Cisco IPv6 Fundamentals, Design & Deployment (IP6FD)

**ID** CI-IP6FD  **Price** US$ 3,595  **Duration** 5 days

### Who should attend

This course is primarily intended for:

- Network Engineers and Technicians
- Network Operations Center (NOC) Support Personnel and Help Desk Technicians
- Any individual involved in implementation and verification of routing protocols in the enterprise networks

### Prerequisites

The knowledge and skills that a learner must have before attending this course are as follows:

- Cisco Certified Network Associate (CCNA) certification.
- Understanding of networking and routing (on CCNP level, but no certification required).
- Working knowledge of the Microsoft Windows operating system.

### Course Objectives

Upon completing this course, you will be able to:

- Describe the factors that led to the development of IPv6 and possible uses of this new IP structure
- Describe the structure of the IPv6 address format, how IPv6 interacts with data link layer technologies, and how IPv6 is supported in Cisco IOS Software
- Implement IPv6 services and applications
- Understand the updates to IPv4 routing protocols needed to support IPv6 topologies
- Understand multicast concepts and IPv6 multicast specifics
- Evaluate the scenario and desired outcome and identify the best transition mechanism for the situation
- Describe security issues, how security for IPv6 is different than for IPv4, and emerging practices for IPv6-enabled networks
- Describe the standards bodies that define IPv6 address allocation, in addition to one of the leading IPv6 deployment issues—multihoming
- Describe the deployment strategies that service providers might consider when deploying IPv6
- Describe case studies for enterprise, service provider, and branch networks

### Course Content

The IPv6 Fundamentals, Design, and Deployment (IP6FD) v3.0 course is an instructor-led course that is presented by Cisco Learning Partners to their end-user customers. This five-day course aims at providing network engineers and technicians that are working in the enterprise sector with the knowledge and skills that are needed to study and configure Cisco IOS Software IPv6 features. The course also provides an overview of IPv6 technologies, covers IPv6 design and implementation, describes IPv6 operations,
Detailed Course Outline

Module 1: Introduction to IPv6

Describe the factors that led to the development of IPv6 and possible uses of this new IP structure.

Lesson 1: Explaining the Rationale for IPv6

This lesson defines how to describe the history of IPv4 and the rationale for implementing IPv6 to resolve IPv4 addressing and security issues. Upon completing this lesson, you will be able to:

- Describe the expansion and adoption of IPv4
- Describe address exhaustion in IPv4
- Describe the rationale for creating a next-generation IP
- Describe why existing solutions, such as NAT, create new issues

The lesson includes these topics:

- IP Address Allocation
- History of IPv4
- Next Generation of IP
- IPv4 Workarounds

Lesson 2: Evaluating IPv6 Features and Benefits

This lesson defines how to explain the benefits of addressing with IPv6 and describe how larger IPv6 address sizes facilitate autoconfiguration and aggregation. Upon completing this lesson, you will be able to:

- Describe the features and benefits of IPv6
- Explain the size of an IPv6 address
- Describe how a larger IPv6 address space enables autoconfiguration and aggregation
- Discuss advanced IPv6 features
- Discuss the transition strategies to IPv6

The lesson includes these topics:

- Features and Benefits of IPv6
- IPv6 Addresses
- IPv6 Autoconfiguration and Aggregation
- Advanced IPv6 Features
- Transition Strategies to IPv6

Module 2: IPv6 Operations

Describe the structure of the IPv6 address format, how IPv6 interacts with data link layer technologies, and how IPv6 is supported in Cisco IOS Software.

Lesson 1: Understanding the IPv6 Addressing

addressing, routing, services, transition, and deployment of IPv6 in enterprise as well as in service provider networks, and includes case studies useful for deployment scenarios. The course also includes remote labs.
Architecture

This lesson defines how to describe the IPv6 addressing architecture, including types of addresses and address representation. Upon completing this lesson, you will be able to:

- Describe the IPv6 addressing architecture
- Describe the format and uses of the various types of IPv6 addresses
- Create and use the various types of IPv6 addresses
- Determine the required IPv6 addresses for an IPv6 host and an IPv6 router

The lesson includes these topics:

- IPv6 Addressing Architecture
- IPv6 Address Formats and Types
- IPv6 Address Uses
- Required IPv6 Addresses

Lesson 2: Describing the IPv6 Header Format

This lesson defines how to describe changes in the IPv6 header and the purpose of extension headers. Upon completing this lesson, you will be able to:

- Describe the major changes in an IPv6 header and the benefits of these changes
- Describe the new fields that were added to an IPv6 header and explain their operation
- Describe the purpose of extension headers in IPv6

The lesson includes these topics:

- IPv6 Header Changes and Benefits
- IPv6 Header Fields
- IPv6 Extension Headers

Lesson 3: Enabling IPv6 on Hosts

This lesson defines how to configure IPv6 on Windows and Linux-based operating systems. Upon completing this lesson, you will be able to:

- Describe how IPv6 is enabled on the hosts
- Describe how IPv6 is enabled on Windows
- Describe how IPv6 is enabled on Mac OS X
- Describe how IPv6 is enabled on Linux-based operating systems

The lesson includes these topics:

- Enabling IPv6 on Hosts
- Enabling IPv6 on Windows
- Enabling IPv6 on Mac OS X
- Enabling IPv6 on Linux

Lesson 4: Enabling IPv6 on Cisco Routers

This lesson defines how to describe and use Cisco IOS Software commands to enable IPv6 on Cisco routers. Upon completing this lesson, you will be able to:

- Use Cisco IOS Software commands to enable IPv6 on Cisco routers
- Configure IPv6 addresses on Cisco router interfaces
- Explain the two types of IPv6 autoconfiguration

The lesson includes these topics:

- Enabling IPv6 on Cisco Routers
- IPv6 Address Configuration
- Autoconfiguration

Lesson 5: Using ICMPv6 and Neighbor Discovery

This lesson defines how to describe ICMPv6...
message types and how they are used to troubleshoot IPv6 issues, and how to describe the neighbor discovery protocol. Upon completing this lesson, you will be able to:

- Describe the format and use of ICMPv6 packets
- Describe the ICMPv6 error types and their codes
- Describe the ICMPv6 Echo Request and Echo Reply types
- Describe the data link layers for which IPv6 is defined
- Describe ICMPv6 neighbor discovery message types
- Describe how IPv6 stateless autoconfiguration works
- Discuss the value of autoconfiguration in IPv6
- Describe how renumbering is accomplished through router advertisements in IPv6
- Describe the syntax of the Cisco IOS commands that are used for neighbor discovery
- Describe a network prefix renumbering scenario in Cisco IOS Software
- Describes the ICMPv6 MLD message types
- Describe ICMPv6 message types that are used for IPv6 Mobility

The lesson includes these topics:

- ICMPv6
- ICMP Errors
- Echo
- IPv6 over Data Link Layers
- Neighbor Discovery
- Stateless Autoconfiguration
- Value of Autoconfiguration
- Renumbering
- Cisco IOS Neighbor Discovery Command Syntax
- Cisco IOS Network Prefix Renumbering Scenario
- ICMP MLD

- IPv6 Mobility

The lesson includes these activities:

- Lab 2-2: Using Neighbor Discovery

Lesson 6: Troubleshooting IPv6

This lesson defines how to configure and troubleshoot a Cisco IOS router to support IPv6 operation. Upon completing this lesson, you will be able to:

- Configure a Cisco router to support IPv6 operation
- Troubleshoot IPv6 configuration problems
- Describe some useful Cisco IOS Software IPv6 debug commands
- Describe sample output from the debug ipv6 icmp Cisco IOS Software command

The lesson includes these topics:

- Cisco IOS IPv6 Configuration Example
- Cisco IOS show Commands
- Cisco IOS debug Commands
- Cisco IOS debug Command Example

Module 3: IPv6 Services

Implement IPv6 services and applications.

