MINI-LINK™ MANAGER R7.1

Technical Product Description

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1 INTRODUCTION

1.1 GENERAL

MINI-LINK Manager is a flexible platform for managing all the Ericsson microwave transmission networks. It provides off the shelf integration of primarily Ericsson MINI-LINK point-to-point and point-to-multipoint microwave systems (capacities ranging from 2x2 Mbit/s to 155 Mbit/s) like MINI-LINK Traffic Node, MINI-LINK E and C, MINI-LINK High Capacity, MINI-LINK BAS and also integration of non-Ericsson systems (NERA NEW-NMS, ETU) into common applications.

At Element Manager layer, MINI-LINK Manager provides functions such as FM, CM, AM, PM, SM based on the recommendations from Open Systems Interconnect (OSI) “FCAPS” model. The CM functionality is either embedded or provided using dedicated Local Managers and Element Managers. MINI-LINK Manager can also be used to mediate FM, PM and Inventory data to other management systems.

The product consists of commercial Hardware platforms and Software packages (Adaptations and Applications) that can be composed in a modular way to fit the management requirements of networks of various sizes and configurations. All Applications can also be accessed from the MINI-LINK Manager Client.

MINI-LINK Manager is positioned to provide a cost effective management solution for Ericsson Transmission Network Elements and to allow it to be integrated into Customer Network Management environments.

1.2 PURPOSE

This document is intended to give a technical view of the MINI-LINK Manager Products and is mainly targeted for technicians.

1.3 SYSTEM OVERVIEW

MINI-LINK Manager provides a complete management solution for Ericsson Microwave Transmission Networks. It can easily be adjusted to different customer needs via its flexible configuration options.

By having a distributed and modular architecture, the MINI-LINK Manager product enables investments to be made according to actual needs, additional investments is therefore only required when the need occurs, through expansion of the network.

The network management capacity can be easily extended as the network expands. By adding additional MINI-LINK Manager Servers and/or Clients, upgrading hardware or adding components (adaptations and applications), network management capacity and functionality is adjusted to face the new requirements of the Microwave Transmission Network.

When configuration management of the integrated equipment is needed, specific configuration applications (LM/EM) are launched from the MINI-LINK Manager. This means that the operator has easy access to the information and tools required to manage the network.

The MINI-LINK Manager graphical user interface has the look and feel of Microsoft Windows, this ensures familiarity for the users and means that the learning time is reduced to a minimum

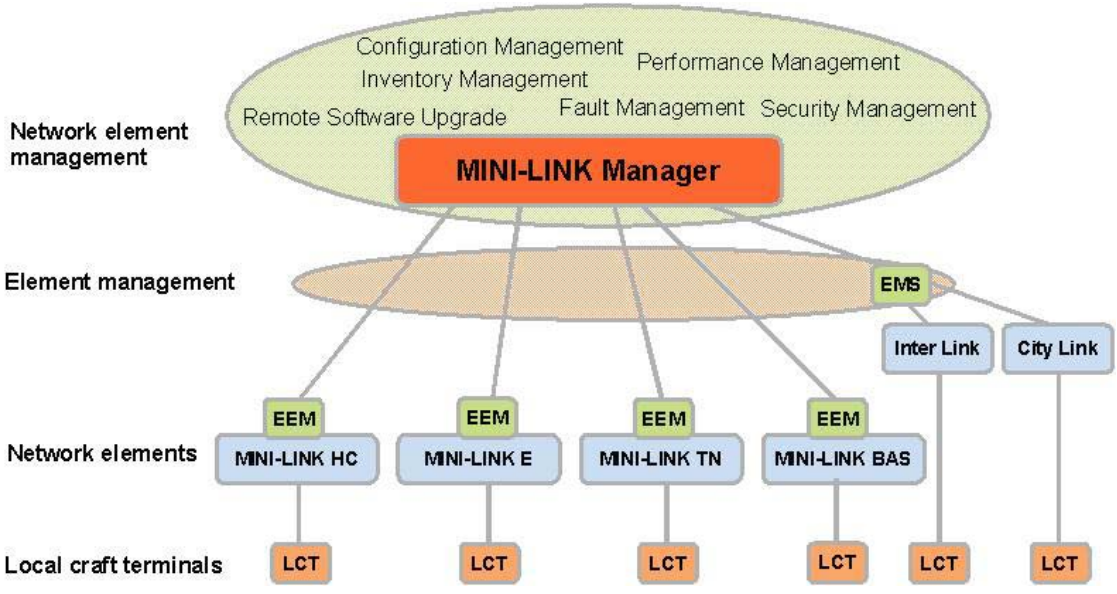

Figure 1. MINI-LINK Manager positioning

2 SOFTWARE CONFIGURATION

2.1 BASIC BUILDING BLOCKS

The MINI-LINK Manager platform is composed of the following Application SW packages:

- **MINI-LINK Manager Server Application**
  The MINI-LINK Manager Server Application is used as a complete Network Element Management System with Fault Management, Performance Management, Configuration Management and Security Management. The MINI-LINK Manager Server Application collects Fault and Performance Data from microwave network equipment and converts the received information to a generic format. The collected information is made available to all connected Clients and in addition to that the Application Server supports a number of export interfaces towards upper level Network Management Systems. Historical FM, PM and Inventory data can be exported to a Centralized SQL database. It allows the operator to have a complete view of data stored on all of the Servers in the managed network. Additional Application Servers can be added as the network grows or to cater for requirements on a distributed system, depending on the needs of the operator.

- **MINI-LINK Manager Client Application**
  In many network solutions, the operator wants to operate the network from various places like a Network Management Center or from different Regional Management Centers. The MINI-LINK Manager Client Application includes a powerful graphical user interface that provides a complete view of the managed network by connecting to one or several MINI-LINK Manager Servers, depending on the configuration and size of the managed Microwave Transmission Network. The MINI-LINK Manager Server Application already includes a MINI-LINK Manager Client Application that runs on the same PC as the server.

- **MINI-LINK Manager Terminal Services Application**
  The MINI-LINK Manager Terminal Services Application is a Server application that enables several users to launch MINI-LINK Manager Client sessions from remote PC accessed via Windows Terminal Services. This is mostly valuable when the operator needs access, for a short time per session and with low bandwidth, to the network from various places also outside the Network Management Center or different Regional Management Centers. The actual Client session executes on the dedicated Windows TS server and only the GUI is displayed on the remote PC.

MINI-LINK Manager applications can be combined in many different ways, securing a perfect fit for Microwave Transmission network management solutions.

2.2 ARCHITECTURE

MINI-LINK Manager is based on object-oriented technology and is designed as a multi-user system with Client/Server architecture. Around the OSS core, different components such as applications and adaptations (interfaces to equipment/systems) interact with each other using well-defined interfaces. Components are separated and thus unaware of each other's implementation. This facilitates maintenance and future extension of the system.

The data distribution is optimized for the high performance requirements of TMN systems and is characterized by using the latest object technologies to provide support of communication among objects between Server and Clients on different computers - on a local area network (LAN), a wide area network (WAN), or the Internet.

For flexibility and cost-effectiveness, the MINI-LINK Manager system platform comprises standard PCs and commercial Servers under Microsoft Windows 2003/XP.

The user interface is based on Windows "look and feel" and designed for intuitive operations. This increases efficiency and security against errors in routine operations, while at same time reducing staff training time to a minimum.

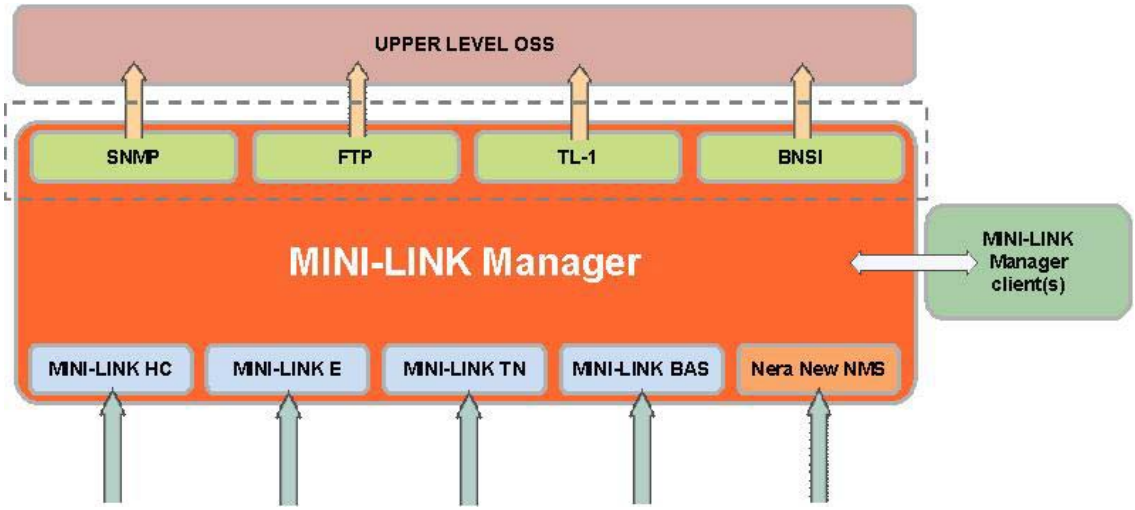

Figure 2. MINI-LINK Manager Architecture

3 APPLICATION SOFTWARE DESCRIPTION

3.1 FAULT MANAGEMENT

The MINI-LINK Manager common Fault Management application is designed to support efficient operation and maintenance of Microwave Transmission networks.

The availability of the Transmission and transport Network is visualized in the Network Explorer, Animated Maps and the Alarm & Event list. Fault Management complies with the ITU-T Telecommunications Managed Network (TMN) model.

The network alarm status can be presented using different views:

- **The Network Explorer** – Provides an alarm summary view in both the Alarm Banner and in the network tree view.
- **Animated Graphical Maps** – Provides an animated view of the status in the network with immediate update of Alarm/event changes in the network.
- **Alarm List** with sorting, filtering, and vital alarm handling capabilities such as acknowledgement, deletion, alarm commenting, severity coloring etc.

The Fault Management application includes important features that support rapid treatment of disturbances in the network:

- **Navigation from Fault to Reason**
  Fault to Reason navigation enables direct navigation from fault to reason by launching the corresponding integrated management application (LM/EM) for detailed fault analysis and re-configuration in order to solve network problems promptly. MINI-LINK Manager can launch integrated management applications with information about the alarming object. The user can then be automatically logged-in to the faulty equipment.
- **Navigation from Fault to Maps**
  Fault to Map navigation enables direct navigation from a fault in the alarm list to the correspondent animated map. This speeds-up the time to find out where the fault is located geographically and gives the user possibilities to do a visual correlation.

