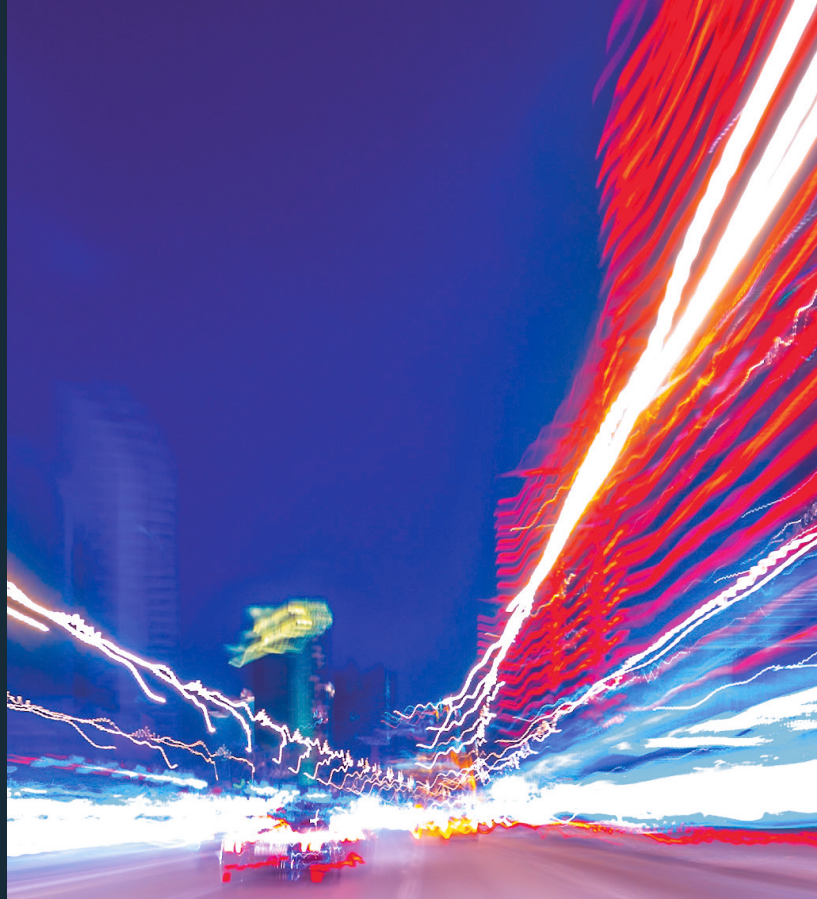




Amazing technical knowledge and retention of facts. Thank you again.



Watch our course intro video.



LTE RAN Performance and Optimization

Course Description

In this course, the main aspects of monitoring the performance of the LTE network and ensuring it is appropriately optimized are covered. This includes a recap of the LTE radio functionality, as well as exploring the main principles of performance monitoring. Areas such as Network Synchronization, call / session considerations and the main Accessibility, Retainability and Mobility KPIs will be examined. In conclusion, the subjects of Traffic and QoS Analysis, Cell Resources and Capacity Areas will be explored.

Prerequisites: LTE Air Interface

4

Days
(LiveOnsite, LiveOnline)

24

CPD Learning Credits



Level: 3
(Advanced)

This course will contain the following sections:

1. LTE Radio Functionality Recap

Topic areas covered include:

- LTE at a Glance.
- E-UTRAN / EPS Architecture and Bearers:
 - Network Architecture.
 - Bearers and Signalling Connections.
- E-UTRAN Radio Interface:
 - Key Features of LTE Radio.
 - LTE Access Schemes.
 - LTE Spectrum.
 - LTE OFDM Parameters.
- LTE Radio Frame and Channels:
 - Radio Frame.
 - Resource Allocation and Resource Blocks.
 - Downlink Physical Control Resources.
 - Uplink Physical Control Resources.
- LTE Protocol Architecture.
- LTE RRM (Radio Resource Management):
 - Radio Channel Control.
 - LTE Power Management.
 - LTE Packet Scheduling.
 - LTE Mobility.
- MIMO Techniques.
 - LTE QoS Architecture.

2. Principles of Network Performance Monitoring

Topic areas covered include:

- Network Optimization Process.
- Performance Monitoring Basics:
 - Performance Monitoring Building Blocks.
 - Counters and KPI Calculation.
 - KPI Categories.
 - KPI Level of Detail and Troubleshooting.
- Performance Monitoring Reports:
 - Capacity Report Example (Non LTE Example).
 - Black & Grey List Example.
- Field Measurements.

3. Network Synchronization Analysis

Topic areas covered include:

- Cell Synchronization Procedures:
 - Downlink Synchronization Procedure.
 - Uplink Synchronization Procedure.
- Physical Cell ID.
- PCI Planning:
 - PCI Planning Issues.
 - PCI Planning Strategies.
- PRACH Planning:
 - PRACH Physical Configuration Parameters.
 - PRACH Power Settings.
 - PRACH Preamble Generation.

4

Days
(Live**Onsite**, Live**Online**)

24

CPD Learning
Credits



LiveOnsite,
LiveOnline

Network Synchronization Analysis (cont.)

- Root Sequence and Preamble Dimensioning:
 - Preamble Groups.
 - Root Sequence Planning.
 - “Phantom” Preambles.
- Network Synchronization Performance:
 - RACH Performance.
- Network Synchronization Performance Example:
 - RACH Success Rate.

