CCNP Service Provider

Introduction

Software and networking become more and more interconnected every day. Technology advances are enabling new applications and businesses that connect everything—people, devices, machines, and applications. And with intent-based networking, service providers can take advantage of automation to scale and secure their infrastructure. To capitalize on these opportunities, today's service provider professionals need a broader range of skills and a deeper focus in strategic technology areas. The CCNP Service Provider certification program gives you exactly that breadth and depth.

CCNP Service Provider certification helps you prove your skills in the ever-changing landscape of service provider technologies. The certification covers core technologies and a service provider focus area of your choice. You choose where you want to focus. You choose where to take your career.

Required exam

350-501 SPCOR: Implementing and Operating Cisco Service Provider Network Core Technologies

The Implementing and Operating Cisco Collaboration Core Technologies (CLCOR) v1.0 course helps you prepare for advanced-level roles focused on the implementation and operation of Cisco collaboration solutions. You will gain the knowledge and skills needed to implement and deploy core collaboration and networking technologies, including infrastructure and design, protocols, codecs, and endpoints, Cisco Internetwork Operating System (IOS®) XE gateway and media resources, call control, Quality of Service (QoS), and additional Cisco collaboration applications. This course earns you 64 Continuing Education (CE) credits towards recertification.

Duration

5 Days

Course Objectives

- Describe the Service Provider network architectures, concepts, and transport technologies
- Describe the Cisco Internetwork Operating System (Cisco IOS®) software architectures, main IOS types, and their differences
- Implement Open Shortest Path First (OSPF) in the Service Provider network
- Implement Integrated Intermediate System-to-Intermediate System (IS-IS) in the Service Provider network
- Implement Border Gateway Protocol (BGP) routing in Service Provider environments
- Implement route maps and routing policy language
- Describe IPv6 transition mechanisms used in the Service Provider networks
- Implement high-availability mechanisms in Cisco IOS XR software
- Implement traffic engineering in modern Service Provider networks for optimal resource utilization
- Describe segment routing and segment routing traffic engineering concepts
- Describe the VPN technologies used in the Service Provider environment
- Configure and verify Multiprotocol Label Switching (MPLS) L2VPN in Service Provider environments
- Configure and verify MPLS L3VPN in Service Provider environments
- Implement IP multicast services

- Describe the Quality of Service (QoS) architecture and QoS benefits for SP networks
- Implement QoS in Service Provider environments
- Implement control plane security in Cisco devices
- Implement management plane security in Cisco devices
- Implement data plane security in Cisco devices
- Describe the Yet Another Next Generation (YANG) data modeling language
- Implement automation and assurance tools and protocols
- Describe the role of Cisco Network Services Orchestrator (NSO) in Service Provider environments
- Implement virtualization technologies in Service Provider environments

Prerequisites

- Intermediate knowledge of Cisco IOS or IOS-XE
- Familiarity with Cisco IOS or IOS XE and Cisco IOS XR Software configuration
- Knowledge of IPv4 and IPv6 TCP/IP networking
- Intermediate knowledge of IP routing protocols
- Understanding of MPLS technologies
- Familiarity with VPN technologies

Target Audience

- Network administrators
- Network engineers
- Network managers
- System engineers
- Project managers
- Network designers

Course Outline

- Describing Service Provider Network Architectures
- Describing Cisco IOS Software Architectures
- Implementing OSPF
- Implementing IS-IS
- Implementing BGP
- Implementing Route Maps and Routing Protocol for LLN [Low-Power and Lossy Networks] (RPL)
- Transitioning to IPv6
- Implementing High Availability in Networking
- Implementing MPLS
- Implementing Cisco MPLS Traffic Engineering
- Describing Segment Routing
- Describing VPN Services
- Configuring L2VPN Services
- Configuring L3VPN Services
- Implementing Multicast
- Describing QoS Architecture
- Implementing QoS
- Implementing Control Plane Security
- Implementing Management Plane Security
- Implementing Data Plane Security
- Introducing Network Programmability
- Implementing Automation and Assurance
- Introducing Cisco NSO
- Implementing Virtualization in Service Provider Environments

Lab Outline

- Deploy Cisco IOS XR and IOS XE Basic Device Configuration
- Implement OSPF Routing
- Implement Integrated IS-IS Routing
- Implement Basic BGP Routing
- Filter BGP Prefixes Using RPL
- Implement MPLS in the Service Provider Core
- Implement Cisco MPLS Traffic Engineering (TE)
- Implement Segment Routing
- Implement Ethernet over MPLS (EoMPLS)
- Implement MPLS L3VPN
- Implement BGP Security
- Implement Remotely Triggered Black Hole (RTBH) Filtering

