

# VOIP in MPLS Networks

## Two Trend Technologies Combined

One of the central real-time applications in MPLS networks is the implementation of voice (and video) over IP in MPLS networks. Ensuring the Quality of Service (QoS) is an indispensable parameter for the seamless performance of the implementation. Even if there is no direct connection between MPLS and QoS from the technical viewpoint: It is a fact that almost all MPLS networks have been and continue to be equipped with notable quality of service features. The available product range of ISPs extends from pure transport services for real-time data over VoIP-capable VPNs to a complete IP telephony service, where the customer only requires the end devices. The course will enable the participants to integrate voice solutions on the basis of voice over IP over an MPLS network. This includes the pure transport of voice over the data network up to the complex scope of performance of a voice network operator on an MPLS platform.

### Course Contents

- MPLS Concepts and Trunk Protocols
- Media Streams in IP Networks: Voice, Video, Instant Messaging
- Signaling of Media Streams with SIP and SDP
- VoIP Architecture for Providers and Enterprise
- The Soft Switch in the MPLS Network
- Gateways into the PSTN
- Quality of Service: DiffServ for IP & MPLS, 802.1p in the LAN
- End-to-End QoS and Mapping
- Appropriate MPLS-VPN Concepts for VoIP/IP Telephony
- Central Service VPN (CS-VPN) for VoIP/IP Telephony

In this course of the ExperTeach Networking series, each student will receive the comprehensive ExperTeach course documentation.

### Target Group

The course addresses designers and operators of MPLS networks who wish to implement and optimize integrated voice over IP solutions.

### Knowledge Prerequisites

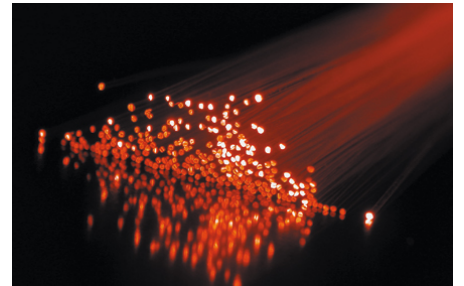
A profound knowledge in the fields of IP and IP routing is required. A good basic know-how in the sectors MPLS and voice over IP will be helpful, but is not mandatory.



### Reservation and Registration

We will be glad to make a free and non-binding course reservation for you for the duration of two weeks. On [www.experteach-training.com](http://www.experteach-training.com) under *Registration*, you can conveniently make course reservations, registrations, and hotel reservations. Alternatively, call us under +49 6074 4868-0.

For closed groups of participants, we can modify the course contents according to your requirements. Do not hesitate to contact us!



**3 days** €1,695 exclusive of V.A.T.

### Course date (mm/dd/yy)/Location

04/23-04/25/12 Frankfurt 11/05-11/07/12 Frankfurt

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## VOIP in MPLS Networks – Two Trend Technologies Combined

