223852 Oct 20 16:52 /usr/lib/ssh/ssh-keysign
-r-sr-xr-x 1 root   bin  19096 Oct 20 16:53 /usr/lib/fs/smbfs/mount
…
…
```

As part of a security check, you would like to inspect all the files and directories on the system with `setuid` permissions.

The `find` command here looks for permissions starting with `4` and as you know from the previous task, `4` represents `setuid`. Can you find the `dbdesign` file and its permission representation? *Yes, it is the `s` in the owner permission set.*

5. Modify the system directives in the /etc/system file so that the programs cannot execute with an executable stack.

```
root@s11-desktop:~# cp /etc/system /etc/system.orig

Best practice: Always save a copy of the /etc/system file before making any changes
to it.

root@s11-desktop:~# vi /etc/system
root@s11-desktop:~# cat /etc/system
…
…
*
*           set nautopush=32
*           set maxusers=40
*
*      To set a variable named 'debug' in the module named
'test_module'
*
*           set test_module:debug = 0x13


set noexec_user_stack=1
set noexec_user_stack_log=0

Modify the file to add the last two system directives.

This is an example of a security measure where the programs should not request an
executable stack in the first place.

root@s11-desktop:~# init 6

Reboot the system to make the configuration effective.
```

Practice 9-3: Configuring and Using the Secure Shell

Overview

In this practice, you work with the Secure Shell configuration. This practice includes the following activities:

- Setting up host-based authentication
- Configuring Secure Shell
- Configuring the ssh-agent
- Using Secure Shell

Task 1: Setting Up Host-Based Authentication

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to both the Sol11-Server1 and Sol11-Desktop virtual machines as the `oracle` user. Use `oracle1` as the password. Assume primary administrator privileges.

3. Using the `vi` editor, enable host-based authentication by making the following entries on `s11-server1` and `s11-desktop`. If the indicated entries do not exist, add them as shown.

```
root@s11-server1:~# vi /etc/ssh/ssh_config
root@s11-server1:~# grep HostBasedAuthentication /etc/ssh/ssh_config
HostBasedAuthentication yes

If this entry does not exist in the file, add it as shown.

root@s11-server1:~# vi /etc/ssh/shosts.equiv
root@s11-server1:~# cat /etc/ssh/shosts.equiv
s11-desktop

If the /etc/ssh/shosts.equiv file does not yet exist, create it with the information
specified in the preceding lines. Note that on s11-server1, this file should have only
an s11-desktop entry.
Now restart the ssh service to make the changes effective.


root@s11-server1:~# svcadm restart ssh


Now repeat the preceding steps on s11-desktop. Note that on s11-desktop, the
/etc/ssh/shosts.equiv file should have only an s11-server1 entry. Be sure to
restart the ssh service to make the changes effective.
```

4. Use the `grep` command to verify that the `jholt` account is created on `s11-server1` and `s11-desktop`.

```
root@s11-server1:~# grep jholt /etc/passwd
jholt:x:60007:10:john holt:/home/jholt:/bin/sh
root@s11-desktop:~# grep jholt /etc/passwd
jholt:x:60007:10:john holt:/home/jholt:/bin/ksh
```

Yes, the `jholt` account exists on both the VMs. If the account does not exist, create it. Make sure that you have the same password `Mypass1` on both systems.

Task 2: Configuring Secure Shell

The following activities are covered in this task:

- Configuring the private/public keys
- Copying the public key onto the remote host (server)
- Verifying the Secure Shell (SSH) access

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Server1 and Sol11-Desktop virtual machines as the `oracle` user. Use `oracle1` as the password. Assume primary administrator privileges.

3. Starting on Sol11-Server1, use the `su` command to switch to the `jholt` account.

```
root@s11-server1:~# su - jholt
Oracle Corporation    SunOS 5.11    11.0    November 2011
jholt@s11-server1:~$
```

During SSH configuration for `jholt`, you will be moving back and forth between `s11-server1` and `s11-desktop`. If you need to know which VM you are on, check the command prompt. In this example, it is `s11-server1`. Alternatively, use the `hostname` command.

4. Use the `ssh` command to remotely log in to `s11-desktop`. After a successful login, `exit` back to `s11-server1`.

```
jholt@s11-server1:~$ ssh s11-desktop
The authenticity of host 's11-desktop (192.168.0.111)' can't be
established. RSA key fingerprint is
38:d3:8a:bb:be:d4:b8:93:08:7a:b5:99:5d:7f:04:40.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 's11-desktop,192.168.0.111' (RSA) to the
list of known hosts.
Password: Mypass1
Last login: Fri Dec 2 08:17:26 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11    11.0    November 2011
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
```

> Can you tell the purpose of this login and exit without doing anything? As the warning displays, the system has added an entry in the known_hosts file in the .ssh directory in jholt's home directory.
>
> Confirm it.

5. Create the rsa pair of public and private keys on your system.

```
jholt@s11-server1:~$ ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/home/jholt/.ssh/id_rsa):
Press Enter Key
Enter passphrase (empty for no passphrase): passphrase
Enter same passphrase again: passphrase
Your identification has been saved in /home/jholt/.ssh/id_rsa.
Your public key has been saved in /home/jholt/.ssh/id_rsa.pub.
The key fingerprint is:
51:28:86:f9:3b:55:d3:bf:eb:a9:5d:af:0d:f5:2a:8f jholt@s11-server1
jholt@s11-server1:~$ ls .ssh
id_rsa   id_rsa.pub   known_hosts
```

You created the rsa private/public key pair to be used by ssh.

Can you find these keys? *Yes, they are in the* .ssh *directory.*

6. Copy your rsa public key to the remote system and store it in jholt's .ssh directory.

```
jholt@s11-server1:~$ scp .ssh/id_rsa.pub jholt@s11-desktop:id_rsa.pub
Password: Mypass1
id_rsa.pub      100% |****************************|   399      00:00
jholt@s11-server1:~$ ssh s11-desktop
Password: Mypass1
Last login: Fri Dec 2 08:17:26 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11      11.0      November 2011
jholt@s11-desktop:~$ ls
id_rsa.pub     …
jholt@s11-desktop:~$ mkdir -p .ssh
jholt@s11-desktop:~$ cat ./id_rsa.pub >> .ssh/authorized_keys
jholt@s11-desktop:~$ rm ./id_rsa.pub
```

.pub means that it is the public key and it must be placed in the .ssh/authorized_keys file. This public key will be used by the s11-desktop host to authenticate your incoming ssh connection.

7. Exit `s11-desktop` and go back in by using the `ssh` command to see the `rsa` prompt.

```
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
jholt@s11-server1:~$ ssh s11-desktop
Enter passphrase for key '/home/jholt/.ssh/id_rsa': passphrase
Last login: Fri Dec 2 08:19:23 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11    11.0    November 2011
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
```

This demonstrates that your `rsa` public key is functioning, and it is supposed to ask you for the passphrase that you specified when you created the `rsa` key.

8. Repeat Steps 5–7 for the `dsa` pair of the private/public keys. These steps are listed here as a reminder.

```
jholt@s11-server1:~$ ssh-keygen -t dsa
Generating public/private dsa key pair.
Enter file in which to save the key (/home/jholt/.ssh/id_dsa): Press
Enter Key
Enter passphrase (empty for no passphrase): passphrase
Enter same passphrase again: passphrase
Your identification has been saved in /home/jholt/.ssh/id_dsa.
Your public key has been saved in /home/jholt/.ssh/id_dsa.pub.
The key fingerprint is:
7a:b8:cb:f8:33:e5:fb:02:a5:c3:b2:53:cc:75:90:9e jholt@s11-server1
jholt@s11-server1:~$ scp ./.ssh/id_dsa.pub jholt@s11-
desktop:id_dsa.pub
Enter passphrase for key '/home/jholt/.ssh/id_rsa': passphrase
id_dsa.pub        100% |****************************|  607      00:00
jholt@s11-server1:~$ ssh s11-desktop
Enter passphrase for key '/home/jholt/.ssh/id_rsa': passphrase
Last login: Fri Dec 2 08:18:06 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11    11.0    November 2011
jholt@s11-desktop:~$ ls
id_dsa.pub  …
jholt@s11-desktop:~$ cat ./id_dsa.pub >> .ssh/authorized_keys
jholt@s11-desktop:~$ rm ./id_dsa.pub
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
```

Currently, you have created the `rsa` and `dsa` pairs of keys. The private keys are on your `s11-server1` system and the public keys have been transmitted and stored on the remote system for authentication.

9. Use the `ssh` command to log in to the `s11-desktop` machine. When prompted for the `rsa` key passphrase, do not supply the value. Just press the Enter key, but provide the password for the `dsa` key prompt.

