

Course ID	Course Title
5G-SEC-ST	5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features
Course Duration	
3-4 days	
Aimed At	<i>5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features</i> is aimed at technical professionals in the commercial, homeland security, or defense sectors.
Prerequisites	<i>The 5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features</i> course requires prior knowledge of 5G wireless such as may be acquired by taking the Eogogics course <i>5G Wireless Technology/Applications</i> (5GTA, 5 days).
Related Courses	<ul style="list-style-type: none">• <i>5G New Radio Training</i> (5G-NR, 2-3 days)• <i>5G Radio Network Technology Training</i> (5G-NET-TECH, 3-4 days)• <i>5G Wireless Training: Layers 1, 2, 3</i> (5G-TF1, 4-5 days)• <i>5G RAN Training: Technology & Planning</i> (5GTUTE, 5 days)• <i>5G Wireless Technology/Applications</i> (5GTA, 5 days)• <i>5G Wireless Priority Services Training</i> (5G-PRIOR1, 3-5 days)
Course in a Nutshell	This course, <i>5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features</i> , undertakes a deep-dive into topics of interest to Defense and Homeland Security professionals including 5G NR Network Architecture, 5G Security, 5G D2D Support; Proximity Services, 3GPP Internet of Things (IoT), and 5G NR Advanced Features. The topics that are part of this course are continually updated to synch with the evolving state-of-the-art of 5G Wireless.
Customize It!	We can tailor the included topics, tech level, and duration of <i>5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features</i> to your team's technical requirements.
Outline	<i>5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features – 5G Basics</i> <ul style="list-style-type: none">• What is 5G• End-to-end 5G ecosystem• 3GPP standards for 5G: Features and technical proposals

- ITU IMT-2020

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - 5G Technology Overview

- 5G technical objectives and major use cases
- 5G requirements for RAN: Bandwidth, power, spectral efficiency, new technology adaptation, latency, signaling load, capacity, coverage, interference, mobility
- 5G requirements for Core: Network topology, cloud architectures, big data analytics

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - 5G NR Network Architecture

- 5G NR architecture options
- Architecture
 - gNB and ng-eNB functionalities
 - AMF functionalities
 - AMF functionalities
 - UPF functionalities
 - SMF functionalities
- 5G network interfaces
 - NG interface
 - Xn interface
- 5G radio protocol architecture
 - Control plane
 - User plane
- RAN-core interfaces

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - 5G Security

- 5G security requirements
 - Security business models in 5G
 - Security threats for 5G
 - Security principals for IOT
 - UE security requirement
 - gNB security requirement
 - Core network security requirement
- 5G security overview and principles
 - 5G NR security termination points
 - Security in state transition and mobility
- 5G security architecture

- 5G security infrastructure
- PHY layer security
- 5G RAN security
- Service level security
- PDU session user plane security
- Automated security management and control framework
- 5G security procedures
 - 5G UE authentication and key management
 - Authentication framework
 - Authentication procedures
 - Key management
 - Key hierarchy
 - Key derivation and distribution
 - Security context
 - NAS security mechanism
 - RRC security mechanism
 - Security handling in mobility
 - Security of dual connectivity
- Other 5G security services
 - Security based interfaces
 - Security management of network slicing
 - Security for non-3GPP access
 - EAP method authentication
 - Hash functions

***5G Training: Security, D2D Support, Proximity Services, IoT,
Advanced Features - 5G D2D Support; Proximity Services (ProSe)***

- Proximity services architecture model
 - ProSe function
 - ProSe identifiers
- RAN Aspects of ProSe
- ProSe stacks
 - Control plane
 - User plane
- ProSe discovery
 - EPC Level ProSe discovery
- ProSe communication procedures
- Security aspects of ProSe
- ProSe security features
 - ProSe discovery security
 - ProSe One to Many Communication Security
 - ProSe One to One Communication Security
 - ProSe Public Safety Discovery Security

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - 3GPP Internet of Things (IOT)

- 3GPP Rel. 13 IOT market requirements
 - Enhanced Machine Type Communication (eMTC)
 - Narrow Band IOT (NB-IOT)
 - EGPRS and GSM IOT (EC-GSM-IOT)
 - Comparison
- eMTC
 - Objectives of eMTC
 - Deployment of eMTC
 - Main PHY and RF features of eMTC
- NB-IOT
 - Objectives of NB-IOT
 - Radio characteristics and protocols
 - NB-IOT modes of operation
 - Stand-alone
 - Guard Band
 - In-Band
 - PHY features
 - Frame structure
 - Reference signals
 - Synchronization signals
 - NB-IOT channels
 - Downlink operation
 - UpLink operation
 - Random access
 - Cell access
 - Mobility
- EC-GSM-IOT
 - Objectives of EC-GSM-IOT
 - PHY features
- Core network features for IOT
- IOT security
- Device categories
- Rel 14 IOT enhancements
 - eMTC enhancement
 - NB-IOT enhancement
 - EC-GSM-IOT enhancement
 - Enhanced DRX
- IOT advancement
 - Further eMTC (FeMTC)
 - Enhanced further eMTC (eFeMTC)
 - Enhanced NB-IOT (eNB-IOT)
 - Further enhanced NB-IOT (FeNB-IOT)

- IOT dual connectivity

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - 5G NR Advanced Features

- Advanced MIMO and beamforming
- 3D beamforming and diversity
- V2X features
- Ultra-Reliable Low Latency (URLLC)
- Non-Orthogonal Multiple Access (NOMA)
- NS-SS (Spectrum Sharing)
- LAA / eLAA / MuLTFire (NR-U)

5G Training: Security, D2D Support, Proximity Services, IoT, Advanced Features - Wrap-up: Recap and Discussion

DCN PnTK-f