

Ethernet, TCP/IP & MPLS in Modern Networks

COURSE DESCRIPTION

The Ethernet, TCP/IP & MPLS in Modern Networks course provides a comprehensive understanding of how modern telecommunications networks operate using Ethernet and IP-based technologies. The course explores how Ethernet has evolved into a carrier-grade transport technology, replacing legacy systems such as SDH, and how it integrates with TCP/IP and MPLS to form today's "All Ethernet & IP" infrastructures.

Participants will learn about Ethernet framing, VLANs, traffic prioritisation, and service testing, along with IP addressing, routing, quality of service and network security. The course also covers MPLS and its role in enabling scalable, high-performance transport networks.

Through practical examples and discussions, participants will gain the knowledge required to design, test and maintain modern Layer 2 and Layer 3 networks.

WHO SHOULD ATTEND


Technical managers, network engineers, software engineers, telecommunications and ICT professionals involved in the design, installation, commissioning, testing or maintenance of modern Ethernet and IP-based networks.

PREREQUISITES

Participants should have a basic understanding of networking concepts, including Ethernet and IP fundamentals. Prior experience working with telecommunications or IT networks is recommended.

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SOME COURSE BENEFITS

- Understanding of how Ethernet, TCP/IP and MPLS integrate in modern networks
- Ability to design and test carrier-grade Ethernet services
- Knowledge of IP addressing, routing and network protocols
- Understanding of quality of service (QoS) and traffic prioritisation
- Improved ability to ensure SLA performance and service reliability

COURSE OBJECTIVES

Participants will gain the knowledge and skills required to:

- Understand Ethernet, TCP/IP and MPLS technologies and how they interact
- Configure and analyse VLANs, traffic prioritisation and service profiles
- Understand IP addressing, subnetting and routing fundamentals
- Test Ethernet services and IP application performance
- Apply QoS techniques to support service level agreements (SLAs)
- Understand MPLS architecture and transport mechanisms

FORMAT

2-day interactive classroom training including discussions, quizzes and group exercises.

Maximum attendees: 12 per course.

CONTENT

Day 1 – Ethernet & Carrier Networks

Introduction & Network Fundamentals

Overview of modern network architectures
OSI 7-layer model (Layers 1–3)

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Layer 1 – Physical Connectivity

Fibre optic connectivity fundamentals
Handling and safety considerations

Layer 2 – Ethernet & LAN Technologies

LAN and switched Ethernet
Traffic prioritisation
Class of Service (CoS) and Quality of Service (QoS)
VLANs and tagging (802.1Q)

Carrier Ethernet

- Carrier Ethernet networks and services
- Traffic shaping, queuing and policing
- Connection-oriented Ethernet (linear and ring topologies)
- Ethernet services (E-Line and E-LAN)
- Ethernet protection switching (linear and ring)
- QinQ (VLAN stacking)
- Carrier Ethernet applications

Ethernet Testing

- RFC 2544 – Testing the UNI
- Y.1564 – Testing the EVC


Ethernet Synchronisation

- IEEE 1588v2 overview
- SyncE fundamentals

Day 2 – IP Networking & MPLS

Layer 3 – IP Networking

TCP/IP fundamentals
IP addressing and packet structure
Type of Service (ToS) and DiffServ

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IPv4 Addressing

- Public and private addressing
- Static and dynamic addressing
- Address classes
- Subnetting

IPv6

- IPv6 addressing
- Security features
- Header structure
- Compatibility with IPv4

Network Protocols & Routing

- ICMP and related protocols
- Routing protocols overview (OSPF, IS-IS, BGP)
- Routing vs switching

Layer 4 – Transport Protocols

- TCP
- UDP

MPLS Fundamentals

- Multi Protocol Label Switching (MPLS)
- Label Switch Routers (LSR)
- Label Switched Paths (LSP)
- Push, swap and pop operations
- MPLS labels and label stacking

MPLS Services

- Label Distribution Protocol (LDP)
- Layer 2 MPLS services

- Virtual Private LAN Service (VPLS)
- Virtual Private Wire Service (VPWS)
- Pseudowires (PWE3, CESoPSN)
- MPLS-TP (Transport Profile)

Future Networks

- Converged “All-IP” network architectures
- Evolution of Ethernet and IP transport

Assessment

- Instructor-led interactive quizzes
- Group presentations
- Knowledge-based activities and exercises

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