



Integrated Cloud Applications & Platform Services



Oracle Linux System Administration I

Activity Guide – Volume I

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Table of Contents

Practices for Lesson 1: Course Introduction	7
Course Practice Environment: Security Credentials.....	8
Practices for Lesson 1: Overview	9
Practice 1-1: Exploring the dom0 Environment	10
Practice 1-2: Starting, Stopping, and Listing Guests	16
Practice 1-3: Exploring the host01 VM	18
Practice 1-4: Exploring the host02 VM	22
Practice 1-5: Logging Off from Your Student PC.....	25
Practices for Lesson 2: Introduction to Oracle Linux.....	27
Practices for Lesson 2: Overview	28
Practice 2-1: Quiz – Introduction to Oracle Linux	29
Solution 2-1: Quiz – Introduction to Oracle Linux	31
Practice 2-2: Viewing Kernel Information.....	32
Practices for Lesson 3: Oracle Cloud Computing	35
Practices for Lesson 3: Overview	36
Practice 3-1: Quiz – Oracle Cloud Computing.....	37
Solution 3-1: Quiz – Oracle Cloud Computing.....	39
Practices for Lesson 4: Installing Oracle Linux 7	41
Practices for Lesson 4: Overview	42
Practice 4-1: Installing Oracle Linux	43
Practice 4-2: Completing Initial Setup.....	90
Practice 4-3: Booting Up the host03 VM Guest.....	100
Practices for Lesson 5: Oracle Linux 7 Boot Process.....	101
Practices for Lesson 5: Overview	102
Practice 5-1: Exploring the GRUB 2 Bootloader.....	103
Practice 5-2: Booting Different Kernels.....	110
Practice 5-3: Using the GRUB 2 Menu	119
Practice 5-4: Exploring <code>systemd</code> Units	126
Practice 5-5: Working with <code>systemd</code> Target and Service Units	132
Practices for Lesson 6: System Configuration	141
Practices for Lesson 6: Overview	142
Practice 6-1: Configuring Date and Time.....	143
Practice 6-2: Configuring NTP and Chrony	147
Practice 6-3: Exploring the <code>/etc/sysconfig</code> Directory.....	156
Practice 6-4: Exploring the <code>/proc</code> File System.....	159

Practice 6-5: Exploring the <code>sysfs</code> File System	163
Practice 6-6: Using the <code>sysctl</code> Utility.....	165
Practices for Lesson 7: Package Management	167
Practices for Lesson 7: Overview	168
Practice 7-1: Using the <code>rpm</code> Utility	169
Practice 7-2: Accessing the Oracle Linux Yum Server	173
Practice 7-3: Creating a Local <code>Yum</code> Repository.....	183
Practice 7-4: Using the <code>yum</code> Utility	187
Practice 7-5: Using Oracle Linux Software Collections	207
Practice 7-6: Using the Unbreakable Linux Network (ULN)	220
Practices for Lesson 8: Automating Tasks.....	237
Practices for Lesson 8: Overview	238
Practice 8-1: Automating Tasks.....	239
Practices for Lesson 9: Kernel Module Configuration	247
Practices for Lesson 9: Overview	248
Practice 9-1: Using Loadable Kernel Modules.....	249
Practices for Lesson 10: Oracle Ksplice	253
Practices for Lesson 10: Overview	254
Practice 10-1: Using Ksplice Uptrack	255
Practice 10-2: Installing the Ksplice Offline Client and Kernel Updates	267
Practices for Lesson 11: User and Group Administration	273
Practices for Lesson 11: Overview	274
Practice 11-1: Administering User Accounts	275
Practice 11-2: Administering Group Accounts	284
Practice 11-3: Implementing User Private Groups	285
Practice 11-4: Configuring Password Aging	288
Practice 11-5: Using the User Manager GUI	290
Practice 11-6: Restricting the Use of the <code>su</code> Command	296
Practice 11-7: Allowing the Use of the <code>sudo</code> Command	301
Practices for Lesson 12: Partitions, File Systems, and Swap	307
Practices for Lesson 12: Overview	308
Practice 12-1: Listing the Current Disk Partitions	309
Practice 12-2: Partitioning a Storage Device	314
Practice 12-3: Creating <code>ext3</code> and <code>ext4</code> File Systems	319
Practice 12-4: Implementing Access Control Lists	323
Practice 12-5: Increasing Swap Space	327
Practice 12-6: Removing Partitions and Additional Swap Space	329
Practices for Lesson 13: Network Configuration	333

Practices for Lesson 13: Overview	334
Practice 13-1: Configuring the <code>eth1</code> Network Interface	335
Practice 13-2: Using NetworkManager with the GNOME GUI	341
Practice 13-3: Using the Network Connection Editor	358
Practice 13-4: Using the <code>nmcli</code> Utility	361
Practice 13-5: Using the <code>nmtui</code> Utility	376
Practice 13-6: Using the <code>ip</code> Utility	380
Practices for Lesson 14: IPv6.....	389
Practices for Lesson 14: Overview	390
Practice 14-1: Using IPv6	391
Practices for Lesson 15: OpenSSH	397
Practices for Lesson 15: Overview	398
Practice 15-1: Connecting to a Remote Server by Using <code>ssh</code>	399
Practice 15-2: Configuring OpenSSH to Connect Without a Password	403
Practices for Lesson 16: Security Administration	407
Practices for Lesson 16: Overview	408
Practice 16-1: Configuring a <code>chroot</code> Jail.....	409
Practice 16-2: Configuring a <code>chroot</code> Jail for <code>ftp</code> Users.....	412
Practice 16-3: Exploring <code>firewalld</code>	419
Practice 16-4: Configuring <code>firewalld</code>	433
Practice 16-5: Configuring <code>iptables</code>	440
Practice 16-6: Configuring a TCP Wrapper	445
Practice 16-7: Restoring VM Configurations.....	447
Practices for Lesson 17: Oracle on Oracle	451
Practices for Lesson 17: Overview	452
Practice 17-1: Using <code>scp</code> to Upload <code>oracle</code> Packages.....	453
Practice 17-2: Installing and Running Oracle Database Pre-Install.....	454
Practice 17-3: Preparing Disks for ASM Use	466
Practice 17-4: Installing and Configuring ASMLib	468
Practice 17-5: Reverting Changes Made to <code>host03</code>	472
Practices for Lesson 18: System Monitoring and Management.....	477
Practices for Lesson 18: Overview	478
Practice 18-1: Using <code>sosreport</code> to Collect System Information	479
Practice 18-2: Using Standard Linux Performance Monitoring Tools.....	483
Practice 18-3: Installing and Using OSWatcher	499
Practice 18-4: Using OSWatcher Analyzer	506
Practices for Lesson 19: System Logging.....	517
Practices for Lesson 19: Overview	518

Practice 19-1: Configuring System Logging	519
Practice 19-2: Using <code>rsyslog</code> Templates	524
Practice 19-3: Using <code>logwatch</code>	526
Practice 19-4: Using <code>journald</code>	529
Practice 19-5: Using Process Accounting.....	534
Practices for Lesson 20: Troubleshooting	537
Practices for Lesson 20: Overview	538
Practice 20-1: Transferring Utilities from dom0	539
Practice 20-2: System Boots into Single-User Mode.....	540
Solution 20-2: System Boots into Single-User Mode.....	542
Practice 20-3: Status Commands Fail	544
Solution 20-3: Status Commands Fail	546
Practice 20-4: <code>cron</code> Job Fails to Run	547
Solution 20-4: <code>cron</code> Job Fails to Run.....	549
Practice 20-5: User Cannot Log In	551
Solution 20-5: User Cannot Log In	554
Practice 20-6: File System Troubleshooting	556
Solution 20-6: File System Troubleshooting	560
Practice 20-7: Network Connectivity Problem	564
Solution 20-7: Network Connectivity Problem	566
Practice 20-8: Remote Access Problem.....	568
Solution 20-8: Remote Access Problem	571
Practice 20-9: Log File Is Not Getting Updated	574
Solution 20-9: Log File Is Not Getting Updated	577
Appendix A: Source Code for Problem-Causing Executables.....	579
Appendix: Remote Access Options.....	583
Appendix: Remote Access Options – Overview	584
Appendix: Using the TigerVNC Viewer to Connect to dom0	585

Practices for Lesson 1: Course Introduction

Course Practice Environment: Security Credentials

For OS usernames and passwords, see the following:

- If you are attending a classroom-based or live virtual class, ask your instructor or LVC producer for OS credential information.
- If you are using a self-study format, refer to the communication that you received from Oracle University for this course.

For product-specific credentials used in this course, see the following table:

Product-Specific Credentials		
Virtual Machines/Application	Username	Password
host01/OS	root	oracle
host01/OS	oracle	oracle
host02/OS	root	oracle
host02/OS	oracle	oracle
host03/OS	root	oracle
host03/OS	oracle	oracle
dom0/OS	vncuser	vnctech

Practices for Lesson 1: Overview

Practices Overview

In these practices, you:

- Become familiar with Oracle VM Server for the x86 environment installed on your student PC
- Connect to the virtual machines used for the hands-on practices and become familiar with the VM guest configurations

Assumptions

- A student PC has been assigned to you.
- Your student PC is running Oracle VM Server.
- The GNOME desktop is installed on **dom0**.
- Three guests (virtual machines) are created: **host01**, **host02**, and **host03**.
- Guest VMs **host01** and **host02** are running Oracle Linux.
- You install Oracle Linux on **host03** in the installation practice.

Practice 1-1: Exploring the **dom0** Environment

Overview

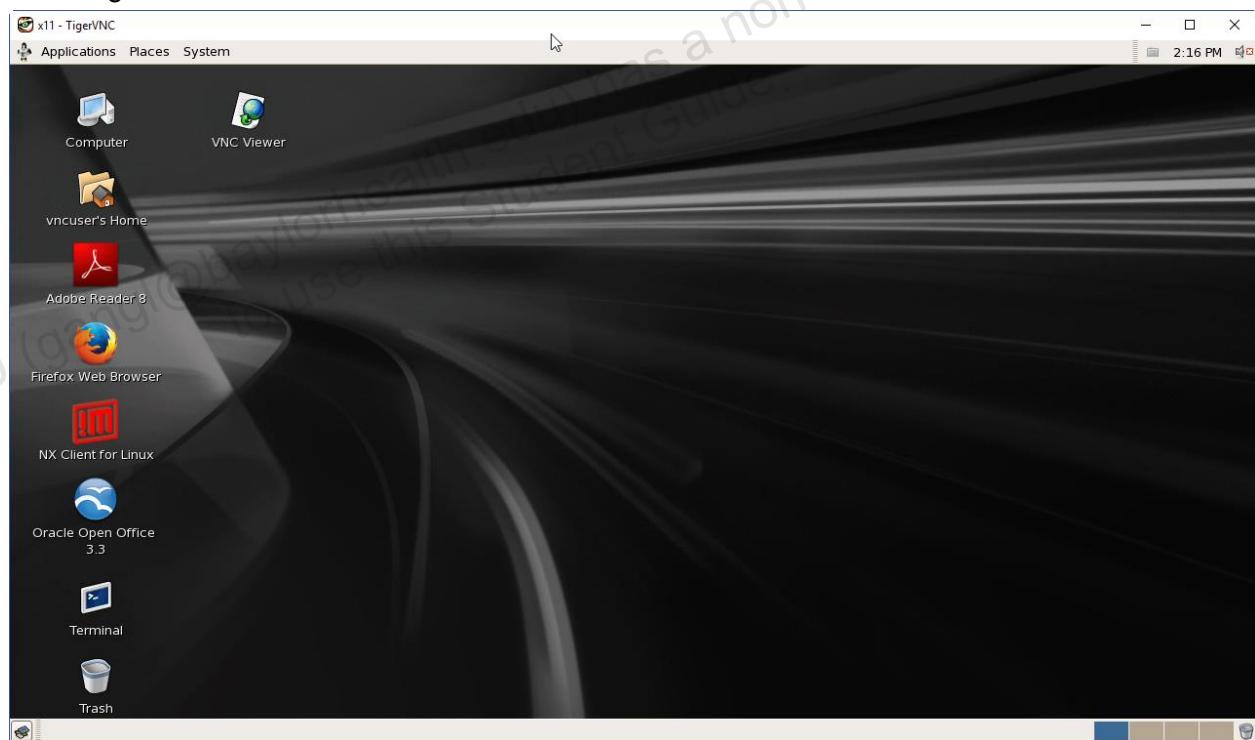
In this practice, you explore the **dom0** configuration and directory structure.

Assumptions

- A student PC has been assigned to you.
- Your student PC is running Oracle VM Server for x86.
- You are logged on to your student PC as `vncuser` with the appropriate password.
- The GNOME desktop is installed on **dom0**.
- There are three guests (virtual machines): **host01**, **host02**, and **host03**.

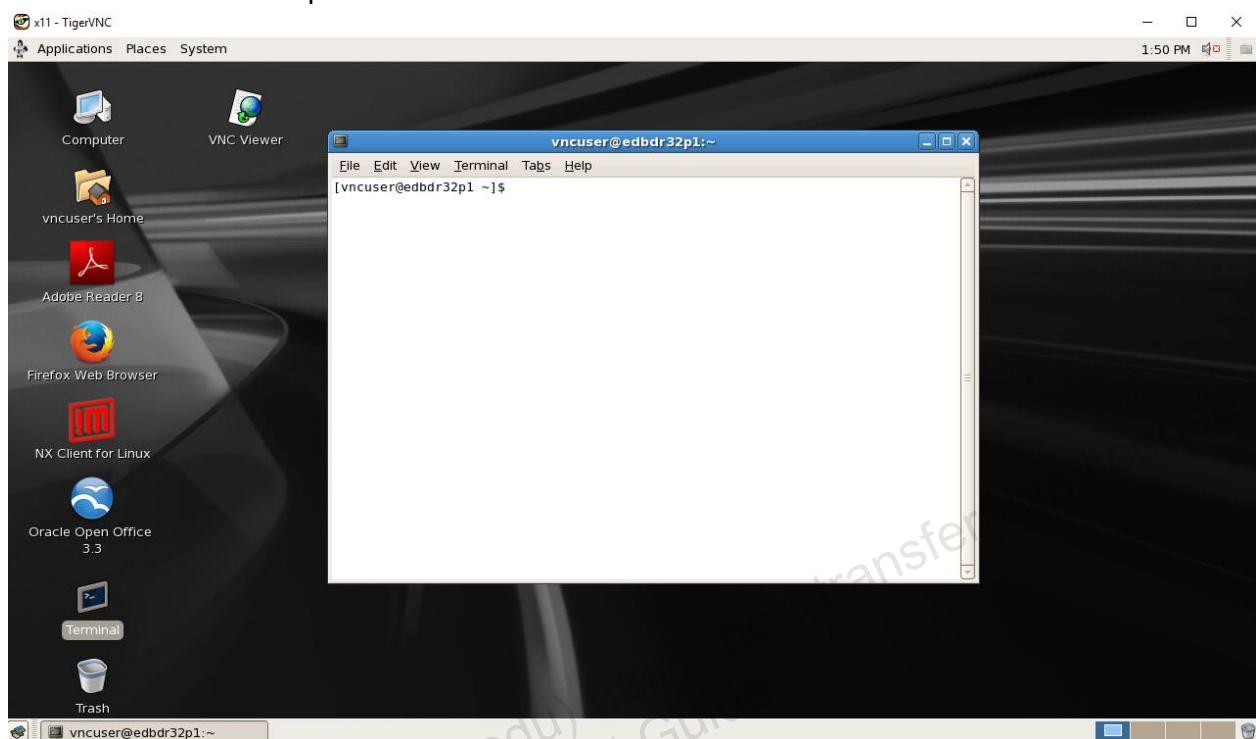
Tasks

1. Open a terminal window.
 - Begin this task from the **dom0** GNOME virtual desktop window as shown in the following screenshot:



Double-click the **Terminal** icon on the GNOME desktop.

- A terminal window opens as follows:



2. Become the `root` user by using the `su -` command from the prompt in the terminal window.
 - See the above Security Credentials section to obtain the initial `root` password for `dom0`. You might be required to change the `root` password the first time you use the `su -` command.
 - Confirm that you are `root` by printing the user identity with the `whoami` command.

```
$ su -  
...  
# whoami  
root
```

3. Determine the operating system that is running on `dom0`.
 - a. Use the `cat` command to view the contents of the `/etc/ovs-release` file.

```
# cat /etc/ovs-release  
Oracle VM server release 3.2.1
```
 - b. Use the `uname -a` command to display the operating system version.

```
# uname -a  
Linux edbdr32p1 2.6.39-300.22.2.el5uek #1 SMP Fri Jan 4 12:40:29  
PST 2013 x86_64 x86_64 x86_64 GNU/Linux
```

 - In this example, the Linux kernel is `2.6.39-300.22.2.el5uek`.
 - The host name is `edbdr32p1` (your host name is different).

4. Determine the network configuration of **dom0**.

- a. Use the `ifconfig -a` command to display the network configuration. Only a partial output is shown.

```
# ifconfig -a
...
bond0      Link encap:Ethernet ...
            inet addr:NN.NN.NN.NN ...
...
eth0       Link encap:Ethernet ...
...
lo         Link encap:Local Loopback
            inet addr:127.0.0.1 ...
...
vif...     Link encap:Ethernet ...
...
virbr0     Link encap:Ethernet ...
            inet addr:192.0.2.1 ...
...
virbr1     Link encap:Ethernet ...
            inet addr:192.168.1.1 ...
...
```

- The `bond0` network interface for **dom0** provides a connection to the outside world. `NN.NN.NN.NN` is substituted for the actual IP address in this example. This IP address for each **dom0** system will be different.
- The `lo` interface is a software loopback interface that identifies the `localhost`. It is always assigned an IP address of `127.0.0.1`.
- The `virbr0` interface is a `xen` bridge interface used by VM guests. It is assigned an IP address of `192.0.2.1`.
- The `virbr1` interface is a second `xen` bridge interface used by VM guests. It is assigned an IP address of `192.168.1.1`.
- You also note the `vif<#>. <#>` entries. These are virtual interfaces that are tied to the VM/domU IDs. You can get the VM/domU IDs from the `xm list` command, which you run later in this practice.

5. Explore the `/OVS` directory structure on **dom0**.

- a. Explore the top level of the `/OVS` directory. (Only a partial output is shown.)

```
# ls -l /ovs
drwxr-xr-x ... iso_pool
drwxr-xr-x ... publish_pool
drwxr-xr-x ... running_pool
drwxr-xr-x ... seed_pool
drwxr-xr-x ... sharedDisk
```

- There are five directories in the `/OVS` directory.

b. Explore the /OVS/running_pool directory.

```
# cd /OVS/running_pool
# ls -l
drwxr-xr-x ... host01
drwxr-xr-x ... host02
drwxr-xr-x ... host03
```

- The files needed to create the VMs are in separate directories in the /OVS/running_pool directory.
- This example shows that three VM directories exist, for VMs **host01**, **host02**, and **host03**.

c. Explore the **host01** VM directory.

```
# cd /OVS/running_pool/host01
# ls -l
-rw-r--r-- ... system.img
-rw-r--r-- ... u01.img
-rw-r--r-- ... u02.img
-rwxr-xr-x ... vm.cfg
```

- The **system.img** file is the operating system virtual disk.
- The **u01.img** and **u02.img** files are additional virtual disks that are used in various practices in this course.
- The **vm.cfg** file is the configuration file for the virtual machine. This file is read when the virtual machine is created.

d. View the **vm.cfg** file.

```
# cat vm.cfg
# Automatically generated xen config file
name = "host01"
builder = "hvm"
memory = "2048"
boot = 'cd'
disk = [ 'file:/OVS/running_pool/host01/system.img,hda,w',
          'file:/OVS/running_pool/host01/u01.img,hdb,w',
          'file:/OVS/running_pool/host01/u02.img,hdd,w',
          'file:/OVS/seed_pool/OracleLinux-R7-U5-Server-x86_64-
dvd.iso,hdc:cdrom,r']
vif = [ 'mac=00:16:3e:00:01:01, bridge=virbr0',
          'mac=00:16:3e:00:02:01, bridge=virbr1']
device_model = "/usr/lib/xen/bin/qemu-dm"
kernel = "/usr/lib/xen/boot/hvmloader"
vnc=1
vncunused=1
vcpus=1
timer_mode=0
```

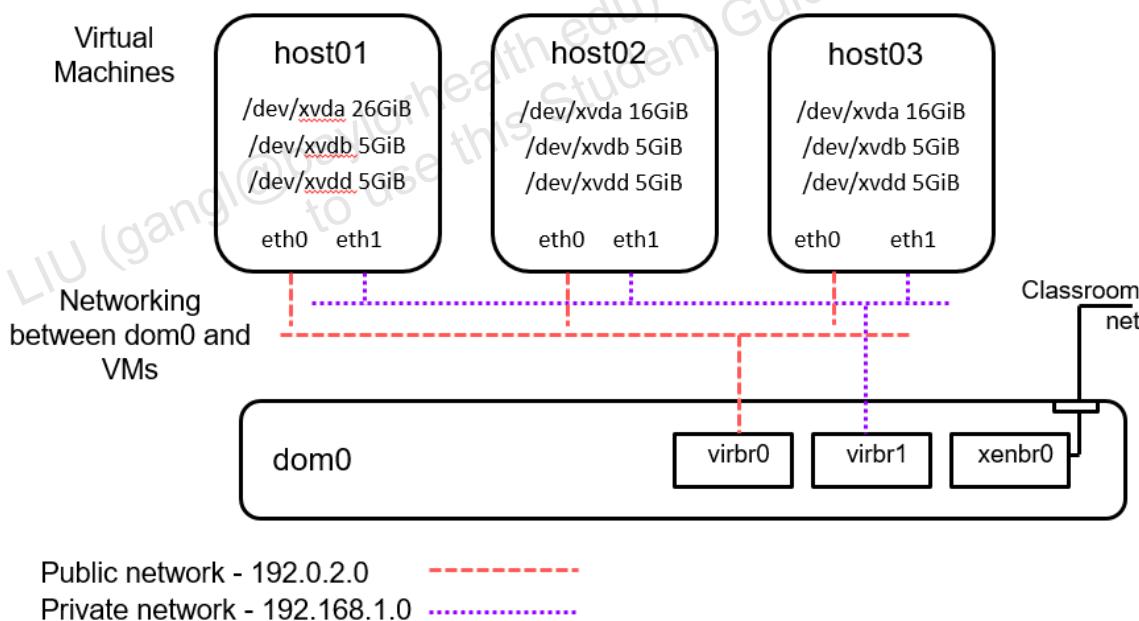
```

apic=1
acpi=1
pae=1
serial = "pty" # enable serial console
on_reboot    = 'restart'
on_crash     = 'restart'
usb = 1
usbdevice = 'tablet'

```

- Note that there are three virtual disks represented by the three .img files.
- Note that the Oracle Linux 7 Update 5 dvd.iso is mounted on a virtual CD-ROM device.
- Note that there are two virtual network interfaces. The interface on the virbr0 bridge is eth0 and the interface on the virbr1 bridge is eth1.
- The boot = 'cd' means the guest will try to boot on hard disk (c) or, if not available, boot on CD-ROM (d). Simply reverse the letters to change the boot order (for example, boot = 'dc').

This is the configuration. All three VMs (**host01**, **host02**, and **host03**) have two network interfaces and three disks.



e. Explore the /OVS/seed_pool directory:

```
# cd /OVS/seed_pool
# ls -l
drwxr-xr-x  ...  devtoolset
drwxr-xr-x  ...  kssplice
-rw-r--r--  ...  OracleLinux-R7-U5-Server-x86_64-dvd.iso
drwxr-xr-x  ...  oswbb
drwxr-xr-x  ...  sfws
-rwxr-xr--  ...  system01.tgz
-rwxr-xr--  ...  system02.tgz
-rwxr-xr--  ...  system03.tgz
drwxr-xr-x  ...  ts_scripts
drwxr-xr-x  ...  ts_source
-rwxr-xr--  ...  u01_01.tgz
-rwxr-xr--  ...  u01_02.tgz
-rwxr-xr--  ...  u01_03.tgz
-rwxr-xr--  ...  u02_01.tgz
-rwxr-xr--  ...  u02_02.tgz
-rwxr-xr--  ...  u02_03.tgz
-rwxr-xr-x  ...  vm01.cfg
-rwxr-xr-x  ...  vm02.cfg
-rwxr-xr-x  ...  vm03.cfg
```

- This directory contains files used to create the initial environment and used in various practices throughout this course.
- Oracle Linux 7 Update 5 is installed on the **host01** and **host02** VMs from the OracleLinux-R7-U5-Server-x86_64-dvd.iso file in this directory.

Practice 1-2: Starting, Stopping, and Listing Guests

Overview

In this practice, you use `xm` commands to list, create, and shut down virtual machines.

Assumptions

- You are logged on to **dom0**.
- You have a terminal window open.
- You are the `root` user.

Tasks

1. List all currently active guests, as well as **dom0** itself.

Use the `xm list` command. The output shown here is a sample. Your output will vary.

# xm list					
Name	ID	Mem	VCPUs	State	Time (s)
Domain-0	0	1024	4	r-----	281.1
host01	1	2048	1	-b----	157.6
host02	2	2048	1	-b----	159.0
host03	3	2048	1	-----	13.2

2. Shut down a VM.

Use the `xm shutdown -w <VM name>` command to shut down the **host01** VM. The `-w` option tells the system to wait until all services in the domain are shut down cleanly. Run `xm list` to display the running VMs.

- The `xm shutdown` command takes a few seconds to complete.

# xm shutdown -w host01					
Domain host01 terminated					
All domains terminated					
# xm list					
Name	ID	Mem	VCPUs	State	Time (s)
Domain-0	0	1024	4	r-----	289.6
host02	2	2048	1	-b----	159.0
host03	3	2048	1	-b----	13.2

3. Start a VM.

Use the `xm create <config_file>` command to start the **host01** VM. `<config_file>` is named `vm.cfg` and is located in the `/OVS/running_pool/<VM_name>` directory. Run `xm list` to display the running VMs.

```
# cd /OVS/running_pool/host01
# xm create vm.cfg
Using config file "./vm.cfg".
Started domain host01 (id=#)
# xm list
Name           ID   Mem  VCPUs      State   Time(s)
Domain-0        0    1024       4      r----  304.5
host01         4    2048       1      r----  18.7
host02         2    2048       1     -b---- 159.0
host03         3    2048       1     -b----  13.2
```

- Note that **host01** is now active.
- In this example, the State column for **dom0** and **host01** shows ‘r’ (run state). The State column for **host02** and **host03** shows ‘b’ (blocked). The following describes these values:
 - r: running: Healthy condition
 - b: blocked: Not running or cannot run due to I/O wait or no work to complete

Practice 1-3: Exploring the host01 VM

Overview

In this practice, you:

- Log on to **host01**
- View the Oracle Linux version on **host01**
- View the Unbreakable Enterprise Kernel version on **host01**
- View the storage devices available on **host01**
- View the network configuration on **host01**

Assumptions

- You are logged on to **dom0** as the `root` user.
- The **host01** VM guest is running.

Tasks

1. Connect to **host01** guest by using **vncviewer**.

- a. From **dom0**, use the `xm vncviewer host01&` command.

```
# xm vncviewer host01&
```

- The “&” character causes the command to run in the background, giving the foreground prompt back.

- b. The following window is displayed. Log on as `root`, providing the password.

- If the screen is blank, press Enter to display the login prompt.

```
host01 login: root
Password:
```



- c. Use the `hostname` command to confirm that you are logged on to the **host01** VM.

```
# hostname
host01.example.com
```

- d. Log out by entering either the `logout` command or the `exit` command.

```
# logout
```

- e. Close the VNC window by clicking the X at the top-right corner of the window.

2. Connect to the **host01** guest by using `ssh`.

Alternatively, from **dom0**, use the `ssh` command to connect to the **host01** VM guest.

- If necessary, press the **Enter** key to see the prompt in the terminal window you are using.

- Because this is the first time you have logged on by using `ssh`, the command checks to make sure you are connecting to the host you think you are connecting to. Enter `yes`.
- Provide the `root` password.
- If you get a message, “**ssh: connect to host host01 port 22: No route to host**,” wait a few seconds to allow `host01` to boot and then run the `ssh host01` command again.

```
[dom0]# ssh host01
The authenticity of host 'host01 (192.0.2.101)' can't be
established.
RSA key fingerprint is ...
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'host01,192.0.2.101' (RSA) to the
list of known hosts.
root@host01's password:
[root@host01 ~]# hostname
host01.example.com
```

- The `hostname` command confirms you have successfully logged on to `host01`.

3. Explore the `host01` VM guest.

- Use the `cat` command to view the contents of the `/etc/oracle-release` file.

```
# cat /etc/oracle-release
Oracle Linux Server release 7.5
```

- Use the `uname -r` command to determine your running kernel version.

```
# uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- You are running Unbreakable Enterprise Kernel (UEK) Release 4.1. UEK became the default kernel beginning with Oracle Linux 5 Update 6.
- Use the `fdisk` command to view the storage devices.

```
# fdisk -l | grep /dev
Disk /dev/xvda: 27.9 GB, 27917287424 bytes, 54525952 sectors
/dev/xvda1      *        ...          83    Linux
/dev/xvda2            ...          83    Linux
/dev/xvda3            ...          83    Linux
/dev/xvda4            ...          5    Extended
/dev/xvda5            ...         82    Linux swap / Solaris
Disk /dev/xvdb: 5368 MB, 5368709120 bytes, 10485760 sectors
Disk /dev/xvdd: 5368 MB, 5368709120 bytes, 10485760 sectors
```

- Three devices are available: `/dev/xvda`, `/dev/xvdb`, and `/dev/xvdd`.
- Do not run the following commands. This is for information only:
 - The `/dev/xvda` disk device represents a 26 GiB system image file created with the following command (in the `/OVS/running_pool/host01` directory on `dom0`):

- ```
dd if=/dev/zero of=system.img bs=1M count=26624
```
- The /dev/xvdb disk device represents a 5 GiB utility image file created with the following command (in the /OVS/running\_pool/host01 directory on **dom0**):
 

```
dd if=/dev/zero of=u01.img bs=1M count=5120
```
  - The /dev/xvdd disk device represents a 5 GiB utility image file created with the following command (in the /OVS/running\_pool/host01 directory on **dom0**):
 

```
dd if=/dev/zero of=u02.img bs=1M count=5120
```
  - Note that fdisk reports the size of /dev/xvda as 27.9 GB, which is a decimal approximation of the reported 27917287424 bytes. 27917287424 bytes equals 26 GiB in binary units. Similarly, fdisk reports the sizes of /dev/xvdb and /dev/xvdd as 5368 MB, which is a decimal approximation of the reported 5368709120 bytes. 5368709120 bytes equals 5 GiB in binary units.
  - The /dev/xvda device has Oracle Linux Minimal Install packages installed, in addition to several other necessary packages.
- d. Use the ip addr command to display the network interfaces. Only partial output is shown.

```
ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue ...
 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
 inet addr:127.0.0.1/8 scope host lo
...
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc ...
 link/ether 00:16:3e:00:01:01 brd ff:ff:ff:ff:ff:ff
 inet 192.0.2.101/24 brd 192.0.2.255 scope global ... eth0
...
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc ...
 link/ether 00:16:3e:00:02:01 brd ff:ff:ff:ff:ff:ff
 inet 192.168.1.101/24 brd 192.168.1.255 scope global ... eth1
...
```

- The system has two Ethernet network interfaces, **eth0** and **eth1**.
  - The **eth0** interface is on the 192.0.2 subnet, has an IPv4 address of 192.0.2.101, and provides access to **dom0** and the other VM guest systems.
  - The **eth1** interface is on the 192.168.1 subnet and has an IPv4 address of 192.168.1.101.
- e. View the /etc/hosts file on **host01**.

```
cat /etc/hosts
127.0.0.1 localhost localhost.localdomain ...
192.0.2.1 example.com dom0
192.0.2.101 host01.example.com host01
192.0.2.102 host02.example.com host02
192.0.2.103 host03.example.com host03
```

- f. Use the `exit` command to log off **host01**.

```
exit
logout
Connection to host01 closed.
```

## Practice 1-4: Exploring the host02 VM

---

### Overview

In this practice, you:

- Log on to **host02**
- View the Oracle Linux version on **host02**
- View the Unbreakable Enterprise Kernel version on **host02**
- View the storage devices available on **host02**
- View the network configuration on **host02**

### Assumptions

- You are logged on to **dom0** as the `root` user.
- The **host02** VM guest is running.

### Tasks

1. Explore the **host02** VM guest.
  - a. Use the `ssh` command to log on to **host02**.
    - Because this is the first time you have logged on using `ssh`, the command checks to make sure you are connecting to the host you think you are connecting to. Enter `yes`.
    - Provide the `root` password.

```
ssh host02
The authenticity of host 'host02 (192.0.2.102)' can't be
established.
RSA key fingerprint is ...
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'host02,192.0.2.102' (RSA) to the
list of known hosts.
root@host02's password:
[root@host02 ~]# hostname
host02.example.com
```
  - The `hostname` command confirms whether you have successfully logged on to **host02**.
- b. Use the `cat` command to view the contents of the `/etc/oracle-release` file.

```
cat /etc/oracle-release
Oracle Linux Server release 7.5
```

- c. Use the `uname -r` command to determine your running kernel version.

```
uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- d. Use the `fdisk` command to view the storage devices.

```
fdisk -l | grep /dev
Disk /dev/xvda: 17.2 GB, 17179869184 bytes, 33554432 sectors
/dev/xvda1 * ... 83 Linux
/dev/xvda2 ... 83 Linux
/dev/xvda3 ... 83 Linux
/dev/xvda4 ... 5 Extended
/dev/xvda5 ... 82 Linux swap / Solaris
Disk /dev/xvdb: 5368 MB, 5368709120 bytes, 10485760 sectors
Disk /dev/xvdd: 5368 MB, 5368709120 bytes, 10485760 sectors
```

- Three devices are available: `/dev/xvda`, `/dev/xvdb`, and `/dev/xvdd`.
  - Do not run the following commands. This is for information only:
    - The `/dev/xvda` disk device represents a 16 GiB system image file created with the following command (in the `/OVS/running_pool/host02` directory on `dom0`):
 

```
dd if=/dev/zero of=system.img bs=1M count=16384
```
    - The `/dev/xvdb` disk device represents a 5 GiB utility image file created with the following command (in the `/OVS/running_pool/host02` directory on `dom0`):
 

```
dd if=/dev/zero of=u01.img bs=1M count=5120
```
    - The `/dev/xvdd` disk device represents a 5 GiB utility image file created with the following command (in the `/OVS/running_pool/host02` directory on `dom0`):
 

```
dd if=/dev/zero of=u02.img bs=1M count=5120
```
  - Note that `fdisk` reports the size of `/dev/xvda` as 17.2 GB, which is a decimal approximation of the reported 17179869184 bytes. 17179869184 bytes equals 16 GiB in binary units. Similarly, `fdisk` reports the sizes of `/dev/xvdb` and `/dev/xvdd` as 5368 MB, which is a decimal approximation of the reported 5368709120 bytes. 5368709120 bytes equals 5 GiB in binary units.
  - The `/dev/xvda` device has Oracle Linux Server with GUI packages installed along with the following add-ons:
    - FTP Server
    - File and Storage Server
    - Network File System Client
- e. Use the `ip addr` command to display the network interfaces. Only a partial output is shown.

```
ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue ...
 link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
 inet addr:127.0.0.1/8 scope host lo
...
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc ...
 link/ether 00:16:3e:00:01:02 brd ff:ff:ff:ff:ff:ff
 inet 192.0.2.102/24 brd 192.0.2.255 scope ... eth0
```

```
...
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc ...
 link/ether 00:16:3e:00:02:02 brd ff:ff:ff:ff:ff:ff
...
```

- The system has two Ethernet network interfaces, **eth0** and **eth1**.
- The **eth0** interface is on the 192.0.2 subnet, has an IPv4 address of 192.0.2.102, and provides access to **dom0** and the other VM guest systems.
- The **eth1** interface does not have an IP address assigned.

f. View the `/etc/hosts` file on **host02**.

- This file contains default installation settings.

```
cat /etc/hosts
127.0.0.1 localhost localhost.localdomain localhost4 ...
::1 localhost localhost.localdomain localhost6 ...
```

g. Use the `exit` command to log off **host02**.

```
exit
logout
Connection to host02 closed.
```

You are now the `root` user on **dom0**.

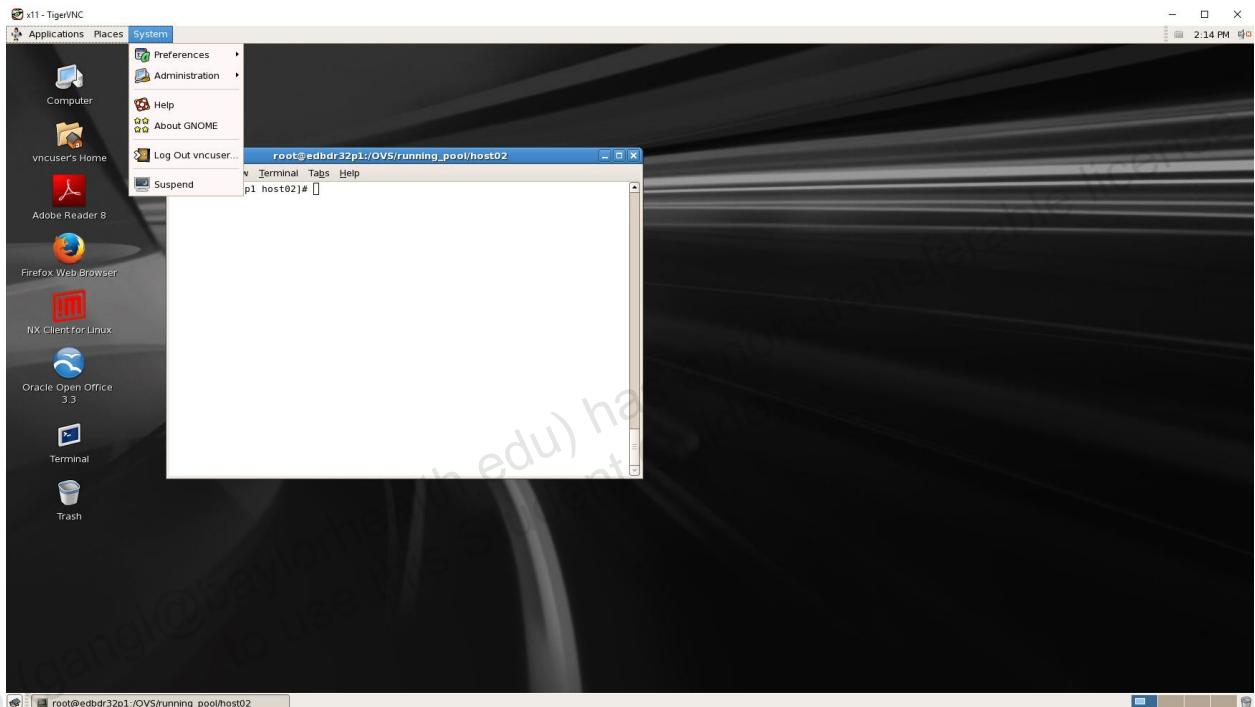
## Practice 1-5: Logging Off from Your Student PC

### Overview

In this practice, you learn how to log off from your system.

### Tasks

1. Learn how to log off from your student PC.
  - a. Open the **System** menu on the GNOME desktop.



- b. Select **Log Out vncuser** from the System menu.
    - You would click the **Log Out** button to log out.
    - Do not log out, however, until the end of each day of training.

- c. Click the **Cancel** button to stay logged on.



- Alternatively, you could log off by clicking the X in the upper-right corner of the window.

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## **Practices for Lesson 2: Introduction to Oracle Linux**

## Practices for Lesson 2: Overview

---

### Practices Overview

In these practices, you test your knowledge of Linux and of Oracle's contributions and commitment to Linux. You also view the different kernel packages that are installed with Oracle Linux.

## Practice 2-1: Quiz – Introduction to Oracle Linux

---

### Overview

In this quiz, you answer questions about the history of Linux in general, as well as Oracle's commitment and contributions to Linux.

### Questions

Choose the best answer from those provided for each multiple choice or True/False question.

1. Which of the following statements are true? (Choose all that apply)
  - a. Linux is a UNIX-like operating system named after its developer, Linus Torvalds.
  - b. Richard Stallman released version 0.01 of the Linux kernel in September 1991.
  - c. The goal of the GNU Project to create a free, UNIX-like operating system was realized in 1992 with the addition of the Hurd kernel.
  - d. Distributors of GPL software must provide the binaries at no cost, but they can charge for the source code.
2. Thousands of programmers all over the world participate in the development of the Linux operating system.
  - a. True
  - b. False
3. Linus Torvalds releases a new version of the mainline kernel approximately:
  - a. Every month
  - b. Every three months
  - c. Every six months
  - d. Every year
4. The revision control system for the Linux kernel source code is called:
  - a. SCCS
  - b. RCS
  - c. BitKeeper
  - d. Git
5. A Linux distribution is a collection of software built on top of the Linux kernel and offered as a complete package.
  - a. True
  - b. False
6. Which of the following statements are true? (Choose all that apply)
  - a. All Oracle Linux code is available to the Linux community.
  - b. Oracle Ksplice allows you to apply kernel and select user space library updates on a running system.
  - c. Oracle has a dedicated Linux kernel development team.
  - d. Oracle has made many technical contributions to the Linux community.

7. Oracle Linux is fully compatible with which of the following Linux distributions?
  - a. Debian
  - b. Ubuntu
  - c. SUSE
  - d. RHEL
8. The Unbreakable Enterprise Kernel is optimized for Oracle applications and is the only kernel offered with Oracle Linux.
  - a. True
  - b. False

## Solution 2-1: Quiz – Introduction to Oracle Linux

---

### Solutions

1. Which of the following statements are true? (Choose all that apply)
  - a. Linux is a UNIX-like operating system named after its developer, Linus Torvalds.
2. Thousands of programmers all over the world participate in the development of the Linux operating system.
  - a. True
3. Linus Torvalds releases a new version of the mainline kernel approximately:
  - b. Every three months
4. The revision control system for the Linux kernel source code is called:
  - d. Git
5. A Linux distribution is a collection of software built on top of the Linux kernel and offered as a complete package.
  - a. True
6. Which of the following statements are true? (Choose all that apply)
  - a. All Oracle Linux code is available to the Linux community.
  - b. Oracle Ksplice allows you to apply kernel and select user space library updates on a running system.
  - c. Oracle has a dedicated Linux kernel development team.
  - d. Oracle has made many technical contributions to the Linux community.
7. Oracle Linux is fully compatible with which of the following Linux distributions?
  - d. RHEL
8. The Unbreakable Enterprise Kernel is optimized for Oracle applications and is the only kernel offered with Oracle Linux.
  - b. False. It is true that the Unbreakable Enterprise Kernel is optimized for Oracle applications, but Oracle Linux also includes a Red Hat–compatible kernel for customers requiring strict RHEL compatibility.

## Practice 2-2: Viewing Kernel Information

### Overview

In this practice, you connect to the **host01** VM, view the installed kernel packages, and determine which kernel is running. You also view the text file used by Oracle support teams to easily identify the active kernel. Note that the displayed sample output might not represent your own system.

### Assumptions

- You are logged on to **dom0** as the root user.
- VM **host01** is running.

### Tasks

1. Connect to the **host01** guest as the `root` user by using `ssh`.
  - a. Use the `ssh` command to connect to the VM guest **host01** as `root`. Confirm that you have connected to **host01** by entering the `hostname` command:

```
ssh host01
root@host01's password:
hostname
host01.example.com
```

2. List the kernel release that is currently running on your system.
  - a. Use the `uname -r` command to print the kernel release.
3. List the kernel packages that are installed on your system.
  - a. Use the `rpm -qa` command to query the kernel packages installed on your system.

```
rpm -qa | grep "kernel"
kernel-uek-4.1.12-112.16.4.el7uek.x86_64
kernel-3.10.0-862.el7.x86_64
kernel-uek-firmware-4.1.12-112.16.4.el7uek.noarch
kernel-tools-3.10.0-862.el7.x86_64
kernel-headers-3.10.0-862.el7.x86_64
kernel-tools-libs-3.10.0-862.el7.x86_64
```

- Note that the following two kernel packages are installed (associated firmware packages, and headers and tools packages are also installed):
  - Unbreakable Enterprise Kernel package (`kernel-uek-4.1.12-112.16.4.el7uek.x86_64`)
  - Red Hat-compatible kernel package (`kernel-3.10.0-862.el7.x86_64`)

4. View the /etc/\*release files on your system.
  - a. Change to the /etc/ directory and view the “release” files.

```
cd /etc
ls -l *release
-rw-r--r-- ... oracle-release
-rw-r--r-- ... os-release
-rw-r--r-- ... redhat-release
lrwxrwxrwx ... system-release -> oracle-release
cat oracle-release
Oracle Linux Server release 7.5
cat redhat-release
Red Hat Enterprise Linux Server release 7.5 (Maipo)
```

- Note that /etc/system-release is a symbolic link to /etc/oracle-release.

5. Log out from host01.

```
logout
Connection to host01 closed.
```

You are now the root user on dom0.

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## **Practices for Lesson 3: Oracle Cloud Computing**

## **Practices for Lesson 3: Overview**

---

### **Practices Overview**

In these practices, you test your knowledge of Oracle Cloud Computing.

## Practice 3-1: Quiz – Oracle Cloud Computing

---

### Overview

In this quiz, you answer questions about Infrastructure as a Service (IaaS) and various aspects of Oracle Cloud Infrastructure.

### Questions

Choose the best answer from those provided for each multiple choice or True/False question.

1. Which of the following statements are true? (Choose all that apply)
  - a. Infrastructure as a Service (IaaS) allows users to access applications and data from anywhere, as long as they can access the internet.
  - b. With IaaS, the user has access to the foundation level of the computing “task”—compute capacity, network bandwidth, and storage capacity.
  - c. IaaS allows a user to create virtual machines as required and decide what operating system and/or apps to use.
  - d. IaaS is one of three main service models, the other two being SaaS and PaaS.
2. Oracle Cloud Infrastructure services include Compute, Networking, and Block Volume services.
  - a. True
  - b. False
3. An instance is:
  - a. A template of a virtual hard drive
  - b. A compute host running in the cloud
  - c. A storage architecture
  - d. A shape
4. A virtual version of a traditional network on which instances run is called:
  - a. A subnet
  - b. IPv6
  - c. A Virtual Cloud Network (VCN)
  - d. An IPSec VPN
5. An image specifies the number of CPUs and amount of memory allocated to an instance.
  - a. True
  - b. False

6. Which of the following steps are involved in launching an Oracle Cloud Infrastructure instance? (Choose all that apply)
  - a. Create an SSH key pair.
  - b. Create or choose a compartment for your resources.
  - c. Create or choose a virtual cloud network (VCN).
  - d. Create or choose a subnet for the VCN.
7. Which of the following statements are true about subnets? (Choose all that apply)
  - a. A subnet is a subdivision of a cloud network.
  - b. Subnets contain virtual network interface cards (VNICs), which attach to instances.
  - c. You can change the size of a subnet after creation.
  - d. Each subnet exists in a single availability domain.
8. When you create an instance, it is automatically attached to a Virtual Network Interface Card (VNIC) in the cloud network's subnet.
  - a. True
  - b. False

## Solution 3-1: Quiz – Oracle Cloud Computing

---

### Solutions

1. Which of the following statements are true? (Choose all that apply)
  - a. Infrastructure as a Service (IaaS) allows users to access applications and data from anywhere, as long as they can access the internet.
  - b. With IaaS, the user has access to the foundation level of the computing “task”—compute capacity, network bandwidth, and storage capacity.
  - c. IaaS allows a user to create virtual machines as required and decide what operating system and/or apps to use.
  - d. IaaS is one of three main service models, the other two being SaaS and PaaS.
2. Oracle Cloud Infrastructure services include Compute, Networking and Block Volume services.
  - a. True
3. An instance is:
  - b. A compute host running in the cloud
4. A virtual version of a traditional network on which instances run is called:
  - c. A Virtual Cloud Network (VCN).
5. A shape specifies the number of CPUs and amount of memory allocated to an instance.
  - a. True
6. Which of the following steps are involved in launching an Oracle Cloud Infrastructure instance? (Choose all that apply)
  - a. Create an SSH key pair.
  - b. Create or choose a compartment for your resources.
  - c. Create or choose a virtual cloud network (VCN).
  - d. Create or choose a subnet for the VCN.
7. Which of the following statements are true about subnets? (Choose all that apply)
  - a. A subnet is a division of a cloud network.
  - b. Subnets contain virtual network interface cards (VNICS), which attach to instances.
  - c. It is false, because you *cannot* change the size of a subnet after creation.)
  - d. Each subnet exists in a single availability domain.
8. When you create an instance, it is automatically attached to a Virtual Network Interface Card (VNIC) in the cloud network's subnet.
  - a. True.

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## **Practices for Lesson 4: Installing Oracle Linux 7**

## Practices for Lesson 4: Overview

---

### Practices Overview

In these practices, you:

- Install Oracle Linux on the **host03** virtual machine
- Log on to **host03**, complete initial setup, and perform shutdown operations
- Re-create the **host03** VM Guest

## Practice 4-1: Installing Oracle Linux

---

### Overview

In this practice, you install Oracle Linux on the **host03** virtual machine (VM).

### Assumptions

- You are logged on as the `root` user on **dom0**.
- You have a terminal window open.

### Tasks

1. Create the **host03** VM.

a. From **dom0**, use the `xm destroy` command as follows:

- Destroy the virtual machine and create it again in the step below.

```
[dom0]# xm destroy host03
```

b. Use the `cd` command to change to the `/OVS/running_pool/host03` directory.

```
[dom0]# cd /OVS/running_pool/host03
```

c. Use the `xm create` command to create the **host03** VM as follows:

```
[dom0]# xm create vm.cfg
```

Using config file ".`/vm.cfg`".

Started domain host03 (id=...)

2. Connect to the **host03** guest by using the `vm vncviewer host03&` command.

```
[dom0] # xm vncviewer host03&
```

- The Oracle Linux 7.5 installation menu appears as shown:



- Notice that the default option is **Test this media & install Oracle Linux 7.5**. This option is automatically selected after 60 seconds. Therefore, the menu might or might not appear, depending on how quickly you connected to **host03** using **vncviewer**.

3. Use the up arrow to highlight **Install Oracle Linux 7.5** from the menu.

- If you do not see the Oracle Linux 7.5 menu, it means the 60 second timeout has expired and the media test has begun. In this case, a screen similar to the following appears:

```
[4.117544] dracut-pre-udev[327]: modprobe: ERROR: could not insert 'sha256_m
b': No such device
[OK] Started Show Plymouth Boot Screen.
[OK] Reached target Paths.
[OK] Reached target Basic System.
[OK] Started Device-Mapper Multipath Device Controller.
 Starting Open-iSCSI...
[4.575415] vbd vbd-5632: 19 xenbus_dev_probe on device/vbd/5632
[OK] Started Open-iSCSI.
 Starting dracut initqueue hook...
[5.565296] dracut-initqueue[676]: mount: /dev/sr0 is write-protected, mounting read-only
[OK] Started Show Plymouth Boot Screen.
[OK] Reached target Paths.
[OK] Reached target Basic System.
[OK] Started Device-Mapper Multipath Device Controller.
 Starting Open-iSCSI...
[OK] Started Open-iSCSI.
 Starting dracut initqueue hook...
[5.565296] dracut-initqueue[676]: mount: /dev/sr0 is write-protected, mounting read-only
[OK] Created slice system-checkisodm5.slice.
 Starting Media check on /dev/sr0...
/dev/sr0: e20f6894b07fdc93f9c5f0e15d95b9fe
Fragment sums: 951adb933b5ebdf827f58729f531fab64b7cbe659f885594fa124ff8d3ab
Fragment count: 20
Press [Esc] to abort check.
Checking: 008.2%
```

- You can press the Esc key to abort the media test, or do nothing to let the test run to completion.

- The following is the installation menu with **Install Oracle Linux 7.5** selected:



- Note that the **Automatic boot...** timer has disappeared.

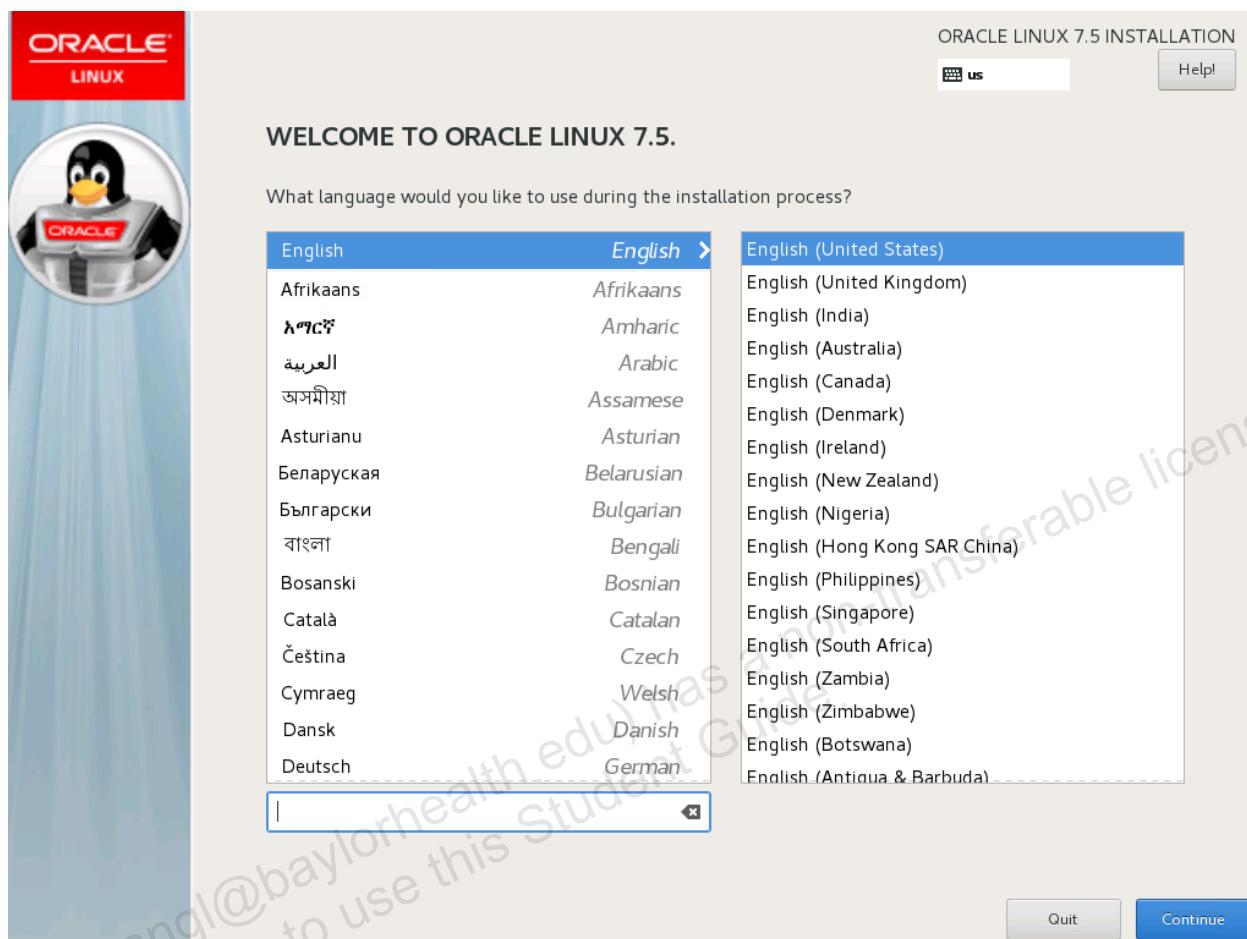
a. Press Enter to select **Install Oracle Linux 7.5**.

- The following are sample boot messages with this option selected:

```
[OK] Stopped target Remote File Systems (Pre).
[OK] Stopped target Initrd Default Target.
[OK] Stopped dracut mount hook.
 Stopping dracut mount hook...
[OK] Stopped target Basic System.
[OK] Stopped target Sockets.
[OK] Closed Open-iSCSI iscsiuiuo Socket.
[OK] Stopped target System Initialization.
[OK] Stopped target Local File Systems.
[OK] Stopped Apply Kernel Variables.
 Stopping Apply Kernel Variables...
[OK] Stopped target Swap.
[OK] Stopped target Slices.
[OK] Stopped target Paths.
[OK] Stopped dracut pre-mount hook.
 Stopping dracut pre-mount hook...
[OK] Stopped dracut initqueue hook.
 Stopping dracut initqueue hook...
 Stopping Open-iSCSI...
[OK] Stopped target Local Encrypted Volumes.
[OK] Stopped Open-iSCSI.
 Stopping Device-Mapper Multipath Device Controller...
[OK] Stopped Device-Mapper Multipath Device Controller.
[OK] Stopped udev Coldplug all Devices.
 Stopping udev Coldplug all Devices...
[OK] Stopped dracut pre-trigger hook.
 Stopping dracut pre-trigger hook...
 Stopping udev Kernel Device Manager...
[OK] Stopped udev Kernel Device Manager.
[OK] Stopped dracut pre-udev hook.
 Stopping dracut pre-udev hook...
[OK] Stopped dracut cmdline hook.
 Stopping dracut cmdline hook...
[OK] Stopped Create Static Device Nodes in /dev.
 Stopping Create Static Device Nodes in /dev...
[OK] Stopped Create list of required static device nodes for the current kernel.
 Stopping Create list of required static device nodes for the current kernel...
[OK] Closed udev Control Socket.
[OK] Closed udev Kernel Socket.
 Starting Cleanup udevd DB...
[OK] Started Cleanup udevd DB.
[OK] Reached target Switch Root.
[OK] Started Plymouth switch root service.
 Starting Switch Root...
```

Welcome to Oracle Linux Server 7.5!

4. The first window to appear after choosing to install Oracle Linux 7.5 is the LANGUAGE SELECTION window.



- Select the appropriate language.
- If you are taking this class in the United States, select **English (United States)**.
- Scroll down if necessary and click **Continue**.

5. The INSTALLATION SUMMARY window appears next.

- You can select the installation options under LOCALIZATION, SOFTWARE, or SYSTEM in any order.
- This INSTALLATION SUMMARY window reappears after you complete each installation option.

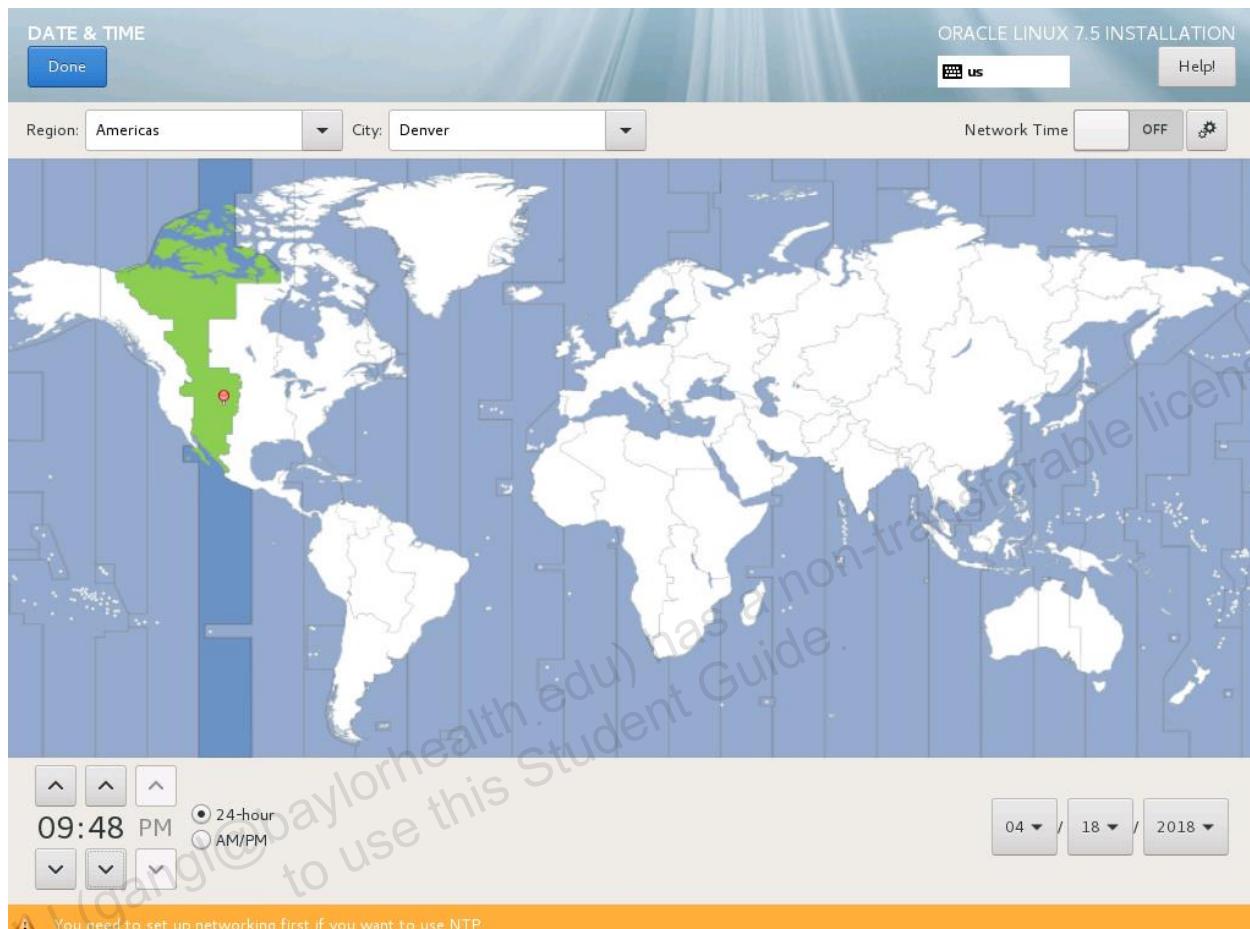


For this practice, begin by selecting the LOCALIZATION menu options.

6. Configure DATE & TIME.

- Select the DATE & TIME menu option.

The DATE & TIME window appears.



- Select the appropriate time zone for your location.
- The time zone can be chosen by either selecting from the drop-down list or clicking the map.
- Set the correct date and time at the bottom of this window.
- Scroll up if necessary and click **Done**.

7. The INSTALLATION SUMMARY window appears.

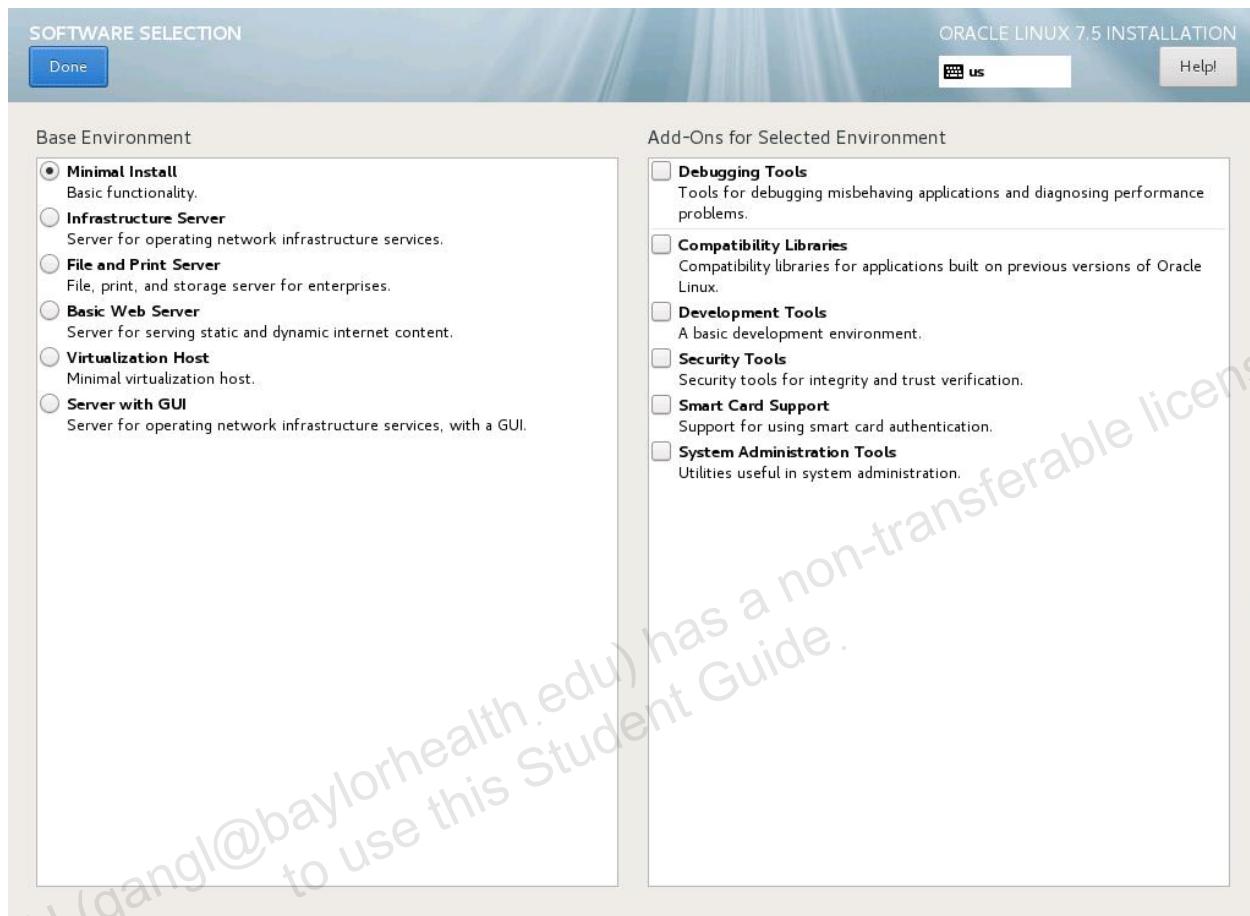


- a. Select the LANGUAGE SUPPORT menu option.  
No changes are necessary on this window.
- b. Scroll up if necessary and click **Done**. The Installation Summary window appears.
- c. Select the KEYBOARD menu option.  
No changes are necessary on this window.
- d. Scroll up if necessary and click **Done**. The Installation Summary window appears.
- e. Select the INSTALLATION SOURCE menu option.  
No changes are necessary on this window.
- f. Scroll up if necessary and click **Done**. The Installation Summary window appears.

8. Configure SOFTWARE SELECTION.

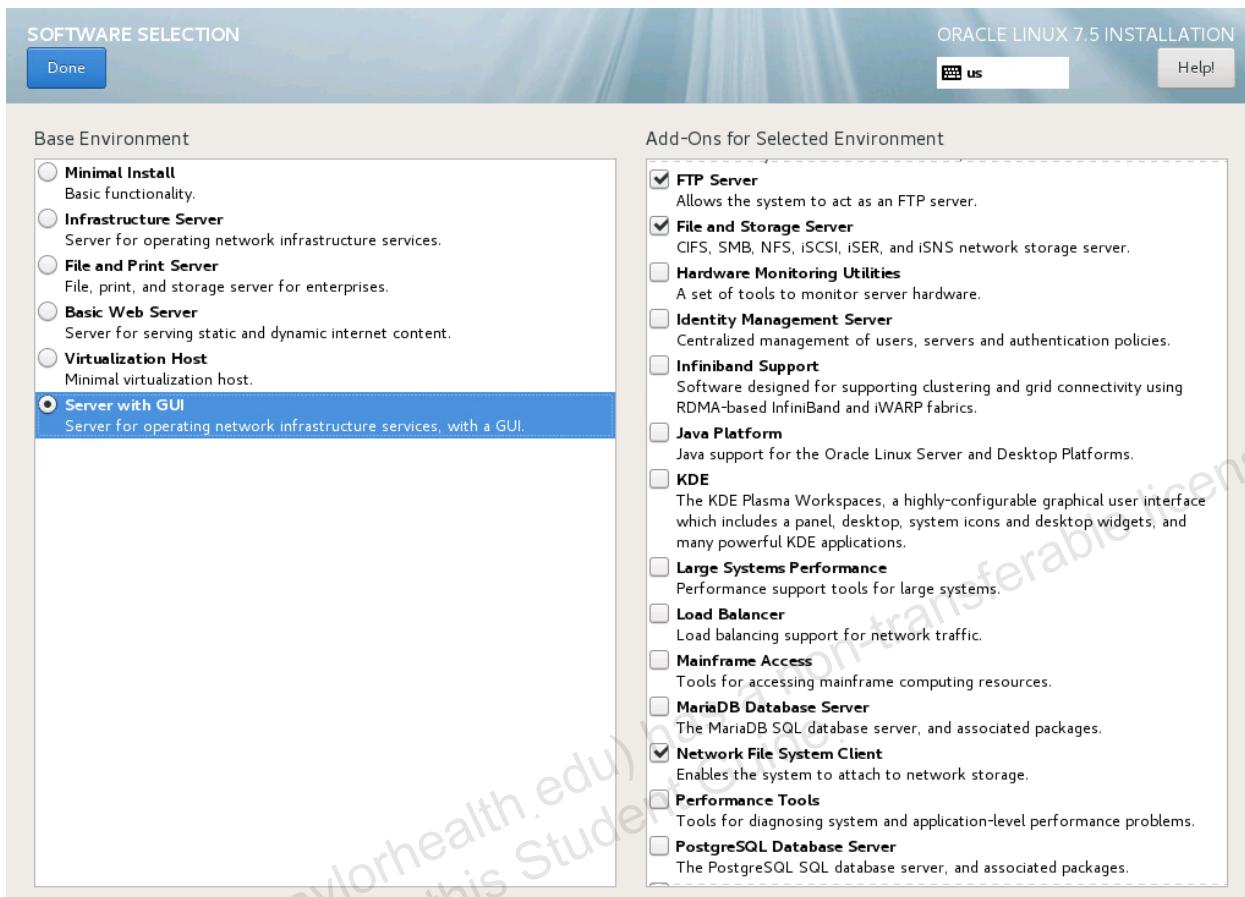
- a. Select the SOFTWARE SELECTION menu option.

The SOFTWARE SELECTION window appears.



- b. Select the **Server with GUI** option as the Base Environment.

The Add-Ons for Selected Environment changes are as shown:

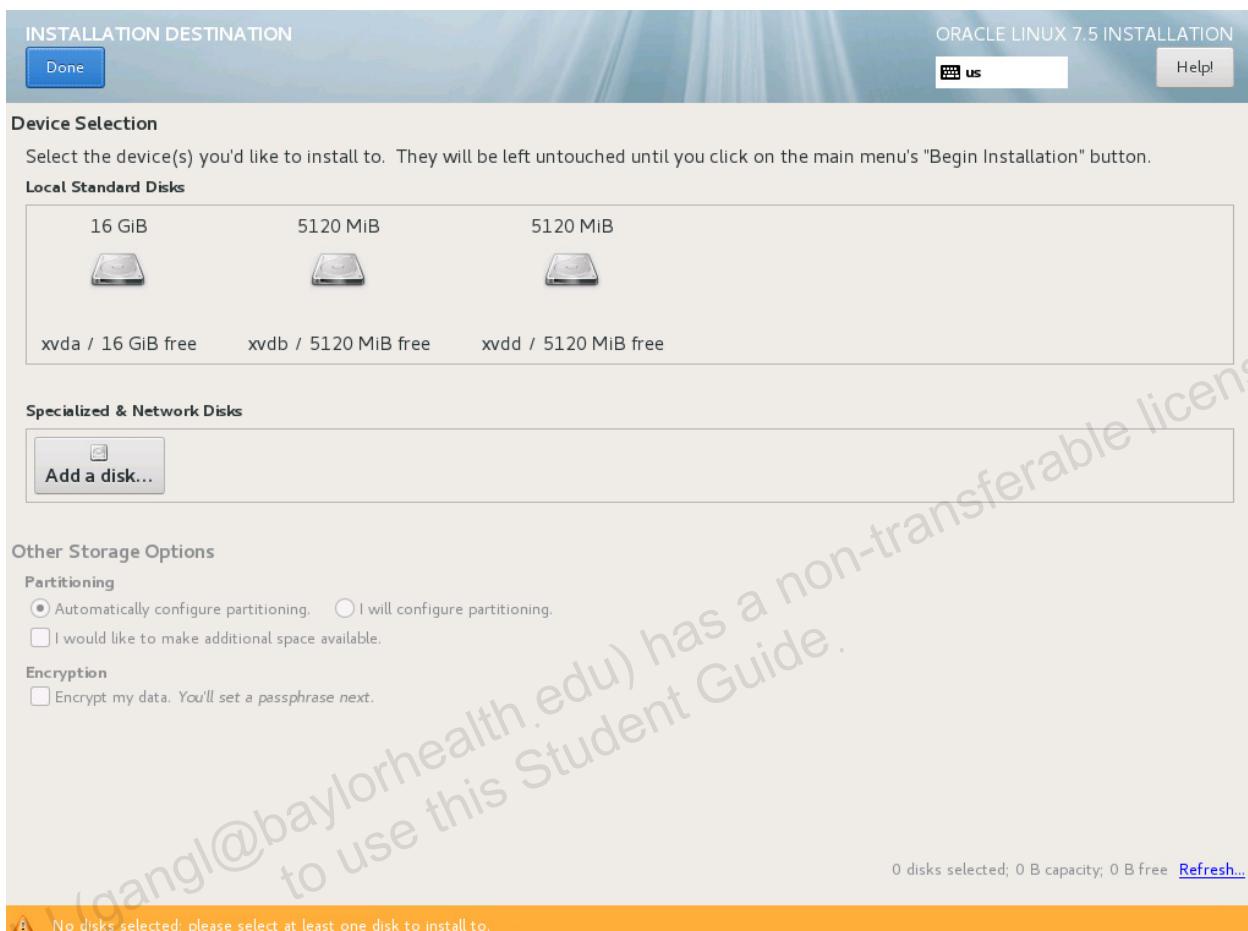


- c. Select the following Add-Ons:
  - 1) FTP Server
  - 2) File and Storage Server
  - 3) Network File System Client
- d. Scroll up if necessary and click **Done**. The Installation Summary window appears.

9. Configure INSTALLATION DESTINATION.

- a. Select the INSTALLATION DESTINATION menu option.

The INSTALLATION DESTINATION window appears.

