

Troubleshooting of the LTE Radio Interface – 4 days

CONTENTS

The course provides in-depth knowledge of protocols and procedures found on Evolved UTRAN (E-UTRAN) through theory combined with case studies and self-solved hands-on exercises. Complex practical troubleshooting and optimization activities are made simple using monitoring tools, such as TEMS Investigation, and log-files recorded in live networks. Throughout the course a number of signalling scenarios are analysed, showing both successful and failed scenarios.

PREREQUISITES

Participants must hold basic knowledge of LTE/EPC network architecture, terminology and modes of operation. For required background knowledge, attending Apis' course LTE/EPC System Overview (or equivalent) is recommended. Additionally, familiarity with E-UTRA interface, protocols and signalling scenarios, so as with network monitoring tools, e.g. TEMS Investigation, would be beneficial.

WHO SHOULD ATTEND

This course is targeted at telecom professionals working on troubleshooting, quality assessment, optimisation, and OAM of E-UTRA.

Note: Participants are required to have a Windows laptop.

EPS Overview and E-UTRAN Protocol Architecture

- Mobile network evolution: GSM to EPS
- Network nodes, areas, bearer concepts and identity numbers introduced for EPS
- EPS interfaces and protocols
- E-UTRA frequency bands and UE capabilities
- Logical, Transport and Physical channels and their relation to the radio interface protocol stack
- X2, S1 and S11-interface protocol stacks

Uu-Interface (E-UTRA Radio Interface) Protocols

- NAS procedures (EMM and ESM)
- RRC procedures
- UE states and state transitions (NAS and RRC)
- PDCP and RLC protocols
- MAC and E-UTRA Scheduling
- Dynamic scheduling and semi-persistent scheduling
- Hybrid-ARQ
- E-UTRA Physical Layer

The X2 Interface

- X2 Application Protocol (X2AP) procedures
- Inter cell interference cooperation
- Data forwarding and in-order delivery of data PDUs at handover

Mobility

- Cell Reselection procedure
- Tracking Area Update
- Measurement Control & Reporting
- LTE Events
- Handover between eNodeBs

Interworking

- Interworking with legacy R8 or pre-R8 3GPP networks
- CS Fallback

E-UTRAN Signalling Procedures and Hands-on Exercises

- Random access procedure
- RRC connection establishment
- Attach procedure, incl. establishment of default EPS bearer and security associations
- Dedicated Bearer activation
- Mobility and Interworking
- Troubleshooting Case Studies