Long Term Evolution Radio Access
Network L15
Training Programs

Catalog of Course Descriptions
# Catalog of Course Descriptions

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# Introduction

Ericsson has developed a comprehensive Training Programs service to satisfy the competence needs of our customers, from exploring new business opportunities to expertise required for operating a network. The Training Programs service is delineated into packages that have been developed to offer clearly defined, yet flexible training to target system and technology areas. Each package is divided into flows, to target specific functional areas within your organization for optimal benefits.

**Service delivery is supported using various delivery methods including:**

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</table>
Ericsson eMBMS Radio Network Essentials – live virtual

LZU1089781 R2A

Description
Do you want to know how LTE Broadcast, also referred to as Evolved Multimedia Broadcast Multicast Service (eMBMS), works from a Radio Access Network (RAN) perspective? Then this course is for you! The course covers end to end functionality with focus on the RAN.

Learning objectives
On completion of this course the participants will be able to:

1. Give an overview of the eMBMS solution
   1.1 Identify the benefits and use cases of eMBMS
   1.2 Describe the system architecture, nodes and interfaces of eMBMS
   1.3 Explain the concept of MBSFN
   1.4 Explain synchronization
   1.5 Discuss quality of service in eMBMS
   1.6 List the basic RAN eMBMS features
2. Explain the protocols used for eMBMS
   2.1 Identify the protocols in each interface
   2.2 Describe the end to end protocol stacks
3. Explain the radio interface basics
   3.1 Elaborate on the Uu channels
   3.2 Explain how eMBMS is received by the UE
   3.3 Explain System Information for eMBMS
   3.4 Describe the layers 1, 2 and 3 in the Uu interface
4. Describe the MBMS service provision procedure
   4.1 Explain service announcement
   4.2 Describe session start
   4.3 Detail MBMS notification procedure
   4.4 Explain how data transfer is done
   4.5 Explain session stop
5. Explain eMBMS RAN functions and features
   5.1 Describe mobility scenarios
   5.2 Describe Admission control for eMBMS services
   5.3 Explain Internal MCE feature
   5.4 Describe SIB16 Time Information Broadcast feature
5.5 Understand the MBMS Multi-Carrier support

**Target audience**
The target audience for this course is:
Service Planning Engineer, Service Design Engineer, Network Design Engineer, Network Deployment Engineer, Service Deployment Engineer, System Technician, Service Technician, System Engineer, Service Engineer, Field Technician, System Administrator

**Prerequisites**
Successful completion of the following courses:
- LZU1087020-R11A LTE/SAE System Overview
- LZU1089929-R1A LTE L15 Air Interface
- LZU1089943-R1A LTE L15 Radio Network Functionality

**Duration and class size**
The length of the course is 6 hours spread over 2 sessions and the maximum number of participants is 12.

**Learning situation**
This course is based on interactive theoretical instructor-led lessons given in a live virtual classroom environment.

**Time schedule**
The time required always depends on the knowledge of the attending participants. The time for covering the topics which is stated below can be used as an estimate.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics in the course</th>
<th>Time (min)</th>
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<tbody>
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<td>1</td>
<td>Overview</td>
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<td>1</td>
<td>eMBMS Protocols</td>
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</tr>
<tr>
<td>2</td>
<td>Radio Aspects</td>
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</tr>
<tr>
<td>2</td>
<td>Service Provision procedure</td>
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</tr>
<tr>
<td>2</td>
<td>eMBMS RAN functions and features</td>
<td>30</td>
</tr>
</tbody>
</table>
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LZU 108 9940 R1A

Description
Do you need to build a solid understanding of the new Ericsson Network Manager (ENM) product? Do you need an introduction to some of the core ENM concepts? If you are an Installation Engineer, work in Field Support, are an OSS System Administrator or Operational Staff, then this VCT provides an incisive introduction to the background, structure and functionality supporting ENM.

This VCT assume no prior knowledge of legacy OSS or ENM.

This VCT course provides:
A concise overview of essential ENM technical, historical and business drivers. An exploration of the software architecture and components supporting ENM. A survey of ENM functionalities.

Learning objectives
On completion of this course the participants will be able to:

1. Describe the Origins and Evolution of ENM
   1.1 Trace the major trends in Telecoms Network Evolution
   1.2 Appreciate the technical and business evolution of OSS to ENM
   1.3 Understand the goals and drivers of Unified Management

2. Discuss the ENM Architecture Basics
   2.1 Explore the ENM platform
   2.2 Overview ENM Common Modules
   2.3 Appreciate the drivers for YMER
   2.4 Overview the YMER Architecture
   2.5 List and evaluate YMER Architecture Layers
   2.6 Illustrate layer interwork
   2.7 Introduce ENM Databases and file systems
   2.8 Introduce the concepts of Virtualization, Replication and Redundancy in ENM

3. Overview the full range of ENM Functionalities
   3.1 Tour the ENM User Applications and Interface
   3.2 Investigate ENM on-line help, tutorials and tips
   3.3 Tour Network Explorer and Topology Manager
   3.4 Overview Configuration Management
3.5 Explore ENM’s Performance Management Application
3.6 Understand Fault Management in ENM
3.7 Describe Security in ENM
3.8 Understand standard Network Software and License Management in ENM

**Target audience**

The target audience for this course is:

Service Planning Engineer, Service Design Engineer, Network Design Engineer, Network Deployment Engineer, Service Deployment Engineer, System Technician, Service Technician, System Engineer, Service Engineer, Field Technician, System Administrator, Application Developer, Business Developer, Customer Care Administrator

**Prerequisites**

Successful completion of the following courses:

Basic understanding of Telecommunications

**Duration and class size**

The length of the course is 6 hours spread over 2 sessions and the maximum number of participants is 12.

**Learning situation**

This course is based on interactive theoretical instructor-led lessons given in a live virtual classroom environment.

**Time schedule**

The time required always depends on the knowledge of the attending participants. The time for covering the topics which is stated below can be used as an estimate.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics in the course</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to ENM – Describing the Origins of ENM</td>
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<tr>
<td>1/2</td>
<td>The Architecture and Platform of ENM</td>
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</tr>
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<td>2</td>
<td>ENM’s Functionalities and User Interface</td>
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Ericsson Network Manager (ENM) 15B System Administration

LZU1089941 R1A

Description
Are you a System Administrator? Will you be working with Ericsson Network Manager? This course will give the student thorough knowledge required to administer the ENM product.

This course prepares ENM System Administrators to handle maintenance activities and backup key ENM components, manage ENM user accounts, monitor the status of ENM services and log files, and perform troubleshooting of issues in preparation for opening Customer Service Requests with Ericsson support.

Learning objectives
On completion of this course the participants will be able to:

1. Provide a high-level description of ENM
   1.1 Describe the role that the ENM plays in supporting the network
   1.2 Describe the ENM hardware platform architectures
   1.3 Explore the ENM Utilities
   1.4 Overview the ENM User Interfaces and Help
   1.5 Understand Healthchecks in ENM
   1.6 Overview Guideline System Administrator Tasks

2. Work with LITP Platform
   2.1 Describe the ENM Linux IT Platform (LITP) components and services
   2.2 Use the LITP Self Management command line interfaces to work with Managed
   2.3 View objects managed by the LITP
   2.4 Working with the Management and Peer Servers
   2.5 Understanding Virtualization, Replication and Redundancy in ENM

3. Investigate Disk & Volume Management
   3.1 Understand the Persistent Storage Cluser (PSC)
   3.2 Appreciate the Different Databases in ENM
   3.3 Explore the MySQL database
   3.4 Overview the Versant Database
   3.5 Explain the use of the PostgreSQL database
   3.6 Navigate the ENM file system structure
   3.7 Explain the disk configurations used in ENM
   3.8 Explore the Migration of Data
4. Overview the ENM Workspaces
4.1 Add/remove Web Applications to the ENM Launcher
4.2 Add/remove Citrix Applications to the ENM Launcher

5. Implement User Management and Collections
5.1 Highlight Single Sign-on (SSO)
5.2 Overview User management in ENM
5.3 Add, Remove, Lock & Unlock ENM User Accounts
5.4 Modify a User's Authority and Policies
5.5 Make use of the CLI to administer Users
5.6 Monitor user related Managed Component status and logs
5.7 Perform backup of the user database
5.8 Understand User management housekeeping activities
5.9 Discuss Migration of Users

6. Appreciate Security management in ENM
6.1 Overview Security management in ENM
6.2 Understand Policy management principles
6.3 Explore Perimeter Security
6.4 Appreciate Data Protection
6.5 Manage Credentials

7. Understand Logging and Monitoring in ENM
7.1 Overview the different logs in ENM
7.2 Overview Monitoring in ENM
7.3 Implement Monitoring Alerts
7.4 Explore the OSS Monitoring Tool

8. Understand ENM License Handling
8.1 Deploy licenses for System use

9. Overview integration with other systems
9.1 Understand the North Bound Interfaces (NBIs)
9.2 Perform Administration of the ENIQ feature

10. Learn to perform O&M Backup Solution
10.1 Use and maintain the O&M Backup Solution (OMBS)
10.2 Describe the OMBS Hardware & Software Architecture
10.3 Investigate the use of the GUI/Command line interfaces to configure Backup Profiles
10.4 Employ the tools to perform and verify the backup execution
10.5 Identify the functionality of Bare Metal Restore as part of OMBS

11. Understand housekeeping tasks in ENM
11.1 What needs to be done in User Management?
11.2 Maintaining Log files
11.3 Understanding Bulk Export Files
11.4 Overview Workspaces

12. Overview Application Troubleshooting
12.1 Explore Fault Management application trouble shooting
12.2 Understand FM Architecture in ENM
12.3 Describe Performance Management application points of failure
12.4 Investigate Configuration Management application interfaces
12.5 Understand the Auto Provisioning flow in ENM

**Target audience**
The target audience for this course is:
System Administrator

**Prerequisites**
Successful completion of the following courses:
ENM Overview LZU 1089803 R1A
LTE Network Management with ENM 14 LZU 1089797 R1A
Successful completion of the following external courses or equivalent knowledge would be advantageous:
Versant
PostgreSQL
SQL
Red Hat Enterprise Linux
The participants should also be familiar with Veritas Volume Management and have general knowledge of TCP/IP.