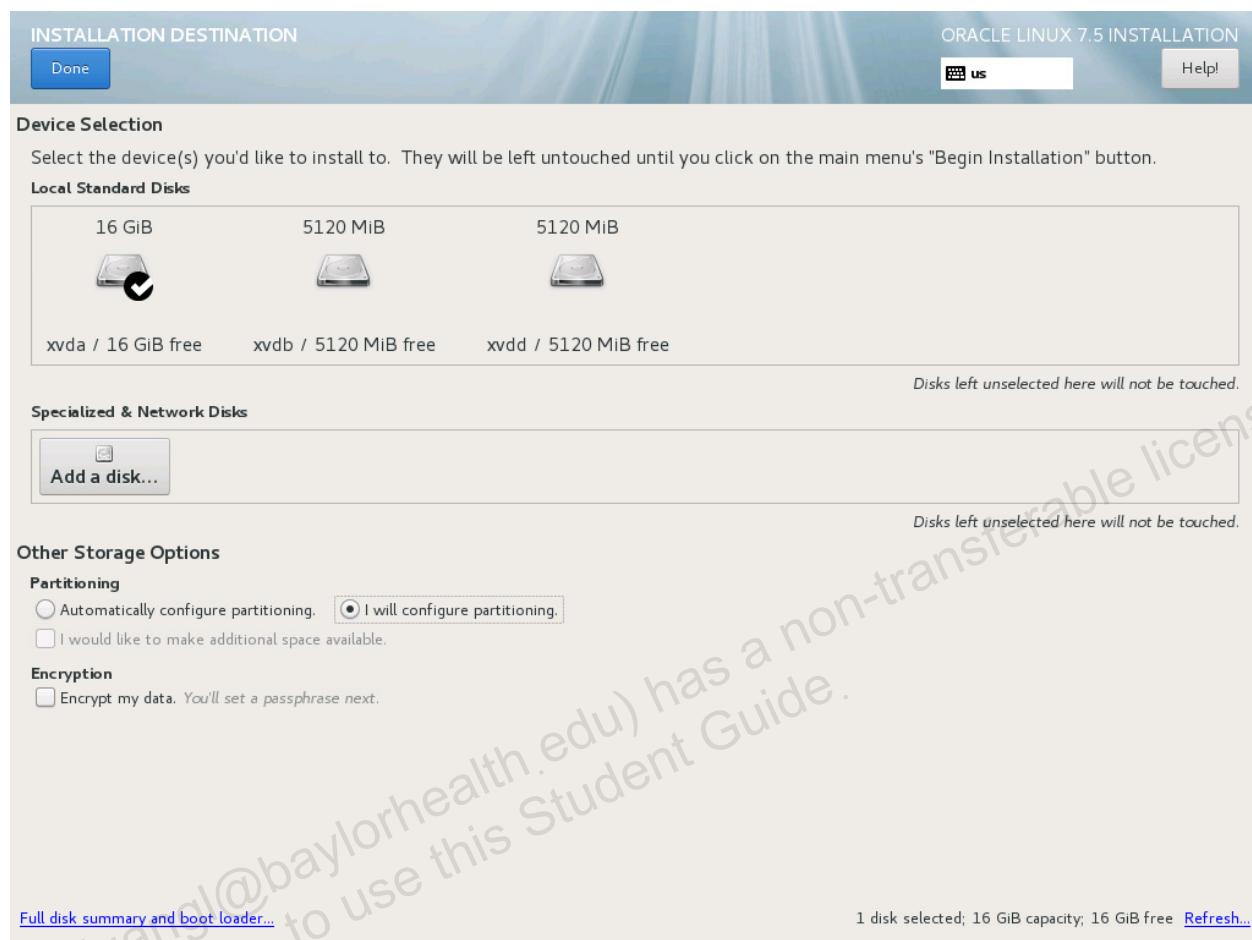


- b. Under Device Selection, Local Standard Disks, select the **16 GiB** disk (xvda).

- Note that device sizes are shown in binary units (MiB and GiB) rather than decimal units (MB and GB). Following the usage in the installer, binary units will be used when specifying partition sizes in this practice. It is preferable that partitions be aligned on MiB boundaries. This also can allow partitions to be aligned with physical block sizes, improving transfer speeds.

- c. Under Other Storage Options, Partitioning, select **I will configure partitioning**.

The screen appears as shown, with a check mark on the 16 GiB disk.

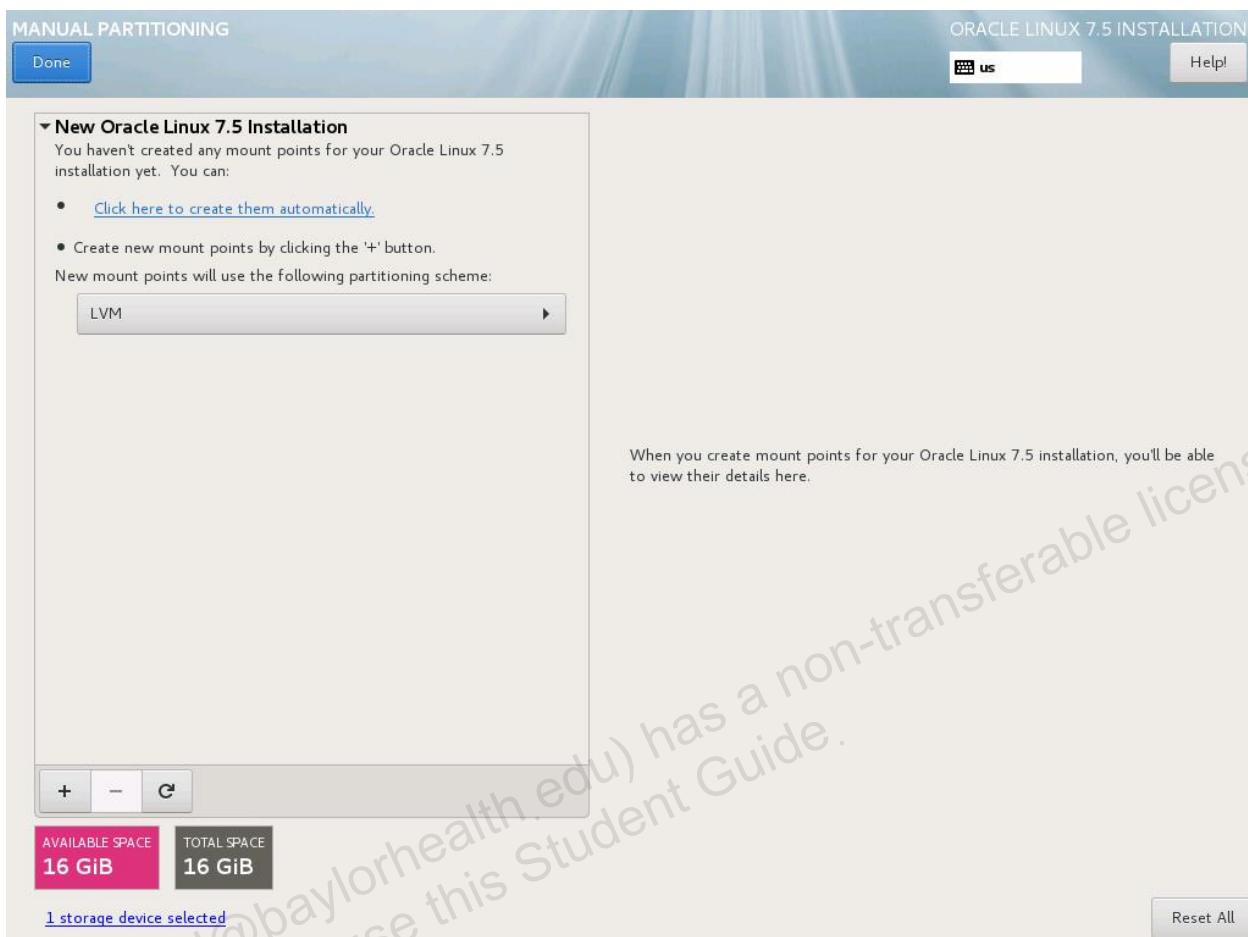


- d. Scroll up if necessary and click **Done**.

10. Manually create the `/boot` mount point with the following characteristics:

- Mount Point: `/boot`
- File System Type: **ext4**
- Size: **1 GiB**
- Partition: **xvda1**

The following window appears:



- a. Click the selection menu that currently displays LVM to display the following menu:

Standard Partition

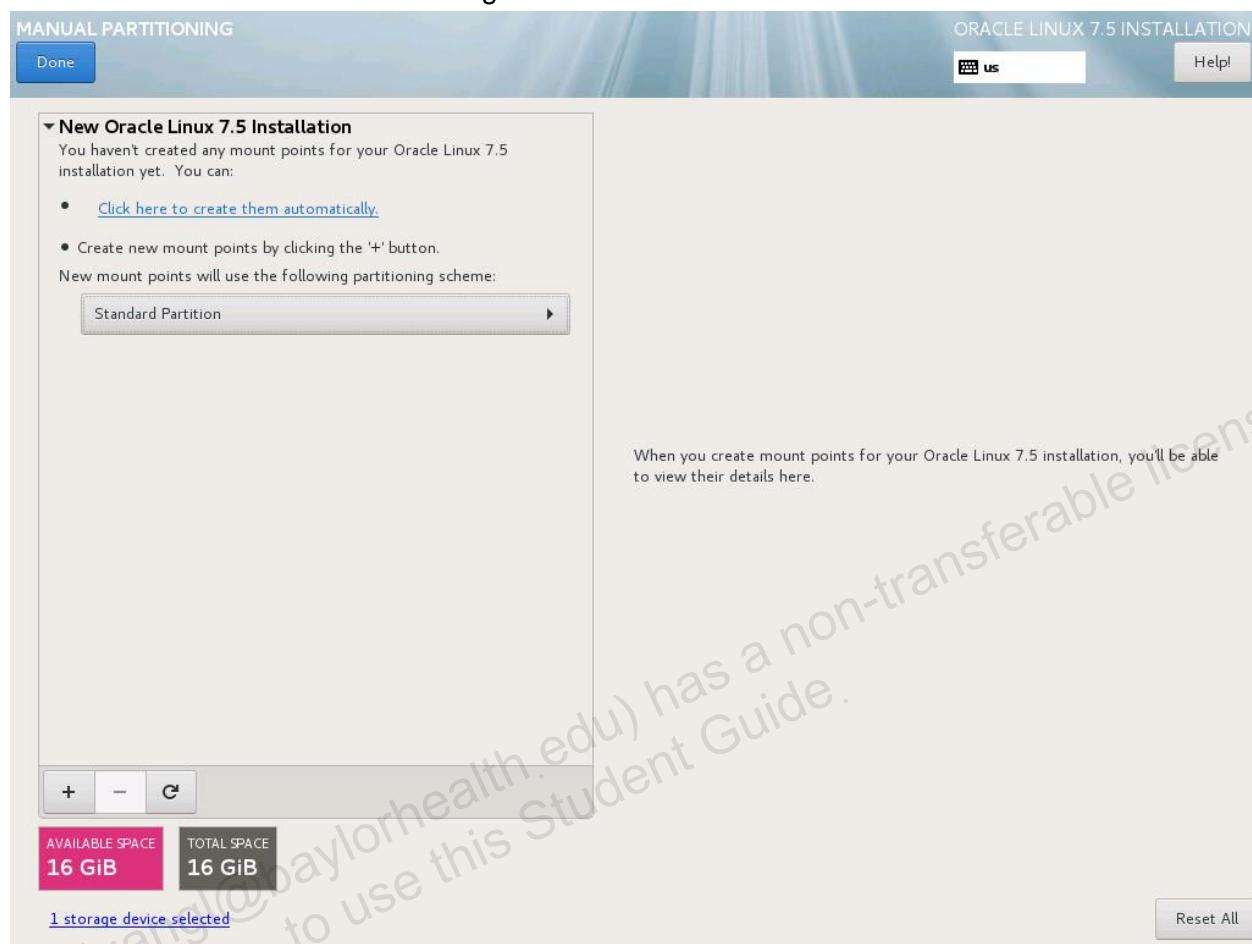
Btrfs

LVM

LVM Thin Provisioning

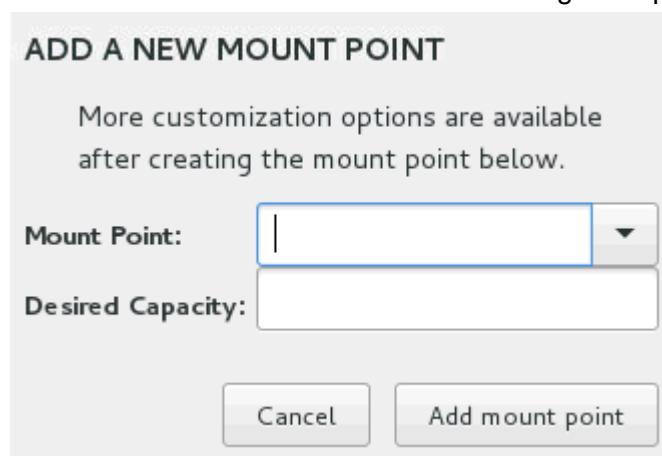
- b. Select **Standard Partition** from the menu.

- The screen reflects this change:



- c. Click the + menu option to add a new mount point.

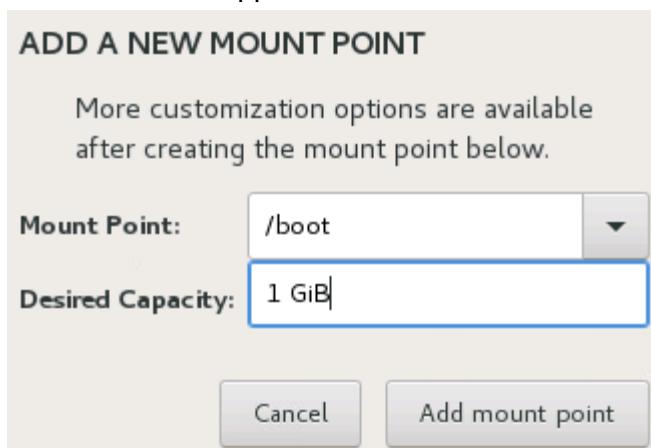
- The ADD A NEW MOUNT POINT dialog box appears:



- d. Click the down arrow on the **Mount Point** field and select /boot.

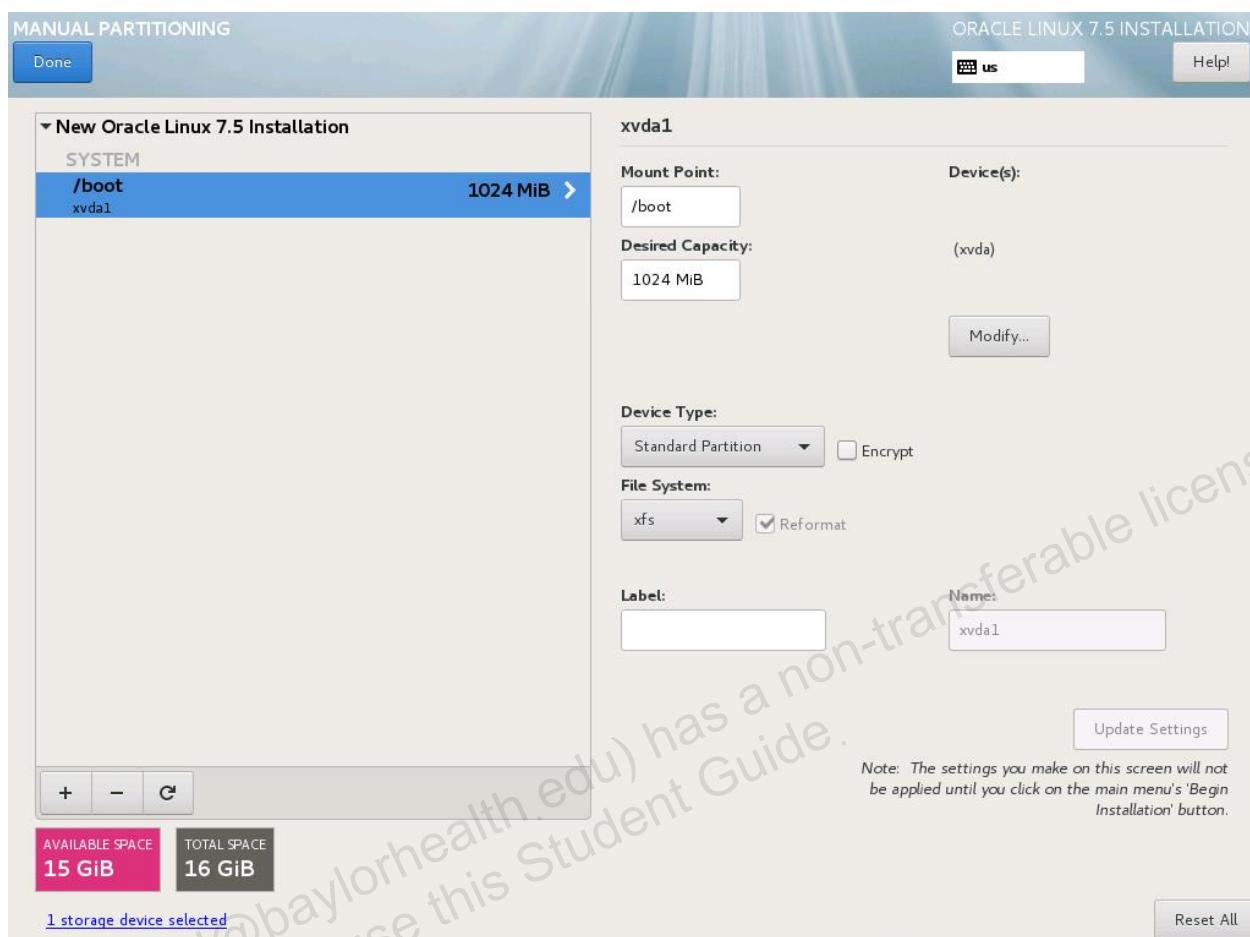
- e. Enter a **Desired Capacity** of **1 GiB**.

- Your window appears as follows:



- f. Click **Add mount point**.

The partitioning window shows the /boot mount point on the **xvda1** partition.



- g. With /boot selected, click the File System down arrow and select **ext4** as the file system type from the pop-up menu.

ext4

ext3

ext2

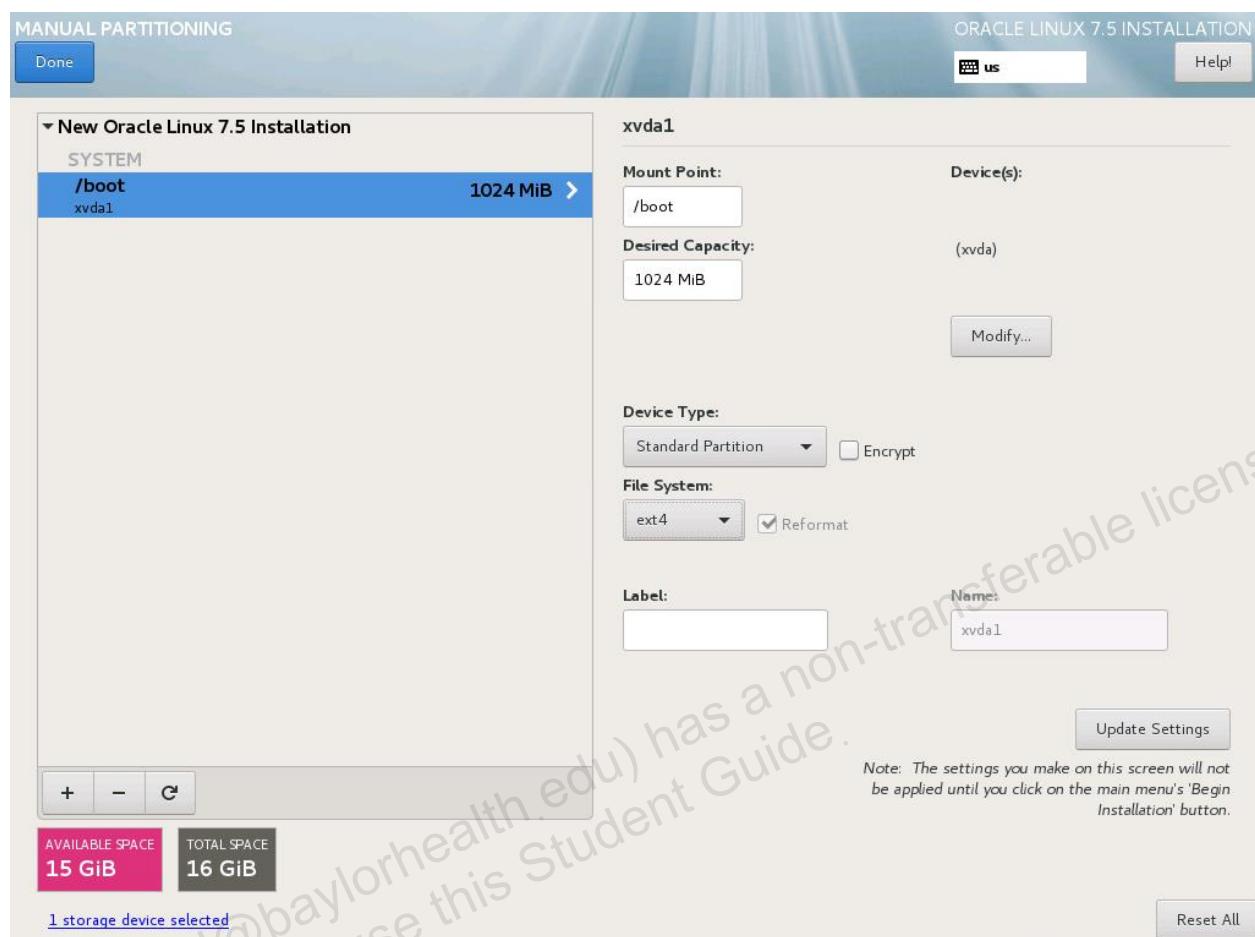
swap

BIOS Boot

xfs

vfat

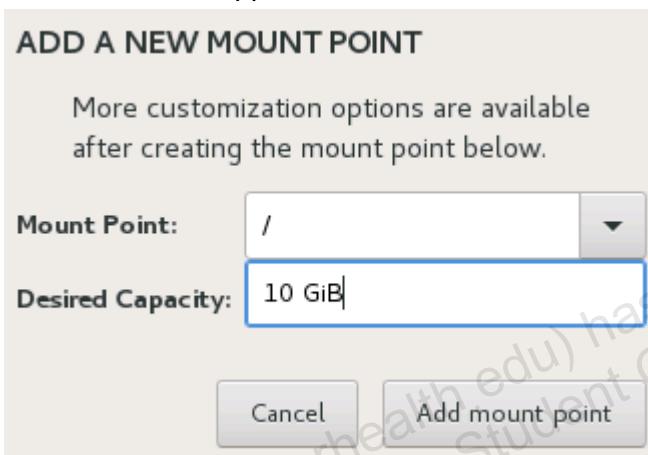
The partition window now shows File System as **ext4** for /boot.



- h. Click **Update Settings**.

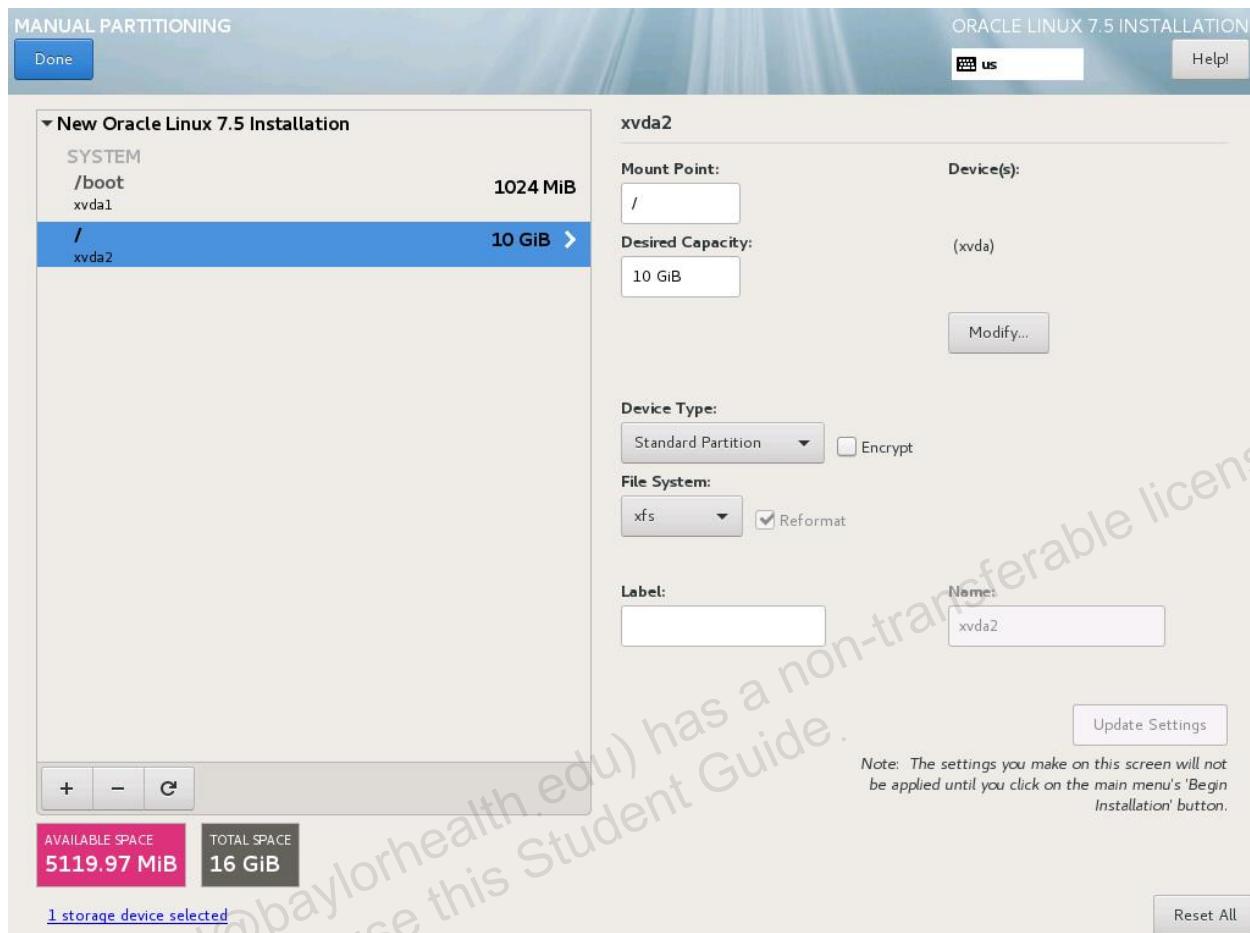
11. Manually create the root (/) mount point with the following characteristics:

- Mount Point: /
  - File System Type: **ext4**
  - Size: **10 GiB**
  - Partition: **xvda2**
- a. Click the plus (+) sign menu option.
  - The ADD A NEW MOUNT POINT window appears.
  - b. Click the down arrow on the **Mount Point** field and select /.
  - c. Enter a **Desired Capacity** of **10 GiB**.
  - Your window appears as follows:



- d. Click **Add mount point**.

The partitioning window shows the / mount point on the **xvda2** partition.



- e. With / selected, click the File System down arrow and select **ext4** as the file system type from the pop-up menu.

ext4

ext3

ext2

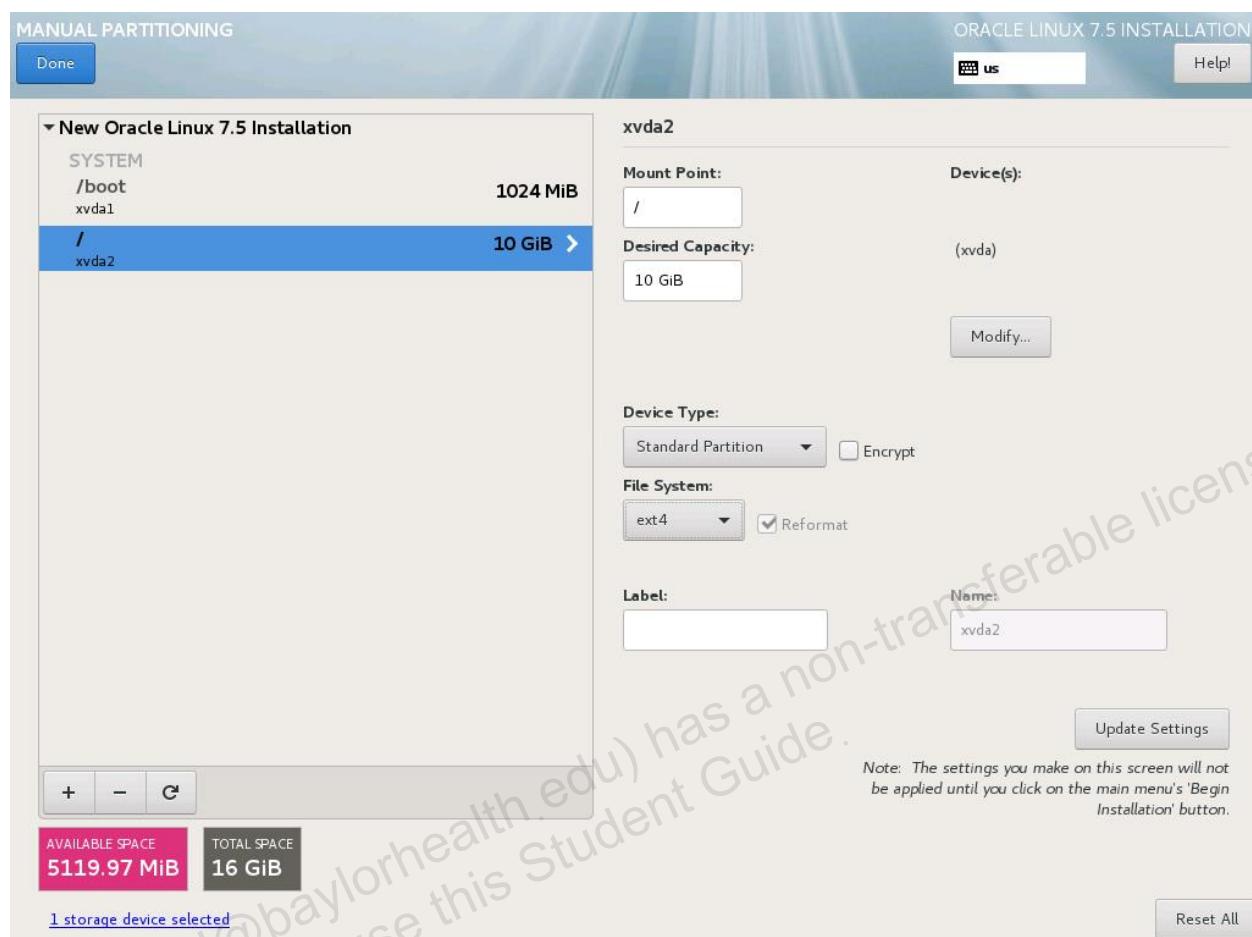
swap

BIOS Boot

xfs

vfat

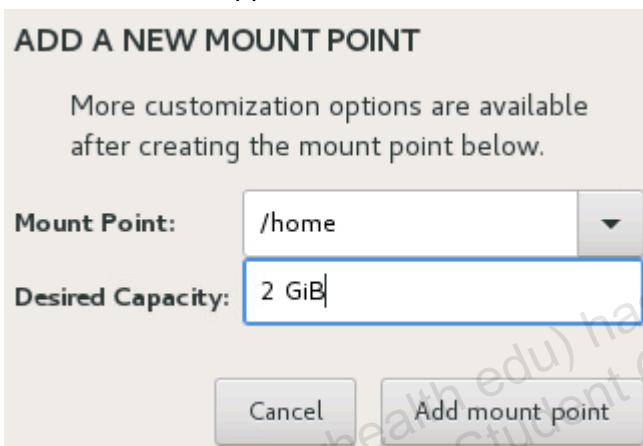
The partition window now shows File System as **ext4** for /.



- f. Click **Update Settings**.

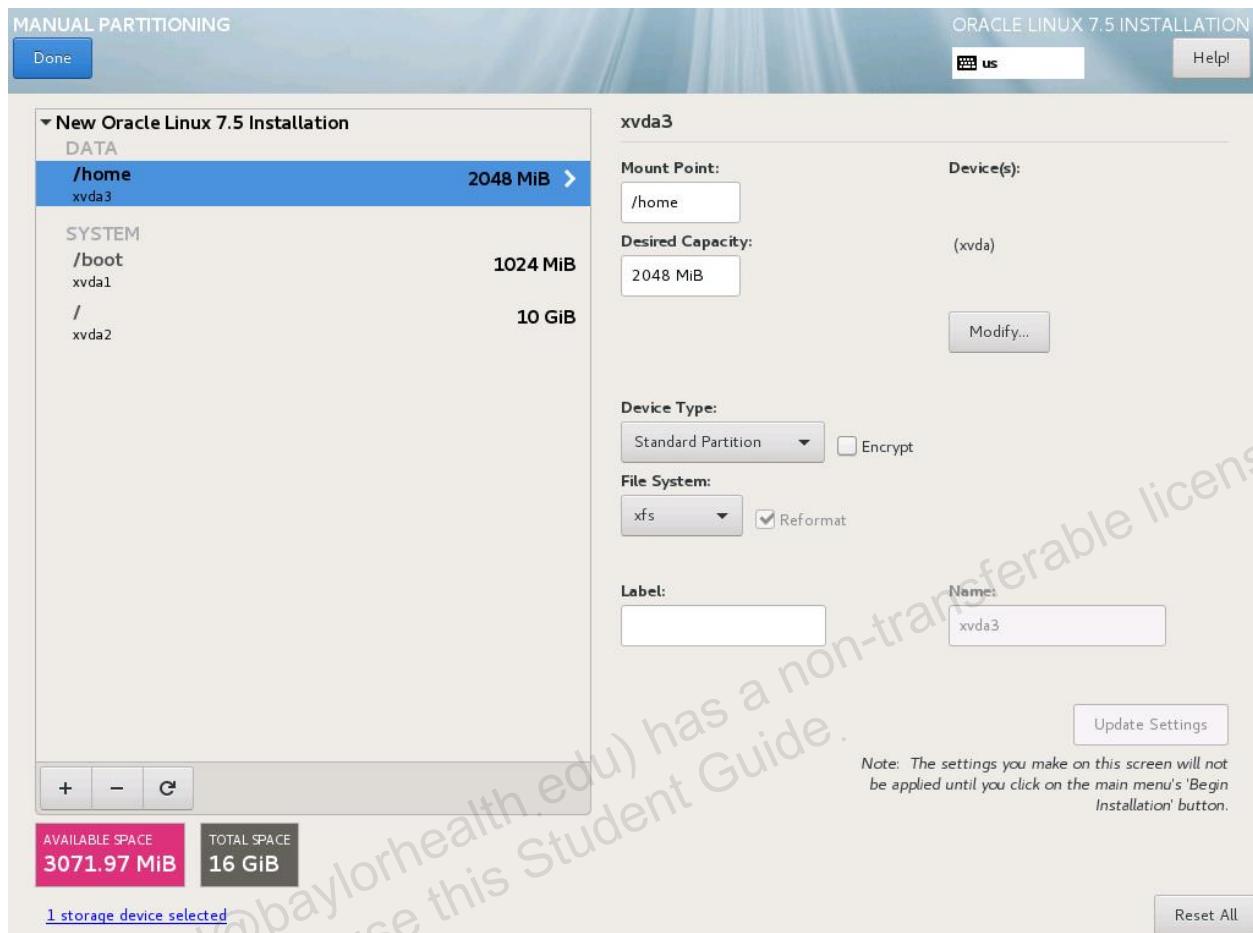
12. Manually create the `/home` mount point with the following characteristics:

- Mount Point: `/home`
  - File System Type: **ext4**
  - Size: **2 GiB**
  - Partition: **xvda3**
- a. Click the plus (+) sign menu option.
  - The ADD A NEW MOUNT POINT window appears.
  - b. Click the down arrow on the **Mount Point** field and select `/home`.
  - c. Enter a **Desired Capacity** of **2 GiB**.
  - Your window appears as follows:



- d. Click **Add mount point**.

The partitioning window shows the /home mount point on the xvda3 partition.



- e. With /home selected, click the File System down arrow and select **ext4** as the file system type from the pop-up menu.

ext4

ext3

ext2

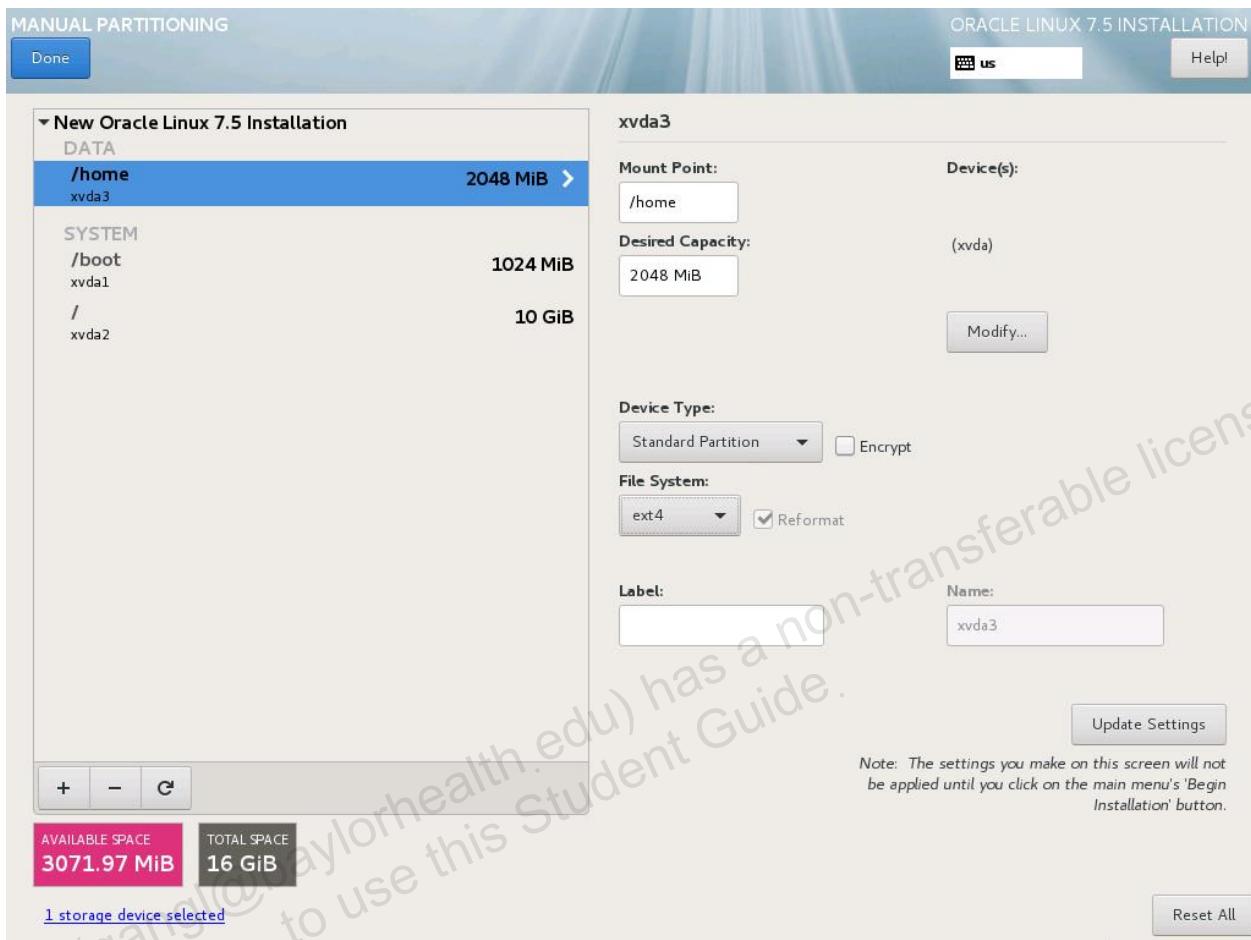
swap

BIOS Boot

xfs

vfat

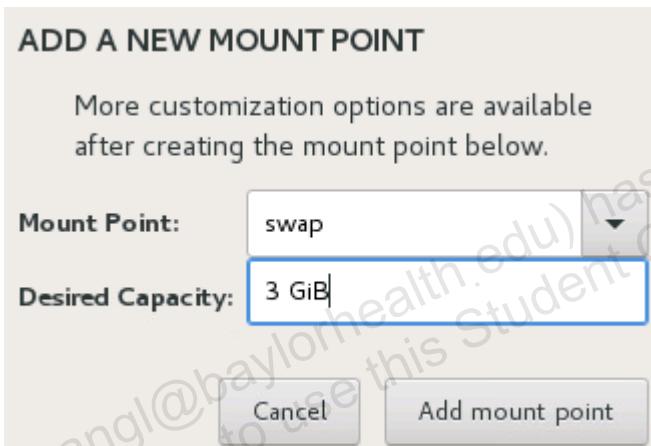
- f. The partition window now shows File System as **ext4** for /home.
- Notice the AVAILABLE SPACE is 3071.97 MiB.



- g. Click **Update Settings**.

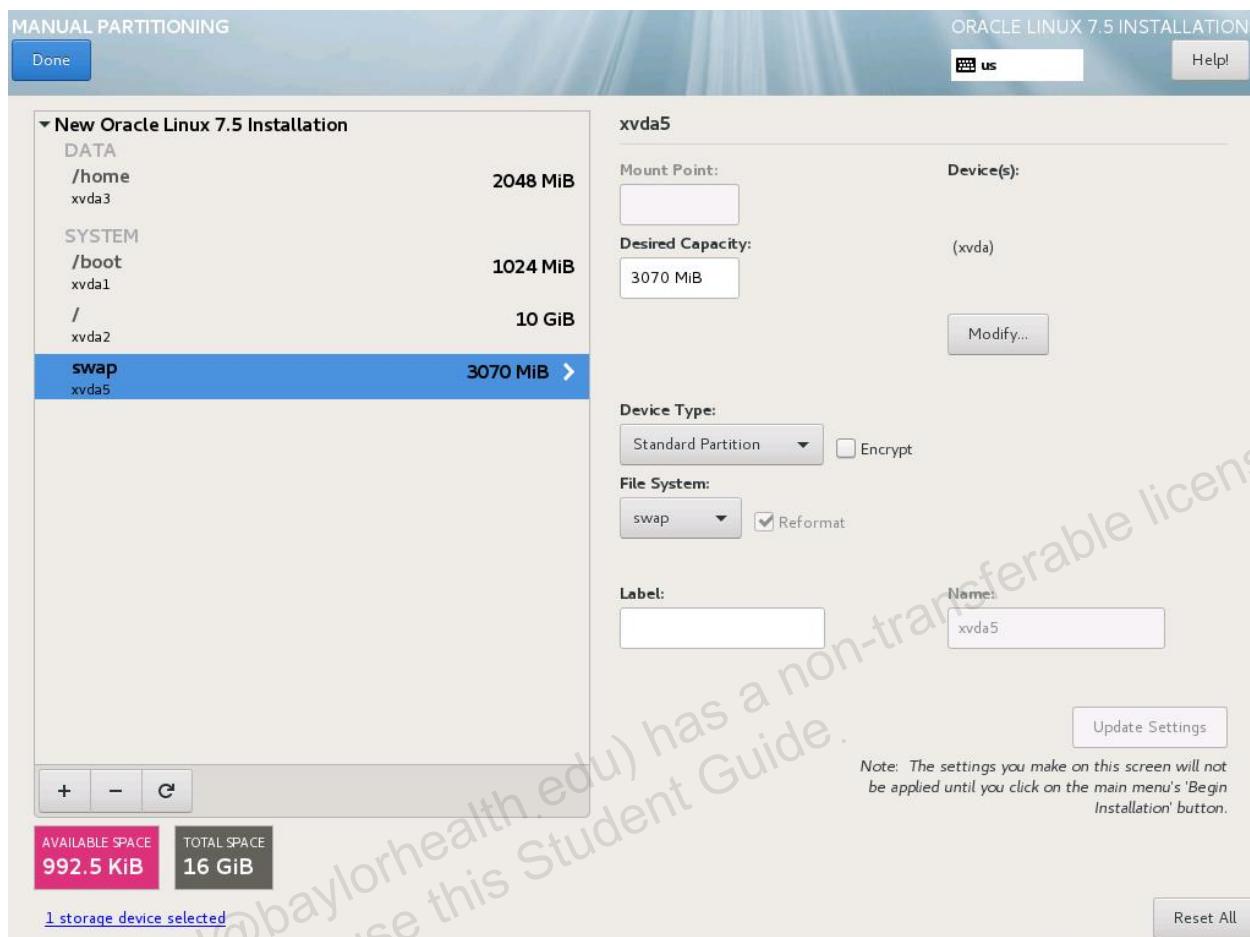
13. Manually create the `swap` partition with the following characteristics:

- Mount Point: `swap`
  - File System Type: **swap**
  - Size: **Remaining available space**
  - Partition: **xvda5**
- a. Click the plus (+) sign menu option.
    - The ADD A NEW MOUNT POINT window appears.
  - b. Click the down arrow on the **Mount Point** field and select `swap`.
  - c. Enter a **Desired Capacity** of **3 GiB**.
    - The AVAILABLE SPACE is 3071.97 MiB.
    - Entering a size greater than the available space adjusts as necessary. 3 GiB equals 3072 MiB, which is slightly more than the remaining available space.
    - Your window appears as follows:



- d. Click **Add mount point**.

The partitioning window shows swap on the **xvda5** partition.



- Notice the size was adjusted to 3070 MiB, which is slightly lesser than 3 GiB.
- Note the **Modify** button in the center right of the screen. This allows the selection of one or more disks a device may reside on. In our case, this remains unchanged.

## 14. Complete manual partitioning.

- Scroll up if necessary and click **Done**.

The following SUMMARY OF CHANGES window appears:

| SUMMARY OF CHANGES |                |                         |             |             |
|--------------------|----------------|-------------------------|-------------|-------------|
| Order              | Action         | Type                    | Device Name | Mount point |
| 1                  | Destroy Format | Unknown                 | xvda        |             |
| 2                  | Create Format  | partition table (MSDOS) | xvda        |             |
| 3                  | Create Device  | partition               | xvda1       |             |
| 4                  | Create Device  | partition               | xvda2       |             |
| 5                  | Create Device  | partition               | xvda3       |             |
| 6                  | Create Device  | partition               | xvda5       |             |
| 7                  | Create Format  | swap                    | xvda5       |             |
| 8                  | Create Format  | ext4                    | xvda3       | /home       |
| 9                  | Create Format  | ext4                    | xvda2       | /           |
| 10                 | Create Format  | ext4                    | xvda1       | /boot       |

[Cancel & Return to Custom Partitioning](#) [Accept Changes](#)

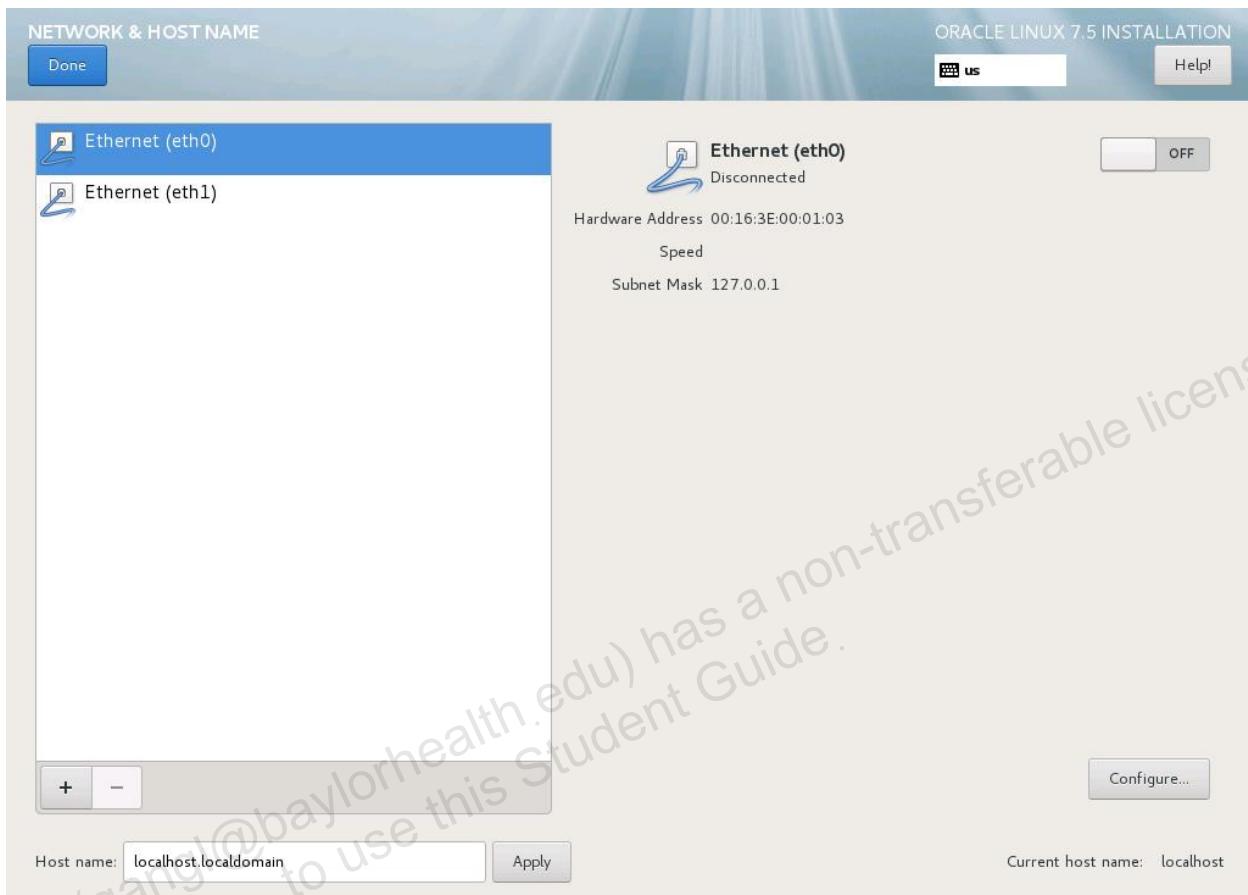
- Click **Accept Changes**.

- The Installation Summary window appears.

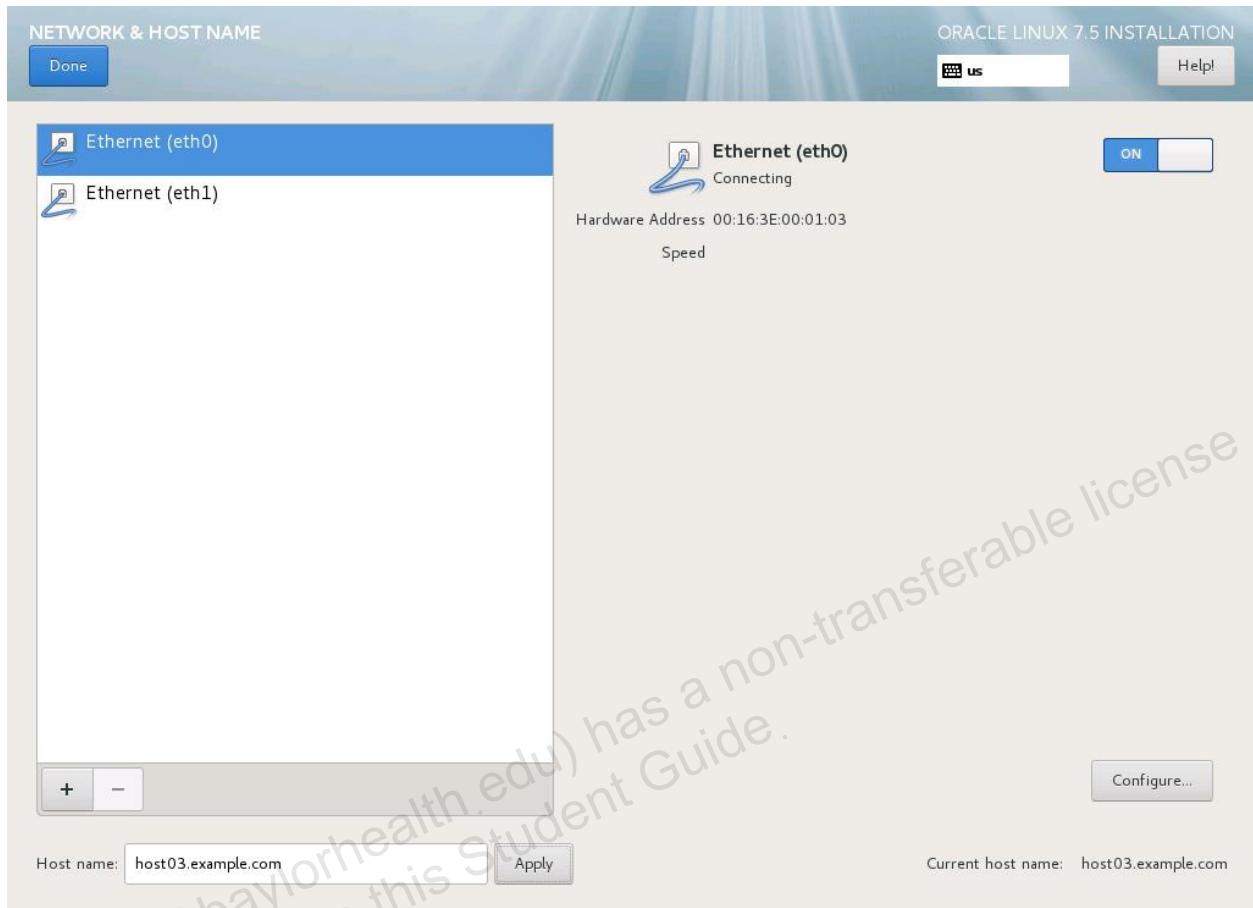
15. Configure NETWORK & HOST NAME.

- a. Select the NETWORK & HOST NAME menu option.

The NETWORK & HOST NAME window appears.

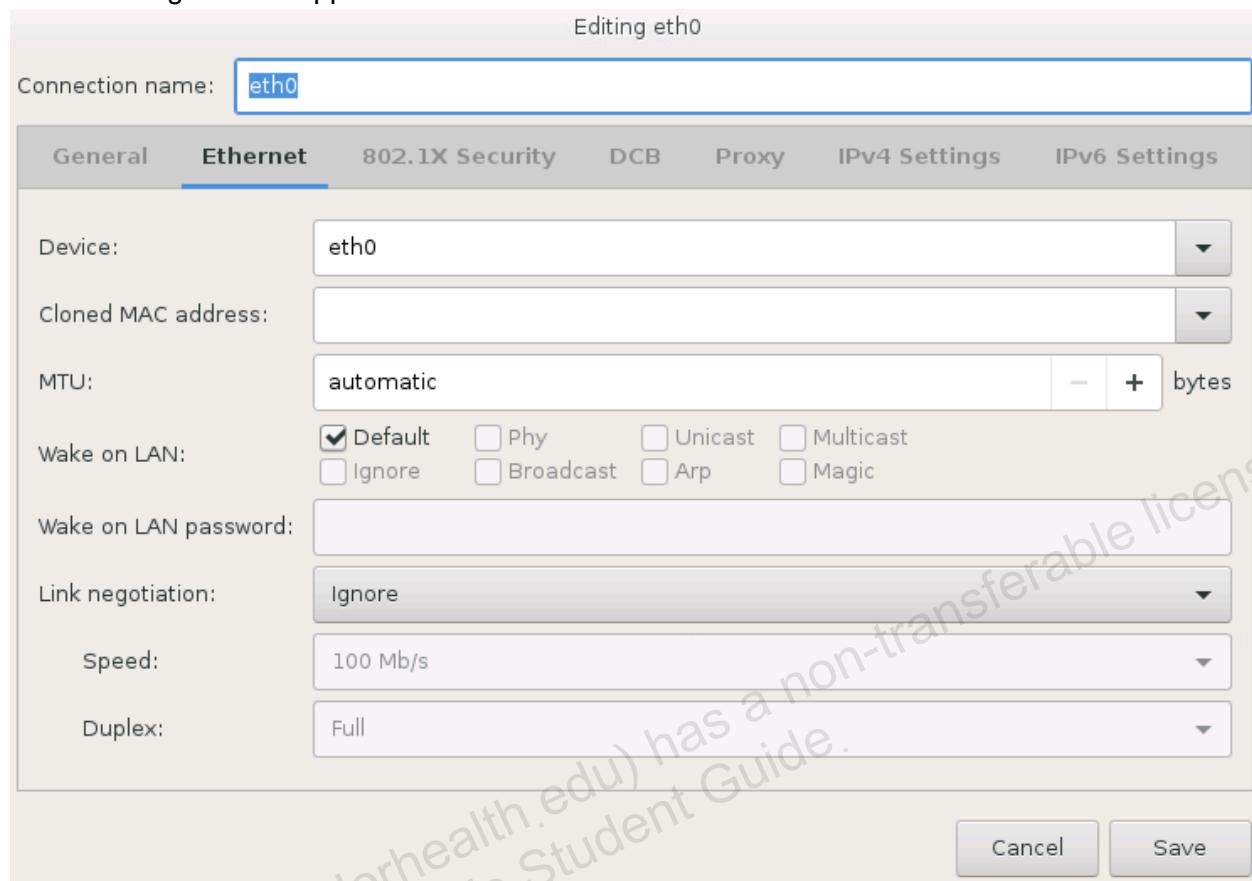


- b. Enter host03.example.com as the **Host name** and click the **Apply** button as shown:



- Note that the current **Host name** changes from **localhost.localdomain** to **host03.example.com**.
- c. With **Ethernet (eth0)** selected, click the OFF switch to toggle to ON.
- d. Click the **Configure...** button.

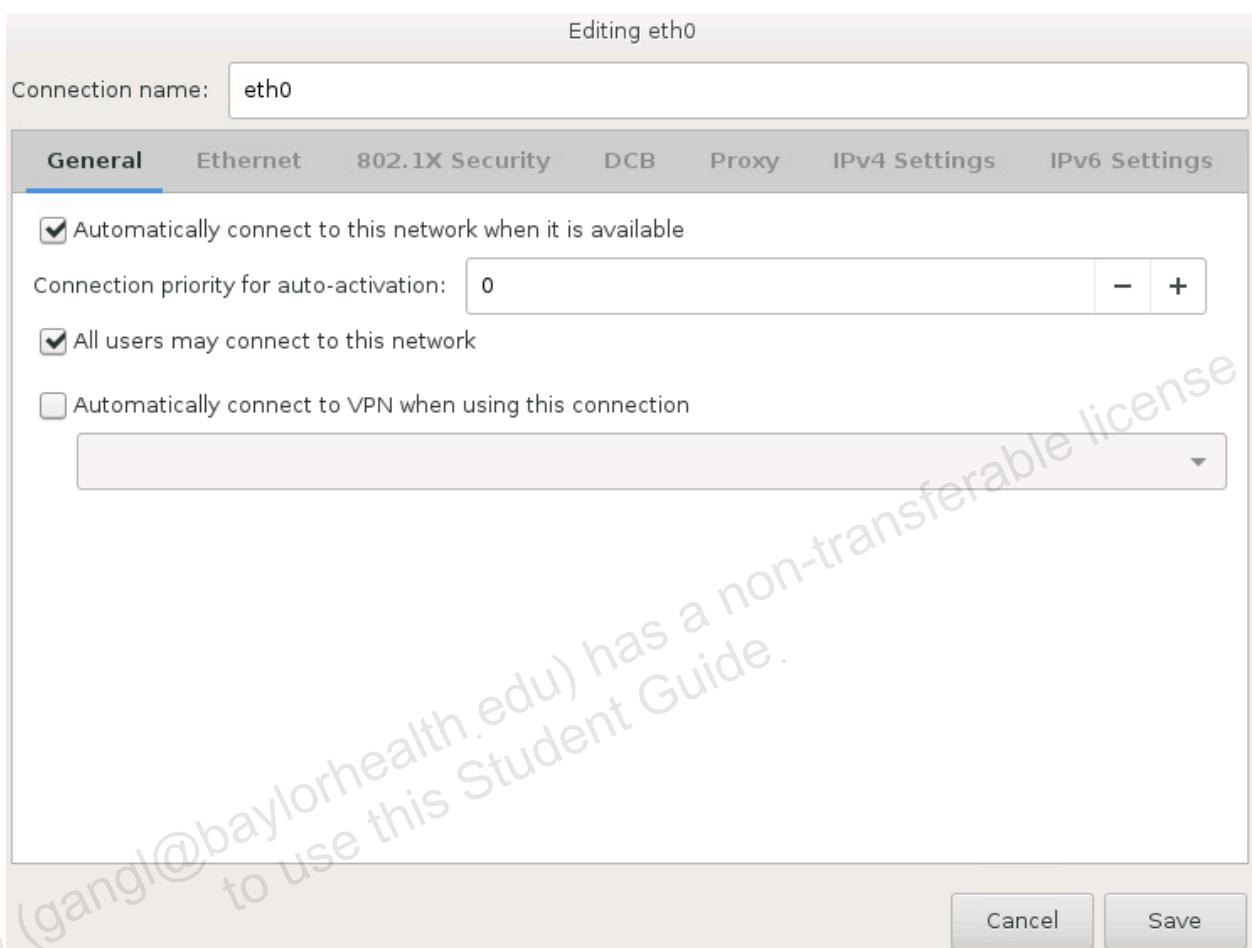
The following window appears:



- e. Click the **General** tab.

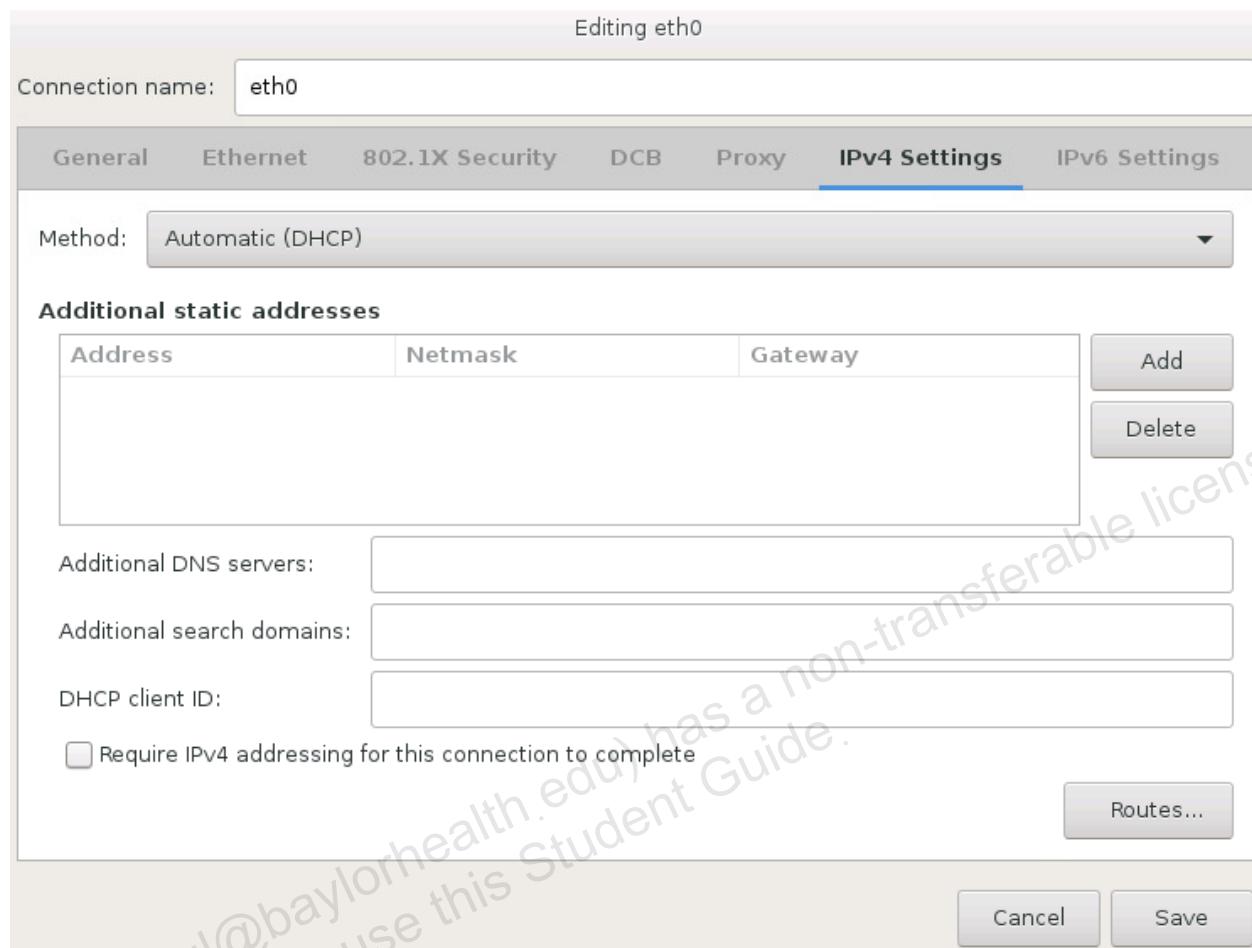
The following window appears:

- f. Select the **Automatically connect to this network when it is available** check box as shown.



- g. Click the **IPv4 Settings** tab.

The following window is shown:



- h. Select **Manual** from the **Method** drop-down menu.

The following is shown in the window:

Editing eth0

Connection name: eth0

General Ethernet 802.1X Security DCB Proxy **IPv4 Settings** IPv6 Settings

Method: Manual

**Addresses**

| Address | Netmask | Gateway |        |
|---------|---------|---------|--------|
|         |         |         | Add    |
|         |         |         | Delete |

DNS servers: [ ]

Search domains: [ ]

DHCP client ID: [ ]

Require IPv4 addressing for this connection to complete

Routes... [ ]

Cancel [ ] Save [ ]

i. Click the **Add** button to add the following IPv4 address, Netmask, and Gateway address:  
1) **Address**=192.0.2.103  
2) **Netmask**=24  
3) **Gateway**=192.0.2.1

Ensure that the window appears as shown:

Editing eth0

Connection name: **eth0**

General Ethernet 802.1X Security DCB Proxy **IPv4 Settings** IPv6 Settings

Method: Manual ▾

**Addresses**

| Address     | Netmask | Gateway   |
|-------------|---------|-----------|
| 192.0.2.103 | 24      | 192.0.2.1 |

Add Delete

DNS servers:

Search domains:

DHCP client ID:

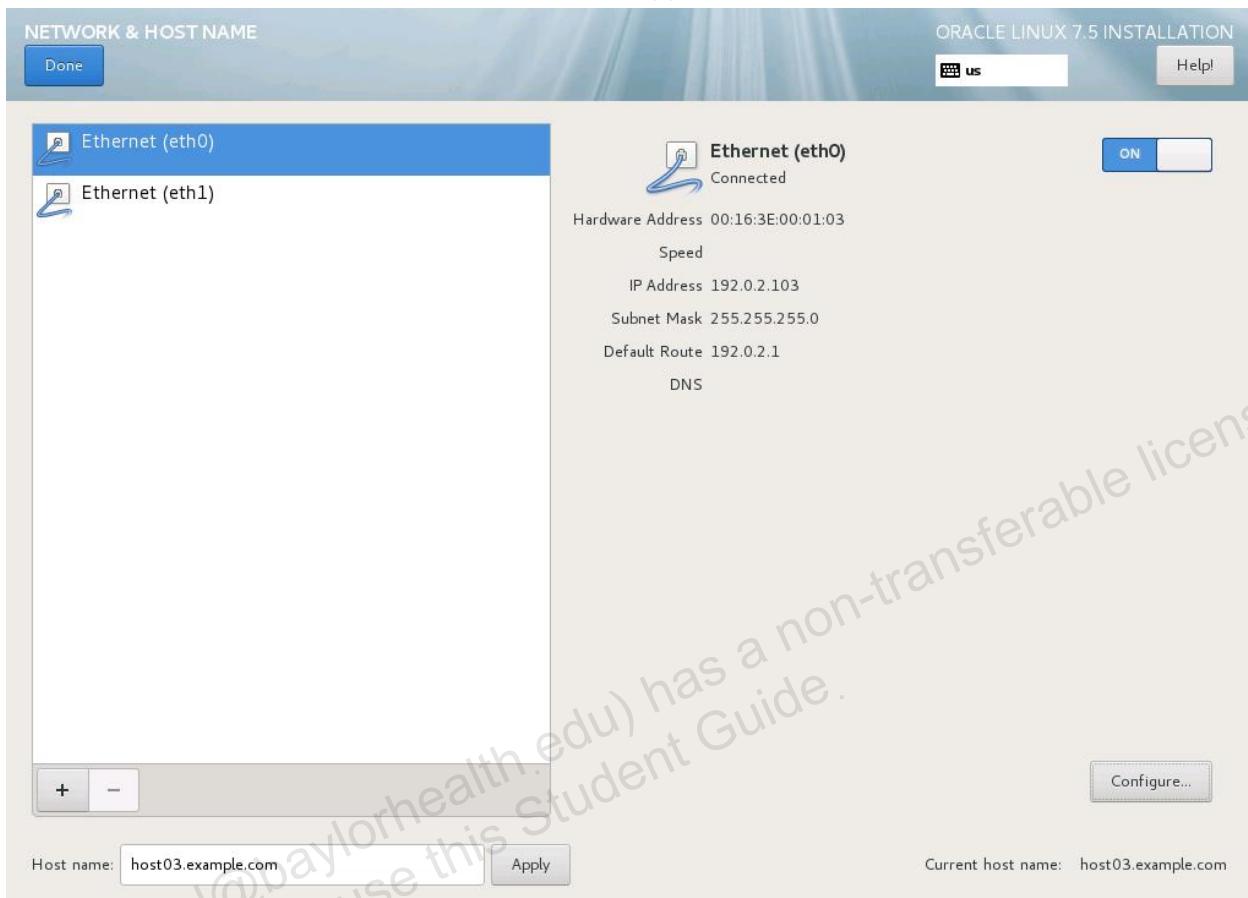
Require IPv4 addressing for this connection to complete

Routes...

Cancel Save

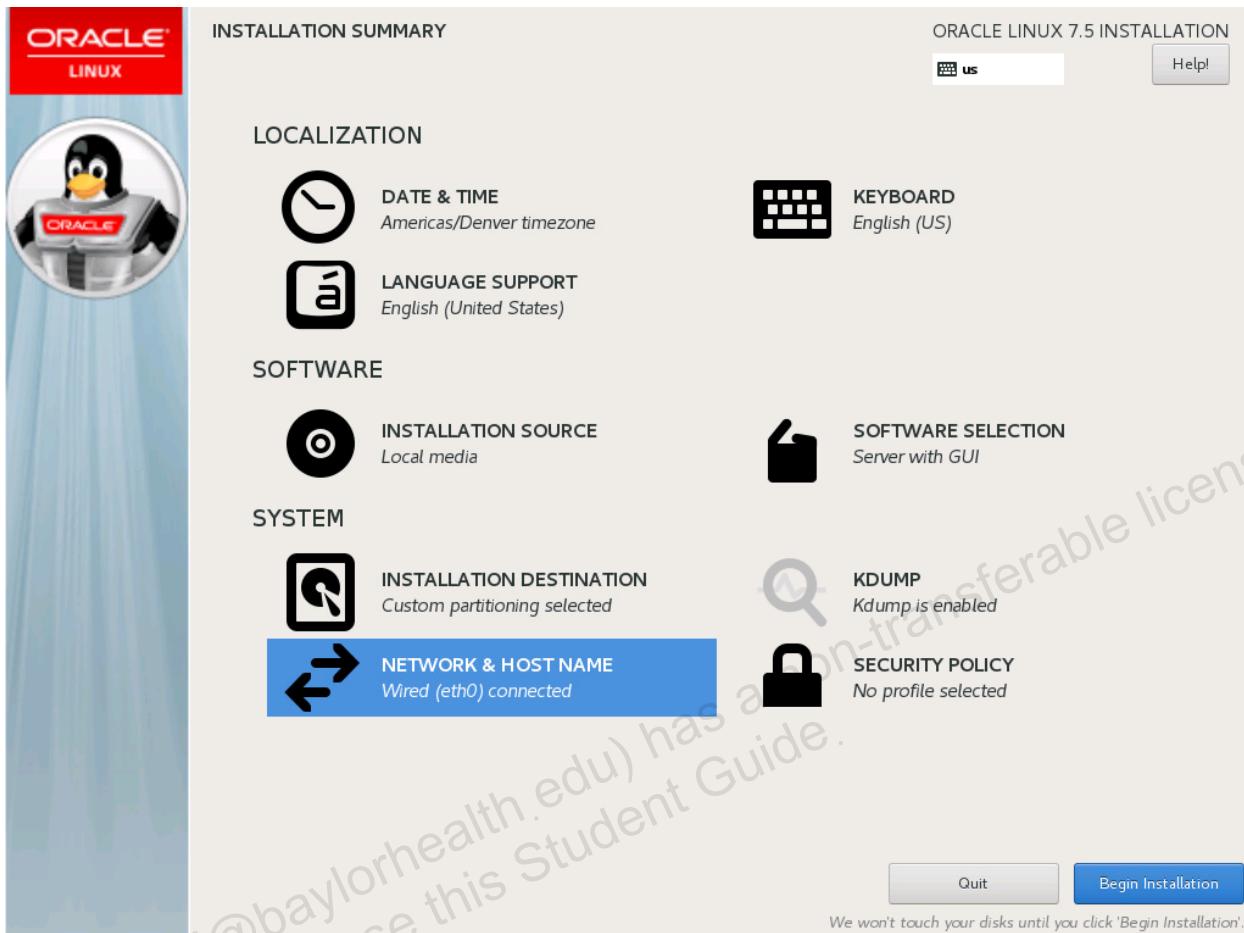
ANG LIU (gangl@baylorhealth.edu) has a non-transferable license  
to use this Student Guide.

- j. Click the **Save** button.
- The NETWORK & HOST NAME window appears.



- k. Scroll up if necessary and click **Done**.

