

## Course Outline

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<b>Course Title:</b>	<b>T9105-Understanding MPLS</b>
<b>Course Duration:</b>	4 Days Classroom without labs
	5 Days Classroom with hands on labs
	5 Days Webinar

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### Target Audience

This course is aimed at people who have a basic understanding of networks, but who want to hone their skills to a level of practical competency with MPLS and Cisco Systems® routers and/or, if required, Juniper Networks® routers.

### Section 1

Welcome, Introductions, House rules, course agenda.

### Section 2

Hype, benefits, and markets for MPLS based VPN's. This section covers the customer expectations of MPLS based VPN's, both real and perceived. The true benefits to both the customer and the service provider are explored.

### Section 3

MPLS essentials, giving a working description of:

- Principles of MPLS
- Structure of MPLS
  - 5 minutes about the key RFC's and other standards governing MPLS
  - The MPLS Shim Header
  - Physical and virtual components of an MPLS network
    - LSP
    - LSR/P router
    - LER/PE router
    - CE Router
  - IP address to label mapping
  - Label Stacking and inner and outer labels
- Label Distribution Protocols, and label distribution processes
  - LDP
  - RSVP

**Lab Setting up and monitoring Label Distribution Protocol, LDP.**

### Section 4a

This section looks in detail at the structure and operation of MPLS based VPN's.

- MPLS based VPN's.
  - The role of the VRF
  - Routing updates using MPiBGP
  - Setting up MPiBGP peering for a VRF (*Assumes MPiBGP is already established on the backbone*)
    - IPv4 address family statements
    - Redistribute statements
  - The Route Distinguisher and Route Target mechanisms
  - Import and export statements
  - PE configuration of a VPN with static customer routes):
    - Overview of backbone Cisco/Juniper configuration steps
    - More detailed look at Cisco/Juniper commands for configuring a customer VPN
    - Configuring VPN's for fully meshed Vs. hub and spoke topologies
    - Route maps
    - Configuring for extranets, COIN's, and management connectivity
    - Cisco and Juniper commands for monitoring a VPN.
  - Enabling customer dynamic routing across the VPN using RIP2 and OSPF
    - The provider VPN configuration summary.
    - The provider configuration procedures
    - A look at The provider provisioning tools Louis?
  - Simple Cisco and Juniper MPLS monitoring commands across the backbone
  - A look at MPLS troubleshooting
  - VRF ping and traceroute
    - no ip propagate ttl

**LAB Building, testing, and troubleshooting an MPLS based VPN.**

### Section 4b

Ethernet Virtual Private LAN Service, VPLS.

- Concepts of MPLS based VPLS
  - Virtual Switching Instances, VSI's
  - Using MPLS as an inter VSI "pseudowire" to from a virtual Ethernet switch

**LAB Building, testing, and troubleshooting an MPLS based VPLS.**

### Section 5

MPLS VPN access methods. This section looks at the different methods of accessing an MPLS based VPN. The operation of each method is briefly discussed, followed by a discussion of the PE requirements to do this. The methods covered are:

- Leased Line
- Frame Relay (Very quick look)
- ATM
- DSL
- ISDN
- LES

### Section 6

Quality of Service (QOS) using MPLS. One of the major benefits that MPLS based VPN's offers is the ability to offer traffic engineered transport of customer packets across the VPN. This means that for the first time, true quality of service guarantees can be given to VPN traffic carried over and IP based backbone. There are several methods of implementing this. These are:

- Edge based traffic classification, marking, shaping, and policing
  - Diffserve and classification methods
  - CBWFQ
  - WRED
  - CAR
  - Policy based routing and packet scheduling

Overview of VOIP and its impact on QOS requirements

**LAB Configuring and testing edge traffic policing**

### Overview Traffic Engineered MPLS, TE-MPLS

- Constraint based Routing Label Distribution, CR-LDP
- CR-LDP traffic descriptors:
  - CDR
  - PDR
  - CBS
  - EBS
  - PBS
  - Frequency
- CR-LDP extension structure
- CR-LDP operation
- Traffic Engineered Resource Reservation Protocol, TE-RSVP

### Section 7

Case study where delegates are given a real life scenario, and have to design an MPLS based solution. This section is strategically important as it helps the delegates to “stand back” from the technology of MPLS, and again see it from a customer centric view point

### Section 8

The future. This looks at the future of MPLS, and gives a short description of GMPLS.

### Course wrap up