**Duration and class size**
The length of the course is 4 days and the maximum number of participants is 8.

**Learning situation**
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
### Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tbody>
<tr>
<td></td>
<td>Introduction</td>
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<tr>
<td></td>
<td>LITP Platform</td>
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<tr>
<td></td>
<td>Databases in ENM</td>
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<tr>
<td></td>
<td>Overview of ENM Workspaces</td>
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<tr>
<td></td>
<td>Overview of User Management (pt1)</td>
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<td></td>
<td>Overview of User Management (pt2)</td>
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</tr>
<tr>
<td></td>
<td>Security Management in ENM</td>
<td></td>
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<tr>
<td></td>
<td>Logging and Monitoring in ENM</td>
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<td></td>
<td>System License Handling</td>
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<tr>
<td></td>
<td>Integrating ENM with other Systems</td>
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<tr>
<td></td>
<td>ENM Backup and Restore</td>
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<tr>
<td></td>
<td>Housekeeping Tasks</td>
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<tr>
<td></td>
<td>Troubleshooting Fault Management</td>
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<td></td>
<td>Troubleshooting Performance Management</td>
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<td>Troubleshooting Configuration Management</td>
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<tr>
<td></td>
<td>Troubleshooting SHM</td>
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<tr>
<td></td>
<td>Troubleshooting Platform Overview including Documentation</td>
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<tr>
<td></td>
<td>Understanding Auto Provisioning in ENM</td>
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Intra LTE and IRAT Mobility with focus on the RAN - live virtual

LZU1089810  R2A

Description
Do you want to know how mobility is implemented in LTE? What are the options for a UE running out of LTE coverage? This Live virtual course will answer all these questions and allow you to explore the area of LTE mobility with examples from live networks.

Learning objectives
On completion of this course the participants will be able to:

1. Describe LTE intra-frequency mobility
   1.1 Explain intra-frequency cell reselection
   1.2 Describe X2 and S1 intra-frequency handover
   1.3 Explain how ANR adds intra-frequency neighbors
   1.4 Explain the Automated Mobility Optimization feature

2. Describe LTE inter-Frequency mobility
   2.1 Describe LTE inter-frequency cell reselection
   2.2 Explain Coverage-Triggered Inter-Frequency Session Continuity
   2.3 Explain Coverage-Triggered Inter-Frequency Handover
   2.4 Explain how ANR adds inter-frequency neighbors
   2.5 Describe LTE inter-frequency load balancing

3. Describe the mobility between LTE and WCDMA
   3.1 Describe LTE cell reselection to and from WCDMA
   3.2 Explain Coverage-Triggered WCDMA Session Continuity
   3.3 Explain Coverage-Triggered WCDMA Handover
   3.4 Explain how ANR adds WCDMA neighbors
   3.5 Describe how traffic is offloaded from LTE to WCDMA

4. Describe the various advanced mobility features in LTE
   4.1 Describe Subscriber Triggered Mobility
   4.2 Describe UE Throughput Aware IFLB
   4.3 Explain Multi-Layer Service-Triggered Mobility
   4.4 Redirect with System Information enhanced with additional observability
   4.5 Explain CS Fallback 1X (Release w/ Redirect) enhanced with additional observability
   4.6 Describe UE Throughput based Mobility to WiFi
Target audience
The target audience for this course is:
Service Engineer, Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview LZU1087020
LTE L15 Air Interface LZU108xxxx
LTE L15 Protocols and Procedures LZU108xxxx

Duration and class size
The length of the course is 12 hours spread over 4 sessions and the maximum number of participants is 12.

Learning situation
This course is based on interactive theoretical instructor-led lessons given in a live virtual classroom environment.

Time schedule
The time required always depends on the knowledge of the attending participants. The time for covering the topics which is stated below can be used as an estimate.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics in the course</th>
<th>Time (min)</th>
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<td>1</td>
<td>LTE Intra-Frequency Mobility</td>
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<td>2</td>
<td>LTE Inter-Frequency Mobility</td>
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</tr>
<tr>
<td>3</td>
<td>LTE WCDMA Mobility</td>
<td>180</td>
</tr>
<tr>
<td>4</td>
<td>Advanced Mobility Features in LTE</td>
<td>180</td>
</tr>
</tbody>
</table>
LTE L14 to L15 Delta

LZU1089939 R1A

Description
How has the Ericsson LTE RAN been improved with the L15B release? What new features and hardware have been introduced? How have the existing features been enhanced? This Delta course explains the new features and hardware in the LTE L15B release for FDD and TDD along with the associated new parameters and counters.

Learning objectives
On completion of this course the participants will be able to:

1. Give an overview of the L15B Software Release
   1.1 Describe the challenges facing Mobile Operators in 2015
   1.2 List the basic and optional features of the L15B Software Release
2. Explain the RAN enhancements in L15B
   2.1 Describe the features that improve radio access in L5B
   2.2 Describe enhancements of carrier aggregation functionality in L15B
3. Explain the capacity and mobility management features in L15B
   3.1 Explain the enhancements in load management and mobility management in L15B
4. Explain the L15B Hardware, Transport Network Functionality and OAM enhancements in L15B
   4.1 Describe the capacity improvements in L15B
   4.2 Describe the hardware enhancements in L15B
   4.3 Describe the enhancements and updates of the L15B SON features
   4.4 Describe the transport network enhancements in L15B

Target audience
The target audience for this course is:
Service Planning Engineer, Service Design Engineer, Network Design Engineer, Network Deployment Engineer, Service Deployment Engineer, System Technician, Service Technician, System Engineer, Service Engineer, Field Technician, System Administrator

Prerequisites
Successful completion of the following courses:
Duration and class size
The length of the course is 2 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment

Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tbody>
<tr>
<td>1</td>
<td>L15B Introduction</td>
<td>2</td>
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<tr>
<td></td>
<td>L15B RAN Enhancements</td>
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<tr>
<td></td>
<td>L15B Capacity and Mobility Management Features</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>L15B Hardware, Transport Network and SON</td>
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</tbody>
</table>
LTE L15 Access Transport Network Dimensioning

LZU1089953 R1A

Description
How is the Ericsson LTE L15 Access Transport Network dimensioned? What are the types of traffic carried by LTE and how are they affected by transport network capacity? What transport network overheads need to be considered and how are these incorporated into dimensioning calculations? How is the Ericsson RBS 6000 hardware dimensioned for the LTE transport interfaces?

With the help of the LTE L15 Access Transport Network Dimensioning course the attendees will learn about the type of traffic that is carried by LTE and how the Access Network dimensioning is carried out according to the latest Ericsson recommendation. They will also learn how the RBS 6000 node hardware and transport interfaces are dimensioned for LTE. This new competence is tested on sample dimensioning exercises at the end of the course so that the students leave with competence in the area of LTE Access Transport Network dimensioning.

Learning objectives
On completion of this course the participants will be able to:

1. Describe the EPS architecture and interfaces
   1.1 List the interfaces in the EPS (Evolved Packet System)
   1.2 Explain the EPS protocol stacks for user and control plane
2. Describe the different types of traffic carried by LTE networks
   2.1 List the protocols that support the various LTE traffic types
   2.2 Explain the operation of TCP, UDP, HTTP and FTP Internet Protocols
   2.3 Explain the issues surrounding Voice over LTE.
3. Explain the IP Functionality of the L15 LTE RAN Transport Network
   3.1 Identify the structure of IPv4 and IPv6 packets
   3.2 Explain the structure of the Ethernet frames used in the LTE Transport Network
   3.3 Explain IPSec and VLAN routing and how they impact dimensioning
   3.4 Explain the LTE Transport Network Overhead used in dimensioning calculations
   3.5 Explain how IP and Ethernet Quality of Service (QoS) is implemented in LTE
4. Perform LTE link dimensioning for FDD and TDD Networks
   4.1 Describe the different LTE link dimensioning approaches
   4.2 Perform last mile and mobile backhaul dimensioning
5. Perform RBS 6000 node hardware and transport interfaces dimensioning for LTE
5.1 Identify the RBS 6000 hardware for LTE
5.2 Explain the LTE Synchronization mechanism
5.3 Dimension the RBS 6000 node hardware and transport interfaces for LTE

Target audience
The target audience for this course is:
Service Planning Engineer, Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LTE L14 Air Interface LZU1089186
LTE L14 Protocols and Procedures LZU1089187
LTE L14 Radio Network Functionality LZU1089188
LTE L14 Network Design LZU1089189

Duration and class size
The length of the course is 1 day and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment.
**Time schedule**

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tbody>
<tr>
<td>1</td>
<td>EPS Architecture and Interfaces</td>
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<tr>
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<td>LTE Traffic</td>
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<tr>
<td></td>
<td>LTE IP Transport Network Functionality</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>LTE Link Dimensioning (including exercise)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>LTE Node Dimensioning (including exercise)</td>
<td>1</td>
</tr>
</tbody>
</table>
LTE L15 Advanced Radio Network Features

Description
Do you want to have full and detailed understanding of the Ericsson E-UTRAN advanced features for increased MBB performance in terms of coverage and capacity? If so, this course will give you all that.
This course describes the optional Power Control, Link Adaptation and Scheduling features as well as optional Capacity, Mobility and Load Management features. This course will definitely boost your competence and understanding of the Advanced Ericsson E-UTRAN solution.

