CCIE Routing & Switching

Cisco Certified Internetwork Expert Routing and Switching (CCIE Routing and Switching) certifies the skills required of expert-level network engineers to plan, operate and troubleshoot complex, converged network infrastructure.

Prerequisites: There are no formal prerequisites for CCIE certification. Other professional certifications or training courses are not required. Instead, candidates must first pass a written qualification exam and then the corresponding hands-on lab exam.

Recommended Training: SolutionEdge Executive Learning Program for CCIE Routing and Switching is a complete, blended learning program to accelerate competency and build the skills that are necessary for expert certification.

Exams : CCIE Routing and Switching Written Exam Version 5.0 (400-101), CCIE Routing and Switching Lab Exam Version 5.0

Syllabus:

Written Exam Version 5.0 (400-101)

Exam Description: The Cisco CCIE Routing and Switching Written Exam (400-101) version 5.0 is a 2-hour test with 90-110 questions that will validate that professionals have the expertise to: configure, validate, and troubleshoot complex enterprise network infrastructure; understand how infrastructure components interoperate; and translate functional requirements into specific device configurations**.**

1.0 Network Principles

- 1.1 Network theory
- 1.1.a Describe basic software architecture differences between IOS and IOS XE
- 1.1.b Identify Cisco express forwarding concepts
- 1.1.c Explain general network challenges
- 1.1.d Explain IP operations
- 1.1.e Explain TCP operations
- 1.1.f Explain UDP operations
- 1.2 Network implementation and operation
- 1.2.a Evaluate proposed changes to a network
- 1.3 Network troubleshooting

- 1.3.a Use IOS troubleshooting tools
- 1.3.b Apply troubleshooting methodologies
- 1.3.c Interpret packet capture

2.0 Layer 2 Technologies

- 2.1 LAN switching technologies
- 2.1.a Implement and troubleshoot switch administration
- 2.1.b Implement and troubleshoot layer 2 protocols
- 2.1.c Implement and troubleshoot VLAN
- 2.1.d Implement and troubleshoot trunking
- 2.1.e Implement and troubleshoot EtherChannel
- 2.1.f Implement and troubleshoot spanning-tree
- 2.1.g Implement and troubleshoot other LAN switching technologies
- 2.1.h Describe chassis virtualization and aggregation technologies
- 2.1.i Describe spanning-tree concepts
- 2.2 Layer 2 multicast
- 2.2.a Implement and troubleshoot IGMP
- 2.2.b Explain MLD
- 2.2.c Explain PIM snooping
- 2.3 Layer 2 WAN circuit technologies
- 2.3.a Implement and troubleshoot HDLC
- 2.3.b Implement and troubleshoot PPP
- 2.3.c Describe WAN rate-based ethernet circuits

3.0 Layer 3 Technologies

- 3.1 Addressing technologies
- 3.1.a Identify, implement and troubleshoot IPv4 addressing and subnetting
- 3.1.b Identify, implement and troubleshoot IPv6 addressing and subnetting
- 3.2 Layer 3 multicast
- 3.2.a Troubleshoot reverse path forwarding
- 3.2.b Implement and troubleshoot IPv4 protocol independent multicast
- 3.2.c Implement and troubleshoot multicast source discovery protocol
- 3.2.d Describe IPv6 multicast
- 3.3 Fundamental routing concepts
- 3.3.a Implement and troubleshoot static routing
- 3.3.b Implement and troubleshoot default routing
- 3.3.c Compare routing protocol types
- 3.3.d Implement, optimize and troubleshoot administrative distance
- 3.3.e Implement and troubleshoot passive interface
- 3.3.f Implement and troubleshoot VRF lite
- 3.3.g Implement, optimize and troubleshoot filtering with any routing protocol
- 3.3.h Implement, optimize and troubleshoot redistribution between any routing protocol

- 3.3.i Implement, optimize and troubleshoot manual and auto summarization with any routing protocol
- 3.3.j Implement, optimize and troubleshoot policy-based routing
- 3.3.k Identify and troubleshoot sub-optimal routing
- 3.3.l Implement and troubleshoot bidirectional forwarding detection
- 3.3.m Implement and troubleshoot loop prevention mechanisms
- 3.3.n Implement and troubleshoot routing protocol authentication
- 3.4 Implement and troubleshoot RIPv2 & RIPng
- 3.5 EIGRP (for IPv4 and IPv6)
- 3.5.a Describe packet types
- 3.5.b Implement and troubleshoot neighbor relationship
- 3.5.c Implement and troubleshoot loop free path selection
- 3.5.d Implement and troubleshoot operations
- 3.5.e Implement and troubleshoot EIGRP stub
- 3.5.f Implement and troubleshoot load-balancing
- 3.5.g Implement EIGRP (multi-address) named mode
- 3.5.h Implement, troubleshoot and optimize EIGRP convergence and scalability
- 3.6 OSPF (v2 and v3)
- 3.6.a Describe packet types
- 3.6.b Implement and troubleshoot neighbor relationship
- 3.6.c Implement and troubleshoot OSPFv3 address-family support
- 3.6.d Implement and troubleshoot network types, area types and router types
- 3.6.e Implement and troubleshoot path preference
- 3.6.f Implement and troubleshoot operations
- 3.6.g Implement, troubleshoot and optimize OSPF convergence and scalability
- 3.7 BGP
- 3.7.a Describe, implement and troubleshoot peer relationships
- 3.7.b Implement and troubleshoot IBGP and EBGP
- 3.7.c Explain attributes and best-path selection
- 3.7.d Implement, optimize and troubleshoot routing policies
- 3.7.e Implement and troubleshoot scalability
- 3.7.f Implement and troubleshoot multiproctocol BGP
- 3.7.g Implement and troubleshoot AS path manipulations
- 3.7.h Implement and troubleshoot other features
- 3.7.i Describe BGP fast convergence features
- 3.8 ISIS (for IPv4 and IPv6)
- 3.8.a Describe basic ISIS network
- 3.8.b Describe neighbor relationship
- 3.8.c Describe network types, levels and router types
- 3.8.d Describe operations
- 3.8.e Describe optimization features

