

## دوره جامع روتینگ و سویچینگ سیسکو از CCNA R&S تا CCIE R&S

### Cisco Routing and Switching Pack

#### مروری بر دوره

دوره Cisco Routing and Switching Pack یک پکیج کامل در حوزه زیرساخت تجهیزات سیسکو می باشد. حضور تجهیزات سیسکو در زیر ساخت های اکثر سازمان ها و شرکت ها، این فرصت را پیش روی متخصصین این حوزه قرار خواهد داد تا با کسب دانش و تخصص در این حوزه از فرصت های شغلی خوبی بهره مند شوند. طراحی این دوره به گونه ای صورتی انجام شده است تا دانشجویان ضمن یادگیری اصول اولیه کار با تجهیزات روتینگ و سویچینگ سیسکو دوره CCNA Routing and Switching به مرور وارد دوره های تخصصی CCNP Routing and Switching شده و به صورت جامع و حرفه ای با مهارت های کار با روترها و سویچ های سیسکو بر طبق آخرین سیلابس سیسکو آشنا شوند. از مهمترین جذابیت های این دوره ارائه فیلم جلسات آموزشی به همراه جزوات فارسی به دانشجویان خواهد بود.

#### سرفصل ها

##### CCNA ۲۰۰-۱۲۵

۱.۱ Compare and contrast OSI and TCP/IP models

۱.۲ Compare and contrast TCP and UDP protocols

۱.۳ Describe the impact of infrastructure components in an enterprise network

- ۱.۳.a Firewalls
- ۱.۳.b Access points



- ۱.۳.c Wireless controllers

#### ۱.۴ Describe the effects of cloud resources on enterprise network architecture

- ۱.۴.a Traffic path to internal and external cloud services
- ۱.۴.b Virtual services
- ۱.۴.c Basic virtual network infrastructure

#### ۱.۵ Compare and contrast collapsed core and three-tier architectures

#### ۱.۶ Compare and contrast network topologies

- ۱.۶.a Star
- ۱.۶.b Mesh
- ۱.۶.c Hybrid

#### ۱.۷ Select the appropriate cabling type based on implementation requirements

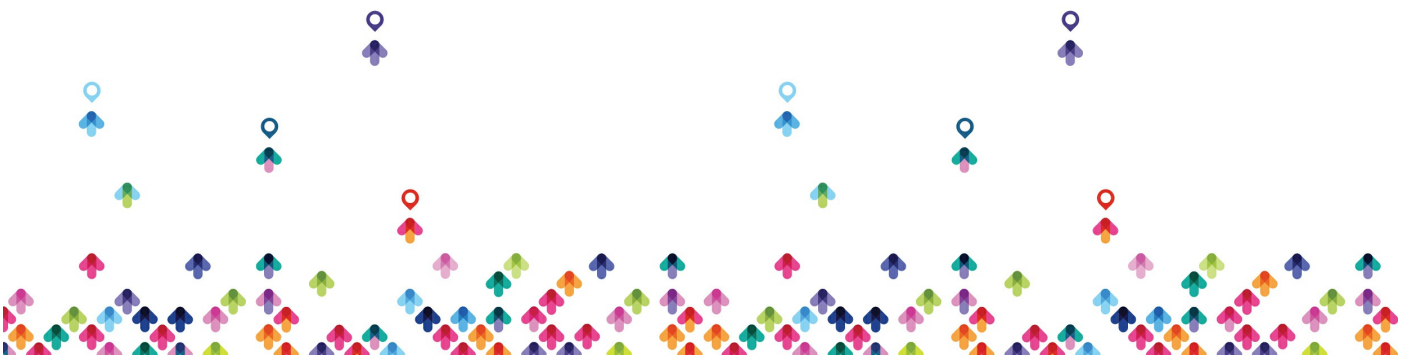
#### ۱.۸ Apply troubleshooting methodologies to resolve problems

- ۱.۸.a Perform and document fault isolation
- ۱.۸.b Resolve or escalate
- ۱.۸.c Verify and monitor resolution

#### ۱.۹ Configure, verify, and troubleshoot IPv۴ addressing and subnetting

#### ۱.۱۰ Compare and contrast IPv۴ address types

- ۱.۱۰.a Unicast
- ۱.۱۰.b Broadcast



- ۱.۱۰.c Multicast

۱.۱۱ Describe the need for private IPv۶ addressing

۱.۱۲ Identify the appropriate IPv۶ addressing scheme to satisfy addressing requirements in a LAN/WAN environment

۱.۱۳ Configure, verify, and troubleshoot IPv۶ addressing

۱.۱۴ Configure and verify IPv۶ Stateless Address Auto Configuration

۱.۱۵ Compare and contrast IPv۶ address types

- ۱.۱۵.a Global unicast
- ۱.۱۵.b Unique local
- ۱.۱۵.c Link local
- ۱.۱۵.d Multicast
- ۱.۱۵.e Modified EUI ۶۴
- ۱.۱۵.f Autoconfiguration
- ۱.۱۵.g Anycast

۴.۱ Configure and verify PPP and MLPPP on WAN interfaces using local authentication

۴.۲ Configure, verify, and troubleshoot PPPoE client-side interfaces using local authentication

۴.۳ Configure, verify, and troubleshoot GRE tunnel connectivity



#### ۴.۴ Describe WAN topology options

- ۴.۴.a Point-to-point
- ۴.۴.b Hub and spoke
- ۴.۴.c Full mesh
- ۴.۴.d Single vs dual-homed

#### ۴.۵ Describe WAN access connectivity options

- ۴.۵.a MPLS
- ۴.۵.b Metro Ethernet
- ۴.۵.c Broadband PPPoE
- ۴.۵.d Internet VPN (DMVPN, site-to-site VPN, client VPN)

#### ۴.۶ Configure and verify single-homed branch connectivity using eBGP IPv۴ (limited to peering and route advertisement using Network command only)

#### ۴.۷ Describe basic QoS concepts

- ۴.۷.a Marking
- ۴.۷.b Device trust
- ۴.۷.c Prioritization
  - ۴.۷.c. [i] Voice
  - ۴.۷.c. [ii] Video
  - ۴.۷.c. [iii] Data
- ۴.۷.d Shaping
- ۴.۷.e Policing
- ۴.۷.f Congestion management



## ۳۰۰-۱۰۱ Routing

### ۱.۱ Identify Cisco Express Forwarding concepts

- ۱.۱.a FIB
- ۱.۱.b Adjacency table

### ۱.۲ Explain general network challenges

- ۱.۲.a Unicast
- ۱.۲.b Out-of-order packets
- ۱.۲.c Asymmetric routing

### ۱.۳ Describe IP operations

- ۱.۳.a ICMP Unreachable and Redirects
- ۱.۳.b IPv۴ and IPv۶ fragmentation
- ۱.۳.c TTL

### ۱.۴ Explain TCP operations

- ۱.۴.a IPv۴ and IPv۶ (P)MTU
- ۱.۴.b MSS
- ۱.۴.c Latency
- ۱.۴.d Windowing
- ۱.۴.e Bandwidth-delay product
- ۱.۴.f Global synchronization



