



---

## CCIE Service Provider Lab Exam Version 4.0

**Exam Description:** The Cisco CCIE® Service Provider Lab Exam version 4.0 is an eight-hour, hands-on exam which requires a candidate to configure, diagnostic, and troubleshoot a series of complex network scenarios for a given specification based on dual stack solutions (IPv4 and IPv6). Knowledge of troubleshooting is an important skill and candidates are expected to diagnose and solve issues as part of the CCIE lab exam. The candidate will not configure all end-user system, however the candidate is responsible for all devices residing in the network.

The following topics are general guidelines for the content likely to be included on the exam. However, other related topics may also appear on any specific delivery of the exam. In order to better reflect the contents of the exam and for clarity purposes, the guidelines below may change at any time without notice.

- 27% 1.0 Core Routing**
- 1.1 Interior Gateway Protocol (IGP)
    - 1.1.a Describe, implement, and troubleshoot IS-IS
    - 1.1.b Describe, implement, and troubleshoot OSPFv2 and OSPFv3
    - 1.1.c Describe and optimize IGP scale and performance
  
  - 1.2 Border Gateway Protocol (BGP)
    - 1.2.a Describe, implement, and troubleshoot IBGP, EBGP, and MP-BGP
    - 1.2.b Describe, implement, and troubleshoot BGP route policy enforcement
    - 1.2.c Describe and optimize BGP scale and performance
    - 1.2.d Describe, implement, and troubleshoot advanced BGP features, for example, add-path and BGP LS
  
  - 1.3 Multiprotocol Label Switching (MPLS)
    - 1.3.a Describe, implement, and troubleshoot LDP
    - 1.3.b Describe and optimize LDP scale and performance
  
  - 1.4 MPLS Traffic Engineering
    - 1.4.a Describe, implement, and troubleshoot RSVP
    - 1.4.b Describe, implement, and troubleshoot ISIS and OSPF extensions
    - 1.4.c Describe, implement, and troubleshoot MPLS TE policy enforcement
    - 1.4.d Describe and optimize MPLS TE scale and performance
  
  - 1.5 Multicast
    - 1.5.a Describe, implement, and troubleshoot PIM (PIM-SM, PIM-SSM, and PIM-BIDIR)
    - 1.5.b Describe, implement, and troubleshoot RP (Auto-RP, BSR, Static, Anycast RP, and MSDP)

- 1.5.c Describe, implement, and troubleshoot mLDP (including mLDP profiles from 0 to 9)
- 1.5.d Describe and optimize multicast scale and performance
- 1.6 Quality of Service (QoS)
  - 1.6.a Describe, implement, and troubleshoot classification and marking
  - 1.6.b Describe, implement, and troubleshoot congestion management and scheduling, for example, policing, shaping, and queuing
  - 1.6.c Describe, implement, and troubleshoot congestion avoidance
  - 1.6.d Describe, implement, and troubleshoot MPLS QoS models (MAM, RDM, Pipe, Short Pipe, and Uniform)
  - 1.6.e Describe, implement, and troubleshoot MPLS TE QoS (CBTS, PBTS, and DS-TE)
- 26%** **2.0 Service Provider Based Services**
  - 2.1 Carrier Ethernet
    - 2.1.a Describe, implement, and troubleshoot E-LINE, for example, VPWS
    - 2.1.b Describe, implement, and troubleshoot E-LAN and E-TREE, for example VPLS and H-VPLS
  - 2.2 L3VPN
    - 2.2.a Describe, implement, and troubleshoot L3VPN
    - 2.2.b Describe, implement, and troubleshoot Inter-AS L3VPN
    - 2.2.c Describe, implement, and troubleshoot Multicast VPN
    - 2.2.d Describe, implement, and troubleshoot Unified MPLS and CSC
    - 2.2.e Describe, implement, and troubleshoot shared services, for example, Extranet and Internet access
  - 2.3 Overlay VPN
    - 2.3.a Describe, implement, and troubleshoot L2TPv3
    - 2.3.b Describe, implement, and troubleshoot LISP
    - 2.3.c Describe, implement, and troubleshoot GRE and mGRE based VPN
  - 2.4 Internet Service
    - 2.4.a Describe, implement, and troubleshoot Internet Peering and Transit
    - 2.4.b Describe, implement, and troubleshoot IPv6 transition mechanism, for example, NAT44, NAT64, 6RD, and DS Lite
    - 2.4.c Describe, implement, and troubleshoot Internet peering route and transit policy enforcement
- 17%** **3.0 Access and Aggregation**
  - 3.1 Transport and encapsulation technologies
    - 3.1.a Describe, implement, and troubleshoot ethernet technologies
  - 3.2 PE-CE connectivity
    - 3.2.a Describe, implement, and troubleshoot PE-CE routing protocols, for example, static, OSPF, and BGP
    - 3.2.b Describe, implement, and troubleshoot route redistribution
    - 3.2.c Describe, implement, and troubleshoot route filtering