Lesson 1: IPv6 Mobility

This lesson defines how to describe the Mobile IP model in an IPv6 environment. Upon completing this lesson, you will be able to:

- Describe IP Mobility technology and issues
- Explore the Mobile IPv6 processes
- List the examples able to support or use Mobile IPv6
The lesson includes these topics:
- Introduction to IP Mobility
- Mobile IPv6
- Network Mobility Examples

**Lesson 2: Describing DNS in an IPv6 Environment**

This lesson defines how to describe how DNS works in an IPv6 environment. Upon completing this lesson, you will be able to:
- Identify DNS-supported objects and records in IPv6 networks
- Describe DNS tree structure in IPv6 networks
- Describe how DDNS works in IPv6 networks

The lesson includes these topics:
- DNS Objects and Records
- DNS Tree Structure
- Dynamic DNS

**Lesson 3: Understanding DHCPv6 Operations**

This lesson defines how to describe how DHCPv6 operates. Upon completing this lesson, you will be able to:
- Describe how DHCP operation in IPv6 differs from its operation in IPv4
- Describe the operation of DHCP in IPv6
- Identify the multicast addresses that DHCP uses in IPv6
- Describe how DHCPv6 prefix delegation works
- Troubleshoot DHCPv6

The lesson includes these topics:
- DHCPv6
- DHCPv6 Operation

- DHCPv6 Multicast Addresses
- DHCPv6 Prefix Delegation Process
- DHCPv6 Troubleshooting

The lesson includes these activities:
- Lab 3-1: Using Prefix Delegation

**Lesson 4: Understanding QoS Support in an IPv6 Environment**

This lesson defines how to describe the fields in the IPv6 header that are used to support QoS and explain how these fields differ from the IPv4 QoS model. Upon completing this lesson, you will be able to:
- Discuss the fields that are used in the IPv6 header to support QoS functions
- Discuss the flow label field in the IPv6 header and how it is structured to potentially support QoS
- Explain how QoS in IPv6 is configured in the Cisco IOS Software

The lesson includes these topics:
- IPv6 Header Fields Used for QoS
- IPv6 and the Flow Label Field
- IPv6 QoS Configuration

**Lesson 5: Using Cisco IOS Software Features**

This lesson defines how to describe and configure advanced Cisco IOS features to support IPv6. Upon completing this lesson, you will be able to:
- Describe and configure SSH and Telnet on Cisco routers
- Describe and configure TFTP, HTTP, traceroute, ping, and NTP on Cisco routers
- Describe Cisco Discovery Protocol support for IPv6
- Describe Cisco Express Forwarding support
The lesson includes these topics:

- Describe IP SLA functionality for IPv6

**Module 4: IPv6-Enabled Routing Protocols**

Understand the updates to IPv4 routing protocols needed to support IPv6 topologies.

**Lesson 1: Routing with RIPng**

This lesson defines how to describe RIPng and configure it on Cisco routers. Upon completing this lesson, you will be able to:

- Describe how RIPng is supported in IPv6
- Describe the enhancements made to RIPng to support IPv6
- Configure RIPng on Cisco routers

The lesson includes these topics:

- Introducing RIPng for IPv6
- Examining RIPng Enhancements
- Configuring RIPng

**Lesson 2: Examining OSPFv3**

This lesson defines how to describe OSPFv3 and configure it on Cisco routers. Upon completing this lesson, you will be able to:

- Describe how the OSPFv3 routing protocol is supported in IPv6
- Describe the changes and enhancements made to OSPFv3 to support IPv6
- Configure the OSPFv3 protocol on Cisco routers

The lesson includes these topics:

- Describe OSPFv3 IPsec ESP authentication and encryption
- Describe OSPFv3 advanced functionalities

**Lesson 3: Examining Integrated IS-IS**

This lesson defines how to describe and configure Integrated IS-IS for IPv6. Upon completing this lesson, you will be able to:

- Describe how the IS-IS routing protocol is supported in IPv6
- List the changes made to IS-IS to support IPv6
- Explain the implications of running IS-IS in a single SPF architecture
- Describe multitopology IS-IS for IPv6
- Configure and troubleshoot the IS-IS protocol on Cisco routers

The lesson includes these topics:

- Integrated IS-IS Characteristics
- Changes Made to IS-IS to Support IPv6
- Single SPF Architecture
- Multitopology IS-IS for IPv6
- IS-IS IPv6 Configuration on Cisco Routers

The lesson includes these activities:

- Lab 4-1: Routing with OSPFv3
Lab 4-2: Routing with IS-IS

Lesson 4: Examining EIGRP for IPv6
This lesson defines how to describe EIGRP support for IPv6. Upon completing this lesson, you will be able to:

- Describe Cisco support for IPv6 routing with EIGRP
- Configure EIGRP for IPv6 on Cisco routers

The lesson includes these topics:

- EIGRP for IPv6
- Cisco IOS EIGRP for IPv6 Commands

The lesson includes these activities:

- Lab 4-3: Routing with EIGRP

Lesson 5: Understanding MP-BGP
This lesson defines how to describe how MP-BGP supports IPv6 and how to configure MP-BGP on Cisco routers. Upon completing this lesson, you will be able to:

- Describe how the MP-BGP routing protocol is supported in IPv6
- Describe the changes made to MP-BGP to support IPv6
- Examine BGP peering over link-local addresses
- Examine BGP prefix filtering
- Configure and troubleshoot the MP-BGP protocol on Cisco routers

The lesson includes these topics:

- MP-BGP Support for IPv6
- IPv6 as Payload and Transport Mechanism in MP-BGP
- BGP Peering Over Link-Local Addresses

The lesson includes these activities:

- Lab 4-4: Routing with BGP and MP-BGP

Lesson 6: Configuring IPv6 Policy-Based Routing
This lesson defines how to explain the issues when using PBR and when disabling the processing of extension headers. Upon completing this lesson, you will be able to:

- Explain the issues when using PBR, and when disabling the processing of extension headers
- Explain configuration steps in configuring PBR

The lesson includes these topics:

- Policy-Based Routing
- Configure PBR

Lesson 7: Configuring FHRP for IPv6
This lesson defines how to outline the concepts of first-hop redundancy protocols, and describe HSRP and GLBP for IPv6. Upon completing this lesson, you will be able to:

- Describe the concepts of first-hop redundancy protocols
- Describe HSRP and explain configuration steps in configuring HSRP for IPv6
- Describe GLBP and explain configuration steps in configuring GLBP for IPv6

The lesson includes these topics:

- First-Hop Redundancy Protocols and
Lesson 8: Configuring Route Redistribution

This lesson defines how to describe route redistribution. Upon completing this lesson, you will be able to:

- Describe route redistribution
- Describe PE-CE redistribution for service providers

The lesson includes these topics:

- Route Redistribution
- PE-CE Redistribution for Service Providers

Lesson 2: Using IPv6 MLD

This lesson defines how to describe IPv6 multicast addressing options, MAC address mappings, and multicast address scoping. Upon completing this lesson, you will be able to:

- Describe and use the MLD protocol in multicast networks
- Configure MLD snooping and MLD group limits
- Configure multicast authentication

The lesson includes these topics:

- Multicast Listener Discovery
- MLD Snooping and MLD Group Limits
- Multicast User Authentication and Group Range Support

Module 6: IPv6 Transition Mechanisms

- Evaluate the scenario and desired outcome and identify the best transition mechanism for the situation.

Lesson 1: Implementing Dual-Stack

- Design IPv6 multicast example applications

The lesson includes these topics:

- IPv6 Multicast Addressing
- PIM for IPv6
- Rendezvous Points
- MP-BGP for the IPv6 Multicast Address Family
- How to Implement Multicasting in an IPv6 Network
- IPv6 Multicast Application Example

The lesson includes these activities:

- Lab 5-1: Multicasting

Module 5: IPv6 Multicast Services

Understand multicast concepts and IPv6 multicast specifics.

Lesson 1: Implementing Multicast in an IPv6 Network

This lesson defines how to describe generic multicast address scoping, identify extended multicast use in IPv6, and describe the principles, protocols, differences, and similarities in IPv4 and IPv6. Upon completing this lesson, you will be able to:

- Describe the basic IPv6 multicast addressing and address scoping, and motivations to use IP multicast
- Explain PIM in IPv6 networks
- Describe RP deployments
- Explain MP-BGP for the IPv6 multicast address family
- List the steps for implementing multicasting in an IPv6 network

The lesson includes these topics:

- IPv6 Multicast Addressing
- PIM for IPv6
- Rendezvous Points
- MP-BGP for the IPv6 Multicast Address Family
- How to Implement Multicasting in an IPv6 Network
- IPv6 Multicast Application Example