## ۱.۵ Describe UDP operations

- ۱.۵.a Starvation
- ۱.۵.b Latency

## ۱.۶ Recognize proposed changes to the network

- ۱.۶.a Changes to routing protocol parameters
- ۱.۶.b Migrate parts of the network to IPv۶
- ۱.۶.c Routing protocol migration

## ۲.۱ Configure and verify PPP

- ۲.۱.a Authentication (PAP, CHAP)
- ۲.۱.b PPPoE (client side only)

## ۲.۲ Explain Frame Relay

- ۲.۲.a Operations
- ۲.۲.b Point-to-point
- ۲.۲.c Multipoint

## ۳.۱ Identify, configure, and verify IPv۴ addressing and subnetting

- ۳.۱.a Address types (Unicast, broadcast, multicast, and VLSM)
- ۳.۱.b ARP
- ۳.۱.c DHCP relay and server
- ۳.۱.d DHCP protocol operations



## ۳.۲ Identify IPv۶ addressing and subnetting

- ۳.۲.a Unicast
- ۳.۲.b EUI-۶۴
- ۳.۲.c ND, RS/RA
- ۳.۲.d Autoconfig (SLAAC)
- ۳.۲.e DHCP relay and server
- ۳.۲.f DHCP protocol operations

## ۳.۳ Configure and verify static routing

## ۳.۴ Configure and verify default routing

## ۳.۵ Evaluate routing protocol types

- ۳.۵.a Distance vector
- ۳.۵.b Link state
- ۳.۵.c Path vector

## ۳.۶ Describe administrative distance

## ۳.۷ Troubleshoot passive interfaces

## ۳.۸ Configure and verify VRF lite

## ۳.۹ Configure and verify filtering with any protocol

## ۳.۱۰ Configure and verify redistribution between any routing protocols or routing sources



۳.۱۱ Configure and verify manual and autosummarization with any routing protocol

۳.۱۲ Configure and verify policy-based routing

۳.۱۳ Identify suboptimal routing

۳.۱۴ Explain ROUTE maps

۳.۱۵ Configure and verify loop prevention mechanisms

- ۳.۱۵.a Route tagging and filtering
- ۳.۱۵.b Split-horizon
- ۳.۱۵.c Route poisoning

۳.۱۶ Configure and verify RIPv۲

۳.۱۷ Describe RIPv۴

۳.۱۸ Describe EIGRP packet types

۳.۱۹ Configure and verify EIGRP neighbor relationship and authentication

۳.۲۰ Configure and verify EIGRP stubs

۳.۲۱ Configure and verify EIGRP load balancing

- ۳.۲۱.a Equal cost
- ۳.۲۱.b Unequal cost

۳.۲۲ Describe and optimize EIGRP metrics





۳.۲۳ Configure and verify EIGRP for IPv۶

۳.۲۴ Describe OSPF packet types

۳.۲۵ Configure and verify OSPF neighbor relationship and authentication

۳.۲۶ Configure and verify network types, area types, and router types

- ۳.۲۶.a Point-to-point, multipoint, broadcast, nonbroadcast
- ۳.۲۶.b LSA types, area type: backbone, normal, transit, stub, NSSA, totally stub
- ۳.۲۶.c Internal router, backbone router, ABR, ASBR
- ۳.۲۶.d Virtual link

۳.۲۷ Configure and verify OSPF path preference

۳.۲۸ Configure and verify OSPF operations

۳.۲۹ Configure and verify OSPF for IPv۶

۳.۳۰ Describe, configure, and verify BGP peer relationships and authentication

- ۳.۳۰.a Peer group
- ۳.۳۰.b Active, passive
- ۳.۳۰.c States and timers

۳.۳۱ Configure and verify eBGP (IPv۴ and IPv۶ address families)

- ۳.۳۱.a eBGP
- ۳.۳۱.b ۴-byte AS number



- ۳.۳۱.c Private AS

### ۳.۳۲ Explain BGP attributes and best-path selection

### ۴.۱ Configure and verify GRE

### ۴.۲ Describe DMVPN (single hub)

### ۴.۳ Describe Easy Virtual Networking (EVN)

### ۵.۱ Describe IOS AAA using local database

### ۵.۲ Describe device security using IOS AAA with TACACS+ and RADIUS

- ۵.۲.a AAA with TACACS+ and RADIUS
- ۵.۲.b Local privilege authorization fallback

### ۵.۳ Configure and verify device access control

- ۵.۳.a Lines (VTY, AUX, console)
- ۵.۳.b Management plane protection
- ۵.۳.c Password encryption

### ۵.۴ Configure and verify router security features

- ۵.۴.a IPv۴ access control lists (standard, extended, time-based)
- ۵.۴.b IPv۶ traffic filter



- ۵.۴.c Unicast reverse path forwarding

## ۶.۱ Configure and verify device management

- ۶.۱.a Console and VTY
- ۶.۱.b Telnet, HTTP, HTTPS, SSH, SCP
- ۶.۱.c (T)FTP

## ۶.۲ Configure and verify SNMP

- ۶.۲.a v۲
- ۶.۲.b v۳

## ۶.۳ Configure and verify logging

- ۶.۳.a Local logging, syslog, debugs, conditional debugs
- ۶.۳.b Timestamps

## ۶.۴ Configure and verify Network Time Protocol (NTP)

- ۶.۴.a NTP master, client, version ۳, version ۴
- ۶.۴.b NTP authentication

## ۶.۵ Configure and verify IPv۴ and IPv۶ DHCP

- ۶.۵.a DHCP client, IOS DHCP server, DHCP relay
- ۶.۵.b DHCP options (describe)



## ۶.۶ Configure and verify IPv۴ Network Address Translation (NAT)

- ۶.۶.a Static NAT, dynamic NAT, PAT

## ۶.۷ Describe IPv۶ NAT

- ۶.۷.a NAT۶۴
- ۶.۷.b NPTv۶

## ۶.۸ Describe SLA architecture

## ۶.۹ Configure and verify IP SLA

- ۶.۹.a ICMP

## ۶.۱۰ Configure and verify tracking objects

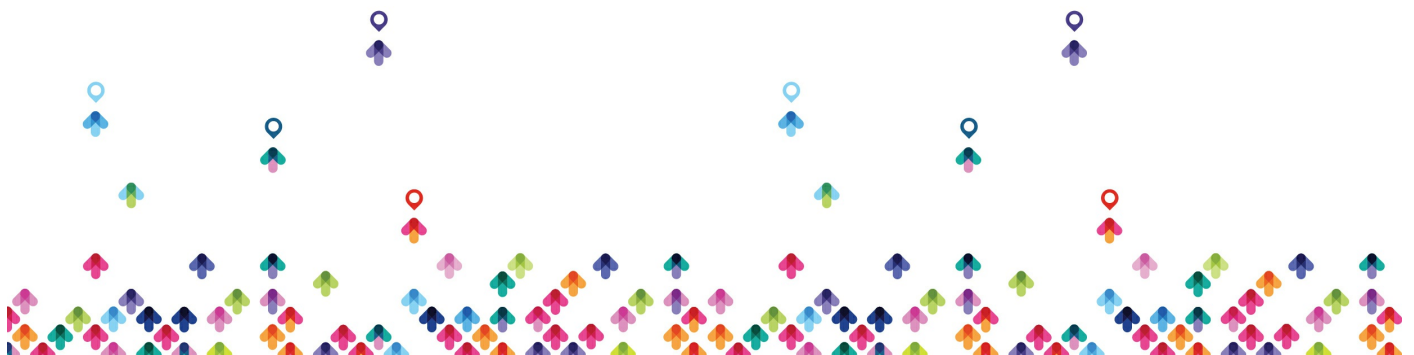
- ۶.۱۰.a Tracking objects
- ۶.۱۰.b Tracking different entities (for example, interfaces, IPSLA results)

