SANDER VAN VUGT

Cert Guide

Learn, prepare, and practice for exam success

Red Hat RHCSA 8

EX200

PEARSON IT CERTIFICATION

Contents

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Red Hat RHCSA™ 8 Cert Guide

EX200

Sander van Vugt

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Contents at a Glance

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About the Author

Sander van Vugt is an independent Linux trainer, author, and consultant living in the Netherlands. Sander is the author of the best-selling *Red Hat Certified System Administrator (RHCSA) Complete Video Course* and the *Red Hat Certified Engineer (RHCE) Complete Video Course*. He has also written numerous books about different Linux-related topics and many articles for Linux publications around the world. Sander has been teaching Red Hat, Linux+, and LFCS classes since 1994. As a consultant, he specializes in Linux high-availability solutions and performance optimization. You can find more information about Sander on his website at http://www.sandervanvugt.com.

For more information about RHCSA certification and additional resources, ...

Dedication

This book is dedicated to my family: Florence, Franck, and Alex. Together we've made great accomplishments over the past year.

Acknowledgments

This book could not have been written without the help of all the people who contributed to it. I want to thank the people at Pearson, Denise Lincoln and Ellie Bru in particular. We've worked a lot together over the years, and this book is another milestone on our road to success!

About the Technical Reviewer

William "Bo" Rothwell, at the impressionable age of 14, crossed paths with a TRS-80 Micro Computer System (affectionately known as a Trash 80). Soon after, the adults responsible for Bo made the mistake of leaving him alone with the TRS-80. He immediately dismantled it and held his first computer class, showing his friends what made this "computer thing" work.

Since this experience, Bo's passion for understanding how computers work and sharing this knowledge with others has resulted in a rewarding career in IT training. His experience includes Linux, Unix, IT security, DevOps, and programming languages such as Perl, Python, Tcl, and Bash. Bo is the founder and lead instructor of One Course Source, an IT training ...

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Introduction

Welcome to the *Red Hat RHCSA 8 Cert Guide*. The Red Hat exams are some of the toughest in the business, and this guide will be an essential tool in helping you prepare to take the Red Hat Certified System Administrator (RHCSA) exam.

As an instructor with more than 20 years of experience teaching Red Hat Enterprise Linux, I have taken the RHCSA exam (and the RHCE exam) numerous times so that I can keep current on the progression of the exam, what is new, and what is different. I share my knowledge with you in this comprehensive Cert Guide so that you get the guidance you need to pass the RHCSA exam.

The RHCSA exam was recently updated for Red Hat Enterprise Linux 8. This book contains all you need to know to pass the RHCSA exam. As ...

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Part I: Performing Basic System Management Tasks

Chapter 1. Installing Red Hat Enterprise Linux

The following topics are covered in this chapter:

- Preparing to Install Red Hat Enterprise Linux
- Performing a Manual Installation

This chapter covers no exam objectives.

To learn how to work with Red Hat Enterprise Linux as an administrator, you first need to install it. This chapter teaches you how to set up an environment in which you can perform all exercises in this book.

On the RHCSA exam, you do not need to install Red Hat Enterprise Linux. However, because you need to install an environment that allows you to test all items

discussed in this book, you start by installing Red Hat Enterprise ...

Chapter 2. Using Essential Tools

The following topics are covered in this chapter:

- Basic Shell Skills
- Editing Files with vim
- Understanding the Shell Environment
- Finding Help

The following RHCSA exam objectives are covered in this chapter:

- Use input-output redirection (>, >>, |, 2>, etc.)
- Create and edit text files
- Locate, read, and use system documentation including man, info, and files in /usr/share/doc

This chapter is dedicated to coverage of the basic Linux

skills that everyone should have before attempting to take the RHCSA exam.

"DO I KNOW THIS ALREADY?" QUIZ

The "Do I Know This Already?" quiz allows you to assess whether you should ...

Chapter 3. Essential File Management Tools

This chapter covers the following subjects:

- Working with the File System Hierarchy
- Managing Files
- Using Links
- Working with Archives and Compressed Files

The following RHCSA exam objectives are covered in this chapter:

- Create, delete, copy, and move files and directories
- Archive, compress, unpack, and uncompress files using **tar**, **star**, **gzip**, and **bzip2**
- Create hard and soft links

Linux is a file-oriented operating system. That means

that many things an administrator has to do on Linux can be traced down to managing files on the Linux operating system. Also, when using hardware devices, files are involved. ...

Chapter 4. Working with Text Files

The following topics are covered in this chapter:

- Using Common Text File–Related Tools
- A Primer to Using Regular Expressions
- Using **grep** to Analyze Text
- Working with Other Useful Text Processing Utilities

The following RHCSA exam objectives are covered in this chapter:

- Use **grep** and regular expressions to analyze text
- Create and edit text files

Since the early days of UNIX, working with text files has been an important administrator skill. Even on modern

Linux versions such as Red Hat Enterprise Linux 8, working with text files is still an important skill. By applying the correct tools, you'll easily find ...

Chapter 5. Connecting to Red Hat Enterprise Linux 8

The following topics are covered in this chapter:

- Working on Local Consoles
- Using SSH and Related Utilities

The following RHCSA exam objectives are covered in this chapter:

- Access remote systems using SSH
- Log in and switch users in multiuser targets
- Boot, reboot, and shut down a system normally
- Securely transfer files between systems
- Configure key-based authentication for SSH

You have already learned how to log in on Linux from a

graphical environment. In this chapter, you learn about some other methods to access a Linux shell and start working. You learn how to work from local consoles ...

Chapter 6. User and Group Management

The following topics are covered in this chapter:

- Different User Types
- Creating and Managing User Accounts
- Creating and Managing Group Accounts

The following RHCSA exam objectives are covered in this chapter:

- Create, delete, and modify local user accounts
- Change passwords and adjust password aging for local user accounts
- Create, delete, and modify local groups and group memberships
- Configure superuser access

On a Linux system, a wide variety of processes are

normally being used. These processes need access to specific resources on the Linux system. To determine how these resources can be accessed, a ...

Chapter 7. Permissions Management

The following topics are covered in this chapter:

- Managing File Ownership
- Managing Basic Permissions
- Managing Advanced Permissions
- Managing ACLs
- Setting Default Permissions with **umask**
- Working with User-Extended Attributes

The following RHCSA exam objectives are covered in this chapter:

- List, set, and change standard ugo/rwx permissions
- Create and configure set-GID directories for collaboration
- Create and manage access control lists

- Diagnose and correct file permission problems

To get access to files on Linux, permissions are used. These permissions are assigned to three entities: the file owner, the group ...

Chapter 8. Configuring Networking

This chapter covers the following subjects:

- Networking Fundamentals
- Managing Network Addresses and Interfaces
- Validating Network Configuration
- Managing Network Configuration with **nmtui** and **nmcli**

The following RHCSA exam objectives are covered:

- Configure IPv4 and IPv6 addresses
- Configure hostname resolution

Networking is one of the most essential items on a modern server. On RHEL 8, networking is managed by

the NetworkManager service, and with the release of RHEL 7, some completely new tools were introduced to help manage networks. If you have already worked with networking on RHEL 6 and older, you will ...

Part II: Operating Running Systems

Chapter 9. Managing Software

The following topics are covered in this chapter:

- Managing Software Packages with YUM
- Using **yum**
- Managing Package Module Streams
- Managing Software Packages with RPM

The following RHCSA exam objectives are covered in this chapter:

- Install and update software packages from Red Hat Network, a remote repository, or from the local file system
- Work with package module streams

Managing software packages is an important task for an administrator of Red Hat Enterprise Linux. In this

chapter, you learn how to manage software packages from the command line by using the **yum** utility. You also learn which role repositories ...

Chapter 10. Managing Processes

The following topics are covered in this chapter:

- Introduction to Process Management
- Managing Shell Jobs
- Using Common Command-Line Tools for Process Management
- Using **top** to Manage Processes
- Using **tuned** to Optimize Performance

The following RHCSA exam objectives are covered in this chapter:

- Identify CPU/memory-intensive processes and kill processes
- Adjust process scheduling

Process management is an important task for a Linux

administrator. In this chapter, you learn what you need to know to manage processes from a perspective of daily operation of a server. You'll learn how to work with shell jobs and generic ...

Chapter 11. Working with Systemd

The following topics are covered in this chapter:

- Understanding Systemd
- Managing Units Through Systemd

The following RHCSA exam objective is covered in this chapter:

- Start and stop services and configure services to start automatically at boot

In this chapter, you'll learn about Systemd, which is the system and service manager used on RHEL 8. You'll read about all the things that Systemd can do, and once you have a good general understanding, you'll learn how to work with Systemd services. Systemd is also involved

in booting your system in a desired state, which is called a target. That topic is covered ...

Chapter 12. Scheduling Tasks

The following topics are covered in this chapter:

- Configuring Cron to Automate Recurring Tasks
- Configuring At to Schedule Future Tasks

The following RHCSA exam objective is covered in this chapter:

- Schedule tasks using at and cron

On a Linux server it is important that certain tasks run at certain times. This can be done by using the At and Cron services, which can be configured to run tasks in the future. The At service is for executing future tasks once only, and the Cron service is for recurring regular tasks. In this chapter you learn how to configure both.

“DO I KNOW THIS ALREADY?” QUIZ

The “Do I Know ...

Chapter 13. Configuring Logging

The following topics are covered in this chapter:

- Understanding System Logging
- Configuring rsyslogd
- Rotating Log Files
- Working with journald

The following RHCSA exam objectives are covered in this chapter:

- Locate and interpret system log files and journals
- Preserve system journals

Analyzing log files is an important system administrator task. If anything goes wrong on a Linux system, the

answer is often in the log files. On RHEL 8, two different log systems are used side by side, and it is important to know which information can be found where. This chapter teaches you all about it. You learn how to read ...

Chapter 14. Managing Storage

The following topics are covered in this chapter:

- Understanding MBR and GPT Partitions
- Managing Partitions and File Systems
- Mounting File Systems

The following RHCSA exam objectives are covered in this chapter:

- List, create, delete partitions on MBR and GPT disks
- Configure systems to mount file systems at boot by universally unique ID (UUID) or label
- Add new partitions and logical volumes, and swap to a system nondestructively
- Create, mount, unmount, and use vfat, ext4, and xfs file systems

Working with storage is an important task for a Linux administrator. In this chapter, you acquire the first set of essential ...

Chapter 15. Managing Advanced Storage

The following topics are covered in this chapter:

- Understanding LVM
- Creating LVM Logical Volumes
- Resizing LVM Logical Volumes
- Configuring Stratis
- Configuring VDO

The following RHCSA exam objectives are covered in this chapter:

- Create and remove physical volumes
- Assign physical volumes to volume groups
- Create and delete logical volumes
- Extend existing logical volumes

- Configure disk compression
- Manage layered storage

In Chapter 14, “Managing Storage,” you learned how to manage partitions on a hard disk. Creating multiple partitions on a disk is useful because it enables you to keep different data types ...

Part III: Performing Advanced System Administration Tasks

Chapter 16. Basic Kernel Management

The following topics are covered in this chapter:

- Understanding the Role of the Linux Kernel
- Working with Kernel Modules
- Upgrading the Linux Kernel

The Linux kernel is the heart of the Linux operating system. It takes care of many things, including hardware management. In this chapter, you learn all you need to know about the Linux kernel from an RHCSA perspective. In fact, you even learn a bit more. This chapter includes information about topics that are not on the current list of RHCSA objectives. I think it is good to know about these topics anyway. Any serious Linux administrator should be able to ...

Chapter 17. Managing and Understanding the Boot Procedure

The following topics are covered in this chapter:

- Managing Systemd Targets
- Working with GRUB 2

The following RHCSA exam objectives are covered in this chapter:

- Configure systems to boot into a specific target automatically
- Modify the system bootloader

In this chapter, you learn how the boot procedure on Red Hat Enterprise Linux is organized. In the first part of this chapter, you learn about Systemd targets and

how you can use them to boot your Linux system into a specific state. The second part of this chapter discusses GRUB2 and how to apply changes to the GRUB 2 boot loader. Troubleshooting ...