```
jholt@s11-server1:~$ ssh s11-desktop
Enter passphrase for key '/home/jholt/.ssh/id_rsa': Press Enter
Key
Enter passphrase for key '/home/jholt/.ssh/id_dsa': passphrase
Last login: Fri Dec 2 08:19:03 2011 from s11-server1.myd
Oracle Corporation     SunOS 5.11      11.0        November 2011
jholt@s11-desktop:~$ exit
logout
Connection to s11-desktop is closed.


You exited from the ssh session to start the next task clean.


jholt@s11-server1:~$ exit
logout
root@s11-server1:~#


Now when you ssh to s11-desktop, you are prompted for the rsa and the dsa
passphrases. If you enter an incorrect passphrase for rsa and the correct passphrase
for dsa, you will be connected.
So now you know that users can create their own ssh authentication keys and manage
the authentication process by using passphrases.
```

Now when you `ssh` to `s11-desktop`, you are prompted for the `rsa` and the `dsa` passphrases. If you enter an incorrect passphrase for `rsa` and the correct passphrase for `dsa`, you will be connected.

So now you know that users can create their own `ssh` authentication keys and manage the authentication process by using passphrases.

Task 3: Using SSH with No Password Prompt

The following activities are covered in this task:

- Bringing up `ssh-agent`
- Exploring the capability of `ssh-agent`
- Deleting the in-use keys
- Adding to the agent
- Verifying that a password is no longer needed

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume primary administrator privileges.

```
oracle@s11-server1:~$ su -
Password:
root@s11-server1:~#
```

3. Use the `su` command to switch to the `jholt` account.

```
root@s11-server1:~# su - jholt
Oracle Corporation     SunOS 5.11     11.0          November 2011


During the subsequent SSH configuration for jholt, you will be moving back and forth
between s11-server1 and s11-desktop. If you need to know which VM you are on,
check the command prompt (in this case, it is s11-server1). Alternatively, use the
hostname command.
```

4. Use the `ssh-agent` command to launch a new shell for no-password prompt configuration.

```
jholt@s11-server1:~$ ssh-agent bash
jholt@s11-server1:~$ ps
  PID TTY          TIME CMD
 3528 console      0:00 ps
 3522 console      0:00 bash
 3526 console      0:00 bash


How can you tell that the new bash shell was just launched for ssh-agent? The most
recent PID is bash (except the echo of the ps command). PID 3526 is the most recent
meaningful PID, which launched the bash shell.
```

5. Verify that `ssh-agent` is up and running.

```
jholt@s11-server1:~$ ps -ef | grep ssh-
    jholt  3527  3526   0 08:30:06 ?              0:00 ssh-agent bash
jholt@s11-server1:~$ env | grep SSH
SSH_AGENT_PID=3527
SSH_AUTH_SOCK=/tmp/ssh-XXXXJqaWVf/agent.3526


Yes, it is up and running. Its environmental variables are also populated.


jholt@s11-server1:~$ ssh-add -?
ssh-add: illegal option -- ?
Usage: ssh-add [options]
Options:
  -l          List fingerprints of all identities.
  -L          List public key parameters of all identities.
  -d          Delete identity.
  -D          Delete all identities.
  -x          Lock agent.
  -X          Unlock agent.
  -t life     Set lifetime (seconds) when adding identities.


One way to display the available valid options is to specify an invalid option. You use
some of these options in the next steps.
```

6. Using the `ssh-add` command, add two identities (`rsa` and `dsa`) to the authentication agent.

```
jholt@s11-server1:~$ ssh-add
Enter passphrase for /home/jholt/.ssh/id_rsa: passphrase
Identity added: /home/jholt/.ssh/id_rsa (/home/jholt/.ssh/id_rsa)
Identity added: /home/jholt/.ssh/id_dsa (/home/jholt/.ssh/id_dsa)
jholt@s11-server1:~$ ssh-add -l
2048 51:28:86:f9:3b:55:d3:bf:eb:a9:5d:af:0d:f5:2a:8f /home/jholt/.ssh/id_rsa
(RSA)
1024 7a:b8:cb:f8:33:e5:fb:02:a5:c3:b2:53:cc:75:90:9e /home/jholt/.ssh/id_dsa
(DSA)


By listing the identities, you can confirm that they are available with the authentication
agent.


jholt@s11-server1:~$ ssh-add -D
All identities removed.


This is how you can delete the identities.
```

7. Explore a few more options of `ssh-add`. Then add them back by using `ssh-add`.

```
jholt@s11-server1:~$ ssh-add -t 60
Enter passphrase for /home/jholt/.ssh/id_rsa: passphrase
Identity added: /home/jholt/.ssh/id_rsa (/home/jholt/.ssh/id_rsa)
Lifetime set to 60 seconds
Identity added: /home/jholt/.ssh/id_dsa (/home/jholt/.ssh/id_dsa)
Lifetime set to 60 seconds


Wait for 60 seconds before trying the next command. Because you specified 60 seconds
as the lifetime for the identities, you must wait until they expire.


jholt@s11-server1:~$ ssh-add -l
The agent has no identities.
jholt@s11-server1:~$ ssh-add
Enter passphrase for /home/jholt/.ssh/id_rsa: passphrase
Identity added: /home/jholt/.ssh/id_rsa (/home/jholt/.ssh/id_rsa)
Identity added: /home/jholt/.ssh/id_dsa (/home/jholt/.ssh/id_dsa)
jholt@s11-server1:~$
```

8. Verify that you can connect to s11-desktop by using the ssh command without a password prompt.

```
jholt@s11-server1:~$ ssh s11-desktop
Last login: Fri Dec 2 08:24:11 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11      11.0       November 2011
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.


Yes, you can. Note that no password prompt is displayed, and this saves you time.
```

9. Use the ssh-add command to lock the authentication agent.

```
jholt@s11-server1:~$ ssh-add -x
Enter lock password: password
Again: password
Agent locked.
jholt@s11-server1:~$ ssh s11-desktop
Enter passphrase for key '/home/jholt/.ssh/id_rsa': passphrase
Last login: Fri Dec 2 08:40:04 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11      11.0       November 2011


Because the agent is locked, you are prompted for a passphrase.


jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
jholt@s11-server1:~$ ssh-add -X
Enter lock password: password
Agent unlocked.


