

**Oracle® Communications**  
**EAGLE Element Management System**

Interface User Guide

**910-6752-001 Revision B**

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# Chapter 1

## Introduction

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### Topics:

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This chapter provides general information about manual organization, the scope of this manual, its targeted audience, how to get technical assistance, and how to locate customer documentation on the Customer Support site.

## Overview

This manual is organized into two main parts.

### E5-MS Administration

The E5-MS Administration part describes how to administer manage access rights of individual E5-MS Users by assigning each user to a Usergroup, and their username and password to access to various E5-MS interfaces.

### E5-MS User Guide for all applications

E5-MS User Guide part describes how to access and interact with all the E5-MS interfaces. The E5-MS graphical user interface (GUI), displays a view of the global network down to the card level with event-filtering capabilities. When outages occur, E5-MS provides fault isolation tools to quickly isolate the problem and enable service restoration. Direct access to the EAGLE command line interface is provided and operators have the flexibility to remotely manage EAGLE systems based on customer defined rules for common and repetitive actions.

## Scope and Audience

This manual is intended for anyone responsible for the following activities:

- E5-MS configuration and administration, and use the E5-MS text-based and Graphical User Interfaces.
- Use the E5-MS to configure and monitor an EAGLE Signaling Transfer Point (STP) in a network.

## Manual Organization

This document is organized into these sections:

- *Introduction* contains general information about manual organization, the scope of this manual, its targeted audience, how to handle hardware repairs and returns, and how to get technical assistance.

### E5-MS Administration

- *E5-MS Administration* describes the chapters and appendix which relate to the administration and configuration of E5-MS.
- *E5-MS Functional Description* provides an overview of the EAGLE 5 - Management System.
- *E5-MS Graphical User Interface* provides an overview of the functions provided by the E5-MS Graphical User Interface

### E5-MS Core Applications

- *EAGLE Discovery Application* describes how the EAGLE Signaling Transport nodes are discovered in the clients network.
- *Fault Management* provides descriptions of the functions provided by E5-MS Fault Management Interface.

- *Measurements Module* provides information about the E5-MS Measurements Module.
- *E5-MS System Administration* provides an overview of the embedded Security Management tool and interface available in the E5-MS.

### Optional Applications

- *Reporting Studio* provides information about the I-net Clear Reports remote interfaces.
- *Configuration Management Interface* provides an overview of the functions provided by the Configuration Management Interface.
- *Link Utilization Interface* provides information about the E5-MS Link Utilization Interface.
- *Northbound Interface (NBI)* provides information about the E5-MS Northbound Interface.
- *Inventory Management* describes the EAGLE optional Inventory Management feature.

### Appendixes

- *E5-MS Backup and Restore* describes the configuration and execution of the backup and restore procedure for the E5-MS.
- *E5-MS Failover* describes the failover procedure for the E5-MS.

## Documentation Admonishments

Admonishments are icons and text throughout this manual that alert the reader to assure personal safety, to minimize possible service interruptions, and to warn of the potential for equipment damage.

**Table 1: Admonishments**

Icon	Description
 DANGER	<b>Danger:</b> (This icon and text indicate the possibility of <i>personal injury</i> .)
 WARNING	<b>Warning:</b> (This icon and text indicate the possibility of <i>equipment damage</i> .)
 CAUTION	<b>Caution:</b> (This icon and text indicate the possibility of <i>service interruption</i> .)
 TOPPLE	<b>Topple:</b> (This icon and text indicate the possibility of <i>personal injury and equipment damage</i> .)

## Customer Care Center

The Tekelec Customer Care Center is your initial point of contact for all product support needs. A representative takes your call or email, creates a Customer Service Request (CSR) and directs your requests to the Tekelec Technical Assistance Center (TAC). Each CSR includes an individual tracking number. Together with TAC Engineers, the representative will help you resolve your request.

The Customer Care Center is available 24 hours a day, 7 days a week, 365 days a year, and is linked to TAC Engineers around the globe.

Tekelec TAC Engineers are available to provide solutions to your technical questions and issues 7 days a week, 24 hours a day. After a CSR is issued, the TAC Engineer determines the classification of the trouble. If a critical problem exists, emergency procedures are initiated. If the problem is not critical, normal support procedures apply. A primary Technical Engineer is assigned to work on the CSR and provide a solution to the problem. The CSR is closed when the problem is resolved.

Tekelec Technical Assistance Centers are located around the globe in the following locations:

### Tekelec - Global

Email (All Regions): [support@tekelec.com](mailto:support@tekelec.com)

- **USA and Canada**

Phone:

1-888-367-8552 (toll-free, within continental USA and Canada)

1-919-460-2150 (outside continental USA and Canada)

TAC Regional Support Office Hours:

8:00 a.m. through 5:00 p.m. (GMT minus 5 hours), Monday through Friday, excluding holidays

- **Caribbean and Latin America (CALA)**

Phone:

+1-919-460-2150

TAC Regional Support Office Hours (except Brazil):

10:00 a.m. through 7:00 p.m. (GMT minus 6 hours), Monday through Friday, excluding holidays

- **Argentina**

Phone:

0-800-555-5246 (toll-free)

- **Brazil**

Phone:

0-800-891-4341 (toll-free)

TAC Regional Support Office Hours:

8:00 a.m. through 5:48 p.m. (GMT minus 3 hours), Monday through Friday, excluding holidays

- **Chile**  
Phone:  
1230-020-555-5468
- **Colombia**  
Phone:  
01-800-912-0537
- **Dominican Republic**  
Phone:  
1-888-367-8552
- **Mexico**  
Phone:  
001-888-367-8552
- **Peru**  
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1-888-367-8552
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Phone:  
0800-176-6497
- **Europe, Middle East, and Africa**  
Regional Office Hours:  
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  - **Signaling**  
Phone:  
+44 1784 467 804 (within UK)
  - **Software Solutions**  
Phone:  
+33 3 89 33 54 00
- **Asia**
  - **India**  
Phone:

+91-124-465-5098 or +1-919-460-2150

TAC Regional Support Office Hours:

10:00 a.m. through 7:00 p.m. (GMT plus 5 1/2 hours), Monday through Saturday, excluding holidays

- **Singapore**

Phone:

+65 6796 2288

TAC Regional Support Office Hours:

9:00 a.m. through 6:00 p.m. (GMT plus 8 hours), Monday through Friday, excluding holidays

## Emergency Response

In the event of a critical service situation, emergency response is offered by the Tekelec Customer Care Center 24 hours a day, 7 days a week. The emergency response provides immediate coverage, automatic escalation, and other features to ensure that the critical situation is resolved as rapidly as possible.

A critical situation is defined as a problem with the installed equipment that severely affects service, traffic, or maintenance capabilities, and requires immediate corrective action. Critical situations affect service and/or system operation resulting in one or several of these situations:

- A total system failure that results in loss of all transaction processing capability
- Significant reduction in system capacity or traffic handling capability
- Loss of the system's ability to perform automatic system reconfiguration
- Inability to restart a processor or the system
- Corruption of system databases that requires service affecting corrective actions
- Loss of access for maintenance or recovery operations
- Loss of the system ability to provide any required critical or major trouble notification

Any other problem severely affecting service, capacity/traffic, billing, and maintenance capabilities may be defined as critical by prior discussion and agreement with the Tekelec Customer Care Center.

## Related Publications

For information about additional publications that are related to this document, refer to the *Related Publications* document. The *Related Publications* document is published as a part of the *Release Documentation* and is also published as a separate document on the Tekelec Customer Support Site.

## Documentation Availability, Packaging, and Updates

Documentation is provided with each system and in accordance with contractual agreements. For General Availability (GA) releases, a complete published E5-MS documentation set. For Limited Availability (LA) releases, Tekelec may publish a documentation subset tailored to specific feature content or hardware requirements. Documentation Bulletins announce a new or updated release.

The E5-MS documentation set is released on an optical disc. This format allows for easy searches through all parts of the documentation set.

The electronic file of each manual is also available from the Customer Support site ([support.tekelec.com](http://support.tekelec.com)). This site allows for 24-hour access to the most up-to-date documentation, including the latest versions of Feature Notices.

Printed documentation is available for GA releases on request only and with a lead time of six weeks. The printed documentation set includes pocket guides for commands and alarms. Pocket guides may also be ordered separately. The Release Notice is available only on the Customer Support site.

**Note:** Customers may print a reasonable number of each manual for their own use.

Documentation is updated when significant changes are made that affect system operation. These and other changes are included in the documentation for the next scheduled release. Updates are made by re-issuing an electronic file to the customer support site. Customers with printed documentation should contact their Sales Representative for an addendum. Occasionally, changes are communicated first with a Documentation Bulletin to provide customers with an advanced notice of the issue until officially released in the documentation. Documentation Bulletins are posted on the Customer Support site and can be viewed per product and release.

## Customer Training

Tekelec offers a variety of technical training courses designed to provide the knowledge and experience required to properly provision, administer, operate, and maintain the EAGLE EMS. To enroll in any of the courses or for schedule information, contact the Tekelec Training Center at +1-919-460-3064 or E-mail [training@tekelec.com](mailto:training@tekelec.com).

A complete list and schedule of open enrollment can be found at [www.tekelec.com](http://www.tekelec.com).

## Locate Product Documentation on the Customer Support Site

Access to Tekelec's Customer Support site is restricted to current Tekelec customers only. This section describes how to log into the Tekelec Customer Support site and locate a document. Viewing the document requires Adobe Acrobat Reader, which can be downloaded at [www.adobe.com](http://www.adobe.com).

1. Log into the [Tekelec Customer Support](http://support.tekelec.com) site.

**Note:** If you have not registered for this new site, click the **Register Here** link. Have your customer number available. The response time for registration requests is 24 to 48 hours.

2. Click the **Product Support** tab.
3. Use the Search field to locate a document by its part number, release number, document name, or document type. The Search field accepts both full and partial entries.
4. Click a subject folder to browse through a list of related files.
5. To download a file to your location, right-click the file name and select **Save Target As**.

# Chapter 2

## E5-MS Administration

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### Topics:

- [E5-MS Administration.....24](#)
- [E5-MS Initialization and First Configuration...24](#)

The first part of this manual describes E5-MS functions, the E5\_MS Graphical User Interface, and E5-MS status reporting.

## E5-MS Administration

This E5-MS Administration part describes how to administer the EAGLE 5 Management System (E5-MS) after the initialization and first configuration are complete.

*E5-MS Functional Description* describes E5-MS platform, inventory, fault management, alarms, and measurement functions.

*E5-MS Graphical User Interface* describes the E5-MS Graphical User Interface (GUI) menus and how to use them to perform configuration, discovery of inventory, fault management, alarms, and measurement operations.

## E5-MS Initialization and First Configuration

Before the E5-MS GUI can be used, the activities described in *E5-MS System Administration* must be performed:

- E5-MS setup - install to a client's workstation.
- Initialization and first configuration of the E5-MS software for a new installation or an upgrade - log in as the "root" user, allow the automatic discovery of the EAGLE systems.

**Note:** When the initialization and first configuration are complete, the E5-MS Graphical User Interface (GUI) will be available for use.

# Chapter 3

## E5-MS Functional Description

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### Topics:

- *E5-MS Overview.....26*
- *E5-MS Architecture.....27*
- *E5-MS Applications.....27*
- *E5-MS Security Tools.....29*
- *Workstation Requirements.....30*
- *EAGLE Baseline Hardware .....31*
- *Upgrade Requirements.....32*

This chapter provides an overview of the EAGLE 5-Management System.

## E5-MS Overview

The E5-MS consolidates real-time management at a centralized point within the signaling network to provide a consistent approach for configuring and monitoring the client's network. The E5-MS is an optional product in the EAGLE product family.

It is based on Zoho WebNMS Framework that provides a single or multi-user a visual graphical view of the EAGLE Network Elements. Using this framework, E5-MS reports the discovery, physical and logical topology maps, centralized event management, graphs and statistical information of the EAGLE system.

The E5-MS DataBase (DB) uses an embedded MySQL Enterprise Edition DB. This DB Data Model is documented including the details on the tables, data formats, the number of entries supported. The rules are incorporated to evaluate DB size based on the number of managed objects, measurements is documented in this User Guide.

The user-configurable windows, based on the customer's choice of filtering and viewing criteria, provide a flexible, efficient way to view and monitor alarms. Features include:

- Easy-to-use GUI-point-and-click operation
- Scene drill-down capability
- Geographical or logical network views
- Color-coded alert severity

There are multiple integrated Graphical User Interfaces (GUIs) for users to monitor and control EAGLE systems and predict the overall operation of their signaling network more accurately and cost effectively, while controlling initial and ongoing costs. The Core applications of the E5-MS are the:

- EAGLE Discovery
- Fault Management
- Measurements Module

The optional applications are the:

- Inventory Management
- Configuration Management Interface
- Link Utilization Interface
- North Bound Interface
- Reporting Studio

The E5-MS captures real-time events from a network of EAGLE systems using the interfaces will provide a full presentation of the EAGLE health, performance, configuration, and inventory.

The System Administrator is provided a Security Interface to created User access at different levels of the E5-MS and EAGLE systems. Once the System Administrator has setup the individual EAGLE commands, the User will have access to complex command scripts, can be created, managed, executed, and scheduled for execution on one or more remote EAGLE systems.

The E5-MS provides a mechanism for forwarding alarms from EAGLE systems and from the E5-MS (including E5-MS agents and interfaces) to a Northbound Interfaces. Alarms are synchronized between the E5-MS and EAGLE upon request from the Northbound Interfaces.

## E5-MS Architecture

The E5-MS is shown in *E5-MS Architecture*

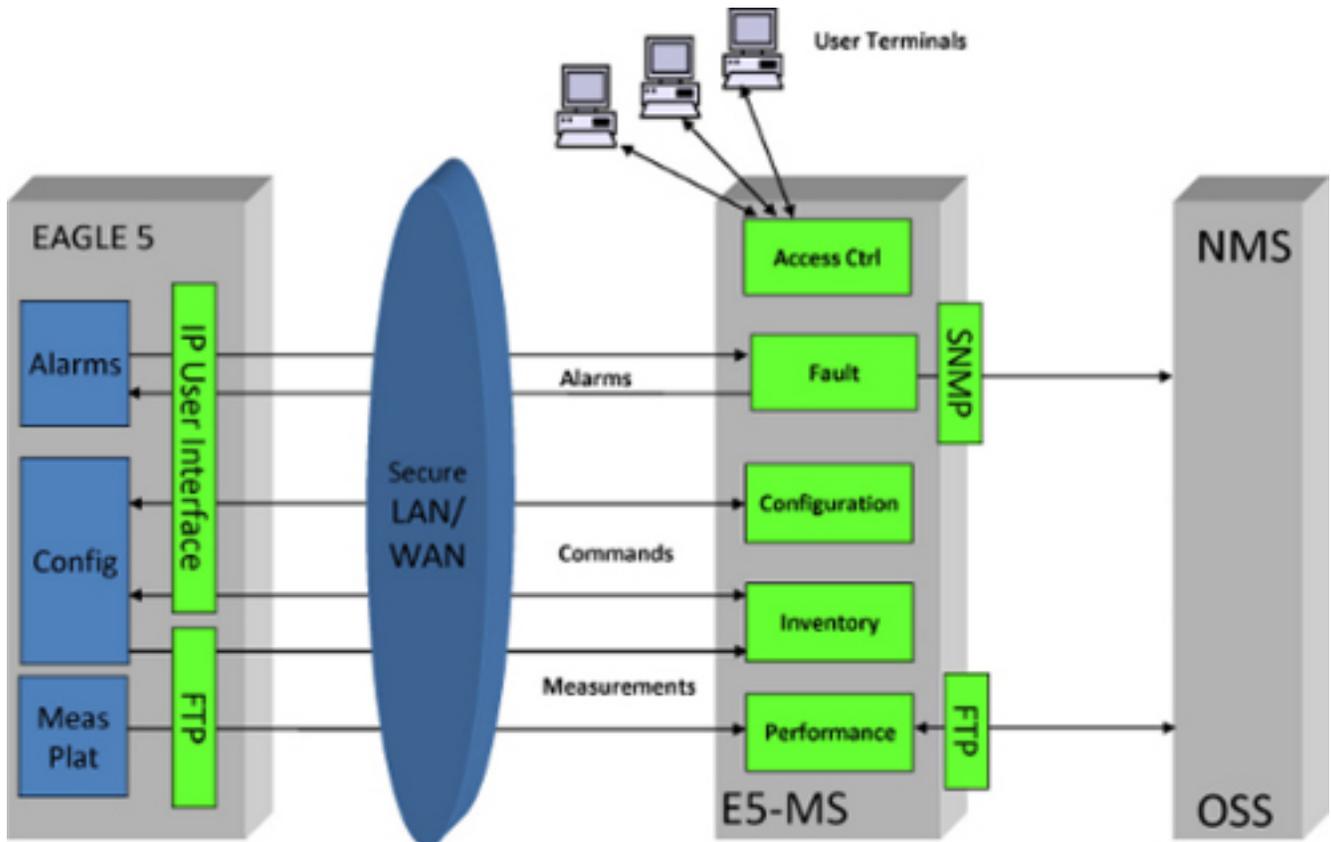


Figure 1: E5-MS Architecture

## E5-MS Applications

The E5-MS, Graphical User Interface (GUI), displays a view of the global network down to the card level with event-filtering capabilities. When outages occur, E5-MS provides fault isolation tools to quickly isolate the problem and enable service restoration. Direct access to the EAGLE Send Command application is provided and operators have the flexibility to remotely manage EAGLE systems based on customer defined rules for common and repetitive actions.

The E5-MS applications available include:

- **EAGLE Discovery Application**

The EAGLE Discovery Tool discovers the EAGLE systems within the clients network. This tool allows the System Administrator or user with administration access to add a new EAGLE, modify the details of the existing EAGLE, rediscovers it and delete an existing EAGLE. The EAGLE Inventory Tool is an option application that fetches the inventory information to build the EAGLE

system chassis view and create a geographical view for the EAGLE starting from a World level to Continent level to Country level to EAGLE Frame level. The Schedule Management allows the user to schedules to update inventory and graphics.

- **Fault Management**

The E5-MS Fault Management store all events history in a Data Base. In normal conditions the historical information can be access for a minimum of 30 days. The number of events stored in the DB are detailed in the Feature Description and documented. The Fault Management application and DB support a minimum of 200 entries per second: 200 TPS. The alarm/event rate supported are documented. all required communication between EAGLE systems and the E5-MS system.

- **Measurements Module**

The E5-MS Measurement Module parses measurement files received from the EAGLE Measurements Platform Agent then transfers the data to the E5-MS database as .csv files. The Measurement Reporting Studio can convert the .csv files into a comprehensive report. There are a set of pre-defined reports integrated in the Measurement Studio, such as the :

- STP System Total Measurements
- Component Measurements
- Network Management Measurements
- Daily Availability Measurements
- Availability Measurements
- Daily Maintenance Measurements
- Hourly Maintenance Measurements
- Gateway Measurements

The files are sent via FTP to the E5-MS Database. The data is use to create reports.

- **Security Administration**

The E5-MS customer is in charge of the system administration and the OS administration. The System Administrator is the owner of the Root Account and setting all privileges for the Group Users.

- **Reporting Studio**

The E5-MS Reporting Studio is a reporting tool. The E5-MS uses the OEM Software (I-net Clear Reports Plus<sup>®</sup>) to create pre-defined measurement reports. It produces an array of output data formats, such as PDF, JPG. The Reporting Designer generation reports using a remote interface provided by I-net Clear Report<sup>®</sup>. E5-MS Users can create/update a report template as per their requirement.

- **Configuration Management Interface (CMI)**

The E5-MS Configuration Management Interface is the application used to access EAGLE commands, parameters, and historical data. The following functions are provided by the Configuration Management Interface:

- Administrator access rights for E5-MS users according to User group
- Create and send commands to one or more EAGLE systems
- Create, manage, and schedule for execution EAGLE command scripts
- Manage and review logs containing information about E5-MS activities, including EAGLE command script execution, all E5-MS User activities, and all accesses to EAGLE systems

The CMI application requires accounts and users to be created on the EAGLE STP. The requirements are documented. Once the user is assigned an EAGLE, they can perform the needed configuration on EAGLE. All E5-MS and EAGLE activity performed by the users, successful or not, are logged and documented.

- **Link Utilization Interface**

The E5-MS Link Utilization Interface (LUI) collects and stores link capacity information about EAGLE signaling links in the E5-MS database. There is a default capacity selection defined by the card configuration or Tekelec defined values, however the user can override link capacity thresholds to allow fine tuning to utilization. The Threshold Alarm feature allow the user to set measurement thresholds to generate alarms for the LUI. The Measurement Reports Studio and CMI are required for the Link, Linkset and card utilization reports.

- **Northbound Interface**

The E5-MS Northbound Interface selectively forwards SNMP alert traps to a maximum 10 client registered Network Management Systems (NMS). Alerts can be synchronized between the E5-MS and a Network Management System. The NBI is an optional application to that converts all E5-MS alarms into northbound SNMP v2c standard traps. The FTP North Bound Interface allows E5-MS raw measurement reports to be forwarded to a database.

- **Backup and Restore**

E5-MS is used to manage and monitor EAGLE nodes in the network. E5-MS has database tables, configuration files and other data, that must to be backed up to take care of any data loss due to any reason. The E5-MS provides both manual and daily automatic back up functionality and scheduled backup intervals can be configured as per user requirement. Backed up content can be restored by user manually.

- **Failover**

In E5-MS, failover support is provided with two redundant servers configured as primary and standby servers. In the failover setup, the primary and standby servers has access to the replicated database. Mysql data files are kept at /Tekelec/Webnms/mysql/data directory.

## E5-MS Security Tools

The Security Administration application GUI I core for the security of the client's network management environment.

The E5-MS is a secured access control mechanism including:

- Password management
  - Password complexity management
  - Password expiration rules management
  - Password are stored in a secured and encrypted file (or database).
- Robust authentication methods including SSL and secure RMI server access control (J2EE security model).
  - LDAP authentication server use is a optional feature.

The E5-MS log files are protected from E5-MS users modifications. The System Administrator will configure each user with the following:

- Authorization for users and groups views
- Roles views
- Operations views
- Managed Object views

Each user will generate user activity logs. The details of those logs are available in each feature FRS. Overall and all logs are documented. The E5-MS Users cannot modify the log files.

The E5-MS System Administration assigned by the client will update their OS with the latest security patches without impacting the software behavior. Tekelec will document the system and OS details of the platforms used during development or testing phases.

Since the clients provide the Hardware and Operating system, they own of the Root account or any privileged accounts (Super Users). Tekelec requires a privileged account to perform installation, configuration, maintenance, support and upgrades. It is assumed that the customer provides privileges to Tekelec personnel according to their needs/requirements but it also assumes the client is the system administrator of the platform.

The E5-MS software and all OEM components are free of critical/major security fault or vulnerability. The default settings (including password) of the software components delivered by Tekelec will follow strong security rules (i.e complex passwords).

The E5-MS OEM components is configured or set in a way to ensure the maximum security possible. For instance, if several levels of security are possible, we use the most secured parameters or options (for instance, logging levels, permissions granularity...)

