Implementing Cisco Multicast
Course MCAST v2.0; 5 Days, Instructor-led

Course Description:
The Implementing Cisco Multicast (MCAST) v2.0 course is a five-day instructor-led course covering the fundamentals of IP multicasting, which includes multicast applications, sources, receivers, group management, and IP multicast routing protocols (such as Protocol Independent Multicast, PIM) used within a single administrative domain (intra-domain). The issues of switched LAN environments and reliable IP multicasting are covered as well. The course provides technical solutions for simple deployments of IP multicast within a provider, or customer network. The curriculum provides the configuration and troubleshooting guidelines for implementation of IP multicast on Cisco routers. The labs provide students with the hands-on experience needed to successfully deploy IP multicast.

Course Objectives:
Upon completion of this session, you should be able to:

- Introduce IP multicast services, to evaluate the functional model of IP multicasting and the technologies present in IP multicasting, acknowledge IP multicast benefits and associated caveats, and determine various types of multicast applications in order to understand IP multicast conceptual model and its implementation prerequisites
- Identify IP multicast issues on a data-link layer, explain the methods of mapping network layer multicast addresses to data-link layer addresses and list the mechanisms for constraining multicast streams in a LAN environment
- Introduce Protocol Independent Multicast sparse mode (PIM-SM) as the most current scalable IP multicast routing protocol to learn the principles of protocol operation and details, become familiar with the determinism built into sparse mode multicast protocols, and configure and deploy PIM-SM in complex IP multicast network deployments
- Review RP distribution solutions, recognize the drawbacks of manual RP configuration, become familiar with the Auto-Rendezvous Point (Auto-RP) and the bootstrap router (BSR) mechanisms, introduce the concept of Anycast RP that works in combination with the Multicast Source Discovery Protocol (MSDP)
- Recognize the drawbacks of the Protocol Independent Multicast sparse mode (PIM-SM) and introduce two extensions to provide possible solution, learn about mechanics of the Source Specific Multicast (SSM) and bidirectional mode of PIM-SM in order to configure and deploy SSM and bidirectional mode of the PIM-SM in a large service provider network
• Explain basic concepts of Multiprotocol BGP (MP-BGP) and its use in the IP multicast environment, apply steps associated with configuring MP-BGP with Address Family Identifier (AFI) syntax to support IP multicast in the inter-domain environment
• Configure and deploy MSDP in the inter-domain environment
• Introduce solutions to mitigate security issues in the IP Multicast network. Examine and implement suitable virtual private network (VPN) technologies, such as Generic Routing Encapsulation (GRE) with IP Security (IPsec) and Group Encrypted Transport (GET) VPN
• Describe the process of monitoring and maintaining multicast high-availability operations. Introduce the PIM triggered join feature and describe how load splitting IP multicast traffic over Equal-Cost Multipath (ECMP) works
• After gaining the knowledge of multicast and multicast related technologies in the previous modules you will be faced and challenged with three real life scenarios for applications of multicast. You will be able to answer to and design multicast related application and network challenges in customer and service provider networks

Prerequisites:
The knowledge and skills that a learner must have before attending this course are as follows:
• Work experience and configuration skills for Cisco routers and LAN switches
• Cisco Certified Network Associate (CCNA) certification:
  o Interconnecting Cisco Network Devices 1 (ICND1)
  o Interconnecting Cisco Network Devices 2 (ICND2)
• Implementing Cisco IP Routing (ROUTE)

Who Should Attend:
The primary audience for this course is as follows:
• network professionals including System Engineers (SEs)
• partners
• customers

Course Outline:
Module 1: IP Multicast Concepts and Technologies
Lesson 1: Introducing IP Multicast
• IP Multicast Benefits and Caveats
• IP Multicast Application Types
• IP Multicast Addressing
• Multicast Sessions and Directory Services
Lesson 2: Understanding the Multicast Service Model
• Basic IP Multicast Model
• Functions of the IP Multicast Network
Lesson 3: Defining Multicast Distribution Trees and Forwarding
• RPF Check
• Source Distribution Trees
• Shared Distribution Trees
Lesson 4: Reviewing Multicast Protocols
- Dense Mode
- Sparse Mode and Variants
- Multicast Protocols in Inter-domain IP Multicasting
- Reporting Group Membership

Module 2: Multicast on the LAN
Lesson 1: Mapping Layer 3 to Layer 2
- MAC Layer Multicast Address
- Internet Group Management Protocol
- IGMP Version 2
- IGMP Version 3
- Configure and Monitor IGMP

Lesson 2: Working with Cisco Group Management Protocol
- Explain Cisco Group Management Protocol
- Configure and Troubleshoot Cisco Group Management Protocol on Cisco Routers
- Configure and Troubleshoot Cisco Group Management Protocol on Cisco LAN Switches
- Identify Cisco Group Management Protocol Implementation Issues

Lesson 3: Using IGMP Snooping
- Explain IGMP Snooping
- Configure and Troubleshoot IGMP Snooping
- IGMP Snooping Implementation Issues
- Introduce RGMP
- Introduce IGMPv3 Host Stack

