

## SIP Advanced – 3 days

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### CONTENTS

This is an advanced SIP training with practical exercises. Functions such as transaction handling, dialogs, different error situations, timers and a lot of other topics are covered in detail. You will learn how SIP works within IP-telephony, as well as multimedia solutions, such as presence and Instant Messaging (IM). This course will cover how SIP works both in wireline and wireless solutions and you will need basic knowledge within VoIP and SIP to participate in this course.

### TARGET AUDIENCE

The target group for this course is people that need to understand the SIP signalling protocol in detail. Among these people we will find testers, developers and implementers.

### PREREQUISITES

Basic knowledge about the TCP/IP protocol suite and about Voice over packet networks equivalent to our course SIP Fundamentals.

### EXERCISES

This is a theoretical training with practical exercises.

#### VoIP and SIP Review

- Background, history and Internet heritage
- Main components; servers and clients.
- Benefits and rules with different transport protocols
  - UDP, TCP, SCTP.
- Basic sessions and SIP mobility features
  - Proxy and Redirect mode
  - SIP Methods & Response codes
  - SIP Registration
- SDP Basics

#### Addressing and Registration

- Message structure and format rules.
  - Mandatory headers and parameters.
  - Addressing and using URIs
- SIP Registration
  - Expiration and Deregistration
  - The location service

#### Message Forwarding

- SIP message routing rules
  - Request-URI and Route headers
  - Via header response routing
  - Route and Record-Route
- Detailed proxy behavior
  - Location server lookup
  - Request forwarding
  - Response processing
  - Loop detection/prevention
- Using DNS for inter-domain signaling

- SIP related DNS records
- Load sharing and redundancy features

## Session Management

- Establishing sessions with INVITE
- Using SDP for negotiation
- SDP Offer/Answer Model
- Dialog creation
- Early Dialogs and UPDATE
- Dialog state management

## State handling

- Statefulness in SIP Servers
- Transaction and dialog-stateful servers
- The transaction layer
- Client and server transaction state machines

## Protocol extensions and updates

- Extending the SIP protocol
- Negotiation extensions
- Reliable provisional responses
- Forking and Cancelling requests
- Using Early Media
- Quality of Service and SIP/SDP

## Security

- Firewalling SIP servers and clients.
- Encryption and Authentication
- Firewalls and NAT/PAT
- Session Traversal Utilities for NAT
- Traversal Using Relays around NAT
- SIP Privacy and Authenticity

## Services and Applications

- SIP Basic call-services and PBX-like features.
- Call-transfer and Call-Pickup
- REFER and Replaces
- 3rd party call control
- SIP for events
- Instant messaging in SIP
- B2BUA (Back to back User Agent)

## Classic Telephony Using SIP

- Sending DTMF in VoIP
- Merging ISUP/PSTN Networks and SIP
- E.164 Phone numbers and SIP-addresses
- DNS and ENUM
- IMS, IP Multimedia Subsystem

### **Exercise 1 – Basic SIP**

- Standard phone call
- Important headers
- Dialogs
- Transaction matching

### **Exercise 2 – Registration and Message Forwarding**

- Registration issues
- Inter-domain call setup and routing
- DNS usage
- Record-routing
- Dialog creation

### **Exercise 3 – Session Management and State Handling**

- Choosing codec
- SDP details
- ACK handling variations
- Forking Calls
- Response processing at forking
- CANCEL

### **Exercise 4 – Protocol Extensions and Security**

- Identifying extensions
- Determining support for SIP functions
- PRACK usage
- QoS negotiations
- Digest authentication

### **Exercise 5 – User Services**

- Presence
- Instant messaging
- Initial vs Re-INVITE
- Service sessions and dialogs