

QoS IN GSM, UMTS AND LTE

- WITH CORE NETWORK FOCUS

Course Description

The evolution of mobile networks from telephony based circuit switched services towards packet based data connectivity introduced many challenges. While traditional telephony platforms offer 'built-in' guarantees on high voice quality (it is part of the system design), the packet based (IP) platforms require careful planning, configuration and tuning in order to provide acceptable quality.

Furthermore, the convergence of data and telephony implementations towards a single (IP based) platform puts new challenges on the design, planning and configuration of the network infrastructure. This is true horizontally (end-to-end) as well as from a vertical perspective (application-mobile radio-transport level). This 'all-IP' vision is definitely implemented by the LTE 4G standards.

Connectivity across mobile IP networks is characterized by variable throughput, delay variations and different packet loss rates. These characteristics are, to a certain level, provisioned by the operator and controlled by network mechanisms in the radio and core systems. The quality on mobile IP connections (used by both telephony and data services) will affect end user satisfaction, especially for time critical services, like voice and video streaming.

This course delivers a thorough description on the new IP-centric network infrastructure and elaborates on the mechanisms for Quality of Service management in GSM, UMTS and LTE networks. Furthermore, a number of KPI are studied and the influencing attributes and parameter values are explained. This also includes intra-system and intersystem mobility in idle and connected mode for telephony and data.

The course covers important mobile network features that are important for QoS and relates them to the quality experienced by the end users.



Content

NETWORK FUNCTIONALITY, SERVICE PROVISIONING, MOBILITY, CALL/SESSION SET UP FEATURE

- GSM and GPRS radio access network and protocols
- UMTS radio access and major differences with previous generation
- The core network node for CS and PS domains
- Call set up flows to and from a mobile terminal
- Attach/Detach and location update procedures in 2G and 3G
- Mobility and connectivity states in GPRS and UMTS
- Handover and Cell change procedures in 2G and 3G
- Differences and similarities between UMTS and LTE implementations

HIGH SPEED DATA PRINCIPLES AND THEIR QoS MECHANISMS

- Procedure for RRC and RAB establishment (R99 and HSPA)
- Mobility features handover, cell selection/reselection and cell change for Data RABs

- Retransmission mechanisms on RLC and physical layer (ARQ, HARQ)
- Resource management with Admission and Congestion control, channel switching
- Scheduling and priority handling between service classes and between data users
- The role of ARP, TP and GBR/MBR in RAB definitions
- Applicable KPIs revealing the data connection qualities

IMPORTANT KPIs' ATTRIBUTES AND CONTROLLING PARAMETERS

- RRC and RAB accessibility related KPIs
- RAB retainability related to KPIs on mobility (handover/cell change, call drop etc)
- PS service integrity KPIs and their relation to down switching, BLER, re-transmissions etc.
- Parameters values that may affect quality
- KPI values and SLA issues increasing quality and user satisfaction

NETWORK DEPENDENCIES BETWEEN CONFIGURATIONS AND NETWORK BEHAVIOUR

- Cell selection and reselection parameter options
- Handover and cell change controlling parameter options
- Mobility management based on frequency/cell/service/IMSI/system level priorities
- Load balancing and dedicated second carrier for HSPA
- DHCP, lease time, address allocation and invocation, public and private IP addresses
- Inactivity and expiration timers, PDP context modification and deactivation procedures
- TCP capabilities, configuration options impact on behaviour of data connections
- Impact of operator NAT and Firewall on end user service behaviour
- Application (VPN, HTTP, VoIP etc) dependant capabilities
- APN configuration options and impact on end user service behaviour

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- Parameter options in Admission and Congestion control features

IMPORTANCE OF THE IP TRANSPORT NETWORK IN QoS

- General considerations on transport network implementations
- QoS classes, QCI and traffic handling priorities in UMTS and LTE
- Internet Protocol, IP and Diffserv mechanisms
- Carrier Ethernet in Backhaul networks
- Default QoS mapping of CS and PS on the IP transport network
- 3G/4G Base Station scheduler algorithm options for voice and data services
- Priority mapping between the services and the IP and Ethernet layers



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Target audience

The target audience of this training is strategic decision makers and radio planners within the telecom community.

Pre-requisites

The participants should have long working experience from WCDMA and GSM Systems.

Course length

3 days

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