Cisco Routing & Switching

BGP: Configuring BGP on Cisco Routers v4.0

Configuring BGP on Cisco Routers (BGP) v4.0 provides students with in-depth knowledge of Border Gateway Protocol (BGP), the routing protocol that is one of the foundations of the Internet and New World technologies such as Multiprotocol Label Switching (MPLS).).

$3,995.00

- 5 Days

Upcoming Dates

Dec 07 - Dec 11

Course Description

Configuring BGP on Cisco Routers (BGP) v4.0 provides students with in-depth knowledge of Border Gateway Protocol (BGP), the routing protocol that is one of the foundations of the Internet and New World technologies such as Multiprotocol Label Switching (MPLS). This curriculum covers the theory of BGP, configuration of BGP on Cisco IOS routers, detailed troubleshooting information, and hands-on exercises that provide learners with the skills that they need to configure and troubleshoot BGP networks in customer environments. Different service solutions in the curriculum cover BGP network design issues and usage rules for various BGP features, preparing learners to design and implement efficient, optimal, and trouble free BGP networks.

Course Outline

Module 1: BGP Overview

Lesson 1: Introducing BGP

- Interdomain Routing
- Why External Routing Protocols?
- BGP Characteristics
- BGP Development Considerations
- Single-Homed Customers
- Multihomed Customers
- Transit Autonomous Systems
- BGP Limitations
- Summary

Lesson 2: Understanding BGP Path Attributes

- BGP Path Attributes
- Well-Known BGP Attributes
- Optional BGP Attributes
- AS-Path Attribute
- Next-Hop Attribute
- Summary

Lesson 3: Establishing BGP Sessions

- BGP Neighbor Discovery
- Establishing a BGP Session
- BGP Keepalives
- MD5 Authentication
- Summary

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Lesson 4: Processing BGP Routes

- Receiving Routing Updates
- Building BGP Table
- BGP Route Selection Criteria
- BGP Route Propagation
- Building IP Routing Table
- Advertising Local Networks
- Automatic Summarization
- Summary

Lesson 5: Configuring Basic BGP

- BGP Routing Process
- Configuring External Neighbors
- Announcing Networks in BGP
- Redistributing Routes into BGP
- BGP Conditional Route Injection
- BGP Support for TTL Security Check
- Multihomed Customer Problem
- Summary

Lesson 6: Monitoring and Troubleshooting BGP

- Monitoring Overall BGP Routing
- Monitoring BGP Neighbors
- Monitoring BGP Table
- Debugging BGP
- BGP Session Startup Problems
- BGP Neighbor Not Reachable
- BGP Neighbor Not Configured
- BGP AS Number Mismatch
- Summary

Lesson 7: Module Summary

Lesson 8: Module Self-Check

Module 2: BGP Transit Autonomous Systems

Lesson 1: Working with Transit AS

- Transit AS Tasks
- External Route Propagation
- Internal Route Propagation
- Packet Forwarding in AS

- Core Router IBGP Requirements in Transit AS
- Summary

Lesson 2: Interacting with IBGP and EBGP in Transit AS

- AS-Path Processing in IBGP
- Multipath Load Sharing in BGP
- BGP Split Horizon
- IBGP Full Mesh
- IBGP Neighbors
- IBGP Next-Hop Processing
- Transit Network Using Edge Routers as Next Hops Example
- Differences Between EBGP and IBGP Sessions
- Scalability Limitations of IBGP-Based Transit Backbones
- Summary

Lesson 3: Forwarding Packets in Transit AS

- Packet Forwarding in Transit AS
- Recursive Lookup in Cisco IOS Software
- Routing Protocols in Transit AS
- BGP and IGP Interaction
- Problems with BGP and IGP Interaction
- Summary

Lesson 4: Monitoring and Troubleshooting IBGP in Transit AS

- Monitoring IBGP
- Common IBGP Problems
- Troubleshooting IBGP Session Startup Issues
- Troubleshooting IBGP Route Selection Issues
- Troubleshooting IBGP Synchronization Issues
- Summary

Lesson 5: Module Summary

Lesson 6: Module Self-Check

Module 3: Route Selection Using Policy Controls

Lesson 1: Using Multihomed BGP Networks

- Business Requirements for Multihomed BGP Networks
- Technical Requirements for Multihomed BGP Networks
- BGP Route Selection Without BGP Policies
- Multihomed Customer Routing Policies
- Influencing BGP Route Selection
- Transit Traffic Issue
- Routing Update Reliability Issue
- Return Traffic Issue
- Summary

Lesson 2: Employing AS Path Filters

- AS Path Filtering Scenarios
- AS Path Regular Expressions
- String Matching
- Applying AS Path Filters
- Configuring BGP AS Path Filters
- Monitoring AS Path Filters

