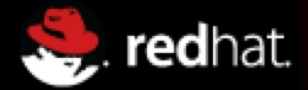


**RED HAT®
TRAINING**



Comprehensive, hands-on training that solves real-world problems

Red Hat System Administration I

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE
Introduction	Working with Text Files	Processes (continued)	Networking	File System
Command Line	Local Users and Groups	Services	Archiving Files	Virtualizing Systems
Managing Files	Permissions	OpenSSH	Software Packages	Review
Getting Help	Processes	Logs		

DAY ONE

Introduction

Command Line

Managing Files

Getting Help

Introduction

- Welcome to Class
- Course Objectives and Structure
- Orientation to Classroom Network
- Internationalization

Welcome to Class

Course Objectives and Structure

DAY ONE	DAY TWO	DAY THREE	DAY FOUR	DAY FIVE
Introduction	Working with Text Files	Processes (continued)	Networking	File System
Command Line	Local Users and Groups	Services	Archiving Files	Virtualizing Systems
Managing Files	Permissions	OpenSSH	Software Packages	Review
Getting Help	Processes	Logs		

Orientation to Classroom Network

Internationalization

DAY ONE

Introduction

Command Line

Managing Files

Getting Help

Chapter 1: Accessing the Command Line

- Using the Local Console
- Using the Desktop
- Using the BASH Shell

Goal:

To login to a Linux system and run simple commands using the shell.

Objectives:

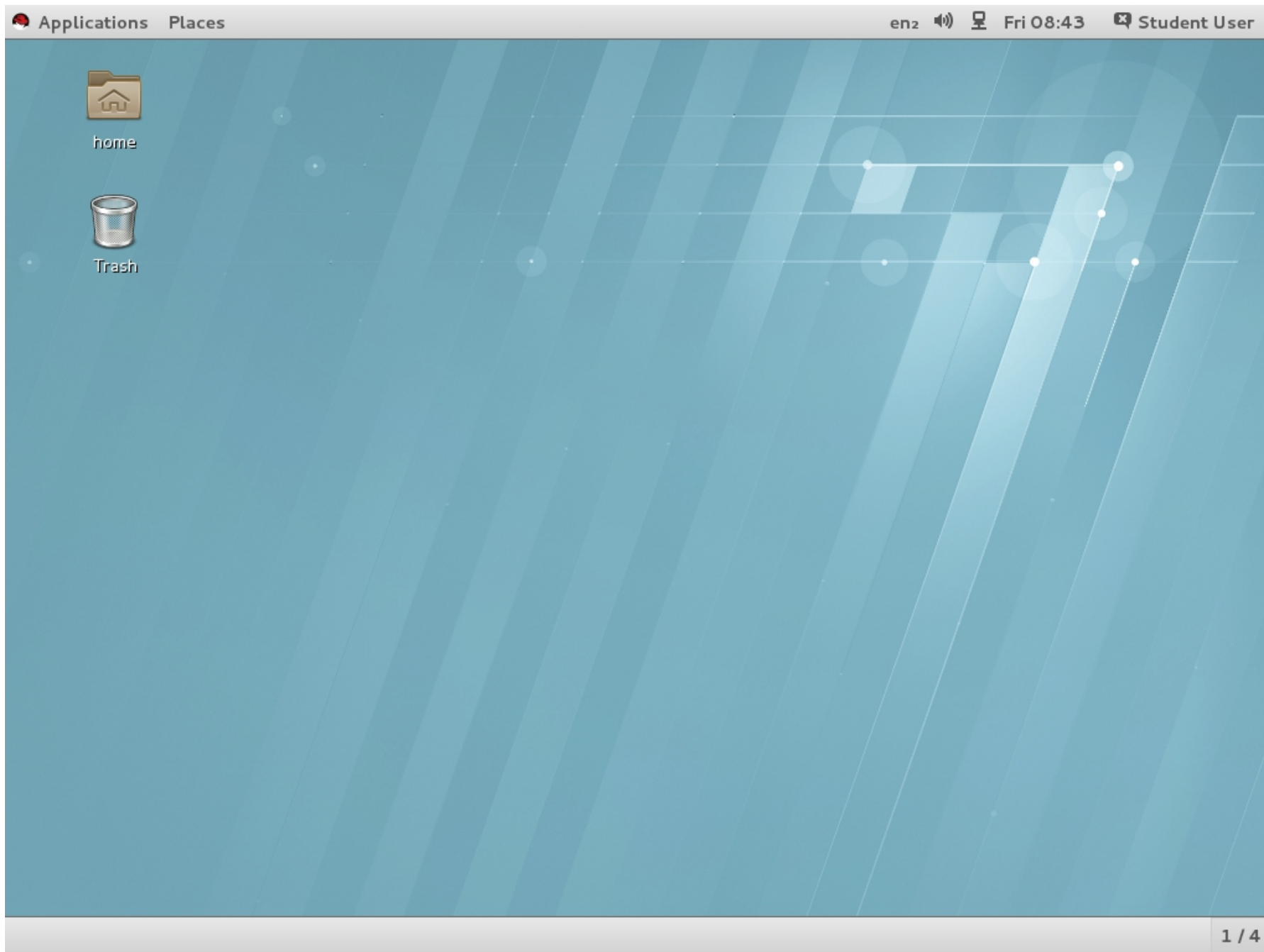
- Use Bash shell syntax to enter commands at a Linux console.
- Launch applications in a GNOME desktop environment.
- Use Bash features to run commands from a shell prompt using fewer keystrokes.

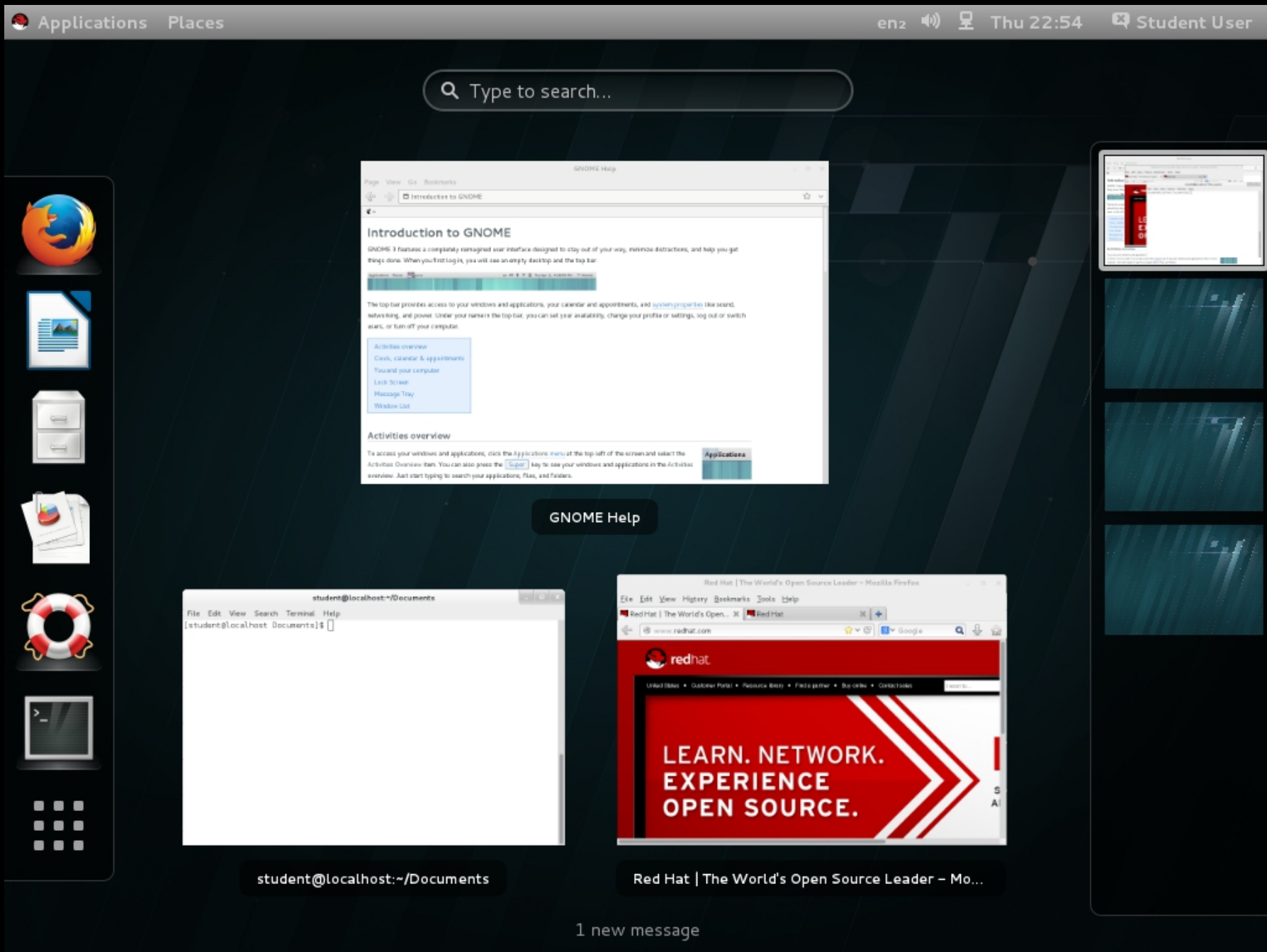
Accessing the Command-Line Using the Local Console

Quiz:

Local Console Access Terms

Accessing the Command-Line Using the Desktop





Executing Commands Using the BASH Shell

Quiz:

BASH Commands and Keyboard Shortcuts

Lab:

Accessing the Command Line

DAY ONE

Introduction

Command Line

Managing Files

Getting Help

Chapter 2: Managing Files From the Command Line

- **The Linux File System Hierarchy**
- **Locating Files by Name**
- **Managing Files Using
Command-Line Tools**
- **Matching File Names Using Path
Name Expansion**

