Global Services

Long Term Evolution Radio Access Network L10

Training Programs

Catalog of Course Descriptions

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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:

Icon	Delivery Method
	Instructor Led Training (ILT)
	Seminar (SEM)
	Workshop (WS)
	Virtual Classroom Training (VCT)
	Web Based Learning/eLearning (WBL)
	Structured Knowledge Transfer (SKT)
	Delivery Enablers
	Remote Training Lab (RTL)

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LTE RBS 6101 Field Maintenance

LZU1087896-R1A

This course is a task-based course covering hardware replacement and maintenance of the RBS 6101 node types. The participants will perform hardware fault localisation, hardware replacement and configuration tasks on a RBS 6101 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools Element Manager and NCLI (Node Command line Interface).

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 Identify the Power and Battery Cabinets on Site
1.3 Identify LTE Interface for Transmission on Site
1.4 Identify, locate and handle the connection Unit for External Alarms
1.5 Identify and locate Remote Electrical Tilt (RET)
1.6 Identify the Antenna System Controller (ASC)

2 Use the Customer Product Information (CPI)
2.1 Explain the CPI Library structure of the node
2.2 Find information in the Library with use of regular expression
2.3 Find operational instructions (OPI) and maintain the node according to the OPI
2.4 Find additional information on an alarm and solve the problem with the help of the CPI and Element Manager

3 Connect to a node using CLI and also using NCLI.
3.1 Understand basic commands using CLI and using NCLI.
3.2 Have a basic understanding of the functionality and technology used in CLI and NCLI.
3.3 Understand the basic principles behind the Managed Object Model (MOM).

4 Use the Element manager and understand the concepts behind Object Explorer
4.1 Download and start the Element Manager.
4.2 Access and use the different “Views”; Containment, ATM, Equipment, IP, Licensing, Radio Network and the Software.
4.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log.
4.4 Access the property help feature from each window.
4.5 Create a Customized View (User Defined) in Element Manager.

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5 Perform maintenance and configuration tasks on the RBS 6101 nodes

5.1 Trace the uplink and downlink traffic paths through the RBS 6101 hardware
5.2 Trace the control and supervision communication throughout the node and the antenna system of an RBS 6101 site
5.3 Power up/down the RBS 6101 and connect a thin client to the node
5.4 Perform preventative maintenance on the RBS 6101
5.5 Find Faulty Hardware units and replace them
5.6 Perform Configuration tasks on the RBS 6101
5.7 Perform configuration version backup and restore on RBS 6101

Target audience

The target audience for this course is:

Field Technician

Prerequisites

Successful completion of the following flow and course:

LTE/SAE - System Overview	LZU1087020
LTE 10 Air Interface (Optional)	LZU1087260

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 instructor-led lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction	15 min
	LTE RAN Systems and Site Introduction	0.5 hour
	Customer Product Information and tool kits	15 min
	Command Line Interface/Node Command Line Interface	1 hour
	Element Management	1 hour
	LTE RBS 6101 Maintenance	3 hours

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LTE/SAE System Overview

LZU1087020-R3C

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 operation and maintanence 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 8
1.3 Explain the logical architecture of EPS (E-UTRAN and EPC)
1.4 Give an overview of the 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
2.4 Describe the S1 (and X2) protocol stacks
2.5 Explain the interaction with IMS on an overview level

3 Describe the E-UTRAN principles
3.1 List the radio interface protocols
3.2 Describe the radio interface techniques used in uplink and downlink
3.3 Describe the channel structure of the radio interface
3.4 Explain the OFDM principle and benefits
3.5 Detail the reference symbols in DL
3.6 Describe MIMO
3.7 Explain the SC-FDMA principle and benefits

4 Describe on an overview level the RBS HW and O&M (Operation and Maintenance)
4.1 Describe the RBS hardware in LTE
4.2 Explain the concepts related to Smart Simplicity, Self Organizing Networks (SON), Automated Provisioning of RBS (APR), Automated Neighbor Relations (ANR)
4.3 Describe the overall role and function of OSS-RC

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Target audience

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

Prerequisites

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 and theoretical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction, LTE/SAE Introduction	3 hours
	EPC Architecture	3 hours
2		3 hours
	Radio Interface principles	3 hours
	Operation and Maintenance and RBS HW	

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LTE L10 Air Interface

LZU1087260-R3A

Description

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), Resoure Blocks, Scheduling, control signaling, System Information, FDD, TDD. Mobility, paging, cell search and random access is 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 8
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

2 Detail 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 HARQ
2.11 Explain the cell search procedure
2.12 Detail the uplink transmission technique
2.13 Have a good understanding of the SC-FDMA principle, signal generation and processing
2.14 Explain the pros and cons with OFDM and SC-FDMA
2.15 Detail the UL control signaling and formats
2.16 Detail the random access procedure
2.17 Describe the Power Control in UL

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2.18 Describe the concepts of layers, channel rank, spatial multiplexing, open and closed loop spatial multiplexing, TX diversity, beamforming, SU-MIMO and MU-MIMO

3 Describe the Radio Resource and Mobility Management

3.1 Describe UL and DL Scheduling principles and signaling
3.2 Explain the scheduler interactions with other functions
3.3 Explain the concepts of dynamic and semi-persistent scheduling
3.4 Describe intra-LTE mobility in ECM-CONNECTED and ECM-IDLE mode
3.5 Explain the concept of event triggered periodical reporting
3.6 Describe the mobility measurements
3.7 List the benefits of CS Fallback

Target audience

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

Prerequisites

Successful completion of the following course:

LTE/SAE Overview LZU1087020

Attendees should have a general knowledge in cellular systems and radio technology. An in-depth knowledge in WCDMA, HSPA and/or GSM radio interface is profitable.

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 and theoretical exercises 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.

Day	Topics in the course	Estimated time
1	Introduction, Radio Interface general principles	4 hours
	Radio Interface Structure and signaling	2 hours
2	Radio Interface Structure and signaling continued	6 hours
3	Radio Interface Structure and signaling continued	4 hours
	Radio Resource & Mobility Management	2 hours

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LTE L10 Protocols and Procedures

LZU1087261-R3A

Description

This course covers the LTE RAN protocols and procedures. It gives an in-depth understanding of the LTE Systems radio access network architecture and signaling, as well as the EPS Bearer Service, End-to-End service from QoS aspects. It covers the LTE radio access interfaces, such as X2 and S1, and corresponding controlling protocols X2AP and S1AP. Also covered in this course are the protocols used over these interfaces: RRC, PDCP, RLC, MAC and the physical layer for the radio interface.

Security aspects such as Authentication and Security Key generation are explained.

The purpose of the course is to enable the students to understand complete traffic case in EPS including CS Fallback.

Learning objectives

On completion of this course the participants will be able to

1 Explain the EPS Architecture
1.1 State the main functions of the network elements
1.2 List the interfaces

2 Explain the Main Functions of the Protocols Involved in EPS.
2.1 Explain how signaling takes place between the UE and the EPC
2.2 State the main functions of Radio Resource Control (RRC), Packet Data Convergence Protocol (PDCP) Radio Link Control (RLC), Medium Access Control (MAC), the physical layer and their relations
2.3 Explain the interaction of the eUTRAN protocols and the mapping of logical, transport and physical channels

3 Explain the LTE/SAE Quality of Service
3.1 Explain the purpose of EPS Bearer Services and eUTRA Radio Bearer
3.2 List the different attributes of the eUTRA Radio Bearer and explain how they are used

4 Explain the RRC Protocol
4.1 Explain the interaction between RRC and the lower layers in the control plane
4.2 Explain the RRC layer structure
4.3 Explain the RRC Service States and the difference between connected and idle mode
4.4 Explain the functions and services of RRC such as System Information Broadcast, Paging, Cell Selection and Mobility

5 Explain the PDCP, RLC and MAC Protocols
5.1 Explain the PDCP functions and services such as header compression and ciphering
5.2 Explain the RLC functions.

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5.3 List the different modes of RLC (transparent, unacknowledged and acknowledged mode) and explain the structure of the PDU involved in these cases.
5.4 Explain the MAC functions such as HARQ, BCH Reception, PCH reception
5.5 Explain the MAC architecture, its entities and their usage for the mapping of transport channels.
5.6 List the contents of the MAC Packet Data Unit (PDU).

6 Explain the X2/S1 Interface and the X2AP/S1AP Protocol
6.1 Explain the main functions and procedures of X2AP signaling protocol.
6.2 Explain the main functions and procedures of S1AP signaling protocol.
6.3 Explain the main functions and procedures of the user plane protocols GTP.

