LTE Signalling

Who Should Attend?

The course is addressed to network optimisers and technical staff requiring deeper understanding of LTE signalling.

Course Scope

1. LTE/SAE architecture
2. LTE protocol architecture
   - Introduction
   - LTE protocol layer
   - Strata
   - User plane
   - Control plane
   - EPS bearer and QoS
   - Radio interface structure
   - 3GPP Technical Specification (3GPP TS) for LTE
3. Non-Access Stratum (NAS)
   - NAS protocol architecture
   - NAS functions
   - NAS procedures
   - UE mode of operation
   - EMM
   - ESM elementary procedures
4. Radio Resource Control (RRC)
   - Introduction
   - Radio interface architecture
   - RRC states
   - RRC procedures and messages
   - System Information
   - Mobility in idle mode
   - Connection control
   - Measurement control
   - Connected mode mobility management
   - RRC timers and constants
5. S1 Application Protocol (S1AP)
   - S1 protocol architecture
   - S1AP functions
   - S1AP elementary procedures
   - E-RAB management procedures
   - Context management procedures
   - Handover signalling
   - Paging
   - NAS transport

- Management procedures
- Other procedures

6. X2 Application Protocol (X2AP)
   - X2 protocol architecture
   - X2AP services
   - X2AP functions
   - X2AP elementary procedures
   - Basic mobility procedures
   - Global procedures
7. GPRS Tunneling Protocol -Control (GTP-C)
   - GTP-C protocol architecture
   - GTP-C procedures
   - Mobility management
   - CSFB
   - Non-3GPP related access
8. LTE security
   - Threats in LTE network
   - EPS security features
   - EPS key hierarchy
   - Authentication and Key agreement
   - EPS protection for signalling and user data
9. Packet Data Convergence Protocol (PDCP)
   - PDCP protocol architecture
   - PDCP services
   - PDCP functions
   - PDCP procedures
   - PDU format
10. Radio Link Control (RLC)
    - RLC protocol architecture
    - RLC services
    - RLC functions
    - RLC procedures
    - RLC transmission example
    - PDU formats
11. Medium Access Control (MAC)
    - MAC protocol architecture
    - MAC services
    - MAC functions
    - MAC procedures
    - PDU formats

Course Objectives

The course offers a complete understanding of all signalling protocols implemented in the Long Term Evolution (LTE) / System Architecture Evolution (SAE) technology. It presents the LTE/SAE architecture with its nodes, interfaces and protocol stacks and describes protocols

through functions and services they provide. It focuses on the details of the radio access network (LTE) signalling, however the most important aspects of the core network (SAE) signalling are also discussed. Most important network procedures, such as signalling connection establishment, attach, service request and handover are discussed and presented on signalling diagrams. The course is based on the 3GPP Technical Specifications and hence is equipment vendor independent.

Prerequisites

Successful completion of the LTE Air Interface course is required.

Training Structure

Three-day training divided into logical sessions.

Methodology

Instructor-led training.