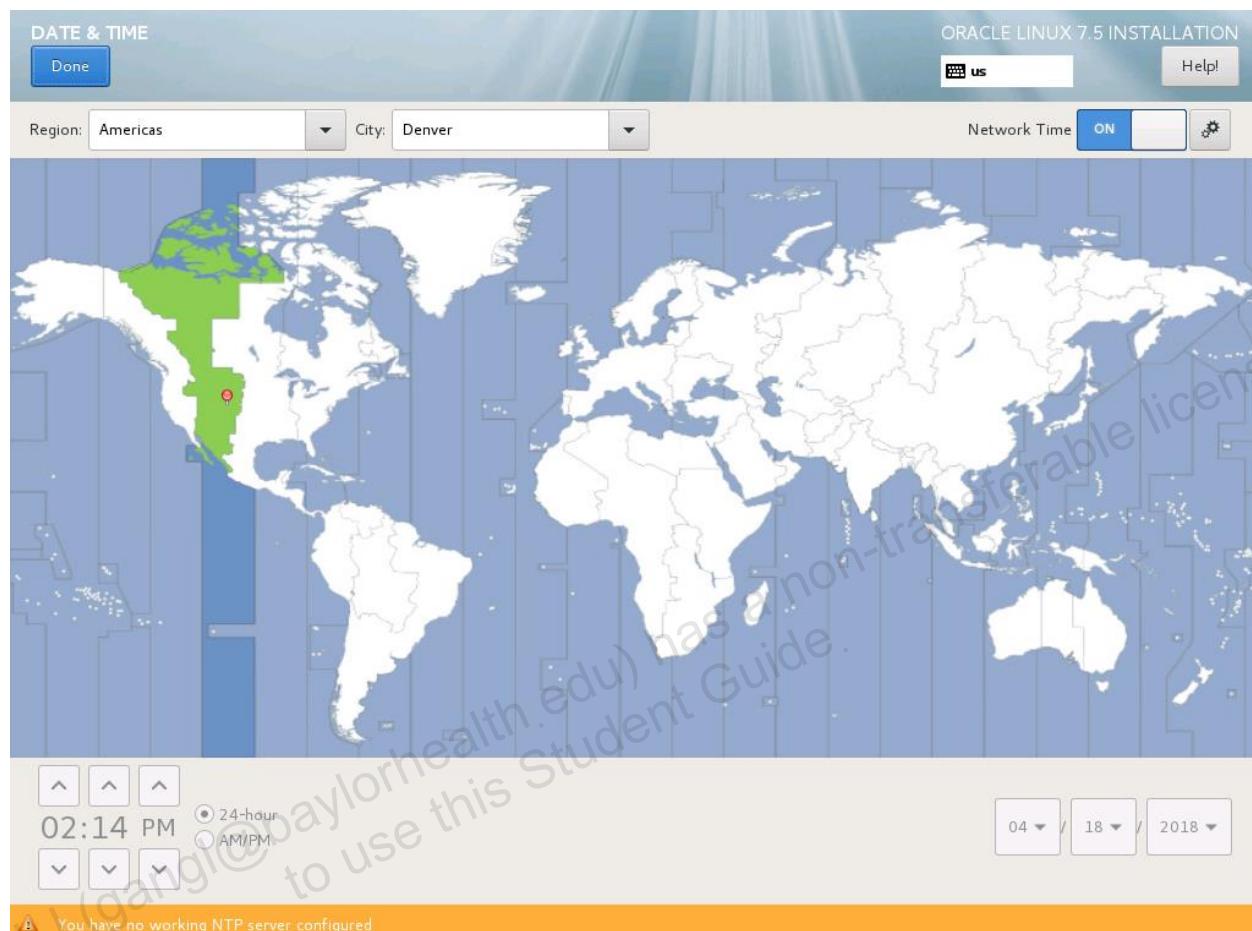
- The INSTALLATION SUMMARY window appears.



16. Turn off Network Time.

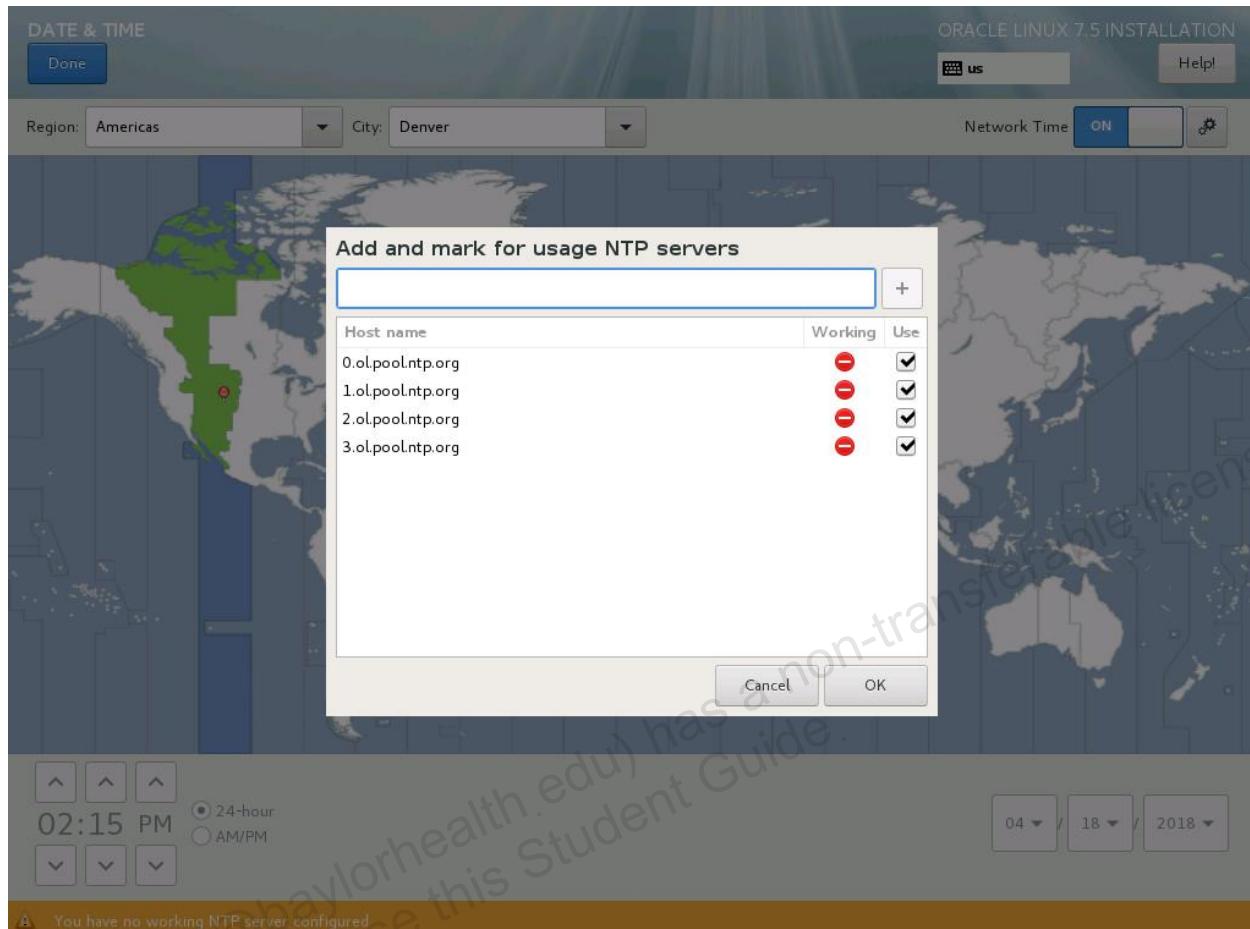
- In the LOCALIZATION section, select the DATE & TIME menu option.

The following window appears:



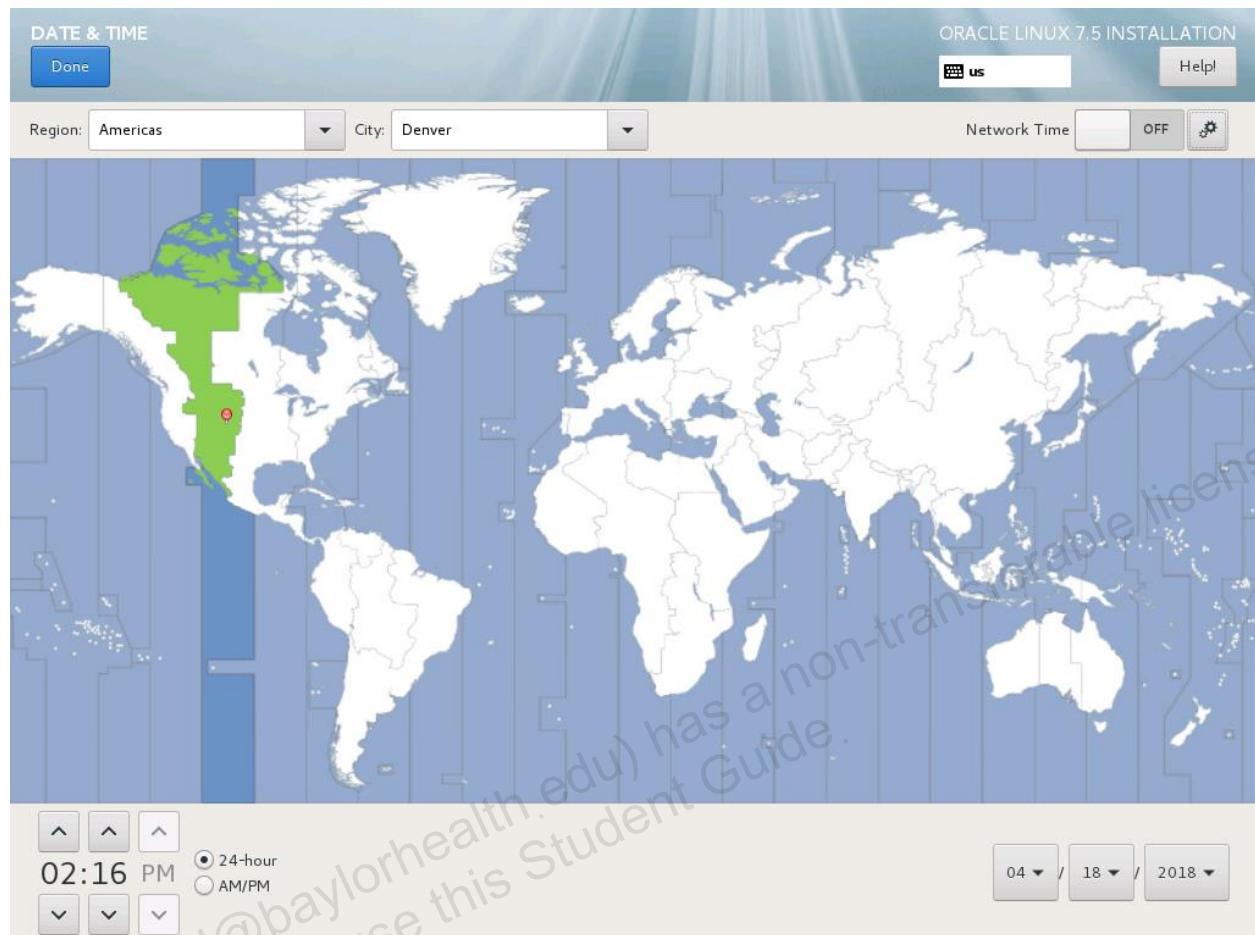
- Note that the Network Time switch is now ON. This is a result of configuring the eth0 interface to provide networking.
- b. Click the configuration icon to the right of the Network Time switch.

The following window appears:

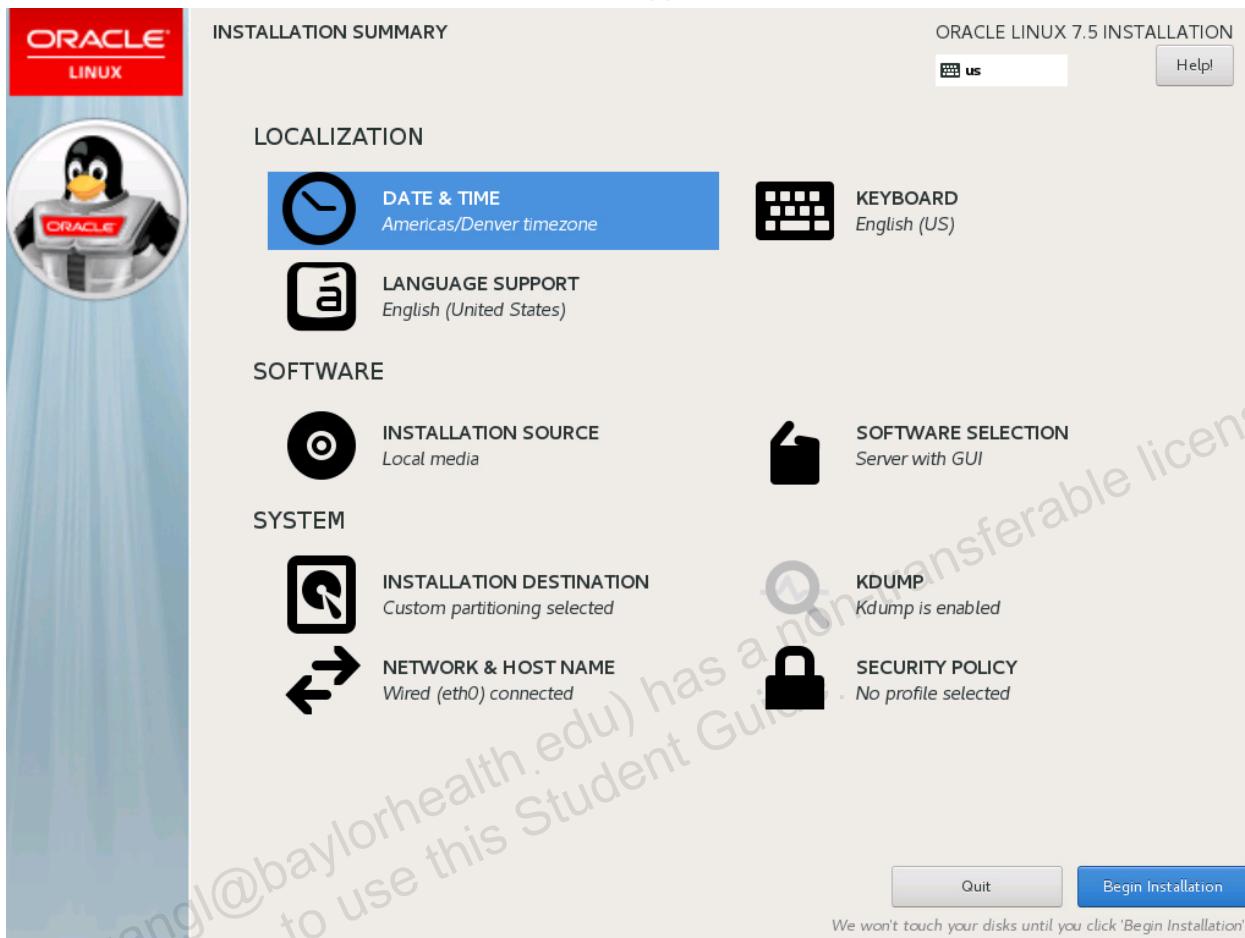


- NTP servers can be specified here, allowing time synchronization via NTP.
- c. Click Cancel to return to the main DATE & TIME screen.
- When left ON, NTP (Network Time Protocol) will be enabled, and `chronyd` will be started after the installation is complete, to synchronize the time. `chrony` is installed as a result of this installation and is described in the lesson titled "System Configuration." Having NTP enabled with `chrony` affects the use of the `timedatectl` command in a practice in the lesson titled "System Configuration," where `timedatectl` is described. To alleviate this, and because we will set up NTP ourselves in a practice in the lesson titled "System Configuration," we will turn the Network Time switch OFF at this point.

- d. Click the switch next to Network Time to turn it OFF as follows:

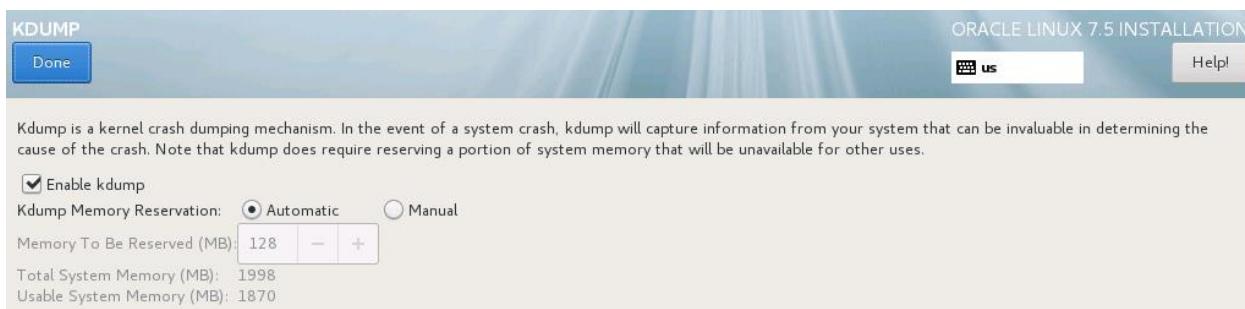


- e. Scroll up if necessary and click **Done**.
- The **INSTALLATION SUMMARY** screen appears.



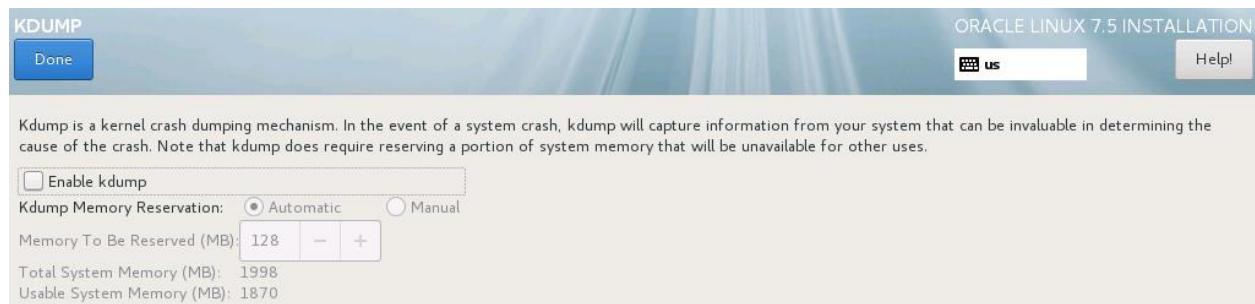
17. Deselect KDUMP.
- In the SYSTEM section, select **KDUMP**.

The following window appears:



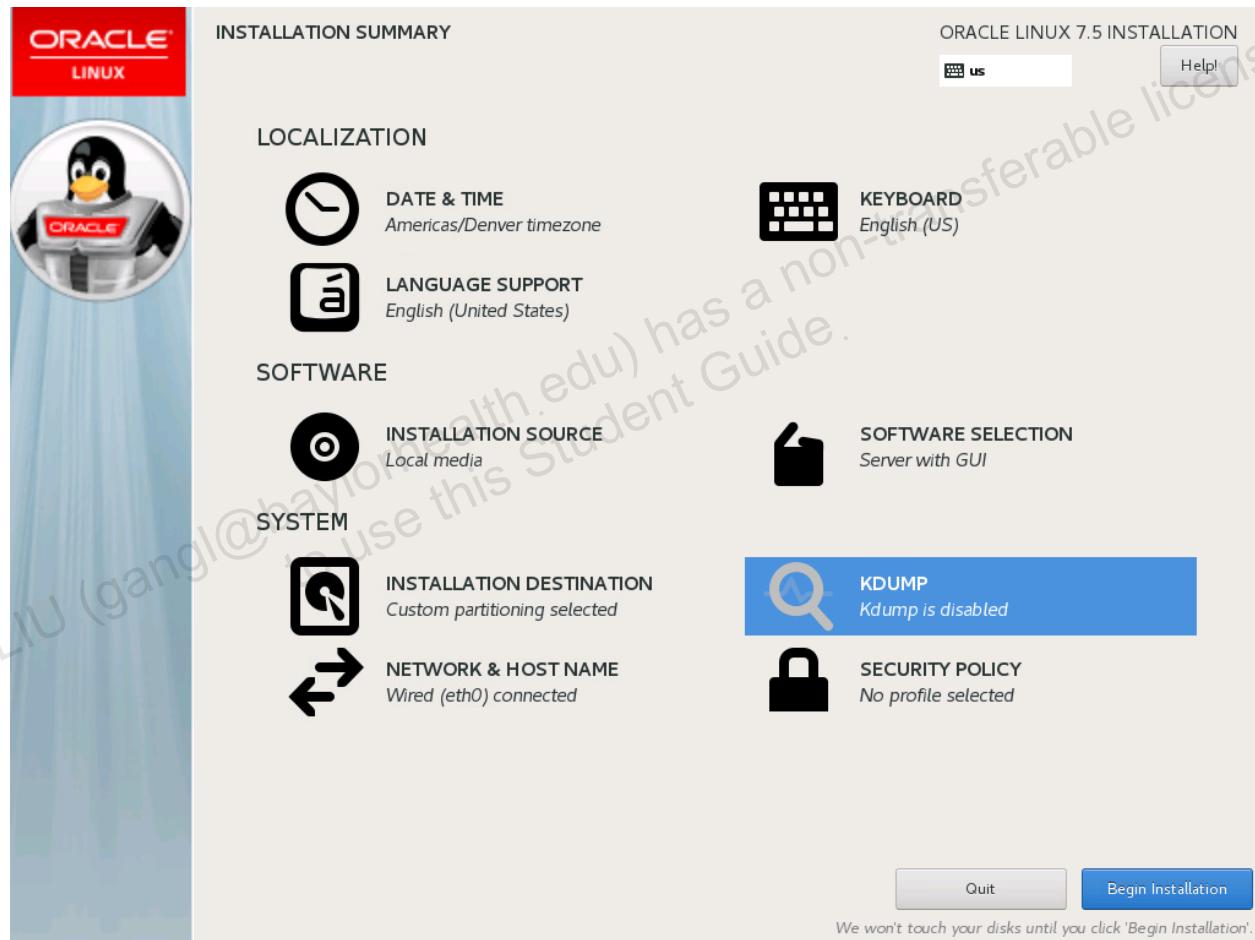
- By default, KDUMP is enabled. Under production operating conditions, keeping KDUMP enabled is valuable in determining the cause of a crash. For class purposes, it is disabled to conserve resources.

- b. Deselect the **Enable kdump** check box:



- c. Scroll up if necessary and click **Done**.

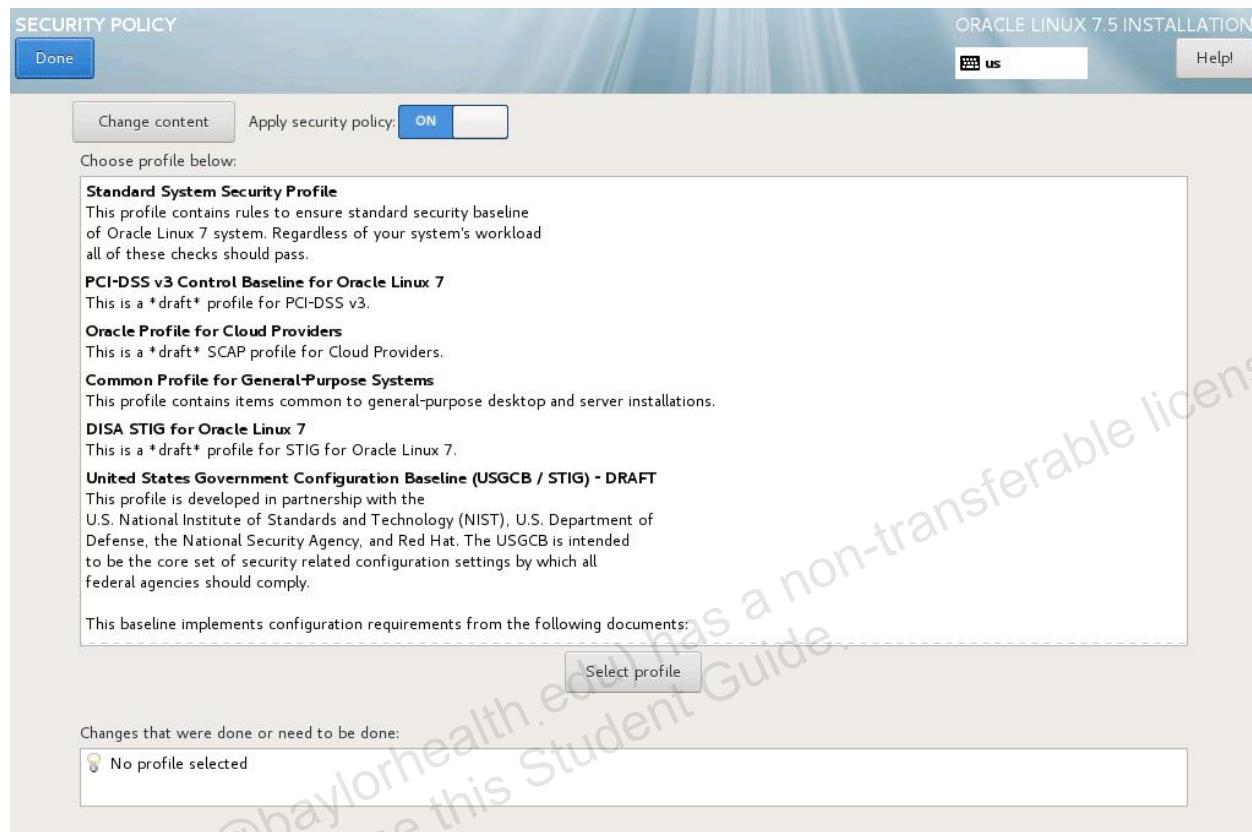
- The INSTALLATION SUMMARY screen now shows KDUMP disabled.



18. View SECURITY POLICY.

- a. In the SYSTEM section, select the SECURITY POLICY menu option.

The following window appears:



- In production environments, different security profiles can be selected.
- b. View the different profiles offered by scrolling through the list. Do not click **Select profile**.  
No changes are necessary in this window.
- c. Scroll up if necessary and click **Done**. The INSTALLATION SUMMARY window appears.

19. Begin the installation.
  - a. From the INSTALLATION SUMMARY window, scroll down if necessary and click **Begin Installation**.

The CONFIGURATION window appears.

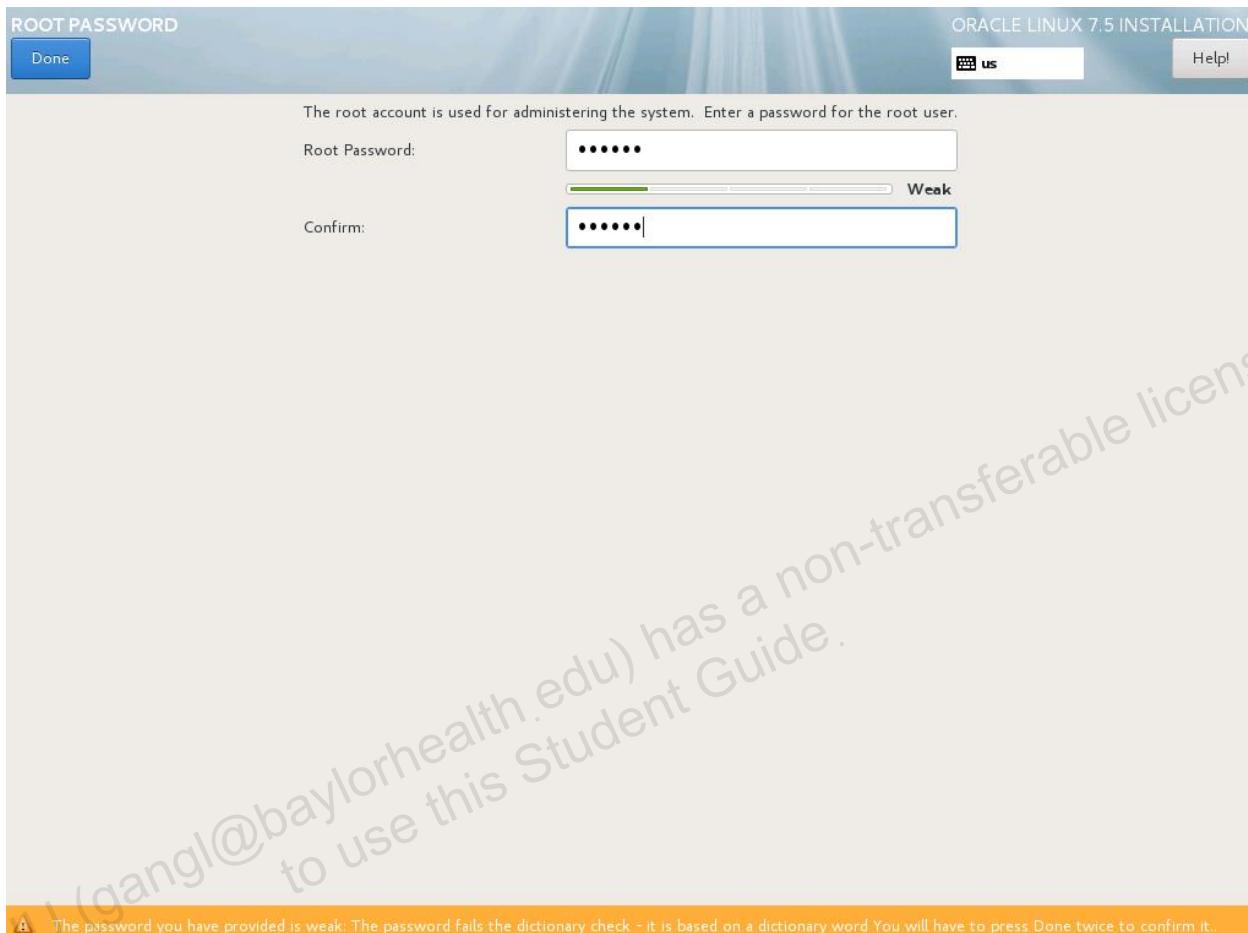


Note that a status bar indicates that packages are being installed.

20. Set the root user password.

- Click ROOT PASSWORD.

The ROOT PASSWORD window appears.



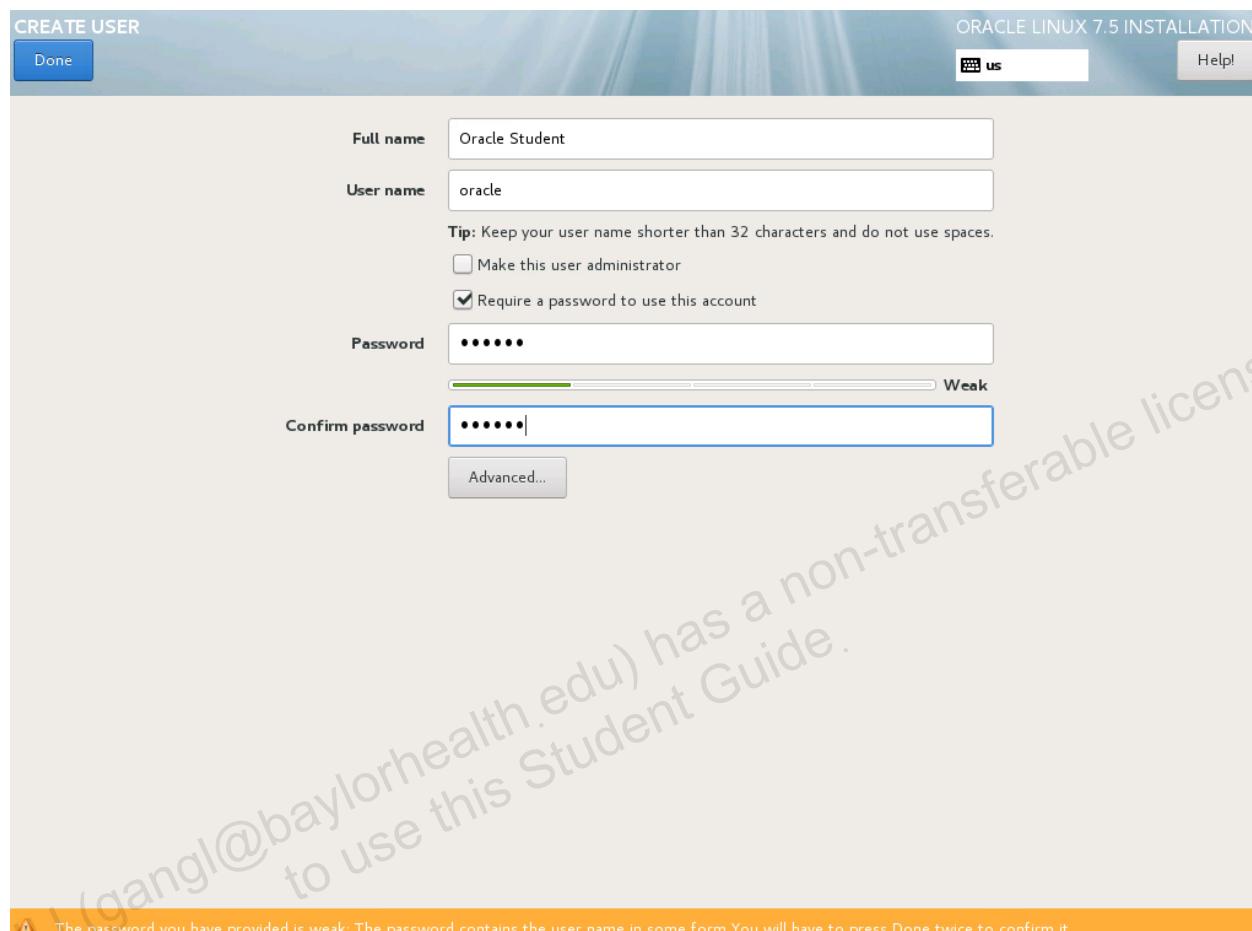
- Enter the Root Password `oracle` for the root user.
- Press Tab or click the **Confirm** field and re-enter the same password `oracle`.
- Scroll up if necessary and click **Done**.
- Click **Done** a second time.

- The CONFIGURATION window appears.

21. Create a nonroot user.

- Click USER CREATION.

The CREATE USER window appears.



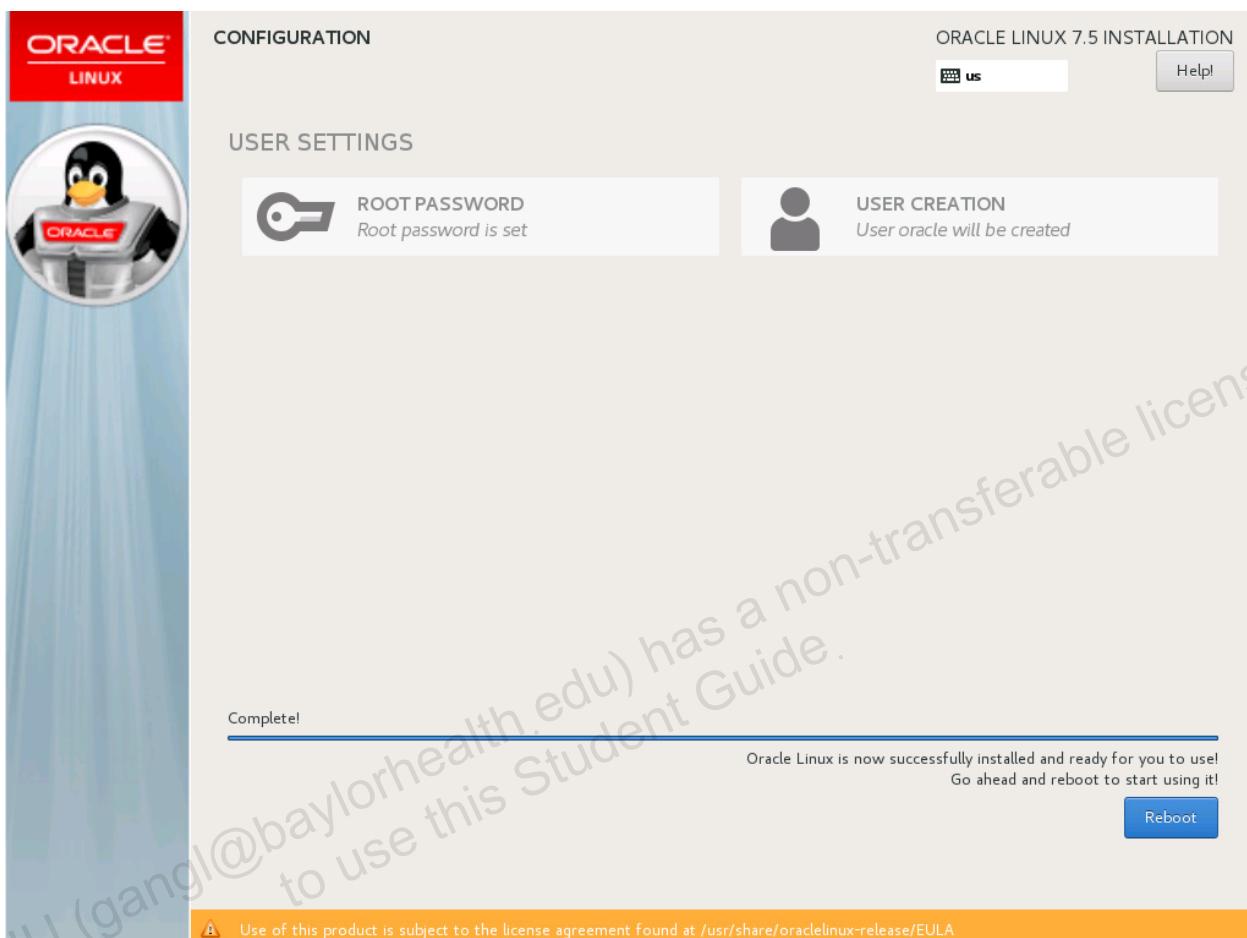
- Create a user with the following attributes:
  - Full Name: Oracle Student
  - Username: oracle
  - Password: oracle
  - Confirm Password: oracle
- Scroll up if necessary and click **Done**.

- d. Click **Done** a second time.
- The CONFIGURATION window appears. The installation and configuration might still be in progress.



22. Reboot after the installation and configuration are complete.

- After all installation and configuration steps are completed, the CONFIGURATION window appears with a "Complete!" message and a Reboot button.



a. Click **Reboot**.

- After you reboot your system, your vnc session closes.

## Practice 4-2: Completing Initial Setup

---

### Overview

In this practice, you complete the Initial Setup.

### Assumptions

- You have completed the installation of Oracle Linux.
- You have rebooted your system.
- You are logged on to **dom0** as the **root** user.

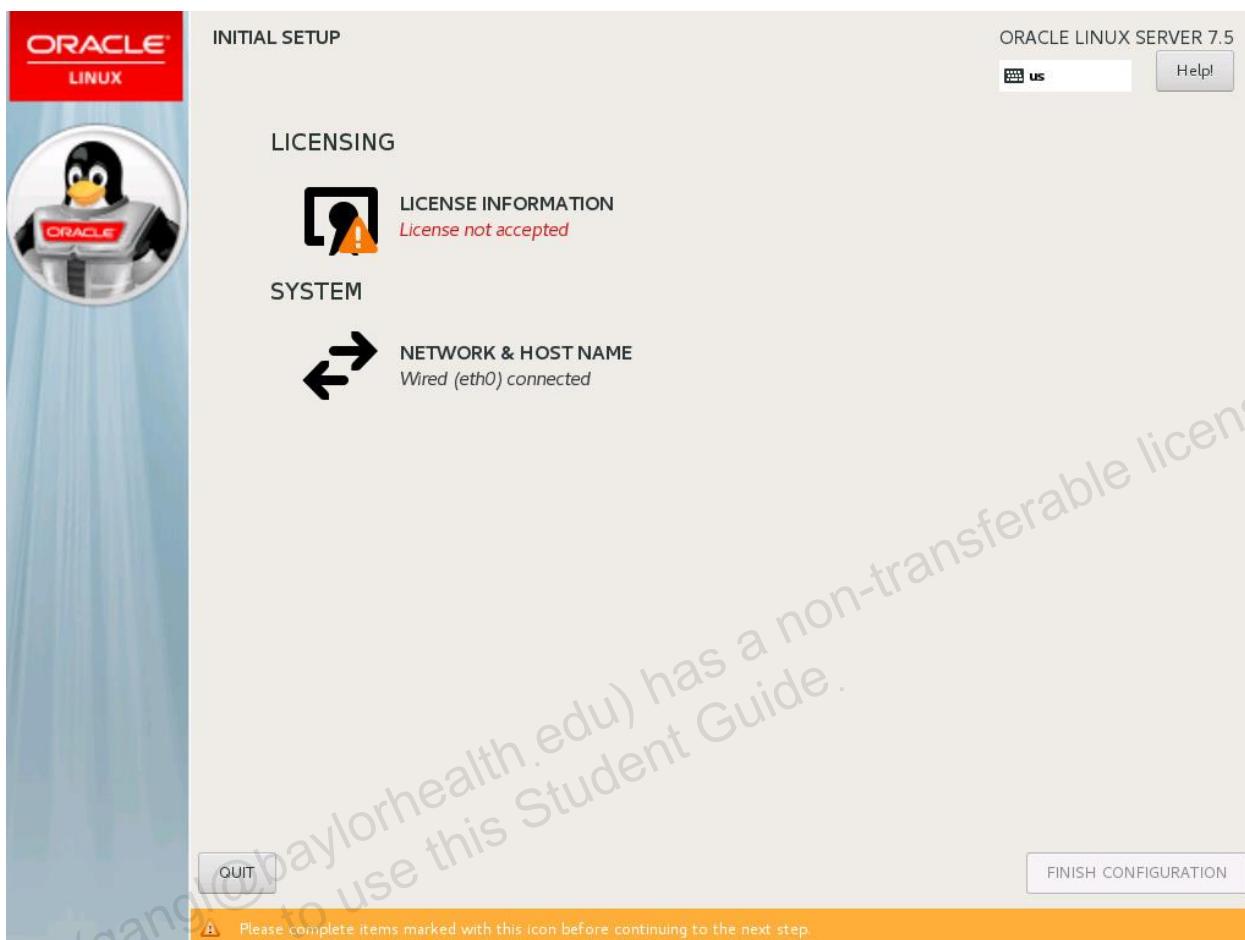
### Tasks

1. Connect to the **host03** guest by using **vncviewer**.
  - a. From **dom0**, run the `xm vncviewer host03&` command.

```
[dom0] # xm vncviewer host03&
```

2. Complete INITIAL SETUP.

The INITIAL SETUP window appears.

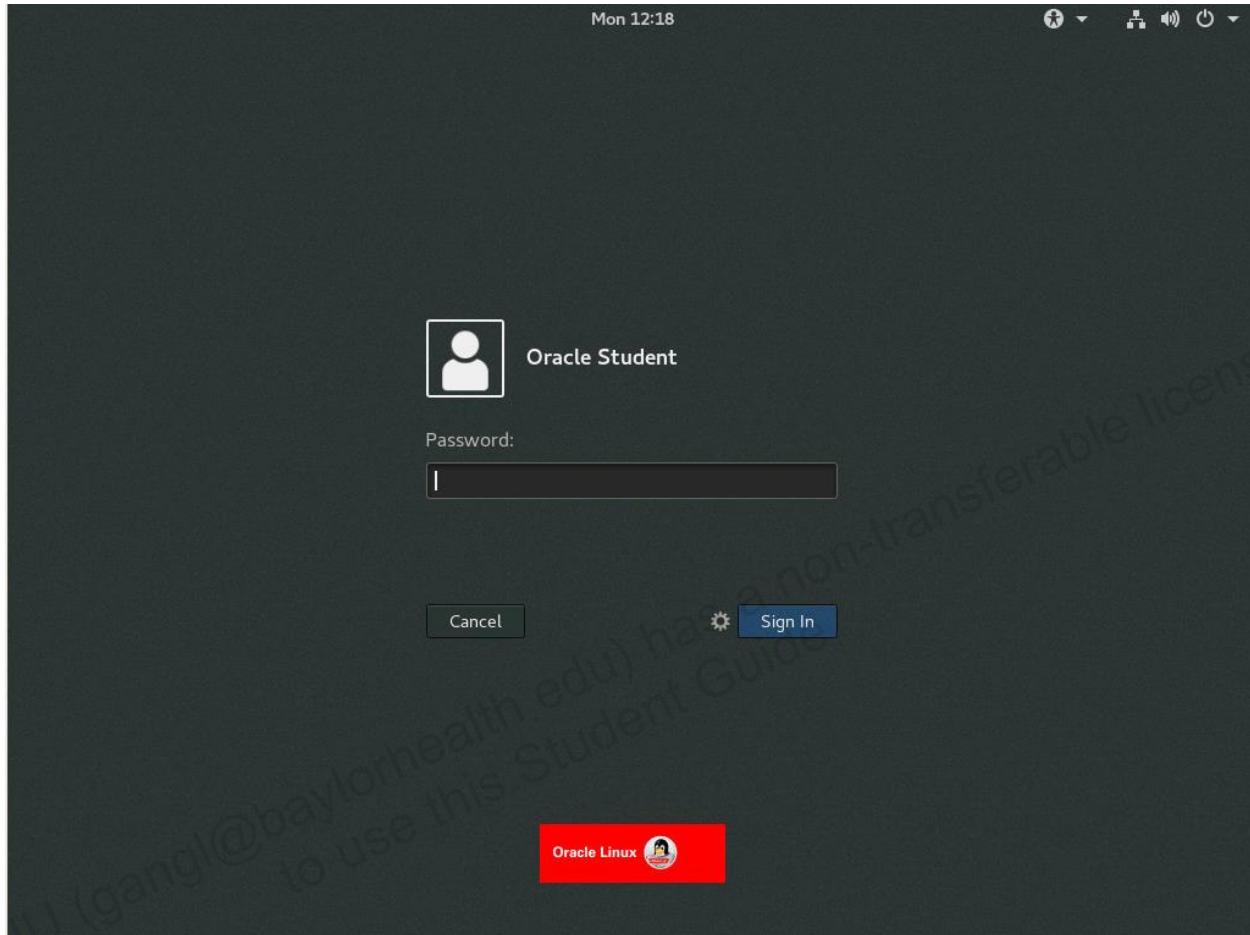


- a. Click LICENSE INFORMATION.
  - The License Agreement appears.
- b. Click **I accept the license agreement**.
- c. Scroll up if necessary and click **Done**.
  - The INITIAL SETUP window appears.
- d. Scroll down if necessary and click **FINISH CONFIGURATION**.

The GNOME desktop login window appears.

3. Log in to Oracle Linux from the GNOME desktop.
  - a. Select Oracle Student.

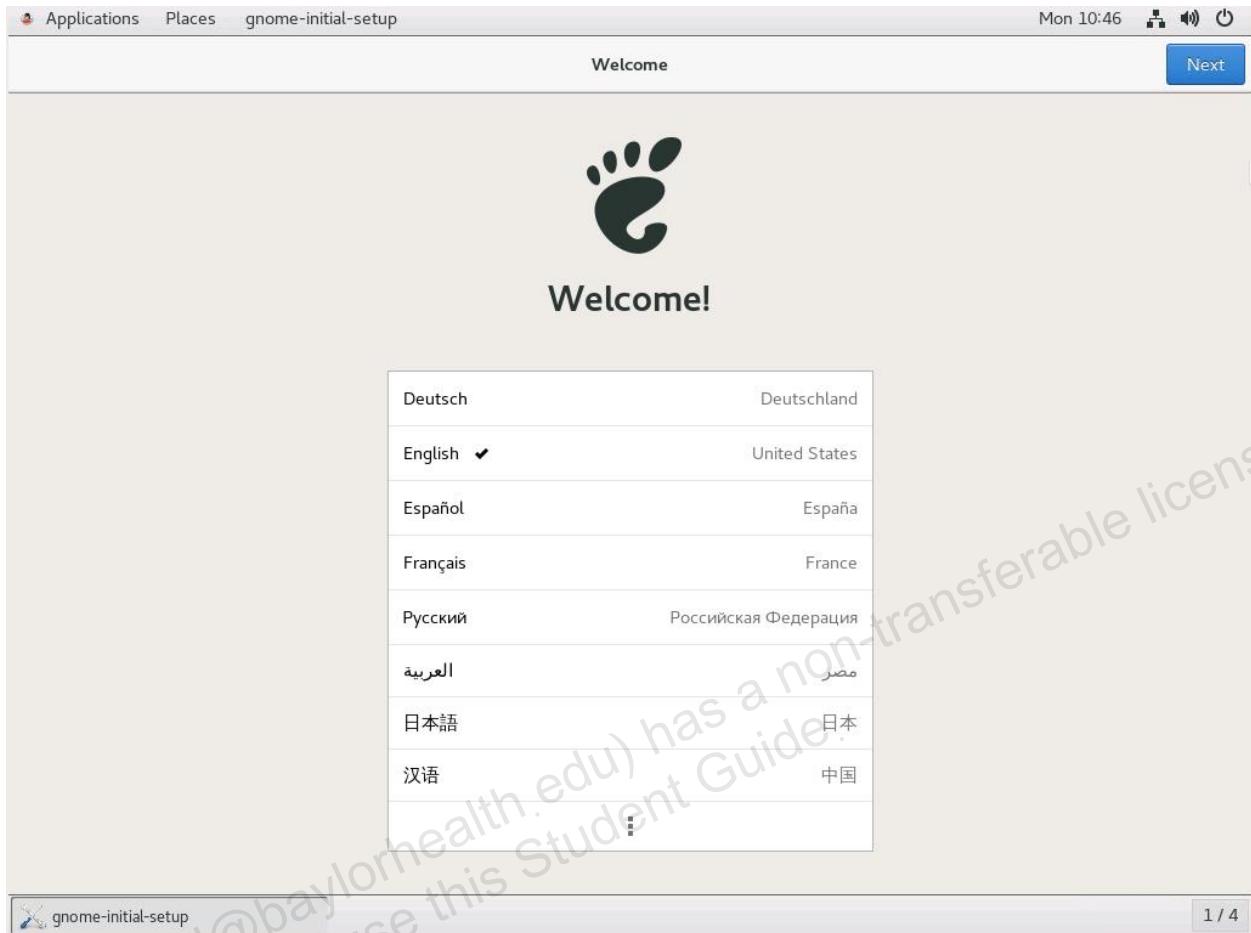
The following window appears:



- b. Enter the password for Oracle Student.
- c. Click **Sign In**.

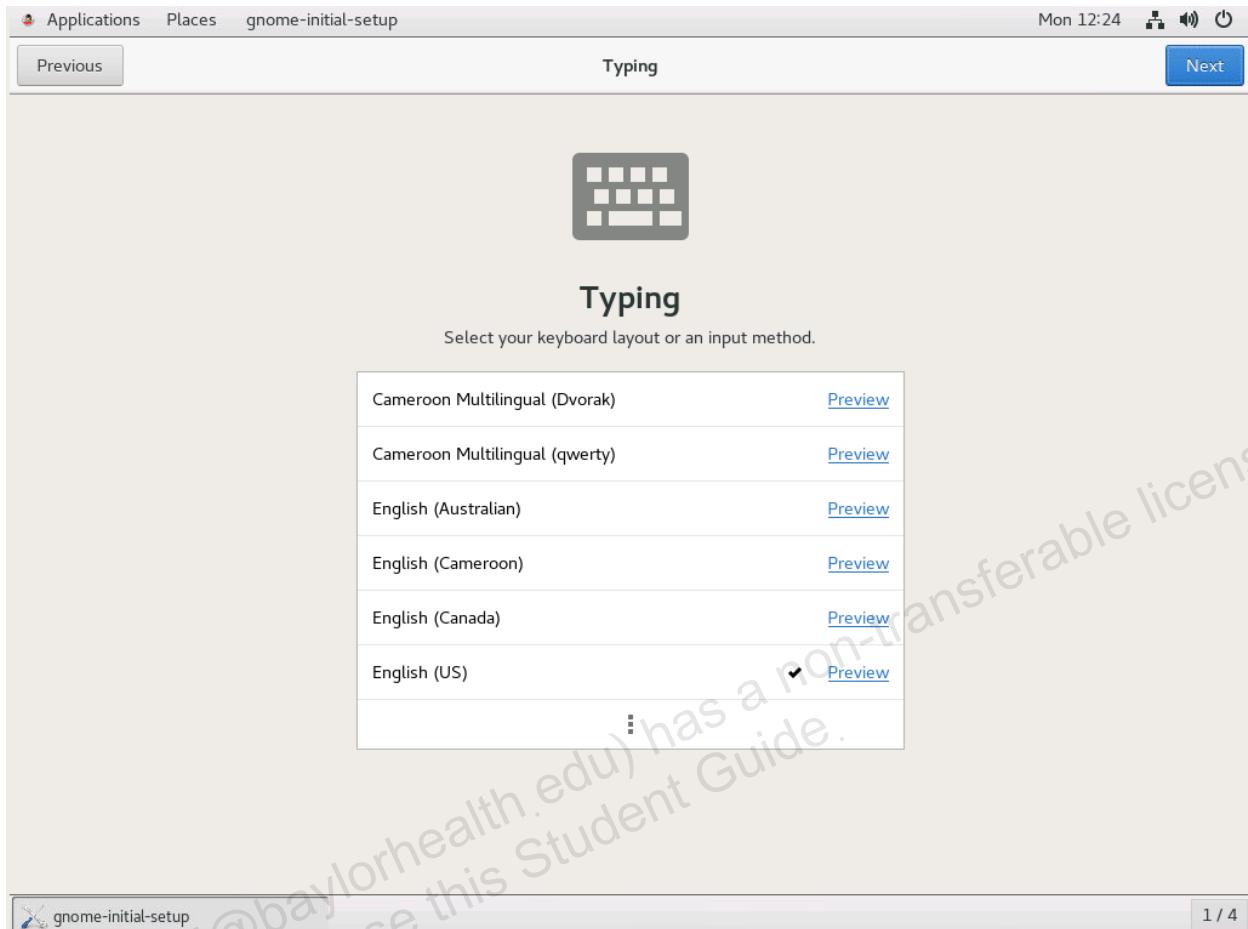
- The GNOME desktop appears.

The first time you log in, a Welcome window prompting you to select a language appears.



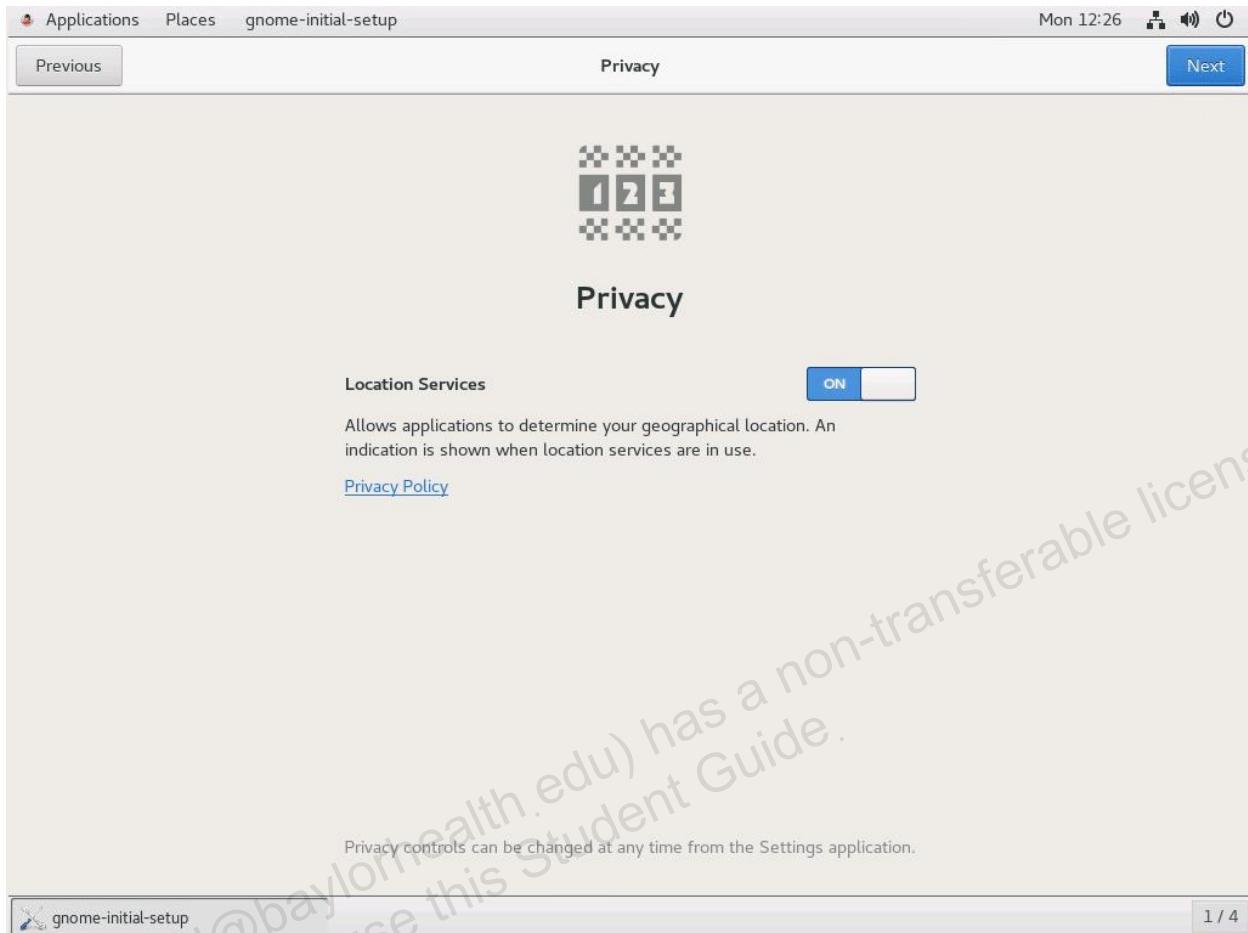
- d. Click **Next**.

The following window appears:



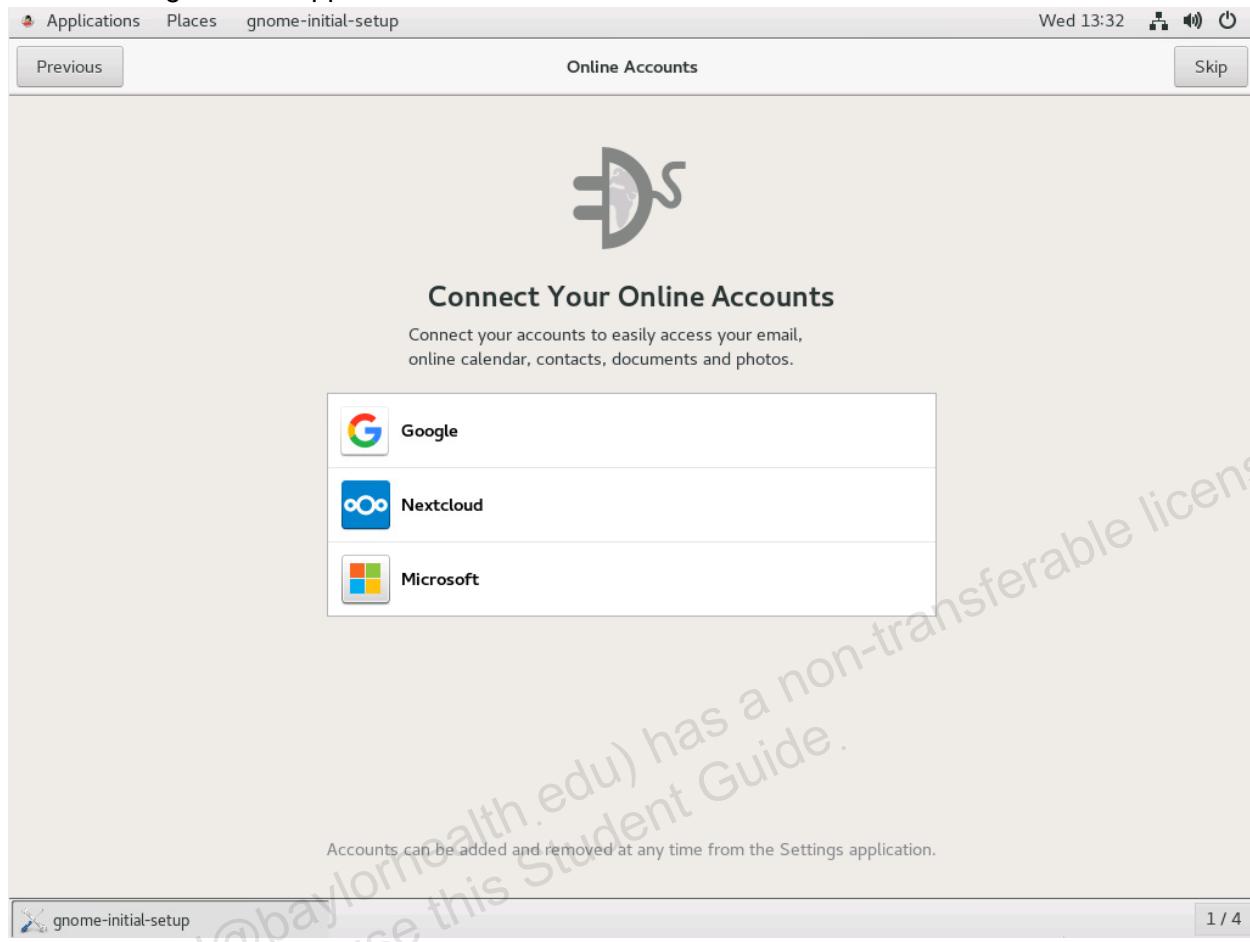
- e. Change the keyboard layout if desired and click **Next**.

The following window appears:



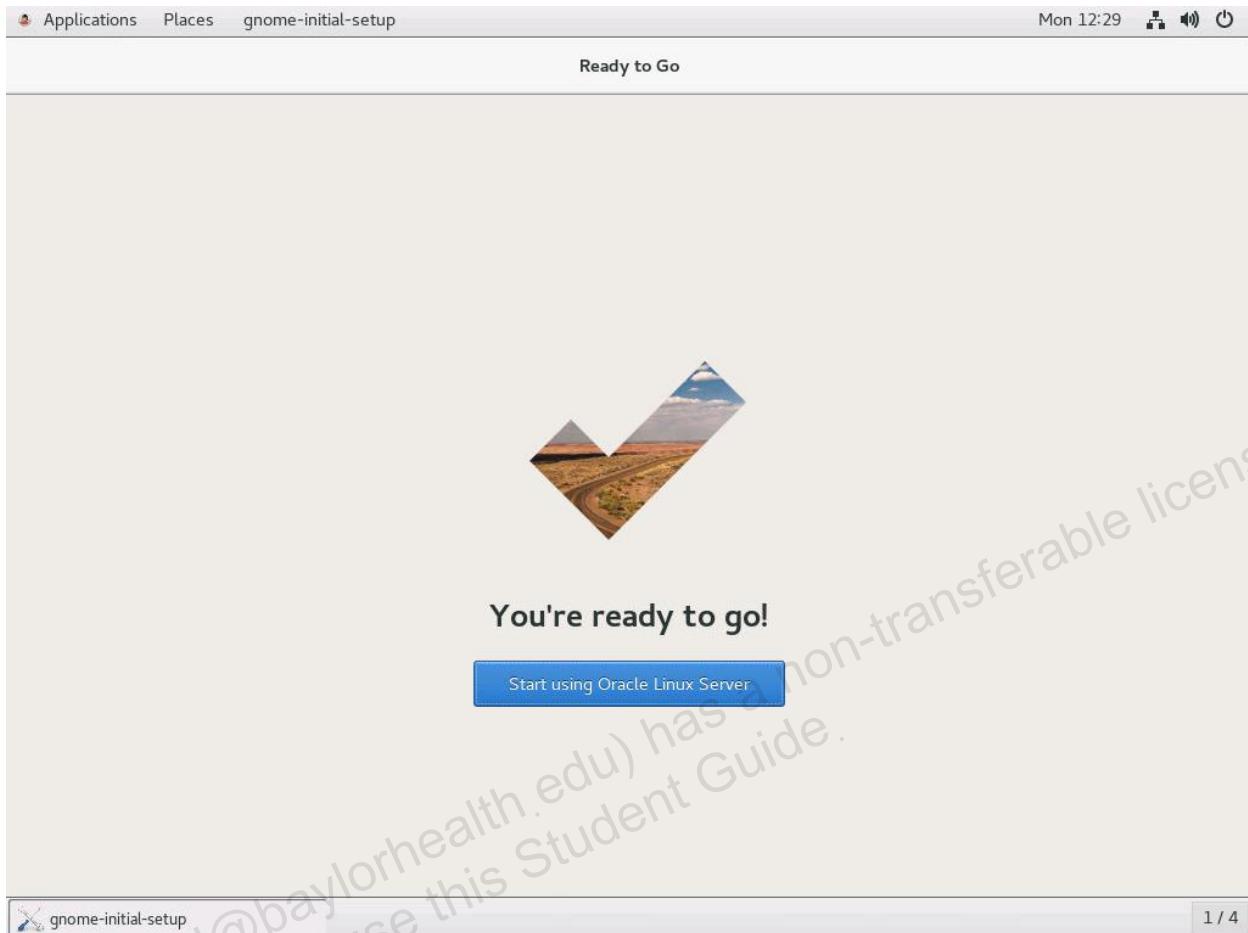
- f. Change the location setting to OFF if desired and click **Next**.

The following window appears:



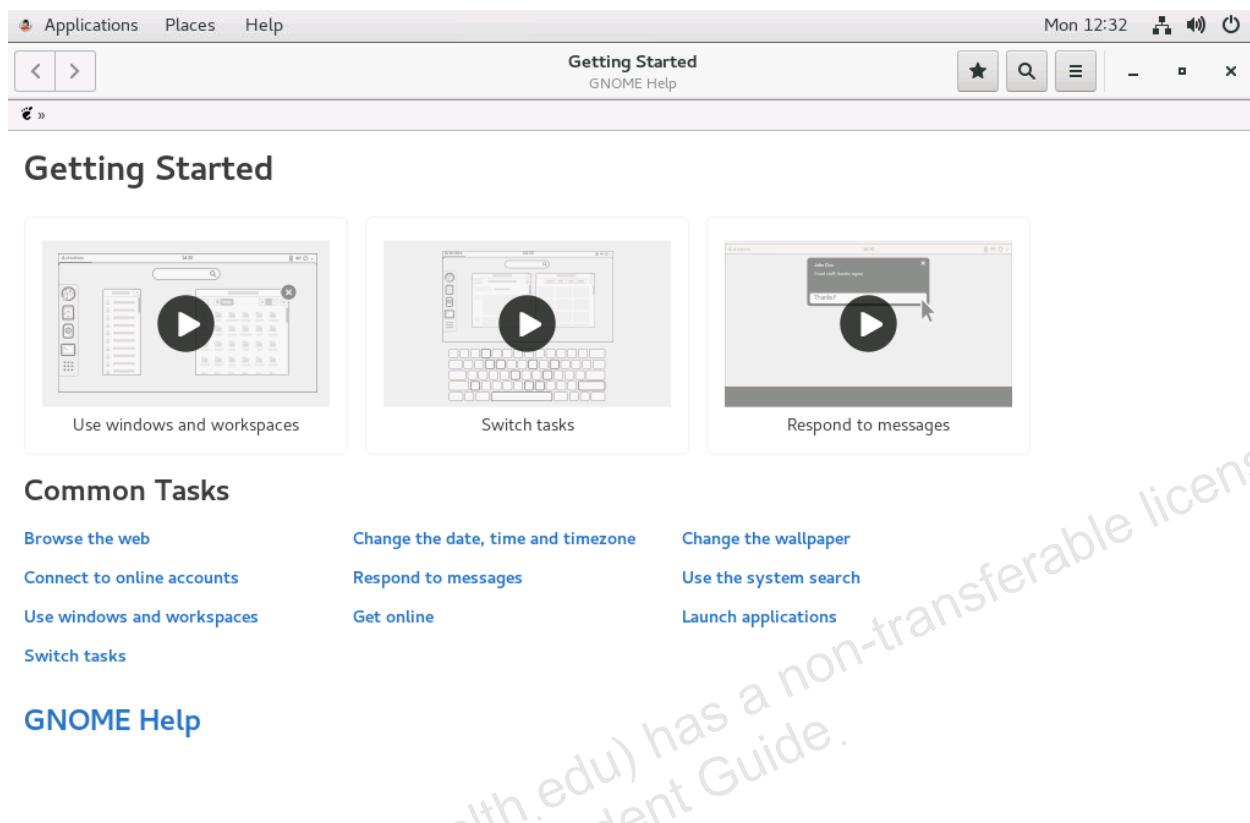
g. Click **Skip**.

The following window appears:



- h. Click **Start using Oracle Linux Server**.

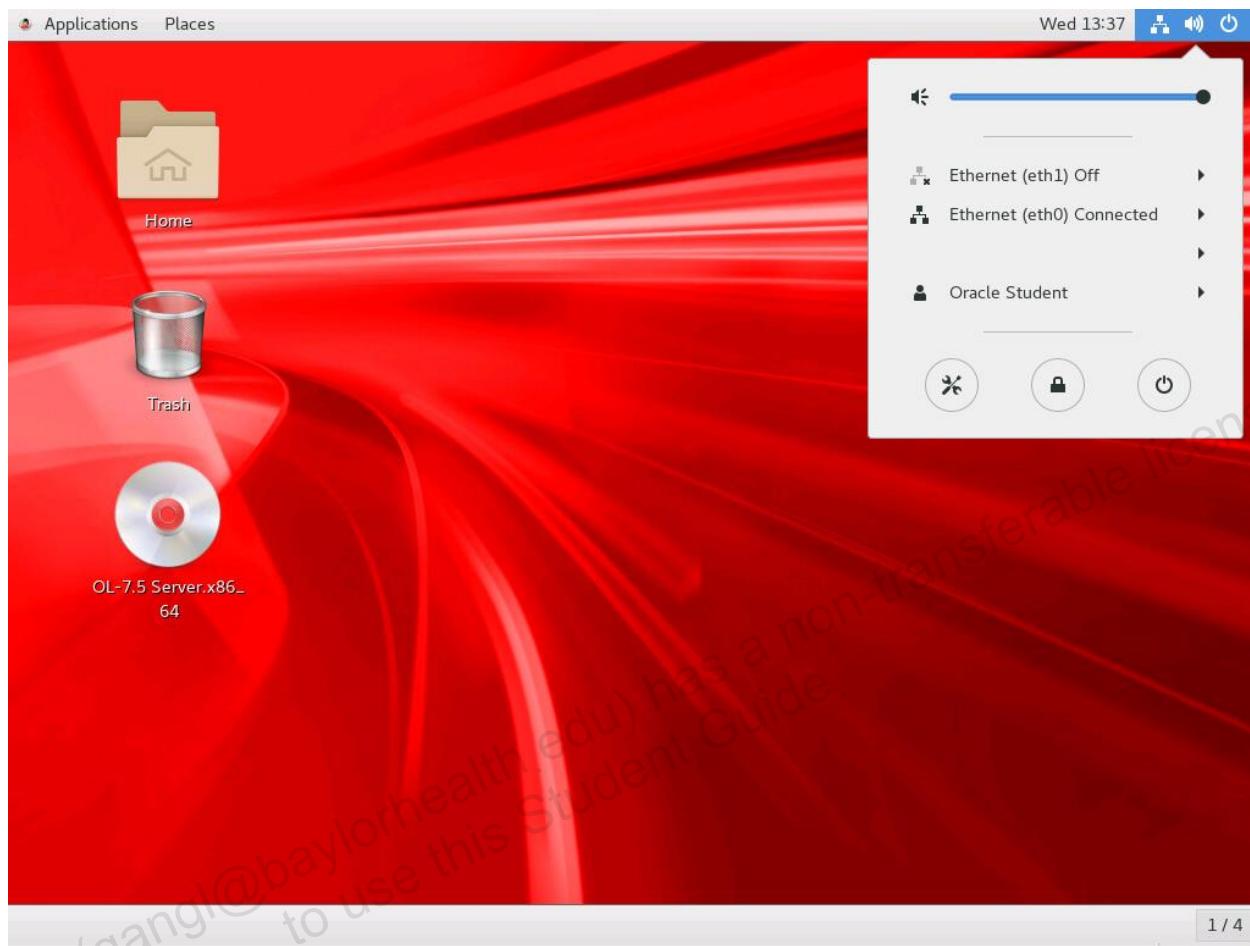
The following window appears:



- i. Click the "x" in the upper-right corner of the GNOME **Getting Started** window to close the window.

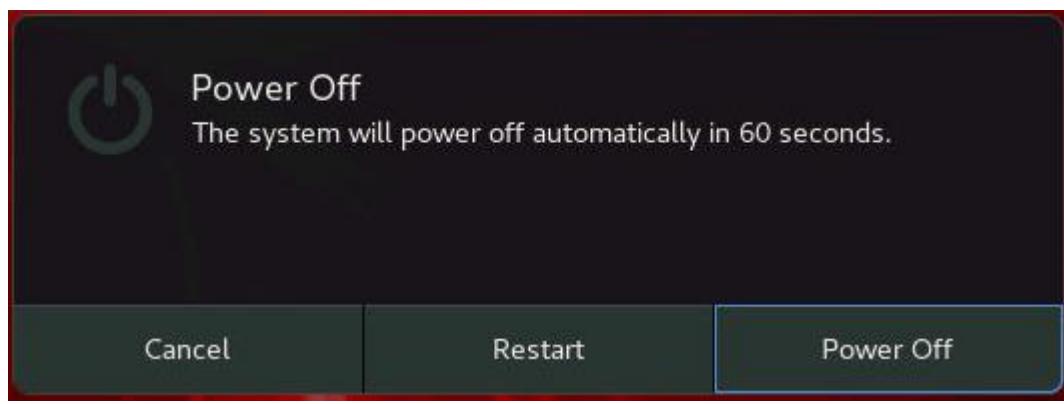
4. Shut down Oracle Linux.

- a. Click the Power icon in the upper-right corner of the GNOME window as shown:



- b. Click the Power Off icon on the drop-down screen.

The following dialog box appears:



- c. Click **Power Off**.

- You are returned to **dom0** as root.

## Practice 4-3: Booting Up the host03 VM Guest

---

### Overview

In this practice, you re-create the **host03** VM.

### Assumptions

You are logged on to **dom0** as the **root** user.

### Tasks

1. Re-create the **host03** VM.

- a. From **dom0**, run the `xm list` command as follows to verify that **host03** is not running.

```
xm list
Name ID Mem VCPUs State Time(s)
Domain-0 0 1024 4 r----- 968983.5
host01 52 2048 1 -b---- 23.6
host02 59 2048 1 -b---- 41.2
```

- Only **dom0** (Domain-0) and two guests (**host01** and **host02**) are running.