The lesson includes these activities:

- Lab 5-1: Multicasting
This lesson defines how to describe the dual-stack approach to integration. Upon completing this lesson, you will be able to:

- Describe the dual-stack applications
- Describe the dual-stack approach and Cisco configuration
- Identify some of the benefits and issues that are associated with dual-stacking

The lesson includes these topics:

- Dual-Stack Applications
- Dual-Stack Node
- The Dual-Stack Approach

**Lesson 2: Describing IPv6 Tunneling Mechanisms**

This lesson defines how to describe the dual-stack and automatic tunneling mechanisms. Upon completing this lesson, you will be able to:

- Show the IPv6-in-IPv4 tunnel methodology and implementation
- Discuss the types of manually configured tunnels
- Describe how automatic tunnels work

The lesson includes these topics:

- Overlay Tunnels
- Manually Configured Tunnels
- Automatic Tunnels

The lesson includes these activities:

- Lab 6-1: Implementing Tunnels for IPv6

**Module 7: IPv6 Security**

Describe security issues, how security for IPv6 is different than for IPv4, and emerging practices for IPv6-enabled networks.

**Lesson 1: Configuring IPv6 ACLs**

This lesson defines how to configure ACLs in an IPv6 environment. Upon completing this lesson, you will be able to:

- Describe standard and extended ACLs in IPv6 networks
- Describe configuration of an ACL in IPv6 networks
- Describe reflexive and time-based ACLs in IPv6 networks
- Identify Cisco IOS Software IPv6 header filtering keywords
- Identify new Cisco IOS Software ICMPv6 types
- Edit IPv6 ACLs
- Configure ACLs in an IPv6 environment

The lesson includes these topics:

- IPv6 ACLs
- IPv6 ACL Configuration
- Reflexive and Time-Based ACLs
- Cisco IOS IPv6 Header Filtering
- Cisco IOS New ICMPv6 Types
- Editing of ACLs
- How to Configure ACLs in an IPv6 Environment

The lesson includes these activities:

- Lab 7-1: Configuring Advanced ACLs

**Lesson 2: Using IPsec, IKE, and VPNs**

This lesson defines how to describe how security is implemented in IPv6. Upon completing this lesson, you will be able to:

- Describe how security is implemented in IPv6
Lessons:

**Configure IPsec and IKE in Cisco IOS routers**
- Describe and configure various VPN solutions, including IPsec VPN, SSL VPN, and DMVPN

The lesson includes these topics:
- IPsec, IKE, and VPNs Basics
- IPsec and IKE
- VPN Connections Using IPv6

The lesson includes these activities:
- Lab 7-2: Implementing IPsec and IKE

**Lesson 3: Discussing Security Issues in an IPv6 Transition Environment**

This lesson defines how to identify security and transition issues in an IPv6 environment. Upon completing this lesson, you will be able to:
- Describe dual-stack transition security issues
- Identify tunnel security issues in transition environments
- Describe the security issues of NAT-PT
- Describe the security issues that are caused by the increased need for ICMP

The lesson includes these topics:
- Dual-Stack Issues
- Tunnel Security Issues
- NAT-PT Security Issues
- ICMP Traffic Requirements

**Lesson 4: Understanding IPv6 Security Practices**

This lesson defines how to describe security practices for IPv6 deployment. Upon completing this lesson, you will be able to:
- Compare common network threats in IPv4 and IPv6 networks, and offers solutions to mitigate them
- Describe IPv6 security practices that you should consider
- Describe the need to hide topology information when possible, for security
- Secure a local link
- Manage ICMPv6 traffic at the IPv6 edge
- Develop a mobility support plan
- Use transition mechanisms as transport
- Secure the routing plane
- Describe an IPv6 early warning system

The lesson includes these topics:
- Threats in IPv6 Networks
- Build Distributed Security Capability
- Hide Topology when Possible
- Secure the Local Link
- ICMPv6 at Edge—Manage ICMPv6 Traffic
- Develop Mobility Support Plan
- Use Transition Mechanisms as Transport
- Secure the Routing Plane
- Deploy an Early-Warning System