By means of unlocking, you go back to the no-password/passphrase prompt.


jholt@s11-server1:~$ ssh s11-desktop
Last login: Fri Dec 2 08:42:11 2011 from s11-server1.myd
Oracle Corporation    SunOS 5.11      11.0       November 2011
jholt@s11-desktop:~$ exit
Connection to s11-desktop closed.
jholt@s11-server1:~$ exit
logout
jholt@s11-server1:~$ exit
logout
root@s11-server1:~#


This completes the ssh configuration and usage.
```

Practices for Lesson 10: Managing System Processes and Scheduling System Tasks

Chapter 10

Practices for Lesson 10

Practices Overview

In these practices, you are presented with a plan for administering system processes. Additionally, these practices will provide you experience in working with scheduling the system and user tasks. The following activities are covered:

- Managing system processes
- Scheduling system tasks

Scenario

Your company would like to assess the system processes functionality in Oracle Solaris 11. You are asked to explore various processes that are running in the operating system. In addition, you look at the scheduling of periodically running system and user tasks. Based on the nature of some business applications, you would like to utilize this knowledge to manage the system or user processes.

Now check your progress. You have completed working with system and file access controls and now you will work with system and user processes.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
√	Test the data storage functionality of Oracle Solaris 11.
√	Inspect the Oracle Solaris zones functionality.
√	Inspect the Oracle Solaris 11 network configuration.
√	Set up users and test the user administration features of Oracle Solaris 11.
√	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Note: Your output displays might differ slightly from those shown in this guide, especially the storage units, number of packages, and process information.

Practice 10-1: Managing System Processes

Overview

In this practice, you learn how to manage various system and user processes. This practice includes the following activities:

- Listing system processes
- Verifying process status
- Terminating a process
- Controlling a process

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click the desktop background and open a terminal window. In the terminal window, run the `su -` command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation      SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

4. Use the `ps` command to view the current process.

```
root@s11-desktop:~# ps
  PID TTY          TIME CMD
 1136 pts/1        0:00 ps
  990 pts/1        0:00 bash
 1971 pts/1        0:00 su
```

What is the process that is displayed as default? *The current shell is displayed (in this case, bash).*
Is there a `ps` process also running? *No, that is the echo command*

5. Using the `ps -ef` command, display the processes one page at a time.

```
root@s11-desktop:~# ps -ef | more
    UID   PID  PPID   C    STIME TTY          TIME CMD
   root     0     0   0 07:19:45 ?           0:01 sched
   root     5     0   0 07:19:43 ?           0:03 zpool-rpool
   root     6     0   0 07:19:44 ?           0:00 kmem_task
   root     1     0   0 07:19:46 ?           0:00 /usr/sbin/init
   root     2     0   0 07:19:46 ?           0:00 pageout
   root     3     0   0 07:19:46 ?           0:05 fsflush
   root     7     0   0 07:19:46 ?           0:00 intrd
…
…
…
```

The `ps` command with the `-ef` options displays a lot more details.

Are these all the processes running on the system? *Yes*

6. Using the same command, look for all processes that match the pattern `bash`.

```
root@s11-desktop:~# ps -ef | grep bash
   root   990   988   0 07:27:37 pts/1       0:00 grep bash
   root   990   987   0 07:27:37 pts/1       0:00 -bash
 oracle   987   982   0 07:27:34 pts/1       0:00 /usr/bin/bash
```

What is the `grep bash` process that is displayed in the output? The *echo command*

Why do you see three `bash` processes? *One process was launched by the `oracle` userid, and the second one was launched on switching to `root`.*

7. Use the `prstat` command to display a dynamic output.

```
root@s11-desktop:~# prstat

  PID USERNAME  SIZE    RSS STATE  PRI NICE     TIME  CPU PROCESS/NLWP
  920 oracle    159M   140M run     59    0  0:02:25 1.4% java/20
  982 oracle     88M    19M run     59    0  0:00:19 0.2% gnome-terminal/2
 1276 root     9696K  3128K cpu0    59    0  0:00:00 0.2% prstat/1
  693 oracle     63M    51M run     58    0  0:00:29 0.2% Xorg/3
  949 oracle     27M    13M sleep   59    0  0:00:07 0.0% nwam-manager/2
  495 root     9420K  1920K sleep   59    0  0:00:04 0.0% VBoxService/7
   11 root       11M    10M sleep   59    0  0:00:35 0.0% svc.configd/26
  956 oracle     12M  5672K run     59    0  0:00:07 0.0% xscreensaver/1
  938 oracle     51M    32M sleep   12   19  0:00:02 0.0% updatemanagerno/1
  915 oracle     27M    16M sleep   59    0  0:00:01 0.0% metacity/1
  990 root     8660K  2600K run     32    0  0:00:00 0.0% bash/1
  921 oracle     87M    17M sleep   59    0  0:00:01 0.0% gnome-power-man/1
  503 root     4056K  2632K sleep   59    0  0:00:01 0.0% hald-addon-acpi/1
  396 root       12M  3580K sleep   59    0  0:00:02 0.0% nscd/30
  622 root     5980K  2096K sleep   59    0  0:00:00 0.0% sendmail/1
  300 root     9800K  3432K sleep   59    0  0:00:00 0.0% devfsadm/6
   61 root     8160K   976K sleep   59    0  0:00:00 0.0% in.mpathd/1
```

```
   463 root      7228K 5808K sleep   59    0   0:00:01 0.0% hald/4
     5 root         0K    0K sleep   99  -20   0:00:03 0.0% zpool-rpool/136
   469 root      3880K 2264K sleep   59    0   0:00:00 0.0% hald-runner/1
   540 daemon    3248K 1248K sleep   59    0   0:00:00 0.0% rpcbind/1
Total: 86 processes, 442 lwps, load averages: 0.09, 0.11, 0.11
```

Can you tell what the `Total` line at the bottom represents? *Summary workload*

What is the count of `lwps`? *442*

What are they? *Lightweight processes*

Why are they significant enough to be displayed? *They can use up the CPU capacity.*

Note: Press Ctrl + C to stop the continuous display of information.

8. Use the `prstat` command to display the highest CPU usage every 10 seconds 10 times.

```
root@s11-desktop:~# prstat -s cpu 10 10
   PID USERNAME   SIZE    RSS STATE   PRI NICE      TIME  CPU PROCESS/NLWP
   793 root      9648K 3064K cpu0    49    0   0:00:00 0.2% prstat/1
   497 root      9420K 1848K sleep   59    0   0:00:05 0.0% VBoxService/7
   789 root      7056K 1016K sleep   59    0   0:00:00 0.0% script/1
   790 root      8640K 2736K sleep   49    0   0:00:00 0.0% bash/1
   440 root      4200K 2772K sleep   59    0   0:00:01 0.0% hald-addon-acpi/1
   416 root      7228K 5800K sleep   59    0   0:00:01 0.0% hald/4
   788 root      7036K 1208K sleep   59    0   0:00:00 0.0% script/1
   409 root       11M 3544K sleep   59    0   0:00:01 0.0% nscd/26
    11 root      9792K 9012K sleep   59    0   0:00:25 0.0% svc.configd/14
     5 root         0K    0K sleep   99  -20   0:00:01 0.0% zpool-rpool/136
   317 root      9752K 3392K sleep   59    0   0:00:00 0.0% devfsadm/6
   626 root      5980K 2108K sleep   59    0   0:00:00 0.0% sendmail/1
   238 root       11M 3012K sleep   59    0   0:00:00 0.0% syseventd/18
   503 root      7356K 1352K sleep   59    0   0:00:00 0.0% cron/1
   496 root      4244K 2244K sleep   59    0   0:00:00 0.0% rmvolmgr/1
   430 root      3984K 2300K sleep   59    0   0:00:00 0.0% hald-addon-netw/1
   417 root      3872K 2252K sleep   59    0   0:00:00 0.0% hald-runner/1
Total: 49 processes, 338 lwps, load averages: 0.04, 0.03, 0.02
```

Which process is using the most CPU? *The `prstat` process*
Note: Your answer may vary.

---

9. Use the `prstat` command to display the process that is using the least amount of memory.

