CISCO NETWORKING ACADEMY PROGRAM CURRICULUM
SCOPE & SEQUENCE

Semester 4 version 2.1

Course Description:
The Cisco Networking Academy Program consists of four semesters. The program is designed to teach students the skill they will need to design, build, and maintain small to medium size networks. This provides them with the opportunity to enter the workforce end/or further their education and training in the computer networking field.

CHAPTER 1

LAN Switching
- Congestion and bandwidth
- Why segment LANs?
- Segmentation with LAN switches
- LAN switching overview
- How a LAN switch learns addresses
- Symmetric switching
- Asymmetric switching
- Two switching methods

Virtual LANs
- Introduction to VLANs
- Frame filtering
- Frame tagging
- VLANs establish broadcast domains
- Port-centric virtual LANs
- Static VLANs
- Dynamic VLANs

LAN Design
- LAN design goals
- Design methodology
- What problem are you trying to solve?
- Developing a LAN topology
- Developing Layer 1 LAN topology
- Extended star topology
- Developing Layer 2 LAN topology
- Layer 2 switching
- Layer 3 router for segmentation
- Server placement

Routing Protocols
- Dynamic routing operations
- Representing distance with metrics
- Classes of routing protocols
- One issue: time to convergence
- Distance vector concept
- Interior or exterior routing protocols
- Interior IP routing protocols
- IGRP overview
- IGRP configuration
- IGRP configuration example

Access Control Lists
- What are access lists
- How access lists work
- A list of tests: deny or permit
- How to identify access lists
- Testing packets with access lists
- How to use wildcard mask bits
- How to use the wildcard any
- How to use the wildcard host
- Where to place IP access lists

IPX Routing
- Cisco routers in NetWare networks
- Novell NetWare protocol suite
- Novell IPX addressing
- Cisco encapsulation names
- Novell uses RIP for routing
- SAP service advertisements
- GNS get nearest server protocol
- Novell IPX configuring tasks
- Verifying IPX operation

CHAPTER 2

Upon completion of this chapter, students will be able to perform tasks related to:

WAN Technology
- WAN services
- CPE, demarc, "last-mile", CO switch, and toll network
- WAN virtual circuits
- WAN line types

WAN Devices
- Fundamental WAN devices
- Routers and switches on a WAN
- Modems on a WAN
- CSU/DSUs on a WAN
- ISDN terminal adapters on a WAN

How WANs Relate to the OSI Model
- Organizations that deal with WAN standards
- WAN physical layer standards
- Name, and briefly describe, six WAN data link encapsulations.

WAN Encapsulation Formats
- Serial line frame fields
- PPP
- HDLC

WAN Link Options
- Two basic WAN link options
- Dedicated lines
- Leased lines
- Packet-switched connections
- Frame Relay
- Circuit-switched connections
- DDR
- ISDN

CHAPTER 3

Upon completion of this chapter, students will be able to perform tasks related to:

WAN Communication
- WAN design requirements
- LAN/WAN integration issues

The First Steps in WAN Design
- WAN design goals
- The gathering requirements phase of WAN design
- Analyzing requirements
- WAN sensitivity testing

How to Identify and Select Networking Capabilities
- The use of the OSI model in WAN design
- A hierarchical WAN design model
- Three hierarchical WAN design layers
- Describe the three-layer design model components.
- Core layer functions
- Distribution layer functions
- Access layer functions
- One-layer network designs
- Two-layer network designs
- The benefits of hierarchical WAN designs
- Server placement in WANs
- Alternatives to dedicated WAN links

CHAPTER 4

Upon completion of this chapter, students will be able to perform tasks related to:

PPP
- The need for PPP
- PPP components
- PPP layer functions
- The six fields of a PPP frame

PPP Session Establishment
- The four phases through which PPP establishes a point-to-point connection
- Phase 1: link establishment and configuration negotiation
- Phase 2: link-quality determination
- Phase 3: network-layer protocol configuration negotiation
- Phase 4: link termination

PPP Authentications
- PAP
- CHAP
- Writing the IOS command steps to configure PPP authentication
- Writing the IOS commands to configure CHAP authentication

CHAPTER 5

Upon completion of this chapter, students will be able to perform tasks related to:

