

# Essentials of Cloud RAN

Understanding evolution of the mobile radio access network

## Overview

Over recent years we have seen the evolution of the radio access network from large, bulky & power-hungry platforms to much more space-friendly form factors. This has been combined with the separation of the baseband functions (BBU) and the radio functions (RRU) allowing for flexibility and supported by fibre interconnect, known as “fronthaul”.

This program provides an explanation of the evolution of the radio access network to the Cloud RAN (C-RAN) architecture, describing why this is needed to support 4G/LTE-A and 5G systems, the cloud and virtualization aspects plus the development of standardized fronthaul networking.

## You will be able to

- Explain the key concepts of fronthaul & Cloud RAN
- Understand the evolution & standardization process for 4G/LTE-A and 5G
- Describe the Cloud RAN architecture
- Outline key radio features that can benefit from Cloud RAN deployments
- Explain the requirements to support a Cloud RAN architecture
- Describe issues related to Cloud RAN deployment
- Explain the operation of CPRI and eCPRI protocols
- Discuss options for implementing fronthaul using a packet-based network infrastructure

## Who can benefit

Technical managers, consultants, engineers and communications professionals who need to understand and familiarize themselves with future trends of Cloud RAN network deployment.

## Pre requisite knowledge

Participants should have a good understanding of cellular communications

## Course Outline

### Review of Mobile Radio Access Networks

- Overview of the radio access network
- Indoor, outdoor & small cell topologies
- Functions of the base station
- Inter base station communications
- Separation of the Baseband (BBU) and Radio (RRU)
- Distributed antennas

### LTE-A Key Features

- LTE-A overview
- Demand for higher speed
- System capacity limitations
- Improvement mechanisms
  - Carrier Aggregation (CA)
  - LTE-A High Order MIMO
  - Massive MIMO & beamforming
  - LTE-A Coordinated Multipoint
  - LTE-A Relay Node
  - LTE-A HetNet and eICIC
- Impact on bandwidth requirements

### 5G System Architecture

- Roadmap for 5G
- ITU-R IMT-2020 plan
- Key drivers
- Non Standalone (NSA) and Standalone (SA)
- Changes/upgrades to existing network
- Enabling Technologies
- New Radio (NR) Features
- Candidate technologies & enhancements
- Use of mmWave frequencies
- Extensions of SON

### Cloud RAN Architecture

- Issues with current radio access networks
- The rationale for Cloud RAN
- Typical Cloud RAN architecture
- Function & operation of the Baseband Unit (BBU)
- Function & operation of the Remote Radio Unit (RRU)
- The fronthaul network
- Virtualization, NFV and SDN
- Virtualizing Baseband Units
- Integrating with a NFV architecture
- Working in an SDN control environment
- Benefits of deploying Cloud RAN
- Issues with Cloud RAN

### Fronthaul Networking

- Bandwidth requirements of advanced radio features
- Limitations of existing solutions
- The CPRI (Common Public Radio Interface) protocol
- Standardisation issues
- The evolution of CPRI to eCPRI
- Performance & efficiency improvements
- eCPRI protocol operation
- Utilization of packet based architectures for fronthaul (e.g. Ethernet/MetroEthernet)

### Final Assessment

DURATION 2 days

MAXIMUM CLASS SIZE 12