Concentration Exams (Choose One)

1. 300-535 SPAUTO: Automating and Programming Cisco Service Provider Solutions

The Implementing Automation for Cisco Service Provider Solutions (SPAUI) v1.0 course prepares you to implement and support automation solutions in a Service Provider network infrastructure, using network programmability principles, protocols, tools, and mechanisms. Through a combination of lessons and hands-on labs, you will learn to deploy, configure, monitor, and operate Service Provider network environments using modern data models. These models allow you to represent operational data and new network management protocols in order to administer hundreds or thousands of devices in a single operation, replacing traditional, time-consuming, error-prone, device-by-device Command Line Interface (CLI) management. The course also introduces powerful automation solutions that can streamline network operations.

This course covers Yet Another Next Generation (YANG) data models and validation tools, Representational State Transfer Configuration Protocol RESTCONF and Network Configuration Protocol (NETCONF) management protocols, model-driven telemetry with Google Remote Procedure Call (gRPC) and Google Network Management Interface (gNMI), traffic automation with XR Transport Control (XTC), Secure Shell (SSH)-based automation tools like NetMiko and Ansible, orchestration provided by Network Services Orchestration (NSO), Network Function Virtualization (NFV) lifecycle management with Elastic Services Controller (ESC), and network operations automation with WAN Automation Engine (WAE). This course prepares you for the 300-535 Automating and Programming Cisco® Service Provider Solutions (SPAUTO) exam.

Duration

3 Days

Course Objectives

- Use NETCONF and RESTCONF programmability protocols on Cisco devices
- Describe and use tools to validate YANG data models on Cisco devices
- Describe and configure model-driven telemetry on Cisco devices
- Describe and configure network traffic automation with Cisco XTC
- Describe and use network automation tools that utilize SSH
- Automate service provider network configuration with Cisco NSO
- Describe how to automate virtualized resources with Cisco ESC
- Describe how to automate service provider WAN with Cisco WAE

Prerequisites

Before taking this course, you should have the following knowledge and skills:

- CCNP equivalent level of knowledge for Routing and Switching (R and S)
- Cisco Internetworking Operating System (IOS XE) and Cisco IOS XR working experience
- SP Operations experience with routing, Multi-Protocol Label Switching (MPLS), and Virtual Private Network (VPN) Solutions
- Network Programmability Basics (Network Programming Foundations, APIs and Protocols, Network Model-Driven APIs and Protocols, Configuration Management with Ansible, Service Provider Network Automation workflows)

Target Audience

This course is designed for Service Provider networking professionals in job roles such as:

- Network administrators
- Network architects
- Network designers
- Network engineers
- Network managers
- Network Operations Center (NOC) personnel
- Network supervisors

Course Outline

- **Implementing Network Device Programmability Interfaces with NETCONF and RESTCONF**
  - Implement NETCONF Protocol
  - Implement RESTCONF Protocol
- **Implementing Model-Driven Programmability with YANG**
  - YANG Data Models
  - YANG Tools
  - YANG Development Kit
- **Implementing Model-Driven Telemetry**
  - Implementing Model-Driven Telemetry with gRPC
  - Implementing Model-Driven Telemetry with gNMI
- **Automating Service Provider Network Traffic with Cisco XTC**
  - Cisco XTC Fundamentals
  - Configure Cisco XTC
- **Automating Networks with Tools That Utilize SSH**
  - Implement Device Configurations with Python Netmiko Library
  - Implement Device Configurations with Ansible Playbooks
- **Orchestrating Network Services with Cisco NSO**
  - Cisco NSO Fundamentals
  - Cisco NSO Device Manager
  - Cisco NSO Services
  - Implement Device Configurations with Python
- **Automating Virtualized Resources with Cisco Elastic Services Controller**
  - Cisco ESC Architecture
  - Cisco ESC Resource Management
- **Automating the WAN with Cisco WAE**
  - Describe the Cisco WAE Components

Lab Outline

- Explore NETCONF Protocol in Cisco Devices
- Configure Cisco IOS XE Devices with RESTCONF
- Explore Cisco and OpenConfig YANG Data Models with YANG Tools
- Use client and Python to Configure Cisco Devices
- Use YANG Development Kit (YDK) to Configure Cisco Devices
- Configure Model-Driven Telemetry with gRPC
- Configure Model-Driven Telemetry with gNMI
- Configure Path Disjointness with Cisco XTC
- Use Python Netmiko Library to Configure Cisco Devices
- Use Ansible to Configure Cisco Devices
- Use Cisco NSO Device Manager
- Create a Loopback Service Template
- Use Cisco NSO REST API with Postman
- Explore and Use Cisco WAE Features

