Hands-On
ROUTE Implementing Cisco IP Routing
CCNP Course 1

BTS
Real-World Experience

Course Description

Revised CCNP Curriculum and Exams

Cisco has redesigned the CCNP courses and exams to reflect the evolving job tasks of global network professionals.

Course 1 ROUTE v1.0 Implementing Cisco IP Routing is a five-day instructor-led course in which network professionals learn to plan, configure, and verify the implementation of complex enterprise LAN and WAN routing solutions, using a range of routing protocols. ROUTE v1.0 also covers configuration of secure routing solutions to support branch offices and mobile workers. The course includes more than seven hours of e-learning lessons and demos that students can absorb at their own pace.

Course 2 SWITCH v1.0 Implementing Cisco IP Switched Networks is a five-day instructor-led course in which network professionals will learn to plan, configure, and verify the implementation of complex enterprise switching solutions, using Cisco Enterprise Campus Architecture. SWITCH v1.0 also covers secure integration of VLANs, WLANs, voice, and video into campus networks.

Course 3 TSHOOT v1.0 Troubleshooting and Maintaining Cisco IP Networks is a five-day instructor-led course in which network professionals learn to (1) plan and perform regular maintenance on complex enterprise routed and switched networks, and (2) use technology-based practices and a systematic ITIL-compliant approach to perform network troubleshooting. Extensive labs provide hands-on learning and reinforce troubleshooting skills. The course includes more than nine hours of e-learning lessons and demos that students can absorb at their own pace.Learn the advanced routing skills you need to provide scalability for Cisco routers that are connected to LANs and WANs as part of a medium-to-large network site. You will learn how to dramatically increase the number of routers and sites using EIGRP and OSPF techniques, instead of redesigning the network when additional sites or configurations are added.

This Course 1 ROUTE v1.0 Implementing Cisco IP Routing course provides Hands-On labs to ensure that you thoroughly understand each technique and includes a CD with supplemental information to help your prepare for the ROUTE exam (642-902) and many study aides and materials.

Students Will Learn

- **Plan and document the configuration and verification of routing protocols and their optimization in enterprise networks**
- **Technologies, components, and metrics of EIGRP used to implement and verify EIGRP routing in diverse, large-scale internetworks based on requirements**
- **Identify, analyze, and match OSPF multiarea routing functions and benefits for routing efficiencies in network operations in order to implement and verify OSPF routing in a complex enterprise network**
- **Implement and verify a redistribution solution in a multiprotocol network that uses Cisco IOS features to control path selection and provides a loop-free topology**

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- **Evaluate common network performance issues, and identify the tools needed to provide Layer 3 path control using Cisco IOS features**
- **Implement and verify a Layer 3 solution using BGP to connect an enterprise network to a service provider**
- **And more...**

Target Audience

Network engineers, technical support personnel, and help desk technicians
Anyone involved in implementing, configuring, and verifying routing protocols in enterprise networks

Prerequisites

-CCNA certification
-Familiarity with internetworking technologies and the ability to perform basic router configuration
-Experience installing, operating, and maintaining Cisco routers and switches in an enterprise environment
-Knowledge of IP, including the ability to perform IP subnetting on non-octal boundaries, configure IP standard and extended access lists, operate and configure distance vector routing protocol, configure serial interface, and interpret a Cisco routing table

Course Outline

1. Planning Routing Services to Requirements

- Assessing Complex Enterprise Network Requirements
    - Cisco hierarchical network model
    - Cisco Enterprise Architecture
    - Traffic conditions in a converged network
    - Cisco SONA framework
    - Routing and routing protocols
- Common Maintenance Processes and Procedures
    - Typical implementation plan information and tasks
    - Implementation documentation

2. Implementing an EIGRP-Based Solution
- Planning
    - Four key technologies employed by EIGRP
    - How EIGRP operates
    - Five components of the metric used by EIGRP
    - Calculate the EIGRP metric for a range of pathways between routers
    - Create a typical implementation plan for an EIGRP-based solution
    - Document EIGRP implementation, operations, and maintenance processes
- Implementing and Verifying Basic EIGRP for the Enterprise LAN Architecture
    - Commands used in a basic EIGRP configuration task