```
root@s11-desktop:~# prstat -S rss 10 10

   PID USERNAME  SIZE    RSS STATE   PRI NICE     TIME  CPU PROCESS/NLWP

     6 root        0K     0K sleep    99  -20  0:00:00 0.0% vmtasks/1
     5 root        0K     0K sleep    99  -20  0:00:01 0.0% zpool-rpool/136
   555 root     1700K   924K sleep    59    0  0:00:00 0.0% utmpd/1
   296 root     7288K   972K sleep    59    0  0:00:00 0.0% iscsid/2
   789 root     7056K  1016K sleep    59    0  0:00:00 0.2% script/1
   581 root     2452K  1048K sleep    59    0  0:00:00 0.0% in.ndpd/1
    65 root     8160K  1076K sleep    59    0  0:00:00 0.0% in.mpathd/1
   525 daemon   3248K  1204K sleep    59    0  0:00:00 0.0% rpcbind/1
   788 root     7036K  1208K sleep    59    0  0:00:00 0.0% script/1
   154 daemon   7352K  1252K sleep    59    0  0:00:00 0.0% kcfd/2
   558 root     2220K  1316K sleep    59    0  0:00:00 0.0% sac/1
    53 netcfg   2260K  1340K sleep    59    0  0:00:00 0.0% netcfgd/2
   503 root     7356K  1352K sleep    59    0  0:00:00 0.0% cron/1
   559 root     2352K  1412K sleep    59    0  0:00:00 0.0% ttymon/1
   265 root     2548K  1444K sleep    60  -20  0:00:00 0.0% zonestatd/5
   188 root     2132K  1480K sleep    59    0  0:00:00 0.0% pfexecd/3
…
…
…
```

Which task is consuming the least amount of memory (RSS)? *vmtasks*
Note: Your answer may vary.

10. Use the `pgrep` command to verify that the process is running.

```
root@s11-desktop:~# pgrep -l mail
  801 sendmail
  794 sendmail

```

Why is the `pgrep` command displaying two processes? *Because you indicated the `mail` pattern, and `pgrep` works with a pattern. The `pgrep` command matched two processes.*

11. Use the `pkill` command to kill both the processes.

```
root@s11-desktop:~# pkill sendmail
root@s11-desktop:~# pgrep -l mail
 1224 sendmail
 1226 sendmail

```

Did it kill both the processes? *Yes*
How can you tell? *The process IDs are different from the display in step 9.*

12. Display the current `sendmail` processes, and this time, use the `kill` command with the `-9` option.

```
root@s11-desktop:~# ps -e | grep sendmail
 1254 ?           0:00 sendmail
 1226 ?           0:00 sendmail
root@s11-desktop:~# kill -9 1254
root@s11-desktop:~# ps -e | grep sendmail
 1270 ?           0:00 sendmail
 1226 ?           0:00 sendmail


What is the meaning of the -9 option? Abort the process right away.
Was the sendmail process #1254 killed? Yes, and a new process was started.
```

Note: In the next few steps, you control a process. You pause it, and then resume it.

13. Create an infinitely running task by using the command task.

```
root@s11-desktop:~# newtask dd if=/dev/zero of=/dev/null&
[1] 3253


For training purposes, you are creating a dummy task to run forever. The dd command
is copying zeros to nulls. Refer to the man pages for details.


root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864  25 16:09:54 pts/2       0:18 dd if=/dev/zero of=/dev/null


You can see that the process ID 3253 is running.
Note: Your process number will vary.
```

14. Use the `pstop` command to stop (pause) the process. Verify that it is stopped.

```
root@s11-desktop:~# pstop 3253
root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864   3 16:09:54 pts/2       0:48 dd if=/dev/zero of=/dev/null
root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864   2 16:09:54 pts/2       0:48 dd if=/dev/zero of=/dev/null
root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864   1 16:09:54 pts/2       0:48 dd if=/dev/zero of=/dev/null


How can you tell that PID 3253 is stopped? The time elapsed is not incrementing.
```

15. Use the `prun` command to resume the process. Verify that it is running.

```
root@s11-desktop:~# prun 3253
root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864   0 16:09:54 pts/2       0:52 dd if=/dev/zero of=/dev/null
root@s11-desktop:~# ps -ef | grep 3253
    root  3253  2864  25 16:09:54 pts/2       1:01 dd if=/dev/zero of=/dev/null


How can you tell that PID 3253 is running? The time elapsed is incrementing.
```

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16. Use the `pkill` command to kill the process. Verify that it is killed.

```
root@s11-desktop:~# pkill -9 dd
[1]+  Killed                    newtask dd if=/dev/zero of=/dev/null
root@s11-desktop:~# ps -ef | grep 3253
root@s11-desktop:~#


How can you tell that PID 3253 is killed? The ps command cannot find it.
```

Practice 10-2: Scheduling System Tasks

Overview

In this practice, you evaluate the task-scheduling method for creating a repetitive task. For repetitive scheduling, you use the cron facility. This practice includes the following activities:

- Scheduling a repetitive task with the cron utility
- Scheduling a user task as superuser

Task 1: Scheduling a Task with the cron Utility

Note: The time used in the cron files can be adjusted as required to see the desired output.

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the oracle user. Use oracle1 as the password.

3. Right-click the desktop background and open a terminal window. In the terminal window, run the su - command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0        November 2011
root@s11-desktop:~#
```

4. Before you start working with the crontab files, you must set the editor variable to vi.

```
root@s11-desktop:~# EDITOR=vi
root@s11-desktop:~# export EDITOR
```

5. Using the crontab -l command, display the contents of the administrator's cron file.

```
root@s11-desktop:~# crontab -l
#ident   "%Z%%M% %I%     %E% SMI"
#
# Copyright 2007 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#
#
#
#
# The root crontab should be used to perform accounting data collection
#
#
10 3 * * * /usr/sbin/logadm
15 3 * * 0 [ -x /usr/lib/fs/nfs/nfsfind ] && /usr/lib/fs/nfs/nfsfind
30 3 * * * [ -x /usr/lib/gss/gsscred_clean ] &&
/usr/lib/gss/gsscred_clean
30 0,9,12,18,21 * * * /usr/lib/update-manager/update-refresh.sh
root@s11-desktop:~#
```

> What is the purpose of the `logadm` test? *Refer to the man pages. It checks the logs for possible rotation.*
>
> When is this task scheduled to run? *Ten minutes after 3 AM every day*

6. Using the `tty` command, find the address of your terminal window.

```
root@s11-desktop:~# tty
/dev/pts/1
```

7. Use the `crontab –e` command to edit the `crontab` file.

```
root@s11-desktop:~# crontab -e

#ident  "%Z%%M% %I%     %E% SMI"
#
# Copyright 2007 Sun Microsystems, Inc.  All rights reserved.
# Use is subject to license terms.
#
#
#
#
# The root crontab should be used to perform accounting data collection
#
#
10 3 * * * /usr/sbin/logadm
15 3 * * 0 [ -x /usr/lib/fs/nfs/nfsfind ] && /usr/lib/fs/nfs/nfsfind
30 3 * * * [ -x /usr/lib/gss/gsscred_clean ] &&
/usr/lib/gss/gsscred_clean
30 0,9,12,18,21 * * * /usr/lib/update-manager/update-refresh.sh
30 10 * * * /usr/bin/echo "time to take a break!" > /dev/pts/1


Here you have configured a cron job to display a reminder message.
What is the purpose of the echo command? To display a message
Where is the message displayed? In your terminal window
```

8. Use the `cat` command to check the users that are available for the subsequent steps.

```
root@s11-desktop:~# cat /etc/passwd
...
...
...
jholt:x:60005:10:john holt:/home/jholt:/bin/bash
jmoose:x:60006:10:jerry moose:/home/jmoose:/bin/bash
panna:x:60007:10:polly anna:/home/panna:/bin/bash
sstudent:x: 60008:10:super student:/home/sstudent:/bin/sh


Plan to use John Holt's account, jholt.
```

9. Using the `vi` editor, add an entry for `jholt` in the `cron.deny` file as indicated.

```
root@s11-desktop:~# cd /etc/cron.d
root@s11-desktop:/etc/cron.d# vi cron.deny
root@s11-desktop:/etc/cron.d# grep jholt cron.deny
jholt


Is there anything else on the added line? No, just the login of the user
```