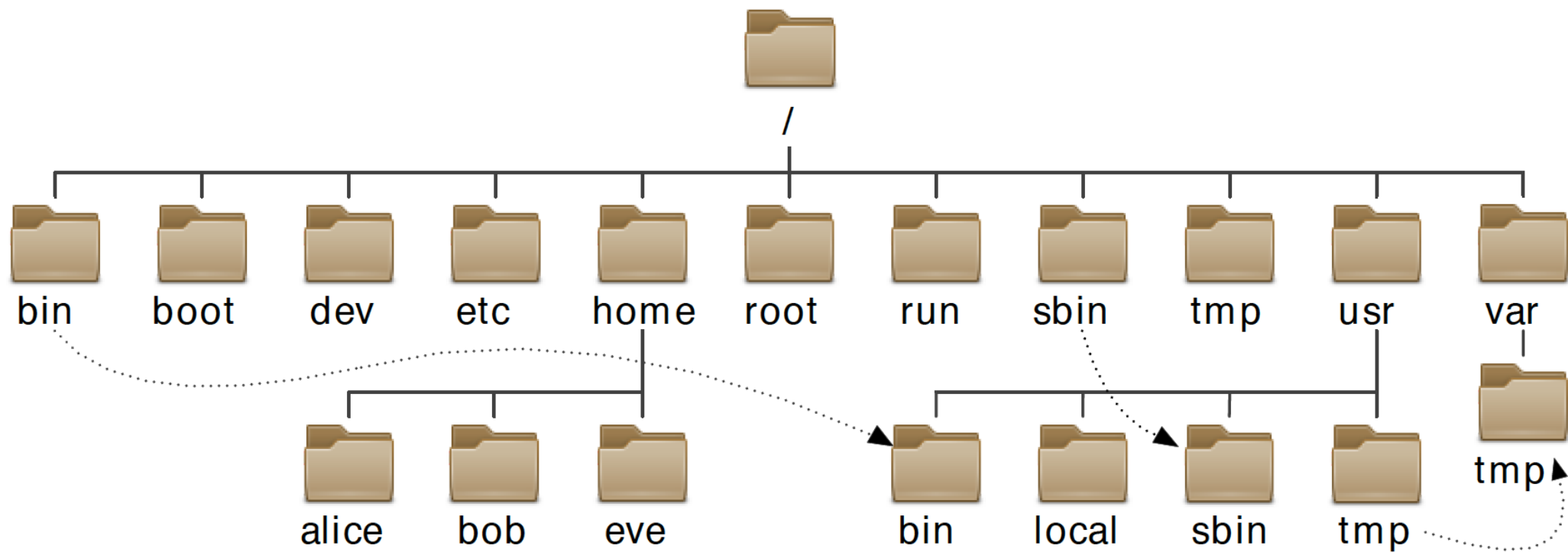
Goal:

To copy, move, create, delete, and organize files while working from the Bash shell prompt.

Objectives:

- Identify the purpose for important directories on a Linux system.
- Specify files using absolute and relative path names.
- Create, copy, move, and remove files and directories using command-line utilities.
- Match one or more file names using shell expansion as arguments to shell commands.

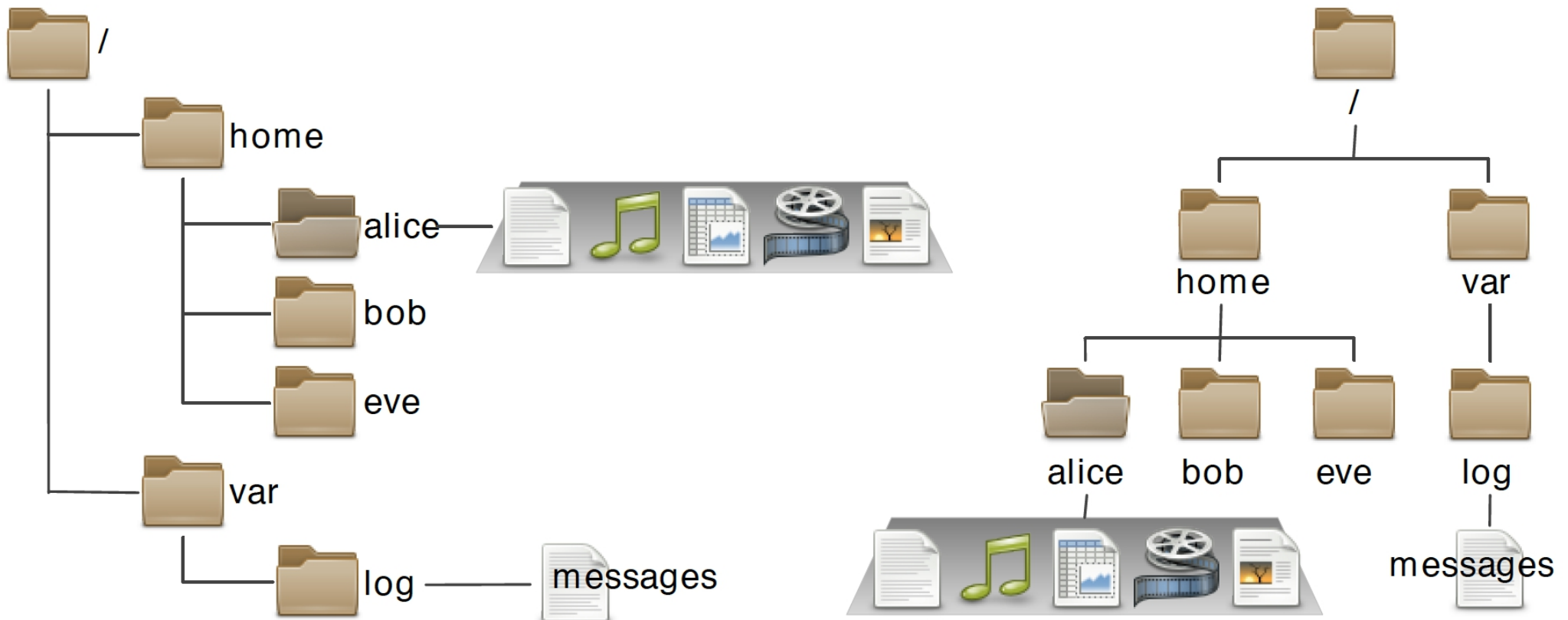
The Linux File System Hierarchy



Quiz:

File System Hierarchy

Locating Files by Name



Quiz:

Locating Files and Directories

Managing Files Using Command-Line Tools

Practice: Command-Line File Management

Matching File Names Using Path Name Expansion

Quiz:

Path Name Expansion

Lab:

Managing Files with Shell Expansion

DAY ONE

Introduction

Command Line

Managing Files

Getting Help

Chapter 3: Getting Help in Red Hat Enterprise Linux

- Reading Documentation Using man Command
- Reading Documentation Using pinfo Command
- Reading Documentation in /usr/share/doc
- Getting Help From Red Hat

Goal:

To resolve problems by using on-line help systems and Red Hat support utilities.

Objectives:

- Use the man Linux manual reader.
- Use the pinfo GNU Info reader.
- Use the Red Hat Package Manager (RPM) package documentation.
- Use the redhat-support-tool command.

Reading Documentation Using man Command

Practice: Using the man Command

Reading Documentation Using `pinfo` Command

Reading Documentation Using `pinfo` Command


```
File: dir      Node: Top      This is the top of the INFO tree

This (the Directory node) gives a menu of major topics.
Typing "q" exits, "?" lists all Info commands, "d" returns here,
"h" gives a primer for first-timers,
"mEmacs<Return>" visits the Emacs topic, etc.

In Emacs, you can click mouse button 2 on a menu item or cross reference
to select it.

* Menu:

Archiving
* Cpio: (cpio).          Copy-in-copy-out archiver to tape or disk.
* Tar: (tar).            Making tape (or disk) archives.

Basics
* Common options: (coreutils)Common options.
                        Common options.
* Coreutils: (coreutils). Core GNU (file, text, shell) utilities.
* Date input formats: (coreutils)Date input formats.
* File permissions: (coreutils)File permissions.
                        Access modes.
* Finding files: (find).  Operating on files matching certain criteria.
* ed: (ed).              The GNU Line Editor.
Viewing line 25/2002, 1%
```

Practice: Using the pininfo Command

Reading Documentation in `/usr/share/doc`

Practice: Viewing Package Documentation

Getting Help From Red Hat

Practice: Creating and Viewing an SoS Report

Knowledgebase



SOLUTIONS

Find answers to questions or issues you may experience



ARTICLES

Read technical articles and best practices for your Red Hat products



DOCUMENTATION

Learn how to install, configure and use your Red Hat products



VIDEOS

Watch short tutorials and presentations for Red Hat products and events



Lab:

Viewing and Printing Help Documentation

DAY TWO

Working with Text Files

Local Users
and Groups

Permissions

Processes

Chapter 4: Creating, Viewing, and Editing Text Files

- Redirecting Output to a File or Program
- Editing Text Files from the Shell Prompt
- Editing Text Files with a Graphical Editor

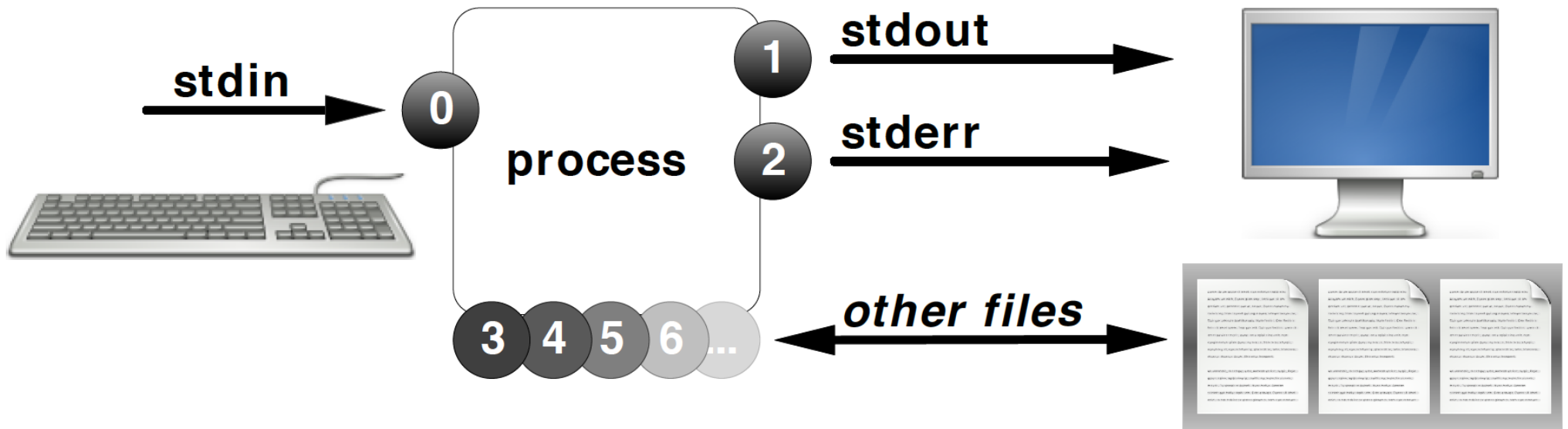
Goal:

To create, view, and edit text files from command output or in an editor.