- **Improved Alarm filtering & sorting**
  ► MINI-LINK Manager alarm filtering & sorting provides a comprehensive and easy to use filtering and sorting mechanism that assists the user in finding related alarms and identifying the root cause alarms.
  ► A fault suppression capability enables the user to discard alarms coming from lower management systems integrated in MINI-LINK Manager. This allows sorting of alarms prior to them being displayed in the alarm list and storage within the database.
  ► The enhanced alarm filtering and sorting capabilities provided by MINI-LINK Manager extend to the export interface, where the ability to select filtering criteria for the alarms to be exported can be tailored for individual requirements.

- **Customizable Graphical User Interface**
  MINI-LINK Manager supports customization of displays in order to select exactly what to see on the user interface. The network status can be presented in numerous ways; for example alarm banners, alarm lists, and graphical network maps with network elements and/or sub-networks.

- **Alarm/Event History Log**
  MINI-LINK Manager Alarm History Viewer provides access to the alarm and event history log (containing alarms, user events and system events) that can easily be audited for post-processing analysis.

3.1.1 MINI-LINK Manager Network Explorer

The Network Explorer gives a view of the database (System View), the logical network hierarchy (Network View) and the alarm status, thus offering effective alarm surveillance from a single application. The key benefits are:

- Comprehensive overview and easy navigation of the network topology.
- Alarm status and application status is visualized automatically for all items in the Explorer tree.
- Intuitive user interface that is easy to learn.
- Active alarm summary – Displays all currently active alarms in the managed network, with direct navigation to the alarm list.

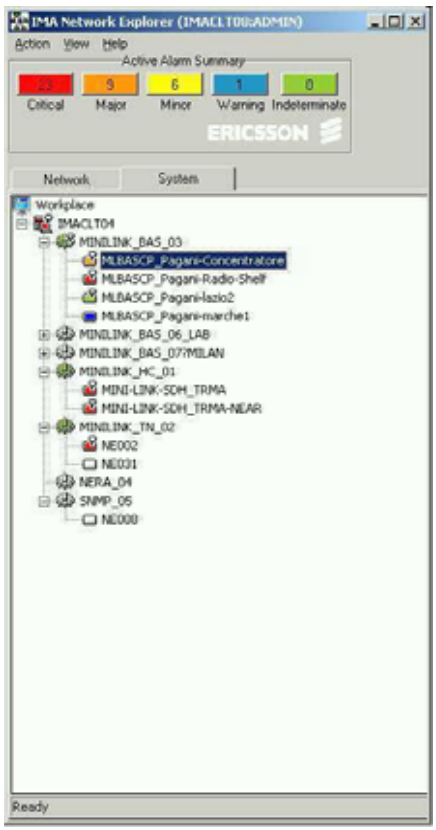

Figure 3. The Network Explorer

The Network Explorer displays the network alarm status by changing the appearance (look and color) of the icons. The alarm lists are easily accessed for the alarming sub-network or NE.

MINI-LINK Manager can be configured to have Alarm surveillance and Alarm synchronization started automatically at system restart. Automatic start can be enabled or disabled individually for each Server node, Adaptation, sub-network and NE.

The MINI-LINK Manager Network Explorer contains an active alarm summary banner that counts all active alarms, on a severity basis, sent from the MINI-LINK Manager Servers.

Figure 4. Network Explorer Alarm Banner

3.1.2 MINI-LINK Manager Alarm List

The alarm lists contain many functions to assist in finding the primary cause of problems in the transmission network. All alarms are colored according to severity and displayed in a tabular fashion.

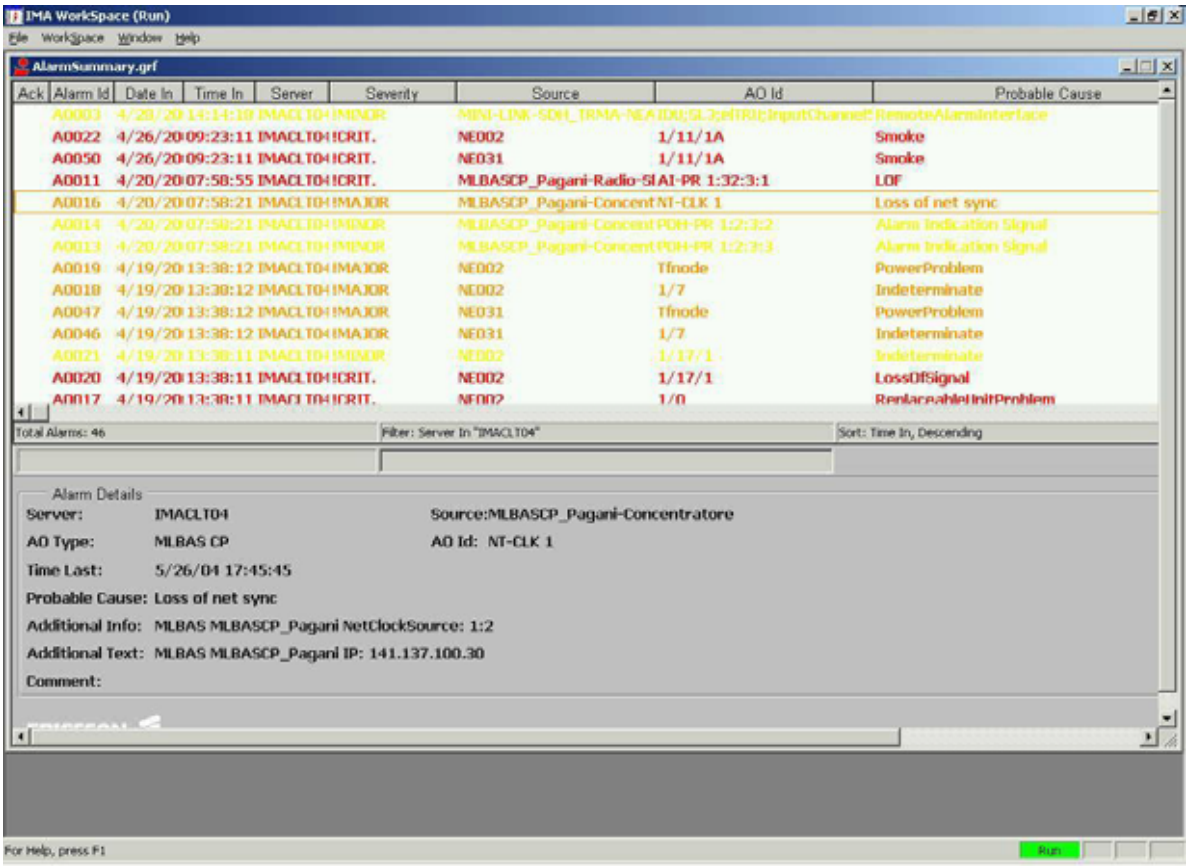

Figure 5. Alarm List

The alarm list includes important features that give effective support in subsequent treating of disturbances in the transmission network.

- Alarms and events are displayed in the Alarm List, only alarms that are cleared and acknowledged are removed (if not explicitly deleted by the user).
- Filtering and sorting can be made either explicitly by defining a filter, or implicitly by starting the alarm list from the Network Explorer for different sources such as servers, sub networks, individual NE etc.
- The operator can delete and acknowledge alarms either one at a time or perform a multiple select operation.

- The operator can insert a comment for alarms; this comment then becomes visible for all users. This is useful, as important information is made available to the next work shift or other operators. Inserted comments are stored together with the alarm in the history log.
- Fault to reason navigation, i.e. by just selecting an alarm and pressing the LM button, launches the corresponding CM application for rapid corrective actions.
- Fault to map navigation, i.e. by just selecting an alarm and pressing the Map button, the corresponding animated map is displayed.
- Printouts of alarms from the alarm list.
- The horn starts beeping when a new alarm becomes active or when the operator acknowledges an alarm.

MINI-LINK Manager supports three modes for alarm acknowledgement:

- **Alarm disappears from alarm list when cleared** means that an alarm will disappear from the alarm list when it has been cleared even if it has not been acknowledged by an operator yet. MINI-LINK Manager will then automatically acknowledge the alarm. An operator may manually acknowledge an alarm before it has cleared but this is not required for the alarm to disappear.
- **Alarm disappears from alarm list when acknowledged and cleared** means that the alarm disappears from the alarm list when it has been cleared and also acknowledged by an operator.
- **Alarm disappears from alarm list when acknowledged twice and cleared** means that an alarm must be acknowledged at least once after it has cleared even if it already has been acknowledged. Alarm must always be acknowledged twice.

3.1.3 MINI-LINK Manager Animated Maps

The alarm status of sub-networks and NE's can be summarized and visualized by using animated maps with graphic symbols with a pre-defined dynamic behavior. The displays are easily customized to different needs, without any programming skills required, and can be visualized on a number of levels as follows:

- Network Level
- Sub-network in multiple layers
- NE level

In large networks, the number of network resources makes it more complex for the operator to have a complete view of the Microwave Transmission Network and at the same time be able to navigate down to a single network element for detailed analysis.

The Network Explorer application and animated maps give a comprehensive logical and/or physical presentation of the topology and the status of the network. Network Explorer visualizes the Transmission Network from the highest network level, through its component sub-networks, down to the individual network elements belonging to those sub-networks.

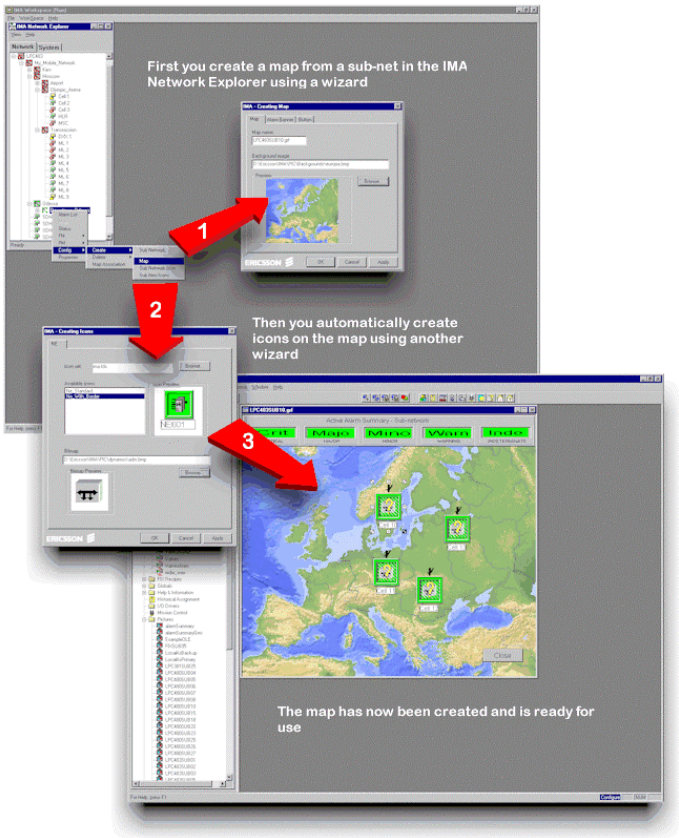

Figure 6. Animated Map Configuration

Figure 7. Animated Map example

3.1.4 MINI-LINK Manager Alarm & Event Logging

All alarms, user actions and system events are stored in the history database. The Alarm & Event database can be easily accessed for post processing and in-depth analysis using the Alarm History Viewer application. It is possible to export the information in both comma delimited ASCII file or in XML format.

