CCIE Service Provider

Written and Lab Exam Content Updates

Introduction

The CCIE Service Provider (SP) exam topics have been refreshed from version 3.0 to version 4.0. The new exam curriculum comprises six topic domains. Each topic represents the logical structure defined in most Service Provider teams around the world. The new segmentation into these six domains also improves the alignment between the curriculum, the exam sections, and the score report sections.

Each domain lists the technology topics. The topics are general guidelines for the content that is likely to be included in the exam. However, other related topics may also appear on any specific delivery of the exam. Some topics appear on the Written exam and the Lab exam, but other topics appear only on the Written exam.

Domain Comparison Between CCIE SPv3 and CCIE SPv4

CCIE SPv3	CCIE SPv4
1. Describe, Implement, Optimize, and Troubleshoot Core IP Technologies	1. SP Architecture and Evolution
2. Describe, Implement, Optimize, and Troubleshoot Access and Edge Connection Technologies	2. Core Routing
3. Describe, Implement, Optimize, and Troubleshoot Remote Access Technologies	3. Service Provider-Based Services
4. Describe, Implement, Optimize, and Troubleshoot L3VPN Technologies	4. Access and Aggregation
5. Describe, Implement, Optimize, and Troubleshoot L2VPN Technologies	5. High Availability and Fast Convergence
6. Describe, Implement, Optimize, and Troubleshoot Managed Service Traversing the Core	6. SP Security, SP Operation and Management
7. Describe Service Provider Network Implementing Principles	

Two domains have been removed from the CCIE curriculum in the new version: **Managed Service Traversing the Core** and **Service Provider Network Implementing Principles.**

Two new domains have been created in the new CCIE version 4.0: **SP Architecture and Evolution** and **SP Security, SP Operation and Management.**

Other domains have been merged: **L3VPN Technologies** and **L2VPN Technologies.** These two domains are now covered in the **Service Provider-Based Services** domain.

The **Core IP Technologies** domain has been split into two domains:

- Core Routing
- High Availability and Fast Convergence

The new **Access and Aggregation** domain covers the same topics listed in the old domains: **Access and Edge Connection Technologies** and **Remote Access Technologies**.

The CCIE SPv4 exam focuses on dual-stack solutions for both IPv4 and IPv6 technologies, as it was already deployed in the CCIE SPv3 exam. All solutions, for example, routing protocols and L3VPN, cover both IPv4 and IPv6 technologies.

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The IPv6 Forum offers the IPv6 Education Certification Logo Program. By taking the CCIE Service Provider certification exam, the engineers are able to demonstrate their IPv6 knowledge and skills associated with the expert level. Candidates who obtain the CCIE Service Provider certification can include in their resumes the IPv6 Forum Gold Certification Category.

For more information, including how to obtain logos, refer to the IPv6 Education Certification Logo Program URL: http://www.ipv6forum.com/ipv6_education/Certified/site/faq.php

CCIE Service Provider v4.0 Topic Changes

The topics were added, moved, or retired based on feedback received from the key industry Subject Matter Expert (SME). All these changes reflect the evolution of the Service Provider environment. The CCIE Service Provider v4.0 should meet the expectation of the candidates working in a Service Provider industry.

Topics added to the CCIE Service Provider v4.0 Written Exam:

- SP architecture concepts
- Virtualization concepts
- Mobility concepts
- Describe BGP path attributes
- Describe MPLS forwarding and control plane mechanisms
- Describe MPLS TE attributes
- Describe MPLS advanced features, for example, segment routing, G-MPLS, MPLS-TP, and MPLS TE Inter-AS
- Describe multicast P2MP TE
- Describe EVPN (EVPN-VPWS and PBB EVPN)
- Describe IEEE 802.1ad (Q-in-Q), IEEE 802.1ah (Mac-in-Mac), and ITU G.8032 (REP)
- Describe broadband forum TR-101, for example, trunk N:1 and trunk 1:1
- Describe QoS link fragmentation (LFI), cRTP, and RTP
- Describe multichassis/clustering high availability
- Describe Layer 1 failure detection
- Describe BGPsec
- Describe backscatter traceback
- Describe lawful-intercept
- Describe BGP Flowspec
- Describe DDoS mitigation techniques
- Describe network event and fault management
- Describe performance management and capacity procedures
- Describe maintenance and operational procedures
- Describe the network inventory management process
- Describe network change, implementation, and rollback
- Describe the incident management process based on the ITILv3 framework