Chapter 18. Essential Troubleshooting Skills

The following topics are covered in this chapter:

- Understanding the RHEL 8 Boot Procedure
- Passing Kernel Boot Arguments
- Using a Rescue Disk
- Fixing Common Issues
- Recovering Access to a Virtual Machine

The following RHCSA exam objectives are covered in this chapter:

- Boot systems into different targets manually
- Interrupt the boot process in order to gain access to a system

In Chapter 17, “Managing and Understanding the Boot Procedure,” you learned how a RHEL 8 server boots and which role the boot loader GRUB 2 and Systemd play in that process. In this chapter, you learn what you can do when common ...

Chapter 19. An Introduction to Bash Shell Scripting

The following topics are covered in this chapter:

- Understanding Shell Scripting Core Elements
- Using Variables and Input
- Using Conditional Loops

Shell scripting is a science all by itself. You do not learn about all the nuts and bolts related to this science in this chapter. Instead, you learn how to apply basic shell scripting elements, which allows you to write a simple shell script and analyze what is happening in a shell script.

"DO I KNOW THIS ALREADY?"

QUIZ

The “Do I Know This Already?” quiz allows you to assess whether you should read this entire chapter thoroughly or jump to the “Exam ...

Part IV: Managing Network Services

Chapter 20. Configuring SSH

The following topics are covered in this chapter:

- Hardening the SSH Server
- Using Other Useful sshd Options
- Configuring Key-Based Authentication with Passphrases

The following RHCSA exam objective is covered in this chapter:

- Configure key-based authentication for SSH

Secure Shell (SSH) is among the most important utilities that system administrators use. In Chapter 5, "Connecting to Red Hat Enterprise Linux 8," you

learned how to use SSH to connect to a server using a password or key-based authentication. In this chapter, you learn about some of the more advanced configuration settings.

“DO I KNOW THIS ALREADY?” ...

Chapter 21. Managing Apache HTTP Services

The following topics are covered in this chapter:

- Configuring a Basic Apache Server
- Understanding Apache Configuration Files
- Creating Apache Virtual Hosts

The following RHCSA exam objectives are covered in this chapter:

- No RHCSA exam objectives relate directly to Apache, but minimal Apache knowledge is required to master the SELinux-related objectives.

This is the only chapter in this book that discusses a subject that is not even listed in the RHCSA objectives. However, for a Red Hat server administrator, it is

important to know how to deal with the Apache web service. In following chapters, you ...

Chapter 22. Managing SELinux

The following topics are covered in this chapter:

- Understanding SELinux Working Modes
- Understanding Context Settings and the Policy
- Restoring Default File Contexts
- Using Boolean Settings to Modify SELinux Settings
- Diagnosing and Addressing SELinux Policy Violations

The following RHCSA exam objectives are covered in this chapter:

- Set enforcing and permissive modes for SELinux
- List and identify SELinux file and process context
- Restore default file contexts

- Use boolean settings to modify system SELinux settings
- Diagnose and address routine SELinux policy violations

Since the earliest days of Linux, file permissions ...

Chapter 23. Configuring a Firewall

The following topics are covered in this chapter:

- Understanding Linux Firewalling
- Working with Firewalld

The following RHCSA exam objective is covered in this chapter:

- Restrict network access using firewall-cmd/firewall

If a server is connected to the Internet, it needs to be protected against unauthorized access. SELinux is one part of this protection as discussed in Chapter 22, "Managing SELinux"), and a firewall is the second part.

The Linux kernel implements firewalling via the netfilter framework. To configure which packets are allowed and which are not, Firewalld is the default solution in RHEL 8. ...

Chapter 24. Accessing Network Storage

The following topics are covered in this chapter:

- Using NFS Services
- Using CIFS Services
- Mounting Remote File Systems Through fstab
- Using Automount to Mount Remote File Systems

The following RHCSA exam objective is covered in this chapter:

- Mount and unmount network file systems using NFS

The RHCSA exam requires that you know how to access network storage. This encompasses different topics.

We'll discuss accessing network storage that has been provided through CIFS and NFS. You'll learn how to mount network storage through the fstab file, as well as how to automatically mount this storage using automount ...

Chapter 25. Configuring Time Services

The following topics are covered in this chapter:

- Understanding Local Time
- Using Network Time Protocol
- Managing Time on Red Hat Enterprise Linux

The following RHCSA exam objective is covered in this chapter:

- Configure time service clients

An increasing number of services offered through Linux servers depend on the correct configuration of time on the server. Think of services such as database

synchronization, Kerberos authentication, and more. In this chapter, you learn how time is configured on a Linux server.

“DO I KNOW THIS ALREADY?” QUIZ

The “Do I Know This Already?” quiz allows you to assess whether ...

Chapter 26. Final Preparation

Congratulations! You made it through the book, and now it's time to finish getting ready for the RHCSA exam. This chapter helps you get ready to take and pass the exam. In this chapter, you learn more about the exam process and how to register for the exam. You also get some useful tips that will help you avoid some common pitfalls while taking the exam.

GENERAL TIPS

In this section, you get some general tips about the exam. You learn how to verify your exam readiness, how to register for the exam, and what to do on the exam.

Verifying Your Readiness

Only register for the exam when you think that you are ready to pass it. This book contains a lot of material to help you verify your exam readiness. To start with, ...

Chapter 27. Theoretical Pre-Assessment Exam

This chapter provides an RHCSA theoretical pre-assessment exam to help you determine what you know and what you do not know. This theoretical exam is provided so that you can assess your skills and determine the best route forward for studying for the exam.

The RHCSA exam is a 100% practical exam. Therefore, you need to work on actual configuration tasks, and you must deliver a working configuration at the end of the exam. Therefore, passing this practical exam requires that you have a working knowledge of RHEL 8. This chapter helps you check whether you have the requisite knowledge.

In the following pre-exam theoretical exam, you are asked how you would approach some essential tasks. The purpose is ...

Part V: RHCSA RHEL 8 Practice Exams

RHCSA Practice Exam A

GENERAL NOTES

Here are some tips to ensure your exam starts with a clean environment:

- You do not need external servers or resources.
- Do *not* register or connect to external repositories.
- Install a new VM according to the instructions in each practice exam.
- No sample solutions are provided for these practice exams. On the real exam, you need to be able to verify the solutions for yourself as well.
- You should be able to complete each exam within two hours.

1. Install a RHEL 8 or CentOS 8 virtual machine that meets the following requirements:
    1. 2 GB of RAM
    2. 20 GB of disk space using default partitioning
    3. One additional 20-GB disk that does not have any partitions installed
    4. Server with GUI installation pattern

2. Create user **student ...**

RHCSA Practice Exam B

GENERAL NOTES

Here are some tips to ensure your exam starts with a clean environment:

- You do not need external servers or resources.
- Do not register or connect to external repositories.
- Install a new VM according to the instructions in each practice exam.
- No sample solutions are provided for these practice exams. On the real exam, you need to be able to verify the solutions for yourself as well.
- You should be able to complete each exam within two hours.

1. Install a RHEL 8 or CentOS 8 virtual machine that meets the following requirements:
    1. 2 GB of RAM
    2. 20 GB of disk space using default partitioning
    3. One additional 20-GB disk that does not have partitions installed
    4. Server with GUI installation pattern

2. Create user **student ...**

Appendix A. Answers to the "Do I Know This Already?" Quizzes and Review Questions

ANSWERS TO THE "DO I KNOW THIS ALREADY" QUIZZES

Chapter 1

1. A. Fedora is an experimental/enthusiast version containing many components that may or may not make it into the RHEL distribution tree and onto the RHCSA exam.

2. D. All RHEL software updates are made available in CentOS as well.

3. A. In particular, when working with virtual machines, you'll be happy to have a GUI at your disposal.

4. C. XFS is used as the default file system. When

Red Hat decided which file system to use as the default file system, Btrfs was not stable enough yet.

5. A. The size of an XFS file system cannot be reduced.

6. C. The Fedora project tries to make a stable distribution as ...

Glossary

$PATH A variable that contains a list of directories that are searched for executable files when a user enters a command.

. The current directory. Its value can be requested using the **pwd** command.

A

absolute filename A filename that is complete and starts with the name of the root directory, including all directories up to the current file or directory.

access control list (ACL) In Linux permissions, a system that makes it possible to grant permissions to more than one user and more than one group. Access control lists also allow administrators to set default permissions for specific directories.

anacron A service that ensures that vital cron jobs can be executed when the server is down at the moment that the job normally should be ...

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SYMBOLS

Red Hat Certified System Administrator (RHCSA) Complete Video Course, 3rd Edition has more than 16 hours of comprehensive video training—including whiteboard concept teaching, live CLI work, screencast teaching, and hands-on labs—so you have everything you need to prepare for RHCSA success. This new edition of the best-selling *RHCSA Complete Video Course* is fully updated for the RHEL 8 version of the exam. The combination of video, labs, practice exams, and virtual machines is a unique offering that gives you a full toolkit to learn and excel on your exam.

- Module 1: Performing Basic System Management Tasks
- Module 2: Operating Running Systems
- Module 3: Performing Advanced System Administration Tasks
- Module 4: Managing Network Services
- Module 5: Sample Exam

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RHCSA Practice Exam C

GENERAL NOTES

Here are some tips to ensure your exam starts with a clean environment:

- You do not need any external servers or resources.
- Do *not* register or connect to any external repositories.
- Install a new VM according to the instructions in each practice exam.
- No sample solutions are provided for these practice exams. On the real exam, you need to be able to verify the solutions for yourself as well.
- You should be able to complete each exam within two hours.

1. Install a RHEL 8 or CentOS 8 virtual machine that meets the following requirements:
    1. 2 GB of RAM
    2. 20 GB of disk space using default partitioning
    3. One additional 20-GB disk that does not have any partitions installed
    4. Server with GUI installation pattern
2. Create user ...

RHCSA Practice Exam D

GENERAL NOTES

Here are some tips to ensure your exam starts with a clean environment:

- You do not need any external servers or resources.
- Do *not* register or connect to any external repositories.
- Install a new VM according to the instructions in each practice exam.
- No sample solutions are provided for these practice exams. On the real exam, you need to be able to verify the solutions for yourself as well.
- You should be able to complete each exam within two hours.

1. Install a RHEL 8 or CentOS 8 virtual machine that meets the following requirements:
    1. 2 GB of RAM
    2. 20 GB of disk space using default partitioning
    3. One additional 20-GB disk that does not have any partitions installed
    4. Server with GUI installation pattern
2. Create user ...

Appendix B. Memory Tables

CHAPTER 2

Table 2-2 Standard Input, Output, and Error Overview

Name	Default Destination	Use in Redirection	File Descriptor Number
	Computer keyboard	< (same as 0<)	0
	Computer monitor	> (same as 1>)	1
STDERR		2>	2

Table 2-3 Common Bash Redirectors

Redirector	Explanation
(same as 1>)	Redirects STDOUT. If redirection is to a file, the current contents of that file are overwritten.
(same as 1>>)	Redirects STDOUT. If output is written to a file, the output is appended to that file.
	Redirects STDERR.

	Redirects STDERR to the same destination as STDOUT. Notice that this has to be used in combination with normal output redirection, as in **ls whuhiu > errout 2>&1**.
(same as 0<)	Redirects ...

Appendix C. Memory Tables Answer Key

CHAPTER 2

Table 2-2 Standard Input, Output, and Error Overview

Name	Default Destination	Use in Redirection	File Descriptor Number
STDIN	Computer keyboard	< (same as 0<)	0
STDOUT	Computer monitor	> (same as 1>)	1
STDERR	Computer monitor	2>	2

Table 2-3 Common Bash Redirectors

Redirector	Explanation
> (same as 1>)	Redirects STDOUT. If redirection is to a file, the current contents of that file are overwritten.
>> (same as 1>>)	Redirects STDOUT. If output is written to a file, the output is appended to that file.