By default the history viewer displays up to 1000 records of historical alarm and events. To find and sort the information stored in the database, MINI-LINK Manager supports advanced filtering functionality to help the operator in setting up filtering conditions.

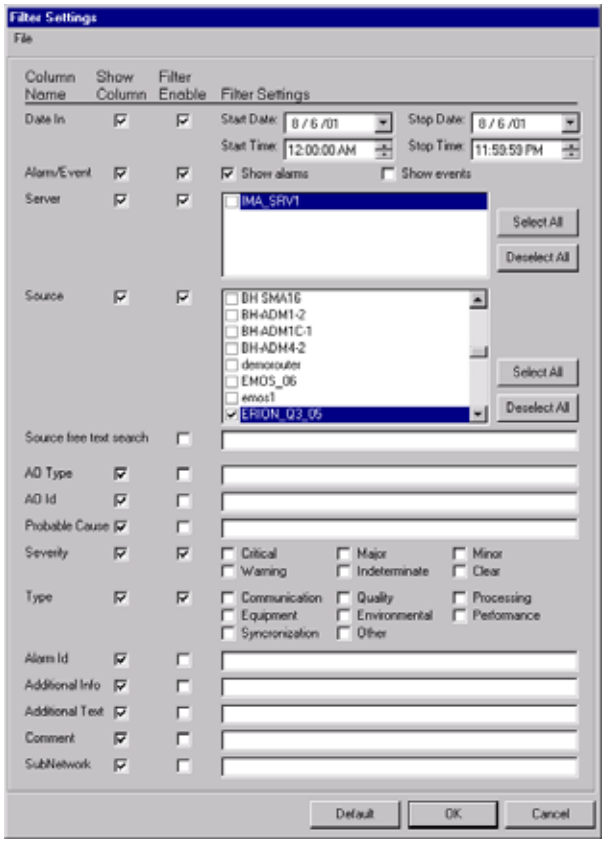

Figure 8. FM Historical Viewer filter.

By default the alarms displayed in the history viewer are sorted on the “Date In” column, this can easily be changed by clicking on any of the column headers to change the sorting order. The information in the alarm list can be saved to file or be printed.

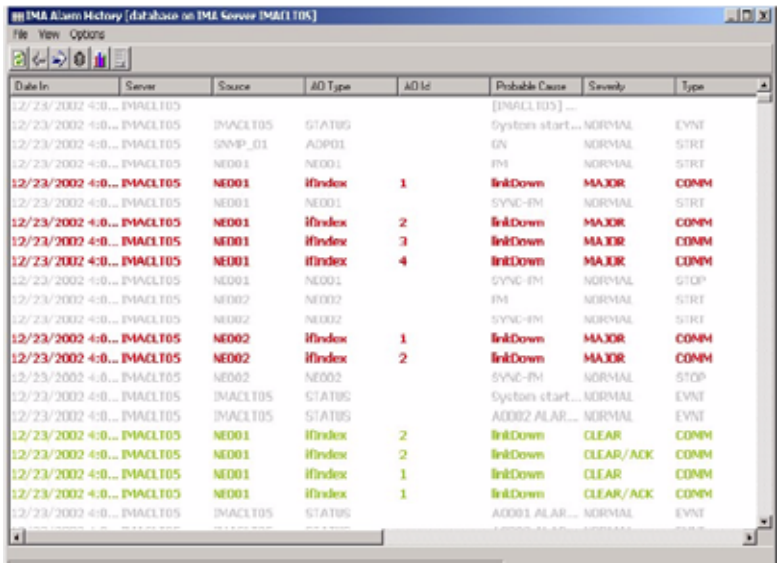

Figure 9. Alarm History Viewer, grid view.

It is also possible to change between the normal Grid View and a Chart View.

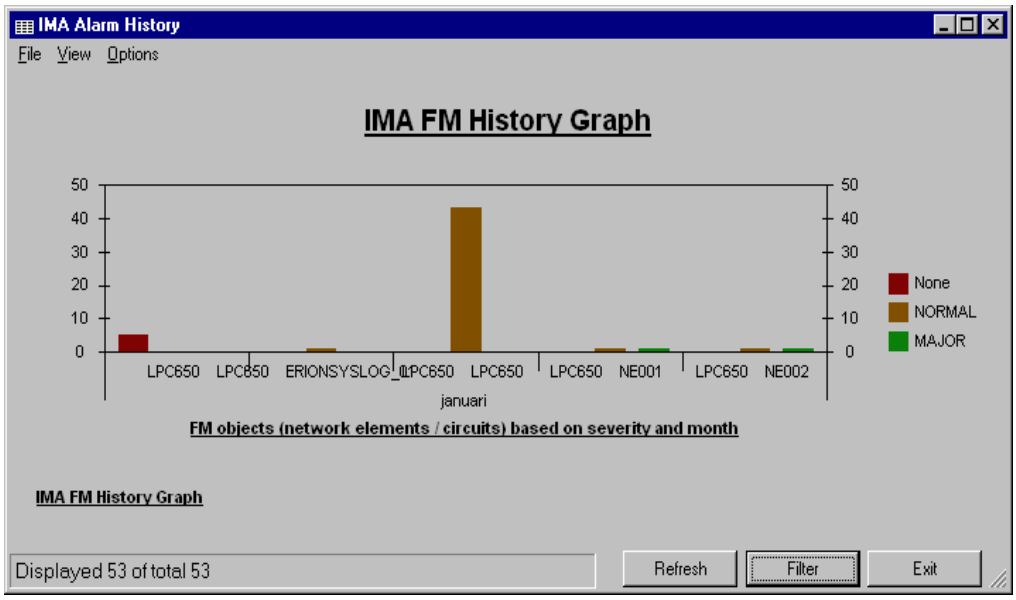

Figure 10. Alarm History Viewer, chart view.

3.2 PERFORMANCE MANAGEMENT

MINI-LINK Manager Performance Management collects, stores, and process performance data from all the network elements in the microwave transmission network, and produces customized reports on performance and network quality for operations, maintenance and planning.

The collected performance data and the available time intervals depend on the type of the managed network elements and the specific measure configuration in MINI-LINK Manager.

The main features of the MINI-LINK Manager PM application are:

- Collection and storing of PM data (15 minute/24 hour)
- Report Tool for data presentation and evaluation
- Printouts
- Save to file capability (comma delimited text files or in XML format)
- Export of PM data towards other Management Systems through FTP and TL-1 export interfaces.

Threshold crossing events generated by the managed network elements are integrated into MINI-LINK Manager Fault Management application and displayed in the MINI-LINK Manager Alarm Summary together with other faults and events.

3.2.1 PM Data Viewer

PM Data Viewer is an easy to use and flexible report tool for the collected PM Data that enables the user to select, filter and view the quality of the Transmission Network.

PM Data Viewer is designed with a very flexible and intuitive GUI that enables the operator to easily create customized reports through:

- Easy selection of PM data to include in the PM Report.
- Flexible filtering capabilities for time interval settings for PM Reports.
- Print and save to file capability (comma delimited text files or in XML format).

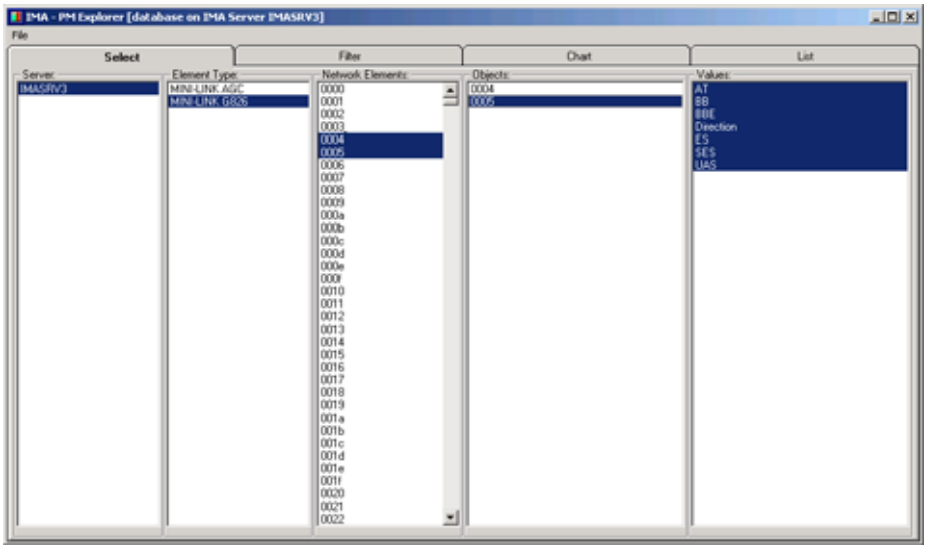

Figure 11. PM data source selection

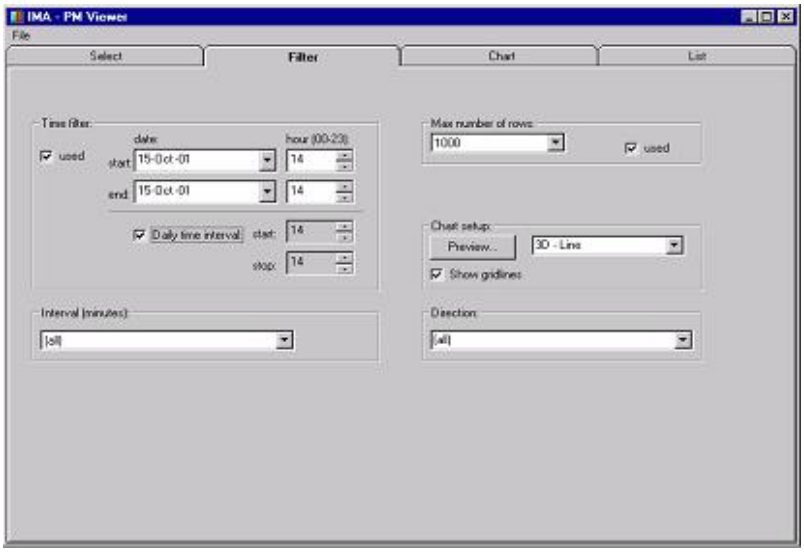

Figure 12. Filtering in PM Data Viewer

PM reports can be displayed in two different views:

- Chart view – The PM Chart view enables creation of different graphical presentations of the collected data including a number of different chart options (2D, 3D, Pie etc)
- List view – The PM List view allows analysis of the collected data by visualizing the detailed measured values in tabular format.