## ۶.۱۱ Configure and verify Cisco NetFlow

- ۶.۱۱.a NetFlow v۵, v۹
- ۶.۱۱.b Local retrieval
- ۶.۱۱.c Export (configuration only)

## ۳۰۰-۱۱۵ Switch

## ۱.۱ Configure and verify switch administration



- ۱.۱.a SDM templates
- ۱.۱.b Managing MAC address table
- ۱.۱.c Troubleshoot Err-disable recovery

## ۱.۲ Configure and verify Layer ۲ protocols

- ۱.۲.a CDP, LLDP
- ۱.۲.b UDLD

## ۱.۳ Configure and verify VLANs

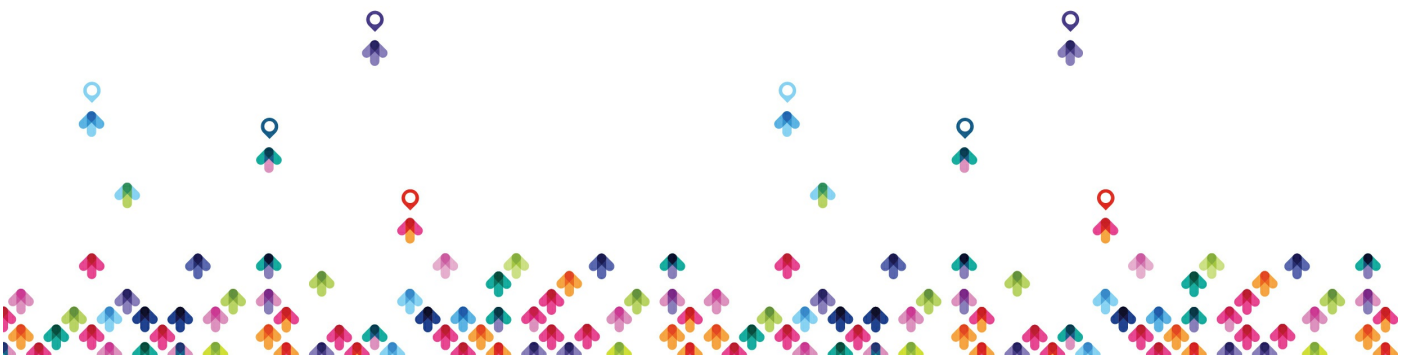
- ۱.۳.a Access ports
- ۱.۳.b VLAN database
- ۱.۳.c Normal, extended VLAN, voice VLAN

## ۱.۴ Configure and verify trunking

- ۱.۴.a VTPv۱, VTPv۲, VTPv۳, VTP pruning
- ۱.۴.b dot۱Q
- ۱.۴.c Native VLAN
- ۱.۴.d Manual pruning

## ۱.۵ Configure and verify EtherChannels

- ۱.۵.a LACP, PAgP, manual
- ۱.۵.b Layer ۲, Layer ۳
- ۱.۵.c Load balancing
- ۱.۵.d EtherChannel misconfiguration guard



## ۱.۶ Configure and verify spanning tree

- ۱.۶.a PVST+, RPVST+, MST
- ۱.۶.b Switch priority, port priority, path cost, STP timers
- ۱.۶.c PortFast, BPDUguard, BPDUfilter
- ۱.۶.d Loopguard and Rootguard

## ۱.۷ Configure and verify other LAN switching technologies

- ۱.۷.a SPAN, RSPAN

## ۱.۸ Describe chassis virtualization and aggregation technologies

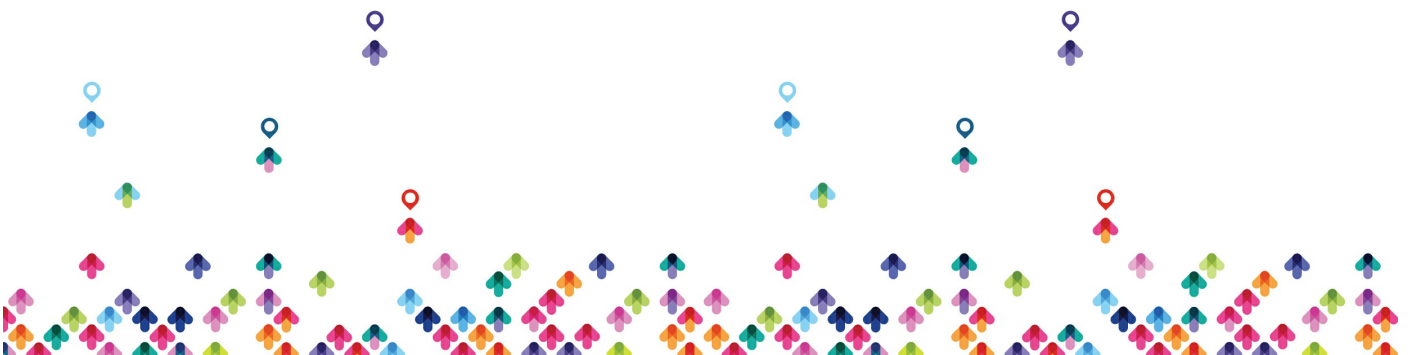
- ۱.۸.a Stackwise

## ۲.۱ Configure and verify switch security features

- ۲.۱.a DHCP snooping
- ۲.۱.b IP Source Guard
- ۲.۱.c Dynamic ARP inspection
- ۲.۱.d Port security
- ۲.۱.e Private VLAN
- ۲.۱.f Storm control

## ۲.۲ Describe device security using Cisco IOS AAA with TACACS+ and RADIUS

- ۲.۲.a AAA with TACACS+ and RADIUS
- ۲.۲.b Local privilege authorization fallback



### ۳.۱ Configure and verify first-hop redundancy protocols

- ۳.۱.a HSRP
- ۳.۱.b VRRP
- ۳.۱.c GLBP

### ۳۰۰-۱۳۵ T-SHOOT

#### ۱.۱ Use Cisco IOS troubleshooting tools

- ۱.۱.a Debug, conditional debug
- ۱.۱.b Ping and trace route with extended options

