Configuring BGP on Cisco Routers

Duration: 5 Days Course Code: BGP Version: 4.1

Overview:

Configuring BGP on Cisco Routers provides students with an in-depth knowledge of Border Gateway Protocol (BGP), a routing protocol that is one of the foundations of the Internet and New World technologies such as Multiprotocol Label Switching (MPLS).
This course focuses on the theory of BGP, the configuration and troubleshooting of BGP on Cisco IOS routers. Extensive use of hands on labs has been incoporated into this curriculum to ensure learners have the skills required to configure and troublshoot BGP networks in customer environments.

Each student will have their own virtual pod of equipment with access to the labs 24x7 for 90 days.

This course is worth 40 Credits in the Continuing Education Program

Virtual Learning

This interactive training can be taken from any location, your office or home and is delivered by a trainer. This training does not have any delegates in the class with the instructor, since all delegates are virtually connected. Virtual delegates do not travel to this course, Global Knowledge will send you all the information needed before the start of the course and you can test the logins.

Target Audience:

Service Provider and Enterprise network engineers that design,deploy and maintain core IP network infrastructures running BGP.

Objectives:

- **After you complete this course you 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 route selection process in a network scenario where 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 and confederations as possible solutions 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.

Prerequisites:

Attendees should meet the following prerequisites:

- Intermediate to advanced knowledge of Cisco IOS Software configuration.
- Configuring and Troubleshooting RIP, EIGRP,I SPF and IS-IS.
- CCNA - Implementing and Administering Cisco Solutions

Testing and Certification

Recommended preparation for exam(s):

- No exam is currently aligned to this course.

Follow-on-Courses:

- MPLS - Implementing Cisco MPLS

Content:

Introducing BGP

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

Exploring BGP Path Attributes

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

Establishing BGP Sessions

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

Processing BGP Routes

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

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

Monitoring and Troubleshooting BGP

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

Working with Transit AS

- Transit AS Tasks
- External Route Propagation
- Internal Route Propagation
- Packet Forwarding in an AS
- Core Router IBGP Requirements in a

Using Multihomed BGP Networks

- Business Requirements for Multihomed BGP Networks
- Technical Requirements for Multihomed BGP Networks
- BGP Route Selection
- Multihomed Customer Routing Policies
- Influencing BGP Route Selection
- Transit Traffic Issue
- Routing Update Reliability Issue
- Return Traffic Issue

Employing AS Path Filters

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

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

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

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

Implementing Changes in BGP Policy

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

Influencing BGP Route Selection with Weights

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

Exploring Customer-to-Provider Connectivity Requirements

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

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

Connecting a Customer to a Single Service Provider

- BGP Configuration on Customer Routes
- Conditional BGP Advertising in Customer Networks
- BGP Configuration on Service Provider Routers
- Removing Private AS Numbers
- BGP Support for Dual AS Configuration for Network AS Migrations
- Backup Solutions with BGP
- Load Sharing
- Load Sharing with BGP Multipath
- Load Sharing wth EBGP Multihop

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

Transit AS

Interacting with IBGP and EBGP in a Transit AS

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

Forwarding Packets in a Transit AS

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

Monitoring and Troubleshooting IBGP in a Transit AS

- Monitoring IBGP
- Common IBGP Problems
- Troubleshooting IBGP Session Start-Up Issues
- Troubleshooting IBGP Route Selection Issues
- Troubleshooting IBGP Sychronization Issues
- BGP Route Selection Criteria
- Influencing BGP Route Selection
- Configuring Per-Neighbor Weights
- Changing Weights with Route Maps
- BGP Route Selection and Filtering Tools Summary

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

Using AS Path Prepending

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

Exploring the BGP MED

- Selecting the Proper Return Path
- MED Progression in a BGP Network
- Changing the MED
- Troubleshooting the MED
- Advanced MED Considerations

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

Introducing Route Reflectors

- IBGP Scalability Issues in a Transit AS
- Route Reflector Split-Horizon Rules
- Redundant Route Reflectors
- Route Reflectors Clusters
- Additional Route Reflector Loop-Prevention Mechanisms
- Network Design with Route Reflectors
- Potential Network Issues
- Hierachical Route Reflectors
- Route Reflector Backbone Migration
- Configuring Route Reflectors

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
- BFD for BGP
- BGP Nonstop Forwarding Awareness
- BGP Scan Time
- BGP Advertisement Interval
- BGP Keepalive and Hold-Down Timers

Optimizing BGP Scalability

- BGP Route Limiting
- Configuring BGP Route Limiting
- 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
- BGP Route Dampening
- BGP Route Dampening Operation
- Configuring BGP Route Dampening

Labs

- Discovery 1: Configure Basic BGP
- Discovery 2: Announce Networks in BGP
- Discovery 3: Implement the BGP Support for TTL Security Check Feature
- Discovery 4: Configure a Basic BGP Network

- Discovery 5: BGP Route Propagation
- Discovery 6: IBGP Full Mesh
- Discovery 7: BGP Administrative Distance
- Discovery 8: Configure a Transit AS
- Discovery 9: Configure Non-Transit Autonomous System
- Discovery 10: Filter Customer Prefixes
- Discovery 11: Prefix-Based Outbound Route Filtering
- Discovery 12: Configure Route Maps as BGP Filters
- Discovery 13: Configure BGP Using BGP Filtering
- Discovery 14: Configure Per-Neighbor Weights
- Discovery 15: Configure and Monitor Local Preference
- Discovery 16: Configure Local Preference Using Route Maps
- Discovery 17: Configure AS Path Prepending
- Discovery 18: Configure the MED
- Discovery 19: Configure Local Preference Using the Communities
- Discovery 20: Configure BGP Route Selection Using BGP Attributes
- Discovery 21: Configure Route Reflector
- Discovery 22: Implement Route Reflector Configurations
- Discovery 23: Configure BGP Route Limiting
- Discovery 24: Configure BGP Peer Groups
- Discovery 25: Configure BGP Route Dampening

Further Information:

For More information, or to book your course, please call us on Head Office Tel.: +974 40316639

training@globalknowledge.qa

www.globalknowledge.com/en-qa/

Global Knowledge, Qatar Financial Center, Burj Doha,Level 21, P.O.Box 27110, West Bay, Doha, Qatar