

# Voice over IP & MPLS

31 August - 4 September 2009  
Lae, Papua New Guinea



COMMONWEALTH  
TELECOMMUNICATIONS  
ORGANISATION

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## Overview

This course is designed to foster a good understanding of Voice over IP (VoIP) and Multi Protocol Label Switching (MPLS) technologies and its deployment scenarios.

As the course will provide participants with the critical knowledge to function in an efficient ICT environment, it is a must for anyone wishing to obtain an in-depth knowledge of VoIP and MPLS technologies.

It will cover the following topics:

- Background knowledge on VoIP and MPLS technologies
- Understanding of VoIP and MPLS technologies and their architecture
- The relationship between legacy network and MPLS technologies
- The benefits of deploying VoIP and MPLS technologies
- Possible scenarios for the deployment of VoIP and MPLS technologies

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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

On completion of the course, participants will be able to:

- Understand VoIP technology and architecture
- Name the protocols used in VoIP
- Name the advantages and disadvantages of VoIP
- Understand MPLS technology and its architecture
- Understand the benefits of MPLS in terms of its ability to be deployed over legacy and next generation networks

## Key objectives

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

- Understand what VoIP is
- Understand VoIP technology and architecture
- Describe how VoIP works
- Explore possible deployment scenarios based on other telco models
- Understand what MPLS is
- Explain the elements of an MPLS network
- Understand the development of IP MPLS as an overlay network architecture
- Understand the challenges facing communications companies and how MPLS networks can address these challenges

## Who should attend

- Telecoms professionals such as engineers and network deployment professionals
- Anyone who are keen on understanding VoIP and MPLS and the relationship between these technologies.

## Learning environment

- Traditional classroom including collaborative learning. Use of presentations, group learning, class exercises, case studies and problem solving.

Additionally, the course will be supported with a case study of a virtual network deployed by Telkom South Africa.

## Pre-requisites

- Knowledge of legacy networks (intermediate level)
- Knowledge of next generation networks (NGN) at a basic level, will be an added advantage

## Course content

### VOICE OVER IP (VoIP)

- 1 **Definition**
- 2 **An overview of packet-based networks:**
  - o Asynchronous transfer mode (ATM)
  - o Frame relay
  - o X.25
- 3 **Historical background of VoIP**
- 4 **The H323 standard as used in VoIP**
- 5 **Internet protocol facts about:**
  - o Types of connections
  - o Guarantees
  - o Error checking and corrections
  - o Packet delivery
  - o Routers
  - o Internet protocol headers
- 6 **VoIP basic telephony operation covering**
  - o IP telephony via a voice gateway
  - o Personal computer (PC) based telephony
  - o Fax-fax based telephony
- 7 **Understanding VoIP network requirements**
- 8 **VoIP and the OSI reference model**
- 9 **Protocol structure of VoIP including the mapping of IP protocols and the different types of protocols as used in the H.323 standard.**
- 10 **How VoIP calls are made**
- 11 **VoIP benefits including:**
  - o Cost reduction
  - o Simplification
  - o Consolidation
- 12 **VoIP applications and implementations**
- 13 **Quality of service (QoS) issues and challenges:**
  - o Delay
  - o Jitter
  - o Echo
  - o Packet loss

## Course content

### **MULTI PROTOCOL LABEL SWITCHING (MPLS)**

- 1 What is MPLS?**
- 2 Traditional routing and packet switching**
- 3 MPLS basics**
- 4 MPLS and the OSI reference model**
- 5 MPLS architecture build up**
- 6 Understanding MPLS network components including:**
  - o Label edge routers (LERs)
  - o Label switching routers (LSRs)
  - o Forward equivalence class (FEC)
  - o Labels and label bindings
  - o Label creation
  - o Label distribution
- 7 MPLS operation in terms of how a packet travels through an MPLS network which includes the following steps:**
  - o label creation and distribution
  - o table creation at each router
  - o label-switched path creation
  - o label insertion/table lookup
  - o packet forwarding
- 8 MPLS applications including but not limited to:**
  - o improving packet-forwarding performance in the network
  - o supporting QoS and CoS for service differentiation
  - o supports network scalability
  - o integrating IP and ATM in the network
  - o building interoperable networks
- 9 The benefits of MPLS which include the following:**
  - o The use of one unified network infrastructure
  - o Better IP over ATM integration
  - o Border gateway protocol (BGP)-free core
  - o The peer-to-peer model for MPLS VPN
  - o Optimal traffic flow
  - o Traffic engineering
- 10 MPLS and virtual private networks (VPN) supporting VoIP in an IP network.**

## Course leader



**Bhekisisa Nelson Nkosi**

Bhekisisa Nelson Nkosi is a highly qualified Learning and Development Specialist at Telkom South Africa's Centre for Learning. His specialist areas are wireless communications, installation and maintenance of exchange lines, customer premise and PBX equipment, including all integrated value add products (IVAPs).

Besides the above, Bhekisisa has trained extensively on broadband technologies, next generation networks, IP, ISP related courses and contact centre support services.

Bhekisisa is a qualified assessor and moderator registered with the Information System, Electronic & Telecommunications Technologies Sector Education Training Authority of South Africa (ISETT-SETA)

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## 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.

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