## Workstation Requirements

The workstation hardware requirements provided by the customer are as follows:

- **Small System**
  - CPU at 2MHz minimum - 1 CPU system supported
  - Memory 2GB or higher - 8 GB recommended
  - Disk space, a minimum of 400MB for software installation + 200MB for swap, however 500GB SAS disks are recommended. (for database and history requirements)
- **Medium System**
  - CPU at 2MHz minimum - 1 CPU system supported
  - Memory 4GB or higher - 8 GB recommended
  - Disk space, a minimum of 400MB for software installation + 200MB for swap, however 500GB SAS disks are recommended. (for database and history requirements)
- **Large System**
  - CPU at 2MHz minimum - 1 CPU system supported
  - Memory 8GB or higher - 16GB recommended

- Disk space, a minimum of 400MB for software installation + 200MB for swap, however 500GB SAS disks are recommended. (for database and history requirements)

The E5-MS can be viewed using either of the following web browsers provided by the customer:

- Microsoft® Internet Explorer version 8.0 or later
- Mozilla Firefox® version 16 or later.

**Note:** Your browser of choice should have pop-ups enabled allowed.

For system installations for the E5-MS, the RedHat Package Manager architecture, Packages, RPM installation dependencies are documented.

E5-MS application requires Linux 64 bit Operating Systems. It is developed and tested on CentOS Suite but could be installed on different suites (Red Hat Enterprise).

## EAGLE Baseline Hardware

To prepare for the installation of the E5-MS, the customer will be in charge of the hardware of the EAGLE systems in their network. The E5-MS product is available in a tiered architecture using the following configurations:

- **Small Network:**
  - up to 4 Network Elements (2 STP pairs)
  - up to 5 concurrent Users
- **Medium Network:**
  - up to 20 Network Elements (10 STP pairs)
  - up to 15 concurrent Users
- **Large Network:**
  - up to 50 Network Elements (25 STP pairs)
  - up to 25 concurrent Users

The EAGLE must be equipped with the following:

- At least one IPSM card (supports up to 3 cards)
- Measurement Platform activation
  - Either Integrated Measurement Platform on E5-MASP cards
  - Or Measurement Platform on CPM cards
- User and for Command Interface and Topology collection
- Terminal settings for Alarm Management
  - Two terminals per IPSM are required.

---

<sup>1</sup> Microsoft is a registered trademark of the Microsoft Corporation.

<sup>2</sup> Firefox is a registered trademark of the Mozilla Foundation.

## Upgrade Requirements

The E5-MS software supports incremental upgrades (for P2 to GA build or maintenance releases). Since the solution supports packaging and RPM installation, the upgrade of targeted components are possible. This requires Packages/RPM dependencies to be documented.

# Chapter

# 4

## E5-MS Graphical User Interface

---

### Topics:

- [Overview .....34](#)
- [E5-MS Login.....34](#)
- [E5-MS Applications Main View .....36](#)
- [Alarm Summary View.....40](#)

This chapter describes the E5-MS Graphical User Interface (GUI), how the user will login E5-MS and how to use the E5-MS user interface menus.

## Overview

The E5-MS Graphical User Interface (GUI) that provides a comprehensive geographical view for users to monitor and control in a client's network. The user receives real-time performance data from the EAGLE system which assist in maintenance operations. The System Administrator and Users launch the E5-MS to login as shown in [Figure 2: E5-MS Launch Screen](#) from a client workstation.



**Figure 2: E5-MS Launch Screen**

Please contact your System Administrator to assign **E5-MS Authentication** security operation.

## E5-MS Login

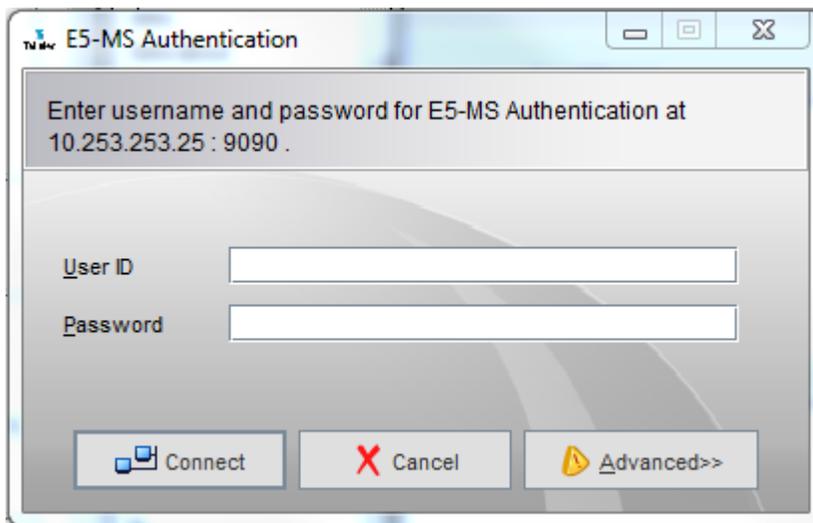
The E5-MS login page is used to authenticate users of the E5-MS.

### Logging In to E5-MS

Please contact your System Administrator to assign **E5-MS** security operation.

This procedure describes how to log in to the E5-MS.

1. From the [Figure 2: E5-MS Launch Screen](#), click Launch E5-MS Client.
2. Enter the **User ID** and **Password** as shown on the [Figure 3: E5-MS Authentication Screen](#).

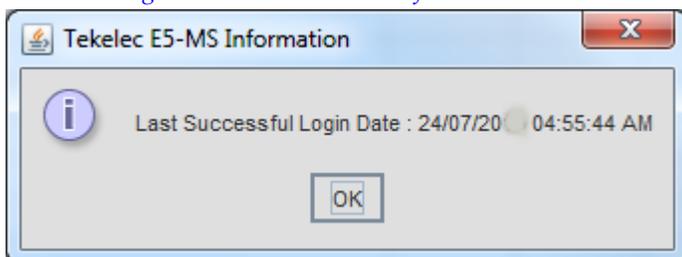


**Figure 3: E5-MS Authentication Screen**

Please contact your System Administrator for your User ID and Password.

3. Click the **Connect** button or press the Enter key on the keyboard.

If the user name and password entered in [Step 1](#) are correct, the E5-MS User is authenticated as shown in [Figure 4: Tekelec E5-MS Information Screen](#).



**Figure 4: Tekelec E5-MS Information Screen**

Only after submitting a correct password, will User be successfully login to E5-MS. If there is a problem with the user name or password, an error message appears.

- If your password has expired, the **Change Password** page is displayed.
- If an error message appeared in [Figure 5: Authentication Failure](#), check to make sure the username and password are correct and repeat the login.



**Figure 5: Authentication Failure**

- If login was not successful after repeating the login attempt, contact a System Administrator

### Login Page Elements

Element	Description
UserID Field	Enter your E5-MS User name in this field.
Password Field	Enter your password in this field. If your password is not known, contact a System Administrator to reset the password.
Connect Button	Click on this button to sign in to the E5-MS.

### E5-MS Applications Main View

As shown in the E5-MS Applications Main Screen the user has access to the E5-MS GUI.

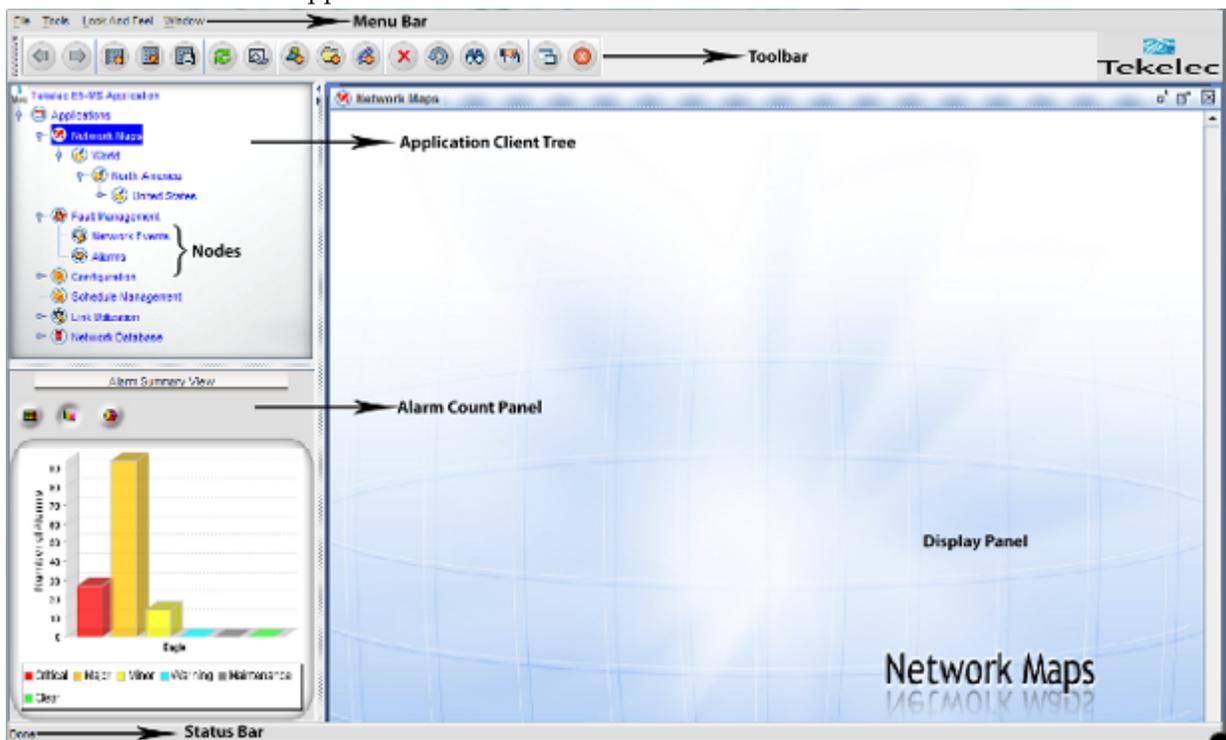


Figure 6: E5-MS Applications Main Screen

### Menu Bar

As shown in the E5-MS Menu Bar, it is the horizontal strip at the top of the E5-MS GUI, that contains available menus with drop down menus. It includes links to the specific to the E5-MS applications. Many items located within the menu bar have keyboard shortcuts that enable the user to choose menu options by just pressing a key combination.

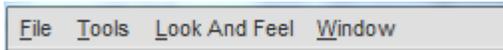


Figure 7: E5-MS Menu Bar

**Menu Bar**

<p><b>File</b></p>	<p><u>B</u>ack  <u>F</u>orward  <u>D</u>etach  <u>C</u>lose          C<u>l</u>ose All  <u>E</u>xit</p>
<p><b>Tools</b>(only Security Administration has a keyboard shortcuts available)</p>	<p><u>S</u>ecurity Administration          C<u>h</u>ange Password  <u>T</u>hemes          E<u>a</u>gle Discovery          E<u>a</u>gle Inventory  <u>R</u>eport Designer  <u>R</u>eporting Studio          N<u>B</u>I          N<u>B</u>I Agent Configuration          N<u>B</u>I FTP Configuration          L<u>i</u>cence Details</p>
<p><b>Look and Feel</b></p>	<p><u>M</u>etal  <u>C</u>DE Motif  <u>W</u>indows  <u>W</u>indows Classic</p>
<p><b>Window</b></p>	<p>C<u>a</u>scade          T<u>i</u>le Horizontal          T<u>i</u>le Vertical          S<u>a</u>ve Location and Size          S<u>h</u>ow Toolbar</p>

### Toolbar Icons

The toolbars are a set of icons that are part of the E5-MS Application. The Common Toolbar are easy-to-use and always-available for performing common functions. Then there are several other Toolbars associated with the application such as the:

- Map Toolbar - which is viewed at the top of the E5-MS GUI when the maps are viewed in the display screen.
- Detached Network Map Toolbar - which is specific to the maps view when the display screen is detached.
- Network Event and Network Database Toolbar - which is specific to

### Common Toolbar Icons

ICON	ICON Name	Description
	Go Back to Previous	Navigating Through Active Windows
	Go Forward to Next	
	Find	Searching Elements in a Map, Searching Events, Searching Alarms.
	Properties	Viewing Properties, Viewing row Details.
	Detach Current Window	Detaching a Window from the display window.
	Stop	Stops the current process that is being executed.

### Network Map Toolbar Icons

There are additional options, within the Network Map display as shown in



Figure 8: Network Map Toolbar

ICON	ICON Name	Description
	Select Mode	Zooming In and Out
	Zoom Window	
	Zoom Mode	Rearranging Map Symbols- There is a click, drag and drop capability on each map screen
	Zoom In	
	Zoom Out	
	Cut	

ICON	ICON Name	Description
	Copy	
	Paste	
	Undo	To undo the last operation performed in the map
	Group View	Grouping Map Symbols - The user must have permission to use these icons from the System Administrator
	Expand Selected (or All) Groups	
	Group Selected Symbols	

### Network Map Toolbar

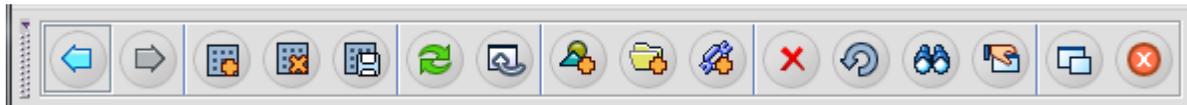


Figure 9: Network Map Toolbar

ICON	ICON Name	Description
	Add Map	Adding Custom Maps
	Delete Map	Deleting Map Layout
	Save Map	Saving Map Layout
	Refresh	Refreshing Map Layout
	Relayout	Resetting Map Layout
	Add Symbol	Adding a Symbol
	Add Container	Adding a Container
	Add Link	Adding a Link
	Delete	Deleting a selected Symbol
	Undo Add/Delete	To undo the last operation performed of adding or deleting a Symbol

### Network Event Toolbar

The Network Event toolbar has the additional options of Save and Print as shown in the Network Event Toolbar.



Figure 10: Network Event Toolbar

ICON	ICON Name	Description
	Save	Saving Events available only in Network Events and Alarms view
	Print	Printing Events available only in Network Events and alarms view
	Refresh	Refreshing the Page View
	Add Custom View	A tailored view for viewing a subset of data that satisfies specific criteria.
	Modify Custom View	
	Remove Custom View	

## Alarm Summary View

The Alarm Summary View panel in the lower left of the E5-MS GUI provides the user with an immediate view of the alarms. As shown in figure

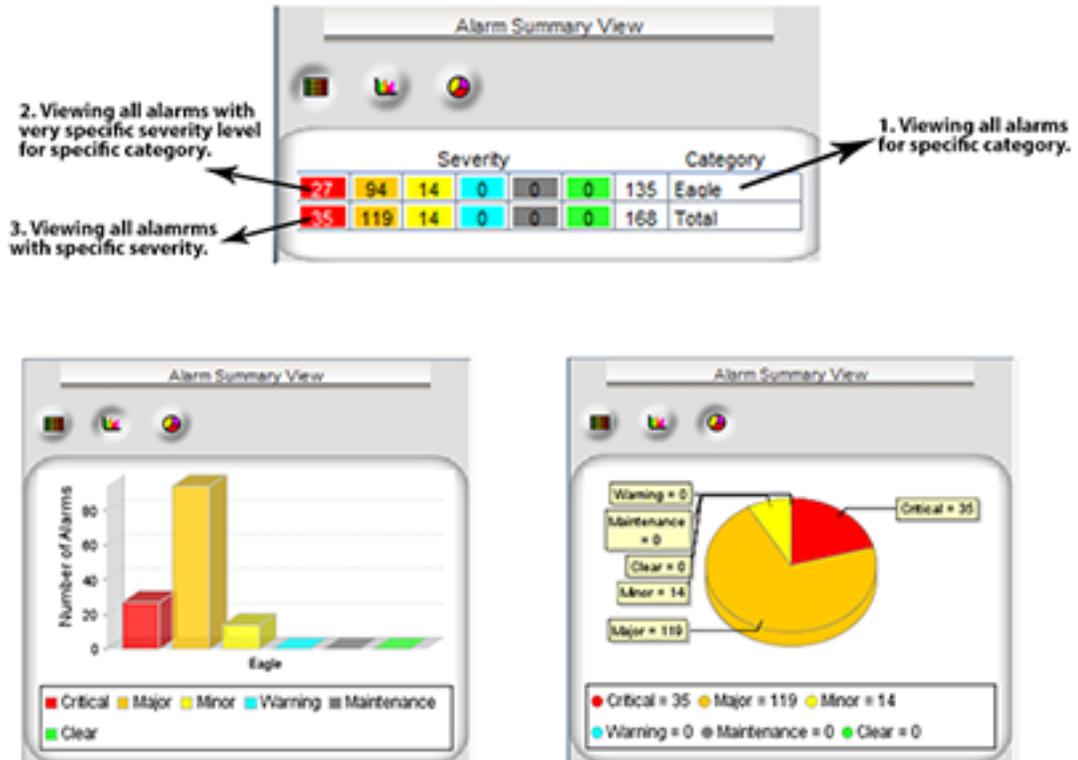


Figure 11: Alarm Summary Views

### Alarm Severity Representation

Color	ICON Name
	Critical
	Major
	Minor
	Warning
	Maintenance
	Clear

# Chapter 5

## EAGLE Discovery Application

---

### Topics:

- *Overview.....43*
- *Functional Description .....43*
- *EAGLE Discovery.....43*
- *Discovery GUI.....44*
- *Schedule Management Screen .....51*
- *Map Views .....51*
- *Inventory Management.....61*

This chapter provides information about the EAGLE Discovery application.

## Overview

The E5-MS has three elements of the inventory process are the

- EAGLE Discovery GUI, which runs various commands on EAGLE to populate inventory data in E5-MS database.
- EAGLE Inventory GUI, which is used for building various map views and provide input to other E5-MS interfaces such as the CMI, Security and Fault Management, etc.
- Schedule Management GUI, which automatically schedules updates for the Update Inventory and Update Graphics for each EAGLE added the E5-MS.

## Functional Description

### EAGLE Discovery

The E5-MS System Administrator will initiate the first discovery of inventory in the existing EAGLE network using the **EAGLE Discovery** tool.

The EAGLE Discovery tool in the E5-MS retrieves the EAGLE inventory data as a topology collection of frames, shelves, cards and card type. The map data populates the Network Maps screen and inventory data provides a fresh inventory in the inventory database. As data is collected it is logged as topology collection in Logs and topology action in Audit trails.

The **EAGLE Discovery** process populates EAGLE inventory data in E5-MS with the following data:

- Inventory data
- Map data

The E5-MS logs all topology collection into logs and action to Audit trails. This discovery supports TL1, SNMP, Telnet and SSH enabled EAGLE systems.

As the EAGLE systems are added or deleted, the E5-MS provides a clean up process. The Update Inventory and Update Graphics are scheduled daily to ensure the Inventory and Map data are correct. By default, the **Update Graphics** operation is scheduled to run on 00:00 AM per day and **Update Inventory** are scheduled to run on 01:00 AM per day.

**Note:** Users have the ability to update the frequency and timing of the **Update Inventory** and **Update Graphics** operations as desired.

### User Access Control

Before performing this procedure, you must be granted access by a System Administrator.

This procedure describes how to discover the EAGLE systems in your network.

1. Click **Tools** at the top of the E5-MS GUI menu bar.

2. Select EAGLE Discovery from the dropdown menu. As shown the EAGLE Discovery



**Figure 12: EAGLE Discovery**

## Validation

The communication path used for the discovery process is an IP ping. This is required to validate the user configured the EAGLE system.

E5-MS selects any of the available EAGLE IPSM IP addresses and corresponding terminals except **EMSALM** terminal for performing EAGLE discovery, in case the EAGLE communication is a **TL1**. During the discovery process, the first ping is sent to the first able **IPSM IP**. If the first able **IPSM IP** does not respond to EAGLE commands, the next configured **IPSM IP** is pinged.

Once there is a successful EAGLE discovery with one of the configured IPSM IP, then other configured IPs (if any) are maintained in E5-MS database without performing any ping test. The user can perform discovery for a single EAGLE at a time.

**Note:** No verification is performed to validate that the user configured EAGLE is an EAGLE or not. Only IP ping based mechanism is used for kicking off discovery process.

## Discovery GUI

The main functions of the **EAGLE Discovery** screen as shown in [Figure 13: EAGLE Discovery Screen](#) are the:

- **Existing EAGLES(s)**, which display the list of existing EAGLE systems.
- **New EAGLE**, which shows the required fields needed for EAGLE Discovery. In case, of an existing EAGLE, the fields are filled in with the EAGLE values.
- **Add, Modify and Delete** operations buttons.

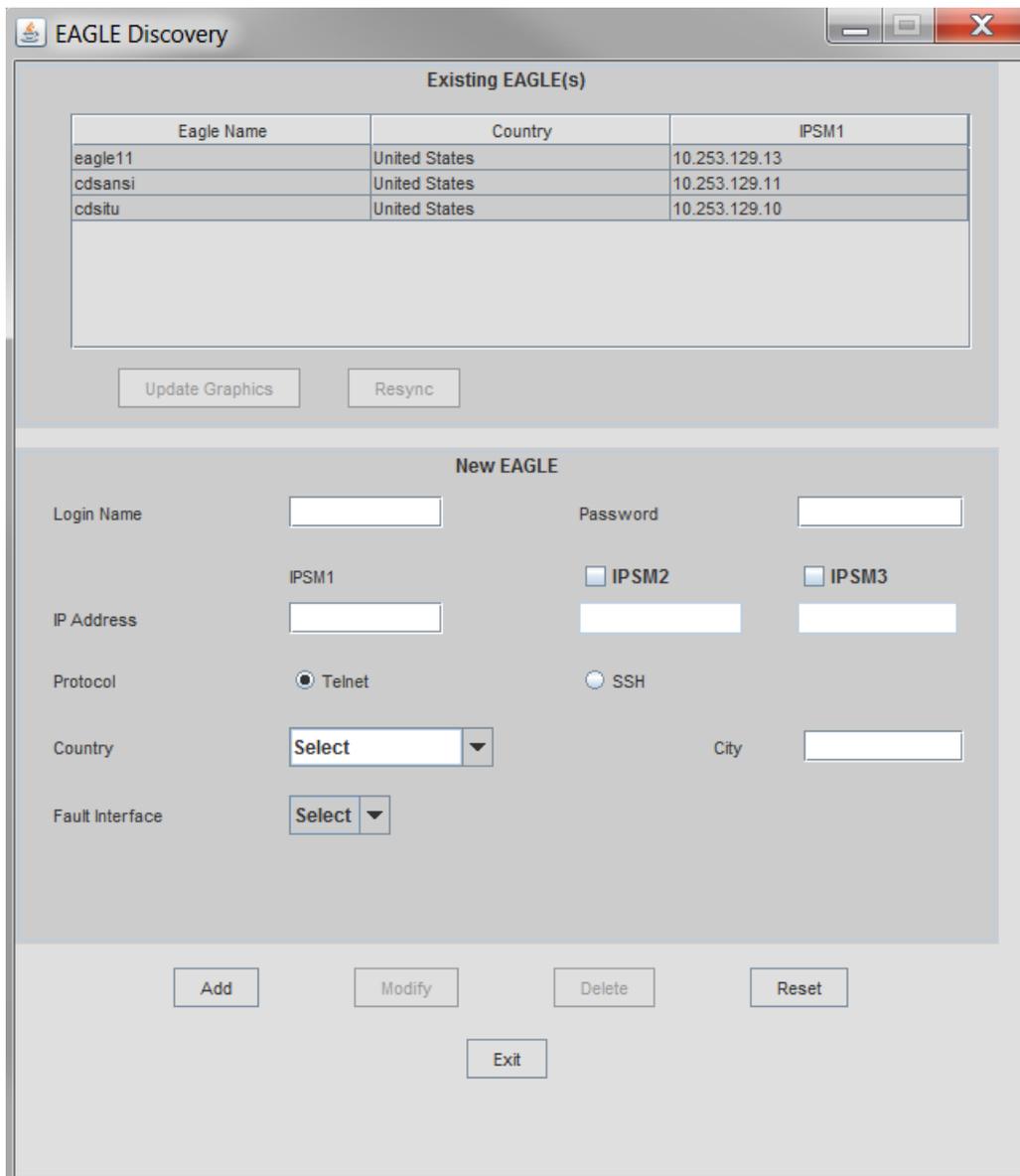


Figure 13: EAGLE Discovery Screen

For the **Existing EAGLE(s)** listed in **EAGLE Discovery** screen, users can trigger a **Resynchronization** of alarms as shown in [Figure 14: EAGLE Discovery Screen for Existing EAGLE\(s\)](#).