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Topics added to the CCIE Service Provider v4.0 Written Exam and Lab Exam:

- Describe, implement, and troubleshoot advanced BGP features, for example, add-path and BGP LS
- Describe, implement, and troubleshoot mLDP (including mLDP profiles from 0 to 9)
- Describe and optimize multicast scale and performance
- Describe, implement, and troubleshoot MPLS QoS models (MAM, RDM, pipe, short pipe, and uniform)
- Describe, implement, and troubleshoot MPLS TE QoS mechanisms (CBTS, PBTS, and DS-TE)
- Describe, implement, and troubleshoot E-LAN and E-TREE, for example, VPLS and H-VPLS
- Describe, implement, and troubleshoot Unified MPLS and CSC
- Describe, implement, and troubleshoot LISP
- Describe, implement, and troubleshoot GRE- and mGRE-based VPN
- Describe, implement, and troubleshoot IPv6 transition mechanism, for example, NAT44, NAT64, 6RD, and DS lite
- Describe, implement, and troubleshoot end-to-end fast convergence
- Describe, implement, and troubleshoot multi-VRF CE
- Describe, implement, and troubleshoot Layer 2 failure detection
- Describe, implement, and troubleshoot Layer 3 failure detection
- Describe, implement, and troubleshoot control plane protection techniques (LPTS and CoPP)
- Describe, implement, and troubleshoot logging and SNMP security
- Describe, implement, and troubleshoot timing, for example, NTP, 1588v2, and SyncE
- Describe, implement, and troubleshoot SNMP traps, RMON, EEM, and EPC
- Describe, implement, and troubleshoot port mirroring protocols, for example, SPAN, RSPAN, and ERSPAN
- Describe, implement, and troubleshoot NetFlow and IPFIX
- Describe, implement, and troubleshoot IP SLA
- Describe, implement, and troubleshoot MPLS OAM and Ethernet OAM

Topics removed from the CCIE Service Provider v4.0 Lab Exam:

- Describe, implement, optimize, and troubleshoot packet over SONET
- Describe, implement, optimize, and troubleshoot IP over DWDM
- Describe, implement, optimize, and troubleshoot SP high-end products
- Describe, implement, optimize, and troubleshoot SONET/SDH connections
- Describe, implement, optimize, and troubleshoot T1/T3 and E1/E3 connections
- Describe, implement, optimize, and troubleshoot IP over DSL to the customer
- Describe, implement, optimize, and troubleshoot IP over wire line to the customer
- Describe, implement, optimize, and troubleshoot IP over cable to the customer

Topics removed from the CCIE Service Provider v4.0 Exam:

- Describe, implement, optimize, and troubleshoot Frame Relay connections
- Describe, implement, optimize, and troubleshoot ATM connections
- Entire domain: describe, implement, optimize, and troubleshoot managed service traversing the core
- Entire domain: describe service provider network implementing principles

