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CCIE ENTERPRISE INFRASTRUCTURE

SYLLABUS

Prepared For :
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Course Outline

NETWORK INFRASTRUCTURE (30%)

SWITCHED CAMPUS

- Switch administration

1. Managing MAC address table
2. Errdisable recovery
3. L2 MTU

- Layer 2 protocols

4. CDP, LLDP
5. UDLD

- VLAN technologies

6. Access ports
7. Trunk ports (802.1Q)
8. Native VLAN
9. Manual VLAN pruning
10. VLAN database

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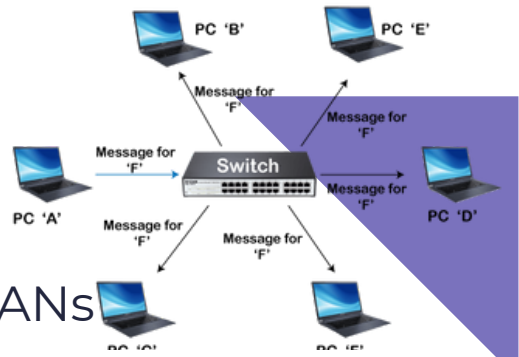

11. Normal range and extended range VLANs
12. Voice VLAN
13. VTP

- EtherChannel

1. LACP, static
2. Layer 2, Layer 3
3. Load balancing
4. EtherChannel Misconfiguration Guard

- Spanning Tree Protocol

5. PVST+, Rapid PVST+, MST
6. Switch priority, port priority, path cost, STP timers
7. PortFast, BPDU Guard, BPDU Filter
8. 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

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EIGRP

- Adjacencies
- Best path selection

1. RD, FD, FC, successor, feasible successor
2. Classic Metrics and Wide Metrics

- Operations

3. General operations
4. Topology table
5. Packet types
6. Stuck In Active
7. Graceful shutdown

- EIGRP load balancing

8. Equal-cost
9. Unequal-cost
10. Add-path

- EIGRP Named Mode
- Optimization, convergence and scalability

11. Fast convergence requirements
12. Query propagation boundaries
13. IP FRR (single hop)
14. Leak-map with summary routes
15. EIGRP stub with leak map

- OSPF (v2 and v3)

16. Adjacencies
17. Network types, area types
18. Path preference

19. Operations
    1. General operations
    2. Graceful shutdown
    3. GTSM (Generic TTL Security Mechanism)
10. Optimization, convergence and scalability
    1. Metrics
    2. LSA throttling, SPF tuning, fast hello
    3. LSA propagation control (area types)
    4. Stub router
    5. Loop-free alternate
    6. Prefix suppression

- BGP

    IBGP and EBGP peer relationships
    1. Peer-group/update-group, template
    2. Active, passive
    3. Timers
    4. Dynamic neighbors
    5. 4-byte AS numbers
    6. Private AS

    Path selection
    1. Attributes
    2. Best path selection algorithm
    3. Load balancing

    Routing policies
    1. Attribute manipulation
    2. Conditional advertisement
    3. Outbound Route Filtering
    4. Standard and extended communities
    5. Multi-homing

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- AS path manipulations

1. local-AS, allowas-in, remove-private-as
2. Prepend
3. Regexp

- Convergence and scalability

4. Route reflector
5. Aggregation, as-set

- Other BGP features

6. Multipath, add-path
7. Soft reconfiguration, Route Refresh

- Multicast

1. Layer 2 multicast

IGMPv2, IGMPv3
IGMP Snooping, PIM Snooping
IGMP Querier
IGMP Filter
MLD

- Reverse path forwarding check
- PIM

1. Sparse Mode
2. Static RP, BSR, AutoRP
3. Group to RP Mapping
4. Bidirectional PIM
5. Source-Specific Multicast
6. Multicast boundary, RP announcement filter
7. PIMv6 Anycast RP
8. IPv4 Anycast RP using MSDP
9. Multicast multipath

SOFTWARE DEFINED INFRASTRUCTURE (25%)

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CISCO SD ACCESS

- Design a Cisco SD Access solution

1. Underlay network (IS-IS, manual/PnP)
2. Overlay fabric design (LISP, VXLAN, Cisco TrustSec)
3. Fabric domains (single-site and multi-site using SD-WAN transit)

- Cisco SD Access deployment

4. Cisco DNA Center device discovery and device management
5. Add fabric node devices to an existing fabric
6. Host onboarding (wired endpoints only)
7. Fabric border handoff

- Segmentation

8. Macro-level segmentation using VNs
9. Micro-level segmentation using SGTs (using Cisco ISE)

- Assurance

10. Network and client health (360)
11. Monitoring and troubleshooting

CISCO SD-WAN

- Design a Cisco SD-WAN solution

1. Orchestration plane (vBond, NAT)
2. Management plane (vManage)
3. Control plane (vSmart, OMP)
4. Data plane (vEdge/cEdge)

- WAN edge deployment

5. Onboarding new edge routers
6. Orchestration with zero-touch provisioning/Plug-And-Play
7. OMP
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- Configuration templates
- Localized policies (only QoS)
- Centralized policies

1. Application Aware Routing
2. Topologies

TRANSPORT TECHNOLOGIES AND SOLUTIONS (15%)

MPLS

- Operations

1. Label stack, LSR, LSP
2. LDP
3. MPLS ping, MPLS traceroute

- L3VPN

4. PE-CE routing
5. MP-BGP VPNv4/VPNv6
6. Extranet (route leaking)

DMVPN

- Troubleshoot DMVPN Phase 3 with dual-hub

1. NHRP
2. IPsec/IKEv2 using pre-shared key
3. Per-Tunnel QoS

- Identify use cases for FlexVPN

4. Site-to-site, Server, Client, Spoke-to-Spoke
5. IPsec/IKEv2 using pre-shared key
6. MPLS over FlexVPN

INFRASTRUCTURE SECURITY AND SERVICES (15%)

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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

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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

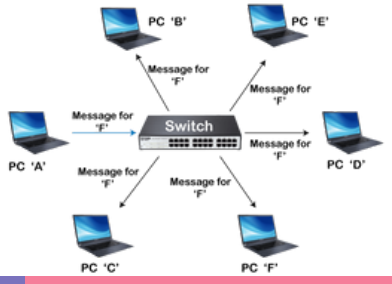
End to end L3 QoS using MQC

- 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

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Cisco IOS-XE troubleshooting tools

- Packet Trace
- Conditional debugger (debug platform condition)

INFRASTRUCTURE AUTOMATION AND PROGRAMMABILITY (15%)

Data encoding formats

- JSON
- XML

Automation and scripting

- EEM applets
- Guest shell
  1. Linux environment
  2. CLI Python module
  3. 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