

PEARSON IT
CERTIFICATION

Save 10%
on Exam
Voucher

See Inside


Practice
Tests


Video
Training


Flash
Cards


Review
Exercises


Labs


Interactive
Study Guide


Study
Planner

Cert Guide

Advance your IT career with hands-on learning

CompTIA®

Network+

N10-008



ANTHONY SEQUEIRA
CCIE® NO.15626

In addition to the wealth of content and exam preparation exercises, this edition includes a series of free hands-on exercises to help you master several real-world configuration and troubleshooting activities. These exercises can be performed on the **CompTIA Network+ N10-008 Hands-on Lab Simulator Lite** software, included free on the companion website that accompanies this book. This software, which simulates the experience of configuring real operating systems and network devices, contains the following 14 free lab exercises:

1. Network Topologies
2. Matching Well-Known Port Numbers
3. TCP/IP Protocols and Their Functions
4. Network Application Protocols
5. OSI Model Layer Functions
6. Contrast Virtualization Technologies and Services
7. Using ARP to Discover a MAC Address
8. IPv4 Address Types and Classes
9. Configuring a Client Network Adapter with an IPv4 Address
10. Configuring a Small Office/Residential Router—Network User Security Settings
11. Matching Wireless Standards and Terminology
12. Using ipconfig, ping, arp, tracert Together to Troubleshoot Connectivity
13. Security Appliance Terminology and Methods
14. Troubleshooting Practice

CompTIA Network+ N10-008 Hands-on Lab Simulator Minimum System Requirements:

Windows: Microsoft Windows 10, Windows 8.1; Intel Pentium III or faster; 512 MB RAM (1GB recommended); 1.5 GB hard disk space; 32-bit color depth at 1024x768 resolution

Mac: Apple macOS, 11, and 10.15; Intel Core Duo 1.83 Ghz or faster; 512 MB RAM (1 GB recommended); 1.5 GB hard disk space; 32-bit color depth at 1024x768 resolution

Other applications installed during installation: Adobe AIR 3.8; Captive JRE 6

CompTIA Network+ N10-008 Cert Guide

Table of Contents

Cover

Title Page

Copyright Page

Contents at a Glance

Table of Contents

Introduction

Part I: Networking Fundamentals

Chapter 1 The OSI Model and Encapsulation

Foundation Topics

The Purpose of Reference Models

The OSI Model

Layer 1: The Physical Layer

Layer 2: The Data Link Layer

Media Access Control

Logical Link Control

Layer 3: The Network Layer

Layer 4: The Transport Layer

Layer 5: The Session Layer

Layer 6: The Presentation Layer

Layer 7: The Application Layer

The TCP/IP Stack

Layers of the TCP/IP Stack

Common Application Protocols in the TCP/IP Stack

Real-World Case Study

Summary

Table of Contents

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Complete Chapter 1 Hands-On Labs in Network+ Simulator Lite

Additional Resources

Review Questions

Chapter 2 Network Topologies and Types

Foundation Topics

Defining a Network

The Purpose of Networks

Network Types and Characteristics

LAN

WAN

WLAN

SAN

Other Categories of Networks

CAN

MAN

PAN

Software-Defined Wide Area Network (SD-WAN)

Multiprotocol Label Switching

Multipoint Generic Routing Encapsulation (mGRE)

Networks Defined Based on Resource Location

Client/Server Networks

Peer-to-Peer Networks

Networks Defined by Topology

Physical Versus Logical Topology

Bus Topology

Ring Topology

Star Topology

Hub-and-Spoke Topology

Full-Mesh Topology

Table of Contents

Partial-Mesh Topology

Service-Related Entry Points

Virtual Network Concepts

Virtual Servers

Virtual Routers and Firewalls

Virtual Switches (vSwitches)

Virtual Desktops

Other Virtualization Solutions

Provider Links

Satellite

Digital Subscriber Line

Cable Modem

Leased Line

T1

E1

T3

E3

Metro-optical

Synchronous Optical Network

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Chapter 3 Network Media Types

Foundation Topics

Copper and Fiber Media and Connectors

Coaxial Cable

Twisted-Pair Cable

Table of Contents

- Shielded Twisted Pair
- Unshielded Twisted Pair
- Twisted-Pair Cable Connectors
- Plenum Versus Nonplenum Cable
- Fiber-Optic Cable
- Multimode Fiber
- Single-Mode Fiber
- Fiber-Optic Cable Connectors
- Fiber Connector Polishing Styles
- Ethernet and Fiber Standards
- Distance and Speed Limitations
- Transceivers