7 Explain Security in LTE
7.1 Explain Authentication Procedure
7.2 Explain Radio Access Security
7.3 Explain TN Security

8 Explain Mobility in LTE
8.1 X2 Handover
8.2 S1 Handover
8.3 IRAT Handover

9 Explain CS Fall Back for Dual Radio UEs
9.1 Explain the reason for having CS Fallback
9.2 Understand the sequence for CS Fallback

Target audience

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

Prerequisites

The participants should be familiar with radio interface solution for LTE or successful completion of the following course:

LTE L10 Air Interface LZU1087260

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 and theoretical exercises given in a classroom environment

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Time schedule

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

Day	Topics in the course	Estimated time
1	EPS Architecture	2 hours
	Explain the main functions of the protocols involved in EPS	2 hours
	Explain the LTE/SAE Quality of Service	2 hours
2	Explain the RRC Protocol	4,5 hours
	Explain the PDCP Protocol	1,5 hours
3	Explain the RLC and MAC Protocols	2 hours
	Explain the X2/S1 Interface, X2AP/S1AP and GTP-U Protocols	1,5 hours
	Explain Security in LTE	0,3 hour
	Explain Mobility in LTE	1,7 hours
	Explain CS Fallback	0,5 hours

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LTE L10 Radio Network Functionality

LZU1087262-R2B

Description

Do you want to have full and detailed understanding of the Ericsson E-UTRAN features and functionalities? If so, the LTE L10 Radio Network Functionality course will give you all that. This course describes the Idle Mode Behavior, how Radio Connection Supervision is carried out, Power Control settings, calculations and functions. The Capacity Management functions and Handover as well as Channel Switching algorithms 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 registration updating procedures
2.3 Explain paging procedures
2.4 Describe the organization of 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 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 Explain the impact of MIMO

5 Describe the purpose and function of the Capacity Management
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 Admission Control
5.4 Explain Congestion Control
5.5 Explain the interaction with QoS

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6 Explain the purpose and function of Intra-LTE Handover, Inter-Radio Access Technologies (IRAT) Handover and IRAT Session Continuity

6.1 Explain Intra LTE mobility
6.2 Explain Coverage Triggered Session Continuity (GSM, WCDMA and CDMA2000)
6.3 Distinguish between release with redirect and handover
6.4 Detail what type of events trigger measurement reports to be sent to the eNB
6.5 Describe the purpose of the handover evaluation algorithm and Best Cell Evaluation

7 Explain the purpose and function of Automated Neighbor Relations (ANR)

7.1 Explain the detection and adding of external RBS
7.2 Explain the detection and adding of external cells
7.3 Explain the detection and adding of cell relations
7.4 Explain the detection and adding X2 connections

Target audience

The target audience for this course is: Service Design Engineers and Network Design Engineers.

Prerequisites

Successful completion of the following courses:

LTE/SAE System Overview	LZU1087020
LTE L10 Air Interface	LZU1087260
LTE L10 Protocols and Procedures	LZU1087261

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 and theoretical exercises given in a classroom environment.

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Time schedule

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

Day	Topics in the course	Estimated time
1	Introduction of the course and Radio Network Solution	1 hour
	Idle Mode Behavior	2.5 hours
	Radio Connection Supervision	1 hour
	Link Adaptation	1.5 hours
2	Power Control	1 hour
	Scheduling	1 hour
	Capacity Management	1 hour
	Handover	2 hours
	Automated Neighbor Relations (ANR)	1 hour

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LTE L10 Radio Network Design

LZU1087263-R3A

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 L10 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 L10 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.
4.2 Perform Control Channel dimensioning
4.3 Perform Tracking Area planning
4.4 Perform Paging Capacity calculations

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
5.7

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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 6201 and 6102.

Target audience

The target audience for this course is: Service Planning Engineers, Service Design Engineers and Network Design Engineers.

This audience is responsible for the dimensioning and design of the LTE Radio Access Network.

Prerequisites

Successful completion of the following courses:

LTE L10 Air Interface	LZU1087260
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262

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 using a calculator or PC.

Time schedule

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

Day	Topics in the course	Estimated time
1	Introduction	1 hour
	General dimensioning principles	1 hour
	Radio interface capacity	0.5 hour
	Traffic types and protocols	1 hour
	LTE dimensioning	2.5 hours
2	LTE dimensioning	3 hours
	Co-location and co-existence	2 hours
	LTE cell planning	1 hours

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TEMS CellPlanner 8 Operation for LTE

LZU1087313-R1A

Description

How is LTE Cell planning carried out using TEMS CellPlanner version 8.1? How path loss predicted using the Ericsson 9999 propagation model for LTE and how can this model be tuned? What LTE alalysis plots and reports can be produced using the TEMS CellPlanner LTE module?

This course will explain the operation of TEMS CellPlanner LTE module and guide students through a series of practical exercises that take them through all the stages of LTE cell planning from setting up a project to producing detailed traffic analysis plots and reports.

Learning objectives

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

1 Explain the operation of the TEMS CellPlanner LTE module.
1.1 Describe the Ericsson 9999 propagation model.
1.2 Explain how the TEMS CellPlanner LTE module performs downlink traffic analysis.
1.3 Explain the operation of the 'Monte Carlo' LTE analysis function.
1.4 Explain how the TEMS CellPlanner LTE module performs uplink traffic analysis.

2 Create a new TEMS CellPlanner project.
2.1 Define the LTE System and data services.
2.2 Define the LTE Equipment used in a project.
2.3 Create LTE Equipment Templates.
2.4 Add, move and delete LTE sites in a project.

3 Perform downlink LTE traffic analysis using TEMS CellPlanner.
3.1 Use the TEMS CellPlanner LTE module to perform pathloss predictions for a number of LTE sties.
3.2 Produce LTE best server and downlink interference analysis plots using TEMS CellPlanner.
3.3 Use the TEMS CellPlanner LTE module to produce downlink traffic analysis plots and reports.

4 Perform uplink LTE traffic analysis using TEMS CellPlanner.
4.1 Use the TEMS CellPlanner LTE module to produce uplink traffic analysis plots and reports.
4.2 Use the TEMS CellPlanner LTE module to perform neighbor cell analysis.

Target audience

The target audience for this course is: Service Planning Engineers, Service Design Engineers and Network Design Engineers.

This audience is responsible for the dimensioning and design of the LTE Radio Access Network.

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Prerequisites

The participants should be familiar with the Ericsson WCDMA RAN and ideally should have attended the following course:

LTE L10 Radio Network Design LZU1087263

Previous experience with TEMS CellPlanner is not essential but would be an advantage.

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 instructor-led lessons with practical exercises using TEMS Cellplanner running locally on the student's PC.

Time schedule

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

Day	Topics in the course	Estimated time
1	TEMS CellPlanner LTE Module Introduction	2 hours
	TEMS CellPlanner LTE Project Creation	4 hours
2	TEMS CellPlanner LTE Downlink Analysis	4 hours
	TEMS CellPlanner LTE Uplink Analysis	2 hours

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LTE/SAE– System Overview, WBL

LZU1087318-R2A

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).

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
1.3 Describe the flexible spectrum usage

2 Describe the EPS Architecture
2.1 Explain the logical architecture of EPS (E-UTRAN and EPC)
2.2 Give an overview of the interfaces in EPS
2.3 Describe the radio interface techniques
2.4 Explain the difference between the FDD and TDD mode
2.5 Detail the terminal states
2.6 Describe the Evolved Packet Core
2.7 Describe the role of the MME and the S-GW
2.8 Detail the S1 and X2 interfaces and their protocol stacks

3 Describe the Air Interface
3.1 Explain the radio interface structure
3.2 Detail the channel structure of the radio interface
3.3 Describe the physical signals in UL and DL
3.4 Detail the time-domain structure in the radio interface in UL and DL for both FDD and TDD mode
3.5 Detail the downlink transmission technique
3.6 Have a good understanding of the OFDM principle, signal generation and processing
3.7 Detail the reference symbols in DL
3.8 Detail the control signaling in DL
3.9 Detail the uplink transmission technique
3.10 Have a good understanding of the SC-FDMA principle, signal generation and processing
3.11 Explain the pros and cons with OFDM and SC-FDMA
3.12 Detail the control signaling in UL
3.13 Describe the concepts of layers, channel rank, spatial multiplexing, SU-MIMO and MU-MIMO

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4 Detail the Radio Resource Management and Mobility

4.1 Describe the Radio Resource Management
4.2 Describe UL and DL scheduling and signaling
4.3 Explain the concepts of dynamic and persistent scheduling
4.4 Describe LTE Mobility
4.5 Describe intra-LTE mobility in ECM_CONNECTED and ECM_IDLE mode
4.6 Explain inter-working with 2G/3G

Target audience

The target audience for this course are:

Network Engineer

Service Engineer

Service Design Engineer

Network Design Engineer

Prerequisites

A general knowledge in cellular systems and radio technology.

