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For Training and Development

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Course: LTE Signalling and Protocol

Code	City	Hotel	Start	End	Price	Language - Hours
429	Stockholm (Sweden)	Hotel Meeting Room	2025-07-21	2025-07-25	5450 €	En - 25

Overview

LTE, Long Term Evolution, as defined as Release 8 through Release 10 of the 3GPP specifications, consists of the eUTRAN and the SAE /EPC. There are a considerable number of protocols and signalling messages being passed during system operation, between Uu and eUTRAN as well as between eUTRAN and EPC.

This three day course describes the overall protocol structure before focussing on specific protocols. The protocols examined include LTE to Ue protocols including PDCP, RRC, RLC and MAC, the inter-eNodeB protocol X2, the S1 protocol between the E-UTRAN and the evolved packet core and the evolved GTP for LTE.

This course is intended for telecom professionals working in the areas of LTE hardware and software development, LTE system engineering and in the testing and verification field.

Objectives

On completion of this course the delegate will be able to:

- Describer the use of S1-AP protocol for Non-Access Stratum Messaging
- Decribe the Initital Attach Request message
- Describe the use of GTP-C messaging between the MME & SGW
- Understand the temporary identities issued by the MME

- Understand the Temporary Radio Identities issued by the eNodeB
- Understand support for Quality of Service in LTE/EPC
- Understand the use of SrS interface
- Understand Circuit Switched Fallback procedures
- Explain the basic operation of VoLTE
- Understand & explain Dedicated & Default EPS Bearers

Modules

An Overview of the Evolved Packet System (3 topics)

- 3GPP Releases
- Overview of the LTE Air Interface
- Overview of the System Architecture Evolution (SAE)

LTE/SAE Protocol Architecture (7 topics)

- Service Data Flow Concepts
- An introduction to GPRS Tunneling Protocol (GTP)
- GTP-C & GTP-U
- Packet Scheduling & Packet Filtering Algorithms
- Default EPS Bearer
- Dedicated EPS Bearer
- Quality of Service (QoS)

Non-Access Stratum - NAS Signalling (8 topics)

- NAS Protocol States and Transitions
- NAS Security
- Integrity Protection
- Non Access Stratum Protocols
- Evolved Mobility Management - EMM

- Evolved Session Management - ESM
- Mobility Management across EMM States
- EMM Procedures

Medium Access Control - MAC Protocol (8 topics)

- MAC Architecture
- Mapping of Logical Channels to Transport Channels
- MAC Procedures
- Random Access
- Uplink Time Alignment
- Downlink Data Transfer
- Uplink Data Transfer
- PDUs and Formats

Radio Link Control – RLC (9 topics)

- RLC Structure
- Transparent Mode - TM -Entity
- Unacknowledged Mode - UM - Entity
- Acknowledged Mode - AM - Entity
- Functions
- Procedures
- Data Transfer
- ARQ Procedures
- Formats

Packet Data Convergence Protocol – PDCP (6 topics)

- PDCP Structure & Entities
- Functions
- PDCP Procedures
- Data Transfer

- Re-establishment
- Status Report

Radio Resource Control – RRC (7 topics)

- RRC States & State Transitions
- RRC Procedures
- System Information
- Connection Control
- Inter-RAT Mobility
- Measurements
- PDU Formats

S1 Application Protocol (6 topics)

- S1AP Services
- S1AP Functions
- S1AP Procedures
- E-RAB Management
- Context Management
- Handover Signalling

X2 Application Protocol (5 topics)

- X2AP Services
- X2AP Functions
- X2AP Procedures
- Handover
- Global Procedures: Load and Error Indication

Evolved GTP: GTPv2-C (6 topics)

- GTP Stack

- GTP Format
- Messages
- Path Management
- Tunnel Management
- Mobility Management

Interworking with Pre-Release 8 Networks (2 topics)

- Signalling for UMTS Networks
- Signalling for non-3GPP Networks

The Scandinavian Academy for Training and Development employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:

- **Theoretical Lectures:**
  - We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.
- **Scientific Assessment:**
  - We evaluate trainees skills before and after the course to ensure their progress.
- **Brainstorming and Interaction:**
  - We encourage active participation through brainstorming sessions and applying concepts through role play.
- **Practical Cases:**
  - We provide practical cases that align with the scientific content and the participants specific needs.
- **Examinations:**
  - Tests are conducted at the end of the program to assess knowledge retention.
- **Educational Materials:**
  - We provide both printed and digital scientific and practical materials to participants.
- **Attendance and Final Result Reports:**
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- **Program Timings:**
  - Training programs are held from 10:00 AM to 2:00 PM and include coffee break sessions during lectures.