- Summary

Lesson 3: Filtering with Prefix Lists

- Requirements for Prefix-Based Filters
- Prefix Lists vs. IP Access Lists
- Configuring Prefix Lists
- BGP Filters Implementation
- Implementing Prefix Lists in the BGP Process
- Modifying Prefix Lists
- Monitoring Prefix Lists
- Summary

Lesson 4: Using Outbound Route Filtering

- Outbound Route Filtering
- Inbound vs. Outbound Filtering Example
- BGP Prefix-Based Outbound Route Filtering
- Outbound Route Filter Message
- Configuring Outbound Route Filtering
- Using Outbound Route Filtering
- Summary

Lesson 5: Applying Route Maps as BGP Filters

- Route Map Overview
- BGP Route-Map Policy List Support
- BGP Route Map Continue
- Prefix List Use in Route Maps
- BGP Filters
- Using Route Maps as BGP Filters
- Summary

Lesson 6: Implementing Changes in BGP Policy

- Traditional Filtering Limitations
- BGP Soft Reset Enhancement
- Route Refresh
- Configuring Route Refresh
- Monitoring Route Refresh
- Summary

Lesson 7: Module Summary

Lesson 8: Module Self-Check

Module 4: Route Selection Using Attributes

Lesson 1: Influencing BGP Route Selection with Weights

- BGP Route Selection Criteria
- Influencing BGP Route Selection
- Configuring Per-Neighbor Weights
- Changing Weights with Route Maps
- BGP Route Selection and Filtering Tools Summary
- Summary

Lesson 2: Setting BGP Local Preference

- Consistent Route Selection Within the AS
- BGP Local Preference

- Configuring Default Local Preference
- Monitoring Local Preference
- Configuring Local Preference with Route Maps
- Summary

Lesson 3: Using AS Path Prepending

- Return Path Selection in a Multihomed AS
- AS Path Prepending
- AS Path Prepending Design Considerations
- BGP Hide Local-Autonomous System
- Summary

Lesson 4: Understanding BGP Multi-Exit Discriminators

- Selecting the Proper Return Path
- MED Propagation in a BGP Network
- Changing MED
- Troubleshooting the MED
- Advanced MED Configuration
- Summary

Lesson 5: Addressing BGP Communities

- Selecting the Proper Return Path
- BGP Communities Overview
- Using Communities
- Configuring BGP Communities
- BGP Named Community Lists
- BGP Cost Community
- BGP Link Bandwidth Feature
- BGP Support for Sequenced Entries in Extended Community Lists
- Summary

Lesson 6: Module Summary

Lesson 7: Module Self-Check

Module 5: Customer-to-Provider Connectivity with BGP

Lesson 1: Understanding Customer-to-Provider Connectivity

- Customer-to-Provider Connectivity Types
- Customer Redundant Connectivity
- Customer-to-Provider Routing Schemes
- Customer Routing Schemes
- Customer Addressing Requirements
- Customer AS Number Allocation

Lesson 2: Implementing Customer Connectivity Using Static Routing

- When to Use Static Routing?
- Characteristics of Static Routing
- Designing Static Route Propagation in a Service Provider Network
- BGP Backup with Static Routes
- Floating Static Routes with BGP
- Load Sharing with Static Routes
- Summary

Lesson 3: Connecting a Customer to a Single Service Provider

- BGP Configuration on Customer Routers
- Conditional BGP Advertising in Customer Networks
- BGP Configuration on Service Provider Routers
- Removing a Private AS Numbers
- BGP Support for Dual AS Configuration for Network AS MigrationsBackup Solutions with BGP
- Load Sharing
- Load Sharing with BGP Multipath
- Load Sharing with EBGP Multihop
- Summary

Lesson 4: Connecting a Multihomed Customer to Multiple Service Providers

- BGP Configuration for Multihomed Customers
- Multihomed Customer Address Space Selection
- Multihomed Customer AS Number Selection
- AS Number Translation
- Primary and Backup Link Selection
- BGP Incoming Link Selection
- Load Sharing with Multiple Providers
- Summary

Lesson 5: Module Summary

Lesson 6: Module Self-Check

Module 6: Scaling Service Provider Networks

Lesson 1: Scaling IGP and BGP in Service Provider Networks

- Common Service Provider Network
- Route Propagation in Service Provider Networks
- Scaling Service Provider Routing Protocols
- Scaling Service Provider Addressing
- Summary

Lesson 2: Introducing and Designing Route Reflectors

- IBGP Scalability Issues in a Transit AS
- Route Reflector Split-Horizon RulesRedundant Route Reflectors
- Route Reflector Clusters
- Additional Route Reflector Loop-Prevention Mechanisms
- Network Design with Route Reflectors
- Potential Network Issues
- Hierarchical Route Reflectors
- Summary