2>	Redirects STDERR.
2>&1	Redirects STDERR to the same destination as STDOUT. Notice that this has to be used in combination with normal output redirection, as in **ls whuhiu ...**

Appendix D. Study Planner

Practice Test	Reading	Task

Element	Task	Goal Date	First Date Completed	Second Date Completed (Optional)	Notes
Introduction	Read Introduction				
1. Installing Red Hat Enterprise Linux Server	Read Foundation Topics				
1. Installing Red Hat Enterprise Linux Server	Review Key Topics				
1. Installing Red Hat Enterprise Linux Server	Define Key Terms				
1. Installing Red Hat Enterprise Linux Server	Answer Chapter Review Questions				
1. Installing Red Hat Enterprise Linux Server	Complete Chapter Lab				
2. Using Essential Tools	Read Foundation Topics				
2. Using Essential Tools	Complete Chapter Exercises				

2. Using Essential Tools	Review Key Topics				

Code Snippets

Many titles include programming code or configuration examples. To optimize the presentation of these elements, view the eBook in single-column, landscape mode and adjust the font size to the smallest setting. In addition to presenting code and configurations in the reflowable text format, we have included images of the code that mimic the presentation found in the print book; therefore, where the reflowable format may compromise the presentation of the code listing, you will see a “Click here to view code image” link. Click the link to view the print-fidelity code image. To return to the previous page viewed, click the Back button on your device or app.

```
[root@server1 ~]# mount
sysfs on /sys type sysfs (rw,nosuid,nodev,noexec,relatime,seclabel)
proc on /proc type proc (rw,nosuid,nodev,noexec,relatime)
devtmpfs on /dev type devtmpfs (rw,nosuid,seclabel,size=909060k,
  nr_inodes=227265,mode=755)
securityfs on /sys/kernel/security type securityfs (rw,nosuid,nodev,
  noexec,relatime)
tmpfs on /dev/shm type tmpfs (rw,nosuid,nodev,seclabel)
devpts on /dev/pts type devpts (rw,nosuid,noexec,relatime,seclabel,
  gid=5,mode=620,ptmxmode=000)
tmpfs on /run type tmpfs (rw,nosuid,nodev,seclabel,mode=755)
tmpfs on /sys/fs/cgroup type tmpfs (ro,nosuid,nodev,noexec,seclabel,
  mode=755)
…
/dev/nvme0n1p1 on /boot type xfs (rw,relatime,seclabel,attr2,inode64,
  noquota)
sunrpc on /var/lib/nfs/rpc_pipefs type rpc_pipefs (rw,relatime)
tmpfs on /run/user/42 type tmpfs (rw,nosuid,nodev,relatime,seclabel,
  size=184968k,mode=700,uid=42,gid=42)
tmpfs on /run/user/1000 type tmpfs (rw,nosuid,nodev,relatime,seclabel,
  size=184968k,mode=700,uid=1000,gid=1000)
gvfsd-fuse on /run/user/1000/gvfs type fuse.gvfsd-fuse
  (rw,nosuid,nodev,relatime,user_id=1000,group_id=1000)
/dev/sr0 on /run/media/student/RHEL-8-0-BaseOS-x86_64 type iso9660
  (ro,nosuid,nodev,relatime,nojoliet,check=s,map=n,blocksize=2048,
  uid=1000,gid=1000,dmode=500,fmode=400,uhelper=udisks2)
tmpfs on /run/user/0 type tmpfs (rw,nosuid,nodev,relatime,seclabel,
  size=184968k,mode=700))
```

```
[root@server1 ~]# findmnt
TARGET                                SOURCE     FSTYPE  OPTIONS
/                                     /dev/mapper/rhel-root
|                                                xfs
rw,relatime,seclabel,at
├─/sys                                sysfs      sysfs
rw,nosuid,nodev,noexec,
| ├─/sys/kernel/security              securityfs securit
rw,nosuid,nodev,noexec,
| ├─/sys/fs/cgroup                    tmpfs      tmpfs
ro,nosuid,nodev,noexec,
…
├─/proc                               proc       proc
rw,nosuid,nodev,noexec,
| └─/proc/sys/fs/binfmt_misc          systemd-1  autofs
rw,relatime,fd=46,pgrp=
├─/dev                                devtmpfs   devtmpf
rw,nosuid,seclabel,size
| ├─/dev/shm                          tmpfs      tmpfs
rw,nosuid,nodev,seclabe
```

```
| ├─/dev/pts                                devpts     devpts
rw,nosuid,noexec,relati
| ├─/dev/mqueue                             mqueue     mqueue
rw,relatime,seclabel
| └─/dev/hugepages                          hugetlbfs  hugetlb
rw,relatime,seclabel,pa
├─/run                                      tmpfs      tmpfs
rw,nosuid,nodev,seclabe
| ├─/run/user/0                             tmpfs      tmpfs
rw,nosuid,nodev,relatim
| ├─/run/user/42                            tmpfs      tmpfs
rw,nosuid,nodev,relatim
| ├─/run/user/1000                          tmpfs      tmpfs
rw,nosuid,nodev,relatim
| | └─/run/user/1000/gvfs                   gvfsd-fuse fuse.gv
rw,nosuid,nodev,relatim
| └─/run/media/student/RHEL-8-0-BaseOS-x86_64
|                                           /dev/sr0   iso9660
ro,nosuid,nodev,relatim
├─/boot                                     /dev/nvme0n1p1
|                                                      xfs
rw,relatime,seclabel,at
└─/var/lib/nfs/rpc_pipefs                   sunrpc     rpc_pip rw,relatime
```

```
[root@server1 ~]# df -hT

   Filesystem          Type      Size  Used Avail Use%   Mounted on
   /dev/mapper/centos-root xfs   5.9G  3.9G  2.1G  66%  /
   devtmpfs            devtmpfs  908M     0  908M   0%  /dev
   tmpfs               tmpfs     918M  144K  917M   1%  /dev/shm
   tmpfs               tmpfs     918M   21M  897M   3%  /run
   tmpfs               tmpfs     918M     0  918M   0%  /sys/fs/cgroup
   /dev/sda1           xfs       197M  131M   67M  67%  /boot
```

```
[root@localhost tmp]# \ls -l
total 3
lrwxrwxrwx. 1 root root 5 Jan 19 04:38 home -> /home
-rw-r--r--. 3 root root 158 Jun 7 2013 hosts
```

```
[root@server1 ~]# file etc.taretc.
tar: POSIX tar archive (GNU)
```

```
[root@localhost ~]# cut -f 1 -d : /etc/passwd
root
bin
daemon
adm
lp
sync
shutdown
halt
...
```

```
[root@localhost ~]# ps aux | tail -n 10
postfix 1350   0.0  0.7  91872  3848 ?      S    Jan24 0:00 qmgr -l
      -t unix -u
root    2162   0.0  0.3  115348 1928 tty1   Ss+ Jan24 0:00 -bash
postfix 5131   0.0  0.7  91804  3832 ?      S    12:10 0:00 pickup
      -l -t unix -u
root    5132   0.0  0.0  0      0    ?      S    12:10 0:00
      [kworker/0:1]
root    5146   0.0  0.9  133596 4868 ?      Ss   12:12 0:00 sshd:
      root@pts/0
root    5150   0.0  0.3  115352 1940 pts/0  Ss   12:12 0:00 -bash
root    5204   0.0  0.0  0      0    ?      S    12:20 0:00
      [kworker/0:2]
root    5211   0.0  0.0  0      0    ?      S    12:26 0:00
      [kworker/0:0]
root    5212   0.0  0.2  123356 1320 pts/0  R+   12:26 0:00 ps aux
root    5213   0.0  0.1  107928  672 pts/0  R+   12:26 0:00 tail -n 10
```

```
[root@localhost ~]# ps aux | wc
     90      1045    7583
```

```
[root@localhost ~]# tail -n 6 /etc/passwd
anna:x:1000:1000::/home/anna:/bin/bash
rihanna:x:1001:1001::/home/rihanna:/bin/bash
annabel:x:1002:1002::/home/annabel:/bin/bash
anand:x:1003:1003::/home/anand:/bin/bash
joanna:x:1004:1004::/home/joanna:/bin/bash
joana:x:1005:1005::/home/joana:/bin/bash
```

```
[root@localhost ~]# grep anna /etc/passwd
anna:x:1000:1000::/home/anna:/bin/bash
rihanna:x:1001:1001::/home/rihanna:/bin/bash
annabel:x:1002:1002::/home/annabel:/bin/bash
joanna:x:1004:1004::/home/joanna:/bin/bash
```

```
[root@localhost ~]# grep ^anna /etc/passwd
anna:x:1000:1000::/home/anna:/bin/bash
annabel:x:1002:1002::/home/annabel:/bin/bash
```

```
awk -F :    '{ print $4 }'   /etc/passwd
```

```
[root@server1 ~]# ssh 192.168.4.220 -l root
The authenticity of host '192.168.4.220 (<no hostip for proxy
command>)' can't be established.
ECDSA key fingerprint is 35:64:36:f8:ac:4f:8a:94:aa:6e:4b:85:ed:76:0a:eb.
Are you sure you want to continue connecting (yes/no)?
```

```
[sander@lab ~]$ screen
[detached from 30500.pts-0.lab]
[sander@lab ~]$ screen
[detached from 30532.pts-0.lab]
[sander@lab ~]$ screen -r
There are several suitable screens on:
          30532.pts-0.lab (Detached)
          30500.pts-0.lab (Detached)
Type "screen [-d] -r [pid.]tty.host" to resume one of them.
[sander@lab ~]$ screen -r 30500
```

```
[root@localhost ~]# id linda
uid=1001(linda) gid=1001(linda) groups=1001(linda)
```

```
[linda@localhost ~]$ su
Password:
[root@localhost linda]#
```

```
ntp:x:38:38::/etc/ntp:/sbin/nologin
chrony:x:994:993::/var/lib/chrony:/sbin/nologin
abrt:x:173:173::/etc/abrt:/sbin/nologin
pulse:x:171:171:PulseAudio System Daemon:/var/run/pulse:/sbin/nologin
gdm:x:42:42::/var/lib/gdm:/sbin/nologin
gnome-initial-setup:x:993:991::/run/gnome-initial-setup/:/sbin/nologin
postfix:x:89:89::/var/spool/postfix:/sbin/nologin
sshd:x:74:74:Privilege-separated SSH:/var/empty/sshd:/sbin/nologin
tcpdump:x:72:72::/:/sbin/nologin
user:x:1000:1000:user:/home/user:/bin/bash
```

```
[root@localhost ~]# tail -n 10 /etc/shadow
ntp:!!:16420::::::
chrony:!!:16420::::::
abrt:!!:16420::::::
pulse:!!:16420::::::
gdm:!!:16420::::::
gnome-initial-setup:!!:16420::::::
postfix:!!:16420::::::
sshd:!!:16420::::::
tcpdump:!!:16420::::::
user:$6$3VZbGx1djo6FfyZo$/Trq7Q.3foIsIFYxBm6UnHuxxBrxQxHDnDuZxgS.
  We/MAuHn8HboBZzpaMD8gfm.fmlB/ML9LnuaT7CbwVXx3l:16420:0:99999:7:::
```

```
[root@localhost skel]# cat /etc/default/useradd
# useradd defaults file
GROUP=100
HOME=/home
INACTIVE=-1
EXPIRE=
SHELL=/bin/bash
SKEL=/etc/skel
CREATE_MAIL_SPOOL=yes
```

```
linux:~ # chage -l linda
Last password change                                    : Apr 11, 2019
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 of warning before password expir         : 7
```

```
kvm:x:36:qemu
qemu:x:107:
libstoragemgmt:x:994:
rpc:x:32:
rpcuser:x:29:
"/etc/group.edit" 65L, 870C
```

```
[root@server1 home]# ls -l
total 8
drwx------. 3 bob bob             74 Feb 6 10:13 bob
drwx------. 3 caroline caroline   74 Feb 6 10:13 caroline
drwx------. 3 fozia fozia         74 Feb 6 10:13 fozia
drwx------. 3 lara lara           74 Feb 6 10:13 lara
drwx------. 5 lisa lisa           4096 Feb 6 10:12 lisa
drwx------. 14 user user          4096 Feb 5 10:35 user
```

```
chown -R linda /home/linda
```

```
chown .account /home/account
```

```
chgrp account /home/account
```

```
[root@server1 ~]# groups lisa
lisa : lisa account sales
```

```
[lisa@server1 ~]$ groups
lisa account sales
[lisa@server1 ~]$ newgrp sales
[lisa@server1 ~]$ groups
sales lisa account
[lisa@server1 ~]$ touch file1
[lisa@server1 ~]$ ls -l
total 0
-rw-r--r--. 1 lisa sales 0 Feb 6 10:06 file1
```

```
[root@hnl ~]# ls -l /etc/shadow
----------. 1 root root 1184 Apr 30 16:54 /etc/shadow
```

