| Vendor: | .il SPLOTY | System: | 5G |
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| Level: | **Intermediate** | Duration: | **4 days** |
| Course Title: | | | |

# 5G System Overview

## Description:

This training is an excellent choice for engineers who have already gained experience with previous generations of mobile technology and begun to work with the new 5G system. Training maintains an appropriate balance between the topics related to 5G CN, NG-RAN (radio part) and 5G based teleservices, giving the opportunity to understand the system as a whole. This training also provides required background knowledge needed to fully participate in more advanced training sessions focused on particular subsystem or network element issues.

## Target audience:

The course is intended for 5G system technical staff and their management.

## Contents:

**Introduction**

3GPP mobile network evolution, 5G system performance, technical/business use cases

**Architecture**

5GS service based and reference point architecture, UDM, UDR, UDSF, 5G-EIR, AMF, SMF, UPF, multiple Packet Session Anchors, Session and Service Continuity, SMS over NAS, PCF, AF, IMS/VoLTE support, interworking with LTE/EPC, NEF, NWDAF, AUSF, N3IWF, NRF, LADN, international roaming, GTPv1-U tunnelling, protocol stacks; identifiers: SUPI/IMSI, SUCI, PEI/IMEI, 5G-GUTI, GPSI/MSISDN/external identifier, Internal-Group Identifier, External Group Identifier, DNN, DNAI

**PDU sessions & QoS**

PDU Session types, QoS Flows, QoS Rules & PDRs, QoS profile: 5QI, non-GBR, GBR and delay critical GBR characteristics; ARP, RQA, notification control, UE-AMBR, Session-AMBR, UPF traffic processing, Forwarding Action Rules, QoS Enforcement Rules, Usage Reporting Rules, Support for Edge Computing,

**Network Slicing**

Network slicing concept, UE's multiple network slices, S-NSSAI and NSSAI, network slice instances, subscription parameters, UE Configuration, AMF selection, PDU session establishment and SMF selection, Network Function Virtualisation (NFV), TNL associations, RAN virtualisation,

**Traffic Cases**

RM states: RM-REGISTERED and RM-DEREGISTERED states, TA/TA list management, CM states: CM-CONNECTED with RRC-CONNECTED state, CM-CONNECTED with RRC-INACTIVE state, CM-IDLE, selective (de)activation of U-plane connections, UE reachability in CM-CONNECTED, RAN-based Notification Area (RNA) and paging, MICO mode, procedures: Registration, UE Triggered Service Request, Network Triggered Service Request, AN Release, PDU Session Establishment, SMS, Xn-based Handover, N2-based Handover, N26-based 5GS to EPS handover

**Security**

User identity confidentiality; Authentication and Key Agreement (AKA); NAS, RRC and user data ciphering and integrity protection, mobile equipment identification

**NG-RAN**

Separation of gNB-CU and gNB-DU, Separation of gNB-CU-CP and gNB-CU-UP, F1 and E1 interfaces, fronthaul options (CPRI, eCPRI, nFAPI), F1/E1 procedures: F1 startup and cells activation, gNB-CU-UP E1 Setup, UE Initial Access, Inter-gNB-DU Mobility, RRC-CONNECTED to RRC-INACTIVE state transition, RRC-INACTIVE to other RRC states transition,

**NR**

Frequency bands (FR1/FR2), Carrier Aggregation(CA) & Supplementary Uplink (SUL), OFDMA, multiple numerologies, channel bandwidth, FDD/TDD, dynamic TDD, frame structure, Resource Element (RE) & Resource Block (RB), Bandwidth Part (BWP), ARFCN, cell search, SSB blocks, reference signals, MIMO, digital and analogue beamforming, beam sweeping, resource allocation methods

**DSS**

Spectrum sharing alternatives (static sharing, re-farming, dynamic spectrum sharing), DSS support in 3GPP standards, deployment alternatives (MBSFN, mini-slot, rate matching), SSB transmission in DSS (non-MBSFN and MBSFN scenario), 3GPP features required for DSS, impact on System Information (SI), capacity

considerations (PDCCH capacity, PDSCH capacity), cell resource coordination, DSS deployment phases.

**Multi-RAT Dual Connectivity**

MR-DC types: NR-DC, EN-DC, NGEN-DC, NE-DC, bearer types, traffic cases

# Prerequisites:

The participants should have general technical telecommunications/computer science knowledge on a degree level. Knowledge about LTE is very useful.

# Training method:

Lectures and multimedia presentations.