Duration and class size

The length of the course is 3 hours.

Learning situation

This is a web-based interactive training course with multimedia content.

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LTE L10B eNode B Commissioning

LZU108409-R1B

Description

Do you need to understand how to integrate LTE eNode B, RBS 6000

This course provide the participants hands-on experience of the procedures that need to be performed for the commissioning and integration of the eNode B.

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 from an overview level the RBS 6000 platform and hardware
1.2 Explain the integration steps of RBS 6000

2 Explain the concept of Management Tools
2.1 Use the Element Manager (EM)
2.2 Use the Command Line Interface (CLI)
2.3 Configure the Client to connect to the RBS

3 Perform the commissioning and integration of the RBS
3.1 Powering Up RBS
3.2 Checking RBS Status
3.3 Connecting Clients
3.4 Selecting Integration Scenario
3.5 Auto-integrating RBS using Site Installation Files
3.6 Integrating RBS Manually
3.7 Monitoring RBS Integration
3.8 Verifying External Alarms
3.9 Checking Hardware Status
3.10 Performing Test Calls
3.11 Completing and Storing Integration Reports

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Target audience

The target audience for this course is: Network Deployment Engineer, Field Technician and System Technician.

This audience is responsible for configuration of the eNode B.

Prerequisites

Successful completion of the following courses:

LTE/SAE Overview	LZU1087020
RBS6000 Overview	LZU1087503

Or

LTE/SAE 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.

Day	Topics in the course	Estimated time
1	• Introduction	0.5 hour
	• eNode B Management Applications	0.5 hour
	• eNode B Integration (theory and practical exercises)	5 hours

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LTE L10 Operation

LZU1087410-R1B

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 (OaM) support

1.1 Describe the nodes that build up LTE/SAE
1.2 Describe on an overview level the OaM infrastructure
1.3 Describe the Operation and Maintenance architecture of an RBS6000 and where to find documentation about the Managed Object Model

2 Perform Hardware and Software Management on a LTE RAN

2.1 Explain the hardware building practice of RBS6000 (MPE, DUL, RUL) and which ways OaM connectivity can be established to the node
2.2 Display, export and handle hardware and software resources in an RBS6000 via OSS-RC and EMAS
2.3 Describe the file system in an RBS6000
2.4 Describe the Configuration Version concepts
2.5 Manage Configuration Versions and file system using OSS-RC, EMAS, COLI and AMOS
2.6 Describe the Upgrade process for a batch of RBS6000 nodes

3 Perform Fault Management on a LTE RAN

3.1 Explain the Fault Management Model
3.2 Describe the Fault Management process in the LTE RAN
3.3 Solve some common alarms by following Procedural Information, and using OSS (Alarm List Viewer, Alarm Log Browser and Alarm Status Matrix), AMOS and EM in the process
3.4 Describe the function of the command line interface (CLI) and Node Command Line Interface (NCLI)

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4 Perform Performance Management on the LTE RAN

4.1 Describe what Observability of the LTE RAN means and how this is related to Key Performance Indicators
4.2 Describe the E-UTRAN PM solution
4.3 Describe the performance statistics generated in the LTE RAN (Counter collection, Cell Traffic Recording, User Equipment Traffic Recording)
4.4 Explain the Subscription Profile principle
4.5 Get an overview of statistics and recording concepts in the LTE, and use the OSS-RC to initiate UE Tracing

5 Perform basic RBS6000 Configuration procedures using OSS-RC and Element Manager

5.1 Describe the main steps in RBS6000 Integration
5.2 Explain Radio Network Handling in OSS-RC
5.3 Be familiar with the different ways configuration could be performed and changed in an RBS6000, and perform a parameter change using EM, AMOS and BCM

Target audience

The target audience for this course is: System Engineers and Service Engineers

This audience is responsible for operation of the LTE RAN, most likely from a Network Management Center or OMC.

Prerequisites

Successful completion of the following courses:

LTE/SAE Overview	LZU1087020
RBS6000 Overview	LZU1087503

Or

LTE/SAE Overview, WBL	LZU1087318
RBS 6000 in a Nutshell	LZU1087504

Duration and class size

The length of the course is 3 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 a technical environment using equipment and tools, which can be accessed remotely.

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Time schedule

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

Day	Topics in the course	Estimated time
1	Network architecture and LTE features	1 hour
	RBS6000 Hardware and Software concepts and related OSS-RC tools	3 hours
	Operational exercises (ALEX library and MOM documentation familiarization)	0,5 hour
	Operational exercises (HW and SW management)	1,5 hours
2	Operational exercises (HW and SW management) continued	1,5 hours
	Fault Management	1 hour
	Operational exercises (Fault management)	2 hours
	LTE Performance Management	1 hour
	Operational exercises (Performance Management)	0,5 hours
3	LTE Configuration Management	1 hour
	Operational exercises (Configuration Management)	3 hours
	Operational exercises summary	1 hour
	Course summary	1 hour

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LTE L10 Configuration

LZU1087411-R2A

Description

This course describes how to integrate an RBS6000 from scratch in the L10 version of LTE RAN. The course includes theoretical parts covering how the integration should be carried out step by step to bring the RBS into service. The tools used in this process are described and exercises give the participant the possibility to investigate how the different configuration files and tools are used. Apart from this, Ethernet and the IP suite of protocols used to configure the Transport Network in an RBS6000 are described along with the related Managed Objects required for configuration.

After this course, the participants will be familiar with how to bring an RBS6000 into service both manually and by using the Autointegration feature.

Learning objectives

After completing the course the student will be able to:

1 Explain LTE L10 interfaces and the integration of RBS6000

1.1 Describe the interfaces S1, X2 and Mul to an eNodeB in LTE L10.
1.2 Explain on an overview level the integration process of an RBS6000 and in which ways this process can be carried out (manual, auto-integration).
1.3 Describe which tools that could be used in the different steps of the integration procedure.
1.4 Explain what the MOM is, why it is important in configuration and where to find information about it

2 Explain Ethernet, IP Suite and related MOs in L10

2.1 Explain the IP Functionality of the L10 RAN Transport Network.
2.2 Explain how IP and Ethernet fit into the protocol layers in the LTE L10 RAN.
2.3 Explain the basic structure of an IP Packet and Ethernet frame and how switching is done on Layer 2 and 3.
2.4 Explain what IP Security (IP-sec) is and how it is supported in the LTE RAN
2.5 Explain how Quality of Service (QoS) is supported by IP and Ethernet
2.6 Describe the hardware used to support IP/Ethernet transmission in RBS6000.
2.7 Explain how generic IP and Ethernet concepts are related to the Micro-CPP MOM in L10.

3 Integrate an RBS6000

3.1 Describe the integration process of an RBS6000 in detail
3.2 Perform the on-site integration of an RBS6000 manually with the Site Installation file, the Site Basic file and the Site External file.
3.3 Configure the Transport Network carrying S1 and X2 user plane and control plane traffic to an RBS6000 with and without IP-sec.
3.4 Configure the Radio Network in an RBS6000.
3.5 Configure QoS parameters in RBS6000.

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3.6 Configure the RBS6000 with the Auto-integration feature.

Target audience

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

Prerequisites

Successful completion of the following courses:

LTE L10 Operation	LZU1087410
LTE L10 Air Interface	LZU1087260

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.

Time schedule

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

Day	Topics in the course	Estimated time
1	Course introduction and introduction of LTE/SAE, the integration procedure of an RBS6000 and the Managed Object Model	1,5 hours
	Ethernet, IP Suite and the RBS6000 IP related MOM	3,5 hours
2	Manual on-site configuration of the RBS6000	1 hour
	Manual on-site configuration of the RBS6000 (cont.)	1 hour
	Configuration of the S1 and X2 interfaces	1,5 hours
	Configuration of the Radio Network and QoS	1,5 hours
	Auto-integration of RBS6000	1,5 hours
	Summary of the course	0,5 hour

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LTE L10 Troubleshooting

LZU1087412-R2A

Description

While configuring and operating a L10 based LTE RAN network, what are the usual faults, how are they detected and solved in a RBS 60000 node? How does Ericsson local/field support enable and collect logs from a RBS6000 node?

