

## Module 1: Operation of IP Data Networks

- Operation of IP Data Networks
- Recognize the purpose and functions of various network devices such as Routers, Switches, Bridges and Hubs.
- Select the components required to meet a given network specification.
- Identify common applications and their impact on the network
- Describe the purpose and basic operation of the protocols in the OSI and TCP/IP models.
- Predict the data flow between two hosts across a network.
- Identify the appropriate media, cables, ports, and connectors to connect Cisco network devices to other network devices and hosts in a LAN

## Module 2: LAN Switching Technologies

- Determine the technology and media access control method for Ethernet networks
- Identify basic switching concepts and the operation of Cisco switches.
  - Collision Domains
  - Broadcast Domains
  - Types of switching
  - CAM Table
- Configure and verify initial switch configuration including remote access management.
  - Cisco IOS commands to perform basic switch setup
- Verify network status and switch operation using basic utilities such as ping, telnet and ssh.
- Identify enhanced switching technologies
  - RSTP
  - PVSTP
  - Etherchannels
- Describe how VLANs create logically separate networks and the need for routing between them.
  - Explain network segmentation and basic traffic management concepts
- Configure and verify VLANs
- Configure and verify trunking on Cisco switches
  - DTP
  - Auto negotiation
- Configure and verify PVSTP operation
  - describe root bridge election
  - spanning tree mode

## Module 3: IP addressing (IPv4 / IPv6)

- Describe the operation and necessity of using private and public IP addresses for IPv4 addressing
- Identify the appropriate IPv6 addressing scheme to satisfy addressing requirements in a LAN/WAN environment.

- Identify the appropriate IPv4 addressing scheme using VLSM and summarization to satisfy addressing requirements in a LAN/WAN environment.
- Describe the technological requirements for running IPv6 in conjunction with IPv4 such as dual stack
- Describe IPv6 addresses
  - Global unicast
  - Multicast
  - Link local
  - Unique local
  - eui 64
  - autoconfiguration

## Module 4:IP Routing Technologies

- Describe basic routing concepts
  - CEF
  - Packet forwarding
  - Router lookup process
- Describe the boot process of Cisco IOS routers
  - POST
  - Router bootup process
- Configure and verify utilizing the CLI to set basic Router configuration
  - Cisco IOS commands to perform basic router setup
- Configure and verify operation status of a device interface, both serial and ethernet
- Verify router configuration and network connectivity
  - Cisco IOS commands to review basic router information and network connectivity
- Configure and verify routing configuration for a static or default route given specific routing requirements
- Manage Cisco IOS Files
  - Boot preferences
  - Cisco IOS image(s)
  - Licensing
    - Show license
    - Change license
- Differentiate methods of routing and routing protocols
  - Static vs. Dynamic
  - Link state vs. Distance Vector
  - Administrative distance
  - split horizon
  - metric
  - next hop
  - ip routing table
  - Passive Interfaces
- Configure and verify OSPF (single area)

- Benefit of single area
- neighbor adjacencies
- OSPF states
- Discuss Multi area
- Configure OSPF v2
- Configure OSPF v3
- Router ID
- Passive interface
- LSA types
- Configure and verify EIGRP (single AS)
  - Feasible Distance / Feasible Successors /Administrative distance
  - Feasibility condition
  - Metric composition
  - Router ID
  - Auto summary
  - Path selection
  - Load balancing
    - Equal
    - Unequal
  - Passive interface
- Configure and verify interVLAN routing (Router on a stick)
  - sub interfaces
  - upstream routing
  - encapsulation
- Configure SVI interfaces

## Module 5:IP Services

- Configure and verify DHCP (IOS Router)
  - configuring router interfaces to use DHCP
  - DHCP options
  - excluded addresses
  - lease time
- Describe the types, features, and applications of ACLs
  - Standard
    - Sequence numbers
    - Editing
  - Extended
  - Named
  - Numbered
  - Log option
- Configure and verify ACLs in a network environment
  - Named
  - Numbered

- Log option
- Identify the basic operation of NAT
  - Purpose
  - Pool
  - Static
  - 1 to 1
  - Overloading
  - Source addressing
  - One way NAT
- Configure and verify NAT for given network requirements
- Configure and verify NTP as a client
- Recognize High availability (FHRP)
  - VRRP
  - HSRP
  - GLBP
- Configure and verify Syslog
  - Utilize Syslog Output
- Describe SNMP v2 & v3

## Module 6: Network Device Security

- Configure and verify network device security features such as
  - Device password security
  - Enable secret vs enable
  - Transport
  - Disable telnet
  - SSH
  - VTYS
  - Physical security
  - Service password
  - Describe external authentication methods
- Configure and verify Switch Port Security features such as
  - Sticky MAC
  - MAC address limitation
  - Static / dynamic
  - Violation modes
    - Err disable
    - Shutdown
  - Protect restrict
  - Shutdown unused ports
  - Err disable recovery
  - Assign unused ports to an unused VLAN
  - Setting native VLAN to other than VLAN 1
- Configure and verify ACLs to filter network traffic

- Configure and verify an ACLs to limit telnet and SSH access to the router

## Module 7: Troubleshooting

- Identify and correct common network problems
- Utilize netflow data
- Troubleshoot and correct common problems associated with IP addressing and host configurations.
- Troubleshoot and Resolve VLAN problems
  - identify that VLANs are configured
  - port membership correct
  - IP address configured
- Troubleshoot and Resolve trunking problems on Cisco switches
  - correct trunk states
  - correct encapsulation configured
  - correct vlans allowed
- Troubleshoot and Resolve Spanning Tree operation issues
  - root switch
  - priority
  - mode is correct
  - port states
- Troubleshoot and Resolve routing issues
  - routing is enabled
  - routing table is correct
  - correct path selection
- Troubleshoot and Resolve OSPF problems
  - neighbor adjancies
  - Hello and Dead timers
  - OSPF area
  - Interface MTU
  - Network types
  - Neighbor states
  - OSPF topology database
- Troubleshoot and Resolve EIGRP problems
  - neighbor adjancies
  - AS number
  - Load balancing
  - Split horizon
- Troubleshoot and Resolve interVLAN routing problems
  - Connectivity
  - Encapsulation
  - Subnet
  - Native VLAN
  - Port mode trunk status

- Troubleshoot and Resolve ACL issues
  - Statistics
  - Permitted networks
  - Direction
    - Interface
- Troubleshoot and Resolve WAN implementation issues
  - Serial interfaces
  - PPP
  - Frame relay
- Troubleshoot and Resolve Layer 1 problems
  - Framing
  - CRC
  - Runts
  - Giants
  - Dropped packets
  - Late collision
  - Input / Output errors
- Monitor NetFlow statistics
- Troubleshoot etherchannel problems

## Module 8: WAN Technologies

- Identify different WAN Technologies
  - Metro Ethernet
  - VSAT
  - Cellular 3G / 4G
  - MPLS
  - T1 / E1
  - ISDN
  - DSL
  - Frame relay
  - Cable
  - VPN
- Configure and verify a basic WAN serial connection
- Configure and verify a PPP connection between Cisco routers
- Configure and verify Frame Relay on Cisco routers
- Implement and troubleshoot PPPoE