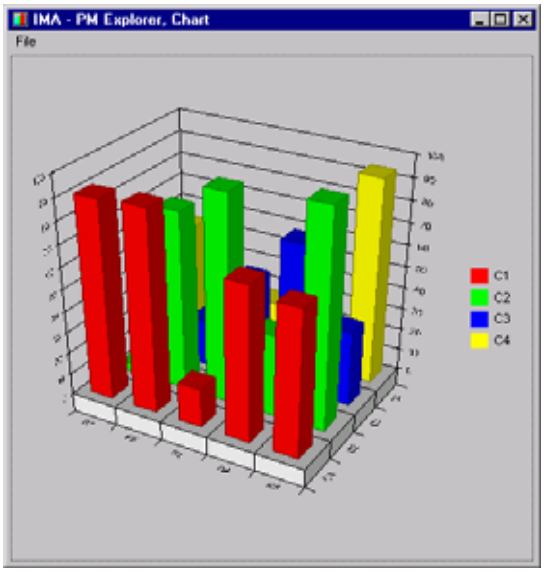

Figure 13. PM Chart View

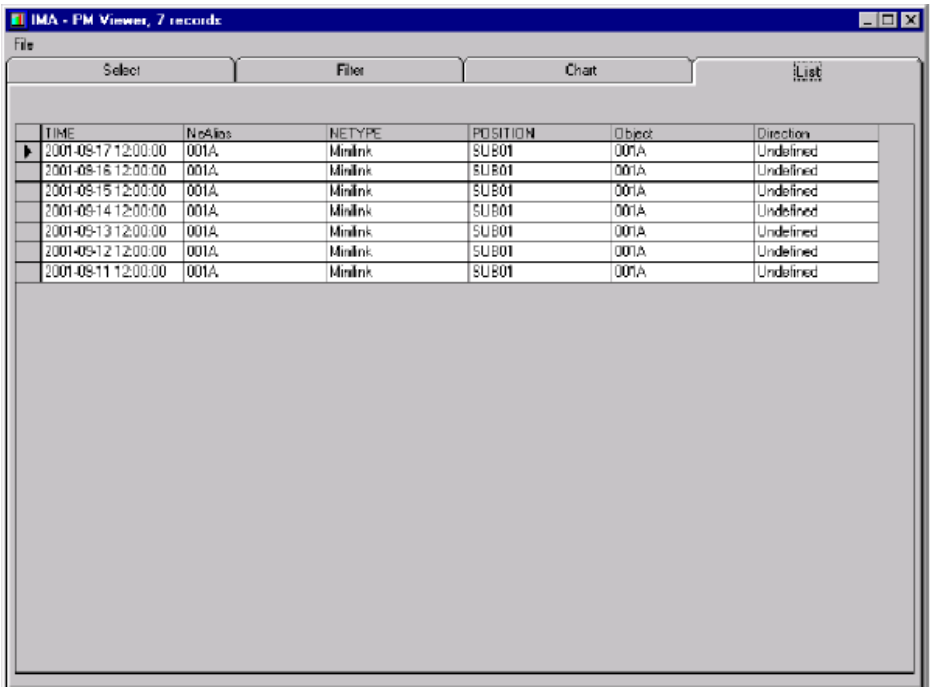

Figure 14. PM List View

3.3 CONFIGURATION MANAGEMENT

3.3.1 Launch of integrated or embedded LM/EM

MINI-LINK Manager provides Configuration Management functionality for Network Elements via embedded EM capability (MINI-LINK E, C) or launching of the native configuration application (EM/LM) for the managed equipment. These applications can be launched in various ways such as from the right-click menu in the Network Explorer, right-clicking menus on icons in the animated maps, or from the alarm list.

When a configuration application is launched from MINI-LINK Manager, context sensitive information regarding the selected Network Element is used in the launching mechanism. This enables MINI-LINK Manager to start the configuration application towards the NE of interest thus saving valuable time for the operator.

Also when the NE is integrated via the SNMP Manager Adaptation it is possible to launch either a Telnet or Web Browser session directly towards the NE. That can be done automatically, passing the IP address to the application, meaning that the user does not have to insert it every time.

3.3.2 Remote Software Upgrade

MINI-LINK Manager supports network-wide Remote Software Upgrade functionality to allow upgrade of the embedded software for all MINI-LINK equipment. This functionality gives the possibility first to download a new software package towards several NE’s and successively perform the remote activation of it.

3.4 INVENTORY MANAGEMENT

MINI-LINK Manager provides automatic collection of all relevant HW and SW inventory data for all managed MINI-LINK equipment. The collection can be performed at once or scheduled on a daily base or on specific period. Collected data are stored in the MINI-LINK Manager inventory database and are possible to export to the Centralized DB.

The Inventory Viewer gives the possibility of showing the collected inventory data, or only a filtered view, according to the defined network inventory hierarchy.

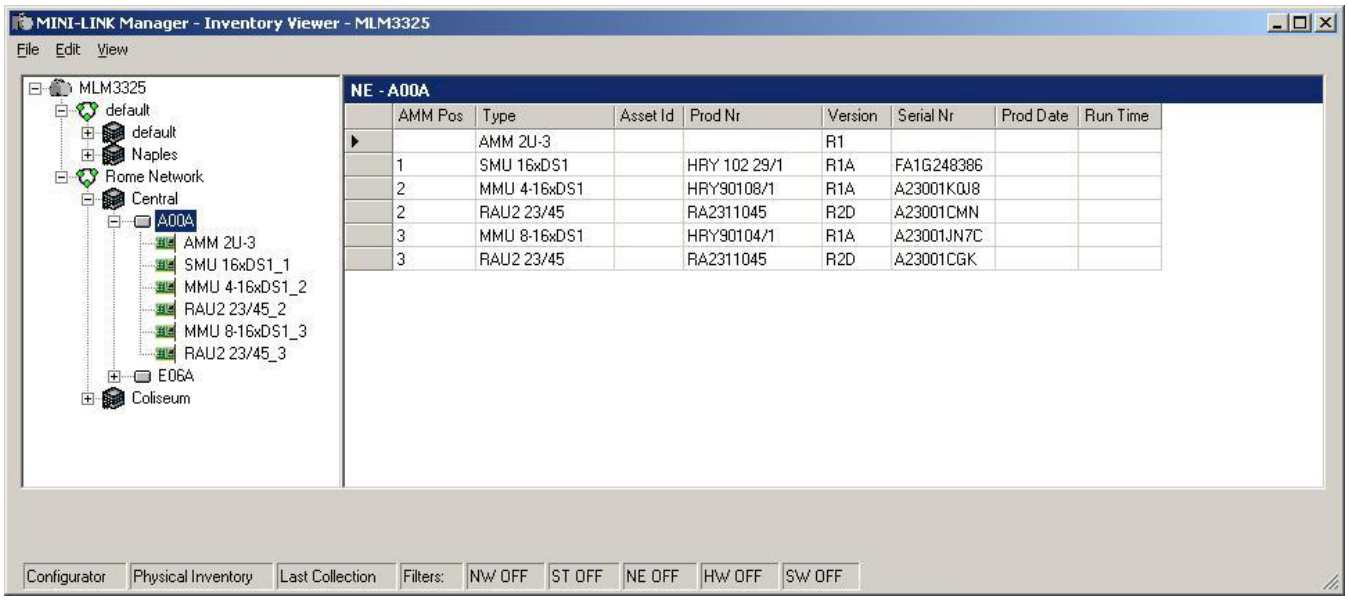

Figure 15. Inventory Viewer

Inventory data from the two latest collections are always available in MINI-LINK Manager to allow the operator checking the inventory differences. The Inventory Viewer shows:

- Added Network Elements
- Removed Network Elements
- Network Elements that have changes in inventory respect to the previous collection

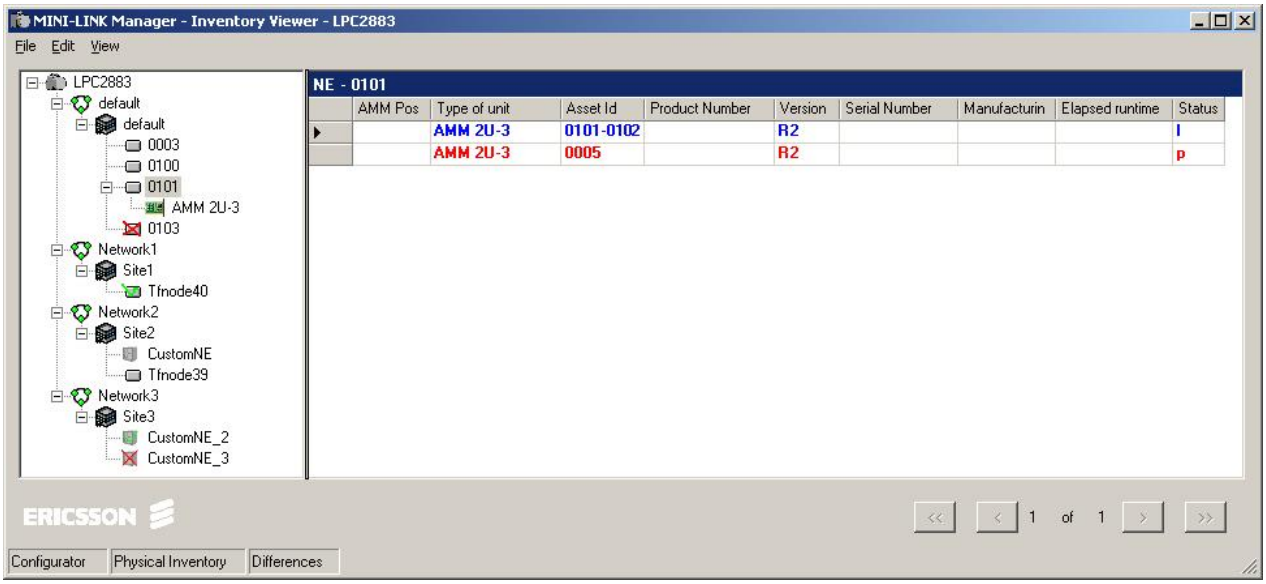

Figure 16. Inventory data differences

Inventory data can be exported as file, CSV/XML based, to other systems by using the FTP export interface.

3.5 CONFIGURATION DATA MANAGEMENT

MINI-LINK Manager provides automatic collection of Configuration data for MINI-LINK E and TN radio terminals. Collected data are stored in the MINI-LINK Manager Configuration data DB and are possible to export to the Centralized DB. The collection of Configuration data can be either scheduled to run periodically on specific intervals or performed upon immediate request.

The Configuration data Viewer shows the collected configuration data and it is also possible to display the differences from the previous collection.

