

# **Cert Guide**

Advance your IT career with hands-on learning



XK0-005











Review Exercises



### CompTIA® Linux+ XK0-005 Cert Guide

### **Companion Website and Pearson Test Prep Access Code**

Access interactive study tools on this book's companion website, including practice test software, review exercises, Key Term flash card application, a study planner, and more!

To access the companion website, simply follow these steps:

- 1. Go to www.pearsonitcertification.com/register.
- 2. Enter the print book ISBN: 9780137866885.
- **3.** Answer the security question to validate your purchase.
- **4.** Go to your account page.
- **5.** Click on the **Registered Products** tab.
- **6.** Under the book listing, click on the **Access Bonus Content** link.

When you register your book, your Pearson Test Prep practice test access code will automatically be populated with the book listing under the Registered Products tab. You will need this code to access the practice test that comes with this book. You can redeem the code at **PearsonTestPrep.com**. Simply choose Pearson IT Certification as your product group and log in to the site with the same credentials you used to register your book. Click the **Activate New Product** button and enter the access code. More detailed instructions on how to redeem your access code for both the online and desktop versions can be found on the companion website.

If you have any issues accessing the companion website or obtaining your Pearson Test Prep practice test access code, you can contact our support team by going to **pearsonitp.echelp.org**.

## CompTIA Linux+ XK0-005 Cert Guide

## **Table of Contents**

Cover

Title Page

Copyright Page

Contents at a Glance

**Table of Contents** 

Introduction

Part I: System Management (Obj. 1.1 - 1.7)

Chapter 1: Understanding Linux Fundamentals

Do I Know This Already? Quiz

Foundation Topics

Filesystem Hierarchy Standard

What Goes Where in the FHS

The Root of the Filesystem

Where to Put Programs

#### **Basic Boot Process**

What Is the Boot Process?

System Boot Options

initrd and initramfs

Booting with UEFI

Booting via PXE

Booting via NFS

Booting via ISO

#### **Boot Loaders and Files**

**GRUB Legacy** 

GRUB2



Changes Made for GRUB2

**GRUB2 Command Names** 

Installing GRUB2

Using the GRUB2 Command Line

Demystifying Kernel Images

Configuring GRUB2

Common Commands at Boot Time

#### When Kernels Panic

Identifying a Kernel Panic

Getting More Information

Kernel Panic Causes

#### Device Types in /dev

#### Installing Software from Source

Components of a Source Code Install

The Makefile

Example of a Compilation of Source Code

#### Storage Concepts

**Partitions** 

MBR

**GPT** 

Data Storage Methods

**Block Storage** 

File Storage

Object Storage

FUSE (Filesystem in Userspace)

Why Use a FUSE?

Handling FUSE User Requests

Possible FUSE Applications/Uses

**RAID** 

**RAID Levels** 

Mirroring

Striping

Parity



#### Listing Your Hardware Info

The Proc Filesystem

Notable Is\* Commands

Friends of procfs

The dmidecode Command

Displaying DMI Table Information

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 2: Managing Files and Directories

Do I Know This Already? Quiz

**Foundation Topics** 

#### File and Directory Operations

Tips for Working with Linux Files

**Basic Navigation** 

**Advanced Navigation** 

Listing Files and Directories

Touching Files

Copying Files and Directories

Moving Objects

Creating and Removing Directories

Removing Objects

#### File Metadata and File Types

**Determining File Types** 

The file Command

Displaying File Metadata

The stat Command

#### Soft and Hard Links

Linking Files

Symbolic Links



#### Hard Links

#### File Compression, Archiving, and Backup

Using tar

Using Compression Utilities

Using tar with Compression Utilities

Taking Pity on the Unarchiver

**Useful Creation Options** 

Listing Archive Files

Using cpio

Using the dd Command

**Compression Tools** 

Backing Up Is Hard to Do

**Backup Types** 

Other Backup Types

#### Copying Objects Between Systems

Using the scp Command

Everything and the Kitchen rsync

The nc Command

#### File Editing

The Message Line

Editing in vim

Opening a File for Editing

Navigating Within a File

Force Multipliers

**Undo Operations** 

Saving Files

Quitting vim

Changing or Replacing Text

**Deleting Text and Lines** 

Searching in vim

Searching and Replacing

nano, nano

Why nano and Not Pico?



