Hands-On

Modern Mobile and Long Term Evolution

LTE

Course Description

With 3G mobile technologies already rolled out by over 200 operators in over 80 countries, standards bodies, manufacturers and operators are looking towards the next generation of mobile technology. The UMTS standards body, 3GPP has created a plan to achieve ambitious goals for where mobile communications should go. This is Long Term Evolution LTE.

For technicians and technical professionals to stay in touch with this evolution, a good grounding in the technology and terminology of 2G, 3G and 4G systems is needed. The key conceptual design philosophies of each generation need to be understood in order to build effective networks as they evolve. Transition will not occur overnight. Indeed it may be many years before every network has transitioned every part to 4G. The mechanisms of linking the different technologies must be appreciated.

The increased performance in the future will depend upon changes in the radio path. The new or changed areas include the use of MIMO antenna systems, OFDM-based multiple access as well as the architectural changes.

This course describes the technical features of 2G GSM, 3G UMTS and the evolution of technologies that will change to support 4G LTE. This includes, notably, the core network which has its own evolution plan, SAE, System Architecture Evolution. Examples of switched configuration will be studied to illustrate practical aspects.

Students Will Learn

- **Describe way current GSM and UMTS networks deliver services**
- **Introduce the System Architecture Evolution as it relates to LTE**
- **Identify the functions of new technology releases**
- **Consider the protocol architecture and protocols specified to support LTE**
- **Compare new Physical layer principles and characteristics with current GSM, GPRS and 3G services**
- **Identify the key advantages of HSPA/HSPA+ principles and features**
- **Analyse IMS architecture, principles and features**
- **Carrying Circuit Voice over Packet Networks VoIP**
- **Continuous Packet Connectivity and Packet Backhaul Evolution**
- **Configuring IP services and Backhaul**
- **Configuring Routers for Mobile Services**
- **And More...**

Target Audience

For technicians and technical professionals.

Prerequisites

The course assumes some top-level familiarity with existing mobile networks but no specific RF expertise is required.

Course Outline

1: Generations and Definitions

- First Generation Analog systems
- Second Generation Digital systems
- General System Mobile
- Enhanced Second Generation (2G+)
- Short Message Service
- General Packet Radio Service (GPRS)
- Wireless Application protocols (WAP)

2: The Mobile Arena

- Current generation GSM and UMTS
- Enhancing to HSPA
- Mobile WiMAX
- Goals of LTE: Performance Aims and Objectives
- EDGE

3: Overview of the Technology

- Circuit and Packet approaches compared
- Access Network
- Core Network

4: Components of a Modern Service for Mobile (GSM) Network

- Mobile Terminals

- Subscriber Identification Modules (SIM)
- International Equipment Identification (IMEI)
- International Operator Identification
- International Mobile ISDN Number

5: Service Components

- BSS and BTS
- MSC
- HLR
- VLR
- AuC
- EIR

6: Base Stations and Cells

- Mobile System Controllers
- Core Networks
- Roaming

7 : 3G - Universal Mobile Telecommunications Services (UMTS) Architecture

- Role of UMTS in 3G

- UMTS Services
- Core network Interfaces
- UMTS Terrestrial Radio Access Network (UTRAN)
- User Equipment
- Evolving the Packet network Radio Interface
- HSPDA and HSPDA+

8: Signalling

- Signalling in ISDN and Mobile Networks
- Signalling System 7
- Mobile Intelligent Networks

9: Value Added Services

- Intelligent Network Concepts
- Intelligent Network Service Creation
- IN Signalling

10: Technology: Moving Antennas On 2G to 4G

- MIMO Concepts
- Space Time Diversity Coding and Spatial Multiplexing

11: 4G Technology: Orthogonal Frequency Division Multiplexing OFDM

- Fundamentals of OFDM

- Proposed use in LTE
- Uplink and Downlink are Different:
- Multi-Access using OFDM
- Single-carrier FDMA (SC-FDMA)
- New to Modulation mechanisms
- Forward Error Correction

12: Core Network Aspects - SAE System Architecture Evolution

- LTE Architectural Concepts
- Evolved Packet Core EPC
- Mobility Management
- Serving Gateway
- PDN gateway
- User Plane Entity
- The Application Protocol Interfaces

13: Building New Generation Wireless Access

- Building the IP Core
- Deploying MPLS for core services
- Pseudo wire Emulation Edge to Edge (PWE3)
- Emulating Circuit Switched services
- Carrying Voice over Packet Services VoIP
- SIP signalling
- Allocating IP Addresses

14: Evolving Backhaul to Optical Ethernet

- Metro Ethernet Forum (MEF) Backhaul
- MEF 22 Mobile Backhaul
- Service Emulation over MEF Services

15: Practical Mobile Wireless Switch Configuration

- Mobile Wireless Routers
- Example Configuration of Cisco MWR-2941
- Configuring Precision Timing
- IP address Allocation
- Configuring PWE3 for 3G ATM services
- Emulating T1/E1 circuits

Evaluation and Review

Delivery Method

Instructor-Led with numerous exercises and case-studies.

Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

4 Days