

# IP & MPLS

17 - 21 August 2009  
Port Louis, Mauritius



COMMONWEALTH  
TELECOMMUNICATIONS  
ORGANISATION

[www.cto.int](http://www.cto.int)



## Overview

The next generation of telecommunications networks will deliver broadband data and multimedia services to users. The Ethernet interface is becoming the interface of preference for user computers, IP phones, digital IP television and network servers within the network itself. The network infrastructure will deliver these high performance IP services over switched infrastructures deployed using multi-protocol label switching (MPLS).

This course provides an understanding of how MPLS works and will cover:

- Basic MPLS concepts
- Understanding MPLS network components
- MPLS architectures
- Label assignment and distribution
- Frame-mode and cell-mode MPLS implementation
- MPLS applications
- IP routing/transport protocols
- IP quality of service
- IPV4 to IPV6 migration

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**Tel:** +44 (0) 208 600 3800 **Fax:** +44 (0) 870 0345 626 **Email:** [programmes@cto.int](mailto:programmes@cto.int)

Course programme may change due to unforeseen circumstances

## Learning outcomes

At completion, participants would have acquired and be able to:

- Describe the basic function of MPLS
- Compare the efficiency of routed and MPLS switched options for QoS networks
- Build infrastructures using MPLS over different physical infrastructures
- Provide reliability by deploying the re-routing options in the event of failures
- Deliver high bandwidth MPLS services for OSPF and BGP4 routed networks
- Engineer traffic on MPLS services
- Provide emulated services over MPLS infrastructures
- Describe the basic functions of IP Network

## Key objectives

The main objective of this course is to provide an understanding of how MPLS works, its advantages and limitations and how it can be deployed to provide effective services over a 21st century converged network.

This course will equip participants with the necessary knowledge and tools to:

- Describe basic MPLS frame-mode and cell-mode architectures and identify how they support applications that are used to address the drawbacks in traditional IP routing
- Describe the MPLS label format
- Describe the LDP process by explaining label allocation, label distribution, label retention, label convergence and penultimate hop popping in both frame and cell modes
- Describe the peer-to-peer architecture of MPLS
- Explain the routing and packet forwarding modal in MPLS architecture
- Describe different MPLS applications, including MPLS VPNs and MPLS TE
- Successfully deploy VPN services based on MPLS/VPN

## Who should attend

This course is for implementers, designers, managers and infrastructure engineers that need to plan, implement and use new generation of networks and services. Specifically:

- Telecom engineers and telecom technicians
- Telecoms professionals moving into technical management positions
- Professionals interested in MPLS

## Learning environment

- The teaching will allow for interactive, cross-learning opportunities involving working in teams, class exercises and problem solving

## Pre-requisites

To benefit fully from this course, participants are expected to have:

- Basic understanding of IP routing and telecommunication knowledge
- Basic understanding of various routing protocols, including RIP, IGRP, EIGRP, OSPF, IS-IS and BGP.

## Course content

### 1 MPLS basics

- o What exactly is MPLS?
- o Identifying the characteristics of simple MPLS services
- o Label switched routers
- o Ingress and egress label edge routers
- o Forward equivalent classes
- o Label switched paths
- o Selecting label headers appropriate to the technology
- o Distributing labels with label distribution protocol (LDP)
- o Comparing traffic patterns in routed and MPLS switched networks

### 2 Stacking labels for service discrimination

- o Multi-service provisioning
- o Mechanisms used in ATM networks and their problems
- o Deploying label stacking for identification of services
- o Tunnelling VPN services
- o Delivering transit network services

### 3 MPLS history

- o Tag switching, layer 3 switching
- o MPLS interaction with ATM
- o New applications of MPLS
- o VPNs, MPLS standards

### 4 MPLS technology

- o Label switch routers
- o Label distribution protocol
- o CE routers, PE routers, P routers
- o Basic MPLS configuration

### 5 MPLS operation

- o How MPLS works (detailed examples)
- o MPLS protocol stack

## Course content

### 6 MPLS traffic engineering

- o Constraint based routing
- o Path selection procedures
- o Path signalling, data forwarding
- o Forwarding tables, RSVP-TE, CR-LDP

### 7 MPLS VPNs (MPLS-VPN)

- o MPLS concepts and goals, routing information exchanges, forwarding mechanisms
- o MPLS interaction with OSPF, BGP and customer routing protocols, backbone and VPN addressing, extended communities

### 8 Quality of service options in MPLS networks

- o Defining the objectives of QoS
- o QoS options
- o Selecting between multiple QoS paths
- o Deploying QoS using class of service and experimental bits
- o Explicitly routed LSP
- o RSVP for QoS
- o Constraint based label switched paths

### 9 IP routing overview

- o IP routing protocols
- o IP transport protocols
- o Basics of migration from IPv4 to IPv6

### 10 Quality of service

- o Congestion controls in IP networks
- o Class of service in multimedia networks

## Course leader



**Dr Joe Tabe**  
Msc, PhD

Dr. Joe Tabe is a data and voice network consultant with over ten years experience in data and voice technologies. Among other technical qualifications, Joe is a Cisco certified Internetwork Expert (CCIE), a Cisco certified Network Professional (CCNP), and a Cisco certified Network Associate (CCNA).

Joe is currently working on building a data centre for a hosted IP contact centre (HIPCC) for a major client in the UK. He has designed and implemented many networks running various protocols including BGP, MPLS, EIGRP, OSPF and RIP.

