



Microwave Networks R15 Training Programs

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)
	Virtual Classroom Training (VCT)
	eLearning (WBL)

Ericsson AB

Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



Ericsson Microwave Products Overview



LZU1088322 R2B

Description

Are you about to include products from the Ericsson Microwave portfolio into your network? Or perhaps you are interested in getting an understanding of the products, their functionality and what benefits they can give to your transport network? Regardless of which, this is the course to take as it will explain building practice and traffic features for the different product families. In addition to this the course will give implementation examples for the products and explain the basics for how management of them is arranged.

Learning objectives

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

- 1 Describe what the Ericsson Microwave products are and for what use they are commonly deployed.
- 2 Describe what type of traffic can be transported.
- 3 List the product families.
- 4 Describe the product families' main functional properties.
- 5 Give typical application scenarios for the product families.
- 6 Describe how management of a MINI-LINK network is arranged.

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

The student should have a basic understanding in Ethernet and TDM transport technologies.



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**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.

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 (hours)
1	<ul style="list-style-type: none">• What is Microwave Transmission?• Why deploy Microwave Transmission?• Market trends in Microwave Transmission• Microwave product portfolio• Deployment scenarios• Technologies & Solutions• Management	1 hour



Ethernet Standards



LZU 108 7591 R1A

Description

Ethernet is becoming one of the main standard communication protocols used in transport networks to handle the requirements of transporting data traffic in the networks in an efficient way.

Do you have the competence required to handle this?

This course covers the basics of Ethernet and related standards. The objectives of this course will be the prerequisites for many of the product Operations and Operation and Maintenance courses

Learning objectives

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

- 1 Understand the structure of the Ethernet frame and MAC address format
- 2 Describe the differences between bridging and switching
- 3 Understand Ethernet framing, Ethernet over PDH and Ethernet over SDH
- 4 Define and understand different Ethernet protection protocols
- 5 Understand the Operations, Administration and Maintenance (OAM) features of Ethernet
- 6 Define which traffic management mechanisms are available to manage Ethernet traffic performance assurance
- 7 Understand the use of IGMP over L2 Switches
- 8 Describe T-MPLS and PBT (PBB-TE)

Target audience

The target audience for this course is:

Fundamentals



**Prerequisites**

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is appr. 2 hours.

Learning situation

This is a self-paced web based course

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 (hours)
1	Introduction Bridge and Switching Ethernet Services Ethernet over PDH and SDH Ethernet Protections Ethernet OAM Traffic Management IGMP over Layer 2 Switch T-MPLS and PBT Test	



Ethernet Transport Overview & Fundamentals



LZU 108 8519 R1A

Description

This course is made of two modules. First the Overview module that gives an introduction into Carrier Ethernet. It explains the need for Carrier Ethernet when building a common Ethernet transport network. It describes the key attributes that make it different from LAN-based Ethernet, and the role of Metro Ethernet Forum in promoting Carrier Ethernet.

The second module is the "Ethernet Transport Fundamentals, web based learning module. This module describes the Ethernet protocol in detail and key concepts Ethernet is based on. It also gives in depth explanation of some of the features Ethernet offers. Telecom Grade Ethernet is also described and the different Telecom Grade Ethernet Solutions are explained."

Both modules end with a knowledge assessment

Learning objectives

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

- 1 Describe the concept and solution of Carrier Ethernet
- 2 To learn about challenges in Telco Networks
- 3 To know the background on Ethernet
- 4 To know about Carrier Ethernet Services
- 5 Describe the Ethernet Protocol
- 6 Explain how Ethernet Works
- 7 Compare the different Ethernet Link Types
- 8 Describe Ethernet Bridging and Switching
- 9 Explain Ethernet Loop Avoidance
- 10 Describe the Rapid Spanning Tree Protocol
- 11 Explain the operation of Ethernet VLANs and the IEEE802.1q Protocol
- 12 Describe Ethernet Resiliency and Link Aggregation
- 13 Describe Ethernet Ring Protection





- 14 Understand Provider Bridging - QinQ
- 15 Understand Provider Backbone Bridging Mac-in-Mac

Target audience

The target audience for this course is:
Fundamentals

Prerequisites

Successful completion of the following courses:

Ethernet Standards LZU 108 7591

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course

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 (hours)
1	BGP Concepts What is BGP Why BGP How BGP works BGP Peering Sharing Prefixes BGP Attributes Summary	

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Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



IP Overview & Fundamentals



LZU 108 8538 R1A

Description

This course contains of two parts: Overview and Fundamentals. Both ends with knowledge assessments.

The first part gives an introduction into IP. It gives a short historic perspective. It explains the business drivers behind IP, how the networks are evolving to "all-IP", and how IP packet networks are different from circuit based telephony networks.

The second part is made for people who want more technical detail. Fundamentals presents the main concepts behind the IP protocol.

Learning objectives

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

- 1 Learn about the business drivers for IP
- 2 Learn about the historical background
- 3 Learn about how the industry is going towards all-IP
- 4 Learn about packet switching versus circuit switching
- 5 Understand what is TCP/IP
- 6 Know the IPv4 Packet Structure
- 7 Know the IPv4 Address Schema
- 8 Know about classless IP addressing
- 9 Learn about the life of an IP Packet

Target audience

The target audience for this course is:

Fundamentals



**Prerequisites**

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is appr. 1 hour

Learning situation

This is a self-paced web-based course

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 (hours)
1	Business drivers for IP Historical background of IP How is the industry going towards all-IP? Packet switching versus circuit switching approach What is IP? What id TCP/IP? OSI Model IPv4 Package structure 32-bit address scheme of IPv4 IP addressing	