4. Call and Retainability Analysis

Topic areas covered include:

- Call and EPS Bearer Setup:
 - Default EPS Bearer Setup.
 - Dedicated EPS Bearer Setup.
 - Default EPS Bearer Activation.
- NAS and RRC States:
 - RRC States.
 - NAS States.
- Call Setup Performance:
 - RRC Connection Setup.
 - Default EPS Bearer Setup.
 - Dedicated EPS Bearer Setup.
 - Paging.
 - Call Setup Success Ratio (CSSR).
 - Additional Bearer Setup Success Ratio.
 - Voice/ VoLTE Call Setup Performance.
- Call Setup Performance Examples:
 - RRC Connection Setup Success Ratio.
- Retainability Analyses:
 - Normal Releases.
 - Abnormal Releases.
- Radio Link Failure Optimization:
 - Downlink RLF Detection.
 - Uplink Radio Link Failure Detection.
 - RRC Connection Reestablishment.
 - Radio Link Failure Parameters.
- DRX/DTX Operation Mode:
 - DRX/DTX Mode Procedure.
 - DRX/DTX Mode Parameters.

Call and Retainability Analysis (cont.)

- Retainability Performance:
 - Call Drop Rate (CDR).
 - Call Minutes Per Drop (MPD).
 - Voice/ VoLTE Retainability Performance.
 - RRC Re-Establishment Performance.
- Retainability Performance Examples:
 - UE Context Drops.

5. Mobility Control and Analysis

Topic areas covered include:

- LTE Mobility Overview.
- LTE Idle Mode Mobility:
 - Cell Selection Procedure.
 - Cell Selection Parameters.
 - Cell Reselection Procedure.
 - Cell Reselection Parameters.
 - Cell Reselection and System Information Messages.
 - Cell Reselection Absolute Priorities.
 - Idle Mode Mobility Performance Monitoring.
- LTE Connected Mode Mobility:
 - Basic Mobility Between LTE Cells.
 - Mobility to other RAT (IRAT).
 - UE Measurements.
 - Connected Mode Mobility Parameters.
 - Connected Mode Mobility Performance Monitoring.
 - Other Mobility Performance KPIs.
- Voice Call Mobility in LTE/EPS:
 - Voice Mobility in IMS Scenario.
 - Voice Mobility using SRVCC Scenario.
 - Voice Mobility using CSFB Scenario.
 - Voice Mobility Performance Monitoring.

6. Traffic and Quality Analysis

Topic areas covered include:

- Throughput Types and Measurements:
 - Network Throughput Aggregation Level.
 - Network Throughput and Protocol Stack.
- Physical Layer Throughput:
 - Peak Throughput.

Traffic and Quality Analysis (cont.)

- LTE Adaptive Modulation and Coding (AMC):
 - AMC Concept and Architecture.
 - CQI Values and MCS.
 - CQI Values to Physical Layer Throughput Example.
 - AMC Parameters.
- UL Fractional Power Control:
 - UL Power Control Overview.
 - UL Closed-Loop Power Control Commands.
 - UL Power Control Parameters.
 - UL Power Control Settings Impact on Throughput.
 - Adaptive Transmission Bandwidth.
 - Power Headroom Report Configuration.
- LTE MIMO:
 - LTE Transmission Modes.
 - MIMO Practical Considerations.
 - Antenna Configuration For MIMO.
 - MIMO Parameters.
- Traffic and Quality Performance Monitoring:
 - E-UTRAN Radio Throughput.
 - E-UTRAN Retransmission Rate (BLER).
 - E-UTRAN Connection Delay and RTT.
 - Call Traffic in Erlang.
- Traffic and Quality Performance Examples:
 - Downlink and Uplink Cell Throughput.
 - Downlink and Uplink MAC BLER %.
 - CQI Statistics.

7. Cell Resources and Capacity Areas

Topic areas covered include:

- E-UTRAN Network Capacity Areas.
- Downlink and Uplink Resource Usage.
- Control Channel Dimensioning:
 - PHICH Dimensioning.
 - PDCCH Dimensioning.
 - PUCCH Dimensioning.
- Uplink Power and Interference Analysis.
- S1 and X2 Dimensioning.

Cell Resources and Capacity Areas (cont.)

- Resources and Capacity Monitoring:
 - PRB Usage per TTI %.
 - Number of PRB Allocated.
 - Resources and Capacity Monitoring Examples.
- PUCCH and PUSCH SINR Statistics:
 - PUSCH RSSI Statistics.
 - RRC Active UEs Statistics.

8. ANNEX - LTE KPI Generic Formulas

Topic areas covered include:

- RACH Performance.
- Call Setup Performance:
 - RRC Setup.
 - Radio Bearer Setup.
 - E-RAB Setup.
 - Initial Context & S1-U Setup.
- Retainability Performance:
 - Radio Bearer Drops.
 - UE Context Drops.
 - E-RAB Drops.
- Mobility Performance:
 - X2 Handovers.
 - S1 Handovers.
 - E-UTRAN Handovers.
- CSFB Performance.
- Call Traffic:
 - E-UTRAN Traffic.
 - E-RAB/EPS and IP Traffic.



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