Advanced Carrier-Grade Network and Traffic Engineering Training Course



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Sharm El-Sheikh

4100 € (Per Person)

Ref: #NO6691_278982

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of the principles, technologies, and best practices for designing, managing, and optimizing carrier-grade networks. In today's hyper-connected world, the demand for high-availability, scalable, and secure network infrastructure is paramount for service providers and large enterprises. This program delves into the core components that define carrier-class services, from advanced routing protocols to sophisticated traffic engineering techniques. Participants will gain a robust understanding of how to ensure network resilience and predictable performance under demanding conditions. The curriculum is informed by foundational industry knowledge, such as the concepts detailed in the seminal work "MPLS-Enabled Applications" by authors Ina Minei and Julian Lucek, which provides a deep dive into leveraging MPLS for advanced services. At BIG BEN Training Center, we have structured this course to bridge the gap between theoretical knowledge and practical application, equipping engineers and architects with the skills needed to build and maintain the networks that power modern digital services, including 5G, cloud computing, and the Internet of Things. This course is the definitive guide to mastering the complexities of modern, high-performance networking and traffic management.

Target Audience / This training course is suitable for:

- Network Engineers and Administrators.
- Telecommunications Professionals.
- Network Architects and Designers.
- IP Network Planners.
- Network Operations Center (NOC) Technicians and Supervisors.
- Systems Engineers involved in network infrastructure.
- Solutions Architects designing network services.
- Technical Project Managers overseeing network deployments.

Target Sectors and Industries:

- Telecommunications Service Providers.
- Internet Service Providers (ISPs).
- Mobile Network Operators (MNOs).
- Cloud and Hosting Service Providers.
- Data Center Operators.
- Large Enterprise Corporations with extensive WANs.
- Government agencies and public sector organizations managing critical infrastructure.
- Financial Services and Banking Institutions.

Target Organizations Departments:

- Network Engineering and Planning.
- Network Operations and Management.
- Infrastructure and Architecture.
- IT and Technical Support.
- Research and Development (R&D).
- Cybersecurity and Network Security.
- Service Delivery and Provisioning.

Course Offerings:

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

- Design highly available and scalable carrier-grade network architectures.
- Implement and troubleshoot advanced BGP routing policies for optimal traffic flow.
- Deploy MPLS-based services, including L2VPNs and L3VPNs.
- Master traffic engineering principles using MPLS-TE and Segment Routing.
- Configure and manage robust Quality of Service (QoS) mechanisms to meet SLAs.
- Analyze network traffic patterns for effective capacity planning and optimization.
- Integrate modern concepts like SDN and NFV into carrier network strategies.
- Develop security strategies to protect core network infrastructure from threats.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be highly interactive, engaging, and practical, ensuring participants can immediately apply their learned skills. This course moves beyond traditional lectures by incorporating a blended learning approach that emphasizes real-world application. A significant portion of the training is dedicated to hands-on lab simulations where participants will configure, manage, and troubleshoot complex network scenarios in a controlled environment. We utilize detailed case studies drawn from actual service provider network deployments, allowing attendees to analyze challenges and design effective solutions. The sessions are facilitated by experienced industry experts who encourage active participation through group discussions, collaborative problem-solving exercises, and Q&A sessions. Participants will work in teams on projects that mirror real-world network engineering tasks, such as designing a resilient core network or developing a traffic engineering policy. Continuous feedback is provided by the instructor to reinforce key concepts and ensure a deep understanding of the material. This immersive and practical approach ensures a comprehensive learning experience that builds both technical competence and strategic thinking.

Course Agenda (Course Units):

Unit One: Foundations of Carrier-Grade Networking

- Introduction to Carrier-Grade Network Principles.
- High Availability (HA) and Redundancy Mechanisms.
- Network Scalability and Modularity Concepts.
- Core, Distribution, and Access Layer Architectures.
- Fundamentals of IP Routing Protocols (OSPF, IS-IS).
- Introduction to Multiprotocol Label Switching (MPLS).
- Understanding the Service Provider Network Ecosystem.

Unit Two: Advanced IP Routing and MPLS Services

- Deep Dive into Border Gateway Protocol (BGP).
- BGP Attributes, Path Selection, and Policy Control.
- Implementing BGP Route Reflectors and Confederations.
- MPLS Label Distribution Protocol (LDP) Operations.
- Building Layer 3 VPNs (L3VPNs) over an MPLS Core.
- Implementing Layer 2 VPNs (L2VPNs) such as VPLS and EVPN.
- Inter-AS VPNs and Carrier Supporting Carrier (CSC) Scenarios.

Unit Three: Mastering Network Traffic Engineering

- Core Concepts of Traffic Engineering (TE).
- Constraint-Based Path Computation.
- Resource Reservation Protocol with Traffic Engineering (RSVP-TE).
- Implementing and Verifying MPLS Traffic Engineering Tunnels.
- Introduction to Segment Routing (SR-MPLS and SRv6).
- Traffic Flow Analysis and Network Baselining.
- Strategies for Network Capacity Planning and Forecasting.

Unit Four: Quality of Service (QoS) and Performance Management

- Understanding the Need for QoS in Carrier Networks.
- Differentiated Services (DiffServ) and Integrated Services (IntServ) Models.
- Classification, Marking, and Policing Traffic.
- Advanced Queuing Mechanisms (WFQ, CBWFQ, LLQ).
- Traffic Shaping and Congestion Avoidance Techniques.
- Defining and Monitoring Service Level Agreements (SLAs).
- Network Performance Monitoring and Troubleshooting Tools.

Unit Five: Modern Carrier Networks and Future Trends

- Introduction to Software-Defined Networking (SDN) for Service Providers.
- Network Functions Virtualization (NFV) Architecture and Use Cases.
- Network Automation using Python and Ansible for Carrier Environments.
- Carrier-Grade Security Principles and DDoS Mitigation.
- Strategies for IPv4 to IPv6 Transition and Coexistence.
- The Role of Carrier Networks in 5G and IoT.
- Emerging Technologies and the Future of Network Engineering.

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 traditional role of a network engineer evolve to manage intent-based policies rather than device-specific configurations?

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

This course distinguishes itself by focusing on the holistic engineering mindset required to build and operate modern, high-performance networks, rather than merely teaching protocol configurations. While many courses focus on specific vendor commands, our curriculum emphasizes the underlying principles of scalability, resilience, and traffic optimization that are universally applicable across any platform. We uniquely bridge the gap between established, foundational technologies like BGP and MPLS and the next generation of networking, including Segment Routing, SDN, and automation. This dual focus ensures participants are not only proficient in managing today's complex infrastructures but are also fully prepared for the industry's future trajectory. The content is heavily influenced by real-world service provider challenges, using case studies that explore complex peering arrangements, SLA management, and large-scale migration projects. By concentrating on the 'why' behind network design choices and traffic engineering strategies, this course cultivates a deeper, more strategic level of expertise, empowering participants to architect robust solutions that are efficient, secure, and future-proof, moving them beyond the role of a technician to that of a true network architect.