Multiplexing in Fiber-Optic Networks

Cable Management

- Media Converters

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Chapter 4 IP Addressing

Foundation Topics

Binary Numbering

- Principles of Binary Numbering
- Converting a Binary Number to a Decimal Number
- Converting a Decimal Number to a Binary Number
- Binary Numbering Practice
- Binary Conversion Exercise 1
- Binary Conversion Exercise 1: Solution

Table of Contents

Binary Conversion Exercise 2
Binary Conversion Exercise 2: Solution
Binary Conversion Exercise 3
Binary Conversion Exercise 3: Solution
Binary Conversion Exercise 4
Binary Conversion Exercise 4: Solution

IPv4 Addressing

IPv4 Address Structure
Classes of Addresses
Types of Addresses
Unicast
Broadcast
Multicast

Assigning IPv4 Addresses

IP Addressing Components
Static Configuration
Dynamic Configuration
BOOTP
DHCP
Automatic Private IP Addressing

Subnetting

Purpose of Subnetting
Subnet Mask Notation
Subnet Notation: Practice Exercise 1
Subnet Notation: Practice Exercise 1 Solution
Subnet Notation: Practice Exercise 2
Subnet Notation: Practice Exercise 2 Solution
Extending a Classful Mask
Borrowed Bits
Calculating the Number of Created Subnets
Calculating the Number of Available Hosts
Basic Subnetting Practice: Exercise 1
Basic Subnetting Practice: Exercise 1 Solution

Table of Contents

Basic Subnetting Practice: Exercise 2

Basic Subnetting Practice: Exercise 2 Solution

Calculating New IP Address Ranges

Advanced Subnetting Practice: Exercise 1

Advanced Subnetting Practice: Exercise 1 Solution

Advanced Subnetting Practice: Exercise 2

Advanced Subnetting Practice: Exercise 2 Solution

Additional Practice

Classless Interdomain Routing

Address Translation

NAT

PAT

IP Version 6

Need for IPv6

IPv6 Address Structure

IPv6 Address Types

IPv6 Data Flows

Unicast

Multicast

Anycast

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Complete Chapter 4 Hands-On Labs in Network+ Simulator Lite

Additional Resources

Review Questions

Chapter 5 Common Ports and Protocols

Foundation Topics

Ports and Protocols

Table of Contents

DHCP (Dynamic Host Configuration Protocol)

DNS (Domain Name System)

FTP (File Transfer Protocol)

H.323

HTTP

HTTPS

IMAP

IMAP over SSL

LDAP

LDAPS

MGCP

MySQL

NTP

POP3

POP3 over SSL

RDP

SFTP

SIP

SMB

SMTP

SMTP TLS

SNMP

SSH

SQLnet

Structured Query Language (SQL) Server

Syslog

Telnet

TFTP

Protocol/Port Summary

IP Protocol Types

Transmission Control Protocol (TCP)

User Datagram Protocol (UDP)

Internet Control Message Protocol (ICMP)

Generic Routing Encapsulation (GRE)

Table of Contents

Internet Protocol Security (IPsec)

TCP/IP Suite Protocol Summary

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Chapter 6 Network Services

Foundation Topics

DHCP

DNS

NTP

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Chapter 7 Corporate and Datacenter Architectures

Foundation Topics

The Three-Tiered Network Architecture

The Access/Edge Layer

The Distribution/Aggregation Layer

The Core Layer

Software-Defined Networking

Spine and Leaf

Table of Contents

Storage Area Networks
Deciding on an Architecture
Real-World Case Study
Summary
Exam Preparation Tasks
Review All the Key Topics
Define Key Terms
Additional Resources
Review Questions

Chapter 8 Cloud Concepts

Foundation Topics
Deployment Models
Service Models
Key Cloud Concepts

- Infrastructure as Code (IaC)
- Connectivity Options
- Multitenancy
- Elasticity
- Scalability
- Cloud Security

Real-World Case Study
Summary
Exam Preparation Tasks
Review All the Key Topics
Define Key Terms
Additional Resources
Review Questions

Part II: Network Implementations

Chapter 9 Various Network Devices

Foundation Topics

Table of Contents

Networking Devices

- Hubs
- Bridges
- Layer 2 Switch
- Layer 3 Capable Switch
- Routers
- Access Points
- Wireless LAN Controller
- Load Balancer
- Cable Modem
- DSL Modem
- VPN Headend
- Proxy Servers
- Firewalls
- Intrusion Detection and Prevention
- IDS Versus IPS
- IDS and IPS Device Categories
- Networking Device Summary