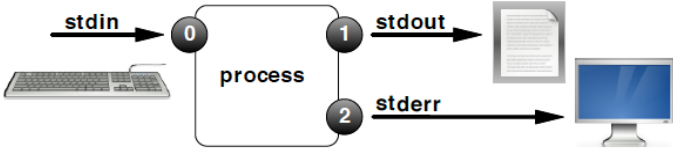
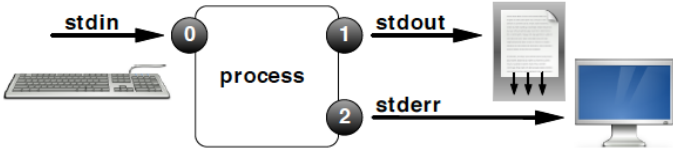
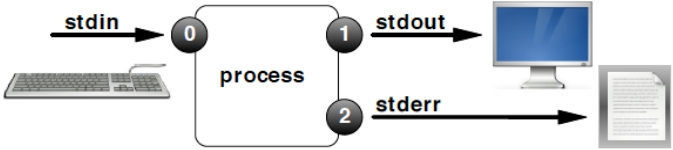
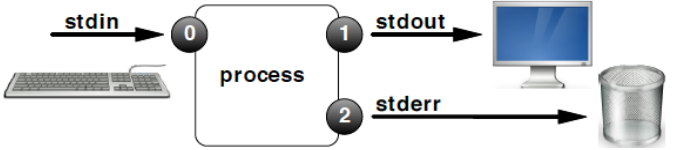
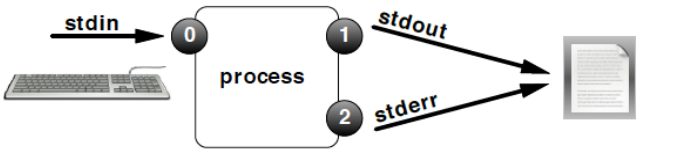
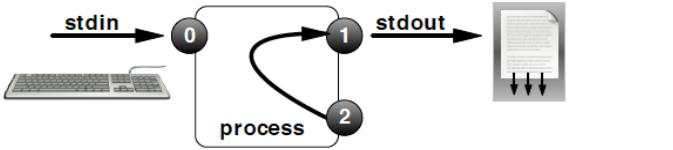
Objectives:

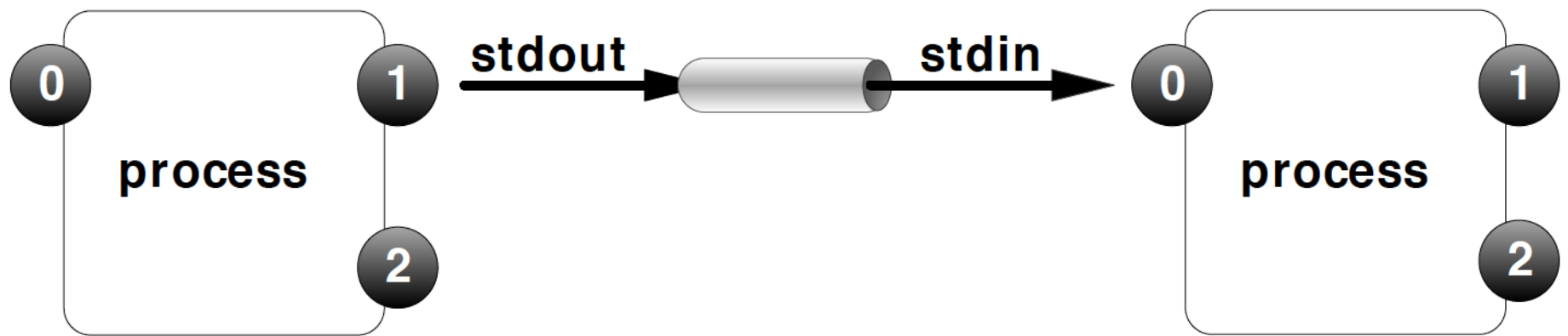
- Redirect the text output of a program to a file or to another program.
- Edit existing text files and create new files from the shell prompt with a text editor.
- Copy text from a graphical window to a text file using a text editor running in the graphical environment.

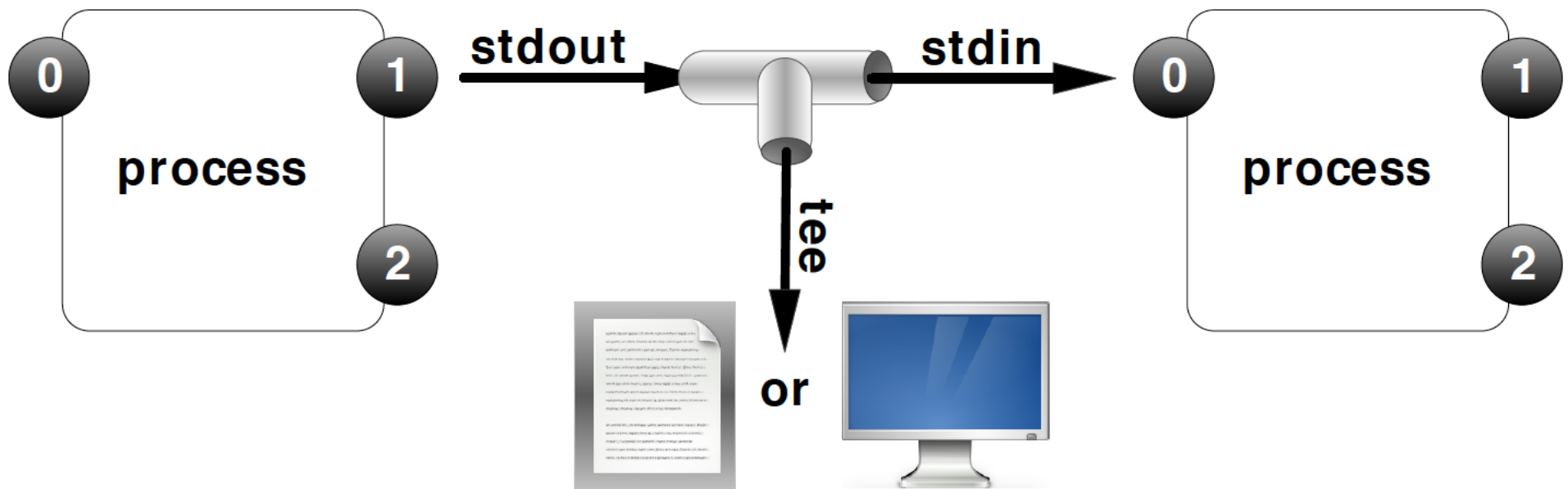
Redirecting Output to a File or Program



Output Redirection Operators

Usage	Explanation (note)	Visual aid
<code>>file</code>	redirect stdout to a file ⁽¹⁾	
<code>>>file</code>	redirect stdout to a file, append to current file content ⁽²⁾	
<code>2>file</code>	redirect stderr to a file ⁽¹⁾	
<code>2>/dev/null</code>	discard stderr error messages by redirecting to /dev/null	
<code>&>file</code>	combine stdout and stderr to one file ⁽¹⁾	
<code>>>file 2>&1</code>	combine stdout and stderr , append to current file content ⁽²⁾ ⁽³⁾	

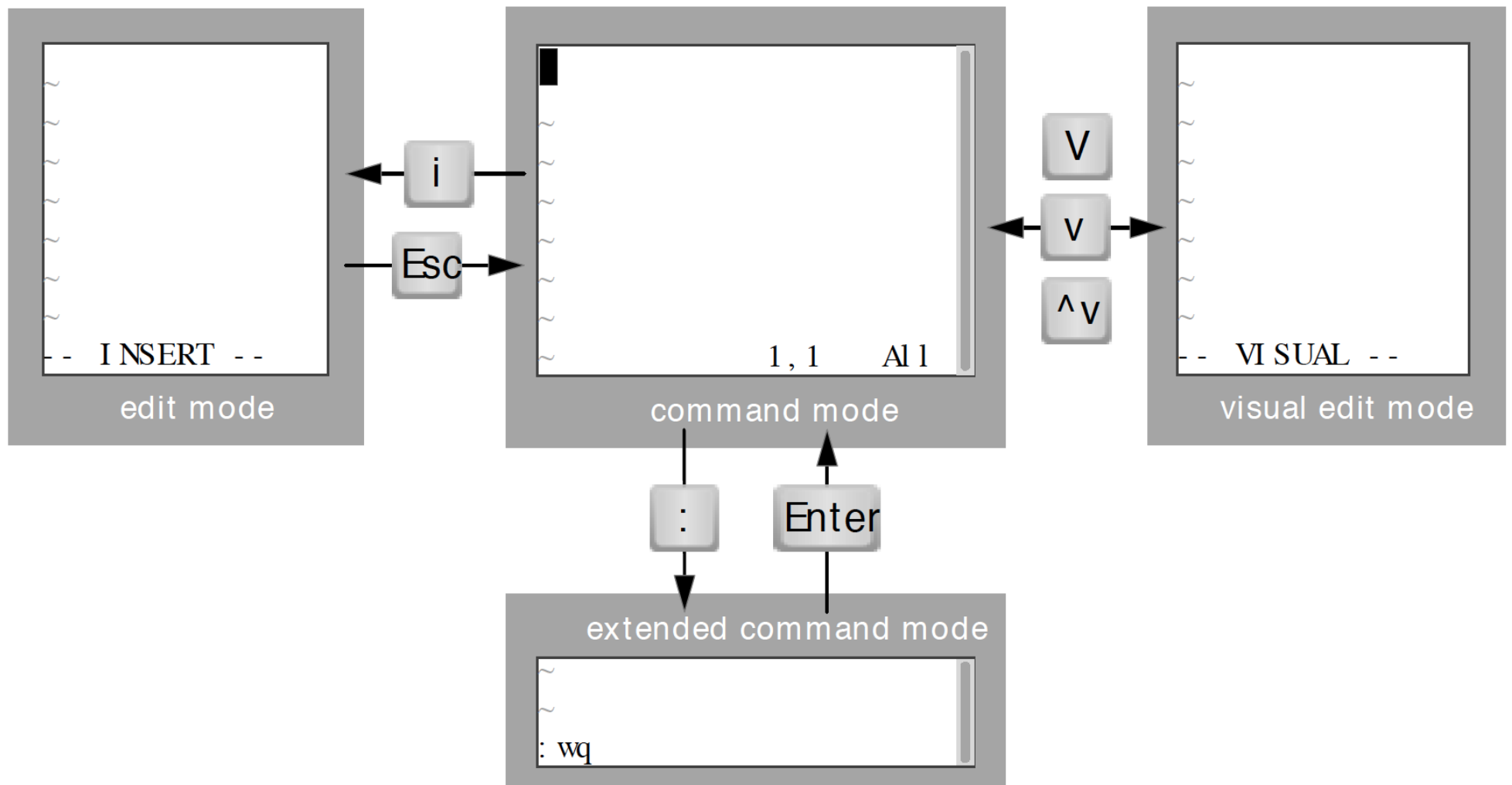




Quiz:

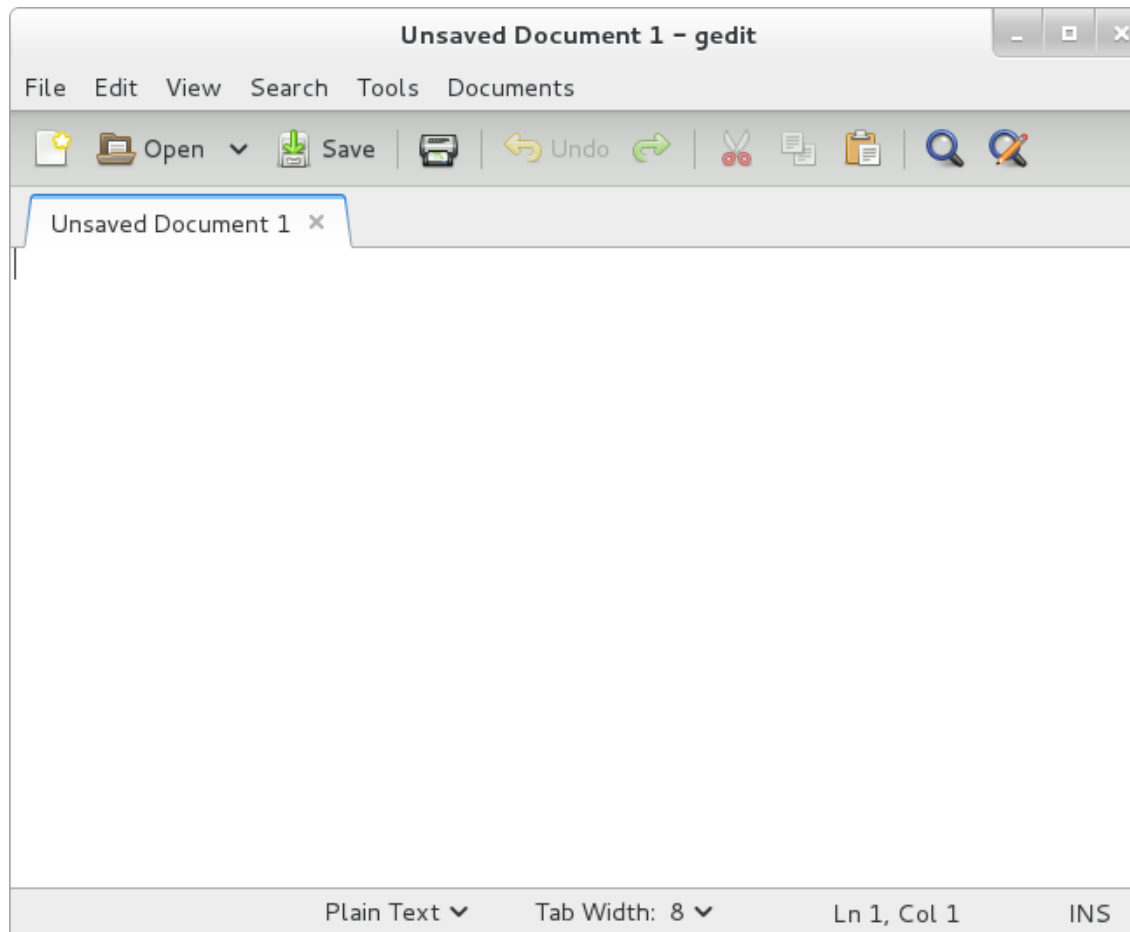
I/O Redirection and Pipelines

Editing Text Files from the Shell Prompt



Practice: Editing Files with Vim

Editing Text Files with a Graphical Editor



The screenshot shows a Linux desktop environment. On the left, a terminal window titled 'student@desktop1:~' displays the output of the command 'ls -l'. The output lists various system directories with their permissions, ownership, and timestamps. The 'Downloads' directory is highlighted in blue. On the right, a gedit editor window titled '*Unsaved Document 1 - gedit' is open. The editor's menu bar includes 'File', 'Edit', 'View', 'Search', 'Tools', and 'Documents'. The toolbar contains icons for opening, saving, printing, undo, redo, cut, copy, paste, find, and replace. The editor's content area shows the same directory listing as the terminal, with the 'Downloads' directory highlighted in blue. A red text overlay is positioned in the lower right of the gedit window, reading: 'After text selection at left, click middle mouse button here to paste.'

```
student@desktop1:~$ ls -l
total 0
drwxr-xr-x. 2 student student 52 Feb 21 11:52 Desktop
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Documents
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Downloads
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Music
drwxr-xr-x. 2 student student 6 Feb 21 11:33 Pictures
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Public
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Templates
drwxr-xr-x. 2 student student 6 Feb 16 11:29 Videos
student@desktop1 ~]$
```

**After text selection at left,
click middle mouse button here to paste.**

Practice: Copying Text Between Windows

Lab:

Creating, Viewing, and, Editing Text Files

DAY TWO

Working with
Text Files

**Local Users
and Groups**

Permissions

Processes

Chapter 5: Managing Local Linux Users and Groups

- Users and Groups
- Gaining Superuser Access
- Managing Local User Accounts
- Managing Local Group Accounts
- Managing User Passwords

Goal:

To manage local Linux users and groups and administer local password policies.

Objectives:

- Explain the role of users and groups on a Linux system and how they are understood by the computer.
- Run commands as the superuser to administer a Linux system.
- Create, modify, lock, and delete locally defined user accounts.
- Create, modify, and delete locally defined group accounts.
- Lock accounts manually or by setting a password-aging policy in the shadow password file.

Users and Groups

Quiz:

User and Group Concepts

Gaining Superuser Access

Practice: Running Commands as root

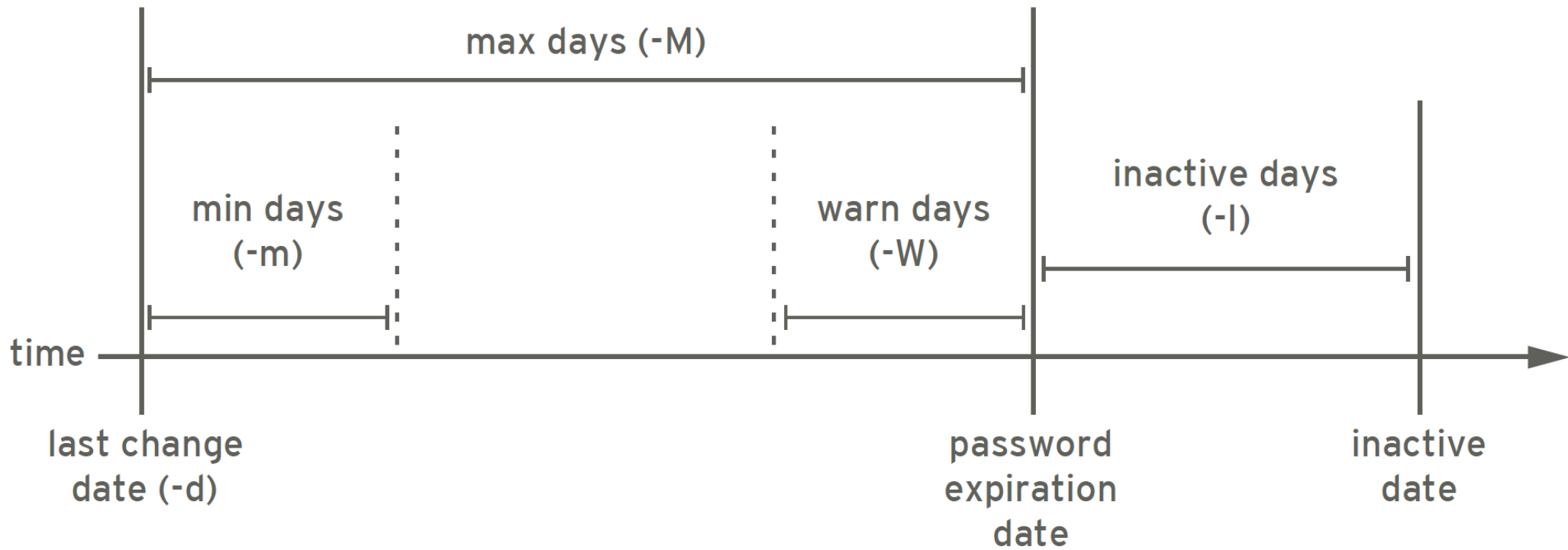
Managing Local User Accounts

Practice: Creating Users Using Command-line Tools

Managing Local Group Accounts

Practice: Managing Groups Using Command-line Tools

Managing User Passwords



Practice: Managing User Password Aging

Lab:

Managing Local Linux Users and Groups

DAY TWO

Working with
Text Files

Local Users
and Groups

Permissions

Processes

Chapter 6: Controlling Access to Files with Linux File System Permissions

- Linux File System Permissions
- Managing File System Permissions from the Command Line
- Managing Default Permissions and File Access

Goal:

- To set Linux file system permissions on files and interpret the security effects of different permission settings.

