

CCNP ROUTE



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1.0 Network Principles

- 1.1 Identify Cisco Express Forwarding concepts
 - 1.1.a FIB
 - 1.1.b Adjacency table
- 1.2 Explain general network challenges
 - 1.2.a Unicast
 - 1.2.b Out-of-order packets
 - 1.2.c Asymmetric routing
- 1.3 Describe IP operations
 - 1.3.a ICMP Unreachable and Redirects
 - 1.3.b IPv4 and IPv6 fragmentation
 - 1.3.c TTL
- 1.4 Explain TCP operations
 - 1.4.a IPv4 and IPv6 (P)MTU
 - 1.4.b MSS
 - 1.4.c Latency
 - 1.4.d Windowing
 - 1.4.e Bandwidth-delay product
 - 1.4.f Global synchronization
- 1.5 Describe UDP operations
 - 1.5.a Starvation
 - 1.5.b Latency
- 1.6 Recognize proposed changes to the network
 - 1.6.a Changes to routing protocol parameters
 - 1.6.b Migrate parts of the network to IPv6
 - 1.6.c Routing protocol migration



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2.0 Layer 2 Technologies

- 2.1 Configure and verify PPP
 - 2.1.a Authentication (PAP, CHAP)
 - 2.1.b PPPoE (client side only)
- 2.2 Explain Frame Relay
 - 2.2.a Operations
 - 2.2.b Point-to-point
 - 2.2.c Multipoint

3.0 Layer 3 Technologies

- 3.1 Identify, configure, and verify IPv4 addressing and subnetting
 - 3.1.a Address types (Unicast, broadcast, multicast, and VLSM)
 - 3.1.b ARP
 - 3.1.c DHCP relay and server
 - 3.1.d DHCP protocol operations
- 3.2 Identify IPv6 addressing and subnetting
 - 3.2.a Unicast
 - 3.2.b EUI-64
 - 3.2.c ND, RS/RA
 - 3.2.d Autoconfig (SLAAC)
 - 3.2.e DHCP relay and server
 - 3.2.f DHCP protocol operations
- 3.3 Configure and verify static routing
- 3.4 Configure and verify default routing
- 3.5 Evaluate routing protocol types
 - 3.5.a Distance vector
 - 3.5.b Link state
 - 3.5.c Path vector
- 3.6 Describe administrative distance



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- 3.7 Troubleshoot passive interfaces
- 3.8 Configure and verify VRF lite
- 3.9 Configure and verify filtering with any protocol
- 3.10 Configure and verify redistribution between any routing protocols or routing sources
- 3.11 Configure and verify manual and autosummarization with any routing protocol
- 3.12 Configure and verify policy-based routing
- 3.13 Identify suboptimal routing
- 3.14 Explain ROUTE maps
- 3.15 Configure and verify loop prevention mechanisms
 - 3.15.a Route tagging and filtering
 - 3.15.b Split-horizon
 - 3.15.c Route poisoning
- 3.16 Configure and verify RIPv2
- 3.17 Describe RIPv6
- 3.18 Describe EIGRP packet types
- 3.19 Configure and verify EIGRP neighbor relationship and authentication
- 3.20 Configure and verify EIGRP stubs
- 3.21 Configure and verify EIGRP load balancing
 - 3.21.a Equal cost
 - 3.21.b Unequal cost
- 3.22 Describe and optimize EIGRP metrics



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- 3.23 Configure and verify EIGRP for Ipv6
- 3.24 Describe OSPF packet types
- 3.25 Configure and verify OSPF neighbor relationship and authentication
- 3.26 Configure and verify network types, area types, and router types
 - 3.26.a Point-to-point, multipoint, broadcast, nonbroadcast
 - 3.26.b LSA types, area type: backbone, normal, transit, stub NSSA, totally stub
 - 3.26.c Internal router, backbone router, ABR, ASBR
 - 3.26.d Virtual link
- 3.27 Configure and verify OSPF path preference
- 3.28 Configure and verify OSPF operations
- 3.29 Configure and verify OSPF for Ipv6
- 3.30 Describe, configure, and verify BGP peer relationships and authentication
 - 3.30.a Peer group
 - 3.30.b Active, passive
 - 3.30.c States and timers
- 3.31 Configure and verify eBGP (IPv4 and IPv6 address families)
 - 3.31.a eBGP
 - 3.31.b 4-byte AS number
 - 3.31.c Private AS
- 3.32 Explain BGP attributes and best-path selection



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4.0 VPN Technologies

- 4.1 Configure and verify GRE
- 4.2 Describe DMVPN (single hub)
- 4.3 Describe Easy Virtual Networking (EVN)

5.0 Infrastructure Security

- 5.1 Describe IOS AAA using local database
- 5.2 Describe device security using IOS AAA with TACACS+ and RADIUS
 - 5.2.a AAA with TACACS+ and RADIUS
 - 5.2.b Local privilege authorization fallback
- 5.3 Configure and verify device access control
 - 5.3.a Lines (VTY, AUX, console)
 - 5.3.b Management plane protection
 - 5.3.c Password encryption
- 5.4 Configure and verify router security features
 - 5.4.a IPv4 access control lists (standard, extended, time-based)
 - 5.4.b IPv6 traffic filter
 - 5.4.c Unicast reverse path forwarding

6.0 Infrastructure Services

- 6.1 Configure and verify device management
 - 6.1.a Console and VTY
 - 6.1.b Telnet, HTTP, HTTPS, SSH, SCP
 - 6.1.c (T)FTP
- 6.2 Configure and verify SNMP
 - 6.2.a v2
 - 6.2.b v3



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- 6.3 Configure and verify logging
 - 6.3.a Local logging, syslog, debugs, conditional debugs
 - 6.3.b Timestamps
- 6.4 Configure and verify Network Time Protocol (NTP)
 - 6.4.a NTP master, client, version 3, version 4
 - 6.4.b NTP authentication
- 6.5 Configure and verify IPv4 and IPv6 DHCP
 - 6.5.a DHCP client, IOS DHCP server, DHCP relay
 - 6.5.b DHCP options (describe)
- 6.6 Configure and verify IPv4 Network Address Translation (NAT)
 - 6.6.a Static NAT, dynamic NAT, PAT
- 6.7 Describe IPv6 NAT
 - 6.7.a NAT64
 - 6.7.b NPTv6
- 6.8 Describe SLA architecture
- 6.9 Configure and verify IP SLA
 - 6.9.a ICMP
- 6.10 Configure and verify tracking objects
 - 6.10.a Tracking objects
 - 6.10.b Tracking different entities
(for example, interfaces, IPSLA results)
- 6.11 Configure and verify Cisco NetFlow
 - 6.11.a NetFlow v5, v9
 - 6.11.b Local retrieval
 - 6.11.c Export (configuration only)



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