

5G-Core Interception

SYNOPSIS

- **Technology Seminar with Optional Hands-On:** gain insight to 5G Core architecture, protocols, service scenarios and collection of user/event related information.
- Focus on service based architecture (SbA) principles and detailed discussion on the service based API of important VNF (UDM,AMF,SMF,PCF,NRF,AUSF,UDR,5G-EIR,SMSF,NEF).
- Focus on passive and active interception on Sbi interfaces and on Core-RAN interfaces including cross-interface correlation of addresses and identities.
- Discussion on Inter-System mobility (EPC-5GC) and UE degradation to 4G.

DURATION

- 5 Days

PREREQUISITES

- LTE Essentials seminar or equivalent knowledge.

TARGET AUDIENCE

- Software engineers, tester, system architects, electronic warfare and interception engineers.
- Field engineers, troubleshooters, technical staff responsible for O&M.

COURSE TARGETS

- The students would be able to design, develop, deploy, optimize and operate 5G Core Interception equipment.
- Gain insight to 5G Core service based API, system architecture and protocols, NF discovery & routing, API flows and important parameters.
- Understand the important 5GC service scenarios, registration, authentication and session setup, inter-node and inter-system mobility scenarios.
- Information to be gained from Core-RAN signalling and user-plane protocols.
- Understand Identity tracking and cross-interface correlation of events and parameters, and binding signalling contexts to user-plane traffic flows.
- Security in 5GC, key generation and key derivation on encrypted interfaces.

5G-Core Interception - Introduction

1. Transition to 5G and Technology Overview

- a. Evolution from EPC to 5GC – responsibilities & service concepts
- b. 5GC Service based Architecture and Interfaces
- c. New Network and Service Concepts, enhanced Capabilities
- d. 5GC Basic end-to-end Scenarios

2. 5G Core Service based Architecture

- a. Virtualization and Service Based Architecture
- b. RESTful and Open API
- c. HTTP2 based 3GPP API Principles

3. 5G Core-RAN Interfaces and Protocols

- a. NGAP Service Scenarios
- b. Mobility Cases - XNAP Mobility Scenarios
- c. Encrypted NAS dialogs – and their keys
- d. Additional insights to be gained from User-Plane Protocols
- e. End-to-end Correlation of Identities, UE Contexts & Traffic Flows
- f. O-RAN interfaces (F1,E1) and Protocols
- g. UE Location & micro Mobility visible on F1AP

5G-Core Interception - Technology & SBI

4. NRF NF Discovery Sbi

- a. NF-NF Dialog, Routing and addressing – with/without SCP
- b. Intra/Inter-PLMN NF Discovery Scenarios
- c. N_{NRF} API and **Hands-On**
- d. N_{NRF} API - Slice Selection Scenarios

5. 5GC Repositories and their Sbi

- a. Migrated 4G/5G Repositories and Interfaces
- b. SbA Repository Queries used in Service Scenarios
- c. UDM Notifications
- d. N_{UDR} , N_{UDM} , N_{AUSF} , N_{5G-EIR} API and **Hands-On**

6. AMF Subscriber Management Sbi

- a. AMF-UE Mobility Scenarios and NAS dialogs
- b. AMF Location and Reachability Scenarios
- c. AMF Secondary NAS Scenarios
- d. AMF Notifications
- e. N_{AMF} API and **Hands-On**

5G-Core Interception - User-Plane and Applications

7. SMF User-Plane Management Sbl

- a. Migrated 4G/5G Packet Core
- b. SMF-AMF-UE Session/Flow Setup Scenarios
- c. User-Plane topology Setup/Modify Scenarios
- d. N_{SMF} API and Hands-On
- e. User-Plane Protocols and N4 PFCP Flows

8. Optional: PCF/BCF Policy Influence API

- a. Access and Session Policy Influence Scenarios
- b. UE Preferences Influence Scenarios
- c. User-Plane Topology Influence Scenarios
- d. N_{PCF} and N_{BCF} API and Hands-On

9. SMS Delivery and AF Service Delivery Scenarios

- a. SMS Delivery Scenarios and T-ADS Queries
- b. N_{SMSF} API
- c. N_{NEF} API Overview and AF-NEF Service Scenarios

5G-Core Interception - Mobility/Roaming and Security

10. 4G-5G Inter-System Mobility

- a. Core Degradation Triggers (5G to LTE, 5G to 3G)
- b. PLMN/Core Selection and Cross Core Registration Scenarios
- c. IP Session Mobility/Continuity Scenarios with/without N26
- d. Identity and Security Continuation upon Inter-System Mobility
- e. VoNR/VoLTE Handover and Fallback Scenarios
- f. **N26 API Flows - Hands-On**

11. Security in 5GC and on Roaming Interfaces

- a. Security and Authorization on SbA interfaces
- b. 5GC Roaming Interfaces (HR/LBO, N3GPP)
- c. 5GC SbA Interconnect Security Architecture - **N32** flows
- d. Lawful Interception in 5GC (X1/X2 for AMF, UDM, and IMS)