nanos Interface

Thats a Wrap

Feeling a Bit (awk)ward

The printf Function

Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 3: Configuring and Managing Storage

Do I Know This Already? Quiz

**Foundation Topics** 

#### **Determining Storage Hardware**

Viewing SCSI Device Information

Viewing Partition and Filesystem Device File Information

The Isblk Command

The blkid Command

The (Non-Linux) fcstat Command

#### Performing Disk Partitioning

fdisk

Partitioning with parted

partprobe

#### Inspecting and Managing Software RAID

Creating and Inspecting a Software RAID

Inspecting a Software RAID Device

#### Using Logical Volume Manager (LVM)

Overview of LVM

Understanding Multipath

Managing LVM

#### Mounting Local and Remote Devices

The Filesystem Table



Manually Mounting Filesystems

Unmounting Filesystems

Using systemd to Mount

Linux Unified Key Setup (LUKS)

#### Monitoring Storage Space and Disk Usage

Using iostat

Using du

Using df

#### Filesystem Management

Filesystem Checker

EXT2/3/4 Tools Overview

Tuning ext Filesystems

**Btrfs Tools** 

XFS Commands

#### Storage Area Networks/Network-Attached Storage

SAN vs. NAS

Multipathing with multipathd

Typical Network Filesystems Used by SAN/NAS

Samba vs. SMB and CIFS

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 4: Managing Processes and Services

Do I Know This Already? Quiz

**Foundation Topics** 

#### Managing Processes

Viewing Processes

Whats the Diff?

The htop Command

The free Command



Blocks and Buffers

Pages, Slabs, and Caches

Interpreting Displayed Information from free

Sending Signals to Processes

Killing Processes by PID

Using pgrep and pkill to Send Signals

Killing Processes Using Other Criteria

Finding What Is Using a Resource

Introducing Isof

Using Isof

Job Control

Managing Process Priorities

#### systemd

Whats Different About systemd?

Units in systemd

Unit File Directory Locations

systemd Environment Variables

systemd Targets and Runlevels

Wants and Requires

Booting with systemd

Commands to Manage systemd

The State of Services/Units

Listing Services

**Enabling and Disabling Services** 

Service Start, Stop, Restart, and Status

Masking Services

#### Scheduling Services

Configuring crontabs

Using the crontab Command

**Matching Times** 

Spelling Out Month and Day Names

Making Multiple Matches

Step Values



Putting Together the crontab

Issues About PATH

Dealing with Output

Nicknames

Other Files

System crontabs

Convenience crontabs

Restricting Access

Running ad hoc Jobs

The at Command

The batch Command

Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 5: Using Network Tools and Configuration Files

Do I Know This Already? Quiz

**Foundation Topics** 

Interface Management

iproute2

Interface Management Commands

The ip Command

Examples of the ip Command

The ss Command

NetworkManager

The nmtui Command

The nmcli Command

The net-tools Suite

The ifconfig Command

Configuring via ifcfg-\* files and network-scripts

On Debian-Based Systems



The hostname Command

The arp Command

The route Command

#### Name Resolution

Configuring Name Resolution

Controlling Resolution

Setting Hostnames on systemd Systems

The host, dig, and nslookup Commands

The whois Command

#### **Network Monitoring**

Is the Remote Host Reachable?

The ping Command

The traceroute Command

The mtr Command

Is the Data Flowing Properly?

Using netstat

Swimming with Wireshark

The tcpdump Command

#### Remote Networking Tools

SSH (Secure Shell)

Using curl and wget

The nc Command

Using rsync

Using scp

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 6: Building and Installing Software

Do I Know This Already? Quiz

**Foundation Topics** 



#### Package Management

The Most Common Package Types

Package Managers

Debian Package Management

Managing Local Debian Packages

Installing Packages with dpkg

Removing Packages

Dependency Issues

Querying Packages

Reconfiguring Packages

Using Repositories

What Is a Repository?