#### ۱.۲ Apply troubleshooting methodologies

- ۱.۲.a Diagnose the root cause of networking issues (analyze symptoms, identify and describe root cause)
- ۱.۲.b Design and implement valid solutions
- ۱.۲.c Verify and monitor resolution

#### ۲.۱ Troubleshoot switch administration

- ۲.۱.a SDM templates
- ۲.۱.b Managing MAC address table



- ۲.۱.c Troubleshoot Err-disable recovery

## ۲.۲ Troubleshoot Layer ۲ protocols

- ۲.۲.a CDP, LLDP
- ۲.۲.b UDLD

## ۲.۳ Troubleshoot VLANs

- ۲.۳.a Access ports
- ۲.۳.b VLAN database
- ۲.۳.c Normal, extended VLAN, voice VLAN

## ۲.۴ Troubleshoot trunking

- ۲.۴.a VTPv۱, VTPv۲, VTPv۳, VTP pruning
- ۲.۴.b dot۱Q
- ۲.۴.c Native VLAN
- ۲.۴.d Manual pruning

## ۲.۵ Troubleshoot EtherChannels

- ۲.۵.a LACP, PAgP, manual
- ۲.۵.b Layer ۲, Layer ۳
- ۲.۵.c Load balancing
- ۲.۵.d EtherChannel misconfiguration guard

## ۲.۶ Troubleshoot spanning tree

- ۲.۶.a PVST+, RPVST+, MST





- ۲.۶.b Switch priority, port priority, path cost, STP timers
- ۲.۶.c PortFast, BPDUguard, BPDUfilter
- ۲.۶.d Loopguard, Rootguard

## ۲.۷ Troubleshoot other LAN switching technologies

- ۲.۷.a SPAN, RSPAN

## ۲.۸ Troubleshoot chassis virtualization and aggregation technologies

- ۲.۸.a Stackwise

## ۳.۱ Troubleshoot IPv۴ addressing and subnetting

- ۳.۱.a Address types (Unicast, broadcast, multicast, and VLSM)
- ۳.۱.b ARP
- ۳.۱.c DHCP relay and server
- ۳.۱.d DHCP protocol operations

## ۳.۲ Troubleshoot IPv۶ addressing and subnetting

- ۳.۲.a Unicast
- ۳.۲.b EUI-۶۴
- ۳.۲.c ND, RS/RA
- ۳.۲.d Autoconfig (SLAAC)
- ۳.۲.e DHCP relay and server
- ۳.۲.f DHCP protocol operations



۳.۳ Troubleshoot static routing

۳.۴ Troubleshoot default routing

۳.۵ Troubleshoot administrative distance

۳.۶ Troubleshoot passive interfaces

۳.۷ Troubleshoot VRF lite

۳.۸ Troubleshoot filtering with any protocol

۳.۹ Troubleshoot between any routing protocols or routing sources

۳.۱۰ Troubleshoot manual and autosummarization with any routing protocol

۳.۱۱ Troubleshoot policy-based routing

۳.۱۲ Troubleshoot suboptimal routing

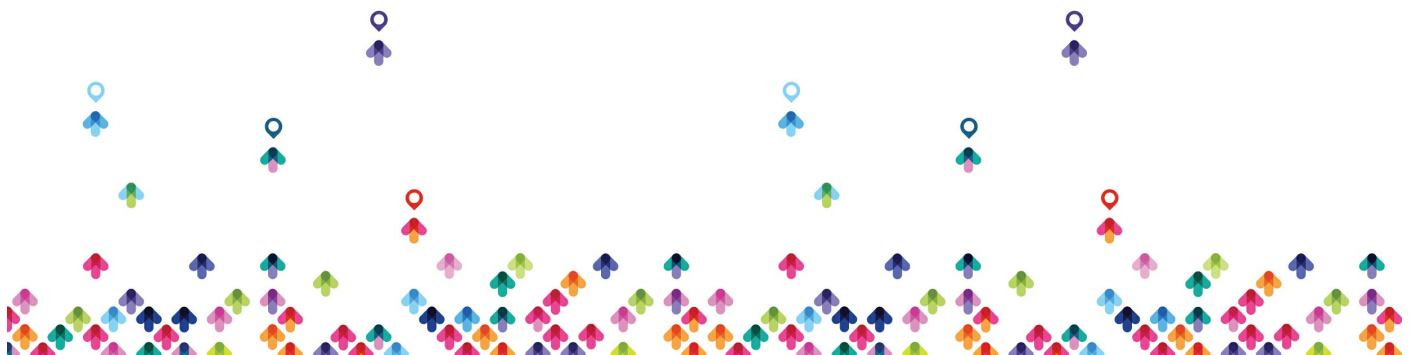
۳.۱۳ Troubleshoot loop prevention mechanisms

- ۳.۱۳.a Route tagging, filtering
- ۳.۱۳.b Split-horizon
- ۳.۱۳.c Route poisoning

۳.۱۴ Troubleshoot RIPv۲

۳.۱۵ Troubleshoot EIGRP neighbor relationship and authentication

۳.۱۶ Troubleshoot loop free path selection



- ۳.۱۶.a RD, FD, FC, successor, feasible successor

### ۳.۱۷ Troubleshoot EIGPR operations

- ۳.۱۷.a Stuck in active

### ۳.۱۸ Troubleshoot EIGRP stubs

### ۳.۱۹ Troubleshoot EIGRP load balancing

- ۳.۱۹.a Equal cost
- ۳.۱۹.b Unequal cost

### ۳.۲۰ Troubleshoot EIGRP metrics

### ۳.۲۱ Troubleshoot EIGRP for IPv۶

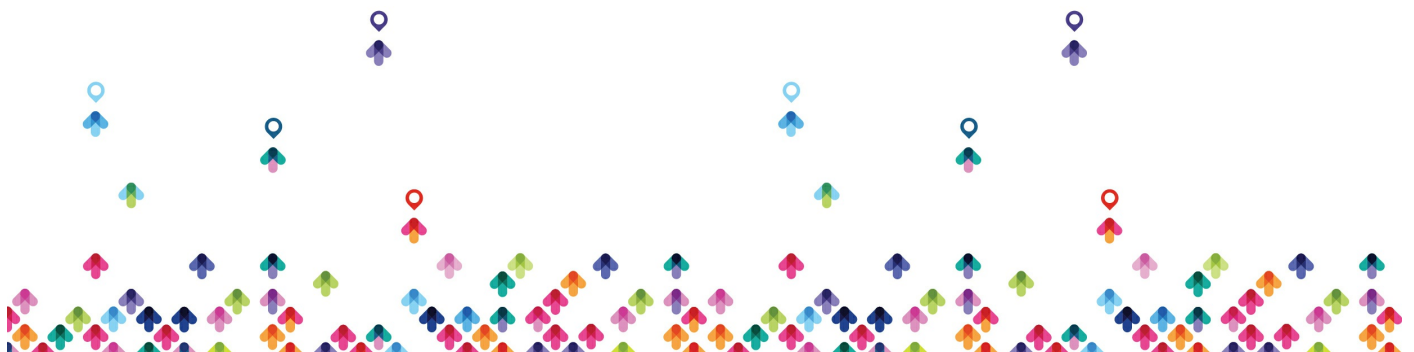
### ۳.۲۲ Troubleshoot OSPF neighbor relationship and authentication