LTE L10 Troubleshooting explains how a fault is detected, the different types of logs in a RBS6000 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 the LTE RAN

1.1 Describe which on-site tools that are available for troubleshooting the RBS and understand how to log in to and use these tools

1.2 Describe which OSS-RC tools that are available for troubleshooting the RBS and understand when each tool could be useful

1.3 Describe the OSS-RC Cell/UE Trace support and how to activate traces

2 Describe how to recover an RBS and how to use the Data Collection Guideline when creating CSRs/TRs

2.1 Describe the Ericsson support process

2.2 Explain what the Data Collection Guideline (DCG) is used for and how to collect the mandatory files required in it

2.3 Describe the logs that CPP provides and when they are useful to use

2.4 Describe the CV directory structure and the files that are building up a CV

2.5 Describe different ways of recovering an eNB after a fault

3 Describe the eNB interfaces and perform system level troubleshooting

3.1 Describe which interfaces that the RBS provides

3.2 Describe how to check O&M connectivity on the Mul interface

3.3 Describe how to check and act on Alarms

3.4 Explain what Network Synchronization is and how its status can be verified in an eNB

3.5 Verify MO status

3.6 Explain how Node performance can be verified

3.7 Describe some ways to check end-to-end system performance and execute commands to check S1 connectivity issues

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Target audience

The target audience for this course is: System Engineers, Service Engineers, Field Technicians.
This audience is responsible for RBS 6000 in a LTE environment, including troubleshooting and emergency handling of the node.

Prerequisites

Successful completion of the following courses:

LTE L10 Air Interface	LZU1087260
LTE L10 Configuration	LZU1087411
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262

Duration and class size

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

Learning situation

This is a task-oriented learning course based on tasks in the work-process given 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.

Day	Topics in the course	Estimated time
1	Introduction Troubleshooting tools RBS6000 Hardware structure	2
	Troubleshooting tools Exercises	2
	RBS Recovery and Data Collection Guideline	2
	RBS Recovery and Data Collection Guideline Exercises	2
2	RBS6000 interfaces (S1/X2/Mul) System view troubleshooting	2
	System view Exercises	2

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LTE L10 Performance Management

LZU1087414-R2A

Description

How can the performance of the Ericsson LTE Network be monitored? What are the Key Performance Indicators (KPI) and Performance Indicators (PIs) that should be used? What is contained in LTE Cell Trace and UE Trace and how are they handled by the Ericsson OSS-RC?

With the help of the LTE L10 Performance Management course the attendees will learn how to use the OSS-RC Performance Management tools to collect counters from the Enhanced UTRAN (E-UTRAN) and use them to produce KPI reports using ENIQ Business Objects Rich Client. They will also be shown how to set up Cell and UE trace and decode the data collected using the OSS-RC Network Status Display Traffic Recording View.

Learning objectives

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

1 Explain the LTE network structure and Performance Management solution
1.1 List the nodes that make up the LTE/SAE Network
1.2 Explain the LTE Performance Management solution

2 Describe the E-UTRAN counter collection and storage process
2.1 Contrast the different counter types collected by the RBS
2.2 Explain how E-UTRAN counters fit into Performance Management Flow Charts
2.3 Use E-UTRAN counters to produce LTE KPIs
2.4 Use E-UTRAN counters to produce License and Resource PIs

3 Explain what is collected by LTE Cell and UE Trace
3.1 Explain briefly how LTE Cell and UE Trace are collected and stored

4 Use the OSS-RC to collect E-UTRAN counters and handle LTE Cell and UE Trace
4.1 Create, activate and delete subscription profiles
4.2 Use the OSS-RC to open and view the contents of LTE Cell and UE Trace files

5 Explain the ENIQ and Business Objects (BO) Web Intelligence Rich Client operation
5.1 Use Business Objects (BO) Web Intelligence Rich Client to open and refresh Ericsson predefined LTE performance reports
5.2 Create user defined LTE performance reports using the Business Objects (BO) Web Intelligence Rich Client
5.3 Share user defined LTE performance reports with other ENIQ users

Target audience

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The target audience for this course is: Service Planning Engineers, Service Design Engineers, Network Design Engineers, System Engineers and Service Engineers.

This audience is responsible for LTE Performance Management.

Prerequisites

Successful completion of the following courses:

LTE L10 Air Interface	LZU1087260
LTE L10 Configuration	LZU1087411
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262
LTE L10 Troubleshooting	LZU1087412 (Optional)

The students should also have a basic knowledge of Microsoft Excel.

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 a classroom and 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.

Day	Topics in the course	Estimated time
1	Performance Management Introduction	1 hour
	E-UTRAN Counters	5 hours
2	LTE Cell and UE Trace	1 hour
	OSS-RC Statistics, Cell and UE Trace Handling	2 hours
	ENIQ and Business Objects	3 hours

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LTE L10 Initial Tuning

LZU1087415-R2A

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 L10 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 in OSS
2.2 Define cluster and drive test routes according to best performance
2.3 Describe the features necessary to reach high rates in the network
2.4 Set up TCP and TCP parameters for parallel processes
2.5 Perform the technical setup of the tools (e.g. TEMS Investigation)

3 Perform what is known as CELL tuning
3.1 Describe the different interference scenarios in a LTE network
3.2 Define coverage in different scenarios e.g. macro and hotspot
3.3 Implement changes to improve coverage
3.4 Verify capacity in different scenarios e.g. macro and hotspot
3.5 Implement changes to improve capacity

4 Perform a Network and UE tuning
4.1 Explain Accessibility formulas (acc to 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

Target audience

The target audience for this course is: System Engineers, Service Engineers.

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Prerequisites

Successful completion of the following courses:

LTE L10 Air Interface	LZU1087260
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262
LTE L10 Network Design	LZU1087263

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.

Day	Topics in the course	Estimated time
1	Explain the process of tuning	3 hours
	Perform preparations necessary for the tuning	3 hours
2	Cell tuning	3 hours
	Perform a Network and UE tuning	3 hours

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LTE L10 Optimization

LZU1087416-R2A

Description

After the initial tuning of your network has been done and the network is public, it is time to optimize the parameter settings.

With the help of the LTE L10 Optimization course the attendees will get an understanding of the mechanisms involved in the optimization process. They will be able to define the formulas for the KPI's according to the counters available. This will improve the performance of the LTE network and prepare for further expansions.

Learning objectives

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

1 Explain the process of Optimization
1.1 Describe the difference between tuning and optimization
1.2 Define the network quality in terms of KPI's
1.3 Describe the different steps in the optimization process

2 Explain the data collection
2.1 Show the collection and storage of the performance statistics
2.2 Learn how to setup formulas and statistic for the RAN used in the analysis of counters

3 Perform a throughput and busy hour calculation
3.1 Calculate the traffic volume over the day
3.2 Show the different rates available in the RAN and make calculations of throughput

4 Perform Accessibility data analysis according to collected data
4.1 Describe formulas for Accessibility according to the defined KPI's and available counters
4.2 Perform data analysis of counters statistics
4.3 Propose changes to enhance Accessibility

5 Perform Retainability data analysis according to the collected data
5.1 Describe formulas for Retainability according to the defined KPI's and available counters
5.2 Perform data analysis of counters statistics
5.3 Propose changes to enhance Retainability

6 Perform Integrity data analysis according to collected data
6.1 Describe formulas for Integrity according to the defined KPI's and available counters
6.2 Perform data analysis of counter statistics
6.3 Propose changes to enhance the Integrity

7 Perform Mobility data analysis according to collected data
7.1 Describe formulas for Mobility according to the defined KPI's and available counters
7.2 Perform data analysis of counter statistics

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7.3 Propose changes to enhance the Mobility performance

8 Perform UE tracing and measurements

Target audience

The target audience for this course is: Service Engineers, System Engineers

Prerequisites

LTE L10 Air Interface	LZU1087260
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262
LTE L10 Network Design	LZU1087263

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.

Day	Topics in the course	Estimated time
1	Explain the process of tuning	1 hour
	Explain the data collection	1 hour
	Perform a throughput an busy hour calculation	2 hours
	Perform Accessibility data analysis	2 hours
2	Perform Retainability data analysis	2 hours
	Perform Integrity data analysis	2 hours
	UE tracing and measurements	2 hours

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LTE/SAE in Nutshell

LZU1087417-R1A

Description

Do you want to know what LTE/SAE is all about. This eLearning course will give you on overview on end user experience of Long Term Evolution (LTE) in terms of services and applications, speed and capacity as well as network setup. The course will also highlight the mobile technology evolution. The course content is a simple explanation of the next generation technology with a focus on a non technical target audience.