Viewing Configured Repositories

Adding Repositories

Installing Remote Packages

Working with the Cache

Upgrading the System

Removing Packages

**Graphical Managers** 

RPM and YUM Package Management

The RPM Database

**RPM Package Files** 

Package Name Conventions

The rpm Command

Validation of Packages

Installation of Packages

Additional Installation Options

Verifying a Packages Integrity

Freshening vs. Upgrading

Removing Packages

Other Removal Options

**Querying Packages** 

Package Management with YUM

Installing Packages



Fetching Updates

Finding Packages to Install

Configuring YUM

Dandified YUM

ZYpp

Installing Software Packages with zypper

Removing a Package with zypper

Managing Repositories

#### Sandboxed Applications

What Is a Sandboxed App?

App Sandbox Applications

Flatpak

**Applmage** 

Snapd

### System Updates

Updating the Kernel

Choosing an Update Method

Reboot Methods

Manual Update

Update with Package Manager

Linux Kernel Utilities

No Reboot Method

Live Kernel Patching Overview

Issues with Live Patching

The Live Patch Process

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 7: Managing Software Configurations

Do I Know This Already? Quiz



#### **Foundation Topics**

#### **Updating Configuration Files**

Restart or Reload?

Restarting a Service

Reloading a Service

Grace Under Pressure

Dealing with RPM Configurations

Rage About Your Machine

Two Methods to Retain the Original Configuration File

Handling .rpmsave and .rpmnew Files

Repository Configuration Files

Repository Configuration File Overview

The APT Configuration File

The YUM Configuration File

The DNF Configuration File

**Actual Repository Files** 

The YUM Repo Files

The APT Repo Files

#### Configuring Kernel Options

Viewing Kernel Parameters

Doing It the Manual Way

Getting Used to Using sysctl

Ways to Set Kernel Parameters

Using the sysctl.conf File

Using the sysctl Command Directly

Using /etc/sysctl.conf

Using the sysctl Command to Load Parameters

**Understanding Kernel Modules** 

Managing Kernel Modules

Loading and Unloading Modules Manually

The modprobe Command

#### Configuring Common System Services

Secure Shell (SSH)



Network Time Protocol (NTP)

NTP Expressed Through Chrony

The timedatectl Command

System Logging with Syslog

#### Representing Locales

Fallback Locales

Contents of a Locale

The localectl Command

How Linux Uses the Locale

systemd and syslog

syslog

The logger Command

Configuring syslogd

Key File Locations

Other syslog Implementations

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Part II: Security (Obj. 2.1 - 2.5)

### Chapter 8: Understanding Linux Security Best Practices

Do I Know This Already? Quiz

**Foundation Topics** 

Public Key Infrastructure

Purpose of Certificates

Certificate Authentication

Self-Signed Certificates

Certificate Authorities

Private Keys

Public Keys

**Encryption and Hashing** 



**Digital Signatures** 

#### Certificate Use Cases

#### Authentication

Multifactor Authentication

Tokens

OTP

**Biometrics** 

LDAP

Pluggable Authentication Modules (PAMs)

**Password Policies** 

Password Length

LDAP Integration

**User Lockouts** 

The /etc/pam.d Directory

pam\_tally2 and faillock

System Security Services Daemon

Single Sign-On (SSO)

#### Linux Hardening

The nmap Command

The nc Command

Secure Boot and UEFI

System Logging Configurations

Using umask

Disabling/Removing Insecure Services

**Enforcing Password Strength** 

**Setting Password Parameters** 

Aging Your Passwords

No Wire Hangers (Group Passwords)

Removing Unused Packages

**Tuning Kernel Parameters** 

Securing Service Accounts

Configuring the Host Firewall

Summary



**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 9: Implementing Identity Management

Do I Know This Already? Quiz

**Foundation Topics** 

#### Account Creation and Deletion

User Account Fundamentals

What Accounts Are What?