**Lesson 5: Configuring Cisco IOS Firewall for IPv6**

This lesson defines how to describe and configure Cisco IOS Firewall for IPv6 traffic. Upon completing this lesson, you will be able to:
- Describe Cisco IOS Classic Firewall
- Describe how Cisco IOS Classic Firewall works
- Implement IPv6 inspection on Cisco ISRs
- Describe the Zone-Based Policy Firewall for IPv6
- Configure and verify Zone-Based Policy Firewall zones and zone pairs
- Configure and verify a basic OSI Layer 3 to 4 interzone access policy
- List the commands that are used to verify and troubleshoot Cisco IOS Firewall

The lesson includes these topics:
- Describe Cisco IOS Classic Firewall
- Describe how Cisco IOS Classic Firewall works
- Implement IPv6 inspection on Cisco ISRs
- Describe the Zone-Based Policy Firewall for IPv6
- Configure and verify Zone-Based Policy Firewall zones and zone pairs
- Configure and verify a basic OSI Layer 3 to 4 interzone access policy
- List the commands that are used to verify and troubleshoot Cisco IOS Firewall
DELIVERY METHODS

ILT – Instructor-Led Classroom Training
ILT sessions are conducted in a physical classroom environment.

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ILO sessions are conducted via WebEx in a VoIP environment.

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configuration and operation

The lesson includes these topics:

- Cisco IOS Firewall for IPv6
- IPv6 Inspection on ISRs
- Implement IPv6 Inspection on ISRs
- Zone-Based Policy Firewall for IPv6 on ISRs
- Configuring Zones and Zone Pairs
- Configuring a Basic OSI Layer 3 to 4 Interzone Access Policy
- Troubleshooting the Zone-Based Policy Firewall

The lesson includes these activities:

- Lab 7-3: Configuring Cisco IOS Firewall

Module 8: Deploying IPv6

Describe the standards bodies that define IPv6 address allocation, in addition to one of the leading IPv6 deployment issues—multihoming.

Lesson 1: Examining IPv6 Address Allocation

This lesson defines how to explain IPv6 address allocation in the IPv6 Internet. Upon completing this lesson, you will be able to:

- Describe the IPv6 Internet
- Explain how IPv6 addresses are allocated
- Describe how to connect a network to the IPv6 Internet

The lesson includes these topics:

- IPv6 Internet
- IPv6 Address Allocation
- Connecting to the IPv6 Internet

Lesson 2: Understanding the IPv6 Multihoming Issue

This lesson defines how to identify an IPv6 multihoming issue and prescribe a potential solution. Upon completing this lesson, you will be able to:

- Outline the multihoming issues in IPv6
- Review the current IPv6 multihoming solutions

The lesson includes these topics:

- IPv6 Multihoming Aspects and Issues
- IPv6 Multihoming Status

Lesson 3: Identifying IPv6 Enterprise Deployment Strategies

This lesson defines how to identify IPv6 enterprise integration strategies. Upon completing this lesson, you will be able to:

- Define the enterprise network
- Identify specific concerns with campus networks that use IPv6
- Identify specific concerns with WAN networks that use IPv6
- Identify the advantages and disadvantages of dual-stack integration in IPv6 enterprise networks
- Identify the advantages and disadvantages of using encapsulation in IPv6 enterprise networks
- Identify the advantages and disadvantages of translation in IPv6 enterprise networks

The lesson includes these topics:

- Enterprise Networks
- Impacts of Network Services
- WAN Networks
- Dual Stack: Advantages and Disadvantages
- Tunneling: Advantages and Disadvantages
- Translation: Advantages and Disadvantages
Module 9: IPv6 and Service Providers

Describe the deployment strategies that service providers might consider when deploying IPv6.