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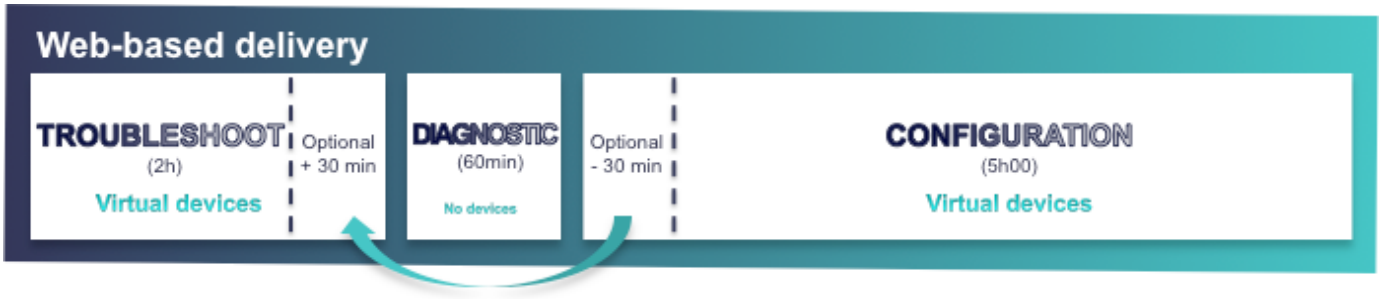
CCIE Service Provider v4.0 New Exam Format

The exam number changed from 350-029 to 400-201. However, the Written exam format remains essentially the same. The format of the Lab exam has changed significantly.

The web-based delivery infrastructure that supports the new Lab exam is very similar to the previous version 3.0. However, now the whole exam is delivered using virtual devices only. In the previous exam, XR devices and switch devices were hardware-based. Using this new infrastructure throughout the exam, the topology represents a more realistic Service Provider Backbone scenario. The exam focuses more on conceptual design technologies and troubleshooting, rather than evaluating specific hardware platform knowledge.

The Lab exam format is very similar to the CCIE R&Sv5.0, which consists of these three modules:

- **Troubleshoot**
- **Diagnostic**
- **Configuration**



The **Troubleshoot** module delivers incidents that are independent of each other, which means that the resolution of one incident does not depend on the resolution of another. The topology that is used in the **Troubleshoot** module is completely different than the topology that is used in the **Configuration** module. The length of the **Troubleshoot** module is two hours; however, the candidate can borrow up to 30 minutes from **Configuration** module. In another words, the candidate can choose to use the extra 30 minutes on **Troubleshoot** module or **Configuration** module.

The **Diagnostic** module focuses on the skills needed to diagnose the network issues properly. In this module, students have no access to the devices. The length of this module is 60 minutes. The main objective of the **Diagnostic** module is to further assess the skills needed to diagnose network issues properly. These skills include:

- Analyzing
- Correlating
- Discerning multiple sources of documentation
    - For example, email threads, network topology diagrams, console outputs, logs, and even traffic captures

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These activities are a natural part of the overall troubleshooting tasks. These activities are designed as a separated Lab module because the format of the items is significantly different. The **Troubleshoot** module describes incidents that require candidates to resolve networking issues by understanding the symptoms, fix the issues using terminal sessions to the console port of the actual devices, and then verify the solutions.

However, the **Diagnostic** module requires candidates to choose between predefined options to indicate:

- What is the root cause of the issue?
- Where is the issue located in the diagram?
- What critical piece of information will lead to identifying the root cause?
- What piece of information is missing to make the right judgment about the root cause?

The **Configuration** module provides the closest scenario of the real Service Provider backbone including external connectivity, for example, upstream, downstream, and peering. The scenario is composed of multiple items, which are often interdependent, and it conforms to the real Service Provider environment. At the beginning of the module, candidates have full visibility of the entire module. They can choose to work in the sequence that the items are presented in, or they can resolve items in whatever order feels more comfortable and logical to them.

The modules in the Lab exam are delivered in a fixed sequence: the day starts with the **Troubleshoot** module, which is followed by the **Diagnostic** module, and lastly the **Configuration** module. The entire Lab exam lasts up to eight hours.