Learning objectives
On completion of this course the participants will be able to:

1. Describe the purpose and use of the function of the advanced features for Power Control, Link Adaptation and Scheduling
   1.1 Detail the optional features for Power Control
   1.2 Detail the optional features for Link Adaptation
   1.3 Detail the optional features for Scheduling
   1.4 Describe Combined Cell
   1.5 Describe Coordinated Multipoint (CoMP)
   1.6 Describe Carrier aggregation features
   1.7 Describe the MIMO features and benefits

2. Describe the purpose and function of the Capacity Management
   2.1 Explain the dynamic MSRs
   2.2 Explain Dynamic GBR Admission Control
   2.3 Explain Differentiated Admission Control
   2.4 Explain the interaction with QoS

3. Explain advanced mobility
   3.1 Detail the advanced mobility features
   3.2 Explain the Automated Neighbor Relations (ANR) feature

4. Explain the Load Management features
   4.1 Detail Multicarrier Load Management
   4.2 Detail IRAT Offload
Target audience
The target audience for this course is:
Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
- LTE/SAE System Overview LZU1087020
- LTE L15 Air Interface LZU1089929
- LTE L15 Protocols and Procedures LZU1089931
- LTE L15 Radio Network Functionality LZU1089943

Duration and class size
The length of the course is 3 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment
Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to the course and feature overview</td>
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<tr>
<td></td>
<td>Link Adaptation features</td>
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<tr>
<td></td>
<td>Power Control features</td>
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</tr>
<tr>
<td></td>
<td>Scheduling features</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>MIMO, Combined Cell and CoMP features</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>Carrier Aggregation features</td>
<td>2.0</td>
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<tr>
<td></td>
<td>Admission Control features</td>
<td>2.0</td>
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<tr>
<td></td>
<td>Mobility features and concepts</td>
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<td>3</td>
<td>Mobility features and concepts cont’d</td>
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<tr>
<td></td>
<td>Automated Neighbor Relations</td>
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<tr>
<td></td>
<td>Load Management features</td>
<td>2.0</td>
</tr>
</tbody>
</table>
LTE L15 Air Interface

LZU1089929 R1A

Description
Do you need to know what information elements are within each of the LTE layer 1 channels and where to find them in the physical layer resource? This course reveals the radio technology involved in E-UTRAN (Evolved UTRAN, also referred to as LTE – Long Term Evolution).

The course provides detailed descriptions and explanations of the radio interface channel structure and explains the concepts of channel coding, modulation, OFDM (Orthogonal Frequency Division Multiplexing), SC-FDMA (Single-Carrier Frequency Division Multiple Access), MIMO (Multiple Input Multiple Output), Resource Blocks, Scheduling, control signaling, System Information, FDD, TDD. Paging, cell search and random access are also explained on an overview level.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the LTE radio interface general principles
   1.1 Describe the evolution of cellular networks
   1.2 Summarize the evolution of 3GPP releases, from release 99 to release 9
   1.3 Describe the radio interface techniques
   1.4 Explain the difference between the FDD and TDD mode
   1.5 Describe the flexible spectrum usage
   1.6 Explain the concepts of channel coding and FEC (Forward Error Correction)
   1.7 Describe the principle for OFDM
   1.8 Describe UL and DL scheduling principles and signaling

2. Detail the downlink transmission technique and describe the radio interface structure and signaling
   2.1 Detail the channel structure of the radio interface
   2.2 Describe the physical signals in UL and DL
   2.3 Detail the radio interface protocols
   2.4 Detail the time-domain structure in the radio interface in UL and DL for both FDD and TDD mode
   2.5 Detail the downlink transmission technique
   2.6 Have a good understanding of the OFDM principle, signal generation and processing
   2.7 Detail the reference symbols in DL
   2.8 Detail the DL control signaling and formats
2.9 Detail the paging procedures
2.10 Explain the antenna setups
2.11 Explain the cell search procedure

3. Detail the uplink transmission technique
3.1 Have a good understanding of the SC-FDMA principle, signal generation and processing
3.2 Explain the pros and cons with OFDM and SC-FDMA
3.3 Detail the UL control signaling and the PUCCH formats
3.4 Detail the random access preamble formats and the RACH root sequence allocation
3.5 Describe power control and UL transmit timing control

4. Detail MIMO in LTE
4.1 Describe the general concepts of beamforming, diversity and spatial multiplexing
4.2 Describe the radio channel and antenna basics
4.3 Describe the concepts of channel rank, transmission rank, precoding and layers
4.4 List and explain the transmission modes in 3GPP Release 8-12
4.5 Explain SU-MIMO and MU-MIMO
4.6 Describe open loop and closed loop spatial multiplexing in LTE

Target audience
The target audience for this course is:
Service Engineer, Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LZU1087020 R1A LTE/SAE System Overview

Duration and class size
The length of the course is 3 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment.
**Time schedule**

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
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<tr>
<td></td>
<td>Downlink Transmission Technique</td>
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<tr>
<td></td>
<td>Downlink Transmission Technique continued</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Uplink Transmission Technique</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Uplink Transmission Technique continued</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MIMO in LTE</td>
<td>3</td>
</tr>
</tbody>
</table>
LTE L15 Configuration

Description
Are you now ready to configure your own LTE radio access network? What needs to be done at the RBS site, how would the tools in OSS-RC be used and what do the configuration files look like?
LTE L15 Configuration describes how an RBS 6000 is configured in the L15 version of LTE RAN. The course includes both theoretical sessions describing what need to be configured, and practical exercises during which the configurations are made. Configurations are carried out step by step using OSS-RC’s Base Station Integration Manager (BSIM) and the RBS Element Manager.
After the course, participants will be familiar with the difference between manual- and autointegration procedures, understand the structures and contents of configuration files that are required during the integration of the RBS, including the impact of IpSec support during the integration. The Mul-, S1- and X2- interfaces, including basic radio network configurations are made during the training.

Learning objectives
On completion of this course the participants will be able to:

1. Explain LTE L15 interfaces and the integration of RBS 6000
   1.1 Describe the interfaces S1, X2 and Mul to an eNodeB in LTE L15
   1.2 Identify the main differences between various RBS 6000 products and different units
   1.3 Summarize the integration process of an RBS 6000 and differentiate between the manual integration and auto integration procedures
   1.4 Identify the tools that are used in the different steps of the integration procedure
   1.5 Explain what the Managed Object Model (MOM) is, why it is important in configuration and where to find information about it

2. Configure the Transport Network in RBS 6000
   2.1 Relate the IP and Ethernet functionality to the L15 RAN Transport Network
   2.2 Describe the hardware used to support IP/Ethernet transmission in RBS 6000
   2.3 List the various ways Network Synchronization reference may be realized for a RBS 6000
   2.4 Recognize the Managed Objects related to the Mul-, the S1- and X2-interfaces implementation, and how some key attributes implement the transport network functionalities
   2.5 Edit BSIM templates in the OSS-RC to be used during configuration
   2.6 Perform the on-site integration of an RBS 6000 manually with the Site Installation
file, the Site Basic file and the Site External file

2.7 Configure the Transport Network and Radio Network using both manual and auto integration procedures

3. Configure the Radio Network in RBS 6000
   3.1 Explain the concept of cell and its relation to sector and antennae system in RBS 6000
   3.2 Recognize the Managed Objects related to radio network configuration
   3.3 Identify some basic parameters related to cell and cell relations
   3.4 Identify, and, if necessary, change QoS related parameters in RBS 6000

4. Understand the impact of IpSec during the Transport Network configuration in RBS 6000
   4.1 Explain what IP Security (IpSec) is and how it is supported in the LTE RAN
   4.2 Recognize Managed Objects related to IpSec implementation and the some key attributes that define the working of IpSec
   4.3 State how the configuration files would be affected with IpSec in the LTE RAN
   4.4 Identify how the configuration procedure would be affected by having IpSec in the RBS 6000

Target audience
The target audience for this course is:
Service Planning Engineer, Network Deployment Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LTE L15 Operation LZU1089934
LTE L15 Air Interface LZU1089929 (Optional)

Duration and class size
The length of the course is 3 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
### Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course introduction and introduction of LTE/SAE, the integration procedure of an RBS 6000 and the Managed Object Model</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Transport Network Configuration theory</td>
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<tr>
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<td>Radio Network Configuration theory</td>
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<tr>
<td></td>
<td>Radio Network Configuration theory</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>Manual on-site configuration of the RBS 6000</td>
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<tr>
<td></td>
<td>Configuration of the S1 and X2 interfaces</td>
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</tr>
<tr>
<td></td>
<td>Configuration of the Radio Network and QoS</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Impact of IpSec theory</td>
<td>1.5</td>
</tr>
<tr>
<td>3</td>
<td>Understanding IpSec</td>
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</tr>
<tr>
<td></td>
<td>Summary of the course</td>
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</tr>
</tbody>
</table>
LTE L15 eNodeB Commissioning

Description
Do you need to understand how to integrate the LTE eNodeB implemented on an RBS 6000 from a site perspective? What does Autointegration imply and how is it different from manual integration?
This course provides the participants with hands-on experience of the procedures that need to be performed for the commissioning and integration of the eNodeB at the site.

