Advanced IP/MPLS Network Engineering for Providers Training Course

21 - 25 Dec 2026

Vienna

5800 € (Per Person)

Ref: #TEL3622_146052

Course Introduction / Overview:

This intensive training course provides a comprehensive exploration of advanced IP/MPLS network engineering principles, specifically tailored for service provider environments. In today's hyper-connected world, a robust, scalable, and intelligent network backbone is paramount for delivering high-quality services, and IP/MPLS remains the cornerstone technology. This program moves beyond basic concepts to delve into the complex architectures and protocols that power modern telecommunications and internet services. As detailed by experts like Ina Minei in the seminal work "MPLS-Enabled Applications: Emerging Developments and New Technologies", the true power of MPLS lies in its ability to enable sophisticated services like L3VPNs, VPLS, and granular Traffic Engineering. BIG BEN Training Center has designed this course to equip participants with the practical skills needed to design, implement, and troubleshoot large-scale service provider networks. We will cover everything from IGP scalability and advanced BGP policies to implementing Quality of Service (QoS) for stringent SLAs and exploring next-generation technologies like Segment Routing. The curriculum is meticulously structured to build a deep, functional understanding of how to leverage IP/MPLS to create a resilient, service-aware, and future-proof network infrastructure, ensuring optimal performance and reliability for end-users.

Target Audience / This training course is suitable for:

- Network Engineers and Administrators.
- IP Network Architects and Designers.
- Network Operations Center (NOC) Staff.
- Telecommunications Professionals.
- Technical Managers overseeing network infrastructure.
- Systems Engineers involved in network deployment.
- Consultants specializing in service provider solutions.

Target Sectors and Industries:

- Telecommunications Service Providers.
- Internet Service Providers (ISPs).
- Mobile Network Operators.
- Cloud and Hosting Service Providers.
- Data Center Operators.
- Large Enterprise IT Infrastructure Teams.
- Governmental and Public Sector Network Agencies.
- Managed Service Providers (MSPs).

Target Organizations Departments:

- Network Engineering and Planning.
- Core Network Operations.
- IP Network Architecture and Design.
- Service Provisioning and Activation.
- Technical Support and Escalation Teams.
- Research and Development (R&D).
- Infrastructure Security.

Course Offerings:

By the end of this course, the participants will have able to:

- Design and implement scalable interior gateway protocols (IGPs) like OSPF and IS-IS for large networks.
- Master advanced Border Gateway Protocol (BGP) attributes, policies, and route reflection for optimal traffic flow.
- Configure and verify MPLS Label Distribution Protocol (LDP) and fundamental label switching operations.
- Deploy and troubleshoot MPLS Layer 3 VPNs (L3VPNs) using MP-BGP and VRF instances.
- Implement MPLS Layer 2 VPN (L2VPN) services, including VPLS and VPWS, for transparent LAN extension.
- Engineer traffic paths using RSVP-TE and implement Fast Reroute (FRR) for high availability.
- Apply Quality of Service (QoS) mechanisms within an MPLS network to enforce service level agreements.
- Understand the principles and migration strategies for Segment Routing (SR-MPLS).
- Troubleshoot complex multi-protocol issues in a live service provider network environment.
- Develop strategies for integrating IPv6 services over an MPLS core using 6PE and 6VPE.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be highly interactive, immersive, and practical, ensuring that participants gain tangible skills they can apply immediately in their professional roles. We believe that mastering complex topics like IP/MPLS network engineering requires more than just theoretical lectures. Therefore, the course heavily emphasizes hands-on lab exercises that simulate real-world service provider network scenarios. Participants will spend significant time configuring, verifying, and troubleshooting routers in a virtual environment. The training combines expert-led instruction with collaborative group discussions, allowing participants to share experiences and solve problems collectively. We will analyze detailed case studies of successful and failed network deployments to understand best practices and common pitfalls. Each module is reinforced with practical examples and interactive Q&A sessions to clarify complex concepts. Our instructors provide continuous feedback and guidance, fostering a supportive learning environment where participants can confidently build their expertise from foundational principles to advanced, next-generation networking technologies. This blended approach ensures a deep and lasting understanding of the material.