Learning objectives

On completion of this course the participants will have answers to the following questions:

1 What is LTE/SAE?
1.1 How fast is LTE?
1.2 What is included in the Mobile Technology Evolution?
2 What is the end user experience?
2.1 What are possible services and application?
2.2 What is the speed and capacity?
2.3 Is it better than 3G?
2.4 How much does it cost?
2.5 Do I need a new phone?
2.6 Is the coverage and mobility better then today?
3 How does LTE/SAE work?
3.1 Which Frequencies are used?
3.2 Which nodes are included in the Radio Network?
3.3 Which nodes are included in the Core Network?
4 What is the meaning of the typical LTE related abbreviations?

Target audience

The target audience for this course is: System Technicians, Service Technicians, Field Technicians, System Administrators, Application Developers, Business Developers, Customer Care Administrators.

The main focus of this course is on non techical personnel.

Prerequisites

None

Duration and class size

The length of the course is 1 hour.

Learning situation

This is a web-based interactive training course with multimedia content.

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LTE RBS 6102 Field Maintenance

LZU1087645-R3A

This course is a task-based course covering hardware replacement and maintenance of the RBS 6102 node types. The participants will perform hardware fault localisation, hardware replacement and configuration tasks on a RBS 6102 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools Element Manager and NCLI (Node Command line Interface).

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 Identify the Power and Battery Cabinets on Site
1.3 Identify LTE Interface for Transmission on Site
1.4 Identify, locate and handle the connection Unit for External Alarms
1.5 Identify and locate Remote Electrical Tilt (RET)
1.6 Identify the Antenna System Controller (ASC)
2 Use the Customer Product Information (CPI)
2.1 Explain the CPI Library structure of the node
2.2 Find information in the Library with use of regular expression
2.3 Find operational instructions (OPI) and maintain the node according to the OPI
2.4 Find additional information on an alarm and solve the problem with the help of the CPI and Element Manager
3 Connect to a node using CLI and also using NCLI.
3.1 Understand basic commands using CLI and using NCLI.
3.2 Have a basic understanding of the functionality and technology used in CLI and NCLI.
3.3 Understand the basic principles behind the Managed Object Model (MOM).
4 Use the Element manager and understand the concepts behind Object Explorer
4.1 Download and start the Element Manager.
4.2 Access and use the different “Views”; Containment, Equipment, IP, Licensing, Radio Network and the Software.
4.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log.
4.4 Access the property help feature from each window.
4.5 Create a Customized View (User Defined) in Element Manager.

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5 Perform maintenance and configuration tasks on the RBS 6102 nodes
5.1 Trace the uplink and downlink traffic paths through the RBS 6102 hardware
5.2 Trace the control and supervision communication throughout the node and the antenna system of an RBS 6102 site
5.3 Power up/down the RBS 6102 and connect a thin client to the node
5.4 Perform preventative maintenance on the RBS 6102
5.5 Find Faulty Hardware units and replace them
5.6 Perform Configuration tasks on the RBS 6102
5.7 Perform configuration version backup and restore on RBS 6102

Target audience

The target audience for this course is:

Field Technician

Prerequisites

Successful completion of the following flow and course:

LTE/SAE - System Overview	LZU1087020
LTE 10 Air Interface (Optional)	LZU1087260

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 instructor-led lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction	15 min
	LTE RAN Systems and Site Introduction	0.5 hour
	Customer Product Information and tool kits	15 min
	Command Line Interface/Node Command Line Interface	1 hour
	Element Management	1 hour
	LTE RBS 6102 Maintenance	3 hours

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LTE RBS 6201 Field Maintenance

LZU1087648-R3A

This course is a task-based course covering hardware replacement and maintenance of the RBS 6201 node types. The participants will perform hardware fault localisation, hardware replacement and configuration tasks on a RBS 6201 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools Element Manager and NCLI (Node Command line Interface).

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 Identify the Power and Battery Cabinets on Site
1.3 Identify LTE Interface for Transmission on Site
1.4 Identify, locate and handle the connection Unit for External Alarms
1.5 Identify and locate Remote Electrical Tilt (RET)
1.6 Identify the Antenna System Controller (ASC)

2 Use the Customer Product Information (CPI)
2.1 Explain the CPI Library structure of the node
2.2 Find information in the Library with use of regular expression
2.3 Find operational instructions (OPI) and maintain the node according to the OPI
2.4 Find additional information on an alarm and solve the problem with the help of the CPI and Element Manager

3 Connect to a node using CLI and also using NCLI.
3.1 Understand basic commands using CLI and using NCLI.
3.2 Have a basic understanding of the functionality and technology used in CLI and NCLI.
3.3 Understand the basic principles behind the Managed Object Model (MOM).

4 Use the Element manager
4.1 Download and start the Element Manager.
4.2 Access and use the different “Views”; Containment, Equipment, IP, Licensing, Radio Network and the Software.
4.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log.
4.4 Access the property help feature from each window.
4.5 Create a Customized View (User Defined) in Element Manager.

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5 Perform maintenance and configuration tasks on the RBS 6201 nodes
5.1 Trace the uplink and downlink traffic paths through the RBS 6201 hardware
5.2 Trace the control and supervision communication throughout the node and the antenna system of an RBS 6201 site
5.3 Power up/down the RBS 6201 and connect a thin client to the node
5.4 Perform preventative maintenance on the RBS 6201
5.5 Find Faulty Hardware units and replace them
5.6 Perform Configuration tasks on the RBS 6201
5.7 Perform configuration version backup and restore on RBS 6201

Target audience

The target audience for this course is:

Field Technician

Prerequisites

Successful completion of the following flow and course:

LTE/SAE - System Overview	LZU1087020
LTE 10A Air Interface (Optional)	LZU1087260

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 instructor-led lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction	15 min
	LTE RAN Systems and Site Introduction	0.5 hour
	Customer Product Information and tool kits	15 min
	Command Line Interface/Node Command Line Interface	1 hour
	Element Management	1 hour
	LTE RBS 6201 Maintenance	3 hours

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MIMO in WCDMA and LTE

LZU1087652-R2A

Description

Have you wondered how MIMO works and how it can double the data rate and spectral efficiency in WCDMA and LTE?

With the help of the MIMO in WCDMA and LTE course the attendees will learn how multiple antennas in HSPA and LTE is implemented and how much the performance is can increase.

In this course, the basic radio channel and antenna properties is explained and related to the multiple antenna processing in HSPA and LTE.

With the guidance of the instructor the mysteries of MIMO, spatial multiplexing, layers and data rate multiplication will be uncovered reducing wasted time back at work.

Learning objectives

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

1 Describe the basics of MIMO
1.1 Explain the reason for multi-antenna processing
1.2 List the different methods of multi-antenna processing
1.3 Explain the different multi antenna possibilities
1.4 Explain the general concepts of beamforming, diversity and spatial multiplexing
1.5 Explain the concepts of MIMO, SIMO, MISO and SISO

2 Describe the radio channel and antenna basics
2.1 Explain multi-path propagation
2.2 Explain time dispersion and delay spread
2.3 Explain the doppler effect
2.4 Explain coherence bandwidth and coherence time
2.5 Explain angular spread and its impact on antenna configuration
2.6 Explain polarization properties of the radio channel
2.7 Explain basic antenna properties
2.8 Explain polarization properties of antennas
2.9 Describe beamforming using an ULA (Uniform Linear Array)
2.10 Explain polarization diversity

3 Explain the concepts of precoding and spatial multiplexing
3.1 Explain the concept of spatial multiplexing
3.2 Explain SDMA (Spatial Division Multiple Access)
3.3 Explain the difference of single-rank and multi-rank transmissions
3.4 Explain the concepts of channel rank, transmission rank and layers
3.5 Describe the difference of antenna ports and antenna elements
3.6 Explain the role of the precoder and the matrix algebra involved

4 Describe MIMO in WCDMA
4.1 Explain Tx diversity in WCDMA
4.2 Explain spatial multiplexing in WCDMA

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4.3 Describe the UE feedback (PCI)
4.4 Describe the configuration of MIMO in WCDMA

5 Describe MIMO in LTE
5.1 Explain Tx diversity in LTE
5.2 Describe SU-MIMO and MU-MIMO
5.3 Explain spatial multiplexing in LTE
5.4 Describe the UE feedback (CSI, PMI, RI and CQI) in LTE
5.5 Describe open loop spatial multiplexing in LTE
5.6 Describe closed loop spatial multiplexing in LTE
5.7 Describe the configuration of MIMO in LTE

Target audience

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

Prerequisites

The participants should be familiar with the WCDMA and/or LTE Radio Interface. An interest in radio channel properties and antennas would be an advantage.