- b. Use the `cd` command to change to the `/OVS/running_pool/host03` directory:

```
cd /OVS/running_pool/host03
```

- c. Use the `xm create` command as follows:

```
xm create vm.cfg
Using config file "./vm.cfg".
Started domain host03 (id=...)
```

- d. Confirm that **host03** VM is running by using the `xm list` command as follows:

```
xm list
Name ID Mem VCPUs State Time(s)
Domain-0 0 1024 4 r----- 969014.4
host01 52 2048 1 -b---- 23.7
host02 59 2048 1 -b---- 41.6
host03 62 2048 1 -b---- 7.8
```

- This output shows **host03** is now running.

## **Practices for Lesson 5: Oracle Linux 7 Boot Process**

## Practices for Lesson 5: Overview

---

### Practices Overview

In these practices, you:

- Explore the GRUB 2 bootloader
- Edit the GRUB 2 configuration file to boot different kernels
- Boot the rescue kernel to repair the initial RAM disk image
- Use the GRUB 2 menu to modify kernel boot parameters
- View `systemd` units
- View target units
- View the default target unit
- Change the default target unit
- View service units
- Configure a service to start and stop at a specific target state

## Practice 5-1: Exploring the GRUB 2 Bootloader

---

### Overview

In this practice, you explore the `/boot` directory, the GRUB 2 configuration file, and kernel boot parameters. The displayed sample output might not exactly match what you see on your system. In some cases, only a partial output is shown.

### Assumptions

- You are logged on to **dom0**.
- You have a terminal window open.
- You are the `root` user.
- You completed the installation of Oracle Linux.
- VM **host03** is running.

If you were unable to complete the Oracle Linux installation on **host03**, substitute **host02** for **host03** in this practice and all future practices in this course.

### Tasks

1. Connect to the **host03** guest by using the `xm vncviewer host03&` command.

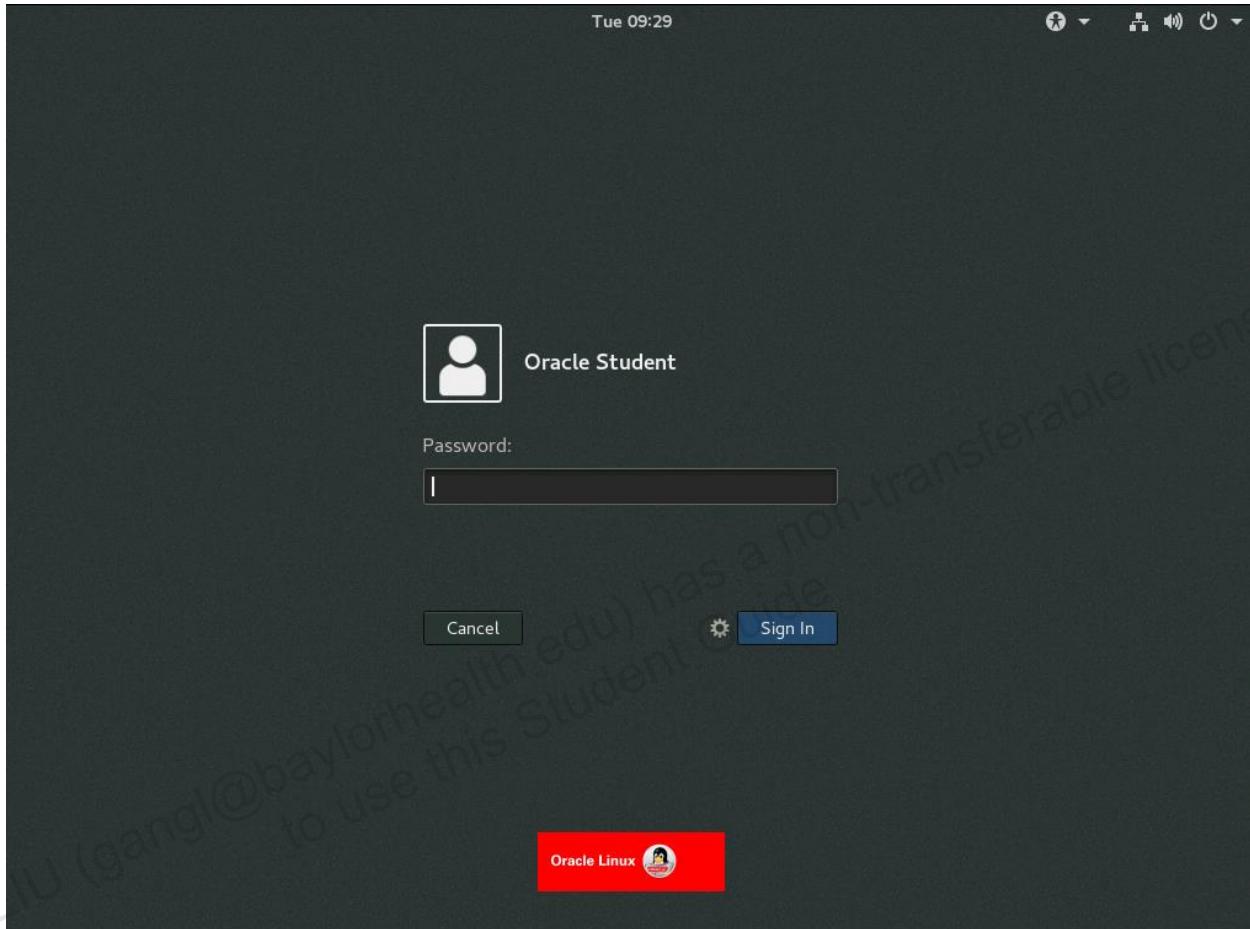
```
xm vncviewer host03&
```

- After you connect, the GNOME login window appears.

2. Log in from the GNOME desktop.
  - You might need to press Enter to display the list of users.

- a. Select Oracle Student.

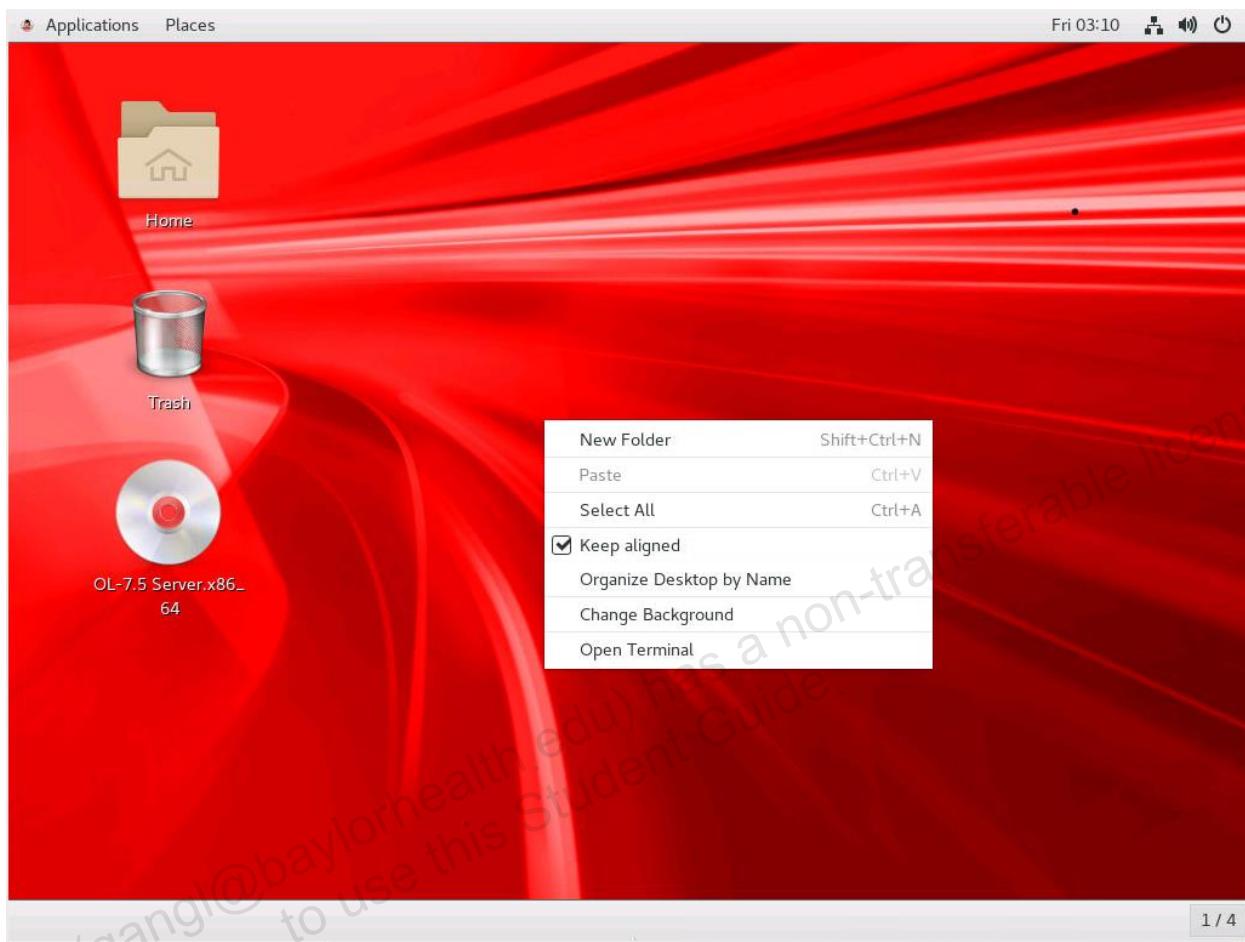
The following window appears:



- b. Enter the password for Oracle Student.
  - c. Click **Sign In**.

- After you log in, the GNOME desktop appears.

3. Open a terminal window and become the `root` user.
  - a. Right-click the desktop to display the pop-up menu.

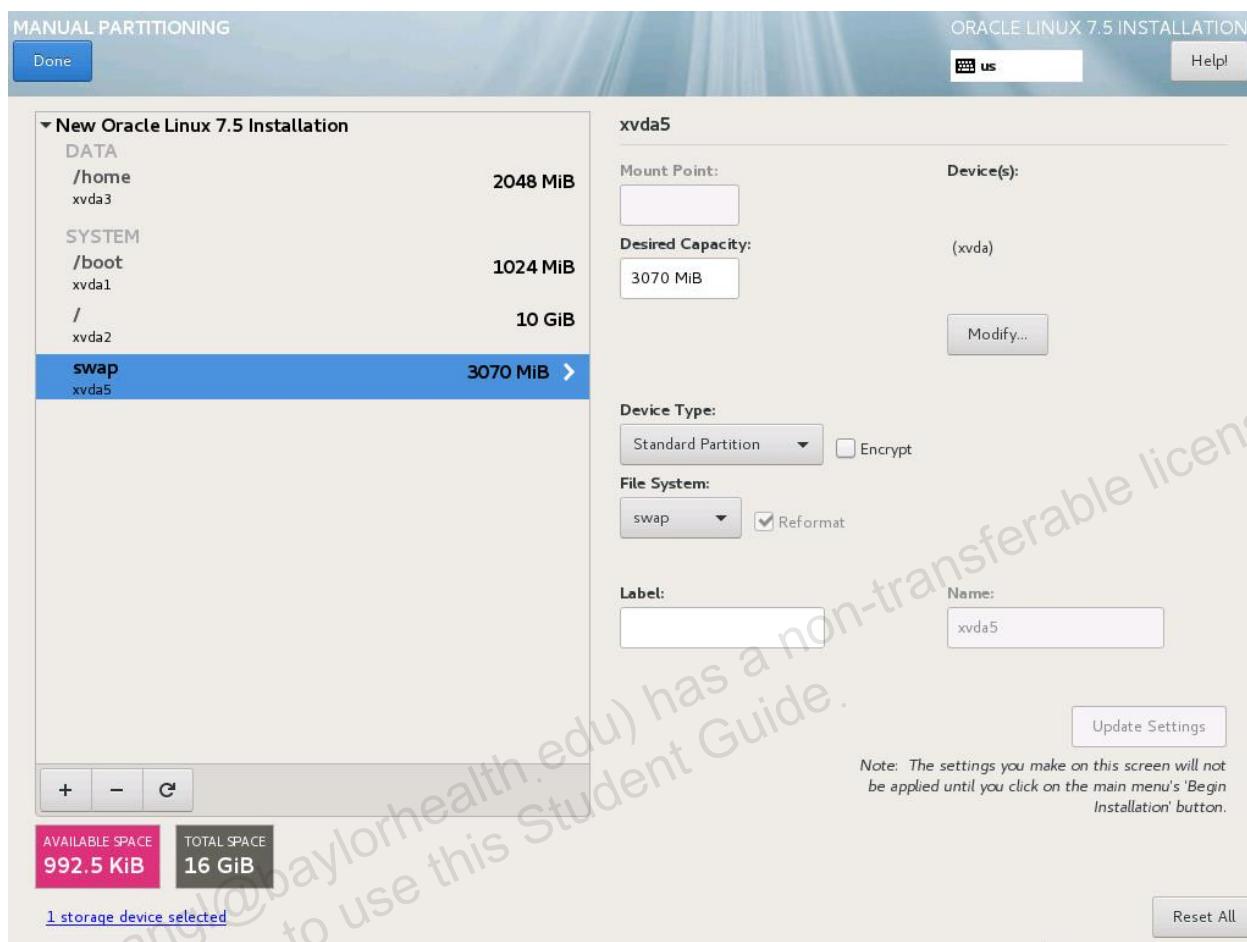


- b. Click **Open Terminal** to display a terminal window.
  - c. In the terminal window, enter the `su -` command. Then enter the `root` password to become `root`.

```
$ su -
Password:
whoami
root
```

- The `whoami` command confirms that you are the `root` user.

4. The following screen shows the partition layout for the installation of your Oracle Linux system:



- The partition mounted on `/boot` contains the kernel and other files used to boot your system.
- a. Use the `df` command to confirm the mounted partitions. Some of your numbers might vary.

```
df -h
Filesystem Size Used Avail Use% Mounted on
...
/dev/xvda2 9.8G 3.6G 5.7G 39% /
/dev/xvda3 2.0G 11M 1.8G 1% /home
/dev/xvda1 976M 168M 741M 19% /boot
...
```

- Note that `/boot` is a separate partition mounted on `/dev/xvda1`.
- The `/boot` partition is always located on a standard partition.
- Placing the `/boot` partition on an LVM volume is not supported.

5. Explore the /boot partition.

- a. Use the `ls` command to view the /boot/grub2 directory.

```
ls /boot/grub2
device.map fonts grub.cfg grubenv i386-pc locale
```

- Note the GRUB 2 configuration file, `grub.cfg`, in this directory.

- b. Use the `less` command to view the GRUB 2 configuration file /boot/grub2/grub.cfg.

- Navigate through the file using the standard “`less`” navigation keys.
  - The `ENTER` key advances one line.
  - The `SPACEBAR` advances one screen.
  - The up and down arrows scroll forward and backward one line at a time.
  - Press “`q`” to exit the `less` command.
- Some things to note about the `grub.cfg` file:
  - Do not edit this file. The file is generated by the `grub2-mkconfig` command using template scripts from the `/etc/grub.d` directory and settings from the `/etc/default/grub` file.
  - Each installed kernel is represented by a `menuentry` stanza along with parameters delimited by `{ }`.
  - Each `menuentry` stanza includes a `linux16` directive that specifies the kernel version to be booted as well as kernel boot parameters.
  - Each `menuentry` stanza includes an `initrd16` directive followed by the path to the `initramfs` image.
  - The kernel given on the `linux16 /vmlinuz-<kernel_version>` line must match the version number of the `initramfs` image given on the `initrd16 /initramfs-<kernel_version>.img` line of each stanza.

```
less /boot/grub2/grub.cfg
#
DO NOT EDIT THIS FILE
#
It is automatically generated by grub2-mkconfig using templ...
from /etc/grub.d and settings from /etc/default/grub
#

BEGIN /etc/grub.d/00_header
...
END /etc/grub.d/00_header

...
BEGIN /etc/grub.d/10_linux
menuentry 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64
with Unbreakable Enterprise Kernel) 7.5'... {
...
```

```

linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64
root=UUID=...
 initrd16 /initramfs-4.1.12-112.16.4.el7uek.x86_64.img
}
menuentry 'Oracle Linux Server (3.10.0-862.el7.x86_64 with
Linux) 7.5'... {
...
 linux16 /vmlinuz-3.10.0-862.el7.x86_64 root=UUID=...
 initrd16 /initramfs-3.10.0-862.el7.x86_64.img
}
menuentry 'Oracle Linux Server (0-rescue-...with Linux) 7.5'...
{
...
 linux16 /vmlinuz-0-rescue-... root=UUID=...
 initrd16 /initramfs-0-rescue-...img
}

END /etc/grub.d/10_linux

BEGIN /etc/grub.d/20_linux_xen

END /etc/grub.d/20_linux_xen

BEGIN /etc/grub.d/20_ppc_terminfo
END /etc/grub.d/20_ppc_terminfo

BEGIN /etc/grub.d/30_os-prober
END /etc/grub.d/30_os-prober

BEGIN /etc/grub.d/40_custom
...
END /etc/grub.d/40_custom

BEGIN /etc/grub.d/41_custom
...
END /etc/grub.d/41_custom

```

- Press “q” to exit the less command.
- Use the grep command to list the bootable kernels in /boot/grub2/grub.cfg.

```
grep '^menuentry' /boot/grub2/grub.cfg
menuentry 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64
with Unbreakable Enterprise Kernel) 7.5' ... {
menuentry 'Oracle Linux Server (3.10.0-862.el7.x86_64 with
Linux) 7.5' ... {
```

```
menuentry 'Oracle Linux Server (0-rescue...with Linux) 7.5' ...
```

- e. Use the `ls` command to view the kernel files.

```
ls /boot/vmlinuz*
/boot/vmlinuz-0-rescue-...
/boot/vmlinuz-3.10.0-862.el7.x86_64
/boot/vmlinuz-4.1.12-112.16.4.el7uek.x86_64
```

- Note that these file names match with entries in the `grub.cfg` file.
- For clarification purposes, the “el” in the file names is not “e” then the number 1, it is “e” then lowercase letter L. The “el” stands for Enterprise Linux.

- f. Use the `ls` command to view the initial RAM disk files.

```
ls /boot/initramfs*
/boot/initramfs-0-rescue-...img
/boot/initramfs-3.10.0-862.el7.x86_64.img
/boot/initramfs-4.1.12-112.16.4.el7uek.x86_64.img
```

- Note that these file names match with entries in the `grub.cfg` file.

## 6. View the kernel boot parameters.

- a. Use the `uname -r` command to determine the loaded kernel version.

```
uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- In this example, UEK (el7uek) is loaded.

- b. Use the `grep` command to view the kernel boot parameters.

- Append the kernel version from the previous command to “`vmlinuz-`” in the `grep` command.

```
grep vmlinuz-4.1.12-112.16.4.el7uek.x86_64
/boot/grub2/grub.cfg

 linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64
root=UUID=... ro rhgb quiet LANG=en_US.UTF-8
```

- Kernel boot parameters are appended to the “`linux16`” entry in `grub.cfg`.
- These parameters are written to the `/proc/cmdline` file and viewable after boot.
- The UUID value differs on your system and, therefore, is not displayed.

- c. Use the `cat` command to view the `/proc/cmdline` file.

```
cat /proc/cmdline
BOOT_IMAGE=/vmlinuz-4.1.12-112.16.4.el7uek.x86_64 root=UUID=...
ro rhgb quiet LANG=en_US.UTF-8
```

- Note that the content is the same as the kernel boot parameters in `grub.cfg`.

## Practice 5-2: Booting Different Kernels

---

### Overview

In this practice, you change the GRUB 2 configuration file to boot different kernels. You repair the initial RAM disk image to fix a boot problem.

### Assumptions

You are the `root` user on the **host03** VM.

### Tasks

1. Boot the Red Hat Compatible Kernel (RHCK).

- a. Use the `uname -r` command to display the current running kernel.

```
uname -r
4.1.12-112-16.4.el7uek.x86_64
```

- The current running kernel is UEK (el7uek).

- b. Use the `grep` command to list the bootable kernels in `/boot/grub2/grub.cfg`.

```
grep '^menuentry' /boot/grub2/grub.cfg
menuentry 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64
with Unbreakable Enterprise Kernel) 7.5' ... {
menuentry 'Oracle Linux Server (3.10.0-862.el7.x86_64 with
Linux) 7.5' ... {
menuentry 'Oracle Linux Server (0-rescue-...with Linux) 7.5' ...
{
```

- Note that UEK is listed first in `grub.cfg`.
  - You want to boot the kernel listed second, which is the RHCK.
- c. Use the `vi` editor to change the `GRUB_DEFAULT` entry in `/etc/default/grub` from `saved` to `1`.
- Use `0` to reference the first kernel entry, use `1` to reference the second kernel entry, and so on.
  - Use the `cp` command to make a backup copy of `/etc/default/grub` before editing.

```
cp /etc/default/grub /etc/default/grub_SAV
vi /etc/default/grub
...
GRUB_DEFAULT=saved (old entry)
GRUB_DEFAULT=1 (new entry)
```

- d. Use the `grub2-mkconfig` command to generate `grub.cfg`.

```
grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
...
done
```

- e. Use the `systemctl reboot` command to reboot your system.

- It might take a couple of minutes to complete the reboot.

```
systemctl reboot
...
```

- After you reboot your system, your VNC session closes.

- f. Connect to **host03** by using VNC.

- 1) Run the `xm vncviewer host03&` command.

```
xm vncviewer host03&
```

- g. Select Oracle Student from the GNOME login window and provide the password.

- h. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.

- i. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- j. Use the `uname -r` command to display the new running kernel.

```
uname -r
3.10.0-862.el7.x86_64
```

- With `GRUB_DEFAULT=1`, the kernel associated with the second menuentry in `grub.cfg` is booted.
- The second bootable kernel is the RHCK (el7).

2. Cause the boot process to fail.

- In this practice, you move the `initramfs` file associated with the RHCK and cause the boot process to fail.
- You then re-create the `initramfs` file by using the `dracut` utility to fix your boot problem.
- The first thing you do is increase the GRUB 2 timeout variable to 20 so that the menu is displayed for a longer period of time.

- a. Use the `vi` editor to change the `GRUB_TIMEOUT` entry in `/etc/default/grub` from 5 to 20.
- The GRUB kernel selection menu is displayed for 20 seconds instead of 5 seconds.

```
vi /etc/default/grub
...
GRUB_TIMEOUT=5 (old entry)
GRUB_TIMEOUT=20 (new entry)
```

- b. Use the `grub2-mkconfig` command to generate `grub.cfg`.

```
grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
...
done
```

- c. Use the `mv` command to move the `initramfs` image for the RHCK to the `root` user's home directory.
- You can use the `~` character to represent the `root` user's home directory.

```
mv /boot/initramfs-3.10.0-862.el7.x86_64.img ~
```

- d. Use the `systemctl reboot` command to reboot your system.

```
systemctl reboot
...
```

- After you reboot your system, your VNC session closes.

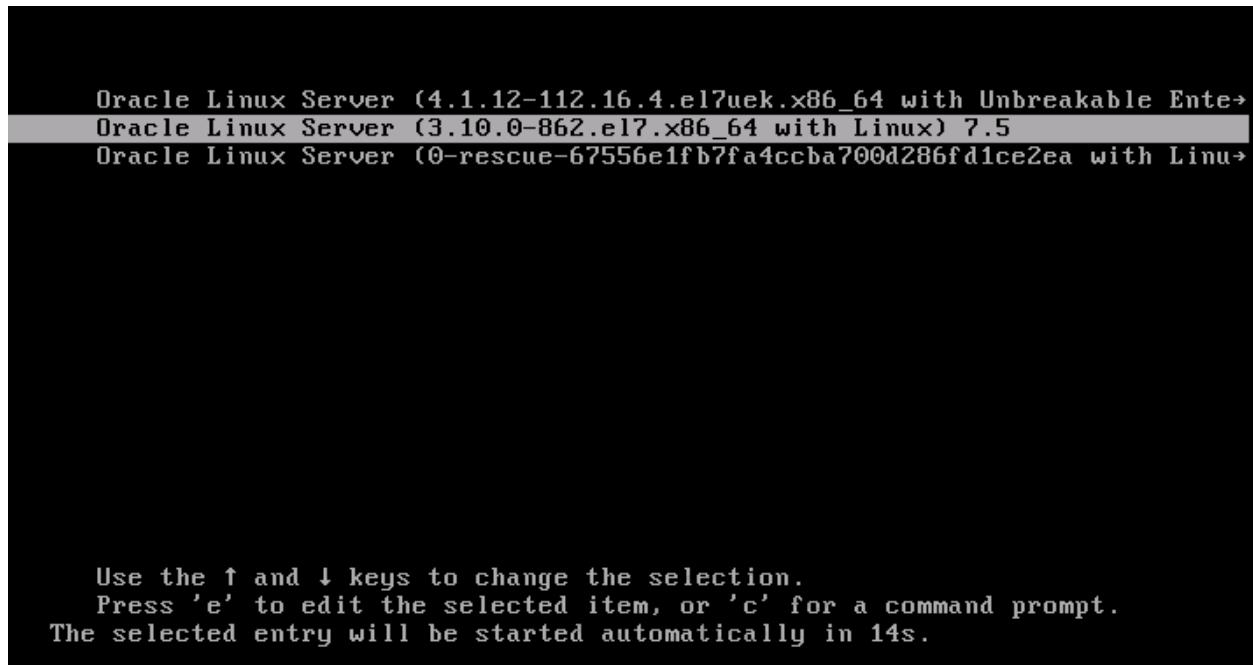
- e. Connect to **host03** by using VNC.

- 1) Run the `xm vncviewer host03&` command.

```
xm vncviewer host03&
```

The GRUB 2 menu appears with the RHCK (3.10.0-862.el7.x86\_64) selected by default.

- Either press **Enter** to select the RHCK or wait for the remainder of the 20 second timeout period to expire. The RHCK is automatically selected after 20 seconds.



Because the `initramfs` disk image for the RHCK is missing, the system fails to boot the RHCK. The following message appears:

```
error: file '/initramfs-3.10.0-862.el7.x86_64.img' not found.
Press any key to continue...
```

Whether you press any key or take no action here, after a brief period, diagnostic messages briefly appear. Then the terminal window closes and **host03** is automatically shut down.

- Boot the rescue kernel and repair an initial RAM disk image.

- As root on **dom0**, use the `cd` command to change to the `/OVS/running_pool/host03` directory.

```
cd /OVS/running_pool/host03
```

- Use the `xm create` command to create the **host03** VM.

```
xm create vm.cfg
Using config file "./vm.cfg"
Started domain host03 (id=...)
```

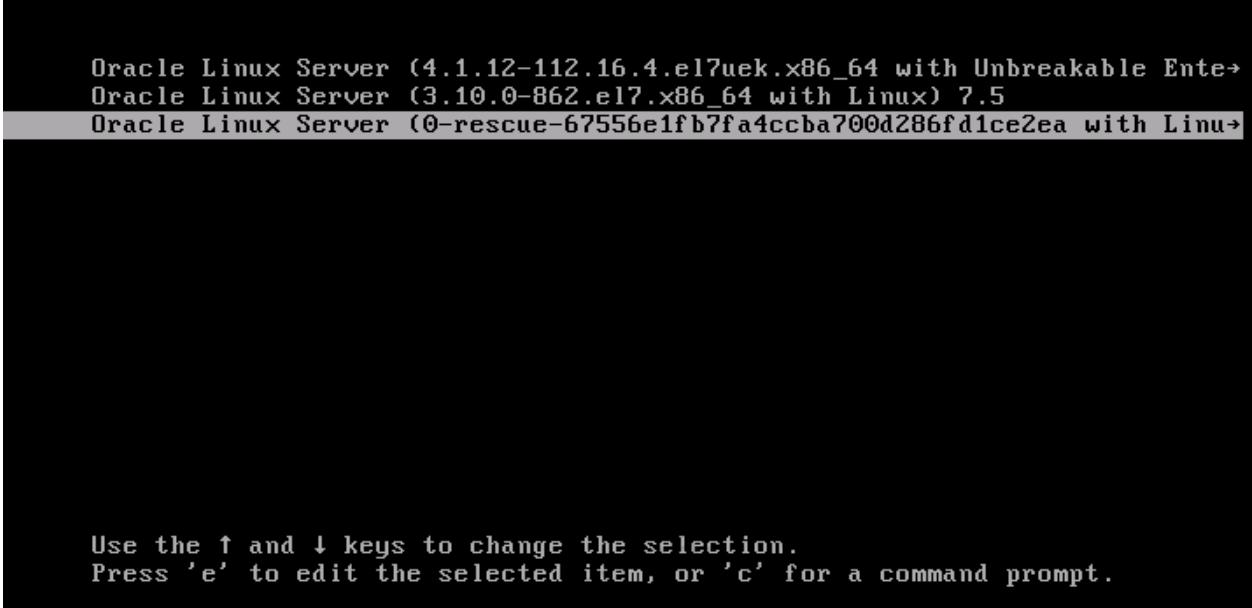
- Connect to **host03** by using VNC.

- Run the `xm vncviewer host03&` command.

```
xm vncviewer host03&
```

The GRUB 2 menu appears with the RHCK (3.10.0-862.el7.x86\_64) selected by default.

- d. Use the down arrow to highlight the rescue kernel as shown. Press **Enter** to select the rescue kernel.
- It might take a couple of minutes to complete the boot process.



```
Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64 with Unbreakable Ente→
Oracle Linux Server (3.10.0-862.el7.x86_64 with Linux) 7.5
Oracle Linux Server (0-rescue-67556e1fb7fa4ccba700d286fd1ce2ea with Linu→

Use the ↑ and ↓ keys to change the selection.
Press 'e' to edit the selected item, or 'c' for a command prompt.
```

- e. Select Oracle Student from the GNOME login window and provide the password.
- f. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.
- g. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- h. Use the `uname -r` command to display the new running kernel.

```
uname -r
3.10.0-862.el7.x86_64
```

- Note the rescue kernel boots the RHCK with a known good initramfs.
- i. Use the `ls` command to view the initial RAM disk files.

```
ls /boot/initramfs*
initramfs-0-rescue-...img
initramfs-4.1.12-112.16.4.el7uek.x86_64.img
```

- Note that the `initramfs-3.10.0-862.el7.x86_64.img` file for the RHCK is missing.
- j. Use the `cd` command to change to the `/boot` directory.
- The `/boot` directory is where you want to create the `initramfs` file.

```
cd /boot
```

- k. Use the `dracut` utility to create the `initramfs-3.10.0-862.el7.x86_64.img` file.
- The first parameter is the desired file name, `initramfs-3.10.0-862.el7.x86_64`.
  - The second parameter is the kernel version, `3.10.0-862.el7.x86_64`. This is necessary if a kernel version different from the currently booted kernel must be created. By default, `dracut` creates `initramfs` images using the currently booted kernel version, which is true here.
  - This command takes a few seconds to complete.
  - For clarification purposes, the “`e1`” in the file name is not “`e`” then the number `1`, it is “`e`” then lowercase letter `l`. The “`e1`” stands for Enterprise Linux.

```
dracut initramfs-3.10.0-862.el7.x86_64.img 3.10.0-862.el7.x86_64
```

- l. Use the `ls` command to view the initial RAM disk files.

```
ls /boot/initramfs*
initramfs-0-rescue-...img
initramfs-3.10.0-862.el7.x86_64.img
initramfs-4.1.12-112.16.4.el7uek.x86_64.img
```

- Note that the `initramfs-3.10.0-862.el7.x86_64.img` file now exists.
- m. Use the `lsinitrd` command to view the contents of the image created by `dracut`.

- You can pipe the output of the command to `less` to view one screen at a time.

```
lsinitrd initramfs-3.10.0-862.el7.x86_64.img | less
...
```

- n. Use the `systemctl reboot` command to reboot your system.

- It might take a couple of minutes to complete the reboot.

```
systemctl reboot
...
```

- After you reboot your system, your VNC session closes.

- o. Connect to **host03** by using VNC.

- 1) Run the `xm vncviewer host03&` command.

```
xm vncviewer host03&
```

The GRUB 2 menu appears with the RHCK (`3.10.0-862.el7.x86_64`) selected by default.

- p. Either press **Enter** to select the RHCK or wait for the remainder of the 20 second timeout period to expire. The RHCK is automatically selected after 20 seconds.

```
Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64 with Unbreakable Ente→
Oracle Linux Server (3.10.0-862.el7.x86_64 with Linux) 7.5
Oracle Linux Server (0-rescue-67556e1fb7fa4ccba700d286fd1ce2ea with Linu→

Use the ↑ and ↓ keys to change the selection.
Press 'e' to edit the selected item, or 'c' for a command prompt.
The selected entry will be started automatically in 16s.
```

- q. Select Oracle Student from the GNOME login window and provide the password.  
r. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.  
s. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- t. Use the `uname -r` command to display the new running kernel.

```
uname -r
3.10.0-862.el7.x86_64
```

- Note that the RHCK boots successfully.

4. Boot UEK.

- a. Use the `cp` command to restore `grub.cfg` from the backup copy, `grub_SAV`.

```
cp /etc/default/grub_SAV /etc/default/grub
cp: overwrite '/etc/default/grub'? y
```

- b. Recall that the GRUB\_DEFAULT directive in the original /etc/default/grub file is set to saved. Verify this by using the grep command to view this directive.

```
grep saved /etc/default/grub
GRUB_DEFAULT=saved
```

- c. With a setting of saved (which is the default), GRUB 2 determines the correct kernel to load from the value of the saved\_entry directive in /boot/grub2/grubenv, which is the GRUB 2 environment file. Use the grub2-editenv list command to view the value of the saved\_entry directive.

```
grub2-editenv list
saved_entry=Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64
with Unbreakable Enterprise Kernel) 7.5
```

- d. The default value of saved\_entry is obtained from the UPDATEDefault and DEFAULTKERNEL directives in /etc/sysconfig/kernel. Use the cat command to view these settings.

```
cat /etc/sysconfig/kernel
UPDATEDefault specifies if new-kernel-pkg should make
new kernels the default
UPDATEDefault=yes

DEFAULTKERNEL specifies the default kernel package type
DEFAULTKERNEL=kernel-uek
```

- Note that the DEFAULTKERNEL directive is set to kernel-uek. In this case, the most recently installed UEK is the default.
- e. Use the grep command to review the bootable kernels in /boot/grub2/grub.cfg.

```
grep '^menuentry' /boot/grub2/grub.cfg
menuentry 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64
with Unbreakable Enterprise Kernel) 7.5' ... {
menuentry 'Oracle Linux Server (3.10.0-862.el7.x86_64 with
Linux) 7.5' ... {
menuentry 'Oracle Linux Server (0-rescue-...with Linux) 7.5' ...
{
```

- Note that the first entry matches with the value of saved\_entry, seen above: 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86\_64 with Unbreakable Enterprise Kernel) 7.5'. This is UEK.
- The value of saved for the GRUB\_DEFAULT directive is /etc/default/grub, and, therefore, will cause GRUB 2 to load UEK, as specified in /boot/grub2/grub.cfg.

- f. Use the `grub2-mkconfig` command to generate `grub.cfg` using the original `/etc/default/grub` file just restored.

```
grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
...
done
```

- g. Use the `systemctl reboot` command to reboot your system.

- It might take a couple of minutes to complete the reboot.

```
systemctl reboot
...
```

- After you reboot your system, your VNC session closes.

- h. Connect to **host03** by using VNC.

- 1) Run the `xm vncviewer host03&` command from **dom0**.

```
xm vncviewer host03&
```

- i. Select Oracle Student from the GNOME login window and provide the password.

- j. Right-click the GNOME desktop and open a terminal window.

- k. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- l. Use the `uname -r` command to ensure that you are running UEK.

```
uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- Notice that UEK (el7uek) is now loaded.

## Practice 5-3: Using the GRUB 2 Menu

---

### Overview

In this practice, you access the GRUB 2 menu and modify the kernel boot parameter to boot into rescue (single-user) mode. You also change into rescue mode from the command line.

### Assumptions

You are the `root` user on the **host03** VM.

### Tasks

1. Display the default system-state target.

- a. Use the `systemctl get-default` command to view the default system-state target.

```
systemctl get-default
graphical.target
```

- The `graphical.target` unit corresponds to run level 5 on a SysV init system.

- b. Use the `runlevel` command to display the current run level.

```
runlevel
N 5
```

- The `runlevel` command still exists in Oracle Linux 7 but is included only for compatibility reasons.

2. Increase the time for which the boot menu is displayed.

- a. Use the `vi` editor to change the `GRUB_TIMEOUT` entry in `/etc/default/grub` from 5 to 60.

- This change causes the boot menu to display for 60 seconds before booting the default menuentry.

```
vi /etc/default/grub
...
GRUB_TIMEOUT=5 (old entry)
GRUB_TIMEOUT=60 (new entry)
```

- b. Use the `grub2-mkconfig` command to generate `grub.cfg`.

- Remember that any time a change is made to `/etc/default/grub`, you need to re-generate the `grub.cfg` file.

```
grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
...
done
```

3. Reboot your system and display the GRUB 2 menu.

- a. Reboot your VM by using the `systemctl reboot` command.

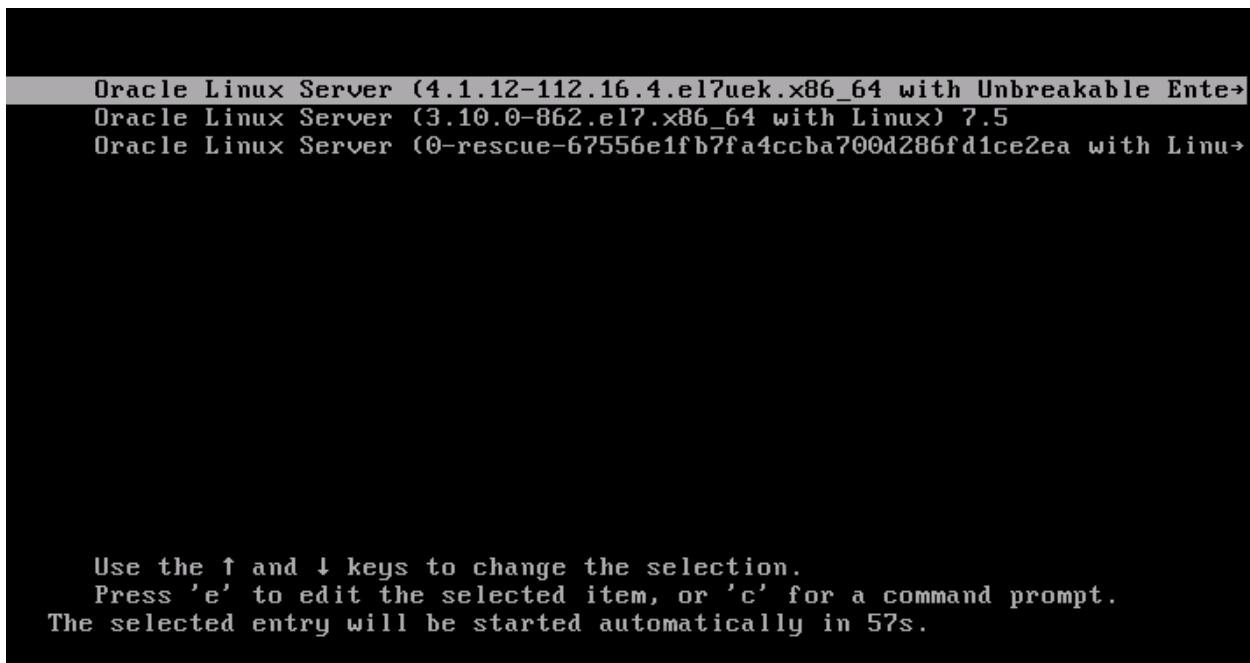
```
systemctl reboot
```

- After you reboot your system, your VNC session closes.

- b. Run the `xm vncviewer host03&` command from **dom0**.

```
xm vncviewer host03&
```

After a few seconds, the GRUB 2 menu appears as shown:



- Each entry in the GRUB 2 menu is associated with a `menuentry` entry in the `grub.cfg` file.
4. Edit a bootable kernel entry to boot into rescue mode.
- Rescue mode is the same as single-user mode.
  - a. Use the up and down arrow keys if necessary to highlight the Unbreakable Enterprise Kernel (UEK) entry.

- b. Press the **e** key to edit the entry.

- The code associated with UEK from `grub.cfg` is displayed as shown:

```
setparams 'Oracle Linux Server (4.1.12-112.16.4.el7uek.x86_64 with Unbreakable
Enterprise Kernel) 7.5'

load_video
set gfxpayload=keep
insmod gzio
insmod part_msdos
insmod ext2
set root='hd0,msdos1'
if [x$feature_platform_search_hint = xy]; then
 search --no-floppy --fs-uuid --set=root --hint='hd0,msdos1' 9b0dc08\
5-a263-41f0-98fb-f368987f4feb
else
 search --no-floppy --fs-uuid --set=root 9b0dc085-a263-41f0-98fb-f368\
987f4feb
Press Ctrl-x to start, Ctrl-c for a command prompt or Escape to
discard edits and return to the menu. Pressing Tab lists
possible completions.
```

- c. Use the arrow keys to position your cursor at the end of the `linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64` line as shown:

```
linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64 root=UUID=274e601a-635a\
-4253-839c-2747d2be1b4b ro rhgb quiet
initrd16 /initramfs-4.1.12-112.16.4.el7uek.x86_64.img
```

Note these shortcuts: Ctrl + a (or the Home key can be tried) takes you to the beginning of the line; Ctrl + e (or the End key can be tried) to the end of the line.

The following table lists the options for booting to a specific `systemd` system-state target.

- The numeric options are for legacy purposes.

| Option                                                                       | Description                                                                                                                                                    |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0,1,2,3,4,5,6 or<br><code>systemd.unit=runlevelN.target</code>               | Specifies the nearest <code>systemd</code> -equivalent system-state target to an Oracle Linux 6 run level. <i>N</i> can take an integer value between 0 and 6. |
| 1,s,S,single or<br><code>systemd.unit=rescue.target</code>                   | Specifies the rescue shell. The system boots to single-user mode and prompts for the <code>root</code> password.                                               |
| 2,3,4 or <code>systemd.unit=multi-user.target</code>                         | Specifies the <code>systemd</code> target for multi-user, nongraphical login                                                                                   |
| 5 or <code>systemd.unit=graphical.target</code>                              | Specifies the <code>systemd</code> target for multi-user, graphical login                                                                                      |
| <code>-b, emergency, or</code><br><code>systemd.unit=emergency.target</code> | Specifies emergency mode. The <code>root</code> password is required.                                                                                          |

- d. At the end of the `linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64` line, append a kernel boot parameter to specify the rescue shell. The following example appends the word `single`, but you could also use `1`, `s`, `S`, or `system.unit=rescue.target`.

```
linux16 /vmlinuz-4.1.12-112.16.4.el7uek.x86_64 root=UUID=274e601a-635a\-
-4253-839c-2747d2be1b4b ro rhgb quiet single_
initrd16 /initramfs-4.1.12-112.16.4.el7uek.x86_64.img
```

- e. Press `Ctrl + x` to accept your change and continue the boot process.

- It might take a couple of minutes to complete the reboot.
- The boot process proceeds until the following “Welcome” screen appears:

```
[OK] Reached target Swap.
[OK] Found device /dev/disk/by-uuid/9b0dc085-a263-41f0-98fb-f368987f4feb.
[OK] Started udev Wait for Complete Device Initialization.
[OK] Found device /dev/disk/by-uuid/dd8dcabe-19cd-4820-884a-a9dea9b0bd38.
 Starting Activation of DM RAID sets...
[OK] Started Activation of DM RAID sets.
[OK] Reached target Local Encrypted Volumes.
[OK] Started Monitoring of LVM mirrors, snapshots etc. using dmeventd or progress polling.
[OK] Reached target Local File Systems (Pre).
 Starting File System Check on /dev/disk/by-uuid/9b0dc085-a263-41f0-98fb-f368987f4feb...
 Starting File System Check on /dev/disk/by-uuid/dd8dcabe-19cd-4820-884a-a9dea9b0bd38...
[10.783598] systemd-fsck[489]: /dev/xvda3: clean, 163/131072 files, 27306/524288 blocks
[OK] Started File System Check on /dev/disk/by-uuid/dd8dcabe-19cd-4820-884a-a9dea9b0bd38.
[10.792751] systemd-fsck[488]: /dev/xvda1: clean, 338/65536 files, 55237/262144 blocks
 Mounting /home...
[OK] Started File System Check on /dev/disk/by-uuid/9b0dc085-a263-41f0-98fb-f368987f4feb.
 Mounting /boot...
[OK] Mounted /boot.
[OK] Mounted /home.
[OK] Reached target Local File Systems.
 Starting Tell Plymouth To Write Out Runtime Data...
 Starting Import network configuration from initramfs...
[OK] Started Tell Plymouth To Write Out Runtime Data.
[OK] Started Import network configuration from initramfs.
 Starting Create Volatile Files and Directories...
[OK] Started Create Volatile Files and Directories.
 Starting Update UTMP about System Boot/Shutdown...
[OK] Started Update UTMP about System Boot/Shutdown.
[OK] Reached target System Initialization.
[OK] Started Rescue Shell.
 Starting Rescue Shell...
[OK] Reached target Rescue Mode.
 Starting Update UTMP about System Runlevel Changes...
[OK] Started Update UTMP about System Runlevel Changes.
Welcome to emergency mode! After logging in, type "journalctl -xb" to view
system logs, "systemctl reboot" to reboot, "systemctl default" or ^D to
boot into default mode.
Give root password for maintenance
(or type Control-D to continue): _
```

- Note the different options available for you to enter from rescue mode:
  - `journalctl -xb`
  - `systemctl reboot`
  - `systemctl default`
  - `Ctrl + D (^D)`

- f. Enter the `root` password for maintenance.

```
Give root password for maintenance
(or type Control-D to continue):
```

- g. Use the `runlevel` command to display the current run level.

```
runlevel
N 1
```

- Note that you are in single-user mode (run level is 1).

- h. Use the `systemctl status network` command to check if the network service is enabled.

```
systemctl status network
Network.service - LSB: Bring up/down networking
 Loaded: loaded (/etc/rc.d/init.d/network; bad; vendor preset;
disabled)
 Active: inactive (dead)
 Docs: man:systemd-sysv-generator(8)
```

- Note that the network service is loaded but is not started – inactive (dead) – in rescue mode.

- i. Use the `systemctl get-default` command to view the default system-state target.

```
systemctl get-default
graphical.target
```

- Note that the default system-state target remains set to `graphical.target`, even though you are in rescue (single-user) mode.

5. Bring the system from rescue mode to the default system-state target.

- Press `Ctrl + d` to exit rescue mode and continue the boot process.
- Select Oracle Student from the GNOME login window and provide the password.
- Right-click the GNOME desktop and open a terminal window.
- In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- e. Use the `runlevel` command to display the current run level.

```
runlevel
1 5
```

- Note that you are at run level 5, which corresponds to the system `graphical.target` target unit.

6. Enter rescue mode from the shell.

- You can enter rescue mode after you are logged in.
- a. Use the `systemctl rescue` command to enter rescue mode.
  - This command sends a message to all users currently logged on that the system is going down.

```
systemctl rescue
```

- The following screen appears almost immediately:

```
Welcome to emergency mode! After logging in, type "journalctl -xb" to view
system logs, "systemctl reboot" to reboot, "systemctl default" or ^D to
boot into default mode.

Give root password for maintenance
(or type Control-D to continue): _
```

- b. Press **Ctrl + d** to exit rescue mode and continue the boot process.
- c. Select Oracle Student from the GNOME login window and provide the password.
- d. Right-click the GNOME desktop and open a terminal window.
- e. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
```

```
Password:
```

```
#
```

7. Revert changes and reboot.

- a. Use the `cp` command to restore `grub.cfg` from the backup copy `grub_SAV`.

```
cp /etc/default/grub_SAV /etc/default/grub
cp: overwrite '/etc/default/grub'? y
```

- b. Use the `grub2-mkconfig` command to generate `grub.cfg`.

```
grub2-mkconfig -o /boot/grub2/grub.cfg
Generating grub configuration file ...
...
done
```

- c. Remove the `grub_SAV` file.

```
rm /etc/default/grub_SAV
rm: remove regular file '/etc/default/grub_SAV'? y
```

- d. Remove the `initramfs-3.10.0-862.el7.x86_64.img` file from the `root` user's home directory. (**Caution:** Do not remove this file from the `/boot` directory.)

```
rm ~/initramfs-3.10.0-862.el7.x86_64.img
rm: remove regular file '/root/initramfs-3.10.0-
862.el7.x86_64.img'? y
```

- e. Use the `systemctl reboot` command to reboot your system.

- It might take a couple of minutes to complete the reboot.

```
systemctl reboot
...
```

- After you reboot your system, your VNC session closes.

- f. Connect to **host03** by using VNC.

- 1) Run the `xm vncviewer host03&` command from **dom0**.

```
xm vncviewer host03&
```

- g. Select Oracle Student from the GNOME login window and provide the password.

- h. Right-click the GNOME desktop and open a terminal window.

- i. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

## Practice 5-4: Exploring `systemd` Units

### Overview

In this practice, you view `systemd` units. In most cases, partial output is shown and your output can vary. Where needed, scroll through the output using navigation keys such as Page Up and Page Down. Also where needed, enter "q" to terminate output and return to the prompt.

### Assumptions

You are the `root` user on the **host03** VM.

### Tasks

1. Explore all `systemd` unit files.

Run the `systemctl list-unit-files` command to list all installed unit files.

```
systemctl list-unit-files
UNIT FILE STATE
proc-sys-fs-binfmt_misc.automount static
dev-hugepages.mount static
dev-mqueue.mount static
proc-fs-nfsd.mount static
...
brandbot.path enabled
cups.path enabled
...
abrt-ccpp.service enabled
abrt-oops.service enabled
...
machine.slice static
system.slice static
...
avahi-daemon.socket enabled
cups.socket enabled
...
anaconda.target static
basic.target static
...
systemd-readahead-done.timer indirect
...
```

The output is a selection of the different types of `systemd` units:

- `automount`: Provide automount capabilities for on-demand mounting of file systems as well as parallelized boot-up
- `mount`: Mount units control mount points in the file system

- path: Can activate services when file system path information changes
  - scope: Similar to service units but manage foreign processes instead of starting them as well
  - service: Start and control daemons and the processes they consist of
  - slice: Use to group units that manage system processes, such as service units and scope units, in a hierarchical tree for resource management purposes
  - socket: Encapsulate local interprocess communication (IPC) or network sockets in the system, which are useful for socket-based activation
  - target: Use to group units or to provide well-known synchronization points during boot-up
  - timer: Use to trigger activation of other units based on timers
  - device: Expose kernel devices in `systemd` and can also be used to implement device-based activation
  - snapshot: Can be used to temporarily save the state of the set of `systemd` units, which can later be restored by activating the saved snapshot unit
  - swap: Encapsulate memory swap partitions or swap files
2. Explore automount units.

- a. Use the `systemctl list-units --type automount` command to list the currently active automount units on your system.

```
systemctl list-units --type automount
UNIT LOAD ACTIVE SUB DESCRIPTION
proc-sys-... loaded active waiting Arbitrary Executab...
...
LOAD = Reflects whether the unit definition was properly ...
ACTIVE = The high-level unit activation state, i.e. general...
SUB = The low-level unit activation state, values depend ...

1 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the `--all` option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type automount --all
...
1 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

3. Explore mount units.

- a. Use the `systemctl list-units --type mount` command to list the currently active mount units on your system.

```
systemctl list-units --type mount
UNIT LOAD ACTIVE SUB DESCRIPTION
-.mount loaded active mounted /
```

```
boot.mount loaded active mounted /boot
dev-hugepages.mount loaded active mounted Huge Pages File ...
...
```

**14 loaded units listed.** Pass --all to see loaded but inactive...  
To show all installed unit files use 'systemctl list-unit-files'

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type mount --all
...
16 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

#### 4. Explore scope units.

- a. Use the systemctl list-units --type scope command to list the currently active scope units on your system.

```
systemctl list-units --type scope
UNIT LOAD ACTIVE SUB DESCRIPTION
session-1.scope loaded active running Session 1 of user ...
...
1 loaded units listed. Pass --all to see loaded but inactive...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type scope --all
...
1 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

#### 5. Explore slice units.

- a. Use the systemctl list-units --type slice command to list the currently active slice units on your system.

```
systemctl list-units --type slice
UNIT LOAD ACTIVE SUB DESCRIPTION
-.slice loaded active active Root Slice
system-getty.slice loaded active active system-getty.slice
...
9 loaded units listed. Pass --all to see loaded but inactive...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type slice --all
...
10 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

6. Explore socket units.

- a. Use the `systemctl list-units --type socket` command to list the currently active socket units on your system.

```
systemctl list-units --type socket
UNIT LOAD ACTIVE SUB DESCRIPTION
avahi-daemon.socket loaded active running Avahi mDNS...
cups.socket loaded active running CUPS Printing ...
...
16 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type socket --all
...
18 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

7. Explore timer units.

- a. Use the `systemctl list-units --type timer` command to list the currently active timer units on your system.

```
systemctl list-units --type timer
UNIT LOAD ACTIVE SUB DESCRIPTION
systemd-tmpfiles... loaded active waiting Daily Cleanup ...
...
1 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type timer --all
...
2 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

8. Explore device units.

- a. Use the `systemctl list-units --type device` command to list the currently active device units on your system.

```
systemctl list-units --type device
UNIT LOAD ACTIVE SUB DESCRIPTION
...
sys-devices...block... loaded active plugged /sys/devices/...
...

23 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the `--all` option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type device --all
...
51 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

## 9. Explore snapshot units.

- a. Use the `systemctl list-units --type snapshot` command to list the currently active snapshot units on your system.

```
systemctl list-units --type snapshot
0 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the `--all` option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type snapshot --all
0 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

## 10. Explore swap units.

- a. Use the `systemctl list-units --type swap` command to list the currently active swap units on your system.

```
systemctl list-units --type swap
UNIT LOAD ACTIVE SUB DESCRIPTION
dev-disk-by\...swap loaded active active /dev/disk/by-uuid...

1 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive, if any.

```
systemctl list-units --type swap --all
...
2 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

## Practice 5-5: Working with `systemd` Target and Service Units

### Overview

In this practice, you view target units, view the default target unit, change the default target unit, view service units, and configure a service to start and stop at a specific target state.

In some tasks, partial output is shown and your output can or will differ in some cases. Where needed, scroll through the output using navigation keys such as Page Up and Page Down. Also where needed, enter "q" to terminate output and return to the prompt.

### Assumptions

You are the `root` user on the **host03** VM.

### Tasks

1. Explore target units.
  - a. Use the `systemctl list-units --type target` command to list the currently active targets on a system.

```
systemctl list-units --type target
UNIT LOAD ACTIVE SUB DESCRIPTION
basic.target loaded active active Basic System
cryptsetup.target loaded active active Local Encrypted Volumes
getty-pre.target loaded active active Login Prompts (Pre)
getty.target loaded active active Login Prompts
graphical.target loaded active active Graphical Interface
local-fs-pre.target loaded active active Local File Systems ...
local-fs.target loaded active active Local File Systems
multi-user.target loaded active active Multi-User System
...
network.target loaded active active Network
nfs-client.target loaded active active NFS client services
nss-user...target loaded active active User and Group Name ...
...
slices.target loaded active active Slices
sockets.target loaded active active Sockets
swap.target loaded active active Swap
sysinit.target loaded active active System Initialization
timer.target loaded active active Timers

LOAD = Reflects whether the unit definition was properly ...
ACTIVE = The high-level unit activation state, i.e. general...
SUB = The low-level unit activation state, values depend ...
```

```
20 loaded units listed. Pass --all to see loaded but inactive...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the --all option to see all loaded units, including those that are inactive.

```
systemctl list-units --type target --all
...
28 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

2. View and change the default target unit.

- a. Use the `systemctl get-default` command to view which target unit is used by default.

```
systemctl get-default
graphical.target
```

- The default target unit is represented by the `/etc/systemd/system/default.target` file.

- b. Use the `ls -l` command to list information about the `/etc/systemd/system/default.target` file.

```
ls -l /etc/systemd/system/default.target
lrwxrwxrwx ... /etc/systemd/system/default.target ->
/lib/systemd/system/graphical.target
```

- Note that the `default.target` file is a symbolic link to the current default target unit file, `graphical.target`.

- c. Use the `runlevel` command to view the SysV runlevel.

```
runlevel
N 5
```

- The `graphical.target` unit corresponds to runlevel 5 on a SysV init system.

- d. Use the `systemctl set-default` command to change the default target unit to the `multi-user.target` unit.

```
systemctl set-default multi-user.target
Removed symlink /etc/systemd/system/default.target.
Created symlink from /etc/systemd/system/default.target to
/usr/lib/systemd/system/multi-user.target.
```

- Note that changing the default target unit removes the existing `default.target` symbolic link and re-creates the symbolic link, which points to the new default target unit file.

- e. Use the `ls -l` command to confirm that the `default.target` file is now a symbolic link to the `multi-user.target` file.

```
ls -l /etc/systemd/system/default.target
lrwxrwxrwx ... /etc/systemd/system/default.target ->
/usr/lib/systemd/system/multi-user.target
```

- The `systemctl set-default` command does not change the state of the system.

f. Use the `runlevel` command to verify that the state of the system has not changed.

```
runlevel
N 5
```

g. Use the `systemctl isolate` command to change the currently active system target to `multi-user.target`.

```
systemctl isolate multi-user.target
```

The GNOME desktop is closed and you now have a login prompt. The `multi-user.target` does not start the X Window services.

```
Oracle Linux Server 7.5
Kernel 4.1.12-112.16.4.el7uek.x86_64 on an x86_64
host03 login:
```

h. Log in as the `root` user. Provide the `root` password when prompted.

```
host03 login: root
Password:
```

i. Use the `systemctl get-default` command to view the default target unit.

```
systemctl get-default
multi-user.target
```

j. Use the `runlevel` command to view the SysV runlevel.

```
runlevel
5 3
```

- Note that the runlevel changed from 5 to 3.
- The `multi-user.target` unit corresponds to runlevel 3 on a SysV init system.

k. Use the `systemctl isolate` command to change the currently active system target back to `graphical.target`.

```
systemctl isolate graphical.target
```

- Note that the GNOME desktop login window appears.

l. Select Oracle Student from the GNOME login window; enter the password.

m. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.

n. In the terminal window, become the `root` user by entering the `su -` command followed by the `root` password.

```
$ su -
Password:
#
```

- o. Use the `systemctl get-default` command to view the default target unit.

```
systemctl get-default
multi-user.target
```

- Note that the default target unit is still `multi-user.target`.
- Running the `systemctl isolate` command does not change the default, but does change the state of the system.

- p. Use the `runlevel` command to view the SysV run level.

```
runlevel
3 5
```

- Notice the run level changed from 3 to 5.
- If you reboot your system, it boots to SysV run level 3 because the default target unit is `multi-user.target`.

- q. Use the `systemctl set-default` command to change the default target unit to the `graphical.target` unit.

```
systemctl set-default graphical.target
Removed symlink /etc/systemd/system/default.target.
Created symlink from /etc/systemd/system/default.target to
/usr/lib/systemd/system/graphical.target.
```

### 3. Explore service units.

- a. Use the `systemctl list-units --type service` command to list the currently active services on a system.

```
systemctl list-units --type service
UNIT LOAD ACTIVE SUB DESCRIPTION
abrt-ccpp.service loaded active exited Install ABRT core...
abrt-oops.service loaded active running ABRT kernel log ...
...
LOAD = Reflects whether the unit definition was properly ...
ACTIVE = The high-level unit activation state, i.e. general...
SUB = The low-level unit activation state, values depend ...

64 loaded units listed. Pass --all to see loaded but inactiv...
To show all installed unit files use 'systemctl list-unit-files'
```

- b. Run the same command again, but include the `--all` option to see all loaded units, including those that are inactive.

```
systemctl list-units --type service --all
...
160 loaded units listed.
To show all installed unit files use 'systemctl list-unit-files'
```

- c. Use the `systemctl status` command to view detailed information about the `atd.service` unit.

- You can omit the `.service` extension.

```
systemctl status atd
● atd.service - Job spooling tools
 Loaded: loaded (/usr/lib/systemd/system/atd.service; enabled;
 vendor preset: enabled)
 Active: active (running) since <date_time; time> ago
 Main PID: 2880 (atd)
 CGroup: /system.slice/atd.service
 └─2880 /usr/sbin/atd -f

<date_time> host03.example.com systemd[1]: Started Job spooling
tools.
<date_time> host03.example.com systemd[1]: Starting Job spooling
tools...
```

- In this example, the `atd` service is loaded and running.

- The most recent log entries are displayed at the end of the output.

- d. Use the `systemctl is-active` command to check if the `iscsid` service is running (active) or not running (inactive).

```
systemctl is-active iscsid
inactive
```

- e. Use the `systemctl is-enabled` command to check if the `iscsid` service is enabled or disabled.

```
systemctl is-enabled iscsid
disabled
```

- f. Use the `systemctl status` command to view detailed information about the `iscsid` service.

```
systemctl status iscsid
● iscsid.service - Open-iSCSI
 Loaded: loaded (/usr/lib/systemd/system/iscsid.service; disabled;
 vendor preset: disabled)
 Active: inactive (dead)
 Docs: man:iscsid(8)
 man:iscsiadm(8)
```

- This confirms that the `iscsid` service is not running (inactive) and is disabled.
- The output of this command also includes references to man pages for `iscsid` and `iscsiadm`.

4. Start, stop, enable, and disable a service.

- a. Use the `systemctl start` command to start the `iscsid` service.

```
systemctl start iscsid
```

- b. Use the `systemctl status` command to view detailed information about the `iscsid` service.

```
systemctl status iscsid
● iscsid.service - Open-iSCSI
 Loaded: loaded (/usr/lib/systemd/system/iscsid.service; disabled; vendor preset: disabled)
 Active: active (running) since <date_time; time> ago
 Docs: man:iscsid(8)
 man:iscsiadm(8)
 Process: 2718 ExecStart=/usr/sbin/iscsid (code=exited, status=0/SUCCESS)
 Main PID: 2721 (iscsid)
 CGroup: /system.slice/iscsid.service
 └─2720 /usr/sbin/iscsid
 ├─2721 /usr/sbin/iscsid

<date_time> host03.example.com systemd[1]: Starting Open-iSCSI...
<date_time> host03.example.com iscsid[2720]: iSCSI daemon with pid=2721 ...
<date_time> host03.example.com systemd[1]: Failed to read PID from file ...
<date_time> host03.example.com systemd[1]: Started Open-iSCSI.
Hint: Some lines were ellipsized, use -l to show in full.
```

- Notice the `iscsid` service is active (running) but is still disabled.
- This means that the `iscsid` service does not automatically start on a system reboot.

- c. Use the `systemctl enable` command to enable the `iscsid` service.

```
systemctl enable iscsid
Created symlink from /etc/systemd/system/multi-user.target.wants/iscsid.service to
/usr/lib/systemd/system/iscsid.service.
```

- Notice that the `systemctl enable` command enables a service by creating a symbolic link for the lowest-level system-state target at which the service starts.
- In this example, the command creates the symbolic link `iscsid.service` for the `multi-user` target.

- d. Use the `systemctl status` command to view detailed information about the `iscsid` service.

```
systemctl status iscsid
● iscsid.service - Open-iSCSI
 Loaded: loaded (/usr/lib/systemd/system/iscsid.service; enabled; vendor preset: disabled)
 Active: active (running) since <date_time; time> ago
```

```

Docs: man:iscsid(8)
 man:iscsiadm(8)

Main PID: 2721 (iscsid)
 CGroup: /system.slice/iscsid.service
 ├─2720 /usr/sbin/iscsid
 └─2721 /usr/sbin/iscsid

<date_time> host03.example.com systemd[1]: Starting Open-iSCSI...
<date_time> host03.example.com iscsid[2720]: iSCSI daemon with pid=2721 ...
<date_time> host03.example.com systemd[1]: Failed to read PID from file ...
<date_time> host03.example.com systemd[1]: Started Open-iSCSI.
Hint: Some lines were ellipsized, use -l to show in full.

```

- Note that the `iscsid` service is enabled.
- e. Use the `ls -l` command to view the contents of the `/etc/systemd/system/multi-user.target.wants` directory.
- Pipe the output of the command to `less` to view one screen at a time.

```
ls -l /etc/systemd/system/multi-user.target.wants | less
lrwxrwxrwx ... abrt-ccpp.service ->
/usr/lib/systemd/system/abrt-ccpp.service
lrwxrwxrwx ... abrtd.service ->
/usr/lib/systemd/system/abrtd.service
...
lrwxrwxrwx ... iscsid.service ->
/usr/lib/systemd/system/iscsid.service
...
```

- Notice the symbolic link `iscsid.service` file in this directory.
  - With the service enabled, the service starts on a system reboot.
- f. Use the `systemctl disable` command to disable the `iscsid` service.

```
systemctl disable iscsid
Removed symlink /etc/systemd/system/multi-
user.target.wants/iscsid.service.
```

- Notice that the `systemctl disable` command deletes the symbolic link for the service.
- g. Use the `systemctl stop` command to stop the `iscsid` service.

```
systemctl stop iscsid
```

- h. Use the `systemctl status` command to view detailed information about the `iscsid` service.

```
systemctl status iscsid
● iscsid.service - Open-iSCSI
```

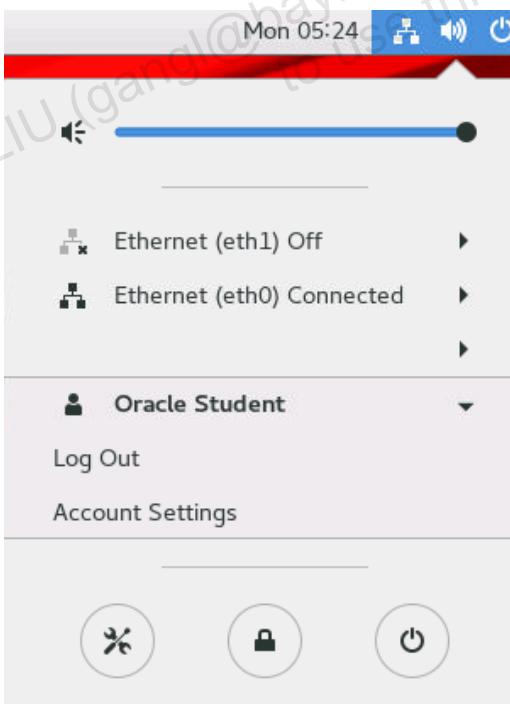
```

Loaded: loaded (/usr/lib/systemd/system/iscsid.service;
disabled; vendor preset: disabled)
Active: inactive (dead) since <date_time> ago
Docs: man:iscsid(8)
 man:iscsiadm(8)
Process: 2951 ExecStop=/sbin/iscsiadm -k 0 2 (code=exited,
status=0/SUCCESS)
Main PID: 2721 (code=exited, status=0/SUCCESS)

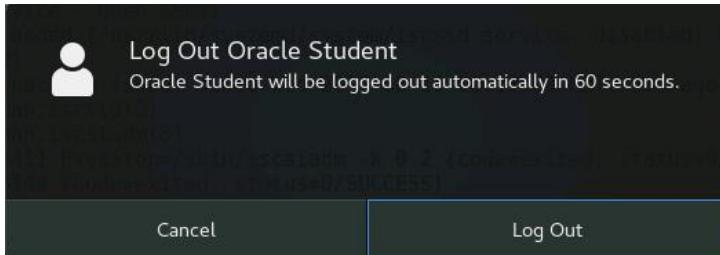
<date_time> host03.example.com systemd[1]: Starting Open-
iSCSI...
<date_time> host03.example.com iscsid[2720]: iSCSI daemon with
pid=2721 ...
<date_time> host03.example.com systemd[1]: Failed to read PID
from file ...
<date_time> host03.example.com systemd[1]: Started Open-iSCSI.
<date_time> host03.example.com systemd[1]: Stopping Open-
iSCSI...
<date_time> host03.example.com systemd[1]: Stopped Open-iSCSI.
Hint: Some lines were ellipsized, use -l to show in full.

```

- This confirms that the `iscsid` service is not running (inactive) and is disabled.
5. Log off **host03** in preparation for the next practice.
- Select the Power icon in the upper-right corner of the GNOME screen and select Oracle Student.



- 1) Click Log Out. The following pop-up appears:



- 2) Click Log Out.
- 3) Click the X in the top-right corner of the GNOME login window to close the window.

You are now the `root` user on `dom0`.

## **Practices for Lesson 6: System Configuration**

## Practices for Lesson 6: Overview

---

### Practices Overview

In these practices, you configure date and time, enable NTP on **dom0** and **host03**, enable chrony on **host03**, modify system configuration files, view and modify kernel settings, and view hardware device and device driver attributes.

## Practice 6-1: Configuring Date and Time

### Overview

In this practice, you use the `date`, `hwclock`, and `timedatectl` utilities to configure and display date and time information.

### Assumptions

You are logged on to `dom0` as the `root` user.

### Tasks

1. Log on to `host03`.

- a. Use `ssh` to log on to `host03`, providing the root password.

```
ssh host03
The authenticity of host 'host03 (192.0.2.103)' can't be
established.
RSA key fingerprint is ...
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'host03,192.0.2.103' (RSA) to the
list of known hosts.
root@host03's password:
Last login: ...
```

2. Use the `date` command.

The sample output is displayed.

- a. Run the `date` command with no arguments to display the current date and time.

```
date
Tue Sep 25 09:18:51 MDT 2018
```

- b. Run the `date` command with the argument to view the weekday name.

```
date +%A
Tuesday
```

- c. Run the `date` command with the argument to view the full month name.

```
date +%B
September
```

- d. Use the `date` command to change the date to another date (for example, 19 November, 2015).

- You can substitute any date. The example changes the date to 19 November, 2015.

```
date +%D -s 2015-11-19
11/19/15
```

- e. Use the `date` command to change the date to the correct date.

- Substitute today's correct date. The example changes the date to 25 September, 2018.

```
date +%D -s 2018-09-25
09/25/18
```

- f. Use the `date` command to change the time to the correct time.
- Substitute the current local time. The example changes the time to 4:14 PM.

```
date +%T%p -s 4:14:00PM
16:14:00PM
```

3. Use the `hwclock` command.

The sample output is displayed.

- a. Run the `hwclock` command with no arguments to display the hardware clock's current date and time.

```
hwclock
Tue 25 Sep 2018 09:26:27 AM MDT -0.751687 seconds
```

- b. Use the `hwclock` command with the `-w` option to set the hardware clock to the current system time.

```
hwclock -w
```

- c. Run the `date` command and the `hwclock` command to confirm that the date and time settings are the same.
- The variation in seconds is due to the delay between running the two commands.

```
date
Tue Sep 25 16:15:11 MDT 2018
hwclock
Tue 25 Sep 2018 04:15:17 PM MDT -0.244813 seconds
```

4. Use the `timedatectl` command.

- a. Run the `timedatectl` command with no arguments to display the system date and time information. The sample output is displayed.

```
timedatectl
 Local time: Tue 2018-09-25 16:16:05 MDT
 Universal time: Tue 2018-09-25 22:16:05 UTC
 RTC time: Tue 2018-09-25 22:16:05
 Time zone: America/Denver (MDT, -0600)
 NTP enabled: no
 NTP synchronized: no
 RTC in local TZ: no
 DST active: yes
 Last DST change: DST began at
 Sun 2018-03-11 01:59:59 MST
 Sun 2018-03-11 03:00:00 MDT
```

```
Next DST change: DST ends (the clock jumps one hour backwards)
at
```

```
Sun 2018-11-04 01:59:59 MDT
```

```
Sun 2018-11-04 01:00:00 MST
```

- If the above output shows NTP enabled: yes, disable it as follows and re-check it:

```
timedatectl set-ntp 0
timedatectl
...
NTP enabled: no
...
```

- Use the `timedatectl` command with the `set-time` argument to change the date to another date (for example, 19 November, 2015).
  - You can substitute any date. The example changes the date to 19 November, 2015.
  - Run the `timedatectl` command afterwards with no arguments to verify that the date changed.

```
timedatectl set-time 2015-11-19
timedatectl
Local time: Thu 2015-11-19 00:00:04 MST
Universal time: Thu 2015-11-19 07:00:04 UTC
RTC time: Thu 2015-11-19 07:00:05
...
```

- Use the `timedatectl` command to change the date to the correct date.
  - Substitute today's correct date. The example changes the date to 25 September, 2018.
  - Run the `timedatectl` command afterwards with no arguments to verify that the date changed.

```
timedatectl set-time 2018-09-25
timedatectl
Local time: Tue 2018-09-25 00:00:01 MDT
Universal time: Tue 2018-09-25 06:00:01 UTC
RTC time: Tue 2018-09-25 06:00:01
...
```

- Use the `timedatectl` command to change the time to the correct time.
  - Substitute the current local time. The example changes the time to 4:22 PM.
  - Enter the hour using a 24-hour clock.
  - Run the `timedatectl` command afterwards with no arguments to verify that the time changed.

```
timedatectl set-time 16:22:00
timedatectl
Local time: Tue 2018-09-25 16:22:01 MDT
Universal time: Tue 2018-09-25 22:22:01 UTC
```

RTC time: Tue 2018-09-25 22:22:02

...

## Practice 6-2: Configuring NTP and Chrony

### Overview

In this practice, you configure NTP on **dom0**, install the `ntp` software package on **host03**, configure NTP on **host03** to synchronize with **dom0**, and configure chrony on **host03**.

### Assumptions

- This practice is performed on both **dom0** and **host03**.
- You are the `root` user and have a terminal window open on **dom0**.
- You are the `root` user and have a terminal window open on **host03**.

### Tasks

#### 1. Enable Network Time Protocol (NTP) on **dom0**.

This task is performed on **dom0**.