10. Grant everyone permission to write to `/dev/pts/1` by using the `chmod` command.

```
root@s11-desktop:/etc/cron.d# ls -l /dev/pts/1
crw--w---- 1 oracle tty 243, 1 Dec  5 13:24 /dev/pts/1
root@s11-desktop:/etc/cron.d# chmod a+rw /dev/pts/1
root@s11-desktop:/etc/cron.d# ls -l /dev/pts/1
crw-rw-rw- 1 oracle tty 243, 1 Dec  5 13:25 /dev/pts/1


If this permission is not already granted, grant it now. This permission is crucial for a
user to be able to write to the terminal window.
```

11. Log in as the `jholt` account, set the editor to `vi`, and attempt to list your `crontab` file.

```
root@s11-desktop:/etc/cron.d# su - jholt
Oracle Corporation    SunOS 5.11      11.0        November 2011
jholt@s11-desktop:~$ crontab -l
crontab: you are not authorized to use cron.   Sorry.
jholt@s11-desktop:~$


Were you able to view the contents of the crontab file? No, it looks like John Holt is not
allowed to use any crontab facilities.
```

12. Exit to get back to the administrator account. Add the indicated users to the `cron.allow`
file.

```
jholt@s11-desktop:~$ exit
logout
root@s11-desktop:/etc/cron.d# vi cron.allow
root@s11-desktop:/etc/cron.d# cat cron.allow
jmoose
jholt
panna


Now use Jerry Moose's account, jmoose, to see whether he can create a cron job.
```

13. As Jerry Moose, attempt to create an entry in his `crontab` file.

```
root@s11-desktop:/etc/cron.d# su - jmoose
Oracle Corporation    SunOS 5.11      11.0       November 2011
jmoose@s11-desktop:~$ EDITOR=vi
jmoose@s11-desktop:~$ export EDITOR
jmoose@s11-desktop:~$ crontab -e
jmoose@s11-desktop:~$ crontab -l
30 14 * * * /usr/bin/echo "time to go to a movie!" > /dev/pts/1
jmoose@s11-desktop:~$
```

Were you able to create a `cron` job and display a simple message? *Yes*

14. Exit the `jmoose` account. As the administrator, using the `cat` command, display the contents of the `cron.deny` and `cron.allow` files.

```
jmoose@s11-desktop:~$ exit
logout
root@s11-desktop:/etc/cron.d# cat cron.deny
daemon
bin
nuucp
jholt
root@s11-desktop:/etc/cron.d# cat cron.allow
jmoose
jholt
panna
root@s11-desktop:/etc/cron.d#
```

Notice that John Holt's account, `jholt`, is duplicated in both the `cron.deny` file and the `cron.allow` file.

Will he be allowed to create the `cron` jobs? *Refer to the next step.*

15. As John Holt, attempt to create a `cron` job. Verify that you were able to create the job, and then exit the `jholt` account.

```
root@s11-desktop:/etc/cron.d# su - jholt
Oracle Corporation     SunOS 5.11       11.0        November 2011
jholt@s11-desktop:~$ EDITOR=vi
jholt@s11-desktop:~$ export EDITOR
jholt@s11-desktop:~$ crontab -e
jholt@s11-desktop:~$ crontab -l
30 14 * * * /usr/bin/echo "time to have a drink!" > /dev/pts/1
jholt@s11-desktop:~$ exit
logout
root@s11-desktop:/etc/cron.d# exit
logout


Were you able to create a cron job and display a simple message? Yes
This demonstrates that as long as you have an entry in the cron.allow file, you can
create and submit a cron job.
```

Task 2: Scheduling a User Task as Superuser

As a superuser, you create another user's `crontab` file in this task. This demonstrates that as a superuser, you do have authorization. In addition, you do not have to allow the superuser in the `cron.allow` file.

1. Verify that the Sol11-SuperServer and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password.

3. Right-click the desktop background and open a terminal window. In the terminal window, run the `su -` command to assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation     SunOS 5.11       11.0        November 2011
root@s11-desktop:~#
```

4. Before you work with the `crontab` files, you must set up the `editor` variable to `vi`.

```
root@s11-desktop:~# EDITOR=vi
root@s11-desktop:~# export EDITOR
```

5. Display the contents of the cron.allow and cron.deny files.

```
root@s11-desktop:~# cd /etc/cron.d
root@s11-desktop:/etc/cron.d# cat cron.allow
jholt
jmoose
panna
root@s11-desktop:/etc/cron.d# cat cron.deny
daemon
bin
nuucp
jholt
root@s11-desktop:/etc/cron.d#


Currently, you have jmoose, jholt, and panna in the allow file. If your file output is
different, modify it to make it look like this display.
```

6. Using the tty command, find the address of your terminal window.

```
root@s11-desktop:/etc/cron.d# tty
/dev/pts/1
```

7. Use the crontab –e command to edit panna's crontab file as indicated. Display the
results.

```
root@s11-desktop:/etc/cron.d# crontab -e panna
root@s11-desktop:/etc/cron.d# crontab -l panna
30 17 * * * /usr/bin/echo "have a nice day!" > /dev/pts/1
```

8. Verify that the `cron` job has been created.

```
root@s11-desktop:/etc/cron.d# cd /var/spool/cron/crontabs
root@s11-desktop:/var/spool/cron/crontabs# ls -l
total 20
-rw------- 1 root sys     191 Oct 20 09:14 adm
-rw------- 1 root staff    63 Dec  5 16:48 jholt
-r-------- 1 root staff    45 Dec  5 16:48 jholt.au
-rw------- 1 root staff    64 Dec  5 16:46 jmoose
-r-------- 1 root staff    45 Dec  5 16:46 jmoose.au
-rw------- 1 root root     65 Dec  5 17:33 panna
-r-------- 1 root root     46 Dec  5 17:33 panna.au
-rw------- 1 root root    448 Dec  5 16:46 root
-r-------- 1 root root     45 Dec  5 16:46 root.au
-rw------- 1 root sys     309 Oct 20 09:12 sys
root@s11-desktop:/var/spool/cron/crontabs# cat panna
30 17 * * * /usr/bin/echo "have a nice day!" > /dev/pts/1
root@s11-desktop:/var/spool/cron/crontabs#


Has the cron job been created? Yes, it has.

root@s11-desktop:/var/spool/cron/crontabs# cd
root@s11-desktop:~#
```

Practices for Lesson 11: Performing Basic System Monitoring and Troubleshooting

Chapter 11

Practices for Lesson 11

Practices Overview

In these practices, you are presented with five common problems that you are asked to resolve with guidance from your senior system administrator. The problems are as follows:

- Script execution issue
- Software update failure
- Network connectivity issue
- Directory access issues
- Using the man pages

Unlike in previous practices, the solutions for each step are not provided immediately after the step. This is done intentionally to give you the opportunity to apply what you have learned about your job tasks during this course. However, you can find the solutions for each practice at the end of this document.

Scenario

You have done a great job so far in completing each of the tasks on your Test Activities Checklist. Your final task is to troubleshoot specific system issues based on the information provided to you about a particular problem. In each of the practices that follow, you are given a brief description of the problem and asked to resolve the issue. You are provided with some guidance to direct your actions.

√	Test Activities Checklist
√	Install the Oracle Solaris 11 OS and test both the text installer and the LiveCD installation options.
√	Test the software update and package management functionality from both the command line and the GUI.
√	Test the services functionality in Oracle Solaris 11.
√	Test the data storage functionality of Oracle Solaris 11.
√	Inspect the Oracle Solaris zones functionality.
√	Inspect the Oracle Solaris 11 network configuration.
√	Set up users and test the user administration features of Oracle Solaris 11.
√	Set up system and file system access controls and SSH to test a subset of the Oracle Solaris 11 security features.
√	Inspect system processes and test the task scheduling functionality.
	Troubleshoot specific system issues.

Practice 11-1: Troubleshooting a Script Execution Issue

Overview

In this practice, you troubleshoot a script execution issue.

Scenario

In this practice, you create a simple script called `dispinfo`. The purpose of the script is to display basic account information. However, the problem is that every time you want to execute the script, you receive permission errors.

Hint: Inspect the file permissions on the script.

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.
2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.
3. As John Holt, using the `vi` editor, create a file called `dispinfo`.
   Question: What does this script do?
   Hint: Execute the `id` command and display the result.
4. When you try to execute the script, the system says "permission denied."
5. Using the `chmod` command, add the `execute` permission for the owner on the `dispinfo` script.
   Note: To be able to execute the script, you need the `execute` permission on the script.

Practice 11-2: Troubleshooting a Software Update Failure

Overview

In this practice, you resolve a software update failure issue.

Scenario

In this practice, you are planning to update your system with a `diffstat` package. Before you update the system, you would like to verify that the package is available in the IPS repository. The problem is that the system cannot find a properly configured repository. You get some help from your senior system administrator to resolve the problem.

Scenario Setup:

To set up the scenario, log in to Sol11-Server1 as `oracle` with the password `oracle1`. Switch to administrator by using the same password.

Issue the following command:

```
# svcadm disable application/pkg/server
```

Hints:

- Determine the correct location of the IPS repository.
- Determine whether the IPS service is enabled.

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Assume primary administrator privileges.

3. Using the `pkg search` command, attempt to find the `diffstat` package in the IPS repository.

   Note: Analyze the problem. The message says "`unable to contact valid package repository`," and then again it says "`unable to contact any configured publishers`." For training purposes, assume that you have talked about this issue with your senior system administrator, who said that you should complete the next step to fix the problem.

4. Log in to the IPS server (Sol11-Server1). Using the `svcadm enable` command, enable the `application/pkg/server` service.

5. Verify that you can now find the package from the Sol11-Desktop virtual machine.

   Good job! Now you have investigated the problem of not being able to access the IPS repository. You corrected the situation by enabling the IPS package service and now you are able to access the IPS repository.

Practice 11-3: Troubleshooting a Network Connectivity Issue

Overview

In this practice, you resolve a network connectivity issue.

Scenario

In this practice, you plan to access s11-desktop. The problem is that when you use the `ping` command to check the connectivity between your host and s11-desktop, the command is not successful. You must troubleshoot and correct this problem. You get some help from your senior system administrator to resolve the problem.

Scenario Setup:

On Sol11-Server1, from the `/opt/ora/scripts` directory, execute `lab11_bug2`:

```
# ./lab11_bug2
```

Hints:

- Check the current state of the network interface.
- Determine the command to correct the problem.

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.
2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.
3. Using the `ping` command, attempt to check the connectivity between s11-server1 and s11-desktop.

   Note: You should see the message "`no route to host`," which means that the system cannot get to the specified IP address.

   Question: What should you check?

   Answer: The network interface on s11-server1

4. Using the `ipadm` command, check whether the network interface is up.

   Question: Is the `net0` network interface up?

   Answer: No, it is down.

   Question: What are the other displayed entries in the output?

   Answer: Both are loopback addresses: one for IPv4 and the other one for IPv6.

5. Your senior system administrator advised you to use the `ipadm` command to bring up the interface.
6. Using the same `ipadm` command, verify the results.

   Question: Is `net0` up now?

   Answer: Yes

7. Use the `ping` command to check the connectivity to s11-desktop.

   You have successfully connected to s11-desktop because the interface is up.

Practice 11-4: Troubleshooting Directory Access Issues

Overview

In this practice, you perform two tasks:

- Troubleshooting a directory access issue
- Troubleshooting a default shell issue

Task 1: Resolving the Directory Issue

Scenario

You are planning to log in as John Holt and perform a few tasks. The problem is that after logging in to John's account, when you attempt to `cd` into his home directory, you get an error. You must troubleshoot and correct this problem.

Scenario Setup:

On Sol11-Server1, from the `/opt/ora/scripts` directory, execute `lab11_bug3`:

./lab11_bug3

Hints:

- Check the permissions of the `/export` directory.
- Check the permissions of the `/export/test` directory.
- Check the permissions of the `/export/test/bug` directory.

1. Verify that the Sol11-Server1 virtual machine is running. If the virtual machine is not running, start it now.
2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.
3. Log in to John Holt's account by using the `su` command. Attempt to `cd` into the `/export/test/bug` directory.

   Note: The system displays a "`no permissions`" message. Investigate the cause in the subsequent steps.
4. Exit back to the administrator account and check the permissions on the intervening directories (`/export/test` and `/export/test/bug`).

   Note: It looks like the `/export/test` and `/export/test/bug` directories were created by the `root` user.

   Question: What permission does John Holt need to be able to `cd` into these two directories?

   Answer: x (execute)

   Question: Do they have the required permission for the non-root users to `cd` into these directories?

   Answer: No. The non-root users require execute permission.

5. Using the `chmod` command, change permissions on the directories. Verify the results.

    Question: Are the required permissions in place?

    Answer: *Yes*

6. Log in to John Holt's account and verify that the issue has been corrected.

    You have resolved the issue of access to the directories. You have corrected the permissions, and this has addressed the access problem.

Task 2: Resolving the Default Shell Issue

Scenario

You notice that a user called `sstudent` has been created with the default shell of `bourne`. The problem is that when you log in as `sstudent` and attempt to verify the default shell, it turns out to be a different shell. You must troubleshoot and take corrective action if needed.

Hints:

- Check the default shell assigned to the `sstudent` user.
- View the man pages for the default `bourne` shell.
- Determine the relationship between both shells.

1. Verify that the Sol11-Server1 virtual machine is running. If the virtual machine is not running, start it now.
2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume primary administrator privileges.
3. Use the `cat` command to display the `/etc/passwd` file. Determine the default shell configuration for the `sstudent` user.

    Question: What is the default shell for the `sstudent` account?

    Answer: `sh` (Bourne shell)

4. Log in to the `sstudent` account and issue the `ps` command to determine the default shell.

    Note: The default shell is displayed as `ksh93`. Why? Find out in the next step.

5. Using the `man` command, display the man pages for the `bourne` shell (`sh`) and the `ksh93` shell.

    Question: What do you conclude from this analysis?

    Answer: If the `sh` shell (`bourne` shell) is assigned to a user as a default, you are given the `ksh93` shell automatically.

    Note: The `ksh93` is an improved version of the `bourne` shell and the `korn` shell.

6. Exit the `sstudent` account.

    You have successfully investigated the issue of the default shell. Because you have determined that it is not a problem, it does not need correction. However, you can explain to the user the reason a different shell is displayed.

Practice 11-5: Using the Man Pages

Overview

In this practice, you explore how to use the Oracle Solaris man pages.

Scenario

The man pages are considered critical tools because they contain valuable information that includes command syntax, file formats, utility documentation, and other references. In this practice, you are presented with multiple options that enable you to examine the output and understand the function of the commands.

Task:

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.

3. Using the `catman` command, create a keyword index on the man pages.

   Now that you have created an index on the keywords, the search function will be faster.

4. Switch to John Holt's account, `jholt`. Using the `man` command, find all information about the function "`create zfs filesystem`".

   Hint: Because the output is so extensive, it is recommended that you examine your own display output.

   On studying the output closely, you can see that this keyword search displays all matches of `create`, `ZFS`, and `file system`, similar to the results of an Internet search.

   Because you created the keyword index, the search will be faster the next time you run it.

5. Using the `man` command, perform a single word search on `init`.

   On examining the display, note that all those utilities are listed where the `init` command or `init` facilities are used.

   Exit completely from the system.

Solution for Practice 11-1: Troubleshooting Script Execution Issue

Scenario

In this practice, you create a simple script called `dispinfo`. The purpose of the script is to display basic account information. However, the problem is that every time you want to execute the script, you receive permission errors.

Hint: Inspect the file permissions on the script.

Task:

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Right-click on the desktop and open a terminal window. Assume administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation    SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

3. As John Holt, using the `vi` editor, create a file called `dispinfo` as follows.