It is important to note that the system does not allow the candidate to go back and forth between modules. When working in the **Troubleshoot** module, the candidates can choose to get extra 30 minutes in addition the two hours originally given to complete the **Troubleshoot** module. However, the candidate cannot see the **Configuration** module yet, and does not know where the extra time will be needed. If the candidate decides to use the extra 30 minutes for **Troubleshoot** module, the candidate will have only four and a half hours to complete the entire **Configuration** module. To maintain the total exam time to eight hours, the optional 30 minutes that the candidate decided to use in the **Troubleshoot** module is deducted automatically from the time originally allocated for the **Configuration** module. On the contrary, if the candidate spends only two hours in the **Troubleshoot** module, the **Configuration** module is credited by the time gained, in another words, the candidate will have five hours to complete the last module.

The web-based delivery system displays a warning message when the two hours has expired in the **Troubleshoot** module. The system asks if the candidate wants to proceed in the **Troubleshoot** module, adding up to extra 30 minutes before advancing to the next module, or if the candidate wants to stop working in the **Troubleshoot** module and advance to the next module.

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Diagnostic Module

The **Diagnostic** module does not have terminal sessions to access the device console. This module provides the candidate with a set of documentation that represents a snapshot of a realistic situation: at a point in time in an investigation process that a network engineer might be facing. For example, a support engineer might need to provide the root cause analysis to the customer, or might need to help out a colleague who is stuck in a troubleshooting process; or might have to summarize the previous investigation steps.

Within the **Diagnostic** module, the items are presented in a format that is similar to the Written exam. It includes multiple-choice (single answer or multiple answers), drag-and-drop type style, and point-and-click on diagrams. The major difference between the Written exam and **Diagnostic** module is that the items (called troubleshoot tickets) contain a set of documentation that the candidate must consult to understand the problem scenario. Then in turn, the candidate analyzes and correlates information (after discerning between valuable and worthless information) to make a right choice among the predefined options listed in the item.

The troubleshoot tickets do not require candidates to write anything to provide the answer. All tickets are close-ended, in another words the grading is deterministic, which ensures fair and consistent scoring. This approach also helps to grant credit to distinguish candidates from those that accurately identify the root cause of a networking issue, but fail to resolve it within the defined constraints, which the **Troubleshoot** module does not offer.

Real-life experience is certainly the best training to prepare for the module. However, Real-life experience is embedded when preparing for the **Troubleshoot** module. Candidates with limited experience should focus on discovering, practicing and applying efficient and effective troubleshooting methodologies that are used for any realistic networking challenge.

Passing Criteria

To pass the Lab exam, the candidate must meet these two conditions:

- The total sum of all of modules must be at least the minimum value of the cut-score or higher.
- The minimum cut-score of each individual module must be achieved.

The reason for these criteria is to prevent the candidate from passing the Lab exam while failing or even bypassing a module, for example, the **Diagnostic** module.

The point value of each item in each Lab module is shown on the candidate guide, which is provided at the Lab exam. The points are granted only when all criteria of the item are met. No partial score is granted on any items.