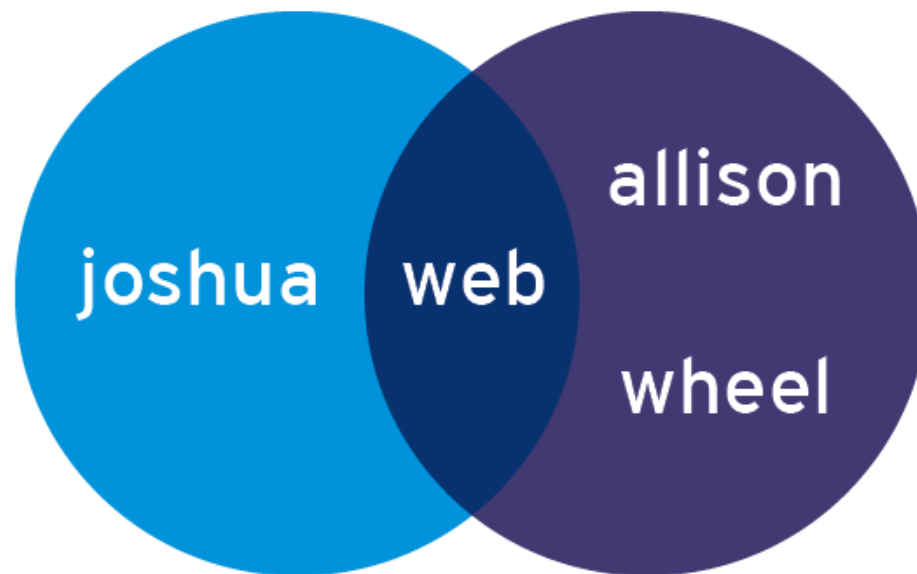
Objectives:

- Explain how the Linux file permissions model works.
- Change the permissions and ownership of files using command-line tools.
- Configure a directory in which newly created files are automatically writable by members of the group which owns the directory, using special permissions and default umask settings.

Linux File System Permissions

joshua

allison



Quiz:

Interpreting File and Directory Permissions

Managing File System Permissions from the Command Line

Practice: Managing File Security from the Command Line

Managing Default Permissions and File Access

Practice: Controlling New File Permissions and Ownership

Lab:

Controlling Access to Files with Linux File System Permissions

DAY TWO

Working with
Text Files

Local Users
and Groups

Permissions

Processes

Chapter 7: Monitoring and Managing Linux Processes

- Processes
- Controlling Jobs
- Killing Processes
- Monitoring Process Activity

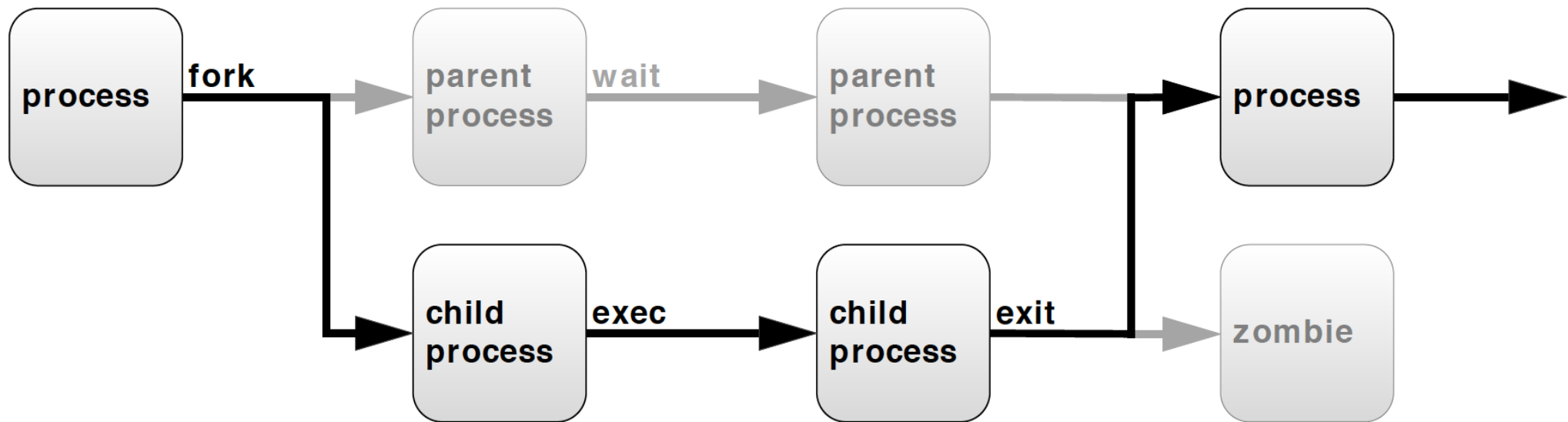
Goal:

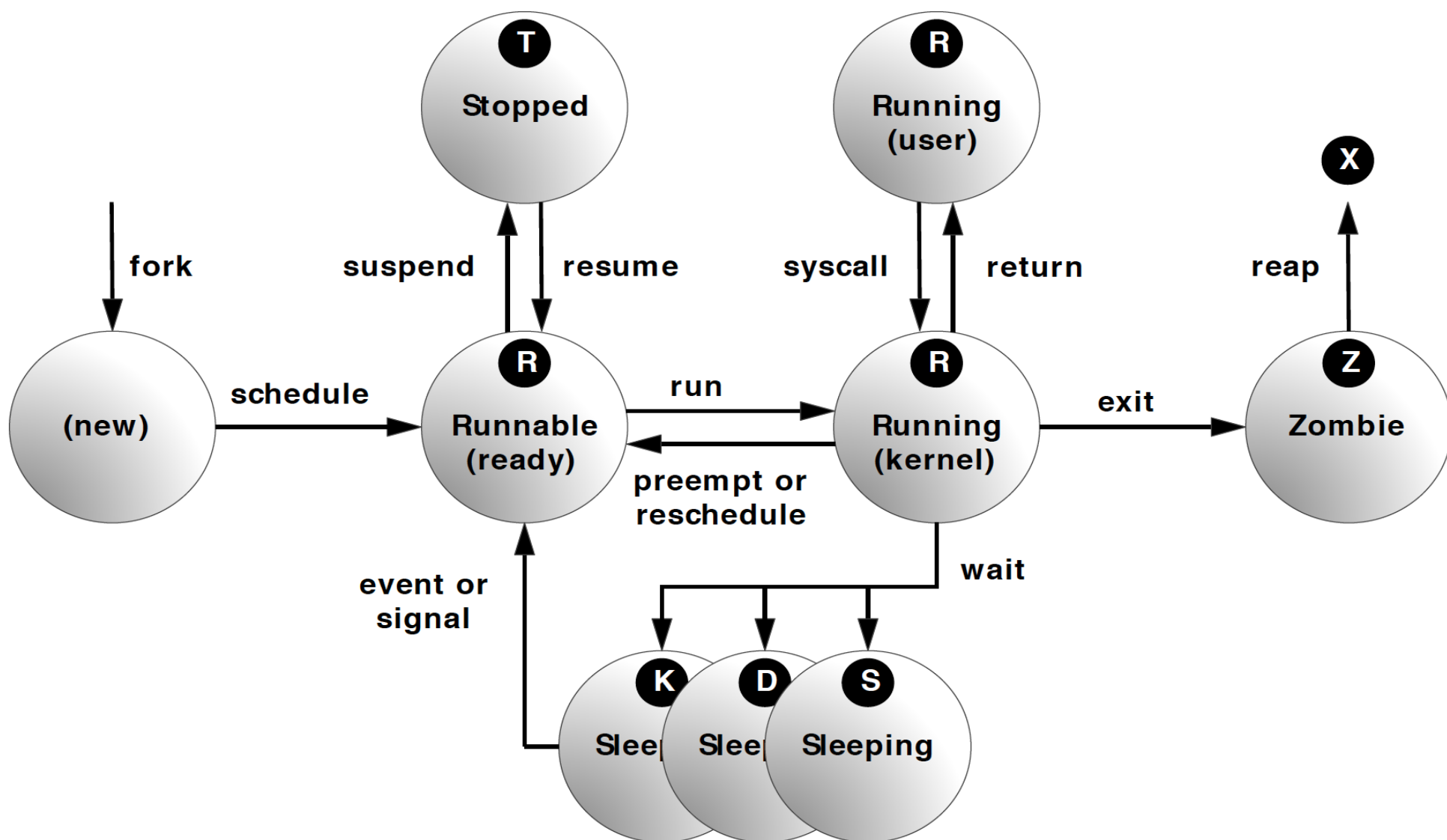
To evaluate and control processes running on a Red Hat Enterprise Linux system.

Objectives:

- List and interpret basic information about processes running on the system.
- Control processes in the shell's session using bash job control.
- Terminate and control processes using signals.
- Monitor resource usage and system load due to process activity.

Processes





Quiz: Processes

Controlling Jobs

Practice: Background and Foreground Processes

Killing Processes

Practice: Killing Processes

Monitoring Process Activity

Practice: Monitoring Process Activity

Lab:

Monitoring and Managing Linux Processes

DAY THREE

Processes

Services

OpenSSH

Logs

Chapter 8: Controlling Services and Daemons

- Identifying Automatically Started System Processes
- Controlling System Services

Goal:

To control and monitor network services and system daemons using systemd.

Objectives:

- List system daemons and network services started by systemd service and socket units.
- Control system daemons and network services using systemctl.

Identifying Automatically Started System Processes

Practice: Identify the status of systemd units

Controlling System Services

Practice: Using `systemctl` to Manage Services

Lab: Controlling Services and Daemons

DAY THREE

Processes

Services

OpenSSH

Logs

Chapter 9: Configuring and Securing OpenSSH Service

- Accessing the Remote Command Line with SSH
- Configuring SSH Key-based Authentication
- Customizing SSH Service Configuration

Goal:

To configure secure command-line access on remote systems using OpenSSH.

Objectives:

- Log into a remote system using ssh to run commands from a shell prompt.
- Set up ssh to allow secure password-free logins by using a private authentication key file.
- Customize sshd configuration to restrict direct logins as root or to disable password-based authentication.

