Course ID
LTE-FU
Course Duration
4 days

Course Title
LTE Functionality

Related Courses

- LTE Technology & Business (LTE-BIZ, 2 days)
- LTE Tutorial (LTE-CT, 3 days)
- LTE (LTE-C3DC, 3 days)
- LTE Signaling (LTESIG, 3 days)
- LTE Network Planning (LTE-NPC, 5 days)
- LTE: RF Network Design (LTEWK, 5 days)
- LTE: Next Generation Mobile Networks (LTE4, 4 days)
- HSDPA (HSDPA, 2 days)
- HSUPA (HSUPA, 2 days)

Aimed At

Technical personnel with a good understanding of UMTS/WCDMA and some prior LTE background who wish to study LTE operations in depth.

Group Size

5-25

Prerequisites

- LTE/SAE Technology (LTE-TECH, 3 days)
- LTE Air Interface Techniques (LTEAI, 4 days)
- UMTS (UMTS-FDD, 3 days)

The UMTS course, or equivalent knowledge/experience, is a required prerequisite for this course. LTE overview is recommended but not required.

Course in a Nutshell

This course will undertake an in-depth study of the LTE air interface. The course will begin with a discussion of the radio channel environment and the related RF propagation issues to help you understand the problems that OFDM/MIMO solve. This is followed by a discussion of the modulation principles along with a detailed look at the LTE physical layer structure as it complements the modulation and MIMO channels. The course concludes with a discussion of the LTE idle mode functionality and physical layer procedures with emphasis on the channel quality and random access techniques. Also connected mode with emphasis on scheduler, power control and Link Adaptation is further analyzed and user mobility cases are explicitly presented with emphasis on parameter configuration and optimization.

Customize It!

- If some of your participants lack the necessary WCDMA/LTE background, we can teach an extended five-day course that includes WCDMA principles, LTE overview, and LTE air interface techniques.
- Add a workshop day at the end of the course, for a total of five days, for a deeper dive into capacity planning and coverage calculations.

Course Outline

- Introduction to LTE/SAE
  - Evolution of wireless networks
  - 3GPP releases to date
  - EPS (E-UTRAN and EPC) logical architecture
  - EPS interfaces
  - EPC (Evolved Packet Core) architecture
  - SAE/LTE interfaces
- Radio Interface Principles
  - Propagation characteristics
    - Channel models
    - Frequency selective channels
    - Time dependent radio channels
    - Multipath radio conditions: Delay, Doppler spectrum, multi-antenna channel model
    - Macrocell propagation model: Urban case
    - Macrocell propagation model: Rural case
    - ***Exercises***
  - Modulation principles
    - BPSK, QPSK, 16QAM, 64QAM
    - OFDM: Principles of operation
    - MIMO system
    - ***Exercises***
  - LTE radio interface techniques
    - Radio Interface techniques: Uplink/downlink
    - Radio channel structure
    - Radio interface
    - ***Exercises***
- Physical Layer Procedures
  - Synchronization procedures
  - Timing synchronization
  - Radio link monitoring
  - Intercell synchronization
  - Power control: Uplink/downlink
  - Random access procedures: Preample selection
  - Channel quality: Channel Quality Indication (CQI) Report
  - Precoding Matrix Indicators (PMI)
  - Rank Indicator (RI)
- LTE Idle Mode Functionality
  - Idle mode
  - RRC states on idle mode
  - PLMN selection
  - Cell selection process: Criteria; normally camping

- Cell reselection evaluation process
- System information
- Paging; DRX for paging
- INTER-FREQUENCY cell reselection
- INTRA-FREQUENCY cell reselection
- INTER-RAT cell reselection
- SUBframe patterns
- Network compatibility (2G measurements RSSI, 3G measurements, WIMAX compatibility)
- ***Case studies: Analyzing optimization problems***

- LTE Connected Mode Functionality
  - MAC layer description
  - HARQ process
  - QoS profiling
  - Scheduling: Scheduler introduction
  - Scheduler examples: Vendor specific description
  - Scheduler and Cell planning correlation
  - Link Adaptation Function
  - Feedback reports (PMI, CQI)
  - Power control
  - **Exercises and planning considerations**

- LTE Mobility Functionality
  - LTE measurements and events
  - Event triggered handovers
  - Event triggered Release with Redirect
  - Event triggered cell reselection
  - Inter System Handovers (LTE to GSM, LTE to WCDMA)
  - VoLTE: An introduction
  - CS Fallback
  - 3GPP features and performance enhancements
  - **Exercises and case studies**

- Course Wrap-up : Recap and Discussion

DCN NTDR-Ltm-vf