- a. Open a second terminal window on **dom0** and become the `root` user.
- b. From **dom0**, use the `service` command to check the status of the NTP daemon, `ntpd`.

```
[dom0]# service ntpd status
ntpd is stopped
```

- The NTP daemon is stopped.
- c. Use the `grep` command to search for “server” in the `/etc/ntp.conf` file.

```
[dom0]# grep server /etc/ntp.conf
Use public servers from the pool.ntp.org project.
#server 0.rhel.pool.ntp.org
#server 1.rhel.pool.ntp.org
#server 2.rhel.pool.ntp.org
#broadcast 192.168.1.255 key 42 # broadcast server
#broadcast 224.0.1.1 key 42 # multicast server
#multicastserver 239.255.254.254 # multicast server
server 127.127.1.0 # local clock
```

- Notice that in addition to the public servers, a server is also configured for the local clock (`server 127.127.1.0`).
- The local server is added because systems behind the Oracle University firewall are not given access to a public NTP server.
- d. Use the `grep` command to search for “driftfile” in the `/etc/ntp.conf` file.

```
[dom0]# grep driftfile /etc/ntp.conf
driftfile /var/lib/ntp/drift
```

- In this example, the `driftfile` is specified as `/var/lib/ntp/drift`.

- e. Use the `ls` command to check for the existence of the `/var/lib/ntp/drift` file.

```
[dom0]# ls /var/lib/ntp/drift
ls: /var/lib/ntp/drift: No such file or directory
```

- In this example, the file does not exist.

- f. Use the `touch` command to create the `/var/lib/ntp/drift` file.

```
[dom0]# touch /var/lib/ntp/drift
```

- g. Change the user and group ownership of `/var/lib/ntp/drift` to `ntp`.

```
[dom0]# chown ntp:ntp /var/lib/ntp/drift
```

- h. Use the `service` command to start the NTP daemon, `ntpd`.

```
[dom0]# service ntpd start
Starting ntpd: [OK]
```

- i. Use the `service` command to check the status of the NTP daemon, `ntpd`.

```
[dom0]# service ntpd status
ntpd (pid ...) is running...
```

- The `ntpd` service is now running.

- j. Use the `ntpq -p` command to display a list of known NTP peers.

- This command returns a remote host of `LOCAL(0)` and a refid of `.LOCL.`, as shown.
- The preceding `*` indicates that your system is synchronized with the local server. You might have to wait several minutes for your system to synchronize, to show the `*` next to `LOCAL(0)`.
- The stratum is `10` as shown. The remaining output might vary from your output.
- Refer to the `ntpq(8)` man page for a description of the command output.
- If the command times out and returns an error, wait a few seconds and try again.

```
[dom0]# ntpq -p
 remote refid st t when pool reach delay offset jitter
=====
*LOCAL(0) .LOCL. 10 1 46 64 17 0.000 0.000 0.001
```

- k. Use the `ntpstat` command to show network time synchronization status.

- The sample output is shown.
- If the command returns “unsynchronised”, wait awhile—between one and fifteen minutes—and try again.

```
[dom0]# ntpstat
synchronized to local net at stratum 11
time correct to within 11 ms
polling server every 256 s
```

2. Copy the `ntp` software package from **dom0** to **host03**.

- You need to install the `ntp` software package and its uninstalled dependency on **host03**.
- The `ntp` package and one dependency are staged on **dom0**.
  - Normally, you get packages from the Oracle Linux yum server, from the Unbreakable Linux Network (ULN), or from another Yum repository.
  - The Oracle Linux yum server, ULN, and Yum repositories are covered in the lesson titled “Package Management.”
  - Use the `scp` command to transfer the packages `ntp-4.2.6p5-28.0.1.el7.x86_64.rpm` and its dependency, `autogen-libopts-5.18-5.el7.x86_64.rpm`, from **dom0** to **host03**.
  - The `scp` command is covered in the lesson titled “OpenSSH.”

- a. From **dom0**, use the `cd` command to change to the `/OVS/seed_pool/sfws` directory.

```
[dom0]# cd /OVS/seed_pool/sfws
```

- b. Use the `ls` command to list the `ntp*` and `autogen*` packages.

```
[dom0]# ls ntp* autogen*
autogen-libopts-5.18-5.el7.x86_64.rpm
ntp-4.2.6p5-28.0.1.el7.x86_64.rpm
```

- c. Use the `scp` command to connect to **host03** as `root`.

- Provide the `root` password when prompted. Your transfer numbers might vary.

```
[dom0]# scp ntp* autogen* host03:~
root@host03's password:
ntp-4.2.6p5-28.0.1.el7.x86_64.rpm 100% 548KB 548.3KB/s ...
autogen-libopts-5.18-5.el7.x86_64.rpm 100% 65KB 64.5KB/s ...
```

The remaining tasks are performed on **host03**.

3. Install the `ntp` software package on **host03**.

- a. Use the `cd` command to ensure you are in the `root` user’s home directory.

- Use the `ls` command to list the `ntp` and `autogen-libopts` software packages.

```
cd
ls ntp* autogen*
autogen-libopts-5.18-5.el7.x86_64.rpm
ntp-4.2.6p5-28.0.1.el7.x86_64.rpm
```

- b. Before these packages are installed, a GNU Privacy Guard (GnuPG) public key must be imported. This key is provided as part of system installation and allows verification of package authenticity.

```
rpm --import /etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
```

- c. Now run the `rpm` commands to install the necessary packages.

```
rpm -Uvh autogen-libopts-5.18-5.el7.x86_64.rpm
Preparing... ####### [100%]
```

```
Updating / installing...
 1:autogen-libopts-5.18-5.el7 ##### [100%]
rpm -Uvh ntp-4.2.6p5-28.0.1.el7.x86_64.rpm
Preparing... #### [100%]
Updating / installing...
 1:ntp-4.2.6p5-28.0.1.el7 ##### [100%]
```

- If the GnuPG key was not installed correctly, you will see a warning message about NOKEY.
- The `rpm` command is covered in the lesson titled “Package Management.”

#### 4. Enable Network Time Protocol (NTP) on the **host03** VM.

In this task, you configure **host03**’s computer time to synchronize with **dom0**’s computer time.

- a. Use the `cp` command to make a backup copy of the `/etc/ntp.conf` file.

```
cp /etc/ntp.conf /etc/ntp.conf_SAV
```

- b. Use the `vi` command to edit the `/etc/ntp.conf` file and make the following changes:

```
vi /etc/ntp.conf
```

- Change the original line, shown as follows:
  - `#restrict 192.168.1.0 mask 255.255.255.0 nomodify notrap`
  - Remove the `#` character to uncomment the line. Change the IP address from `192.168.1.0` to `192.0.2.0` as shown:
  - `restrict 192.0.2.0 mask 255.255.255.0 nomodify notrap`
- Insert a `#` character for each line beginning with “server” as shown:
  - `#server 0.rhel.pool.ntp.org iburst`
  - `#server 1.rhel.pool.ntp.org iburst`
  - `#server 2.rhel.pool.ntp.org iburst`
  - `#server 3.rhel.pool.ntp.org iburst`
- Add a “server” line to designate **dom0** (`192.0.2.1`) as the remote clock synchronization server as shown:
  - `server 192.0.2.1`
- The following represents all the changes needed to the `/etc/ntp.conf` file.
  - The specific changes are in **bold**.
  - Remember to remove the `#` sign from the beginning of the “restrict” line.

```
restrict 192.0.2.0 mask 255.255.255.0 nomodify notrap
#server 0.rhel.pool.ntp.org iburst
#server 1.rhel.pool.ntp.org iburst
#server 2.rhel.pool.ntp.org iburst
#server 3.rhel.pool.ntp.org iburst
server 192.0.2.1
```

- c. Use the `grep` command to search for “driftfile” in the `/etc/ntp.conf` file.

```
grep driftfile /etc/ntp.conf
driftfile /var/lib/ntp/drift
```

- In this example, the `driftfile` is specified as `/var/lib/ntp/drift`.

- d. Use the `ls` command to check for the existence of the `/var/lib/ntp/drift` file.

```
ls /var/lib/ntp/drift
ls: cannot access /var/lib/ntp/drift: No such file or directory
```

- In this example, the file does not exist.

- e. Use the `touch` command to create the `/var/lib/ntp/drift` file.

```
touch /var/lib/ntp/drift
```

- f. Change user and group ownership of `/var/lib/ntp/drift` to `ntp`.

```
chown ntp:ntp /var/lib/ntp/drift
```

- g. Use the `systemctl` command to stop the `firewalld` service.

- The purpose of this command is to open UDP port 123 for NTP packets.
- The `firewalld` service is discussed in the lesson titled “Security Administration.” In that lesson, you learn how to create firewall rules to open up specific ports.
- For now, you are just going to stop the `firewalld` service, which essentially opens up all ports.

```
systemctl stop firewalld
```

- h. Use the `systemctl` command to start the NTP daemon, `ntpd`.

- This command might take a few seconds to complete.

```
systemctl start ntpd
```

- i. Use the `ntpq -np` command to verify that **host03** is synchronizing the system clock with **dom0** (192.0.2.1). The “n” option provides numeric host address output and the “p” option causes peer information to be displayed.

```
ntpq -np
 remote refid st t when pool reach delay offset jitter
=====
*192.0.2.1 LOCAL(0) 11 u 43 64 377 0.102 0.002 0.002
```

- “\*192.0.2.1” indicates **host03** is synchronized with **dom0**. You may have to wait several minutes for your system to synchronize, to show the \* next to 192.0.2.1. Other specifics of your output will vary.

5. Disable Network Time Protocol (NTP) on the **host03** VM.

- a. Use the `systemctl` command to stop the NTP daemon, `ntpd`.

```
systemctl stop ntpd
```

- b. Run the `ntpq -np` command and note that the connection to a remote NTP synchronization server is refused.

```
ntpq -np
ntpq: read: Connection refused
```

6. Configure NTP on **host03** using chrony.

- a. Use the `cp` command to make a backup copy of the `/etc/chrony.conf` file.

```
cp /etc/chrony.conf /etc/chrony.conf_SAV
```

- b. Use the `vi` command to edit the `/etc/chrony.conf` file and make the following changes:

```
vi /etc/chrony.conf
```

- Insert a # character for each line beginning with “server” as shown:
  - `#server 0.rhel.pool.ntp.org iburst`
  - `#server 1.rhel.pool.ntp.org iburst`
  - `#server 2.rhel.pool.ntp.org iburst`
  - `#server 3.rhel.pool.ntp.org iburst`
- Add a “server” line to designate **dom0** (192.0.2.1) as the remote clock synchronization server as shown:
  - `server 192.0.2.1`
- Change the original line as shown:
  - `#allow 192.168.0.0/16`
- Remove the # character to uncomment the line and change the entry from `192.168.0.0/16` to `192.0.2/24` as shown:
  - `allow 192.0.2/24`
- The following represents all the changes needed to the `/etc/chrony.conf` file.
- The specific changes are in **bold**.
- Remember to remove the # sign from the beginning of the “allow” line.

```
#server 0.rhel.pool.ntp.org iburst
#server 1.rhel.pool.ntp.org iburst
#server 2.rhel.pool.ntp.org iburst
#server 3.rhel.pool.ntp.org iburst
server 192.0.2.1
allow 192.0.2/24
```

- c. Use the `systemctl` command to start the chrony daemon, `chronyd`.

```
systemctl start chronyd
```

To check if chrony is synchronized, use the `tracking`, `sources`, and `sourcestats` commands.

- d. Run the `chronyc -n tracking` command to check chrony tracking. The "n" option provides numeric host address output.
- Alternatively, you could run `chronyc` to display a `chronyc>` prompt, and then run the `tracking` command from the `chronyc>` prompt.
  - The sample output is shown.
  - It can take several minutes to synchronize.

```
chronyc -n tracking
```

```

Reference ID : C0000201 (192.0.2.1)
Stratum : 12
Ref time (UTC) : Wed Sep 26 01:32:34 2018
System time : 0.000000000 seconds fast of NTP time
Last offset : -0.000003461 seconds
RMS offset : 0.000002367 seconds
Frequency : 0.015 ppm fast
Residual freq : -0.003 ppm
Skew : 0.213 ppm
Root delay : 0.000075392 seconds
Root dispersion : 0.011567660 seconds
Update interval : 64.2 seconds
Leap status : Normal

```

- Some of the fields are described:

- Reference ID: Refers to the server providing synchronization
- Stratum: The distance from a computer attached to a highly accurate reference clock
- Ref time: The most recent time chrony utilized a time measurement from the server providing synchronization (time is UTC)

- e. Run the `chronyc sources` command to show information about `chronyd` time sources.

- The "n" option provides numeric host address output.
- The sample output is shown.

```

chronyc -n sources
210 Number of sources = 1
MS Name/IP address Stratum Poll Reach LastRx Last sample
=====
^* 192.0.2.1 11 6 377 30 -228ns [+9374s]...

```

- f. Run the `chronyc sources` command with the "v" option (verbose) to provide column descriptions.

- The sample output is shown.

```

chronyc -n sources -v
210 Number of sources = 1

.-- Source mode '^' = server, '=' = peer, '#' = local clock.
/ .- Source state '*' = current synced, '+' = combined , '-' = not combined,
| / '?' = unreachable, 'x' = time may be in error, '~' = time too variable.
|| Reachability register (octal) -. | xxxx [yyyy] +/- zzzz
|| Log2(Polling interval) --. | | xxxx = adjusted offset,
|| \ | | | yyyy = measured offset,
|| | | | | zzzz = estimated error.
|| | |
MS Name/IP address Stratum Poll Reach LastRx Last sample
=====
^* 192.0.2.1 11 6 377 30 -228ns [+9374ns] +/- 12ms

```

- For more information about chrony, see the files in /usr/share/doc/chrony-n.n, where "n.n" is replaced with the current chrony version number in this path. See the `chronyc(1)` man page.

g. Run the `chronyc sourcestats` command.

- This command provides statistics around calculations for time sources.
- The sample output is shown.

```
chronyc -n sourcestats
210 Number of sources = 1
Name/IP Address NP NR Span Frequency Freq Skew Offset Std Dev
=====
192.0.2.1 6 5 353 -0.001 0.046 -42ns 1901ns
```

h. Run the command again but include the `-v` option to obtain column descriptions.

```
chronyc -n sourcestats -v
210 Number of sources = 1
 .- Number of sample points in measurement set.
 / .- Number of residual runs with same sign.
 / / .- Length of measurement set (time).
 / | / .- Est. clock freq error (ppm).
 | | / .- Est. error in freq.
 | | / .- Est. offset.
 | | | .- On the -.
 | | | samples. \
 |
Name/IP Address NP NR Span Frequency Freq Skew Offset Std Dev
=====
192.0.2.1 6 5 353 -0.001 0.046 -42ns 1901ns
```

7. Revert changes made on the **host03** VM.

a. Use the `systemctl` command to stop the chrony daemon, `chronyd`.

```
systemctl stop chronyd
```

b. Run the `chronyc tracking` command and notice `chronyc` cannot talk to the `chronyd` daemon.

```
chronyc tracking
```

```
506 Cannot talk to daemon
```

c. Return `/etc/ntp.conf` to its default state.

```
cp /etc/ntp.conf_SAV /etc/ntp.conf
```

```
cp: overwrite '/etc/ntp.conf'? y
```

d. Remove `/etc/ntp.conf_SAV`.

```
rm /etc/ntp.conf_SAV
```

```
rm: remove regular file '/etc/ntp.conf_SAV'? y
```

e. Return `/etc/chrony.conf` to its default state.

```
cp /etc/chrony.conf_SAV /etc/chrony.conf
```

```
cp: overwrite '/etc/chrony.conf'? y
```

f. Remove `/etc/chrony.conf_SAV`.

```
rm /etc/chrony.conf_SAV
rm: remove regular file '/etc/chrony.conf_SAV'? y
```

- g. Use the `rpm` command with the `-e` option to erase the `ntp-4.2.6p5-28.0.1.el7.x86_64.rpm` and `autogen-libopts-5.18-5.el7.x86_64.rpm` packages.

```
rpm -e ntp-4.2.6p5-28.0.1.el7.x86_64
rpm -e autogen-libopts-5.18-5.el7.x86_64
```

- h. Remove the `ntp-4.2.6p5-28.0.1.el7.x86_64.rpm` and `autogen-libopts-5.18-5.el7.x86_64.rpm` packages from the home directory of the `root` user. Ensure you are in the `root` user's home directory first.

```
cd
rm ntp-4.2.6p5-28.0.1.el7.x86_64.rpm
rm: remove regular file 'ntp-4.2.6p5-28.0.1.el7.x86_64.rpm'? y
rm autogen-libopts-5.18-5.el7.x86_64.rpm
rm: remove regular file 'autogen-libopts-5.18-5.el7.x86_64.rpm'? y
```

- i. Restart `firewalld`.

```
systemctl start firewalld
```

8. Revert changes made on the `dom0` VM.

- a. Use the `service` command to stop the NTP daemon, `ntpd`.

```
[dom0]# service ntpd stop
Shutting down ntpd: [OK]
```

- b. Remove the `/var/lib/ntp/drift` file.

```
[dom0]# rm /var/lib/ntp/drift
rm: remove regular file '/var/lib/ntp/drift'? y
```

## Practice 6-3: Exploring the /etc/sysconfig Directory

---

### Overview

In this practice, you:

- Explore the /etc/sysconfig directory
- Explore selected files in this directory
- See that many initialization scripts derive values from files in the directory
- View the documentation file that describes the entries in the directory
- Make changes to the content of files in the directory
- Observe the effect of the changes

### Assumptions

You are the `root` user on the **host03** VM.

### Tasks

1. Explore the /etc/sysconfig directory.

- a. Use the `cd` command to change to the /etc/sysconfig directory.

```
cd /etc/sysconfig
```

- b. Use the `ls -l` command to display the contents of the /etc/sysconfig directory.

```
ls -l
...
-rw-r--r-- ... root root ... atd
-rw-r--r-- ... root root ... authconfig
-rw-r--r-- ... root root ... autoofs
drwxr-xr-x ... root root ... cbq
-rw-r--r-- ... root root ... cgred
-rw-r--r-- ... root root ... chronyd
drwxr-xr-x ... root root ... console
-rw-r--r-- ... root root ... cpupower
-rw----- ... root root ... crond
...
lrwxrwxrwx ... root root ... grub -> /etc/default/grub
...
drwxr-xr-x ... root root ... modules
-rw-r--r-- ... root root ... netconsole
-rw-r--r-- ... root root ... network
drwxr-xr-x ... root root ... network-scripts
-rw-r--r-- ... root root ... nfs
...
```

- Some of these files contain configuration settings for the respective service.

- Some of these files contain command-line arguments for the respective service.
  - Some of these are directories and some are symbolic links.
- c. Use the `less` command to view selected files.
- Press `q` to quit the `less` command and close the file.
  - Some files are given as examples but you can view files and directories of your choice.

```
less atd
specify additional command line arguments for atd
...
less authconfig
...
IPADOMAOINJOINED=no
...
USEMKHOMEDIR=no
...
less autofs
...
Init system options.
...
less crond
Settings for the CRON daemon.
CRONDARGS= : any extra command-line startup arguments ...
...
less firewalld
firewalld command line args
...
less kernel
UPDATEDEFAULT specifies if new-kernel-pkg should make
new kernels the default
UPDATEDEFAULT=yes
...
```

- Note that the files contain configuration settings, command-line options, and so on.
2. Explore the `/usr/share/doc/initscripts*/sysconfig.txt` file.
- a. Use the `cd` command to change to the `/usr/share/doc/initscripts*` directory.

```
cd /usr/share/doc/initscripts*
pwd
/usr/share/doc/initscripts-9.49.41
ls
changes.ipv6 examples ipv6-tunnel.howto sysconfig.txt
COPYING ipv6-6to4.howto static-routes-ipv6 sysvinitfiles
```

- b. Use the `less` command to display the contents of the `sysconfig.txt` file.

```
less sysconfig.txt
=====
```

Generic options:

```
/etc/sysconfig/*
...
```

- c. Search the contents of the `sysconfig.txt` file for `/etc/sysconfig`.
- While viewing the file using the `less` command, use the slash (/) followed by `etc/sysconfig` to search for this string.
  - Press **n** (lowercase for “next”) to display the next instance of the string.
- d. Continue to view the `/etc/sysconfig` entries in this file.
- e. At the `/etc/sysconfig/network` entry, notice some of the variables initialized in this file. Here are some examples:
- ```
NETWORKING=yes | no  
GATEWAY=<gateway IP>  
NISDOMAIN=<nis domain name>
```
- f. Press **q** to quit the “`less`” command.

Practice 6-4: Exploring the /proc File System

Overview

In this practice, you explore the `proc` file system (directory), view various files and directories that represent the current state of the kernel, and change the value of current settings. Where needed, scroll through output using navigation keys such as Page Up and Page Down. Also where needed, enter "q" to terminate output and return to the prompt.

Assumptions

You are the `root` user on the **host03** VM.

Tasks

- Explore the `proc` file system (directory).

- Use the `ls` command to display the contents of the `/proc` directory.

- The sample output is shown.

```
# ls /proc
1    17  29527  29749  341  497  acpi      kcore      slabinfo
10   18  29594  29763  382  5     buddyinfo  keys      softirqs
11   19  29615  29770  39   507  bus       key-users  stat
...
```

- Numbered entries are directories referring to process IDs.

- Use the `ls` command to display entries without numerical names.

```
# ls -ld /proc/[a-z]* | less
dr-xr-xr-x. ... root  root  ... /proc/acpi
-r--r--r--. ... root  root  ... /proc/buddyinfo
dr-xr-xr-x. ... root  root  ... /proc/bus
-r--r--r--. ... root  root  ... /proc/cgroups
-r--r--r--. ... root  root  ... /proc/cmdline
-r--r--r--. ... root  root  ... /proc/consoles
-r--r--r--. ... root  root  ... /proc/cpuinfo
...
```

- Notice that some entries are files and some entries are directories.

- View the `meminfo` file to display information about RAM.

```
# less /proc/meminfo
MemTotal: 2045064 kB
MemFree: 1046080 kB
...
```

- View the `cpuinfo` file to display information about the processors used by your system.

```
# less /proc/cpuinfo
```

```

processor      : 0
vendor_id     : GenuineIntel
cpu_family    : 6
model         : 58
...

```

- e. View the `devices` file to display information about the various character and block devices currently configured.

```

# less /proc/devices
Character devices:
  1 mem
  4 /dev/vc/0
  4 tty
...
Block devices:
  2 fd
259 blkext
  9 md
...

```

- f. View the `/proc/fs/ext4` directory to display the ext4 file systems currently configured.

```

# ls /proc/fs/ext4
xvda1  xvda2  xvda3

```

2. Explore process directories in the `proc` file system.

- a. Use the `ls` command to display only the directories in `/proc` with numerical names. Change to the `/proc` directory first.

- The sample output is shown.

```

# cd /proc
# ls -d [0-9]*
 1    1305  16430   221   29452   29672   29737   29846   315   422   ...
 10   1389    17     23   29517   29680   29741   29853   333   423   ...
 11      14    18     24   29527   29684   29747   29883   336   428   ...
...

```

- b. Show that one process directory exists for each process running on your system.

```

# ls -d [0-9]* | wc -l
135
# ps -e | wc -l
136

```

- The `ps` command produces one more entry due to the column headings.

```

# ps -e | less
 PID  TTY          TIME      CMD

```

```
1 ?          00:00:03    systemd
...

```

- c. View the contents of the process directory for PID=1.

```
# cd /proc/1
# ls -l
dr-xr-xr-x. ... root root ... attr
-rw-r--r--. ... root root ... autogroup
-r-----. ... root root ... auxv
-r--r--r--. ... root root ... cgroup
--w-----. ... root root ... clear_refs
-r--r--r--. ... root root ... cmdline
-rw-r--r--. ... root root ... comm
-rw-r--r--. ... root root ... coredump_filter
-r--r--r--. ... root root ... cpuset
lrwxrwxrwx. ... root root ... cwd -> /
-r-----. ... root root ... environ
lrwxrwxrwx. ... root root ... exe -> /usr/lib/systemd/...
dr-x-----. ... root root ... fd
...

```

- Notice that some entries are files, some entries are directories, and some entries are symbolic links.

- d. Use the `less` command to display the status of PID=1.

```
# less status
Name: systemd
State: S (sleeping)
Tgid: 1
Ngid: 0
Pid: 1
PPid: 0
...

```

3. Change the values of kernel settings.

- a. Use the `cat` command to check the status of IP forwarding.

```
# cat /proc/sys/net/ipv4/ip_forward
1
```

- If the value is 0, IP forwarding is disabled; if set to 1, forwarding is enabled.
 - IP forwarding allows you to set up a Linux router or gateway, for example.
- b. If the value of IP forwarding is currently set to 1, use the `echo` command to set the value of IP forwarding to 0 and then change it back to 1. If the value of IP forwarding is currently set to 0, simply change it to 1 by only running the second `echo` command followed by the `cat` command.

```
# echo 0 > /proc/sys/net/ipv4/ip_forward
```

```
# cat /proc/sys/net/ipv4/ip_forward  
0  
# echo 1 > /proc/sys/net/ipv4/ip_forward  
# cat /proc/sys/net/ipv4/ip_forward  
1
```

- c. Use the `cat` command to view the local port range used by TCP and UDP traffic.

```
# cat /proc/sys/net/ipv4/ip_local_port_range  
32768 61000
```

- d. If the port range is not 32768 61000, use the `echo` command to define the local port range used by TCP and UDP traffic to be 32768 61000.

```
# echo "32768 61000" > /proc/sys/net/ipv4/ip_local_port_range
```

- Notice that the first local port and the last local port allowed are surrounded by quotation marks.

Practice 6-5: Exploring the `sysfs` File System

Overview

In this practice, you explore the `sysfs` file system. You view the virtual block devices and virtual interfaces, and determine which power states are supported on your system.

Assumptions

You are the `root` user on the **host03** VM.

Tasks

1. Explore the `/sys` directory.

- a. Use the `ls` command to display the contents of the `/sys` directory.

```
# ls -l /sys
drwxr-xr-x. ... block
drwxr-xr-x. ... bus
drwxr-xr-x. ... class
drwxr-xr-x. ... dev
drwxr-xr-x. ... devices
drwxr-xr-x. ... firmware
drwxr-xr-x. ... fs
drwxr-xr-x. ... hypervisor
drwxr-xr-x. ... kernel
drwxr-xr-x. ... module
drwxr-xr-x. ... power
```

- b. Use the `ls` command to display the virtual disk block (`xvd`) devices on your system.

```
# ls -l /sys/block | grep xvd
lrwxrwxrwx. ... xvda -> ../devices/vbd-768/block/xvda
lrwxrwxrwx. ... xvdb -> ../devices/vbd-832/block/xvdb
lrwxrwxrwx. ... xvdd -> ../devices/vbd-5696/block/xvdd
```

- c. Traverse the `/sys/bus` directory and display the virtual interface (`vif`) devices.

```
# cd /sys/bus/xen/devices
# ls vif*
vif-0:
devtype    driver    modalias    net    nodename    power    subsystem
uevent

vif-1:
devtype    driver    modalias    net    nodename    power    subsystem
uevent
```

- d. Display the operational state, MAC address, and MTU of eth0.

```
# cd vif-0/net/eth0
# pwd
/sys/bus/xen/devices/vif-0/net/eth0
# ls
...
address device flags link_mode phys_port_id ...
...
# cat operstate
up
# cat address
00:16:3e:00:01:03
# cat mtu
1500
```

- e. Determine which power states are supported.

```
# cd /sys/power
# ls
disk image_size pm_async ... reserved_size ... state ...
# cat state
freeze disk
```

The possible states and their meanings are as follows:

- mem: The following possible strings in the /sys/power/mem_sleep file determine action when mem is written to /sys/power/state:
 - s2idle: Suspend-To-Idle
 - shallow: Power-On Suspend
 - deep: Suspend-To-RAM
- standby: Power-On Suspend
- freeze: Suspend-To-Idle
- disk: Suspend-To-Disk
- See the following for more information about Power Management Sleep States: <https://www.kernel.org/doc/Documentation/power/states.txt>.

Practice 6-6: Using the `sysctl` Utility

Overview

In this practice, you use the `sysctl` utility and view the `/etc/sysctl.d/99-sysctl.conf` configuration file.

Assumptions

You are the `root` user on the **host03** VM.

Tasks

1. Use the `sysctl` utility.

- a. Use the `sysctl` command to disable IP forwarding.

- Setting the `ip_forward` variable to 0 disables IP forwarding.

```
# cat /proc/sys/net/ipv4/ip_forward
1
# sysctl -w net.ipv4.ip_forward=0
net.ipv4.ip_forward = 0
# cat /proc/sys/net/ipv4/ip_forward
0
```

- b. Use the `sysctl` command to enable IP forwarding.

- Setting the `ip_forward` variable to 1 enables IP forwarding.

```
# sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
# cat /proc/sys/net/ipv4/ip_forward
1
```

- c. Use the `sysctl` command to display the current kernel settings, piping the output to the `less` command.

```
# sysctl -a | less
...
debug.exception-trace = 1
...
dev.raid.speed_limit_min = 1000
dev.scsi.logging_level = 0
...
fs.inode-nr = 48811    449
fs.inode-state = 48811    449 0  0  0  0  0
...
kernel.sched_child_runs_first = 0
kernel.sched_latency_ns = 6000000
...
```

```

net.ipv4.route.gc_thresh = -1
net.ipv4.route.gc_timeout = 300
...
net.ipv6.neigh.default.mcast_solicit = 3
net.ipv6.neigh.default.proxy_delay = 80
...
net.netfilter.nf_log.0 = NONE
net.netfilter.nf_log.1 = NONE
...
vm.page-cluster = 3
vm.panic_on_oom = 0
...

```

- Scroll through the output using navigation keys such as Page Up and Page Down. Enter "q" to return to the prompt.
2. Use the `less` command to view the contents of the `/etc/sysctl.d/99-sysctl.conf` file.

```

# less /etc/sysctl.d/99-sysctl.conf
# sysctl settings are defined through files in
# /usr/lib/sysctl.d/, /run/sysctl.d/, and /etc/sysctl.d/.
#
# Vendors settings live in /usr/lib/sysctl.d/.
# To override a whole file, create a new file with the same in
# /etc/sysctl.d/ and put new settings there. To override
# only specific settings, add a file with a lexically later
# name in /etc/sysctl.d/ and put new settings there.
#
# For more information, see sysctl.conf(5) and sysctl.d(5).

```

- Changes that are made by using both `echo` and `sysctl` are lost when the system is rebooted.
 - To preserve custom settings, add them to a `/etc/sysctl.d/<name>.conf` file.
 - Values that are added to these files take effect each time the system boots.
 - To immediately enable changes added to files in `/etc/sysctl.d/<name>.conf`, run `sysctl -p /etc/sysctl.d/<name>.conf`, providing the file name.
 - Enter "q" to return to the prompt.
3. Log off **host03** in preparation for the next practice.
- a. Use the `exit` command to log off from **host03**.

```

# exit
logout
Connection to host03 closed.

```

You are now the `root` user on **dom0**.

Practices for Lesson 7: Package Management

Practices for Lesson 7: Overview

Practices Overview

In these practices, you:

- Use the `rpm` utility to perform software package management
- Access the Oracle Linux yum server
- Create a local `yum` repository and use the `yum` utility
- Install and use a collection from the Oracle Linux Software Collection library
- Become familiar with the Oracle Unbreakable Linux Network (ULN)

Note that a legacy `yum` configuration is used in these practices with the `public-yum-ol7.repo` file.

Practice 7-1: Using the rpm Utility

Overview

In this practice, you use the `rpm` utility to query installed packages, install packages, upgrade packages, and remove packages.

Assumptions

- You are logged on to **dom0** as the `root` user.
- The sample output is provided. Package names and versions shown might differ from the actual output.

Tasks

1. Log on to **host03**.

- a. Connect to the **host03** guest by using the `xm vncviewer host03&` command.

```
# xm vncviewer host03&
```

The GNOME login window appears.

- b. Select Oracle Student from the GNOME login window; enter the password.
- c. Right-click the GNOME desktop and select **Open Terminal** from the shortcut menu.
- d. In the terminal window, become the `root` user by entering the `su -` command and providing the `root` password.

```
$ su -
```

```
Password:
```

2. Query packages by using `rpm`.

- a. Query all installed packages.

```
# rpm -qa
...
gnome-terminal-...el7.x86_64
nfs4-acl-tools-...el7.x86_64
rpm-...el7.x86_64
dmraid-events-...el7.x86_64
libnetfilter_conntrack-...el7_3.x86_64
```

- b. Query whether a specific package (`bash`, for example) is installed.

```
# rpm -q bash
bash-4.2.46-30.el7.x86_64
```

- c. Get detailed information about the `bash` package.

```
# rpm -qi bash
Name        : bash
Version     : 4.2.46
Release     : 30.el7
Architecture: x86_64
Install Date: <date_time>
Group       : System Environment/Shells
...
```

- d. List the files in the `bash` package.

```
# rpm -ql bash
/etc/skel/.bash_logout
/etc/skel/.bash_profile
/etc/skel/.bashrc
/usr/bin/alias
/usr/bin/bash
...
```

- e. Perform a reverse search. That is, determine what package the `/etc/sysconfig` file belongs to.

```
# rpm -qf /etc/sysconfig
filesystem-...el7.x86_64
```

- f. List the configuration files associated with the `cups` package.

```
# rpm -qc cups
/etc/cups/classes.conf
/etc/cups/client.conf
/etc/cups/cups-files.conf
/etc/cups/cupsd.conf
/etc/cups/lpoptions
...
```

3. Install packages by using `rpm`.

- a. Use the `df` command to determine the mount point for Oracle Linux installation media.

```
# df -h
Filesystem ... Mounted on
...
/dev/sr0    ... /run/media/oracle/OL-7.5 Server.x86_64
...
```

- When logging on to **host03** via `vncviewer`, the Oracle Linux installation media is automatically mounted on `/run/media/oracle/OL-7.5 Server.x86_64`.
- If you logged on to **host03** using `ssh`, `/dev/sr0` will not be mounted as above.

- Because the installation media must be mounted persistently, this mount point must be unmounted and then remounted on a different mount point. Perform the following task only if /dev/sr0 is already mounted on /run/media/oracle/OL-7.5 Server.x86_64.

- b. Use the `umount` command to unmount /dev/sr0:

```
# umount /dev/sr0
```

- c. Use the `mkdir -p` command to create the /localrepo/media directory. Then use the `mount` command to mount the Oracle Linux installation media.

```
# mkdir -p /localrepo/media
# mount -o ro /dev/sr0 /localrepo/media
```

- d. Add the following entry to the end of the /etc/fstab file to mount the ISO if the system is rebooted (the /etc/fstab file is discussed in the lesson titled “Partitions, File Systems and Swap”):

```
# vi /etc/fstab
...
/dev/sr0 /localrepo/media iso9660 ro,nosuid,nodev 0 0
```

- e. Use the `cd` command to change to the /localrepo/media directory.

```
# cd /localrepo/media
```

- f. Use the `ls` command to list the contents of the directory.

```
# ls
addons EULA images LiveOS ... repodata RPM-GPG-KEY-oracle
EFI GPL isolinux Packages ... RPM-GPG-KEY TRANS.TBL
```

- Notice the Packages subdirectory.

- g. Use the `cd` command to change to the Packages directory, and then list the contents of the directory.

```
# cd Packages
# ls
389-ds-base-...el7.x86_64.rpm
389-ds-base-libs-...el7.x86_64.rpm
abattis-cantarell-fonts-...el7.noarch.rpm
...
zsh-5.0.2-28.el7.x86_64.rpm
zziplib-...el7.i686.rpm
zziplib-...el7.x86_64.rpm
```

- h. Verify that the `zsh` package (Z-Shell) is not already installed.

```
# zsh
bash: zsh: command not found...
...
# rpm -q zsh
package zsh is not installed
```

- In this example, the `zsh` package is not installed.
- Verify whether a GPG key has been imported.

```
# rpm -q gpg-pubkey
gpg-pubkey-...
```

- In this case, a GPG key has been imported. If you do not see `gpg-pubkey-...` as a response, you will get a `NOKEY` warning when installing `zsh` in the next step. This is not a concern for the purposes of this practice, and a GPG key will be imported in a later task.

- Install the `zsh` package by using `rpm`.

```
# rpm -Uvh zsh-5.0.2-28.el7.x86_64.rpm
Preparing... ################################################ [100%]
Updating / installing...
1:zsh-5.0.2-28.el7 ################################################ [100%]
```

- Verify that the `zsh` package is now installed.

```
# rpm -q zsh
zsh-5.0.2-28.el7.x86_64
```

- Run the `zsh` command and then display the process ID of `zsh`.

```
# zsh
# ps
 PID  TTY      TIME CMD
12041 pts/0    00:00:00 su
12047 pts/0    00:00:00 bash
12616 pts/0    00:00:00 zsh
12635 pts/0    00:00:00 ps
```

- Use the `exit` command to log out of `zsh`.

```
# exit
# ps
 PID  TTY      TIME CMD
12041 pts/0    00:00:00 su
12047 pts/0    00:00:00 bash
12697 pts/0    00:00:00 ps
```

- Remove packages by using `rpm`.

- Remove the `zsh` package.

```
# rpm -e zsh
```

- Verify that the `zsh` package has been removed.

```
# rpm -q zsh
package zsh is not installed
# zsh
-bash: /bin/zsh: No such file or directory
```

Practice 7-2: Accessing the Oracle Linux Yum Server

Overview

In this practice, you review the configuration required to access the Oracle Linux yum server from the **host03** VM. You then simulate upgrading your system (**you do not actually perform the upgrade**) from the Oracle Linux yum server.

Assumptions

- You are the `root` user on the **host03** VM.
- You are the `root` user on **dom0**.

Tasks

This task refers to the following networking-related files and service. These are discussed further in the lesson titled “Network Configuration.”

- Network Manager service
- Domain Name Service (DNS) resolver configuration file, `/etc/resolv.conf`
- Network interface configuration files, `/etc/sysconfig/network-scripts/ifcfg*`

1. Configure the Domain Name Service (DNS) resolver configuration file.

The DNS resolver configuration file, `/etc/resolv.conf`, provides access to DNS.

- If NetworkManager is running, which it is, any time you restart the network service, the contents of `/etc/resolv.conf` are updated from information in an `/etc/sysconfig/network-scripts/ifcfg*` file.
- Rather than update `/etc/resolv.conf`, update the appropriate `ifcfg*` file to include DNS information.
 - a. On **host03**, create a backup of `/etc/sysconfig/network-scripts/ifcfg-eth0`.

```
# cp /etc/sysconfig/network-scripts/ifcfg-eth0
/etc/sysconfig/network-scripts/ifcfg-eth0_SAV
```

- b. On **host03**, add the `DOMAIN` directive and add the `DNS1`, `DNS2`, and `DNS3` entries to the end of the `/etc/sysconfig/network-scripts/ifcfg-eth0` file as shown.
 - 1) **dom0** is configured as a DNS server with a search domain of `example.com` and a nameserver address of `192.0.2.1`.
 - 2) The other entries specified are valid Oracle University DNS domain and nameserver IPs.

```
# vi /etc/sysconfig/network-scripts/ifcfg-eth0
...
DOMAIN="example.com edu.oracle.com"
DNS1=192.0.2.1
DNS2=152.68.154.3
```

DNS3=10.237.18.52

- c. On **host03**, use the `systemctl` command to restart the network service.

```
# systemctl restart network
```

- d. On **host03**, use the `cat` command to display the contents of the `/etc/resolv.conf` file.

```
# cat /etc/resolv.conf
# Generated by NetworkManager
search example.com edu.oracle.com
nameserver 192.0.2.1
nameserver 152.68.154.3
nameserver 10.237.18.52
```

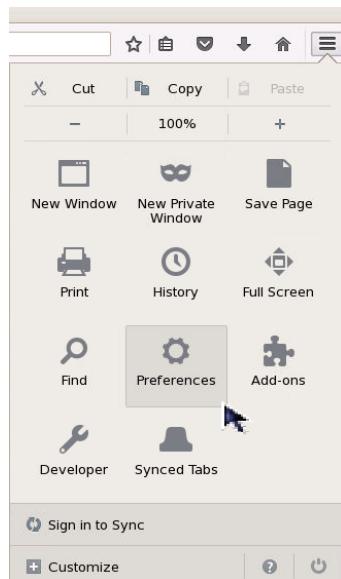
- Note that NetworkManager generated the `/etc/resolv.conf` file from information in the `/etc/sysconfig/network-scripts/ifcfg-eth0` file.
- The `DOMAIN` directive in the `ifcfg-eth0` file corresponds to the `search` directive in `/etc/resolv.conf`.
- The `DNS#` directives in the `ifcfg-eth0` file correspond to the `nameserver` directives in `/etc/resolv.conf`.

2. Determine the **HTTP Proxy** server on **dom0**.

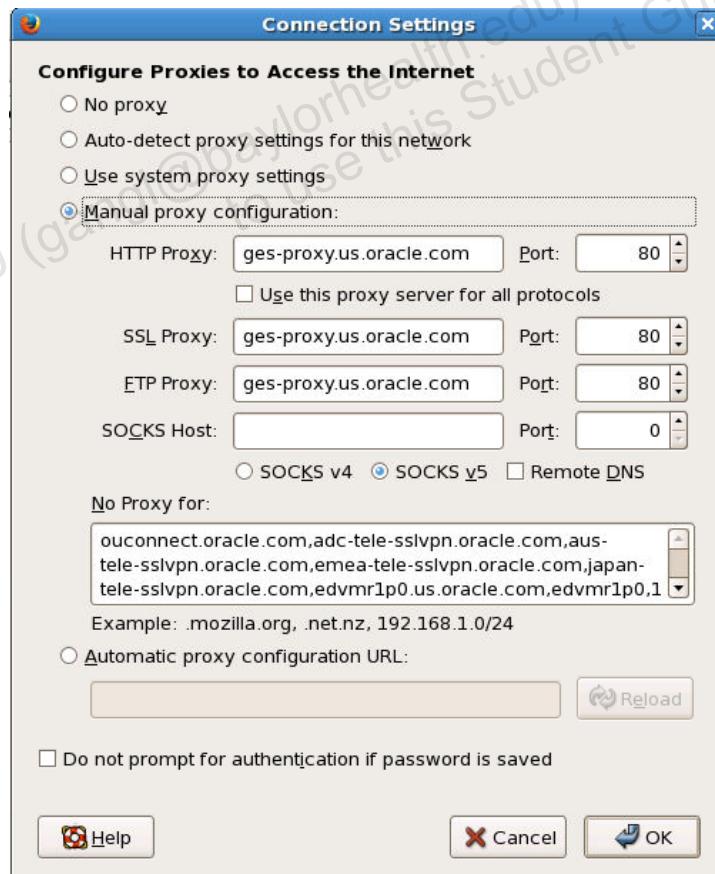
- a. On **dom0**, open Firefox by double-clicking the Firefox icon on the desktop.



- b. Click the menu icon in the upper-right corner of the browser window and select **Preferences** to display the Firefox Preferences window.



- c. Select the **Advanced** menu option in the Firefox Preferences window, and then click the **Network** tab.
d. Click the **Settings** button. The Connection Settings window appears.



- e. Note the **HTTP Proxy** setting.
 - In this example, the setting is ges-proxy.us.oracle.com on Port 80.
- f. Click **Cancel** to close the **Connection Settings** window.
- g. Click **X** in the Firefox **Preferences** tab to close it.
- h. Click **X** in the upper-right corner of the browser window to close the browser on **dom0**.

All remaining commands are issued from the **host03** VM.

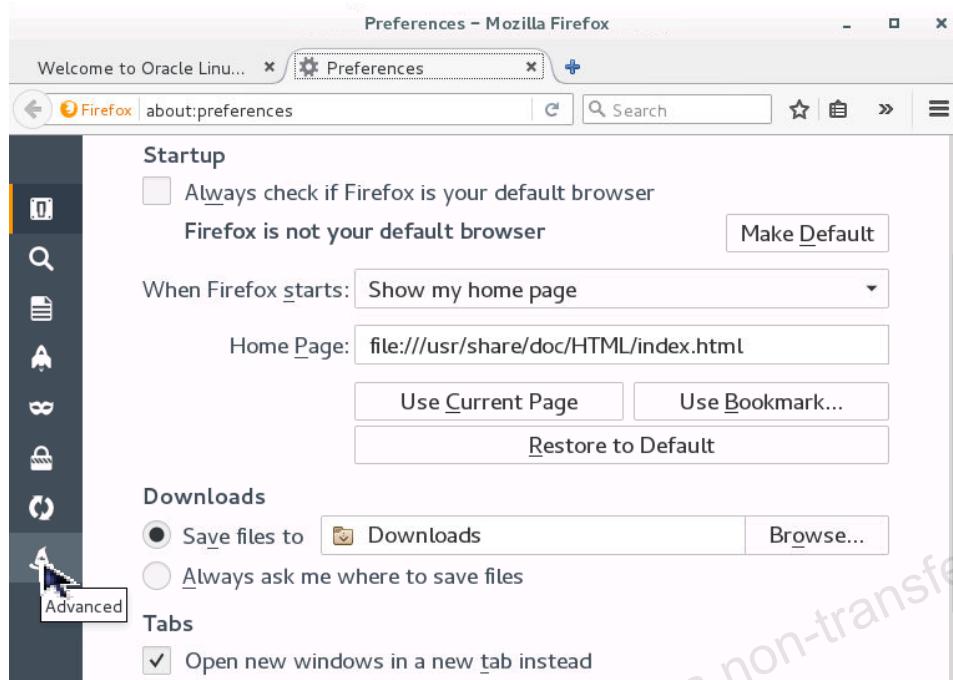
3. Set the **HTTP Proxy** in Firefox on **host03**.

- In this example, the **HTTP Proxy** is ges-proxy.us.oracle.com.
- a. On the **host03** GNOME menu bar, click **Applications**, and then click the **Firefox Web Browser** icon.



- The browser appears. Ignore any connection issues or "Problem loading page" messages.
- b. Click the menu icon in the upper-right corner of the browser window and select **Preferences** to display the Firefox Preferences window.

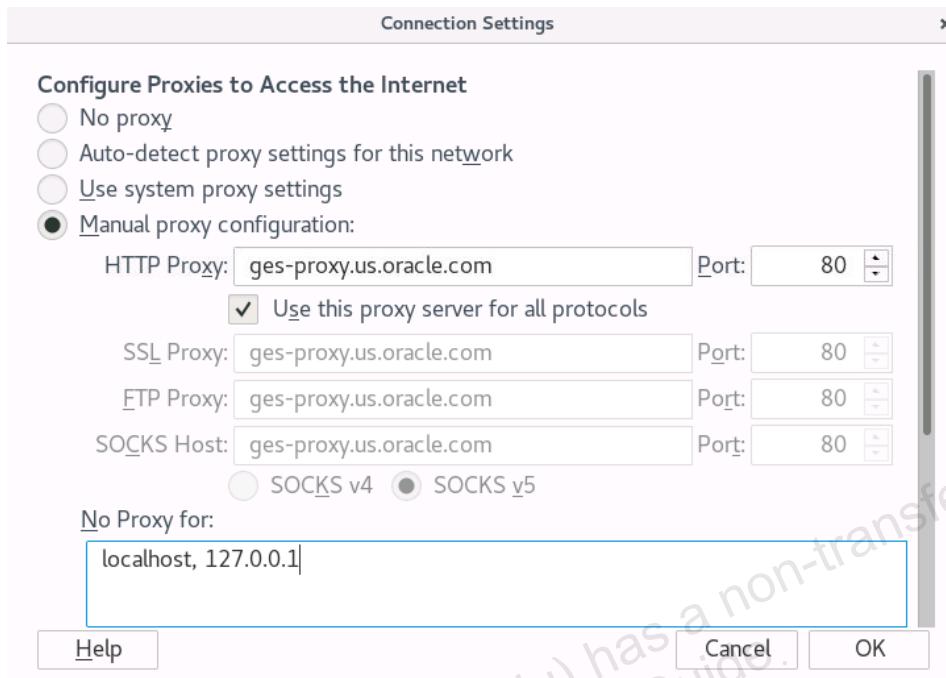
- c. Select the **Advanced** menu option and then click the **Network** tab.



- d. Click the **Settings** tab and enter the following settings:
- 1) Click Manual proxy configuration.
 - 2) Set HTTP Proxy to ges-proxy.us.oracle.com on Port 80 (or whatever was set on dom0).

3) Select Use this proxy server for all protocols.

- The Connection Settings window should look like the following (substituting the **HTTP Proxy** settings from **dom0**):



- Click **OK**.
 - Click the **X** in the Firefox **Preferences** tab to close it.
4. Access the Oracle Linux yum server URL.
- In the browser, enter the URL for the Oracle Linux yum server,
<http://yum.oracle.com>.

- The page looks like the following:

A screenshot of a Mozilla Firefox browser window showing the Oracle Linux Yum Server website. The address bar shows 'yum.oracle.com'. The page features the Oracle Linux logo and a penguin wearing an Oracle vest. The main content area is titled 'Oracle Linux Yum Server' and contains text about the yum server, links to 'Getting Started' and 'Configuring the Oracle Linux Yum Server', and a 'Frequently Asked Questions' section. On the right, there's a sidebar titled 'Browse the repositories' with links for 'What's New', 'Oracle Linux 5', 'Oracle Linux 6', and 'Oracle Linux 7'.

- The page contains a link to steps to manually configure your system to receive updates from the Oracle Linux yum server if necessary.
- Scroll down if needed. Click "Read more >>" in the paragraph which begins "If you have an older version of Oracle Linux..." to view the instructions.

A screenshot of the same Oracle Linux Yum Server website as above, but with a mouse cursor hovering over the 'Read more >>' link in the 'Configuring the Oracle Linux Yum Server' section. The rest of the page content is visible, including the 'Getting Started' section, the 'Learn more about the Oracle Linux Yum Server' link, and the repository sidebar.

Getting Started

How to connect to Oracle Linux Yum Server

[Home > Getting Started](#)

[Introduction](#)

[Configuring Your System to Install Software from Oracle Linux Yum Server](#)

[Oracle Linux](#)

[Checking Yum Configuration](#)

[Red Hat Enterprise Linux, CentOS & Scientific Linux](#)

[Installing Software from Oracle Linux Yum Server](#)

[Available Software](#)

[Connecting To Yum Mirrors in Oracle Cloud Infrastructure \(OCI\)](#)

[Additional Software Available in OCI](#)

[References](#)

Introduction

Oracle Linux yum server server hosts software for Oracle Linux and compatible distributions. These instructions help you get started configuring your Linux system for Oracle Linux yum server and installing software via `yum`.

Configuring Your System to Install Software from Oracle Linux Yum Server

If you are starting from scratch, and don't have a Linux OS installed, download and install Oracle Linux. Alternatively, use an [Oracle Linux Vagrant box](#) to run with Oracle VM VirtualBox.

- This is for information only; you do not need to run any commands from this page.
 - c. Click the **X** in the upper-right corner of the browser window to close the browser on **host03**.
5. Set the proxy variable in the `/etc/yum.conf` file.
- a. Back up `/etc/yum.conf` first.

```
# cp /etc/yum.conf /etc/yum.conf_SAV
```

- b. Use the `vi` command to add the `proxy` variable definition to the `/etc/yum.conf` file.
 - Add the entry before the comments that begin with "# This is the default..." in the `/etc/yum.conf` file.
 - This proxy variable is needed to access the Oracle Linux yum server from the command line on your classroom machine.

```
# vi /etc/yum.conf
proxy=http://ges-proxy.us.oracle.com:80
```

6. Review the Oracle Linux yum server repository file on **host03**.

- a. Use the `cd` command to change to the `/etc/yum.repos.d` directory. Use the `ls` command to display the contents of the directory.

```
# cd /etc/yum.repos.d
# ls
public-yum-ol7.repo
```

- Note that the `public-yum-ol7.repo` file already exists in this directory as part of the system installation.

- b. Use the `less` command to view the `public-yum-ol7.repo` file.

- Your system is preconfigured to access the latest Oracle Linux 7 repository on the Oracle Linux yum server, [`ol7_latest`], and the Oracle Linux 7 UEK R4 repository, [`ol7_UEKR4`].
- These are enabled by the `enabled=1` setting.
- All other repositories are disabled by the `enabled=0` setting.

```
# less public-yum-ol7.repo
[ol7_latest]
...
enabled=1
...
[ol7_UEKR4]
...
enabled=1
...
```

- c. Run the `yum repolist` command to list the configured repositories. The first time this command is run, repo information is downloaded and cached. Some of the numbers will vary and your output order might be different.

```
# yum repolist
Loaded plugins: langpacks, ulninfo
ol7_UEKR4                                         | 1.2 kB  00:00:00
ol7_latest                                         | 1.4 kB  00:00:00
(1/5): ol7_UEKR4/x86_64/updateinfo              | 80 kB   00:00:06
(2/5): ol7_latest/x86_64/updateinfo            | 561 kB   00:00:05
(3/5): ol7_latest/x86_64/group                 | 659 kB   00:00:06
(4/5): ol7_UEKR4/x86_64/primary               | 2.5 MB   00:00:06
(5/5): ol7_latest/x86_64/primary               | 7.7 MB   00:00:02
ol7_UEKR4                                         110/110
ol7_latest                                         8667/8667
repo id          repo name          status
ol7_UEKR4/x86_64  Latest Unbreakable Enterprise Kernel ...
ol7_latest/x86_64 Oracle Linux 7Server Latest (x86_64) ...
repolist: 8,777
```

- Note that the two repositories correspond to the two “enabled=1” settings in the public-yum.ol7.repo file.

7. Run the yum update command to display available updates.

DO NOT APPLY UPDATES!

- ***Do not apply updates. It takes a couple of hours to do so.***
- Answer **NO (n)** when asked, “Is this ok”.

```
# yum update
...
Transaction Summary
=====
Install ...
Upgrade ...
Total download size: ...
Is this ok [y/d/N] : n
Exiting on user Command
Your transaction was saved, rerun it with:
  yum load-transaction /tmp/yum_save_tx...
```

- You should see that new packages are available to be installed.
- You should also see a number of packages with updates available.
- ***Do not update at this time. It takes a couple of hours to update.***

Practice 7-3: Creating a Local Yum Repository

Overview

In this practice, you use the `createrepo` utility to create a local yum repository, and create a `repo` file to enable the local repository.

Assumptions

- You are the root user on the **host03** VM.
- The Oracle Linux `dvd.iso` image is mounted on `/localrepo/media/`.
- This local yum repository is needed in subsequent practices.

Tasks

1. Disable the Oracle Linux yum server repositories.

- a. Run the `yum clean all` command to clean up the yum cache.

```
# yum clean all
Loaded plugins: langpacks, ulninfo
Cleaning repos: ol7_UEKR4 ol7_latest
Cleaning up everything
...
```

- b. Use the `vi` editor to edit the `/etc/yum.repos.d/public-yum-ol7.repo` file and set all "enabled=1" to "enabled=0". These should be just `ol7_latest` and `ol7_UEKR4`.

```
# vi /etc/yum.repos.d/public-yum-ol7.repo
[ol7_latest]
...
enabled=1                                (old value)
enabled=0                               (new value)
...
[ol7_UEKR4]
...
enabled=1                                (old value)
enabled=0                               (new value)
...
```

- c. To ensure all repositories are disabled, use the `grep` command and search for the string "enabled" in the `/etc/yum.repos.d/public-yum-ol7.repo` file.

```
# grep enabled /etc/yum.repos.d/public-yum-ol7.repo
enabled=0
enabled=0
enabled=0
enabled=0
```

```
enabled=0
enabled=0
enabled=0
...
```

- In this example, all repositories are disabled (`enabled=0`).
 - Repeat the above tasks, if necessary, to ensure that all repositories are disabled.
2. Ensure that the Oracle Linux `dvd.iso` image is mounted on `/localrepo/media`, because it was set up previously.

- a. Use the `df` command to display the mounted file systems.

```
# df -h
Filesystem           Size  Used Avail Use% Mounted on
...
/dev/sr0            ...    ...      0  100% /localrepo/media
...
```

- Note that the Oracle Linux media is still mounted on `/localrepo/media`.
- b. Verify this by using the `ls` command to list the contents of `/localrepo/media`.

```
# ls /localrepo/media
addons  EULA  images LiveOS ... repodata  RPM-GPG-KEY-oracle
EFI     GPL   isolinux Packages ... RPM-GPG-KEY  TRANS.TBL
```

- Note that the contents of the directory reflect the Oracle Linux ISO contents, as seen previously.
3. Create the local repository.

- a. Use the `rpm` command to check whether the `createrepo` package is installed.

```
# rpm -q createrepo
createrepo-...el7.noarch
```

- In this example, the package is installed.
- b. Change to the `/localrepo` directory.

```
# cd /localrepo
# ls
media
```

- c. Use the `createrepo` command to create a repository of the current directory.
- This command takes several minutes to complete.
 - Include the `“.”` argument to represent the current directory.

```
# createrepo .
Spawning worker 0 with 5180 pkgs
Workers Finished
Saving Primary metadata
Saving file lists metadata
Saving other metadata
Generating sqlite DBs
```

```
Sqlite DBs complete
```

- d. View the results of the `createrepo` command.

```
# pwd
/localrepo
# ls -l
drwxr-xr-x. ... media
drwxr-xr-x. ... repodata
```

- Notice that the `repodata` directory has been created.

- e. View the contents of the `repodata` directory.

```
# ls -l repodata
-rw-r--r-- ... other.sqlite.bz2
-rw-r--r-- ... other.xml.gz
-rw-r--r-- ... filelists.xml.gz
-rw-r--r-- ... primary.xml.gz
-rw-r--r-- ... primary.sqlite.bz2
-rw-r--r-- ... repomd.xml
-rw-r--r-- ... filelists.sqlite.bz2
```

- f. Use the `cd` command to change to the `yum` repository directory. Use the `vi` editor to create the `iso.repo` file.

```
# cd /etc/yum.repos.d
# vi iso.repo
[Myrepo]
name=Oracle Linux
baseurl=file:///localrepo
gpgkey=file:///localrepo/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1
```

- g. In this example, the GPG key is located on the Oracle Linux `dvd.iso` image.

```
# cd /localrepo/media
# ls *GPG*
RPM-GPG-KEY RPM-GPG-KEY-oracle
```

- There are two files that contain the GPG key.
- The files are the same, so either can be used.

```
# diff RPM-GPG-KEY RPM-GPG-KEY-oracle
```

- h. Use the `cp` command to copy the `RPM-GPG-KEY-oracle` file from `/localrepo/media` to `/localrepo`.

- Copy the `RPM-GPG-KEY-oracle` file because this is the file you designated in the `iso.repo` file.

```
# cp /localrepo/media/RPM-GPG-KEY-oracle /localrepo
```

- i. Manually install the public key.

```
# rpm --import RPM-GPG-KEY-oracle
```

- If a GPG key was previously imported, this will simply import one again.

- j. Confirm the import of the public key.

```
# rpm -q gpg-pubkey
```

```
gpg-pubkey-...
```

- k. Use the `yum repolist` command to list the configured repositories.

- Note that the “Myrepo” repository is the only enabled repository. Some of your numbers might vary.

```
# yum repolist
```

```
Loaded plugins: langpacks, ulninfo
```

repo id	repo name	status
Myrepo	Oracle Linux	5,180
Myrepo/primary_db		4.8 MB 00:00:00
repo list: 5,180		2.9 kB 00:00:00

Practice 7-4: Using the yum Utility

Overview

In this practice, you use the `yum` utility to list both installed packages and packages available to be installed, install a package, check for packages with updates available, update a package, and remove a package. You install the “Server with GUI” package group, start the X Window system, and log in to the GNOME desktop. You run a graphical tool from an `ssh` session without using the GNOME desktop. You remove packages from the “Server with GUI” package group, restore configuration files, and restart the network.

Assumptions

- This practice assumes that you have a local `yum` repository configured.
- You utilize both the **host01** and **host03** VMs.
- You are the `root` user on the **host03** VM.
- You are the `root` user on **dom0**.

Tasks

The following tasks are completed using the **host03** VM.

1. List packages by using `yum`.
 - a. List all packages installed on your system and all packages available in all configured repositories.
 - Notice that some packages were installed during installation (@anaconda/7.5) and some are available in the new repository (Myrepo).

```
# yum list
Loaded plugins: langpacks, ulninfo
Installed Packages
GConf2.x86_64           ...
GeoIP.x86_64             ...
ModemManager.x86_64      ...
ModemManager-glib.x86_64 ...
...
zsh.x86_64               ...
zziplib.i686              ...
zziplib.x86_64            ...

@anaconda/7.5
@anaconda/7.5
@anaconda/7.5
@anaconda/7.5
...
Myrepo
Myrepo
Myrepo
```

- b. List only the installed packages.

```
# yum list installed
Loaded plugins: langpacks, ulninfo
Installed Packages
GConf2.x86_64           ...
GeoIP.x86_64             ...

@anaconda/7.5
@anaconda/7.5
```

ModemManager.x86_64	...	@anaconda/7.5
ModemManager-glib.x86_64	...	@anaconda/7.5
...		
zenity.x86_64	...	@anaconda/7.5
zip.x86_64	...	@anaconda/7.5
zlib.x86_64	...	@anaconda/7.5

- c. List only the packages that are available to be installed from enabled repositories.

```
# yum list available
Loaded plugins: langpacks, ulninfo
Available Packages
389-ds-base.x86_64          ...
389-ds-base-libs.x86_64       ...
ElectricFence.i686           ...
...
zsh.x86_64                   ...
zziplib.i686                 ...
zziplib.x86_64               ...
```

- d. List the name of the package to which the /etc/sysconfig/crond file belongs.

```
# yum provides /etc/sysconfig/crond
...
cronie-...x86_64 : Cron daemon for executing programs ...
Repo        : @anaconda/7.5
...
```

2. Install packages by using yum.

- a. Install the 389-ds-base package.

- Answer **y** when prompted.

```
# yum install 389-ds-base
Loaded plugins: langpacks, ulninfo
Resolving Dependencies
--> Running transaction check
...
--> Finished Dependency Resolution

Dependencies Resolved
=====
Package ...

=====
Installing:
389-ds-base ...
Installing for dependencies:
389-ds-base-libs ...
```

```
...
Transaction Summary
=====
Install 1 Package (+10 Dependent packages)
Total download size: 3.2 M
Installed size: 9.2 M
Is this ok [y/d/N]: y
Downloading packages
...
Running transaction
  Installing : svrcore-...x86_64
...
Installed:
  389-ds-base.x86_64 ...
Dependency Installed:
  389-ds-base-libs.x86_64 ...
...
Complete!
```

3. Update the packages by using `yum`.

a. Check which installed packages have updates available.

```
# yum check-update
Loaded plugins: langpacks, ulninfo
```

- In this case, there are no updates available.

4. Remove the packages by using `yum`.

a. Remove the `389-ds-base` package.

- If the following “`yum remove`” command fails, run the “`yum clean all`” command to clean up the `yum` cache, and then run the “`yum remove`” command again.
- Answer `y` when prompted.

```
# yum remove 389-ds-base
...
Transaction Summary
=====
Remove      1 Package

Installed size: 5.3 M
Is this ok [y/N]: y
...
Removed:
  389-ds-base.x86_64 ...
```

Complete!

5. Log on to **host01**, which will be used to install a package group.
 - a. From the terminal window on **dom0**, connect to the **host01** guest by using the `xm vncviewer host01&` command. Press the **Enter** key to get a prompt if necessary.

```
# xm vncviewer host01&
```

- A text-based login prompt appears, as **host01** does not have the "Server with GUI" package group installed.

- b. Log on as the **root** user, providing the password.

```
Oracle Linux Server ...
...
host01 login: root
Password:
```

The following tasks are completed using the **host01** VM.

6. Configure the Domain Name Service (DNS) resolver configuration file.
 - a. Create a backup of `/etc/sysconfig/network-scripts/ifcfg-eth0`.


```
# cp /etc/sysconfig/network-scripts/ifcfg-eth0
/etc/sysconfig/network-scripts/ifcfg-eth0_SAV
```
 - b. Add the `DOMAIN` directive and add the `DNS1`, `DNS2`, and `DNS3` entries to the end of the `/etc/sysconfig/network-scripts/ifcfg-eth0` file as shown.


```
# vi /etc/sysconfig/network-scripts/ifcfg-eth0
...
DOMAIN="example.com edu.oracle.com"
DNS1=192.0.2.1
DNS2=152.68.154.3
DNS3=10.237.18.52
```
 - c. Use the `systemctl` command to restart the network service.


```
# systemctl restart network
```
 - d. Use the `cat` command to display the contents of the `/etc/resolv.conf` file.


```
# cat /etc/resolv.conf
# Generated by NetworkManager
search example.com edu.oracle.com
nameserver 192.0.2.1
nameserver 152.68.154.3
nameserver 10.237.18.52
```

 - Note that NetworkManager generated entries in the `/etc/resolv.conf` file from information in the `/etc/sysconfig/network-scripts/ifcfg-eth0` file.
7. Set the proxy variable in the `/etc/yum.conf` file.
 - a. Back up `/etc/yum.conf` first.

```
# cp /etc/yum.conf /etc/yum.conf_SAV
```

- b. Use the `vi` command to add the `proxy` variable definition to the `/etc/yum.conf` file.
- Add the entry before the comments that begin with "# This is the default..." in the `/etc/yum.conf` file.
 - This proxy variable is needed to access the Oracle Linux yum server from your classroom machine.

```
# vi /etc/yum.conf
proxy=http://ges-proxy.us.oracle.com:80
```

8. Update the Oracle Linux yum server repository file.

- a. Use the `cd` command to change to the `/etc/yum.repos.d` directory. Use the `ls` command to display the contents of the directory.

```
# cd /etc/yum.repos.d
# ls
public-yum-ol7.repo
```

- Note that the `public-yum-ol7.repo` file already exists in this directory as part of the system installation.
- Use the `less` command to view the `public-yum-ol7.repo` file.
- The system is preconfigured to access the latest Oracle Linux 7 repository on the Oracle Linux yum server, [ol7_latest], and the Oracle Linux 7 UEK R4 repository, [ol7_UEKR4].
- These are enabled by the `enabled=1` setting.
- All other repositories are disabled by the `enabled=0` setting.

```
# less public-yum-ol7.repo
[ol7_latest]
...
enabled=1
...
[ol7_UEKR4]
...
enabled=1
...
```

- c. Use the `vi` editor to edit the `/etc/yum.repos.d/public-yum-ol7.repo` file and set the `ol7_latest` and `ol7_UEKR4` repositories from "enabled=1" to "enabled=0". Set the `ol7_u5_base` repository from "enabled=0" to "enabled=1".

```
# vi /etc/yum.repos.d/public-yum-ol7.repo
[ol7_latest]
...
enabled=1                                (old value)
enabled=0                               (new value)
...
[ol7_u5_base]
```

```

...
enabled=0                                (old value)
enabled=1                                (new value)

...
[ol7_UEKR4]

...
enabled=1                                (old value)
enabled=0                                (new value)

...

```

- The `ol7_u5_base` repository is an installation media copy of packages released with Oracle Linux 7 Update 5. This provides a static repository (it is not updated) to be used for the purposes of this practice. Production environments would ordinarily use repositories that are updated, such as `ol7_latest`, `ol7_UEKR4` and others.
- d. Run the `yum repolist` command to list the configured repositories. The first time this command is run, repository information is downloaded and cached. Some of the times might vary and your output order might be different.

```
# yum repolist
Loaded plugins: ulninfo
ol7_u5_base
(1/3): ol7_u5_base/x86_64/updateinfo | 1.4 kB 00:00:00
(2/3): ol7_u5_base/x86_64/group      | 809 kB 00:00:09
(3/3): ol7_u5_base/x86_64/primary   | 3.2 MB 00:00:01
ol7_u5_base                                         7278/7278
repo id          repo name           status
ol7_u5_base/x86_64  Oracle Linux 7Server ... (x86_64) 7,278
repolist: 7,278
```

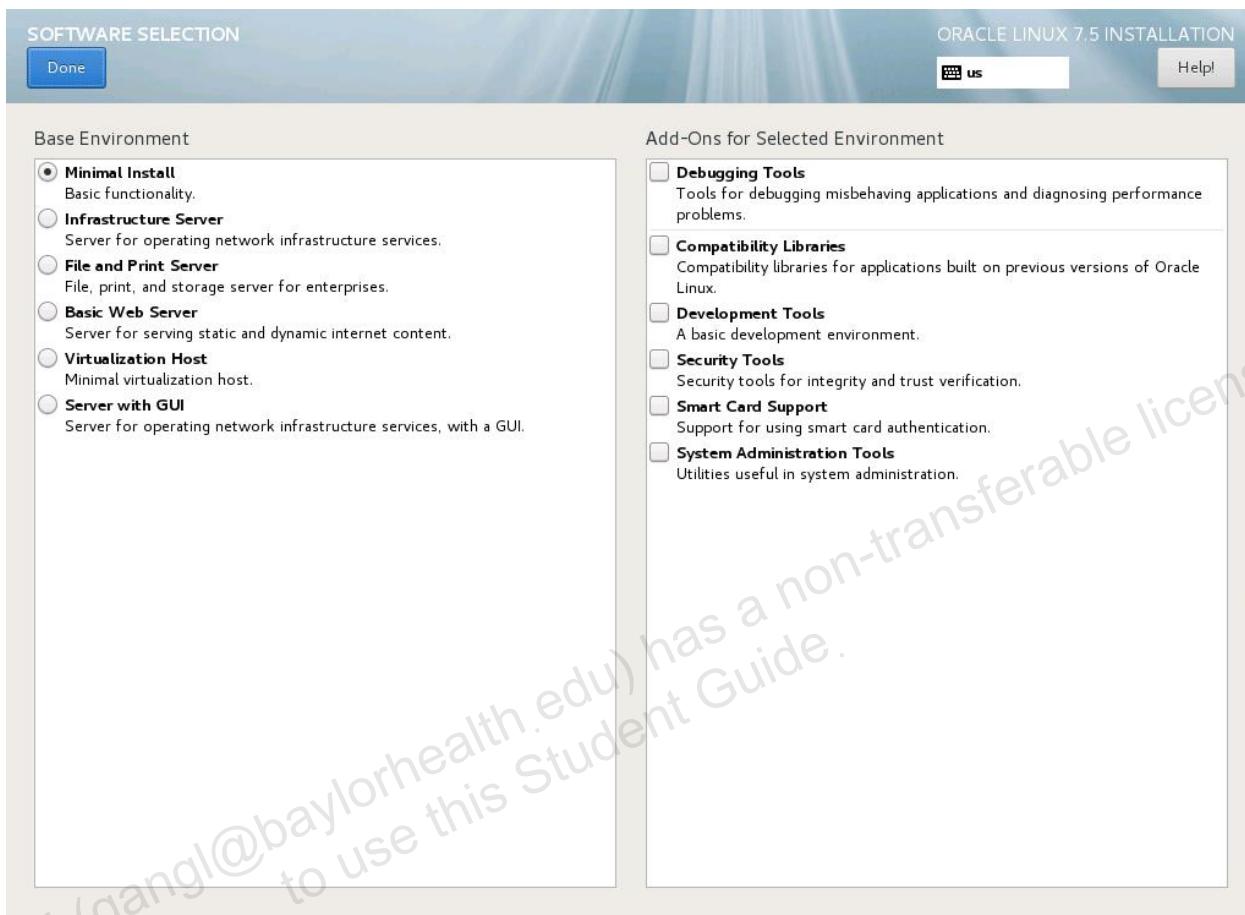
- Note that the `ol7_u5_base` repository shown corresponds to the single “`enabled=1`” setting in the `public-yum.ol7.repo` file.
- e. Use the `rpm` command to determine if a GPG key has been imported.

```
# rpm -q gpg-pubkey
gpg-pubkey-...
```

- A GPG key was previously imported on **host01**.

9. Install the "Server with GUI" package group.

- Note that **host01** was installed with the "Minimal Install" Base Environment, as shown in this screenshot from the Anaconda installer:



- The "Minimal Install" Base Environment does not provide GUI support.
- a. Use the `yum` command to install the "Server with GUI" package group in order to use an X Window system on **host01**. It can take 20 to 25 minutes for all packages to be downloaded and installed. If the screen blanks during this time, press a key to bring it back (for example, the left arrow key).

```
# yum group install "Server with GUI"
...
Resolving Dependencies
...
--> Finished Dependency Resolution

Dependencies Resolved
...
Installing for group install "Base":
...
```

```
Installing for group install "Desktop Debugging and Performance Tools":  
...  
Installing for group install "Dial-up Networking Support":  
...  
Installing for group install "Fonts":  
...  
Installing for group install "GNOME":  
...  
Installing for group install "Guest Agents":  
...  
Installing for group install "Guest Desktop Agents":  
...  
Installing for group install "Hardware Monitoring Utilities":  
...  
Installing for group install "Input Methods":  
...  
Installing for group install "Internet Browser":  
...  
Installing for group install "Multimedia":  
...  
Installing for group install "Printing Client":  
...  
Installing for group install "X Window System":  
...  
Transaction Summary  
=====  
Install 272 Packages (+717 Dependent packages)  
  
Total download size: 687 M  
Installed size: 2.1 G  
Is this ok [y/d/N]: y  
Downloading packages:  
...  
Running transaction  
    Installing : ...  
...  
Complete!
```

10. Start the X Window System and log on to **host01** from the GNOME desktop.

- a. Using the `systemctl` command, check the default target unit.

```
# systemctl get-default
multi-user.target
```

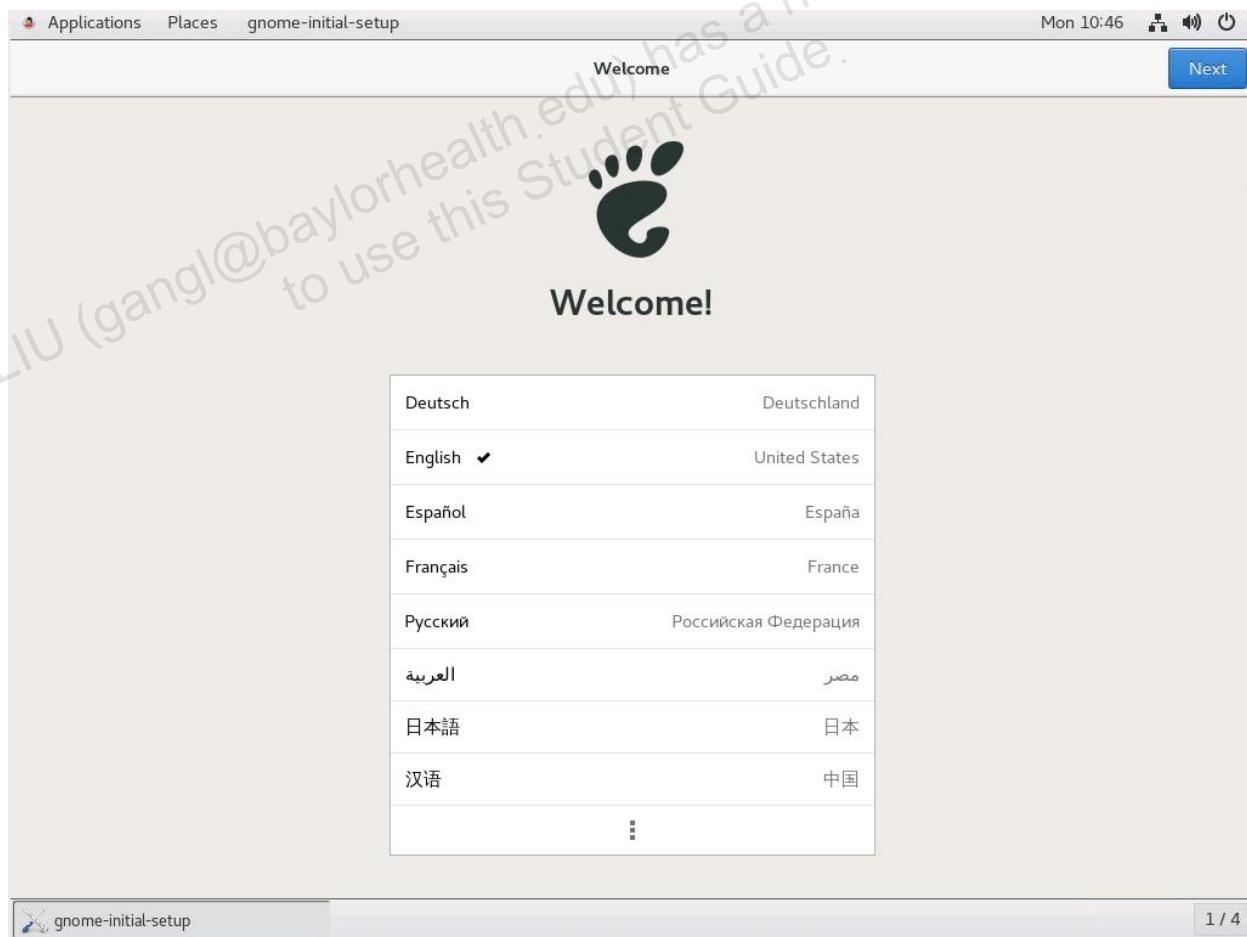
- Note that the system is running at `multi-user.target`, which does not start the X Window System. The `graphical.target` is needed for this.