Regular User Accounts

User Entries in /etc/passwd

Special Login Files

pam\_tally2 and faillock

**Group Accounts** 

Group Entries in /etc/group

Group Passwords

Adding Users and Groups

Adding Users with useradd

useradd Defaults

skel Templates

Adding Groups with groupadd

Modifying Users and Groups

Modifying User Accounts with usermod

Modifying Groups with groupmod

Removing Users and Groups

Removing Users

Removing Groups

The Shadow Suite

**Encrypted Passwords and Shadow Fields** 

/etc/shadow File Permissions

Changing Passwords



Aging Passwords

A Login Shell Session

A Non-Login Shell Session

User Identity Query Options

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 10: Implementing and Configuring Firewalls

Do I Know This Already? Quiz

**Foundation Topics** 

#### Common Firewall Technologies

iptables: Old and Reliable, but Complicated

nftables: Newer, Tighter, More Dynamic firewalld: Newer, Flexible, Easier to Use

UFW: Uncomplicated Indeed

### Understanding iptables

Overview of Filtering Packets

Important Terms

Using iptables to Filter Incoming Packets

Filtering by Protocol

Multiple Criteria

Filtering Based on Destination

Changing the Default Policy

Revisiting the Original Rules

Saving the Rules

Using iptables to Filter Outgoing Packets

Stateful Rules

Logging Rules

Implementing NAT

Additional Firewall Technologies



The fail2ban Service DenyHosts IPset

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 11: Using Remote Connectivity for System Management

Do I Know This Already? Quiz

Foundation Topics

SSH (Secure Shell)

SSH Components

Tunneling

X11 Forwarding

Port Forwarding

### Executing Commands as Another User

The sudo Command

The sudoedit Command

User Privilege Escalation

The su Command

**PolicyKit** 

The pkexec Command

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 12: Understanding and Applying Access Controls

Do I Know This Already? Quiz

**Foundation Topics** 



#### File Permissions

Permission Trio Bits

Manipulating Permissions

Octal Mode

Symbolic Mode

#### File and Directory Ownership

Changing File Ownership

Changing Group Ownership

#### Understanding and Using umask

#### Permission Granularity Issues

Special Bit Permissions

Setting the SUID Bit on Files

Setting the SGID Bit on Files

Setting the SGID Bit on Directories

Setting the Sticky Bit

Viewing and Changing File Attributes

Displaying File Attributes

Key File Attributes

Setting File Attributes

Removing File Attributes

### Finding Files by Permission

#### Access Control Lists

Not Enough Granularity

ACLs to the Rescue

Viewing ACLs

Setting an ACL

We All Wear Masks

#### Context-Based Access

Security-Enhanced Linux (SELinux)

SELinux Mode

**SELinux Policy** 

SELinux Booleans

**SELinux Contexts** 



The audit2allow Command

**AppArmor** 

aa-disable Command

aa-complain Command

aa-unconfined Command

/etc/apparmor.d/ Directory

/etc/apparmor.d/tunables Directory

Command-Line Utilities

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Part III: Scripting, Containers and Automation (Obj. 3.1 - 3.5)