2. 300-515 SPVI: Implementing Cisco Service Provider VPN Services

The Implementing Cisco Service Provider VPN Services (SPVI) v1.0 course prepares you to manage end-customer Virtual Private Network (VPN) environments built over a common service provider Multiprotocol Label Switching (MPLS) backbone. You will complete hands-on labs to reinforce MPLS VPN fundamental concepts, benefits, and classification, MPLS components, MPLS control plane, and data plane operations, MPLS VPN routing using Virtual Routing and Forwarding (VRF), Layer 2 and Layer 3 MPLS VPNs, IPv6 MPLS VPN implementations, IP Multicast VPNs, and shared services VPNs. The course also covers solutions for deploying MPLS VPN crossing multiple Service Provider domains that improve the use of network bandwidth.

This course prepares you for the 300-515 Implementing Cisco® Service Provider VPN Services (SPVI) exam. By passing this exam, you earn the Cisco Certified Specialist - Service Provider VPN Services Implementation certification, and you satisfy the concentration exam requirement for the CCNP® Service Provider certification.

Duration

5 Days

Course Objectives

- Describe VPN concepts and operation in a Service Provider environment
- Implement Layer 3 MPLS VPN operations in a Service Provider environment
- Implement Layer 3 Inter-domain MPLS VPN services traversing multiple Service Providers
- Implement Layer 3 Multicast MPLS VPN operations in a Service Provider environment
- Troubleshoot typical issues in Layer 3 MPLS VPN environments
- Implement Layer 2 VPN operations in a Service Provider environment
- Troubleshoot Layer 2 VPN issues in a Service Provider network
- Implement MPLS VPN solutions for IPv6 environments
- Troubleshoot MPLS VPN solutions for IPv6 environments

Prerequisites

Before taking this course, you should have Service Provider knowledge at the professional level, equivalent to the material in the following Cisco courses:
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- Building Cisco Service Provider Next-Generation Networks Part 1 (SPNGN1) v1.2

- Building Cisco Service Provider Next-Generation Networks Part 2 (SPNGN2) v1.2
- Deploying Cisco Service Provider Network Routing (SPROUTE)

Target Audience

- Network administrators
- Network engineers
- Network supervisors
- Network managers
- Network Operations Center (NOC) personnel
- Network designers
- Network architects
- Channel partners

Course Outline

- **Introducing VPN Services**
  - VPN Fundamentals
  - MPLS VPN Control Plane Operation
- **Troubleshooting MPLS VPN Underlay**
  - Troubleshoot Core Interior Gateway Protocol (IGP)
  - Troubleshoot Border Gateway Protocol (BGP)
- **Implementing Layer 3 MPLS VPNs**
  - Multiprotocol BGP (MP-BGP) Routing Requirements in MPLS VPNs
  - Provider Edge to Customer Edge (PE-to-CE) Routing Requirements in Layer 3 MPLS VPNs
- **Implementing Layer 3 Interdomain MPLS VPNs**
  - Inter-Autonomous System (AS) for Layer 3 MPLS VPNs
  - Content Security and Control (CSC) for Layer 3 MPLS VPNs
- **Implementing Layer 3 Multicast MPLS VPNs**
  - Multicast VPN (MVPN) Fundamentals
  - Implement Intranet MVPN
- **Troubleshooting Intra-AS Layer 3 VPNs**
  - Troubleshoot PE-CE Connectivity
  - Troubleshoot PE-to-Route Reflector
- **Implementing Layer 2 VPNs**
  - Layer 2 Service Architecture and Carrier Ethernet Services
  - Refresh on Traditional Ethernet LAN (E-LAN), E-Line, and E-Tree Solutions
- **Troubleshooting Layer 2 VPNs**
  - Troubleshoot Common Issues for Traditional E-Line, E-LAN, and E-Tree Ethernet Solutions
  - Troubleshoot Common Issues for Ethernet VPN (EVPN) Native, EVPN Virtual Private Wire Service (VPWS), and EVPN Integrated Routing and Bridging (IRB) Solutions
- **Implementing Layer 3 IPv6 MPLS VPNs**
  - Classical Solutions for Deploying IPv6 over IPv4 Environments
  - Using 6VPE to Deploy IPv6 Connectivity over MPLS Environment
- **Troubleshooting Layer 3 IPv6 MPLS VPNs**
  - Troubleshooting PE-to-PE Connectivity