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 and theoretical exercises 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.

Day	Topics of the course	Estimated time
1	MIMO Introduction	1 hour
	Radio channel and antenna basics	2 hours
	Precoding and spatial multiplexing	1 hour
	MIMO in WCDMA	1 hour
	MIMO in LTE	1 hour

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LTE L10 Access Network Dimensioning

LZU1087712-R2A

Description

Dimensioning the transport network in LTE (Long Term Evolution) is a challenge. Not only is all the traffic packet switched to its nature, LTE also provides very high peak rates that have to be taken care of by the backbone network. Also the RBS6000 hardware has to be dimensioned in such a way that it can handle the high baseband processing loads.

This course explains the methods of dimensioning the L10 version of the E-UTRAN nodes. Co-siting with WCMDA or GSM nodes is not covered in this version of the course, which means that the focus is on the actual RBS6000 for LTE and the dimensioning of the node hardware and the transport interfaces towards the SAE (System Architechture Evolved).

Learning objectives

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

1 Describe the EPC Architecture
1.1 Describe the interfaces in EPS (Evolved Packet System)
1.2 Describe the Evolved Packet Core (EPC)
1.3 Describe the role of the MME, S-GW and PDN-GW
1.4 Describe the EPS bearer and what traffic types and services can be expected in LTE L10

2 Explain the IP Functionality of the L10 LTE RAN Transport Network
2.1 Explain how IP and Ethernet fit into the protocol layers in the LTE RAN.
2.2 Explain the basic structure of an IP Packet and Ethernet frame.
2.3 Explain IP concepts such as IPSec, MPLS, VLAN and routing and how they impact the dimensioning of the network.
2.4 Explain how Quality of Service (QoS) is achieved using IP and Ethernet and how DSCP values are mapped to Pbit values.

3 Perform link dimensioning in LTE L10
3.1 Explain terms and concepts related to dimensioning
3.2 Describe the dimensioning process
3.3 Perform Transport Network overhead calculations
3.4 Perform last mile and mobile backhaul dimensioning

4 Perform node dimensioning for RBS6000
4.1 Describe the RBS6000 hardware in LTE
4.2 Dimension the RBS6000 hardware

Target audience

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

This audience is responsible for the dimensioning and design of the LTE Access Transport Network.

Prerequisites

Successful completion of the following courses:

LTE L10 Air Interface	LZU1087260
LTE L10 Protocols and Procedures	LZU1087261
LTE L10 Functionality	LZU1087262
LTE L10 Network Design	LZU1087263

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.

Day	Topics in the course	Estimated time
1	EPC architecture and IP network overview	1 hour
	IP Transport Network Functionality	2 hours
	IP Link Dimensioning with Link Dimensioning exercise	2 hours
	Node dimensioning with Node HW dimensioning exercis	1 hour

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KPIs in LTE/SAE Network

LZU1087713-R2A

Description

How can the performance of the Ericsson LTE/SAE network be monitored? What Key Performance Indicators (KPIs) are used for Long Term Evolution (LTE) and Evolved Packet Core (EPC) nodes? How are evolved NodeB (eNodeB), Serving Gateway (SGW) and Mobility Management Entity (MME) counters used to create KPI formulas?

This 'KPIs in LTE/SAE Network' course will allow students to become familiar with using counters from eNodeB, SGW and MME nodes to create KPI formulas to measure network Accessibility, Retainability, Integrity, Mobility and Availability performance.

The knowledge gained in this 'KPIs in LTE/SAE Network' course will enable Engineers to efficiently measure the performance of the LTE/SAE Network and make more efficient use of their time during network optimization.

Learning objectives

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

1 Explain Evolved Packet System (EPS) Architecture.
1.1 Explain the terms 'EPS', 'LTE', 'EUTRAN', 'SAE', 'EPC'.
1.2 Explain the LTE UE states and EPS bearer concept.
1.3 Describe the functionality of the EPS nodes.

2 Create LTE KPIs using eNodeB counters.
2.1 Describe the eNodeB counter types and structures.
2.2 Use Ericsson CPI documentation to explain eNodeB counters.
2.3 Use eNodeB counters to create LTE KPI formulas.

3 Create EPC KPIs using SGW counters.
3.1 Describe the SGW counter types and structures.
3.2 Use Ericsson CPI documentation to explain SGW counters.
3.3 Use SGW counters to create EPC KPI formulas.

4 Create EPC KPIs using MME counters.
4.1 Describe the MME counter types and structures.
4.2 Use Ericsson CPI documentation to explain MME counters.
4.3 Use MME counters to create EPC KPI formulas.

Target audience

The target audience for this course is: Service Planning Engineers, Service Design Engineers, Network Design Engineers, System Engineers and Service Engineers.

This audience is responsible for LTE/SAE Optimization.

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Prerequisites

The participants should be familiar with Radio Access Network performance management and have a basic knowledge of Microsoft Excel.

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 using Microsoft Excel.

Time schedule

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

Day	Topics in the course	Estimated time
1	LTE/SAE Network Introduction	2 hours
	LTE KPIs using eNodeB Counters	4 hours
2	EPC KPIs using SGW Counters	3 hours
	EPC KPIs using MME Counters	3 hours

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LTE Evolution, Advantages in Features and Applications

LZU1087714-R1A

Description

Are you ready to introduce LTE/SAE (Long Term Evolution/System Architecture Evolution)? We will give you a kick-start on how to handle the different business aspects covering both opportunities and challenges for LTE/SAE.

The impact of introducing LTE/SAE on existing networks is examined and different network considerations related to Radio, Transport and Core are presented.

A high level LTE/SAE network overview is provided as an introduction.

Learning objectives

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

1 Have LTE/SAE overview
1.1 Explain the evolution of cellular networks GSM, WCDMA, CDMA, TD-SCDMA
1.2 Name different driving factors behind LTE/SAE
1.3 Have high level understanding of LTE radio fundamentals
1.4 Explain the architecture of EPS (E-UTRAN and EPC)
1.5 List a selection of more important key LTE/SAE features

2 Discuss LTE/SAE Business Environment
2.1 Explore current Market outlook
2.2 Identify key business challenges
2.3 Get familiar with various end user services and trends
2.4 Distinguish different revenue and price models
2.5 Explore various LTE device concepts

3 Examine LTE/SAE Network Considerations
3.1 Discuss general Network Deployment Aspects
3.2 Outline different Radio Network Considerations
3.3 Outline different Transport Network Considerations
3.4 Outline different Core Network Considerations
3.5 Have a high level understanding of Voice over LTE

Target audience

The target audience for this course is: Business Developer and Fundamentals.

This audience is typically working in Marketing and Sales or as Operation Managers.

Prerequisites

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.

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Learning situation

This course is based on theoretical instructor-led lessons and theoretical exercises 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.

Day	Topics in the course	Estimated time
1	LTE/SAE overview:	
	Evolution of Cellular Networks	0,5 hour
	Driving factors behind LTE/SAE	0,5 hour
	LTE Radio fundamentals	1 hour
	Architecture of EPS (E-UTRAN and EPC)	1 hour
	LTE/SAE Business aspects:	
	Market Outlook	0,5 hour
	Market Trends	0,5 hour
	Key Business Challenges	0,5 hour
	End User Services and Applications	0,5 hour
	Devices	0,5 hour
	Revenue and pricing models	0,5 hour
2	Network Considerations:	
	Network Deployment considerations	0,5 hour
	Radio Network Considerations	0,5 hour
	Transport Network Considerations	1 hour
	Core Network Considerations	1 hour
	Exercise	2 hours
	Summary and Conclusion	1 hour

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LTE/CDMA Inter-working and Co-existence

LZU1087715-R1A

Description

This course provides a framework for CDMA to LTE interworking in radio network point of view. CDMA engineers could learn LTE concepts with ease through comparison diagrams between CDMA and LTE. Radio issues like interference, antenna Tx/Rx co-existence, and link budget are explained. To consolidate the understanding of the explained topics, RF calculation exercises are explained.

The course also provides descriptions of signal-to-noise ratio, power requirements and radio coverage.