212.209.113.33 = 11010100.11010001.00001010.00100001

```
/27 = 11111111.11111111.11111111.11100000
```

```
[root@server1 ~]# ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
  group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel
  state UP group default qlen 1000
    link/ether 00:0c:29:50:9e:c9 brd ff:ff:ff:ff:ff:ff
    inet 192.168.4.210/24 brd 192.168.4.255 scope global dynamic
      noprefixroute ens33
       valid_lft 1370sec preferred_lft 1370sec
    inet6 fe80::959:3b1a:9607:8928/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
```

```
[root@server1 ~]# ip -s link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
  mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    RX: bytes  packets  errors  dropped overrun mcast
    0          0        0       0       0       0
    TX: bytes  packets  errors  dropped carrier collsns
    0          0        0       0       0       0
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel
  state UP mode DEFAULT group default qlen 1000
    link/ether 00:0c:29:50:9e:c9 brd ff:ff:ff:ff:ff:ff
    RX: bytes  packets  errors  dropped overrun mcast
    143349     564      0       0       0       0
    TX: bytes  packets  errors  dropped carrier collsns
    133129     541      0       0       0       0
```

```
[root@server1 ~]# ip route show
default via 192.168.4.2 dev ens33 proto dhcp metric 100
192.168.4.0/24 dev ens33 proto kernel scope link src 192.168.4.210
  metric 100
192.168.122.0/24 dev virbr0 proto kernel scope link src 192.168.122.1
  linkdown
```

```
[root@server1 ~]# ss -lt
State       Recv-Q       Send-Q         Local Address:Port          Peer
Address:Port
LISTEN      0            32           192.168.122.1:domain
0.0.0.0:*
LISTEN      0            128                0.0.0.0:ssh
0.0.0.0:*
LISTEN      0            5                127.0.0.1:ipp
0.0.0.0:*
LISTEN      0            128                0.0.0.0:sunrpc
0.0.0.0:*
LISTEN      0            128                   [::]:ssh
[::]:*
LISTEN      0            5                   [::1]:ipp
[::]:*
LISTEN      0            128                   [::]:sunrpc
[::]:*
```

```
[root@server1 ~]# nmcli con show
NAME     UUID                                  TYPE       DEVICE
ens33    db6f53bd-654e-45dd-97ef-224514f8050a  ethernet   ens33
```

```
[root@server1 yum.repos.d]# cat CentOS-Base.repo
# CentOS-Base.repo
#
# The mirror system uses the connecting IP address of the client and
  the
# update status of each mirror to pick mirrors that are updated to
  and
# geographically close to the client. You should use this for CentOS
  updates
# unless you are manually picking other mirrors.
#
# If the mirrorlist= does not work for you, as a fall back you can
  try the
# remarked out baseurl= line instead.
#
#

[base]
name=CentOS-$releasever - Base
mirrorlist=http://mirrorlist.centos.org/?release=$releasever&arch=
  $basearch&repo=os
```

```
#baseurl=http://mirror.centos.org/centos/$releasever/os/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-8

#released updates
[updates]
name=CentOS-$releasever - Updates
mirrorlist=http://mirrorlist.centos.org/?release=$releasever&arch=
  $basearch&repo=updates
#baseurl=http://mirror.centos.org/centos/$releasever/updates/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-8

#additional packages that may be useful
[extras]
name=CentOS-$releasever - Extras
mirrorlist=http://mirrorlist.centos.org/?release=$releasever&arch=
  $basearch&repo=extras
#baseurl=http://mirror.centos.org/centos/$releasever/extras/$basearch/
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-8
```

```
[root@server1 ~]# yum install kernel
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * base: centos.mirror1.spango.com
 * extras: mirror.netrouting.net
 * updates: mirrors.supportex.net
Resolving Dependencies
--> Running transaction check
---> Package kernel.x86_64 0:4.10.0-229.1.2.el8 will be installed
--> Processing Dependency: linux-firmware >= 20190911 for package:
  kernel-4.10.0-229.1.2.el7.x86_64
--> Running transaction check
---> Package linux-firmware.noarch 0:20140213-0.3.git4164c23.el8
  will be updated
---> Package linux-firmware.noarch 0:20140911-0.1.git365e80c.el8
  will be an update
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
================================================================================
 Package                            Arch                    Version
Repository                Size
```

```
================================================================================
Installing:
  kernel                          x86_64
3.10.0-229.1.2.el8                            updates
31M
Updating for dependencies:
  linux-firmware                noarch
20190911-0.1.git365e80c.el8                base
17 M

Transaction Summary
================================================================================
Install 1 Package
Upgrade               ( 1 Dependent package)

Total size: 48 M
Is this ok [y/d/N]: y
Downloading packages:
warning: /var/cache/yum/x86_64/8/base/packages/linux-firmware-20140911-
  0.1.git365e80c.el7.noarch.rpm: Header V3 RSA/SHA256 Signature, key
  ID f4a80eb5: NOKEY
Retrieving key from file:///etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-8
Importing GPG key 0xF4A80EB5:
 Userid : "CentOS-8 Key (CentOS 7 Official Signing Key)
  <security@centos.org>"
 Fingerprint: 6341 ab27 53d7 8a78 a7c2 7bb1 24c6 a8a7 f4a8 0eb5
 Package : centos-release-8-0.1406.el7.centos.2.3.x86_64 (@anaconda)
 From : /etc/pki/rpm-gpg/RPM-GPG-KEY-CentOS-8
Is this ok [y/N]: y
```

```
[AppStream]
name=AppStream
baseurl=file:///repo/AppStream
gpgcheck=0
```

```
[root@server3 yum.repos.d]# yum repolist
Updating Subscription Management repositories.
Unable to read consumer identity
This system is not registered to Red Hat Subscription Management.
  You can use subscription-manager to register.
AppStream                                194 MB/s | 5.3 MB     00:00
BaseOS                                    86 MB/s | 2.2 MB     00:00
Last metadata expiration check: 0:00:01 ago on Sat 25 May 2019
  09:20:19 AM EDT.
repo id                         repo name                         status
AppStream                       AppStream                         4,672
BaseOS                          BaseOS                            1,658
```

```
[root@server3 ~]# yum search user
Updating Subscription Management repositories.
Unable to read consumer identity
This system is not registered to Red Hat Subscription Management.
  You can use subscription-manager to register.
Last metadata expiration check: 0:02:23 ago on Sat 25 May 2019
  09:20:19 AM EDT.
=================== Name & Summary Matched: user ===================
trouser-lib.x86_64    : TrouSerS libtspi library
trouser-lib.i686      : TrouSerS libtspi library
trouser-lib.x86_64    : TrouSerS libtspi library
gnome-user-docs.noarch : GNOME User Documentation
gnome-user-docs.noarch : GNOME User Documentation
xdg-user-dirs.x86_64   : Handles user special directories
xdg-user-dirs.x86_64   : Handles user special directories
util-linux-user.x86_64 : libuser based util-linux utilities
...
```

```
[root@server3 ~]# ps aux | head
USER   PID %CPU %MEM    VSZ   RSS TTY  STAT START   TIME    COMMAND
root     1  0.0  0.4 252864 7792 ?    Ss   08:25   0:02    /usr/lib/
  systemd/systemd --switched-root --system --deserialize 17
root     2  0.0  0.0      0     0 ?    S    08:25   0:00    [kthreadd]
root     3  0.0  0.0      0     0 ?    I<   08:25   0:00    [rcu_gp]
root     4  0.0  0.0      0     0 ?    I<   08:25   0:00    [rcu_par_gp]
root     6  0.0  0.0      0     0 ?    I<   08:25   0:00    [kworker/0:
                                                             0H-kblockd]
root     8  0.0  0.0      0     0 ?    I<   08:25   0:00    [mm_percpu_wq]
root     9  0.0  0.0      0     0 ?    S    08:25   0:00    [ksoftirqd/0]
root    10  0.0  0.0      0     0 ?    I    08:25   0:00    [rcu_sched]
root    11  0.0  0.0      0     0 ?    S    08:25   0:00    [migration/0]
```

```
[root@server3 ~]# ps -ef
UID      PID   PPID  C STIME TTY       TIME     CMD
root       1      0  0 08:25 ?       00:00:02  /usr/lib/systemd/systemd
                                                  --switched-root
                                                  --system --deserialize
                                                  17
...
root   34948      2  0 12:16 ?       00:00:00  [kworker/0:1-events]
root   34971   1030  0 12:17 ?       00:00:00  sshd: root [priv]
root   34975  34971  0 12:17 ?       00:00:00  sshd: root@pts/2
root   34976  34975  0 12:17 pts/2   00:00:00  -bash
root   35034      1  0 12:17 pts/2   00:00:00  sleep 3600
root   35062      2  0 12:20 ?       00:00:00  [kworker/u256:2]
root   35064      2  0 12:20 ?       00:00:00  [kworker/0:3-cgroup_
                                                  destroy]
root   35067      2  0 12:20 ?       00:00:00  [kworker/1:2-events_
                                                  freezable_power_]
root   35087    939  0 12:21 ?       00:00:00  sleep 60
root   35088  33127  0 12:22 pts/1   00:00:00  ps -ef
```

```
[root@server3 ~]# ps fax
   PID TTY      STAT   TIME  COMMAND
     2 ?        S      0:00  [kthreadd]
     3 ?        I<     0:00  \_ [rcu_gp]
     4 ?        I<     0:00  \_ [rcu_par_gp]
...
  2460 ?        Ssl    0:00  \_ /usr/bin/pulseaudio --daemonize=no
  2465 ?        Ssl    0:00  \_ /usr/bin/dbus-daemon --session
                              --address=systemd: --nofork
                              --nopidfile --systemd-activation --
  2561 ?        Ssl    0:00  \_ /usr/libexec/at-spi-bus-launcher
  2566 ?        Sl     0:00  |   \_ /usr/bin/dbus-daemon --config-
                              file=/usr/share/defaults/at-spi2/
                              accessibility.conf --nofork
  2569 ?        Sl     0:00  \_ /usr/libexec/at-spi2-registryd
                              --use-gnome-session
  2589 ?        Ssl    0:00  \_ /usr/libexec/xdg-permission-store
  2594 ?        Sl     0:00  \_ /usr/libexec/ibus-portal
  2704 ?        Sl     0:00  \_ /usr/libexec/dconf-service
  2587 ?        Sl     0:00  /usr/libexec/ibus-x11 --kill-daemon
  2758 ?        Sl     0:00  /usr/bin/gnome-keyring-daemon --daemonize
                              --login
```

```
  2908 tty3     Sl     0:00  /usr/libexec/ibus-x11 --kill-daemon
  2936 ?        Ssl    0:00  /usr/libexec/geoclue
  3102 tty3     Sl+    0:00  /usr/libexec/gsd-printer
  3173 tty3     Sl+    0:12  /usr/bin/vmtoolsd -n vmusr
  3378 ?        Ssl    0:00  /usr/libexec/fwupd/fwupd
  3440 ?        Ss     0:00  gpg-agent --homedir /var/lib/fwupd/gnupg
                               --use-standard-socket --daemon
  3455 ?        S      0:00  /usr/libexec/platform-python /usr/
                               libexec/rhsmd
 33093 ?        Ss     0:00  /usr/lib/systemd/systemd --user
 33105 ?        S      0:00  \_ (sd-pam)
 33117 ?        S<sl   0:00  \_ /usr/bin/pulseaudio --daemonize=no
 33123 ?        Ssl    0:00  \_ /usr/bin/dbus-daemon --session
                               --address=systemd: --nofork
                               --nopidfile --systemd-activation --
 35034 pts/2    S      0:00  sleep 3600
```

```
[root@server3 ~]# uptime
 12:43:03 up  4:17,  3 users,  load average: 4.90, 0.98, 0.19
```

```
[root@server1 ~]# systemctl -t help
Available unit types:
service
socket
target
device
mount
automount
swap
timer
path
slice
scope
```

```
[Unit]