**Note:** If the **Update Graphics**, **Update Inventory** and **Stop Inventory** are grayed out the user is not assigned to the Inventory GUI. Please contact your System Administrator. The Inventory GUI applications is an optional, to the Core features. Please check the Licenses.

Eagle Name	Country	IPSM1
eagle11	United States	10.253.129.13
cdsansi	United States	10.253.129.11
cdsitu	United States	10.253.129.10

**eagle11**

Login Name: eagle Password: ●●●●

IPSM1: 10.253.129.13  IPSM2  IPSM3

IP Address: [ ] [ ] [ ]

Protocol:  Telnet  SSH

Country: United States City: Morrisville

Fault Interface: TL1

EMSALM Port: 23 17 17

Add Modify Delete Reset Exit

Figure 14: EAGLE Discovery Screen for Existing EAGLE(s)

### Existing EAGLE(s)

Update Inventory operation is the interface to manually update either single or multiple EAGLE(s) complete inventory. Update Inventory operation triggered from EAGLE Discovery GUI stores data fetched from EAGLE systems in flat files. There is only one file per command per EAGLE maintained in E5-MS system. This inventory update shall overwrite existing files(if any exists).

Update Graphics operation is the interface to update inventory data (i.e. frame, shelf, slot and card) on single or multiple EAGLE systems that are required to update the graphics available in Chassis View. Update Graphics shall run subset of Update Inventory commands. This update is pertaining to the specific EAGLE the user is fetching updates.

EAGLE Discovery GUI shall support minimum of one hundred (i.e. 100) EAGLEs that can be configured in E5-MS.

When the user clicks on existing EAGLE, configuration section of the EAGLE Discovery GUI should display all details of EAGLE.

If EAGLE Update graphics operation is successful, an E5-MS Information dialog box will appear stating Graphics updated for EAGLE <EAGLE NAME> by user <USER NAME>.

If EAGLE Update graphics operation fails, an E5-MS Error message will appear stating EAGLE <EAGLE NAME> graphics update failed! Reason: <REASON> Please resolve the issue and retry

If EAGLE Update Inventory operation is successful, an E5-MS Information dialog box will appear stating Inventory updated for EAGLE <EAGLE NAME> by user <USER NAME>.

If EAGLE Update Inventory operation fails, an E5-MS Error message will appear stating EAGLE <EAGLE NAME> inventory update failed! Reason: <REASON> Please resolve the issue and retry

**Note:** The Inventory module notifies other E5-MS management modules (like Fault, Configuration and Security etc.) of EAGLE add, modify and delete events.

## Add an EAGLE System

Before performing this procedure, you must be granted the right to **EAGLE Discovery** by a System Administrator.

This procedure describes how to add each EAGLE system to which the E5-MS is connected.

1. Click Tools icon on the Menu Bar.
2. Select **EAGLE Discovery**  
EAGLE Discovery screen pops up as shown in [Figure 13: EAGLE Discovery Screen](#)
3. Type the name and password of the EAGLE in their respective fields.  
The System Administrator will provide the name and password of the EAGLE system being discovered.
4. Enter the IP address of the EAGLE in IPSPM 1. There must be at least one IP address for each EAGLE system.  
It is possible to configure a total of three (3) IPSPM interfaces for each EAGLE in IPSPM 2 and IPSPM 3 fields.
5. Enable the Protocol by selecting either Telnet or SSH.
6. Select the country the EAGLE system is located. Click the drop down arrow to select the country. A country must be selected. If the country is not listed, select **Others**. As shown in figure



**Figure 15: Country and City**

There is no validation when selecting the country.

7. Type in the City the EAGLE system is located as shown in figure Country and City.  
There is not validation when the city is entered.

8. Select the Fault Interface as a TL1 or SNMP.



**Figure 16: Fault Interface**

If TL1 is selected, the EMSALM Port must be selected for each IPSM interface as shown in



**Figure 17: EMSALM Port**

If SNMP is selected the following fields:

- Read Community
- Write Community
- Active OAM IP
- Standby OAM IP

As shown in



**Figure 18: SNMP as Fault Interface**

9. Click the **Add** button at the bottom of the EAGLE Discovery screen.  
An E5-MS Information dialog box will appear stating EAGLE addition request has been sent to server. Please wait for status.

## Active and Standby OAMs Switch

If the active and standby OAMs switch on the EAGLE, the Active OAM IP and Standby OAM IP fields will updated after a user triggers resync with the EAGLE and after completion of resync, selects the EAGLE in the existing EAGLE(s) list.

## IP Address

The validation on the authenticity of the IPSM terminals is provided by E5-MS user in the IP Address fields.

1. Ensure all terminals exist on the EAGLE IPSM card IP by contacting the System Administrator for the IP addresses.
2. Enter the IP address of the EAGLE in IPSM 1. There must be at least one IP address for each EAGLE system.

It is possible to configure a total of three (3) IPSM interfaces for each EAGLE in IPSM 2 and IPSM 3 fields. As shown in figure IP Address

 A screenshot of a web interface for configuring IP addresses. It features three input fields labeled 'IPSM1', 'IPSM2', and 'IPSM3'. The 'IPSM1' field is currently empty, while 'IPSM2' and 'IPSM3' also appear to be empty. The label 'IP Address' is positioned to the left of the first field.

**Figure 19: IP Address**

If IPSM 1 is not entered before IPSM 2 / 3, an E5-MS Error dialog box will appear stating Please enter IP address for IPSM1!

If the IPSM IP address is invalid, an E5-MS error message dialog box will appear IP address <IP Entered> entered for <IPSM> is not valid! Please provide a valid IP Address

If the IP address is used on another EAGLE IPSM, an E5-MS error message dialog box will appear IP addresses provided for one or more IPSM cards are same!

EAGLE Discovery validates which of the IPs specified as Active OAM IP is valid with a message Please provide a valid IP address for Active OAM IP! and the Standby validation with Please provide a valid IP address for Standby OAM IP!.

## Protocol

The two options to enabled the protocol on the EAGLE are Telnet and SSH as shown in figure

 A screenshot of a web interface for selecting a protocol. It shows a label 'Protocol' followed by two radio buttons: 'Telnet' (which is selected) and 'SSH'.

**Figure 20: Protocol**

Telnet is the protocol used for the Cut Through interface.

## Country and City

To populate the maps automatically, a Country must be selected.

1. Click the drop down arrow to select the country the EAGLE system is located as shown in figure Country and City

Country is a required field. If the country is not listed, select **Others**

There is not validation when the country is entered.

 A screenshot of a web interface for configuring location information. It features a 'Country' label next to a dropdown menu with a 'Select' button. The dropdown menu is open, showing options: 'Others' and 'Pakistan'. To the right of the dropdown is a 'City' label and an empty text input field.

**Figure 21: Country and City**

2. Type in the City the EAGLE system is located as shown in figure Country and City. City must be less than 30 characters else, an error message. If more than 30 characters are put in, an error message City name cannot exceed 30 characters!. City can not contain any special characters or numbers, an error message Please enter a valid city name! There is not validation when the city is entered.

## Fault Interfaces

### TL1

Select the Fault Interface as a TL1 or SNMP. As shown in Fault Interface



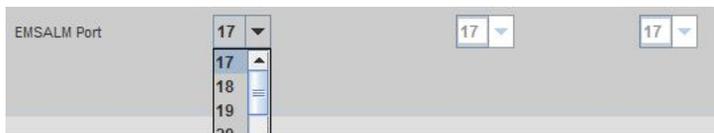
**Figure 22: Fault Interface**

### TL1 / EMSALM ports

Select the range for the EMSALM ports.

All three EMSALM ports for different IPSM interfaces (IPSM1, IPSM2 and IPSM3) configured on EAGLE Discovery GUI should be in different ranges. Valid terminal ranges can be [17-24], [25-32] and [33-40] EMSALM Ports of two or more IPSM cards lie in the same terminal range. Valid ranges are [17-24], [25-32] and [33-40].

As shown in EMSALM Ports



**Figure 23: EMSALM Ports**

## Active and Standby OAMs Switch

If the active and standby OAMs switch on the EAGLE, the Active OAM IP and Standby OAM IP fields will updated after a user triggers resync with the EAGLE and after completion of resync, selects the EAGLE in the existing EAGLE(s) list.

### SNMP

Select the Fault Interface as a SNMP. As shown in SNMP Interface

**Figure 24: SNMP Interface**

The following fields must be filled:

- Read Community
- Write Community

- Active OAM IP
  - Standby OAM IP
1. Read Community must have less than 30 characters. The field will blot out once the characters are entered.  
If more than 30 characters, this message will appear Read community cannot be longer than 30 characters!.
  2. Write Community must have less than 30 characters. The field will blot out once the characters are entered.  
If more than 30 characters, this message will appear Write community cannot be longer than 30 characters!.
  3. Active OAM IP a validation on whether the IPs specified is the Active OAM IP.  
If an invalid IP address is entered, this message will appear Please provide a valid IP address for Active OAM IP!
  4. Standby OAM IP a validation on whether the IPs specified is the Standby OAM IP.  
If an invalid IP address is entered, this message will appear Please provide a valid IP address for Standby OAM IP!

## Schedule Management Screen

EAGLE Discovery is executed when a new EAGLE is added to the network or modification are performed on an existing EAGLE.

The Schedule Management screen provides the user to setup an automatic schedule to Update Inventory and Update Graphics. The inventory data is used to populate and build various map views and provide input to other E5-MS modules such as CMI, Security and Fault Management.

For each EAGLE added to E5-MS, two operations are automatically scheduled on Schedule Management screen - **Update Inventory** and **Update Graphics**. By default, **Update Graphics** operation are scheduled to run on 00:00 AM per day and Update Inventory are scheduled to run on 01:00 AM per day. A user has the ability to stop the scheduled execution of either of these operations by disabling the corresponding scheduled tasks. Also, users have the ability to update the frequency and timing of the operations as desired

## Map Views

The EAGLE Discovery data provides the E5-MS the geographic locations of the EAGLE systems. This data is used to populate maps for all discovered EAGLE(s) automatically. During the EAGLE Discovery the user inputs the Country of the EAGLE system. The Country will provide enough data to construct the graphical map drill down view.

The graphical map drill down levels are the following:

- [Figure 25: World Level Map](#)
- [Figure 26: Continent Level Map](#)
- [Figure 27: Country Level Map](#)
- [Figure 28: Eagle Frame Map](#)

- *Figure 29: Chassis View*
- *Figure 30: Shelf View*

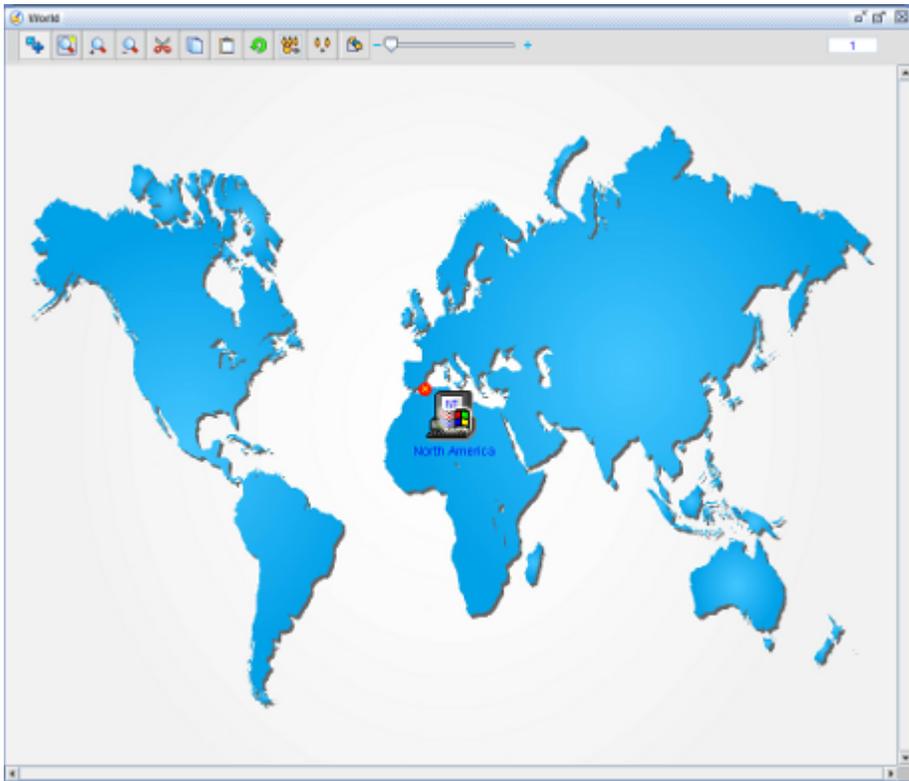


Figure 25: World Level Map

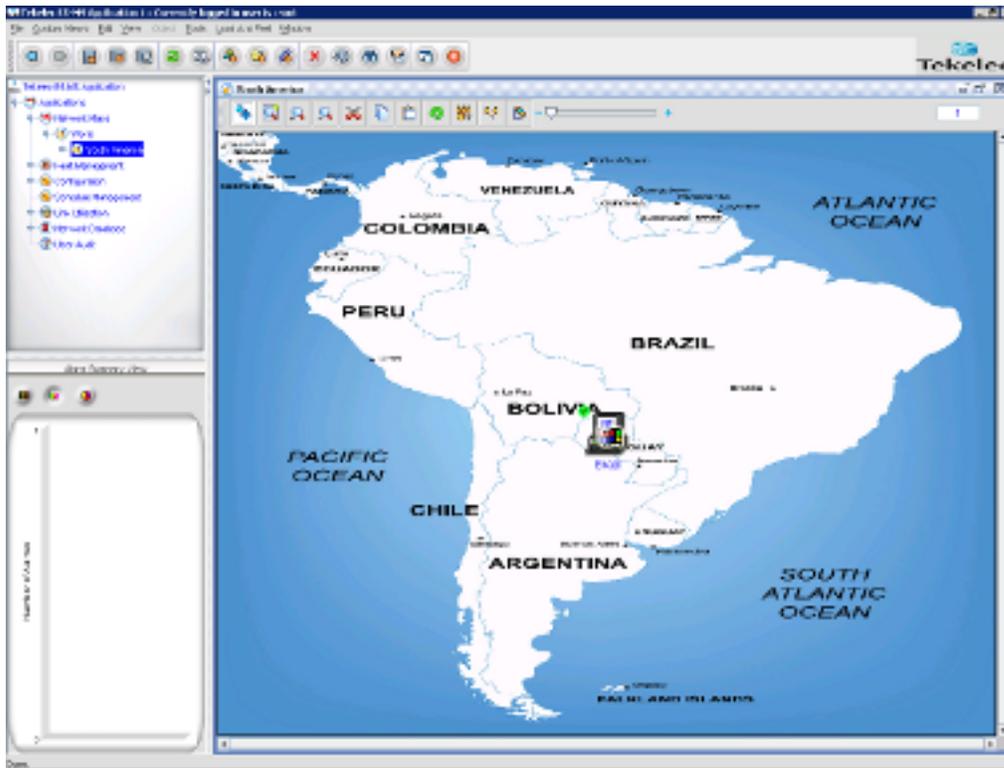


Figure 26: Continent Level Map

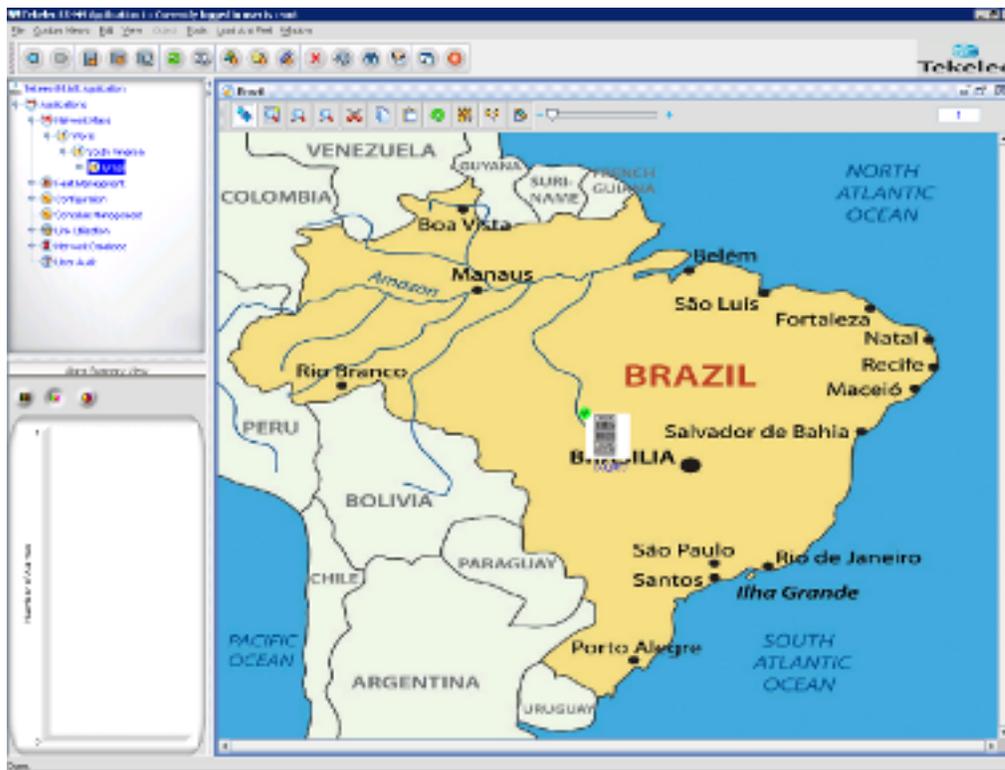


Figure 27: Country Level Map



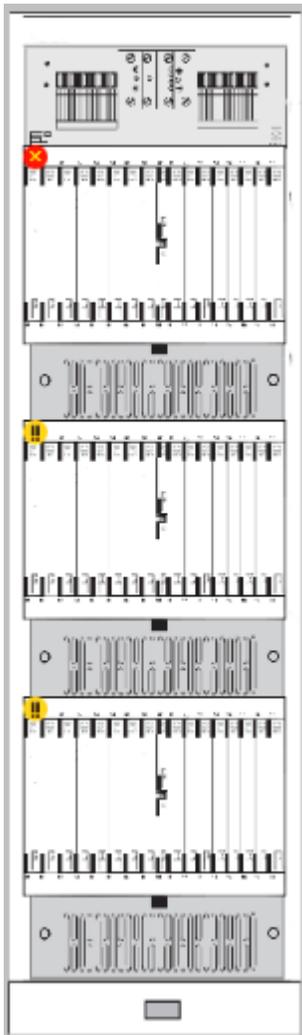


Figure 29: Chassis View



**Figure 30: Shelf View**

In case, the country is not available in the list of countries presented in **EAGLE Discovery** screen as the EAGLE is deployed, as shown in Table E5-MS Maps List, there is an **Others** option in the Country drop down list the user selects.

**Table 2: E5-MS Maps List**

Continent Map	Country Map
Africa	Algeria Cameroon Egypt Ghana Ivory Coast Kenya Mali Morocco Senegal Tunisia
Asia	China India Indonesia Japan

Continent Map	Country Map
	Kuwait Malaysia Pakistan Russia Singapore Sri Lanka Taiwan Turkey UAE Vietnam
Europe	Albania Austria Belgium Bosnia Bulgaria Croatia Czech Republic Finland France Germany Greece Hungary Iceland Ireland Italy Macedonia Moldova Norway Poland Portugal Serbia Slovakia Slovenia

Continent Map	Country Map
	Sweden Netherlands Romania Spain Switzerland UK
North America	Canada Costarica Elsalvador Guatemala Honduras Jamaica Mexico Nicaragua United States
Oceania	Australia New Zealand
South America	Argentina Brazil Chile Columbia Ecuador Peru Uruguay
Others	All countries not covered in above list are shown in this map.

## Map View Features

E5-MS automatically plots EAGLE symbols on various maps; however, user needs to drag symbol to appropriate coordinates in map and save map from Custom Views on the toolbar at the top of E5-MS, then select Save Map . The symbol remains associated with the coordinates on map where it was saved.

If the System Administrator assigns a users to **Map Editing Operations**, they can save the edits.

The double clicking functionality allows the user to move from upper level map to a lower level map except for the movement from EAGLE frame view to chassis view, which is through a menu item on the EAGLE frame symbol.

**Note:** Chassis menu item limitation is as per the framework.

To navigate upwards (i.e. from lower to higher map view) user need to use the tree view. For example, while navigating from EAGLE frame map to Country map, E5-MS user uses the tree view provided in the left side of E5-MS main screen.

**Note:** Feasibility of providing single click option for navigating upwards is checked.

In World map, symbol(s) is corresponding to continent(s) and other.

In Continent map, symbol(s) is corresponding to country(s).

In Country map, symbol(s) is corresponding to EAGLE(s).

In Country map, EAGLE symbol displays city information in tool tip as configured in EAGLE Discovery GUI. (If the Inventory application is available to the user, when an EAGLE added to E5-MS operations the Update Inventory and Update Graphics is automatically scheduled as separate tasks on Schedule Management GUI. By default, Update Graphics operation is scheduled to run on 00:00 AM per day and Update Inventory are scheduled to run on 02:00 AM per day. The scheduled time can be changed by the user.)

In EAGLE frame map, symbol(s) correspond to frame(s) available for that particular EAGLE.

In Chassis View, single frame view of an EAGLE display all cards are at their appropriate location.

Inventory updates (if any) is reflected in Chassis View on re launch of Chassis View from EAGLE Frame view.

User is provided with menu items on chassis view to view alerts, events of a card, by right-clicking the card.

User is provided with menu item on chassis view to write certain editorial comments via journal menu item.

User is provided with a menu item on chassis view to view card details.

Chassis view displays last inventory update time in format DD:MM:YYYY HH:MM:SS. Inventory update time refers to following operations:

1. Update Inventory triggered from EAGLE Discovery GUI.
2. Update Graphics triggered from EAGLE Discovery GUI.
3. Modify operation performed from EAGLE Discovery GUI.
4. Scheduled EAGLE rediscovery operation performed from scheduler interface

All maps are created dynamically during the discovery process itself.

Maps is available in the tree view in the left pane for navigation purpose.

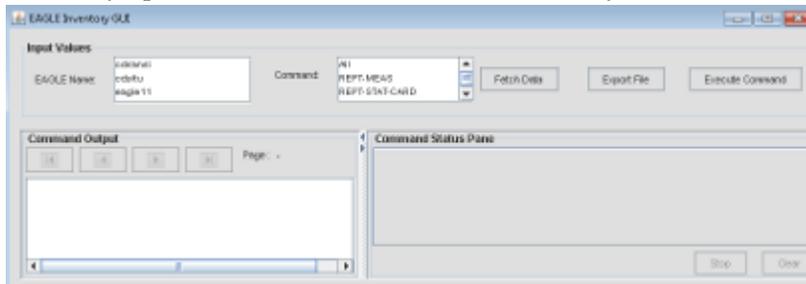
**Note:** \*- Only maps for which EAGLE discovery has been performed are available in tree and map View.