Learning objectives

1 Explain the background and architecture of CDMA2000

1.1 Compare common control and overhead channels - CDMA vs 1xEV-DO
1.2 Describe the radio interface techniques used in uplink and downlink
1.3 Describe the channel structure of the radio interface
1.4 Compare 1xRTT and 1xEV-DO coding and modulation for high data rates

2 Describe RF inter-working scenarios

2.1 Highlight the RRM characteristics among CDMA, 1xEV-DO, and LTE
2.2 Explain IRAT session continuity and handover
2.3 Describe Search windows and intersystem synchronisation
2.4 Explain Operation of measurements of 1xEV-DO for IRAT purposes
2.5 Describe Ncell planning during mobility

3 Illustrate RF characteristics among CDMA, 1xEV-DO, and LTE

3.1 Describe BTS Tx and Rx performance
3.2 Describe UE Tx and Rx performance
3.3 Explain RF emissions
3.4 Explain Channel Plans
3.5 Compare Synchronisation requirements - GPS vs NTP server
3.6 Explain impact of RF hardware characteristics on SISO and MIMO performance including data fill issues

4 Describe Antenna Tx/Rx co-existence and interference

4.1 Review Rx blocking, Tx noise and intermodulation issues
4.2 Explain Inter-band & Inter-technology interference issues including examples from practical experience in different parts of the world
4.3 Review various antenna isolation scenarios (Vertical vs Horizontal separation, and X polarisation)
4.4 Describe Ancillary combining equipment - filters, combiners & TMAs
4.5 Provide discussion of repeaters at a high level
4.6 Give examples of managing intersystem isolation to maintain performance
4.7 Calculate isolation and filter characteristic requirements

5 Describe Performance Characteristics

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5.1 Perform Link Budget comparison
5.2 Discuss the impact of Tx power and SINR in LTE performance and coverage
5.3 Discuss RF cell planning and design aspects for 3GPP2 vs LTE
5.4 Highlight differences in tuning and optimisation requirements for 3GPP2 vs LTE

Target audience

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

Prerequisites

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 both theoretical lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	• Background and architecture of E-UTRAN and EPC	1 hours
	• RF inter-working scenarios	3 hours
	• RF characteristics of CDMA, 1xEV DO and LTE	2 hours
2	• Antenna co-existence and interference	3 hours
	• Performance characteristics	3 hours

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LTE RBS 6601 Field Maintenance

LZU1087890-R1A

This course is a task-based course covering hardware replacement and maintenance of the RBS 6601 node types. The participants will perform hardware fault localisation, hardware replacement and configuration tasks on a RBS 6601 type. On completion of this course the participants will also be familiar with the features of the operation and maintenance tools Element Manager and NCLI (Node Command line Interface).

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 Identify the Power and Battery Cabinets on Site
1.3 Identify LTE Interface for Transmission on Site
1.4 Identify, locate and handle the connection Unit for External Alarms
1.5 Identify and locate Remote Electrical Tilt (RET)
1.6 Identify the Antenna System Controller (ASC)

2 Use the Customer Product Information (CPI)
2.1 Explain the CPI Library structure of the node
2.2 Find information in the Library with use of regular expression
2.3 Find operational instructions (OPI) and maintain the node according to the OPI
2.4 Find additional information on an alarm and solve the problem with the help of the CPI and Element Manager

3 Connect to a node using CLI and also using NCLI.
3.1 Understand basic commands using CLI and using NCLI.
3.2 Have a basic understanding of the functionality and technology used in CLI and NCLI.
3.3 Understand the basic principles behind the Managed Object Model (MOM).

4 Use the Element manager and understand the concepts behind Object Explorer
4.1 Download and start the Element Manager.
4.2 Access and use the different “Views”; Containment, ATM, Equipment, IP, Licensing, Radio Network and the Software.
4.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log.
4.4 Access the property help feature from each window.
4.5 Create a Customized View (User Defined) in Element Manager.

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5 Perform maintenance and configuration tasks on the RBS 6601 nodes
5.1 Trace the uplink and downlink traffic paths through the RBS 6601 hardware
5.2 Trace the control and supervision communication throughout the node and the antenna system of an RBS 6601 site
5.3 Power up/down the RBS 6601 and connect a thin client to the node
5.4 Perform preventative maintenance on the RBS 6601
5.5 Find Faulty Hardware units and replace them
5.6 Perform Configuration tasks on the RBS 6601
5.7 Perform configuration version backup and restore on RBS 6601

Target audience

The target audience for this course is:

Field Technician

Prerequisites

Successful completion of the following flow and course:

LTE/SAE - System Overview	LZU1087020
LTE 10 Air Interface (Optional)	LZU1087260

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 instructor-led lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction	15 min
	LTE RAN Systems and Site Introduction	0.5 hour
	Customer Product Information and tool kits	15 min
	Command Line Interface/Node Command Line Interface	1 hour
	Element Management	1 hour
	LTE RBS 6601 Maintenance	3 hours

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LTE RBS 6301 Field Maintenance

LZU1087893-R1A

This course is a task-based course covering hardware replacement and maintenance of the RBS 6301 node types. The participants will perform hardware fault localisation, 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 Element Manager and NCLI (Node Command line Interface).

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 Identify the Power and Battery Cabinets on Site
1.3 Identify LTE Interface for Transmission on Site
1.4 Identify, locate and handle the connection Unit for External Alarms
1.5 Identify and locate Remote Electrical Tilt (RET)
1.6 Identify the Antenna System Controller (ASC)

2 Use the Customer Product Information (CPI)
2.1 Explain the CPI Library structure of the node
2.2 Find information in the Library with use of regular expression
2.3 Find operational instructions (OPI) and maintain the node according to the OPI
2.4 Find additional information on an alarm and solve the problem with the help of the CPI and Element Manager

3 Connect to a node using CLI and also using NCLI.
3.1 Understand basic commands using CLI and using NCLI.
3.2 Have a basic understanding of the functionality and technology used in CLI and NCLI.
3.3 Understand the basic principles behind the Managed Object Model (MOM).

4 Use the Element manager and understand the concepts behind Object Explorer
4.1 Download and start the Element Manager.
4.2 Access and use the different “Views”; Containment, ATM, Equipment, IP, Licensing, Radio Network and the Software.
4.3 Find the alarm list and comment on the Alarms and Events on the Alarm and Event Log.
4.4 Access the property help feature from each window.
4.5 Create a Customized View (User Defined) in Element Manager.

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5 Perform maintenance and configuration tasks on the RBS 6301 nodes
5.1 Trace the uplink and downlink traffic paths through the RBS 6301 hardware
5.2 Trace the control and supervision communication throughout the node and the antenna system of an RBS 6301 site
5.3 Power up/down the RBS 6301 and connect a thin client to the node
5.4 Perform preventative maintenance on the RBS 6301
5.5 Find Faulty Hardware units and replace them
5.6 Perform Configuration tasks on the RBS 6301
5.7 Perform configuration version backup and restore on RBS 6301

Target audience

The target audience for this course is:

Field Technician

Prerequisites

Successful completion of the following flow and course:

LTE/SAE - System Overview	LZU1087020
LTE 10A Air Interface (Optional)	LZU1087260

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 instructor-led lessons and practical exercises 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.

Day	Topics in the course	Estimated time
1	Course Introduction	15 min
	LTE RAN Systems and Site Introduction	0.5 hour
	Customer Product Information and tool kits	15 min
	Command Line Interface/Node Command Line Interface	1 hour
	Element Management	1 hour
	LTE RBS 6301 Maintenance	3 hours

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IP Networking

LZU102397-R5A

Description

This course will provide participants with an insight into and an understanding of the TCP / IP protocol stack from the physical layer to the application layer. Participants will learn the operation of different protocols and applications within the TCP / IP suite such DHCP, DNS, NFS, NIS, NTP, HTTP, SNMP, SMTP, Telnet, FTP, TFTP and RTP. Participants will learn about IP addressing, both classful and classless (CIDR) and how subnetting / aggregation and VLSM operates. Participants will learn about different network devices and will develop a detailed understanding of LAN Switching, Routing and Routing protocols. Hands-on exercises using protocol analysers are used to facilitate the understanding of theory sessions.

