

LTE Made Simple

Web Based Training Duration:

- app. 3 hours

Web Based Training Description:

- This Web Based Training addresses the needs of everybody who needs to understand the technology and concepts of LTE as the future 4G standard of 3GPP.
- After the general introduction to 4G standards is given, the Web Based Training starts with an introduction of the requirements of LTE.
- The following part presents important characteristics of the key layer 1 technologies: OFDM and MIMO.
- The Web Based Training continues with a description of the LTE L1. Among others we evaluate in detail the application of essential technologies like OFDMA for the downlink and SC-FDMA for the uplink in LTE as well as the LTE frame structure.
- This part concludes with the discussion of the physical layer procedures.
- The next chapter evaluates in detail the higher layer protocols of E-UTRAN.
- This chapter is presenting the initial context setup procedure of LTE and is describing the data flow of a TCP/IP packet through the protocol layers.

Some of your Questions that will be answered:

- What is LTE and why it is introduced in the first place?
- What are the requirements for LTE and how do they differentiate from those of UMTS?
- What are the key characteristics of LTE's (E-UTRAN's) layer 1 and layer 2/3?
- How does the LTE and SAE (System Architecture Evolution) evolved mobile radio network look like?
- How do the basic physical layer technologies of LTE like OFDM and MIMO work?
- How the physical frame structure is facilitating the use of a flexible bandwidth allocation?
- How the physical layer procedures work in LTE?
- How the throughput of the UE categories can be calculated?
- What are the tasks of the higher layer protocol entities and functions of the enhanced node B: MAC, RLC, PDCP, and RRC?
- How in detail the TCP packets travel through the protocol layers?

Table of Contents:

Part 1: Principles and Motivation of LTE

- Overview and Outlook of the technical Evolution
- Performance and Mobility Management related Issues
- Architecture related Issues
- Procedure and Radio related Issues
- Quiz 1: Mobile Radio Comparison
- Requirements on LTE
- AIPN - What does it mean?
- LTE and System Architecture Evolution (SAE)
- The Control Plane Protocol Stack
- The User Plane Protocol Stack
- X2 Interface Control Plane Protocol Stack
- X2 Interface User Plane Protocol Stack
- Channel Types
- Quiz 2: E-UTRAN Protocol Stack and Channel Overview

Part 2: Key Technologies of the LTE Physical Layer

- Introduction of OFDM Technology
- OFDM Principle and Example
- OFDM versus OFDMA
- OFDM versus OFDMA continued
- LTE Modulation schemes
- OFDM Issues and Solutions
- ... and the solution in OFDM: Cyclic Prefix
- Quiz 3: OFDM and Modulation
- The Basic Problems: Signal Fading Physics between TX and RX

- Possible Solutions: Smart Antenna Technologies
- MIMO Principle Operation
- Quiz 4: MIMO Principles

Part 3: The Physical Layer of E-UTRAN

- Logical Channels in E-UTRAN
- Transport Channels in E-UTRAN
- Physical Channels in E-UTRAN
- Uplink Direction - UE to eNB
- Downlink Direction - eNB to UE
- Quiz 5: LTE Physical Channel Details
- LTE Frame Structure (FDD)
- Resource Block and Resource Element Definition
- Overview of Important Identifiers in LTE
- Quiz 6: Frames and Identifiers
- Overview of Physical Layer Procedures
- Random Access Principle
- LTE Random Access Procedure
- UE Classes
- Quiz 7: Physical Layer Procedures and UE Classes

Part 4: The Higher Layers of E-UTRAN

- Features of the MAC Layer
- Features of the RLC Layer
- Features of the PDCP Layer
- Features of the RRC Layer
- RRC State Characteristics
- NAS Protocol States and Transitions