All maps and map symbols are supplied with E5-MS itself and contain static images. However, user have the option to change the map images via `ContinentZonalMap.xml` file available at `<E5-MS_HOME>/conf/tekelec`. Any modifications to specified XML file requires server restart for changes to take effect. Such changes will not apply to existing maps, all existing will have to be re-added(deleted then added)for changes to take effect.

All cards, map symbols and map images are reused from the classic EMS after converting the images to the desired format. New images if any are procured from Tekelec.

## Inventory Management

E5-MS support a GUI interface `Eagle Inventory` to view inventory files generated on Update Inventory operation. As shown in EAGLE Inventory GUI



**Figure 31: EAGLE Inventory GUI**

Authorized E5-MS user assigned `Eagle Inventory` operation from security GUI launches the `Eagle Inventory` GUI from `Tools > Eagle Inventory` menu item.

The `Eagle Inventory` GUI has two panes:

- Input Values pane
- Output pane

Input Values pane shall allow user to select EAGLE Name, Command and Fetch Data button for which data needs to be read from flat files available on server.

Output pane displays the data fetched from flat files available on server for the command selected for an EAGLE.

EAGLE Inventory GUI shall refresh list of available EAGLE(s) on selecting `Eagle Name` drop down.

EAGLE Inventory GUI shall contain a drop down for EAGLE(s) and a drop down for command name.

Selection of both the EAGLE and the command is mandatory for fetching inventory data.

EAGLE Inventory GUI fills the fetched inventory data in the Output Pane provided.

EAGLE Inventory data is exportable to a text file.

### Existing EAGLE(s)

Update Inventory operation is the interface to manually update either single or multiple EAGLE(s) complete inventory. Update Inventory operation triggered from EAGLE Discovery GUI stores data fetched from EAGLE systems in flat files. There is only one file per command per EAGLE maintained in E5-MS system. This inventory update shall overwrite existing files (if any exists).

Update Graphics operation is the interface to update inventory data (i.e. frame, shelf, slot and card) on single or multiple EAGLE systems that are required to update the graphics available in Chassis

View. Update Graphics shall run subset of Update Inventory commands. This update is pertaining to the specific EAGLE the user is fetching updates.

EAGLE Discovery GUI shall support minimum of one hundred (i.e. 100) EAGLEs that can be configured in E5-MS.

When the user clicks on existing EAGLE, configuration section of the EAGLE Discovery GUI should display all details of EAGLE.

If EAGLE Update graphics operation is successful, an E5-MS Information dialog box will appear stating Graphics updated for EAGLE <EAGLE NAME>by user <USER NAME>.

If EAGLE Update graphics operation fails, an E5-MS Error message will appear stating EAGLE <EAGLE NAME> graphics update failed! Reason: <REASON> Please resolve the issue and retry

If EAGLE Update Inventory operation is successful, an E5-MS Information dialog box will appear stating Inventory updated for EAGLE <EAGLE NAME> by user <USER NAME>.

If EAGLE Update Inventory operation fails, an E5-MS Error message will appear stating EAGLE <EAGLE NAME> inventory update failed! Reason: <REASON> Please resolve the issue and retry

**Note:** The Inventory module notifies other E5-MS management modules (like Fault, Configuration and Security etc.) of EAGLE add, modify and delete events.

## Inventory Commands

The table for Inventory Commands lists the commands that are run in the Nightly scheduled inventory for each EAGLE system.

**Table 3: Inventory Commands**

No.	For Each EAGLE System
1.	rtrv-shlf
2.	rept-stat-card
3.	rtrv-card
4.	rtrv-map
5.	rtrv-scr-aftpc
6.	rtrv-scr-blkdpc
7.	rtrv-scr-blkopc
8.	rtrv-scr-cdpa
9.	rtrv-scr-cgpa
10.	rtrv-scr-destfld
11.	rtrv-scr-dpc
12.	rtrv-scr-isup

No.	For Each EAGLE System
13.	rtrv-scr-opc
14.	rtrv-scr-tt
15.	rtrv-scr-sio
16.	rtrv-scr-scrset
17.	rept-stat-db
18.	rtrv-gpl
19.	rept-stat-gpl
20.	rept-stat-rte
21.	rept-stat-ls
22.	rtrv-ls
23.	rept-stat-slk
24.	rtrv-slk
25.	rtrv-tbl-capacity
26.	rept-meas
27.	rtrv-log
	<b>For Each EAGLE System</b>
28.	rtrv-bip
29.	rtrv-card

# Chapter 6

## Fault Management

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### Topics:

- *Overview.....65*
- *External E5-MS Applications.....65*
- *Functional Description.....65*
- *Events and Alarms Viewer .....67*
- *Alarm Correlations Rules.....69*
- *Southbound Resynchronization.....72*
- *Alarm Acknowledgement and Clear.....73*
- *Alarm Maintenance Mode.....75*
- *IPSM Switching.....76*
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- *Fault Management GUI.....78*
- *SNMP Traps.....80*
- *Alarm Reports.....83*
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This chapter provides descriptions of the functions provided by the E5-MS Fault Management Interface.

## Overview

Fault Management Interface provides an interface users can monitor multiple EAGLE systems alarm streams managed by E5-MS. The Fault Management Interface gathers the EAGLE southbound information from the EAGLE Inventory application database, if the customer has the Inventory application available. The E5-MS supports EAGLE alarms on both SNMP and TL1 southbound protocol then processes them into events. Each alarm depicts the alarm state of the EAGLE and all its sub components (i.e. frame, shelf, and card).

## External E5-MS Applications

EAGLE inventory the base for fault management module. Fault management module associates all events and alarms to managed object (i.e. eagle and its sub components) populated by inventory module, also, it displays alarms on the drill down view generated by inventory module.

A System Administrator will assign the users single or multiple operations of the Fault Management application, such as maintenance, active, resynchronization, alarm acknowledgement, unacknowledgement and clear.

## Functional Description

Fault management module can be divided into following features:

- **Alarm/Event Viewer**
  - E5-MS provides a tabular interface for displaying all events and alarms. EAGLE UAMs/SNMP traps are processed into events and added to the **Network Events** GUI then processed into alarms and displayed in the **Alarms** GUI and drill down view. Alarms represented a drill down view as follows:
    - Chassis view displays an alarm state of each card in an EAGLE frame.
    - Frame view displays an alarm state of each EAGLE frame.
    - EAGLE nodal view displays an alarm state of an EAGLE.
    - Zonal view displays an alarm state of multiple EAGLE(s) in a zone.
- **Alarm Correlation and Aggregation**
  - E5-MS fault management module applies correlation and aggregation rules ([Table 4: Alarm Correlations Rules](#)) on events to generate alarms. This ensures that all events generated shall get logically grouped to represent actual alarm state of EAGLE and its sub components.
- **Southbound Resynchronization**
  - E5-MS constructs an alarm state of managed EAGLE and its sub components (i.e. frame, shelf, card) by processing UAMs/SNMP traps, however, there are scenarios where the E5-MS is out of sync with EAGLE alarm state (for e.g. due to connection failure between E5-MS and EAGLE

etc.). To resolve the out of sync scenarios, the E5-MS has a southbound resynchronization feature which synchronizes the E5-MS with the EAGLE alarm state.

- **Alarm Acknowledgement and Clear**

- E5-MS provides the user an acknowledge or clear an alarm functionally. Both acknowledgement and clear are secured operations and only user(s) assigned with these security operations are able to perform these operations.
- Alarm acknowledgement allows a user associated with alarm for tracking and resolving of alarms. An optional email feature will send the user a notification for the alarm.
- Alarm clear operation clears an event for alarm in E5-MS; however, this does not make any changes on EAGLE.

- **Alarm Maintenance mode**

- E5-MS provides a user to put an alarm in maintenance mode. This functionality is useful when an alarm is getting generated on EAGLE at a rapid rate due to a particular failure. The flood of events at the E5-MS keep increasing the alarm count of a particular alarm till the same alarm is resolved. In such cases the user can put an alarm in maintenance mode, which drops the particular EAGLE alarm as soon as it is received on E5-MS without processing. Once the failure is resolved on the EAGLE then the user is able to get the alarm out of maintenance mode by using active mode. Alarm once the alarm is active on E5-MS it is cleared from alarms view and processed in a normal fashion.
- Maintenance and Active mode are a secured operation and only authorized users are able to perform these operations.

- **IPSM Switching**

- E5-MS provides an automatic recovery from fault interface failure when EAGLE is TL1 enabled. If the E5-MS loses connectivity to EAGLE via one of IPSM interface; the other configured IPSM on the EAGLE is used for listen for the UAM/UIM data. In this case E5-MS automatically switches between the available IPSM interfaces to maintain connectivity with EAGLE as per the algorithm stated in **IPSM Switching Algorithm**.

- **SNMP Active/Standby OAM Switching**

- E5-MS has an automatic switchover between Active and Standby OAM in case the EAGLE is SNMP enabled. If there is a switchover, the EAGLE does not have a mechanism to notify E5-MS, however, the southbound resynchronization at the E5-MS fails as the resync request is sent to current active OAM IP. In this case a southbound resync fails at E5-MS then resync request is sent to standby OAM IP. If resync is successful then the E5-MS is switched between active and standby OAM in the database, unless there is a resync failure message sent to the client.

- **Custom View**

- E5-MS shall provide provision for creating custom views which is tailored for viewing a subset of data that satisfies specific criteria. Custom views are persistent in nature and can be created by each user for both Alarms and Network Events View. E5-MS provides a right click menu option to create, modify and delete custom view as shown in Network Events and Alarm Tree Node available on left panel under Fault Management.

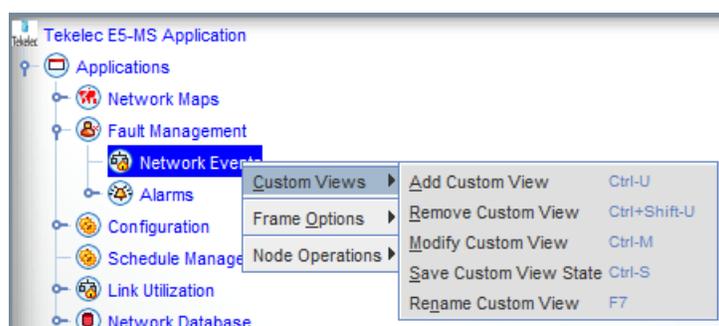


Figure 32: Network Events and Alarm Tree Node

## Events and Alarms Viewer

The Network Events and Alarms interface displays events and alarms. The EAGLE UAMs/SNMP traps, also known as events are added to **Network Events** GUI then processed into alarms and get displayed in **Alarms** GUI. Alarms represented on drill down view depicts the alarms state at each level as follows:

- Chassis view displays alarm state of each card in an EAGLE frame.
- Frame view displays alarm state of each EAGLE frame.
- EAGLE nodal view displays alarm state of an EAGLE.
- Zonal view displays alarm state of multiple EAGLE systems in a zone.

The Fault Management Interface gathers EAGLE southbound protocol information from inventory module.

## Event and Notification Details

E5-MS shall automatically trigger southbound resynchronization under scenarios listed below and corresponding resynchronization initiation events are raised along with client notifications.

### Event Details

Element	Description
Source Field	E5-MS
Sub Resource Field	<EAGLENAME>
Severity Pane	Info.
Category	Fault
Message	Initiating alarm resynchronization with EAGLE
Reason	Specified below along with each use case

## Notification Details

Initiating alarm resynchronization with EAGLE <EAGLENAME>.

Reason: Specified below along with each use case.

Automatic resynchronization Scenarios:

Scenarios	Message
On EAGLE addition	EAGLE added to E5-MS
On receipt of 'UIM 1340' for resynchronization, in case southbound protocol is TL1	Received UIM 1340 from EAGLE for alarm resynchronization
On receipt of 'resyncRequiredTrap' for resynchronization, in case southbound protocol is SNMP	Received resyncRequiredTrap from EAGLE for alarm resynchronization.
Change of EAGLE southbound protocol or protocol specific configurations	EAGLE configuration details modified by user.
On switching to next configured EMSALM terminal (if configured on other IPSM interface) in case existing EMSALM connection breaks	Connection established on EMSALM port <EMSALMPORT> on IPSM IP <IP ADDRESS>.
On receipt of heartbeat once fault interface for an eagle is down, in case southbound protocol is SNMP	Regaining connection.
On warm start of server	Warm start of server.
E5-MS shall send automatic resynchronization operation status notifications to all active E5-MS clients	Automatic Alarm resynchronization completed for EAGLE <EAGLENAME>.

## Failure of Automatic Resynchronization

In case of failure of automatic resynchronization for an EAGLE an event will occur and notifications are sent to all active E5-MS clients. Event details are as follows:

Fields	Description
Source	E5-MS
Sub resource	<EAGLENAME>
Category	Fault

Fields	Description
Severity	INFO
Message	Automatic resynchronization failed for EAGLE.

If a notification is sent to client the message would be Alarm resynchronization failed for EAGLE: <EAGLENAME>.

### Automatic Resynchronization

E5-MS shall trigger resynchronization on active OAM in case SNMP FAK is enabled on EAGLE. If resynchronization fails on active OAM then E5-MS shall automatically trigger resynchronization on standby OAM as configured during EAGLE Add operation on EAGLE Discovery GUI. If resynchronization gets successful then active and standby OAM are switched at E5-MS, else an error message Alarm resynchronization failed for EAGLE: <EAGLENAME> are displayed to user. Event details are as follows:

Fields	Description
Source	E5-MS
Sub resource	<EAGLENAME>
Category	Fault
Severity	INFO
Scenario and message	<ul style="list-style-type: none"> <li>Switching completed successfully: - Switched to standby OAM IP &lt;New Active OAM IP&gt; from &lt;NEW Standby OAM IP&gt; for EAGLE.</li> <li>Switching detected but OAM not updated at E5-MS: - Switching of Active/Standby OAMs detected but data not updated. Reason: DB operation failed</li> </ul>

**Note:** This functionality are applicable in case EAGLE supports SNMP at southbound for fault management.

### Alarm Correlations Rules

To ensure all events are generated in a logical group to represent the alarm state of the EAGLE and its sub components, the FMI applies correlation and aggregation rules on events to generate alarms. As shown in the table Alarm Correlations Rules below

Table 4: Alarm Correlations Rules

Step #	Step	Severity	Resource	SubResource	Behavior on Alarms	Behavior on Network Events	Alarm Entry in database
1	Send Minor Alarm with Resource as A and SubResource as B	Minor	A	B	New Minor alarm is displayed in Alarms (count is 1, severity is Minor, previous severity is Clear).	New Minor event is displayed in Network Events (count is 1, severity is Minor).	New entry in database for this minor alarm (count =1, Severity is minor, Previous severity is Clear).
2	Send Major Alarm with Resource as A and SubResource as B	Major	A	B	Minor alarm (step1) is replaced by Major alarm (count is reset to 1, severity is major, previous severity is Minor).	New Major event displayed in Network events (count is 1, severity is Major), while the old Minor event is still visible.	Update existing alarm entry in database for resource, sub resource combination. Updated alarm is(count =1, Severity=major, Previous severity=minor).
3	Send <u>SAME</u> Major Alarm with Resource as A and SubResource as B	Major	A	B	Old Major alarm (step2) is replaced by new Major alarm (count is incremented to 2, severity is major, previous severity is Minor).	New major event displayed in Network events with count = 1 and severity = Major.	Update existing alarm entry in database for this major alarm (count =2, Severity=Major, Previous severity=Minor).
4	Send Minor Alarm with Resource as A and SubResource as B	Minor	A	B	Major alarm (step3) is replaced by new Minor alarm (count is set to 1, severity is Minor, previous	New Minor alarm is displayed in Network Events (count is 1;	Update existing alarm entry in database for this minor alarm (count =1, Severity=Minor,

Step #	Step	Severity	Resource	SubResource	Behavior on Alarms	Behavior on Network Events	Alarm Entry in database
					severity is Major).	severity is Minor while the old Minor (step1) and major event (step2, step 3) are still visible.	Previous severity=Major).
5	Send <u>Same</u> Minor Alarm with Resource as A and SubResource as B	Minor	A	B	Minor alarm (step4) is replaced by new Minor alarm (count is incremented to 2, severity is Minor, previous severity is Major).	New minor event displayed in Network events with count = 1 and severity = Minor.	Update existing entry in database for this minor alarm (count =2, Severity=Minor, Previous severity=Major).

### Alarm Correlation and Aggregation

An EAGLE aggregated alarms are child managed object(s) to reflect the status of parent managed object as follows:

Parent MO alarm status = max [max(Child MO alarm(s)), parent MO alarms(if any) ]

#### Aggregation Details

The aggregation details work as follows:

- Zonal alarm is the max of all EAGLE alarms that exist in that zone.
- EAGLE alarm is the max of all frame alarms that are configured for that EAGLE and EAGLE alarms.
- EAGLE frame alarm is the max of all card alarms for that frame and EAGLE Frame alarms.

The EAGLE events in the Network Events screen are linked to the alarms referenced in **link to Alarm Correlation Rules**

## Southbound Resynchronization

E5-MS manages the alarms status of the EAGLE and its sub components (i.e. frame, shelf, card) by processing UAMs/SNMP traps. There are cases when the E5-MS gets out of sync with EAGLE alarm state (for e.g. due to connection failure between E5-MS and EAGLE etc.). To handle such cases, E5-MS has a southbound resynchronization feature which gets E5-MS in sync with EAGLE alarm state.

The southbound resynchronization functionality is performed on multiple EAGLE systems simultaneously regardless of the southbound protocol (i.e. SNMP or TL1). The E5-MS user resynchronizes the southbound resynchronization both manually and automatically facility clicking the **RESYNC** button from the EAGLE Discovery tool, as mentioned in Inventory Chapter....

### Buffer Incoming UAM Details

E5-MS buffers incoming UAMs for an EAGLE for which southbound resynchronization has been initiated in case southbound protocol is TL1.

**Note:** In case of SNMP, buffering happens at EAGLE end itself.

### Location of Buffered Southbound Resynchronization

E5-MS buffers configurable number be named as `QUEUE_MAX_SIZE` at file location `/Tekelec/WebNMS/conf/tekelec/fault.properties` (4 Alarms/sec for 20 minutes per EAGLE = 5000 alarms) of EAGLE alarms during southbound resynchronization. If number of alarms cross the buffer size then buffer is overwritten and a 'Warning' alarm is raised with following properties:

Fields	Description
Source	E5-MS
Sub resource	AlarmMemory<EAGLENAME>
Category	Fault
Severity	Warning
Scenario and message	Buffer overflows during southbound resynchronization for EAGLE: <EAGLE NAME>.This could result in loss of alarms.

**Note:** If SNMP, buffering happens at EAGLE end itself. The buffer value is further fine tuned during performance testing.

E5-MS shall randomly select any available IPSM terminal as RESYNC terminal for fetching EAGLE alarm(s) snapshot using TL1 protocol. If no terminals are available on EAGLE for RESYNC then a failure message Southbound resynchronization failed for EAGLE: <EAGLE NAME>!Reason: Terminal not available on EAGLE to perform 'RESYNC'. Please resolve the issue and try again.

## Alarm Acknowledgement and Clear

Alarm acknowledgement and clear alarm functions are secured functions that a System Administrator assigns the users the **Alert Pickup** security operation.

Alarm acknowledgement is an interface a user associates an alarm for tracking and resolving. An email notification is sent to the assigned user.

Alarm clear operation clears the alarm in E5-MS; however it does not make any changes on EAGLE.

### Alarm Acknowledgement

On alarm acknowledgement operation, alarm are updated with the user name (i.e. alarm owner field is updated with user name that is assigned) and acknowledged timestamp (i.e. AckDate) in database. The following event is generated on acknowledging an alarm:

Fields	Description
Source	<Alarm Source>
Sub resource	<Alarm Subresource>
Category	Fault
Severity	INFO
Scenario and message	<p>Success Scenario:</p> <p>Alarm acknowledged for user <b>&lt;User to whom alarm is assigned&gt;</b> by <b>&lt; User who assign alarm &gt;</b></p> <p>Failure scenarios :</p> <ul style="list-style-type: none"> <li>Invalid User: Alarm acknowledgement operation failed for user <b>&lt;User to whom alarm is assigned &gt;</b> by <b>&lt;User who assigned alarm&gt;</b>. Reason: <b>&lt;User to which alarm is assigned&gt;</b> is invalid user.</li> <li>Disabled user: Alarm acknowledgement operation failed for user <b>&lt;User to whom alarm is assigned &gt;</b> by <b>&lt;User who assigned alarm&gt;</b>. Reason: <b>&lt;User to which alarm is assigned&gt;</b> is disabled user.</li> </ul>

### Email Alarm Acknowledgement

An optional feature of the Fault Management Interface is an Alarm Acknowledgement email sent to the user assigned to the alarm. Email id of E5-MS user and mail server configurations are picked from database.

## Alarm Unacknowledged

If the user does not acknowledge the alarm associated with the username, the alarm will be removed from the data base (i.e. alarm owner field and AckDate is reset). The following event is generated:

Fields	Description
Source	<Alarm Source>
Sub resource	<Alarm Subresource>
Category	Fault
Severity	INFO
Scenario and message	Success Scenario: Alarm unacknowledged by user <Username>. Failure scenario: Alarm unacknowledged operation failed for user <User who unassign alarm>

## Email Alarm Unacknowledged

As an optional feature of the Fault Management Interface is an Alarm Unacknowledged email sent to the user assigned to the alarm. The email id of E5-MS user and mail server configurations are picked from database.

## Alarm Clear Event

Clear Alert operation is available to only authorized E5-MS users having **Clear Alerts** security operation assigned.

The Alarm Clear event function provides the following event is generated:

Fields	Description
Source	<Alarm Source>
Sub resource	<Alarm Subresource>
Category	Alarm Category
Severity	Clear
Scenario and message	<ul style="list-style-type: none"> <li>Manual Clear: - Alarm cleared by E5-MS user &lt;USERNAME&gt;.</li> <li>Automatic Clear: - Alarm cleared by E5-MS.</li> <li>Maintenance Alarm changed to Active mode message - Maintenance alarm cleared by E5-MS user &lt;USERNAME&gt;.</li> <li>Buffer overflow alarm clear message - Buffer overflow alarm cleared by E5-MS.</li> </ul>

**Note:** Alarm clear operation triggered from E5-MS does not send any notification to corresponding EAGLE.

To clear the alarm (Edit > Clear Alerts). If there is a failure, an error message stating Alarm acknowledgement operation failed for Resource: <RESOURCE> and Sub resource: <SUBRESOURCE>! Reason: <REASON> Please resolve the issue and try again. will pop up on the screen.

## Alarm Maintenance Mode

The **Maintenance** mode function is available to authorized E5-MS users assigned by a System Administrator.

An alarm can be put in a **Maintenance** mode by the user when an alarm is generated by the EAGLE at a rapid rate due to a particular failure. To prevent the events from flooding the E5-MS, the user would put the alarm in **Maintenance** mode. This function is for a particular alarm to drop as soon as it is received on E5-MS without processing. Once the failure scenario gets resolved on EAGLE then user can put the alarm out of **Maintenance** mode by using **Active** mode functionality. Once the alarm is active on E5-MS it is cleared from alarms view and processed as normal.

The alarms in **Maintenance** mode alarm severity is highlighted in grey color.

### Setup Alarm in Maintenance Mode

The alarm severity is set in the maintenance mode then all events received at the E5-MS corresponding the set alarm are dropped without processing. The following event is generated to put the alarm in maintenance mode:

Fields	Description
Source	<Alarm SOURCE>
Sub resource	<Alarm SUBRESOURCE>
Severity	Maintenance
Message	Error message: Alarm set to maintenance by user <USER NAME>

Notification such as Alarm maintenance operation failed for all/some alarms! Please try again. is sent to user in case of a failure of the Maintenance operation.

