



LTE RAN Operation

(ARI0001)

Course Outline

LTE RAN Operation

This four day course focuses on LTE RAN operations. ariesoGEO exercises will enhance LTE/ VoLTE theory.

Section 1 – E-UTRA Introduction

- E-UTRA Features: Radio Access, Modulation, Bandwidth and Coding.
- UE Capabilities.

Section 2 – LTE Air Interface

- Frame Structure.
- Downlink Synchronisation Signals: PSS & SSS.
- The LTE Downlink Physical Channels - PBCH, PCFICH, PDCCH, EPDCCH, PHICH.
- The LTE Uplink Physical Channels - PRACH, PUCCH, PUSCH, Uplink Data Transmission, Uplink Reference Signals, Demodulation Reference Signals and Sounding Reference Signals.
- Downlink and Uplink Timing - Timing Relationship and Timing Advance calculations.
- LTE MIMO Options.
- Carrier Aggregation.
- Requirements for VoLTE.

Section 3 – Air Interface Protocols

- Defined the use of NAS, IP, RRC, PDCP, RLC and MAC.
- Mapping Logical Channels into Transport Channels
- RNTI Identities.
- Random Access Process: Contention and Non-Contention based Random Access Procedure.

RF and Air Interface Activity

- ariesoGEO Activity: RF Aspects, LTE Lower layer, MIMO/Transmission Mode investigation, Layer 3 Spider.

Section 4 – LTE Initial Procedures

- LTE Mobility and Session Management: ECM Connected and ECM Idle, and EPS Bearer Contexts.
- LTE Identities.
- Radio Resource Control: Cell Selection, PLMN Selection and Cell Re-selection, and RRC establishment
- Initial Attach/Registration: Default EPS Bearer Establishment, and Combined Attach.
- Key eNB Messages and Triggers.

Section 5 – Defining EPS Bearers

- LTE QoS Characteristics: TFTs and Quality of Service
- Establishing EPS Bearers: Network Initiated; Activate, Modify and Delete, Mobile Initiated; Activate, Modify and Delete.
- Key eNB Messages.
- Modifying EPS Bearers.
- Releasing EPS Bearers.

Section 5 – Utilizing EPS Bearers

- Originating / terminating high speed data call: Service Request, Paging in LTE, and E-RAB and RRC Messages
- S1 Release: E-UTRAN and MME triggered

Section 6 – Circuit Switched Fallback

- CSFB Initial Procedures.
- CSFB Call Procedures: Mobile Originated and Mobile Terminated
- CSFB SMS Procedures: Mobile Originated and Mobile Terminated
- CSFB Call Delay Factors

Bearer and CSFB Activity

- ariesoGEO Activity: Bearer investigation, including connection setup, ERAB and RRC KPIs. CSFB location investigation, including layer 3 analysis.

Section 7 – VoLTE

- Basics of SIP.
- IMS Architecture.
- VoLTE Registration: SIP Registration
- VoLTE Call Procedures: VoLTE Mobile Originated Call Setup, Media Description, and VoLTE Mobile Terminated Call Setup
- VoLTE Instant Messaging: Mobile Originated and Mobile Terminated
- SRVCC and eSRVCC.
- VoLTE in the RAN.
- VoLTE KPIs.

VoLTE Activity

- ariesoGEO Activity: VoLTE usage and location investigation.

Section 8 – Air Interface Operational Procedures

- Contents of RRC MIB and SIB messages, Scheduling Options.
- PLMN selection and Initial Cell Selection algorithms, Optimization of Parameters.
- Paging and ECM Idle DRX.
- ISR (Idle Signalling Reduction).
- RRC Messages in Operation: Measurement Configuration, Mobility Control Information, and Radio Resource Configuration
- MAC Scheduling: Scheduling Uplink and Downlink Users, Scheduling Methods, and VoLTE Scheduling, SPS (Semi Persistent Scheduling)
- ECM Connected DTX and DRX.

Section 9 – X2 Interface and Operation

- X2 Functions and Protocols related to Air Interface: Mobility, and ICIC and eICIC.
- X2AP: Message Format, Messages and Key Parameters.
- GTPv1-U: GTPv1-U Header, Messages and Key Parameters.

Section 10 – LTE Air Interface Mobility

- Mobility functional architecture, role of the eNB and MME, Tracking Areas.
- E-UTRA Measurements, RSSI, RSRP, RSRQ.
- Idle Mode Procedures, LTE Idle Mode monitoring requirements.
- Cell Reselection, Priority based Reselection, Intra-Frequency measurements, Inter-Frequency and inter-RAT measurements, High and Medium Mobility States, Ranking of Cells, Tracking Area Update.
- Configuring Periodic and Event based Reporting: Timers and Thresholds
- Mobility in ECM Connected State, Measurements, Gap Configurations, Event Triggers, Timing, the Handover Process.
- Carrier Aggregation and CA Mobility.
- Inter-RAT Mobility.

Mobility Activity

- ariesoGEO Activity: LTE Mobility, Investigations.

Section 11 – LTE Parameters and Optimization

- Key LTE Coverage Plots: RSRP, RSRQ, Bearers, etc.
- Frequency Planning.
- PCI Planning: MOD3, MOD6 and MOD30.
- RAN KPI's: User/Network impacting KPIs, Accessibility, Retainability, Integrity, Mobility, Availability, RAB Performance, and Practical Targets
- Impact of VOLTE on KPI's.
- Coverage Optimization.
- Capacity Optimization.
- Optimizing Mobility.

KPI's Activity

- ariesoGEO Activity: KPIs in ariesoGEO, RF plots, PCI information and user usage plotting.

Student Activity

- ariesoGEO Activity: Free play with an expert on hand to advise.

