

## IPv6 Fundamentals, Design and Deployment

**Duration: 5 Days    Course Code: IP6FD    Version: 4.0**

### Overview:

This five-day course provides network engineers and technicians who are working in the enterprise sector with the knowledge and skills that are needed to study and configure the IP version 6 (IPv6) features of Cisco IOS Software. This course provides an overview of IPv6 technologies, covers IPv6 design and implementation, describes IPv6 operations, addressing, routing, services, and transition, and describes the deployment of IPv6 in enterprise and service provider networks. Hands-on labs and case studies are used to provide possible deployment scenarios.

**This course is worth 40 Credits in the Continuing Education Program**

### Target Audience:

The primary audience for this course is network engineers and technicians who are working in the enterprise sector.

### Objectives:

- **After completing this course you should be able to:**
- Describe the factors that led to the development of IPv6, and the 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
- Describe the nature of changes to DNS and DHCP to support IPv6, and how networks can be renumbered using both services
- Understand the updates to IPv4 routing protocols needed to support IPv6 topologies
- Understand multicast concepts and IPv6 multicast specifics
- Describe IPv6 transition mechanisms and which methods will be most effective in your network
- 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, as well as one of the leading IPv6 deployment issues, multihoming
- Describe the deployment strategies that service providers are facing when deploying IPv6
- Describe case studies for enterprise, service provider, branch, and access network

### Prerequisites:

**Attendees should meet the following pre-requisites:**

- Cisco CCNA® certification:
- Understanding of networks and routing ( Cisco CCNP® level recommended but not required).
- Working knowledge of the Microsoft Windows operating system.
- CCNA - Implementing and Administering Cisco Solutions
- ENCOR - Implementing and Operating Cisco Enterprise Network Core Technologies

### Testing and Certification

**Recommended preparation for exam(s):**

- No exam currently aligns to this course

### Follow-on-Courses:

**The following courses are recommended for further study:**

- None recommended at this time



## Content:

### Explaining the rationale for IPv6

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

### Evaluating IPv6 Features and Benefits

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

### Understanding Market Drivers

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

### Understanding the IPv6 Addressing Architecture

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

### Describing the IPv6 Header Format

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

### Enabling IPv6 on Hosts

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

### Enabling IPv6 on Cisco Routers

- Enabling IPv6 on Cisco Routers
- IPv6 Address Configuration

### Using ICMPv6 and Neighbor Discovery

- 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

### Routing with RIPng

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

### Examining OSPFv3

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

### Examining Integrated IS-IS

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

### Examining EIGRP for IPv6

- EIGRP for IPv6
- Cisco IOS EIGRP for IPv6 Commands

### Understanding MP-BGP

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

### Configuring IPv6 Policy-Based Routing

- Policy-Based Routing
- Configure PBR

### Configuring FHRP for IPv6

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

### Configuring Route Redistribution

- Route Redistribution
- PE-CE Redistribution for Service Providers

### Implementing Multicast in an IPv6 Network

- IPv6 Multicast Addressing
- PIM for IPv6
- Rendezvous Points
- MP-BGP for the IPv6 Multicast Address Family

### Discussing Security Issues in an IPv6 Transition Environment

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

### 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

### Configuring Cisco IOS Firewall for IPv6

- Cisco IOS Firewall for IPv6
- IPv6 Inspection on ISRs
- Implement IPv6 Inspection on ISR
- 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

### Examining IPv6 Address Allocation

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

### Understanding the IPv6 Multihoming Issue

- IPv6 Multihoming Aspects and Issues
- IPv6 Multihoming Status
- Protocol-Based Solutions

### Identifying IPv6 Enterprise Deployment Strategies

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

### Identifying IPv6 Service Provider Deployment

- IPv6 Service Provider Deployment
- Dual-Stack Deployment
- IPv6-Only Deployment
- Encapsulation

## Troubleshooting IPv6

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

## IPv6 Mobility

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

## Describing DNS in an IPv6 Environment

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

## Understanding DHCPv6 Operations

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

## Understanding QoS Support in an IPv6 Environment

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

## 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

- How to Implement Multicasting in an IPv6 Network

- IPv6 Multicast Application Example

## Using IPv6 MLD

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

## Implementing Dual Stack

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

## Describing IPv6 Tunnelling Mechanisms

- Overlay Tunnels
- Manually Configured Tunnels
- Automatic Tunnels

## Configuring IPv6 ACLs

- 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

## Using IPsec,IKE and VPNs

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

- IPv6 Services
- Key Service Provider Strategies

## 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
- Deploy Cisco 6PE on MPLS Networks

## Understanding 6VPE

- Cisco 6VPE
- Configuring 6VPE

## Understanding IPv6 Broadband Access Services

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

## Planning and Implementing IPv6 in Enterprise Networks

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

## 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

## Planning and Implementing IPv6 in Branch Networks

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

## Labs

- Discovery Lab 1: Enabling IPv6 on Hosts
- Discovery Lab 2: Using Neighbor Discovery
- Discovery Lab 3: Using Prefix Delegation
- Discovery Lab 4: Routing with OSPFv3
- Discovery Lab 5: Routing with IS-IS
- Discovery Lab 6: Routing with EIGRP
- Discovery Lab 7: Routing with BGP and

MP-BGP

- Discovery Lab 8: Multicasting
- Discovery Lab 9: Implementing Tunnels for IPv6
- Discovery Lab 10: Configuring Advanced ACLs
- Discovery Lab 11: Implementing IPsec and IKE
- Discovery Lab 12: Configuring Cisco IOS Firewall
- Discovery Lab 13: Configuring 6PE and 6VPE

---

### Further Information:

For More information, or to book your course, please call us on Head Office 01189 123456 / Northern Office 0113 242 5931

[info@globalknowledge.co.uk](mailto:info@globalknowledge.co.uk)

[www.globalknowledge.com/en-gb/](http://www.globalknowledge.com/en-gb/)

Global Knowledge, Mulberry Business Park, Fishponds Road, Wokingham Berkshire RG41 2GY UK