- Select the interfaces and networks that will participate in EIGRP routing use the network command and wildcard masks
      - Verify basic EIGRP operations, and that the router recognizes EIGRP neighbors and their routes
      - Create neighbor relationships using the neighbor command and verify that the router recognizes EIGRP neighbors and routes
      - Control routing update advertisements using the passive-interface command
      - Configure and verify the last-resort gateway or default route
      - Compare manual route summarization to default automatic route summarization
      - Configure and verify route summarization
  - Configuring and Verifying EIGRP for the Enterprise WAN Architecture
    - Effect on EIGRP operations
      - Circuit emulation link such as Metro Ethernet or EoMPLS
      - MPLS VPNs
      - Frame Relay
    - Physical and Logical multipoint interfaces
      - Dynamic DLCI mapping
      - Static DLCI mapping
      - Broadcast vs. non-broadcast
    - Logical multipoint interface
      - Dynamic DLCI mapping
      - Static DLCI mapping
      - broadcast vs. non-broadcast
    - Logical point-to-point interface
    - Configure and verify EIGRP operating over Frame Relay
    - Features of load balancing across equal paths
    - Configure and verify EIGRP load balancing across unequal cost paths
    - Configure EIGRP bandwidth use across WAN links
  - Implementing and Verifying EIGRP Authentication
    - Evaluate router authentication
    - Configure MD5 authentication
    - Troubleshoot MD5 authentication
  - Advanced EIGRP Features in an Enterprise Network
    - Factors affecting scalability in large internetworks
    - Using queries to update routing tables when a route is lost and there is no successor
    - Mark the spokes of a large network as stubs to reduce EIGRP queries and improve network scaling
    - Why stuck-in-active (SIA) connections occur
    - Minimize active routes
    - Illustrate how graceful shutdown prevents loss of packets when routers go down

3. Implementing a Scalable Multiarea Network OSPF-Based Solution
  - Planning
    - Link-state routing protocols
    - Two-tier hierarchy structure
    - How link-state routing protocols establish neighbor adjacencies
    - How OSPF calculates the best path to each destination network
    - How link-state updates (LSUs) verify active links
    - Different OSPF area types
    - Create a typical implementation plan and documentation package for an OSPF-based solution
  - How OSPF Packet Processes Work
    - Five OSPF packet types
    - How OSPF neighbor adjacencies are established
    - Exchanging and synchronizing link-state databases (LSDBs) or topology tables
    - Maintaining a database of the most recent link-state sequence numbers
    - Verifying that OSPF packets are flowing properly between two routers
  - Improving Routing Performance in a Complex Enterprise Network

- OSPF network types
- Determine adjacency behavior
  - Point-to-point links
  - Broadcast networks
  - Metro Ethernet and EoMPLS networks
  - MPLS networks
- Select a DR and BDR
- Implement OSPF over Frame Relay
  - Frame Relay NBMA
  - Point-to-point Frame Relay network
  - Point-to-multipoint Frame Relay network
- Use subinterfaces in OSPF over Frame Relay
- Configuring and Verifying OSPF Routing
  - Configure basic single-area and multiarea OSPF
  - Enable the route process
  - Configure a router ID
  - Enable OSPF on networks and interfaces using the network and ip ospf commands
  - Configure and verify basic multiarea OSPF operations
  - Neighbor relationship
  - OSPF router types
  - LSAs defined by OSPF
  - Interpret the OSPF LSDB and routing table
  - Controlling routing advertisements using the passive-interface command
  - Effects of a non-contiguous backbone or area that does not connect to area 0 and how OSPF virtual links are used to address these issues
  - Configure and verify an OSPF virtual link
  - Change the cost metric from default values
- Configuring and Verifying OSPF Route Summarization
  - Functions of inter-area route summarization and external route summarization
  - Configure route summarization in OSPF
  - Benefits of a default route in OSPF
  - Configure a default route injection into OSPF
- Configuring and Verifying OSPF Special Area Types
  - OSPF area types
  - Configure OSPF stub areas and totally stubby areas
  - Interpret routing tables for stub areas and totally stubby areas
  - Configure OSPF NSSAs
  - Verify all types of OSPF stub areas
- Configuring and Verifying OSPF Authentication
  - Distinguish between the two types of authentication used in OSPF
  - Configure and troubleshoot simple password authentication
  - Configure and troubleshoot MD5 authentication

