

## DATA SHEET

# ADVANCED IMPLEMENTING AND TROUBLESHOOTING MPLS VPN NETWORKS

## COURSE OVERVIEW

**Advanced Implementing and Troubleshooting MPLS VPN Networks Boot Camp is a comprehensive five-day hands-on course that will enable you to develop the skills to successfully deploy a complex MPLS VPN installation with significant focus on troubleshooting common problems. You will explore the intricacies of the benefits of an MPLS VPN solution, the common pitfalls, and the best practices for implementing MPLS VPN. Eight in-depth hands-on labs ensure that you learn the theory as well as the practical skills. You will learn how to build intranet and extranet MPLS VPN networks, add Internet access, and then migrate this complex network into multiple autonomous systems (ASs) where Inter-AS VPNs and Carrier Supporting Carrier (CsC) VPNs are supported.**

## WHO SHOULD ATTEND

This course is intended for network professionals including designers, implementers, and support staff that are involved with the deployment of large-scale networks for large enterprises or the design and deployment of high-end networks requiring MPLS VPNs.

## OBJECTIVES

Upon completion of this course, you will be able to perform the following tasks:

- Identify methods of deploying MPLS VPNs in a variety of network scenarios
- Select the best MPLS VPN method to implement for a given network scenario
- Implement the chosen MPLS VPN solution and verify that it is functioning as intended
- Filter MPLS VPN Routes
- Implement and troubleshoot MPLS VPN Internet Access
- Deploy Carrier Supporting Carrier (CsC) VPNs
- Characterize the fundamental components of an MPLS VPN Network
- Implement Shared Internet Access through a Single NAT Gateway
- Gain practical skills in deploying an Inter-AS MPLS VPN
- Partition MPLS VPN Route Reflectors
- Implement MPLS VPN with RIPv2, BGPv4, and OSPF
- Establish VPNv4 Peering
- Identify and troubleshoot frequently encountered MPLS VPN problems

## COURSE PREREQUISITES

Course prerequisites are listed in Table 1.

**Table 1: Course Prerequisites**

Prerequisite Knowledge	Relevant Courses
<ul style="list-style-type: none"> <li>• Experience using the Cisco IOS® Software Command Line Interface (CLI)</li> <li>• Routing fundamentals and IP addressing</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Introduction to Cisco Networking Devices (ICND)</i> or equivalent</li> <li>• Cisco Certified Network Associate (CCNA) certification is highly recommended for this course</li> </ul>
<ul style="list-style-type: none"> <li>• Detailed knowledge of IP routing including network protocols, IP addressing, and subnetting.</li> <li>• Configuring and troubleshooting IP routing and route redistribution using OSPF, RIPv2, BGPv4, and static routing</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Building Scalable Cisco Networks (BSCI)</i></li> </ul>
<ul style="list-style-type: none"> <li>• Configuring and troubleshooting basic MPLS</li> </ul>	<ul style="list-style-type: none"> <li>• <i>MPLS Technology Essentials (MPLSTE)</i></li> <li>• <i>ISP Workshop and MPLS (IFMV)</i></li> </ul>

## CISCO PART NUMBER

AS-TRAIN-E in North America and Europe

AS-TRAIN-E-A in Asia Pacific

AS-TRAIN-E-L in Latin America

## DURATION

Five Days.

## COURSE OUTLINE

1. Implementing and Troubleshooting MPLS
  - a. MPLS Operation
  - b. Deploying MPLS
    - i. MTU Issues
    - ii. TraceRoute with MPLS
    - iii. Route Summarization
  - c. Verifying and Troubleshooting MPLS
    - i. Control Plane Troubleshooting
    - ii. Forward Plane Troubleshooting
2. Implementing Intranet and Extranet MPLS VPNs
  - a. VPN Routing and Forwarding (VRF) Instance
  - b. Overlapping VPNs
  - c. MP-BGP
  - d. Multiprotocol Extensions for BGP
  - e. MPLS VPN Connection Rules
  - f. Configuring MPLS VPN
    - i. Configuring VRFs
    - ii. Associate VRFs to Interfaces
3. Scaling MPLS VPN Networks
  - a. Improving MPLS VPN Convergence
  - b. Improving BGP Performance
  - c. Sizing Edge Routers
4. Implementing Inter-AS MPLS VPNs
  - a. Inter-AS MPLS VPN Building Blocks
  - b. Inter-AS Deployment Options
  - c. Scaling Inter-AS MPLS VPNs
  - d. Route Filtering Techniques
5. Troubleshooting MPLS VPNs
  - a. Preparing for Troubleshooting
- iii. Configuring MP-BGP
- iv. Configuring VRF Routing Contexts
- v. Configuring PE-to-CE Routing
- vi. Configuring CE-to-PE Routing
  1. With Static Routing
  2. With RIPv2, eBGP, and OSPF
  3. Configuring and Verifying Extranet MPLS VPNs

- b. Control Plane Troubleshooting
- c. Forward Plane Troubleshooting
- 6. Implementing Inter-AS Carrier Supporting Carrier (CsC)
  - a. Enabling CsC
  - b. CsC Topologies
  - c. Security in CsC
- d. Configuring CsC
- 7. Internet Access in MPLS VPN Networks
  - a. Simple Solutions
  - b. VRF Specific Default Route
  - c. VPN to Internet through Subinterfaces
  - d. Internet in an Extranet

## LAB OUTLINE

### Lab 1: Configuring Router and IP Connectivity

Explore your classroom lab environment including familiarizing yourself with the classroom routers, lab topology, current configurations, and current routing.

