

# CCIE ENTERPRISE INFRASTRUCTURE v1.0



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Enterprise Infrastructure v1.0 training

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## Basic Switching

- ❖ Switch administration
  - Managing MAC address table
  - Errdisable recovery
  - L2 MTU
- ❖ Layer 2 protocols
  - CDP, LLDP
  - UDLD
- ❖ VLAN technologies
  - Access ports
  - Trunk ports (802.1Q)
  - Native VLAN
  - Manual VLAN pruning
  - VLAN database
  - Normal range and extended range VLANs
  - Voice VLAN
  - VTP
- ❖ EtherChannel
  - LACP, static
  - Layer 2, Layer 3
  - Load balancing
  - EtherChannel Misconfiguration Guard
- ❖ Spanning Tree Protocol
  - PVST+, Rapid PVST+, MST
  - Switch priority, port priority, path cost, STP timers
  - PortFast, BPDU Guard, BPDU Filter
  - Loop Guard, Root Guard

## Routing Concepts

- ❖ Administrative distance
- ❖ VRF-lite
- ❖ Static routing
- ❖ Policy Based Routing
- ❖ VRF-aware routing with any routing protocol
- ❖ Route filtering with any routing protocol
- ❖ Manual summarization with any routing protocol
- ❖ Redistribution between any pair of routing protocols
- ❖ Routing protocol authentication
- ❖ Bidirectional Forwarding Detection

## EIGRP

- ❖ Adjacencies
- ❖ Best path selection
  - RD, FD, FC, successor, feasible successor

- Classic Metrics and Wide Metrics
- ❖ Operations
  - General operations
  - Topology table
  - Packet types
  - Stuck In Active
  - Graceful shutdown
- ❖ EIGRP load balancing
  - Equal-cost
  - Unequal-cost
  - Add-path
- ❖ EIGRP Named Mode
- ❖ Optimization, convergence and scalability
  - Fast convergence requirements
  - Query propagation boundaries
  - IP FRR (single hop)
  - Leak-map with summary routes
  - EIGRP stub with leak map

## OSPF (v2 and v3)

- ❖ Adjacencies
- ❖ Network types, area types
- ❖ Path preference
- ❖ Operations
  - General operations
  - Graceful shutdown
  - GTSM (Generic TTL Security Mechanism)
- ❖ Optimization, convergence and scalability
  - Metrics
  - LSA throttling, SPF tuning, fast hello
  - LSA propagation control (area types)
  - Stub router
  - Loop-free alternate
  - Prefix suppression

## BGP

- ❖ IBGP and EBGP peer relationships
  - Peer-group/update-group, template
  - Active, passive
  - Timers
  - Dynamic neighbors
  - 4-byte AS numbers
  - Private AS

- ❖ Path selection
  - Attributes
  - Best path selection algorithm
  - Load balancing
- ❖ Routing policies
  - Attribute manipulation
  - Conditional advertisement
  - Outbound Route Filtering
  - Standard and extended communities
  - Multi-homing
- ❖ AS path manipulations
  - local-AS, allowas-in, remove-private-as
  - Prepend
  - Regexp
- ❖ Convergence and scalability
  - Route reflector
  - Aggregation, as-set
- ❖ Other BGP features
  - Multipath, add-path
  - Soft reconfiguration, Route Refresh

## Multicast

- ❖ Layer 2 multicast
  - IGMPv2, IGMPv3
  - IGMP Snooping, PIM Snooping
  - IGMP Querier
  - IGMP Filter
  - MLD
- ❖ Reverse path forwarding check
- ❖ PIM
  - Sparse Mode
  - Static RP, BSR, AutoRP
  - Group to RP Mapping
  - Bidirectional PIM
  - Source-Specific Multicast
  - Multicast boundary, RP announcement filter
  - PIMv6 Anycast RP
  - IPv4 Anycast RP using MSDP
  - Multicast multipath

## Cisco SD Access

- ❖ Design a Cisco SD Access solution
  - Underlay network (IS-IS, manual/PnP)
  - Overlay fabric design (LISP, VXLAN, Cisco TrustSec)
  - Fabric domains (single-site and multi-site using SD-WAN transit)
- ❖ Cisco SD Access deployment
  - Cisco DNA Center device discovery and device management
  - Add fabric node devices to an existing fabric
  - Host onboarding (wired endpoints only)
  - Fabric border handoff
- ❖ Segmentation
  - Macro-level segmentation using VNs
  - Micro-level segmentation using SGTs (using Cisco ISE)
- ❖ Assurance
  - Network and client health (360)
  - Monitoring and troubleshooting