Accessing the Remote Command Line with SSH

Practice: Accessing the Remote Command-Line

Configuring SSH Key-based Authentication

Practice: Using SSH Key-based Authentication

Customizing SSH Service Configuration

Practice: Restricting SSH Logins

Lab: Configuring and Securing OpenSSH Service

DAY THREE

Processes

Services

OpenSSH

Logs

Chapter 10: Analyzing and Storing Logs

- **System Log Architecture**
- **Reviewing Syslog Files**
- **Reviewing systemd Journal Entries**
- **Preserving the systemd Journal**
- **Maintaining Accurate Time**

Goal:

To locate and accurately interpret relevant system log files for troubleshooting purposes.

Objectives:

- Describe the basic syslog architecture in Red Hat Enterprise Linux 7.
- Interpret entries in relevant syslog files to troubleshoot problems or review system status.
- Find and interpret log entries in the systemd journal to troubleshoot problems or review system status.
- Configure systemd-journald to store its journal on disk rather than in memory.
- Maintain accurate time synchronization and time zone configuration to ensure correct timestamps in system logs.

System Log Architecture

Quiz:

System Logging Components

Reviewing Syslog Files

Practice: Finding Log Entries

Reviewing systemd Journal Entries

Practice: Finding Events with journalctl

Preserving the systemd Journal

Practice: Configure a Persistent systemd Journal

Maintaining Accurate Time

Quiz: Adjusting System Time

Lab:

Analyzing and Storing Logs

DAY FOUR

Networking

Archiving Files

Software Packages

Chapter 11: Managing Red Hat Linux Enterprise Networking

Networking Concepts

Validating Network Configuration

Configuring Networking with nmcli

Editing Network Configuration Files

Configuring hostnames and Name
Resolution

Goal:

To configure basic IPv4 networking on Red Hat Enterprise Linux systems.

Objectives:

- Explain fundamental concepts of computer networking.
- Test and review current network configuration with basic utilities.
- Manage network settings and devices with nmcli and NetworkManager.
- Modify network settings by editing the configuration files.
- Configure and test system hostname and name resolution.

Networking Concepts

IP Address:

172.17.5.3 = 10101100.00010001.00000101.00000011

Netmask:

255.255.0.0 = 11111111.11111111.00000000.00000000

10101100.00010001.00000101.00000011
└────────────────┘ └────────────────┘
Network Host

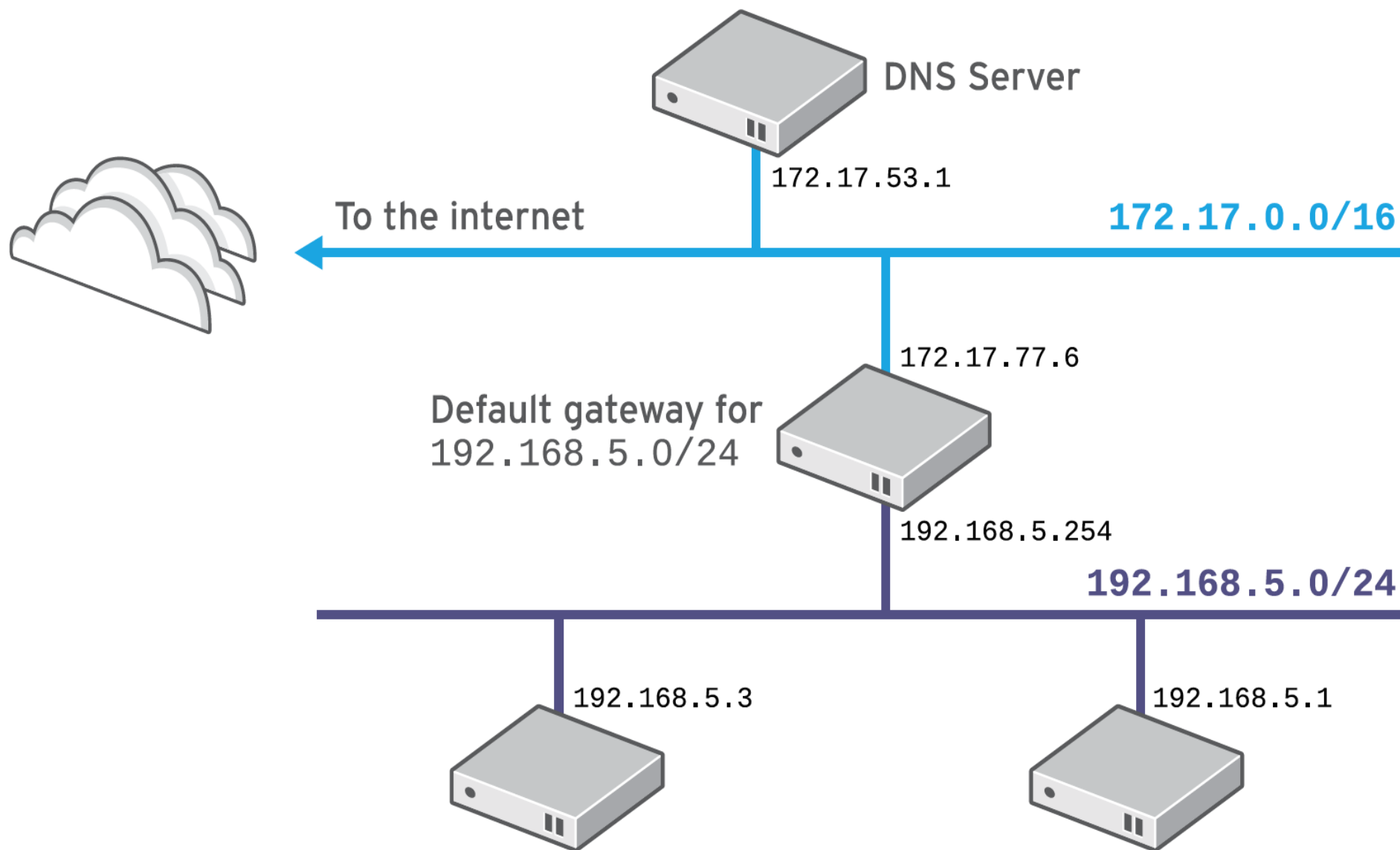
IP Address:

192.168.5.3 = 11000000.10101000.00000101.00000011

Netmask:

255.255.255.0 = 11111111.11111111.11111111.00000000

11000000.10101000.00000101.00000011
└────────────────┘ └────────────────┘
Network Host



Quiz: Networking Concepts

Validating Network Configuration

Practice: Examining Network Configuration

Configuring Networking with nmcli

Practice: Configuring Networking with nmcli

Editing Network Configuration Files

Practice: Editing Network Configuration Files

Configuring hostnames and Name Resolution

Practice: Configuring hostnames and Name Resolution

Lab: Managing Red Hat Enterprise Linux Networking

DAY FOUR

Networking

Archiving Files

Software Packages

Chapter 12: Archiving and Copying Files Between Systems

- Managing Compressed tar Archives
- Copying Files Between Systems Securely
- Synchronizing Files Between Systems Securely

Goal:

To archive and copy files from one system to another.

Objectives:

- Use tar to create new compressed archive files and extract files from existing archive files.
- Copy files securely to or from a remote system running sshd.
- Securely synchronize the contents of a local file or directory with a remote copy.

Managing Compressed tar Archives

Practice: Backing Up and Restoring Files From a tar Archive

Copying Files Between Systems Securely

Practice: Copying Files Over the Network With scp

Synchronizing Files Between Systems Securely

Practice: Synchronizing Two Directories Securely with rsync

Lab:

Archiving and Copying Files Between Systems

DAY FOUR

Networking

Archiving Files

Software Packages

Chapter 13: Installing and Updating Software Packages

- Attaching Systems to Subscriptions for Software Updates
- RPM Software Packages and YUM
- Managing Software Updates with yum
- Enabling yum Software Repositories
- Examining RPM Package Files

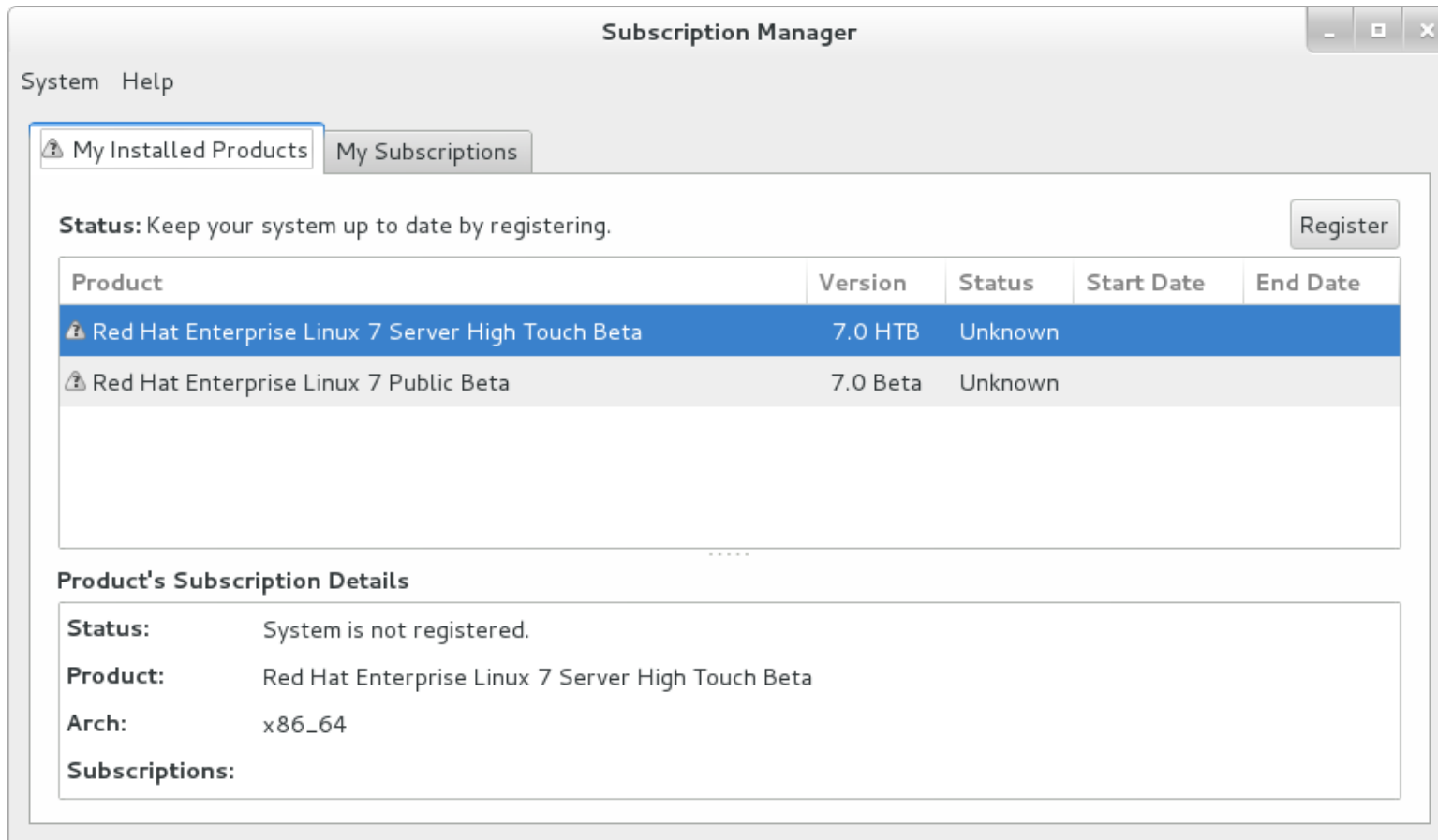
Goal:

To download, install, update, and manage software packages from Red Hat and YUM package repositories.