Learning objectives
On completion of this course the participants will be able to:

1. Describe the LTE system from an overview level
   1.1 Describe on an overview level the RBS 6000 platform and hardware
   1.2 List the integration steps of RBS 6000
   1.3 Understand how the integration process would be different when integrating with a smart phone
2. Use the management tools available at the LTE RBS site
   2.1 Use the Element Manager (EM) to find information relevant for an LTE RBS commissioner
   2.2 Use the Command Line Interface (CLI) to print some basic information
   2.3 Configure a client computer to connect to the RBS to open the Element Manager
3. Perform commissioning and integration of the RBS
   3.1 Power up the RBS
   3.2 Check the RBS status
   3.3 Connect the client computer
   3.4 Select the integration scenario
   3.5 Integrate the RBS manually
   3.6 Understand how the integration procedure differs with Auto-integration
   3.7 Monitor the RBS integration
   3.8 Verify the external alarms
   3.9 Check the hardware status
   3.10 Test the User Plane Traffic
   3.11 Complete and store integration report
Target audience
The target audience for this course is:
System Technician, Field Technician, Network Deployment Engineer

Prerequisites
Successful completion of the following courses:
- LTE/SAE System Overview LZU1087020
- RBS 6000 Overview LZU1087503
- Or
- LTE/SAE Overview WBL LZU1087318
- RBS 6000 in a Nutshell WBL LZU1087504

Duration and class size
The length of the course is 1 day and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.

Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tr>
<td>1</td>
<td>Introduction</td>
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<tr>
<td></td>
<td>Describe the LTE system from an overview level</td>
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</tr>
<tr>
<td></td>
<td>Use the management tools available at the LTE RBS site</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>Perform commissioning and integration of the RBS</td>
<td>3.0</td>
</tr>
</tbody>
</table>
LTE L15 Initial Tuning

Description
When starting up your new LTE network, initial tuning is the most powerful way to verify the performance. With the help of the LTE L15 Initial Tuning course the attendees will learn the mechanisms involved in the initial tuning process. We will define the theoretical formulas and processes, as well as analyze data according to the KPI’s wanted.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the process for LTE RAN tuning
   1.1 Describe the difference between tuning and optimization
   1.2 Describe the different steps in the tuning process
2. Perform the Preparations necessary for a tuning exercise
   2.1 Perform a network design review and consistency check
   2.2 Define cluster and drive test routes
   2.3 Define the services to test
   2.4 Perform the setup of the drive test tools
3. Perform CELL tuning
   3.1 Describe the different interference scenarios in a LTE network
   3.2 Describe the interfrequency interference ratio, F
   3.3 Define coverage in different scenarios e.g. macro and hotspot
   3.4 Implement changes to improve coverage
   3.5 Describe the neighbor list with or without the Automated Neighbor Relations
4. Perform UE tuning
   4.1 Explain Accessibility formulas (KPI) and analysis of the data from drive test
   4.2 Explain Retainability formulas (KPI) and analysis of the data from the drive test
   4.3 Explain Integrity formulas (KPI) and analysis of the data from the drive test
   4.4 Explain Mobility formulas (KPI) and analysis of the data from the drive test

Target audience
The target audience for this course is:
System Engineer, Service Engineer
Prerequisites
Successful completion of the following courses:
- LZU1089929-R1A LTE L15 Air Interface
- LZU1089935-R1A LTE L15 Configuration
- LZU1089931-R1A LTE L15 Protocols and Procedures
- LZU1089188-R1A LTE L15 Radio Network Functionality
- LZU1089936-R1A LTE L15 Troubleshooting

Duration and class size
The length of the course is 2 days and the maximum number of participants is 8.

Learning situation
The course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.

Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tbody>
<tr>
<td>1</td>
<td>Explain the process of tuning</td>
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<tr>
<td></td>
<td>Perform preparations necessary for the tuning</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Cell tuning</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Perform a Network and UE tuning</td>
<td>3</td>
</tr>
</tbody>
</table>
LTE L15 Operation

Description
Do you have sufficient skills to operate your Long Term Evolution (LTE) radio access network?
This course covers common operational tasks in the LTE radio network that NOC and OMC personnel come across in their daily work. Hardware, Software, Configuration, Fault and Performance Management concepts are covered. Practical exercises, based on work-order like instructions, contribute to the understanding of LTE network operations. OSS-RC tools and Element Management tools relevant for LTE are used where applicable.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the LTE network architecture and the Operation and Maintenance (O&M) support
   1.1 Note the primary functions of the nodes that build up LTE/SAE
   1.2 Describe on an overview level the O&M infrastructure
   1.3 Explain the Operation and Maintenance architecture of an RBS 6000 and where to find documentation about the Managed Object Model
2. Perform hardware and software Management in LTE RAN
   2.1 Explain the hardware building practice of RBS 6000 (MPE, DU, RU) and different ways O&M connectivity can be established to the node
   2.2 Export and handle hardware and software resources in an RBS 6000 via OSS-RC and EM
   2.3 Recognize the file system in an RBS 6000
   2.4 Describe the key Configuration Version concepts
   2.5 Work with Configuration Versions and file system using OSS-RC, EM, CLI and AMOS
   2.6 List the software upgrade procedure for a batch of RBS 6000 nodes
3. Perform fault management in LTE RAN
   3.1 Explain the fault management model
   3.2 Solve some common alarms by following Procedural Information, using OSS-RC (Alarm List Viewer and Alarm Status Matrix), AMOS and EM in the process
   3.3 Differentiate between the functions of the Command Line Interface (CLI) and Node Command Line Interface (NCLI)
4. Perform performance management on the LTE RAN
4.1 List the performance observables in the LTE RAN, and explain how they are related to Key Performance Indicators
4.2 Explain the E-UTRAN performance management solution
4.3 Identify the various performance statistics/recordings generated in the LTE RAN (Statistics, Cell Tracing, User Equipment Tracing)
4.4 Create a new Subscription Profile in the OSS-RC
4.5 Initiate a UE Trace using the OSS-RC
4.6 Explain what streaming events are and collect these events in OSS-RC
4.7 Perform Key Performance Indicators checks using AMOS

5. Perform basic RBS 6000 configuration procedures using OSS-RC and Element Manager
5.1 Describe the main steps in RBS 6000 integration
5.2 Note the different tools and procedures that could be used for configuration
5.3 Perform configuration changes in an existing eNodeB using Element Manager and/or OSS-RC and/or AMOS

Target audience
The target audience for this course is:
System Engineer, Service Engineer

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview Lzu1087020
RBS 6000 Overview Lzu1087503
Or
LTE/SAE Overview Lzu1087318 (WBL)

Duration and class size
The length of the course is 2 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
### Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Network architecture and LTE features</td>
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<tr>
<td></td>
<td>RBS 6000 Hardware and Software concepts and related OSS-RC tools</td>
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</tr>
<tr>
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<td>Operational exercises (ALEX library and MOM documentation familiarization)</td>
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<tr>
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<td>Operational exercises (HW and SW management)</td>
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<tr>
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<td>Operational exercises (HW and SW management) continued</td>
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<tr>
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<td>Fault Management</td>
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<td>Operational exercises (Fault management)</td>
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<tr>
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<td>LTE Performance Management</td>
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<tr>
<td></td>
<td>Operational exercises (Performance Management)</td>
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<tr>
<td>2</td>
<td>LTE Configuration Management</td>
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<tr>
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<td>Operational exercises (Configuration Management)</td>
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<td>Operational exercises summary</td>
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<tr>
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<td>Course summary</td>
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</tbody>
</table>
LTE L15 Operation with Ericsson Network Manager (ENM)

Description
The "LTE L15 Operation with Ericsson Network Manager (ENM)" course covers common operational tasks in the LTE radio network that NOC and OMC personnel come across in their daily work, using Ericsson Network Manager (ENM) as the operations tool. Hardware, Software, Configuration, Fault and Performance Management concepts are covered. Practical exercises, based on work-order like instructions, contribute to the understanding of LTE network operations. ENM tools and Element Management tools relevant for LTE are used where applicable.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the LTE network architecture and the Operation and Maintenance (O&M) support
   1.1 Note the primary functions of the nodes that build up LTE/SAE
   1.2 Describe on an overview level the O&M infrastructure
   1.3 Explain the Operation and Maintenance architecture of an RBS 6000 and where to find documentation about the Managed Object Model (MOM)

2. Perform hardware and software Management in LTE RAN
   2.1 Explain the hardware building practices of several RBS 6000 node types, namely the DUL/DUS-31/DUS-41 based RBS products (e.g. RBS 6201, RBS 6601), the pico RBS (RBS 6401 and RBS 6402) and the Radio Dot System (RDS) based configurations.
   2.2 Describe the different ways O&M connectivity can be established to the various types of RBS nodes
   2.3 Export and handle hardware and software resources in an RBS 6000 via ENM
   2.4 Recognize the file system in various types of RBS 6000
   2.5 Describe the key Configuration Version and backup management concepts
   2.6 Work with Configuration Versions/ backup management and file system handling using ENM (Topology Manager), EM, COLI, COM-CLI and AMOS
   2.7 List the software upgrade procedure in LTE RAN and understand how ENM may be used to carry out the upgrade procedure
   2.8 Discuss the various ways hardware and software inventory may be created using the ENM and the Element Management interfaces

3. Perform fault management in LTE RAN
3.1 Explain the fault management model
3.2 Solve some common alarms by following Procedural Information, using network management and element management tools/interfaces
3.3 Differentiate between the functions of the Command Line Interface (COLI) and Node Command Line Interface (NCLI), COM-CLI in the process of fault management.