Module 3: PIM Sparse Mode
Lesson 1: Introducing Protocol Independent Multicast Sparse Mode
- PIM-SM Concepts
- PIM-SM Packets
- PIM-SM States and Flags

Lesson 2: Understanding PIM-SM Protocol Mechanics
- PIM Neighbor Discovery
- PIM-SM Forwarding
- PIM-SM Joining
- PIM-SM Registering
- PIM-SM SPT-Switchover
- PIM-SM Pruning

Lesson 3: Using PIM-SM in a Sample Situation
- PIM-SM State Maintenance
- PIM-SM Review
- PIM DM Fallback
Lesson 4: Configuring and Monitoring PIM-SM
- PIM-SM Configuration
- Configuring Static RPs
- Debugging PIM-SM

Module 4: Rendezvous Point Engineering
Lesson 1: Identifying RP Distribution Solutions
- Dynamic RP Information Distribution
- Auto-RP Mechanism
- BSR Mechanism
- Anycast RP
Lesson 2: Implementing Auto-RP
- Configuring the Candidate RPs
- Configuring the Mapping Agents
- Tune the Auto-RP
- Troubleshoot the Auto-RP
- Constrain the Scope
Lesson 3: Using PIMv2 BSR
- BSR Solution
- Configure BSR
- Troubleshoot BSR
- Constrain the Scope of BSR Message Flooding
Lesson 4: Using Anycast RP and MSDP
- Explain MSDP
- Distribution Trees in MSDP
- Configure Basic MSDP
- Anycast RP Overview
- Implement Anycast RP

Module 5: PIM Sparse Mode Protocol Extensions
Lesson 1: Introducing Source Specific Multicast
- SSM Concepts
- SSM Deployment with IGMPv3
Lesson 2: Configuring and Monitoring SSM
- Configure IGMPv3
- Configure SSM
- Introducing SSM Mapping
- Monitor SSM
Lesson 3: Reviewing Bidirectional PIM
- Bidirectional Multicast Trees
- PIM-SM Bidirectional Mode Operation
- Designated Forwarder
Lesson 4: Configuring and Monitoring Bidirectional PIM
- Configure PIM-SM Bidirectional Mode
- PIM-SM Bidirectional Mode Monitoring

Module 6: Multiprotocol Extensions for BGP
Lesson 1: Introducing MP-BGP
- BGP Example
- BGP Fundamentals
- MP-BGP Overview
- MP-BGP Update Messages and Capability Negotiation
- Implementation of MP-BGP
Lesson 2: Configuring and Monitoring MP-BGP
- Configuring MP-BGP
- Configuring Incongruent BGP Topologies
- Monitoring MP-BGP

Module 7: Inter-domain IP Multicast
Lesson 1: Examining Dynamic Inter-domain IP Multicast
- ISP Requirements to Deploy IP Multicast
- SSM Role in Inter-domain IP Multicast
- MSDP Role in Inter-domain IP Multicast
Lesson 2: Explaining Multicast Source Discovery Protocol
- Using MSDP
- MSDP Concepts
- MSDP Peers
- MSDP Messages
- MSDP SA Messages
Lesson 3: Using MSDP SA Caching
- MSDP SA Caching Overview
- MSDP SA Caching Server
- MSDP SA Caching Client
- Pseudo MSDP Peer
Lesson 4: Configuring and Monitoring MSDP
- Enabling MSDP
- Controlling the Distribution of MSDP SA Messages
- MSDP Configuration Example
- MSDP MD5 Password Authentication
- Monitoring and Debugging MSDP

Module 8: IP Multicast Security
Lesson 1: Introducing IP Multicast and Security
- Threats in a Multicast Environment
- Securing a Network Element
- Securing the Network at the Edge
- PIM and Internal Security

Lesson 2: Securing a Multicast Network
- Securing the Multicast Network
- Sender Control
- Receiver Control
- Admission Control
- Securing MSDP
- Using GET VPN to Protect IP Multicast

Module 9: Multicast Optimization and High Availability Features
Lesson 1: Using Multicast Optimization and High Availability Features
- Monitoring and Maintaining Multicast High Availability Operations (NSF/SSO and ISSU)
- PIM Triggered Joins
- Load Splitting IP Multicast Traffic over Equal Cost Multipath (ECMP)

Module 10: Applications of Multicast
Lesson 1: Exploring IP Multicast and Video Applications
- Examine Situations in Video Applications
- Design a Solution
Lesson 2: Using IP Multicast in Mission-Critical Environments
- Examine Situations in Mission-Critical Environment
- Design a Solution
- Discuss Cisco PGM Implementation
Lesson 3: Exploring How Enterprise IT Uses IP Multicasting Globally
- How Enterprise IT Uses IP Multicasting Globally

Lab Outline:
- Lab 2-1: Layer 2 and Layer 3 Multicast
- Lab 3-1: PIM-SM Protocol Basics
- Lab 3-2: PIM-SM Protocol Mechanics and Timers
- Lab 5-1: PIM Sparse-Dense Mode and Manual RP Configuration
- Lab 5-2: Configuring Dynamic RP Information Distribution
- Lab 5-3: Bidirectional PIM
- Lab 5-4: Source Specific Multicast
- Lab 7-1: Anycast RP, External MP-BGP, and MSDP Peering