ISDN
- What is ISDN

- Basic ISDN components
- ISDN reference points
- ISDN switches and SPIDs
- Differentiate between E, I, and Q ISDN protocols

How ISDN Relates to the OSI Model
- ITU-T standards of the first three layers of ISDN
- ISDN physical layer
- ISDN data link layer
- ISDN network layer
- ISDN encapsulation

ISDN Uses
- Three uses for ISDN
- ISDN remote nodes
- ISDN SOHO connectivity

ISDN Services: BRI and PRI
- ISDN BRI and ISDN PRI
- How BRI connectivity is established

ISDN Configuration Tasks
- ISDN global and interface parameter configuration tasks
- Write the IOS commands to configure ISDN BRI
- Writing the IOS commands to define an ISDN switch type
- Write the IOS commands pertaining to SPIDs
- Write the IOS commands for a complete ISDN BRI configuration
- Describe how to confirm BRI operations

Dial On Demand Routing
- DDR considerations
- Writing IOS commands pertaining to verifying DDR operation
- Write IOS commands pertaining to troubleshooting DDR operation

CHAPTER 6

Upon completion of this chapter, students will be able to perform tasks related to:

Frame Relay Technology
- Give an overview of Frame Relay technology
- Local access rate, DLCI, LMI, CIR, committed burst, excess burst, FECN, BECN, and DE
- Frame Relay operation
- Frame Relay DLCIs
- The fields of the Frame Relay frame format
- Frame Relay addressing

LMI: Cisco's Implementation of Frame Relay
- LMI operation
- The fields of the LMI frame format

LMI Features
- Global addressing
- Multicasting and Inverse ARP
- Frame Relay mapping
- Frame Relay switching tables

Frame Relay Subinterfaces
- What are Frame Relay subinterfaces?
- Split horizon routing environments

- The resolution of point-to-point and multipoint reachability issues

The Configuration of Basic Frame Relay
- Writing the IOS command sequence to completely configure Frame Relay
- The commands for verifying Frame Relay operation
- The steps you must use to confirm that the Frame Relay line is up
- The steps you must use to confirm Frame Relay maps
- The steps you must use to confirm connectivity to the central site router
- The steps you must use to configure the serial interface for a Frame Relay connection
- The steps you must use to verify a Frame Relay configuration
- The steps you must use to configure Frame Relay subinterfaces
- Optional Frame Relay commands

CHAPTER 7

The Administrative Side of Network Management
- What does a network look like?
- Understanding and establishing the boundaries of the network
- Costs of a network
- Error report documentation

Monitoring the Network
- Why is it necessary to monitor a network?
- Connection monitoring
- Simple network management protocol
- Remote monitoring (RMON)

Troubleshooting Networks
- Problem solving
- Troubleshooting methods
- Software tools

CHAPTER 8

Upon completion of this chapter, students will be able to perform tasks related to:

Basic Networking Knowledge
- Star, bus, mesh, and ring topologies
- Segments and backbones
- The major network operating systems (NOS): Microsoft Windows NT, Novell NetWare, and Unix
- The clients that best serve specific network operating systems and their resources
- The directory services of the major network operating systems
- IP, IPX, and NetBEUI and associate them with their functions Internet Protocol (IP)
- Mirroring, duplexing, striping, volumes, tape backup
- The OSI model and the protocols, services, functions that pertain to each layer
- Cat 3, Cat 5, fiber optic, UTP, and STP
- 10Base2, 10Base5, 10Base-T, 100Base-T, 100Base-TX, 100BaseVG-AnyLAN
- Full and half-duplexing, WAN and LAN; server, workstation, and host; server-based networking and peer-to-peer networking; cable, NIC, and router; broadband and baseband; Gateway (as both a default IP router and as a method to connect dissimilar systems or protocols)

Physical Layer
- Troubleshooting the physical Layer when you have network problems after installing or replacing a NIC
- Hubs, MAUs, switching hubs (switches), repeaters, transceivers

Data Link Layer
- Bridges, what they are and why they are used
- The 802 specifications
- The function and characteristics of MAC addresses

Network Layer
- Routing occurs at the network layer
- The difference between a router and a brouter
- The difference between routable and non-routable protocols
- The concept of default gateways and subnetworks
- The reason for employing unique network Ids
- The difference between static and dynamic routing