4. Perform performance management on the LTE RAN
4.1 List the performance observables in the LTE RAN, and explain how they are related to Key Performance Indicators
4.2 Explain the E-UTRAN performance management solution
4.3 Identify the various performance statistics/recordings generated in the LTE RAN (Statistics, Cell Tracing, User Equipment Tracing)
4.4 Create new Subscription Profile and verify the collection of statistics using the ENM and COLI/COM-CLI
4.5 Initiate a UE Trace
4.6 Explain what streaming events are and collect these events

5. Perform basic RBS 6000 configuration procedures using ENM and EM/COM-CLI
5.1 Describe the main steps in RBS 6000 integration
5.2 Note the different tools and procedures that could be used for configuration
5.3 Perform configuration changes in an existing eNodeB using Element Manager, COM-CLI and ENM

Target audience
The target audience for this course is:
System Engineer, Service Engineer

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview LZU1087020
RBS 6000 Overview LZU1087503
Or
LTE/SAE Overview LZU1087318 (WBL)

Duration and class size
The length of the course is 2 days and 0 hours and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
### Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
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<td>Chapter 2: Hardware/ Software Management and exercises</td>
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<td>Chapter 2: Hardware/software Management (continued)</td>
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<td>Chapter 3: Fault Management and exercises</td>
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<td>Chapter 4: Performance Management and exercises</td>
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<td>Chapter 5: Configuration Management</td>
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<td>Summary and End of course procedures</td>
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LTE L15 Performance Management and Optimization

Description
How are eNodeB counters used to monitor the performance of the LTE network? How are these counters collected and stored? What are the Key Performance Indicators (KPI) for the LTE network? What are the parameters that influence these KPIs? What is contained in LTE Cell and UE Trace and how are they handled by the Ericsson OSS-RC?

This ‘LTE L15 Performance Management and Optimization’ course will allow students to become familiar with using eNodeB counters to create KPI formulas to measure E-UTRAN Accessibility, Retainability, Integrity, Mobility and Availability performance and the parameters that may be used to optimize these areas.

Through practical exercises they will learn how to use the Ericsson OSS-RC to collect counters from the eNodeB, setup and decode LTE Cell and UE Trace. They will also use the Advanced MO Scripting (AMOS) tool to display counter values and KPIs on the eNodeB.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the E-UTRAN Performance Management solution
   1.1 Describe the difference between Initial Tuning and Optimization
   1.2 Identify how eNodeB counters are collected and stored

2. Measure LTE Accessibility performance
   2.1 Describe the E-RAB setup procedure and associated counters
   2.2 Use eNodeB counters to create E-RAB Accessibility KPIs
   2.3 Explain the eNodeB parameters and Features that influence Accessibility

3. Measure LTE Retainability performance
   3.1 Describe the E-RAB release procedure and associated counters
   3.2 Use eNodeB counters to create E-RAB Retainability KPIs
   3.3 Explain the eNodeB parameters and Features that influence Retainability

4. Measure LTE Integrity performance
   4.1 Explain the counters that are used to measure LTE Radio Bearer LTE throughput
   4.2 Use eNodeB counters to create E-UTRAN Integrity KPIs
   4.3 Explain the eNodeB parameters and Features that influence Integrity

5. Measure LTE Mobility performance
   5.1 Explain the various LTE mobility procedures and associated counters
5.2 Use eNodeB counters to create E-UTRAN Mobility KPIs
5.3 Explain the eNodeB parameters and Features that influence Mobility
6. Measure LTE Cell Availability
6.1 Explain the counters that are used to measure LTE Cell Availability
6.2 Use eNodeB counters to create Cell Availability KPIs and measure System Utilization
6.3 Explain the eNodeB parameters and Features that influence Cell Availability and System Utilization
7. Explain what is collected by LTE Cell and UE Trace
7.1 Explain briefly how LTE Cell and UE Trace are collected and stored
8. Use the OSS-RC to collect E-UTRAN counters and handle LTE Cell and UE Trace
8.1 Create, activate and delete subscription profiles
8.2 Use the OSS-RC to open and view the contents of LTE Cell and UE Trace files
9. Explain the Advanced MO Scripting (AMOS) tool
9.1 Use AMOS to display pm counters from an eNodeB
9.2 Use AMOS to display eNodeB KPIs

Target audience
The target audience for this course is:
Service Planning Engineer, Service Design Engineer, Network Design Engineer, System Engineer, Service Engineer

Prerequisites
Successful completion of the following courses:
LTE L15 Air Interface LZU1089929
LTE L15 Configuration LZU1089935
LTE L15 Protocols and Procedures LZU1089931
LTE L15 Radio Network Functionality LZU1089943
LTE L15 Advanced Radio Network Features LZU1089942
LTE L15 Troubleshooting LZU1089936

Duration and class size
The length of the course is 4 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
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<th>Day</th>
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<th>Estimated Time (hours)</th>
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<td>LTE Performance Management Introduction</td>
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<tr>
<td></td>
<td>LTE Accessibility Optimization</td>
<td>3</td>
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<tr>
<td></td>
<td>LTE Retainability Optimization</td>
<td>2</td>
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<tr>
<td>2</td>
<td>LTE Integrity Optimization</td>
<td>4</td>
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<td></td>
<td>LTE Mobility Optimization</td>
<td>3</td>
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<tr>
<td>3</td>
<td>LTE Availability Optimization</td>
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<tr>
<td></td>
<td>LTE Cell and UE Trace</td>
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<td>4</td>
<td>OSS-RC Statistics, Cell and UE Trace Handling</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Advanced MO Scripting (AMOS)</td>
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</table>
LTE L15 Protocols and Procedures

Description
Do you need to know what procedures are triggered in the EPS network and how? What messages are exchanged among the LTE and EPC nodes? And which protocols are used to implement them? This course provides an indepth understanding of the various protocols and procedures in the E-UTRAN. It looks into the overall EPS architecture, the functionalities of each node and the interfaces interconnecting them. It details how Quality of Service and the different levels of security are implemented in LTE. Focus is given on the functions and services provided by various L3 signaling protocols, NAS, RRC, GTP-C, and the different L2 transport protocols, PDCP, RLC and MAC. It provides a thorough discussion of the Attach procedure and the different types of intraLTE, interLTE, and IRAT mobility.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the EPS Protocol Architecture
   1.1 Distinguish between the different EPS Protocols
   1.2 Explain the EPS architecture, Bearer and Tracking Area
   1.3 Draw a simplified EPS diagram showing the protocols used.

2. Explain the LTE/SAE Quality of Service and Security in LTE
   2.1 Explain the purposes of EPS Bearer Service and Data Radio Bearer
   2.2 List the different attributes of the Data Radio Bearer and explain how they are used
   2.3 Explain Authentication Procedure
   2.4 Explain Radio Access Security
   2.5 Explain TN Security

3. Explain the various L3 Signaling Protocols
   3.1 Explain the functions of the Non Access Stratum NAS protocol
   3.2 List the different procedures in the NAS layer
   3.3 Explain the interaction between RRC and the lower layers in the control plane
   3.4 Explain the RRC Service States and the difference between connected and idle mode
   3.5 Explain the functions and services of RRC such as System Information Broadcast, Paging, Cell Selection and Mobility
   3.6 Explain the main functions and procedures of X2AP signaling protocol.
   3.7 Explain the main functions and procedures of S1AP signaling protocol.
   3.8 Explain the main functions and procedures of the signaling protocol GTP-C.
4. Explain the L2 transport protocols PDCP, RLC, MAC and GTP-U Protocols
   4.1 Explain the PDCP functions and services such as header compression and ciphering
   4.2 Explain the RLC functions.
   4.3 List the different modes of RLC (transparent, unacknowledged and acknowledged mode) and explain the structure of the PDU involved in these cases.
   4.4 Explain the MAC functions such as HARQ, BCH Reception, PCH reception
   4.5 Explain the MAC architecture, its entities and their usage for the mapping of transport channels.
   4.6 List the contents of the MAC Packet Data Unit (PDU).
   4.7 Explain the main functions and procedures of the transport protocol GTP-U

5. Explain Mobility in LTE
   5.1 Intra-Frequency Handover (X2 and S1 Handover)
   5.2 Coverage Triggered Session Continuity
   5.3 Inter-frequency Handover
   5.4 IRAT Handover
   5.5 CS Fallback
   5.6 Single Radio Voice Call Continuity (SRVCC) Handover to UTRAN/GERAN/CDMA1x

Target audience
The target audience for this course is:
Service Design Engineer, Network Design Engineer, Service Engineer

Prerequisites
Successful completion of the following courses:
LTE L15 Air Interface LZU1089929

Duration and class size
The length of the course is 4 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment.
Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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</thead>
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<td>Exercise</td>
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<td>Explain the LTE/SAE Quality of Service and Security</td>
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<td>Exercise</td>
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<tr>
<td>2</td>
<td>Explain the LTE Security</td>
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<tr>
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<td>Explain the NAS and RRC protocols</td>
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<tr>
<td>3</td>
<td>Practical layer 3 Exercise</td>
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</tr>
<tr>
<td></td>
<td>Explain the X2/S1 Interface, X2AP/S1AP and GTP-C protocols</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Explain the PDCP, RLC, MAC and GTP-U protocols</td>
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</tr>
<tr>
<td>4</td>
<td>Continue with PDCP, RLC, MAC and GTP-U protocols</td>
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<tr>
<td></td>
<td>Explain Mobility in LTE</td>
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<tr>
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<td>Practical exercise</td>
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LTE L15 Radio Network Design

Description
What is the 3GPP Long Term Evolution (LTE) strategy for the UMTS Network? How does Orthogonal Frequency Division Multiplexing (OFDMA) and Single-Carrier Frequency Division Multiple Access (SC-FDMA) used in the evolved UMTS Terrestrial Radio Access Network (eUTRAN) produce data rates in excess of 100 Mbps? What types of traffic are carried by the LTE Network? How is the coverage and capacity of an LTE cell calculated? How is the LTE Radio Network implemented with Ericsson hardware?