- b. Use the `systemctl isolate` command to change the currently active system target to `graphical.target`.

```
# systemctl isolate graphical.target
```

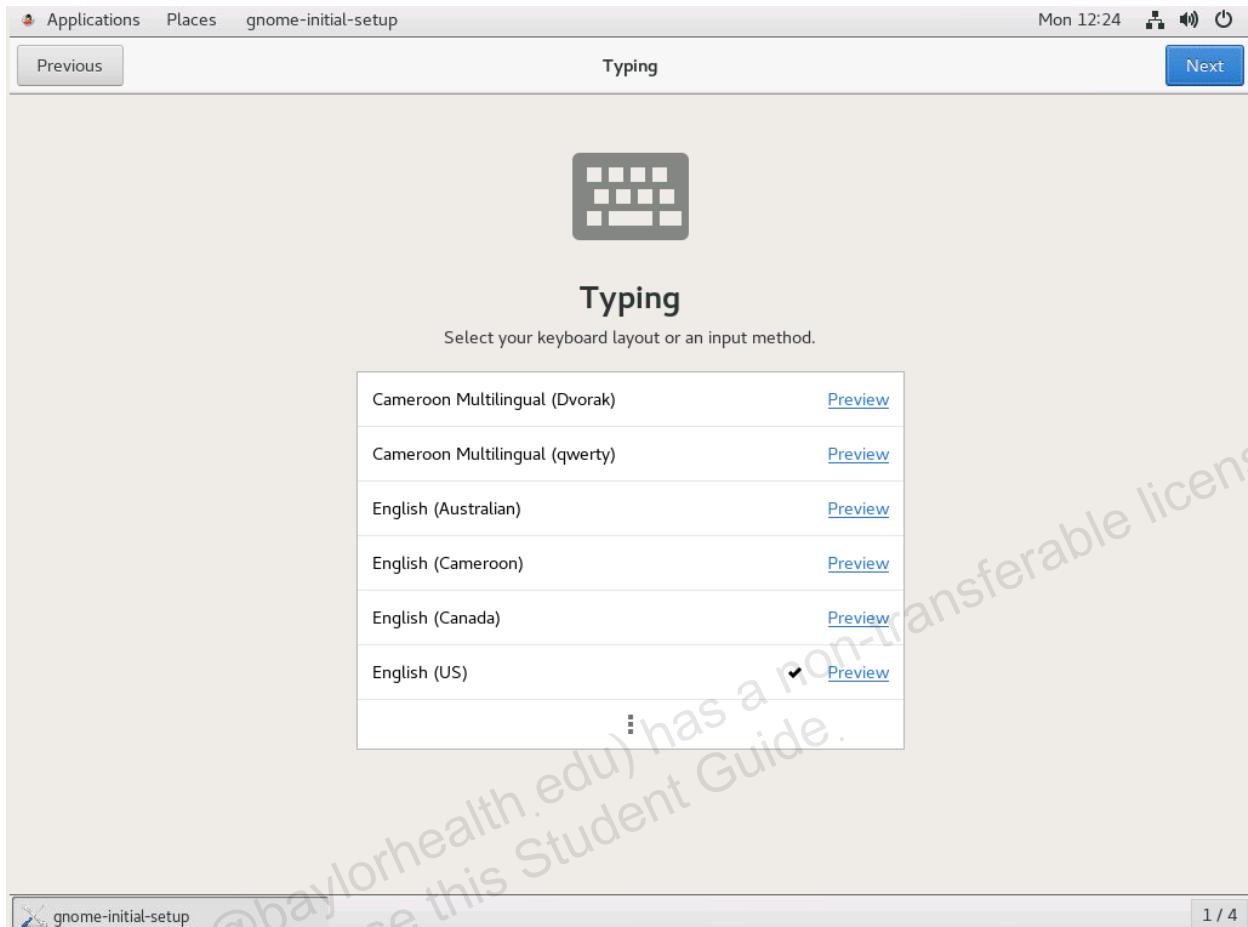
- The X Window System starts and the GNOME desktop login screen is presented.
- Running the `systemctl isolate` command does not change the default target unit, but does change the state of the system.

- c. Select Oracle Student from the GNOME login window, enter the password, and click **Sign In** or press the **Enter** key. After several seconds, you are presented with a GNOME Welcome screen allowing a language selection. This is part of the GNOME initial setup that occurs upon first use of GNOME.



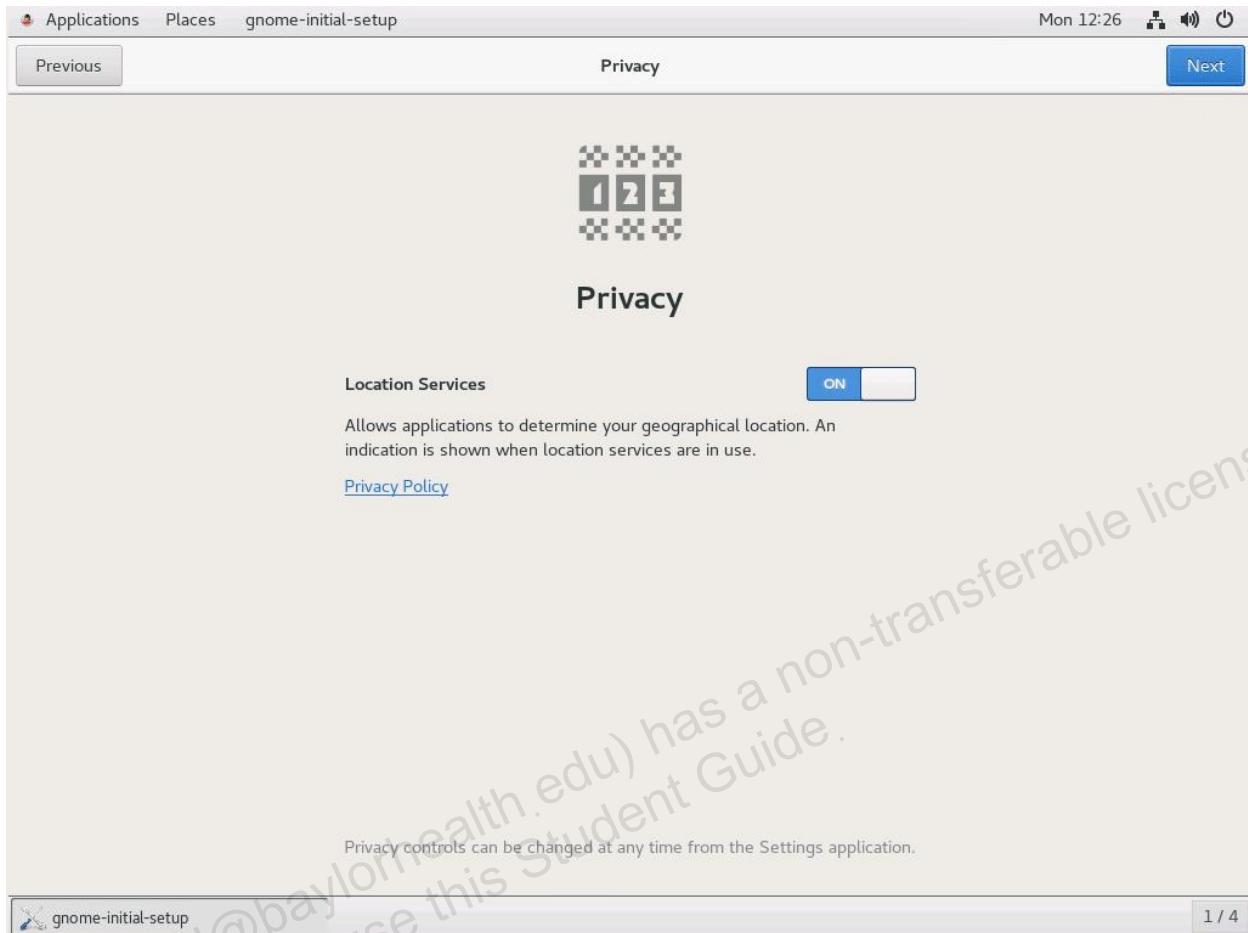
- d. Change the language if desired and click **Next**.

The following window appears:



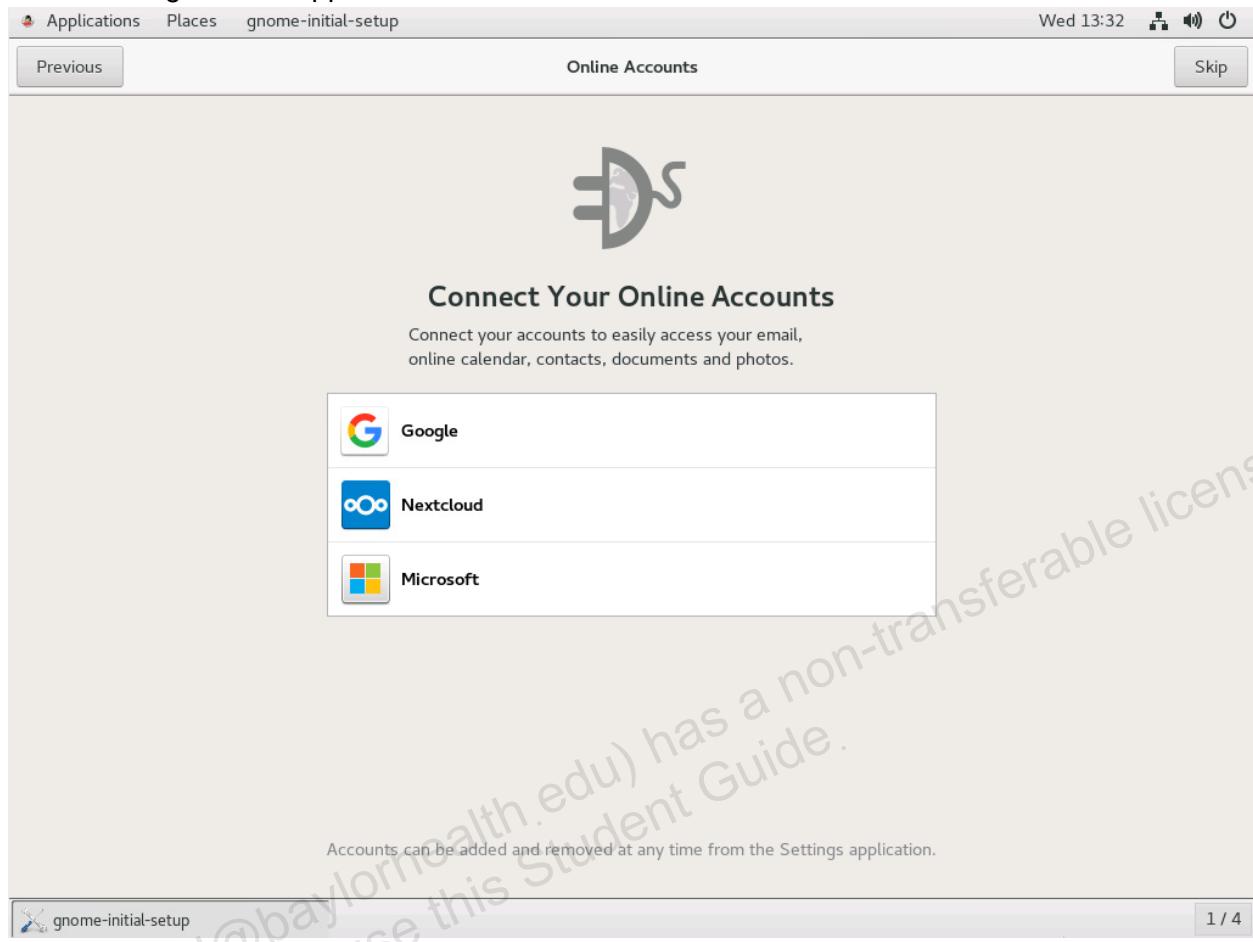
- e. Change the keyboard layout if desired and click **Next**.

The following window appears:



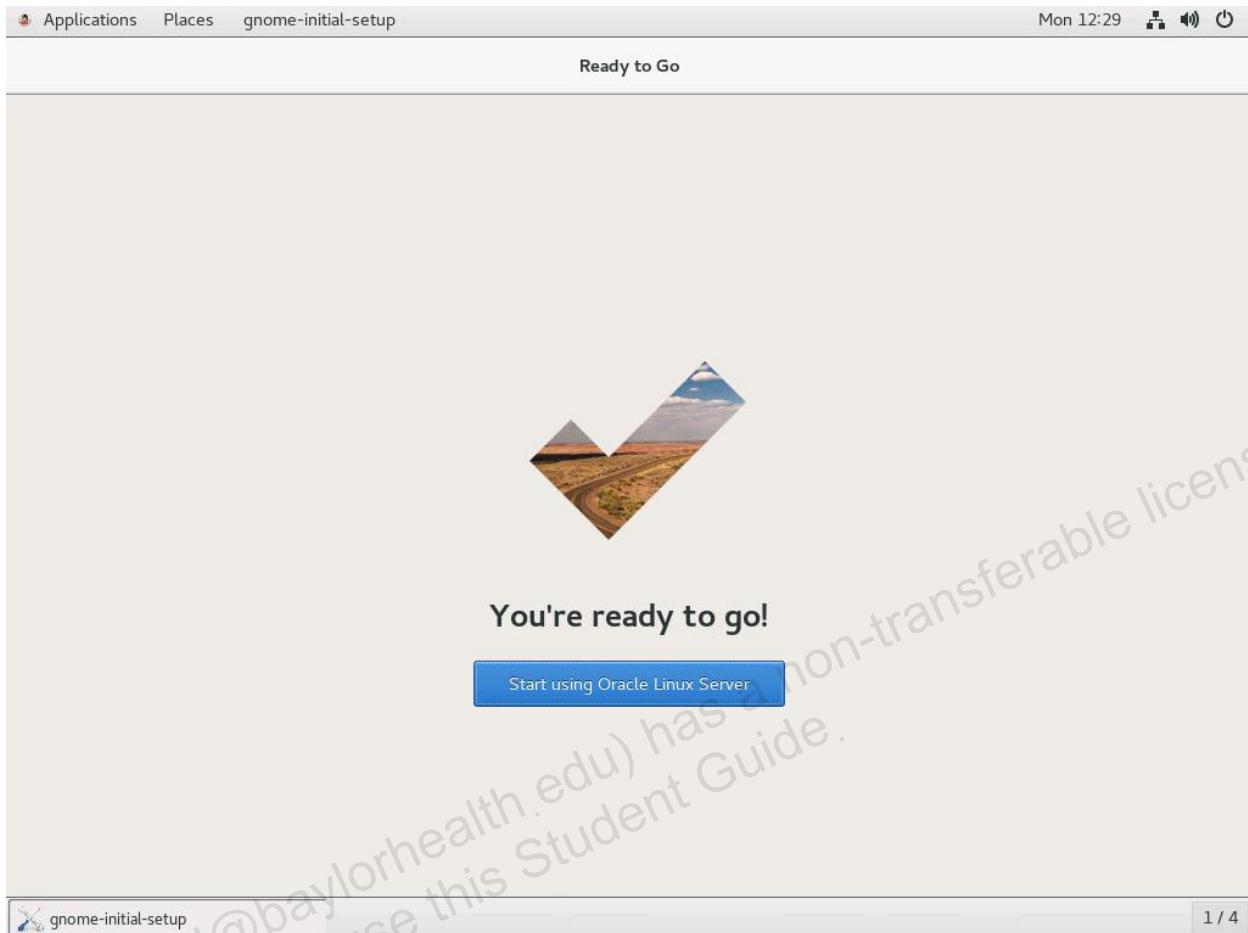
- f. Change the location setting to OFF if desired and click **Next**.

The following window appears:



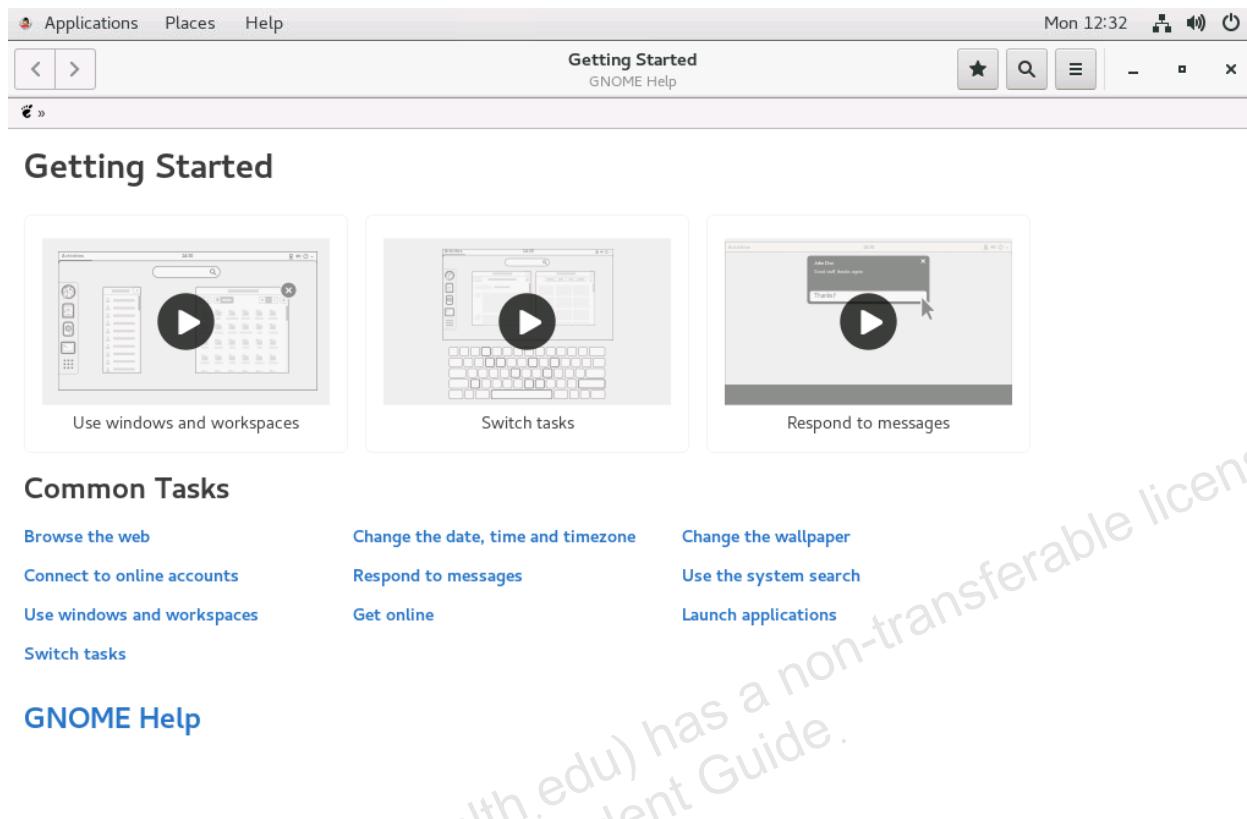
g. Click **Skip**.

The following window appears:



- h. Click **Start using Oracle Linux Server**.

The following window appears:



GNOME Help



- i. Click the "x" in the upper-right corner of the GNOME **Getting Started** window to close the window.
- j. Right-click the GNOME desktop and select **Open Terminal** from the shortcut menu.
- k. In the terminal window, become the `root` user by entering the `su -` command and providing the `root` password.

```
$ su -
```

```
Password:
```

- The GNOME desktop GUI is running and accessible.

11. Run a graphical application from an `ssh` session.

- a. From the terminal window on `dom0`, log on to `host01` using the `ssh` command with the "`x`" option to allow a graphical tool to be displayed using the X Window System by means of X11 forwarding. Press the **Enter** key to get a prompt if necessary. Provide the `root` password for `host01` when prompted.

```
# ssh -X host01
```

```
root@host01's password:
```

```
...
```

```
/usr/bin/xauth:  file /root/.Xauthority does not exist
```

- Note that you see the message: /usr/bin/xauth: file /root/.Xauthority does not exist. This occurs the first time you connect using ssh -X. The /root/.Xauthority file is created when the first connection is made and this message will not recur.
- Connecting with the ssh -X command allows you to run a graphical application or tool without using a desktop GUI such as GNOME on the remote system where the application is running. See the ssh(1) and ssh_config(5) man pages for security considerations when using ssh with X11 forwarding.

The following tasks are completed from the ssh session on **host01**.

- Use the yum command to install the system-config-date package. This package allows you to set the date, time, and time zone from a GUI interface.

```
# yum install system-config-date
Loaded plugins: langpacks, ulninfo
Resolving Dependencies
...
Transaction Summary
=====
Install 1 Package (+3 Dependent packages)

Total download size: 1.3 M
Installed size: 4.0 M
Is this ok [y/d/N]: y
Downloading packages:
...
Installed:
  system-config-date.noarch ...

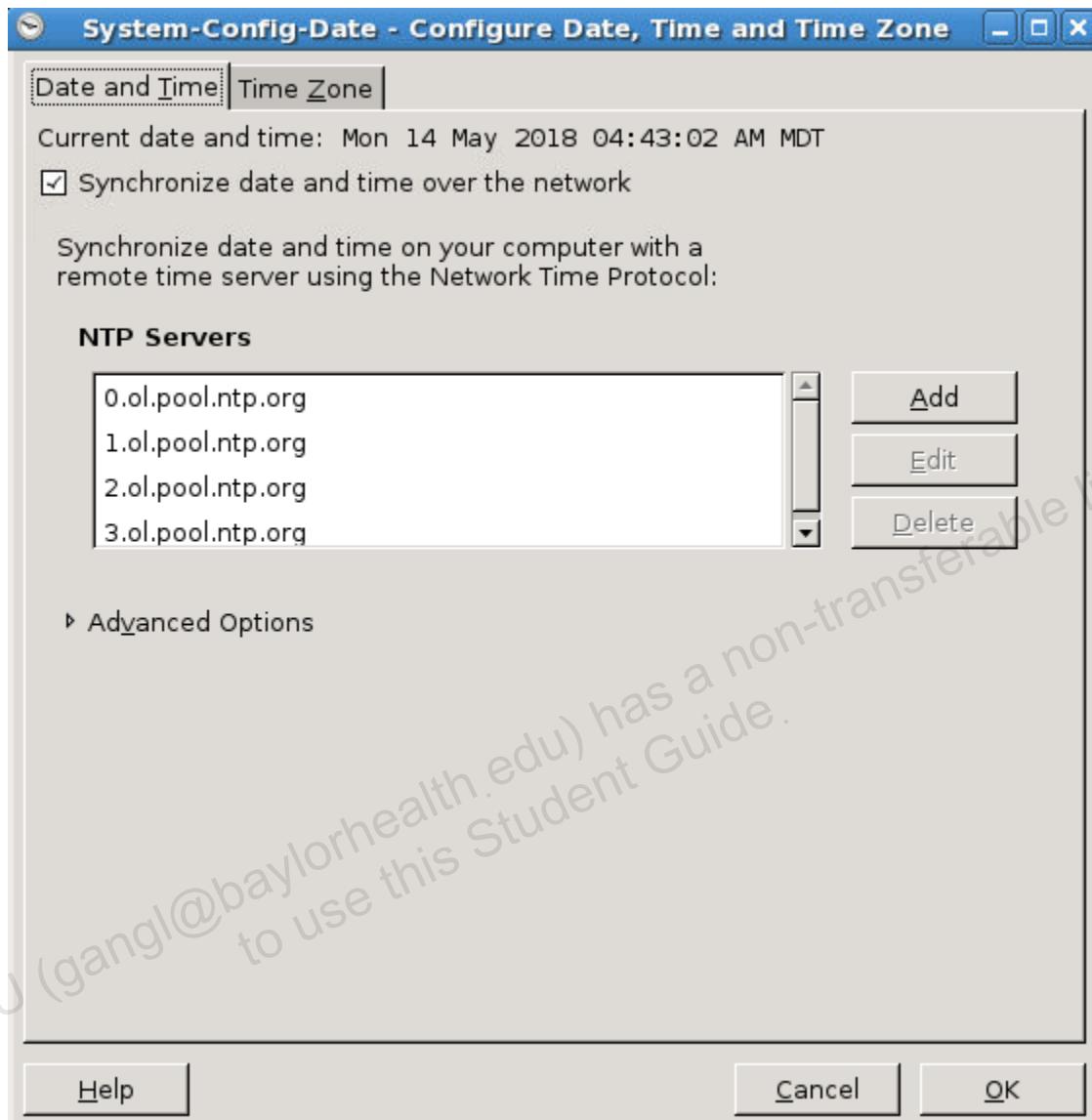
Dependency Installed:
  rarian.x86_64 ...
  rarian-compat.x86_64 ...
  system-config-date-docs.noarch ...

Complete!
```

- Run the system-config-date command to start the Date/Time Properties tool.

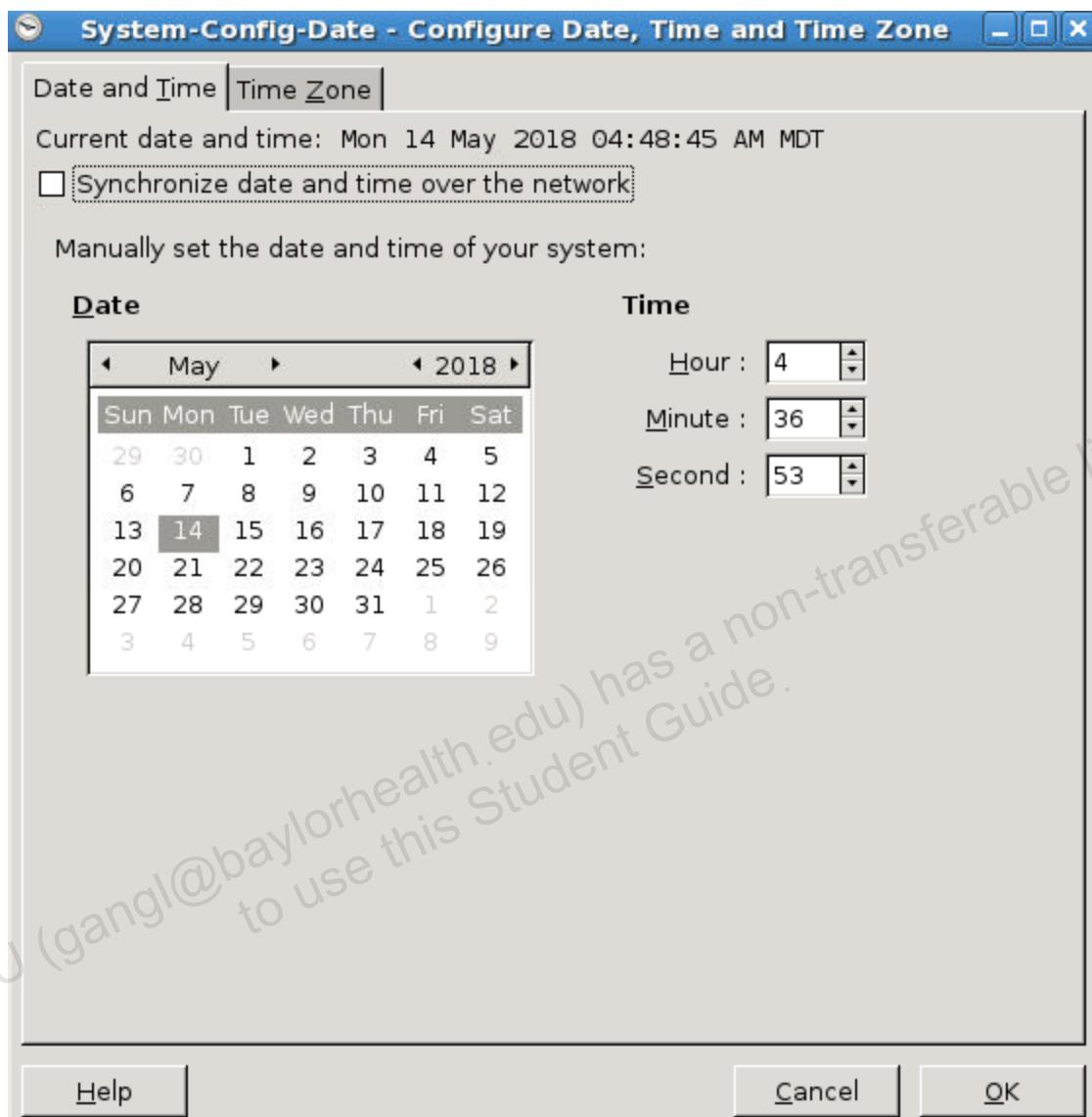
```
# system-config-date
```

- The following window appears with the **Date and Time** tab selected by default:

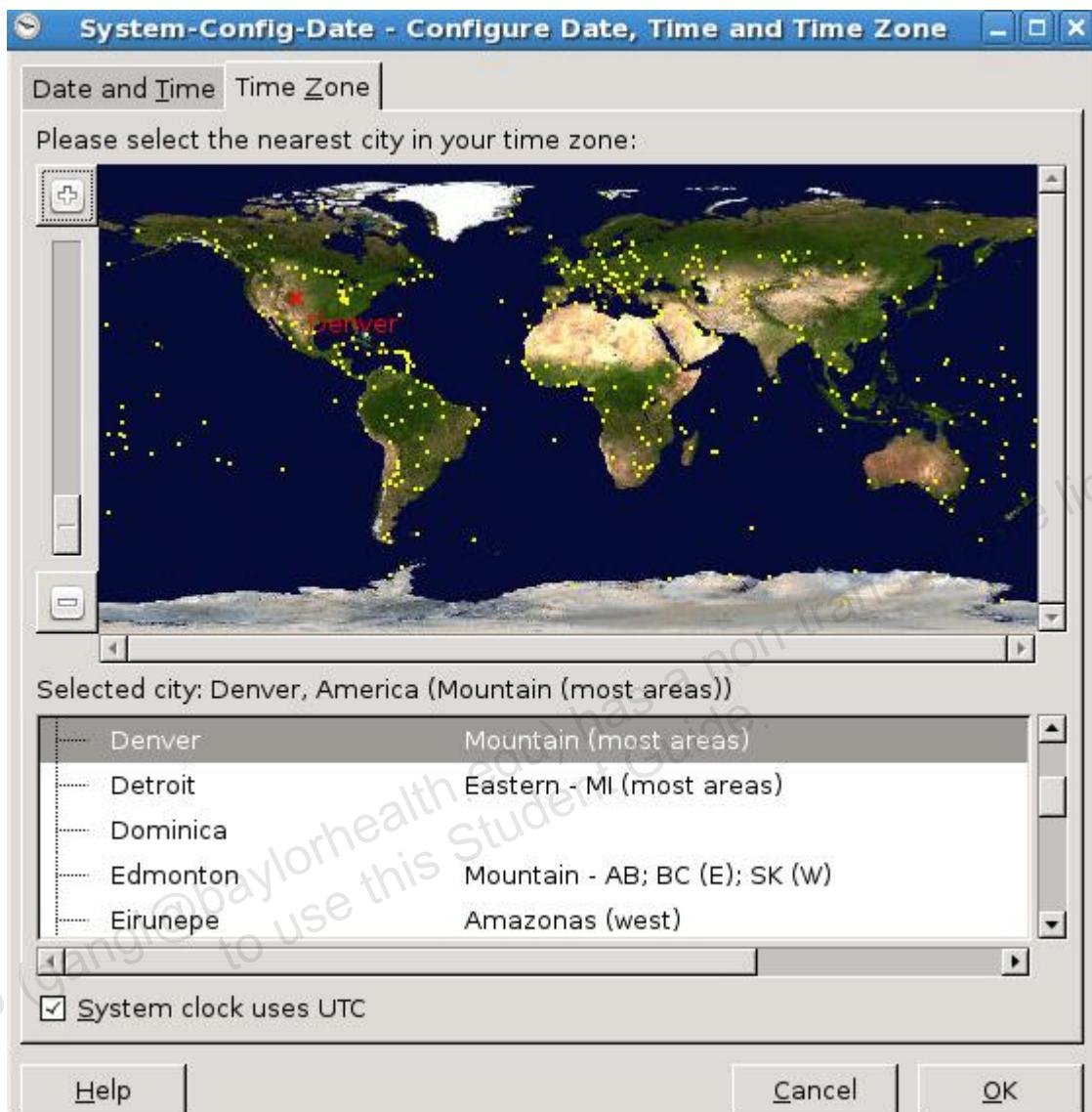


- Note that NTP time synchronization is enabled.

- d. Deselect "Synchronize date and time over the network" to allow the date and time to be set manually, as shown in the following window:



- e. Select the **Time Zone** tab to view the following window:



- f. Terminate the Date/Time Properties tool by clicking **OK**.
g. End your `ssh` session by using the `exit` command followed by **Ctrl + C** to terminate the connection.

```
# exit
logout
CTRL-C Killed by signal 2.
```

- You are now in the terminal window logged on to **dom0**.
- When using `ssh -X`, the use of graphical applications or tools can result in connections that are still present when `exit` or `logout` is issued, preventing `ssh -X` sessions from terminating. Issuing **Ctrl + C** terminates these connections, allowing `ssh -X` sessions to terminate.

The following tasks are completed from the **host01** GNOME GUI vnc session.

12. Unlock the GNOME GUI on **host01** if needed. If the GNOME GUI is not locked, proceed to the next task entitled "Change the current system target..."
 - a. Activate the **host01** vnc session window by clicking it. Press the **Enter** key. You are presented with the Oracle Student login password prompt.
 - b. Enter the password for the Oracle Student user and click **Unlock** or press the **Enter** key. You should now be in a terminal window on **host01** in the GNOME GUI, logged on as **root**.
13. Change the current system target to be nongraphical.

- a. In the GNOME GUI terminal window, use the `systemctl isolate` command to return the currently active system target to `multi-user.target`.

```
# systemctl isolate multi-user.target
```

- The X Window System terminates and a text-based login prompt is presented.

- b. Log on as the **root** user, providing the password.

```
Oracle Linux Server ...  
...  
host01 login: root  
Password:
```

14. Remove packages from the "Server with GUI" package group, restore configuration files, and restart the network.

- a. Use the `yum` command to remove packages from the "Server with GUI" package group. It will take several minutes to complete. Some of the numbers might vary.

```
# yum group remove "Server with GUI"  
Loaded plugins: langpacks, ulninfo  
...  
Dependencies Resolved  
...  
Transaction Summary  
=====  
Remove 264 Packages (+183 Dependent packages)  
  
Installed size: 1.3 G  
Is this ok [y/N]: y  
...  
Running transaction  
...  
Removed:  
...  
Dependency Removed:
```

```
...
```

```
Complete!
```

- b. Restore /etc/yum.conf.

```
# cp /etc/yum.conf_SAV /etc/yum.conf  
cp: overwrite '/etc/yum.conf'? y
```

- c. Remove /etc/yum.conf.

```
# rm /etc/yum.conf_SAV  
rm: remove regular file '/etc/yum.conf_SAV'? y
```

- d. Restore /etc/sysconfig/network-scripts/ifcfg-eth0.

```
# cp /etc/sysconfig/network-scripts/ifcfg-eth0_SAV  
/etc/sysconfig/network-scripts/ifcfg-eth0  
cp: overwrite '/etc/sysconfig/network-scripts/ifcfg-eth0'? y
```

- e. Remove /etc/sysconfig/network-scripts/ifcfg-eth0_SAV.

```
# rm /etc/sysconfig/network-scripts/ifcfg-eth0_SAV  
rm: remove regular file '/etc/sysconfig/network-scripts/ifcfg-  
eth0_SAV'? y
```

- f. Restart the network.

```
# systemctl restart network
```

15. Log off from **host01** and end the vnc session.

- a. Use the **exit** command to log off from **host01**.

```
# exit  
Oracle Linux Server ...  
...  
host01 login:
```

- b. Click the "x" in the upper-right corner of the **host01** vnc window to end the vnc session.

You are now the root user on **dom0**.

You remain logged on to **host03** in a vnc session.

Practice 7-5: Using Oracle Linux Software Collections

Overview

In this practice, you disable the local `yum` repository, enable repositories from the Oracle Linux `yum` server, and view all packages in the Software Collection Library. You install a software collection and run commands from the installed software collection. You view software collection man pages and optional packages available with the software collection. You remove the software collection, disable the repos from the Oracle Linux `yum` server, and re-enable the local repo for use in subsequent practices. Configuration files are restored and the network is restarted.

Assumptions

- You are the `root` user on **dom0**.
- You are the `root` user on the **host03** VM.

Tasks

1. Unlock the GNOME GUI on **host03**. If the GNOME GUI is not locked, proceed to the next task titled "Disable the local yum repository."
 - a. Activate the **host03** vnc session window by clicking it. Press the **Enter** key. You are presented with the Oracle Student login password prompt.
 - b. Enter the password for the Oracle Student user and click **Unlock** or press the **Enter** key. You should now be in a terminal window on **host03** in the GNOME GUI, logged on as `root`.
2. Disable the local yum repository.
 - a. Use the `vi` editor to edit the `/etc/yum.repos.d/iso.repo` file and set the `Myrepo` repository from "enabled=1" to "enabled=0".

```
# vi /etc/yum.repos.d/iso.repo
[Myrepo]
name=Oracle Linux
baseurl=file:///localrepo
gpgkey=file:///localrepo/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1 (old entry)
enabled=0 (new entry)
```

3. Enable Oracle Linux `yum` server repositories.
 - a. Use the `vi` editor to edit the `/etc/yum.repos.d/public-yum-ol7.repo` file and set the `ol7_latest`, `ol7_optional_latest` and `ol7_software_collections` repositories from "enabled=0" to "enabled=1". These repositories are required to use the Software Collection Library for Oracle Linux under Oracle Linux 7.

```
# vi /etc/yum.repos.d/public-yum-ol7.repo
[ol7_latest]
```

```

...
enabled=0                                (old value)
enabled=1                                (new value)

...
[ol7_optional_latest]

...
enabled=0                                (old value)
enabled=1                                (new value)

[ol7_software_collections]

...
enabled=0                                (old value)
enabled=1                                (new value)

...

```

- b. Run the `yum repolist` command to list the configured repositories. Some numbers will vary and your output order might be different.

```
# yum repolist
Loaded plugins: langpacks, ulninfo
ol7_latest
ol7_optional_latest
ol7_software_collections
(1/7): ol7_latest/x86_64/group          | 1.4 kB 00:00:00
(2/7): ol7_latest/x86_64/updateinfo     | 561 kB 00:00:06
(3/7): ol7_software_collections/primary | 3.6 MB 00:00:01
(4/7): ol7_latest/x86_64/primary        | 7.7 MB 00:00:02
(5/7): ol7_software_collections/updateinfo| 8.7 MB 00:00:05
(6/7): ol7_optional_latest/x86_64/updateinfo| 452 kB 00:00:06
(7/7): ol7_optional_latest/x86_64/primary | 2.0 MB 00:00:06
ol7_latest                               8667/8667
ol7_optional_latest                      7012/7012
ol7_software_collections                 12536/12536
repo id                     repo name           status
ol7_latest/x86_64      Oracle Linux 7Server ... 8,667
ol7_optional_latest/x86_64  Oracle Linux 7Server ... 7,012
ol7_software_collections  Software Collection ... 12,536
repolist: 28,215
```

- Note that the three repositories correspond to the three “enabled=1” settings in the `public-yum.ol7.repo` file.

4. View packages available in the Software Collection Library.

- Use the `yum` command to list available packages, temporarily disabling all repositories and enabling only the `ol7_software_collections` repository. Pipe the output to less.

```
# yum --disablerepo='*' --enablerepo='*software_collections'
list available|less

Loaded plugins: langpacks, ulninfo
Available Packages
devassist09.x86_64          ...
devassist09-build.x86_64      ...
...
devtoolset-7.x86_64          ...
...
```

- Scroll through the output using the Page Up and Page Down keys or spacebar. You can see groups of packages with names corresponding to specific software collections.
- b. Use "q" to quit less and return to the shell prompt.

```
q
#
```

5. Install the devtoolset-7 software collection. This is one of the collections in the Oracle Software Collection Library.
 - a. From the terminal window on **dom0**, use the `scp` command to copy `devtoolset-7` repository files to **host03**. Provide the `root` password when prompted for each copy operation. It can take several seconds for the `root` password prompt to appear in each case. Use the `cd` command to change to the `/OVS/seed_pool/devtoolset` directory first.

```
[dom0]# cd /OVS/seed_pool/devtoolset
[dom0]# scp -r devtoolset-reqd-repo host03:/
root@host03's password:
...
[dom0]# scp -r devtoolset-opt-repo host03:/
root@host03's password:
...
[dom0]# scp devtoolset-reqd.repo host03:/etc/yum.repos.d
root@host03's password:
...
[dom0]# scp devtoolset-opt.repo host03:/etc/yum.repos.d
root@host03's password:
...
```

The following tasks are completed using the **host03** VM.

- b. On **host03**, use the `vi` editor to edit the `/etc/yum.repos.d/public-yum-ol7.repo` file and set the `ol7_latest`, `ol7_optional_latest` and

ol7_software_collections repositories from "enabled=1" to "enabled=0". This will disable these repositories.

```
# vi /etc/yum.repos.d/public-yum-ol7.repo
[ol7_latest]
...
enabled=1                                (old value)
enabled=0                                (new value)

...
[ol7_optional_latest]
...
enabled=1                                (old value)
enabled=0                                (new value)

[ol7_software_collections]
...
enabled=1                                (old value)
enabled=0                                (new value)
```

- Though these repositories are normally required to use the Oracle Software Collection Library under Oracle Linux 7, they are being disabled in order to use a static local repository.
- c. Use the vi editor to edit the /etc/yum.repos.d/devtoolset-reqd.repo file and enable the devtoolset-reqd-repo repository by changing "enabled=0" to "enabled=1".

```
# vi /etc/yum.repos.d/devtoolset-reqd.repo
[devtoolset-reqd-repo]
name=devtoolset-7 required packages
...
enabled=0                                (old value)
enabled=1                                (new value)
```

- This is a static local repository created from the packages required to install the devtoolset-7 collection. It is being used in this practice instead of the normally required ol7_latest, ol7_optional_latest and ol7_software_collections repositories, which will be updated over time. For the purposes of this practice, the unchanging package versions in this local repository are being used.
- d. View the devtoolset-reqd-repo repository.

```
# yum repolist
Loaded plugins: langpacks, ulninfo
devtoolset-reqd-repo | 2.9 kB 00:00:00
```

devtoolset-reqd-repo/primary_db		30 kB	00:00:00
repo id		repo name	status
devtoolset-reqd-repo		devtoolset-7 required packages	37
repolist: 37			

- e. Use the `yum` command to install the `devtoolset-7` collection.

```
# yum install devtoolset-7
Loaded plugins: langpacks, ulninfo
Resolving Dependencies
--> Running transaction check
...
Dependencies Resolved
...
Transaction Summary
=====
Install 1 Package (+36 Dependent packages)

Total download size: 131 M
Installed size: 347 M
Is this ok [y/d/N]: y
Downloading packages:
...
Installed:
  devtoolset-7.x86_64 ...

Dependency Installed:
  cpp.x86_64 ...
  devtoolset-7-binutils.x86_64 ...
  devtoolset-7-dwz.x86_64 ...
  devtoolset-7-dyninst.x86_64 ...
...
Complete!
```

6. Run commands from the `devtoolset-7` software collection.

- a. Use the `yum` command to determine if `scl-utils` is installed.

```
# yum list scl-utils
Loaded plugins: langpacks, ulninfo
Installed Packages
scl-utils.x86_64          ...                                     @anaconda/7.5
```

- Note that `scl-utils` is already installed. This package contains the `scl` utility which is required to run commands from the software collections.
- b. Use the `yum` command to show the versions of `strace` installed on the system. `strace` is included with the `devtoolset-7` collection. Among other things, `strace` provides information about system calls and can be useful with the debugging process.

```
# yum list installed *strace*
Loaded plugins: langpacks, ulninfo
Installed Packages
devtoolset-7-strace.x86_64      4.17-3.el7      @devtoolset-reqd-repo
strace.x86_64                    4.12-6.el7      @anaconda/7.5
```

- Note that there are two versions of `strace` installed. `devtoolset-7-strace.x86_64` is version 4.17, from the `devtoolset-7` collection. This is newer than `strace.x86_64`, which is version 4.12, from the installation of Oracle Linux. Among other enhancements, `strace` 4.17 has the ability to specify regular expressions to select desired system calls, a feature unavailable with `strace` 4.12.
- The versions of `strace` shown here are for this lab environment and might be different from more recent Oracle Linux and Software Collection versions.
- c. Use the `which` command to determine which `strace` executable from the Oracle Linux installation will be run.

```
# which strace
/bin/strace
```

- In the GNOME desktop terminal shell used for this practice, `/bin/strace` is shown as the path. `/bin` is a link to `/usr/bin`, which is the actual location of the `strace` executable.
- d. Use the `scl` utility to create a shell environment in which the `devtoolset-7` collection is enabled.

```
# scl enable devtoolset-7 bash
```

- At this point you are in a bash shell from which commands and utilities from the `devtoolset-7` collection can be run without using `scl`.
- e. Use the `which` command to determine the location of the `strace` executable from the `devtoolset-7` collection that will be used within this shell environment.

```
# which strace
/opt/rh/devtoolset-7/root/usr/bin/strace
```

- Note that the `devtoolset-7` version of `strace` is installed in the `/opt` path rather than the `/usr/bin` directory. Collections from the Software Collection Library are installed in the `/opt` path.
- f. From within this shell environment, run the `strace` utility from the `devtoolset-7` software collection using its regular expression feature. The desired version of `strace`

will be run within the shell automatically. The following command traces the execution of the `ls` command, displaying the `vmlinuz*` files in the `/boot` directory. The regular expression, `stat$`, is used with the `strace` utility to view system calls ending with the string "stat". The `stat` system calls examine file system information.

```
# strace -e trace=stat$ ls /boot/vmlinuz*
stat("/opt/rh/devtoolset-7/root/usr/lib64/tls/x86_64" ...
stat("/opt/rh/devtoolset-7/root/usr/lib64/tls" ...
...
fstat(3, {st_mode=S_IFREG|0644, st_size=...}) = 0
fstat(3, {st_mode=S_IFREG|0755, st_size=...}) = 0
...
lstat("/boot/vmlinuz-...el7uek.x86_64" ...
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev...
/boot/vmlinuz-0-rescue-...
/boot/vmlinuz-...el7.x86_64
/boot/vmlinuz-...el7uek.x86_64
+++ exited with 0 +++
```

- Note that three forms of system calls for file system information are returned as a result of using the regular expression, `stat$`: `stat`, `fstat`, and `lstat`. Three `vmlinuz` files are displayed toward the end of the output as a result of running the `ls` command.
- g. Exit the shell environment and re-run the `strace` command. The `scl` utility must be used in this case to specify the software collection version of `strace`. The "--" command separator is used before specifying `strace` and its arguments.

```
# exit
exit
# scl enable devtoolset-7 -- strace -e trace=stat$ ls
/boot/vmlinuz*
stat("/opt/rh/devtoolset-7/root/usr/lib64/tls/x86_64" ...
stat("/opt/rh/devtoolset-7/root/usr/lib64/tls" ...
...
fstat(3, {st_mode=S_IFREG|0644, st_size=...}) = 0
fstat(3, {st_mode=S_IFREG|0755, st_size=...}) = 0
...
lstat("/boot/vmlinuz-...el7uek.x86_64" ...
fstat(1, {st_mode=S_IFCHR|0620, st_rdev=makedev...
/boot/vmlinuz-0-rescue-...
/boot/vmlinuz-...el7.x86_64
/boot/vmlinuz-...el7uek.x86_64
```

```
+++ exited with 0 +++
```

- Note that the stat, fstat, and lstat forms of system calls are returned here, just as they were when running the strace command within the devtoolset-7 shell environment. You can also see the three vmlinuz files displayed toward the end of the output as a result of running the ls command.
- h. Attempt to run the same strace command without using the scl utility. This will use a version of strace available from the Oracle Linux installation.

```
# strace -e trace=/stat$ ls /boot/vmlinuz*
strace: invalid system call '/stat$'
```

- Note that this form of the strace command is identical to that used within the devtoolset-7 shell environment. Because we are not in that shell environment and are not using the scl utility, an Oracle Linux installed version of strace is used. This version of strace does not recognize the use of regular expressions.

7. View man pages from the devtoolset-7 collection.

- a. Use the scl utility to view the man page for the devtoolset-7 collection itself.

```
# scl enable devtoolset-7 'man devtoolset-7'
DEVELOPMENT (7)           User Commands           DEVELOPMENT (7)

NAME
      devtoolset-7 - manual page for devtoolset-7 ... Software
Collection

SYNOPSIS
      scl enable devtoolset-7 <command>
      ...
```

- Recall that if devtoolset-7 is enabled within a shell environment, you can simply enter man devtoolset-7, without prefixing it with scl enable devtoolset-7. Here, we have enclosed the command and its argument (man devtoolset-7) in quotes, rather than using the "--" command separator.
- b. Enter "q" to quit the man page to return to the shell prompt.

```
q
#
```

- c. Enable the devtoolset-7 collection within a shell environment and view the man page for the strace utility.

```
# scl enable devtoolset-7 bash
# man strace
STRACE(1)          General Commands Manual          STRACE(1)
```

```

NAME
    strace - trace system calls and signals
...
-e trace=/regex
        Trace only those system calls that
match the regex. ...
...

```

- Note that the use of regular expressions is included in this man page. Use the "/" (forward search) or "?" (backward search) characters to search for the string "regex" if necessary.
- d. Enter "q" to quit the man page and then use the `exit` command to terminate the shell environment.

```

q
# exit
exit

```

- e. View the man page for the `strace` version from the Oracle Linux installation.

```

# man strace
STRACE(1)           General Commands Manual          STRACE(1)

NAME
    strace - trace system calls and signals
...

```

- If you attempt to search for the string "regex" on this man page, you will get "Pattern not found". Regular expressions are not part of this `strace` version.

- f. Enter "q" to quit the man page to return to the shell prompt.

```

q
#

```

- 8. View optional packages available with the `devtoolset-7` collection. Software collections can have optional packages that are not installed with the main package and its dependencies.

- a. Use the `vi` editor to edit the `/etc/yum.repos.d/devtoolset-opt.repo` file and enable the `devtoolset-opt-repo` repository by changing "`enabled=0`" to "`enabled=1`".

```

# vi /etc/yum.repos.d/devtoolset-opt.repo
[devtoolset-opt-repo]
name=devtoolset-7 optional packages
...
enabled=0

```

(old value)

enabled=1

(new value)

- This is a static local repository created from the optional packages available with the `devtoolset-7` collection. It is being used in this practice instead of the normally required `ol7_latest`, `ol7_optional_latest` and `ol7_software_collections` repositories, which will be updated over time. For the purposes of this practice, the unchanging package versions in this local repository are being used.
- b. View the `devtoolset-opt-repo` repository in addition to the `devtoolset-reqd-repo` repository.

```
# yum repolist

Loaded plugins: langpacks, ulninfo
devtoolset-opt-repo                                | 2.9 kB  00:00:00
devtoolset-opt-repo/primary_db                      | 68 kB   00:00:00
repo id                                              repo name          status
devtoolset-opt-repo                                devtoolset-7 optional packages    125
devtoolset-reqd-repo                               devtoolset-7 required packages   37
repolist: 162
```

- c. Use the `yum` command to view the remaining available packages.

```
# yum list available devtoolset-7\*

Loaded plugins: langpacks, ulninfo
Available Packages
devtoolset-7-binutils-devel.i686  ...      devtoolset-opt-repo
devtoolset-7-binutils-devel.x86_64 ...      devtoolset-opt-repo
...
```

- These packages were not installed when the `devtoolset-7` collection was installed because they are optional and not required. Package names from this list can be used to install desired optional packages.

9. Remove the `devtoolset-7` software collection.

- a. Use the `yum` command to remove the `devtoolset-7` collection.

```
# yum remove devtoolset-7\*

Loaded plugins: langpacks, ulninfo
Resolving Dependencies
--> Running transaction check
--> Package devtoolset-7.x86_64        ...      will be erased
...
--> Finished Dependency Resolution

Dependencies Resolved
```

```

...
Transaction Summary
=====
Remove 26 Packages

Installed size: 249 M
Is this ok [y/N]: y
...
Removed:
  devtoolset-7.x86_64 ...
...
Complete!

```

10. Disable currently enabled repositories.

- Run the `yum clean all` command to clean up the `yum` cache.

```

# yum clean all
Loaded plugins: langpacks, ulninfo
Cleaning repos: devtoolset-opt-repo devtoolset-reqd-repo
Cleaning up everything
...

```

- Use the `cd` command to change to the `/etc/yum.repos.d` directory. Use the `vi` editor to edit the `devtoolset-reqd.repo` file and set the `devtoolset-reqd-repo` repository from "enabled=1" to "enabled=0".

```

# cd /etc/yum.repos.d
# vi devtoolset-reqd.repo
[devtoolset-reqd-repo]
...
enabled=1                                (old value)
enabled=0                                (new value)

```

- Use the `vi` editor to edit the `devtoolset-opt.repo` file and set the `devtoolset-opt-repo` repository from "enabled=1" to "enabled=0".

```

# vi devtoolset-opt.repo
[devtoolset-opt-repo]
...
enabled=1                                (old value)
enabled=0                                (new value)

```

11. Re-enable the local yum iso repository.

- Use the `vi` editor to edit the `iso.repo` file and set the `Myrepo` repository from "enabled=0" to "enabled=1".

```
# vi iso.repo
[Myrepo]
...
enabled=0 (old entry)
enabled=1 (new entry)
```

- Use the `yum repolist` command to list the configured repositories.

```
# yum repolist
Loaded plugins: langpacks, ulninfo
repo id          repo name           status
Myrepo           Oracle Linux        5,180
repolist: 5,180
```

- Note that the "Myrepo" repository is the only enabled repository.

12. Revert changes and log off.

- Remove the devtoolset yum configuration files. Use the `pwd` command to check that you are still in the `/etc/yum.repos.d` directory.

```
# pwd
/etc/yum.repos.d
# rm devtoolset-reqd.repo
rm: remove regular file 'devtoolset-reqd.repo'? y
# rm devtoolset-opt.repo
rm: remove regular file 'devtoolset-opt.repo'? y
```

- Remove the devtoolset repository packages. Change to the `/` directory first.

```
# cd /
# /bin/rm -r devtoolset-reqd-repo
# /bin/rm -r devtoolset-opt-repo
```

- Restore `/etc/yum.conf`.

```
# cp /etc/yum.conf_SAV /etc/yum.conf
cp: overwrite '/etc/yum.conf'? y
```

- Remove `/etc/yum.conf_SAV`.

```
# rm /etc/yum.conf_SAV
rm: remove regular file '/etc/yum.conf_SAV'? y
```

- e. Restore /etc/sysconfig/network-scripts/ifcfg-eth0.

```
# cp /etc/sysconfig/network-scripts/ifcfg-eth0_SAV  
/etc/sysconfig/network-scripts/ifcfg-eth0  
cp: overwrite '/etc/sysconfig/network-scripts/ifcfg-eth0'? y
```

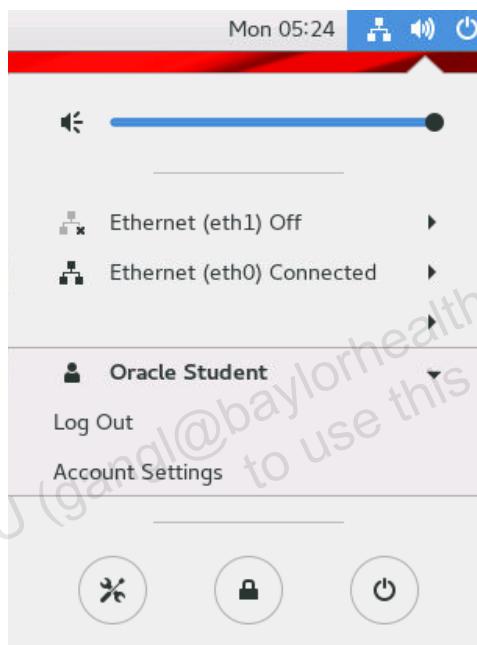
- f. Remove /etc/sysconfig/network-scripts/ifcfg-eth0_SAV.

```
# rm /etc/sysconfig/network-scripts/ifcfg-eth0_SAV  
rm: remove regular file '/etc/sysconfig/network-scripts/ifcfg-  
eth0_SAV'? y
```

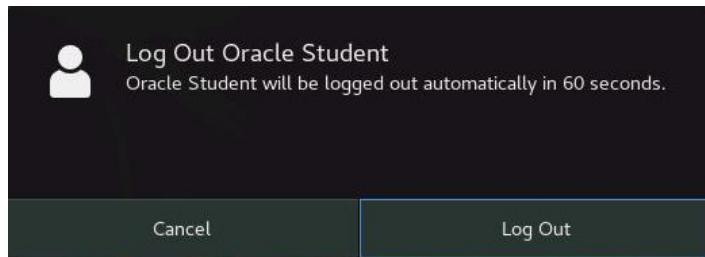
- g. Restart the network.

```
# systemctl restart network
```

- h. Select the Power icon in the upper-right corner of the GNOME screen and select Oracle Student.



- 1) Click Log Out. The pop-up appears.



- 2) Click Log Out.

- 3) Click the X in the top-right corner of the GNOME login window to close the window.

You are now the root user on **dom0**.

Practice 7-6: Using the Unbreakable Linux Network (ULN)

Overview

In this practice, you become familiar with registering a system with ULN, and with the ULN web interface. **You cannot access the ULN without a Customer Support Identifier (CSI). All you can do is read through the tasks in this practice to help understand the capabilities of ULN.**

Assumptions

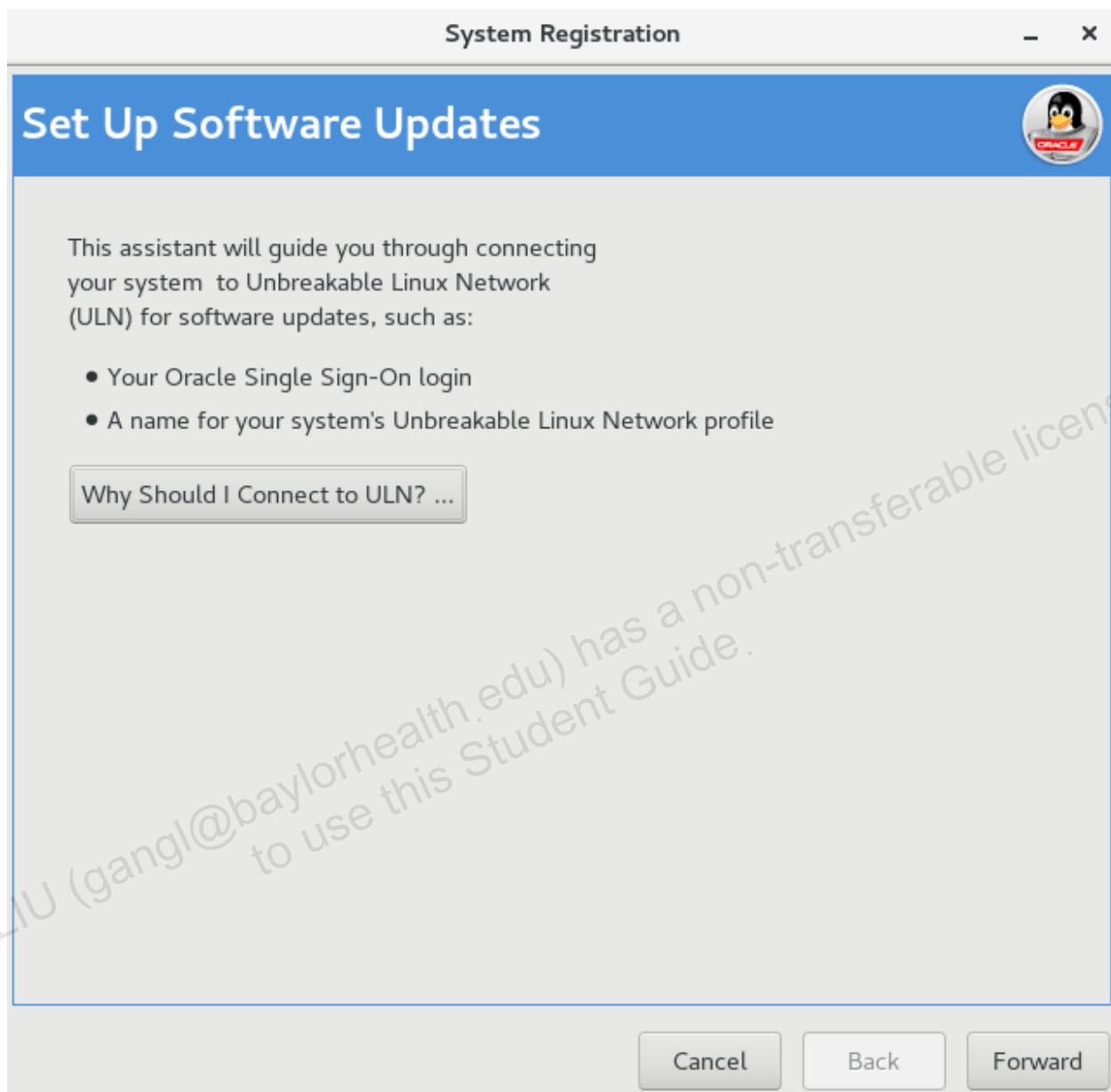
This practice is **not** intended to be a hands-on exercise.

Tasks

1. Register your system with the Unbreakable Linux Network (ULN).
 - a. Run the `uln_register` command to begin the registration process. The registration process GUI screens shown below assume you are running the following command from a terminal window in an X Window system.

```
# uln_register
```

The following window appears:



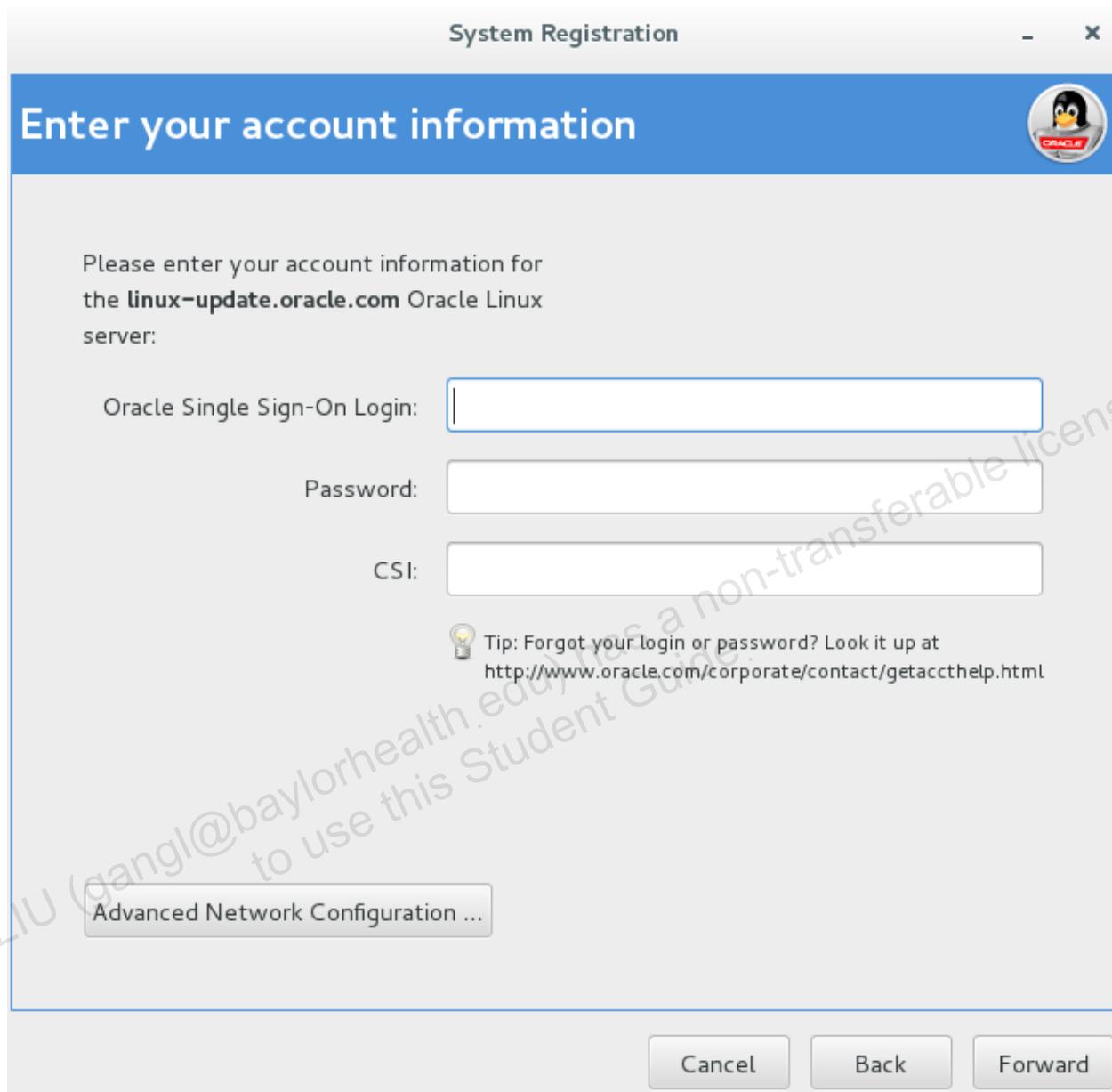
- b. Click the **Why Should I Connect to ULN?** button.

The following window appears:



- This window is for information only.
- c. Click **Take me back to the registration**.
- The window titled "Set Up Software Updates" reappears.
- d. Click **Forward**.

The following window appears:



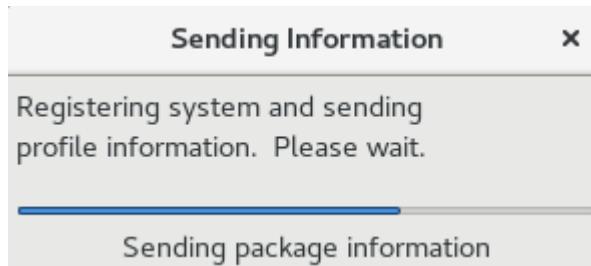
- e. Enter your **Login**, **Password**, and **CSI** information. Click **Forward**.

The following window appears:



- f. Change your **System Name** (if necessary).
 - In this example, the System Name is set to **OracleLinux7Update5.example.com**, although only part of the System Name is displayed.
- g. Ensure the **Send hardware profile** and the **Send package profile** check boxes are selected.
 - Optionally, click the **View Hardware Profile** and **View Package Profile** buttons to display the information that will be sent.
- h. Click **Forward**.

The **Sending Information** window is displayed.

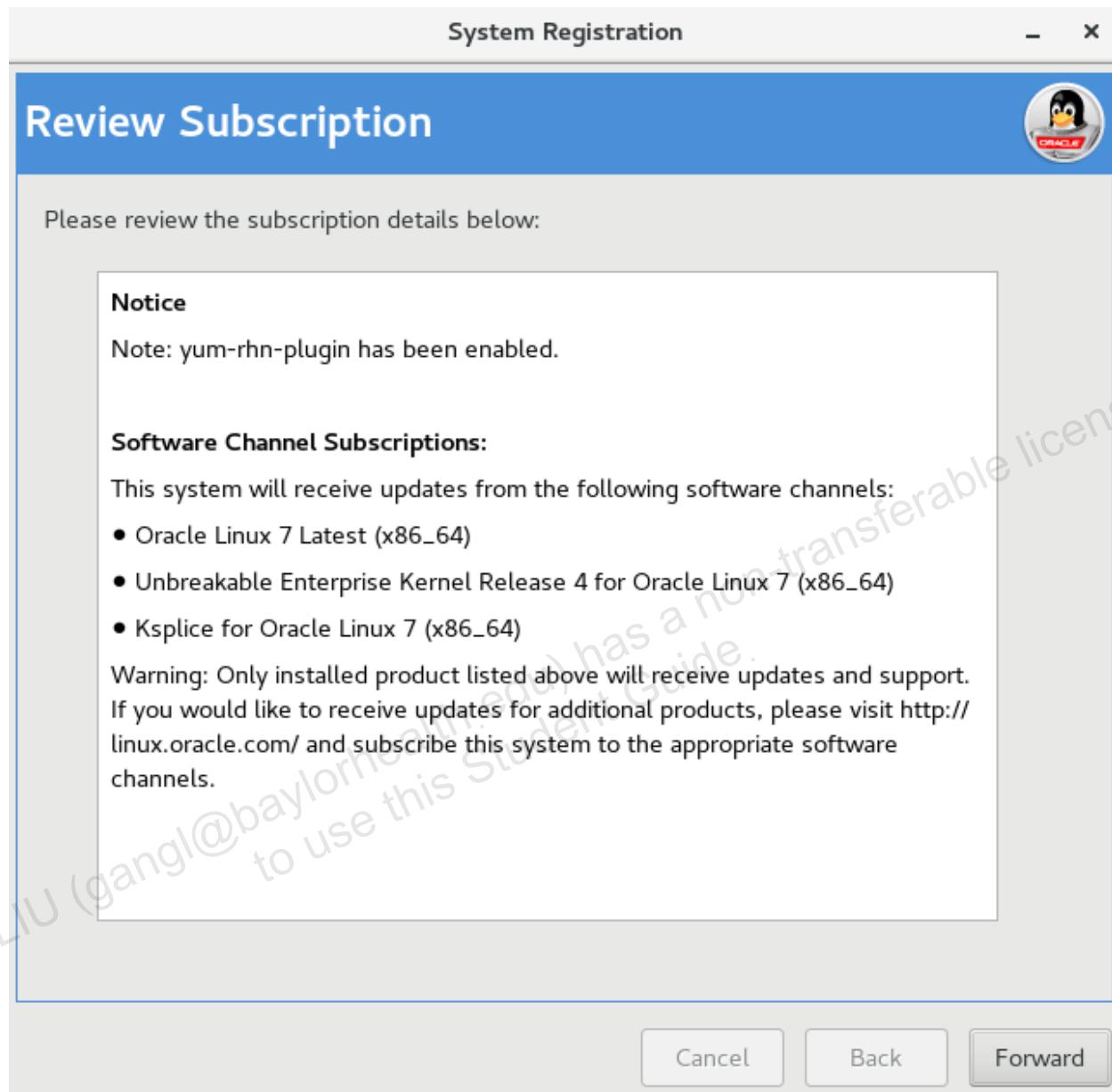


After the information is sent, the following window appears:



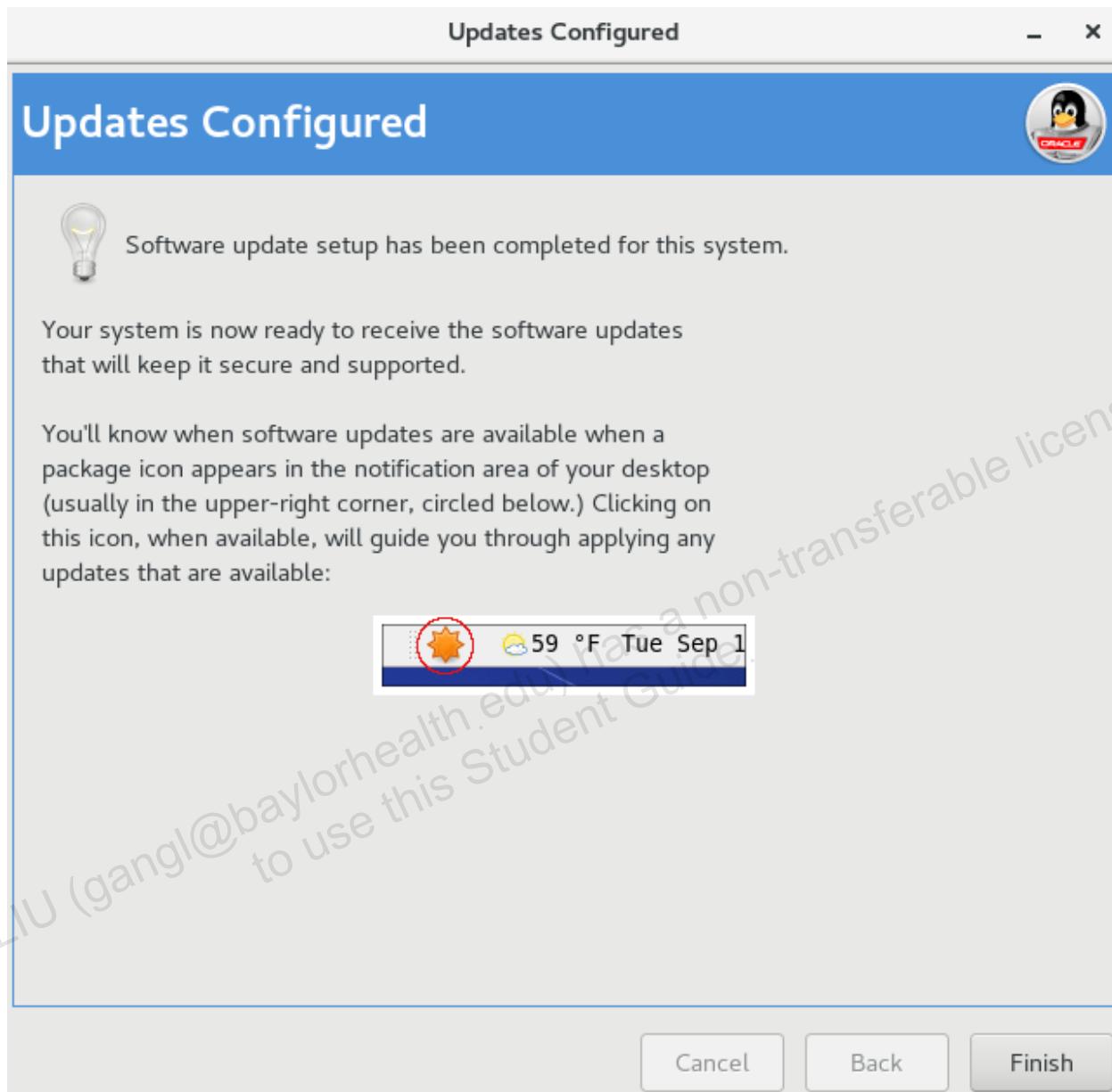
- i. Select the **Yes, I want to access Ksplice** check box, which is selected by default.
 - Ksplice is discussed in another lesson.
- j. Click **Forward**.