IP Routing Overview & Fundamentals



LZU 108 8593 R1A

Description

This course consists of two modules, IP Routing Overview and IP Routing Fundamentals. The IP Routing Overview module describes what IP Routing is, why we use it and how it works. It describes the different types of routing available. It also describes the difference between switching and routing

The IP Routing Fundamentals module describes how IP packets are transmitted in an IP network. Provides information about how Routing Table is populated with route data. The purpose and main functionalities of Dynamic Routing protocols. It also presents techniques to reduce the size of Routing Tables

Learning objectives

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

- 1 Know the basics of IP routing
- 1 Describe how IP addresses and subnet masks used
- 2 Understand the differences between routing and switching
- 3 Know what routers and routing tables are
- 4 Compare static versus dynamic routing protocols
- 5 Understand the difference between interior and exterior routing protocols
- 6 Describe what IP routing is
- 7 Understand how IP packets are transmitted
- 8 Know the purpose and main characteristics of dynamic routing protocols
- 9 Compare Distance Vector and Link State Advertisement routing protocols
- 10 Understand the function of a Default Gateway router
- 11 Define what is Route summarization
- 12 Tell how does Administrative Distance influence route selection
- 13 Describe the importance of Convergence Time



**Target audience**

The target audience for this course is:
Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals LZU 108 8538

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course

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 (hours)
1	What is IP Routing IP addressing Routing and Switching Routers and Routing Tables Static versus Dynamic Routing Protocols Interior versus Exterior Routing Protocols Packet Transmission Routing Protocols Default Gateways Summarization Administrative Distance Convergence Time	

Ericsson AB

Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



IP-QoS Overview & Fundamentals



LZU 108 8528 R1A

Description

The overview module describes what IP QoS is, why we use it and on a very high-level what are the requirements and how it works. It compares IP QoS to a road network and uses this analogy to explain certain topics. It also describes briefly about DiffServ and QoS marking

The Fundamentals module describes what IP QoS is, why we use it and how it works. It reviews a few concepts related to QoS, including throughput, delay, jitter and loss. It examines how IP Precedence is used and how this evolved to Differentiated Services. It describes the different roles and functions of all components that make up a DiffServ. It also describes congestion avoidance mechanisms and how IP QoS is mapped into layer 2 headers

Learning objectives

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

- 1 Know why we use QoS
- 1 Understand congestion avoidance
- 2 Explain the benefits of QoS to a service provider
- 3 Identify the benefits of QoS to an end user
- 4 Understand some typical deployment scenarios
- 5 Understand why previously used best-effort approach was sufficient but is now unsuitable for triple play services.
- 6 Revise the concepts of throughput, delay, jitter and loss.
- 7 Describe Integrated Services.
- 8 Understand per-hop processing.
- 9 Understand how IP Precedence is used.
- 10 Know how IP Precedence evolved to Differentiated Services (DS).
- 11 Be aware of the different DS components.
- 12 Explain the different DiffServ functions like classification, marking, policing, queuing and scheduling.





- 13 Describe how the concept of the Token Bucket works.
- 14 Identify and explain different congestion avoidance mechanisms like RED and WRED.
- 15 Understand where the IP QoS marking is mapped into Layer 2 headers

Target audience

The target audience for this course is:
Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals	LZU 108 8538
IP Routing Overview & Fundamentals	LZU 108 8593

Duration and class size

The length of the course is appr. 2 hours.

Learning situation

This is a self-paced web based course



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 (hours)
1	Why QoS Congestion Avoidance Benefits of QoS to the Service Provider Benefits of QoS to the End User Typical Deployment Scenarios Network Requirements Addressing QoS Requirements IP Precedence Differentiated Services DS Components DiffServ Functions Congestion Avoidance IP QoS in Layer 2	

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Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



IS-IS Overview & Fundamentals



LZU 108 8534 R1A

Description

This course consists of two parts: one overview and one fundamentals.

The Overview part provides introduction to the topic on a high level.

It provides a high level introduction to Intermediate System to Intermediate System (IS-IS). It explains ISIS role in Internet Protocol (IP) and Open Systems Interconnection (OSI) environments.

The Fundamentals part provides the essential information about the topic one must know prior to moving into the more detailed information of the topic.

Fundamentals are addressing the pre-requisite elements of the topic.

The Fundamentals part covers technology background of Intermediate System to Intermediate System (IS-IS) protocol.

It provides the essential information about ISIS.

Learning objectives

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

- 1 Understanding Intermediate System to Intermediate System (ISIS) role in data networks
- 2 Understanding key concepts of Intermediate System to Intermediate System (ISIS)

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals	LZU 108 8538
IP Routing Overview & Fundamentals	LZU 108 8593



**Duration and class size**

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course

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 (hours)
1	IS-IS Concepts Link State Database – Building common network view – Creating network topology – Topology of a broadcast network – Calculating best paths Neighbor Discovery Area Concept – Finding way out of L1 area – Suboptimal routing between areas IP Prefix Redistribution into IS-IS OSI addressing schema	

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SE-164 80 Stockholm

Telephone: +46 10 719 0000



Microwave Transmission Technology



LZU 108 8614 R1A

Description

This learning module will introduce you to Microwave Transmission. It will give you an overview of how microwave transmission works and the advantages of using it.

Learning objectives

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

- 1 Get a high level of understanding of how Microwave Transmission works and what is transported.
- 2 Learn the advantages of using Microwave Transmission.
- 3 List applications.
- 4 Understand the importance of network design and network management

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course





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 (hours)
1	What is Microwave Transmission Range and Capacities Applications – Why deploy Microwave – Yesterday – Today – Tomorrow – Definitions Network design and availability Network management	



Microwave Transmission Technology Fundamentals - Antennas



LZU 108 9276 R1A

Description

This course covers parabolic antenna technology for Microwave Transmission systems, from antenna gain, pattern and half-power beam width to ETSI antenna classes, ways to connect the antenna to the radio and installation with alignment.