Objectives:

- Register systems with your Red Hat account and entitle them to software updates for installed products.
- Explain what an RPM package is and how RPM packages are used to manage software on a Red Hat Enterprise Linux system.
- Find, install, and update software packages using the yum command.
- Enable and disable use of Red Hat or third-party YUM repositories.
- Examine and install downloaded software package files.

Attaching Systems to Subscriptions for Software Updates




System Registration

The subscription management service you register with will provide your system with updates and allow additional management.

I will register with: Default

☐ I will use an Activation Key

 If required, please configure your proxy before moving forward. Configure Proxy


Cancel Next

System Registration

Please enter your Red Hat account information:

Login:

Password:

 Tip: Forgot your login or password? Look it up at http://redhat.com/forgot_password

Please enter the following for this system:

System Name:

☒ Manually attach subscriptions after registration

Subscription Manager

System Help

My Installed Products

My Subscriptions

All Available Subscriptions

Show subscriptions active on:

2014-02-14

Update

2 applied

Filters

* Click to Adjust Quantity

Red Hat Employee Subscription	Both	Unlimited	1
Red Hat Employee Subscription	Both	Unlimited	1
30 Day Self-Supported Red Hat Enterprise Linux Server, (2 sockets) (Up to 1 guest) Evaluation	Both	4	1
90 Day Self-Supported Red Hat Satellite 6 MDP-2	Physical	20	1
Red Hat Satellite Managed Design Program	Physical	9	1

Subscription Details

Products:

Product	Installed
Red Hat Beta	
Red Hat Enterprise Linux 7 Public Beta	
Red Hat Enterprise Linux Server	
Red Hat Software Collections Beta (for RHEL Server)	

Attach

Contract Selection

Choose the specific contract to use:

Subscription:

30 Day Self-Supported Red Hat Enterprise Linux Server, (2 sockets) (Up to 1 guest) Evaluation

Total Contracts:

4

* Click to Adjust Quantity

Contract	Type	Used / Total	Start Date	End Date	Quantity
10380689	Virtual	0 / 1	02/10/2014	03/11/2014	1
10365182	Virtual	0 / 1	01/19/2014	02/17/2014	1
10380689	Physical	0 / 1	02/10/2014	03/11/2014	1
10365182	Physical	0 / 1	01/19/2014	02/17/2014	1

Cancel

Attach

Quiz:

Red Hat Subscription Management

RPM Software Packages and Yum

Quiz:

RPM Software Packages

Managing Software Updates with yum

Practice: Installing and Updating Software with yum

Enabling yum Software Repositories

Practice: Enabling Software Repositories

Examining RPM Package Files

Practice: Working with RPM Package Files

Lab: Installing and Updating Software Packages

DAY FIVE

File System

Virtualized Systems

Review

Chapter 14: Accessing Linux File Systems

- Identifying File Systems and Devices
- Mounting and Unmounting File Systems
- Making Links between Files
- Locating Files on the System

Goal:

To access and inspect existing file systems on a Red Hat Enterprise Linux system.

Objectives:

- Identify the file system hierarchy.
- Access the contents of file systems.
- Use hard links and symlinks to make multiple names.
- Search for files on mounted file systems.

Identifying File Systems and Devices

Quiz:

Identifying File Systems and Devices

Mounting and Unmounting File Systems

Practice: Mounting and Unmounting File Systems

Making Links Between Files

Practice: Making Links Between Files

Locating Files on the System

Practice: Locating Files on the System

Lab:

Accessing Linux File Systems

DAY FIVE

File System

Virtualized Systems

Review

Chapter 15: Using Virtualized Systems

- Managing a Local Virtualization Host
- Installing a New Virtual Machine

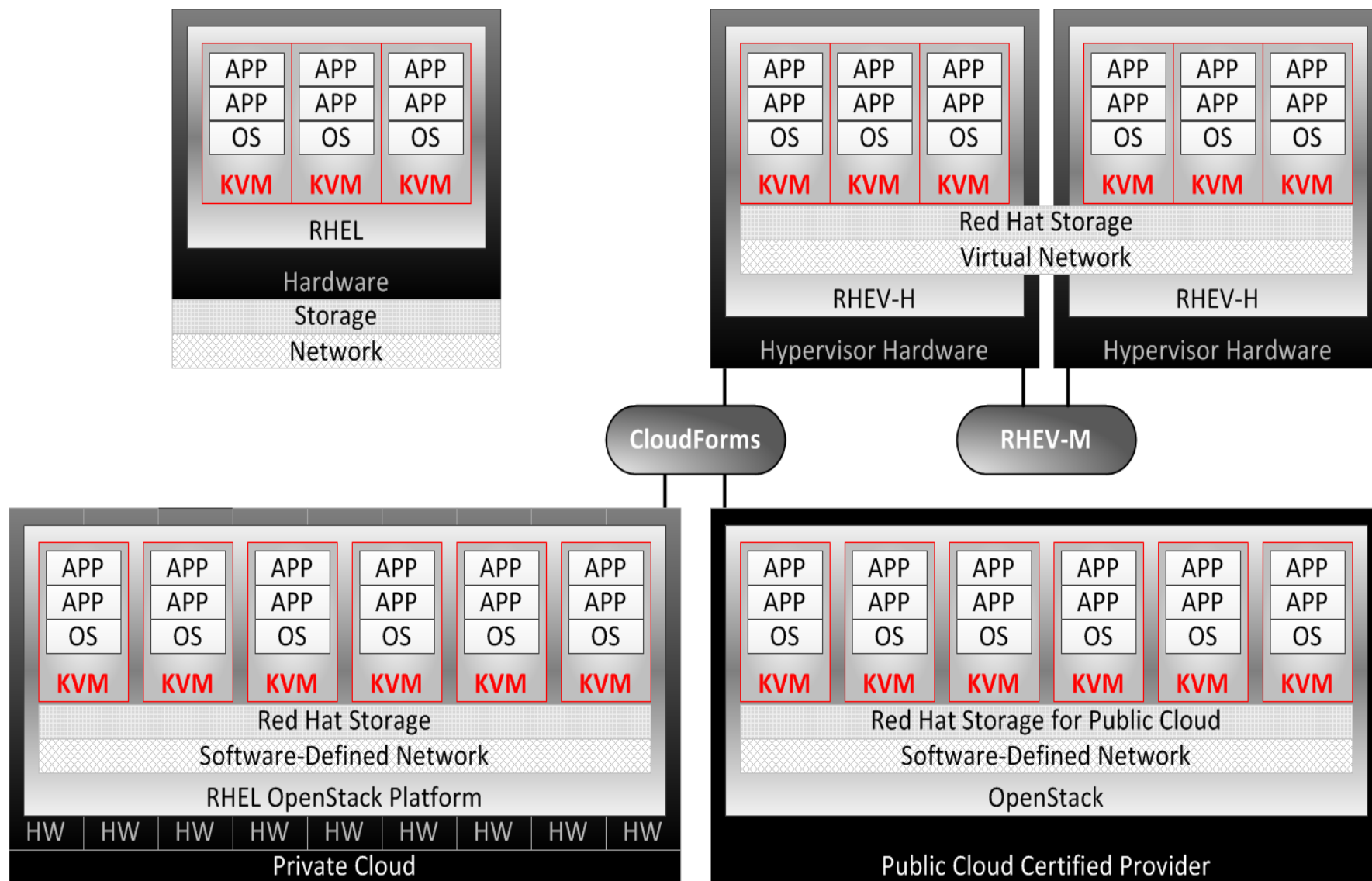
Goal:

To create and use Red Hat Enterprise Linux virtual machines with Kernel-based Virtual Machine (KVM) and libvirt.

Objectives:

- Install a Red Hat Enterprise Linux system as a host for running virtual machines.
- Perform an interactive install of Red Hat Enterprise Linux on a virtual machine.

Managing a Local Virtualization Host



SOFTWARE SELECTION

RED HAT ENTERPRISE LINUX 7.0 INSTALLATION

Done

us

Base Environment

- ☐ **Minimal Install**
Basic functionality.
- ☐ **Infrastructure Server**
Server for operating network infrastructure services.
- ☐ **File and Print Server**
File, print, and storage server for enterprises.
- ☐ **Basic Web Server**
Server for serving static and dynamic internet content.
- ☒ **Virtualization Host**
Minimal virtualization host.
- ☐ **Server with GUI**
Server for operating network infrastructure services, with a GUI.

Add-Ons for Selected Environment


- ☐ **Network File System Client**
Enables the system to attach to network storage.
- ☐ **Remote Management for Linux**
Remote management interface for Red Hat Enterprise Linux, including OpenLMI and SNMP.
- ☒ **Virtualization Platform**
Provides an interface for accessing and controlling virtualized guests and containers.
- ☐ **Compatibility Libraries**
Compatibility libraries for applications built on previous versions of Red Hat Enterprise Linux.
- ☐ **Development Tools**
A basic development environment.

