5G (SA) RAN Signaling and Operations

5G_307x | Expert-Led Live | 5G Access | ✿✿✿
Course Duration: 3 days

This course takes an in-depth look at the life of a 5G device in the context of Standalone (SA) option 2 deployment. It describes successful scenarios through signaling call flows. It steps through key operations such as power up and system acquisition, RRC connection setup, bearer setup with 5G NR, and DL and UL operations on 5G NR. This course covers key operations through call flows with details of major messages and their key parameters. The course helps students with an in-depth understanding of successful call flows for Option 2 based signaling and bearer paths.

Intended Audience

This detailed technical course is intended for engineering, RAN performance, and operations related job functions who need to get an in-depth understanding of signaling procedures of SA NR with the 5GC deployment.

Objectives

After completing this course, the student will be able to:

- Step through the life of a 5G UE in SA (Option 2) deployment
- Identify steps of preparing to monitor 5G cell and 5G network acquisition
- Identify steps of RRC connection setup with the gNB
- Identify key steps of registering and setting up PDU session in SA
- Explore the role of beamforming in DL and UL traffic operations
- Step through the handover and mobility operations

Course Prerequisites

5G NR Air Interface

Outline

1. 55G SA (Option 2) Network
1.1 End-to-end SA Architecture
1.2 Use of Interfaces: NR, N1, N2, N3, Xn
1.3 Role of protocols like PHY, MAC, RRC, PDCP, etc.
1.4 NR Numerology and Frame structure
1.5 Use of DL and UL Physical signals and Channels
1.6 Role of Beamforming and MIMO
Exercise: 5G SA Operations

2. 5G Cell Acquisition and RACH Procedure
2.1 Synch Raster and Synchronization
2.2 Cell ID and Beam ID Detection
2.3 MIB and System Information Blocks(SIBs)
2.4 Random Access Operation
2.5 UE and gNB Timing Alignment
2.6 RRC Setup and Indication for Network Slice
Exercise: 5G Cell Acquisition

3. Registration and PDU Session Setup
3.1 Registration and Authentication
3.2 AMF, SMF and UPF Selection
3.3 AS and NAS Security
3.4 QoS Parameters in 5G
3.5 PDU Session Setup
Exercise: Registration and PDU Session Setup

4. Traffic Operations in DL
4.1 CSI-RS Measurement Configuration
4.2 Feedback - CQI,PMI,RI,CRI,LI
4.3 Resource Allocation for DL
4.4 CSI-RS reports for Beam Selection and for MCS
4.5 Carrier Aggregation and Band combinations
Exercise: Traffic Operations in DL

5. Traffic Operations in UL
5.1 Scheduling Request (SR) & BSR
5.2 Resource Allocation for UL
5.3 UL Power Control
5.4 DCIs for UL operation
Exercise: Traffic Operations in UL

6. Handover and Idle Mode Operations
6.1 Beam Management - Switching, monitoring
6.2 MAC CE changes of TCI state
6.3 Xn and N2 based Handover
6.4 Idle Mode Mobility
Exercise: Handover and Idle Mode Operations

Final Assessment