Learning objectives

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

- 1 Understand how Microwave Transmission antennas work and what main components they have
- 1 Understand the different ways to connect a microwave radio to the antenna
- 2 Understand how antennas give a signal gain
- 3 Understand the importance of proper installation and antenna alignment

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is 0.5 hour.

Learning situation

This is a self paced web based course





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 (hours)
	Introduction to the course	
	Antenna Fundamentals	
	Antenna Connections	
	Antenna Gain	
	Installation and Alignment	
	Summary	



Microwave Transmission Technology Fundamentals - Applications



LZU 108 9273 R1A

Description

This course covers applications of Microwave systems in networks:

- Types of traffic
- From single hops to networks
- Operation and Maintenance
- Synchronization
- Microwave industry trends

Learning objectives

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

- 1 Understand and describe typical applications for Microwave Transmission Technologies

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is 0.5 hour.



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Learning situation

This is a self paced web based course

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 (hours)
	Introduction to the course	
	Traffic Types	
	Network Topologies	
	Alternative Technologies	
	Operation and Maintenance	
	Synchronization	
	Industry Trends	
	Summary	



Microwave Transmission Technology Fundamentals - Equipment



LZU 108 9275 R1A

Description

This learning module explains the basic functional units of a Microwave Transmission system. Different types of systems for indoor and outdoor installation, protection techniques as well as technologies to improve throughput and availability of the radio link are also discussed.

Learning objectives

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

- 1 Understand the Principle Architecture of a Microwave radio system
- 2 Understand the functionality of modulation
- 3 Understand the different building principles and protection modes available for microwave radio systems
- 4 Understand the importance of reducing the power consumption
- 5 Understand different improvements factors for the microwave path
- 6 Understand the importance of DCN and Network Management

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is 0.5 hour.



ERICSSON

**Learning situation**

This is a self paced web based course

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 (hours)
	Introduction to the course	
	Principle Architecture	
	Modulation	
	Building Principles	
	Protection	
	Power Consumption	
	Improvement Factors	
	DCN and NMS	
	Summary	



Microwave Transmission Technology Fundamentals - Fading



LZU 108 9278 R1A

Description

This course explains fading phenomena in microwave radio propagation: Rain fading, multipath fading and ground reflections.

Learning objectives

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

- 1 Understand and describe Radio propagation:
- 1 Understand and describe Rain fading
- 2 Understand and describe Multipath fading
- 3 Understand and describe Ground reflections

Target audience

The target audience for this course is:
Fundamentals

Prerequisites

Successful completion of the following courses:
There are no prerequisites for this course

Duration and class size

The length of the course is 0.25 hour.

Learning situation

This is a self paced web based course

**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 (hours)
	Introduction to the course	
	Fading	
	Rain Fading	
	Fading from Atmospheric Propagation	
	Multipath Fading from Ground Reflections	
	Summary	



Microwave Transmission Technology Fundamentals - Path Planning



LZU 108 9277 R1A

Description

This course covers the main steps of Microwave path planning. The student will learn why path planning is essential, which competencies the planner needs and what his work consists of. The student will also be introduced to some of the key issues that must be considered, such as Quality and Availability, planning tools, field surveys, fade margin, diversity and interference. The scope of this course is not to train participants to do Microwave planning themselves.

Learning objectives

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

- 1 Understand why microwave planning is essential
- 1 Understand what the main dimensioning parameters for Quality and Availability are
- 2 Describe the general workflow for microwave planning
- 3 Give examples of how the tasks in the general workflow are handled

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is 0.5 hour.



**Learning situation**

This is a self paced web based course

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 (hours)
	Introduction to the course	
	What does the planner do	
	Workflow	
	Summary	



Microwave Transmission Technology Fundamentals - Radio propagation



LZU 108 9279 R1A

Description

This course introduces microwave propagation: Radio wave properties, atmospheric influences, free space loss and line of sight.

Learning objectives

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

- 1 Describe the main properties of radio waves; frequency, bandwidth, power and polarization.
- 2 Describe how the atmosphere influences the propagation by bending the radio signal.
- 3 Describe how to reach free line of sight.
- 4 Describe the parameters in the distance related free space loss.

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

There are no prerequisites for this course

Duration and class size

The length of the course is 0.5 hour.

Learning situation

This is a self paced web based course





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 (hours)
	Introduction to the course	
	The Radio Wave	
	Wave Propagation	
	The Radio Path	
	Free Space Loss	
	Summary	



MINI-LINK CN Fundamentals



LZU1088927 R2A

Description

Are you about to include the MINI-LINK CN into your network? Or perhaps you are interested in the functionality and what benefits it can give to your transport network. Regardless of which, this is the course to take to understand the building practice and functionality of MINI-LINK CN.

Learning objectives

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

- 1 Describe the building practice of MINI-LINK CN.
 - 1.1 Indoor components.
 - 1.2 Radio and antenna.
- 2 Describe the main features of MINI-LINK CN.
 - 2.1 Radio link and Ethernet traffic features.
 - 2.2 Protection.
 - 2.3 Network synchronization.
 - 2.4 Feature Licenses.
 - 2.5 Hop compatibility with other MINI-LINK products.
- 3 Describe the basics of the Software Architecture and Local Management Tools.
 - 3.1 Connection to the Management Network.
 - 3.2 Software upgrade.
 - 3.3 Configuration handling.

Target audience

The target audience for this course is:

Fundamentals

Ericsson AB

Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



Prerequisites

Successful completion of the following courses:

WBL Ericsson Microwave Products Overview, LZU1088322.

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.