<p><b>1 Motivation</b></p> <p>1.1 Present Voice Networks</p> <p>1.1.1 Carrier PSTNs</p> <p>1.1.2 Virtual Private Networks (VPNs)</p> <p>1.1.3 Cellular Networks</p> <p>1.1.4 Enterprise Networks</p> <p>1.1.5 Voice over IP</p> <p>1.2 Motivation of Packetized Voice Transmission</p> <p>1.3 The MPLS Concept</p> <p>1.3.1 IP Overlay Models—Scalability</p> <p>1.3.2 Sophisticated Requirements—Traffic Engineering</p> <p>1.3.3 Transit Services—Tunneling</p> <p><b>2 Voice in MPLS Networks</b></p> <p>2.1 Voice-over-MPLS Solutions</p> <p>2.2 Voice over IP over MPLS</p> <p>2.3 TDM over MPLS</p> <p>2.4 Voice over MPLS</p> <p>2.5 Trunking over ATM</p> <p>2.6 Voice over ATM over MPLS</p> <p><b>3 Payload Data with Voice over IP</b></p> <p>3.1 Real-Time Applications over IP—The Mechanisms</p> <p>3.1.1 RTP—Transport and Reconstruction Function</p> <p>3.1.2 RTCP—Information on RTP Connections</p> <p>3.2 cRTP—Header Compression on the Trunk</p> <p>3.3 Bandwidths for VoIP</p> <p><b>4 Signaling with VoIP</b></p> <p>4.1 VoIP Concepts in an Overview</p> <p>4.1.1 SIP</p> <p>4.1.2 H.323</p> <p>4.1.3 Megaco/H.248</p> <p>4.2 The Components of the SIP Architecture</p> <p>4.2.1 The End Devices: User Agents</p> <p>4.2.2 The Gateways</p> <p>4.2.3 The Servers in an Overview</p> <p>4.2.4 Proxy Server</p> <p>4.2.5 Location Server</p> <p>4.2.6 Redirection Server</p> <p>4.3 SIP Messages</p> <p>4.4 SDP—Session Description Protocol</p> <p>4.5 Exemplary SIP Processes</p> <p>4.5.1 An Exemplary Process without SIP Server</p> <p>4.5.2 An Example Process with SIP Server</p> <p>4.5.3 Integration of DNS</p> <p>4.5.4 SIP and H.323 in Comparison</p> <p>4.6 The Visions of SIP</p> <p><b>5 MPLS Concepts</b></p>	<p>5.1 On Rails through the Network: Label-Switched Paths</p> <p>5.1.1 Path Selection via IP Routing</p> <p>5.1.2 The Label under Scrutiny</p> <p>5.1.3 Forwarding Information Base</p> <p>5.2 Label Distribution</p> <p>5.2.1 Label Distribution Protocol</p> <p>5.2.2 Unsolicited Downstream: Unsolicited Distribution</p> <p>5.2.3 Downstream on Demand: Labels on Demand</p> <p>5.2.4 Further Label Distribution Mechanisms</p> <p>5.3 Routing Protocols in the IP World</p> <p>5.3.1 The Recommended IGP: OSPF</p> <p>5.3.2 The Trend in Provider Networks: IS-IS</p> <p>5.3.3 Basic Features of BGP-4</p> <p>5.3.4 Transport of Transit Traffic with MPLS</p> <p>5.4 VPNs on the Basis of MPLS</p> <p>5.4.1 VPNs with MPLS and BGP-4</p> <p><b>6 Quality of Service in the MPLS Network</b></p> <p>6.1 Requirements of VoIP</p> <p>6.1.1 Delay</p> <p>6.1.2 Jitter</p> <p>6.1.3 Packet Loss</p> <p>6.1.4 Delay Analysis</p> <p>6.2 What Is Quality of Service?</p> <p>6.3 Queuing</p> <p>6.3.1 The Three Basic Questions</p> <p>6.3.2 In Which Queue?</p> <p>6.3.3 Which Packets Have to be Discarded?</p> <p>6.3.4 When Will Packets be Sent?</p> <p>6.4 QoS Models</p> <p>6.4.1 Hose Model</p> <p>6.4.2 Pipe Model</p> <p>6.5 MPLS with DiffServ</p> <p>6.5.1 TOS vs. DiffServ</p> <p>6.5.2 LSRs and DiffServ</p> <p>6.5.3 Classes of Service and DiffServ</p> <p>6.6 MPLS with IntServ</p> <p>6.6.1 RSVP and Scalability</p> <p>6.6.2 Traffic Engineering via MPLS</p> <p>6.7 QoS in the LAN According to IEEE 802.1Q/p</p> <p><b>7 VPNs for Voice over IP</b></p> <p>7.1 The VoIP VPN—A Closed User Group</p> <p>7.1.1 The Central Service VPN for VoIP</p> <p>7.2 Special Issues</p> <p>7.2.1 Call Admission Control</p> <p>7.2.2 Gateways into Other Voice Networks</p> <p>7.2.3 Tariffing and CDRs</p> <p><b>A Details</b></p>	<p><b>A.1 The Test Network</b></p>
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