Lesson 3: Configuring and Monitoring Route Reflectors

- IBGP network
- This lesson includes these topics:
- Route Reflector Backbone Migration
- Configuring Route Reflectors

Lesson 4: Module Summary

Lesson 5: Module Self-Check

Module 7: Optimizing BGP Scalability

Lesson 1: Improving BGP Convergence

- BGP Convergence
- BGP Processes
- CPU Effects of BGP Processes
- Improving BGP Convergence
- PMTU Discovery
- Increasing Input Queue Depth
- BGP Prefix Independent Convergence
- Bidirectional Forwarding Detection for BGP
- BGP Nonstop Forwarding Awareness
- BGP Scan Time
- BGP Advertisement Interval
- BGP Keepalive and Hold-Down Timers
- Summary

Lesson 2: Limiting the Number of Prefixes Received from a BGP Neighbor

- Objective: Configure BGP to limit the number of prefixes that are received from a neighbor
- BGP Route Limiting
- Configuring the BGP Route Limiting
- Summary

Lesson 3: Implementing BGP Peer Groups

- BGP Peer Groups Overview
- BGP Peer Groups as a Performance Tool
- BGP Peer Group Limitations
- Configuring BGP Peer Groups
- BGP Peer Group Configuration Examples
- BGP Dynamic Update Peer Groups Feature
- BGP Peer Templates Overview
- BGP Peer Templates Inheritance
- BGP Peer Templates Configuration
- Summary

Lesson 4: Using BGP Route Dampening

- BGP Route Dampening
- BGP Route Dampening Operation
- Configuring BGP Route Dampening
- Summary

Lesson 5: Module Summary

Lesson 6: Module Self-Check

Labs:

- Discovery 1: Configure Basic BGP
- Discovery 3: Implement BGP TTL Security Check
- Discovery 4: BGP Route Propagation
- Discovery 5: IBGP Full Mesh
- Discovery 6: BGP Administrative Distance
- Discovery 7: Configure Non-Transit Autonomous System
- Discovery 8: Filtering Customer Prefixes
- Discovery 9: Prefix-Based Outbound Route Filtering
- Discovery 10: Configure Route Maps as BGP Filters
- Discovery 11: Configure Per-Neighbor Weights
- Discovery 12: Configure and Monitor Local Preference
- Discovery 13: Configure Local Preference Using Route Maps

- Discovery 14: Configure AS Path Prepending
- Discovery 15: Configure MED
- Discovery 16: Configure Local Preference Using the Communities
- Discovery 17: Configure Route Reflector
- Discovery 18: Configure BGP Route Limiting
- Discovery 19: Configure BGP Peer Groups
- Discovery 20: Configure BGP Route Dampening

- Challenge 1: Configure a Basic BGP Network
- Challenge 2: Configure a BGP Transit AS
- Challenge 3: Configure BGP Using BGP Filtering
- Challenge 4: Configure BGP Route Selection Using BGP Attributes
- Challenge 5: Configure BGP Route Reflectors

Audience

Primary target audience:

- This course is intended primarily for network administrators, network engineers, network managers and systems engineers who would like to implement BGP.

Secondary target audience:

- This course is intended for network designers and project managers. The course is also recommended to all individuals preparing for BGP exam.

Prerequisites

To fully benefit from this course, students should have the following prerequisite skills and knowledge:

- Intermediate to advanced knowledge of Cisco IOS Software configuration
- Configuring and troubleshooting RIP, EIGRP, OSPF and IS-IS

Skills and knowledge equivalent to those learned in:

- Interconnecting Cisco Networking Devices, Part 1 (ICND1) and Part 2 (ICND2), or
- Interconnecting Cisco Networking Devices: Accelerated Version (CCNAX)
- Implementing Cisco IP Routing (ROUTE)
- Building Cisco Service Provider Next-Generation Networks Part 1 (SPNGN1)
- Building Cisco Service Provider Next-Generation Networks Part 2 (SPNGN2)

What You Will Learn

After completion of this course, students will be able to...

- Describe how to configure, monitor, and troubleshoot basic BGP to enable interdomain routing in a network scenario with multiple domains
- Describe how to use BGP policy controls to influence the BGP route selection process in a network scenario in which you must support connections to multiple ISPs
- Describe how to use BGP attributes to influence the route selection process in a network scenario where you must support multiple connections.
- Describe how to successfully connect the customer network to the Internet in a network scenario in which multiple connections must be implemented
- Describe how to configure the service provider network to behave as a transit AS in a typical implementation with multiple BGP connections to other autonomous systems.
- Enable route reflection as possible solution to BGP scaling issues in a typical service provider network with multiple BGP connections to other autonomous systems.
- Describe the available BGP tools and features to optimize the scalability of the BGP routing protocol in a typical BGP network