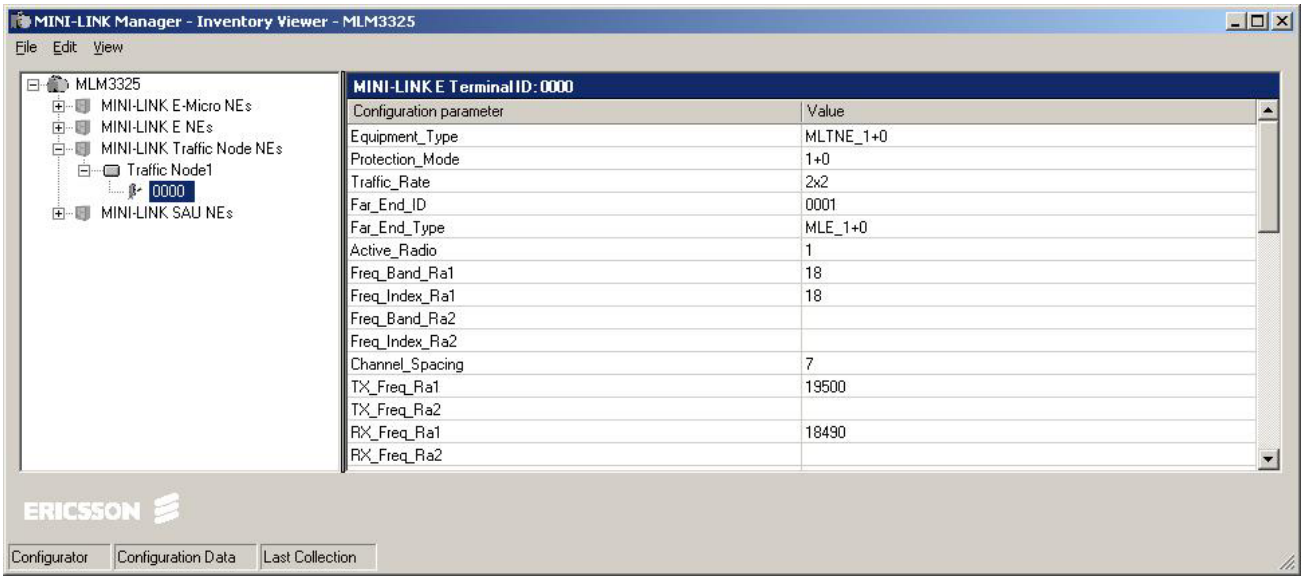

Figure 17. Configuration data Viewer

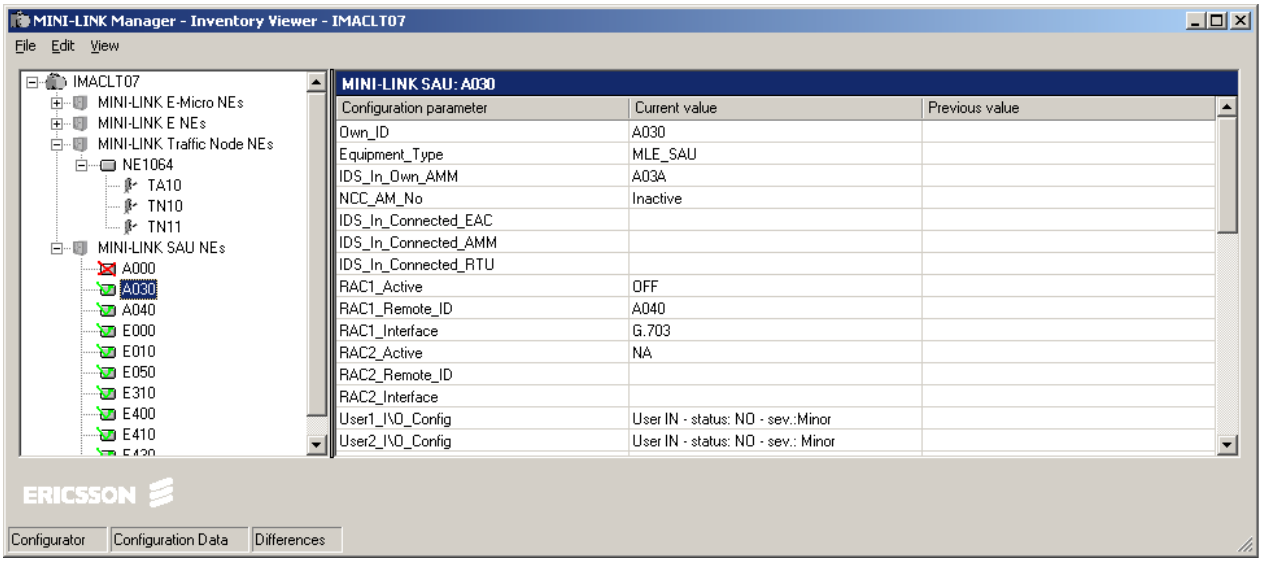

Figure 18. Configuration data differences

Collected configuration data can be exported to an external System as files, in CSV or XML format, by using the FTP export interface

3.6 SECURITY MANAGEMENT

3.6.1 Security Management

MINI-LINK Manager offers a versatile, easily managed access control schema. The access rights of staff categories and/or individuals to virtually all system resources can be defined and controlled.

These facilities can be used to limit access, e.g. to specific sub-networks, Network Elements, objects and displays. Moreover, MINI-LINK Manager security supports limitation of the rights to give commands and change settings.

The system can be configured to log all operator/application actions.

MINI-LINK Manager Security Management is based on Windows security, allowing users to login into the system using their Windows security profile.

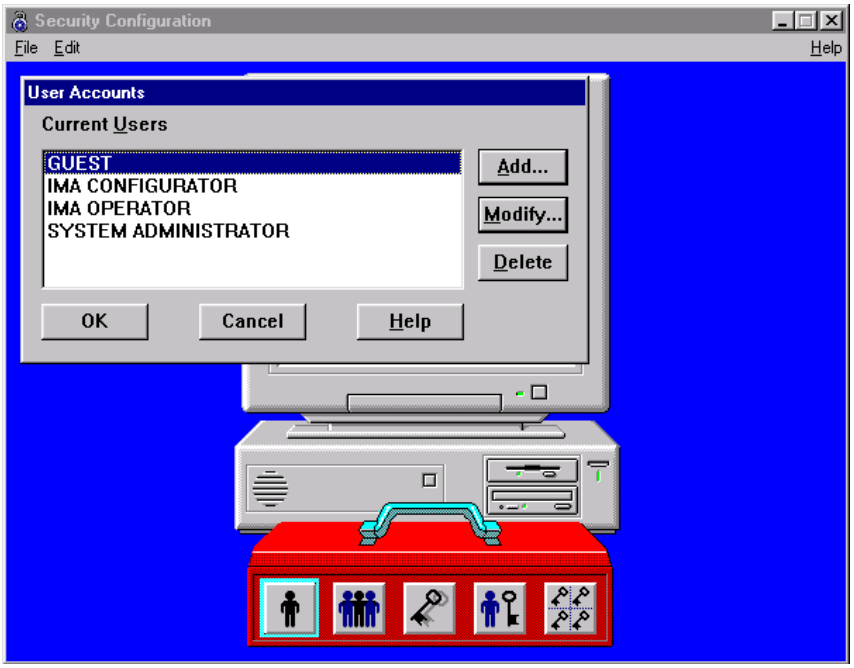

Figure 19. Security Configuration window

3.7 CENTRALIZED DATABASE SUPPORT

3.7.1 Centralized Database

MINI-LINK Manager Server supports export of historical FM, PM, Inventory and Configuration data to a Centralized SQL DB. This feature is particularly useful in case of a large Network with several MINI-LINK Servers. It allows the operator to have a complete view of historical FM, PM and Inventory data present on all of the MINI-LINK Manager Servers in the Network.

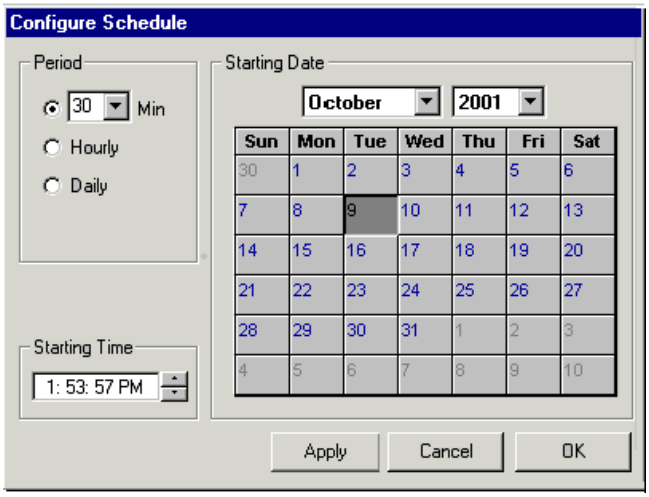

Figure 20. CTDB Export Scheduling Configuration

Each MINI-LINK Manager Server collects and store data in its local database. Transfer of data to the SQL Centralized DB takes place by scheduling tasks for exporting data between MINI-LINK Manager Server local databases and MINI-LINK Manager Centralized DB. These tasks are completely transparent to the MINI-LINK Manager system as they work as scheduled jobs that periodically send data from the local DB to the centralized one.

The MINI-LINK Manager centralized database stores data automatically synchronized from all the MINI-LINK Manager servers in the network and allow operators to see the merged data from a single view. Historical data for FM, PM at each MINI-LINK Manager server are periodically removed but only after being copied to the MINI-LINK Manager Centralized Database

Internal procedures are provided to ensure data consistency.

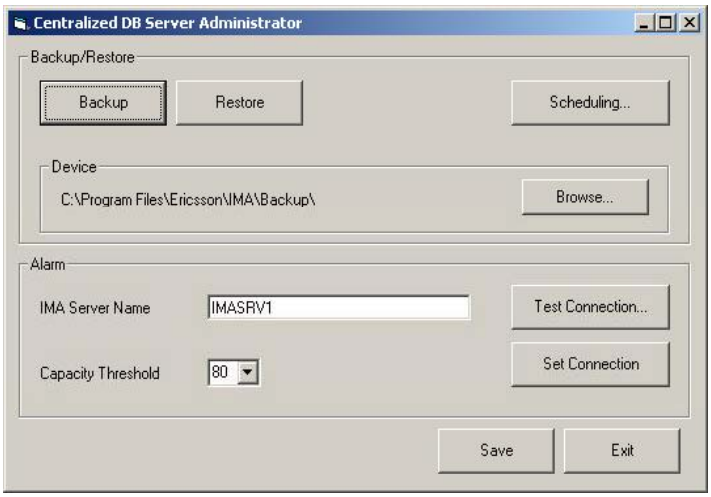

Figure 21. Centralized DB Server Administration

4 ADMINISTRATION

4.1 AUTO-DISCOVERY AND AUTO-CONFIGURATION

MINI-LINK Manager can detect nodes (that can be either network elements or management systems) in the network, reducing the time needed to identify these nodes and configure the database.