- 3.2.d Describe, implement, and troubleshoot loop prevention techniques in Multihomed environments
- 3.2.e Describe, implement, and troubleshoot end-to-end fast convergence
- 3.2.f Describe, implement, and troubleshoot Multi-VRF CE
- 3.3 Quality of Service (QoS)
  - 3.3.a Describe, implement, and troubleshoot classification and marking
  - 3.3.b Describe, implement, and troubleshoot congestion management and scheduling, for example, policing, shaping, and queuing
  - 3.3.c Describe, implement, and troubleshoot congestion avoidance
- 3.4 Multicast
  - 3.4.a Describe, implement, and troubleshoot IGMP and MLD
  - 3.4.b Describe, implement, and troubleshoot PIM
  - 3.4.c Describe, implement, and troubleshoot RP
  - 3.4.d Describe and optimize multicast scale and performance
- 13% 4.0 High Availability and Fast Convergence**
  - 4.1 System level HA
    - 4.1.a Describe, implement, and troubleshoot SSO/NSF, NSR, and GR
    - 4.1.b Describe, implement, and troubleshoot IGP-LDP Sync
    - 4.1.c Describe, implement, and troubleshoot LDP Session Protection
  - 4.2 Layer 1/2/3 failure detection techniques
    - 4.2.a Describe, implement, and troubleshoot Layer 2 failure detection
    - 4.2.b Describe, implement, and troubleshoot Layer 3 failure detection
  - 4.3 Routing/fast convergence
    - 4.3.a Describe, implement, and optimize IGP convergence
    - 4.3.b Describe, implement, and optimize BGP convergence
    - 4.3.c Describe, implement, and optimize IP FRR and TE FRR
- 17% 5.0 Service Provider Security, Service Provider Operation and Management**
  - 5.1 Control plane security
    - 5.1.a Describe, implement, and troubleshoot control plane protection techniques (LPTS and CoPP)
    - 5.1.b Describe, implement, and troubleshoot routing protocol security, for example, BGP-TTL security and protocol authentication
    - 5.1.c Describe, implement and troubleshoot BGP prefix suppression
    - 5.1.d Describe, implement and troubleshoot LDP security, for example, authentication and label allocation filtering
    - 5.1.e Describe, implement, and troubleshoot BGP prefix based filtering
  - 5.2 Management plane security
    - 5.2.a Describe, implement, and troubleshoot device management, for example, MPP, SSH, and VTY
    - 5.2.b Describe, implement, and troubleshoot logging and SNMP security

- 5.3 Infrastructure security
  - 5.3.a Describe, implement, and troubleshoot uRPF
  - 5.3.b Describe, implement, and troubleshoot iACL
  - 5.3.c Describe, implement, and troubleshoot RTBH
  
- 5.4 Timing and synchronization
  - 5.4.a Describe, implement, and troubleshoot timing protocol, for example, NTP, 1588v2, and SyncE
  
- 5.5 Network monitoring and troubleshooting
  - 5.5.a Describe, implement, and troubleshoot syslog and logging functions
  - 5.5.b Describe, implement, and troubleshoot SNMP traps, RMON, EEM, and EPC
  - 5.5.c Describe, implement, and troubleshoot port mirroring protocols, for example, SPAN, RSPAN, and ERSPAN
  - 5.5.d Describe, implement and troubleshoot NetFlow and IPFIX
  - 5.5.e Describe, implement, and troubleshoot IP SLA
  - 5.5.f Describe, implement, and troubleshoot MPLS OAM and Ethernet OAM
  
- 5.6 Network configuration and change management
  - 5.6.a Describe network change, implementation, and rollback