### Lab 2: Configuring and Verifying MPLS

Build from Lab 1 by configuring an MPLS infrastructure and verifying that MPLS label switching is functioning properly.

### Lab 3: Configuring Intranet MPLS VPNs

Introduce VPNs into the classroom network. Configure and verify VRF on PE Routers, CE to PE routing using static routes, CE to PE routing using RIPv2, CE to PE routing using eBGP, and CE to PE routing using OSPF.

### Lab 4: Migrating to VPNv4 Route Reflectors

Establish VPNv4 peering between the router reflector and PE and Autonomous Systems Border Router (ASBR) routers.

### Lab 5: Interconnecting MPLS VPNs between ASs

Explore on a basic network some methods for interconnecting MPLS VPNs between autonomous systems.

### Lab 6: Creating Complex Inter-AS MPLS VPNs

Building from Lab 5, connect that simple network back into a large real-world network dealing with real-world issues. Reconnect the POPs and reestablish iBGP peering relationships. Establish a VPNv4 MP-eBGP multi-hop peering session between new RRs. Create leak only loopback addresses to a remote AS. Finally, verify that inter-AS VPN routing is operating correctly.

### Lab 7: Configuring Carrier Supporting Carrier (CsC)

Implement CsC in the classroom by first configuring MPLS on the PE interface to the CE. Next, configure MPLS on the CE interface to the PE. Configure CE to CE routing. Configure external network advertisements. Finally, verify a successful implementation by loopback interfaces.

### Lab 8: Configuring MPLS VPN Internet Access

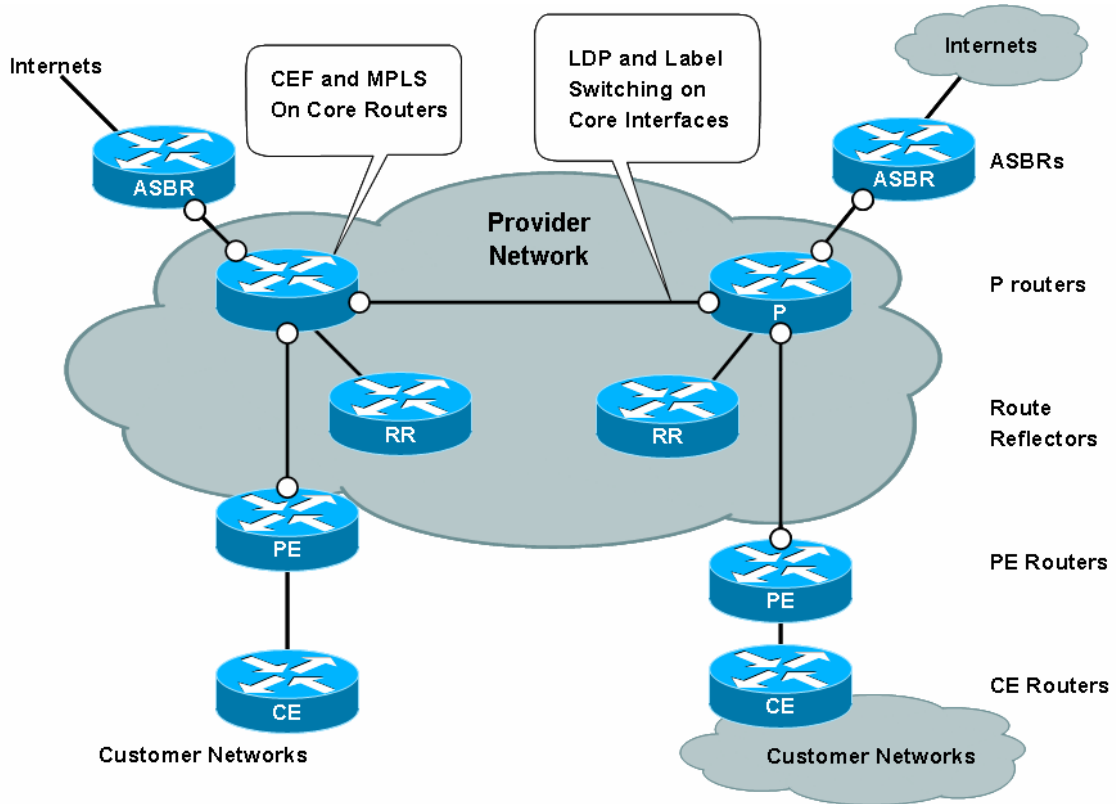
Implement various methods of Internet access using MPLS VPNs including Internet Access with Route Leaking, Shared Access through Internet VRF, and Full Internet Routing in CE.

## LAB TOPOLOGY

Figure 1 shows the lab topology.

**Figure 1: Lab Topology**

The training lab topology is designed to simulate a real-world network with core routers, edge routers, and access routers.



## REGISTRATION INFORMATION

For more information about schedules and registration for this course, please contact [aeskt\\_registration@cisco.com](mailto:aeskt_registration@cisco.com). The part number for this course is **AS-TRAIN-E** in North America and Europe, **AS-TRAIN-E-A** in Asia Pacific, and **AS-TRAIN-E-L** in Latin America.

## FOR MORE INFORMATION

For more information on Advanced Services Education course offerings including custom training options, as well as AS Curriculum Planning Services and AS Technical Knowledge Library (TKL) refer to the AS Education Website at [www.cisco.com/go/ase](http://www.cisco.com/go/ase).



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