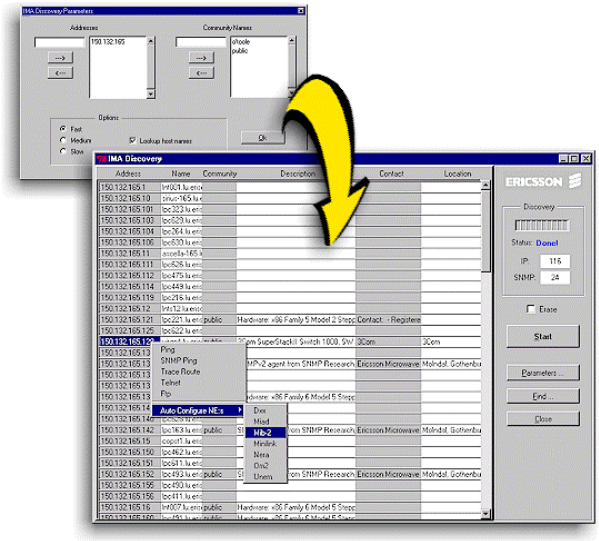

Figure 22. Auto-discovery

Using this facility, MINI-LINK Manager can automatically retrieve configuration data from integrated EM and store the data in the database, hence eliminating the extra manual work with entering network configuration data. This is especially valuable for configuration of large networks and/or changing networks, since the system will ensure the configuration data consistency.

When the Auto-Configuration is finished, the database is updated and the NE's are visible in the Network Explorer, ready to be managed.

4.2 HIGH AVAILABILITY OPTIONS

Low downtime in the networks is an essential factor for effective and profitable operation. A management system consists of a large number of different components. Depending on its function and use, different levels of availability can apply. MINI-LINK Manager enables the operator to maximize availability by minimizing problem sources.

The approach of providing high availability solution should be focused on failures most likely to occur, have the most serious consequence, and can be addressed in the most sensible manner. Ericsson's recommendation is to focus primarily on the solutions listed below.

The following different methods to provide high availability apply to MINI-LINK Manager:

- **Power failure** - One of the most common hardware related problems is caused by external power failure. This problem is addressed by introducing one or more Uninterruptible Power Supplies (UPS). The UPS can provide the system with power for given periods following external power failure. It can also allow the system to make a graceful shutdown to avoid corruption of hard disk content.

- **Hard disk failure** - Probably the second most common failures of computer equipment are due to disk crashes. The hard disk is a high precision mechanical device, which is sensitive to environmental parameters such as external vibrations and excessive temperature fluctuations. To minimize this problem mirrored disks may be used, thus preserving the integrity of any stored data.

- **LAN failure** - By using FTA (Fault Tolerant Adapters), cable cuts and failures of LAN adapters (NIC, Network Interface Card) will result in an automatic switch over to the secondary adapter without impact on the network management operations.

- **Cold Stand-by** - The use of geographically redundant stand-by servers is also supported. The MINI-LINK Manager Stand-by Server can be located on another LAN interconnected via a WAN, hence, another building or another city. This solution supports a manual switch over phase where the management application must be started. To ensure data consistency between the Working Server and the Stand-by Server, data transfer is done automatically between them. When the working server fails the stand-by server can be quickly configured to take over control of the network and become the working server.

4.3 SNMP MANAGEMENT

Simple Network Management Protocol (SNMP) is an application protocol offering network management services in the Internet domain.

The wide base of equipment supporting SNMP makes the MINI-LINK Manager SNMP Manager Adaptation an important component in providing support for supervision of DCN devices and telecom devices. This together with the wide range of supported interfaces provides a powerful integrated management system solution.

Since there are many devices, that have MIB extensions to support equipment specific functionality, the SNMP Manager also has a built in MIB compiler that enables the user to extend the number of equipment that can be integrated.

The SNMP Manager is a versatile tool that is designed to add SNMP management functionality to MINI-LINK Manager to provide easy and effective monitoring of nodes and other devices on the DCN such as routers, switches, bridges etc.

Any equipment that supports SNMPv1 can be monitored. These are examples on what the SNMP Manager can handle:

- DataCom equipment such as routers, terminal servers, ATM switches, hubs and bridges
- Computer systems, both UNIX and PC
- Office equipment such as printers

The functionality for MIB-II (RFC1213, RFC1907) is already included, but the SNMP Manager is extendible. This means that the SNMP Manager can be used as a base to add further functionality to MINI-LINK Manager by adding other types of SNMP MIB.

Addition of new functionality can be done in two ways:

1. By setting up additional supervision with the Configuration Tool, including the addition of a new MIB.
2. By creating a loadable extension, i.e. a “sub adaptation”.

The SNMP Manager consists of three parts:

- **SNMP Manager Adaptation** -The SNMP Manager Adaptation is the software component that handles SNMP protocol specifics and converts all received information to a generic format, which is used by MINI-LINK Manager for presentation of FM and PM Data.
- **SNMP Manager Configuration Tool -** A comprehensible GUI for SNMP MIB browsing, MIB compilation and configuration of polling jobs, offering the operator an easy way of integrating devices on the LAN such as, computers, bridges, routers and printers.
- **SNMP Manager MIB Admin** - The SNMP MIB Admin is the administration tool for adding and removing an SNMP MIB. It provides a very flexible way of adding new functionality to the SNMP Manager.

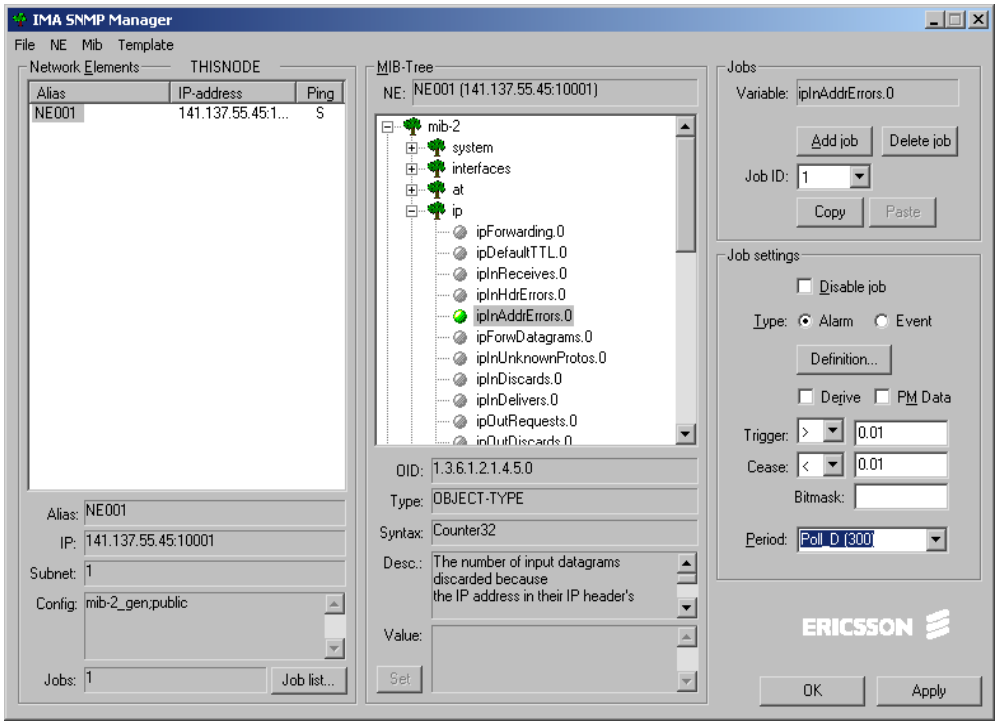

Figure 23. SNMP Manger configuration window

The configuration tool is used to set up, change and remove SNMP jobs (SNMP alarms and SNMP events) on different Network Elements. It is also used to define how the SNMP alarms and events shall be translated into MINI-LINK Manager alarms. It can also be used as a generic MIB browser, and is able to both read and write MIB variables.

5 INTERFACES AND INTEGRATIONS

MINI-LINK Manager is designed for integration of microwave transmission equipment and systems into common management applications. Its open and modular architecture provides the basis for future expansion of the system.

5.1 INTEGRATIONS OF ELEMENT MANAGERS/NETWORK ELEMENTS

The table below lists the NE and EM systems currently integrated in MINI-LINK Manager and the supported functionality.

FUNCTIONALITY / ADAPTATIONS	Fault Management	Performance Management	Configuration Management	Inventory Management
MINI-LINK Traffic Node	X	X	X	X(*)
MINI-LINK E, C	X	X	X	X(*) MINI-LINK E
MINI-LINK High Capacity	X	X	X	X(*)
MINI-LINK BAS	X	X	X	X(*)
SAU-IP	X	X(*)	X	X(*)
NERA Radio Links (via NEW-NMS)	X	X	X	
DXX Manager/MINI-LINK Connexion	X	X	X	
SNMP Manager	X	X	X	

(*) This functionality is planned to released as Service Pack to MINI-LINK Manager 7.1

5.1.1 MINI-LINK Traffic Node Adaptation

The MINI-LINK Traffic Node Adaptation integrates MINI-LINK Traffic Node equipment via SNMPv3 interface. However, in order to provide CM functionality for Radio Terminals housed in the Traffic Node, it is required to install the MINI-LINK E Adaptation.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
MINI-LINK Traffic Node	Enhanced Fault Management Auto-discovery and Auto-configuration

	• Performance Management • Configuration Management via the Web-based MINI-LINK TN LCT • Remote Software Upgrade • Automatic Inventory collection • Automatic Configuration Data collection for radio terminals

5.1.2 MINI-LINK E Adaptation

The MINI-LINK E Adaptation allows management and configuration of MINI-LINK E and C equipment by means of embedded CM capability. Each adaptation requires an additional SW module, the MINI-LINK E Adapter, to connect the MINI-LINK E and MINI-LINK C equipment. MINI-LINK E Adapter can be either automatically installed on the same MINI-LINK Manager Server machine or stand-alone on a different computer.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
MINI-LINK E, C	• Fault Management • Auto-discovery and Auto-configuration • Performance Management • Embedded Configuration Management capability • Remote Software Upgrade • Automatic Inventory collection (only for MINI-LINK E) • Automatic Configuration Data collection (only for MINI-LINK E)

5.1.3 MINI-LINK BAS Adaptation

The MINI-LINK BAS Adaptation integrates the MINI-LINK BAS equipment via SNMPv1 interface.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
MINI-LINK BAS	• Fault Management • Auto-discovery and Auto-configuration

	• Performance Management • Configuration Management via the Web-based MINI-LINK BAS EEM • Remote Software Upgrade • Automatic Inventory collection

5.1.4 MINI-LINK HC Adaptation

The MINI-LINK HC Adaptation integrates the Ericsson MINI-LINK HC equipment via SNMPv3 interface.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
MINI-LINK HC	• Fault Management • Auto-discovery and Auto-configuration • Performance Management - Configuration Management via the Web-based MINI-LINK HC LCT • Remote Software Upgrade • Automatic Inventory collection

5.1.5 NERA NEW-NMS Adaptation

The NERA NEW-NMS Adaptation integrates the NERA SDH Radio equipment via the NERA NEW NMS Element Manager.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
NERA NEW-NMS	• Fault Management • Auto-discovery and Auto-configuration • Performance Management • Configuration Management via launch of NERA NEW-NMS • Manual Inventory support

5.1.6 SAU-IP Adaptation

The SAU-IP Adaptation integrates the SAU-IP equipment via SNMP Manager Adaptation Please note that a dedicated adaptation via SNMPv3 interface is planned to be released in a Service Pack to MINI-LINK Manager 7.1.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
SAU-IP	• Fault Management • Auto-discovery and Auto-configuration • Performance Management • Configuration Management via the Web-based SAU-IP LCT • Automatic Inventory support

5.1.7 DXX Manager/MINI-LINK Connexion Adaptation

The DXX Manager Adaptation integrates the DXX equipment via the DXX 8100 Network Manager.

