Evolution of 2G to 5G

Telecom Systems Survey

Engineering & Technology Solutions - Pakistan

About Organizer:

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Course Objectives

This training provides an in-depth insight of evolution of mobile technologies from 2G to 3G, 4G and 5G. This course is equally beneficial for technical and non technical staff. While young engineers will have real benefit by getting immense knowledge both related to technical and commercial aspects of technologies. While professionals can increase their understanding level about different technologies.

The different technologies are explained in practical terms, highlighting their advantages and limitations. We look at how the business case and user behaviour change when next-generation technology is introduced for voice and data services, and discuss challenges that may arise during each transition. case.

Who Should Attend:

- Electrical / Electronics Engineers working or planning to work in Telecom Sector
- Engineers, Technicians and Project Managers working in Telecom sector
- Panning & Optimization and Operations Engineers
- Non Technical managers who want to have insight of technology
- Account Managers and Sales Managers

Pre- Requisites:

Basic understanding of Mobile phone system with degree / Diploma in Electrical, Electronics, Telecom , IT , Computer Sciences .

Detailed Course Outline

Introduction
o Mobile market drivers
o Customer expectations
o The migration path from 2G to 5G – technology overview and terminology
o 2G, 3G and 4G / 5G in the local market

Brief over view of 2G (GSM Network)
- Architecture, Handovers, Access Techniques
- Protocol Stack
- Performance Indicators

Limitations of 2G
o GSM/GRPS/EDGE – The foundations of today's system evolution
o Network coverage and capacity
o Frequency spectrum limitations
o 2.5G: Data rates and restrictions in GPRS/EDGE
o Current and future developments: Evolved EDGE

Broadband – the new business case
o Current mobile data traffic and forecast to 2017 by region
o How does traffic and user behaviour change when moving from 2G to 3G and 4G? Case studies
o Key enabler: Availability and cost of international bandwidth
o New devices: Smartphones, tablets, home gateways, access points – average traffic per user

3G, UMTS technology overview
o CDMA Basics – spread spectrum, soft capacity
o UMTS network architecture
o Explaining FDD and TDD, W-CDMA, TD-CDMA, TD-SCDMA
o 3G frequency spectrum
o Information security in 3G

3G capabilities and limitations
o Cell coverage area, 3G vs. 2G
o 3G network capacity dimensioning (incl. backhaul)
o 3G area coverage vs. data rate, network capacity
o Subscriber profiles, traffic mix
o How many users can be served with different services?

3.5G – Where are the limits of HSPA?
o Higher data rates in downlink and uplink: HSDPA and HSUPA
o Even higher with HSPA+, DC-HSPA, MC-HSPA
o MIMO – getting the most out of your network
o Upgrading the network
o HSPA deployments Case studies from local market (If Any)

Challenges during the transition from 2G to 3G and 3.5G

o New handsets
o Network coverage and capacity
o Spectrum availability, refarming
o Network deployment strategies
o Quality of service (QoS) issues – experience from real life 3G networks
o Upgrading from microwave to fibre backhaul
o Developing pricing plans to suit your network
o Communicating with your customers
o Managing churn

New services, pricing and marketing strategies
o 3G services and applications
o Video calls
o Mobile VoIP and OTT – menace or opportunity for network operators?
o VoIP pricing
o Multimedia services – the role of IMS
o Moving towards All-IP networks – The NGN concept
o WebRTC – the next big thing?
o Driving usage with value-added services (VAS)
o Changing data bundles and pricing plans
o Wireless/mobile Triple-Play services?

CDMA-2000 – Competition from the "other" 3G technology
o Competitive strengths and weaknesses of CDMA-2000
o Network architecture and components
o CDMA-2000 services
o Data capabilities: 1xEVDO, 1xEVDV
o CDMA-2000 in the Middle East and worldwide
o Competitive pricing of CDMA-2000 and EV-DO services

4G/LTE – Should an operator skip 3G?
o Market drivers and business case for 4G
o When is 3G no longer enough? Data traffic rise vs. spectrum availability
o Upgrading the network from 3G to 4G
o LTE status in the Middle East and worldwide
o LTE overview: OFDM principles, LTE terminals, SAE architecture and components
o LTE and IMS, VoLTE
o LTE coverage and capacity
o LTE spectrum
o Deployment and marketing strategies – case studies from around the world

WiMAX – The "other" 4G technology
o Market drivers for WiMAX – "WiFi on steroids"
o Convergence with LTE
o WiMAX network architecture and components
o Mobile WiMAX
o WiMAX spectrum, a hot commodity

WiFi – The solution to mobile capacity problems?
o WiFi and WiMAX – where is the difference?
o WiFi capabilities and limitations
o Architecture and components
o Ad-hoc and mesh networks
o Market drivers and applications for WiFi
o Services and business cases for WiFi: Hotspots, Campus coverage, Public access, Municipal networks

Developing a long-term broadband strategy, future outlook
o Femtocells ("Small Cells"): Maximising the user experience
o Towards 5G: When is 4G no longer enough?
o The need for fibre
o Long-term strategic options: Partnerships, mergers, acquisitions, new licences

What is 5G Wireless Communication?

- 5th Generation Wireless technology
- 5G as a technology vision
- Why 5G?
- End-to-End 5G Ecosystem
- 5G high level requirements and features
- Basic concepts behind 5G technology of mobile
- communication
- 5G technologies
- 5G technical objectives
- 5G Activities and Interest Groups
- 5GPP
- 5G Forum
- 5GMF
- 3GPP
- ITU-T's IMT-2020, WRC-15

5G Wireless Requirements, Applications, and Services

- 5G promises and challenges
- Disruptive technology directions
- Bandwidth
- Power consumption
- Infrastructure
- Spectral efficiency
- Resilience of the network

- Adapting new topologies
- Radio propagation and channel models
- Pervasive networks
- Internet of things (IoT) and M2M
- Wireless sensor networks and ubiquitous computing
- Wearable devices with AI capabilities

5G Technology Enablers

- System design concepts
- Dynamic Spectrum Access (DSA)
- Interference Management
- Small Cells
- Coordinated Multipoint
- Mass-scale MIMO, Massive MIMO
- Caching and Delivering Techniques
- Personal Mobile Internet
- Device-to-Device Communication
- Software-Defined Radio (SDR)
- Cognitive Radio
- Smart-radio
- Multi-hop networks
- Direct device-to-device (D2D) communications
- Dynamic Adhoc Wireless Networks (DAWN)
- IPv6 and 6LowPAN
- Centralized RAN vs. Cloud RAN
- NFV, SDN, ICN, semantic and cloud networking
- Direct Device-to-Device Communication (D2D)
- Massive Machine Communication (MMC)
- Massive Internet of Things (IoT)
- SDN and NFV
- Moving Networks (MN)
- Ultra-Dense Networks (UDN)
- Ultra-Reliable Communication (URC)
- Mobile ad hoc network (MANET)
- Wireless mesh network (WMN)
- Vandermonde-subspace frequency division multiplexing (VFDM)
- Millimeter-Wave
- 5G Cloud radio access network (C-RAN)
- Ultra small cells based heterogeneous network (HetNet)
- Heterogeneous cloud radio access network (H-CRAN)
- Disruptive approaches for increasing network capacity
- Programmable optical backbone networks with petabit throughput
- Ultra Reliable and Low Latency Communication (URLLC)
- 5G management and orchestration
- Full Dimension MIMO
- 6/10
- Adaptive Coding and Modulation (AMC)
- Filter-Bank Multi-Carrier (FBMC)
- Frequency and Quadrature Amplitude Modulation (FQAM)