

5G System Overview incl. Mission Critical Communication in 5G

CONTENTS

The 5G System Overview provides a solid technical understanding of the 5G System as defined and standardized by 3GPP.

The course accounts for the various aspects of the 5G System (Radio Access Network, 5G Core), nodes / functions, interfaces / reference points, basic procedures and main architectural ideas. The course explains the key 5G features, like network slicing and edge computing, and how these are used to make the 5G System more efficient and flexible than earlier generations of 3GPP networks. The ITU 5G Use Cases (eMBB, URLLC and mMTC) are outlined in terms of services and technical aspects.

This course also examines the public safety services specified by 3GPP as key applications within the Mission Critical use case for 5G networks.

It begins by detailing the stringent Quality of Service requirements of critical communication services, followed by an analysis of 5G Standalone (SA) network capabilities designed to meet these demands. The 3GPP Mission Critical system architecture is introduced, along with the specific 5G SA features — in both the access and core domains — that enable low-latency, high-priority communication for fast-response verticals.

TARGET AUDIENCE

This course is intended for technical professionals that need to understand the 5G System from a technical perspective.

This course is intended for technical professionals involved in the design, deployment, or operation of mission critical and public safety communication systems for the law enforcement agencies, police forces, defence organisations, and contingency or disaster response agencies.

PREREQUISITES

General technical knowledge of LTE/EPS/4G is highly recommended.

Participants are expected to have a technical background. Basic knowledge of the Standalone 5G system architecture will enable them to fully benefit from this course.

5G System Overview

- What is 5G and why?
- 5GPPP, ETSI and ITU requirements for 5G
- ITU 5G Use Cases – eMBB, URLLC and mMTC
- Primary 5G Verticals
- 3GPP 5G standardisation development: from R15 to R18 and onwards

5G Architecture Overview

- End-to-end Client-Server model
- Key benefits of Virtualization

5G Access Networks

- 5G New Radio: general characteristics and features
- NG-RAN: gNB: functionalities and deployment options – split gNB, CUPS in NG-RAN, Open-RAN
- E-UTRAN in 5G: Dual Connectivity options, Non-Standalone and Standalone deployments
- Other Access Networks: WiFi, Satellite, wireline

5G Core Network

- The new Service-Based Architecture (SBA)
- NF Services and Service Based Interfaces
- New 5GC Networks Functions (NFs): AMF, SMF, PCF, AUSF, UDM, UPF, NEF etc.
- Virtualization of the 5G Core Network Functions
- Basic traffic cases: Registration and PDU Session setup

5G User Plane

- Basic definitions: PDU Session, SSC Modes, SDF, QoS Flow, PSA
- PDU Session: Session Attributes, Session types and features – Multi-Access, Sessions with multiple PSAs
- User Plane QoS: 5QI, QoS parameters distribution from CP to UP
- User Plane routing: UPF chaining, DNAI selection principles

Examples of 5G Features

- APIs and Service Influencing
- Network Slicing
- Edge Computing
- Local Area Data Networks
- Time-Sensitive Communication

The Network Slicing Feature

- Dividing physical resources into logical networks
- Network slice data model: S-NSSAI, slice instances, slice selection
- Network slicing for different use cases

Applications in 5G

- Voice over 5G
- Advanced Data Services
- IoT Applications
- Vertical example: Mission Critical

Introduction to Critical Communication and Public Safety Services

- Examples of critical communication applications
- Critical communication service requirements
- Public Safety Services as an application within the critical communication services family
- Public Safety systems currently in use

Mission Critical/Public Safety in 3GPP

- Timeline of the 3GPP specifications for Mission Critical/Public Safety (MC/PS)
- Basic 3GPP definitions for the Mission Critical service components
- Suitability of the 3GPP 4G and 5G for MC/PS
- 3GPP features for MC/PS support introduction

Architecture for Mission Critical Services in 3GPP

- Client-Server communication over 3GPP networks for MC/PS
- UE support: MC Services Client
- MC Server: Common Services Core and MCX Server
- MC Control:
 - Identity management
 - Group management
 - Configuration management
 - Key management
 - Location management
- MCX Registration Procedure

- Definition of MCX Services: MCPTT (Push-To-Talk), MCVideo, MCDData

Mission Critical Push-To-Talk (MCPTT) service

- MCPTT definition
- MCPTT vs. legacy Telephony Service
- MCPTT Call types
- MCPTT Architecture
- MCPTT group call establishment
- Floor Control for MCPTT group calls

Mission Critical Video (MCVideo) service

- MCVideo Definition
- MCVideo Architecture
- MCVideo Group Call Establishment

Mission Critical Data (MCDData) service

- MCDData Definition
- MCDData Architecture

Radio Support for MCX in 5G

- New Radio access
 - 5QI settings for MCX
 - NR features to support Low Latency
 - NR features to support High Throughput
 - NR features to support High Reliability
- WiFi access
 - Multi-Access PDU Sessions for WiFi Offload
 - Access Traffic Steering, Switching and Splitting
- Satellite access coverage options

Network Support for MCX in 5G

- 5G features for MCX support
 - Network Slicing
 - Edge Computing
 - Multicast Broadcast Services (MBS)
 - Private Networks

MCX Enablers in 3GPP

- IMS Control for MCX
- Proximity Services (ProSe)