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
DXX Manager/ MINI-LINK Connexion	• Fault Management with alarm ack to/from DXX • Auto-discovery and Auto-configuration • Performance Management • Configuration Management via launch of DXX Manager • Manual Inventory support

5.1.8 SNMP Manager Adaptation

The SNMP Manager Adaptation integrates equipment, supporting SNMP, via SNMPv1 interface

For full compatibility, please refer to MINI-LINK Manager Compatibility Table in Appendix 2

Network Element / Element Manager	Supported Functionality
SNMP MIB	• Fault Management • Performance Management • Configuration Management via launch of specific application • Manual Inventory support

5.2 EXPORT INTERFACES TO NETWORK MANAGEMENT SYSTEMS

The table below lists the Export Interfaces currently available on the MINI-LINK Manager system:

FUNCTIONALITY / EXPORT INTERFACE	Fault Management	Performance Management	Inventory Management
SNMP	X		
TL-1	X	X	
BNSI	X		
FTP		X	X

5.2.1 SNMP Interface

MINI-LINK Manager Server Application supports the SNMP interface, one of the most common protocols used for network management. The SNMP Proxy Agent is used for exporting alarms and network element configuration data to other management systems using the SNMP V1 protocol with a proprietary IMA MIB (Management Information Base).

Alarms and events from the MINI-LINK Manager Server are propagated through the SNMP Export Interface as SNMP Traps to:

- Notify about New/Ceasing alarms or send information about alarm acknowledgment and deletion
- Notify when Network Elements are created/deleted or to changes in state or attributes for NE occur.
- Notify System Events generated in the MINI-LINK Manager Server.

In order to minimize the DCN load due to cyclic polling and extra read commands, each Trap includes full information concerning the alarm/event that is reported

For synchronisation purposes, the IMA MIB also provides an Alarm Table, containing all current active alarms.

Using the Event Forwarding Discriminator, the SNMP Export Interface provides also the possibility to select advanced filtering criteria for the alarms to be exported to cater for individual customer requirements.

5.2.2 TL-1 Interface

MINI-LINK Manager Application Servers support the TL-1 interface to export alarm and performance data from MINI-LINK Manager to other management systems that use TL-1.

The TL-1 Interface:

- Forwards all alarms and alarm ceasing, when they arrive to the MINI-LINK Manager Server.
- Forwards all events, when they arrive to the MINI-LINK Manager Server.
- Forwards all performance data, when they are collected in MINI-LINK Manager Server.
- Secure data storage in the MINI-LINK Manager using local buffers.

Moreover, it is possible to use the MINI-LINK Manager TL-1 interface interactively from a simple Telnet application (on PC or UNIX).

5.2.3 BNSI Interface

BNSI stands for Basic Network Surveillance Interface, which is an Ericsson interface standard supported by MINI-LINK Manager Server.

The BNSI interface enables MINI-LINK Manager to act as a mediation device towards any Ericsson OSS/NMS that support BNSI. It monitors the alarms received on the MINI-LINK Manager servers, then converts and forwards them to the Ericsson OSS/NMS systems.

The BNSI interface:

- Uses TCP/IP and the rexec protocol, to communicate with the OSS/NMS system.
- Can do optional synchronization (i.e. send all current alarms) upon connection establishment.
- Forwards all alarms and alarm ceasing, when they arrive to the MINI-LINK Manager Server.
- Handles all Probable Causes that are defined in the NIB file (a text file - lookup table with Probable Causes associated with a number that OSS/NMS supports). The Probable Causes that are not defined in the NIB file are sent as an “Unknown” alarm to the OSS/NMS system.

- Sends optional heartbeat messages to the OSS/NMS system at an interval defined when communication is established.
- Logs connections and disconnection, as well as errors in a log window, and optionally to a file.
- Can be configured to only accept connections from a specified set of TCP/IP addresses.
- Can accept up to 20 OSS/NMS connections.

The functionality of the BNSI interface implemented in MINI-LINK Manager corresponds to the BNSI version 1, and a sub-set of BNSI version 2.

5.2.4 FTP Interface

FTP stands for File Transfer Protocol, which is a generic interface standard for transfer files from one computer to another. The FTP interface is used for exporting Performance and Inventory data from MINI-LINK Manager to an FTP Server

It is possible to schedule the exporting process on different intervals The files are formatted in either comma-separated text files or in XML (XML stands for extensible Mark-up Language and is a self-described data format which is a standard format according to the World Wide Contortion (W3C))

6 HARDWARE REQUIREMENTS

The exact hardware platform highly depends on the need for performance, availability, history log, number of adaptations, number of applications etc. For more exact specifications of the hardware platform, please contact your Ericsson representative.

The platform specifications described below serves as a general hardware recommendation.

6.1 MINI-LINK MANAGER SERVER

Central Processor Unit	Intel Xeon (with Hyper-threading) > 2 GHz
Primary memory	1 Gbyte
Un-removable media	20 Gbyte disk
Removable media	CD-ROM and 3.5” diskette
Tape Drives	20/40-GB DAT
Monitor	1280x1024 True Color resolution
DCN connection	10/100 BaseT LAN
Interfaces	2 USB ports
Operating System software	Microsoft Windows 2003 Server

6.2 MINI-LINK MANAGER CLIENT

Central Processor Unit	Intel Pentium4 (with Hyper-threading) > 2 GHz
Primary memory	512 Mbytes
Un-removable media	4 Gbyte disk
Removable media	CD-ROM and 3.5” diskette
Screen	1280x1024 True Color resolution
DCN connection	10/100 BaseT LAN
Interfaces	USB port
Operating System SW	Microsoft Windows XP Professional (SP2)

6.3 MINI-LINK MANAGER TERMINAL SERVER

Central Processor Unit	Intel Xeon (with Hyper-threading) > 2 GHz
Primary memory	2 Gbyte

Un-removable media	20 Gbyte disk
Removable media	CD-ROM and 3.5” diskette
Screen	1280x1024 True Color resolution
DCN connection	10/100 BaseT LAN
Interfaces	USB port
Operating System software	Microsoft Windows 2003 Server

6.4 MINI-LINK MANAGER CENTRALISED DB SERVER

Central Processor Unit	Intel Xeon (with Hyper-threading) > 2 GHz
Primary memory	1 Gbyte
Un-removable media	20 Gbyte disk
Removable media	CD-ROM and 3.5” diskette
Tape Drives	20/40-GB DAT
Screen	1280x1024 True Color resolution
DCN connection	10/100 BaseT LAN
Interfaces	USB port
Operating System software	Microsoft Windows 2003 Server

The amount of data storable on the Centralized DB Server highly depends on the size of the available un-removable media. It is suggested to use a Raid Controller to handle more than one hard disk, increasing the total storage size and providing a fault tolerance level on data.

6.5 MINI-LINK E ADAPTER SERVER

Central Processor Unit	Intel Pentium 4 > 1 GHz
Primary memory	512 MB
Un-removable media	20 GB
Removable media	CD-ROM and 3.5” diskette
Screen	VGA monitor (800x600)
DCN connection	10/100 BaseT LAN
Operating System software	Microsoft Windows 2003 Server

7 RELEVANT STANDARDS

The structure an operation of MINI-LINK Manager is in line with the principles expressed in the following recommendations:

7.1 STANDARDS SUPPORTED

7.1.1 General

Ref.	Area	Title of recommendation	Comment
X.733 '92	Management functions	Information technology – Open Systems Interconnection - Systems management: Alarm reporting function	
X.734 '92	Management functions	Information technology – Open Systems Interconnection - Systems management: Event report management function	
X.735 '92	Management functions	Information technology – Open Systems Interconnection - Systems management: Log control function	
X.741 '95	Management functions	Information technology – Open Systems Interconnection - Systems management: Objects and attributes for access control	User access control exists in IMA, but security on object level is not supported.
M.3010 '96	Telecommunication Management Network	Principles for a Telecommunications management network	Functional Architecture according to M.3010. The layers covered are Element Management Layer (EML), Network Management Layer (NML) and partially the Service and Management Layers (SML and BML).
M.3400 ´97	Telecommunication Management Network	TMN management functions	Functional areas: Fault Management, Configuration Management, Performance Management

7.1.2 SNMP

Apart from these RFC (RFC1213, RFC1907), around 60 MIBs are included in the MINI-LINK Manager SNMP delivery. (They can be added using the MibAdm Tool).

Ref.	Area	Title of recommendation	Comment
RFC 1155		SMI – Structure of Management Information	
RFC 1157		SNMP – Simple Network Management Protocol	
RFC 1213		MIB-II – Management Information Base-II	

7.1.3 TL1

TL1 is used by MINI-LINK Manager to export FM and PM data to other Network Management Systems

Ref.	Area	Title of recommendation	Comment
GR-833			Fault and Performance management information is transferred according to a subset of this standard.

7.1.4 Performance Management

Ref.	Area	Title	Comment
G.821 '96	Quality and availability targets	Error performance of an international digital connection operating at a bit rate below the primary rate and forming part of an integrated services digital network	Supports this standard for those network elements that have it implemented. (Covers below 2Mbit/s)
G.826 '96	Quality and availability targets	Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate.	ES, SES, EB, BBE, Unavailable Time/ Unavailable Seconds. (Covers 2Mbit/s and higher).

8 ABBREVIATIONS AND TERMS

CSV	Comma-separated Values File
EM	Element Manager
FTP	File Transfer Protocol
GUI	Graphical User Interface
LM	Local Manager
NE	Network Element
OSS	Operational Support System
SNMP	Simple Network Management Protocol
SDH	Synchronous Digital Hierarchy
XML	Extensible Markup Language

9 APPENDIX 1 - MINI-LINK MANAGER HW PLATFORMS

Ericsson offers different HW platforms from HP for MINI-LINK Manager Server (for Small, Medium and Large network size), Terminal Server, Client, Centralized Database Server and MINI-LINK E Adapter software.