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 (hours)
1	<ul style="list-style-type: none">• MINI-LINK CN System Architecture• MINI-LINK CN Hardware Architecture• MINI-LINK CN Software Architecture• MINI-LINK CN Features	1 hour

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Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000



MINI-LINK LH R1 Fundamentals



LZU1088929 R1B

Description

Are you about to include the all indoor Ethernet and SDH/SONET trunk microwave radio MINI-LINK LH R1 into your network? Or perhaps you are interested in the functionality and what benefits it can give to your transport network. Regardless of which, this is the course to take to understand the building practice and functionality of MINI-LINK LH R1.

As MINI-LINK LH is built on the same platform as MINI-LINK TN this course concentrates on what is specific for MINI-LINK LH. For parts in common with MINI-LINK TN references are made to the web based courses MINI-LINK TN Fundamentals 1, System Architecture , LZU1088699, and MINI-LINK TN Fundamentals 2, Features and System Management, LZU1089130. These courses are recommended to be taken prior to this.

Learning objectives

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

- 1 Describe the building practice of MINI-LINK LH R1.
 - 1.1 Indoor components.
 - 1.2 Waveguide and antenna
- 2 Describe the main features of MINI-LINK LH R1.
 - 2.1 Ethernet and SDH/SONET traffic handling.
 - 2.2 Protection.
 - 2.3 Network synchronization.
 - 2.4 Connection to the Management Network.
 - 2.5 Feature Licenses.
 - 2.6 Hop compatibility with other MINI-LINK products.
- 3 Describe the basics of the Software Architecture and Local Management Tools
 - 3.1 Software upgrade.
 - 3.2 Configuration handling.

Target audience

The target audience for this course is:

Fundamentals





Prerequisites

Successful completion of the following courses:

WBL Ericsson Microwave Products Overview, LZU1088322

WBL MINI-LINK TN Fundamentals 1, System Architecture, LZU1088699

WBL MINI-LINK TN Fundamentals 2, Features and System Management, LZU1089130.

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.

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 (hours)
1	<ul style="list-style-type: none">MINI-LINK LH R1 System ArchitectureMINI-LINK LH R1 Hardware ArchitectureMINI-LINK LH R1 Software ArchitectureMINI-LINK LH R1 Features	1 hour

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SE-164 80 Stockholm

Telephone: +46 10 719 0000



MINI-LINK PT Fundamentals



LZU1088553 R3B

Description

Are you about to include the all outdoor, all packet, high capacity microwave terminals MINI-LINK PT into your network? Or perhaps you are interested in the functionality and what benefits they can give to your transport network.

Regardless of which, this is the course to take as it will explain the building practice and functionality of MINI-LINK PT 2020, MINI-LINK PT 6020 and MINI-LINK PT 3060..

Learning objectives

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

- 1 Describe the building practice of MINI-LINK PT.
 - 1.1 The all outdoor building practice.
 - 1.2 The interfaces.
- 2 Describe the main functionalities of MINI-LINK PT.
 - 2.1 Microwave radio properties.
 - 2.2 Ethernet traffic handling.
 - 2.3 Network synchronization handling.
 - 2.4 Connection to the Management Network.
 - 2.5 Licenses.
 - 2.6 Hop compatibility with other MINI-LINK products.
- 3 Describe the basics of the Software Architecture and Local Management Tools

Target audience

The target audience for this course is:

Fundamentals





Prerequisites

Successful completion of the following courses:

WBL Microwave Networks Overview, LZU1088322
Ethernet and IP Technology Fundamentals.

Duration

The length of the course is 0,6 hour.

Learning situation

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

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 (hours)
1	<ul style="list-style-type: none">• MINI-LINK PT System Architecture• MINI-LINK PT Hardware Architecture• MINI-LINK PT Key Features• MINI-LINK PT Software Architecture	0,6

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MINI-LINK PT Operation and Maintenance



LZU 1089721 R1A

Description

Do you have the right knowledge to work with operation and maintenance of a MINI-LINK PT? If not, this is the course for you.

With the help of the theoretical lessons the attendees will get a good knowledge about the MINI-LINK PT 2020, MINI-LINK PT 6020 and MINI-LINK PT 3060 and their functions.

During the practical exercises and with guidance from the instructors the attendees will learn the most efficient ways of performing operation and maintenance of a MINI-LINK PT.

Learning objectives

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

- 1 Describe the building practice of MINI-LINK PT.
 - 1.1 Describe the MINI-LINK PT features and characteristics.
 - 1.2 Name the interfaces on MINI-LINK PT.
- 2 Describe the main functionalities of the MINI-LINK PT.
 - 2.1 Microwave radio properties.
 - 2.2 Ethernet traffic handling.
 - 2.3 Network synchronization handling.
 - 2.4 Connection to the Management Network.
 - 2.5 Licenses.
 - 2.6 Hop compatibility with other MINI-LINK products.
- 3 Configure a MINI-LINK PT Network Element.
 - 3.1 Setting up management network connectivity.
 - 3.2 Setting up the radio link.
 - 3.3 Setting up the Ethernet traffic in Customer Bridging mode.
 - 3.4 Setting up the Ethernet traffic in Provider Bridging mode.

Target audience

The target audience for this course is:

Network Deployment Engineer, System Engineer, Field Technician, System Technician



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Prerequisites

Successful completion of the following courses:

The participants should be familiar with digital transmission fundamentals and the subjects/contents of Microwave Networks Overview (LZU 1088322) and Ethernet Transport Overview and Fundamentals (LZU 1088519) or similar knowledge. Moreover, they must be experienced in working with a PC and the Windows operating system.

