Engineering & Technology Solutions

To Empower Through Excellence

Training, Consultancy and Solutions Company. Islamabad - Pakistan

Certified 3G / 4G Professional

COURSE OBJECTIVES

To comprehend the :

- Motivation for migration to LTE
- Concepts of Packet Switching and QoS
- Concepts of E-UTRAN, Protocols, OFDMA and MIMO
- EPC & E-UTRA Planning and Design Procedures
- Need for LTE Backhaul evolution
- Homogenous and Heterogeneous Handovers
- Call setup procedures and Mobility support
- IPSec and Security Architecture

On completion of the course, the participants will be able to:

- ✓ Describe LTE/EPC network evolution and architecture
- ✓ Describe LTE/EPC network and service features
- ✓ Describe the principle of air interface in LTE/EPC network
- ✓ Describe the security and QoS mechanism of the EPC
  Core Planning & Optimization
- ✓ Describe the key technologies and protocols used in LTE/EPC
- ✓ Explain the LTE/EPC equipment structure and features
- ✓ LTE IMS (IP Multimedia Sub-System)
- ✓ Security Threats and Vulnerabilities
  RF Planning & Optimization

The course starts with the motivation, requirements and needs behind the evolution of cellular communications from 1G through 4G/LTE. It explains the entire 4G system also called Evolved Packet System (EPS) in detail and elucidates three vital parts that constitute the system. These parts include EPC (Evolved Packet Core, or simply Core Network), LTE (Long Term Evolution, or Evolved Universal Terrestrial Radio Network, or simply Radio Network), UE (User Equipment). It also intends to describe the techniques to boost capacity and improve network performance. Furthermore it introduces the tools used in planning and measurements. The course will also cover the Security, QoS and IMS topics and explains the underlying IETF protocols. Each topic will be explained with real life examples and analogies to make it easier to understand. Hands on exercises will be planned to give insight into the presented material.

About Organizer:

ETS is Pakistan's leading Telecom Training provider. With 60+ Consultants from all over the world make it possible to deliver trainings, workshops and conferences around the world covering up to date technologies.

Through our dedication to customer-centric innovation and strong partnerships, we have established end-to end advantages in telecom services, solutions and Trainings. ETS is committed to create maximum value for telecom companies, enterprises and consumers by providing competitive solutions and services. Our customers extended from Pakistan to Middle East and Africa. For more details visit our URL : www.ets.biz.pk

Module 1: Setting the Stage

- Comparison of design goals of 2G/3G/3.5G, 3.75G and 4G technologies
- Comparison of European based CDMA (AKA W-CDAM and USA based CDMA)AKA Cdma2000)
- Explanation of OFDMA and MIMO technologies
- Cellular Communications Evolution & Standards Bodies (3GPP, IETF, IEEE, WiMAX Forum)
- Features and Vision of LTE & Advanced LTE 2020.

Module-2: Insight into CDMA (UTRAN)

- UTRAN and Key Features of CDMA Air Interface
- E-UTRAN & Key Features of OFDMA Air Interface
- Radio Channels (Logical, Transport, and Physical)
- CDMA/OFDMA Power Control Mechanism
- Understanding Smart Antennas Technologies
- Radio Waves Propagation, Multipath, and Fading
- Radio link Performance Improvement Techniques

Module-3: Insight into PS & CS Core Networks

- Functional Entities and their Key Functions
- Interfaces and Protocols
- Bearers (Default Bearers and Dedicated Bearers)
- Mobility Management, Homogenous and Heterogeneous Handovers
- End to End Call Setup Procedures and Handovers
- End to End Call Setup Procedures in Roaming Scenario
- Comprehending Circuit Switching & Packet Switching
- Middle Mile, Backhaul, and Last Mile Concept and need for Backhaul upgrading.

Module-4: IMS (IP Multimedia Sub-System)

- Need of IMS and Key Features of IMS
- Architecture (Functional Entities and Interfaces) of IMS and SIP protocol.
- CDMA Vs. LTE Backhaul Requirements

Module-5: CDMA Security

- Security and Privacy in 3G and 4G
- Security Threats and Vulnerabilities
- Security Requirements and End to End Security
- Security protocols IPSec, AAA, and Diameter

Module-6: CDMA RF Planning

- Cellular Network RF Planning Basics
- RF Planning Work Flow
- RF Link Budgeting/Path Balance Estimation
- Frequency Planning and Anti-interference Mechanism
- Performance Enhancement Strategies via Cell Sectoring and Smart Antenna Technologies
- RF Planning Model Tuning & Tools Used

Module-7: RF Performance Optimization

- CDMA/OFDMA Key Performance Indicators (KPIs)
- Network Evaluation and Performance Enhancement
- RF Optimization Principles and Work-flow
- Drive Testing & Tools Used for Drive Testing
- Key Traffic Statistics Including CSSR/CDR/HOSR, their Formulas and Measuring Methodologies
- RF Issues Resolution Using Traffic Statistics Including Examples of High CDR, Low HOSR.