This LTE L15 Network Design course introduces attendees to the concepts of LTE and the operation of OFDMA and SC-FDMA. With this knowledge they will be guided through the LTE Radio Network dimensioning process and given the opportunity to perform sample LTE dimensioning exercises. They will also be introduced to the TEMS CellPlanner LTE module and the hardware that supports the Ericsson LTE L14 network.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the reasons behind the 3GPP Long Term Evolution (LTE) strategy for UMTS.
   1.1 Explain the general dimensioning principles
2. Perform calculations on the radio interface capacity
   2.1 Explain how the LTE downlink and uplink data rates are achieved and calculated.
   2.2 List the LTE UE category capabilities.
   2.3 Explain radio wave propagation and typical channel models
3. Describe the different types of traffic carried by LTE networks.
   3.1 Explain the protocols that support the various LTE traffic types.
   3.2 Explain the operation of TCP, UDP, HTTP and FTP Internet Protocols.
   3.3 Explain the issues surrounding Voice over LTE.
4. Explain the Ericsson LTE dimensioning process.
   4.1 Perform uplink and downlink coverage and capacity calculations for LTE FDD and TDD.
   4.2 Perform Control Channel dimensioning
   4.3 Perform Tracking Area planning
   4.4 Perform Paging Capacity calculations
   4.5 Explain which tools are used in radio network dimensioning
4.6 Apply subscriber and traffic growth scenarios and perform dimensioning exercise
4.7 Recommend sites for LTE deployment to meet coverage and capacity requirements set by the customer

5. Perform analysis of co-location and co-existence scenarios
5.1 Explain on overview level the transmitter interference characteristics.
5.2 Explain Adjacent Channel Leakage Ratio (ACLR) and spurious emissions.
5.3 Describe the receiver interference characteristics
5.4 Explain Adjacent Channel Selectivity (ACS) and receiver blocking.
5.5 Explain Adjacent Channel Interference Ratio (ACIR).
5.6 Explain the co-location and co-existence and problems that may occur

6. Explain the tools and hardware associated with LTE cell planning.
6.1 Explain the downlink and uplink analysis supported by the TEMS CellPlanner LTE module.
6.2 List the Ericsson products in the RBS 6000 family.
6.3 Explain the hardware structure and capabilities of the RBS 6101, 6102, 6201, 6202, and 6601.

Target audience

The target audience for this course is:
Service Planning Engineer, Service Design Engineer, Network Design Engineer

Prerequisites

Successful completion of the following courses:
LZU1089929 R1A LTE L15 Air Interface
LZU1089931 R1A LTE L15 Protocols and Procedures
LZU1089188 R1A LTE L15 Radio Network Functionality

Duration and class size

The length of the course is 2 days and the maximum number of participants is 16.

Learning situation

This course is based on theoretical instructor-led lessons with practical exercises.
## Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

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<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<td>General dimensioning principles</td>
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<td>Radio interface capacity</td>
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<td>Traffic types and protocols</td>
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<td>LTE dimensioning</td>
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<td>LTE dimensioning</td>
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<tr>
<td>2</td>
<td>Co-location and co-existence</td>
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<tr>
<td></td>
<td>LTE cell planning</td>
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LTE L15 Radio Network Functionality

Description
Do you want to have full and detailed understanding of the Ericsson E-UTRAN general functionality? If so, the LTE L15 Radio Network Functionality course will give you that.

This course describes the Idle Mode Behavior, how Radio Connection Supervision is carried out, Power Control calculations, settings and functions as well as Link Adaptation and basic scheduling behavior. Also, the basic Admission Control and Mobility functionality will definitely boost your competence and understanding of the Ericsson E-UTRAN solution.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the logical architecture of E-UTRAN and introduce Radio Functionality
   1.1 Detail the logical architecture of the Ericsson E-UTRAN
   1.2 List the Radio Functionality supported in the Ericsson E-UTRAN
2. Describe the purpose and function of Idle Mode Behavior
   2.1 Explain PLMN and Cell selection and reselection
   2.2 Explain location and TA updating procedures
   2.3 Explain paging procedures
   2.4 Describe system information
3. Explain the purpose and function of Radio Connection Supervision
   3.1 Explain how the radio connection supervision is carried out
   3.2 Explain how in-synch and out-of-synch is determined by the radio link monitoring algorithm in the RBS
4. Describe the purpose and use of the function Power Control, Link Adaptation and basic Scheduling
   4.1 Explain the interaction between Power Control, Link Adaptation and Scheduling
   4.2 Explain open loop power control for initial access
   4.3 Configure the power of common channels
   4.4 Explain uplink power control for PUSCH and PUCCH
   4.5 Detail DL-SCH processing using MIMO
5. Describe the purpose and function of basic Admission Control
   5.1 Describe the interaction between the Monitored System Resources (MSRs) and the different algorithms
5.2 Explain the static and dynamic MSRs
5.3 Explain basic Admission Control
6. Explain the concepts of LTE Mobility
   6.1 Explain X2 and S1 Handover
   6.2 Detail what type of events trigger measurement reports to be sent to the eNB
   6.3 Describe the purpose of the handover evaluation algorithm and Best Cell Evaluation
   6.4 Explain IF and IRAT mobility
   6.5 Explain CS Fallback

Target audience
The target audience for this course is:
Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview LZU1087020
LTE L15 Air Interface LZU1089929
LTE L15 Protocols and Procedures LZU1089931

Duration and class size
The length of the course is 3 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment
Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

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<th>Day</th>
<th>Topics in the course</th>
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<td>Idle Mode Behavior</td>
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<td>Radio Connection Supervision</td>
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<td>2</td>
<td>Link Adaptation</td>
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<td>Power Control</td>
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<td>Scheduling</td>
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<td>MIMO processing and feedback</td>
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<td>3</td>
<td>Basic Admission Control</td>
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<td></td>
<td>X2 and S1 Handover</td>
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<tr>
<td></td>
<td>IF and IRAT Mobility</td>
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<tr>
<td></td>
<td>CS Fallback</td>
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</table>
LTE L15 Troubleshooting

Description
While configuring and operating an L15 based LTE RAN network, what are the common faults, how are they detected and solved in a RBS 6000 node? How does Ericsson local/field support enable and collect logs from a RBS 6000 node?

LTE L15 Troubleshooting explains how a fault is detected, the different types of logs in a RBS 6000 and how logs are collected to be appended to Customer Service Requests (CSRs). Alarm handling procedures and tools are covered, together with the procedure for initiating performance recordings and statistics in the process of working with troubleshooting a problem. Verification of connectivity issues and emergency recovery concepts are also explained, making it ideal for operation and maintenance personnel. Customer Product Information (CPI) in ALEX is used as much as possible during the training.

Learning objectives
On completion of this course the participants will be able to:

1. Describe and use the different troubleshooting tools for in LTE RAN
   1.1 List and use tools available at the RBS site which are available for troubleshooting the RBS
   1.2 Identify tools in the OSS-RC are useful for troubleshooting the LTE RBS
   1.3 Distinguish between Cell Trace and UE Trace support and be able to activate these traces

2. Explain the emergency recovery procedure of an RBS and collect data while creating Customer Service Requests (CSRs)
   2.1 Understand the Ericsson support process
   2.2 Explain what Data Collection Guideline (DCG) is, and apply commands to gather mandatory inputs while writing CSRs
   2.3 Browse through and appreciate the various logs that RBS provides while troubleshooting
   2.4 List and explain the functions of the various files that make up a Configuration Version (CV)
   2.5 Recover a RBS 6000 from an emergency cyclic restart state, and from a different CV

3. Discuss and perform system level troubleshooting concepts
   3.1 Describe which interfaces that the RBS provides
3.2 Check O&M connectivity on the Mul interface
3.3 Expand and act on Alarms
3.4 Verify the Network Synchronization status
3.5 Differentiate between the various states of Managed Objects
3.6 Relate counter values to RBS's performance
3.7 Discuss various end-to-end system performance issues
3.8 Execute commands to check S1 connectivity

Target audience
The target audience for this course is:
System Engineer, Service Engineer, Field Technician

Prerequisites
Successful completion of the following courses:
LTE L15 Operation LZU1089934
LTE L15 Air Interface LZU1089929
LTE L15 Configuration LZU1089935
LTE L15 Protocols and Procedures LZU1089931

Duration and class size
The length of the course is 3 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools, which are accessed remotely.
**Time schedule**

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<tr>
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<td>Troubleshooting tools</td>
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<td>RBS 6000 Hardware structure</td>
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<td>Troubleshooting tools Exercises</td>
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<td>RBS Recovery and Data Collection Guideline</td>
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<td>2</td>
<td>RBS Recovery and Data Collection Guideline Exercises</td>
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<td>RBS 6000 interfaces (S1/X2/MuI)</td>
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<td>System view troubleshooting</td>
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</tr>
<tr>
<td>3</td>
<td>System view Exercises</td>
<td>3.0</td>
</tr>
</tbody>
</table>
LTE RBS 6402 Field Maintenance

LZU1089944 R1A

Description
This course is a task-based maintenance course where participants will understand the functions of the RBS 6402, its optional units and learn how to handle RBS faults at site. During this activity, participants will also get familiar with the use of the ALEX documents (or Customer Product Information) to handle faulty equipment and perform correct procedure in replacing the hardware.