Networked Devices

- Voice over IP Protocols and Components
- Printer
- Physical Access Control Devices
- Cameras
- Heating, Ventilation, and Air Conditioning (HVAC) Sensors
- Technologies for the Internet of Things
- Industrial Control Systems/Supervisory Control and Data Acquisition (SCADA)

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Table of Contents

Additional Resources

Review Questions

Chapter 10 Routing Technologies and Bandwidth Management

Foundation Topics

Routing

Sources of Routing Information

- Directly Connected Routes

- Static Routes

- Dynamic Routing Protocols

Routing Protocol Characteristics

- Believability of a Route

- Metrics

- Interior Versus Exterior Gateway Protocols

- Route Advertisement Method

- Distance Vector

- Link State

Routing Protocol Examples

Bandwidth Management

- Introduction to QoS

- QoS Configuration Steps

- QoS Components

- QoS Mechanisms

- Policing and Traffic Shaping

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Table of Contents

Chapter 11 Ethernet Switching

Foundation Topics

Principles of Ethernet

Ethernet Origins

Carrier-Sense Multiple Access with Collision Detection

Distance and Speed Limitations

Ethernet Switch Features

Virtual LANs

Switch Configuration for an Access Port

Trunks

Switch Configuration for a Trunk Port

Spanning Tree Protocol

Corruption of a Switchs MAC Address Table

Broadcast Storms

STP Operation

Link Aggregation

LACP Configuration

Power over Ethernet

Port Monitoring

Port Mirroring Configuration

User Authentication

Management Access and Authentication

First-Hop Redundancy

Other Switch Features

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Table of Contents

Chapter 12 Wireless Standards

Foundation Topics

Introducing Wireless LANs

WLAN Concepts and Components

Wireless Routers

Wireless Access Point

Antennas

Frequencies and Channels

CSMA/CA

Transmission Methods

WLAN Standards

802.11a

802.11b

802.11g

802.11n (Wi-Fi 4)

802.11ac (Wi-Fi 5)

802.11ax (Wi-Fi 6)

802.11x Standard Summary

Deploying Wireless LANs

Types of WLANs

IBSS

BSS

ESS

Mesh Topology

Sources of Interference

Wireless AP Placement

Securing Wireless LANs

Security Issues

Approaches to WLAN Security

Security Standards

WEP

WPA

WPA2

Table of Contents

Additional Wireless Options

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resources

Review Questions

Part III: Network Operations

Chapter 13 Ensure Network Availability

Foundation Topics

Monitoring Tools

Performance Metrics/Sensors

SNMP

Additional Monitoring Topics

Syslog

Logs

Application Logs

Security Logs

System Logs

Environmental Monitor

Interface Statistics/Status

NetFlow

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Table of Contents

Additional Resources

Review Questions

Chapter 14 Organizational Documents and Policies

Foundation Topics

Plans and Policies

- Change Management

- Incident Response Plan

- Disaster Recovery and Business Continuity Policies

- System Life Cycle

Hardening and Security Policies

- Password Policy

- Security Policies

- Data Loss Prevention

- Remote Access Policies

- Bring-Your-Own-Device (BYOD) Policy

- Acceptable Use Policy (AUP)

- Safety Procedures

- Privileged User Agreement (PUA)

- Onboarding/Offboarding Procedures

- Licensing Restrictions

- International Export Controls

- Non-Disclosure Agreement (NDA)

Common Documentation

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Chapter 15 High Availability and Disaster Recovery

Table of Contents

Foundation Topics

High Availability

- High Availability (HA) Measurement
- MTTR, MTBF, RTO, and RPO
- Fault-Tolerant Network Design
- Hardware Redundancy
- Layer 3 Redundancy
- Design Considerations for High-Availability Networks
- High-Availability Best Practices
- Content Caching
- Load Balancing
- Hardware Redundancy

Real-World Case Study: SOHO Network Design

- Case Study Scenario
- Suggested Solution
- IP Addressing
- Layer 1 Media
- Layer 2 Devices
- Layer 3 Devices
- Wireless Design
- Environmental Factors
- Cost Savings Versus Performance
- Topology

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Part IV: Network Security

Chapter 16 Common Security Concepts

Table of Contents

Foundation Topics

Core Security Concepts

- Confidentiality, Integrity, and Availability (CIA)