Joe's other engagements include peer training on many data and voice topics, building MPLS core for data centers and training candidates pursuing Cisco Certified Network Associate certification.

Hosted by:

**Mauritius Telecom**

In partnership with:

**Telecommunications Regulatory Board  
of Cameroon**

## About the CTO

The Commonwealth Telecommunications Organisation (CTO) is an international development partnership between Commonwealth and non-Commonwealth governments, business and civil society organisations.

It provides the international community with effective means to help bridge the digital divide and achieve social and economic development through the use of Information and Communication Technologies (ICT) in the specific areas of Telecommunications, IT, Broadcasting and the Internet.

## About the programme for development and training (PDT)

Managed by the CTO, the PDT is a unique low-cost membership programme providing needs-based professional training and capacity building courses on telecommunications policy, regulation, technologies and telecoms business management.

The PDT has delivered over 3600 bilateral training and consultancy projects, covering every aspect of the telecommunications industry, training over 35,000 professionals in 33 countries of the Commonwealth.

For more programmes  
and courses run by  
the PDT contact us at:

**Tel:** +44 (0) 208 600 3800  
**Fax:** +44 (0) 870 034 5626  
**Email:** [programmes@cto.int](mailto:programmes@cto.int)

See more information  
on our website

[www.cto.int](http://www.cto.int)

# Registration form

**IP & MPLS**  
17 - 21 August 2009, Port Louis, Mauritius

**ID: 6528**

Please fill in this application form and fax it back to +44 208 600 3819 or return it to the CTO at the address below. Please use CAPITAL LETTERS.

## Personal details

Mr/Mrs/Ms/Other ..... First name ..... Last name .....

Job title .....

Organisation .....

Address .....

City ..... Postcode ..... Country .....

Tel ..... Mobile ..... Fax .....

Email .....

Authorising line manager's name .....

Authorising line manager's email .....

## Payment options

### 1) Select delegate rate

	Standard rate	Early registration/Group discounts*
CTO members	<input type="checkbox"/> £701	<input type="checkbox"/> 10%
PDT partners	<input type="checkbox"/> £701	<input type="checkbox"/> 10%
Others	<input type="checkbox"/> £1,132	<input type="checkbox"/> 10%

\* two or more delegates from same organisation

### 2) Payment mode (choose one option only)

- Invoice**  
Invoice me at the above address (Discounts do not apply, payment must be received by us prior to event).
- Bank transfer**  
Make payments to: Couetts & Co.  
440 Strand, London, WC2R 0QS, UK  
A/C Name: CTO; A/C Number 08367507  
Bank Sort Code :18-00-02  
SWIFT Code: COUT GB22  
IBAN Reference: GB72COUT18000208367507

Credit Card: Visa / Mastercard (delete as appropriate)

Card holder's name .....

Card holder's billing address (if different from above) .....

Card number

Valid from ..... Expiry date ..... 3 digit security code

## Signature

Date ..... Name ..... Signature .....

## Additional information

To help us improve our services to you and your organisation, please tell us more about yourself and your organisation.

### Your role in the organisation

- Strategic / executive  
 Planning  
 Control  
 Operational

### Your area of work in the organisation

- Business development  
 Corporate affairs  
 Customer service and care  
 Engineering and technical management  
 Financial, purchasing & investor relations  
 IT / IP management
- Marketing and sales  
 Public relations and corporate communications  
 Regulatory and legal affairs  
 Telecoms network management  
 Human resources  
 Other

### Your organisation type

- Government  
 Regulator  
 Operator  
 Manufacturer  
 Other

### Your organisation's service areas

- Fixed network / services  
 Mobile / wireless network / services  
 Satellite network / services  
 Internet
- Broadcasting  
 Value-added services  
 Support  
 Other services

## 3 SIMPLE WAYS TO REGISTER

-  Fill in and fax this form back to **+44 208 600 3819**
-  Call the programme team at **+44 208 600 3800**
-  Email this completed form back to **register@cto.int**

## NEED HELP?

Call us now on **+44 208 600 3800**  
or e-mail the programme team at **programmes@cto.int**

## Summary Terms and Conditions

The CTO will endeavour, as can be reasonably expected, to ensure that the course is delivered to meet delegates' expectations. Registration is subject to availability and payment received by the deadline, where specified for each course. Dates may be subject to changes. Travel, accommodation, daily transportation to venue, subsistence and other costs are the sole responsibility of the delegate and are not included in the above fees.

Applicants are responsible for their visa arrangements and other formalities wherever required. Course bookings may be cancelled at the discretion of the CTO or its partners. Applicants paying by bank transfer are responsible for bank charges and any other such costs and should ensure the exact amount in GBP Sterling is credited in the CTO bank account. Applicants requiring additional information prior to their booking should ensure they provide sufficient time before the booking deadline.

Cancellation rules apply, as summarised above. For a full version of our Terms and Conditions, please visit our website at [www.cto.int](http://www.cto.int).

## Withdrawals / Cancellations / Refunds

For delegate cancellations/withdrawals, the following refund rules apply:

- 31 days or more prior to event: the full amount less a handling charge of £55
- 30 days or less prior to event: no refund

For CTO cancellations/withdrawals, delegates are entitled to a 100% refund within 60 days of the cancellation/withdrawal. Refunds will be made by bank transfer only.

## Data Protection / Privacy

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