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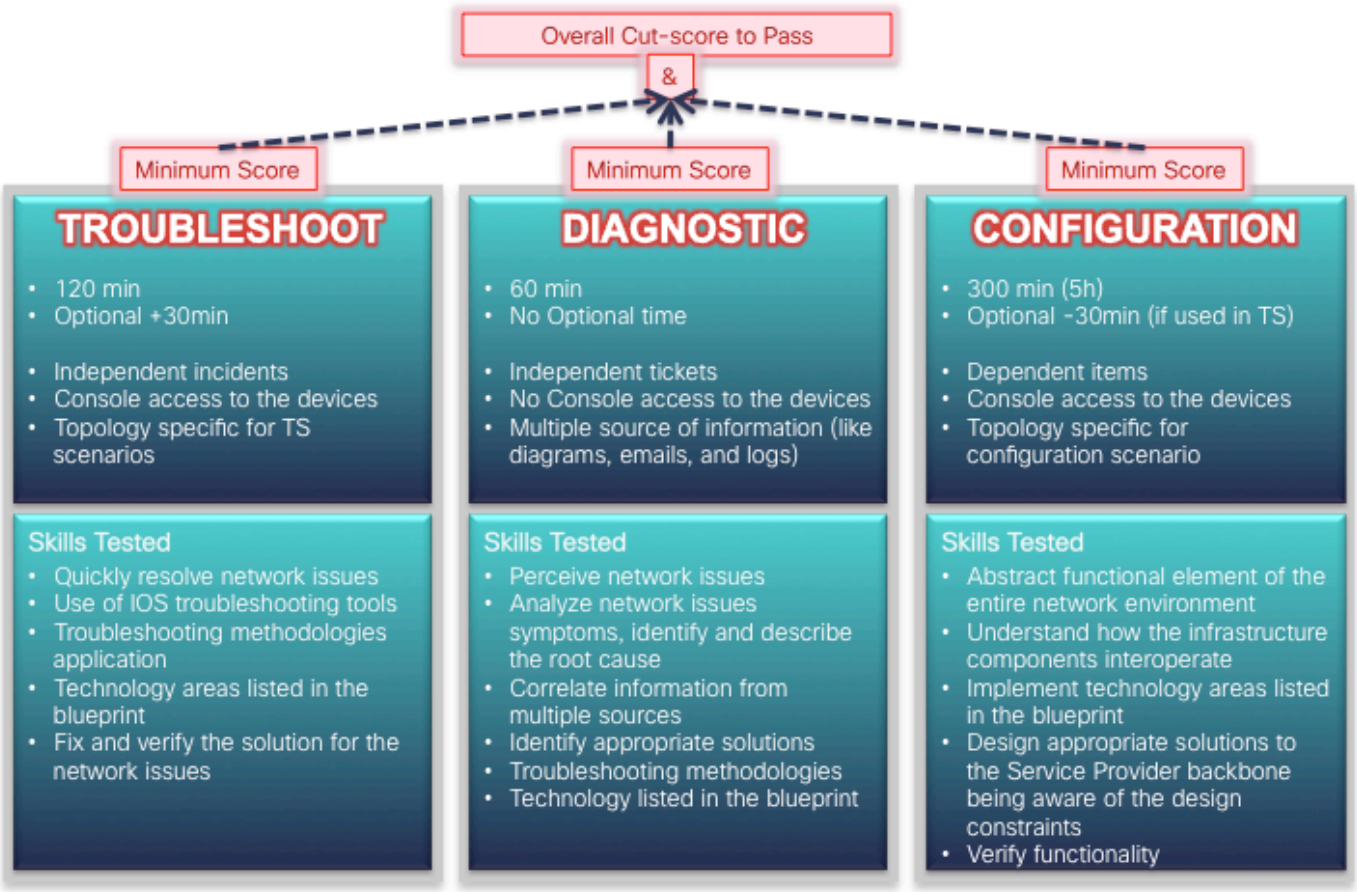

CCIE Service Provider v4.0 Recommended Hardware and Software Equipment

The CCIE SP Lab exam is based on the Cisco Software release running within a 100% virtual environment. Candidates who want to prepare for the exam using hardware can use this Cisco equipment and Cisco Software releases:

- ASR 9000 Series running the Cisco IOS XR 5.2 release
- ASR 1000 Series running the Cisco IOS XE 3.13S.15.4(3)S release
- Cisco 7600 Series running the Cisco IOS 15.5(3)S release
- Cisco ME 3600 Series running the Cisco IOS 15.5(3)S release

All the technologies mentioned in the blueprint are based on the feature set and solutions that are supported and available on the Cisco Software releases mentioned in this list.

The Cisco Learning Network is a social learning network that is designed for networking professionals across the globe. It hosts all official information regarding to Cisco Certifications, including the exam topics.

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