Understanding Networking Fundamentals Training

Duration: **5 Day**

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Overview

A strong foundation of basic networking concepts is fundamental to a successful career in information technology. Networking technologies underlie all IT activities and a strong comprehension of the hardware and protocols used to create networks is essential to future success. In this course, you will learn how to configure a workstation to connect to a network, analyze network traffic using a protocol analyzer, examine switch and router configurations, perform basic IPv4 addressing and subnetting, and research network security solutions. You will gain an understanding of basic network functions, standards, and protocols, to prepare you to tackle advanced networking skills.

Prerequisites

There are no prerequisites for this course.

Who Should Attend

- New IT professionals who want to learn the basics of a structured, layered approach to networking, including the fundamentals of network hardware and components, network protocols, IP addressing and subnetting, and various tools used in network monitoring and troubleshooting. Ideal candidates include:
- Entry-level and newly hired technical professionals, including PC support, help desk, and networking professionals
- Sales and marketing professionals looking to increase their ability to communicate with technical professionals and increase sales
- Technical professionals looking to strengthen core skill before pursuing advanced topics and certifications

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What You Will Learn

- Basics of layered network protocols and compare the two primary reference models: OSI and TCP/IP
- Inspect a structured cabling system, including the proper use and installation of UTP and fiber optic cables
- Configure a workstation to connect to a network
- Ethernet operations and the use of VLANs by examining the configuration and operation of switches on a network
- Spanning Tree operation as a method of eliminating broadcast storms on a switched network
- Configure a Wi-Fi router for operation on a SOHO network, including security, SSID, and Wi-Fi channel
- Various IP addressing considerations, including binary to decimal conversion, dotted decimal notation, classful vs. classless addressing, private vs. public addresses, and the use of network masking
- Create a subnet for a small network, selecting the correct masks for various situations to accommodate the current number of hosts in each subnet and to also allow for future growth
- Operation of various TCP/IP protocols on a network, including connectionless and connection-oriented communications using UDP and TCP, translation between private and public addresses using NAT, and support protocols such as ARP, DNS, and DHCP
- Router configurations to determine the function of various routing protocols, including RIP, IGRP, and OSPF, within and between networks
- Various WAN technologies, including circuit switched solutions such as leased lines and packet switched solutions such as Carrier Ethernet, and determine the best WAN connectivity solution for a given corporate network
- Use a protocol analyzer to capture and view network traffic, including e-mail, instant message exchanges, and web transactions
- Basic network security implementations by testing the impact a router that has been configured as a firewall has on the flow of traffic through a network
- Research the suitability of popular anti-malware suites for mitigating network security threats
- Research Mobile Device Management (MDM) solutions to support BYOD deployments

Outline

1. Network Overview

- Defining a Network
- Reasons to Use a Network
- Network Components
- End Devices
- Operating Systems
- Network Infrastructure
- Network Types
- Network Services

2. Network Functions and Standards

- Generic Network Functions
- Standards Organizations
- Institute of Electrical and Electronics Engineers (IEEE)

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- Common WAN Serial Interface Standards
- Internet Organizations
- Internet Standards Process
- OSI Model Overview
- TCP/IP Model

3. Local Signaling Media

- Serial Cabling Specifications
- Media Interface Specifications
- DCE and DTE Specifications
- Twisted-Pair Cabling Specifications
- Cable Runs
- Unshielded Twisted Pair Cabling
- Half-Duplex and Full-Duplex Operation
- Seven Keys to Successful UTP Wiring
- Fiber Optic Cabling Systems
- Fiber Optic Cabling Types
- Wireless Networking Systems
- Wireless Network Preparation
- Cellular Modem

4. Ethernet

- Ethernet Overview
- Network Interface Cards
- Ethernet Addressing
- Ethernet Standards
- 10 Mbps Ethernet Connectivity Options
- 100 Mbps Ethernet Connectivity Options
- Gigabit Ethernet Overview
- 10 Gigabit Ethernet Connectivity Options
- 40 Gigabits and 100 Gigabits
- Ethernet Version II Frame Structure
- Ethernet Type Field
- IEEE 802.3 with 802.2 Frame Format
- Captured Frame Displayed by a Protocol Analyzer
- Ethernet Equipment Overview
- Ethernet Ports and Connectors
- Ethernet Switches
- Routers
- Integrating 10, 100, and 1,000 Mbps and 10 Gbps Ethernet
- Ethernet Performance Issues

5. Switching

- Switching Overview
- Current Switch Installations
- Switch Operation Overview
- The Learning Process
- The Flooding Process Part1
- The Forwarding and Filtering Process
- The Flooding Process Part 2

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- Switch Loop Problems
- Switch Configuration
- Port Security
- Spanning Tree Algorithm Overview
- STA Root Switch Election
- STA Path Selection
- Spanning Tree Timers
- STA Self-Healing Ability
- VLAN Overview
- VLAN Configuration
- VLAN Operation
- VLANs on Multiple Switches
- Switch Troubleshooting