### ۳.۲۳ Troubleshoot network types, area types, and router types

- ۳.۲۳.a Point-to-point, multipoint, broadcast, nonbroadcast
- ۳.۲۳.b LSA types, area type: backbone, normal, transit, stub, NSSA, totally stub
- ۳.۲۳.c Internal router, backbone router, ABR, ASBR
- ۳.۲۳.d Virtual link

### ۳.۲۴ Troubleshoot OSPF path preference

### ۳.۲۵ Troubleshoot OSPF operations



### ۳.۲۶ Troubleshoot OSPF for IPv۶

### ۳.۲۷ Troubleshoot BGP peer relationships and authentication

- ۳.۲۷.a Peer group
- ۳.۲۷.b Active, passive
- ۳.۲۷.c States and timers

### ۳.۲۸ Troubleshoot eBGP

- ۳.۲۸.a eBGP
- ۳.۲۸.b ۴-byte AS number
- ۳.۲۸.c Private AS

### ۴.۱ Troubleshoot GRE

### ۵.۱ Troubleshoot IOS AAA using local database

### ۵.۲ Troubleshoot device access control

- ۵.۲.a Lines (VTY, AUX, console)
- ۵.۲.b Management plane protection
- ۵.۲.c Password encryption

### ۵.۳ Troubleshoot router security features

- ۵.۳.a IPv۴ access control lists (standard, extended, time-based)
- ۵.۳.b IPv۶ traffic filter



- ۵.۳.c Unicast reverse path forwarding

## ۶.۱ Troubleshoot device management

- ۶.۱.a Console and VTY
- ۶.۱.b Telnet, HTTP, HTTPS, SSH, SCP
- ۶.۱.c (T) FTP

## ۶.۲ Troubleshoot SNMP

- ۶.۲.a v۲
- ۶.۲.b v۳

## ۶.۳ Troubleshoot logging

- ۶.۳.a Local logging, syslog, debugs, conditional debugs
- ۶.۳.b Timestamps

## ۶.۴ Troubleshoot Network Time Protocol(NTP)

- ۶.۴.a NTP master, client, version ۳, version ۴
- ۶.۴.b NTP authentication

## ۶.۵ Troubleshoot IPv۴ and IPv۶ DHCP

- ۶.۵.a DHCP client, IOS DHCP server, DHCP relay
- ۶.۵.b DHCP options (describe)



## ۶.۶ Troubleshoot IPv۴ Network Address Translation (NAT)

- ۶.۶.a Static NAT, Dynamic NAT, PAT

## ۶.۷ Troubleshoot SLA architecture

## ۶.۸ Troubleshoot tracking objects

- ۶.۸.a Tracking objects
  - ۶.۸.b Tracking different entities (for example, interfaces, IPSLA results)

## CCIE Routing and Switching

### ۱.۱ LAN switching technologies

- ۱.۱.a Implement and troubleshoot switch administration
  - ۱.۱.a [i] Managing MAC address table
  - ۱.۱.a [ii] errdisable recovery
  - ۱.۱.a [iii] L۲ MTU
- ۱.۱.b Implement and troubleshoot layer ۲ protocols
  - ۱.۱.b [i] CDP, LLDP
  - ۱.۱.b [ii] UDLD
- ۱.۱.c Implement and troubleshoot VLAN
  - ۱.۱.c [i] access ports
  - ۱.۱.c [ii] VLAN database
  - ۱.۱.c [iii] normal, extended VLAN, voice VLAN
- ۱.۱.d Implement and troubleshoot trunking



- ۱.۱.d [i] VTPv۱, VTPv۲, VTPv۳, VTP pruning
- ۱.۱.d [ii] dot۱Q
- ۱.۱.d [iii] Native VLAN
- ۱.۱.d [iv] Manual pruning
- ۱.۱.e Implement and troubleshoot etherchannel
  - ۱.۱.e [i] LACP, PAgP, manual
  - ۱.۱.e [ii] layer ۲, layer ۳
  - ۱.۱.e [iii] load-balancing
  - ۱.۱.e [iv] etherchannel misconfiguration guard
- ۱.۱.f Implement and troubleshoot spanning-tree
  - ۱.۱.f [i] PVST+/RPVST+/MST
  - ۱.۱.f [ii] switch priority, port priority, path cost, STP timers
  - ۱.۱.f [iii] port fast, BPDUguard, BPDUfilter
  - ۱.۱.f [iv] loopguard, rootguard
- ۱.۱.g Implement and troubleshoot other LAN switching technologies
  - ۱.۱.g [i] SPAN, RSPAN, ERSPAN

## ۱.۲ Layer ۲ Multicast

- ۱.۲.a Implement and troubleshoot IGMP
  - ۱.۲.a [i] IGMPv۱, IGMPv۲, IGMPv۳
  - ۱.۲.a [ii] IGMP snooping
  - ۱.۲.a [iii] IGMP querier
  - ۱.۲.a [iv] IGMP filter



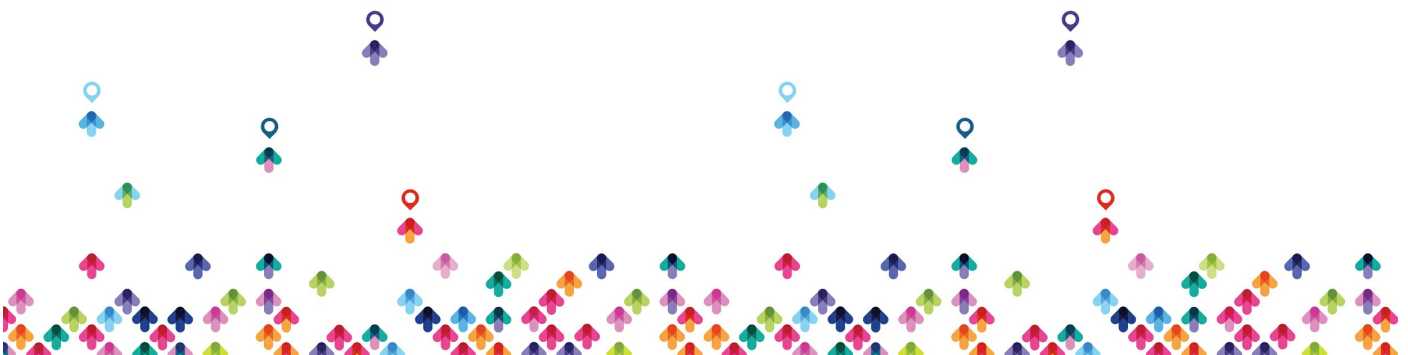
- ۱.۲.a [v] IGMP proxy

## ۱.۳ Layer ۲ WAN circuit technologies

- ۱.۳.a Implement and troubleshoot HDLC
- ۱.۳.b Implement and troubleshoot PPP
  - ۱.۳.b [i] authentication [PAP, CHAP]
  - ۱.۳.b [ii] PPPoE
  - ۱.۳.b [iii] MLPPP