Transport Layer
- The distinction between connectionless and connection-orientated transport
- Explain the purpose of name resolution

TCP/IP Fundamentals
- IP default gateways
- DHCP, DNS, WINS, and host files
- TCP, UDP, POP3, SMTP, SNMP, FTP, HTTP, and IP
- Why TCP/IP is supported by every operating system and millions of hosts worldwide
- The purpose and function of Internet Domain Name Server hierarchies (how email arrives in another country)
- Class A, B, and C addresses and their default subnet mask numbers
- The port numbers used (for example HTTP, FTP, SMTP) for a given service
- Proxy and why it is used
- IP address, DNS, default gateway, IP proxy, WINS, DHCP, host name, and internet domain name

TCP/IP Suite: Utilities
- How and when to use ARP to test, validate, and troubleshoot IP connectivity
- How and when to use Telnet to test, validate, and troubleshoot IP connectivity
- How and when to use NBTSTAT to test, validate, and troubleshoot IP connectivity
- How and when to use TRACERT to test, validate, and troubleshoot IP connectivity
- How and when to use NETSTAT to test, validate, and troubleshoot IP connectivity
- How and when to use IPCONFIG/WINIPCONFIG to test, validate, and troubleshoot IP connectivity
- How and when to use FTP to test, validate, and troubleshoot IP connectivity
- How and when to use PING to test, validate, and troubleshoot IP connectivity

Remote Connectivity
- The distinction between PPP and SLIP
- The purpose and function of PPTP and the conditions under which it is useful
- The attributes, advantages and disadvantages of ISDN and PSTN (POTS)
- The modem configuration parameters which must be set (serial port IRQ, I/O address, maximum port speed) for dial-up networking to function
- The requirements for a remote connection

Security
- Selection of a security model (user and share levels) as a good practice to ensure network security
- The use of standard password practices and procedures as a good practice to ensure network security
- The need to employ data encryption to protect network data as a good practice to ensure network security
- The use of a firewall as a good practice to ensure network connectivity

Implementing Installation of the Network
- Administrative and test accounts, passwords, IP addresses, IP configurations, relevant SOPs, etc. must be obtained prior to the network implementation
- The impact of environmental factors on computer networks
- Common peripheral ports, external SCSI connections (esp. DB-25), print servers, hubs, routers, brouters, bridges, patch panels, UPSs, NICs, and Token Ring media filters
- The consequences of trying to install an analog modem into a digital jack
- The uses of RJ-45 connectors may differ greatly depending on the cabling
- Patch cables contribute to the overall length of the cabling segment

Maintaining and Supporting the Network
- Identify the kinds of test documentation that are usually available regarding a vendors patches, fixes, upgrades, etc.
- Demonstrate awareness of standard backup procedures backup media storage practices
- The need for periodic application of software patches and other fixes to the network
- The need to install anti-virus software on the server and workstation
- The need to frequently update virus signatures

Troubleshooting the Network
- Troubleshooting approach
- Distinguish whether a problem is attributable to the operator or the system
- A second method for determining whether a problem is attributable to the operator or the system
- The need to check the following as physical and logical indicators of trouble: link lights, power lights, error displays, error logs and displays, and performance monitors
- Given a network problem scenario, determine the problem
- The purpose and function of common network tools including: a crossover cable, hardware loopback, tone generator, tone locator (fox and hound)

CHAPTER 9

Upon completion of this chapter, students will be able to perform tasks related to:

OSI Model
- Layer functions
- Application layer
- Presentation layer
- Session layer
- Transport layer
- Network layer
- Data link layer
- Physical layer
- Data encapsulation

Creating Subnets
- How to create a subnet
- Subnet planning
- Sample problems

Router Commands
- Basic router configuration
- Testing and other basic commands
- Configuring IPX Routing
- Configuring standard and extended IP access lists
- PPP encapsulation with PAP and CHAP
- ISDN
- Frame Relay - simple configuration
- Frame Relay - multipoint subinterfaces configuration
- Frame Relay - point-to-point subinterfaces configuration

- Monitoring Frame Relay
- Booting up the router

Skills Based Sample Scenario - Lab Test
Skills based sample scenario- lab test