3GPP Mobile Systems Overview – 4 days

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The 4-day 3GPP Mobile System Overview course describes all the currently used “generations” of mobile (cellular) networks standardized by 3GPP. It accounts for the evolution from the voice centric GSM (2G) via the data traffic of GPRS and UMTS (3G) to the all-IP architecture in LTE (4G) and IMS as used for VoLTE. The course also introduces IoT and 5G. All topics are presented in a comprehensive – yet easily understandable – way. Essential principles, procedures, subsystems, nodes and protocols are described. Basic traffic cases are used to demonstrate the function and architecture of the different systems.

PREREQUISITES

Technical education and/or at least one year of technical telecom experience is recommended.

3GPP Mobile System Overview

- 2G, 3G and 4G – what is it all about and what’s the difference?
- Circuit Switched vs Packet Switched services

GSM (2G) System Overview

- Nodes and architecture of GSM
- Terminals, Radio NW and Core: MS, BTS, BSC, MSC, VLR and HLR
- Basic traffic cases; voice call setup and SMS
- Mobility Management

The GSM Radio Interface

- Time Division Multiple Access (TDMA)
- Time slots, physical and logical channels
- Radio Resource Management

General Principles in Mobile Networks

- Radio Network vs Core Network responsibilities
- User Identities
- Registration / Attach
- Security: authentication, encryption etc.
- Cells, Areas, Mobility principles
- Radio Resource Management
- Control Plane vs User Plane

IP Introduction

- IP networking principles
- LAN, MAN, WAN
- Routing, Switching
- The TCP/IP protocol stack
- IP addresses, DHCP, DNS

UMTS (3G) System Overview

- Which are the 3G services?
- Nodes and architecture of UMTS
- UTRAN – the 3G Radio Access Network: Node B and RNC

- Wideband-CDMA

Data over GPRS (2,5G) and UMTS (3G)

- Nodes and architecture of the Packet Switched Core: SGSN and GGSN
- Attach procedure
- PDP Context Activation
- Tunneling of user data for Mobile Broadband

LTE/EPS (4G) System Overview

- 4G Services – all-IP
- The Mobile Broadband Service
- Nodes and Architecture of LTE
- E-UTRAN – the 4G Radio Access Network: eNB
- OFDM
- EPC – the Evolved Packet Core: MME, SGW, PGW, HSS
- QoS – Quality of Service
- PDD Connection Setup and Data Transfer in LTE (Mobile Broadband)

Voice over IP using SIP

- VoIP principles and services
- OTT services vs Operator voice
- SIP – the Session Initiation Protocol

IMS (the IP Multimedia Subsystem) and VoLTE

- What is IMS and why do we need it?
- Nodes and Architecture of IMS
- Basic procedures: Registration and Invitation
- The IMS Profile for VoLTE

Overview of 5G

- What is new and different in 5G?
- Virtualization, Network Slicing and Edge computing
- The 5G System Architecture
- 5G Use Cases: eMBB, URLLC and mMTC
- Stand-Alone New Radio