



# 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. 5G 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 MIMOExercise: 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 SliceExercise: 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 SetupExercise: 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 operationExercise: 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 MobilityExercise: Handover and Idle Mode Operations

Final Assessment