

Course Outline

IPv6 Fundamentals, Design, and Deployment Course IP6FD: 5 days Instructor Led

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About this course

IPv6 Fundamentals, Design, and Deployment (IP6FD) v3.0 is a 5-day training program offered by NterOne and delivered by an expert authorized Cisco Certified Systems Instructor (CCSI) to better prepare you or your company for the inevitable shift from IPv4 to IPv6. 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 IP6FD training 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 IPv6 training also provides an overview of IPv6 technologies, covers IPv6 design and implementation, describes IPv6 operations, 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.

Audience profile

- Network Administrators
- Network Engineers
- Channel Partners/Resellers, Customers, Employees
- System Engineers

At course completion

After completing this course, students 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 of the leading IPv6 deployment issues - Multihoming

Course Outline

Module 1: Introduction to IPv6

Lesson 1: Explaining the Rationale for IPv6

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

Course Outline

- IPv4 Workarounds

Lesson 2: Evaluating IPv6 Features and Benefits

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

Lesson 3: Understanding Market Drivers

- Market Growth for IPv6
- Native IPv6 Content
- Drivers for Adoption

Module 2: IPv6 Operations

Lesson 1: Understanding the IPv6 Addressing Architecture

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

Lesson 2: Describing the IPv6 Header Format

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

Lesson 3: Enabling IPv6 on Hosts

- 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

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

Lesson 5: Using ICMPv6 and Neighbor Discovery

- ICMPv6
- ICMP Errors

Course Outline

- 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

Lesson 6: Troubleshooting IPv6

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

Module 3: IPv6 Services

Lesson 1: IPv6 Mobility

- Introduction to IP Mobility
- Mobile IPv6
- Network Mobility Examples

Lesson 2: Describing DNS in an IPv6 Environment

- DNS Objects and Records
- DNS Tree Structure
- Dynamic DNS

Lesson 3: Understanding DHCPv6 Operations

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

Lesson 4: Understanding QoS Support in an IPv6 Environment

- IPv6 Header Fields Used for QoS
- IPv6 and the Flow Label Field
- IPv6 QoS Configuration

Course Outline

Lesson 5: Using Cisco IOS Software Features

- Cisco IOS Software Features
- Cisco IOS IPv6 Tools
- IPv6 Support for Cisco Discovery Protocol
- Cisco Express Forwarding IPv6
- IP Service Level Agreements

Module 4: IPv6-Enabled Routing Protocols

Lesson 1: Routing with RIPng

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

Lesson 2: Examining OSPFv3

- OSPFv3 Key Characteristics
- OSPFv3 Enhancements
- OSPFv3 Configuration
- OSPFv3 IPsec ESP Authentication and Encryption
- OSPFv3 Advanced Functionalities

Lesson 3: Examining Integrated IS-IS

- 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

Lesson 4: Examining EIGRP for IPv6

- EIGRP for IPv6
- Cisco IOS EIGRP for IPv6 Commands

Lesson 5: Understanding MP-BGP

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

Lesson 6: Configuring IPv6 Policy-Based Routing

Course Outline

- Policy-Based Routing
- Configure PBR

Lesson 7: Configuring FHRP for IPv6

- First-Hop Redundancy Protocols and Concepts
- HSRP for IPv6
- GLBP for IPv6

Lesson 8: Configuring Route Redistribution

- Route Redistribution
- PE-CE Redistribution for Service Providers

Module 5: IPv6 Multicast Services

Lesson 1: Implementing Multicast in an IPv6 Network

- 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

Lesson 2: Using IPv6 MLD

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

Module 6: IPv6 Transition Mechanisms

Lesson 1: Implementing Dual-Stack

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

Lesson 2: Describing IPv6 Tunneling Mechanisms

- Overlay Tunnels
- Manually Configured Tunnels
- Automatic Tunnels

Module 7: IPv6 Security

Lesson 1: Configuring IPv6 ACLs

Course Outline

- 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

Lesson 2: Using IPsec, IKE, and VPNs

- IPsec, IKE, and VPNs Basics
- IPsec and IKE
- VPN Connections Using IPv6

Lesson 3: Discussing Security Issues in an IPv6 Transition Environment

- Dual-Stack Issues
- Tunnel Security Issues
- NAT-PT Security Issues
- ICMP Traffic Requirements

Lesson 4: Understanding IPv6 Security Practices

- 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

- 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

Course Outline

Module 8: Deploying IPv6

Lesson 1: Examining IPv6 Address Allocation

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

Lesson 2: Understanding the IPv6 Multihoming Issue

- IPv6 Multihoming Aspects and Issues
- IPv6 Multihoming Status

Lesson 3: Identifying IPv6 Enterprise Deployment Strategies

- Enterprise Networks
- Impacts of Network Services
- WAN Networks
- Dual Stack: Advantages and Disadvantages
- Tunneling: Advantages and Disadvantages

Module 9: IPv6 and Service Providers

Lesson 1: Identifying IPv6 Service Provider Deployment

- 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

- 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

- Cisco 6VPE

Course Outline

- Configuring 6VPE

Lesson 4: Understanding IPv6 Broadband Access Services

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

Module 10: IPv6 Case Studies

Lesson 1: Planning and Implementing IPv6 in Enterprise Networks

- 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

- 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

- Branch Deployment Overview
- Branch Deployment Profiles: Single-Tier Profile Implementation

Lab Outline

- Enabling IPv6 on Hosts
- Using Neighbor Discovery
- Using Prefix Delegation
- Routing with OSPFv3
- Routing with IS-IS
- Routing with EIGRP
- Routing with BGP and MP-BGP
- Multicasting
- Implementing Tunnels for IPv6
- Configuring Advanced ACLs
- Implementing IPsec and IKE
- Configuring Cisco IOS Firewall

Course Outline

- Configuring 6PE and 6VPE