Description=Vsftpd ftp daemon
After=network.target

[Service]
Type=forking
ExecStart=/usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf

[Install]
WantedBy=multi-user.target
```

```
[Unit]
Description=Temporary Directory (/tmp)
Documentation=man:hier(7)
Documentation=https://www.freedesktop.org/wiki/Software/systemd/
  APIFileSystems
ConditionPathIsSymbolicLink=!/tmp
DefaultDependencies=no
Conflicts=umount.target
Before=local-fs.target umount.target
After=swap.target

[Mount]
What=tmpfs
Where=/tmp
Type=tmpfs
Options=mode=1777,strictatime,nosuid,nodev
```

```
[Unit]
Description=Cockpit Web Service Socket
Documentation=man:cockpit-ws(8)
Wants=cockpit-motd.service

[Socket]
ListenStream=9090
ExecStartPost=-/usr/share/cockpit/motd/update-motd '' localhost
ExecStartPost=-/bin/ln -snf active.motd /run/cockpit/motd
ExecStopPost=-/bin/ln -snf /usr/share/cockpit/motd/inactive.motd
  /run/cockpit/motd

[Install]
WantedBy=sockets.target
```

```
[Unit]
Description=Multi-User System
Documentation=man:systemd.special(7)
Requires=basic.target
Conflicts=rescue.service rescue.target
After=basic.target rescue.service rescue.target
AllowIsolate=yes

[Install]
Alias=default.target
```

```
[root@server1 ~]# systemctl status vsftpd
   vsftpd.service - Vsftpd ftp daemon
   Loaded: loaded (/usr/lib/systemd/system/vsftpd.service; disabled;
           vendor preset: disabled)
   Active: active (running) since Mon 2019-06-10 06:44:18 EDT; 5s ago
  Process: 10044 ExecStart=/usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf
           (code=exited, status=0/SUCCESS)
 Main PID: 10045 (vsftpd)
    Tasks: 1 (limit: 11365)
   Memory: 696.0K
   CGroup: /system.slice/vsftpd.service
           └─10045 /usr/sbin/vsftpd /etc/vsftpd/vsftpd.conf

Jun 10 06:44:18 server1.example.com systemd[1]: Starting Vsftpd ftp
  daemon...
Jun 10 06:44:18 server1.example.com systemd[1]: Started Vsftpd ftp
  daemon.
```

```
[root@server1 ~]# systemctl list-dependencies vsftpd
  vsftpd.service
  └─system.slice
  └─basic.target
    ├─alsa-restore.cservice
    ├─alsa-state.service
    ├─firewalld.service
    ├─microcode.service
    ├─rhel-autorelabel-mark.service
    ├─rhel-autorelabel.service
    ├─rhel-configure.service
    ├─rhel-dmesg.service
    ├─rhel-loadmodules.service
    ├─paths.target
    ├─slices.target
    | ├─-.slice
    | ├─system.slice
```

```
[root@server1 ~]# systemctl status crond -l
   crond.service - Command Scheduler
   Loaded: loaded (/usr/lib/systemd/system/crond.service; enabled;
             vendor preset: enabled)
   Active: active (running) since Sat 2019-06-08 03:34:57 EDT;
             28min ago
 Main PID: 1101 (crond)
    Tasks: 2 (limit: 11363)
   Memory: 2.3M
   CGroup: /system.slice/crond.service
           ├─1101 /usr/sbin/crond -n
           └─3600 /usr/sbin/anacron -s

Jun 08 03:34:57 server1.example.com crond[1101]: (CRON) STARTUP
  (1.5.2)
Jun 08 03:34:57 server1.example.com crond[1101]: (CRON) INFO (Syslog
  will be used instead of sendmail>
Jun 08 03:34:57 server1.example.com crond[1101]: (CRON) INFO (RANDOM_
  DELAY will be scaled with factor>
```

```
Jun 08 03:34:58 server1.example.com crond[1101]: (CRON) INFO (running
  with inotify support)
Jun 08 04:01:01 server1.example.com CROND[3591]: (root) CMD (run-parts
  /etc/cron.hourly)
Jun 08 04:01:01 server1.example.com anacron[3600]: Anacron started on
  2019-06-08
Jun 08 04:01:01 server1.example.com anacron[3600]: Will run job
  'cron.daily' in 33 min.
Jun 08 04:01:01 server1.example.com anacron[3600]: Will run job
  'cron.weekly' in 53 min.
Jun 08 04:01:01 server1.example.com anacron[3600]: Will run job
  'cron.monthly' in 73 min.
Jun 08 04:01:01 server1.example.com anacron[3600]: Jobs will be
  executed sequentially
```

```
[root@server2 ~]# cat /etc/crontab
SHELL=/bin/bash
PATH=/sbin:/bin:/usr/sbin:/usr/bin
MAILTO=root

# For details see man 4 crontabs

# Example of job definition:
# .---------------- minute (0 - 59)
# |  .------------- hour (0 - 23)
# |  |  .---------- day of month (1 - 31)
# |  |  |  .------- month (1 - 12) OR jan,feb,mar,apr ...
# |  |  |  |  .---- day of week (0 - 6) (Sunday=0 or 7) OR
sun,mon,tue,wed,thu,fri,sat
# |  |  |  |  |
# *  *  *  *  * user-name command to be executed
```

```
[root@server1 cron.d]# cat unbound-anchor
# Look to see whether the DNSSEC Root key got rolled, if so check
  trust and update

10 3 1 * * unbound /usr/sbin/unbound-anchor -a /var/lib/unbound/
  root.anchor -c /etc/unbound/icannbundle.pem
```

```
[root@server1 spool]# cat /etc/anacrontab
# /etc/anacrontab: configuration file for anacron

# See anacron(8) and anacrontab(5) for details.

SHELL=/bin/sh
PATH=/sbin:/bin:/usr/sbin:/usr/bin
MAILTO=root
# the maximal random delay added to the base delay of the jobs
RANDOM_DELAY=45
# the jobs will be started during the following hours only
START_HOURS_RANGE=3-22

#period in days  delay in minutes job-identifier   command
1       5  cron.daily             nice run-parts  /etc/cron.daily
7       25  cron.weekly            nice run-parts  /etc/cron.weekly
@monthly 45 cron.monthly           nice run-parts  /etc/cron.monthly
```

```
0 2 * * 1-5 logger message from root
```

```
logger This message is written at $(date)
```

```
[root@server1 ~]# systemctl status sshd -l
   sshd.service - OpenSSH server daemon
   Loaded: loaded (/usr/lib/systemd/system/sshd.service; enabled;
             vendor preset: enabled)
   Active: active (running) since Sat 2019-06-08 03:34:56 EDT;
             55min ago
     Docs: man:sshd(8)
           man:sshd_config(5)
 Main PID: 1055 (sshd)
    Tasks: 1 (limit: 11363)
   Memory: 5.5M
   CGroup: /system.slice/sshd.service
           └─1055 /usr/sbin/sshd -D -oCiphers=aes256-gcm@openssh.com,
               chacha20-poly1305@openssh.com,ae>

Jun 08 03:34:56 server1.example.com systemd[1]: Starting OpenSSH
  server daemon...
Jun 08 03:34:56 server1.example.com sshd[1055]: Server listening on
  0.0.0.0 port 22.
Jun 08 03:34:56 server1.example.com sshd[1055]: Server listening on ::
  port 22.
Jun 08 03:34:56 server1.example.com systemd[1]: Started OpenSSH server
  daemon.
Jun 08 03:57:38 server1.example.com sshd[3368]: Accepted password for
  root from 192.168.4.1 port 5470>
Jun 08 03:57:38 server1.example.com sshd[3368]: pam_unix(sshd:
  session):session opened for user root
```

```
[root@server1 ~]# tail -10 /var/log/messages
Jun  8 03:57:46 server1 journal[2682]: Received error from DBus
  search provider org.gnome.Software.desktop: Gio.IOErrorEnum:
  Timeout was reached
Jun  8 03:58:20 server1 journal[3078]: failed to get featured apps:
  no apps to show
Jun  8 03:58:20 server1 journal[3078]: Only 0 apps for popular list,
  hiding
Jun  8 03:58:20 server1 journal[2105]: Skipping refresh of rhel-8-for-
  x86_64-highavailability-beta-source-rpms: cannot update repo 'rhel-
  8-for-x86_64-highavailability-beta-source-rpms': Cannot download
  repomd.xml: Curl error (42): Operation was aborted by an application
  callback for https://cdn.redhat.com/content/beta/rhel8/8/x86_64/
  highavailability/source/SRPMS/repodata/repomd.xml [Callback
  aborted]; Last error: Curl error (42): Operation was aborted by
  an application callback for https://cdn.redhat.com/content/beta/
  rhel8/8/x86_64/highavailability/source/SRPMS/repodata/repomd.xml
  [Callback aborted]
```

```
Jun  8 03:58:20 server1 journal[3078]: hiding category graphics
  featured applications: found only 0 to show, need at least 9
Jun  8 03:58:23 server1 journal[2105]: Skipping refresh of rhel-8-
  for-x86_64-supplementary-beta-debug-rpms: cannot update repo 'rhel-
  8-for-x86_64-supplementary-beta-debug-rpms': Cannot download repomd.
  xml: Curl error (42): Operation was aborted by an application
  callback for https://cdn.redhat.com/content/beta/rhel8/8/x86_64/
  supplementary/debug/repodata/repomd.xml [Callback aborted]; Last
  error: Curl error (42): Operation was aborted by an application
  callback for https://cdn.redhat.com/content/beta/rhel8/8/x86_64/
  supplementary/debug/repodata/repomd.xml [Callback aborted]
Jun  8 03:58:46 server1 chronyd[907]: Selected source 5.200.6.34
Jun  8 03:59:16 server1 systemd[2571]: Starting Mark boot as
  successful...
Jun  8 03:59:16 server1 systemd[2571]: Started Mark boot as
  successful.
Jun  8 04:00:16 server1 systemd[3374]: Starting Mark boot as
  successful...
```

```
#### RULES ####

# Log all kernel messages to the console.
# Logging much else clutters up the screen.
#kern.*                                 /dev/console

# Log anything (except mail) of level info or higher.
# Do not log private authentication messages!
*.info;mail.none;authpriv.none;cron.none    /var/log/messages

# The authpriv file has restricted access.
authpriv.*                              /var/log/secure

# Log all the mail messages in one place.
mail.*                                  -/var/log/maillog


# Log cron stuff
cron.*                                  /var/log/cron

# Everybody gets emergency messages
*.emerg                                 :omusrmsg:*

# Save news errors of level crit and higher in a special file.
uucp,news.crit                          /var/log/spooler
```

```
local1.error          /var/log/httpd-error.log
```

```
# see "man logrotate" for details
# rotate log files weekly
weekly

# keep 4 weeks worth of backlogs
rotate 4

# create new (empty) log files after rotating old ones
create

# use date as a suffix of the rotated file
dateext

# uncomment this if you want your log files compressed
#compress

# RPM packages drop log rotation information into this directory
include /etc/logrotate.d

# system-specific logs may be also be configured here
```

```
-- Logs begin at Sat 2019-06-08 04:45:34 EDT, end at Sat 2019-06-08
  04:56:11 EDT. --
Jun 08 04:45:34 server1.example.com kernel: Linux version 4.18.0-80.
  el8.x86_64 (mockbuild@x86-vm-08.b>
Jun 08 04:45:34 server1.example.com kernel: Command line: BOOT_
  IMAGE=(hd0,msdos1)/vmlinuz-4.18.0-80.e>
Jun 08 04:45:34 server1.example.com kernel: Disabled fast string
  operations
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Supporting XSAVE
  feature 0x001: 'x87 floating po>
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Supporting XSAVE
  feature 0x002: 'SSE registers'
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Supporting XSAVE
  feature 0x004: 'AVX registers'
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Supporting XSAVE
  feature 0x008: 'MPX bounds regi>
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Supporting XSAVE
  feature 0x010: 'MPX CSR'
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: xstate_offset[2]:
  576, xstate_sizes[2]:  256
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: xstate_offset[3]:
  832, xstate_sizes[3]:   64
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: xstate_offset[4]:
  896, xstate_sizes[4]:   64
Jun 08 04:45:34 server1.example.com kernel: x86/fpu: Enabled xstate
  features 0x1f, context size is 96>
```

```
[root@localhost ~]# fdisk /dev/sda

Welcome to fdisk (util-linux 2.32.1).
Changes will remain in memory only, until you decide to
  write them.
Be careful before using the write command.


Command (m for help):
```

```
Command (m for help): p
Disk /dev/sda: 20 GiB, 21474836480 bytes, 41943040 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
```

```
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x7ad1a34b

Device     Boot   Start      End  Sectors  Size Id Type
