

5g Essentials Training

Alta3 Research Authorized Training · Applied Technology Academy

5G is the next-generation of mobile networks beyond the 4G LTE mobile networks existing today. The vision of 5G is becoming clearer and most experts say 5G will feature network speeds that are blazingly fast at 20 Gbps or higher and have low latency at mere milliseconds. The entire 5G approach takes advantage of containers, virtualization, microservices, AI, SDN and NFV.

LEVEL	DURATION	EXPERIENCE	AVERAGE SALARY	LABS
Intermediate	3 Days	None	\$134,944	Yes

Course Overview

- **Day One, this course covers just enough of the basics to understand how mobile telephony has changed over the past 27 years and where it is today. Students will cover the architectures of 2G to 4G networks, and 4G to 5G, learning why each new generation was needed, what changed, and what remained with each new generation.**
 - Days two and three will cover in detail, the design motivation and underlying technology of 5G service-based architecture as well as new vocabulary terms. We will cover enough about 5G radio to understand the differences between 4G and 5G, and finally, take a look at the 5G core in action. Sample message flows of typical 5G processes are covered message by message. The goal is to clearly see how 5G accomplishes its goals by observing how it actually works.

Course Outline

Introduction

You will gain exposure to the entire course contents in a very high-level course overview. You will also learn how to access additional information to stay current with 5G.

5G vs 4G features

Mobility essentials:

- Visiting
- Home
- Roaming
- Control Plane
- User Plane
- 5G EN-DC
- 5G Stand Alone
- 5G Options
- LTE vs New Radio

- How to obtain additional 3GPP information about 5G
- New Radio
- New Radio is the replacement for LTE. Learn the differences and similarities between NR and LTE here.
- Understanding why we need these three very different spectrums sub 1 gig
 - mid band
 - millimeter waves
- Priority Sectors in New Radio
- Beamforming
- Pilot Signals
- SU-MIMO vs MU-MIMO
- Massive mimo
- Densification
- Industrial Applications NB-IoT and LTE-M
- 5G Massive Machine Type Communications
- 5G EN-DC Radio Access Network Architecture

You will extend the EN-DC core into the Radio Access network. You will diagram message flows within the 5G EN-DC network. You will learn practical applications for sub gig to millimeter wave RF spectrum.

- eNodeB Baseband Unit (BBU)
- Remote Radio Head (RRH)
- gNodeB Control Unit (CU)
- Distributed Unit (DU)
- Remote Unit (RU)
- Small Cell
- Front/mid haul architecture Common Public Radio Interface (CPRI)
- Centralized Radio Access Network (C-RAN)
- Cloud-RAN
- Bearer components in the E-UTRAN
- Bearer components in 5G EN-DC
- 5G EN-DC Call Flow Exercises 4G Access Stratum Call Flow
- 4G Non-Access Stratum Call Flow
- Authentication Essentials
- X2 handoff to gNodeB
- User Plane essentials
- 5G EN-DC Core Architecture

You will study the core components of the 5G EN-DC network, also known as 5G Non-Stand Alone (5G NSA). Emphasis will be on the interoperability of architecture components and flow paths. Using network diagrams, you will plot the pathway of both user plane and control plane components.

- RAN architecture
- Evolved Packet Core in a 5G network
- Authentication center (AUC)
- Equipment identity register (EIR)
- Service Gateway (SGW)
- Packet Data Network Gateway (PGW)
- Mobility Management Entity (MME)
- 5G EN-DC Topology LAB Exercises Control Plane message pathways
- User Plane message pathways
- IMS Integration

You will learn how the IMS network is integrated into 5G. While study of the IMS is a 5-day class itself, this section will review the role of the IMS, cover a few of the major components, and illustrate what components of the IMS change when integrating into a 5G network.

- The role of the IMS
- Protocols SIP, Diameter, DNS (enum), RTP
- IMS core Essentials P-CSCF
- I-CSCF
- S-CSCF
- SCC
- TAS
- HSS
- MRFC/MFRP
- PCRF
- IMS Call control and media paths
- 5G IMS integration
- IMS Exercise Call control path
- RTP packet path
- Lab exercise IMS call flow in a 5G network
- 5G Stand Alone (SA)

Up to now you have been studying 5G EN-DC or Non-Stand Alone. Now you will learn the massive changes that arise with the implementation of 5G Stand alone. Many powerful features become possible only if 5G SA is deployed.

- 5G Services

- AMF and SMF control functions
- NSSF, AMF selection and slice access.
- NEF, AF and service exposure
- NRF and service discovery
- Database and DB frontend services UDR
- UDM
- AUSF Service including: SUCI - Subscription Concealed Identifier
- SUPI – Subscription Permanent Identifier
- PCF
- SEPP – Security Edge Protection Proxy Certificate of Authority Concerns
- gNodeB, NG-AP, and the 5G core network interfaces
- Comparing SA vs NSA (Stand Alone vs Non-Stand Alone)
- EN-DC and X2-C messaging
- IMS integration
- Slicing
- 5G Stacks

A review of the Protocols in the 5G architecture. Many 4G protocols continue into 5G with a few very important additions that are described in this section. Security personnel in particular need to pay close attention to this section.

- Transport NAS and SMS over HTTP
- PDU Session
- N2 Interface
- NG Application Protocol (NGAP) TS 38.413
- Session Management Function
- N11 Interface
- Interworking with the EPC (TS 23.501 - 4.3.1.1)
- 5G Cloud Based Services
- Service operation naming
- Container-based Design of SBA (1 of 2)
- Container-based Design of SBA (2 of 2)
- HTTP Reverse Proxy
- HTTP/2
- JSON

Intended Audience

Anyone who needs a high-level overview of complete 5G rollout, Management, Planners and Project Managers

Job opportunities in 5G technology will be available in various sectors, from telecommunications and IT infrastructure to health care, education, and manufacturing. Additionally, 5G technologies will open up opportunities for new roles in software development, cybersecurity, and network engineering.

- Professionals planning to use 5G Access
- Professionals looking to merge 5G and Wifi6 radio technology

Prerequisites

There are no prerequisites for this course.

Follow-On Courses

Deploying 5G

Ready to enroll? Call 800.674.3550 or email Info@AppliedTechAc.com — private team cohorts, GSA MAS purchasing, military credentialing funding, VA GI Bill and VR&E and student financing available.