- Confidentiality

- Symmetric Encryption

- Asymmetric Encryption

- Integrity

- Availability

- Threats, Vulnerabilities, and Exploits

- Threats

- Vulnerabilities

- Exploits

- Least Privilege

- Role-Based Access

- Zero Trust

- Defense in Depth

- Network Segmentation Enforcement

- Screened Subnet

- Separation of Duties

- Network Access Control

- Honeypot

Authentication Methods

- Multifactor

- TACACS+

- Single Sign-On

- RADIUS

- LDAP

- Kerberos

- Local Authentication

- 802.1X

- EAP

Risk Management and SIEM

- Risk Management

Table of Contents

- Security Risk Assessments
 - Threat Assessment
 - Vulnerability Assessment
 - Penetration Testing
 - Posture Assessment
 - Business Risk Assessment
 - Process Assessment
 - Vendor Assessment
- Security Information and Event Management (SIEM)

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Chapter 17 Common Types of Attacks

Foundation Topics

Technology-Based Attacks

- Denial of Service
 - Distributed Denial of Service
 - On-Path Attack (Formerly Known as Man-in-the-Middle Attack)
 - DNS Poisoning
 - VLAN Hopping
 - ARP Spoofing
 - Rogue DHCP
 - Rogue Access Point
 - Evil Twin
 - Ransomware
- Password Attacks
- MAC Spoofing
- IP Spoofing

Table of Contents

Deauthentication

Malware

Human and Environmental Attacks

Other Miscellaneous Attacks

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Complete Chapter 17 Hands-On Lab in Network+ Simulator Lite

Additional Resources

Review Questions

Chapter 18 Network Hardening Techniques

Foundation Topics

Best Practices

Wireless Security and IoT Considerations

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Chapter 19 Remote Access Methods

Foundation Topics

Virtual Private Networks (VPNs)

Overview of IPsec with IKEv1

IKE Modes and Phases

Authentication Header and Encapsulating Security Payload

The Five Steps in Setting Up and Tearing Down an IPsec Site-to-Site VPN Using IKEv1

Table of Contents

IKEv2

Other VPN Technologies

Other Remote Access Technologies

Authentication and Authorization Considerations

In-Band vs. Out-of-Band Management

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Complete Chapter 19 Hands-On Lab in Network+ Simulator Lite

Additional Resources

Review Questions

Chapter 20 Physical Security

Foundation Topics

Detection Methods

Prevention Methods

Asset Disposal

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Part V: Network Troubleshooting

Chapter 21 A Network Troubleshooting Methodology

Foundation Topics

Table of Contents

Troubleshooting Basics

- Troubleshooting Fundamentals

- Structured Troubleshooting Methodology

Real-World Case Study

- Summary

- Exam Preparation Tasks

- Review All the Key Topics

- Complete Tables and Lists from Memory

- Define Key Terms

- Additional Resource

- Review Questions

Chapter 22 Troubleshoot Common Cabling Problems

- Foundation Topics

- Specifications and Limitations

- Cable Considerations and Applications

- Common Issues

- Common Tools

- Real-World Case Study

- Summary

- Exam Preparation Tasks

- Review All the Key Topics

- Define Key Terms

- Additional Resources

- Review Questions

Chapter 23 Network Software Tools and Commands

- Foundation Topics

- Software Tools

 - WiFi Analyzer

 - Protocol Analyzer/Packet Capture

 - Bandwidth Speed Tester

Table of Contents

Port Scanner

iperf

NetFlow Analyzers

TF TP Server

Terminal Emulator

IP Scanner

Command Line Tools

ping

ping with IPv6

ipconfig

ifconfig

ip

nslookup

dig

tracert

tracert for IPv6

arp

netstat

hostname

route

telnet

tcpdump

nmap

Basic Network Platform Commands

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Complete Tables and Lists from Memory

Define Key Terms

Additional Resource

Review Questions

Table of Contents

Chapter 24 Troubleshoot Common Wireless Issues

Foundation Topics

Specifications and Limitations

Considerations

Antennas

Frequencies and Channels

Other Considerations

Common Issues

Wireless Network Troubleshooting

Wireless Network Troubleshooting Solution

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Review Questions

Chapter 25 Troubleshoot General Network Issues

Foundation Topics

Considerations for General Network Troubleshooting

Common Issues

Real-World Case Study

Summary

Exam Preparation Tasks

Review All the Key Topics

Define Key Terms

Additional Resources

Review Questions

Part VI: Final Preparation

Chapter 26 Final Preparation

Table of Contents

Tools for Final Preparation

Video Training

Memory Tables

Simulations and Performance-Based Exercises

End-of-Chapter Review Tools

Suggested Plan for Final Review and Study

Strategies for Taking the Exam

Summary

Glossary of Key Terms

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

Table of Contents

T

U

V

W

X

Z

APPENDIX A: Answers to Review Questions

APPENDIX B: CompTIA Network+ (N10-008) Cert Guide Exam
Updates

Index