

Planning the LTE Radio Network – 3 days

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It is commonly accepted that the next leap in wireless networks will come from an evolved network topology. LTE Heterogeneous Network (HetNet), improved by LTE-Advanced, is drawing significant attention to optimize network performance, especially in cases of unequal user or traffic distribution. Such deployment strategy requires planners to consider new mind-sets and challenges. This renewed course provides the key concepts of LTE HetNet included in 3GPP Rel. 8/9 and LTE-Advanced, where a special attention is given to practical considerations to succeed planning complex hierarchical structured LTE radio networks. Alongside, this course covers LTE coverage and capacity dimensioning calculations, based not only on the LTE link-budget aspects and MCS/SNR vs. Resource Block (RB) trade off, but also on the LTE Advanced new features impact. Initial radio interface parameter planning and optimization is also included, e.g. PCI planning. Engaging hands-on exercises and new case-studies analysis make this course an highly qualified practical LTE planning experience within a classroom.

PREREQUISITES

Basic knowledge of LTE/EPS key concepts, architecture, terminology and E-UTRAN implementation is assumed prior to this course. GSM/UMTS radio interface, propagation and planning are useful concepts but not essential, as well as, basic knowledge of the Evolved Packet System (EPS) network architecture and QoS concepts.

WHO SHOULD ATTEND

This intermediate to advanced course is better suited for telecom professionals already working with LTE radio network planning, dimensioning and optimization. Newcomers, integrators and managers will also appreciate this course as it provides a complete end-to-end radio planning details without being too difficult to follow.

LTE Air Interface

- OFDM basics and key parameters
- OFDMA/ SC-FDMA access schemes
- Resource Elements (RE) and Resource Blocks (RB)
- E-UTRA FDD radio frame
- PHY channels and signals
- RRM features: link adaptation (LA), power control (PC) and scheduler
- LTE measurements: RSRP, RSRQ, RSSI, CQI, PMI
- LTE Advanced new characteristics
- Self Organizing Network (SON): ANR, ICIC, MLB, MRO, Self-Configuration and Self-Healing

LTE Radio Environment and Interference

- LTE spectrum allocations
- Radio propagation in LOS and NLOS environments
- Multipath, Inter-Symbol Interference (ISI) and Cyclic-Prefix (CP)
- Doppler shift and Inter-Carrier Interference (ICI)
- Intra and Inter-System Interference: co-channel, adjacent-channel, blocking
- LTE propagation model (Okumura-Hata)
- Channel models (EPA, EPB, ...)
- Interference control mechanisms
- Passive Intermodulation (PIM)

MIMO and Antennas in LTE

- MIMO basics
- LTE MIMO modes: tx diversity, spatial multiplexing, beamforming
- SU-MIMO and MU-MIMO
- MIMO mode switching and feedback information: DCI, PMI
- Practical antenna deployment considerations
- Examples
- MIMO Indoor techniques

LTE Radio Dimensioning

- Cell edge throughput definition
- Cell average throughput definition
- SNIR and sensitivity requirements
- QoS requirements
- Interference power estimation
- LTE Link Budget and MAPL for different bands and operating modes
- Cell coverage and capacity dimensioning and impact of LTE-A Carrier aggregation
- MCS vs RB usage tradeoff (coverage/capacity balance)
- Design scenarios analysis: impact of environment, TMA/LNA, CP, Bandwidth and MIMO
- Link and system level simulations results
- Radio QoS profiles
- Differences to GSM and UMTS dimensioning
- Case studies and exercises

LTE Initial Planning and Optimization

- Physical Cell ID (PCI) planning
- UL Power Control (PC) tuning
- DL and UL Link Adaptation (LA) tuning

LTE Deployment and HetNet Design

- Heterogeneous Network (HetNet) Concept and design challenges
- Homogenous vs HetNet network capacity
- Interference scenarios in HetNets
- Inter-Cell Interference Coordination (ICIC) and X2 Interface functions
- Frequency reuse options: SFN, integer, fractional and soft
- Rel. 8/9 HetNet and LTE-Advanced improvements: Range expansion, eICIC, Interference Cancellation Receiver, CoMP, Relay Nodes
- LTE and WiFi interoperability
- Indoor cells and Fiber-DAS (F-DAS) in LTE
- Preparing for Femtocells and Home eNBs
- Practical considerations
- Examples and lessons learned