**Note:** This is only available to authorized E5-MS user assigned security operations Maintenance and Active mode.

### Setup Alarm in Active Mode from Maintenance Mode

This is only available to authorized E5-MS user assigned security operations **Maintenance** and **Active** mode.

Once the alarm is set to active mode from maintenance mode all events are processed as normal. The following event is generated to put the alarm in active mode:

Fields	Description
Source	<Alarm SOURCE>
Sub resource	<Alarm SUBRESOURCE>
Severity	Clear
Message	Error message: Maintenance alarm cleared by E5-MS user <USER NAME>

To set the alarm to **Active** mode click (View > Maintenance and View > Active)

Notification such as Alarm maintenance operation failed for all/some alarms! Please try again. is sent to user in case of a failure of the Active operation.

## IPSM Switching

E5-MS provides an automated mechanism to recover from fault interface failure in case EAGLE is TL1 enabled. If E5-MS loses connectivity to EAGLE via one of IPSM interface another IPSM can be configured on EAGLE that is used for listening UAM/UIM data.

### IPSM Switching Algorithm

IPSM switching is required in Fault module to ensure automated recovery once the existing Fault interface breaks between E5-MS and EAGLE.

1. On EAGLE addition via inventory module, Fault module automatically connects to EAGLE IPSM interface on EMSALM port to receive UAM's/UIM's.
  - a. Order of connection to IPSM interface is IPSM1, IPSM2 and then IPSM3 as configured on EAGLE Discovery GUI.
2. As soon as first EAGLE gets added to E5-MS a fault scheduler gets started. This scheduler runs at one second interval to check E5-MS Fault interface connectivity to all EAGLE(s).
3. Fault interface between E5-MS and EAGLE is assumed connected; if UIM 1083 gets received at every 15 minutes interval, it is assumed to be down. Specified interval is configurable.
4. In case fault interface gets down then IPSM switching is done as per the below mentioned procedure:
  - a. Case 1:- E5-MS is able to make session to IPSM card on EMSALM terminal
    - a. If UIM 1083 is not received in 15 minutes, raise an alarm. Refer '**Alarm raising rule**.'
    - b. Break the existing connection.
    - c. Recreate session with EAGLE.
      - a. If only one IPSM is available it is tried again.
      - b. If more IPSM are available then next configured IPSM is tried. Next IPSM is chosen from the set of available IPSM before the current one is retried. If set has two IPSM (i.e. if 3 IPSM are configured) then they are chosen in increasing order. For e.g. if connection was

braked with IPSM3 then IPSM1 is tried before IPSM2. If the connection can't be established with IPSM1 and IPSM2 then IPSM3 is tried again.

- c. Automatic Resync gets performed with EAGLE.
- d. Wait for UIM 1083 for 15 minutes again and go to step a.
- b. Case 2: E5-MS is not able to make session to any IPSM card on EMSALM terminal
  - a. E5-MS can't connect to IPSM
  - b. Wait for 15 minutes (i.e. inactive for that time).
  - c. Raise an alarm, refer 'Alarm raising rule'.
  - d. Retry connection with configured IPSMs.
    - a. If only one IPSM is configured then it is tried again.
    - e. If 2 or more IPSM are available then the next configured IPSM is tried before the current one which is IPSM1.
    - f. If connection gets established then wait for UIM 1083 for 15 minutes or if connection can't be established with any configured IPSM go to step a.
5. If UIM 1083 gets received in configured interval (i.e. 15 minutes) then following steps are performed:
  - a. Clear alarm gets raised. Alarm Details is as shown in

Source	E5-MS
Sub Resource	<EAGLENAME>
Severity	Clear
Message	Fault interface is up

## Alarm Raising Rule

1. Number of warning alarms are equal to number of IPSMs configured for that Eagle. Critical alarm is generated thereafter (i.e. count of alarm shall keep incrementing).
2. Warning Alarm Details:

Source	E5-MS
Sub Resource	<EAGLENAME>
Severity	Warning
Message	Connection failure detected on EMSALM <EMSALM> on IPSM IP <IPSM IP>

**Note:** In case E5-MS is unable to make connection to any configured IPSM IP on EMSALM terminal then in the above message IPSM IP and EMSALM port is of the IPSM1 IP for the first time on eagle addition to initiate switching.

3. Critical Alarm Details:

Source	E5-MS
--------	-------

Sub Resource	<EAGLENAME>
Severity	Critical
Message	Cannot connect to EAGLE for receiving alarms

**Note:** In case of critical alarm notification to user shall also be sent every time critical alarm gets raised with following message E5-MS cannot connect to EAGLE: <EAGLENAME> for receiving alarms! Please check the connection.

## Limitation

As specified in algorithm step 2, Fault scheduler kicks off as soon as first EAGLE gets added, however, session creation to EAGLE at EMSALM may take some time. In this case there can be a scenario when though heartbeat is sent by EAGLE but not received at E5-MS during configured time interval due to which an alarm may get raised even though the connectivity is working fine. This scenario has an impact only for first time and not afterwards as the E5-MS shall then get sync up with EAGLE heartbeat received time and shall check at appropriate time afterwards.

## SNMP Active/Standby OAM Switching

E5-MS provides an automated mechanism to switch over between Active and Standby OAM in case EAGLE is SNMP enabled. If there is a switch over between active and standby OAM, the EAGLE does not have a mechanism to notify E5-MS about the switch over. The E5-MS fails the resynchronization request sent to current active OAM IP. After the southbound resynchronization fails, a resync is sent to the new active OAM IP. At the successful resynchronization the E5-MS switches between active and standby OAM in database then resync failure message is sent to client.

## Fault Management GUI

E5-MS provides two GUIs for displaying **Network Events** and **Alarms** available on left panel as tree node under **Fault Management**.

### Network Events and Alarms Screens

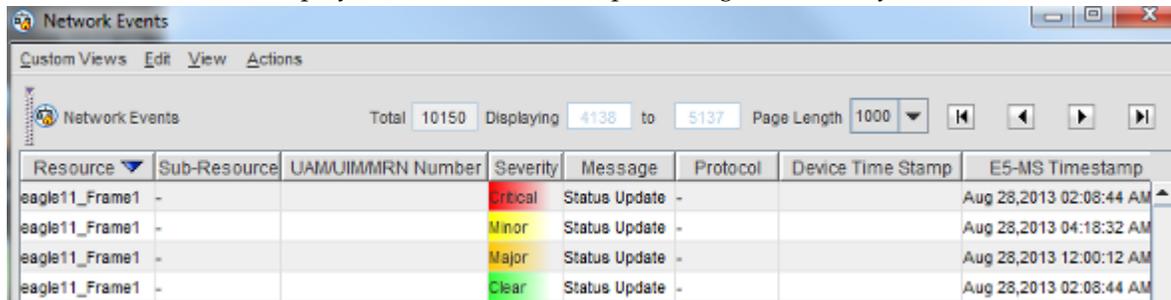
The **Network Events** and **Alarms**, screens are accessed from the **Fault Management** tree node on the left panel of the E5-MS.



Figure 33: Fault Management Tree Node

## Network Events

**Network Events** GUI displays the historical events pertaining to EAGLE system.



The screenshot shows a window titled 'Network Events' with a menu bar (Custom Views, Edit, View, Actions) and a toolbar. Below the toolbar, it displays 'Total 10150', 'Displaying 4138 to 5137', and 'Page Length 1000'. The main content is a table with the following data:

Resource	Sub-Resource	UAM/UIM/MRN Number	Severity	Message	Protocol	Device Time Stamp	E5-MS Timestamp
eagle11_Frame1	-		Critical	Status Update	-		Aug 28,2013 02:08:44 AM
eagle11_Frame1	-		Minor	Status Update	-		Aug 28,2013 04:18:32 AM
eagle11_Frame1	-		Major	Status Update	-		Aug 28,2013 12:00:12 AM
eagle11_Frame1	-		Clear	Status Update	-		Aug 28,2013 02:08:44 AM

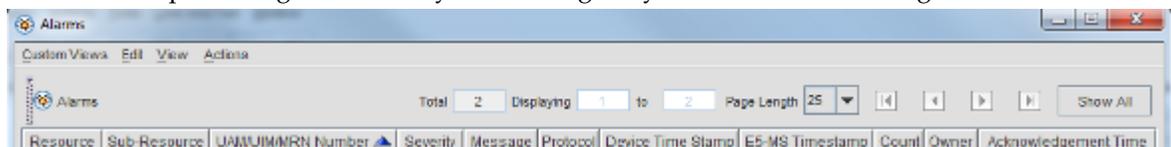
**Figure 34: Historical Network Events**

The Network Events display the following fields:

- Resource
- Sub-Resource
- UAM/UIM/MRN Number
- Severity
- Message
- Protocol
- Device Timestamp
- E5-MS Timestamp

## Alarms

**Alarms** GUI displays alarms from EAGLE system after applying correlation rules. This view displays active alarms pertaining to EAGLE system managed by E5-MS as shown in Figure



The screenshot shows a window titled 'Alarms' with a menu bar (Custom Views, Edit, View, Actions) and a toolbar. Below the toolbar, it displays 'Total 2', 'Displaying 1 to 2', and 'Page Length 25'. The main content is a table with the following data:

Resource	Sub-Resource	UAM/UIM/MRN Number	Severity	Message	Protocol	Device Time Stamp	E5-MS Timestamp	Count	Owner	Acknowledgement Time

**Figure 35: Alarms Pane**

The Alarms display the following fields:

- Resource
- Sub-Resource
- UAM/UIM/MRN Number
- Severity
- Message
- Protocol
- Device Timestamp
- E5-MS Timestamp
- Count
- Owner

- Acknowledgement Time

**Network Events** and **Alarms** GUIs support paging, sorting and searching functionality to help a user quickly browse through the records. Following search criteria is supported in Network Events/ Alarms GUI:

- Severity
- Resource
- Sub-Resource
- Message
- Event/Alarm ID
- Device Timestamp
- E5-MS Timestamp

The users functionality of **Add/Remove/Modify** custom views. **Custom Views** are used to filter the views of **Alarms** and **Network Events** GUI based of following criteria:

- Severity
- Resource
- Sub-Resource
- Message
- Event/Alarm ID

The user creates a custom view by right clicking **Network Events** or **Alarms** tree node available on left panel under **Fault Management**.

Fault management provides an interface to query events database. It allows querying database based on date, time, event type, severity, resource, sub-resource, text and UAM number.

## SNMP Traps

The Fault Management monitors EAGLE alarms at a rate (4 Alarms/sec/EAGLE) at which each EAGLE in a network sends alarms. E5-MS fault management module supports both TL1 and SNMP southbound interfaces simultaneously.

**Note:** Through this requirement, E5-MS is able to support a network where some EAGLEs are SNMP enabled and some are not.

E5-MS fault management module gathers EAGLE southbound protocol information from inventory module. E5-MS listens to SNMP traps and process them into events in case southbound protocol is SNMP.

E5-MS listens to UAMs and UIMs: resynchronization required) and process them into events in case southbound protocol is TL1.

E5-MS buffers EAGLE UAMs/SNMP traps per EAGLE before processing them into event to prevent loss of UAM/trap. Buffer size is configurable; however, it defaults to 5000 alarms/EAGLE (i.e. 4 Alarms/sec for 20 minutes). In case number of alarms cross the buffer size then buffer is overwritten and a 'Warning' alarm is raised with the following properties:

- Source = E5-MS
- SubResource = AlarmMemory\_<EAGLENAME>
- Category = Fault

- Severity - Warning
- Message :
  - During Resync: - Buffer overflows during southbound resynchronization for EAGLE: <EAGLENAME>.This could result in loss of alarms
  - During UAM Processing: - Buffer overflows during UAMs/traps processing for EAGLE: <EAGLENAME>.This could result in loss of alarms.

**Note:** Buffer value is further fine tuned during performance testing

E5-MS listens for traps from multiple EAGLE(s) at configured trap port. E5-MS listens to UAMs and UIMs received on EMSALM terminal configured by user in case southbound protocol is TL1. E5-MS makes connection to EAGLE EMSALM terminal on successful EAGLE discovery and connection is terminated on deletion of EAGLE from E5-MS inventory. E5-MS fault management module receives EAGLE modification event from inventory module will validate if EMSALM terminal it's listening for UAMs exists or not. In case it doesn't exist then existing connection with the EMSALM terminal is destroyed and new connection is constructed.

**Note:** This functionality is applicable in case EAGLE supports TL1 at southbound for fault management and not SNMP.

E5-MS fault management module listens for 'UIM 1083: System alive' at configured interval (default being 15 minutes) to verify EMSALM connection for a TL1 EAGLE. In case specified UIM is not received for configured interval then E5-MS performs following steps:-

1. Case 1:- E5-MS is able to make session to IPSM card on EMSALM terminal
  - a. If UIM 1083 is not received in 15 minutes, raise an alarm. Refer 'Alarm raising rule' in [IPSM Switching Algorithm](#).
  - b. Destroy the existing connection.
  - c. Recreate session with the EAGLE.
    - a. If only one IPSM is available, is tried again.
    - b. If more IPSM are available then the next configured IPSM is tried. Next IPSM is chosen from the set of available IPSM before the current one is retried. If set has two IPSM (i.e. if 3 IPSM are configured) then they are chosen in increment order. For e.g. if connection was destroyed with the IPSM3 then IPSM1 is tried before the IPSM2. If the connection can't be established with the IPSM1 and IPSM2 then IPSM3 is retried.
    - c. Automatic resynchronization gets performed with the EAGLE.
    - d. Wait for UIM 1083 for 15 minutes again and continue as mentioned in Step a.
2. Case 2: E5-MS is not able to make session to any IPSM card on EMSALM terminal
  - a. E5-MS cannot connect to IPSM.
  - b. Wait for 15 minutes (i.e. inactive for that time).
  - c. Raise an alarm, refer 'Alarm raising rule' in [IPSM Switching Algorithm](#).
  - d. Retry connection with configured IPSMs.
    - a. If only one IPSM is configured then same is retried.
  - e. If 2 or more IPSM are available then the next configured IPSM is tried before the current one which in this case is IPSM1.
  - f. If connection get established then wait for UIM 1083 for 15 minutes else if connection cannot be established with any configured IPSM continue from to step a.

If UIM 1083 is received in configured interval (i.e. 15 minutes) then Clear alarm is raised to clear any IPSM switching alarm, if one exists in E5-MS for that EAGLE.

Following alarms are raised during IPSM switching as per 'Alarm Raising rule' mentioned in [IPSM Switching Algorithm](#):

- Source = E5-MS
- SubResource = <EAGLENAME>
- Category = Fault

Messages and severity:

- Warning Alarm:- Connection failure detected on EMSALM <EMSLAM PORT> on IPSM IP <IP ADDRESS>.
- Critical Event: - Cannot connect to EAGLE for receiving alarms.
- Info event message to try on IPSM for new connection: - Trying to connect to EMSALM <EMSALM PORT> on IPSM IP <IP Address>
- Connection establishment INFO message: - Connection established on EMSALM <EMSALM PORT> on IPSM IP <IP Address>.

E5-MS notifies all active E5-MS client sessions about fault interface failure the message E5-MS cannot connect to EAGLE: <EAGLE NAME> for receiving alarms! Please check the connection. to the EAGLE in case a Critical alarm is raised.

Clear alarm details is as follows:

- Source = E5-MS
- Sub resource = <EAGLENAME>
- Severity = Clear
- Message = Fault interface is up.

**Note:** This functionality is applicable in case EAGLE supports TL1 at southbound for fault management and not SNMP.

E5-MS fault management module listens for 'heartbeat Trap' at configured interval (default being 15 minutes) to verify SNMP EAGLE fault management interface.

If a specified trap is not received for configured interval, then a warning alarm is raised first followed by Critical alarm after each time configured interval lapses. E5-MS shall notify all active E5-MS client sessions about fault interface failure the message

E5-MS cannot connect to EAGLE: <EAGLE NAME> for receiving alarms! Please check the connection. to EAGLE in case a Critical alarm is raised.

If heartbeat gets received in configured interval (i.e. 15 minutes) then Clear alarm gets raised to clear any IPSM switching alarm, if one exists in E5-MS for that EAGLE.

E5-MS stores events and alarms in database and allows access to historical information (i.e. events). At maximum E5-MS database provides access to 30 million network event records. E5-MS Network Event GUI provides access to latest 10000 event records only. Complete database events is accessible via reporting tool.

E5-MS automatically cleans up events older than 31 days or if number of events in database crosses the limit of 30 million.

E5-MS provides an interface an option to archive historical events into dump files and clean up database. User can schedule archival and clean up via E5-MS scheduler interface as per his convenience.

E5-MS logs all fault management logs in a separate log file. E5-MS fault management application and database supports a minimum of 200 entries per second (i.e. 200 TPS).

## Alarm Reports

E5-MS shall provide a reporter interface for generating fault management reports.

E5-MS fault management module shall support following reports:

- Daily-Alarm-Totals - contains an aggregate number of alarms for any day within a selected date/time range.
- Audit-Trail-Report - report for auditing alarms
- Maintenance-Mode-History - contains the resources that were placed in maintenance mode within a selected date/time range, and the amount of time each resource remained in this mode.
- Most-Active-Alarmed-Resources - contains the top ten alarms occurring in the network within a selected date/time range for selected resources.
- Alarms-Durations - contains the time (in seconds) that a resource(s) was in an alarm state within a selected date/time range.
- Alarm-History - contains alarms that occurred for selected resources in the network.
- Alarm-Severities - contains percentages of each severity level that occurred within a selected date/time range for selected resources.

## Security Operations

Fault management module shall introduce following new operations in E5-MS:

1. Alarm Acknowledgement operation > **Alert Pickup**.
2. Alarm Clear operation > **Clear Alerts**.
3. Maintenance and Active operation > **Maintenance and Active**.
4. EAGLE Alarm Resynchronization operation > **Eagle Resync**.

## Measurements Module

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### Topics:

- *Overview.....85*
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- *DataBase Tables.....89*
- *Measurement Northbound FTP Module.....91*
- *File Transfer.....92*
- *Report Types Supported by Measurement Platform Module.....93*

The chapter provides descriptions of the feature and functions of the E5-MS Measurements Module. As an interface with the EAGLE Measurement Platform, it processes the measurement files then loads them into a Data Base (DB). This data is compiled to build reports and/or measurement thresholds based alarms.

## Overview

E5-MS Measurements Platform module is used for parsing and management of EAGLE's performance data. The E5-MS Measurements FTP module parses the measurement files to northbound servers using FTP protocol. Measurement platform module is a core part of the license issued for E5-MS. No separate key is needed for it. However, E5-MS Measurements FTP module is licensed and a license must be purchase to use this feature.

## Functional Description

Measurement module manages the measurement CSV files received from all managed EAGLE(s). Support of OAM measurements is not be provided.

All the log messages generated by Measurement platform module are captured in a log file `measurement.txt`. The Measurement module log file is present under `/var/E5-MS/measurement/logs` directory.

Directories used by Measurement platform module i.e. input and output directories exist on the system before the module starts. The E5-MS to create them during installation. The path for input directory is `/root/E5-MS/measurement/csvinput` and path for output directory is `/var/E5-MS/measurement/csvoutput`.

- The Measurement platform module during startup will first verify the existence of `tekelec_meas_headers` table in E5-MS database and a the log message (refer to message 1 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- After verification of `tekelec_meas_headers` table, Measurement platform module verifies the existence of `tekelec_meas_reports` table in the E5-MS database a the log message (refer to message 2 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- After verification of `tekelec_meas_headers` table and `tekelec_meas_reports` tables, the Measurement platform module verifies whether the data (measurement report types and corresponding database tables) required in `tekelec_meas_reports` table is available. If the data is filled, it logs the messages of all the measurement report types supported and their corresponding database tables (refer to message 3 in the [Log Message List](#)). If the data is not available, then it logs the message (refer to message 4 in the [Log Message List](#)).
- The Measurement platform module scans the input directory (`/root/E5-MS/measurement/csvinput`) for measurement report files received from Eagle(s). While scanning, log message (refer to message 5 in the [Log Message List](#)) is written in the log file `measurement.txt`. If no measurement report files are found in the input directory (`/root/E5-MS/measurement/csvinput`) or the module finished the parsing of all the previous measurement report files, it sleeps for a fixed time interval and an log message (refer to message 6 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- The sleep interval (in seconds) used by Measurement platform module is configured using a configuration file `/Tekelec/WebNMS/conf/tekelec/common.config` by System Administrator. The parameter for it shall be `measSleepInterval` and by default, the interval is 30 seconds. Any change in the sleep interval by administrator is effective after the E5-MS server restarts.
- Any non CSV file found in input directory (`/root/E5-MS/measurement/csvinput`) is moved to directory `others` in output directory (`/var/E5-MS/measurement/csvoutput`) without

processing. The log message (refer to message 7 and 8 in the [Log Message List](#)) are written in the log file `measurement.txt`.

- Any empty measurement report file found in input directory (`/root/E5-MS/measurement/csvinput`) is moved to directory `others` in output directory (`/var/E5-MS/measurement/csvoutput`) and a log message (refer to message 8 and 10 in the [Log Message List](#)) are written in the log file `measurement.txt`.
- If the measurement report file found in input directory (`/root/E5-MS/measurement/csvinput`) is not supported (refer to supported report types in **Table Report Types Supported** by Measurement Platform Module by the module, it is moved to directory `others` in output directory (`/var/E5-MS/measurement/csvoutput`) without processing, and a log message (refer to message 8 and 11 in the [Log Message List](#)) are written in the log file `measurement.txt`.
- If the measurement report file found in input directory (`/root/E5-MS/measurement/csvinput`) is supported by the module, a log message (refer to message 12 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- The Measurement module does not support the 5-minute measurements file. If a file is found in input directory (`/root/E5-MS/measurement/csvinput`), it is deleted from the system.
- The Measurement platform module replaces the peg name in case of parsing any reports with peg names shall take care of peg name replacement in case of parsing any reports having such peg names.
- The Measurement platform module creates the database table for a report type if it does not exist. The log message (refer to message 13 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- If the measurement report file found in input directory (`/root/E5-MS/measurement/csvinput`) is non-empty and is supported (refer to supported report types in **Table Report Types Supported** by Measurement platform module, then the module parses it and inserts the data in database. The log message (refer to message 15 in the [Log Message List](#)) are written in the log file `measurement.txt`.
- After parsing of a valid (non-empty and supported) measurement report file, it is moved to an appropriate sub-directory under output directory (`/var/E5-MS/measurement/csvoutput`).
  - If a CLLI name is found in report file, the sub-directory is named as CLLI. The log message (refer to message 9 in the [Log Message List](#)) are written in the log file `measurement.txt`.
  - If a CLLI name is not found in report file, the sub-directory is `others` and log message (refer to message 8 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- Measurement platform module expands an existing database table for creation of new columns in case new measurement pegs are added to an existing measurement report file. In such case, a log message (refer to message 14 in the [Log Message List](#)) is written in the log file `measurement.txt`.
- All the measurement files in output directory (`/var/E5-MS/measurement/csvoutput`), which are older than 'n' days, are archived in a compressed version (`tar.bz2` format) and then the original files is be removed. Here 'n' is the value of the parameter 'Days, directories older than is archived' in `tekelecMeasArchiveCleanupConfig.txt` file placed in `/Tekelec/WebNMS/bin/scripts/measurement/` directory. By default, value of 'n' is 2 and the admin is able to update the value as required.
- All the archive files in output directory (`/var/E5-MS/measurement/csvoutput`), that are older than 'n' days, are removed from system. Here 'n' is the value of the parameter 'Days, archived files older are deleted' in `"tekelecMeasArchiveCleanupConfig.txt"` file placed in `"/Tekelec/WebNMS/bin/scripts/measurement/"` directory. The default, value of 'n' is 30 and the admin is able to update the value as required.
- The Measurement data in various database tables that is older than 'n' days are dropped, where 'n' is the number of days mentioned in `"tekelecMeasDBCleanupConfig.txt"` configuration

file for various tables. This configuration file is present under `/Tekelec/WebNMS/bin/scripts/measurement` directory and the admin is able to update the values as required. Any change to the file is effective from the next time when database cleanup script is run.