The following window appears:



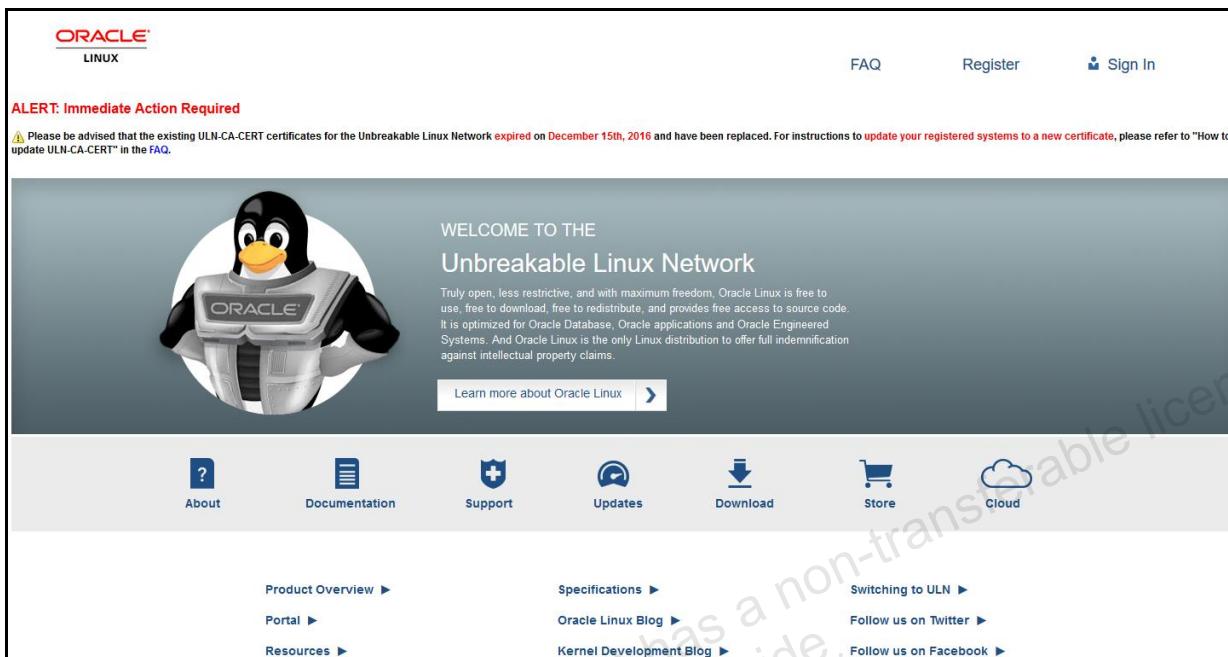
- Notice that when you register for the first time, you are subscribed to the default channel of <OL_version>_<arch>_latest, which is o17_x86_64_latest, and the appropriate Unbreakable Enterprise Kernel, which is o17_x86_64_UEKR4 here.
 - Also notice that you are subscribed to the Ksplice channel, o17_x86_64_kssplice, because you clicked **Yes, I want to access Ksplice** in the previous window.
 - After registering, you can specify additional, or different, channels by using the web interface.
- k. Click **Forward**.

The following window appears:



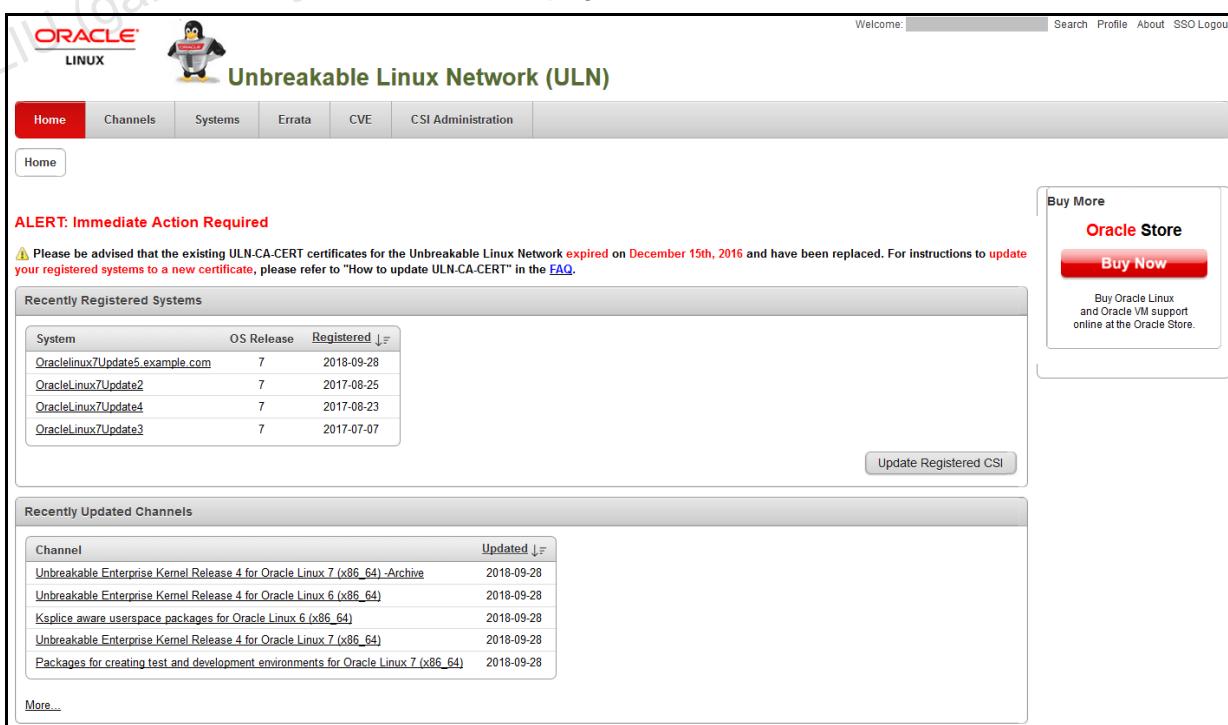
- I. Click **Finish**.

2. Access the Unbreakable Linux Network (ULN) web interface.
 - a. From a browser, enter the following URL for the Unbreakable Linux Network (ULN):
<https://linux.oracle.com>.



The screenshot shows the Oracle Linux homepage with a prominent alert about expired certificates. The main heading is "WELCOME TO THE Unbreakable Linux Network". Below it is a subtext: "Truly open, less restrictive, and with maximum freedom, Oracle Linux is free to use, free to download, free to redistribute, and provides free access to source code. It is optimized for Oracle Database, Oracle applications and Oracle Engineered Systems. And Oracle Linux is the only Linux distribution to offer full indemnification against intellectual property claims." Navigation links include "About", "Documentation", "Support", "Updates", "Download", "Store", and "Cloud". A footer section contains links to "Product Overview", "Specifications", "Switching to ULN", "Portal", "Oracle Linux Blog", "Follow us on Twitter", "Resources", "Kernel Development Blog", and "Follow us on Facebook".

- b. Click **Sign In** to be prompted for login credentials.
 - Provide login information to access the ULN web interface.
 - The Home page of ULN appears.
3. Use the ULN web interface.
 - a. You are first taken to the ULN Home page.



The screenshot shows the Unbreakable Linux Network (ULN) Home page. At the top, there's a navigation bar with tabs for "Home", "Channels", "Systems", "Errata", "CVE", "CSI Administration", and a "Home" button. Below the navigation is an "ALERT: Immediate Action Required" message about expired certificates. A sidebar on the right is titled "Buy More Oracle Store Buy Now" and includes a link: "Buy Oracle Linux and Oracle VM support online at the Oracle Store." The main content area has two tables: "Recently Registered Systems" and "Recently Updated Channels". The "Recently Registered Systems" table lists four entries:

System	OS Release	Registered
Oracelinux7Update5.example.com	7	2018-09-28
OracleLinux7Update2	7	2017-08-25
OracleLinux7Update4	7	2017-08-23
OracleLinux7Update3	7	2017-07-07

A "Update Registered CSI" button is located at the bottom of this section. The "Recently Updated Channels" table lists five entries:

Channel	Updated
Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)-Archive	2018-09-28
Unbreakable Enterprise Kernel Release 4 for Oracle Linux 6 (x86_64)	2018-09-28
Ksplice aware userspace packages for Oracle Linux 6 (x86_64)	2018-09-28
Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)	2018-09-28
Packages for creating test and development environments for Oracle Linux 7 (x86_64)	2018-09-28

A "More..." link is at the bottom of this section.

- Note that the system, **OracleLinux7Update5.example.com**, is registered.
- b. Click the **Channels** tab for a list of all the channels available via ULN.

The following window is displayed, showing a partial list of channels for all releases and all architectures:

The screenshot shows the Oracle Linux Unbreakable Linux Network (ULN) interface. The top navigation bar includes links for Home, Channels (which is highlighted in red), Systems, Errata, CVE, and CSI Administration. The main content area is titled "Unbreakable Linux Network (ULN)". Below the title, there's a breadcrumb navigation showing "Home > Channels". The main section is titled "Channels" and contains two dropdown menus: "Release" set to "All releases" and "Architecture" set to "All architectures". A table lists various channels with columns for Name, Label, Description, and Packages. The table entries are as follows:

Name	Label	Description	Packages
Oracle VM 2 Latest	ovm2_i386_latest	All packages released for Oracle VM 2, including the very latest updated packages	404
Oracle VM 2.1 Server Installation media copy	ovm2_2.1.0_i386_base	All packages released on the Oracle VM 2.1 Server installation media	361
Oracle VM 2.1.1 Server installation media copy	ovm2_2.1.1_i386_base	All packages released on the Oracle VM 2.1.1 Server installation media	383
Oracle VM 2.1.2 Server installation media copy	ovm2_2.1.2_i386_base	All packages released on the Oracle VM 2.1.2 Server installation media	393
Oracle VM 2.1.5 Server Installation media copy	ovm2_2.1.5_i386_base	All packages released on the Oracle VM 2.1.5 Server installation media	398
Oracle VM 2.1 Server Patches	ovm2_2.1.0_i386_patch	Updated packages published after Oracle VM 2.1 Server	11
Oracle VM 2.1.1 Server Patches	ovm2_2.1.1_i386_patch	Updated packages published after Oracle VM 2.1.1 Server	5
Oracle VM 2.1.2 Server Patches	ovm2_2.1.2_i386_patch	Updated packages published after Oracle VM 2.1.2 Server	29
Oracle VM 2.1.5 Server Patches	ovm2_2.1.5_i386_patch	Updated packages published after Oracle VM 2.1.5 Server	28
Oracle VM 2.2 Latest	ovm22_i386_latest	All packages released for Oracle VM 2.2, including the very latest updated packages	416
Oracle VM 2.2.0 Server Installation media copy	ovm22_2.2.0_i386_base	All packages released on the Oracle VM 2.2.0 Server installation media	412
Oracle VM 2.2.1 Server Installation media copy	ovm22_2.2.1_i386_base	All packages released on the Oracle VM 2.2.1 Server installation media	414
Oracle VM 2.2.2 Server Installation media copy	ovm22_2.2.2_i386_base	All packages released on the Oracle VM 2.2.2 Server installation	416
Oracle VM 2.2.3 Server Installation media copy	ovm22_2.2.3_i386_base	All packages released on the Oracle VM 2.2.3 Server installation media	416
Oracle VM 2.2.0 Server Patches	ovm22_2.2.0_i386_patch	Updated packages published after Oracle VM 2.2.0 Server	16
Oracle VM 2.2.1 Server Patches	ovm22_2.2.1_i386_patch	Updated packages published after Oracle VM 2.2.1 Server	17

- You can also view only the channels for a specific Release and Architecture.

- c. Select **Oracle Linux 7** in the **Release** drop-down box and **x86_64** in the **Architecture** drop-down box.

The following window is displayed:

Name	Label	Description	Packages
Oracle Linux 7 Latest Optional Packages (x86_64)	ol7_x86_64_optional_latest	All optional packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)	5042
Oracle Linux 7 Latest (x86_64)	ol7_x86_64_latest	All packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)	5164
Oracle Linux 7 Archive (x86_64)	ol7_x86_64_latest_archive	Archived packages for Oracle Linux 7 (x86_64)	5220
Oracle Linux 7 Update 1 installation media copy (x86_64)	ol7_x86_64_u1_base	All packages released for Oracle Linux 7 Update 1 (x86_64). No errata included	4384
Oracle Linux 7 Update 1 Patch (x86_64)	ol7_x86_64_u1_patch	Updated packages published after release of Oracle Linux 7 Update 1 (x86_64)	531
Oracle Linux 7 GA Installation media copy (x86_64)	ol7_x86_64_u0_base	All packages released for Oracle Linux 7 GA (x86_64). No errata included	4315
Oracle Linux 7 Update 2 installation media copy (x86_64)	ol7_x86_64_u2_base	All packages released for Oracle Linux 7 Update 2 (x86_64). No errata included	4634
Oracle Linux 7 Update 2 Patch (x86_64)	ol7_x86_64_u2_patch	Updated packages published after release of Oracle Linux 7 Update 2 (x86_64)	685
Oracle Linux 7 GA Patch (x86_64)	ol7_x86_64_u0_patch	Updated packages published after release of Oracle Linux 7 GA (x86_64)	583
Oracle Linux 7 Update 3 installation media copy (x86_64)	ol7_x86_64_u3_base	All packages released for Oracle Linux 7 Update 3 (x86_64). No errata included	4768
Oracle Linux 7 Update 3 Patch (x86_64)	ol7_x86_64_u3_patch	Updated packages published after release of Oracle Linux 7 Update 3 (x86_64)	546
Oracle Linux 7 Update 4 installation media copy (x86_64)	ol7_x86_64_u4_base	All packages released for Oracle Linux 7 Update 4 (x86_64). No errata included	4999
Oracle Linux 7 Update 4 Patch (x86_64)	ol7_x86_64_u4_patch	Updated packages published after release of Oracle Linux 7 Update 4 (x86_64)	703
Oracle Linux 7 Update 5 installation media copy (x86_64)	ol7_x86_64_u5_base	All packages released for Oracle Linux 7 Update 5 (x86_64). No errata included	5127
Oracle Linux 7 Update 5 Patch (x86_64)	ol7_x86_64_u5_patch	Updated packages published after release of Oracle Linux 7 Update 5 (x86_64)	659

- The screenshot displays a partial list of channels for the Oracle Linux 7 x86_64 architecture.
- For each channel, you can see its detailed description and how many packages are available for download.

- d. Click the **Systems** tab to see **System Profiles** of the registered systems.

The following window is displayed:

- The **CSI** and **Ksplice Access Key** fields are blanked out in this view.
- The **Ksplice Access Key** is discussed in the lesson titled “Oracle Ksplice.”

System	OS Release	Errata	Errata Packages	CSI	Ksplice Access Key	Subscribed Channels	Status	Action
OracleLinux7Update2	7	373	1349			5	✓ CSI valid	
OracleLinux7Update3	7	448	1632			6	✓ CSI valid	
OracleLinux7Update4	7	108	373			6	✓ CSI valid	
OracleLinux7Update5.example.com	7	128	514			3	✓ CSI valid	

- e. Click the **OracleLinux7Update5.example.com** system link.

The following window is displayed:

- This window shows only the top portion of the window.

The screenshot shows the Oracle Unbreakable Linux Network (ULN) interface. At the top, there's a navigation bar with links for Home, Channels, Systems (which is highlighted in red), Errata, CVE, and CSI Administration. Below the navigation bar, a breadcrumb trail indicates the current page: Home > Systems > System Detail for Oraclelinux7Update5.example.com. The main content area is titled "System Details" and displays the following information for the system "Oraclelinux7Update5.example.com":

Name	Oraclelinux7Update5.example.com
Architecture	x86_64
OS Release	7
Release Name	redhat-release-server
Registered	2018-09-28

Below the system details, there's a section titled "Subscribed Channels" with a "Manage Subscriptions" button. It lists three channels:

Name	Description
Ksplice for Oracle Linux 7 (x86_64)	Oracle Ksplice clients, updates, and dependencies for Oracle Linux 7 (x86_64)
Oracle Linux 7 Latest (x86_64)	All packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)
Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)	Latest packages for Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)

- From the top portion of the window, you can update **System Details**.
- You can also **Manage Subscriptions**, that is, subscribe to or unsubscribe from other available channels.

- f. Scroll down to display the bottom portion of the window.

Type	Severity	Advisory	Summary	Release Date	Num. of Downloadable Packages
	Moderate	ELSA-2018-2835	firefox security update	2018-09-27	1
	-	ELEA-2018-2397	microcode_ctl bug fix and enhancement update	2018-09-27	1
	Important	ELSA-2018-2748	kernel security and bug fix update	2018-09-26	6
	-	ELBA-2018-2769	libvirt bug fix update	2018-09-26	20
	-	ELBA-2018-2761	kexec-tools bug fix update	2018-09-25	1
	-	ELBA-2018-2754	gcc-libraries bug fix and enhancement update	2018-09-25	2
	-	ELBA-2018-2756	sssd bug fix update	2018-09-25	6
	-	ELBA-2018-2758	firewalld bug fix update	2018-09-25	4
	-	ELBA-2018-2765	mutter bug fix update	2018-09-25	2
	-	ELBA-2018-2753	systemd bug fix update	2018-09-25	7
	Moderate	ELSA-2018-2768	nss security update	2018-09-25	4
	Moderate	ELSA-2018-2766	flatpak security update	2018-09-25	2
	-	ELBA-2018-2764	initscripts bug fix update	2018-09-25	1
	-	ELBA-2018-2771	doconf bug fix update	2018-09-25	2
	-	ELBA-2018-4224	linux-firmware bug fix update	2018-09-24	18

[Download All Available Errata for this System](#)

row(s) 1 - 15 of 126 [Next](#)

Enhancement
 Bug fix
 Security

- From the bottom portion of the window, you can see the available errata for the system categorized by **Enhancement**, **Bug fix**, and **Security**.
- You can click the **Advisory** link to display details about a particular errata.
- You can also **Download All Available Errata for this System**.

- g. Click the **Errata** tab to list all errata that have been published.

The following errata are available for all releases offered through Unbreakable Linux Network (ULN).

Search

Advisory Type Bug Enhancement Security

Release Go

Type	Severity	Advisory	Summary	Systems Affected	Release Date
		ELEA-2018-2397	microcode_ctl bug fix and enhancement update	0	2018-09-27
	Moderate	ELSA-2018-2835	firefox security update	0	2018-09-27
		ELBA-2018-2769	libvirt bug fix update	1	2018-09-26
	Important	ELSA-2018-2748	kernel security and bug fix update	1	2018-09-26
		ELBA-2018-2755	tomcat bug fix update	0	2018-09-26
	Important	ELSA-2018-4227	Unbreakable Enterprise kernel security update	0	2018-09-26
		ELBA-2018-2748-1	kernel bug fix update	0	2018-09-26
		ELBA-2018-2752	scap-security-guide bug fix update	0	2018-09-26
		ELBA-2018-4222	qemu bug fix update	0	2018-09-26
		ELBA-2018-4223	libvirt bug fix update	0	2018-09-26
		ELBA-2018-2753	systemd bug fix update	1	2018-09-25

- This window has a **Search** feature. You can also filter by **Advisory Type**.
- You can view errata for a particular release of Oracle Linux and Oracle VM. The Oracle Linux 7 release has been selected in this view, showing a partial list of errata.
- You can also subscribe to a mailing list by clicking the links on the right side of the window.

- h. Click the **CVE** tab to display the following window:

- CVE stands for Common Vulnerabilities and Exposures.

The screenshot shows the Oracle Unbreakable Linux Network (ULN) CVE Summary page. At the top, there's a navigation bar with links for Home, Channels, Systems, Errata, **CVE**, CSI Administration, Welcome, Search, Profile, About, SSO, and Logout. Below the navigation is a logo for Oracle Linux featuring a penguin. The main content area is titled "Unbreakable Linux Network (ULN)". A sidebar on the right contains links to subscribe to Oracle Linux Errata and Oracle VM Errata mailing lists. The main content area displays a table of CVE entries:

CVE Identifier	Synopsis	Release Date
CVE-2018-8897	A statement in the System Programming Guide of the Intel 64 and IA-32 Architectures Software Developer's Manual (SDM) was mishandled in the development of some or all operating-system kernels, resulting in unexpected behavior for #DB exceptions that are deferred by MOV SS or POP SS, as demonstrated by (for example) privilege escalation in Windows, macOS, some Xen configurations, or FreeBSD, or a Linux kernel crash. The MOV to SS and POP SS instructions inhibit interrupts (including NMI), data breakpoints, and single step trap exceptions until the instruction boundary following the next instruction (SDM Vol. 3A, section 6.8.3). (The inhibited data breakpoints are those on memory accessed by the MOV to SS or POP to SS instruction itself.) Note that debug exceptions are not inhibited by the interrupt enable (EFLAGS IF) system flag (SDM Vol. 3A, section 2.3). If the instruction following the MOV to SS or POP to SS instruction is an instruction like SYSCALL, SYSENTER, INT 3, etc. that transfers control to the operating system at CPL < 3, the debug exception is delivered after the transfer to CPL < 3 is complete. OS kernels may not expect this order of events and may therefore experience unexpected behavior when it occurs.	2018-05-08
CVE-2018-8781	The udi_fb_mmap function in drivers/gpu/drm/udi/udi_fb.c at the Linuxkernel version 3.4 and up to and including 4.15 has an integer-overflow vulnerability allowing local users with access to the udidrmfb driver to obtain full read and write permissions on kernel physical pages, resulting in a code execution in kernel space.	2018-07-30
CVE-2018-8088	org.sifj4.ext.EventData in the sifj4-ext module in QOS CH SLF4J before 1.8.0-beta2 allows remote attackers to bypass intended access restrictions via crafted data.	2018-07-30
CVE-2018-7858	Quick Emulator (aka QEMU), when built with the Cirrus CLGD 54xx VGAEmulator support, allows local guest OS privileged users to cause a denial of service (out-of-bounds access and QEMU process crash) by leveraging incorrect region calculation when updating VGA display.	2018-03-12

- You can filter by **CVE Year** or show all CVE years as shown. A partial list of CVE for all years is shown.
- Click the **CVE Identifier** link to display detailed information about a specific CVE.

4. Update your system from ULN.

After you have registered your system, you can use the `yum` utility to install the available updates.

- Run the `yum repolist` command to display the enabled Yum repositories.

```
# yum repolist
Loaded plugins: langpacks, rhnplugin, ulninfo
This system is receiving updates from ULN.

...
repo id          Repo name                  status
ol7_x86_64_UEKR4  Unbreakable Enterprise Kernel ...
ol7_x86_64_kssplice Ksplice for Oracle Linux 7(x86_64)   1,237
ol7_x86_64_latest Oracle Linux 7 Latest (x86_64)      8,671
repolist: 10,004
```

- Notice the message, “This system is receiving updates from ULN.”
- Notice that the enabled repositories are the ULN channels you are subscribed to.

- b. Run the `yum update` command to install the available updates.

```
# yum update
...
Transaction Summary
=====
Install      3 Packages
Upgrade    200 Packages

Total download size: 442 M
Is this ok [y/d/N]: y
...
Complete!
```

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Practices for Lesson 8: Automating Tasks

Practices for Lesson 8: Overview

Practices Overview

In these practices, you use and configure commands to automate tasks.

Practice 8-1: Automating Tasks

Overview

In this practice, you use the `crontab` command and the `at` command to automate tasks. You also prevent the `oracle` user from being able to use the `at` command.

Assumptions

You are the `root` user on `dom0`.

Tasks

1. Log on to **host03**.

- a. Connect to the **host03** guest by using the `xm vncviewer host03&` command.

```
# xm vncviewer host03&
```

The GNOME login window appears.

- b. Select Oracle Student from the GNOME login window; enter the password.
- c. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.
- d. In the terminal window, become the `root` user by entering the `su -` command and providing the `root` password.

```
$ su -
```

Password:

```
# whoami
```

```
root
```

2. Create a crontab for the root user.

- a. Use the `crontab -l` command to list the contents of your crontab file.

```
# crontab -l
```

```
no crontab for root
```

- b. Use the `ls` command to view the contents of the `/var/spool/cron` directory.

```
# ls /var/spool/cron
```

- Note that there are no files in this directory.

- c. Use the `crontab -e` command to create a crontab job that runs the `ls` command every minute.

```
# crontab -e
```

```
* * * * * ls
```

- The `crontab -e` command uses the `vi` editor. Save your changes and exit `vi`.
- The following messages are displayed:

```
no crontab for root - using an empty one
crontab: installing new crontab
```

- d. Use the `ls` command to view the contents of the `/var/spool/cron` directory.

```
# ls /var/spool/cron
root
You have new mail in /var/spool/mail/root
```

- Now there is a `root` file in the `/var/spool/cron` directory.
- You also have mail, because the output from cron jobs is sent to the user's mailbox. It may take a minute for the mail to appear.

- e. Use the `cat` command to display the contents of the `/var/spool/cron/root` file.

```
# cat /var/spool/cron/root
* * * * * ls
```

- f. Use the `mail` command to view the results of your job.

- The sample output is displayed.

```
# mail
...
>N 1 (Cron Daemon) <date_time> 26/841 "Cron <root@host03> ls"
&
```

- To view the details of mailbox entries, press the associated number and then press **Enter**.
- To redisplay the header, press **h** and then press **Enter**.
- To quit the mail program, press **q** and then press **Enter**.

- g. View the currently selected mail message by pressing **Enter**.

```
Message 1:
From root@host03.example.com <date_time>
Return-Path: <root@host03.example.com>
X-Original-To: root
Delivered-To: root@host03.example.com
From: "(Cron Daemon)" <root@host03.example.com>
To: root@host03.example.com
Subject: Cron <root@host03> ls
Content-Type: text/plain; charset=UTF-8
Auto-Submitted: auto-generated
Precedence: bulk
X-Cron-Env: <XDG_SESSION_ID=550>
X-Cron-Env: <XDG_RUNTIME_DIR=/run/user/0>
X-Cron-Env: <LANG=en_US.UTF-8>
X-Cron-Env: <SHELL=/bin/sh>
X-Cron-Env: <HOME=/root>
X-Cron-Env: <PATH=/usr/bin:/bin>
X-Cron-Env: <LOGNAME=root>
```

```
X-Cron-Env: <USER=root>
Date: <date_time> -0600 (MDT)
Status: R

anaconda-ks.cfg
initial-setup-ks.cfg
&
```

- Note that the `ls` command is on the subject line and the files in the `root` user's home directory are listed in the body of the message. Unless another path is specified, commands are run in relation to the given user's home directory (in this case, `root`).

- h. Press `q` and then **Enter** to quit the mail program.

```
& q
```

- i. Use the `crontab -r` command to remove `crontab`.

```
# crontab -r
# crontab -l
no crontab for root
```

- j. Use the `ls` command to view the contents of the `/var/spool/cron` directory.

```
# ls /var/spool/cron
```

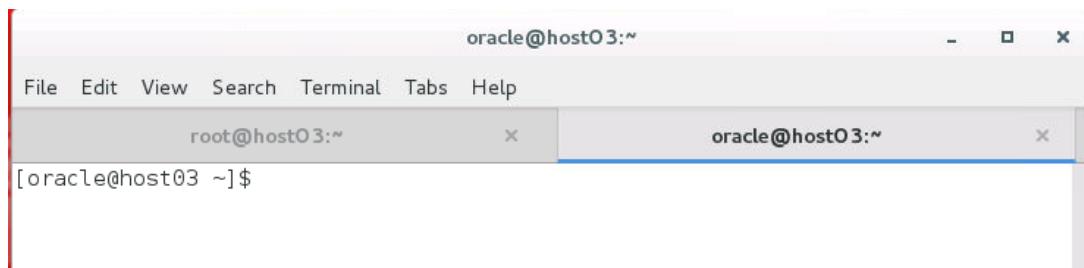
- Note that the `root` file has been removed from this directory.
- k. Delete all messages from the `root` user's mailbox. Issue the `mail` command and then enter `d *` to delete all messages. Follow this with `q` to exit the mailbox.

```
# mail
...
& d *
& q
```

3. Create a `crontab` for the `oracle` user.

In this task, you switch back and forth between the `root` user and the `oracle` user.

- a. With your cursor inside the terminal window, right-click and select **Open Tab** from the pop-up menu to open another tab in your terminal window.
- Your terminal window now has a tab where you are logged in as `root` and a tab where you are logged in as the `oracle` user:



- b. Click the **oracle@host03** tab and confirm that you are logged in as the **oracle** user.

```
[oracle@host03 ~]$ whoami  
oracle
```

- c. Use the `crontab -l` command to list the contents of your `crontab` file.

```
[oracle@host03 ~]$ crontab -l  
no crontab for oracle
```

- d. Use the `crontab -e` command to create a cron job that runs the `echo "Hello World"` command every other minute.

```
[oracle@host03 ~]$ crontab -e  
*/2 * * * * echo "Hello World"
```

- e. Use the `crontab -l` command to list the contents of your `crontab` file.

```
[oracle@host03 ~]$ crontab -l  
*/2 * * * * echo "Hello World"  
You have new mail in /var/spool/mail/oracle
```

- f. Use the `mail` command to view the results of your job.

- The sample output is displayed.
- You might need to wait for a short time before you have any mail.

```
[oracle@host03 ~]$ mail  
...  
>N 1 (Cron Daemon) <date_time> 25/864 "Cron <oracle@host03> "  
&
```

- g. To view the details of mailbox entries, press the associated number and then press **Enter**.

- h. After viewing the details, press **q** and then press **Enter** to quit.

```
& 1  
...  
Hello World  
& q
```

- i. Use the `ls` command to view the contents of the `/var/spool/cron` directory.

```
[oracle@host03 ~]$ ls /var/spool/cron  
ls: cannot open directory /var/spool/cron/: Permission denied
```

- Notice that only the `root` user has permission to view this directory.

- j. Click the **root@host03** tab and confirm that you are logged in as the **root** user.

```
[root@host03 ~]# whoami  
root
```

- k. Use the `ls` command to view the contents of the `/var/spool/cron` directory.

```
[root@host03 ~]# ls /var/spool/cron  
oracle
```

- Note that there is an `oracle` file in the `/var/spool/cron` directory.

- I. Use the `cat` command to display the contents of the `oracle` user's `crontab`.

```
[root@host03 ~]# cat /var/spool/cron/oracle
*/2 * * * * echo "Hello World"
```

- m. Use `crontab -r` to remove the `crontab` for the `oracle` user.

```
[root@host03 ~]# crontab -u oracle -r
[root@host03 ~]# crontab -u oracle -l
no crontab for oracle
```

4. Use the `at` command to schedule a one-time task at a specific time.

- a. Click the `oracle@host03` tab and confirm that you are logged in as the `oracle` user.

```
[oracle@host03 ~]$ whoami
oracle
```

- b. Use `at` to run the `pwd` command in 1 minute.

- Press **Ctrl + D** for <EOT>.

```
[oracle@host03 ~]$ at now + 1 minute
at> pwd
at> <EOT>
job 1 at <date_time>
```

- c. Use the `atq` command to list the pending job.

```
[oracle@host03 ~]$ atq
1      <date_time> a oracle
```

- d. After 1 minute has passed, run the `atq` command again.

```
[oracle@host03 ~]$ atq
```

- Note that this time, there are no pending jobs.

- e. Use the `mail` command to view the results of your job. Your message number might differ.

```
[oracle@host03 ~]$ mail
...
>N 2 Oracle Student <date_time> 14/510 "Output from your job "
&
```

- f. To view the details of mailbox entries, press the associated number and then press **Enter**.

- g. After viewing the details, press **q** and then press **Enter** to quit.

```
& 2
...
/home/oracle
& q
```

5. Restrict the usage of the `at` command.

In this task, you also switch back and forth between the `root` user and the `oracle` user.

- a. Click the `root@host03` tab and confirm that you are logged in as the `root` user.

```
[root@host03 ~]# whoami  
root
```

- b. Use the `vi` editor to add the `oracle` user to the `/etc/at.deny` file.

```
[root@host03 ~]# vi /etc/at.deny  
oracle
```

- c. Click the `oracle@host03` tab and confirm that you are logged in as the `oracle` user.

```
[oracle@host03 ~]$ whoami  
oracle
```

- d. Attempt to use `at` to run a command in 1 minute.

```
[oracle@host03 ~]$ at now + 1 minute  
You do not have permission to use at.
```

- e. Delete all messages from the `oracle` user's mailbox. Issue the `mail` command and then enter `d *` to delete all messages. Follow this with `q` to exit the mailbox.

```
[oracle@host03 ~]$ mail  
...  
& d *  
& q
```

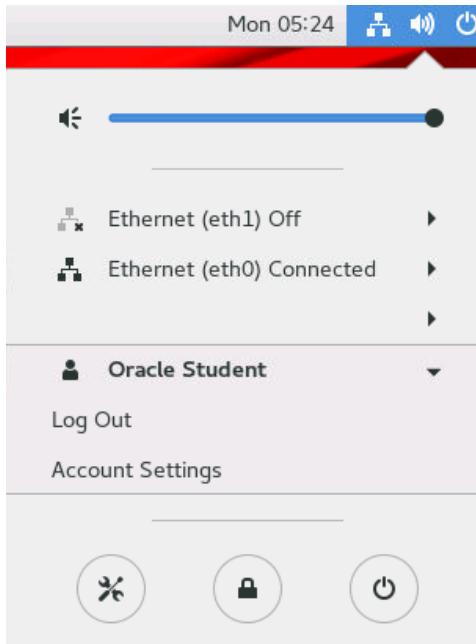
- f. Click the `root@host03` tab and confirm that you are logged in as the `root` user.

```
[root@host03 ~]# whoami  
root
```

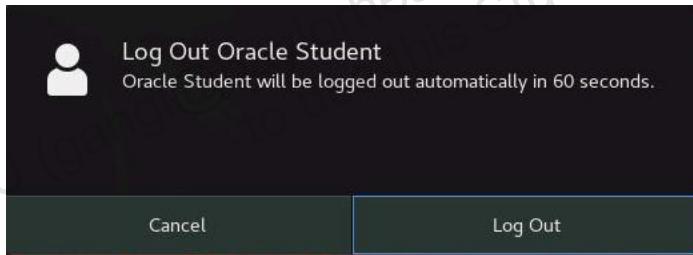
- g. Use the `vi` editor to remove the `oracle` user from the `/etc/at.deny` file.

```
[root@host03 ~]# vi /etc/at.deny  
oracle
```

6. Log off **host03** in preparation for the next practice.
 - a. In the terminal window, click the **x** in the **oracle@host03** tab to close this tab.
 - b. Click the Power icon in the upper-right corner of the GNOME screen and select Oracle Student.



- 1) Click Log Out. The following pop-up appears:



- 2) Click Log Out.
- 3) Click the X in the top-right corner of the GNOME login window to close the window.

You are now the `root` user on **dom0**.

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Practices for Lesson 9: Kernel Module Configuration

Practices for Lesson 9: Overview

Practices Overview

In these practices, you work with loadable kernel modules.

Practice 9-1: Using Loadable Kernel Modules

Overview

In this practice, you perform the following tasks:

- Use kernel module utilities to list modules.
- Get detailed information about modules.
- Load and unload kernel modules.
- Explore the kernel module configuration directory.

Assumptions

- You are the `root` user on `dom0`.
- The sample output is provided. Kernel modules shown might differ from the actual output.

Tasks

1. Log on to `host03`.
 - a. Use the `ssh` command to log on to `host03` as the `root` user. Provide the `root` password when prompted.

```
# ssh host03
root@host03's password:
Last login: ...
```

2. List kernel modules.
 - a. Use the `lsmod` command to list kernel modules currently loaded into the kernel.

- Your output may be different.

```
# lsmod
Module           Size  Used by
...
ip_set          40960  0
nfnetlink       16384  1 ip_set
bridge          114688  1 ebtable_broute
stp             16384  1 bridge
llc             16384  2 stp,bridge
...
```

- The “Size” column displays the amount of memory the module uses.
- The “Used by” column gives the total number of processes that are using the module in addition to any modules that depend on the module, with the names of modules that depend on the given module shown last.
- In the sample output, the `stp` and `bridge` modules depend on the `llc` module. These three modules are currently used by two processes.

- b. Use the `modinfo` command to list detailed information about a specific kernel module (for example, `nls_utf8`).

```
# modinfo nls_utf8
filename:          /lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/fs/nls/nls_utf8.ko
license:          Dual BSD/GPL
srcversion:        1979FB9C37ACEACE1F7BC35
...
```

- Notice that the kernel modules are loaded from the `/lib/modules/<kernel_version>/kernel` directory.

- c. Use the `uname -r` command to display the kernel version.

```
# uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- d. List the kernel modules for the kernel version, piping the output to the `less` command.

```
# ls -R /lib/modules/`uname -r`/kernel | less
/lib/modules/4.1.12-112.16.4.el7uek.x86_64/kernel:
arch
crypto
Documentation
Drivers
dtrace
fs
kernel
lib
mm
net
sound
vmlinux.ctl

/lib/modules/4.1.12-112.16.4.el7uek.x86_64/kernel/arch:
x86

/lib/modules/4.1.12-112.16.4.el7uek.x86_64/kernel/arch/x86:
crypto
kernel
kvm
oprofile

/lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/arch/x86/crypto:
aesni-intel.ko
blowfish-x86_64.ko
...
```

- Scroll through the output using navigation keys such as Page Up and Page Down.

- The actual kernel modules have a .ko (kernel object) extension (UEK R4). In UEK R5, kernel module names end with .ko.xz because they are compressed using xz compression.
- Enter "q" to return to the prompt.

3. Load kernel modules.

- Determine whether the nfs kernel module is currently loaded.

```
# lsmod | grep nfs
```

- In this example, the nfs kernel module is not loaded.
- b. Use the modprobe command to load the nfs kernel module.
- The sample output is provided. Yours might be different.

```
# modprobe -v nfs
```

```
insmod /lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/fs/fscache/fscache.ko
insmod /lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/fs/nfs_common/grace.ko
insmod /lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/fs/lockd/lockd.ko
insmod /lib/modules/4.1.12-
112.16.4.el7uek.x86_64/kernel/fs/nfs/nfs.ko
```

- The preceding example includes the -v (verbose) option.
- Note that modules fscache, grace, and lockd are loaded in addition to the nfs module. These modules must be loaded in order for nfs to run.
- Also note that modprobe uses the insmod command to load the modules.
- c. Confirm that the nfs module is loaded along with the fscache, grace, and lockd modules.
- The sample output is provided. Yours might be different.

```
# lsmod | egrep 'nfs|grace'
```

```
nfs                      286720  0
lockd                   94208   1 nfs
grace                   16384   1 lockd
fscache                  65536   1 nfs
sunrpc                 344064   3 nfs,lockd
```

- Note that the nfs, fscache, grace, and lockd modules are loaded.
- The output shows that the nfs module depends on the lockd, fscache, and sunrpc modules. The lockd module depends on the grace and sunrpc modules.

4. List module dependencies.

- Kernel module dependencies are listed in /lib/modules/<kernel_version>/modules.dep.
- a. Use the grep command to list the kernel module dependencies for nfs.
- Include the -w option for grep to search for the whole word "nfs".

```
# grep -w nfs.ko /lib/modules/`uname -r`/modules.dep
```

```
kernel/fs/nfs/nfs.ko: kernel/fs/lockd/lockd.ko  
kernel/fs/nfs_common/grace.ko kernel/net/sunrpc/sunrpc.ko  
kernel/fs/fscache/fscache.ko  
...
```

- Note that the dependencies listed in the `modules.dep` file for `nfs` correspond with the modules loaded when running the `modprobe nfs` command, except for the `sunrpc` module.
 - The `sunrpc` module did not load when loading `nfs` because it was already loaded.
5. Unload kernel modules.
- a. Use the `modprobe -r` command to unload the `nfs` kernel module.
 - Do not unload or experiment with any other modules because you could potentially damage the operating system or leave the virtual machine in an unusable state.

```
# modprobe -rv nfs  
rmmod nfs  
rmmod fscache  
rmmod lockd  
rmmod grace
```

- The preceding example includes the `-v` (verbose) option.
- Note that `modprobe -r` uses the `rmmod` command to remove the modules.
- Also note that the dependent modules are removed when possible. In this example, all dependent modules loaded earlier were removed.
- In some cases, a module cannot be removed because it is a dependent module for other kernel modules.

6. Log off **host03** in preparation for the next practice.

Use the `logout` command to close the `ssh` connection to **host03**.

```
# logout  
Connection to host03 closed.
```

You are now the `root` user on **dom0**.

Practices for Lesson 10: Oracle Ksplice

Practices for Lesson 10: Overview

Practices Overview

In these practices, you:

- Become familiar with the Ksplice Uptrack commands and the Ksplice web interface
- View the Ksplice Offline Client Packages from the Unbreakable Linux Network (ULN)
- Upload the Ksplice packages from **dom0** to the **host03** VM
- Install the Ksplice Offline Client and kernel updates to **host03**
- View the effective kernel version after updates are applied
- List the active Oracle Ksplice updates in your running kernel

Practice 10-1: Using Ksplice Uptrack

Overview

In this practice, you become familiar with installing the Ksplice Uptrack package, using the Ksplice Uptrack commands, and with the Ksplice web interface. Read through the tasks in this practice to understand the capabilities of Ksplice Uptrack.

Assumptions

This practice is **not** intended to be a hands-on exercise.

Tasks

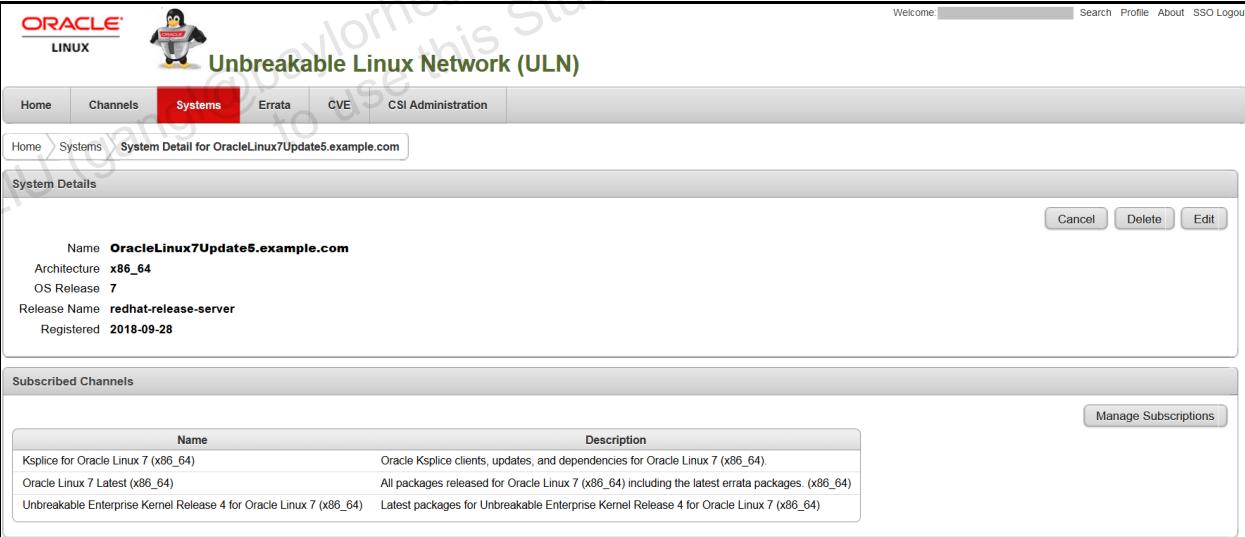
1. Log on to ULN and review the system information.

- a. Sign in at <https://linux.oracle.com>.
- b. Select the registered system.

The following window shows that the system, **OracleLinux7Update5.example.com**, is registered on ULN.

It also shows that the system is subscribed to three channels:

- Ksplice for Oracle Linux 7(x86_64)
- Oracle Linux 7 Latest (x86_64)
- Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)



The screenshot shows the Unbreakable Linux Network (ULN) web interface. At the top, there's a navigation bar with links for Home, Channels, Systems (which is highlighted in red), Errata, CVE, and CSI Administration. Below the navigation bar, the page title is "Unbreakable Linux Network (ULN)". The main content area has two sections: "System Details" and "Subscribed Channels".

System Details:

- Name: OracleLinux7Update5.example.com
- Architecture: x86_64
- OS Release: 7
- Release Name: redhat-release-server
- Registered: 2018-09-28

Subscribed Channels:

Name	Description
Ksplice for Oracle Linux 7 (x86_64)	Oracle Ksplice clients, updates, and dependencies for Oracle Linux 7 (x86_64)
Oracle Linux 7 Latest (x86_64)	All packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)
Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)	Latest packages for Unbreakable Enterprise Kernel Release 4 for Oracle Linux 7 (x86_64)

- c. Run the `yum repolist` command to display the enabled yum repositories.

```
# yum repolist
Loaded plugins: langpacks, rhnplugin, ulninfo
This system is receiving updates from ULN.
repo id          Repo name                  status
ol7_x86_64_UEKR4  Unbreakable Enterprise Kernel Release 4 ...
ol7_x86_64_kssplice Ksplice for Oracle Linux 7 (x86_64) ...
```

```
ol7_x86_64_latest Oracle Linux 7 Latest (x86_64)
```

```
...
```

- Notice the enabled repositories correspond to the ULN channels.
- d. Run the `uname -r` command to display the installed kernel version.

```
# uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- This shows that the UEK version is 4.1.12-112.16.4.

2. Browse the **Ksplice for Oracle Linux 7 (x86_64)** channel on ULN.

The following screenshot shows ULN channels for the Oracle Linux 7 x86_64 architecture:

The screenshot shows a web-based interface for managing Oracle Linux 7 channels. The top navigation bar includes links for Home, Channels (which is selected), Systems, Errata, CVE, and CSI Administration. Below the navigation is a breadcrumb trail: Home > Channels. The main content area is titled 'Channels' and displays a table of available channels. The table has columns for Name, Label, Description, and Packages. The 'Packages' column shows the count of packages for each channel. The channels listed include various Oracle Linux updates, patches, and specific tools like MySQL and Ksplice. The 'Ksplice for Oracle Linux 7 (x86_64)' channel is visible at the bottom of the list.

Name	Label	Description	Packages
Oracle Linux 7 Latest Optional Packages (x86_64)	ol7_x86_64_optional_latest	All optional packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)	5042
Oracle Linux 7 Latest (x86_64)	ol7_x86_64_latest	All packages released for Oracle Linux 7 (x86_64) including the latest errata packages. (x86_64)	5164
Oracle Linux 7 Archive (x86_64)	ol7_x86_64_latest_archive	Archived packages for Oracle Linux 7 (x86_64)	5220
Oracle Linux 7 Update 1 installation media_copy (x86_64)	ol7_x86_64_u1_base	All packages released for Oracle Linux 7 Update 1 (x86_64). No errata included	4384
Oracle Linux 7 Update 1 Patch (x86_64)	ol7_x86_64_u1_patch	Updated packages published after release of Oracle Linux 7 Update 1 (x86_64)	531
Oracle Linux 7 GA Installation media_copy (x86_64)	ol7_x86_64_u0_base	All packages released for Oracle Linux 7 GA (x86_64). No errata included	4315
Oracle Linux 7 Update 2 installation media_copy (x86_64)	ol7_x86_64_u2_base	All packages released for Oracle Linux 7 Update 2 (x86_64). No errata included	4634
Oracle Linux 7 Update 2 Patch (x86_64)	ol7_x86_64_u2_patch	Updated packages published after release of Oracle Linux 7 Update 2 (x86_64)	685
Oracle Linux 7 GA Patch (x86_64)	ol7_x86_64_u0_patch	Updated packages published after release of Oracle Linux 7 GA (x86_64)	583
Oracle Linux 7 Update 3 installation media_copy (x86_64)	ol7_x86_64_u3_base	All packages released for Oracle Linux 7 Update 3 (x86_64). No errata included	4768
Oracle Linux 7 Update 3 Patch (x86_64)	ol7_x86_64_u3_patch	Updated packages published after release of Oracle Linux 7 Update 3 (x86_64)	546
Oracle Linux 7 Update 4 installation media_copy (x86_64)	ol7_x86_64_u4_base	All packages released for Oracle Linux 7 Update 4 (x86_64). No errata included	4999
Oracle Linux 7 Update 4 Patch (x86_64)	ol7_x86_64_u4_patch	Updated packages published after release of Oracle Linux 7 Update 4 (x86_64)	703
Oracle Linux 7 Update 5 installation media_copy (x86_64)	ol7_x86_64_u5_base	All packages released for Oracle Linux 7 Update 5 (x86_64). No errata included	5127
Oracle Linux 7 Update 5 Patch (x86_64)	ol7_x86_64_u5_patch	Updated packages published after release of Oracle Linux 7 Update 5 (x86_64)	683
Developer Preview of Oracle Linux 7 Update 5 (x86_64) - (not for production use)	ol7_x86_64_u5_developer	Developer Preview of Oracle Linux 7 Update 5 (x86_64) - (not for production use)	5108
MySQL 5.6 for Oracle Linux 7 (x86_64)	ol7_x86_64_MySQL56_community	Latest MySQL 5.6 packages for Oracle Linux 7 (x86_64).	15
MySQL 5.5 for Oracle Linux 7 (x86_64)	ol7_x86_64_MySQL55_community	Latest MySQL 5.5 packages for Oracle Linux 7 (x86_64).	15
Oracle Linux 7 Dtrace Userspace Tools (x86_64) - Latest	ol7_x86_64_Dtrace_userspace	The latest Dtrace userspace tools for Unbreakable Enterprise Kernel Release 3 (UEKR3) on Oracle Linux 7 (x86_64).	2
MySQL 5.7 for Oracle Linux 7 (x86_64)	ol7_x86_64_MySQL57_community	Latest MySQL 5.7 packages for Oracle Linux 7 (x86_64).	18
Ksplice aware userspace packages for Oracle Linux 7 (x86_64)	ol7_x86_64_userspace_ksplice	Latest packages for Ksplice aware userspace packages for Oracle Linux 7 (x86_64).	22
Dtrace Userspace Tools (x86_64) for UEKR4 on Oracle Linux 7	ol7_x86_64_UEKR4_DTrace_userspace	The latest Dtrace userspace tools for Oracle Linux 7 (x86_64) with Unbreakable Enterprise Kernel Release 4 (UEKR4).	2
MySQL 8.0 for Oracle Linux 7 (x86_64)	ol7_x86_64_MySQL80_community	Latest MySQL 8.0 packages for Oracle Linux 7 (x86_64).	14
KVM Utilities for Oracle Linux 7 (x86_64)	ol7_x86_64_kvm_utils	Latest packages for KVM Utilities for Oracle Linux 7 (x86_64).	11
Developer Preview of KVM Utilities for Oracle Linux 7 (x86_64)	ol7_x86_64_developer_kvm_utils	Latest KVM Utility packages for test and development for Oracle Linux 7 (x86_64).	51
Oracle Software for Oracle Linux 7 (x86_64)	ol7_x86_64_oracle	Oracle Software for Oracle Linux 7 (x86_64).	1
Oracle Linux 7 Addons (x86_64)	ol7_x86_64_addons	Oracle Linux 7 Addons (x86_64).	80
Unbreakable Enterprise Kernel Release 3 for Oracle Linux 7 (x86_64) - Latest	ol7_x86_64_uekr3	Latest packages for Unbreakable Enterprise Kernel Release 3 for Oracle Linux 7 (x86_64).	99
Ksplice for Oracle Linux 7 (x86_64)	ol7_x86_64_ksplice	Oracle Ksplice clients, updates, and dependencies for Oracle Linux 7 (x86_64).	280

- Notice the **Ksplice for Oracle Linux 7 (x86_64)** entry at the bottom of the screen.
- Also notice that this channel contains **280** packages.

- a. Click the **280** packages link to display the following screen:

The screenshot shows the Oracle Unbreakable Linux Network (ULN) interface. At the top, there is an Oracle Linux logo featuring a penguin. The title "Unbreakable Linux Network (ULN)" is displayed in green. Below the title, a navigation bar includes links for Home, Channels (which is highlighted in red), Systems, Errata, CVE, and CSI Administration. A breadcrumb trail indicates the current location: Home > Channels > Channel: Ksplice for Oracle Linux 7 (x86_64) > Packages. Under the "Channel Packages" tab, there is a search bar and a "Go" button. A table lists various packages with their descriptions:

Package	Description
kssplice-1.0.35-1.el7.x86_64	Oracle Ksplice user-space updates
kssplice-core0-1.0.35-1.el7.x86_64	Oracle Ksplice runtime
kssplice-offline-1.0.35-1.el7.x86_64	Offline Oracle Ksplice user-space installation.
kssplice-snmp-plugin-0.1.0-1.el7.x86_64	Ksplice SNMP plugin
kssplice-tools-1.0.35-1.el7.x86_64	Oracle Ksplice management tools
python-kssplice-uptrack-0.2.3-1.el7.noarch	Python bindings for the Ksplice Uptrack API
uptrack-1.2.52-0.el7.noarch	-
uptrack-offline-1.2.52.offline-0.el7.noarch	-
uptrack-updates-3.10.0-123.1.2.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.13.1.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.13.2.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.20.1.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.4.2.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.4.4.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.6.3.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.8.1.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.9.2.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.9.3.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service
uptrack-updates-3.10.0-123.el7.x86_64-20180717-0.noarch	Rebootless updates for the Ksplice Uptrack rebootless kernel update service

- The uptrack-updates packages contain individual Ksplice binaries, which have one or more updates that can be applied to specific kernel versions. This screen shows a partial list of the available updates for different kernel versions.
- b. Enter **4.1.12-112** in the search box and click **Go** to see what is available for the kernel version we are currently running (**4.1.12-112.16.4**).

The screenshot shows the Oracle Linux Unbreakable Linux Network (ULN) interface. At the top, there's a logo of a penguin holding a small server tower, with the text "ORACLE LINUX". Below the logo, the title "Unbreakable Linux Network (ULN)" is displayed. A navigation bar at the top includes links for Home, Channels, Systems, Errata, CVE, and CSI Administration. The "Channels" link is highlighted in red. The main content area shows a breadcrumb trail: Home > Channels > Channel: Ksplice for Oracle Linux 7 (x86_64) > Packages. Below this, there are two tabs: "Channel Detail" and "Channel Packages", with "Channel Packages" being the active tab. A search bar contains the text "4.1.12-112" and a "Go" button. The results table has columns for "Package" and "Description". The table lists numerous "uptrack-updates" packages, all of which have a description of "Rebootless updates for the Ksplice Uptrack rebootless kernel update service". The packages are listed with their names and versions, such as "uptrack-updates-4.1.12-112.14.1.el7uek.x86_64-20180924-0.noarch" and "uptrack-updates-4.1.12-112.14.16.7.el7uek.x86_64-20180924-0.noarch".

- Notice that there is an "uptrack-updates" RPM for UEK version 4.1.12-112.16.4. This is the UEK version that is running on the system.
- Install the uptrack package.
 - Run the `yum install uptrack` command to install the package.

```
# yum install uptrack
...
Dependencies Resolved
=====
Package           Arch      Version          ...
=====
Installing:
  uptrack        noarch    1.2.52-0.el7    ol7_x86_64_ksplice ...
Installing for dependencies:
  perl-autodie   noarch    2.16-2.el7      ol7_x86_64_latest ...

Transaction Summary
=====
Install 1 Package (+1 Dependent package)

Total download size: 380 k
Installed size: 1.0 M
Is this ok [y/d/N]: y
```

```

...
Installed:
  uptrack.noarch 0:1.2.52-0.el7

Dependency Installed:
  perl-autodie.noarch 0:2.16-2.el7

Complete!

```

4. Install the Ksplice updates.

- a. Run the `uptrack-upgrade -n` command to download the latest package list.
 Though the output shows "Install", the "-n" option prevents installation at this point.

```

# uptrack-upgrade -n
Effective kernel version is 4.1.12-112.16.4.el7uek
The following steps will be taken:
Install [q0j0yb6c] KAISER/KPTI enablement for Ksplice.
Install [afoeymft] Improve the interface to freeze tasks.
Install [bohqh05m] CVE-2017-17052: Denial-of-service due to
incorrect reference counting in fork.
...
Install [slmsck7x] Device Mapper encrypted target Support
middle-endian plain64 IV.
Install [cmas94ja] CVE-2018-5873: Use-after-free in nsfs
directory cache.
Install [9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF
executables.

```

- a. Run the `uptrack-show --available` command to see the updates available for installation.

```

# uptrack-show --available
Available updates:
[q0j0yb6c] KAISER/KPTI enablement for Ksplice.
[afoeymft] Improve the interface to freeze tasks.
[bohqh05m] CVE-2017-17052: Denial-of-service due to
incorrect
reference counting in fork.
...
[slmsck7x] Device Mapper encrypted target Support middle-endian
plain64 IV.
[cmas94ja] CVE-2018-5873: Use-after-free in nsfs directory
cache.
[9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF
executables.

Effective kernel version is 4.1.12-112.16.4.el7uek

```

- Many updates are available in this case.

- b. Run the `uptrack-upgrade -y` command to apply the Ksplice updates.

```
# uptrack-upgrade -y
```

The following steps will be taken:

Install [q0j0yb6c] KAISER/KPTI enablement for Ksplice.

Install [afoeymft] Improve the interface to freeze tasks.

Install [bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect reference counting in fork.

...

Installing [slmsck7x] Device Mapper encrypted target Support middle-endian plain64 IV.

Installing [cmas94ja] CVE-2018-5873: Use-after-free in nsfs directory cache.

Installing [9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF executables.

Your kernel is fully up to date.

Effective kernel version is 4.1.12-124.19.6.el7uek

- c. Run the `uptrack-show --available` command to see the updates available for installation.

```
# uptrack-show --available
```

Available updates:

None

Effective kernel version is 4.1.12-124.19.6.el7uek

- Notice there are no updates available and the effective kernel version is now up-level from the installed kernel version, going from version 4.1.12-112.16.4.el7uek to 4.1.12-124.19.6.el7uek.

- d. Run the `uptrack-show` command to see what updates have been installed.

```
# uptrack-show
```

Installed updates:

[q0j0yb6c] KAISER/KPTI enablement for Ksplice.

[afoeymft] Improve the interface to freeze tasks.

[bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect reference counting in fork.

...

[slmsck7x] Device Mapper encrypted target Support middle-endian plain64 IV.

[cmas94ja] CVE-2018-5873: Use-after-free in nsfs directory cache.

[9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF executables.

Effective kernel version is 4.1.12-124.19.6.el7uek

- e. Run the `uname -r` command to display the original kernel version.

```
# uname -r  
4.1.12-112.16.4.el7uek.x86_64
```

- Ksplice Uptrack does not change the output of `uname`.
- The `uname` command displays the version of the kernel into which a machine was booted.

- f. Run the `uptrack-uname -r` command to display the effective kernel version.

```
# uptrack-uname -r  
4.1.12-124.19.6.el7uek.x86_64
```

- After installing the updates, `uptrack-uname` reflects the updated running kernel.

5. Use the Ksplice web interface.

- a. Open a browser and go to <https://status-ksplice.oracle.com>.

You are prompted to log in.

This interface is now using Oracle SSO accounts for authentication. Oracle's SSO accounts will allow you to have a single username and password for most Oracle services.

If you received your Access Key from [\[URL\]](#), you do not have to do anything. Use the link below to log in with your Oracle account.

If you are a legacy Ksplice customer and do not yet have an Oracle account, you will need to create one before you can log in. Your Oracle account *must* use an email address that is associated with your Ksplice account. [Contact Ksplice Support](#) if you have questions.

[I need to create my Oracle SSO account.](#)

[I am ready to log in with my Oracle SSO account.](#)

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- In this example, click **I am ready to log in with my Oracle SSO account**.
- After the Oracle Sign In window is displayed, provide your login information to sign in.

The Ksplice web interface window is shown with System Status displayed.

The **Access key** and username are grayed out in this view.

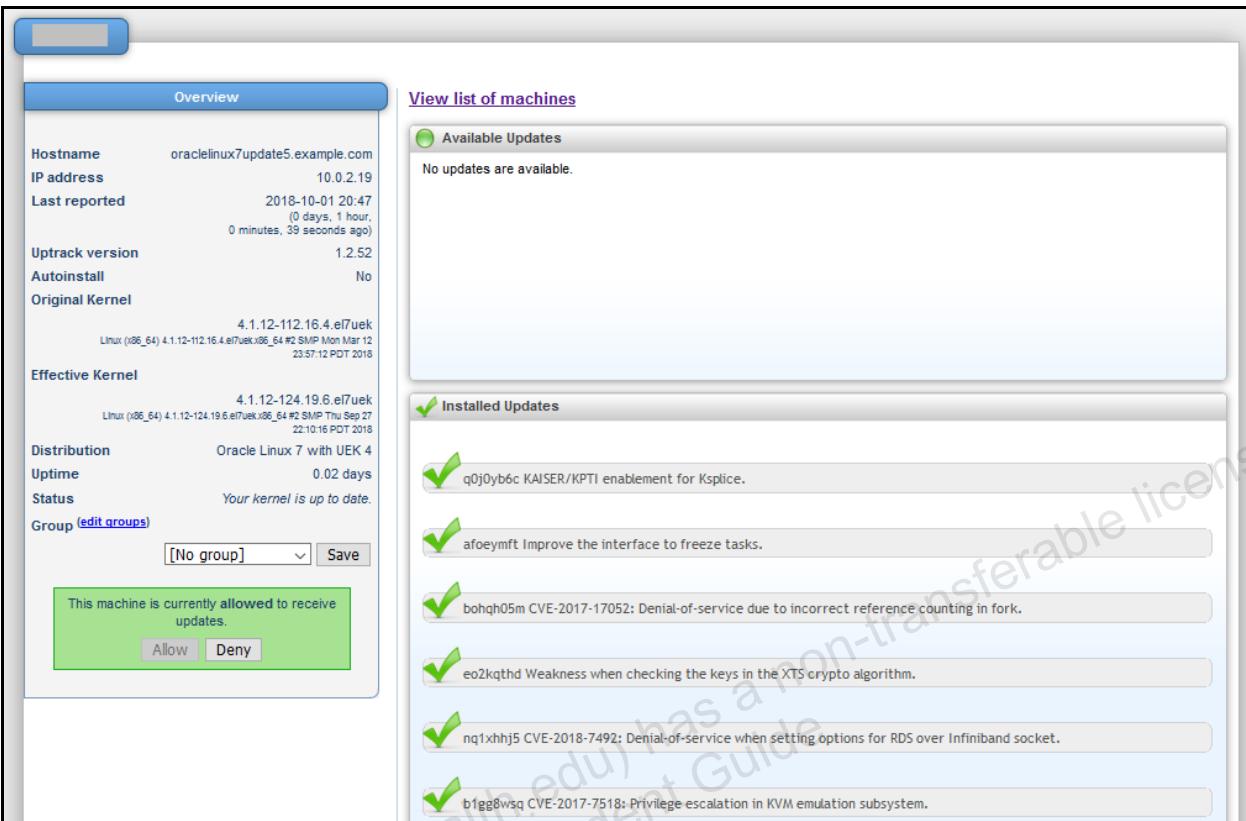
Group	Machine	Status	Auto install	Kernel product	Original Kernel	Effective Kernel	Uptack version
	oracelinux7us-min.example.com (10.0.2.25)	Up to date, 0 installed, 117 more	No	Oracle Linux 7 with UEK 4	4.1.12-112.16.4.el7uek	4.1.12-112.16.4.el7uek	1.2.52
	oracelinux7update5.example.com (10.0.2.19)	Up to date, 117 installed	No	Oracle Linux 7 with UEK 4	4.1.12-112.16.4.el7uek	4.1.12-124.19.6.el7uek	1.2.52

To install Ksplice Uptack on more systems, please see the [Installation instructions](#). To remove Ksplice Uptack from a system, please see the [Removal instructions](#).

Group	Machine	Status	Last reported	Kernel product	Original Kernel	Effective Kernel	Uptack version
Remove	oracelinux7update4.example.com (10.0.2.12)	Inactive, Out of date	2018-10-01 21:30:41	Oracle Linux 7 with UEK 4	4.1.12-94.3.9.el7uek.x86_64	4.1.12-94.3.9.el7uek.x86_64	1.2.52

- The window shows two active machines, one of which is up-to-date and one that has updates to install. There is also one inactive machine that is out of date.
- Click the Machine link, **oracelinux7update5.example.com (10.0.2.19)**.

The following window is displayed:



- Note that there are no updates available.
- A partial list of Installed Updates is shown. Scroll down to view more Installed Updates.
- This corresponds to the output of the `uptrack-show` command.

```
# uptrack-show
Installed updates:
[q0j0yb6c] KAISER/KPTI enablement for Ksplice.
[afoeymft] Improve the interface to freeze tasks.
[bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect
reference counting in fork.
[eo2kqthd] Weakness when checking the keys in the XTS crypto
algorithm.

...
[slmsck7x] Device Mapper encrypted target Support middle-endian
plain64 IV.
[cmas94ja] CVE-2018-5873: Use-after-free in nsfs directory
cache.
[9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF
executables.

Effective kernel version is 4.1.12-124.19.6.el7uek
```

6. Remove the Ksplice updates.

- a. From a terminal window, use the `uptrack-remove` command to remove the Ksplice updates.

```
# uptrack-remove
Please specify update IDs to remove or use the --all argument.
```

- Note that this command requires an additional argument.

- b. Use the `uptrack-remove --all` command to remove all Ksplice updates.

```
# uptrack-remove --all
The following steps will be taken:
Remove [9dm7jc6j] CVE-2018-14634: Privilege escalation in ELF
executables.
Remove [cmas94ja] CVE-2018-5873: Use-after-free in nsfs
directory cache.
Remove [slmsck7x] Device Mapper encrypted target Support middle-
endian plain64 IV.
...
Go ahead [y/N]? y
...
Removing [bohqh05m] CVE-2017-17052: Denial-of-service due to
incorrect reference counting in fork.
Removing [afoeymft] Improve the interface to freeze tasks.
Removing [q0j0yb6c] KAISER/KPTI enablement for Ksplice.
Effective kernel version is 4.1.12-112.16.4.el7uek
```

- Note that the effective kernel version reverted to the original kernel: 4.1.12-112.16.4.el7uek.

7. Use the Ksplice web interface.

- a. The Ksplice interface needs to be refreshed because the updates were removed.

The following window shows the refreshed main System Status page:

Overview

Access key:

- 0 active machines are up to date.
- 2 active machines are out of date.
- 1 machine has stopped using the Uptrack service.

Active Installations

Show group: All machines [Edit groups](#)

Group	Machine	Status	Auto install	Kernel product	Original Kernel	Effective Kernel	Uptrack version
	oraclelinux7u5-min.example.com (10.0.2.25)	0 installed, 117 more	No	Oracle Linux 7 with UEK 4	4.1.12-112.16.4.el7uek	4.1.12-112.16.4.el7uek	1.2.52
	oraclelinux7update5.example.com (10.0.2.19)	0 installed, 117 more	No	Oracle Linux 7 with UEK 4	4.1.12-112.16.4.el7uek	4.1.12-112.16.4.el7uek	1.2.52

To install Ksplice Uptrack on more systems, please see the [Installation instructions](#).
To remove Ksplice Uptrack from a system, please see the [Removal instructions](#).

Inactive Machines

These systems have stopped connecting to the Ksplice Uptrack service. This might be because you removed the Uptrack software, decommissioned or reinstalled the system, or because the Uptrack software can no longer reach the Uptrack servers. This list is provided for your convenience only: Your account will not be charged for an inactive machine after the last billing cycle in which that machine was active.

Click 'remove' to remove a machine from this list, or [remove all](#) of these machines. If a removed machine checks in with the Uptrack server, it will reappear on the status page.

Group	Machine	Status	Last reported	Kernel product	Original Kernel	Effective Kernel	Uptrack version
Remove	oraclelinux7update4.example.com (10.0.2.12)	Inactive, Out of date	2018-10-01 21:30:41	Oracle Linux 7 with UEK 4	4.1.12-94.3.9.el7uek.x86_64	4.1.12-94.3.9.el7uek.x86_64	1.2.52

- Note that the status for oraclelinux7update5.example.com now shows 0 installed, 117 more.
- The Original Kernel and Effective Kernel versions are the same.

b. Click the Machine link for oraclelinux7update5.example.com.

The window now shows updates are available. This is a partial list.

Overview

View list of machines

Available Updates

- q0j0yb6c KAISER/KPTI enablement for Ksplice.
- afoeymft Improve the interface to freeze tasks.
- bohqh05m CVE-2017-17052: Denial-of-service due to incorrect reference counting in fork.
- eo2kqthd Weakness when checking the keys in the XTS crypto algorithm.
- nq1xhhj5 CVE-2018-7492: Denial-of-service when setting options for RDS over Infiniband socket.
- b1gg8wsq CVE-2017-7518: Privilege escalation in KVM emulation subsystem.
- lzcruk19 Information leak when setting crypto key using RNG algorithm.
- npbxwcr Deadlock while queuing messages before remote node is up using RDS protocol.
- 4fmvm11y NULL pointer dereference when using bind system call on RDS over Infiniband socket.
- 3eilpxc9 CVE-2017-14051: Denial-of-service in qla2xxx sysfs handler.

This machine is currently allowed to receive updates.

This corresponds to the output of the `uptrack-show --all` command.

```
# uptrack-show --all
Available updates:
[q0j0yb6c] KAISER/KPTI enablement for Ksplice.
[afoeymft] Improve the interface to freeze tasks.
[bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect
reference counting in fork.
...
Installed updates:
None

Effective kernel version is 4.1.12-112.16.4.el7uek
```

Practice 10-2: Installing the Ksplice Offline Client and Kernel Updates

Overview

In this practice, you:

- View the Ksplice offline client files available from ULN
- Use `scp` to upload the Ksplice packages from **dom0** to the **host03** VM
 - The `scp` command is discussed in the lesson titled “OpenSSH.”
- Install the Ksplice Offline Client packages on **host03**
- Install the kernel updates package on **host03**
- View the effective kernel version after updates have been installed
- List the active Oracle Ksplice updates in your running kernel

Assumptions

- You are the `root` user on **dom0**.
- Software packages have been downloaded and staged on **dom0**.

Tasks

1. View and copy staged packages from **dom0** to **host03**.
 - a. As the `root` user on **dom0**, use the `cd` command to change to the `/OVS/seed_pool/ksplice` directory.


```
[dom0]# cd /OVS/seed_pool/ksplice
```
 - b. Use the `ls` command to display the contents of the directory.


```
[dom0]# ls
perl-autodie-2.16-2.el7.noarch.rpm
uptrack-offline-1.2.52.offline-0.el7.noarch.rpm
uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-20180918-
0.noarch.rpm
```

 - The `uptrack` files in this directory have been downloaded from ULN. `perl-autodie-2.16-2.el7.noarch.rpm` is available on the installation media and is a dependency for the `uptrack-offline` package.
 - The `uptrack-offline` package enables offline Ksplice updates and the `uptrack-updates` package provides the Ksplice updates for UEK version 4.1.12-112.16.4.
2. Use the `scp` command to transfer these packages from **dom0** to **host03**.

Run this command from the `/OVS/seed_pool/ksplice` directory on **dom0**.

- Provide the `root` password when prompted.

```
[dom0]# pwd
/OVS/seed_pool/ksplice
[dom0]# scp * host03:~
```

```
root@host03's password:
perl-autodie-2.16-2.el7.noarch.rpm 100%    77KB   76.8KB/s   00:00
uptrack-offline-1.2.52.offline-0.el7.noarch.rpm 100%   293KB
293.0KB/s   00:00
uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-20180918-
0.noarch.rpm 100%   24MB 24.3MB/s   00:00
```

3. Ensure you have the correct version of the uptrack-updates kernel package on **host03**.

- a. Use the `ssh` command to log on to **host03** as the `root` user.

- Provide the `root` password when prompted.

```
[dom0]# ssh host03
root@host03's password:
Last login: ...
```

- b. From **host03**, use the `uname -r` command to display the version of the running kernel.

```
# uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- c. Use the `cd` command to ensure you are in the `root` user's home directory and then use the `ls` command to display the contents of the directory.

