

## **GSM Technical Introduction for Engineer**

- Introduction of telecommunication system targets
- Switching system introduction and compare between PS and CS technology
- Transmission system introduction and limitations
- Main concept of modulation and power measurement metric in dB

### GSM System Overview

- Nodes and architecture of GSM

### The GSM Radio Interface

- Time Division Multiple Access (TDMA)
- Time slots, physical and logical channels
- Radio related problems and solutions in GSM

- Signaling and Traffic multi frame structure

### Cell Planning

- Cell types (macro, micro, pico)
- Coverage vs capacity
- General steps in the cell planning process

- Cellular Structure in GSM Network

### Mobile Station and BSS (GERAN)

- Mobile Equipment (ME) and Subscriber Identity Module (SIM)
- Base Station System: BTS, BSC
- Mobile Station Block Diagram
- Mobile Station Processing Flow
- Mobile Station Operation Mode (Idle and Dedicated mode)
- Cell selection and Re-selection concept
- Handover concept and HO types

### The Core Network

- Core Network nodes: MSC, GMSC, VLR and HLR

### Selected Traffic Cases

- Location Updating
- Call setup for roaming and non-roaming scenario
- Pre-paid and CAMEL
- SMS transfer

- Security in GSM Network

- Authentication
- Ciphering
- Radio Wave and Antenna
- GSM Services
  - CRBT
  - USSD
  - MMS
  - MCS
  - OCS

#### GPRS System Overview

- Nodes and architecture of GPRS
- SGSN and GGSN

#### EDGE – Evolution towards higher bitrates

- 8QPSK modulation and new coding schemes
- Alignment of GPRS to UMTS

## 3G Technical Introduction for Engineer

- 3G System Standardization
- 3G Network features
- 3G Network Release
  
- UMTS System Overview
- Nodes and architecture of UMTS
- UTRAN introduction
  
- UTRAN Interface
- RNC Functions
- Node B Functions

#### W-CDMA

- Basic WCDMA Concept
- UMTS – FDD Frequency band evolution
- Processing Gain
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- Spreading and UMTS codes
- Code Tree Restrictions

- WCDMA Capacity Limitations
- Scrambling code planning

#### Bearers and Quality of Service

- The Bearer concept
- General QoS parameters

#### UTRAN Protocols and Channels

- Protocols: RRC, RLC, MAC, PHY
- Logical, Transport and Physical channels

#### Selected Traffic Cases

- Call setup (circuit switched)
- Web browsing (packet switched)
- Interoperability UMTS /GSM

#### HSPA – High Speed Packet Access

- UTRAN evolution for higher bitrates

- UMTS power control
  - Open loop power control
  - Inner loop power control
  - Outer loop power control
  - Rake Receiver
- UMTS Handover
  - Soft and softer HO
  - Inter Technology HO (IRAT HO)
  - Inter Frequency HO
  - Admission control
  - Soft congestion control

## **4G Technical Introduction for Engineer**

- History of Radio Cellular Mobile Communication
- PS core modification in 3GPP REL-7 & 8
- LTE targets
- LTE Advanced

### EPS /LTE/4G

- E-UTRAN (LTE) and the Evolved Packet Core (EPC/SAE)
- Nodes and architecture of EPS
- eNB Interfaces
  - X2 Interface
  - S1 Interface
- OFDM Basics
  - LTE Sub-Carrier Spacing
  - Available Capacity and Channel Bandwidths for LTE
  - Maximum Downlink/Uplink Capacity per Radio Channel
  - Difference between OFDMA and SC-FDMA
  - Cyclic prefix (CP)
  - Resource block, Resource element and Radio frame concept
  - Multiple Antenna concept
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- Interworking scenarios between EPS and UMTS/GSM
- LTE Voice Calls
  - Circuit Switched Fall Back (CSFB)
  - Using of IP multimedia subsystem (IMS)
- IMS – the IP Multimedia Subsystem
- IMS nodes and architecture
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