Learning objectives

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

1 Describe Ethernet, IP networking and the relevant Standards Bodies

1.1 List the functions of the different bodies involved in IP standards / RFCs
1.2 Analyze the OSI reference model and how it relates to the TCP / IP stack
1.3 Explain Ethernet in terms of Physical and Data Link Layer: MAC Address, CSMA/CD principles, Fast Ethernet, Gigabit Ethernet and speed negotiation
1.4 Explain the operation of Hubs, Switches and Routers
1.5 Explain Wireless LANs
1.6 Explain the IP Protocol
1.7 Explain the IPv4 packet structure, protocol header and features
1.8 Explain VLSM, CIDR, Subnetting, aggregation, NAT and NAPT
1.9 Explain the ICMP protocol, ping and traceroute
1.10 Explain the IGMP protocol
1.11 Perform exercises calculating IPv4 addresses and subnets
1.12 Describe the IPv6 packet structure, protocol header and features

2 Explain and compare the transport protocols

2.1 Explain TCP, UDP and SCTP protocol structures, headers and functionality

3 List the applications protocols

3.1 List and explain the operation of different protocols / applications such as DHCP, DNS, NFS, NIS, NTP, HTTP, SNMP, SMTP, Telnet, FTP, TFTP and RTP

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4 Describe IP Switching and Routing Protocols and perform exercises

4.1 Explain the purpose and structure of ARP
4.2 Explain the purpose and implementation of VLANs
4.3 Perform exercises for VLAN implementations
4.4 Explain the purpose of Spanning Tree Protocol (STP)
4.5 Perform Spanning Tree Protocol (STP) exercises
4.6 Explain the operation of Static and Dynamic routing protocols
4.7 Perform Static routing exercises
4.8 Explain Interior and Exterior Gateway Protocols
4.9 List the differences between Vector Distance and Link State protocols
4.10 Explain the RIP routing protocol
4.11 Explain the OSPF routing protocol
4.12 Explain the BGP routing protocol
4.13 Explain the IS-IS routing protocol
4.14 Perform routing protocol exercises for RIP, OSPF, BGP and IS-IS

Target audience

The target audience for this course is: Network Design Engineers, Network Deployment Engineers, System Technicians, Service Technicians, System Engineers and Service Engineers.

Prerequisites

There are no pre-requisites.

Duration and class size

The length of the course is 5 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.

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Time schedule

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

Day	Short description of the topics in the course	Estimated time
1	• List the functions of the different Standard Bodies involved in IP Standards / RFCs	0.5 hour
	• Analyze the OSI Reference Model and how it relates to the TCP / IP stack	1.0 hour
	• Explain Ethernet in terms of Physical and Data Link Layer: MAC Address, CSMA/CD principles, Fast Ethernet, Gigabit Ethernet and speed negotiation	1.5 hours
	• Explain the operation of Hubs, Switches and Routers	2.0 hours
	• Explain Wireless LANs	0.5 hour
	• Explain the IP Protocol	0.5 hour
2	• Explain the IPv4 packet structure, protocol header and features	1.0 hour
	• Explain VLSM, CIDR, Subnetting, aggregation, NAT and NAPT	1.0 hour
	• Explain the ICMP protocol, ping and traceroute	1.0 hour
	• Explain the IGMP Protocol	0.5 hour
	• Perform exercises calculating IPv4 addresses and subnets	2.0 hours
	• Describe the IPv6 packet structure, protocol header and features	0.5 hour
3	• Explain TCP, UDP and SCTP protocol structures, headers and functionality	2.0 hours
	• List and explain the operation of different protocols / applications such as DHCP, DNS, NFS, NIS, NTP, HTTP, SNMP, SMTP, Telnet, FTP, TFTP and RTP	2.0 hours
	• Explain and perform exercises about ARP	2.0 hours

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4	• Explain the purpose and structure of ARP	0.5 hour
	• Explain the purpose and implementation for VLANs	0.5 hour
	• Perform exercises for VLANs implementations	1.0 hour
	• Explain the purpose of Spanning Tree Protocol (STP)	0.5 hour
	• Perform Spanning Tree Protocol (STP) exercises	0.5 hour
	• Explain the operation of Static and Dynamic routing protocols	0.5 hour
	• Perform Static routing exercises	1.0 hour
	• Explain Interior and Exterior Gatway Protocols	0.5 hour
	• List the differences between Vector Distance and Link State protocols	1.0 hour
5	• Explain RIP routing protocol	1.0 hour
	• Explain OSPF routing protocol	1.5 hours
	• Explain BGP routing protocol	0.5 hour
	• Explain IS-IS routing protocol	0.5 hour
	• Perform routing protocol exercises for RIP, OSPF, BGP and IS-IS	2.5 hours

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RBS 6000 Overview

LZU1087503-R1A

Description

The new RBS 6000 product family is the compact multi standard base stations used in GSM, WCDMA and LTE networks. The focus of this course is to cover all RBS models used by Ericsson in the current market. We will explain the RBS 6000 units, block diagram, technical specifications and optional units. Installation, operation and maintenance procedures will be briefly described.

Learning objectives

1 Recognize and identify the main components of Radio Access Network, RBS Site Solutions and RBS 6000 basic functions.

1.1 Give an high level overview on the GSM, WCDMA and LTE Network nodes
1.2 Outline the RBS main functions
1.3 Give an outline of the sustainable solutions for RBS 6000 site
1.4 Describe how more room for expansions is generated
1.5 Compare the power consumption of a RBS 6000 to today's technologies
1.6 Describe Antenna, TMA, Site Transmission and Power Backup System for different RBSs
1.7 Understand the Power Supply, external cables and antenna connections for the RBS 6000.

2 Describe on an overview level the RBS 6000 Platform and understand how Radio Access for various radio technologies is implemented in the RBS 6000

2.1 Describe the generic building and form structure used in RBS 6000
2.2 Describe on an overview level the building practice
2.3 Describe on block level which boards and units gives the WCDMA Functionality
2.4 Describe on block level which boards and units gives the LTE Functionality
2.5 Describe on block level which boards and units gives the GSM Functionality
2.6 Explain the advantages of multi-standard RBS

3 Detail the RBS 6000 portfolio for compact macro, full-size macro, main-remote and micro RBS

3.1 Describe the compact outdoor macro base station RBS 6101
3.2 Describe the full size macro base station RBS 6102
3.3 Describe the full size macro base station RBS 6201
3.4 Describe the compact micro or main-remote base stations RBS 6601
3.5 Describe the indoor micro RBS 6301

4 Outline the main Operation and Maintenance tools for RBS 6000

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Target audience

The target audience for this course is: Engineers that would like to get an introduction to RBS 6000 family and corresponding Site Products.

Prerequisites

Successful completion of the following courses:

Ericsson WCDMA System Overview	LZU1085418
GSM System Survey	LZU108852
LTE/SAE - System Overview	LZU1087020

Or

WCDMA RAN Overview (WBL)	LZU1085202
GSM Radio Network Overview (WBL)	LZU1086235
LTE/SAE in Nutshell (WBL)	LZU1087417

Duration and class size

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

Learning situation

Instructor led training.

Time schedule

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

Day	Topics in the course	Estimated time
1	Introduction	0.5 hour
	Radio Access Network, RBS Site Solutions and RBS 6000 basic functions	1.hour
	RBS 6000 Platform	1.0 hour
	RBS 6101	0.5 hour
	RBS 6102	0.5 hour
	RBS 6201	0.5 hour
	RBS 6601	0.5 hour
	RBS 6301	0.5 hour
	Operation and Maintenance tools	0,5 hour
	Course summary	0.5 hour

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RBS 6000 in a Nutshell

LZU1087504-R1A

Description

This WBL course is intended to give the participant an overview of the RBS 6000 series.

Are you interested in the latest RBS technology from Ericsson. The RBS 6000 Overview course will guide you thought the concept and explain you the main benefits of the new architectures. You will learn how the multi-standard concept is implemented, more room for expansion is generated and how you can lower the power consumption of your network for greater sustainability.

Learning objectives

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

1 Describe on an overview level the RBS 6000 Platform
1.1 Describe the generic building and form structure used in RBS 6000
1.2 Describe on an overview level the building practice
1.3 Explain the advantages of multi-standard RBS
1.4 Describe how more room for expansions is generated
1.5 Compare the power consumption of a RBS 6000 to today's technologies

2 Understand how WCDMA is implemented in the RBS 6000
2.1 Describe on block level which boards and units gives the WCDMA Functionality

3 Understand how LTE is implemented in the RBS 6000
3.1 Describe on block level which boards and units gives the LTE Functionality

4 Understand how GSM is implemented in the RBS 6000
4.1 Describe on block level which boards and units gives the GSM Functionality

Target audience

The target audience for this course are:
System Technician
Service Technician
System Engineers
Service Engineers

Prerequisites

The participants should be familiar with the WCDMA, GSM and LTE on overview level.

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Duration

The length of the course is 1 hour.

Learning situation

This is a web-based interactive training course with multimedia content.

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