Hands-On

Multicasting Implementation and Troubleshooting

Course Description

The real time transfer of information from source to many receivers is increasingly a requirement of modern networks. While it is possible to transfer information with simple client server techniques developed within the Internet Protocol Suite, transfer using this unicasting does not scale well to large communities.

Multicasting provides a means of distributing information to multiple receivers at the same moment over a tree of paths through routed networks.

In its simplest form it can be used for the distribution of streams of multimedia over a private infrastructure delivering different channels each as a different multicast group address. In the corporate environment it might be carried over VPNs configured over MPLS infrastructures where the network provision may be separated from the sources and receivers. In such environments the configuration and troubleshooting of stream transmission becomes more challenging.

This course will provide a sound coverage of Multicast protocols and addressing. This will include Protocol Independent Multicast (PIM) and Internet Group Management Protocol (IGMP) versions 2 and 3. Key addressing and multicast routing will be considered for both within Autonomous Systems and Between Autonomous Systems.

The scaling implications of both source tree and shared tree techniques will be considered and the mechanisms for advertising, requesting and pruning distributed streams will be considered.
The mechanisms available for monitoring and troubleshooting stream distributions on Cisco platforms will be considered.

Students Will Learn

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- **Explain the benefits of multicasting**
- **List various types of multicast applications and their requirements**
- **Identify the addressing issues of IP multicasting**
- **Explain the way multicast applications work and identify the prerequisites that have to be fulfilled for an implementation**
- **Explain the principles and detailed operation of different Protocol Independent Multicast (PIM) modes**
- **Describe the variants of PIM sparse mode**
- **Select multicast protocols for different environments**
- **Use protocol analyzers to verify LAN performance and test services**
- **Identify multicast protocols and discuss version interactions**
- **Configure source tree and compare this with shared tree**
- **Deploy sparse mode multicasting using PIM**
- **Monitor and troubleshoot multicast route distribution**
- **Manage Cisco multicast router platforms using SNMP MIBs**
- **And more...**

Target Audience

This course has been developed for those in need of implementing and troubleshooting IP multicast technology in their networks.

Prerequisites

Networking and TCP-IP is recommended.

Course Outline

1: Multicasting Concepts and Addressing

- Why we need multicasting
- IP addressing
- Multicast addressing at Layer 3
- Reserved Link Local Addresses
- Globally Scoped Addresses
- Source Specific Multicast
- GLOP Addresses
- Limited Scope Addresses
- Streaming Protocols
- Real Time Streaming Protocol RFC 2326
- Real Time Transport Protocol RFC 1889 and 3267
- Hands-on Exercise Multicasting Video over Classroom Network

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2: Layer 2 Multicast

- Mapping Multicast to Layer 2
- Layer 2 Multicast Addressing
- Slow Protocol Multicast
- Using Protocol Analyzers to monitor Multicast
- Hands-on Exercise Using Protocol Analyzers to Monitor Multicast

3: Protocol Independent Multicast

- Modes of Multicasting Compared:
- Dense Mode
- Sparse Mode
- Sparse-Dense Mode
- PIM-Sparse Mode RFC 2362
- Defining a group and a tree
- Establishing RPs
- Shared Tree and Source Tree Compared
- Switching between the two
- Shortest Path Tree SPT-bit
- Hello Exchanges
- Exchanges prunes and joins
- Flags Used
- PIM Packets
- Register and Register Stop
- Multicast data packet forwarding
- Sending and Receiving Asserts
- Candidate-RP-Advertisements
- Receiving and Forwarding Bootstrap Information
- Hash Function
- Timer Events
- RFC 2715 Interoperability Rules
- Hands-on Exercise Analyzing PIM Protocol Exchanges

4: Internet Group Management Protocol

- IGMP v2 and IGMPv3 compared
- Compatibility issues
- Host States
- IGMP State Transitions
- IGMP Actions
- Hands-on Exercise Using and Analyzing IGMP Protocol Exchanges

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5: Configuring Multicasting on Cisco Platforms

- Routing and Multicast Routing
- Interface configuration
- PIM-SM configuration
- Defining RPs
- IGMP configuration
- Security considerations
- Hands-on Exercise Configuring IP Multicasting

6: Multicasting over VLANs and VPNs

- Virtual Local Area Networks
- Virtual Private Networks
- Configuring VLAN Trunking
- Multicasting over trunked VLANs
- Hands-on Exercise Using Trunked Multicast

7: Monitoring Multicasting Operations and Troubleshooting

- Monitoring IGMP
- Monitoring routing and Mroute tables
- Scopes
- Cisco Debug modes for multicast troubleshooting
- Indications that multicast service is arriving or blocking
- Hands-on Exercise Troubleshooting Multicast

8: Monitoring Multicast Video Quality

- Measures of video stream quality
- Capturing streams
- Problems of carrying Multicast over WiFi
- WiFi Multicast Relay
- Hands-on Exercise Monitoring Video and reconstructing captured streams

9: Using SNMP to Manage Multicast

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- SNMP and MIBs
- RFC 2932 IPMROUTE-MIB
- IGMP-MIB
- RFC 2934 PIM-MIB
- CISCO-IGMP-FILTER-MIB
- CISCO-IPMROUTE-MIB
- Hands-on Exercise Using SNMP in the Management of Multicasting

Evaluation and Review

Delivery Method

Instructor-Led with Hands-On labs and exercises.

Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

4 Days

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