

# LTE Signalling and Protocol Troubleshooting Training Course

11 – 15 January 2027
Singapore

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## Overview

LTE Signalling and Protocol Troubleshooting Training Course is a one-week intermediate course for mobile network engineers, LTE protocol analysts, radio and core operations teams, and telecom troubleshooting specialists who leave with an LTE Signalling Troubleshooting Playbook. Participants connect LTE control-plane architecture, RRC procedures, NAS procedures, S1AP signalling, EPS bearer flows, mobility events, and protocol trace analysis to diagnose service failures across radio and evolved packet core domains. Agile Leaders Training Center develops practical LTE signalling troubleshooting capability.

## Who Should Attend

- Mobile network teams responsible for LTE service availability and incident resolution
- Radio access teams responsible for RRC behavior, mobility, and handover performance
- Core network teams responsible for NAS, S1AP, subscriber context, and bearer procedures
- Protocol analysis teams responsible for message traces and cause-code investigation
- Operations assurance teams responsible for cross-domain fault isolation and escalation

The course assumes participants already work with LTE network operations or protocol traces and leaves vendor-specific commands, radio planning, and equipment configuration outside its scope.

## Departments and Industries

The course supports departments and industries that operate, assure, or integrate mobile connectivity.

- Mobile telecommunications network operations
- Radio access network engineering and optimization
- Packet core operations and service assurance
- Network equipment and systems integration
- Transport, utilities, and industrial private-network teams

## Learning Objectives

By the end of this course, participants will be able to:

- Analyze LTE and EPC entities, interfaces, and control-plane stacks.
- Apply RRC and NAS message sequences to trace interpretation.
- Compare default and dedicated EPS bearer procedures.
- Diagnose attach, service request, and context failures.
- Evaluate mobility and handover signalling across X2 and S1.

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- Build an LTE Signalling Troubleshooting Playbook.

## Course Agenda

## Day 1: Map LTE Signalling Architecture

- LTE and EPC Network Entity Map
- Uu, S1-MME, S11, and X2 Interface Matrix
- Control-Plane Protocol Stack Layer Map
- UE Identity and Context Reference Sheet
- LTE Signalling Trace Correlation Method

## Day 2: Analyze RRC Procedures

- RRC State and Connection Procedure Diagram
- System Information and Cell Access Checklist
- RRC Connection Establishment Message Flow
- RRC Security and Reconfiguration Sequence
- RRC Failure Cause and Timer Analysis Grid

## Day 3: Analyze NAS and Bearer Procedures

- EPS Attach and Registration Message Flow
- NAS Authentication and Security Sequence
- Default EPS Bearer Establishment Flow
- Dedicated Bearer and QoS Context Map
- NAS Cause Code and Timer Diagnostic Table

## Day 4: Diagnose Mobility and Core Signalling

- S1AP UE Context Procedure Flow
- Tracking Area Update Message Sequence
- X2 and S1 Handover Comparison Matrix
- Service Request and Paging Procedure Trace
- LTE Roaming Signalling Pathway Map

## Day 5: Practice LTE Signalling Troubleshooting

- Suggested Exercise: Correlate RRC and NAS Traces
- Suggested Exercise: Diagnose an Attach Failure
- Suggested Exercise: Analyze Bearer Establishment
- Suggested Exercise: Resolve a Handover Failure
- Capstone Exercise: Complete an LTE Signalling Troubleshooting Playbook

## Practical Exercises

The course uses suggested activities based on anonymized mobile operator, systems integration, transport, and industrial network cases.

- Suggested activity: map LTE and EPC entities, interfaces, identities, and control-plane protocol layers.
- Suggested activity: correlate RRC, NAS, and S1AP messages to isolate an attach or service request failure.
- Suggested activity: compare bearer, mobility, and handover traces using cause codes and timers.
- Suggested activity: present an LTE Signalling Troubleshooting Playbook with evidence, decision points, and escalation paths.

## FAQs

### Who suits LTE signalling troubleshooting training, and what does it assume?

LTE signalling troubleshooting training suits radio, core, assurance, and protocol analysis teams. It assumes participants already work with LTE operations or traces and can recognize basic mobile network entities.

### How does LTE signalling troubleshooting differ from general LTE network training?

LTE signalling troubleshooting focuses on message flows, protocol states, timers, cause codes, trace correlation, and failure isolation. General LTE network training usually gives broader architectural coverage without the same diagnostic depth.

### What is LTE protocol trace analysis?

LTE protocol trace analysis is the structured examination of RRC, NAS, S1AP, and related messages to reconstruct a procedure, locate the failure point, and connect observed causes to radio or core conditions.

### How are RRC and NAS procedures related in LTE signalling?

RRC establishes and manages the radio control connection, while NAS carries mobility, security, and session procedures between the device and core network. Effective diagnosis correlates both timelines.

### Why do EPS bearer procedures matter in LTE troubleshooting?

EPS bearer procedures determine how connectivity and quality-of-service context are established and changed. Their message sequences help analysts distinguish access, context, policy, and transport-related failures.

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## Conclusion

Participants take back an LTE Signalling Troubleshooting Playbook. It combines architecture maps, procedure flows, trace-correlation steps, timer and cause-code tables, bearer and mobility checks, and escalation evidence. The playbook helps network teams reconstruct signalling sequences, isolate cross-domain failures, and communicate diagnostic findings consistently.