Course Agenda (Course Units):

Unit One: Service Provider IGP and BGP Fundamentals

- Introduction to service provider network architectures.
- Advanced OSPF design for scalability and fast convergence.
- IS-IS routing protocol implementation in large-scale networks.
- Fundamentals of the Border Gateway Protocol (BGP).
- BGP path attributes and the best path selection process.
- Implementing BGP routing policies with route maps and prefix lists.
- BGP route reflection and confederations for scalability.

Unit Two: MPLS Core and Layer 3 VPN (L3VPN) Services

- Introduction to MPLS architecture and terminology.
- Label Distribution Protocol (LDP) operation and configuration.
- The MPLS forwarding process and Penultimate Hop Popping (PHP).
- Introduction to MPLS VPN architecture.
- Configuring VRFs, Route Distinguishers (RDs), and Route Targets (RTs).
- Implementing Multi-Protocol BGP (MP-BGP) for VPNv4 routes.
- PE-CE routing protocols (Static, OSPF, BGP).

Unit Three: Advanced MPLS VPN Services

- Implementing Layer 2 VPNs (L2VPNs).
- Virtual Private Wire Service (VPWS) for point-to-point connectivity.
- Virtual Private LAN Service (VPLS) for multipoint connectivity.
- Hierarchical VPLS (H-VPLS) for scalability.
- Inter-AS VPNs for connecting customers across different service providers.
- Carrier Supporting Carrier (CSC) VPN concepts.
- Introduction to Ethernet VPN (EVPN) as a next-generation solution.

Unit Four: MPLS Traffic Engineering and Quality of Service

- Limitations of traditional IGP-based forwarding.
- Introduction to MPLS Traffic Engineering (TE).
- Configuring and verifying RSVP-TE tunnels.
- Constraint-based routing with link attributes and affinities.
- MPLS Fast Reroute (FRR) for sub-50ms protection.
- Quality of Service (QoS) concepts in service provider networks.
- Implementing the Differentiated Services (DiffServ) model over an MPLS core.

Unit Five: Next-Generation Technologies and Troubleshooting

- Integrating IPv6 in an MPLS network with 6PE and 6VPE.
- Introduction to Segment Routing (SR-MPLS) architecture.
- Understanding the benefits of Segment Routing over LDP and RSVP-TE.
- Network automation concepts for service provider environments.
- Common MPLS troubleshooting methodologies.
- Using traceroute, ping, and show commands for MPLS verification.
- Analyzing complex end-to-end service delivery issues.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

As network functions become increasingly virtualized and automated, how does the foundational role of the IP/MPLS transport layer evolve to support dynamic, on-demand service delivery models?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by focusing squarely on the real-world challenges and advanced requirements of service provider networks, rather than offering a generic overview of MPLS. While other courses may stop at basic L3VPN configuration, we dedicate significant time to mission-critical topics like MPLS Traffic Engineering, Fast Reroute (FRR), and implementing robust Quality of Service (QoS) to meet stringent Service Level Agreements (SLAs). Our curriculum is forward-looking, providing a solid introduction to next-generation technologies like Segment Routing (SR-MPLS) and EVPN, ensuring participants are prepared for the future of networking. The methodology emphasizes a deep conceptual understanding over simple command memorization. Through complex case studies and hands-on labs that mirror actual service provider topologies, participants learn not just the "how" but the "why" behind network design choices. This approach, which moves from core principles to advanced applications and future trends, cultivates true engineering expertise, enabling graduates to design, troubleshoot, and optimize complex network infrastructures with confidence and foresight, a level of depth not commonly found in standard training programs.