



**Course Outline for the Training Course on
LTE Access & Core Network**

Duration: 3 Days

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506-A, 5th Floor, Evacuee Trust Complex, F-5/1, Islamabad, Pakistan



Title: LTE Access & Core Network

Duration: 3 days

Course Code: NSE-WLS-606

Course Description:

The course will cover the interworking with legacy 3GPP and Non-3GPP networks. LTE, Long Term Evolution, is the trade name of the development work in 3GPP to satisfy the future vision of UMTS- higher bitrates, band-width efficiency and flexibility, as well as cost efficiency EPC, Evolved Packet core.

The course covers the UMTS-EPS architecture with focus on LTE (evolved UTRAN, E-UTRAN). The downlink and uplink frame structure of E-UTRA is studied in detail. The physical layer, covering OFDM and DFT-spread OFDM (SC-FDMA), layer 2 including MAC with scheduling, resource management and HARQ, RLC with ARQ and PDCP handling ciphering as well as layer 3 RRC and NAS are also studied. The interoperability with other 3G UTRAN is covered, as well as the comparison with future 4G technologies. The new nodes, PDN-GW, Packet Data Network Gateway, S-GW, Serving Gateway and MME, Mobility Management Entity will be presented in details. Signaling procedures for a number of functions will be presented.

Course Objective and key Benefits

Give those working in the LTE and EPC area an understanding of the architecture and functions of the involved protocols. The attendee will be given a deep understanding of the air interface as well as several traffic cases.

Pre Requisite

Basic experience of mobile networks is an advantage but not compulsory

Who Should Attend?

Engineers / Technicians /Network Designers & Planners / Design & Deployment Engineers/ Network Integration & operations Engineers

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Course Outline:

Day 1:

A. 3GPP Core Network Evolution

1. GSM and GPRS
2. UMTS rel99, rel4 up to rel11 including IMS

B. Evolved Packet System Network Architecture

1. Drivers for LTE and EPC
2. High data rates requirements and limitations
3. Comparison between LTE and UMTS Architecture
4. LTE Architecture Nodes, Interfaces and Reference Points
5. Allocation of IP addresses
6. UE identities and context storage

C. OFDM/OFDMA and SC-FDMA

1. OFDM and OFDMA definitions
2. DFT spread OFDMA (SC-FDMA) definitions
3. Cyclic prefix vs Multi-path and Doppler effects
4. Subcarriers and OFDM/DFT-spread OFDM symbols

D. L3 RRC and NAS and L2 MAC, RLC and PDCP protocols

1. Basic protocol functionality description, e.g. Ciphering, ARQ, and scheduling
2. Logical and transport channels

E. L1, physical layer functions

1. Error coding and Rate matching
2. HARQ
3. CRC Scrambling
4. Modulation
5. Layer and resource mapping
6. DL and UL frame structure
7. Physical channels

Day 2:

A. Radio Mapping

1. Mapping of the physical channels onto the FDD radio frame
2. Mapping of the radio signals onto the FDD radio frame

B. Multi antenna techniques

1. RX/TX diversity
2. Beam forming
3. MIMO

C. Data rates and QoS

1. Basic user data rate calculation
2. EPC QoS concept

D. UE states and mobility

1. LTE and RRC UE states
2. Mobility handling for active and idle UE

E. Attach and registration procedure

1. Traffic Case of the signalling during attach and registration procedures

F. Policy and Charging Control, PCC

1. The mechanism of Policy and Charging Rules Function, PCRF and Policy and Charging Enforcement Function, PCEF
2. Enforcement Function, PCEF
3. The QoS on different Service Data Flows, SDF and its QoS Class Identifiers, QCI

Day 3:

A. Signalling Procedures

1. Inter system Routing Area Update, TAU - Tracking Area Update
2. IP bearer establishment

B. Interworking with 3GPP, IP-access

1. Direct tunnel
2. Voice Call Continuity, VCC
3. Handover between EUTRAN and GERAN/UTRAN

C. Interworking with Non-3GPP, IP-access

1. Mobile IP MIPv4 and MIPv6
2. Interworking between IPv4 and IPv6
3. Handover between EUTRAN and other networks e.g. WiMAX

D. A look into future releases

1. R9
2. R10
3. R11