/dev/sda1  *       2048  1026047  1024000  500M 83 Linux
/dev/sda2       1026048 24111103 23085056   11G 8e Linux LVM
```

```
Command (m for help): n
Partition type
   p   primary (2 primary, 0 extended, 2 free)
   e   extended (container for logical partitions)
```

```
Command (m for help): n
Partition type
   p   primary (2 primary, 0 extended, 2 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (3,4, default 3):
First sector (24111104-41943039, default 24111104):
```

```
Last sector, +sectors or +size{K,M,G,T,P} (24111104-41943039,
  default 41943039): +1G

Created a new partition 3 of type 'Linux' and of size 1 GiB
```

```
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error 16:
  Device or resource busy.
The kernel still uses the old table. The new table will be
  used at the next reboot or after you run partprobe(8) or
  kpartx(8) Syncing disks.
[root@localhost ~]#
```

```
[root@control ~]# pvcreate --help
  pvcreate - Initialize physical volume(s) for use by LVM

  pvcreate PV ...
        [ -f|--force ]
        [ -M|--metadatatype lvm2 ]
        [ -u|--uuid String ]
        [ -Z|--zero y|n ]
        [    --dataalignment Size[k|UNIT] ]
        [    --dataalignmentoffset Size[k|UNIT] ]
        [    --bootloaderareasize Size[m|UNIT] ]
        [    --labelsector Number ]
        [    --pvmetadatacopies 0|1|2 ]
        [    --metadatasize Size[m|UNIT] ]
        [    --metadataignore y|n ]
        [    --norestorefile ]
        [    --setphysicalvolumesize Size[m|UNIT] ]
        [    --reportformat basic|json ]
        [    --restorefile String ]
        [ COMMON_OPTIONS ]
```

```
  Common options for lvm:
        [ -d|--debug ]
        [ -h|--help ]
        [ -q|--quiet ]
        [ -v|--verbose ]
        [ -y|--yes ]
        [ -t|--test ]
        [    --commandprofile String ]
        [    --config String ]
        [    --driverloaded y|n ]
        [    --nolocking ]
        [    --lockopt String ]
        [    --longhelp ]
        [    --profile String ]
        [    --version ]

  Use --longhelp to show all options and advanced commands.
```

```
[root@server1 ~]# parted /dev/sdc
GNU Parted 3.2
Using /dev/sdc
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted) print
Error: /dev/sdc: unrecognised disk label
Model: VMware, VMware Virtual S (scsi)
Disk /dev/sdc: 21.5GB
Sector size (logical/physical): 512B/512B
Partition Table: unknown
Disk Flags:
(parted) mklabel msdos
(parted) mkpart
Partition type?  primary/extended? primary
File system type?  [ext2]? xfs
Start? 1MiB
End? 1GiB
(parted) set 1 lvm on
(parted) print
Model: VMware, VMware Virtual S (scsi)
Disk /dev/sdb: 21.5GB
Sector size (logical/physical): 512B/512B
Partition Table: msdos
Disk Flags:

Number  Start   End     Size    Type     File system  Flags
 1      1049kB  1074MB  1073MB  primary  xfs          lvm, lba

(parted) quit
Information: You may need to update /etc/fstab.
```

```
[root@server1 ~]# pvs
  PV         VG   Fmt  Attr PSize     PFree
  /dev/sda2  rhel lvm2 a--    <19.00g        0
  /dev/sdc1       lvm2 ---  1023.00m 1023.00m
```

```
[root@server1 ~]# pvdisplay
  --- Physical volume ---
  PV Name               /dev/sda2
  VG Name               rhel
  PV Size               <19.00 GiB / not usable 3.00 MiB
  Allocatable           yes (but full)
  PE Size               4.00 MiB
  Total PE              4863
  Free PE               0
  Allocated PE          4863
  PV UUID               h9seBL-Z0AK-05xH-RNjO-Ui4d-d8Px-VunuQJ

  "/dev/sdb1" is a new physical volume of "1023.00 MiB"
  --- NEW Physical volume ---
  PV Name               /dev/sdc1
  VG Name
  PV Size               1023.00 MiB
  Allocatable           NO
  PE Size               0
  Total PE              0
  Free PE               0
  Allocated PE          0
  PV UUID               vMqYr7-70nM-kNeW-am8J-c9aA-VWUF-vxw0XJ
```

```
[root@server1 ~]# lsblk
NAME            MAJ:MIN  RM   SIZE  RO TYPE MOUNTPOINT
sda               8:0     0    20G   0 disk
├─sda1            8:1     0     1G   0 part /boot
└─sda2            8:2     0    19G   0 part
  ├─rhel-root   253:0     0    17G   0 lvm  /
  └─rhel-swap   253:1     0     2G   0 lvm  [SWAP]
sdc               8:16    0    20G   0 disk
└─sdc1            8:17    0  1023M   0 part
sdb               8:32    0    20G   0 disk
sr0              11:0     1   6.6G   0 rom  /run/media/student/
                                              RHEL-8-0-0-BaseOS-x86_64
```

```
[root@server1 ~]# vgdisplay
...
  --- Volume group ---
  VG Name               vgdata
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  2
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                1
  Open LV               0
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               1020.00 MiB
  PE Size               4.00 MiB
  Total PE              255
  Alloc PE / Size       127 / 508.00 MiB
  Free  PE / Size       128 / 512.00 MiB
  VG UUID               b68TU5-UPQv-xQRB-7Djx-SuZf-agDb-vAujYD
```

```
[root@server1 ~]# ps aux | head -n 20
USER    PID %CPU %MEM    VSZ   RSS TTY    STAT   START  TIME COMMAND
root    1   1.8  0.6   52980  6812 ?      Ss   11:44  0:02 /usr/lib/
systemd/systemd --switched-root --system --deserialize 23
root    2   0.0  0.0      0     0 ?      S    11:44  0:00  [kthreadd]
root    3   0.0  0.0      0     0 ?      S    11:44  0:00  [ksoftirqd/0]
root    4   0.0  0.0      0     0 ?      S    11:44  0:00  [kworker/0:0]
root    5   0.0  0.0      0     0 ?      S<   11:44  0:00  [kworker/0:0H]
root    6   0.0  0.0      0     0 ?      S    11:44  0:00  [kworker/u128:0]
root    7   0.1  0.0      0     0 ?      S    11:44  0:00  [migration/0]
root    8   0.0  0.0      0     0 ?      S    11:44  0:00  [rcu_bh]
root    9   0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/0]
root    10  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/1]
root    11  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/2]
root    12  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/3]
root    13  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/4]
root    14  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/5]
root    15  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/6]
root    16  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/7]
root    17  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/8]
root    18  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/9]
root    19  0.0  0.0      0     0 ?      S    11:44  0:00  [rcuob/10]
```

```
[    8.153928] sd 0:0:0:0: Attached scsi generic sg0 type 0
[    8.154289] sd 0:0:1:0: Attached scsi generic sg1 type 0
[    8.154330] sd 0:0:2:0: Attached scsi generic sg2 type 0
[    8.154360] sd 0:0:3:0: Attached scsi generic sg3 type 0
[    8.154421] sr 4:0:0:0: Attached scsi generic sg4 type 5
[    8.729016] ip_tables: (C) 2000-2006 Netfilter Core Team
[    8.850599] nf_conntrack version 0.5.0 (7897 buckets, 31588 max)
[    8.939613] ip6_tables: (C) 2000-2006 Netfilter Core Team
[    9.160092] Ebtables v2.0 registered
[    9.203710] Bridge firewalling registered
[    9.586603] IPv6: ADDRCONF(NETDEV_UP): eno16777736: link is not
  ready
[    9.587520] e1000: eno16777736 NIC Link is Up 1000 Mbps Full
  Duplex, Flow Control: None
[    9.589066] IPv6: ADDRCONF(NETDEV_CHANGE): eno16777736: link becomes
  ready
[   10.689365] Rounding down aligned max_sectors from 4294967295 to
  4294967288
[  5158.470480] Adjusting tsc more than 11% (6940512 vs 6913395)
[21766.132181] e1000: eno16777736 NIC Link is Down
[21770.391597] e1000: eno16777736 NIC Link is Up 1000 Mbps Full
  Duplex, Flow Control: None
[21780.434547] e1000: eno16777736 NIC Link is Down
```

```
[root@server1 ~]# hostnamectl status
   Static hostname: server1.example.com
         Icon name: computer-vm
           Chassis: vm
        Machine ID: 5aa095b495ed458d934c54a88078c165
           Boot ID: b7273a66ba254358b566639e329c350d
    Virtualization: vmware
  Operating System: Red Hat Enterprise Linux 8.0 (Ootpa)
       CPE OS Name: cpe:/o:redhat:enterprise_linux:8.0:GA
            Kernel: Linux 4.18.0-80.el8.x86_64
      Architecture: x86-64
```

```
[root@server2 ~]# udevadm monitor
monitor will print the received events for:
UDEV - the event which udev sends out after rule processing
KERNEL - the kernel uevent


KERNEL[132406.831270] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1 (usb)
KERNEL[132406.974110] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0 (usb)
UDEV [132406.988182] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1 (usb)
KERNEL[132406.999249] add /module/usb_storage (module)
UDEV [132407.001203] add /module/usb_storage (module)
KERNEL[132407.002559] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33 (scsi)
UDEV [132407.002575] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0 (usb)
KERNEL[132407.002583] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33/scsi_host/host33 (scsi_host)
KERNEL[132407.002590] add /bus/usb/drivers/usb-storage (drivers)
UDEV [132407.004479] add /bus/usb/drivers/usb-storage (drivers)
UDEV [132407.005798] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33 (scsi)
```

```
UDEV [132407.007385] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33/scsi_host/host33 (scsi_host)
KERNEL[132408.008331] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33/target33:0:0 (scsi)
KERNEL[132408.008355] add /devices/pci0000:00/0000:00:11.0/0000:02:
  04.0/usb1/1-1/1-1:1.0/host33/target33:0:0/33:0:0:0 (scsi)
...
KERNEL[132409.381930] add          /module/fat (module)
KERNEL[132409.381951] add          /kernel/slab/fat_cache (slab)
KERNEL[132409.381958] add          /kernel/slab/fat_inode_cache (slab)
KERNEL[132409.381964] add          /module/vfat (module)
UDEV [132409.385090]  add          /module/fat (module)
UDEV [132409.385107]  add          /kernel/slab/fat_cache (slab)
UDEV [132409.385113]  add          /kernel/slab/fat_inode_cache (slab)
UDEV [132409.386110]  add          /module/vfat (module)
```

```
[root@server1 ~]# lsmod | head
Module                  Size  Used by
nls_utf8               16384  1
isofs                  45056  1
fuse                  126976  3
rfcomm                 90112  6
xt_CHECKSUM            16384  1
ipt_MASQUERADE         16384  1
xt_conntrack           16384  1
ipt_REJECT             16384  1
nft_counter            16384  16
```

```
[root@server1 ~]# modinfo e1000
filename:       /lib/modules/4.18.0-80.el8.x86_64/kernel/drivers/net/
                  ethernet/intel/e1000/e1000.ko.xz
version:        7.3.21-k8-NAPI
license:        GPL
description:    Intel(R) PRO/1000 Network Driver
author:         Intel Corporation, <linux.nics@intel.com>
rhelversion:    8.0
srcversion:     A2C44EC5D0B865EE9C972D5
alias:          pci:v00008086d00002E6Esv*sd*bc*sc*i*
...
depends:
intree:         Y
name:           e1000
vermagic:       4.18.0-80.el8.x86_64 SMP mod_unload modversions
sig_id:         PKCS#7
signer:         Red Hat Enterprise Linux kernel signing key
sig_key:        20:16:97:CB:B1:7E:D5:A0:A7:3C:0B:40:E2:54:80:2D:83:F1:
                  72:5A
sig_hashalgo:   sha256
signature:      97:3A:58:F6:4E:B7:F1:CE:44:50:65:5E:84:41:D8:A7:A3:
                  A2:2D...
parm:           TxDescriptors:Number of transmit descriptors (array
                  of int)
```

```
[root@localhost ~]# systemctl cat multi-user.target
# /usr/lib/systemd/system/multi-user.target
#  SPDX-License-Identifier: LGPL-2.1+
#
#  This file is part of systemd.
#
#  systemd is free software; you can redistribute it and/or modify it
#  under the terms of the GNU Lesser General Public License as
     published by