## ۱.۴ Troubleshooting layer ۲ technologies

- ۱.۴.a Use IOS troubleshooting tools
  - ۱.۴.a [i] debug, conditional debug
  - ۱.۴.a [ii] ping, traceroute with extended options
  - ۱.۴.a [iii] Embedded packet capture
- ۱.۴.b Apply troubleshooting methodologies
  - ۱.۴.b [i] Diagnose the root cause of networking issue [analyze symptoms, identify and describe root cause]
  - ۱.۴.b [ii] Design and implement valid solutions according to constraints
  - ۱.۴.b [iii] Verify and monitor resolution
- ۱.۴.c Interpret packet capture
  - ۱.۴.c [i] Using wireshark trace analyzer





- ۱.۴.c [ii] Using IOS embedded packet capture

## ۲.۱ Addressing technologies

- ۲.۱.a Identify, implement and troubleshoot IPv۴ addressing and sub-netting
  - ۲.۱.a [i] Address types, VLSM
  - ۲.۱.a [ii] ARP
- ۲.۱.b Identify, implement and troubleshoot IPv۶ addressing and sub-netting
  - ۲.۱.b [i] Unicast, multicast
  - ۲.۱.b [ii] EUI-۶۴
  - ۲.۱.b [iii] ND, RS/RA
  - ۲.۱.b [iv] Autoconfig/SLAAC temporary addresses [RFC۴۹۴۱]
  - ۲.۱.b [v] Global prefix configuration feature

## ۲.۲ Layer ۳ Multicast

- ۲.۲.a Troubleshoot reverse path forwarding
  - ۲.۲.a [i] RPF failure
  - ۲.۲.a [ii] RPF failure with tunnel interface
- ۲.۲.b Implement and troubleshoot IPv۴ protocol independent multicast



- ۲.۲.b [i] PIM dense mode, sparse mode, sparse-dense mode
- ۲.۲.b [ii] Static RP, auto-RP, BSR
- ۲.۲.b [iii] Bidirectional PIM
- ۲.۲.b [iv] Source-specific multicast
- ۲.۲.b [v] Group to RP mapping
- ۲.۲.b [vi] Multicast boundary
- ۲.۲.c Implement and troubleshoot multicast source discovery protocol
  - ۲.۲.c.[i] Intra-domain MSDP [anycast RP]
  - ۲.۲.c.[ii] SA filter

## ۲.۳ Fundamental routing concepts

- ۲.۳.a Implement and troubleshoot static routing
- ۲.۳.b Implement and troubleshoot default routing
- ۲.۳.c Compare routing protocol types
  - ۲.۳.c [i] distance vector
  - ۲.۳.c [ii] link state
  - ۲.۳.c [iii] path vector
- ۲.۳.d Implement, optimize and troubleshoot administrative distance
- ۲.۳.e Implement and troubleshoot passive interface
- ۲.۳.f Implement and troubleshoot VRF lite
- ۲.۳.g Implement, optimize and troubleshoot filtering with any routing protocol
- ۲.۳.h Implement, optimize and troubleshoot redistribution between any



## routing protocol

- ۲.۳.i Implement, optimize and troubleshoot manual and auto summarization with any routing protocol
- ۲.۳.j Implement, optimize and troubleshoot policy-based routing
- ۲.۳.k Identify and troubleshoot sub-optimal routing
- ۲.۳.l Implement and troubleshoot bidirectional forwarding detection
- ۲.۳.m Implement and troubleshoot loop prevention mechanisms
  - ۲.۳.m [i] Route tagging, filtering
  - ۲.۳.m [ii] Split horizon
  - ۲.۳.m [iii] Route poisoning
- ۲.۳.n Implement and troubleshoot routing protocol authentication
  - ۲.۳.n [i] MD5
  - ۲.۳.n [ii] key-chain
  - ۲.۳.n [iii] EIGRP HMAC SHA<sub>۲-۲۵۶</sub>bit
  - ۲.۳.n [iv] OSPFv۲ SHA<sub>۱-۱۹۶</sub>bit
  - ۲.۳.n [v] OSPFv۳ IPsec authentication

## ۲.۴ RIP v۲

- ۲.۴.a Implement and troubleshoot RIPv۲

## ۲.۵ EIGRP [for IPv۴ and IPv۶]



- ۲.۵.a Describe packet types
  - ۲.۵.a [i] Packet types [hello, query, update, and such]
  - ۲.۵.a [ii] Route types [internal, external]
- ۲.۵.b Implement and troubleshoot neighbor relationship
  - ۲.۵.b [i] Multicast, unicast EIGRP peering
- ۲.۵.c Implement and Troubleshoot Loop free path selection
  - ۲.۵.c [i] RD, FD, FC, successor, feasible successor
  - ۲.۵.c [ii] Classic metric
  - ۲.۵.c [iii] Wide metric
- ۲.۵.d Implement and troubleshoot operations
  - ۲.۵.d [i] General operations
  - ۲.۵.d [ii] Topology table, update, query, active, passive
  - ۲.۵.d [iii] Stuck in active
  - ۲.۵.d [iv] Graceful shutdown
- ۲.۵.e Implement and troubleshoot EIGRP stub
  - ۲.۵.e [i] stub
  - ۲.۵.e [ii] leak-map
- ۲.۵.f Implement and troubleshoot load-balancing
  - ۲.۵.f [i] equal-cost
  - ۲.۵.f [ii] unequal-cost
  - ۲.۵.f [iii] add-path
- ۲.۵.g Implement EIGRP [multi-address] named mode
  - ۲.۵.g [i] Types of families
  - ۲.۵.g [ii] IPv۴ address-family
  - ۲.۵.g [iii] IPv۶ address-family
- ۲.۵.h Implement, troubleshoot and optimize EIGRP convergence and



## scalability

- ۲.۵.h [i] Describe fast convergence requirements
- ۲.۵.h [ii] Control query boundaries
- ۲.۵.h [iii] IP FRR/fast reroute [single hop]
- ۲.۵.h [iv] Summary leak-map
- ۲.۵.h [v] Summary metric

## ۲.۶ OSPF [v۲ and v۳]

- ۲.۶.a Describe packet types
  - ۲.۶.a [i] LSA types [۱, ۲, ۳, ۴, ۵, ۷, ۹]
  - ۲.۶.a [ii] Route types [N۱, N۲, E۱, E۲]
- ۲.۶.b Implement and troubleshoot neighbor relationship
- ۲.۶.c Implement and troubleshoot OSPFv۳ address-family support
  - ۲.۶.c [i] IPv۴ address-family
  - ۲.۶.c [ii] IPv۶ address-family
- ۲.۶.d Implement and troubleshoot network types, area types and router types
  - ۲.۶.d [i] Point-to-point, multipoint, broadcast, non-broadcast
  - ۲.۶.d [ii] LSA types, area type: backbone, normal, transit, stub, NSSA, totally stub
  - ۲.۶.d [iii] Internal router, ABR, ASBR
  - ۲.۶.d [iv] Virtual link
- ۲.۶.e Implement and troubleshoot path preference
- ۲.۶.f Implement and troubleshoot operations