### Chapter 13: Automating Tasks via Shell Scripting

Do I Know This Already? Quiz

**Foundation Topics** 

Shell Script Elements

Globbing

#### **Environment Variables and Settings**

The PATH Variable

The SHELL Variable

Variable Expansion

Running a Script

Good Script Design

#### Working with Input/Output Streams

Standard In

Standard Out

Standard Error

Find Errors on Demand

Here Documents



Redirection of Streams

Redirecting Standard Input

Redirecting Standard Output

Redirecting Standard Error

Redirection Redux

Understanding /dev/tty

**Pipes** 

**Executing Multiple Commands** 

Multiple Command Operators

Command Substitution

Splitting Streams with the tee Command

Processing Output with the xargs Command

#### Shell Script Elements

Using the Output of Another Command

Conditionals

**Testing Files** 

An Easier Test Syntax

**Testing Strings** 

**Testing Integers** 

**Combining Multiple Tests** 

case Statements

switch Statements

Loops

For Loops

Sequences

while and until Loops

Interacting with Other Programs

Returning an Error Code

**Accepting Arguments** 

Feeling a Bit (awk)ward

Translating Files

**Cutting Columns** 

He sed, She sed



Using grep and Friends

Getting a grep

Examples of Using grep

**Review Questions** 

Expanding grep with egrep and fgrep

Using Regular Expressions and grep

Pasting and Joining

Finding Files

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

### Chapter 14: Performing Basic Container Operations

Do I Know This Already? Quiz

**Foundation Topics** 

#### Container Management

Installing and Verifying the Container Tools

Installing the Container-Tools Package and Dependencies

Verifying the Podman and Skopeo Tool Installation

Finding and Pulling a Container Image

Finding a Suitable Image

Pulling an Image

Viewing and Inspecting Images

Viewing Local Images

Inspecting a Local Image

Running an Image as a Container

Assigning a Container-Friendly Name

Detaching from and Attaching to Containers

Exiting and Ending Execution of a Container

Removing a Container

Viewing Container Logs

**Exposing and Mapping Ports** 



#### Container Image Operations

build Command

push Command

pull Command

list Command

rmi Command

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 15: Performing Basic Version Control Using Git

Do I Know This Already? Quiz

**Foundation Topics** 

#### **Version Control Concepts**

The First Generation

The Second Generation

What Is a Merge?

The Third Generation

#### Using Git for Version Control

Installing Git

Git Concepts and Features

Git Stages

Choosing Your Git Repository Host

Configuring Git

Using git tag

Getting the Status of Files

The .git Directory

Telling Git to Ignore a File

Handling Branches

**Executing Diffs** 

Comparing Versions



Dealing with Whitespace Comparing Branches Merging Files

Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 16: Understanding Infrastructure as Code

Do I Know This Already? Quiz

**Foundation Topics** 

File Formats

YAML

Key Characteristics of YAML

YAML Stream Examples

**JSON** 

Key Characteristics of JSON

JSON Examples

#### Infrastructure as Code Concepts

Just Making a Config Change

Using Source Control

Getting Started with IaC

Utilities: Infrastructure as Code

IaC Utility Choices

Ansible

Puppet and Chef

Puppet

Chef

SaltStack

Salt Architecture

Salt Master Options

Salt Configuration Locations



Salt State Files
Terraform
Coding
Planning
Applying

#### Continuous Integration/Continuous Deployment

How Can It Be Solved?
Continuous Integration
Continuous Delivery
CI/CD Use Cases

#### Advanced Git Topics

merge rebase

**Pull Requests** 

Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 17: Understanding Containers, Cloud, and Orchestration

Do I Know This Already? Quiz

Foundation Topics

### Kubernetes Benefits and Application Use Cases

What Is Kubernetes, Really?

The High-Level Structure of Kubernetes

Kubernetes Control Plane Structure

Kubernetes Node Structure

Container Runtime Interface

**Specialized Container Types** 

Benefits of Using Kubernetes

#### Single-Node Multicontainer Use Cases

Two-Container Node Example A



Two-Container Node Example B

Three-Container Node Example

#### Container Persistent Storage

**Docker Volumes** 

Advantages of Using Docker Volumes

Disadvantages of Using Docker Volumes

**Bind Mounts** 

Advantages of Using Bind Mounts

Disadvantages of Using Bind Mounts

Kubernetes Persistent Volumes

The Kubernetes PersistentVolume Subsystem

The PV and PVC Lifecycles

#### Container Networks

Whats an Overlay Network?

Docker Swarm

Kubernetes Overlay Networks

**Bridging Networks** 

Swotting a NAT

Host Networking

#### Service Mesh

What Is a Service Mesh?

**Example Service Mesh** 

Istio Components

Commercial Istio Distributions

Non-Istio Service Meshes

#### Bootstrapping

#### Container Registries

What Is a Container Registry?

What About Bigger Teams?

What Are My Container Registry Options?