#  the Free Software Foundation; either version 2.1 of the License,
     or
#  (at your option) any later version.

[Unit]
Description=Multi-User System
Documentation=man:systemd.special(7)
Requires=basic.target
Conflicts=rescue.service rescue.target
After=basic.target rescue.service rescue.target
AllowIsolate=yes
```

```
[root@server202 ~]# systemctl status vsftpd
vsftpd.service - Vsftpd ftp daemon
    Loaded: loaded (/usr/lib/systemd/system/vsftpd.service; disabled)
    Active: inactive (dead)
```

```
root@localhost ~]# systemctl --type=target --all
  UNIT                     LOAD      ACTIVE   SUB    DESCRIPTION
  basic.target             loaded    active   active Basic System
  bluetooth.target         loaded    active   active Bluetooth
  cryptsetup.target        loaded    active   active Local Encrypted
                                                     Volumes
  dbus.target              not-found inactive dead   dbus.target
  emergency.target         loaded    inactive dead   Emergency Mode
  getty-pre.target         loaded    active   active Login Prompts
                                                     (Pre)
  getty.target             loaded    active   active Login Prompts
 graphical.target          loaded    active   active Graphical
                                                     Interface
  initrd-fs.target         loaded    inactive dead   Initrd File
                                                     Systems
  initrd-root-device.target loaded   inactive dead   Initrd Root
                                                     Device
  initrd-root-fs.target    loaded    inactive dead   Initrd Root File
                                                     System
  initrd-switch-root.target loaded   inactive dead   Switch Root
  initrd.target            loaded    inactive dead   Initrd Default
                                                     Target
  local-fs-pre.target      loaded    active   active Local File
                                                     Systems (Pre)
  local-fs.target          loaded    active   active Local File
                                                     Systems
  multi-user.target        loaded    active   active Multi-User
                                                     System
```

```
network-online.target     loaded    active   active Network is
                                                  Online
network-pre.target        loaded    active   active Network (Pre)
network.target            loaded    active   active Network
nfs-client.target         loaded    active   active NFS client
                                                  services
nss-lookup.target         loaded    inactive dead      Host and Network
                                                  Name Lookups
nss-user-lookup.target    loaded    active   active User and Group
                                                  Name Lookups
paths.target              loaded    active   active Paths
remote-fs-pre.target      loaded    active   active Remote File
                                                  Systems (Pre)
remote-fs.target          loaded    active   active Remote File
                                                  Systems
rescue.target             loaded    inactive dead   Rescue Mode
rpc_pipefs.target         loaded    active   active rpc_pipefs.
                                                  target
rpcbind.target            loaded    active   active RPC Port Mapper
shutdown.target           loaded    inactive dead   Shutdown
slices.target             loaded    active   active Slices
sockets.target            loaded    active   active Sockets
sound.target              loaded    active   active Sound Card
sshd-keygen.target        loaded    active   active sshd-keygen.
                                                  target
swap.target               loaded    active   active Swap
sysinit.target            loaded    active   active System
                                                  Initialization
```

```
[root@localhost ~]# cat /etc/default/grub
GRUB_TIMEOUT=5
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="crashkernel=auto resume=/dev/mapper/rhel-swap
  rd.lvm.lv=rhel/root rd.lvm.lv=rhel/swap rhgb quiet"
GRUB_DISABLE_RECOVERY="true"
GRUB_ENABLE_BLSCFG=true
```

```
linux ($root)/vmlinuz-4.18.0-80.el8.x86_64 root=/dev/mapper/rhel-root
  ro crash kernel=auto resume=/dev/mapper/rhel-swap rd.lvm.lv=rhel/
  root rd.lvm.lv=rhel/swap rhgb quiet
```

```
[root@server1 ~]# cat /etc/dracut.conf
# PUT YOUR CONFIG HERE OR IN separate files named *.conf
# in /etc/dracut.conf.d
# SEE man dracut.conf(5)

# Sample dracut config file

#logfile=/var/log/dracut.log
#fileloglvl=6

# Exact list of dracut modules to use. Modules not listed here are
    not going
# to be included. If you only want to add some optional modules use
# add_dracutmodules option instead.
#dracutmodules+=""

# dracut modules to omit
#omit_dracutmodules+=""

# dracut modules to add to the default
#add_dracutmodules+=""
```

```
# additional kernel modules to the default
#add_drivers+=""

# list of kernel filesystem modules to be included in the generic
    initramfs
#filesystems+=""

# build initrd only to boot current hardware
#hostonly="yes"
#

# install local /etc/mdadm.conf
#mdadmconf="no"

# install local /etc/lvm/lvm.conf
#lvmconf="no"
```

```
# A list of fsck tools to install. If it is not specified, module's
    hardcoded
# default is used, currently: "umount mount /sbin/fsck* xfs_db
    xfs_check
# xfs_repair e2fsck jfs_fsck reiserfsck btrfsck". The installation is
# opportunistic, so non-existing tools are just ignored.
#fscks=""

# inhibit installation of any fsck tools
#nofscks="yes"

# mount / and /usr read-only by default
#ro_mnt="no"

# set the directory for temporary files
# default: /var/tmp
#tmpdir=/tmp
```

```
[root@lab ~]# virsh dumpxml sander-vm1 | grep "source file="
      <source file='/home/sander/lab1.img'/>
      <source file='/var/lib/libvirt/images/sander-vm1.img'/>
```

```
[root@lab ~]# kpartx -av /home/sander/lab1.img
add map loop0p1 (253:5): 0 1024000 linear /dev/loop0 2048
add map loop0p2 (253:6): 0 7362560 linear /dev/loop0 1026048
```

```
[root@lab mapper]# pvscan /dev/mapper/loop0p2
  PV /dev/sda3 VG centos lvm2 [48.83 GiB / 0 free]
  PV /dev/sda4 VG centos lvm2 [50.00 GiB / 20.00 GiB free]
  PV /dev/sda5 VG vglvm lvm2 [347.32 GiB / 329.32 GiB free]
  PV /dev/mapper/loop0p2 VG centosvm lvm2 [3.51 GiB / 0 free]
  Total: 4 [449.65 GiB] / in use: 4 [449.65 GiB] / in no VG: 0 [0 ]
```

```
if [ -f $1 ]
then
     echo "$1 is a file"
..... [ -d $1 ]
then
       echo "$1 is a directory"
else
      echo "I do not know what \$1 is"
fi
```

```
for (( counter=100; counter>1; counter-- )); .......
          echo $counter
done
exit 0
```

```
#!/bin/bash
#
# This is a script that greets the world
# Usage: ./hello

clear
echo hello world

exit 0
```

```
#!/bin/bash
# run this script with a few arguments
echo The first argument is $1
echo The second argument is $2
echo The third argument is $3
```

```
#!/bin/bash
# run this script with a few arguments
echo you have entered $# arguments
for i in "$@" do
            echo $i
done
exit 0
```

```
#!/bin/bash
if [ -z $1 ]; then
          echo enter a name
          read NAME
else
          NAME=$1
fi
echo you have entered the text $NAME
exit 0
```

```
if [ -z $1 ]
then
        echo no value provided
fi
```

```
[root@localhost ~]# grep -v '#' /etc/httpd/conf/httpd.conf

ServerRoot "/etc/httpd"

Listen 80

Include conf.modules.d/*.conf

User apache
Group apache

ServerAdmin root@localhost

<Directory />
    AllowOverride none
    Require all denied
</Directory>

DocumentRoot "/var/www/html"
```

```
<Directory "/var/www">
    AllowOverride None
    Require all granted
</Directory>

<Directory "/var/www/html">
    Options Indexes FollowSymLinks

    AllowOverride None

    Require all granted
</Directory>

<IfModule dir_module>
    DirectoryIndex index.html
</IfModule>

<Files ".ht*">
    Require all denied
</Files>
```

```
ErrorLog "logs/error_log"

LogLevel warn

<IfModule log_config_module>
    LogFormat "%h %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%
      {User-Agent}i\"" combined
    LogFormat "%h %l %u %t \"%r\" %>s %b" common

    <IfModule logio_module>
      LogFormat "%h %l %u %t \"%r\" %>s %b \"%{Referer}i\" \"%
        {User-Agent}i\" %I %O" combinedio
    </IfModule>


    CustomLog "logs/access_log" combined
</IfModule>

<IfModule alias_module>
```

```
    ScriptAlias /cgi-bin/ "/var/www/cgi-bin/"

</IfModule>

<Directory "/var/www/cgi-bin">
    AllowOverride None
    Options None
    Require all granted
</Directory>

<IfModule mime_module>
    TypesConfig /etc/mime.types

    AddType application/x-compress .Z
    AddType application/x-gzip .gz .tgz


    AddType text/html .shtml
    AddOutputFilter INCLUDES .shtml
</IfModule>
AddDefaultCharset UTF-8

<IfModule mime_magic_module>
    MIMEMagicFile conf/magic
</IfModule>

EnableSendfile on
IncludeOptional conf.d/*.conf
```

```
[root@localhost ~]# systemctl status httpd
   httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled;
     vendor preset: disabled)
   Active: active (running) since Fri 2019-07-05 03:06:02 EDT; 2s ago
     Docs: man:httpd.service(8)
 Main PID: 4540 (httpd)
   Status: "Started, listening on: port 443, port 80"
    Tasks: 213 (limit: 11222)
   Memory: 24.2M
   CGroup: /system.slice/httpd.service
           ├─4540 /usr/sbin/httpd -DFOREGROUND
           ├─4542 /usr/sbin/httpd -DFOREGROUND
           ├─4543 /usr/sbin/httpd -DFOREGROUND
           ├─4544 /usr/sbin/httpd -DFOREGROUND
           └─4545 /usr/sbin/httpd -DFOREGROUND

Jul 05 03:06:02 localhost.localdomain systemd[1]: Starting The Apache
  HTTP Server...
Jul 05 03:06:02 localhost.localdomain httpd[4540]: AH00558: httpd:
  Could not reliably determine the server'>
Jul 05 03:06:02 localhost.localdomain httpd[4540]: Server configured,
  listening on: port 443, port 80
Jul 05 03:06:02 localhost.localdomain systemd[1]: Started The Apache
  HTTP Server.
```

```
[root@server1 httpd]# \ls -l
total 8
drwxr-xr-x. 2 root root 35 Feb 23 03:12 conf
drwxr-xr-x. 2 root root 4096 Feb 25 12:41 conf.d
drwxr-xr-x. 2 root root 4096 Feb 25 12:41 conf.modules.d
lrwxrwxrwx. 1 root root 19 Feb 17 13:26 logs -> ../../var/log/httpd
lrwxrwxrwx. 1 root root 29 Feb 17 13:26 modules -> ../../usr/lib64/
  httpd/modules
lrwxrwxrwx. 1 root root 10 Feb 17 13:26 run -> /run/httpd
```

```
192.168.4.210 server1.example.com server1
192.168.4.220 server2.example.com server2
192.168.4.210 account.example.com account
192.168.4.210 sales.example.com sales
```

```
[root@server1 ~]# cat /etc/sysconfig/selinux

# This file controls the state of SELinux on the system.
# SELINUX= can take one of these three values:
#       enforcing - SELinux security policy is enforced.
#       permissive - SELinux prints warnings instead of enforcing.
# disabled - No SELinux policy is loaded.
SELINUX=enforcing
# SELINUXTYPE= can take one of these two values:
#       targeted - Targeted processes are protected,
#       minimum - Modification of targeted policy. Only selected
          processes are protected.
#       mls - Multi Level Security protection.
SELINUXTYPE=targeted
```

```
[root@server1 ~]# sestatus -v
SELinux status:                 enabled