```
# cd
# ls
...
perl-autodie-2.16-2.el7.noarch.rpm
uptrack-offline-1.2.52.offline-0.el7.noarch.rpm
uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-20180918-
0.noarch.rpm
```

- Note that the kernel version on **host03** is the same as the uptrack-updates kernel package, `4.1.12-112.16.4.el7uek.x86_64`.

4. Install the Ksplice Uptrack kernel update.

- a. Use the `rpm` command to install the Ksplice Offline Client package.

The `uptrack-offline` package is the Ksplice Offline Client.

Note: The `uptrack-offline` package will not install if the `uptrack-1.2.52-0.el7.noarch.rpm` package is already installed.

```
# rpm -Uvh uptrack-offline-1.2.52.offline-0.el7.noarch.rpm
error: Failed dependencies:
        perl(Fatal) is needed by uptrack-offline-1.2.52-
0.offline-0.el7.noarch
        perl-autodie is needed by uptrack-offline-
1.2.52.offline-0.el7.noarch
```

- Note that the installation fails due to dependencies.

- b. Use the `rpm` command to install the `perl-autodie` package.

```
# rpm -Uvh perl-autodie-2.16-2.el7.noarch.rpm
```

```
Preparing...                                ##### [100%]
Updating / installing...
1: perl-autodie-2.16-2.el7      ##### [100%]
```

- c. Repeat the previous step: Use the `rpm` command to install the Ksplice Offline Client package.

```
# rpm -Uvh uptrack-offline-1.2.52.offline-0.el7.noarch.rpm
Preparing...                                ##### [100%]
Updating / installing...
1:uptrack-offline-1.2.52-0.offline-0.##### [100%]
There are no existing modules on disk that need basename
migration.

Now run 'uptrack-upgrade' to protect your kernel
```

- The Ksplice Offline Client package is installed successfully.

- d. Use the `rpm` command to install the `uptrack-updates` package.

```
# rpm -Uvh uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-
20180918-0.noarch.rpm
Preparing...                                ##### [100%]
Updating / installing...
1:uptrack-updates-4.1.12-112.16.4.e##### [100%]
The following steps will be taken:
Install [q0j0yb6c] KAISER/KPTI enablement for Ksplice.
Install [afoeymft] Improve the interface to freeze tasks.
Install [bohqh05m] CVE-2017-17052: Denial-of-service due to
incorrect reference counting in fork.
Install [eo2kqthd] Weakness when checking the keys in the XTS
crypto algorithm.

...
Installing [iteue8sj] Incorrect Spectre v2 mitigation reporting
with noibrs boot option.
Installing [o4omfc8c] CVE-2018-14678: Privilege escalation in
Xen PV guests.
Installing [do4xcsdi] Improved fix to CVE-2018-3620, CVE-2018-
3646: Information leak in Intel CPUs under terminal fault.
Your kernel is fully up to date.
Effective kernel version is 4.1.12-124.19.1.el7uek
```

- All kernel updates are installed.

- e. Use the `uname -r` command to display the version of the running kernel.

```
# uname -r
4.1.12-112.16.4.el7uek.x86_64
```

- f. Use the `uptrack-uname -r` command to display the effective kernel version.

```
# uptrack-uname -r
4.1.12-124.19.1.el7uek.x86_64
```

- The effective kernel version is now up-level from the original kernel version.

- g. Use the `uptrack-show` command to list the active Oracle Ksplice updates in your running kernel.

```
# uptrack-show
Installed updates:
[q0j0yb6c] KAISER/KPTI enablement for Ksplice.
[afoeymft] Improve the interface to freeze tasks.
[bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect reference counting in fork.
[eo2kqthd] Weakness when checking the keys in the XTS crypto algorithm.
...
[n8drj851] CVE-2018-13405: Permissions bypass when creating file in SGID directory.
[o4omfc8c] CVE-2018-14678: Privilege escalation in Xen PV guests.
[do4xcsdi] Improved fix to CVE-2018-3620, CVE-2018-3646: Information leak in Intel CPUs under terminal fault.

Effective kernel version is 4.1.12-124.19.1.el7uek
```

- h. Use the `uptrack-remove --all` command to remove all Ksplice updates.

```
# uptrack-remove --all
The following steps will be taken:
Remove [do4xcsdi] Improved fix to CVE-2018-3620, CVE-2018-3646: Information leak in Intel CPUs under terminal fault.
Remove [o4omfc8c] CVE-2018-14678: Privilege escalation in Xen PV guests.
Remove [iteue8sj] Incorrect Spectre v2 mitigation reporting with noibrs boot option.
...
Go ahead [y/N]? y
...
Removing [bohqh05m] CVE-2017-17052: Denial-of-service due to incorrect reference counting in fork.
Removing [afoeymft] Improve the interface to freeze tasks.
Removing [q0j0yb6c] KAISER/KPTI enablement for Ksplice.
Effective kernel version is 4.1.12-112.16.4.el7uek
```

- Note that the effective kernel version reverted to the original kernel: 4.1.12-112.16.4.el7uek.

5. Remove the Ksplice packages from **host03**.

- a. Use the `rpm` command to remove the packages just installed.

```
# rpm -e uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-20180918-0.noarch
# rpm -e uptrack-offline-1.2.52.offline-0.el7.noarch
```

```
# rpm -e perl-autodie-2.16-2.el7.noarch
```

- b. Use the `rm` command to remove `~/uptrack*`.
- Answer `y` to remove each file.

```
# rm ~/uptrack*
rm: remove regular file '/root/uptrack-offline-1.2.52.offline-0.el7.noarch.rpm'? y
rm: remove regular file '/root/uptrack-updates-4.1.12-112.16.4.el7uek.x86_64-20180918-0.noarch.rpm'? y
```

- c. Use the `rm` command to remove `~/perl-autodie-2.16-2.el7.noarch.rpm`.
- Answer `y` to remove the file.

```
# rm ~/perl-autodie-2.16-2.el7.noarch.rpm
rm: remove regular file 'perl-autodie-2.16-2.el7.noarch.rpm'? y
```

6. Log off **host03** in preparation for the next practice.

Use the `logout` command to close the `ssh` connection to **host03**.

```
# logout
Connection to host03 closed.
```

You are now the `root` user on **dom0**.

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Practices for Lesson 11: User and Group Administration

Practices for Lesson 11: Overview

Practices Overview

In these practices, you:

- Create user and group accounts
- Understand the benefits of user private groups
- Configure password aging
- Use the User Manager GUI
- Restrict the use of the `su` command
- Allow the use of the `sudo` command

Practice 11-1: Administering User Accounts

Overview

In this practice, you use command-line utilities to create new user accounts, view files that are updated when adding a new user, modify a user account, set a password for the new user, and log in as the new user.

Assumptions

You are the `root` user on `dom0`.

Tasks

1. Log on to **host03**.
 - a. Connect to the **host03** guest by using the `xm vncviewer host03&` command.


```
# xm vncviewer host03&
```

 The GNOME login window appears.
 - b. Select Oracle Student from the GNOME login window; enter the password.
 - c. Right-click the GNOME desktop and select **Open Terminal** from the pop-up menu.
 - d. In the terminal window, become the `root` user by entering the `su -` command and providing the `root` password.

```
$ su -
Password:
# whoami
root
```

2. Add a user.
 - a. Use the command-line utility to add the `student1` user.


```
# useradd student1
```
 - b. Use the `cat` command to view the new `student1` entry in the `/etc/passwd` file.

```
# cat /etc/passwd
...
oracle:x:1000:1000:Oracle Student:/home/oracle:/bin/bash
...
student1:x:1001:1001::/home/student1:/bin/bash
```

- Note that the new user's UID and GID are incremented by one.
 - Note that a home directory was created for the new user (`/home/student1`).
 - Note that the default shell for the new user is `/bin/bash`.
- c. Use the `ls` command to verify that the new user's home directory was created.

```
# ls /home
lost+found oracle student1
```

- A home directory was created because `CREATE_HOME` in `/etc/login.defs` is set to yes.

d. View the value of `CREATE_HOME` in `/etc/login.defs`.

```
# grep CREATE_HOME /etc/login.defs
CREATE_HOME      yes
```

e. View the default settings for a new user, stored in `/etc/default/useradd`.

```
# cat /etc/default/useradd
# useradd defaults file
GROUP=100
HOME=/home
INACTIVE=-1
EXPIRE=
SHELL=/bin/bash
SKEL=/etc/skel
CREATE_MAIL_SPOOL=yes
```

- Note that the `SKEL` directive is set to `/etc/skel`.

f. View the contents of `/etc/skel`.

```
# ls -la /etc/skel
...
-rw-r--r--. . . . bash_logout
-rw-r--r--. . . . bash_profile
-rw-r--r--. . . . bashrc
drwxr-xr-x. . . . mozilla
```

g. View the contents of the new user's home directory.

```
# ls -la /home/student1
...
-rw-r--r--. . . . bash_logout
-rw-r--r--. . . . bash_profile
-rw-r--r--. . . . bashrc
drwxr-xr-x. . . . mozilla
```

- Note that the contents of `SKEL` (`/etc/skel`) are copied to the new user's home directory.

h. View the new `student1` entry in the `/etc/group` file.

```
# cat /etc/group
...
oracle:x:1000:oracle
...
student1:x:1001:
```

- Because Oracle Linux uses a user private group (UPG) scheme, a new private group (`student1`, GID=1001) was created when the `student1` user was created.

- i. View the new student1 entry in the /etc/shadow file.

```
# cat /etc/shadow
...
oracle:$6$....:0:99999:7:::
...
student1:!!:17429:0:99999:7:::
```

- j. View the new student1 entry in the /etc/gshadow file.

```
# cat /etc/gshadow
...
oracle:!::oracle
...
student1!:!::
```

- k. Add a new user with the following characteristics:

- Username = student2
- UID = 1055
- GECOS information = "Oracle Student2"
- Default shell = /bin/sh (Bourne shell)

```
# useradd -u 1055 -c "Oracle Student2" -s /bin/sh student2
```

- l. View the new student2 entry in /etc/passwd.

```
# tail -2 /etc/passwd
student1:x:1001:1001::/home/student1:/bin/bash
student2:x:1055:1055:Oracle Student2:/home/student2:/bin/sh
```

- Note that the UID and GID are 1055.
- Note the GECOS information.
- Note the default shell.

3. Modify a user account.

- a. Use the usermod command to modify GECOS information for the student1 user as follows:

```
# usermod -c "Oracle Student1" student1
```

- b. View the student1 entry in the /etc/passwd file.

```
# grep student1 /etc/passwd
student1:x:1001:1001:Oracle Student1:/home/student1:/bin/bash
```

4. Assign a password to the new user.

- a. Use the cat command to view the /etc/shadow file.

```
# cat /etc/shadow
...
oracle:$6$....:0:99999:7:::
...
student1:!!:17429:0:99999:7:::
```

```
student2:!:17429:0:99999:7:::
```

- Note that the “!!” in the student1 and student2 records indicate that no password has been assigned (and that the accounts are locked).
- b. Use the passwd command to create a password (of password) for the student1 user.
- Ignore the “BAD PASSWORD” warning, continuing to use password as the password.

```
# passwd student1
Changing password for user student1.
New password: password
BAD PASSWORD: The password fails the dictionary check - it is
based on a dictionary word
Retype new password: password
passwd: all authentication tokens updated successfully.
```

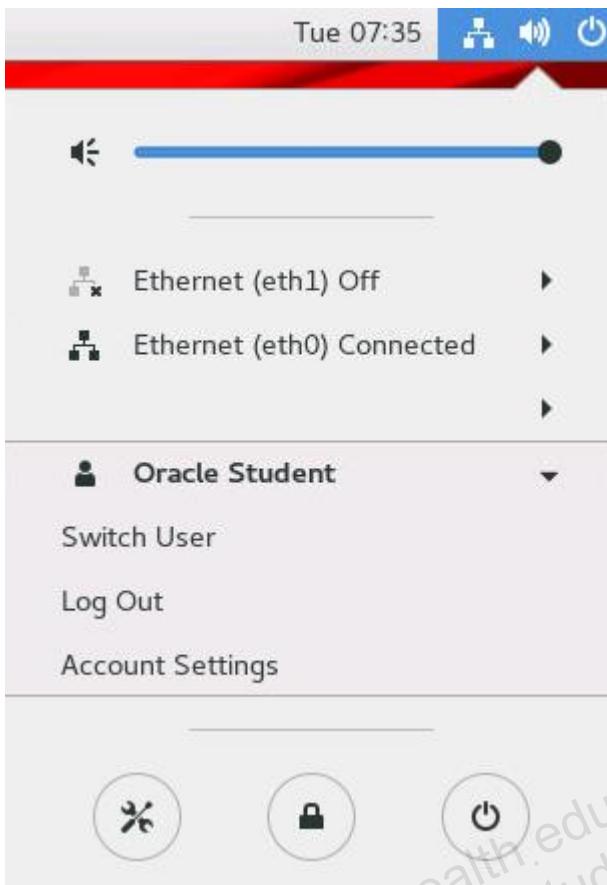
- c. View the /etc/shadow file.

```
# cat /etc/shadow
...
oracle:$6$....:0:99999:7:::
...
student1:$6$....: 17429:0:99999:7:::
student2:!:17429:0:99999:7:::
```

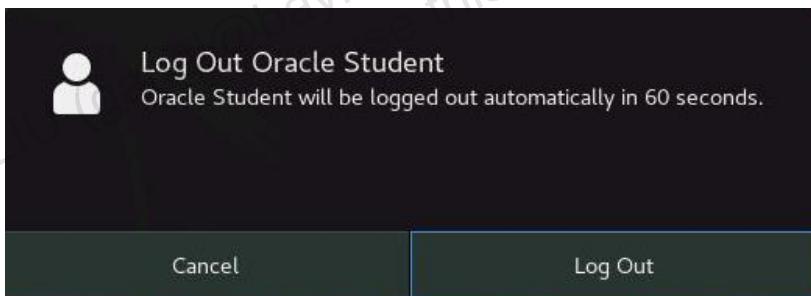
- Now the “!!” for student1 has been replaced with a hashed password value.
- Note that the student2 account is still locked because a password has not been assigned.

5. Log in as a new user.

- a. Log out as the oracle user by clicking **Oracle Student** and selecting **Log Out** from the pop-up menu, as shown in the following screenshot:

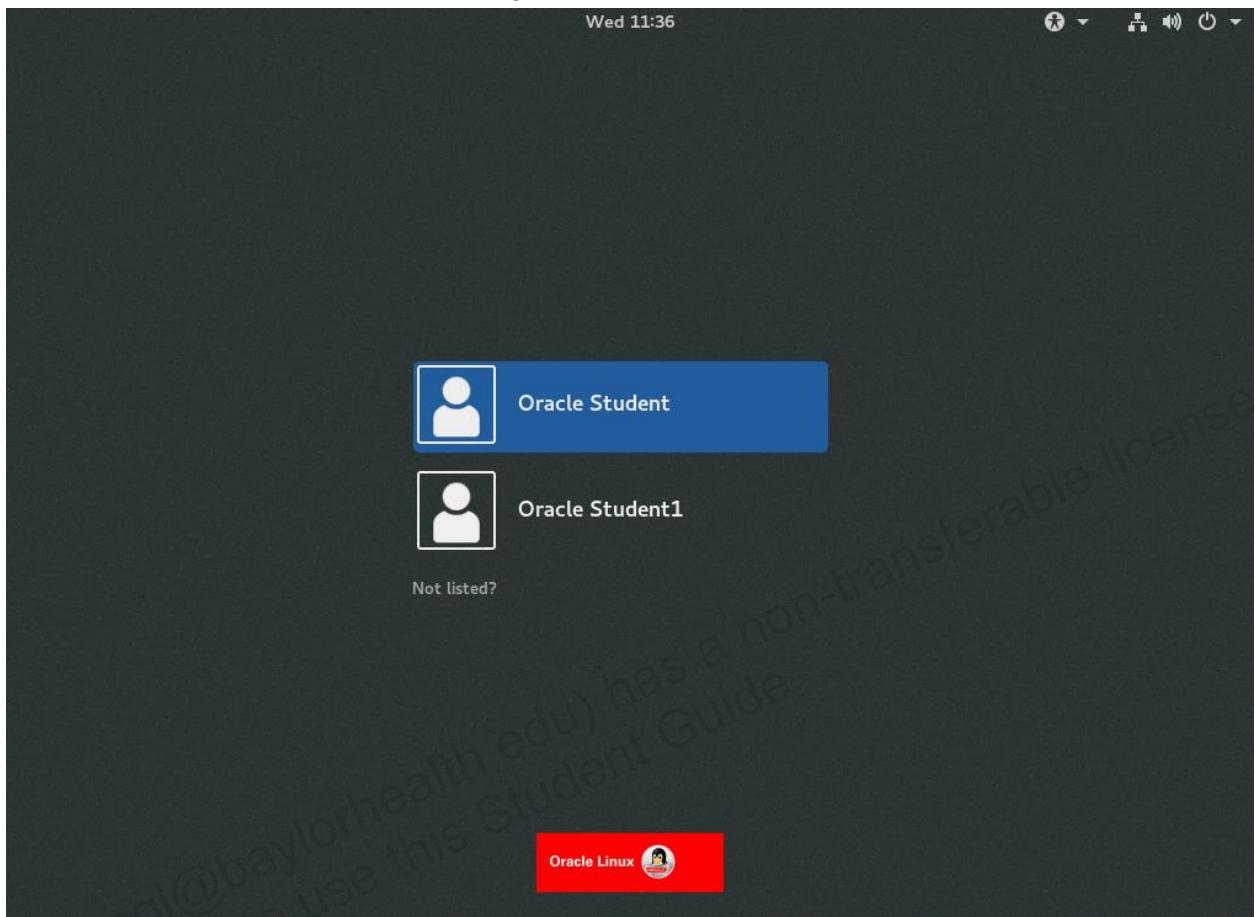


- b. Click **Log Out** in the pop-up.



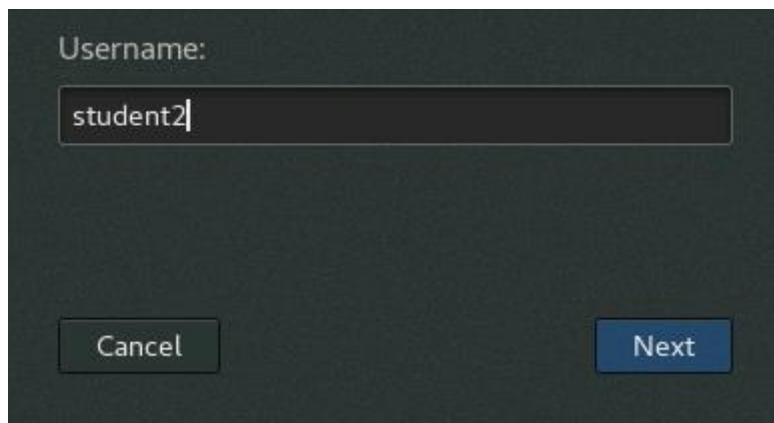
- c. Attempt to log in as student2 (**Oracle Student2**).

- Click **Not listed?** from the following window:



- You are presented with a **Username:** prompt.

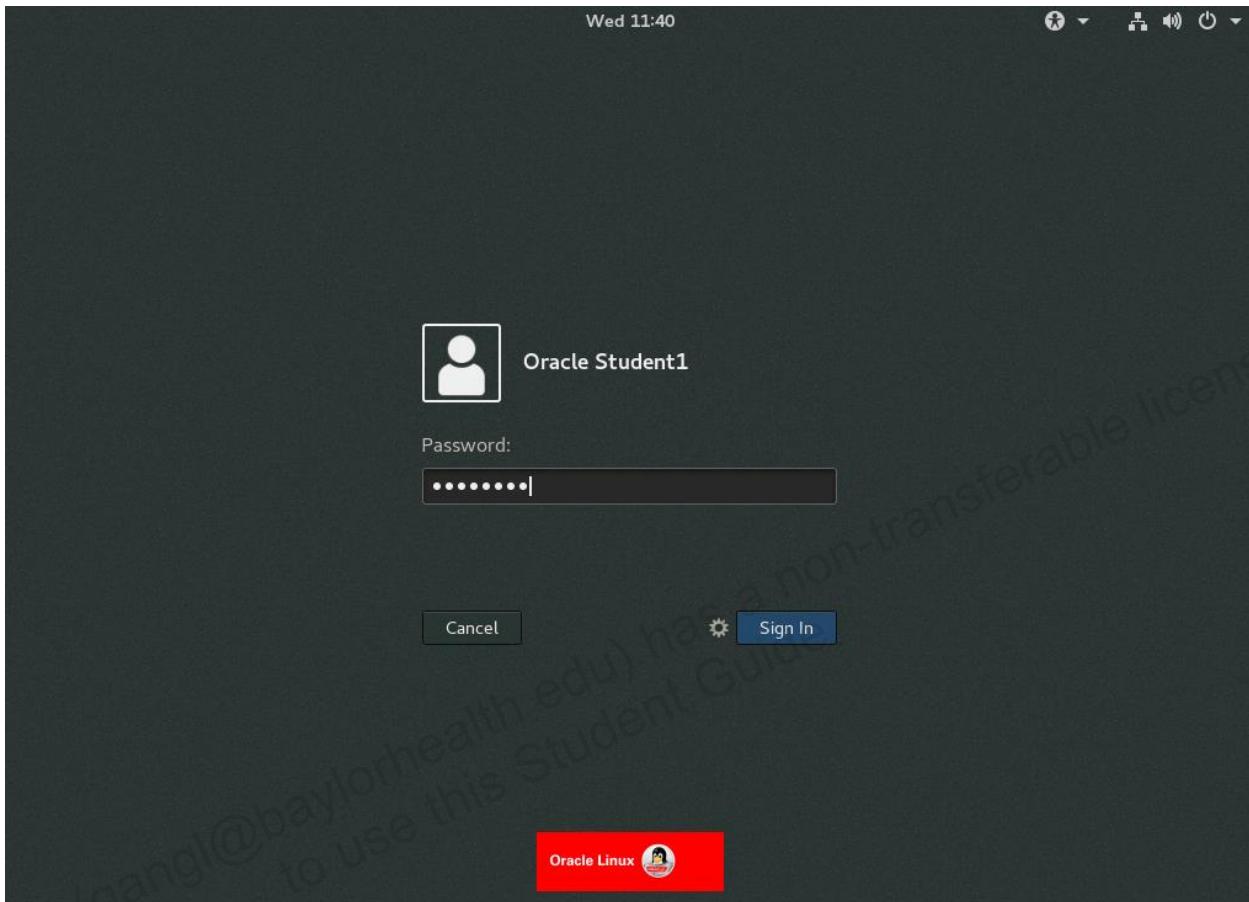
d. Enter student2.



e. Click **Next**.

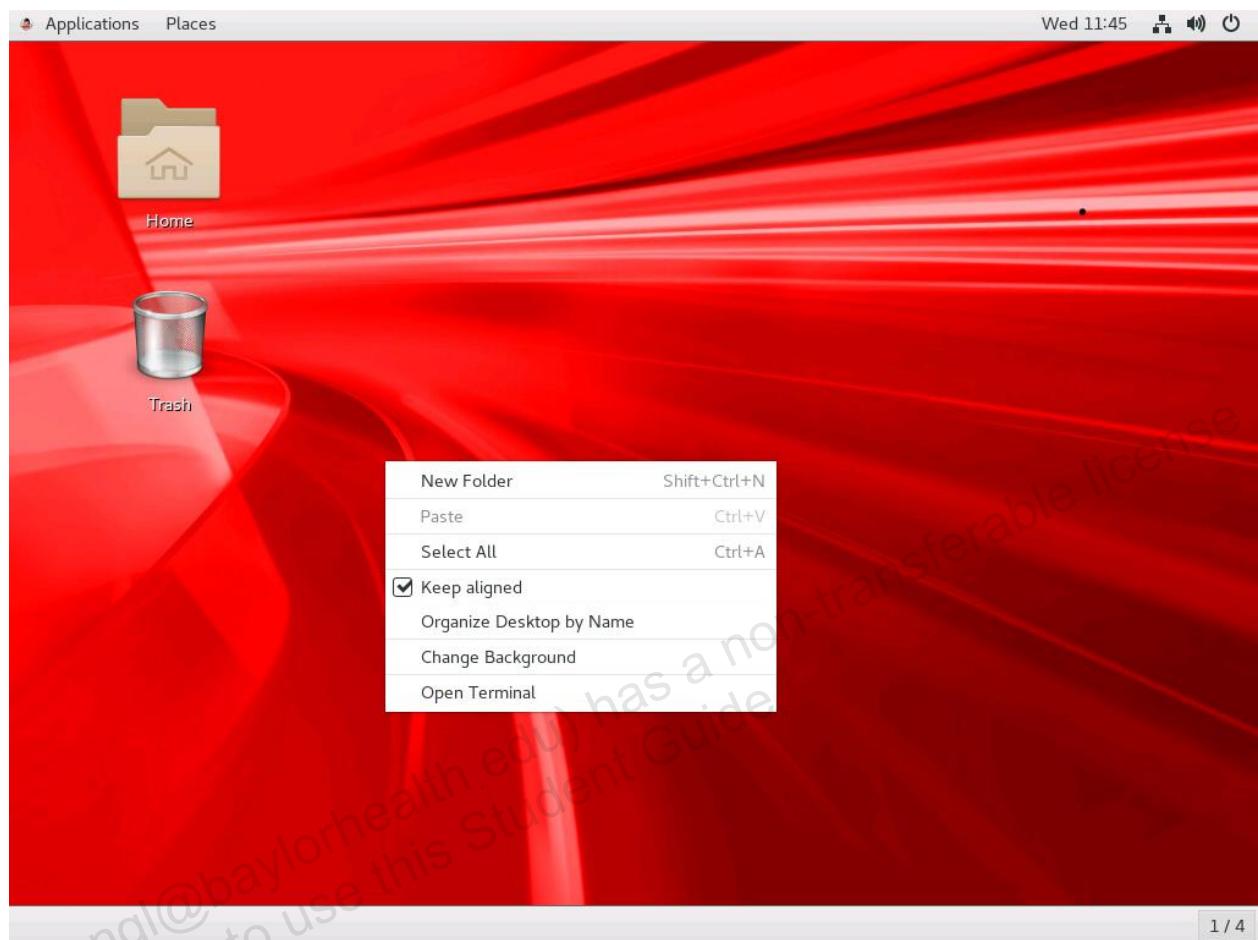
- You are presented with a **Password:** prompt.
- Because no password has been assigned to student2, the account is locked.
- Regardless of what you enter as a password, you cannot log in as student2.
- Click **Cancel** to continue.

- f. Log in as student1 by selecting **Oracle Student1** from the login menu.
- g. Enter password when prompted for the password.
 - The actual password is replaced by a string of dots for security purposes.



- h. Click **Sign In** to successfully log in as student1.
 - Because this is the first time you have logged in as this user, a series of screens appear.
 - Click **Next** in the Welcome window.
 - Click **Next** in the Typing window.
 - Turn **Off** Location Services in the Privacy window. Click **Next**.
 - Click **Skip** in the Online Accounts window.
 - Click **Start using Oracle Linux Server**.
 - Click the **x** in the upper-right corner of the GNOME Getting Started window to close it.

- i. Right-click the desktop to display the pop-up menu as shown in the following screenshot:



- j. Select **Open Terminal** to open a terminal window.
k. From the terminal window, use the `whoami` command to verify that you are logged in as student1.

```
$ whoami  
student1
```

- l. Use the `su -` command to become the root user. Provide the password when prompted.

```
$ su -  
Password:  
# whoami  
root
```

Practice 11-2: Administering Group Accounts

Overview

In this practice, you create a new group account and add users to this new group.

Tasks

1. Add a group.
 - a. Use the `groupadd` command without any options to add the `students` group.

```
# groupadd students
```

- b. View the new `students` entry in the `/etc/group` file.

```
# cat /etc/group
...
student1:x:1001:
student2:x:1055:
students:x:1056:
```

- Note that the GID for the new group is incremented by one.

2. Add users to the new group.

- a. Use the `usermod` command to add the `student1` and `student2` users to the `students` group.

```
# usermod -aG 1056 student1
# tail -1 /etc/group
students:x:1056:student1
# usermod -aG 1056 student2
# tail -1 /etc/group
students:x:1056:student1,student2
```

- Note that both `student1` and `student2` have a secondary group membership in the `students` group.

- b. View the primary group membership for `student1` and `student2`.

```
# grep student /etc/passwd
student1:x:1001:1001:Oracle Student1:/home/student1:/bin/bash
student2:x:1055:1055:Oracle Student2:/home/student2:/bin/sh
```

- Note that the `student1` primary group is still 1001.
- Note that the `student2` primary group is still 1055.

Practice 11-3: Implementing User Private Groups

Overview

In this practice, you use the UPG scheme to give different users write access to files in a single directory.

Tasks

- Set up a shared /students directory.

- Use the `mkdir` command to create the /students directory.

```
# mkdir /students
```

- Use the `chgrp` command to change the group for this /students directory to the students group.

```
# ls -ld /students
drwxr-xr-x. 2 root root ... /students
# chgrp -R students /students
# ls -ld /students
drwxr-xr-x. 2 root students ... /students
```

- Note that the group was set to `root` before issuing the `chgrp` command.
- The `-R` option (recursive) sets the new group for files and directories within /students.

- Use the `chmod` command to set the `setgid` bit on the directory, and give write permissions to the group.

```
# chmod -R 2775 /students
# ls -ld /students
drwxrwsr-x. 2 root students ... /students
```

- Note the new group permissions on the /students directory.

- Create files in the /students directory as the oracle user.

- Use the `usermod` command to add the oracle user to the students group.

```
# usermod -aG students oracle
```

- Use the `su` command to become the oracle user.

```
# su - oracle
$ whoami
oracle
```

- Use the `groups` command to display group membership.

```
$ groups
oracle students
```

- Note that the oracle user belongs to two groups, oracle and students.

- d. Use the `cd` command to change to the `/students` directory.

```
$ cd /students
```

- e. Use the `touch` command to create a file in the `/students` directory.

```
$ touch oracle_file
```

- f. Use the `ls` command to display the permissions and ownership of the new file.

```
$ ls -l oracle_file
```

```
-rw-rw-r--. 1 oracle students ... oracle_file
```

- Note that the permissions are read/write for the `students` group.

3. Create and edit files within the shared directory as a different user.

- a. Use the `su` command to become the `student1` user. The password is `password`.

```
$ su - student1
```

```
Password: password
```

```
$ whoami
```

```
student1
```

- b. Use the `groups` command to display group membership.

```
$ groups
```

```
student1 students
```

- Note that the `student1` user belongs to two groups, `student1` and `students`.

- c. Use the `cd` command to change to the `/students` directory.

```
$ cd /students
```

- d. Use the `touch` command to create a file in the `/students` directory.

```
$ touch student1_file
```

- e. Use the `ls` command to display the permissions and ownership of the files.

```
$ ls -l
```

```
-rw-rw-r--. 1 oracle     students ... oracle_file
```

```
-rw-rw-r--. 1 student1   students ... student1_file
```

- Note that the permissions are read/write for the `students` group.

- f. Use the `touch` command to update the time stamp on the `oracle_file`.

```
$ touch oracle_file
```

- The `touch` command updates the time stamp, which implies write permissions on the file.

- g. Use the `exit` command twice to log out as the `student1` user, and then as the `oracle` user.

```
$ exit
logout
$ whoami
oracle
$ exit
logout
# whoami
root
```

Practice 11-4: Configuring Password Aging

Overview

In this practice, you modify the password aging parameters for a user.

Tasks

- View the password aging information.

- List password aging information in /etc/shadow for the student1 user.

```
# grep student1 /etc/shadow
student1:$6$....:17429:0:99999:7:::
```

- This example gives 17429 days since the password changed (counted in days since Jan 1, 1970). This differs depending on when you created the account.
- 0 is the number of days that need to pass before the password must be changed by the user (0 means never).
- 99999 is the maximum number of days since the password changed that the password can be used. After this number of days, the password needs to be changed by the user.
- 7 is the number of days before the expire date that the user is warned about the pending password change policy. If the password is not changed after this number of days, the user account is locked.

- Use the chage command to view password aging information for the student1 user.

- The chage command allows you to change user password expiry information.
- Reminder: You can edit the /etc/login.defs file to change the default password expiry information for all new users.
- Use the -l (list) option with the command.

```
# chage -l student1
Last password change : Sep 20, 2017
Password expires      : never
Password inactive     : never
Account expires       : never
Minimum number of days between password change : 0
Maximum number of days between password change  : 99999
Number of days or warning before password expires: 7
```

- Modify the password aging parameters.

- Make the following changes to password aging for the student1 user:

- Change the minimum password age value to 14.
- Change the maximum password age value to 30.

```
# chage student1
Changing the aging information for student1
Enter the new value, or press ENTER for the default
```

```
Minimum Password Age [0]: 14
Maximum Password Age [99999]: 30
Last Password Change (YYYY-MM-DD) [2017-09-20]: ENTER
Password Expiration Warning [7]: ENTER
Password Inactive [-1]: ENTER
Account Expiration Date (YYYY-MM-DD) [-1]: ENTER
```

- If the minimum password age is 14, the user cannot change their password for 14 days. When the maximum password age is 30, the user has 16 days remaining before having to change their password.
- b. View the results of the change for student1 in /etc/shadow.

```
# grep student1 /etc/shadow
student1:$6$...:17429:14:30:7:::
```

- c. Use the chage command to view password aging information for the student1 user.

```
# chage -l student1
Last password change : Sep 20, 2017
Password expires      : Oct 20, 2017
Password inactive     : never
Account expires        : never
Minimum number of days between password change : 14
Maximum number of days between password change : 30
Number of days or warning before password expires: 7
```

Practice 11-5: Using the User Manager GUI

Overview

In this practice, you use the User Manager GUI to add a user, and add and delete a group account.

Tasks

1. Use the `yum install` command to install the `system-config-users` package.

- Answer “y” when prompted.

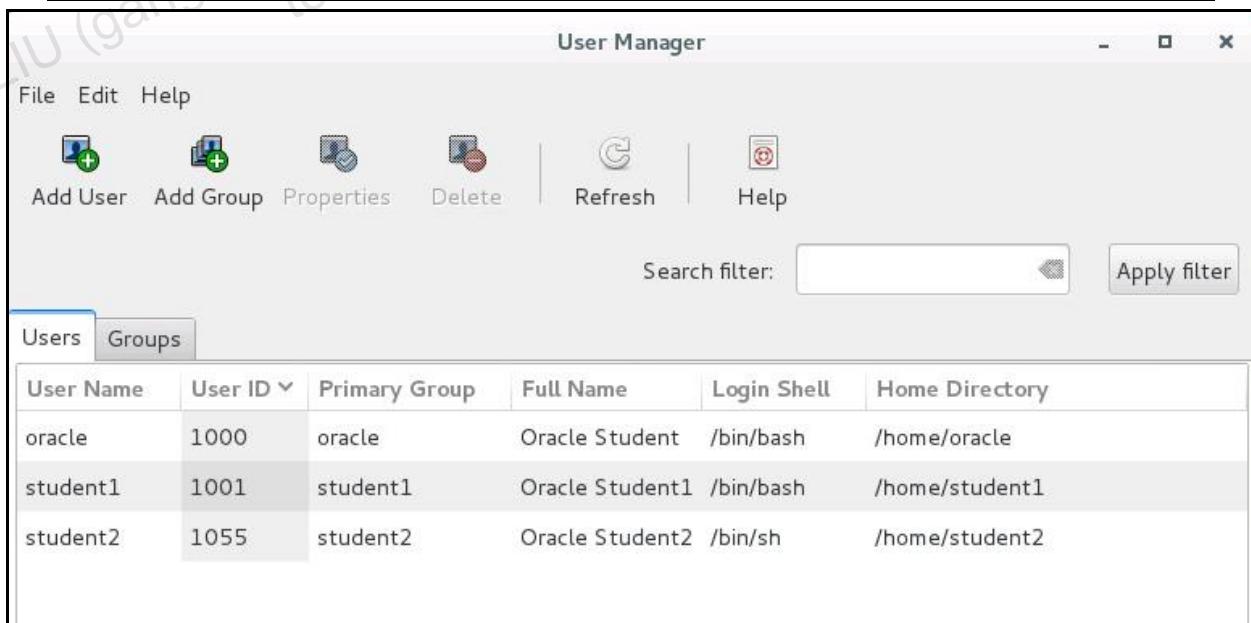
```
# yum install system-config-users
...
Transaction Summary
=====
Install 1 Package (+3 Dependent packages)

Total download size: 805 k
Installed size: 3.9 M
Is this ok [y/d/N]: y
...
Complete!
```

2. Add a new user by using the User Manager GUI.

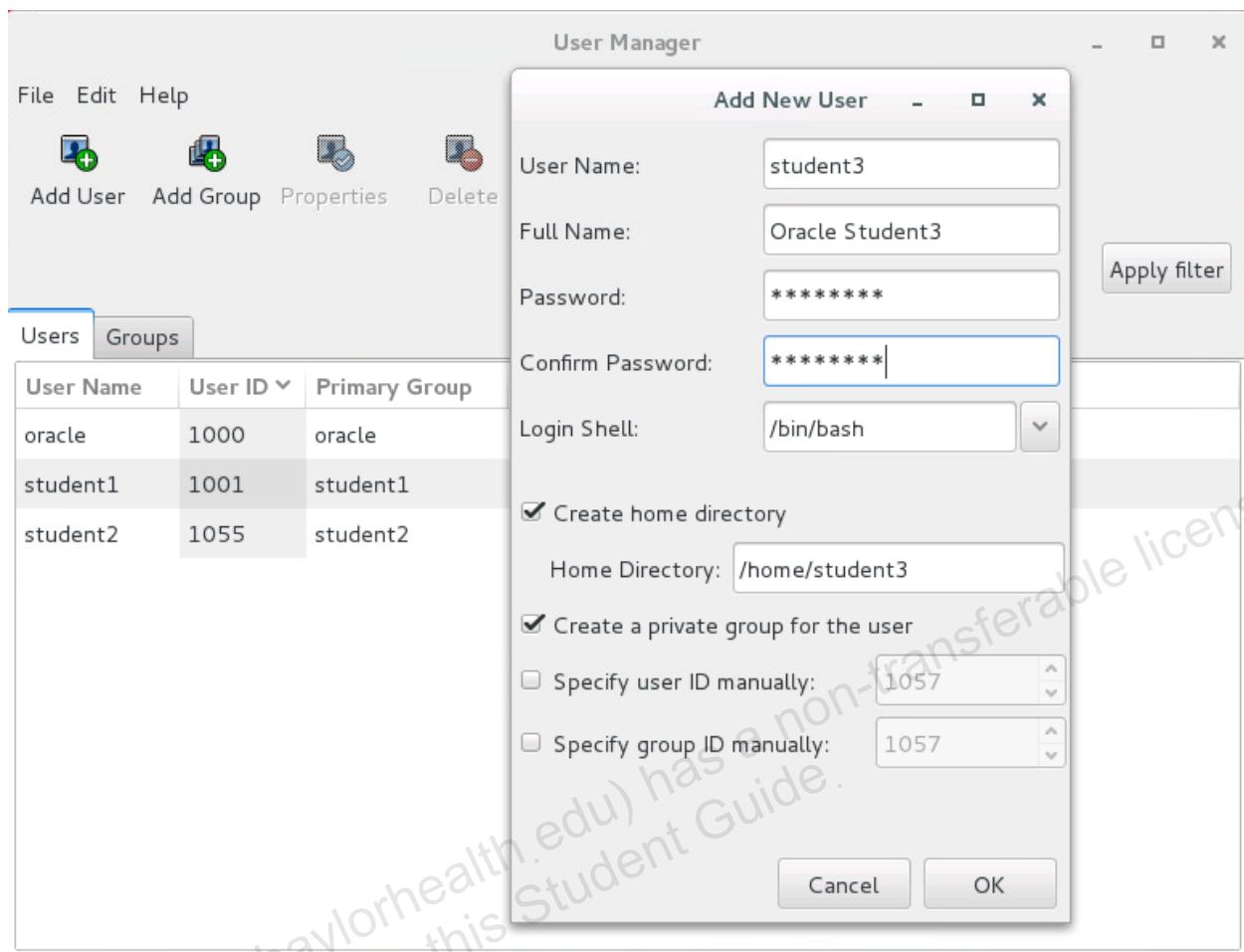
- a. Use the `system-config-users` command to display the User Manager Tool GUI.

```
# system-config-users
```



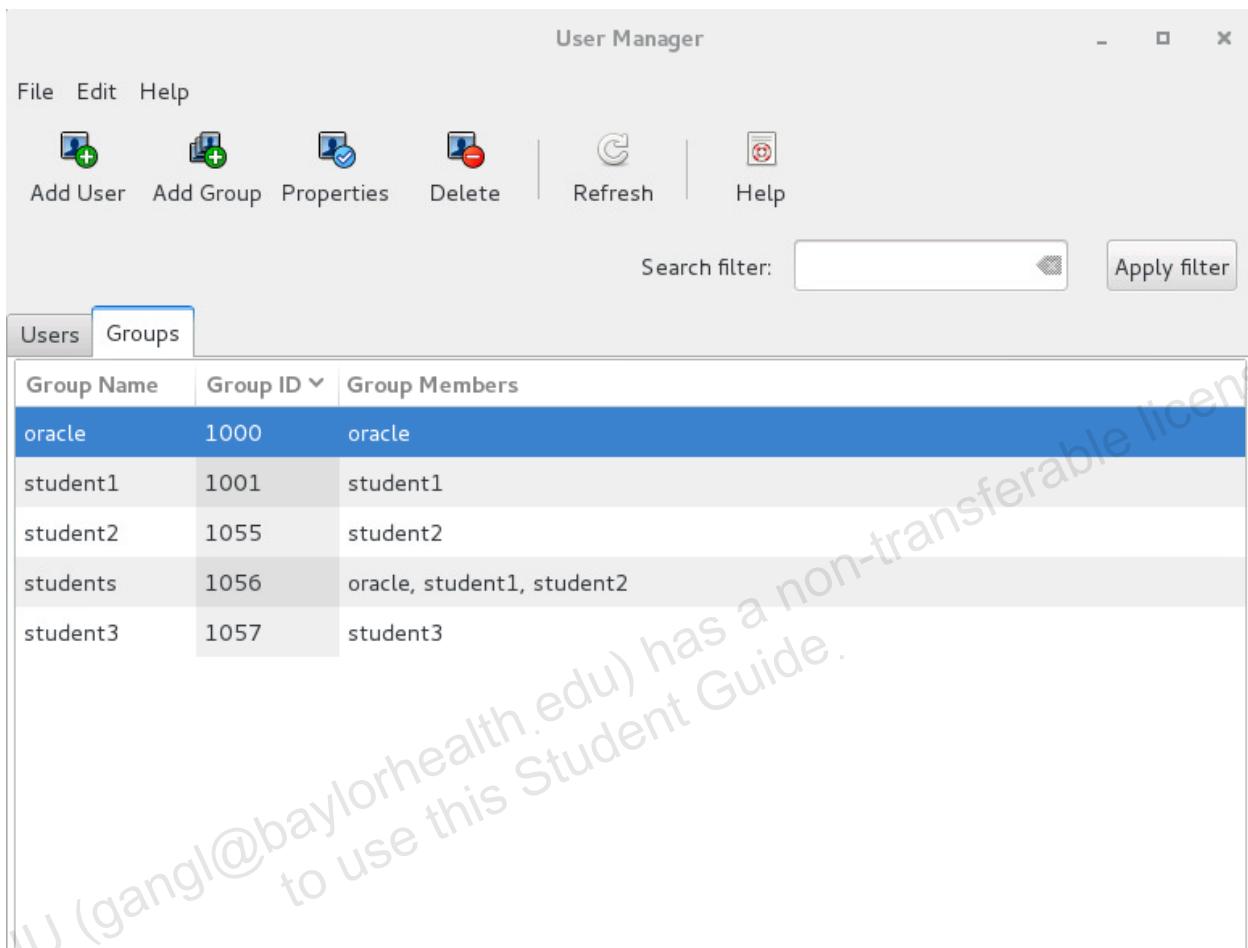
- b. Click **Add User** and provide the new user information, as shown:

- Use `password` for the **Password** and **Confirm Password** fields.



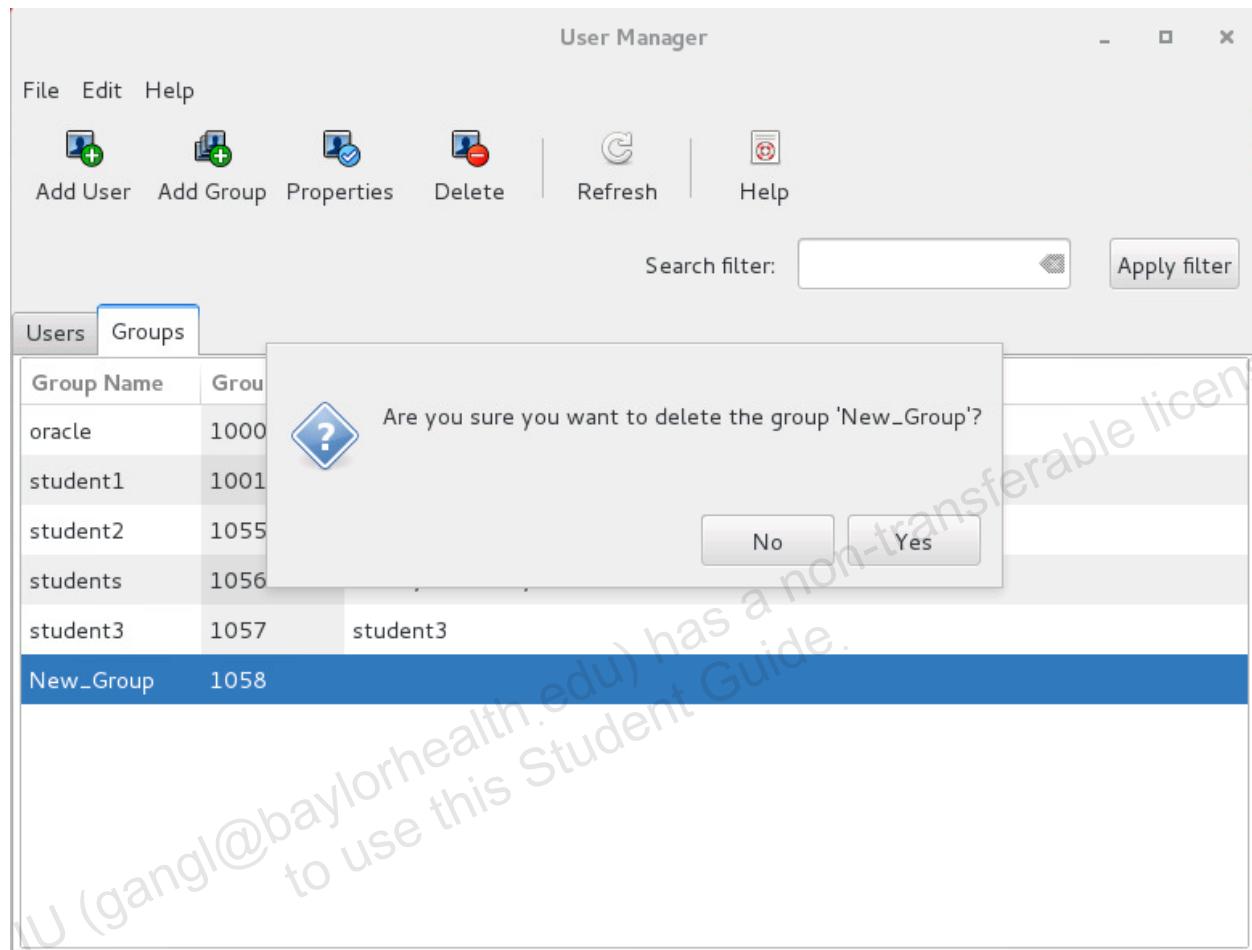
- c. Click **OK**.
- d. Click **Yes** to use the weak password.
 - The updated list of user accounts is displayed.

3. Add a new group.
 - a. Click the **Groups** tab to display the list of group accounts, as shown in the following screenshot:



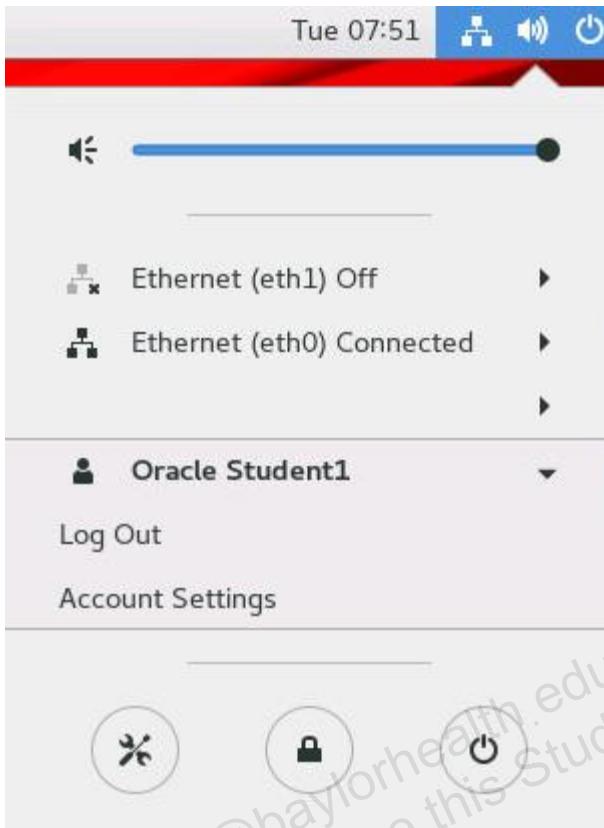
- b. Click **Add Group** and provide a **Group Name** of your choice when prompted.
- c. Click **OK** and notice the updated group list.

4. Delete a group.
 - a. Select the newly added group and click the **Delete** button.
 - b. Click **Yes** to confirm the delete.

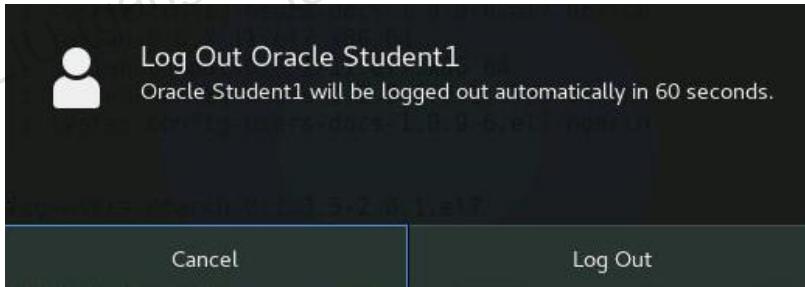


- c. Select the student1 group and click the **Delete** button.
 - Note that you cannot delete this group because the student1 user still exists.
5. Exit the User Manager tool.
 - a. Select **Quit** from the **File** menu.

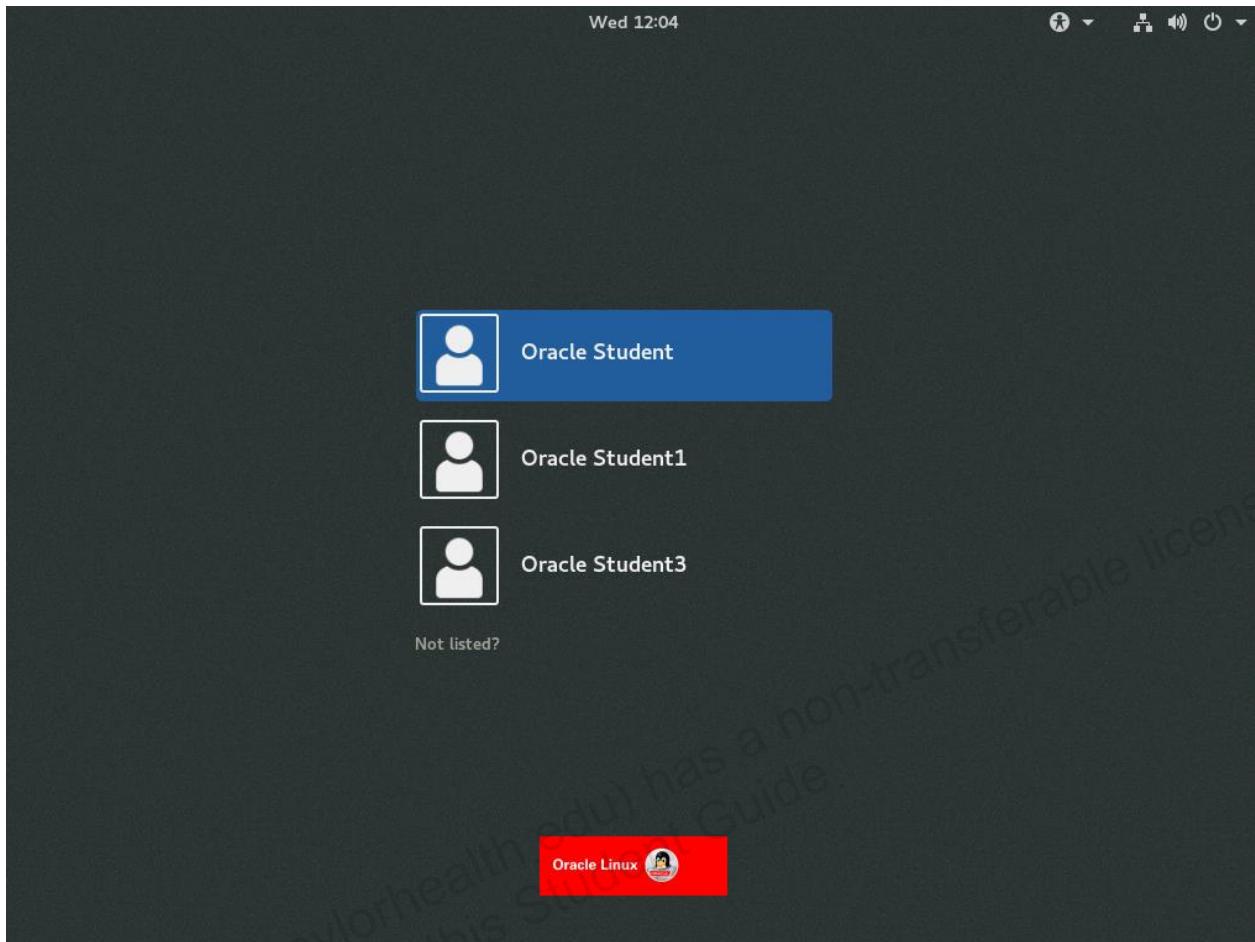
6. Log out as the student1 user.
 - a. Log out as the student1 user by clicking **Oracle Student1** and selecting **Log Out** from the pop-up menu.



- b. Click **Log Out** in the pop-up.



7. Log in as the oracle user.
 - a. Log in as the oracle user by selecting **Oracle Student** from the menu.



- b. Enter the password when prompted.
- c. Right-click the desktop and select **Open Terminal** from the shortcut menu.
- d. From the command prompt in the terminal window, use the `su -` command to become the `root` user. Provide the password when prompted.

```
$ su -  
Password:  
# whoami  
root
```

Practice 11-6: Restricting the Use of the `su` Command

Overview

In this practice, you limit the use of the `su` command to members of the `wheel` group.

Tasks

1. Add the `oracle` user to the `wheel` group.

- a. Use the `grep` command to display the `wheel` entry in the `/etc/group` file.

```
# grep wheel /etc/group
wheel:x:10:
```

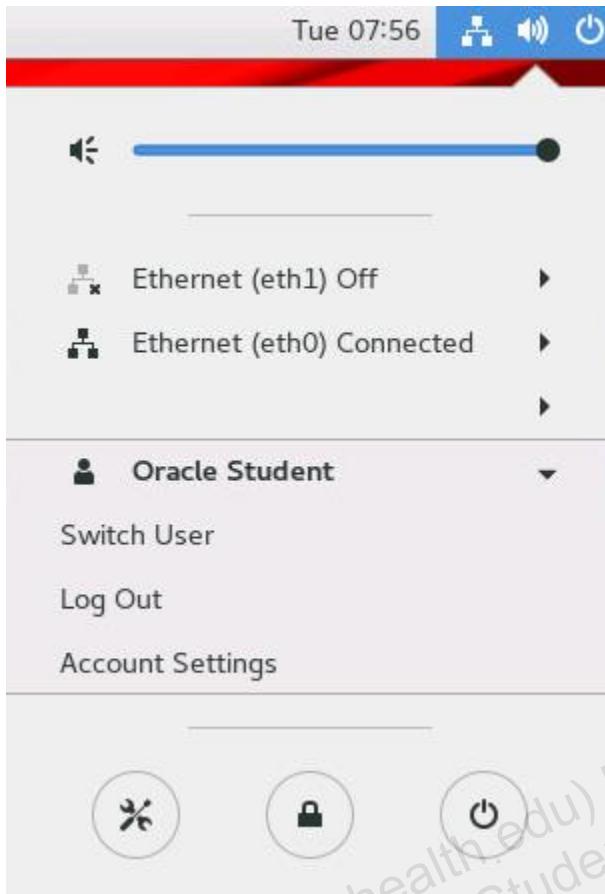
- b. Use the `usermod` command to add the `oracle` user to the `wheel` group. Re-run the `grep` command to verify that the modification occurred.

```
# usermod -aG wheel oracle
# grep wheel /etc/group
wheel:x:10:oracle
```

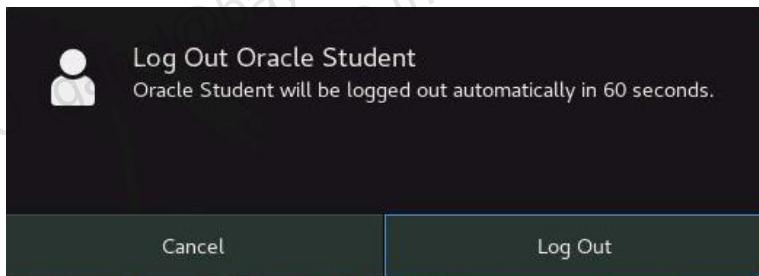
- Note the `oracle` user is now a member of the `wheel` group.

2. Log out and log back in as the `oracle` user. This is necessary to make the `oracle` user's membership in the `wheel` group effective in a current terminal session for the following practice regarding `sudo` privileges. In the present practice, the `oracle` user's membership in the `wheel` group is known to `su` without logging out and logging back in.

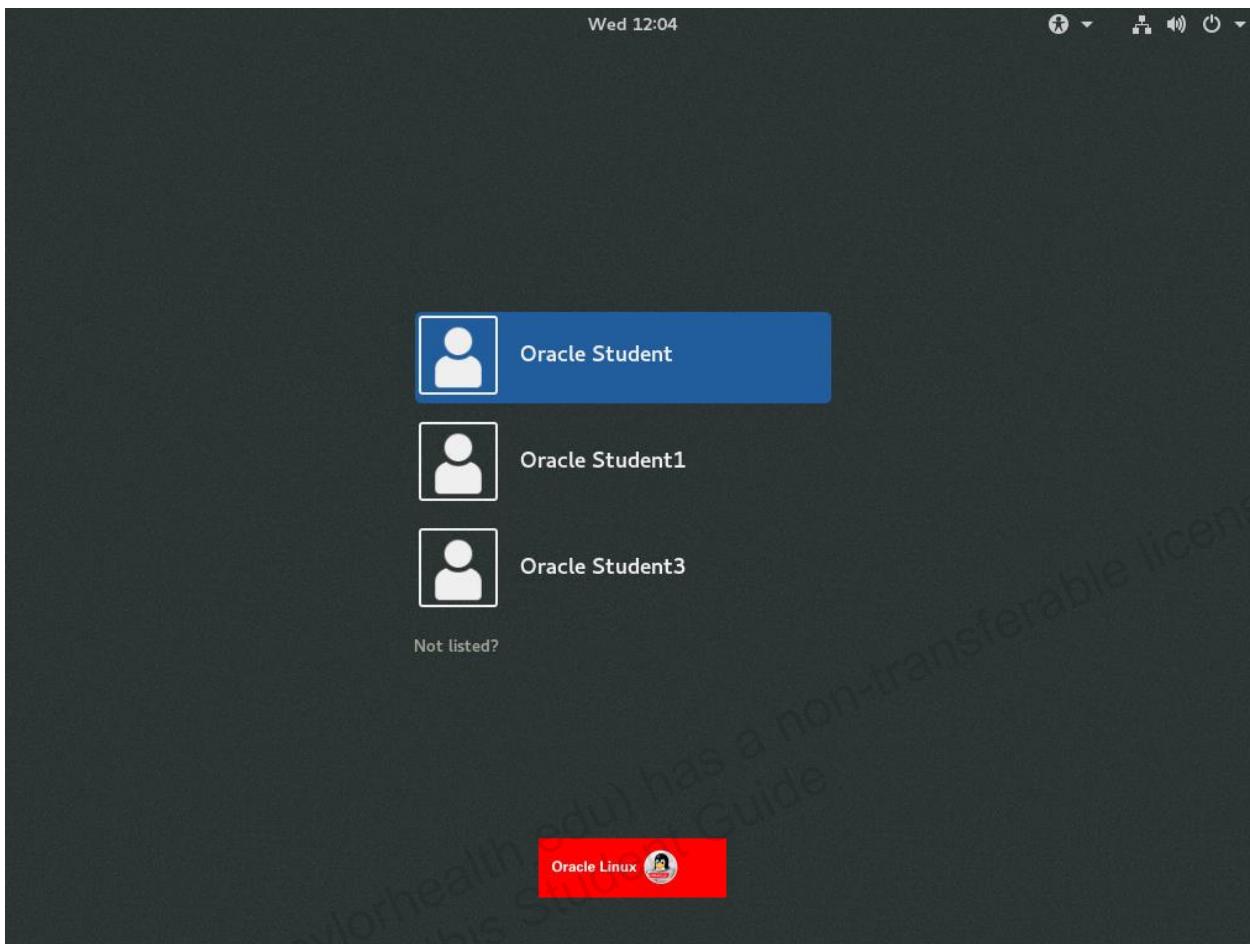
- a. Log out as the `oracle` user. Click the Power icon in the upper-right corner of the GNOME screen and select **Oracle Student**.



- 1) Click Log Out. The following pop-up appears:



- 2) Click Log Out.
- b. Log back in as the `oracle` user by selecting **Oracle Student** from the menu.



- c. Enter the password when prompted.
- d. Right-click the desktop and select **Open Terminal** from the pop-up menu.
- e. From the command prompt in the terminal window, use the `su -` command to become the `root` user. Provide the password when prompted.

```
$ su -  
Password:  
# whoami  
root
```

3. Restrict the use of the `su` command to members of the `wheel` group.
 - The procedure shown next involves the modification of a Pluggable Authentication Module (PAM) configuration file.
 - PAM is covered in another course.

Use the `vi` editor to uncomment (remove the `#` character) the following entry in the `/etc/pam.d/su` file:

```
# vi /etc/pam.d/su  
...  
#auth      required    pam_wheel.so    use_uid      (old entry)  
auth      required    pam_wheel.so    use_uid      (new entry)
```

- ...
- With this entry uncommented, only members of the wheel group can use the su command (with the exception of the root user).
4. Verify that only members of the wheel group can use the su command.

- a. As the root user, use the su - student1 command to become the student1 user.

```
# su - student1
```

- The su command is successful because you are the root user.
- Use the whoami command to confirm you are the student1 user. Use the su command to become the root user. Provide the password when prompted.

```
$ whoami
student1
$ su -
Password:
su: Permission denied
```

- The su command fails because your system is configured to allow only members of the wheel group to use the su command.
- Use the exit command to log out as the student1 user. Use the whoami command to confirm you are the root user. Use the exit command again, and then whoami to verify that you are the oracle user.

```
$ exit
logout
# whoami
root
# exit
logout
$ whoami
oracle
```

- d. Use the su command to become the root user. Provide the password when prompted.

```
$ su -
Password:
...
# whoami
root
```

- The su command succeeded this time because the oracle user is a member of the wheel group.

5. Remove restriction of the su command to members of the wheel group.

- a. Use the vi editor to comment out (insert the # character) the following entry in the /etc/pam.d/su file:

```
# vi /etc/pam.d/su
```

```
...
auth      required  pam_wheel.so  use_uid      (old entry)
#auth     required  pam_wheel.so  use_uid      (new entry)
...
```

- With this entry commented out, all users can use the su command.

Practice 11-7: Allowing the Use of the sudo Command

Overview

In this practice, you run administrative commands with and without `sudo` with the `oracle` user. You work with the `/etc/sudoers` file to understand the interaction of entries in this file along with the `oracle` user's membership in the `wheel` group.

Tasks

1. Attempt to add a new user with and without `root` privileges.
 - a. Use the `exit` command to log out as the `root` user. Then run the `whoami` command to verify that you are the `oracle` user.

```
# exit
logout
$ whoami
oracle
```

- b. Use the `useradd` command to add the `new_user` user.

```
$ useradd new_user
bash: /usr/sbin/useradd: Permission denied
```

- Note that you do not have permission to add a new user.
- c. Insert the `sudo` command before the previous `useradd` command to add the `new_user` user. Enter the password when prompted.

```
$ sudo useradd new_user
```

We trust you have received the usual lecture from the local System Administrator. It usually boils down to these three things:

- #1) Respect the privacy of others.
- #2) Think before you type.
- #3) With great power comes great responsibility.

[sudo] password for oracle:

- Note that in the previous practice, logging out and logging back in as the `oracle` user made the `oracle` user's membership in the `wheel` group known in the current terminal session. This is necessary for the `oracle` user to run commands using `sudo`.
- Note that the command succeeds because the `oracle` user is a member of the `wheel` group and the following `%wheel` entry exists in the `/etc/sudoers` file:

```
%wheel  ALL=(ALL)          ALL
```

- This entry allows any member of the `wheel` group to execute any command, when preceded by `sudo`.

- d. Use the `grep` command to search for `new_user` in the `/etc/passwd` file.

```
$ grep new_user /etc/passwd
new_user:x:1058:1058::/home/new_user:/bin/bash
```

2. Edit the `/etc/sudoers` file to deny sudo authorization for the `oracle` user.

- a. Use the `su -` command to become the `root` user. Provide the password when prompted.

```
$ su -
Password:
# whoami
root
```

- b. Use the `visudo` command to edit the `/etc/sudoers` file and comment out the first `%wheel` entry by inserting the `#` character at the beginning of the line, as shown. This prevents members of the `wheel` group from executing commands using `sudo`, in the absence of other entries in the `/etc/sudoers` file that provide `sudo` authorization.

- This command opens the `/etc/sudoers` file with the `vi` editor but also locks the file.

```
# visudo
...
%wheel      ALL=(ALL)          ALL          (old entry)
#%wheel     ALL=(ALL)          ALL          (new entry)
...
```

- c. After commenting out the first `%wheel` entry, save the file and exit `visudo`.

- Note:** There is a line containing `%wheel` that has `NOPASSWD` in it. Do not modify this line.

3. Attempt to remove the `new_user` user.

- a. Use the `exit` command to log out as the `root` user and then run the `whoami` command to verify that you are the `oracle` user before running the `userdel` command.

```
# exit
logout
$ whoami
oracle
$ userdel new_user
bash: /usr/sbin/useradd: Permission denied
```

- Note that you do not have permission to delete a user.
- Insert the `sudo` command before the `userdel` command to delete the `new_user` user.

```
$ sudo userdel new_user
[sudo] password for oracle:
```

oracle is not in the sudoers file. This incident will be reported.

- The sudo command fails this time because the %wheel entry is commented out in the /etc/sudoers file, and there is no separate oracle user entry in that file either.
 - The password prompt may not appear on your system, depending on the time since the oracle user issued a sudo command.
 - The attempt to issue this administrator command without proper authorization is reported in the /var/log/secure file.
- c. Take a look at the log entry in /var/log/secure. Use the su – command to become the root user. Provide the password when prompted.

```
$ su -
Password:
# whoami
root
```

- d. Use the tail command to view the end of the /var/log/secure file.

```
# tail /var/log/secure
...
<date_time> host03 sudo: oracle : user NOT in sudoers ...
...
```

- Note the "sudo" entry for the attempted use of /sbin/userdel in the /var/log/secure file.
4. Add the oracle user to the /etc/sudoers file.

- a. Use the visudo command to edit the /etc/sudoers file.

```
# visudo
```

- b. Add the following line to /etc/sudoers, which allows the oracle user to use sudo to run the userdel and systemctl commands as the root user. Add this line after the line specifying "root ALL=(ALL) ALL". After adding the line, save the file and exit visudo.

```
oracle ALL=(ALL) /usr/sbin/userdel, /usr/bin/systemctl
```

5. Remove the user new_user by using sudo.

- a. Use the exit command to log out as the root user and then run the whoami command to verify you are the oracle user.

```
# exit
logout
$ whoami
oracle
```

- b. Use the sudo userdel command to delete the new_user user.

```
$ sudo userdel new_user
```

```
[sudo] password for oracle:
```

- No error message implies the command was successful.
- c. Use the `grep` command to search for `new_user` in the `/etc/passwd` file.

```
$ grep new_user /etc/passwd
```

- The `new_user` has been removed from `/etc/passwd`.
- 6. Run another command, which requires administrative privileges.
- a. Use the `systemctl` command to restart the `atd` service.

```
$ systemctl restart atd
```



- b. Enter the `oracle` user's password and the command succeeds.
- If a GUI is not being used, the following text messages will appear:

```
==== AUTHENTICATING FOR org.freedesktop.systemd1.manage-units ====
Authentication is required to manage system services or units.
Authenticating as: Oracle Student (oracle)
Password:
===== AUTHENTICATION COMPLETE =====
```

- If user `oracle` is not a member of the `wheel` group, authentication is then required for the `root` user, requiring the `root` password.
- c. Use `sudo` to run the `systemctl` command again, to restart the `atd` service.

```
$ sudo systemctl restart atd
```

- Note that there was no authentication message, showing that the command succeeded without additional authentication this time, as a result of using `sudo`.
- Also note that you may not have been prompted to enter the `oracle` user's password.

- When a user has been authenticated, the user may then use `sudo` without a password for a short period of time. (The default timeout is 5 minutes.)
 - Do not perform this, but to override the default 5-minute timeout, set the “`timestamp_timeout`” value in `/etc/sudoers` to change the default.
7. Restore system changes and return to **dom0**.
- Use the `su -` command to become the `root` user. Provide the password when prompted.

```
$ su -
Password:
# whoami
root
```

- Remove the `oracle` user from the `wheel` group.

```
# gpasswd -d oracle wheel
Removing user oracle from group wheel
```

- Remove the `students` group.

```
# groupdel students
```

- Remove the `student1`, `student2`, and `student3` users.

```
# userdel student1
# userdel student2
# userdel student3
```

- Remove the home directories for `student1`, `student2`, `student3`, and `new_user`. Change directories to the `/home` directory first.

```
# cd /home
# /bin/rm -r student1 student2 student3 new_user
```

- Remove the mail files for `student1`, `student2`, `student3`, and `new_user`. Change directories to the `/var/mail` directory first. Change directories to the `root` user's home directory afterward.

```
# cd /var/mail
# /bin/rm student1 student2 student3 new_user
# cd
```

- Remove the `oracle` user entry and uncomment the `%wheel` line in the `/etc/sudoers` file using `visudo`.

```
# visudo
```

- Delete the following line:

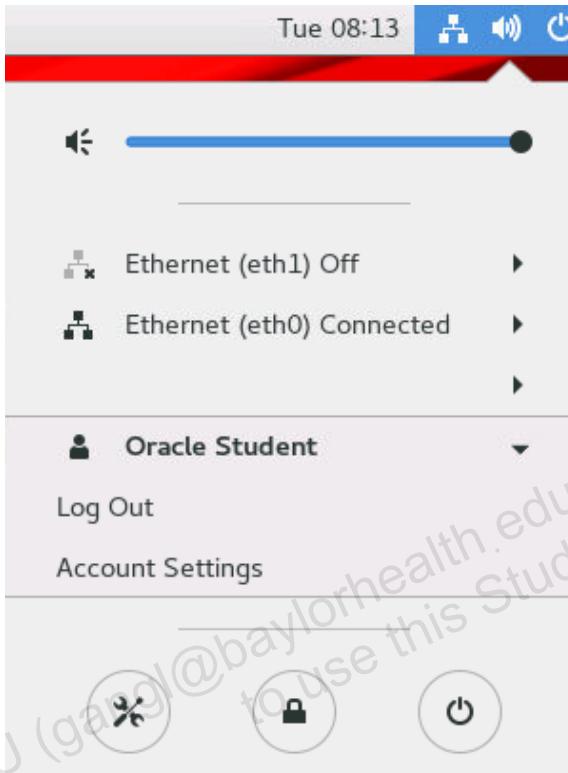
```
oracle ALL=(ALL) /usr/sbin/userdel, /usr/bin/systemctl
```

- Uncomment the first line containing `%wheel` to be as follows (remove the `#` from the beginning of the line), and then save the file and exit `visudo`:

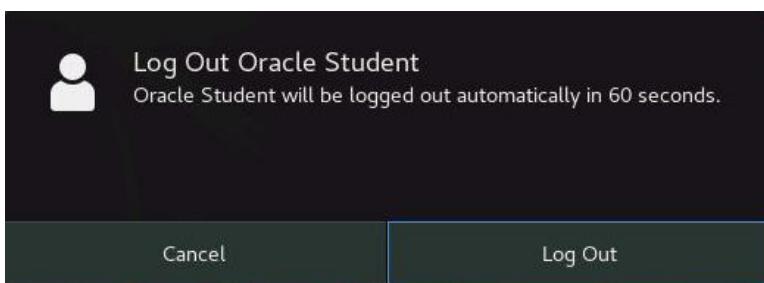
```
...
```

```
#%wheel ALL=(ALL)      ALL          (old entry)
%wheel ALL=(ALL)      ALL          (new entry)
...
```

- Note: There is a line containing %wheel that has NOPASSWD in it. Do not modify this line.
- j. Log off **host03**. Select the Power icon in the upper-right corner of the GNOME screen and select Oracle Student.



- 1) Click Log Out. The following pop-up appears:



- 2) Click Log Out.
- 3) Click X in the top-right corner of the GNOME login window to close the window.

You are now the **root** user on **dom0**.