Ericsson provides the following platforms with the MINI-LINK Manager product already pre-installed on the machine.

9.1 MINI-LINK MANAGER SERVER PLATFORM SMALL NETWORKS

9.1.1 Rack-mounted Model

Computer	HP Proliant DL140 Intel Xeon 2.8 GHz processor 512 KB second level ECC cache, 533MHz front-side-bus
Memory	2x512 MB PC2100 DDR SDRAM
HD	36 GB SCSI HDD
Network Card	Integrated Dual Broadcom NICs
CD-ROM	IDE (ATAPI) CD-ROM Drive
Form Factor	Rack (1U)
Keyboard/Mouse	Server Keyboard, Int/ Compaq Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.1.2 Tower Model

Computer	HP Proliant ML310 G2 Intel Pentium 3.2 GHz processor 512kB second level ECC cache
Memory	2x512MB PC3200 DDR SDRAM
HD	36.4 GB Ultra320 SCSI HDD
DAT	DAT 20/40GB HP 40i, internal drive LVD/SE Wide Ultra SCSI-2
Network Card	NC7760 PCI Gigabit NIC
CD-ROM	48x IDE (ATAPI) CD-ROM Drive
Form Factor	Tower (5U)
Keyboard/Mouse	Server Keyboard, Int/ Compaq Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.2 MINI-LINK MANAGER SERVER PLATFORM MEDIUM NETWORKS

9.2.1 Rack-mounted Model

Computer	HP ProLiant DL380 G4 Intel Xeon 3.2 GHz processor 512 kB level 2 cache, Smart Array 6i Controller
Memory	2x512 MB PC2100 DDR SDRAM
HD	2X36.4GB 1" Hot-Plug 15K RPM U320 HDD mirrored disks
DAT	DAT 20/40GB HP Drive Internal Hot Plug
Network Card	2xNC7781 PCI-X Gigabit NIC
CD-ROM	24x IDE CD-ROM
Form Factor	Rack (2U)
Keyboard/mouse	Server Keyboard, Int/ Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.2.2 Tower Model

Computer	HP Proliant ML350 G4 Torn Intel Xeon 3.2 GHz processor 512kB second level ECC cache
Memory	1GB REG DDR PC2100 DDR SDRAM
HD	2x36.4GB 1" Hot-Plug 15K RPM U320 HDD mirrored disks
DAT	DAT 20/40GB TV HP 40i internal drive LVD/SE Wide Ultra SCSI-2
Network Card	2xNC7760 PCI Gigabit NIC
RAID Controller	Smart Array 642 RAID Controller
CD-ROM	48x IDE (ATAPI) CD-ROM Drive
Form Factor	Tower (5U)
Keyboard	Server Keyboard, Int
Power Supply	Redundant Power Supply
Operating System	MS Windows 2003 Standard Ed.

9.3 MINI-LINK MANAGER SERVER PLATFORM LARGE NETWORKS

Computer	HP ProLiant DL380 G4 Dual Intel Xeon 3.2 GHz processors 512 kB level 2 cache, Smart Array 6i Controller

Memory	4x512 MB PC3200 DDR SDRAM
HD	2x36.4GB 1" Hot-Plug 15K RPM U320 HDD mirrored disks
DAT	DAT 20/40GB HP Drive Internal Hot Plug
Network Card	2xNC7781 PCI-X Gigabit NIC
CD-ROM	24x IDE CD-ROM
Form Factor	Rack (2U)
Keyboard/mouse	Server Keyboard, Int/ Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.4 MINI-LINK MANAGER CLIENT PLATFORM

Computer	HP Compaq dc7100 SFF Intel Pentium 4 3.2GHz processor – 1024kB HyperThread Technology
Memory	2x256 MB DDR
HD	40GB Serial ATA 7200rpm HDD
Graphic Board	Intel Graphics Media Accellerator 900
Network Card	Integrated Broadcom NetXtreme Gigabit NIC
DVD-ROM	DVD-ROM drive
Form Factor	SSF
Operating System	MS Windows XP Professional SP2

9.5 MINI-LINK MANAGER TERMINAL SERVER PLATFORM

Computer	HP ProLiant DL380 G4 Dual Intel Xeon 3.2 GHz processors 512 kB level 2 cache, Smart Array 6i Controller
Memory	4x512 MB PC2100 DDR SDRAM
HD	2x36.4GB 1" Hot-Plug 15K RPM U320 HDD mirrored disks
Network Card	2xNC7781 PCI-X Gigabit NIC
CD-ROM	24x IDE CD-ROM
Form Factor	Rack (2U)
Keyboard/mouse	Server Keyboard, Int/ Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.6 MINI-LINK MANAGER CENTRALIZED DATABASE SERVER PLATFORM

Computer	HP ProLiant DL380 G4 Intel Xeon 3.2 GHz processor 512 kB level 2 cache, Smart Array 6i Controller
Memory	2x512 MB PC2100 DDR SDRAM
HD	2X72.8GB 1" Hot-Plug 15K RPM U320 HDD
Network Card	2xNC7781 PCI-X Gigabit NIC
CD-ROM	24x IDE CD-ROM
Form Factor	Rack (2U)
Keyboard/mouse	Server Keyboard, Int/ Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.7 MINI-LINK E ADAPTER PLATFORM

9.7.1 Rack-mounted Model

Computer	HP Proliant DL140 Intel Xeon 2.8 GHz processor 512 KB second level ECC cache, 533MHz front-side-bus
Memory	512 MB PC2100 DDR SDRAM
HD	36 GB SCSI HDD
Network Card	Integrated Dual Broadcom NICs
CD-ROM	IDE (ATAPI) CD-ROM Drive
Form Factor	Rack (1U)
Keyboard/Mouse	Server Keyboard, Int/ Compaq Scroll Mouse
Operating System	MS Windows 2003 Standard Ed.

9.7.2 Tower Model

Computer	HP Proliant ML310 G2 Intel Pentium 3.2 GHz processor 512kB second level ECC cache
Memory	512MB PC3200 DDR SDRAM
HD	36.4 GB Ultra320 SCSI HDD
Network Card	NC7760 PCI Gigabit NIC
CD-ROM	48x IDE (ATAPI) CD-ROM Drive
Form Factor	Tower (5U)
Keyboard/Mouse	Server Keyboard, Int/ Compaq Scroll Mouse

Operating System	MS Windows 2003 Standard Ed.

9.8 REGULATORY COMPLIANCE

All MINI-LINK Manager HW platforms are standard. The limiting conditions for operation are determined by the original equipment hardware manufacturer. Their detailed specifications should be consulted when provisioning systems for extreme environments.

Ericsson does not provide a system that has been EMC tested as a complete entity, and an appropriate environment must be provided for each component of the installation

The HW platforms described in this chapter conform to the following normative European and International Standards:

Normative:	EN55022:1998: (CISPR 22) - Radio Frequency Interference
Standards:	EN55024:1998 (CISPR 24) - Electromagnetic Immunity
	EN60950: 2000 . Product Safety
	EN61000-3-2:1995 +A1/A2/A14 - Harmonic Currents
	EN61000-3-3:1995 - Voltage Fluctuation and Flicker
European Council Directives:	EMC Directive 89/336/EEC (including amendments)
	Low Voltage Directive 73/23/EEC (amended by 93/68/EEC)
Supplementary Information:	Safety: Protection Class I, Pollution Degree II
	Emissions: EMC Class B

10 APPENDIX 2 - MINI-LINK MANAGER COMPATIBILITY TABLE

COMPATIBILITY TABLE		MINI-LINK Manager 5.1	MINI-LINK Manager 6.1	MINI-LINK Manager 7.1
MINI-LINK TN	R1.0/ R1.1	-	FM, CM, INV <R> (in 6.1 SP1)	-
	R 2.0/ R 2.1			FM, PM, CM, RSU, INV (INV in 7.1+SP1) (2.1 in 7.1 + SP)
MINI-LINK E MINI-LINK C	All	Via MINI-LINK Netman (*)	FM, PM, CM, INV<R>	FM, PM, ECM, RSU, INV (INV in 7.1+SP1 for MINI-LINK E)
MINI-LINK BAS	R1.2	FM, CM, INV<R>	FM, CM, RSU, INV<R>	FM, CM, RSU, INV (INV in 7.1+SP1)
	R1.3		FM, CM, RSU, INV <R> (in 6.1 SP1)	FM, PM, CM, RSU, INV (INV in 7.1+SP1)
	R 1.4			FM, PM, CM, RSU, INV (INV in 7.1+SP1)
MINI-LINK HC	R1E	FM, PM, CM, INV<R> (in 5.1 SP2)	FM, PM, CM, INV<R>	FM, PM, CM, INV (INV in 7.1+SP1)
	R2A/ R3A	-	FM, PM, CM, RSU, INV<R>	FM, PM, CM, RSU, INV (INV in 7.1+SP1)
	R4A	-	FM, PM, CM, RSU, INV<R> (in 6.1 SP1)	FM, PM, CM, RSU, INV (INV in 7.1+SP1)
	R5A	-		FM, PM, CM, RSU, INV (INV in 7.1+SP1)
SAU-IP	R1A	-	-	FM, , CM, (via SNMP Manager)
Generic SNMP	SNMP v1	FM, PM, CM	FM, PM, CM	FM, PM, CM
Nera New-NMS	R5	FM, CM<R>, INV<R>	FM, CM<R>, INV<R>	-
	R6	FM, PM, CM<R>, INV<R>	FM, PM, CM<R>, INV<R>	-
	R7A	FM, PM, CM<R>, INV<R>	FM, PM, CM<R>, INV<R>	-
	R7B	FM, PM, CM<R>, INV<R>	FM, PM, CM<R>, INV<R>	-
	R7C	FM, PM, CM, INV<R>	FM, PM, CM, INV<R>	FM, PM, CM, INV<R>
	R7H	-	FM, PM, CM, INV<R> in 6.1 SP1	FM, PM, CM, INV<R>
	R7L	-	-	FM, PM, CM, INV<R>
	R8A	-	-	FM, PM, CM, INV<R>
DXX Manager / MINI-LINK Connexion	R13/ R13A			FM, PM, CM, INV<R>
	R14 R!4 SP 2.1			FM, PM, CM, INV<R>

(*) MINI-LINK Netman was the original management system for MINI-LINK E and MINI-LINK C networks

Legenda

FM	Integrated Fault Management
PM	Integrated Performance Management
CM	Integrated CM via launch of EM or LCT tool
ECM	Embedded CM
RSU	Remote SW Upgrade
INV	Integrated Inventory Management
<R>	Denotes supported restricted functionality - features should be checked against latest technical and integration descriptions