- The E5-MS software installation is customer friendly and executable. The Measurement file collection and DB storage feature is a core function of E5-MS and is installed together with all other core applications.

## DataBase Overview

The E5-MS Measurement platform is depend on the following two database tables:

1. Table `tekelec_meas_headers` - This table stores the reporting data related to the CLLI (name of the EAGLE), software release (release on EAGLE), report date (date of the report), report time (time of the report), report type (measurement report type), time zone etc. of a measurement report.
2. Table `tekelec_meas_reports` - This table is used to store the report types of Measurement files supported, their corresponding database tables names and number of days after the table is pruned.

These database tables are created during the installation of E5-MS.

The EAGLE(s) connected to E5-MS are configured to FTP their measurement files (CSV files) into a particular location, such as input directory i.e. `/root/E5-MS/measurement/csvinput`, on the E5-MS server. E5-MS Measurement platform module scans the input directory (`/root/E5-MS/measurement/csvinput`) for incoming measurement report files, parse the report files found, insert the measurement data into E5-MS database and move the processed report files to their appropriate place in the output directory (`/var/E5-MS/measurement/csvoutput`). In output directory, a measurement file is placed under a sub-directory named after the CLLI mentioned in the file. In case, the value of CLLI is not available, it is moved to `others` directory in output directory (`/var/E5-MS/measurement/csvoutput`). The different database tables required for different report types (as defined in `tekelec_meas_reports` table) are created by the module when the module finds a report type for the first time. Each measurement peg name in the report is used to create a column with the same name in the table. Once the database table for a particular report type is created, the module inserts the measurement data from all the future reports of same type in the same table.

While creating columns in a database table for a report, there can be an issue because of long measurement peg names resulting in an error while column creation because of MySQL's limit on the width of column names.

To handle this issue, a configuration file `/Tekelec/WebNMS/conf/tekelec/tekmeas.conf` is provided which has the report type, original peg name and its replacement name to be used while creating the following column: `Report Type=<Report type whose counter needs to be renamed in DB>` `<Original measurement peg name in the report>=<Replacement peg name to used while column creation in DB>`, as shown in this example:

- For report **DAILY MAINTENANCE MEASUREMENTS ON GTTACTION PER-PATH**
  - Wide columns - `PATH-CDSN-SCDGTA-CGSN-CGGTA-OPSN-PKG-OPCODE-<A>/F = Short columns - PN_DS_SD_GS_SG_OS_P_O_AF.`
  - Wide columns - `PATH-CDSN-SCDGTA-ECDGTA-CGSN-SCGGTA-ECGTA-OPSN-PKG-OPCODE-<A>/F=PN_DS_SD_ED_GS_SG_EG_OS_P_O_AF.`

- For report **HOURLY MAINTENANCE MEASUREMENTS ON GTT ACTION PER-PATH**. This would be with wide columns
  - Wide columns  
-PATH-CDSN-SCDGTA-ECDGTA-CGSN-SCGGTA-ECGTA-OPSN-PKG-OPCODE-<A>/F= Short columns - PN\_DS\_SD\_ED\_GS\_SG\_EG\_OS\_P\_O\_AF.
  - Wide columns -PATH-CDSN-SCDGTA-CGSN-CGGTA-OPSN-PKG-OPCODE-<A>/F = Short columns - PN\_DS\_SD\_GS\_SG\_OS\_P\_O\_AF

If there are no measurement report files in the input directory, the module go into a sleep time interval for a fixed time interval (30 seconds). After completion of the sleep time interval, it scans the input directory again and processes any reports found. This sleep time interval is configured by E5-MS System Administrator through a configuration file (/Tekelec/WebNMS/conf/tekelec/common.config). Any changes done to the file are effective on E5-MS server restart.

If the module finds a non-CSV file or an empty measurement file in input directory, it simply moves it to the others directory in output directory.

The report files stored in output directory are automatically managed on regular basis. Directories older than 2 days are archived in a compressed version and then the original directories are deleted. The compressed files older than 30 days are deleted. Also, the data in various database tables that is older than 'n' days are dropped, where 'n' is the number of days mentioned in /Tekelec/WebNMS/bin/scripts/measurement/tekelecMeasDBCleanupConfig.txt configuration file. E5-MS System Administrator can update the value of days for cleanup of database tables in tekelecMeasDBCleanupConfig.txt file. Any change done to the file is effective from the next time when database cleanup script is run

There is no separate GUI for measurement platform module in E5-MS client. However, the **User Audit** screen has audit logs showing the operations performed by module. The extensive logs are provided in /var/E5-MS/measurement/logs directory to enable an administrator to verify that it is working fine. Any errors encountered by the module are logged so that the administrator can take corrective actions.

## Log Message List

No.	Description
1.	Database table tekelec_meas_headers verified.
2.	Database table tekelec_meas_reports verified.
3.	Supporting report type <Report Type> with database table <Table name>.
4.	Please restart the server after module schema is installed.
5.	Searching location <input directory path> for new reports.
6.	Sleeping for <sleep time interval> seconds.
7.	Report <input directory path>/<report name> is not a CSV file!

No.	Description
8.	Report <input directory path>/<report name>: Moved to location <output directory path>/others.
9.	Report <input directory path>/<report name>: Moved to location <output directory path>/<CLLI>.
10.	Report <input directory path>/<report name> is empty!
11.	Could not parse <input directory path>/<report name>! Report type <Report Type> not supported by module.
12.	Supporting table of report type <Report Type> is <table name>.
13.	Created <table name> with columns <column name1>, <column name2>,.... <column nameN>.
14.	Modified <table name>, added column <column name>.
15.	Inserted <number of rows> rows in table <table name> with HEADERINDEX value <header index value>.

## DataBase Tables

The E5-MS Measurement platform is depend on the following two database tables:

1. Table tekelec\_meas\_headers - This table stores the reporting data related to the CLLI (name of the EAGLE), software release (release on EAGLE), report date (date of the report), report time (time of the report), report type (measurement report type), time zone etc. of a measurement report.
2. Table tekelec\_meas\_reports - This table is used to store the report types of Measurement files supported, their corresponding database tables names and number of days after the table is pruned.

The Database tables are created during the installation of the E5-MS. Measurement module starts functioning when the E5-MS server starts.

The Measurement module database tables are removed when the E5-MS is uninstalled.

### Table 'tekelec\_meas\_headers'

The table tekelec\_meas\_headers is used by Measurement module to store the report generation related data like CLLI (name of the EAGLE which generated the report), software release (release on EAGLE), report date (date of report generation), report time (time of report generation), report type (measurement report type), time zone etc. of a measurement report. It contains an auto-incremented key named **HEADERINDEX** used to map a report's header data to its measurement data in another table.

Field Name	Value	Description
HEADERINDEX	INTEGER, NOT NULL AUTO_INCREMENT, PRIMARY KEY	Primary Key with auto incremented

Field Name	Value	Description
CLLI	VARCHAR(15), NOT NULL	Name of the EAGLE
SWREL	VARCHAR(50), NOT NULL	Software release name
RPTDATE	DATE, NOT NULL	Measurement report date
RPTIME	TIME, NOT NULL	Measurement report time
TZ	VARCHAR(5)	Time zone
RPTTYPE	VARCHAR(100)	Measurement report name
RPTPD	VARCHAR(50)	Measurement report period
IVALIDDATE	DATE, NOT NULL	Date
IVALIDSTART	TIME, NOT NULL	Start time
IVALIDEND	TIME, NOT NULL	End time
NUMEMTIDS	INT, NOT NULL	Number of records existing in report file.

### Table 'tekelec\_meas\_reports'

The tekelec\_meas\_reports table contains the measurement report types supported by the module.

Field Name	Value	Description
RPTTYPE	VARCHAR(100)	Measurement report type (value of 'RPTTYPE' key in a measurement report file.)
TABLE_NAME	VARCHAR(30), NOT NULL	Database table name which are used to store data form the report file.
DB_RETENTION_DAYS	INTEGER, NOT NULL	Data retention days for database table, data older then this is dropped.

### Table 'tek\_nbi\_ftp\_config'

Field Name	Value	Description
ID	INTEGER, NOT NULL, AUTO_INCREMENT, PRIMARY KEY	ID of the record
ip	VARCHAR(20), NOT NULL	IP address of the server where measurement files are to be FTPed

Field Name	Value	Description
port	VARCHAR(10), NOT NULL	Port number to be used for FTPing the files
username	VARCHAR(20), NOT NULL	Username to be used for connecting to the sever
password	VARCHAR(20), NOT NULL	password for the username provided
ftplacement	VARCHAR(100), NOT NULL	On the remote server, the absolute path till the directory where measurement files need to be FTPed

## Measurement Northbound FTP Module

E5-MS Measurement Northbound FTP module provides the functionality of transferring measurement report files to northbound servers.

The System Administrator assigns this operation to a usergroup. For more information on assigning permissions to a Usergroup go to [Assign Attributes to a Usergroup](#) in Appendix A for the System Administration. If assigned, all the users of that usergroup have the ability to manage server(s) on which the measurement files are to be FTPed.

## NBI FTP Configuration

The System Administrator and all users assigned **NBI FTP Configuration** operation, have access to the measurement files by setting up a FTP IP address in the **NBI FTP Configuration** screen. You can access this screen from the main toolbar under the **Tools** menu.



Figure 36: NBI FTP Configuration Tree Node

For every server, following details are required to be entered by the user:

- IP Address - IP address of the server where measurement files are to be FTPed.
- Port - Port number to be used for FTPing the files.
- Username - Username to be used for connecting to the server.

- Password - Password for the above username.
- FTP Directory - On the remote server, the absolute path till the directory where measurement files need to be FTPed. Note that this directory will exist on the server.

**Figure 37: NBI FTP Configuration Screen**

Once all the fields are completed, the user will click the Add button at the bottom of the screen. The new server will show up in the upper pane on the screen. A user can modify/delete any existing servers by selecting the corresponding server in the list and then clicking on Modify/Delete button.

The user has to modify the exiting details of a server then click **Modify** button.

The user has to select the server to delete then click the **Delete** button. A confirmation dialog box will popup to confirm the deletion of the server.

The **Reset** button clears all the previously populated fields in the NBI FTP GUI.

## File Transfer

The following points must be taken care of for file transfer to work properly:

- The FTP server details must be correctly configured by the user. There are basic validation checks done by the GUI, however the user must ensure the correctness of details like server IP address, port, username, password and FTP directory.
- The server(s) configured in **Manage FTP Servers** screen are running FTP in order to receive measurement files from E5-MS through FTP.
- The user in the **Username field** must have permission to create directory in the FTP directory so the E5-MS can create directories in the FTP directory.

The output directory (`/var/E5-MS/measurement/csvoutput`) of E5-MS Measurement platform module serves as the input directory for E5-MS Measurement FTP module. It scans the output directory for measurement reports and FTP the reports found to the server(s) configured on **Manage FTP Servers** window, every minute. After FTP, the files are moved from

```
/var/E5-MS/measurement/csvoutput/<EAGLE_NAME> directory to
/var/E5-MS/measurement/csvoutput/ftp/< EAGLE_NAME> directory or from
/var/E5-MS/measurement/csvoutput/others directory to
```

`/var/E5-MS/measurement/csvoutput/ftp/others` directory. This ensures that once a file has been found in output directory scan and has been attempted for FTP, it should not be found in the scan next time.

To place the FTPed files on the remote server, the E5-MS creates directories with eagle names in the FTP directory. Inside each eagle named directory, folders with date names are created. The date is the one that is currently on the E5-MS server. So, the directory structure for measurement files is similar to following:

- FTP Directory
  - EAGLE1
    - Date1
    - Date2

The logs of E5-MS Measurement FTP module are available in `/var/E5-MS/measurement/logs/ftp.txt` file. Apart from the successful file transfers, any errors encountered by the module are also logged so that the administrator can take corrective actions.

## Report Types Supported by Measurement Platform Module

RPTTYPE	TABLE_NAME	DB_RETENTION DAYS
AVAILABILITY MEASUREMENTS ON LINK	TEK_MEAS_AVL_LINK	14
AVAILABILITY MEASUREMENTS ON STPLAN	TEK_MEAS_AVL_STPLAN	14
COMPONENT MEASUREMENTS ON LINK	TEK_MEAS_COMP_LINK	14
COMPONENT MEASUREMENTS ON LNKSET	TEK_MEAS_COMP_LNKSET	14
COMPONENT MEASUREMENTS ON SCTPASOC	TEK_MEAS_COMP_SCTPASOC	14
COMPONENT MEASUREMENTS ON SCTPCARD	TEK_MEAS_COMP_SCTPCARD	14
COMPONENT MEASUREMENTS ON UA	TEK_MEAS_COMP_UA	14
DAILY AVAILABILITY MEASUREMENTS ON LINK	TEK_MEAS_AVLD_LINK	30
DAILY MAINTENANCE MEASUREMENTS ON EIR SYSTEM	TEK_MEAS_MTCD_EIR	30

RPTTYPE	TABLE_NAME	DB_RETENTION DAYS
DAILY MAINTENANCE MEASUREMENTS ON GTT ACTION PER-PATH	TEK_MEAS_MTCD_GTTACTPATH	30
DAILY MAINTENANCE MEASUREMENTS ON GTT ACTION SYSTEM	TEK_MEAS_MTCD_GTTACTSYS	30
DAILY MAINTENANCE MEASUREMENTS ON LINK	TEK_MEAS_MTCD_LINK	30
DAILY MAINTENANCE MEASUREMENTS ON LNKSET	TEK_MEAS_MTCD_LNKSET	30
DAILY MAINTENANCE MEASUREMENTS ON LNP LRN	TEK_MEAS_MTCD_LNPLRN	30
DAILY MAINTENANCE MEASUREMENTS ON LNP NPANXX	TEK_MEAS_MTCD_LNPNPANX	30
DAILY MAINTENANCE MEASUREMENTS ON LNP SSP	TEK_MEAS_MTCD_LNPSSP	30
DAILY MAINTENANCE MEASUREMENTS ON LNP SYSTEM	TEK_MEAS_MTCD_LNPSSYSM	30
DAILY MAINTENANCE MEASUREMENTS ON MAP SCREENING PATH	TEK_MEAS_MTCD_MAPPATH	30
DAILY MAINTENANCE MEASUREMENTS ON MAP SCREENING SYSTEM	TEK_MEAS_MTCD_MAPSYS	30
DAILY MAINTENANCE MEASUREMENTS ON MAPSCRN PER-SERVER	TEK_MEAS_MTCD_MAPSRV	30
DAILY MAINTENANCE MEASUREMENTS ON MAPSCRN SYSTEM	TEK_MEAS_MTCD_MAPSYS	30
DAILY MAINTENANCE MEASUREMENTS ON NP SSP	TEK_MEAS_MTCD_NPSSP	30
DAILY MAINTENANCE MEASUREMENTS ON NP SYSTEM	TEK_MEAS_MTCD_NPSSYSM	30
DAILY MAINTENANCE MEASUREMENTS ON SCTPASOC	TEK_MEAS_MTCD_SCTPASOC	30
DAILY MAINTENANCE MEASUREMENTS ON SCTPCARD	TEK_MEAS_MTCD_SCTPCARD	30

RPTTYPE	TABLE_NAME	DB_RETENTION DAYS
DAILY MAINTENANCE MEASUREMENTS ON STP	TEK_MEAS_MTCD_STP	30
DAILY MAINTENANCE MEASUREMENTS ON STPLAN	TEK_MEAS_MTCD_STPLAN	30
DAILY MAINTENANCE MEASUREMENTS ON UA	TEK_MEAS_MTCD_UA	30
DAY-TO-HOUR AVAILABILITY MEASUREMENTS ON LINK	TEK_MEAS_DTHA_LINK	14
DAY-TO-HOUR MAINTENANCE MEASUREMENTS ON LINK	TEK_MEAS_DTHM_LINK	14
DAY-TO-HOUR MAINTENANCE MEASUREMENTS ON LINKSET	TEK_MEAS_DTHM_LNKSET	14
DAY-TO-HOUR MAINTENANCE MEASUREMENTS ON STP	TEK_MEAS_DTHM_STP	14
DAY-TO-HOUR MAINTENANCE MEASUREMENTS ON STPLAN	TEK_MEAS_DTHM_STPLAN	14
GATEWAY MEASUREMENTS ON LNKSET	TEK_MEAS_GTWY_LNKSET	14
GATEWAY MEASUREMENTS ON LSDESTNI	TEK_MEAS_GTWY_LSDESTNI	14
GATEWAY MEASUREMENTS ON LSONISMT	TEK_MEAS_GTWY_LSONISMT	14
GATEWAY MEASUREMENTS ON LSORIGNI	TEK_MEAS_GTWY_LSORIGNI	14
GATEWAY MEASUREMENTS ON ORIGNI	TEK_MEAS_GTWY_ORIGNI	14
GATEWAY MEASUREMENTS ON ORIGNINC	TEK_MEAS_GTWY_ORIGNINC	14
GATEWAY MEASUREMENTS ON STP	TEK_MEAS_GTWY_STP	14
HOURLY MAINTENANCE MEASUREMENTS ON EIR SYSTEM	TEK_MEAS_MTCH_EIR	14
HOURLY MAINTENANCE MEASUREMENTS ON GTTACTION PER-PATH	TEK_MEAS_MTCH_GTTACTPATH	14
HOURLY MAINTENANCE MEASUREMENTS ON GTTACTION SYSTEM	TEK_MEAS_MTCH_GTTACTSYS	14

RPTTYPE	TABLE_NAME	DB_RETENTION DAYS
HOURLY MAINTENANCE MEASUREMENTS ON LNP LRN	TEK_MEAS_MTCH_LNPLRN	14
HOURLY MAINTENANCE MEASUREMENTS ON LNP NPANXX	TEK_MEAS_MTCH_LNPNPANX	14
HOURLY MAINTENANCE MEASUREMENTS ON LNP SSP	TEK_MEAS_MTCH_LNPSSP	14
HOURLY MAINTENANCE MEASUREMENTS ON LNP SYSTEM	TEK_MEAS_MTCH_LNPSYSTEM	14
HOURLY MAINTENANCE MEASUREMENTS ON MAP SCREENING PATH	TEK_MEAS_MTCH_MAPPATH	14
HOURLY MAINTENANCE MEASUREMENTS ON MAP SCREENING SYSTEM	TEK_MEAS_MTCH_MAPSYS	14
HOURLY MAINTENANCE MEASUREMENTS ON MAPSCRN PER-SERVER	TEK_MEAS_MTCH_MAPSRV	14
HOURLY MAINTENANCE MEASUREMENTS ON MAPSCRN SYSTEM	TEK_MEAS_MTCH_MAPSYS	14
HOURLY MAINTENANCE MEASUREMENTS ON NP SSP	TEK_MEAS_MTCH_NPSSP	14
HOURLY MAINTENANCE MEASUREMENTS ON NP SYSTEM	TEK_MEAS_MTCH_NPSYSTEM	14
MAINTENANCE STATUS INDICATORS ON LINK	TEK_MEAS_MSI_LINK	14
MAINTENANCE STATUS INDICATORS ON LINKSET	TEK_MEAS_MSI_LNKSET	14
NETWORK MANAGEMENT MEASUREMENTS ON LINK	TEK_MEAS_NM_LINK	14
NETWORK MANAGEMENT MEASUREMENTS ON LNKSET	TEK_MEAS_NM_LNKSET	14
NETWORK MANAGEMENT MEASUREMENTS ON STP	TEK_MEAS_NM_STP	14
RECORD BASE MEASUREMENTS ON LINK	TEK_MEAS_RBASE_LINK	14
RECORD BASE MEASUREMENTS ON LINKSET	TEK_MEAS_RBASE_LNKSET	14

RPTTYPE	TABLE_NAME	DB_RETENTION DAYS
RECORD BASE MEASUREMENTS ON STP	TEK_MEAS_RBASE_STP	14
STP SYSTEM TOTAL MEASUREMENTS ON CGTT	TEK_MEAS_SYSTOT_CGTT	14
STP SYSTEM TOTAL MEASUREMENTS ON IDPR	TEK_MEAS_SYSTOT_IDPR	14
STP SYSTEM TOTAL MEASUREMENTS ON STP	TEK_MEAS_SYSTOT_STP	14
STP SYSTEM TOTAL MEASUREMENTS ON STPLAN	TEK_MEAS_SYSTOT_STPLAN	14
STP SYSTEM TOTAL MEASUREMENTS ON TT	TEK_MEAS_SYSTOT_TT	14

# Chapter 8

## Reporting Studio

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### Topics:

- *Overview.....99*
- *Measurement Reporting Studio.....99*
- *Functional Description.....100*
- *i-net Clear Reports Remote Interfaces.....101*

This chapter provides an overview of the E5-MS Reporting Studio.

## Overview

The default i-net Clear Reports remote interfaces is utilized for catering to the requirements of E5-MS Reporting Studio. i-net Clear Reports remote interfaces are web based interfaces that open in the default browser of the client machine and allow users perform various reporting functions.

## Measurement Reporting Studio

The Reporting Studio feature is a Reporting tool to manage EAGLE Measurements. The feature is based on the use of an OEM Software (i-Net Clear Reports Plus). with a few pre-defined reports and will allow the users to create customized reports.

The Measurement Reporting Studio offers a set of standard reports for our customers:

- Alarm/Event summary:
  - Possibility to extract alarm and event history with selective date, time, severity, alarm reference (UAM number) and resource/sub-resource and generate reports.
  - Statistics per node, date, time, severity
  - Top 10 alarms and top 10 resources per day (possibly week and month)
- EAGLE STP Measurements
  - STP - Systot
    - Daily Systot reports concatenating key counters (granularity will be either 30 minutes or 15 minutes depending on STP settings)
      - ORIGMSUS
      - TRMDMSUS
      - THRSWMSU
      - GTTPERFD
      - NMSCCPMH
- Link Utilization Interface Reports
  - If LUI feature is ON, Link, Linkset and Card reports are made available (as the current LUI feature does on Classic EMS)

The E5-MS Measurement Reporting Studio have the following output formats:

- HTML, PDF, Text, RTF, XML, JPG
- Optional formats: emails, JAR, XLS, ZIP

The user can schedule automatic report execution using the Reporting Studio. There is a Drill Down Report which provides several layers of data, such as linkset based report navigating the user to the link level alarms.

The Reporting Studio supports multiple languages.

## Functional Description

The E5-MS Reporting Studio shall provide its users below mentioned features:

- Creating reports on ad hoc basis
- Creating reports using a defined template
- Providing a designer interface to users to create/update templates as required
- Exporting reports in various report formats to choose from (pdf, html, xls, jpeg, png, gif, xml, csv, rtf, txt)
- Report template management
- Providing a Repository browser to users, for managing existing report templates and view created reports
- Providing a scheduler interface to user, for scheduling report generation

By default, both **Reporting Studio** and **Report Designer** menu items are visible for the System Administrator with **root** access. There are two menu items under to the Tools icon on the main toolbar of the E5-MS, the **Reporting Studio** and **Report Designer**. The System Administrator provides permission to other user by assigning them **Reporting Studio** permission. The user must have the same username in i-net Clear Reports tool.