#### Summary

**Exam Preparation Tasks** 



Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Part IV: Troubleshooting (Obj. 4.1 - 4.5)

### Chapter 18: Analyzing and Troubleshooting Storage Issues

Do I Know This Already? Quiz

Foundation Topics

High Latency Issues

High Latency Overview

Causes and Symptoms of High Latency

Diagnosing and Fixing High Latency

Diagnosing with the top Command

Diagnosing with the vmstat Command

Fixing the Problem

#### Low Throughput Issues

Low Throughput Overview

Causes and Symptoms of Low Throughput

Diagnosing and Fixing Low Throughput

Diagnosing with the df Command

Diagnosing with the iostat Command

#### Input/Output Operations per Second Scenarios

IOPS Overview

Scenario 1: Transferring Ten 500MB Files

Scenario 2: Transferring 5,000 1MB Files

Why IOPS Are Effectively Irrelevant

#### Capacity Issues

Causes and Symptoms of Capacity Issues

Diagnosing and Fixing Capacity Issues

Diagnosing with the df Command

Diagnosing with the du Command

Diagnosing with the find Command

Filesystem Issues



Filesystem Corruption Overview

Causes and Symptoms of Filesystem Corruption

Diagnosing and Fixing Filesystem Corruption

Diagnosing and Fixing Filesystem Corruption with the fsck Command

Summary

Filesystem Mismatch Overview

Causes and Symptoms of File Mismatch

Diagnosing and Fixing File Mismatch

Diagnosing a Mismatch Issue

Fixing a Mismatch Issue

#### I/O Scheduler Issues

I/O Scheduler Overview

Types of I/O Schedulers

Viewing and Setting I/O Schedulers

Viewing the Current I/O Scheduler

Setting the Current I/O Scheduler

Making the I/O Scheduler Change Persistent

#### **Device Issues**

**NVMe Issues Overview** 

Causes and Symptoms of NVMe Issues

Diagnosing and Fixing NVMe Issues

Using the nyme Command-Line Tool

Solid-State Drive Issues Overview

Causes and Symptoms of SSD Issues

Diagnosing and Fixing SSD Issues

SSD Trim

Garbage Collection

The TRIM Helper

**RAID** Issues

Causes and Symptoms of RAID Failures

Diagnosing and Fixing RAID Failures

Overview of Tools

Monitoring and Alerting with smartd



Checking Device Health with smartctl

Monitoring RAID Array Health

Monitoring RAID Array Health with mdadm

#### LVM Issues

LVM Troubleshooting Overview

Causes and Symptoms of LVM Issues

Diagnosing and Fixing LVM Issues

#### Mount Option Issues

Mounting Options Overview

Causes and Symptoms of Mount Options Issues

Diagnosing and Fixing Mount Option Issues

**Understanding Mount Option Gotchas** 

What Are All These UUIDs in My fstab?

What Is This errors= Option?

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 19: Analyzing and Troubleshooting Network Resource Issues

Do I Know This Already? Quiz

**Foundation Topics** 

#### Network Configuration Issues

Causes and Symptoms of Network Configuration Issues

Diagnosing and Fixing Network Configuration Issues

Diagnosing Subnets with the ip Command

Diagnosing Routes Using the ping Command

Diagnosing Routes Using the ip route Command

Diagnosing Routes Using the traceroute Command

#### Firewall Issues

Firewall Refresher

What Could Possibly Go Wrong?

