

CORE NETWORK PLANNING – LTE/EPS AND UMTS

Course Description

The course meets the requirements from experienced professionals, dealing with operational and planning aspects of the mobile core networks. The course gives a detailed description of post-R99 system architectures, their configuration options and additional features.

Multi Operator CN and resource pooling of SGSN/MSC-S/MME and S-GW are explained. The new systems for operator centric services, like PCRF and CSCF and IP enabled QoS across the UMTS and LTE core and radio infrastructures are also described.

The evolution of UMTS towards HSPA advanced and LTE is described in terms of overall system architectures, protocols and operational features.

The course addresses the implementation options offered by the increasingly IP centric core network and discusses the challenges facing the Core Network Engineers.

In addition, the course focuses on CN design, dimensioning and planning issues, including all relevant internal interfaces and inter-operator interconnects.

Furthermore a number of PS and CS traffic cases are explained and service interworking and continuity across system generations are clarified and discussed.

Content

Post-R99 UMTS system architecture

- Softswitch based core network domain for 2G and 3G
- 3G Direct Tunnel for the PS domain
- Pooled SGSN and MSC resources
- HSDPA and HSUPA impact on UTRAN and CN



PS CN domain

- Principles for end to end IP connectivity in UMTS and GPRS
- The use of APN, secondary PDP context and service aware control in PS CN domain
- International roaming and operator interconnect
- Dependencies between UTRAN and Core Network

CS CN domain

- Mobile softswitch with MSC servers (MSC-S) and MGW
- End-to-end call setup examples in CS domain
- CS transcoding, International roaming and operator interconnect
- Dependencies between UTRAN (RNC) and CS CN

Protocols and functions for IP based interfaces in UMTS

- Iub/Iur interfaces for control and user planes
- Iu and intra-CN interfaces for CS and PS core domains
- SIGTRAN implementation in UMTS
- Requirements on Iu interfaces for Multi Operator CN implementations

UMTS QoS and traffic separation for IP transport

- Matching the UMTS QoS classes with IP traffic classes
- DSCP mapping and UMTS node classification requirements
- Priority, packet loss and delay requirements in traffic separation

Implementation of MOCN, Multi-Operator Core networks

- Iu CS/PS configurations in MSC/SGSN
- Dependencies between flexible Iu, 3G DT and pooled CN resources
- National and International roaming scenarios using flexible Iu (2G-3G and 3G-3G)

Evolution of UMTS and 4G/LTE

- HSPA advanced and above: introducing VoIP and all-IP CN
- 4G/LTE: CN upgrade paths and new radio standards
- Abandoning CS Domain technology while maintaining existing service portfolios

LTE, long term evolution (or 4G)

- LTE network architecture and protocols
- EPC (LTE core network) architecture and functions
- Service interworking between 2G/3G and LTE
- Mobility management in LTE networks
- Inter-System mobility and service continuity

EPC, Evolved Packet Core features and protocols

- MME, S/P-GW, HSS and PCRF system functions
- S1-AP and GTP-C context and procedures in LTE
- Policy, charging and control procedures in LTE
- LTE QoS class indicators QCI
- VCC, Voice Call Continuity and CS fallback/interworking
- QCI mapping into 3G QoS classes and IP DSCP values
- Authentication and security in EPC
- Instant messaging vs. SMS services in LTE and 3G
- USIM/ISIM and service provisioning issues

Core Network planning principles

- Core Network planning process
- Traffic planning and modeling
- Subscriber distribution in terms of CS and PS traffic.
- Definition of traffic cases in the traffic model.
- Calculation of CS and PS traffic distribution/dispersion.

Design and Dimensioning of CN resources

- MSC/SGSN Pool dimensioning principles
- MME/SGW pool dimensioning principles
- Dimensioning of the nodes in the CS domain: MSC Server and MGW.
- Call control and bearer control links in CNPS and EPC domain.
- PS network topology design and dimensioning process
- Signaling network design process.
- Explain signaling volumes calculation based on defined traffic model.
- Signaling link dimensioning for TDM, ATM and IP signaling link.
- Consideration for interconnect planning to other CS and in PS CN
- IPX interconnect to 3G/4G all-IP roaming services

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- Processor capacity and factors that impact processor capacity.
- Intelligent Network planning process.
- IN network nodes and link dimensioning.

Traffic cases

- Combined 3G/LTE registration and mobility
- 3G data Session setup procedures
- Mobile phone call set up (VoIP call session initiation)
- Interworking and service continuity 2G/3G/4G
- Roaming interconnect for CS and PS
- Mobility: Paging and location update procedures
- Handover within UTRAN and Inter-RAT mobility

Target audience

The course targets core network engineers and planners with the task of planning and implementing the mobile system standards based on 3GPP LTE.

Pre-requisites

The participants should have a good understanding and working experience from WCDMA and GSM Systems.

Course Length

5 days

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