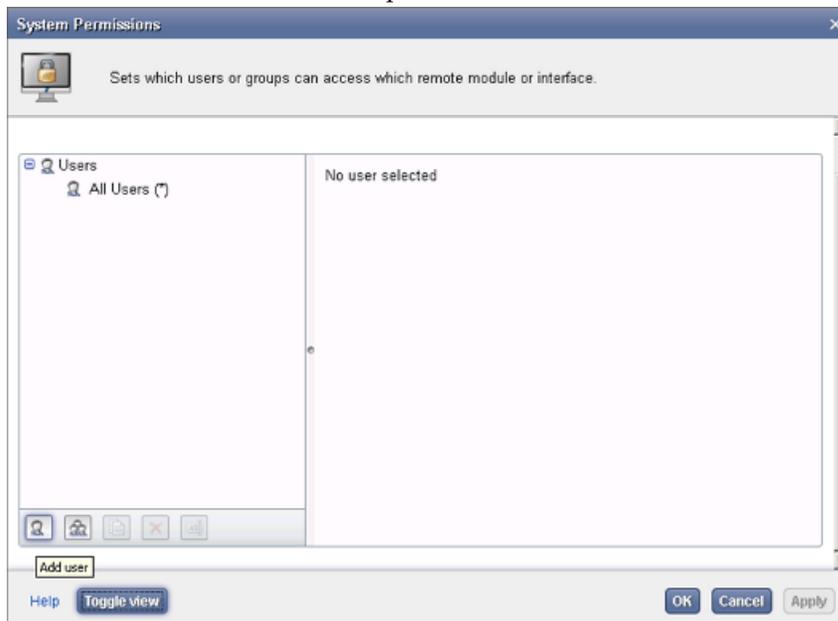


Figure 38: Add User

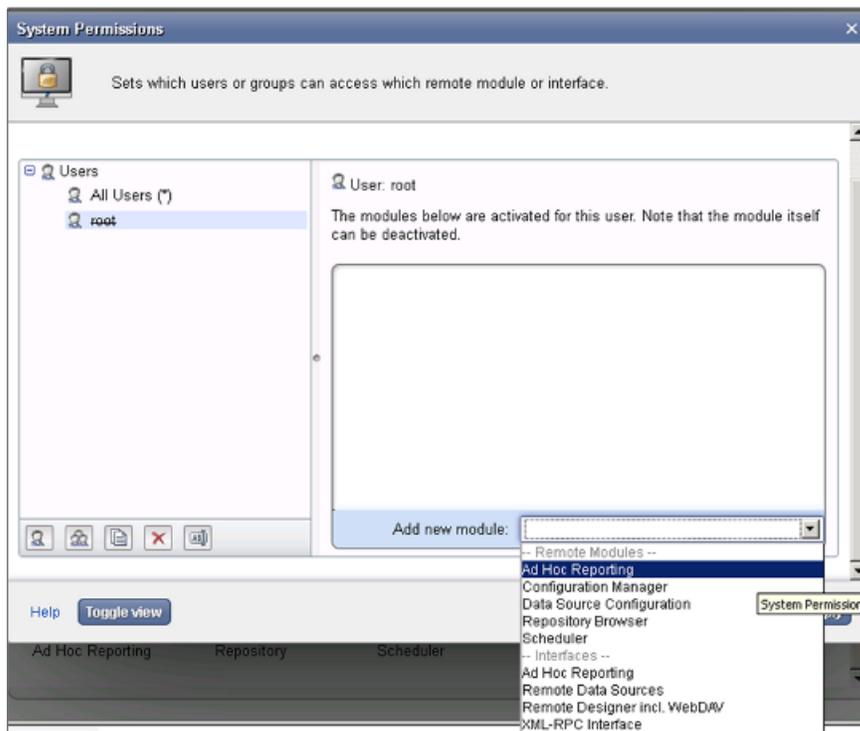


Figure 39: System Permissions

## i-net Clear Reports Remote Interfaces

i-net Clear Reports provides following remote interfaces:

- **Ad Hoc Reporting** - Allows creating reports on the fly without any predefined template.
- **Configuration** - Allows a user management of i-net Clear Reports configurations. A configuration contains all options to configure i-net Clear Reports.
- **Data Source Configuration** - Allows configuring the data sources to be used for report generation.
- **Repository Browser** - Shows listing of existing reporting templates and allowing management of them.
- **Scheduler** - Allows a user schedule report templates to generate reports at desired time.
- **Report Designer**

- Apart from the above web based remote interfaces, there is another webstart application named 'Report Designer' that is used by users to design report templates. User can create/update a report template as per their requirement.

## Remote Interface

The remote interface allows a user access to various remote interfaces as shown in i-net Clear Reports.

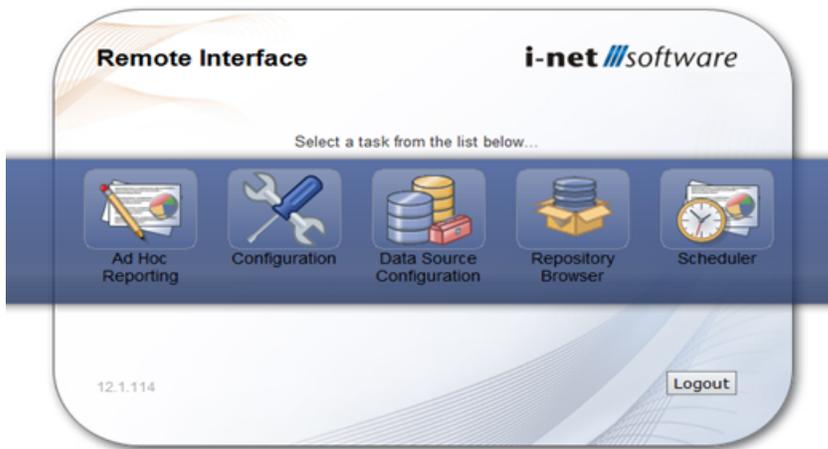


Figure 40: i-net Clear Report

### Ad Hoc Reporting Interface

This chapter provides an overview of the EAGLE 5-Management System.

The Ad Hoc Reporting interface is simple and intuitive web based interface, to generate a report on the fly without using any template. To assign a user access to Ad Hoc Reporting, refer to System Permissions.



Figure 41: Ad Hoc Reporting

### Configuration Manager

The Configuration Manager interface allows a user to manage all the reporting, security and performance related settings.

To assign a user access to the Configuration Manager, refer to System Permissions.



**Figure 42: Configuration Manager Interface**

Post installation of i-net Clear Reports, it needs to be configured for use with E5-MS. This configuration involves steps such as creating 'root' user and assigning him permissions, activating scheduler, creating and activating remote repository, adding data source etc. These actions are performed in Configuration Manager Interface.

## Data Source Configuration Interface

The Data Source Configuration interface allows a user to manage data sources. To assign a user access to the Data Source Configuration, refer to System Permissions.

Post installation of i-net Clear Reports, E5-MS database needs to be added as a data source to i-net Clear Reports for report generation using Data Source Configuration.

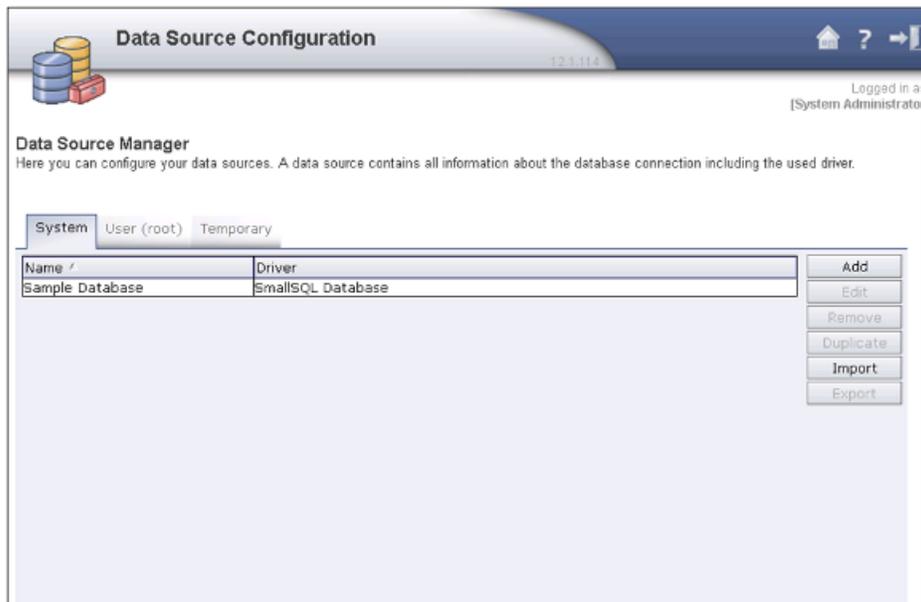


Figure 43: Data Source Configuration Interface

### Repository Browser Interface

The Repository Browser interface allows users to manage report templates. Users can see the list of stored templates, edit them, download and upload them. The user can also generate reports in various formats by executing an existing template.

The repository browser is not just restricted to report templates. It can also be used to create a report repository, where reports published by scheduled or manual execution can be kept.

To assign a user access to the Repository Browser Interface, refer to System Permissions.

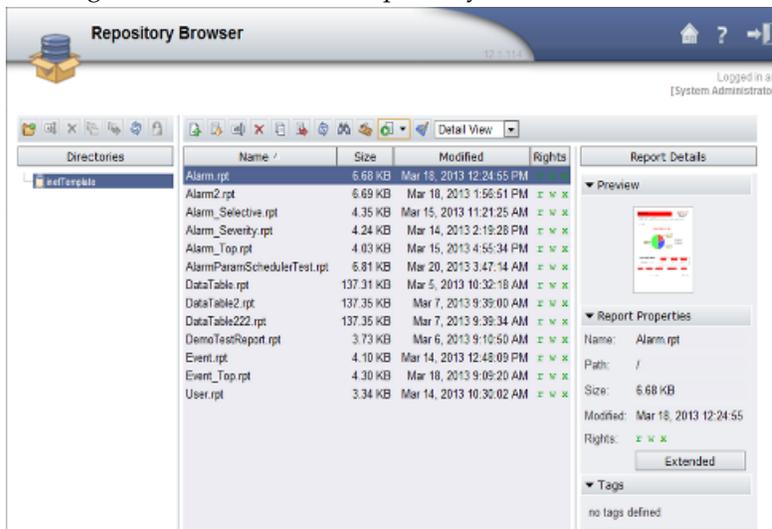


Figure 44: Repository Browser Interface

## Scheduler Interface

The Scheduler interface allows scheduling of report generation by creating named scheduled tasks.

A task can be scheduled for a particular or repeated number of times. Post execution the status of the scheduled task is known and the resulted report can be downloaded, FTPed or mailed to users. It also has provision of instant execution of a scheduled task.

To assign a user access to the Scheduler Interface, refer to System Permissions.

By default, Scheduler feature is not activated in i-net Clear Reports. Scheduler needs to be activated using Configuration Manager.

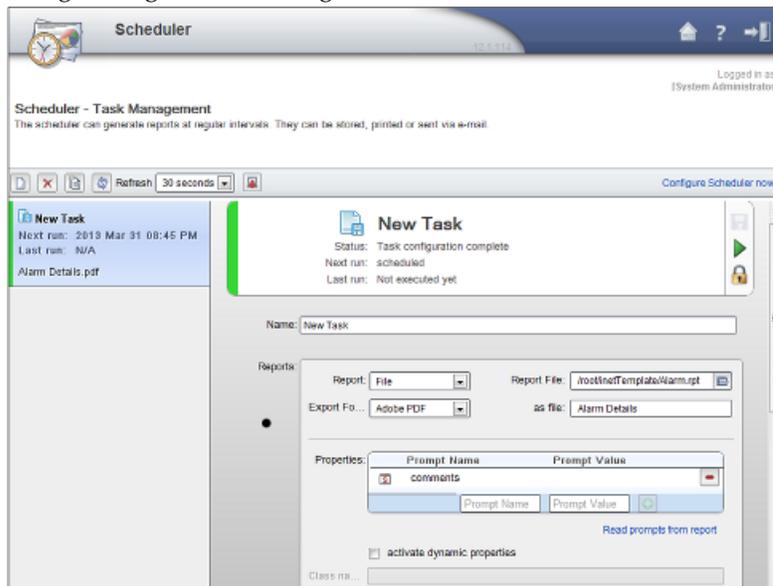


Figure 45: Scheduler

## Report Designer Interface

The Report Designer interface allows creating or editing a report template.

The remote interface of Report Designer allows saving a report template at local as well as configured remote report repository location.

To assign a user access to the Report Designer, interface 'Remote Designer incl. WebDAV' refer to System Permissions. as shown in **Report Designer Interface** needs to be assigned to the user.

If a user is assigned access to Report Designer, then it is mandatory to assign 'Remote Data Sources' interface also so that the user can access E5-MS database while creating/updating report templates.

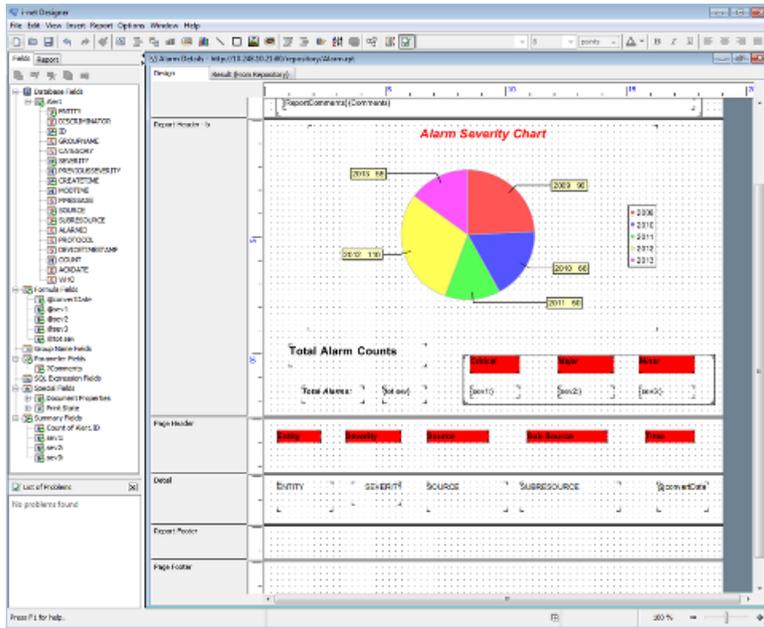


Figure 46: Report Designer

## Configuration Management Interface

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### Topics:

- *Overview.....108*
- *Functional Description.....108*
- *Send Command.....108*
- *Category Management.....114*
- *Script Management.....116*
- *Schedule Management.....122*
- *CMI Informational/Error Message List.....124*

This chapter provides descriptions of the features and functions provided by the E5-MS Configuration Management Interface (CMI).

## Overview

The Configuration Management Interface provides access to EAGLE commands, parameters, and historical data.

CMI module provides two functions:

- Command execution on EAGLE(s) - The **Send Command** screen enables the users execute single commands on desired EAGLE(s).
- Command script creation, management and execution on EAGLE(s) - The following screens are provided to E5-MS users for this functionality:
  - Category Management - To view and manage (create/rename/delete) script categories
  - Script Management - To view the listing of existing scripts, manage (create/modify/delete) them and see execution results
  - Create Script - To create scripts
  - Modify Script - To modify a script
  - View Script - To view the contents of a script
  - Execute Script - To manually execute a script
  - Schedule Management - To schedule a script for execution on EAGLE(s)

## Functional Description

The assigned users can send commands and scripts to the EAGLE and get results. The CMI has an auto-completion of command and command history maintenance to help the users. If the CMI is grayed out the application is not available to the client or the user.

CMI module connects to EAGLE using the IPSM card(s) configured on EAGLE. Please reference the EAGLE Discovery Application chapter for the setup of the IP address from the E5-MS to the EAGLE.

The Configuration Management Interface is accessed from the left pane of the E5-MS GUI tree node. As shown in CMI Tree Node.

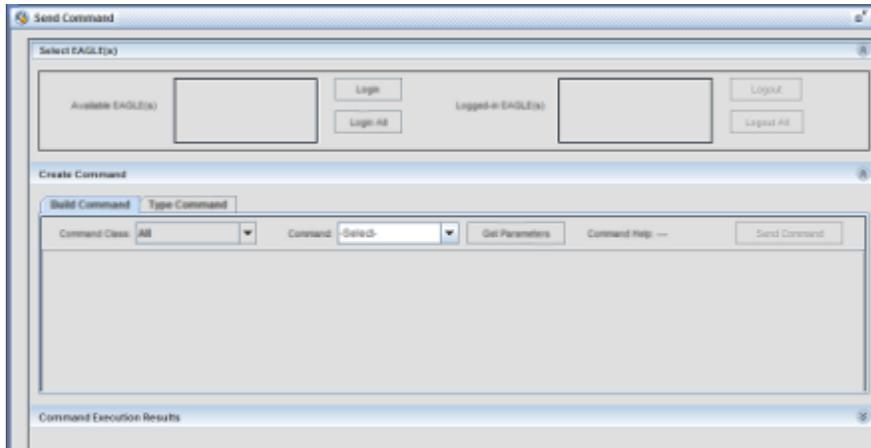


Figure 47: CMI Tree Node

## Send Command

If the Send Command is grayed out, contact your System Administrator. The administrator assigns the **Send Command** operation to the user groups. The System Administrator should refer to [E5-MS System Administration](#) to assign Usergroups and User.

The **Send Command** is located under **Configuration** node in the left pane. The Configuration node is enabled/disabled based on permission of the usergroup. The **Send Command** is shown in [Figure 48: Send Command Screen](#).



**Figure 48: Send Command Screen**

The operations that can be performed using the CMI **Send Command** include:

- **Select EAGLE(s)** pane - enables user to choose EAGLE(s) for login/logout.
- **Create Command** pane - shall enable user to create a command to be sent to EAGLE(s).
- **Command Execution Results** pane - shall display the login, logout and other command execution results from EAGLE(s).

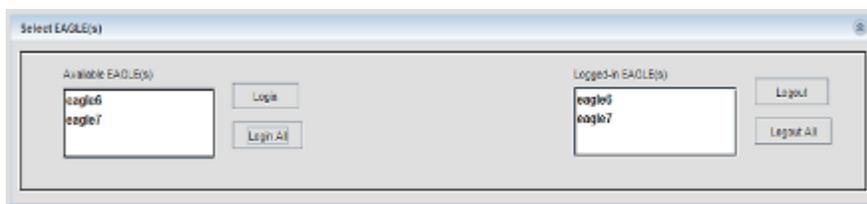
## Select EAGLE(s) Pane

There are two lists available in this pane.

- **Available EAGLE(s)** list the names of all the EAGLE(s) assigned to usergroup and users.
- **Logged-in EAGLE(s)** list the names of EAGLE(s) on which user has successfully logged in.

As shown in [Select EAGLE\(s\) Pane](#)

**Figure 49: Select EAGLE(s) Pane**



## Select EAGLE(s)

If the Send Command is grayed out, please contact your System Administrator. This procedure describes how to login EAGLE systems. These are the EAGLE systems the E5-MS User has permission to login that appear in the **Available EAGLE(s)** list.

- Select the EAGLE system name(s) from the **Available EAGLE(s)** list. Click the **Login** link on the right side of the list.
  - If all of the EAGLE systems are to receive the command, click the **Login All** button.
  - If a subset of the **Available EAGLE(s)** systems are to receive the command, select those systems from the **Available EAGLE(s)** list and click the **Login** button. Multiple EAGLE systems can be selected by sequentially clicking on each of their names while holding down the <Ctrl> key on your keyboard.

At the bottom of the **Send Command** screen is the **Command Execution Results** pane. It is clear until you send a command or script to the EAGLE. Once a command is executed, the most recent 5,000 lines of the EAGLE's responses to the commands issued while the User is using the Send Command page are displayed in the **Command Execution Results** pane.

- To log out from an EAGLE system, select the name of the EAGLE from the **Logged-In EAGLE(s)** list and click the **Logout** button. To log out from all of the EAGLE systems, click the **Logout All** button.

**Note:** The E5-MS User remains logged in to these EAGLE system(s) until the E5-MS User logs out.

Login will not be attempted on EAGLE(s) that the E5-MS is already logged in, reference message 3 in the [CMI Informational/Error Message List](#).

## Create Command Pane

There are two tabs available in this pane.

- **Build Command** tab provides a user a drop-down list of a Command Class and Commands to build a valid command to be sent to EAGLE systems.
  - The **Command Class** drop-down list enables a user build a valid command to be sent to EAGLE.
  - The **Command** drop-down list contains the commands associated with the command class selected in the **Command Class** drop-down.
- **Type Command** tab provides a proficient user to type commands sent to EAGLE systems.

As shown in Create Command



Figure 50: Create Command

## Build Command

The **Build Command** pane has two drop-down lists named **Command Class** and **Command**, a button named **Get Parameters** and another named **Send Command**.



Figure 51: Build Command Tab

### Command Class

- The **Command Class** drop-down list has all the EAGLE command classes assigned to the user's user group. The **All** corresponds to all the commands. By default, the **All** option is pre-selected in the **Command Class** drop-down. As shown in Command Class Menu

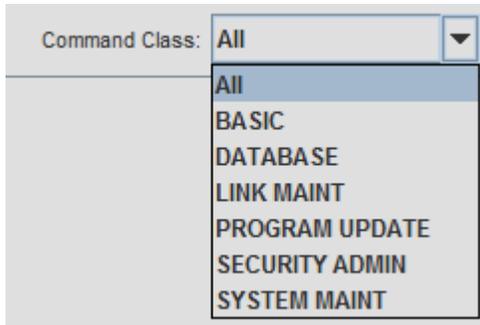


Figure 52: Command Class Menu

- The user will select the command class in the drop-down.

### Command

The **Command** drop-down list has all the commands on which the user has access. The **All** corresponds to all the commands.

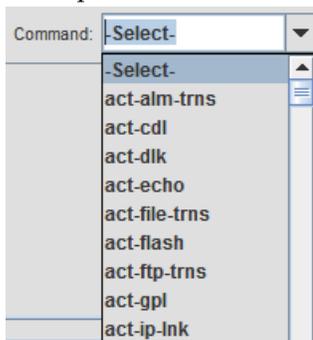
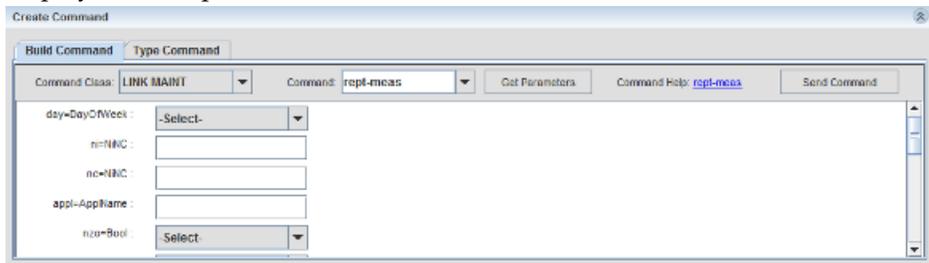


Figure 53: Command Menu

- When selecting a command class in the **Command Class** drop-down list, the **Command** drop-down list is populated with all the commands belonging to that command class. To the commands associated with the command class selected in the **Command Class** drop-down, the **Command** drop-down has an option **-Select-**, that is selected by default in the **Command** drop-down.
- The **Command** drop-down provides the auto-complete ability to the user. As a user shall start typing in characters in the **Command** box, the commands available in the **Command** box are searched and the command most matching to the characters typed in shall be auto completed in the box. The commands that follow the auto-completed command alphabetically are displayed below the box in a popup list and the user can select any of the commands displayed in the popup list into the **Command** box.
- If a user types in characters in **Command** box that do not match any of the command in the **Command** box, then the selection in **Command** box shall not change.
- The user can manually select the desired command in the **Command** drop-down list.

