# 5G Standalone Architecture and Features

## CONTENTS

This course provides an overview of the 5G Standalone (SA) network architecture and features as specified in the 3GPP standards.

It examines the architecture and key components of both the Access and Core Networks, addressing deployment scenarios for Non-Standalone (NSA) and Standalone (SA) modes.

The course concentrates on the advanced 5G SA capabilities – including features that support the transmission of voice, video, and data from a diverse set of applications with varying traffic characteristics, and those features that enable operators to deploy and manage the network in a cost-efficient and scalable manner.

## PREREQUISITES

Technical knowledge of mobile telecom is strongly recommended. A solid understanding of 4G LTE/EPS will be highly beneficial.

## Introduction to 5G

- Expectations and requirements
- 5G Use Cases
- Evolution of the 3GPP standards for 5G since R15

## 5G Network Architecture

- 5G network architecture: access networks and core network
- UE and external data networks
- Deployment options: Non-Standalone (NSA) and Standalone (SA)
- Network Functions Virtualisation (NFV) as a tool to implement the 5G System (5GS)
- 5G UE Identifiers

## 5G Access Network

- NG-RAN: 5G New Radio, NR
    - NR Frequency bands for 5G: FR1 and FR2 (mmWave)
    - Comparison of the NR and E-UTRAN characteristics
- NG-RAN: gNB
    - gNB functionalities
    - Centralized Radio Access Network (C-RAN) deployment option
    - Open-RAN (O-RAN) deployment option
- LTE/E-UTRAN access in 5G
    - Dual connectivity: single-RAT and multi-RAT
- Satellite Access in 5G
- Non-3GPP Access Networks
    - Untrusted WiFi
    - Trusted Wifi
    - Multi-access PDU sessions for WiFi Offload
    - Wireline/Fixed

## 5G Core Network

- 5G Core Network (5G CN) Architecture
    - Service Based Architecture (SBA) principles
    - 5G CN Network Functions (NFs)
    - 5G CN roaming architecture
- Network Functions Virtualisation in 5G CN
- Basic signalling procedures
    - UE Network Access: 5G Registration
    - UE Service Access: PDU Session Establishment

## The 5G User Plane

- UP resources in 5G
  - Basic definitions: QoS Flow, Service Data Flow (SDF)
  - 5G QoS parameters: 5QI
  - 5G Routing rules: traffic steering and influencing
- PDU Session
  - Attributes
  - Session types and the corresponding use cases

## Advanced 5G network capabilities for enhanced service handling

- Traffic Steering and Service Influencing via NEF: 5G APIs
- Network Slicing
- Edge computing
- Private Networks
- Local Area Data Networks
- Time Sensitive Communication

## Application-specific support in 5G

- Telephony Service support
  - IP Multimedia Subsystem (IMS) control
  - EPS/RAT fallback procedures
- Advanced Data Services support
  - Sessions with multiple PSAs
  - Localised Services
- Internet of Things (IoT) support