Learning objectives
On completion of this course the participants will be able to:

1. Explain on overview level the LTE RAN Site Concept for RBS
   1.1 Explain the basic LTE Radio Access Network
   1.2 Outline the RBS 6000 portfolio and Support System
   1.3 Explain the basic heterogeneous network
   1.4 Advantages and benefits of heterogeneous network
   1.5 Understand the concepts of Small Cell Sites

2. Perform maintenance tasks on the RBS 6402 nodes
   2.1 Explain RBS 6402 Main features and optional equipment
   2.2 Explain the RBS 6402 Hardware architecture
   2.3 Identify the RBS 6402 Connection interfaces
   2.4 Understand the RBS 6402 Maintenance procedures
   2.5 Explain RBS 6402 Handling faulty equipment

3. Use the Customer Product Information (CPI) and Tool Kits
   3.1 Explain the CPI Library structure of the node
   3.2 Find information in the CPI Library with use of regular expression
   3.3 Find operational instructions (OPI) and maintain the node according to the OPI
   3.4 Find additional information on an alarm and solve the problem with the help of the CPI
   3.5 Know the different tool kits exist and how to order the Tool Kits

4. Handling Fault on-site
   4.1 Understand how to isolate and correct common malfunctions of RBS 6402
   4.2 Know the behavior of the indicators
   4.3 Perform restart of the RBS 6402
   4.4 Perform RBS 6402 replacement
   4.5 Have a basic understanding of the Ericsson Node Integration Scanner (ENIS)
Target audience
The target audience for this course is:
Field Technician

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview, LZU1087020
LTE L15 Air Interface (optional), LZU
Or
LTE/SAE - System Overview (WBL), LZU1087318
RBS 6000 in a Nutshell, LZU1087504

Duration and class size
The length of the course is 1 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.

Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

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<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
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<td></td>
<td>LTE RAN Systems and Site Introduction</td>
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<td>RBS 6402 components</td>
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<tr>
<td></td>
<td>Handling fault 0n-site</td>
<td>2.0</td>
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</table>
LTE/SAE System Overview

Description
If you want to know what LTE/SAE (Long Term Evolution / System Architecture Evolution) is, this course will give you an overview of the new radio technology and protocols involved in the E-UTRAN (Evolved UTRAN, also referred to as LTE) and the architecture behind EPC (Evolved Packet Core, also referred to as SAE – System Architecture Evolution). The course also provides descriptions of the CPP hardware platform, operation and maintenance and RBS hardware.

Learning objectives
On completion of this course the participants will be able to:

1. Explain the background and architecture of E-UTRAN and EPC
   1.1 Describe the evolution of cellular networks
   1.2 Summarize the evolution of 3GPP releases, from release 99 to release 12
   1.3 Explain the logical architecture of EPS and the interworking with other technologies
   1.4 Explain the EPS bearer concept and give an overview of the LTE QoS framework

2. Describe the EPC Architecture
   2.1 Describe the interfaces in EPS
   2.2 Describe the Evolved Packet Core (EPC)
   2.3 Describe the role of the MME, S-GW and PDN-GW

3. Describe the E-UTRAN Architecture
   3.1 List the functionality of the eNodeB
   3.2 Describe the radio interface techniques; OFDM and SC-FDMA and the physical bit rates
   3.3 Discuss Link Adaption in LTE
   3.4 Describe the basic principles of MIMO
   3.5 Explain the concept of Carrier Aggregation
   3.6 Describe the RBS 6000 Hardware for LTE
   3.7 Describe the Ericsson Radio System
   3.8 Explain the HetNet Solution
   3.9 Outline on overview level the security in LTE
   3.10 Describe the different type of synch in LTE

4. Describe key LTE Solutions
   4.1 Explain the options for Voice; CS Fallback and VoLTE
4.2 Describe the LTE Broadcast Service, eMBMS
4.3 Explain Location services
5. Explain the various LTE mobility scenarios
5.1 Describe LTE idle mode mobility
5.2 Detail Intra LTE connected mode mobility; handovers and session continuity
5.3 Explain IRAT Handover scenarios
6. Describe O&M (Operation and Maintenance) for EPS
6.1 Describe OSS-RC
6.2 Describe ENM
6.3 Explain the concepts related to Smart Simplicity, Self-Organizing Networks (SON), RBS Auto integration

Target audience
The target audience for this course is:
System Engineer, Service Design Engineer, Network Design Engineer, Service Engineer

Prerequisites
Successful completion of the following courses:
A general knowledge in cellular systems and radio technology.

Duration and class size
The length of the course is 2 days and the maximum number of participants is 16.

Learning situation
This course is based on theoretical instructor-led lessons given in a classroom environment.
### Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction, LTE/SAE Introduction</td>
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<tr>
<td></td>
<td>EPC Architecture</td>
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<tr>
<td></td>
<td>E-UTRAN Architecture</td>
<td>2,0</td>
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<td>2</td>
<td>Voice in LTE</td>
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<tr>
<td></td>
<td>LTE Broadcast</td>
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</tr>
<tr>
<td></td>
<td>LTE Positioning</td>
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</tr>
<tr>
<td></td>
<td>LTE Mobility</td>
<td>1,5</td>
</tr>
<tr>
<td></td>
<td>LTE Operation and Maintenance</td>
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</tbody>
</table>
LTE RBS 6202 Field Maintenance

LZU1088285 R4A

Description
This course is a task-based course covering hardware replacement and maintenance of the RBS 6202 standard node with RUL and RUS 01/02 type (optional radio units for hybrid configuration such as RRUL 11, RRUS 01, RRUS 02, RRUS 11, RRUS 12, RRUS 61, mRRUS 12 and AIR 11/21 are available in the Appendix). The participants will perform hardware fault localization, hardware replacement and configuration tasks on a RBS 6202 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools such as Element Manager (EM), COmmand Line Interface (COLI) and Node Command line Interface (NCLI).

Learning objectives
On completion of this course the participants will be able to:

1. **Explain on overview level the LTE RAN Site Concept for RBS**
   1.1 Explain the basic LTE Radio Access Network
   1.2 Outline the RBS 6000 portfolio
   1.3 Identify the RBS 6000 Support System, Radio Modules and Digital Units
   1.4 Understand RBS 6000 Building Block and Hybrid configuration
   1.5 Identify the Antenna System Controller, ASC
   1.6 Identify and locate the Remote Electrical Tilt Unit, RETU

2. **Perform maintenance and configuration tasks on the RBS 6202 nodes**
   2.1 Explain RBS 6202 Main features
   2.2 Explain the RBS 6202 Hardware architecture
   2.3 Identify the RBS 6202 Connection interfaces
   2.4 Explain DUL Hardware architecture
   2.5 Identify the DUL connection Interfaces
   2.6 Explain the Battery Backup System PBC 6200
   2.7 Understand the RBS 6202 Maintenance procedures
   2.8 Explain RBS 6202 Handling faulty equipment

3. **Use the Customer Product Information (CPI) and Tool Kits**
   3.1 Explain the CPI library structure of the node
   3.2 Find information in the CPI Library with use of regular expression
   3.3 Find operational instructions (OPI) and maintain the node according to the OPI
   3.4 Find additional information on an alarm and solve the problem with the help of the CPI
3.5 Know that different tool kits exists and how to order the Tool Kits.

4 Connect to a node using COLI and also using NCLI
4.1 Understand basic commands using COLI and using NCLI
4.2 Have a basic understanding of the functionality and technology used in COLI and NCLI
4.3 Understand the basic principles behind the Managed Object Model (MOM)
4.4 Understand the file system in a CPP based node
4.5 Investigate the purpose and the location of the various types of logs.

5 Use the Element Manager
5.1 Download and start the Element Manager
5.2 Access and use the different “Views”; Containment, ATM, Equipment, IP, Licensing, Radio Network and the Software.
5.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log
5.4 Access the property help feature from each window
5.5 Create a Customized View (User Defined) in Element Manager
5.6 Handling License Key Files, LKF
5.7 Explain how to format the node
5.8 Explain how to load the basic package software

Target audience
The target audience for this course is:
Field Technician

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview, LZU1087020
RBS 6000 Overview, LZU1087503
LTE L13 Air Interface (optional), LZU1089102
Or
LTE/SAE - System Overview (WBL), LZU1087318
RBS 6000 in a Nutshell, LZU1087504

Duration and class size
The length of the course is 1 day and the maximum number of participants is 8.
Learning situation

This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.

Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>LTE RAN Systems and Site Introduction</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>LTE RBS 6202 Maintenance</td>
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</tr>
<tr>
<td></td>
<td>Customer Product Information and Tool Kits</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>Command Line Interface/Node Command Line Interface</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Element Manager</td>
<td>1</td>
</tr>
</tbody>
</table>
LTE RBS 6301 Field Maintenance

Description
This course is a task-based course covering hardware replacement and maintenance of the RBS 6301 standard node with RRUL 11 type (optional radio units for hybrid configuration such as RRUS 01, RRUS 02, RRUS 11, RRUS 12, RRUS 61, mRRUS 12 and AIR 11/21 are available in the Appendix). The participants will perform hardware fault localization, hardware replacement and configuration tasks on a RBS 6301 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools such as Element Manager (EM), COmmand Line Interface (COLI) and Node Command line Interface (NCLI).