4.0 VPN Technologies

- 4.1 Tunneling
- 4.1.a Implement and troubleshoot MPLS operations
- 4.1.b Implement and troubleshoot basic MPLS L3VPN
- 4.1.c Implement and troubleshoot encapsulation
- 4.1.d Implement and troubleshoot DMVPN (single hub)
- 4.1.e Describe IPv6 tunneling techniques
- 4.1.f Describe basic layer 2 VPN wireline
- 4.1.g Describe basic L2VPN LAN services
- 4.2 Encryption
- 4.2.a Implement and troubleshoot IPsec with preshared key
- 4.2.b Describe GET VPN

5.0 Infrastructure Security

- 5.1 Device security
- 5.1.a Implement and troubleshoot IOS AAA using local database
- 5.1.b Implement and troubleshoot device access control
- 5.1.c Implement and troubleshoot control plane policing
- 5.1.d Describe device security using IOS AAA with TACACS+ and RADIUS
- 5.2 Network security
- 5.2.a Implement and troubleshoot switch security features
- 5.2.b Implement and troubleshoot router security features
- 5.2.c Implement and troubleshoot IPv6 first hop security
- 5.2.d Describe 802.1x

6.0 Infrastructure Services

- 6.1 System management
- 6.1.a Implement and troubleshoot device management
- 6.1.b Implement and troubleshoot SNMP
- 6.1.c Implement and troubleshoot logging
- 6.2 Quality of service
- 6.2.a Implement and troubleshoot end-to-end QoS
- 6.2.b Implement, optimize and troubleshoot QoS using MQC
- 6.2.c Describe layer 2 QoS
- 6.3 Network services
- 6.3.a Implement and troubleshoot first-hop redundancy protocols
- 6.3.b Implement and troubleshoot network time protocol
- 6.3.c Implement and troubleshoot IPv4 and IPv6 DHCP
- 6.3.d Implement and troubleshoot IPv4 network address translation
- 6.3.e Describe IPv6 network address translation
- 6.4 Network optimization
- 6.4.a Implement and troubleshoot IP SLA

- 6.4.b Implement and troubleshoot tracking object
- 6.4.c Implement and troubleshoot netflow
- 6.4.d Implement and troubleshoot embedded event manager
- 6.4.e Identify performance routing (PfR)

Lab Exam Version 5.0

Exam Description: The CCIE Routing and Switching Lab Exam version 5.0 is an eight-hour, hands-on exam which requires you to configure and troubleshoot a series of complex networks to given specifications. Knowledge of troubleshooting is an important skill and candidates are expected to diagnose and solve issues as part of the CCIE lab exam. You will not configure end-user systems, but are responsible for all devices residing in the network.

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- 1.1.d Implement and troubleshoot trunking
- 1.1.e Implement and troubleshoot EtherChannel
- 1.1.f Implement and troubleshoot spanning-tree
- 1.1.g Implement and troubleshoot other LAN switching technologies
- 1.2 Layer 2 multicast
- 1.2.a Implement and troubleshoot IGMP
- 1.3 Layer 2 WAN circuit technologies
- 1.3.a Implement and troubleshoot HDLC
- 1.3.b Implement and troubleshoot PPP
- 1.4 Troubleshooting layer 2 technologies
- 1.4.a Use IOS troubleshooting tools
- 1.4.b Apply troubleshooting methodologies
- 1.4.c Interpret packet capture

2.0 Layer 3 Technologies

- 2.1 Addressing technologies
- 2.1.a Identify, implement and troubleshoot IPv4 addressing and subnetting
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- 2.7.h Implement and troubleshoot other features

- 2.8 Troubleshooting layer 3 technologies
- 2.8.a Use IOS troubleshooting tools
- 2.8.b Apply troubleshooting methodologies
- 2.8.c Interpret packet capture

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- 3.3 Troubleshooting VPN technologies
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- 3.3.b Apply troubleshooting methodologies
- 3.3.c Interpret packet capture

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- 4.2.a Implement and troubleshoot switch security features
- 4.2.b Implement and troubleshoot router security features
- 4.2.c Implement and troubleshoot IPv6 first hop security
- 4.3 Troubleshooting infrastructure security
- 4.3.a Use IOS troubleshooting tools
- 4.3.b Apply troubleshooting methodologies
- 4.3.c Interpret packet capture

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- 5.3 Network services
- 5.3.a Implement and troubleshoot first-hop redundancy protocols

- 5.3.b Implement and troubleshoot network time protocol
- 5.3.c Implement and troubleshoot IPv4 and IPv6 DHCP
- 5.3.d Implement and troubleshoot IPv4 network address translation
- 5.4 Network optimization
- 5.4.a Implement and troubleshoot IP SLA
- 5.4.b Implement and troubleshoot tracking object
- 5.4.c Implement and troubleshoot netflow
- 5.4.d Implement and troubleshoot embedded event manager
- 5.5 Troubleshooting infrastructure services
- 5.5.a Use IOS troubleshooting tools
- 5.5.b Apply troubleshooting methodologies
- 5.5.c Interpret packet capture