Lab Outline

- Verify the Service Provider Backbone Operation for MPLS VPN
- Work with VRF Instances
- Troubleshoot the MPLS VPN Backbone
- Configure MP-BGP as the PE-CE Routing Protocol
- Configure and Verify PE-to-CE Routing Requirements

- Enable Shared Services VPN
- Deploy Internet Access as a VPN Service
- Troubleshoot Layer 3 MPLS VPN End-Customer Connectivity
- Implement Different EVPN Solutions
- Troubleshoot EVPN VPWS
- Implement IPv6 VPN Provider Edge Router (6VPE)

3. 300-510 SPRI: Implementing Cisco Service Provider Advanced Routing Solutions

The Implementing Cisco Service Provider Advanced Routing Solutions (SPRI) course teaches you theories and practices to integrate advanced routing technologies including routing protocols, multicast routing, policy language, Multiprotocol Label Switching (MPLS), and segment routing, expanding your knowledge and skills in service provider core networks.

This course prepares you for the 300-510 Implementing Cisco® Service Provider Advanced Routing Solutions (SPRI) exam.

Duration

5 Days

Course Objectives

- Describe the main characteristics of routing protocols that are used in Service provider environments
- Implement advanced features of multiarea Open Shortest Path First (OSPFv2) running in Service Provider networks
- Implement advanced features of multilevel Intermediate System to Intermediate System (ISIS) running in Service Provider networks
- Configure route redistribution
- Configure Border Gateway Protocol (BGP) in order to successfully connect the Service Provider network to the customer or upstream Service Provider
- Configure BGP scalability in Service Provider networks
- Implement BGP security options
- Implement advanced features in order to improve convergence in BGP networks
- Troubleshoot OSPF, ISIS, and BGP
- Implement and verify MPLS
- Implement and troubleshoot MPLS traffic engineering
- Implement and verify segment routing technology within an interior gateway protocol
- Describe how traffic engineering is used in segment routing networks
- Implement IPv6 tunneling mechanisms
- Describe and compare core multicast concepts
- Implement and verifying the PIM-SM protocol
- Implement enhanced Protocol-Independent Multicast - Sparse Mode (PIM-SM) features
- Implement Multicast Source Discovery Protocol (MSDP) in the interdomain environment
- Implement mechanisms for dynamic Rendezvous Point (RP) distribution

Prerequisites

Before taking this course, you should have the following knowledge and skills:

- Intermediate to advanced knowledge of Cisco Internetwork Operating System (Cisco IOS®) or IOS XE and Cisco IOS XR Software configuration

- Knowledge of IPv4 and IPv6 TCP/IP networking
- Intermediate knowledge of BGP, OSPF, and ISIS routing protocols
- Understanding of MPLS technologies
- Understanding of multicast technologies
- Familiarity with segment routing

Target Audience

- Network administrators
- System engineers
- Project managers
- Network designers

Course Outline

- Implementing and Verifying Open Shortest Path First Multiarea Networks
- Implementing and Verifying Intermediate System to Intermediate System Multilevel Networks
- Introducing Routing Protocol Tools, Route Maps, and Routing Policy Language
- Implementing Route Redistribution
- Influencing Border Gateway Protocol Route Selection
- Scaling BGP in Service Provider Networks
- Securing BGP in Service Provider Networks
- Improving BGP Convergence and Implementing Advanced Operations
- Troubleshooting Routing Protocols
- Implementing and Verifying MPLS
- Implementing Cisco MPLS Traffic Engineering
- Implementing Segment Routing
- Describing Segment Routing Traffic Engineering (SR-TE)
- Deploying IPv6 Tunneling Mechanisms
- Implementing IP Multicast Concepts and Technologies
- Implementing PIM-SM Protocol
- Implementing PIM-SM Enhancements
- Implementing Interdomain IP Multicast
- Implementing Distributed Rendezvous Point Solution in Multicast Network

Lab Outline

- Implement OSPF Special Area Types (IPv4 and IPv6)
- Implement Multiarea IS-IS
- Implement Route Redistribution
- Influence BGP Route Selection
- Implement BGP Route Reflectors
- Implement BGP Security Options
- Troubleshoot Routing Protocols
- Implement MPLS in the Service Provider Core
- Implement Cisco MPLS TE
- Configure and Verify Interior Gateway Protocol (IGP) Segment Routing
- Implement Tunnels for IPv6
- Enable and Optimize PIM-SM
- Implement PIM-SM Enhancements
- Implement Rendezvous Point Distribution