Learning objectives
On completion of this course the participants will be able to:

1. **Explain on overview level the LTE RAN Site Concept for RBS**
   1.1 Explain the basic LTE Radio Access Network
   1.2 Outline the RBS 6000 portfolio
   1.3 Identify the RBS 6000 Support System, Radio Modules and Digital Units
   1.4 Understand RBS 6000 Building Block and Hybrid configuration
   1.5 Identify the Antenna System Controller, ASC
   1.6 Identify and locate the Remote Electrical Tilt Unit, RETU

2. **Perform maintenance and configuration tasks on the RBS 6301 nodes**
   2.1 Explain RBS 6301 Main features
   2.2 Explain the RBS 6301 Hardware architecture
   2.3 Identify the RBS 6301 Connection interfaces
   2.4 Explain DUL Hardware architecture
   2.5 Identify the DUL connection Interfaces
   2.6 Explain the Battery Backup System for RBS 6301
   2.7 Understand the RBS 6301 Maintenance procedures
   2.8 Explain RBS 6301 Handling faulty equipment

3. **Use the Customer Product Information (CPI) and Tool Kits**
   3.1 Explain the CPI library structure of the node
   3.2 Find information in the CPI Library with use of regular expression
   3.3 Find operational instructions (OPI) and maintain the node according to the OPI
   3.4 Find additional information on an alarm and solve the problem with the help of the
CPI

3.5 Know that different tool kits exists and how to order the Tool Kits.

4 Connect to a node using COLI and also using NCLI
4.1 Understand basic commands using COLI and using NCLI
4.2 Have a basic understanding of the functionality and technology used in COLI and NCLI
4.3 Understand the basic principles behind the Managed Object Model (MOM)
4.4 Understand the file system in a CPP based node
4.5 Investigate the purpose and the location of the various types of logs.

5 Use the Element Manager
5.1 Download and start the Element Manager
5.2 Access and use the different "Views"; Containment, ATM, Equipment, IP, Licensing, Radio Network and the Software.
5.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log
5.4 Access the property help feature from each window
5.5 Create a Customized View (User Defined) in Element Manager
5.6 Handling License Key Files, LKF
5.7 Explain how to format the node
5.8 Explain how to load the basic package software

Target audience
The target audience for this course is:
Field Technician

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview, Lzu1087020
RBS 6000 Overview, Lzu1087503
LTE L13 Air Interface (optional), Lzu1089102
Or
LTE/SAE - System Overview (WBL), Lzu1087318
RBS 6000 in a Nutshell, Lzu1087504

Duration and class size
The length of the course is 1 day and the maximum number of participants is 8.
Learning situation

This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.

Time schedule

The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>LTE RAN Systems and Site Introduction</td>
<td>0.5</td>
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<tr>
<td></td>
<td>LTE RBS 6301 Maintenance</td>
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</tr>
<tr>
<td></td>
<td>Customer Product Information and Tool Kits</td>
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</tr>
<tr>
<td></td>
<td>Command Line Interface/Node Command Line Interface</td>
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</tr>
<tr>
<td></td>
<td>Element Manager</td>
<td>1</td>
</tr>
</tbody>
</table>
LTE RBS 6401 Field Maintenance

LZU1089575 R1A

Description
This course is a task-based maintenance course where participants will understand the functions of the RBS 6401, it's optional units and learn how to handle RBS faults at site. During this activity, participants will also get familiar with the use of the ALEX documents (or Customer Product Information) to handle faulty equipment and perform correct procedure in replacing the hardware.

Learning objectives
On completion of this course the participants will be able to:

1. **Explain on overview level the LTE RAN Site Concept for RBS**
   1.1 Explain the basic LTE Radio Access Network
   1.2 Outline the RBS 6000 portfolio and Support System
   1.3 Explain the basic heterogeneous network
   1.4 Advantages and benefits of heterogeneous network
   1.5 Understand the concepts of Small Cell Sites

2. **Perform maintenance tasks on the RBS 6401 nodes**
   2.1 Explain RBS 6401 Main features and optional equipment
   2.2 Explain the RBS 6401 Hardware architecture
   2.3 Identify the RBS 6401 Connection interfaces
   2.4 Understand the role of the IPG 6440
   2.5 Understand the RBS 6401 Maintenance procedures
   2.6 Explain RBS 6401 Handling faulty equipment

3. **Use the Customer Product Information (CPI) and Tool Kits**
   3.1 Explain the CPI Library structure of the node
   3.2 Find information in the CPI Library with use of regular expression
   3.3 Find operational instructions (OPI) and maintain the node according to the OPI
   3.4 Find additional information on an alarm and solve the problem with the help of the CPI
   3.5 Know the different tool kits exist and how to order the Tool Kits

4. **Handling Fault on-site**
   4.1 Understand how to isolate and correct common malfunctions of RBS 6401
   4.2 Know the behavior of the indicators
   4.3 Perform restart of the RBS 6401
   4.4 Perform RBS 6401 replacement
4.5 Have a basic understanding of the Ericsson Node Integration Scanner (ENIS)

Target audience
The target audience for this course is:
Field Technician

Prerequisites
Successful completion of the following courses:
- LTE/SAE System Overview, LZU1087020
- RBS 6000 Overview, LZU1087503
- LTE L13 Air Interface (optional), LZU1089120
  Or
- LTE/SAE - System Overview (WBL), LZU1087318
- RBS 6000 in a Nutshell, LZU1087504

Duration and class size
The length of the course is 1 days and the maximum number of participants is 8.

Learning situation
This course is based on theoretical and practical instructor-led lessons given in both classroom and in a technical environment using equipment and tools.
Time schedule
The time required always depends on the knowledge of the attending participants and the hours stated below can be used as estimate.

<table>
<thead>
<tr>
<th>Day</th>
<th>Topics in the course</th>
<th>Estimated Time (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course introduction</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>LTE RAN Systems and Site Introduction</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>RBS 6401 components</td>
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<tr>
<td></td>
<td>LTE RBS 6601 Maintenance</td>
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</tr>
<tr>
<td></td>
<td>Customer Product Information (CPI) and Tool Kits</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Handling fault on-site</td>
<td>2</td>
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</tbody>
</table>
Quality of Service and Security in the RAN- Live Virtual

LZU1089809 R2A

Description
Do you know how Quality of Service and Security are implemented in LTE? Would you like to learn more? This course explains the Quality of Service framework, the QoS related features and Security between the UE and the network.

Learning objectives
On completion of this course the participants will be able to:

1. Introduce LTE/SAE Quality of Service
   1.1 Discuss QoS necessity
   1.2 Explain the EPS Bearer and the QoS parameters
   1.3 Describe the E2E QoS implementation
   1.4 Elaborate on the Default EPS Bearer
   1.5 Elaborate on the Dedicated EPS Bearer

2. Explain QoS implementation in the RAN
   2.1 List the QoS related RAN features
   2.2 Explain how the Scheduler works
   2.3 Describe the enhanced Admission Control
   2.4 Explain QoS in the Transport Network

3. Explain Security in LTE
   3.1 Explain Authentication Procedure
   3.2 Explain Radio Access Security
   3.3 Explain Non Access Stratum (NAS) security
   3.4 Explain IPSec

Target audience
The target audience for this course is:
Service Engineer, Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
**LTE/SAE System Overview, Lzu1087020**

**Duration and class size**
The length of the course is 3 hours spread over 1 session and the maximum number of participants is 12.

**Learning situation**
This course is based on interactive theoretical instructor-led lessons given in a live virtual classroom environment.

**Time schedule**
The time required always depends on the knowledge of the attending participants. The time for covering the topics which is stated below can be used as an estimate.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics in the course</th>
<th>Time (min)</th>
</tr>
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<tr>
<td>1</td>
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</tr>
<tr>
<td>1</td>
<td>QoS implementation in the RAN</td>
<td>85</td>
</tr>
<tr>
<td>1</td>
<td>Security in LTE</td>
<td>45</td>
</tr>
</tbody>
</table>
Description
Do you want to have a detailed understanding of the Ericsson VoLTE (Voice over LTE) solution with focus on E-UTRAN?
This course offers an overview of MMTel, IMS and EPS. It covers end to end considerations, call and mobility procedures that will definitely boost your competence and understanding of VoLTE and the radio related functionality.

Learning objectives
On completion of this course the participants will be able to:

1. Describe the Network Architecture and IMS basics
   1.1 Explain QoS in VoLTE
   1.2 Establishment of default bearer for IMS signaling
   1.3 Detail the VoLTE Call Establishment (dedicated bearer establishment)
   1.4 Describe Single Radio Voice Call Continuity (SRVCC)
   1.5 Explain CS Fallback
2. Describe important radio features for VoLTE
   2.1 Describe feature dependencies and configuration examples

Target audience
The target audience for this course is:
Service Engineer, Service Design Engineer, Network Design Engineer

Prerequisites
Successful completion of the following courses:
LTE/SAE System Overview LZU1087020

Duration and class size
The length of the course is 6 hours spread over 2 sessions and the maximum number of participants is 12.

Learning situation
This course is based on interactive theoretical instructor-led lessons given in a live virtual classroom environment.

Time schedule
The time required always depends on the knowledge of the attending participants. The time for covering the topics which is stated below can be used as an estimate.

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics in the course</th>
<th>Time (min)</th>
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<tbody>
<tr>
<td>1</td>
<td>Network Architecture &amp; IMS overview</td>
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<tr>
<td>1</td>
<td>Quality of Service aspects</td>
<td>30</td>
</tr>
<tr>
<td>1</td>
<td>Establishment of default EPS bearer for IMS signaling</td>
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</tr>
<tr>
<td>1</td>
<td>VoLTE call establishment</td>
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<tr>
<td>1</td>
<td>SRVCC</td>
<td>30</td>
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<tr>
<td>1</td>
<td>CS Fallback</td>
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</tr>
<tr>
<td>2</td>
<td>VoLTE related radio features</td>
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<tr>
<td>2</td>
<td>VoLTE feature dependencies and configuration examples</td>
<td>60</td>
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</tbody>
</table>