- ۲.۶.f [i] General operations
- ۲.۶.f [ii] Graceful shutdown
- ۲.۶.f [iii] GTSM [generic TTL security mechanism]
- ۲.۶.g Implement, troubleshoot and optimize OSPF convergence and scalability
  - ۲.۶.g [i] Metrics
  - ۲.۶.g [ii] LSA throttling, SPF tuning, fast hello
  - ۲.۶.g [iii] LSA propagation control [area types, ISPF]
  - ۲.۶.g [iv] IP FR/fast reroute [single hop]
  - ۲.۶.g [v] LFA/loop-free alternative [multi hop]
  - ۲.۶.g [vi] OSPFv۳ prefix suppression

## ۲.۷ BGP

- ۲.۷.a Describe, implement and troubleshoot peer relationships
  - ۲.۷.a [i] Peer-group, template
  - ۲.۷.a [ii] Active, passive
  - ۲.۷.a [iii] States, timers
  - ۲.۷.a [iv] Dynamic neighbors
- ۲.۷.b Implement and troubleshoot IBGP and EBGP
  - ۲.۷.b [i] EBGP, IBGP
  - ۲.۷.b [ii] ۴ bytes AS number
  - ۲.۷.b [iii] Private AS
- ۲.۷.c Explain attributes and best-path selection
- ۲.۷.d Implement, optimize and troubleshoot routing policies



- ۲.۷.d [i] Attribute manipulation
- ۲.۷.d [ii] Conditional advertisement
- ۲.۷.d [iii] Outbound route filtering
- ۲.۷.d [iv] Communities, extended communities
- ۲.۷.d [v] Multi-homing
- ۲.۷.e Implement and troubleshoot scalability
  - ۲.۷.e [i] Route-reflector, cluster
  - ۲.۷.e [ii] Confederations
  - ۲.۷.e [iii] Aggregation, AS set
- ۲.۷.f Implement and troubleshoot multi-protocol BGP
  - ۲.۷.f [i] IPv۴, IPv۶, VPN address-family
- ۲.۷.g Implement and troubleshoot AS path manipulations
  - ۲.۷.g [i] Local AS, allow AS in, remove private AS
  - ۲.۷.g [ii] Prepend
  - ۲.۷.g [iii] Regexp
- ۲.۷.h Implement and Troubleshoot Other Features
  - ۲.۷.h [i] Multipath
  - ۲.۷.h [ii] BGP synchronization
  - ۲.۷.h [iii] Soft reconfiguration, route refresh

## ۲.۸ Troubleshooting layer ۳ technologies

- ۲.۸.a Use IOS troubleshooting tools
  - ۲.۸.a [i] debug, conditional debug
  - ۲.۸.a [ii] ping, traceroute with extended options



- ۲.۸.a [iii] Embedded packet capture
- ۲.۸.b Apply troubleshooting methodologies
  - ۲.۸.b [i] Diagnose the root cause of networking issue [analyze symptoms, identify and describe root cause]
  - ۲.۸.b [ii] Design and implement valid solutions according to constraints
  - ۲.۸.b [iii] Verify and monitor resolution
- ۲.۸.c Interpret packet capture
  - ۲.۸.c [i] Using wireshark trace analyzer
  - ۲.۸.c [ii] Using IOS embedded packet capture

## ۳.۱ Tunneling

- ۳.۱.a Implement and troubleshoot MPLS operations
  - ۳.۱.a [i] Label stack, LSR, LSP
  - ۳.۱.a [ii] LDP
  - ۳.۱.a [iii] MPLS ping, MPLS traceroute
- ۳.۱.b Implement and troubleshoot basic MPLS L<sup>3</sup>VPN
  - ۳.۱.b [i] L<sup>3</sup>VPN, CE, PE, P
  - ۳.۱.b [ii] Extranet [route leaking]
- ۳.۱.c Implement and troubleshoot encapsulation
  - ۳.۱.c [i] GRE
  - ۳.۱.c [ii] Dynamic GRE
- ۳.۱.d Implement and troubleshoot DMVPN [single hub]





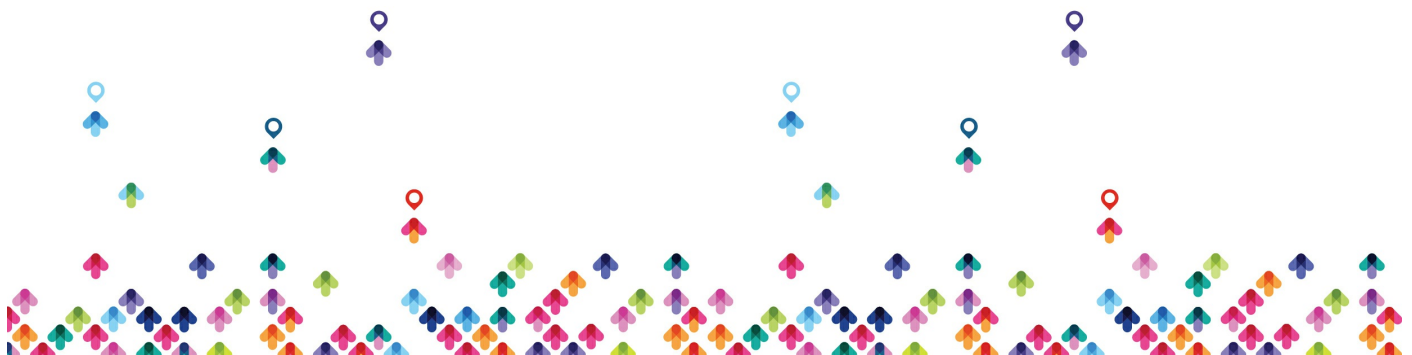
- ۳.۱.d [i] NHRP
- ۳.۱.d [ii] DMVPN with IPsec using preshared key
- ۳.۱.d [iii] QoS profile
- ۳.۱.d [iv] Pre-classify

## ۳.۲ Encryption

- ۳.۲.a Implement and troubleshoot IPsec with preshared key
  - ۳.۲.a [i] IPv۴ site to IPv۴ site
  - ۳.۲.a [ii] IPv۶ in IPv۴ tunnels
  - ۳.۲.a [iii] Virtual tunneling interface [VTI]