6. Logical Addressing

- Logical Address Overview
- Binary Numbering
- Converting Binary to Decimal
- Converting Decimal to Binary
- Conversion Practice
- Dotted Decimal Notation
- Logical Address Types
- Class-Based Addressing
- Network-Specific Addresses
- Reserved Addresses
- Private Addresses
- Network Masking
- Classless Addressing

7. Address Resolution Protocol (ARP)

- Address Resolution Overview
- ARP Process
- ARP Messages
- ARP Cache
- Duplicate MAC Addresses
- Gratuitous ARP
- Proxy ARP
- ARP Restrictions
- ARP Command

8. Network Layer Process

- Logical Addressing
- Network Loop Handling
- Routing Decision-Making
- Path Control
- Multicast Management
- Communication Flexibility
- Multiplexing
- Data Length Management
- Quality of Service

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- Data Receipt Verification
- Diagnostics
- Logical Error Review

9. Subnetting

- Subnetting Overview
- Communication Between Hosts
- IP Address and Mask
- Subnetting Basics
- Subnet Rules
- Subnetting Decisions
- Four Key Addresses
- Case Study
- Onageristic Analysis Inc.
- Masking for Subnets
- Masking for Interfaces
- Headquarters Addressing
- East Addressing
- West Addressing
- WWAN Addressing

10. Routing

- Routing Overview
- Logical Segmentation
- Static Links vs. Dynamic Routing
- Router Configuration Overview
- Routing Protocols
- Routing Metrics
- Routing Decisions
- Routing Protocol Operation
- Routing Information Protocol
- RIP Routing Tables
- Open Shortest Path First (OSPF)
- Enhanced Interior Gateway Routing Protocol (EIGRP)
- Border Gateway Protocol (BGP)

11. WAN Overview

- WAN Overview
- Telecommunications Infrastructure
- Connection Types: PVC and SVC
- WAN Technologies
- WAN Circuit-Switching
- Wide Area Transmission Rates
- SONET
- Leased Lines
- WAN Packet-Switching
- Packet-Switching Networks
- Metro/Carrier Ethernet
- X.25 Overview
- Frame Relay Overview

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12. Host-to-Host Handling

- Process Identification
- Application Port Numbering
- Temporary Ports
- Port Address Translation
- Connectionless Function
- Connectionless Support
- Connection-Based Functions
- Connection Handshake
- Connection Shutdown

13. Supporting Processes

- Dynamic Host Configuration Protocol
- Four-Step IP Addressing Process
- Domain Name System
- Internet Naming Hierarchy
- Top-Level Domains
- Country Domains
- Dynamic DNS
- ICMP Overview
- The ping Command
- Variation Reports

14. NetBIOS and NetBEUI

- A Historical Perspective
- What is NetBIOS
- NetBIOS Services
- NetBIOS vs. NetBEUI
- NetBIOS over TCP/IP
- Server Message Block
- SMB Security
- NetBIOS Limitations
- The net Commands
- The nbtstat Command

15. Security

- Network Security Overview
- Network Security Assessment
- Attack Types
- Hackers and Attackers
- Authentication
- Enciphering
- Intrusion Detection Systems
- Content Filtering
- Firewalls
- Personal Firewalls
- Packet Filters
- Proxy Servers
- Stateful Inspection Firewalls

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- Security Levels
- Single-Layer Protection
- Double-Layer Protection
- Triple-Layer Protection
- Virtual Private Networks (VPNs)
- Develop a Security Plan
- Vulnerability Assessment

16. User and Manager Processes

- User and Manager Processes Overview
- Terminal Emulation
- File Transfer
- Connection-Based File Transfer
- Connectionless File Transfer
- E-Mail
- Sending E-Mail
- Retrieving E-Mail
- Web Browsing
- Uniform Resource Locator
- Network Management

17. Wireless LANs

- Wireless LAN Overview
- Wireless LAN Components
- Wireless Design Issues
- Wireless LAN Standards
- IEEE 802.11b
- IEEE 802.11a
- IEEE 802.11g
- IEEE 802.11n
- Wi-Fi Alliance
- Wireless Security
- Basic Security Steps
- Wired Equivalent Privacy
- Wi-Fi Protected Access
- Wi-Fi Protected Access 2
- Standard Optional Solutions
- Cellular Wi-Fi Router

18. Instant Communications

- Instant Messaging Overview
- Integrated Communications
- Presence Awareness
- Security Issues
- Sarbanes-Oxley (SOX) Act
- Standards
- SIMPLE
- XMPP
- Short Message Service
- SMS Center

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- Enhanced Messaging Service
- Multimedia Messaging Service
- Potential Future

19. Networking Advances

- Internet Protocol Version 6 (IPv6)
- IPv6 Addressing
- Internet2
- What is Unified Communications
- UC Components
- Unified Messaging
- Presence
- Web Conferencing
- Voice over Internet Protocol (VoIP)
- Voice over IP
- Uses for VoIP
- Why VoIP Instead of Traditional Voice
- IPTV
- Streaming
- Protocol Decisions