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 (hours)
1	Introduction	0.5 hour
	MINI-LINK PT theory	1.5 hours
	Practical Exercises in Lab	3.5 hours
	Summing up	0.5 hour

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MINI-LINK SP R1 Fundamentals



LZU1088872 R1B

Description

Are you about to include the all indoor Ethernet aggregation node MINI-LINK SP R1 into your network? Or perhaps you are interested in the functionality and what benefits it can give to your transport network. Regardless of which, this is the course to take as it will explain the building practice and functionality of MINI-LINK SP R1.

Learning objectives

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

- 1 Describe the building practice of MINI-LINK SP R1.
 - 1.1 Indoor components.
- 2 Describe the main features of MINI-LINK SP R1.
 - 2.1 Ethernet traffic handling.
 - 2.2 TDM traffic handling.
 - 2.3 MPLS-TP traffic handling.
 - 2.4 Network synchronization.
 - 2.5 Connection to the Management Network.

Target audience

The target audience for this course is:

Fundamentals





Prerequisites

Successful completion of the following courses:

WBL Ericsson Microwave Products Overview, LZU1088322 R2A

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.

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 (hours)
1	<ul style="list-style-type: none">• MINI-LINK SP R1 System Architecture• MINI-LINK SP R1 Traffic Features• MINI-LINK SP R1 Synchronization Architecture• MINI-LINK SP R1 Network Management	1 hour



MINI-LINK SP R1 Operation and Maintenance



LZU1088873 R1B

Description

If your personnel do not have the appropriate skills and knowledge, operation and maintenance of equipment could be a complex and resource-consuming task. This course will provide your personnel with the full information about structure and features in the MINI-LINK SP family. Furthermore they will learn how to operate and maintain the MINI-LINK SP family in the most efficient way using the MINI-LINK Craft.

Don't forget that this course is combined with Web based courses stated in the prerequisites further below.

Learning objectives

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

- 1 Describe the MINI-LINK SP family and features.
 - 1.1 Illustrate the use of the equipment in the network.
 - 1.2 Demonstrate the main features the MINI-LINK SP family offers.
 - 1.3 Explain the main system architecture.
 - 1.4 Identify the front panel devices.
- 2 Use the MINI-LINK SP Local Craft Terminal.
 - 2.1 Connect to the equipment.
 - 2.2 Navigate the MINI-LINK Craft.
 - 2.3 Navigate the Command Line Interface.
- 3 Operate the initial system set-up.
 - 3.1 Configure unit and port parameters.
 - 3.2 Configure synchronization parameters.
 - 3.3 Configure management network parameters.
- 4 Describe the different traffic functionalities of the MINI-LINK SP.
 - 4.1 Configure Ethernet traffic and protection schemes.
 - 4.2 Configure MPLS-TP.
 - 4.3 Configure Circuit Emulation Services.
 - 4.4 Configure Router functionalities
- 5 Operate main maintenance procedures.
 - 5.1 Configure OAM features.
 - 5.2 Perform the backup and restore of the equipment database.
 - 5.3 Describe the software download principles.
 - 5.4 Identify and manage some emergency conditions.





Target audience

The target audience for this course is:

Network Deployment Engineer, System Technician, Service Technician, System Engineer, Service Engineer, Field Technician.

Prerequisites

Successful completion of the following courses:

Microwave Networks Overview (LZU 1088322) and MINI-LINK SP R1 Fundamentals (LZU 1088872).

The participants should be familiar with the Ethernet and PDH principles.

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 technical environment using equipment and tools which can be optionally accessed remotely. This course can be conducted at the Customer premises.

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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 (hours)
1	Introduction	0,5 hour
	Description of the MINI-LINK SP family and equipment features	1 hour
	Description of the Management of the MINI-LINK SP	1 hour
	Starting the MINI-LINK Craft and do Initial system set-up	1,5 hour
	Configuration of traffic and protection schemes	2 hours
2	Configuration of traffic and protection schemes	3 hours
	Configuration of the performance data collection	1 hour
	Management of the fault reporting	1 hour
	Management of the equipment database and software	0,5 hour
	Summing up	0,5 hour

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MINI-LINK TN R5 Fundamentals 1, System Architecture



LZU1088699 R1B

Description

Are you about to include the multipurpose microwave transport platform MINI-LINK TN R5 into your network? Or perhaps you are interested in the functionality and what benefits it can give to your transport network. Regardless of which, this MINI-LINK TN R5 Fundamentals course is the course to take as it will explain the concept, the hardware architecture, microwave and traffic features and how to manage the system. This the first part of the course will explain the hardware and software architecture of the system.

Learning objectives

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

- 1 Describe the building practice of MINI-LINK TN R5.
 - 1.1 Indoor components.
 - 1.2 Outdoor components.
- 2 Describe the basics of the Software Architecture.
 - 2.1 Software storage.
 - 2.2 Configuration storage.

Target audience

The target audience for this course is:

Fundamentals



**Prerequisites**

Successful completion of the following courses:

WBL Ericsson Microwave Products Overview, LZU1088322

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.

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 (hours)
1	<ul style="list-style-type: none">• MINI-LINK TN R5 System Architecture• MINI-LINK TN R5 Hardware Architecture• MINI-LINK TN R5 Software Architecture	1 hour

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MINI-LINK TN R5 Fundamentals, Key Features and Understanding System Management



LZU1089130 R1B

Description

Are you about to include the multipurpose microwave platform MINI-LINK TN R5 into your network? Or perhaps you are interested in the functionality and what benefits it can give to your transport network. Regardless of which, this is the course to take as it will explain the building practice and functionality of MINI-LINK TN R5.