## ۳.۳ Troubleshooting VPN technologies

- ۳.۳.a Use IOS troubleshooting tools
  - ۳.۳.a [i] debug, conditional debug
  - ۳.۳.a [ii] ping, traceroute with extended options
  - ۳.۳.a [iii] Embedded packet capture
- ۳.۳.b Apply troubleshooting methodologies
  - ۳.۳.b [i] Diagnose the root cause of networking issue [analyze symptoms, identify and describe root cause]
  - ۳.۳.b [ii] Design and implement valid solutions according to constraints
  - ۳.۳.b [iii] Verify and monitor resolution



- ۳.۳.c Interpret packet capture
  - ۳.۳.c [i] Using wireshark trace analyzer
  - ۳.۳.c [ii] Using IOS embedded packet capture

#### ۴.۱ Device security

- ۴.۱.a Implement and troubleshoot IOS AAA using local database
- ۴.۱.b Implement and troubleshoot device access control
  - ۴.۱.b [i] Lines [VTY, AUX, console]
  - ۴.۱.b [ii] SNMP
  - ۴.۱.b [iii] Management plane protection
  - ۴.۱.b [iv] Password encryption
- ۴.۱.c Implement and troubleshoot control plane policing

#### ۴.۲ Network security

- ۴.۲.a Implement and troubleshoot switch security features
  - ۴.۲.a [i] VACL, PACL
  - ۴.۲.a [ii] Stormcontrol
  - ۴.۲.a [iii] DHCP snooping
  - ۴.۲.a [iv] IP source-guard
  - ۴.۲.a [v] Dynamic ARP inspection
  - ۴.۲.a [vi] Port-security



- ۴.۲.a [vii] Private VLAN
- ۴.۲.b Implement and troubleshoot router security features
  - ۴.۲.b [i] IPv۴ access control lists [standard, extended, time-based]
  - ۴.۲.b [ii] IPv۶ traffic filter
  - ۴.۲.b [iii] Unicast reverse path forwarding
- ۴.۲.c Implement and troubleshoot IPv۶ first hop security
  - ۴.۲.c [i] RA guard
  - ۴.۲.c [ii] DHCP guard
  - ۴.۲.c [iii] Binding table
  - ۴.۲.c [iv] Device tracking
  - ۴.۲.c [v] ND inspection/snooping
  - ۴.۲.c [vi] Source guard
  - ۴.۲.c [vii] PACL

### ۴.۳ Troubleshooting infrastructure security

- ۴.۳.a Use IOS troubleshooting tools
  - ۴.۳.a [i] debug, conditional debug
  - ۴.۳.a [ii] ping, traceroute with extended options
  - ۴.۳.a [iii] Embedded packet capture
- ۴.۳.b Apply troubleshooting methodologies
  - ۴.۳.b [i] Diagnose the root cause of networking issue [analyze symptoms, identify and describe root cause]
  - ۴.۳.b [ii] Design and implement valid solutions according to constraints



- ۴.۳.b [iii] Verify and monitor resolution
- ۴.۳.c Interpret packet capture
  - ۴.۳.c [i] Using wireshark trace analyzer
  - ۴.۳.c [ii] Using IOS embedded packet capture

## ۵.۱ System management

- ۵.۱.a Implement and troubleshoot device management
  - ۵.۱.a [i] Console and VTY
  - ۵.۱.a [ii] telnet, HTTP, HTTPS, SSH, SCP
  - ۵.۱.a [iii] [T]FTP
- ۵.۱.b Implement and troubleshoot SNMP
  - ۵.۱.b [i] v۲c, v۳
- ۵.۱.c Implement and troubleshoot logging
  - ۵.۱.c [i] Local logging, syslog, debug, conditional debug
  - ۵.۱.c [ii] Timestamp

## ۵.۲ Quality of service

- ۵.۲.a Implement and troubleshoot end to end QoS
  - ۵.۲.a [i] CoS and DSCP mapping
- ۵.۲.b Implement, optimize and troubleshoot QoS using MQC
  - ۵.۲.b [i] Classification



- ۵.۲.b [ii] Network based application recognition [NBAR]
- ۵.۲.b [iii] Marking using IP precedence, DSCP, CoS, ECN
- ۵.۲.b [iv] Policing, shaping
- ۵.۲.b [v] Congestion management [queuing]
- ۵.۲.b [vi] HQoS, sub-rate ethernet link
- ۵.۲.b [vii] Congestion avoidance [WRED]

### ۵.۳ Network services

- ۵.۳.a Implement and troubleshoot first-hop redundancy protocols
  - ۵.۳.a [i] HSRP, GLBP, VRRP
  - ۵.۳.a [ii] Redundancy using IPv۶ RS/RA
- ۵.۳.b Implement and troubleshoot network time protocol
  - ۵.۳.b [i] NTP master, client, version ۳, version ۴
  - ۵.۳.b [ii] NTP authentication
- ۵.۳.c Implement and troubleshoot IPv۴ and IPv۶ DHCP
  - ۵.۳.c [i] DHCP client, IOS DHCP server, DHCP relay
  - ۵.۳.c [ii] DHCP options
  - ۵.۳.c [iii] DHCP protocol operations
  - ۵.۳.c [iv] SLAAC/DHCPv۶ interaction
  - ۵.۳.c [v] Stateful, stateless DHCPv۶
  - ۵.۳.c [vi] DHCPv۶ prefix delegation
- ۵.۳.d Implement and troubleshoot IPv۴ network address translation
  - ۵.۳.d [i] Static NAT, dynamic NAT, policy-based NAT, PAT
  - ۵.۳.d [ii] NAT ALG



## ۵.۴ Network optimization

- ۵.۴.a Implement and troubleshoot IP SLA
  - ۵.۴.a [i] ICMP, UDP, jitter, VoIP
- ۵.۴.b Implement and troubleshoot tracking object
  - ۵.۴.b [i] Tracking object, tracking list
  - ۵.۴.b [ii] Tracking different entities [e.g. interfaces, routes, IPSLA, and such]
- ۵.۴.c Implement and troubleshoot netflow
  - ۵.۴.c [i] Netflow v۵, v۹
  - ۵.۴.c [ii] Local retrieval
  - ۵.۴.c [iii] Export [configuration only]
- ۵.۴.d Implement and troubleshoot embedded event manager
  - ۵.۴.d [i] EEM policy using applet

## ۵.۵ Troubleshooting infrastructure services

- ۵.۵.a Use IOS troubleshooting tools
  - ۵.۵.a [i] debug, conditional debug
  - ۵.۵.a [ii] ping, traceroute with extended options
  - ۵.۵.a [iii] Embedded packet capture
- ۵.۵.b Apply troubleshooting methodologies
  - ۵.۵.b [i] Diagnose the root cause of networking issue [analyze symptoms, identify and describe root cause]



- ۵.۵.b [ii] Design and implement valid solutions according to constraints
- ۵.۵.b [iii] Verify and monitor resolution
- ۵.۵.c Interpret packet capture
- ۵.۵.c [i] Using wireshark trace analyzer
- ۵.۵.c [ii] Using IOS embedded packet capture

## مخاطبان دوره

- افراد علاقه مند به کار در حوزه شبکه و تجهیزات سیستم

## پیش نیاز ها

- دوره Network+