```
root@s11-desktop:~# su - jholt
Oracle Corporation    SunOS 5.11      11.0      November 2011
jholt@s11-desktop:~$ vi dispinfo
jholt@s11-desktop:~$ cat dispinfo
#!/bin/bash
echo Here is my userid and the group information
id
```

What does this script do? *It executes the `id` command and displays the results.*

4. Using the `chmod` command, add the execute permission for the owner on the `dispinfo` script.

```
jholt@s11-desktop:~$ ./dispinfo
bash: ./dispinfo: Permission denied

jholt@s11-desktop:~$ ls -l dispinfo
-rw-r--r-- 1 jholt staff 64 Dec  5 13:38 dispinfo
jholt@s11-desktop:~$ chmod 744 dispinfo
jholt@s11-desktop:~$ ls -l dispinfo
-rwxr--r-- 1 jholt staff 64 Dec  5 13:38 dispinfo
```

To be able to execute the script, you need the execute permission on it.

5. Now run the script dispinfo with the newly added execute permission.

```
jholt@s11-desktop:~$ ./dispinfo
Here is my userid and the group information
uid=60005(jholt) gid=10(staff)


Why can the system now find your dispinfo script? Because the dispinfo script has
the right permissions.


jholt@s11-desktop:~$ exit
logout
root@s11-desktop:~#
```

Solution for Practice 11-2: Troubleshooting a Software Update Failure

Scenario

In this practice, you plan to update your system with a `diffstat` package. Before you update the system, you would like to verify that the package is available in the IPS repository. The problem is that the system cannot find a properly configured repository. You get some help from your senior system administrator to resolve the problem.

Scenario Setup:

To set up the scenario, log in to Sol11-Server1 as `oracle` with the password `oracle1`. Switch to administrator by using the same password.

Issue the following command:

```
# svcadm disable application/pkg/server
```

Hints:

- Determine the correct location of the IPS repository.
- Determine whether the IPS service is enabled.

Task:

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Right-click on the desktop to open a terminal window and assume primary administrator privileges.

```
oracle@s11-desktop:~$ su -
Password:
Oracle Corporation     SunOS 5.11      11.0      November 2011
root@s11-desktop:~#
```

3. Using the `pkg search` command, attempt to find the `diffstat` package in the IPS repository.

```
root@s11-desktop:~# pkg search diffstat
pkg: Unable to contact valid package repository
Encountered the following error(s):
Unable to contact any configured publishers.
This is likely a network configuration problem.
Framework error: code: 7 reason: couldn't connect to host
URL: 's11-server1.mydomain.com". (happened 4 times)
```

Analyze the problem.

The message says "Unable to contact valid package repository," and then again it says "Unable to contact any configured publishers."

You checked with your senior system administrator, who showed you the next steps for investigating and fixing the problem.

4. Log in to Sol11-Server1 as `oracle` with the password `oracle1`. Switch to the administrator account by using the same password. Display the status of the `application/pkg/server` service.

```
root@s11-server1:~# svcs application/pkg/server
STATE          STIME        FMRI
Disabled       5:55:18      svc:/application/pkg/server:default


Because the IPS package repository service is down, you cannot find it. Enable the
service, and then verify that it is online:


root@s11-server1:~# svcadm enable application/pkg/server
STATE          STIME        FMRI
enabled        5:60:18      svc:/application/pkg/server:default


root@s11-server1:~# svcs application/pkg/server
STATE          STIME        FMRI
Online         6:00:36      svc:/application/pkg/server:default
```

5. Return to the Sol11-Desktop virtual machine. Using the `pkg search` command, attempt to find the `diffstat` package in the repository.

```
root@s11-desktop:~# pkg search diffstat
INDEX           ACTION VALUE                            PACKAGE


pkg.description set.   The diff command compares files line by
line. Diffstat reads the output…….
…
…
…


Success! Now you are able to access the package repository on Sol11-Server1.


Because this configuration was not covered in this class, you had to rely on your senior
system administrator to advise you as to what actions you should take. However, if in
future you are unable to find a package, you may try resolving the issue by using these
commands.
```

Solution for Practice 11-3: Troubleshooting a Network Connectivity Issue

Scenario

In this practice, you plan to access s11-desktop. The problem is that when you use the `ping` command to check the connectivity between your host and s11-desktop, the command is not successful. You must troubleshoot and correct this problem. You get some help from your senior system administrator to resolve the issue.

Scenario Setup:

On Sol11-Server1, from the `/opt/ora/scripts` directory, execute `lab11_bug2`:

```
# ./lab11_bug2
```

Hints:

- Check the current state of the network interface.
- Determine the command to correct the problem.

Task:

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.

```
oracle@s11-server1:~$ su -
Password:
Oracle Corporation     SunOS 5.11      11.0          November 2011
root@s11-server1:~#
```

3. Using the `ping` command, attempt to check the connectivity between s11-server1 and s11-desktop (IP address: 192.168.0.111).

```
root@s11-server1:~# ping 192.168.0.111
ping: sendto No route to host


The message says "No route to host," which means that the ping command cannot
get to the specified IP address.
What should you check? The network interface on s11-server1
```

4.   Using the `ipadm` command, check whether the network interface is up.

```
root@s11-server1:~# ipadm show-addr
ADDROBJ          TYPE        STATE       ADDR
lo0/v4           static      ok          127.0.0.1/8
net0/v4          static      down        192.168.0.100/24
lo0/v6           static      ok          ::1/128
net0/v6          addrconf    ok          fe80::a00:27ff:fee2:9336/10
```

Is the `net0` network interface up? *No, it is down*.

What are the other entries displayed in the output? *Both are loopback addresses: one for IPv4 and the other one for IPv6*.

5.   Using the `ipadm` command, bring up the interface. Verify the results.

```
root@s11-server1:~# ipadm up-addr net0/v4
```

6.   Verify whether the network interface is up and running.

```
root@s11-server1:~# ipadm show-addr
ADDROBJ          TYPE        STATE       ADDR
lo0/v4           static      ok          127.0.0.1/8
net0/v4          static      ok          192.168.0.100/24
lo0/v6           static      ok          ::1/128
net0/v6          addrconf    ok          fe80::a00:27ff:fee2:9336/10
```

Is `net0` up now? *Yes*.

7.   Use the `ping` command to check the connectivity to s11-desktop.

```
root@s11-server1:~# ping 192.168.0.111
192.168.0.111 is alive
```

You have successfully connected to s11-desktop because the network interface is up.

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Solution for Practice 11-4: Troubleshooting Directory Access Issues

Task 1: Resolving the Access to Directory Issue

Scenario

You plan to log in as John Holt and perform some tasks. The problem is that after logging in to John Holt's account, when you attempt to `cd` into his home directory, you get an error. You must troubleshoot and correct this problem.

Scenario Setup:

On Sol11-Server1, from the `/opt/ora/scripts` directory, execute `lab11_bug3`:

```
# ./lab11_bug3
```

Hints:

- Check the permissions of the `/export` directory.
- Check the permissions of the `/export/test` directory.
- Check the permissions of the `/export/test/bug` directory.

1. Verify that the Sol11-Server1 virtual machine is running. If the virtual machine is not running, start it now.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.

```
oracle@s11-server1:~$ su -
Password:
Oracle Corporation     SunOS 5.11     11.0     November 2011
root@s11-server1:~#
```

3. Log in to John Holt's account by using the `su` command. Attempt to `cd` into the `/export/test/bug` directory.

```
root@s11-server1:~# su - jholt
Oracle Corporation     SunOS 5.11     11.0     November 2011
jholt@s11-server1:~$ cd /export/test/bug
-bash: cd: /export/test/bug: Permission denied

Investigate the cause in the subsequent steps.
```

4. Exit to the superuser account and check the permissions on the intervening directories (that is, on /export/test and /export/test/bug).

```
jholt@s11-server1:~$ exit
logout
root@s11-server1:~# ls -ld /export/test
drwxr--r-- 9 root root 9 Dec  5 14:32 /export/test
root@s11-server1:~# ls -ld /export/test/bug
drwxr--r-- 17 root root 33 Dec  5 18:02 /export/test/bug


It looks like the /export/test and /export/test/bug directories were created by
the root user.


