

# 5G NR Air Interface Overview - Part I

5G promises to enable a variety of new services, ranging from high-speed, high-capacity broadband access to ultra reliable low-latency communications to massive machine-type communications. To deliver on these promises, the wireless network must change, including the devices, the radio interface, the radio access network (RAN), and the core network. Part I of this on-demand course offers a high-level technical overview of 5G NR (New Radio) air interface – its features, the use of low-mid-high band spectrum, the reuse of the principles of OFDM/OFDMA, and the use of massive antennas for beamforming and MIMO. Part II covers the flexible numerologies, channels and frame/slot structure, and steps through the life of a 5G UE.

## Intended Audience

This course is designed for a broad audience of wireless network engineers. This includes those in RF, RAN planning, engineering, operations, troubleshooting and support groups.

## Objectives

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

- List the performance goals of the 5G network
- Compare the different 5G frequency spectrums and their characteristics
- Describe MIMO and the beamforming techniques used in 5G
- List the key features of the 5G NR air interface
- Sketch the flexible frame and slot structure of 5G NR

## What You Can Expect

- Self-Paced Duration: 1 HOUR

## Outline

### 1. 5G Scenarios and Performance Targets

- 1.1 Higher data rates
- 1.2 Lower latency
- 1.3 Higher connection density

### 2. 5G NR Air Interface Enhancements

- 2.1 Key features of 5G air interface
- 2.2 Flexible numerologies
- 2.3 Air interface protocol stack

### 3. Frequency Spectrum for 5G

- 3.1 Spectrum considerations
- 3.2 Low, mid, and high bands
- 3.3 Channel bandwidths
- 3.4 Radio signal propagation

### 4. MIMO and Beamforming

- 4.1 Massive antenna
- 4.2 Beamforming and beam tracking

### 5. Protocol Stack of 5G NR

- 5.1 Protocol Stack Enhancements
- Exercise: Protocol Stack

### 6. 5G Operating Bandwidth

- 6.1 Channel bandwidths
- 6.2 Use of OFDM

### 7. 5G NR Frame and Slot Structure

- 7.1 Flexible sub-carrier spacing
- 7.2 Flexible frame and slot structure
- 7.3 Carrier bandwidth part

### 8. Numerology

- 8.1 Importance of numerology in 5G NR
- Putting It All Together