Lesson 1: Identifying IPv6 Service Provider Deployment

This lesson defines how to identify IPv6 service provider deployment strategies. Upon completing this lesson, you will be able to:

- Describe the three main methods that IPv4-only ISPs use to offer IPv6 services to their existing or new customers
- Identify the pros and cons of dual-stack deployment
- Identify the pros and cons of IPv6-only deployment
- Identify the pros and cons of encapsulation
- Identify the pros and cons of various IPv6 services
- Describe two significant service provider strategies for a phased deployment of IPv6
- Describe broadband address allocation in IPv6 networks
- Describe support for encapsulation in broadband IPv6 networks and guidelines for choosing the encapsulation type

The lesson includes these topics:

- IPv6 Service Provider Deployment
- Dual-Stack Deployment
- IPv6-Only Deployment
- Encapsulation
- IPv6 Services
- Key Service Provider Strategies
- Service Layer Address Allocation
- Encapsulation Support

Lesson 2: Understanding Support for IPv6 in MPLS

This lesson defines how to deploy IPv6 over an MPLS network. Upon completing this lesson, you will be able to:

- Explain the operations of MPLS
- Describe the various methods that are used to deploy IPv6 over MPLS
- Explain IPv6 tunnels that are configured on CE routers
- Explain IPv6 over AToM
- Describe Cisco 6PE
- Describe how Cisco 6PE is deployed in an MPLS network

The lesson includes these topics:

- MPLS Operations
- IPv6 over MPLS Deployment Scenarios
- IPv6 Tunnels Configured on CE Routers
- IPv6 over Layer 2 MPLS VPN
- Cisco 6PE
- How to Deploy Cisco 6PE on MPLS Networks

Lesson 3: Understanding 6VPE

This lesson defines how to explain the 6VPE service that service providers offer. Upon completing this lesson, you will be able to:

- Describe how Cisco 6VPE is deployed in an MPLS network
- Implement Cisco 6VPE

The lesson includes these topics:

- Cisco 6VPE
- Configuring 6VPE

The lesson includes these activities:

- Lab 9-1: Configuring 6PE and 6VPE

Lesson 4: Understanding IPv6 Broadband
**Access Services**

This lesson defines how to understand IPv6 broadband access services and DSL-based access in particular. Upon completing this lesson, you will be able to:

- Describe the operation of 6rd
- List customer link encapsulations
- Explain FTTH access architecture
- Explain cable access architecture
- Explain wireless access architecture
- Explain DSL access architecture

The lesson includes these topics:

- IPv6 Rapid Deployment
- Customer Link Encapsulations
- FTTH Access Architecture
- Cable Access Architecture
- Wireless Access Architecture
- DSL Access Architecture

**Module 10: IPv6 Case Studies**

Describe case studies for enterprise, service provider, and branch networks.

**Lesson 1: Planning and Implementing IPv6 in Enterprise Networks**

This lesson defines how to describe the most common planning and implementation approaches, distinguish among enterprise network designs, and adopt a high-level implementation strategy for the process of transitioning from IPv4-only to dual-stack architectures. Upon completing this lesson, you will be able to:

- Define an enterprise network
- Identify specific concerns with campus networks that use IPv6
- Identify specific concerns with WAN

The lesson includes these topics:

- Enterprise Network Definition
- Implementing IPv6 in an Enterprise Campus Network
- IPv6 in an Enterprise WAN Network

**Lesson 2: Planning and Implementing IPv6 in Service Provider Networks**

This lesson defines how to describe and identify the most common planning and implementation approaches that pertain to moving to IPv6 in service provider core networks. Upon completing this lesson, you will be able to:

- Identify the design principles for a service provider network
- Identify deployment considerations for IPv6 for Internet access services
- Identify deployment considerations for native IPv6 support in the service provider core network
- Identify deployment considerations for IPv6 over MPLS in the service provider core network

The lesson includes these topics:

- Service Provider Network Design
- Native IPv6 Deployment in Service Provider Access Networks
- Native IPv6 Deployment in the Service Provider Core Network
- 6PE Deployment in the Service Provider Core Network

**Lesson 3: Planning and Implementing IPv6 in Branch Networks**

This lesson defines how to describe and identify the most common planning and implementation
approaches as they pertain to moving to IPv6 in branch networks. Upon completing this lesson, you will be able to:

- Describe the general considerations when deploying IPv6 in branch networks
- Describe the single-tier profile when deploying IPv6 in branch networks
- Describe the dual-tier profile when deploying IPv6 in branch networks

The lesson includes these topics:

- Branch Deployment Overview
- Branch Deployment Profiles: Single-Tier Profile Implementation
- Branch Deployment Profiles: Dual-Tier and Multitier Profile Implementations