4. Implement an IPv4-Based Redistribution Solution
- Assessing Network Routing Performance and Security Issues
  - Common network performance issues
  - How distribution lists, prefix lists, and route maps work and how they control routing updates
  - Use route maps to filter routes
  - Suppress routing updates using passive interfaces
- Operating a Network Using Multiple IP Routing Protocols
  - The need to use multiple IP routing protocols
  - Route redistribution
  - Configure dynamic routing protocol updates for passive interfaces and distribute lists
  - Use of Policy routing and route maps
  - Seed metrics used by various routing protocols

- Process for points of distribution in a network and identifying possible routing loops
- Create a distribution and loop map for a given network
- Configuring and Verifying Route Redistribution
  - Procedures necessary to configure route redistribution into RIP, EIGRP, and OSPF
  - Advantages of administrative distance in terms of routing protocols
  - Modify administrative distance on the router globally and specifically
  - Assess the impact of administrative distance changes on routing tables
  - Implement route maps with route redistribution to prevent routing loops
    Verify route redistribution operations

5. Implementing Path Control
- Assessing Path Control Network Performance Issues
  - Use filters to determine path selection
  - Use PBR to determine path selection
  - Configure and verify PBR
- Additional Path Control Sessions via E-Learning
  - ROUTE-01 Lesson 1: Parallel Processes when Implementing Path Control
  - ROUTE-01 Lesson 2: Directed Demo of Procedures to Implement Path Control by Other Methods
  - ROUTE-01 Lesson 3: Self-Check Assessment

6. Connection of an Enterprise Network to an ISP Network
- Planning the Enterprise-to-ISP Connection
  - Connectivity requirement between an enterprise network and an ISP
  - Exchanging routing information across an ISP
    - Static routes
    - Common IGPs
    - MPLS VPNs
    - Circuit Emulation
    - BGP
  - Types of enterprise-to-ISP connections and their effect on the selection of an exchange method
    - Single-homed
    - Dual-homed
    - Multihomed
    - Dual-multihomed
- Advantages of Using BGP
  - Connectivity between an enterprise network and an ISP that requires the use of BGP
  - Issues when an enterprise connects to the Internet through multiple ISPs
  - BGP multihoming options
  - How BGP routes between autonomous systems
  - How BGP uses path-vector functionality
  - BGP compared to other distance vector routing protocol and database types
- Comparing the Functions and Uses of EBGP and IBGP
  - Terminology
  - Establishing external and internal BGP (EBGP) neighbor relationships
  - Use of metrics
- Configuring and Verifying Basic BGP Operations
  - Initiate basic BGP configuration
  - Activate a BGP session for external and internal neighboring routers
  - Administratively shut down and re-enable a BGP neighbor
  - Factors and options to correctly configure BGP
  - BGP neighbor states
  - Configure MD5 authentication on the BGP TCP connection between two routers
  - Configure and verify BGP operations in a single-homed environment
  - Troubleshoot BGP configuration
- Using the BGP Attributes and Path Selection Process

- - BGP attributes that affect outbound EBGP path selection
  - Criteria for selecting a BGP path
  - Configure the AS path attribute to affect outbound EBGP path selection
  - Configure local preference attribute to affect outbound path selection
  - Configure the weight attribute to affect outbound EBGP path selection
  - Use route maps to set attributes to control outbound EBGP path selection
    - AS Path prepending
    - Local preference
    - Weight
  - Configure the MED attribute to effect inbound EBGP path selection
  - Configure AS path attribute (AS prepending) to affect inbound EBGP path selection
  - Document implementation, operations, and maintenance
- IPv6 and Routing for Branch Offices and Remote Workers
  - Implementing IPv6
  - Implementing Routing Facilities for Branch Offices and Mobile Workers
  - Analyzing Mobile Workers Designs and Planning for Mobile Workers Installations
  - Directed Demo: Implement Special Facilities for Mobile Workers

Delivery Method

Instructor-Led with numerous 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

5 Days

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