



Service Provider IP, MPLS and BGP Design

Course: Core Routing, VPNs and Traffic Engineering



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Introduction:

Service Provider IP, MPLS and BGP Design, with core routing, VPNs and traffic engineering, is the subject of this 5-day course for backbone designers, WAN service engineers and network planners, ending with a Backbone and VPN Service Design Plan. Many networks grow by adding links and routes without a design, so convergence is slow, customer VPNs leak routes and congestion builds on a few links while others sit idle. Nominees already operate routed IP networks, and teaching is by lab on router emulation and design worksheets. CoreConcept Training Center delivers this service provider design course.

Course Objectives:

- Design a scalable IS-IS or OSPF core with area or level layout, metrics and loopback addressing for a multi-site backbone
- Build an iBGP design with route reflectors and an eBGP policy using communities, local preference and prefix filters
- Configure BGP/MPLS Layer 3 VPNs and Layer 2 pseudowire services with route distinguishers, route targets and extranet rules
- Plan traffic engineering with RSVP-TE tunnels and segment routing policies, including fast reroute protection
- Specify a QoS model with classes, markings, queuing and policing that protects voice, business data and best-effort traffic
- Evaluate SD-WAN overlays and resilience options, then document a backbone and VPN service design with failure and capacity checks

Target Audience:

- Backbone designers responsible for core topology, IGP layout and BGP architecture
 - WAN service engineers who build and support customer VPN and pseudowire services
 - Network planners who size capacity, protection paths and traffic growth on core links
 - Pre-sales and solution engineers who specify managed WAN offers for large customers
 - Enterprise network engineers who run private MPLS or SD-WAN connectivity across many sites
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Course Outline:

Day 1: Backbone Architecture, Requirements and Core IGP Design

- Service Provider Network Layers, Roles and Router Types Compared
- Backbone Requirements Matrix for Services, Growth and Failure Tolerance
- IS-IS Levels and OSPF Areas Compared for Large Cores
- Metric, Loopback and Point-to-Point Link Addressing Plan Worksheet
- IGP Convergence Tuning with BFD, Timers and Incremental SPF

Day 2: BGP Architecture, Route Reflection and Policy Design

- RFC 4271 BGP-4 Best Path Selection and Attribute Walkthrough
- RFC 4456 Route Reflector Hierarchy and Cluster Design Lab
- Confederations from RFC 5065 Compared with Route Reflection
- Community, Extended Community and Large Community Policy Schemes
- Prefix Filtering, Max-Prefix Limits and Peering Edge Policy Lab

Day 3: MPLS Forwarding and L3 and L2 VPN Services

- RFC 3031 Label Switching Architecture and LDP Label Distribution Lab
- RFC 4364 BGP/MPLS L3VPN with Route Distinguishers and Route Targets
- Hub-and-Spoke, Extranet and Shared Services VRF Design Patterns
- RFC 3985 Pseudowire and Ethernet VPN Service Design Comparison
- Inter-AS VPN Options and Carrier Supporting Carrier Concepts

Day 4: Traffic Engineering, Segment Routing, QoS and Overlays

- RFC 3209 RSVP-TE Tunnels, Constraints and Bandwidth Reservation Lab
- RFC 8402 Segment Routing with SR-MPLS Label Stacks and Policies
- TI-LFA Fast Reroute and SRv6 Network Programming Overview
- DiffServ Class Model, Queuing and Policing Configuration for Voice and Data
- SD-WAN Overlay Design Compared with MPLS VPN Underlay Options

Day 5: Lab on a Backbone and VPN Service Design Plan

- Case Regional Backbone Topology and IGP Layout Build
 - Case Route Reflector and Customer Policy Scheme Review
 - VPN Service Catalogue with VRF, Pseudowire and QoS Mapping
 - Failure Scenario Test Sheet with Link, Node and Reflector Loss
 - Backbone and VPN Service Design Plan Completion and Peer Review
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Skills You Will Gain:

- Core IGP Design
- BGP Route Reflector Design
- BGP Policy Engineering
- MPLS VPN Service Design
- Traffic Engineering Planning
- Segment Routing Policy Design
- QoS Class Modelling
- Backbone Resilience Testing

Why Attend This Course:

- Deliver a Backbone and VPN Service Design Plan to the network architecture board and service delivery managers
- Decide whether a service need calls for an L3 VPN, a pseudowire, a traffic engineering tunnel or an SD-WAN overlay
- Avoid route leaks, slow reconvergence and congested links that follow from unplanned backbone growth
- Coach colleagues on reading routing tables, label stacks and BGP policy consistently across teams

Conclusion:

Back at work, the participant presents the Backbone and VPN Service Design Plan to the architecture board and service delivery managers, who use it to approve IGP layout, route reflector placement, VPN templates and protection choices. Operations teams adopt its policy scheme and failure test sheet when onboarding new customers and links. After the first quarter of new services, the unit should review convergence times, link utilisation and policy exceptions against the plan, then revise metrics, tunnels and class settings.

Frequently Asked Questions FAQ:

What should participants know before a service provider IP, MPLS and BGP design course?

Participants should already operate routed IP networks and understand subnetting, OSPF or IS-IS basics and BGP neighbour setup. Bringing a topology diagram or service list from their own network makes the lab work more useful.

How does a service provider IP, MPLS and BGP design course differ from a general networking course?

It concentrates on carrier-scale core routing, BGP policy, VPN services, traffic engineering and protection design. A general networking course covers addressing, switching and single-site routing, and treats MPLS and BGP only in brief.

Why does service provider backbone design use route reflectors?

Route reflectors remove the need for a full iBGP mesh, whose session count grows quickly with router count. Redundant reflectors with clear client groups keep routing state manageable and let new edge routers join with little configuration.

What do participants take back from the service provider IP, MPLS and BGP design course?

Participants take back a Backbone and VPN Service Design Plan, plus an IGP layout worksheet, a BGP policy scheme, a VPN service template set and a failure test sheet adaptable to their own network.