SELinuxfs mount:                /sys/fs/selinux
SELinux root directory:         /etc/selinux
Loaded policy name:             targeted
Current mode:                   enforcing
Mode from config file:          enforcing
Policy MLS status:              enabled
Policy deny_unknown status:     allowed
Memory protection checking:     actual (secure)
Max kernel policy version:      31

Process contexts:
Current context:                unconfined_u:unconfined_r:unconfined_
                                  t:s0-s0:c0.c1023
Init context:                   system_u:system_r:init_t:s0
/usr/sbin/sshd                  system_u:system_r:sshd_t:s0-s0:c0.c1023

File contexts:
Controlling terminal:           unconfined_u:object_r:user_devpts_t:s0
/etc/passwd                     system_u:object_r:passwd_file_t:s0
/etc/shadow                     system_u:object_r:shadow_t:s0
/bin/bash                       system_u:object_r:shell_exec_t:s0
/bin/login                      system_u:object_r:login_exec_t:s0
/bin/sh                         system_u:object_r:bin_t:s0 ->
                                  system_u:object_r:shell_exec_t:s0
/sbin/agetty                    system_u:object_r:getty_exec_t:s0
/sbin/init                      system_u:object_r:bin_t:s0 ->
                                  system_u:object_r:init_exec_t:s0
/usr/sbin/sshd                  system_u:object_r:sshd_exec_t:s0
```

```
[root@server1 /]# ls -Z
       system_u:object_r:bin_t:s0 bin     unconfined_u:object_r:
                                            default_t:s0 repo
       system_u:object_r:boot_t:s0 boot   system_u:object_r:admin_
                                            home_t:s0 root
    system_u:object_r:device_t:s0 dev     system_u:object_r:var_
                                            run_t:s0 run
       system_u:object_r:etc_t:s0 etc     system_u:object_r:bin_t:
                                            s0 sbin
 system_u:object_r:unlabeled_t:s0 files   system_u:object_r:var_t:
                                            s0 srv
 system_u:object_r:home_root_t:s0 home    system_u:object_r:root_t:
                                            s0 stratis
       system_u:object_r:lib_t:s0 lib     system_u:object_r:unlabeled_
                                            t:s0 stratisl
       system_u:object_r:lib_t:s0 lib64   system_u:object_r:sysfs_t:
                                            s0 sys
       system_u:object_r:mnt_t:s0 media   system_u:object_r:tmp_t:
                                            s0 tmp
       system_u:object_r:mnt_t:s0 mnt     system_u:object_r:usr_t:
                                            s0 usr
       system_u:object_r:usr_t:s0 opt     system_u:object_r:var_t:
                                            s0 var
      system_u:object_r:proc_t:s0 proc    system_u:object_r:
                                            unlabeled_t:s0 vdol
```

```
[root@server1 /]# ls -Z /var/www
drwxr-xr-x. root root system_u:object_r:httpd_sys_script_exec_t:s0
  cgi-bin
drwxr-xr-x. root root system_u:object_r:httpd_sys_content_t:s0 html
```

```
semanage fcontext -a -t httpd_sys_content_t "/mydir(/.*)?"
```

```
EXAMPLE
       remember to run restorecon after you set the file context
       Add file-context for everything under /web
       # semanage fcontext -a -t httpd_sys_content_t "/web(/.*)?"
       # restorecon -R -v /web

       Substitute /home1 with /home when setting file context
       # semanage fcontext -a -e /home /home1
       # restorecon -R -v /home1

       For home directories under top level directory, for example
         /disk6/home,
       execute the following commands.
       # semanage fcontext -a -t home_root_t "/disk6"
       # semanage fcontext -a -e /home /disk6/home
       # restorecon -R -v /disk6

SEE ALSO
       selinux (8), semanage (8)

AUTHOR
       This man page was written by Daniel Walsh <dwalsh@redhat.com>

                                    20130617      semanage-fcontext(8)
```

```
root@server1 ~]# getsebool -a | grep ftp
ftp_home_dir --> off
ftpd_anon_write --> off
ftpd_connect_all_unreserved --> off
ftpd_connect_db --> off
ftpd_full_access --> off
ftpd_use_cifs --> off
ftpd_use_fusefs --> off
ftpd_use_nfs --> off
ftpd_use_passive_mode --> off
httpd_can_connect_ftp --> off
httpd_enable_ftp_server --> off
sftpd_anon_write --> off
sftpd_enable_homedirs --> off
sftpd_full_access --> off
sftpd_write_ssh_home --> off
tftp_anon_write --> off
tftp_home_dir --> off
```

```
[root@server1 ~]# firewall-cmd --get-services
RH-Satellite-6 amanda-client amanda-k5-client amqp amqps apcupsd
  audit bacula bacula-client bgp bitcoin bitcoin-rpc bitcoin-testnet
  bitcoin-testnet-rpc ceph ceph-mon cfengine cockpit condor-collector
  ctdb dhcp dhcpv6 dhcpv6-client distcc dns docker-registry docker-
  swarm dropbox-lansync elasticsearch etcd-client etcd-server finger
  freeipa-ldap freeipa-ldaps freeipa-replication freeipa-trust ftp
  ganglia-client ganglia-master git gre high-availability http https
  imap imaps ipp ipp-client ipsec irc ircs iscsi-target isns jenkins
  kadmin kerberos kibana klogin kpasswd kprop kshell ldap ldaps
  libvirt libvirt-tls lightning-network llmnr managesieve matrix mdns
  minidlna mongodb mosh mountd mqtt mqtt-tls ms-wbt mssql murmur
  mysql nfs nfs3 nmea-0183 nrpe ntp nut openvpn ovirt-imageio ovirt-
  storageconsole ovirt-vmconsole plex pmcd pmproxy pmwebapi pmwebapis
  pop3 pop3s postgresql privoxy proxy-dhcp ptp pulseaudio puppetmaster
  quassel radius redis rpc-bind rsh rsyncd rtsp salt-master samba
  samba-client samba-dc sane sip sips slp smtp smtp-submission smtps
  snmp snmptrap spideroak-lansync squid ssh steam-streaming svdrp svn
  syncthing syncthing-gui synergy syslog syslog-tls telnet tftp tftp-
  client tinc tor-socks transmission-client upnp-client vdsm vnc-
  server wbem-http wbem-https wsman wsmans xdmcp xmpp-bosh xmpp-client
  xmpp-local xmpp-server zabbix-agent zabbix-server
```

```
[root@server1 services]# cat ftp.xml
<?xml version="1.0" encoding="utf-8"?>
<service>
  <short>FTP</short>
  <description>FTP is a protocol used for remote file transfer.
  If you plan to make your FTP
server publicly available, enable this option. You need the vsftpd
  package installed for this
option to be useful.</description>
  <port protocol="tcp" port="21"/>
  <module name="nf_conntrack_ftp"/>
</service>
```

```
[root@server1 ~]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpv6-client ssh
  ports:
  protocols:
  masquerade: no
  forward-ports:
  source-ports:
  icmp-blocks:
  rich rules:
```

```
[root@server1 ~]# smbclient -L server2.example.com
Enter SAMBA\root's password:
Anonymous login successful

        Sharename       Type      Comment
        ---------       ----      -------
        print$          Disk      Printer Drivers
        sambashare      Disk      sambashare
        IPC$            IPC       IPC Service (Samba 4.9.1)
Reconnecting with SMB1 for workgroup listing.
Anonymous login successful

        Server               Comment
        ---------            -------

        Workgroup            Master
        ---------            -------
```

```
mount -t cifs -o user=guest //192.168.4.200/data /mnt
```

```
mount -o username=sambauser1 //server/share /somewhere
```

```
server1:/share /nfs/mount/point nfs  sync  0 0
```

```
//server2/sambashare    /sambamount.    cifs\.    username=linda,
  password=password.     0 0
```

```
/nfsdata.     /etc/auto.nfsdata
```

```
Files.    -rw.     server2:/nfsdata
```

```
[root@server1 ~]# timedatectl
               Local time: Mon 2019-06-10 08:27:57 EDT
           Universal time: Mon 2019-06-10 12:27:57 UTC
                 RTC time: Mon 2019-06-10 12:27:57
                Time zone: America/New_York (EDT, -0400)
 System clock synchronized: yes
               NTP service: active
           RTC in local TZ: no
```

```
[root@server1 ~]# systemctl status -l chronyd
   chronyd.service - NTP client/server
    Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled;
              vendor preset: enabled)
    Active: active (running) since Mon 2019-06-10 05:22:30 EDT;
              3h 8min ago
      Docs: man:chronyd(8)
            man:chrony.conf(5)
  Main PID: 1062 (chronyd)
     Tasks: 1 (limit: 11365)
    Memory: 1.5M
    CGroup: /system.slice/chronyd.service
            └─1062 /usr/sbin/chronyd

Jun 10 07:21:04 server1.example.com chronyd[1062]: Selected source
  5.200.6.34
Jun 10 07:28:40 server1.example.com chronyd[1062]: Selected source
  213.154.236.182
```

```
Jun 10 07:28:42 server1.example.com chronyd[1062]: Source
  149.210.142.45 replaced with 195.242.98.57
Jun 10 07:43:51 server1.example.com chronyd[1062]: Selected source
  5.200.6.34
Jun 10 07:53:35 server1.example.com chronyd[1062]: Selected source
  195.242.98.57
Jun 10 08:16:24 server1.example.com chronyd[1062]: Forward time jump
  detected!
Jun 10 08:16:24 server1.example.com chronyd[1062]: Can't synchronise:
  no selectable sources
Jun 10 08:20:44 server1.example.com chronyd[1062]: Selected source
  213.154.236.182
Jun 10 08:22:57 server1.example.com chronyd[1062]: Source
  195.242.98.57 replaced with 195.191.113.251
Jun 10 08:25:05 server1.example.com chronyd[1062]: Selected source
  5.200.6.34
```

```
[root@localhost ~]# tzselect
Please identify a location so that time zone rules can be set
  correctly.
Please select a continent, ocean, "coord", or "TZ".
 1) Africa
 2) Americas
 3) Antarctica
 4) Asia
 5) Atlantic Ocean
 6) Australia
 7) Europe
 8) Indian Ocean
 9) Pacific Ocean
10) coord - I want to use geographical coordinates.
11) TZ - I want to specify the time zone using the Posix TZ format.
#? 1
Please select a country whose clocks agree with yours.
 1) Algeria.              20) Gambia            39) Sao Tome & Principe
 2) Angola.               21) Ghana             40) Senegal
 3) Benin                 22) Guinea            41) Sierra Leone
 4) Botswana              23) Guinea-Bissau     42) Somalia
 5) Burkina Faso          24) Kenya             43) South Africa
 6) Burundi               25) Lesotho           44) South Sudan
 7) C?te d'Ivoire         26) Liberia.          45) Spain
 8) Cameroon              27) Libya             46) St Helena
 9) Central African Rep.  28) Madagascar        47) Sudan
10) Chad                  29) Malawi.           48) Swaziland
11) Comoros               30) Mali.             49) Tanzania
12) Congo (Dem. Rep.)     31) Mauritania.       50) Togo
```

```
13) Congo (Rep.)          32) Mayotte.          51) Tunisia
14) Djibouti              33) Morocco.          52) Uganda
15) Egypt                 34) Mozambique.       53) Western Sahara
16) Equatorial Guinea     35) Namibia           54) Zambia
17) Eritrea               36) Niger.            55) Zimbabwe
18) Ethiopia              37) Nigeria
19) Gabon                 38) Rwanda
#? 54
The following information has been given:

        Zambia
        Central Africa Time

Therefore TZ='Africa/Maputo' will be used.
Selected time is now: Mon Jul 22 12:03:41 CAT 2019.
Universal Time is now: Mon Jul 22 10:03:41 UTC 2019.
Is the above information OK?
1) Yes
2) No
#? 1

You can make this change permanent for yourself by appending the line
  TZ='Africa/Maputo'; export TZ to the file '.profile' in your home
  directory; then log out and log in again.

Here is that TZ value again, this time on standard output so that
  you can use the /usr/bin/tzselect command in shell scripts:
  Africa/Maputo
```