Learning objectives

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

- 1 Describe the main features of MINI-LINK TN R5.
 - 1.1 Ethernet and TDM traffic handling.
 - 1.2 Protection.
 - 1.3 Feature Licenses.
 - 1.4 Hop compatibility with other MINI-LINK products.
- 2 Describe the basics for Management Tools and Network
 - 2.1 MINI-LINK Craft
 - 2.2 ServiceOn Element Manager
 - 2.3 Management Network design.
 - 2.4 Management channels

Target audience

The target audience for this course is:

Fundamentals





Prerequisites

Successful completion of the following courses:

WBL Microwave Networks Overview, LZU1088322

WBL MINI-LINK TN Key Concept and System Architecture, LZU1088699

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.

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 (hours)
1	<ul style="list-style-type: none">MINI-LINK TN R5 Key FeaturesUnderstanding System Management	1 hour



MPLS L2VPN Overview & Fundamentals



LZU 108 8513 R1A

Description

L2VPN Overview & Fundamentals is a combination of 2 modules, the overview course and the fundamentals course. Both courses end with a Knowledge Assessment.

MPLS VPN's Overview module describes what MPLS VPN's are, why we use them and on a very high-level what are the requirements and how they work. It describes the different models for a VPN Service. It also describes briefly about MPLS VPN's.

MPLS L2VPN Fundamentals module describes what MPLS L2VPN is, why we use it and how it works. It describes the different roles and functions of all components that make up a MPLS L2VPN Service. It also describes in detail the different MPLS L2VPN services

Learning objectives

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

- 1 Know what a Virtual Private Network is (VPN).
- 1 Understand the business drivers for VPN's.
- 2 Explain the requirements of a VPN service.
- 3 Identify different VPN models.
- 4 Understand what an MPLS L3VPN is.
- 5 Understand what an MPLS L2VPN is.
- 6 Define the benefits of using MPLS VPN's.
- 7 Know why L2VPNs are used
- 8 Understand the how MPLS is used to setup L2VPNs
- 9 Revise MPLS and label switching
- 10 Describe the signaling that occurs to set up a L2VPN network
- 11 Understand the different L2VPN services – VPWS and VPLS
- 12 Understand the PWE3 Framework
- 13 Know the PW parameters and how they are exchanged
- 14 Be aware of the PW protocol stack, PW Control Word and O&M





- 15 Explain the difference between Ethernet, ATM and TDM (SAToP) carried over PWs
- 16 Describe how bridging works in VPLS, how loops are prevented and understand H-VPLS

Target audience

The target audience for this course is:
Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals	LZU 108 8538
IP Routing Overview & Fundamentals	LZU 108 8593
OSPF <u>or</u> IS-IS Overview & Fundamentals	LZU 108 8536 <u>or</u> LZU 108 8534
MPLS Overview & Fundamentals	LZU 108 8517

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course



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 (hours)
1	What is a VPN Service? Business drivers for VPN's VPN Requirements VPN Models MPLS L3VPN MPLS L2VPN Benefits of MPLS VPN's Why L2VPN What is MPLS L2VPN Different L2VPN Services Virtual Private Wire Service Virtual Private LAN Service	

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SE-164 80 Stockholm

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MPLS Overview & Fundamentals



LZU 108 8517 R1A

Description

This course contains of two modules.

The first module, the Overview, gives an introduction into MPLS (Multiprotocol Label Switching). It explains the need for MPLS in a world evolving to "all-IP". It describes how networks are evolving, based on MPLS, what MPLS offers and on a very high level how MPLS works.

The second module, the Fundamentals, web based learning module. This module describes what MPLS is, why we use it and how it works. It describes the different roles and functions of all components that make up MPLS. It also describes in detail the label switching and distribution process and how these can be used to create VPNs (Virtual Private Network)."

Both modules end with a Knowledge Assessment

Learning objectives

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

- 1 Understand the importance of MPLS (Multiprotocol Label Switching) for next generation telecommunication networks.
- 2 Understand the basics of MPLS (Multiprotocol Label Switching).
- 3 Know what is Multi-Protocol Label Switching (MPLS) is
- 4 Understand why operators need to use MPLS
- 5 Describe how MPLS works
- 6 Compare MPLS to the OSI (Open Systems Interconnection) model
- 7 Understand the different roles that a router can have in an MPLS backbone (LER (Label Edge Router), LSR (Label Switch Router) etc.)
- 8 Explain the MPLS header and what each field means
- 9 Know the typical deployment scenarios for MPLS and how they are created – LSPs (Label Switched Path), FEC's (Forwarding Equivalence Class), label binding etc.
- 10 Describe the different label distribution and control modes
- 11 Explain how LDP (Label Switched Path) works, the message setup, LDP (Label Distribution Protocol) ID etc.





12 Understand how MPLS VPN's work and are setup

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals	LZU 108 8538
IP Routing Overview & Fundamentals	LZU 108 8593
OSPF <u>or</u> IS-IS Overview & Fundamentals	LZU 108 8536 <u>or</u> LZU 108 8534

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course

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 (hours)
1	MPLS Concepts Why MPLS What is MPLS MPLS Functions and Roles Label Switching and Distribution MPLS Virtual Private Networks	

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OSPF Overview & Fundamentals



LZU 108 8536 R1A

Description

This course gives a high level overview of the IP Routing protocol called Open Shortest Path First (OSPF).

It explains the role of this routing protocol in an IP Network.

This course also presents the main concepts behind the IP Routing protocol called Open Shortest Path First (OSPF).

Learning objectives

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

- 1 Understand the role of OSPF(Open Shortest Path First) in IP networks
- 2 Understand the main concepts of OSPF

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

IP Overview & Fundamentals	LZU 108 8538
IP Routing Overview & Fundamentals	LZU 108 8593

Duration and class size

The length of the course is appr. 1 hour.

Learning situation

This is a self-paced web based course





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 (hours)
1	OSPF Concept Link State Database – Building common network view – Creating network topology – Topology of a broadcast network – Calculating best paths LSA Flooding Introduction to concept of area	Self-paced



Transmission Technology Fundamentals - TDM over Packet



LZU 108 9873 R1A

Description

This course explains how TDM services can be transported over packet networks using SAToP and CESoPSN protocols.