Quiz:

Managing a Local Virtualization Host

Installing a New Virtual Machine

New VM

 **Create a new virtual machine**
Step 1 of 5

Enter your virtual machine details


Name:

Connection: localhost (QEMU/KVM)

Choose how you would like to install the operating system

- ☐ Local install media (ISO image or CDROM)
- ☒ Network Install (HTTP, FTP, or NFS)
- ☐ Network Boot (PXE)
- ☐ Import existing disk image

New VM

 **Create a new virtual machine**
Step 2 of 5

Provide the operating system install URL

URL:

▼ URL Options

Kickstart URL:


Kernel options:

☒ Automatically detect operating system based on install media

OS type: Linux

Version: Red Hat Enterprise Linux 7

New VM


 **Create a new virtual machine**
Step 3 of 5

Choose Memory and CPU settings

Memory (RAM): MB
Up to 15636 MB available on the host

CPU:
Up to 6 available

New VM


 **Create a new virtual machine**
Step 4 of 5

☒ Enable storage for this virtual machine

☒ Create a disk image on the computer's hard drive

8.0 - + GB

899.7 Gb available in the default location


☒ Allocate entire disk now 

☐ Select managed or other existing storage

Browse...

Cancel Back Forward

New VM



Create a new virtual machine
Step 5 of 5

Ready to begin installation of **minimal**

OS: Red Hat Enterprise Linux 7

Install: URL Install Tree

Memory: 2048 MB

CPU: 1

Storage: 8.0 GB /var/lib/libvirt/images/minimal.img

☒ Customize configuration before install

▼ Advanced options

Host device enp3s5 (Bridge 'br0') ▼

☒ Set a fixed MAC address

52:54:00:00:00:0C

Virt Type: kvm ▼



Architecture: x86_64 ▼

Cancel

Back

Finish

minimal Virtual Machine

 **Begin Installation**  **Cancel**

Overview

Processor

Memory

Boot Options

VirtIO Disk 1

NIC :00:00:0C

Input

Display Spice

Sound: default

Console


Channel

Video Default

Basic Details

Name:

UUID: 8304ce6c-4e84-4f17-a17b-4e9dbeaa35c3

Status:  Shutoff

Description:

Hypervisor Details

Hypervisor: kvm

Architecture: x86_64

Emulator: /usr/libexec/qemu-kvm

Operating System

Hostname: unknown

Product name: unknown

▸ Applications

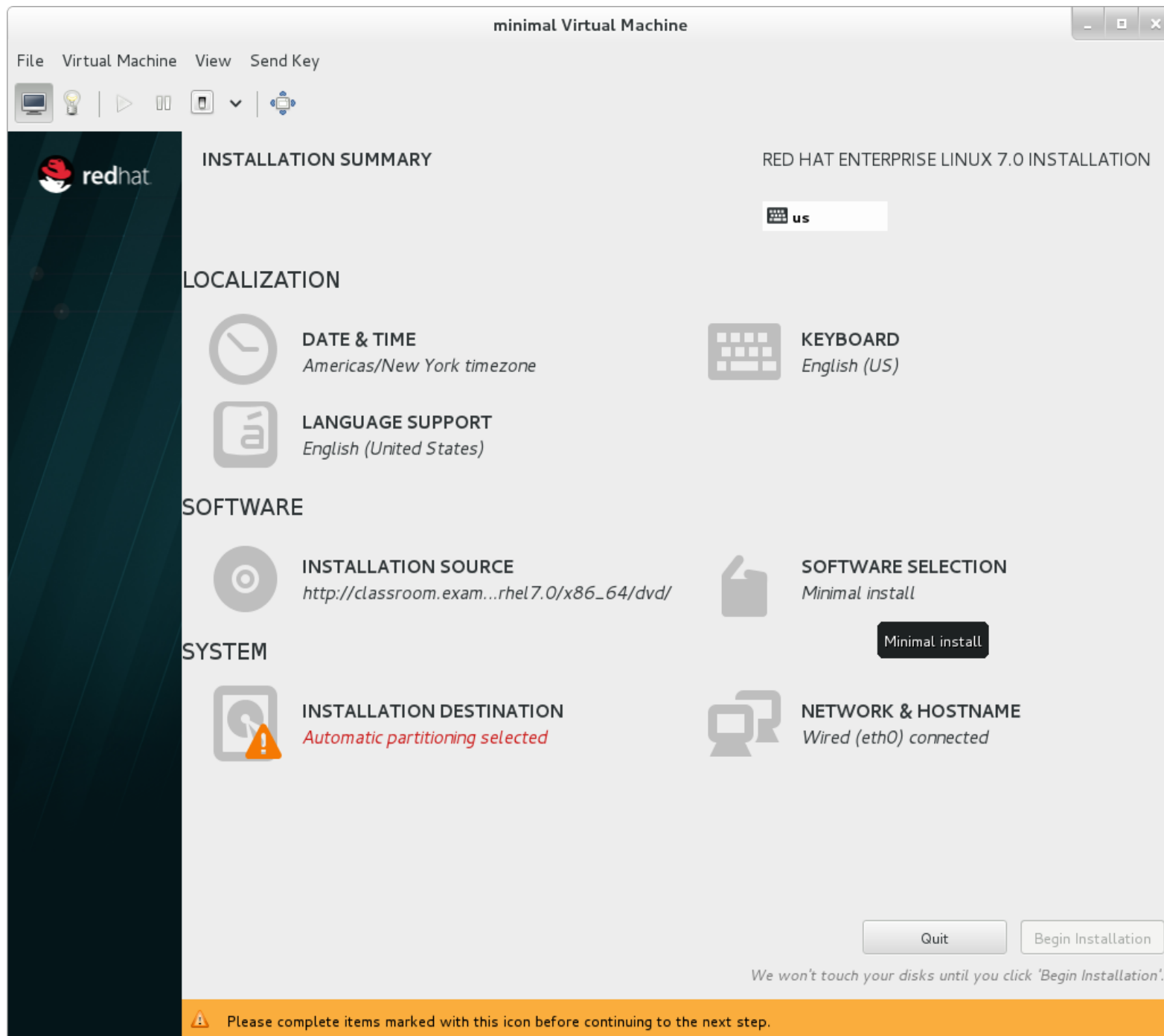
▸ Machine Settings

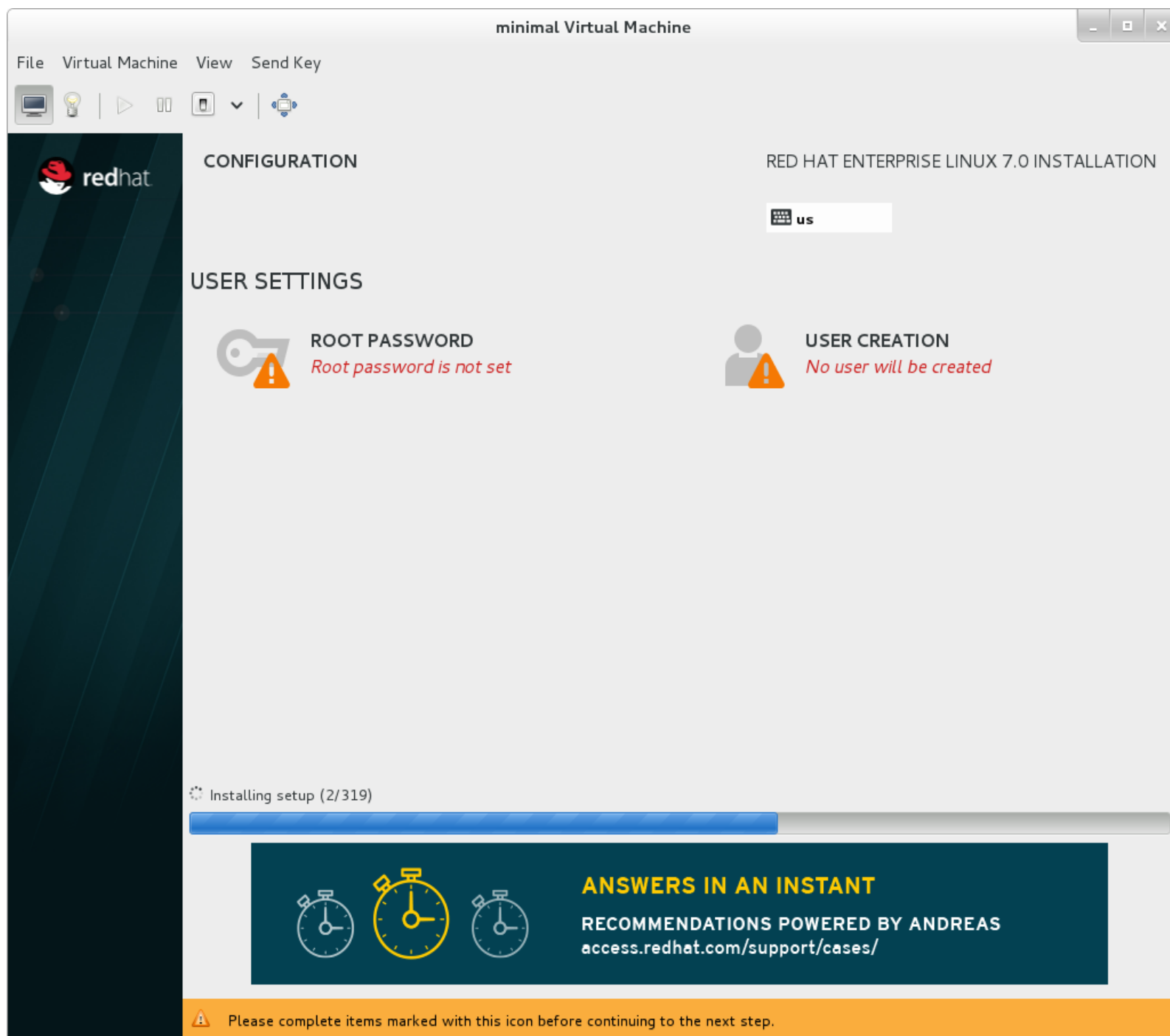
▸ Security

Add Hardware

Cancel

Apply





Practice: Installing a New Virtual Machine

Chapter Test: Using Virtualized Systems

DAY FIVE

File System

Virtualized Systems

Review

Chapter 16: Comprehensive Review

Goal:

To practice and demonstrate knowledge and skills learned in Red Hat System Administration I.

Objective:

Review course chapters to reinforce knowledge and skills.

Comprehensive Review of System Administration I

