

IP MPLS

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Maputo, Mozambique



COMMONWEALTH
TELECOMMUNICATIONS
ORGANISATION



Overview

This five-day course describes data and voice transmission through an MPLS tunnel over an IP network and compares the process with transport over a circuit switched intelligent network. It reviews the major aspects of IPv4 and also explains how MPLS is handled in an IPv4 network. It compares the different methods of packet transmission over alternate IP methods to MPLS tunneling, including different transmission protocols such as TCP, UDP, ICMP and others. At the conclusion of the course, it covers how IPv4 MPLS is carried through an IPv6 network.

For more information
about this course, or to
register, contact us on:
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OBJECTIVES

The course will:

- familiarize participants with basic IP functionality in an IP network
- review and discuss the main concept of data transmission in an IP network compared to an Intelligent Network
- explore the major differences between IPv4 and IPv6
- introduce the concepts that surround quality of service (QoS) management and congestion control in packet switched IP and MPLS networks
- familiarize participants with IP applications, multimedia services and other sessions provided over a packet switched network requiring unfettered transport, such as MPLS

TARGET AUDIENCE

The course will be of great interest to regulatory, legal and policy officers in converged or service-based regulatory agencies and authorities. It will also be of interest to telecommunications professionals working in various departments such as strategy, marketing, sales or business development for fixed or mobile operators, ISPs, broadcasters and content providers ICT consultants

EXPECTED OUTCOMES

By the end of this course participants will be able to:

- understand the main concepts of associated routing, routers and routing protocols;
- understand how data and voice transmission differs between IPv4 and IPv6 networks as well as circuit-switched networks;
- discuss and understand typical MPLS applications and how they are handled under IP
- know the importance of QoS and the impact on packet transmission
- understand the operation and suitability of MPLS in an IP network
- understand QoS Management and Control in MPLS transport

OUTLINE

IP and TCP/IP (Internet Protocol and Transmission Control Protocol):

- TCP/IP
- OSI Model
- TCP/IP Protocol Stack
- IP Addressing
- IP Management
- Impairments
 1. Latency
 2. Jitter
 3. Echo
- Layer 2 LAN and VLAN Switching
 1. Concepts
 2. 802.1Q Tagging Protocol (QinQ)
 3. VLAN Identification
 4. Considerations in an Ethernet network
- Static and Dynamic Routing Protocol Concepts and Differences
- Overview: MPLS in Layer 3 VPN
- L3 Router Functionality and Applications

IP MPLS Data Transmission over IPv4

- MPLS Basics
- MPLS Operation
 1. Forwarding Equivalence Class (FEC)
 2. MPLS header
 3. MPLS Label
 4. Label Switched Path (LSP)
 5. MPLS Benefits
- MPLS Components
 1. IGP: Core Routing Protocol
 2. MPLS Label
 3. Encapsulation of MPLS Label
 4. Forwarding Equivalence Class (FEC)
 5. Label Distribution Protocol
 6. MPLS Application related protocols: MP-BGP, RSVP, others

VPN Specific Principles in Layer 3 MPLS

- Concepts and Functionality of L3 MPLS Application
- Applicable Layer 3 MPLS Protocols
 1. BGP (Border Gateway Protocol) in VPN
 2. BGP in MPLS VPN, Application and Comparison
 3. Virtual Router Applications in VPN
 4. VRF Protocol (Virtual Routing and Forwarding)
- MPLS Traffic Engineering in L3 Environment

VPN Specific Principles in Layer 2 MPLS

- Concepts and Functionality of L2 MPLS Application
- P2P Transport in L2
- Cisco: Martini Draft (Pseudo Wire Application)
 1. Pseudo Wire Emulation Edge-to-Edge
 2. PWE3 Architecture
 3. PWE3 Encapsulation
- Other VPN Technologies:
 1. *Virtual Private LAN Services (VPLS)* and *Virtual Private Wire Service (VPWS)* in MPLS
 2. Application Considerations

Autonomous System Concepts and Principles

- Definition
- Numbering
- AS Boundary Router (ASBR) Function and Settings
- MPLS in Autonomous Systems
 1. Inter-AS MPLS VPN
- Concept and Function of *Virtual Routing and Forwarding (VRF)* in AS
- OSPF (Open Shortest Path First) in ASBR
- Comparison with Inter-AS MPLS
- Inter AS MPLS Traffic Engineering

MPLS-TP (Transport Profile)

- Integration of IP MPLS and MPLS-TP
- Handling of Pseudo Wire in MPLS-TP
- OAM in MPLS, IP, and Carrier Ethernet Networks
- Ethernet Private Line and Ethernet Private LAN
- Virtual Configurations
- Multi Ethernet Network Interoperability via EP-Tree or EVP-tree
- MPLS-TP OAM and Survivability

IP MPLS and IPv6: Functional Overview

- Brief IPv6 Overview
 1. Addressing
 2. Data Routing
 3. Router Advertising and Solicitation
- Benefits of Deploying IPv6 over MPLS Backbones
- IPv6 over MPLS
- IPv6 Tunnels on the Customer Edge Routers
- IPv6 on the Provider Edge Routers (6PE)
 1. 6PE Multipath
 2. Source Address Interface on a 6PE Router
 3. Binding and Advertising Benefits of Deploying IPv6 over MPLS Backbones
- MPLS Routing through an IPv6 network

FACULTY

Karl Hentschel, MBA, B Eng

Karl Hentschel carries a BEng (Bachelor in Electronic Engineering) obtained in 1956 at the Ingenieur Hochschule, Karl-Marx Stadt, Sachsen-Anhalt, DDR Germany and an MBA (Betriebswirtschafts Verwaltung) in 1966 from the Bundeswehrfachschule, Nienburg/Weser, BRD Germany. The accumulated knowledge was augmented with deep dive training in project management, risk mitigation, business continuity, marketing concepts and other relevant topics throughout his career.

From 1968 to 1990 Karl held a number of senior line and staff positions in the areas of regulatory relations, network operations, planning and expansion, customer service, marketing, training and product development at AT&T Canada. He was a senior member of the team supporting long distance competition in Canada responsible for developing the operational plan and the underlying budgets. He worked closely with regulatory staff at the CRTC in Canada and with the FCC in the US on cross border services and facilities.

In his consulting practice, Karl conducts training courses and workshops globally ranging from competitive marketing strategies in Saudi Arabia to detailed technology topics in both fixed wireline and wireless network environments in several Commonwealth countries. His courses on risk mitigation and business continuity are especially well received. Karl brings actual carrier experience to his training and workshops. His training evaluation forms score consistently in the high range.