## Cisco SD-WAN

- ❖ Design a Cisco SD-WAN solution
  - Orchestration plane (vBond, NAT)
  - Management plane (vManage)
  - Control plane (vSmart, OMP)
  - Data plane (vEdge/cEdge)
- ❖ WAN edge deployment
  - Onboarding new edge routers
  - Orchestration with zero-touch provisioning/Plug-And-Play
  - OMP
  - TLOC
- ❖ Configuration templates
- ❖ Localized policies (only QoS)
- ❖ Centralized policies
  - Application Aware Routing
  - Topologies

## MPLS

- ❖ Operations
  - Label stack, LSR, LSP
  - LDP
  - MPLS ping, MPLS traceroute
- ❖ L3VPN
  - PE-CE routing
  - MP-BGP VPNv4/VPNv6
  - Extranet (route leaking)

## DMVPN

- ❖ Troubleshoot DMVPN Phase 3 with dual-hub
  - NHRP
  - IPsec/IKEv2 using pre-shared key
  - Per-Tunnel QoS
- ❖ Identify use cases for FlexVPN
  - Site-to-site, Server, Client, Spoke-to-Spoke
  - IPsec/IKEv2 using pre-shared key
  - MPLS over FlexVPN

## Security and Services

- ❖ Device Security on Cisco IOS XE
  - Control plane policing and protection
  - AAA
- ❖ Network Security
  - Switch security features
    - ✓ VACL, PACL
    - ✓ Storm control
    - ✓ DHCP Snooping, DHCP option 82
    - ✓ IP Source Guard
    - ✓ Dynamic ARP Inspection
    - ✓ Port Security
    - ✓ Private VLAN
  - Router security features
    - ✓ IPv6 Traffic Filters
    - ✓ IPv4 Access Control Lists
    - ✓ Unicast Reverse Path Forwarding

- IPv6 infrastructure security features
  - ✓ RA Guard
  - ✓ DHCP Guard
  - ✓ Binding table
  - ✓ Device tracking
  - ✓ ND Inspection/Snooping
  - ✓ Source Guard
- IEEE 802.1X Port-Based Authentication
  - ✓ Device roles, port states
  - ✓ Authentication process
  - ✓ Host modes
- ❖ System Management
  - Device management
    - ✓ Console and VTY
    - ✓ SSH, SCP
    - ✓ RESTCONF, NETCONF
  - SNMP
    - ✓ v2c
    - ✓ v3
  - Logging
    - ✓ Local logging, syslog, debugs, conditional debugs
    - ✓ Timestamps
- ❖ Quality of Service
  - End to end L3 QoS using MQC
    - ✓ DiffServ
    - ✓ CoS and DSCP Mapping
    - ✓ Classification
    - ✓ Network Based Application Recognition (NBAR)
    - ✓ Marking using IP Precedence, DSCP, CoS
    - ✓ Policing, shaping
    - ✓ Congestion management and avoidance
    - ✓ HQoS, Sub-rate Ethernet Link
- ❖ Network Services
  - First Hop Redundancy Protocols
    - ✓ HSRP, GLBP, VRRP
    - ✓ Redundancy using IPv6 RS/RA
  - Network Time Protocol
    - ✓ Master, client
    - ✓ Authentication

- DHCP on Cisco IOS
  - ✓ Client, server, relay
  - ✓ Options
  - ✓ SLAAC/DHCPv6 interaction
  - ✓ Stateful, stateless DHCPv6
  - ✓ DHCPv6 Prefix Delegation
- IPv4 Network Address Translation
  - ✓ Static NAT, PAT
  - ✓ Dynamic NAT, PAT
  - ✓ Policy-based NAT, PAT
  - ✓ VRF-aware NAT, PAT
  - ✓ IOS-XE VRF-Aware Software Infrastructure (VASI) NAT
- ❖ Network optimization
  - IP SLA
    - ✓ ICMP probes
    - ✓ UDP probes
    - ✓ TCP probes
  - Tracking object
  - Flexible NetFlow
- ❖ Network operations
  - Traffic capture
    - ✓ SPAN
    - ✓ RSPAN
    - ✓ ERSPAN
    - ✓ Embedded Packet Capture
  - Cisco IOS-XE troubleshooting tools
    - ✓ Packet Trace
    - ✓ Conditional debugger (debug platform condition)

## Automation and Programmability

- ❖ Data encoding formats
  - JSON
  - XML
- ❖ Automation and scripting
  - EEM applets
  - Guest shell
    - ✓ Linux environment
    - ✓ CLI Python module
    - ✓ EEM Python module



❖ Programmability

- Interaction with vManage API
  - ✓ Python requests library and Postman
  - ✓ Monitoring endpoints
  - ✓ Configuration endpoints
- Interaction with Cisco DNA Center API
  - ✓ HTTP request (GET, PUT, POST) via Python requests library and Postman
- Interaction with Cisco IOS XE API
  - ✓ Via NETCONF/YANG using Python ncclient library
  - ✓ Via RESTCONF/YANG using Python requests library and Postman
- Deploy and verify model-driven telemetry
  - ✓ Configure on-change subscription using gRPC