Learning objectives

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

- 1 Applications of TDM transport over packet networks
- 2 Different protocols for TMD transport over packet networks
- 3 Differences between Layer 2 (Ethernet) and Layer 3 (IP/MPLS) CES transport
- 4 Latency and capacity issues
- 5 Synch solutions for TDM over packet

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

None

Duration and class size

The length of the course is 0,42 hours.



**Learning situation**

This is a self-paced web based course

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 (hours)
	Introduction	
	Emulation	
	Encapsulation	
	Delay	
	Synchronization	
	Network Considerations	



Microwave Transmission Technology Enhancements - NLOS



LZU 108 9876 R1A

Description

This course shows how point-to-point microwave links can be deployed in non-line-of-sight applications. NLOS techniques diffraction, reflection and penetration are described as well as link budget and spectrum considerations

Learning objectives

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

- 1 principles of point to point links in small cell non-line-of-sight applications,
- 2 main non-line-of-sight techniques: diffraction, reflection and penetration,
- 3 how link budget reserves make non-line-of-sight feasible and
- 4 what the spectrum considerations are.

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

None

Duration and class size

The length of the course is 0,42 hours.



**Learning situation**

This is a self-paced web based course

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 (hours)
	Introduction	
	NLOS Techniques	
	Link Budget	
	Spectrum Considerations	
	Deployment	



Transmission Technology Fundamentals - PDH and SDH



LZU 108 9875 R1A

Description

This course explains the basics of PDH and SDH/SONET transmission technology, including 64kbit/s streams, DS1s and E1s, multiplex hierarchies, SDH network elements and protection.

Learning objectives

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

- 1 how voice is converted for transport in digital networks
- 2 basics of PDH, including E1 channels and multiplex hierarchy
- 3 basics of SDH, including multiplex hierarchy, different mux levels, overheads and protection
- 4 typical applications for PDH and SDH and some key differences between ETSI and ANSI regarding PDH and SDH/Sonet.

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

None

Duration and class size

The length of the course is 0,33 hours.



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Learning situation

This is a self-paced web based course

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 (hours)
	Plesiochronous Digital Hierarchy, PDH	
	Synchronous Digital Hierarchy, SDH	
	Application Examples	



Transmission Technology Fundamentals - Synchronization



LZU 108 9874 R1A

Description

This Course falls under Technical Foundation Portfolio. This course introduces synchronization over transport networks. It shows why synchronization is necessary and explains different technologies to provide it.

Learning objectives

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

- 1 Why synchronization is needed.
- 2 The difference between frequency, phase and time synchronization.
- 3 The basics for the main technologies to provide synchronization over transport networks.
- 4 Synchronization requirements in mobile networks.

Target audience

The target audience for this course is:

Fundamentals

Prerequisites

Successful completion of the following courses:

None

Duration and class size

The length of the course is 0,42 hours.

**Learning situation**

This is a self-paced web based course

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 (hours)
	What is Synchronization	
	Where and Why is Synchronization needed	
	Synchronization Types	
	Synchronization Technologies	
	Requirements	



MINI-LINK Indoor Units M15, Ethernet Operations



LZU1082177 R1A

Description

Are you deploying Ethernet transmission in a MINI-LINK TN/LH/CN network? Are you about to use the more advanced Ethernet settings in the Network Elements? If so, this is the course for you.

With the help of the theoretical lessons the attendees get a good knowledge about the Ethernet functionalities in the MINI-LINK products. During the practical exercises and with guidance from the instructors the attendees learn how to set up the different Ethernet possibilities.

Learning objectives

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

- 1 Describe how to operate advanced Ethernet traffic configurations in MINI-LINK TN/LH/CN network elements.
 - 1.1 Admission control and Switch port types
 - 1.2 Traffic classification
 - 1.3 Policing and Color marking
 - 1.4 Provider Bridging
 - 1.5 QinQ Bridging
 - 1.6 Traffic Class mapping
 - 1.7 Buffer size
 - 1.8 Scheduling
 - 1.9 Active and Passive queue management
 - 1.10 Circuit Emulation Services
 - 1.11 Ethernet Link and Service OAM
- 2 Describe how to operate synchronization over packet in MINI-LINK TN/LH/CN network elements.
 - 2.1 Frequency synchronization slave clock
 - 2.2 Frequency synchronization distribution
 - 2.3 Phase and Time synchronization
- 3 Describe how to operate and how to take advantage of Capacity Booster technologies
 - 3.1 Adaptive Modulation
 - 3.2 Enhanced Radio Link Bonding
 - 3.3 Multi-Layer Header Compression

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SE-164 80 Stockholm

Telephone: +46 10 719 0000



Target audience

The target audience for this course is:

Network Deployment Engineer, System Engineer, Field Technician, System Technician

Prerequisites

Successful completion of the following courses:

MINI-LINK Indoor Units M15, Fundamentals, Commissioning and Basic Operations - LZU1082176

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 (hours)
1	Introduction to the course	0,5
	Ethernet Technology and MINI-LINK Implementations (Admission control, Multicast, Prio mapping, Policing, prio mapping, SP&WFQ Scheduling, WRED, Buffer size. RSTP/MSTP, CES).	2
	Value Package Advanced Ethernet (Provider bridging, Service OAM, IGMP/MLD Snooping)	1
	Value Package Ethernet Capacity Booster (Adaptive Modulation, Enhanced RLB, Multilayer Header Compression)	0,5
	Value Package Frequency Synchronization 1588 (Frequency sync Master/Slave, freq. sync distribution)	1
	Value Package Phase and Time 1588 (Phase and time sync, OC; BC, TC)	1
2	Ethernet Configuration Exercises	5,5
	Summary of the course	0,5

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MINI-LINK Indoor Units M15, Fundamentals, Commissioning and Basic Operations



LZU1082176 R1A

Description

This course is designed for people who need to know MINI-LINK TN/LH/CN system design and perform Commissioning and Basic Operation tasks on the systems. The course contents provides the full information about the systems' architecture and the functions included in the Base Package software. The procedures for configuring radio hop, management DCN, TDM traffic handling and basic Ethernet traffic handling are explained.