What permission does John Holt need to be able to cd into these two directories? He
needs the x (execute) permission.
Do they have the required permission for the non-root users to cd into these directories?
No
```

5. Using the chmod command, change permissions on the directory and the file. Verify the results.

```
root@s11-server1:~# chmod 755 /export/test
root@s11-server1:~# chmod 755 /export/test/bug
root@s11-server1:~# ls -ld /export/test
drwxr-xr-x 3 root root 3 Dec  5 14:32 /export/test
root@s11-server1:~# ls -ld /export/test/bug
drwxr-xr-x 2 root root 2 Dec  5 09:12 /export/test/bug


Are the required permissions in place? Yes
```

6. Log in to John Holt's account and attempt to access the directories.

```
root@s11-server1:~# su - jholt
Oracle Corporation      SunOS 5.11      11.0          November 2011
jholt@s11-server1:~$ cd /export/test/bug
jholt@s11-server1:/export/test/bug~$
```

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Task 2: Resolving the Default Shell Issue

Scenario

You notice that a user called `sstudent` has been created with the default shell of `bourne`. The problem is that when you log in as `sstudent` and attempt to verify the default shell, it turns out to be a different shell. You must troubleshoot and take corrective action if needed.

Hints:

- Check the default shell assigned to the user `sstudent`.
- View the man pages for the default `bourne` shell.
- Determine the relationship between both shells.

1. Verify that the Sol11-Server1 virtual machine is running. If the virtual machine is not running, start it now.

2. Log in to the Sol11-Server1 virtual machine as the `oracle` user. Use `oracle1` as the password. Assume administrator privileges.

   ```
   oracle@s11-server1:~$ su -
   Password:
   Oracle Corporation     SunOS 5.11     11.0     November 2011
   root@s11-server1:~#
   ```

3. Use the `cat` command to display the `/etc/passwd` file. Determine the default shell configuration for the `sstudent` user.

   ```
   root@s11-server1:~# cat /etc/passwd
   ...
   ...
   ...
   jholt:x:60005:10:john holt:/home/jholt:/bin/bash
   jmoose:x:60006:10:jerry moose:/home/jmoose:/bin/bash
   panna:x:60007:10:polly anna:/home/panna:/bin/bash
   sstudent:x:60008:10:super student:/home/sstudent:/bin/sh

   ```

   What is the default shell for the `sstudent` account? *sh (Bourne shell)*

4. Log in to the `sstudent` account and issue the `ps` command to determine the default shell.

   ```
   root@s11-server1:~# su - sstudent
   Oracle Corporation     SunOS 5.11     11.0     November 2011
   sstudent@s11-server1:~$ ps
     PID TTY          TIME CMD
    3255 pts/1        0:00 ksh93
    3261 pts/1        0:00 ps

   ```

   The default shell is displayed as `ksh93`.
   Why? Find out in the next step.

5. Using the man command, display the man pages for the bourne shell (sh) and the ksh93 shell.

```
sstudent@s11-server1:~$ man sh

User Commands                                                  sh(1)

NAME
     sh, jsh - standard and job control shell and command
interpreter

SYNOPSIS
     /usr/bin/sh [acefhiknprstuvx] [argument]...
     /usr/xpg4/bin/sh [+ abCefhikmnoprstuvx]

          [+ o option]... [-c string]  [arg]...

     /usr/bin/jsh [acefhiknprstuvx] [argument]...

DESCRIPTION
     The /usr/bin/sh utility is a command programming language
that executes command read from a terminal or a file.
...
...
...

sstudent@s11-server1:/home/sstudent$ man ksh93

User Commands                                                  ksh93(1)

NAME
     ksh93, rksh93 - Korn Shell, a standard and  restricted  com-
     mand and programming language

SYNOPSIS
     ksh93 [+abcefhikmnoprstuvxBCD] [-R file] [ +o option] ...
          [-] [arg ...]

     rksh93 [+abcefhikmnoprstuvxBCD] [-R file] [+o option] ...
          [-] [arg ...]

DESCRIPTION
     ksh93 is a command and programming  language  that  executes
     commands  read  from  a terminal or a file. rksh93 is a res-
```

```
...
...
...
```

Note: You issued the command `man sh`. But the description has `ksh93` and not `sh`.

What do you conclude from this analysis? *If the `sh` shell (`bourne` shell) is assigned to a user as a default, you are given the `ksh93` shell automatically.*

`ksh93` is an improved version of the `bourne` shell and the `korn` shell.

6. Exit the `sstudent` account.

```
sstudent@s11-server1:~$ exit
root@s11-server1:~#
```

Solution for Practice 11-5: Using the Man Pages

Scenario

The man pages are considered critical tools because they contain valuable information, which includes command syntax, file formats, utility documentation, and other references. During this practice, you are presented with multiple options that enable you to examine the output and understand the function of the commands.

Tasks

1. Verify that the Sol11-Server1 and Sol11-Desktop virtual machines are running. If the virtual machines are not running, start them now.

2. Log in to the Sol11-Desktop virtual machine as the `oracle` user. Use `oracle1` as the password. Right-click on the desktop to open a terminal window and assume administrator privileges.

    ```
    oracle@s11-desktop:~$ su -
    Password:
    Oracle Corporation    SunOS 5.11    11.0    November 2011
    root@s11-desktop:~#
    ```

3. Using the `catman` command, create a keyword index on the man pages.

    ```
    root@s11-desktop:~# catman -w
    Generating index files...


    Now that you have created an index on the keywords, the search function will be faster.
    ```

4. Switch to John Holt's account, `jholt`. Using the `man` command, find all information about the function "`create zfs filesystem`."

    ```
    root@s11-desktop:~# su - jholt
    Oracle Corporation    SunOS 5.11    11.0    November 2011
    jholt@s11-desktop:~$ man -K "create zfs filesystem"
    …
    …
    …


    2. pam_zfs_key(5) NAME     /usr/share/man/man5/pam_zfs_key.5
    pam_zfs_key – PAM user creditial module for ZFS


    3. mkisofs(8)   NAME     /usr/share/man/man8/mkisofs.8
    mkisofs – create an hybrid IS)-9660/JOLIET/HFS/UDF filesystem-
    image with optional Rock Ridge attributes.


    4. newfs(1m)    NAME /usr/share/man/man1m/newfs.1m
    newfs – construct a UFS file system


    5. zfs(1m)      NAME     /usr/share/man/man7fs/zfs.1m
    ```

```
zfs – configures ZFS file systems

…
…
…
1639. ssl(3openssl)  "DATA STRUCTURES"
/usr/share/man/man3openssl/SSL.3openssl

and TLSv1) It's need to create an s-1SSL_CTXs0.


1640. pcreapi(3)  "MATCHING A PATTER: THE TRADITIONAL FUNCTION"
/usr/share/man/man3/pcreapi.3

Doesn't return NULL), but you can also create one for yourself,
and pass


jholt@s11-desktop:~$
```

Hint: Because the output is so extensive, it is recommended that you examine your own display output.

After studying the output closely, you can see that this keyword search displays all matches of `create`, `ZFS`, and `filesystem`, similar to the results of an Internet search.

Because you created the keyword index, the search will be faster the next time you run it.

5. Using the `man` command, perform a single-word search by using `init`. Then exit completely from the system.

```
jholt@s11-desktop:~$ man -k init
1. init(1m)     NAME    /usr/share/man/man1m/init.1m
init - process control initilization


2. inittab(4)   NAME    /usr/share/man/man4/inittab.4
inittab – script for init


3. init.d(4)    NAME    /usr/share/man/man4/init.d.4
init.d – initialization and termination scripts for changing init
states


After examining this display, you note that all those utilities are listed where the init
command or init facilities are used.


jholt@s11-desktop:~$ exit
logout
root@s11-desktop:~# exit
```

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