Causes and Symptoms of Firewall Issues



Diagnosing and Fixing Firewall Issues

Diagnosing with the ping Command

Diagnosing with the telnet Command

Making Sure Services Are Running

#### Interface Errors

Dropped Packets and Collisions

Diagnosing and Fixing Issues Related to Dropped Packets and Collisions

Diagnosing with the ethtool Command

Diagnosing with the netstat Command

Diagnosing with the /sys/class/net/<device>/statistics Information

Wrapping Up Dropping Packets

Link Status

Diagnosing and Fixing Link Status Issues

Layer 1: Physical

Layer 2: Data Link

#### **Bandwidth Limitations**

Bandwidth and Latency

Diagnosing and Fixing Bandwidth Limitations

#### Name Resolution Issues

The Trifecta of DNS

Diagnosing and Fixing Name Resolution Issues

#### **Testing Remote Systems**

How (Not) to Break the Law

Purposes of Testing a Remote System

Testing Remote Systems with NMAP

Running a Simple System Scan

Running a Service Discovery Scan

Running a Vulnerability Scan

Testing Remote Systems with s client

Verifying SSL Connection to a Remote System

Other Useful s client Commands

Commands to Use when Connected to a Host

Opening an SSL Connection to a Host



Showing SSL Certificates on a Host

Testing a Particular TLS Version on a Host

Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 20: Analyzing and Troubleshooting CPU and Memory Issues

Do I Know This Already? Quiz

**Foundation Topics** 

#### Runaway and Zombie Processes

Runaway Processes

What Causes Runaway Processes?

Reserving Some CPU for Non-Realtime Processes

Identifying a Runaway Process

**Ending a Runaway Process** 

**Zombie Processes** 

What Causes Zombie Processes?

Are Zombie Processes Bad?

Removing Zombie Processes

#### High CPU Utilization/Load Average/Run Queues

High CPU Utilization

High Load Average

Viewing System Load Details with the uptime Command

High Run Queues

Viewing System Load Details with the tload Command

#### CPU Times and CPU Process Priorities

Measuring CPU Time

Important CPU Time Terms

**CPU Process Priorities** 

#### Memory Exhaustion and Out of Memory

What Is Out of Memory (OOM)?



Memory Leaks

The Process Killer

#### Swapping

Swap, Caching, and Buffers

Blocks and Buffers

Pages, Slabs, and Caches

How Much Swap Is Enough?

#### Hardware

Viewing CPU Info

Viewing Memory Info

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

**Define Key Terms** 

**Review Questions** 

### Chapter 21: Analyzing and Troubleshooting User and File Permissions

Do I Know This Already? Quiz

Foundation Topics

#### User Login Issues

Inspecting Account Details

**ID Please** 

Get Entity

Case-Sensitivity

Has the User Ever Logged In?

The last Command

The lastlog Command

#### User File Access Issues

Group Issues

Context Issues

Permission Issues

**ACL Issues** 

Attribute Issues



Policy/Non-Policy Issues

#### Password Issues

The faillog Command

/etc/security.access.conf

### Privilege Elevation Issues

#### Quota Issues

Possible Files or Entirety of Blocks?

Converting to Usable Numbers

#### Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

# Chapter 22: Analyzing and Troubleshooting Common Problems Using Systemd

Do I Know This Already? Quiz

**Foundation Topics** 

#### Unit Files

Service Unit File Issues

**Networking Services** 

ExecStart and ExecStop

Before and After

Type

User

Requires and Wants

Timer Unit File Issues

OnCalendar

OnBootSec

Unit

Time Expressions

Mount Unit File Issues

Naming Conventions



What

Where

Type

Options

Target Unit File Issues

Default

Multiuser

Network-online

Graphical

#### Common Problems

Name Resolution Failure

**Application Crash** 

Time-Zone Configuration

**Boot Issues** 

Journal Issues

Services Not Starting on Time

Summary

**Exam Preparation Tasks** 

Review All Key Topics

Define Key Terms

**Review Questions** 

### Chapter 23: Final Preparation

**Exam Information** 

Getting Ready

#### Tools for Final Preparation

Pearson Test Prep Practice Test Software and Questions on the Website

Accessing the Pearson Test Prep Practice Test Software Online

Accessing the Pearson Test Prep Practice Test Software Offline

Customizing Your Exams

**Updating Your Exams** 

Premium Edition

Chapter-Ending Review Tools



Suggested Plan for Final Review/Study Summary

Appendix A: Answers to the Do I Know This Already?

Quizzes and Review Questions

### Glossary

Α

В

С

D

Ε

F

G

Н

ı

J

K

ı

Μ

Ν

0

Ρ

Q

R

S

Т

U

٧

Ζ

Index

Online Elements

Appendix B: Study Planner