Module 8: Need Analysis of 4G / LTE

- ✓ Design goals and Benefits for 4G
- ✓ Spectrum Efficiency and Access Technologies (TDMA, WCDMA, Cdma2000, and OFDMA)
- ✓ Cellular Communications Evolution & Standards Bodies (3GPP, IETF, IEEE, WiMAX Forum)
- ✓ Features and Vision of Advanced LTE 2020.
- ✓ Status of LTE& Competing 4G Technologies

Module 9 : LTE Network Architecture

- ✓ Evolution of the wireless cellular telecommunication network
- ✓ 3GPP versions, from R99 to R9 and later versions
- ✓ Logical structure of the E-UTRAN
- ✓ E-UTRAN Interfaces and protocols
- ✓ LTE uplink and downlink radio interface technologies
- ✓ OFDM principle
- ✓ Channel structure of LTE air interfaces
- ✓ Frame structures used in the uplink and downlink
- ✓ FDD and TDD modes
- ✓ MIMO & LTE MBMS

Module 10 : EPC Architecture

- ✓ EPC architecture
- ✓ Functions of EPC NEs
- ✓ EPC interfaces & Protocols
- ✓ PDN connectivity in the EPC
- ✓ EPC bearer and TFT(s)
- ✓ Identifiers used in the EPC
- ✓ Security & QoS mechanism
- ✓ EPC selection function
- ✓ The IP Multimedia Subsystem (IMS)

Module 11 : EPC Mobility & Session Management

- ✓ Attach and detach signaling procedures
- ✓ Signaling procedure of tracking area update
- ✓ Handover signaling procedures
- ✓ Signaling procedures of bearer establishment, update,
- ✓ and release

Module 12 : IP Multimedia Subsystem / IMS

- ✓ Need of IMS and Key Features of IMS
- ✓ Architecture (Functional Entities and Interfaces) of IMS
- ✓ LTE Backhaul Requirements

Module 13 : LTE Network Protocols & Procedures

- ✓ Interfaces in EPS
- ✓ Signaling flow between the UE and the EPC
- ✓ Main functions of Radio Resource Control (RRC), Packet Data
- ✓ Convergence Protocol (PDCP) Radio Link Control (RLC), Medium
- ✓ Access Control (MAC), Physical Layer
- ✓ Interaction of eUTRAN protocols and mapping of logical, transport
- ✓ and physical channels
- ✓ EPS Bearer Services and eUTRA Radio Bearer
- ✓ Attributes of the eUTRA Radio Bearer
- ✓ RRC layer structure
- ✓ Functions and services states of RRC
- ✓ PDCP functions and services

- ✓ RLC functions and modes
- ✓ MAC functions and architecture s
- ✓ Contents of the MAC Packet Data Unit (PDU).
- ✓ Functions and procedures of X2-AP, S1-AP signaling protocol.
- ✓ Functions and procedures of the user plane protocols
- ✓ GTP.
- ✓ X2,S1 Handover

Module 14 : LTE Security

- ✓ Security and Privacy in LTE
- ✓ Security Threats and Vulnerabilities
- ✓ Security Requirements and End to End Security
- ✓ Security protocols IPSec, AAA, and Diameter

Module 15 : LTE Network Planning & Dimensioning

- ✓ LTE radio network planning Process
- ✓ LTE radio network coverage dimensioning
- ✓ LTE link budget
- ✓ Site number and capacity dimensioning
- ✓ Radio network throughput calculation
- ✓ DL and UL throughput
- ✓ Perform throughput per cell(IP) dimensioning
- ✓ Frequency, TA , PCI and PRACH planning
- ✓ LTE transport networking and dimensioning
- ✓ S1 and X2 interface protocol

Module 16 : LTE eRAN Features and Algorithms

- ✓ LTE eRAN Idle Mode Behavior
- ✓ LTE eRAN Connection Management Feature
- ✓ LTE eRAN Power Control Feature
- ✓ LTE eRAN Scheduling Feature
- ✓ LTE eRAN Load Control Feature
- ✓ LTE eRAN Handover Feature
- ✓ LTE eRAN ICIC Feature
- ✓ LTE eRAN MIMO Feature
- ✓ LTE eRAN ANR and MRO Feature
- ✓ LTE eRAN Beamforming Feature
- ✓ LTE eRAN Subframe Configuration Feature
- ✓ LTE eRAN Transmission Security Feature
- ✓ LTE eRAN QoS Management Feature
- ✓ Transmission Security Deployment

Module 17: EPC Protocol and Procedure

- ✓ Protocols used in EPC (GTP, diameter, etc.)
- ✓ Attach and detach procedure
- ✓ Tracking area update procedure
- ✓ Handover procedure
- ✓ Bearer activation/modification/deactivation procedure
- ✓ SRVCC and CSFB for voice service

Module 18: EPC Network Planning & Design

- ✓ EPC Network planning principles
- ✓ Architecture planning
- ✓ Nodes determination
- ✓ Deployment for MME, SAE-GW and other nodes in EPC
- ✓ Security policy and firewall determination
- ✓ IP connectivity, QoS and MME pool planning
- ✓ Traffic model
- ✓ Bandwidth calculation
- ✓ Internetworking planning
- ✓ IP planning

Module 19 : LTE RF Optimization & Performance

- ✓ LTE Key Performance Indicators (KPIs)
- ✓ Network Evaluation and Performance Enhancement
- ✓ LTE RF Optimization Principles and Work-flow
- ✓ Drive Testing & Tools Used for Drive Testing
- ✓ Key Traffic Statistics Including CSSR/CDR/HOSR, their Formulas and Measuring Methodologies
- ✓ RF Issues Resolution Using Traffic Statistics Including Examples of High CDR, Low HOSR.