Learning objectives

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

- 1 From defined site parameters list needed MINI-LINK TN/LH/CN hardware.
 - 1.1 Sub racks
 - 1.2 Plug-in Units
- 2 From defined site parameters and by using the MINI-LINK Craft know how to configure a MINI-LINK TN/LH/CN network element.
 - 2.1 Hybrid and SDH/SONET unprotected radio hop parameters.
 - 2.2 Hybrid and SDH/SONET protected radio hop parameters
 - 2.3 PDH traffic, Traffic Routing and Ring Protection.
 - 2.4 Ethernet WAN ports
 - 2.5 Layer 1 Ethernet traffic
 - 2.6 Layer 2 Ethernet traffic.
 - 2.7 Layer 1 Radio Link Bonding.
- 3 From defined parameters know how to configure Layer 1 network synchronization by using MINI-LINK Craft.
 - 3.1 SDH/SONET Equipment Clock
 - 3.2 Ethernet Equipment Clock
- 4 Know how to configure the Management Network, DCN, from defined parameters and by using the MINI-LINK Craft.
 - 4.1 Service Channels
 - 4.2 Static Routing and OSPFv2
 - 4.3 DCN over VLAN





Target audience

The target audience for this course is:

Network Deployment Engineer, System Engineer, Field Technician, System Technician

Prerequisites

Successful completion of the following courses:

Microwave Transport Technology
PDH and SDH/SONET Transport Technologies
IP Technology
Ethernet Technology

Duration and class size

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

Learning situation

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



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 (hours)
1	Introduction to the course	0,5
	MINI-LINK TN R5/LH R1 Fundamentals (HW + Base Package)	2
	MINI-LINK CN R2 Fundamentals (HW + Base Package + Eth Switching on CN)	0,5
	MINI-LINK Radio Units	0,5
	MINI-LINK Antennas	0,5
	MINI-LINK Hardware Composition Exercise	2
	2	MINI-LINK LH R1 Fundamentals (LH Specific HW)
Local Management		0,5
Management DCN (SC, Routed DCN, Switched DCN)		1,5
MINI-LINK Functions, (1+1 radio protection, E1 SNCP, XPIC).		1,5
MINI-LINK Radio Hop Capacity Features		0,5
Commissioning Exercise (DCN checking, radio hop configuration, TDM)		1
3	Ethernet Fundamentals and MINI-LINK implementation (L1, LAN, WAN RL-IME and PDH-IME. L2; Q-bridging, VLAN,)	2
	Ethernet Traffic Exercise (L1, LAN, WAN RL-IME and PDH-IME. L2; Q-bridging, VLAN,)	3,5
	Summary of the course	0,5

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MINI-LINK Indoor Units M15, Maintenance and Trouble Shooting



LZU1082178 R1A

Description

By lectures and practical exercises and with guidance from the instructors the attendees will learn how to perform maintenance and trouble shooting tasks in MINI-LINK TN/LH/CN Network Elements.

By the theoretical lessons the attendees will get a deep knowledge about the units and their functions that will help in maintenance and troubleshooting. During the practical exercises and with guidance from the instructors the attendees will learn how to think and what actions to take to find and correct errors in a MINI-LINK network.

Learning objectives

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

- 1 Perform maintenance of MINI-LINK TN/LH/CN network elements.
 - 1.1 Configuration backup.
 - 1.2 Software upgrade.
 - 1.3 Create license request.
- 2 Understand how the MINI-LINK TN/LH/CN is built up in a more detailed way.
 - 2.1 Identify from where alarms originate.
 - 2.2 Traffic handling alarms.
 - 2.3 Radio terminal alarms.
- 3 Know the procedure and tools for trouble shooting with MINI-LINK Craft in MINI-LINK TN/LH/CN
 - 3.1 Alarm logs
 - 3.2 Performance logs.
 - 3.3 Bit Error Tester
 - 3.4 Loops
 - 3.5 Command Line Interface
- 4 Know how to replace faulty hardware.
 - 4.1 Compatibility considerations
 - 4.2 Work process
 - 4.3 Failure Note
- 5 Identify radio propagation alarms and performance degradations
 - 5.1 From fading





5.2 From interference

Target audience

The target audience for this course is:

Network Deployment Engineer, System Engineer, Field Technician

Prerequisites

Successful completion of the following courses:

MINI-LINK Indoor Units M15, Fundamentals, Commissioning and Basic Operations.
LZU1082176

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 (hours)
1	• Introduction to the course	0,5
	• Maintenance Theory. How to perform maintenance tasks (License, Configuration and Software maintenance)	1
	• Hardware Faults. Description of common hardware related errors	0,5
	• Troubleshooting Theory. Description of procedure and tools for troubleshooting	2
	• Replacing Hardware. Compatibility and procedure	0,5
	• DCN and Synchronization. Management Network and Synchronization related error scenarios	0,5
	• Maintenance exercises. BERT, Loops, SW handling	1
2	• Fading and Interference. Microwave radio propagation theory and performance degradations from fading and interference	1
	• Practical troubleshooting exercises	4,5
	• Summary of the course	0,5

Ericsson AB

Global Services

SE-164 80 Stockholm

Telephone: +46 10 719 0000