- After selection of the desired command in the **Command** drop-down list and clicking on the **Get Parameters** button, all parameters of the command and the corresponding HTML help file link are displayed in the pane.

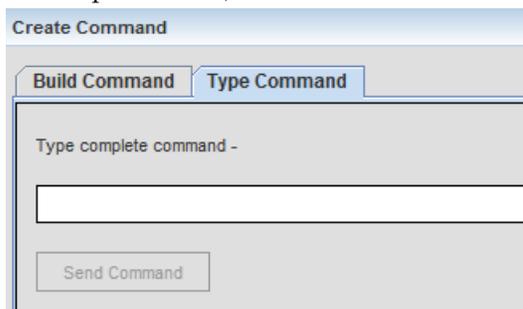


**Figure 54: Get Parameters**

- If the command is one of the last n commands used in the current user session, then the previously used values for various parameters is automatically get populated.
- Reference message 9 in the [CMI Informational/Error Message List](#) that displays if the user clicks on **Get Parameters** button while default option **-Select-** is selected in the **Command** drop-down list.
- When clicking on the help file link of the command, HTML help file for the command will opened in the default browser configured on the system.
- The labels of mandatory parameters are followed by asterisks \* to highlight that they are required.
- When clicking the **Send Command** button after building the command, the command parameters are checked for various validations applicable as per the command. The validations are as provided by EAGLE:
  - Whether a parameter in mandatory
  - Validation on the type of permitted value for a parameter (number, alphanumeric string, letter followed by alphanumeric string etc.)
  - Validation on the range of permitted value for a parameter
- If all the applicable validations on the command parameters successfully pass, the command is sent for execution to the EAGLE(s) selected by the user in the **Logged-in EAGLE(s)** list.
- If any of the applicable validations on the command parameters does not pass, the command is not sent for execution to the EAGLE(s) selected by the user in the **Logged-in EAGLE(s)** list and an error message is displayed to the user.

## Type Command

The **Type Command** pane has a text field for the users to type in a complete command string (command and its parameters).



**Figure 55: Type Command Pane**

A **Send Command** button is below the text field. This button is disabled when text field is empty, until the user starts typing in the text field. Once the **Send Command** button is click, the command is checked for following cases:

- That the command is a valid command
- That the user has permission to use the command

If the command string passes both the validations, the command is sent for execution to the EAGLE(s) selected by the user in the **Logged-in EAGLE(s)** list.

In case the command string does not pass any of the validations the command is not sent for execution to the EAGLE(s) selected by user in the **Logged-in EAGLE(s)** list reference message 7 in the [CMI Informational/Error Message List](#).

## Command Execution Results Pane

This pane is used to display results of login, logout and other commands as shown in [Figure 56: Command Execution Results Pane](#). For each EAGLE a user attempts to login, a new tab is created in this pane. The name of the tab is the same as the name of the EAGLE. All the command execution results from an EAGLE is displayed in its own tab. There is a close (x) button associated with each tab and user has the ability to close the tab using this button. On clicking the close (x) button, a confirmation box is shown to user to confirm whether the user really wants to close the tab. If the EAGLE is not logged in, the tab will close. In case EAGLE is logged in, an error message is shown to the user and the tab is not closed.

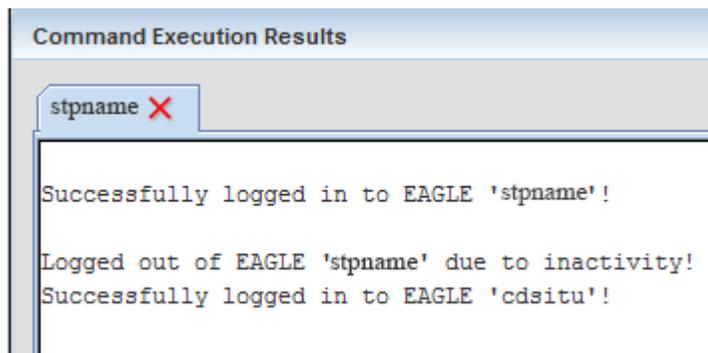


Figure 56: Command Execution Results Pane

## Command Execution Results Pane

This procedure describes how to view the login, logout and other commands sent to the EAGLE systems.

1. See the **Results:** pane to view command output.

The **Results:** pane will continue to store output (including results from multiple consecutive **Send Command** submissions made while on the **Send Command** page) up to 5000 lines. Beyond this limit, the information in the **Results:** pane will roll-over with new lines appending at the bottom of the pane and old lines will be deleted from the top.

2. To view the most recent send-command execution results from the current User login session, click the tab of the corresponding EAGLE system (see **View complete result**).

This link is displayed as soon as script results start to appear in the **Results:** pane. Click on the link to open a browser window to view the complete result file.

The browser window displays up to the most recent 500,000 lines of **Send Command** results from the current User login session (see **Complete Results Browser Window**

The complete results file will continue to grow up to the most recent 500,00 lines. Beyond this limit, the information in the complete results file will roll-over. When the user leaves the **Send Command** page and comes back to this page without logging out, the **Results:** pane is cleared but the complete results data is retained and is accessible by clicking the **To view complete result, click here** link. However, if the user logs out and returns to the **Send Command** page after logging in again, both the **Results:** pane and the complete results data will be cleared.

3. Click the **Clear Results** button to clear the complete results file and the **Results:** pane (see **Send Command** pane).

The link **To view complete result, click here** file will not be visible after the **Clear Results** button is clicked.

**Note:** A user can not clear the result data while command execution is in progress. The button will be disabled while command execution is in progress.

## Category Management

The **Category Management** page is accessed by clicking on the link labeled **Category Mgmt** in the main menu on the left side of the E5-MS under Configuration Management Interface. An example of this screen is shown in *Figure 57: Category Management Screen*.

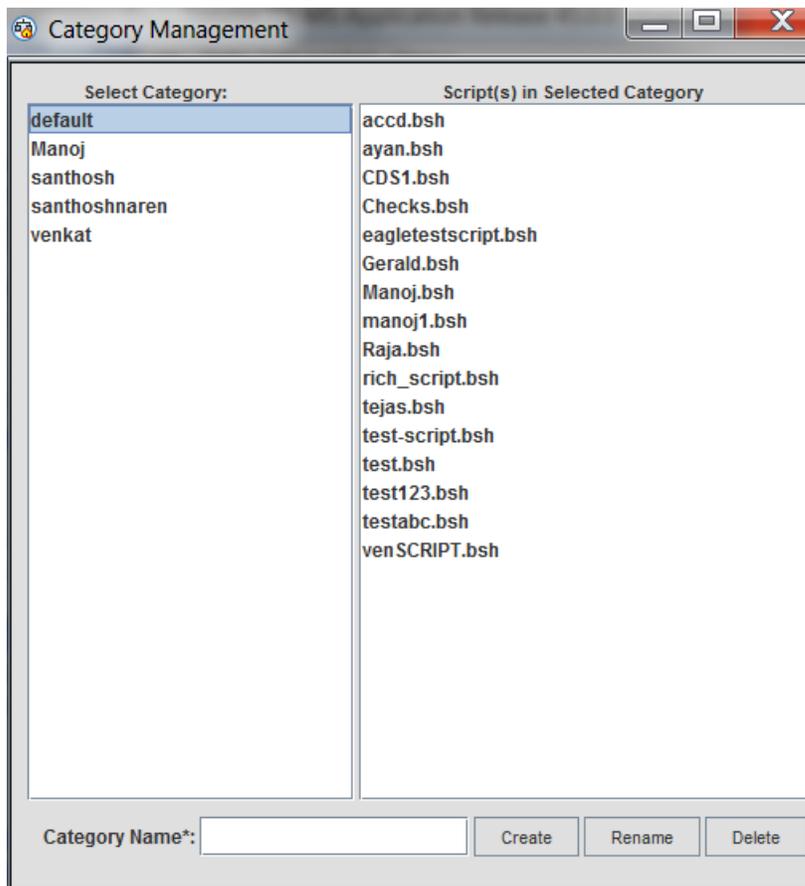


Figure 57: Category Management Screen

**Category Management** screen has two columns namely **Select Category** and **Script(s) in Selected Category**:

- **Select Category** column - It lists all the existing categories. A user will select a category by clicking on that category name. A category named `Default` exists by default for every E5-MS user.
- **Script(s) in Selected Category** column - It lists all the scripts belonging to the category selected in **Select Category** column.

A text box labeled **Category Name\*** and three buttons at the bottom of the pane are **Create**, **Rename** and **Delete**. A user has the ability to:

- Create a new category by providing a valid category name in **Category Name\*** field and clicking on the **Create** button.
- Rename an existing category by selecting that category in **Select Category** column, providing a new and valid category name in **Category Name\*** field and clicking on the **Rename** button.
- Delete an existing category by selecting that category in **Select Category** column and clicking on the **Delete** button. If there are scripts in the category being deleted, they are moved to category **Default**. In case, one or more scripts in the category being deleted have identical names as those in category **Default**, then category deletion will fail (reference message 17 and 18 in the [CMI Informational/Error Message List](#)).

The user can view the scripts associated to a category.

To create a category, the user has rules regarding category names, failing which, the category is not created:

- Cannot be blank (reference message 19 in the [CMI Informational/Error Message List](#))
- Must have a minimum of 3 characters (reference message 20 in the [CMI Informational/Error Message List](#))
- Must have maximum 255 characters (reference message 21 in the [CMI Informational/Error Message List](#))
- Must not be 'All' (reference message 22 in the [CMI Informational/Error Message List](#))
- Must only have alphanumeric characters (0-9, a-z, A-Z) (reference message 23 in the [CMI Informational/Error Message List](#))
- Must be unique for the user (reference message 24 in the [CMI Informational/Error Message List](#))

In case a category creation fails reference message 25 in the [CMI Informational/Error Message List](#).

In case a category renaming fails reference message 26 and 27 in the [CMI Informational/Error Message List](#)

A user can delete a category, other than the **default** category. While deleting a category, the user is shown a confirmation dialogue box. On confirmation from user, it is checked if there are any scripts in this category having identical names as those in category 'default'. If yes, then the category is not deleted, reference message 30 in the [CMI Informational/Error Message List](#).

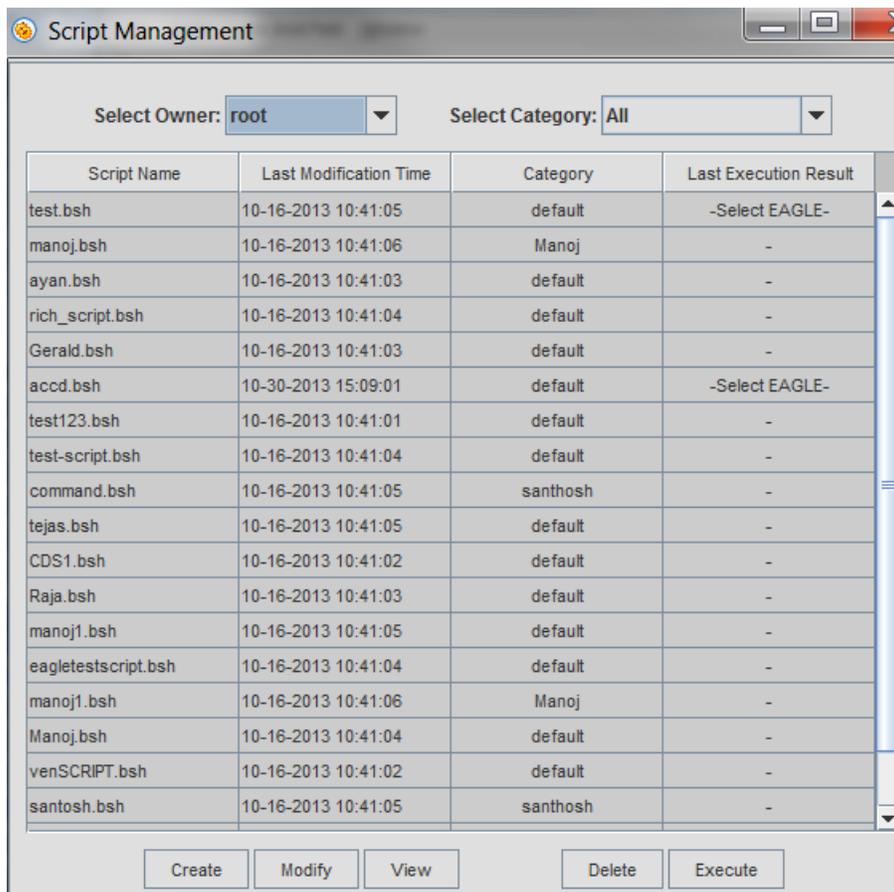
After confirmation of category deletion by user, if there are no scripts in this category having identical names as those in category '**default**', then all the associated scripts are moved to 'default' category and thereafter the category is deleted.

In case a category deletion fails reference message 28 and 29 in the [CMI Informational/Error Message List](#).

In case a user is deleted from E5-MS system, his/her categories shall also be deleted from system if no script exists in any of the categories. In case one or more scripts exist for the user, his/her categories shall not be deleted.

## Script Management

The Script Management screen is accessed by clicking on the **Script Management** link in the main menu on the left side of the E5-MS GUI under Configuration. An example of this page is shown in .



**Figure 58: Script Management Screen**

On top of the **Script Management**' screen, the **Select Owner** and **Select Category** drop-downs menus are provided. The **Select Owner** drop down allow the System Administrator to enabled and disabled a non-admin user. It list all the E5-MS users and the currently logged in user's name. The **Select Category** drop down has the listing of all the categories for the user selected in **Select Owner** drop down. The **All** option is set by default. Below these drop downs, the listing of scripts are provided based on the user and category selected above. Following four columns shall be provided:

- Script Name - Name of the script
- Last Modification Time - Time when the script was last modified
- Category - Name of the category the script belongs to
- Last Execution Result - Name of the EAGLE(s) on which the script has been executed

Selecting an EAGLE name in the `Last Execution Result` column shall launch a new **Script Execution Result** window showing the script execution result for that EAGLE as shown in Script Execution Result Screen. Note that only 2000 lines of script execution output is visible on the screen at a time. In case, the execution output is more than 2000 lines, then the user can view the desired output by using the navigational buttons provided on the window.

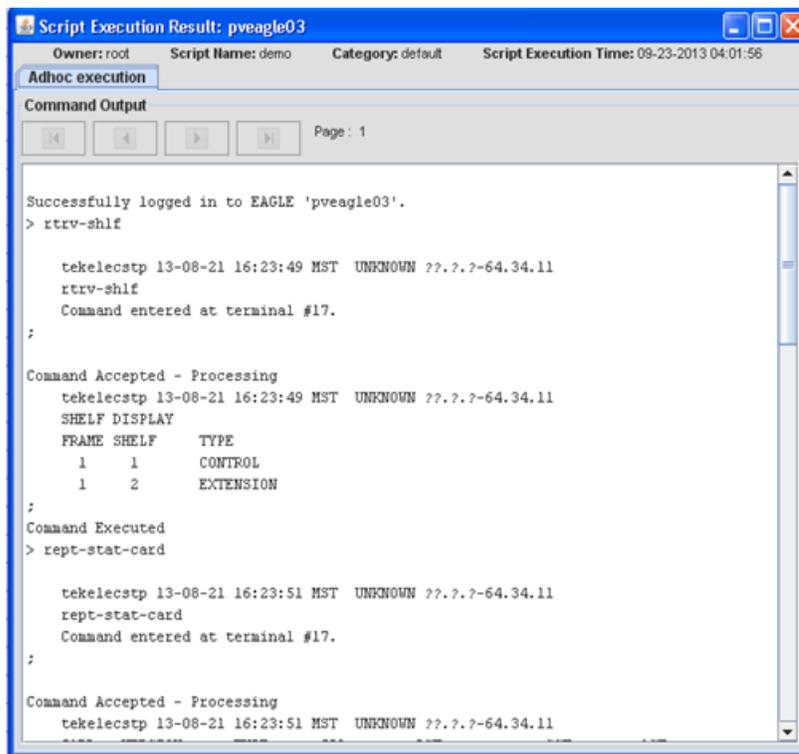


Figure 59: Script Execution Result screen

This section presents procedures available for CMI **Script Management**. Operations that can be performed for CMI **Script Management** include:

- **Create** - Clicking it launches the **Create Script** screen. This button is enabled only if the user's user group has been provided the **Create Script** operation by E5-MS admin.
- **Modify** - Selecting a script on the page and clicking **Modify** button shall launch the **Modify Script** screen. This button shall be enabled only if the user's user group has been provided the **Create Script** operation by E5-MS admin.
- **View** - Selecting a script on the page and clicking it shall launch the **View Script** screen.
- **Delete** - Selecting a script on the page and clicking **Delete** button shall launch a confirmation box asking for deletion of the selected script as shown in Script Deletion Confirmation
- **Execute** - Selecting a script on the page and clicking **Execute** button shall launch the **Execute Script** screen. This button is enabled only if the user's user group has been provided the **Execute Script** operation by E5-MS admin.

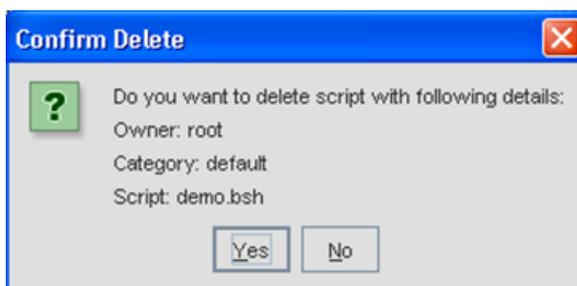


Figure 60: Script Deletion Confirmation

## Create Script

Create Script screen has three panes, as follows:

- **Build Command** pane - It shall enable user to build a command to be included in the script.
- **Edit Script** pane - It shall enable user to manually edit the script.
- **Save Script Results** pane - It shall display the results of saving the script.

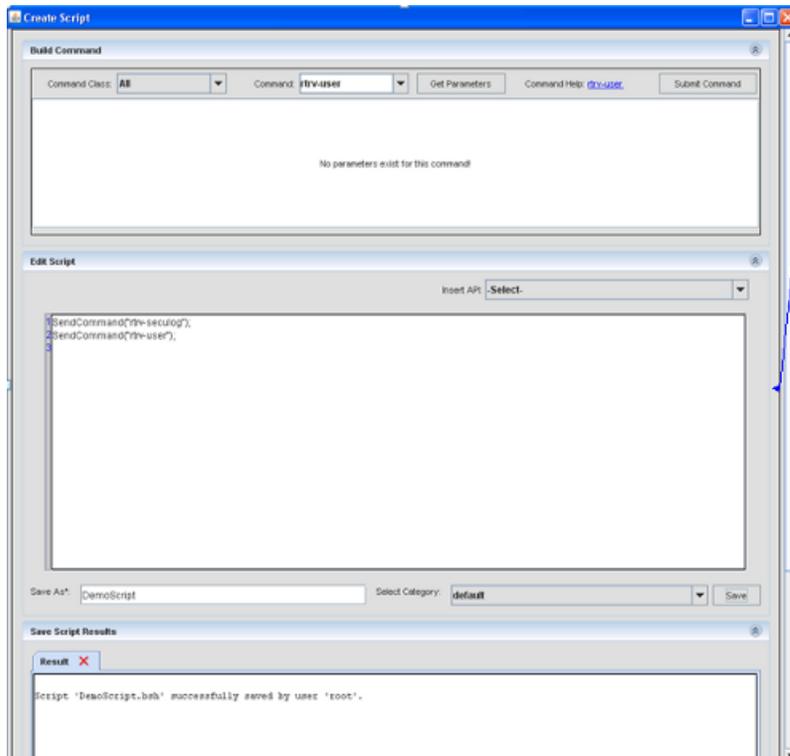


Figure 61: Create Script Screen

## Edit Scripts

This pane allows a user to edit a script manually. The drop down menu "Insert API" is provided above the free edit text area which has all the APIs defined in CMI Scripting Functions

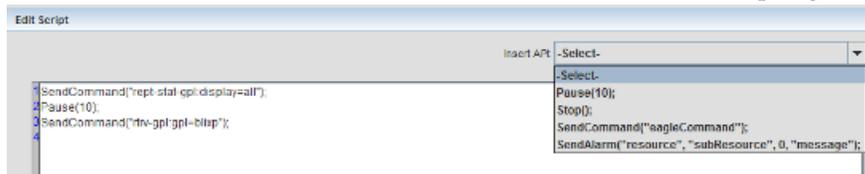


Figure 62: Edit Script Screen

Selecting an API in the drop down shall add it to the edit area at the location of the cursor.

A text box namely 'Save As\*' shall be provided below the edit area. A drop down namely 'Select Category' shall also be provided adjacent to it. Providing a valid script name and selecting a desired category and then clicking the 'Save' button shall save the script in the category. In case user has used

one or more commands in the script on which he/she does not have access, then script shall not be saved and an appropriate error message is shown to the user.

These functions are described below:

1. **Pause(10)**: This function shall introduce a pause of '10' seconds during script execution. A user can use a desired value instead of 10. This function can be used in a scenario when a command fails and user wants to retry that command once again. In such a case, the script can be paused for a given seconds of time. Another example of its usage can be where a user wants the script to deliberately wait for some time.
2. **Stop()**: This function shall stop the execution of a script. This function can be used in case a user wants to stop the script execution altogether in case of a mandatory command failure. Every command executed from within a script returns a status showing whether it completed successfully or not. In case it was not successful and the rest of the commands in the script are dependent on it, then a user can stop the script.
3. **SendCommand("eagleCommand")**: This function shall send a command to EAGLE for execution. It returns the status of command execution in Boolean (true=success, false=failure). Note that when a user manually writes the complete command in SendCommand API instead of building the command, then while saving the script, only command name is validated for user's access. In case a user writes invalid parameters/values for the command, then those shall not be validated while saving the script.
4. **SendAlarm("resource", "subResource", 0, "message")**: This function shall generate an alarm on a Resource "resource" and Sub-Resource 'subResource' with severity (denoted by 0) and alarm message as provided in "message" field. The user is required to update the default values as per his/her requirement. This function can be used to generate a custom alarm to indicate a success or failure in script execution. For example, if a command fails in the script, an alarm can be generated so that the user can take corrective action later.
  - a. **resource** = Script execution
  - b. **subResource** = <Script name>
  - c. **0 (severity)** = <Desired severity>, e.g. 1 (Critical), 2 (Major), 3 (Minor), 4 (Warning) and 7 (Info)
  - d. **message** = <Desired message>, e.g. "Command 'Rept-stat-card' failed", "Script Failed", "Script completed successfully" etc.

## Modify Script

This screen is similar to 'Create Script screen. When launched, it has the details of script (script contents, name and category) pre-populated on the page. The user can modify the script contents, name and category and save.

If a user modifies the script content on **Modify Script** screen and tries to close the window without saving the changes, a warning message is shown to the user, if they want to save the script.

## View Script

View Script screen details and contents of a script in a non-editable edit area.

## Execute Script

Execute Script screen has two panes, in the following order, top to bottom:

- **Select Script** pane - It enables user to select desired script and EAGLE(s) for execution.
- **Script Execution Results** pane - It displays the script execution results

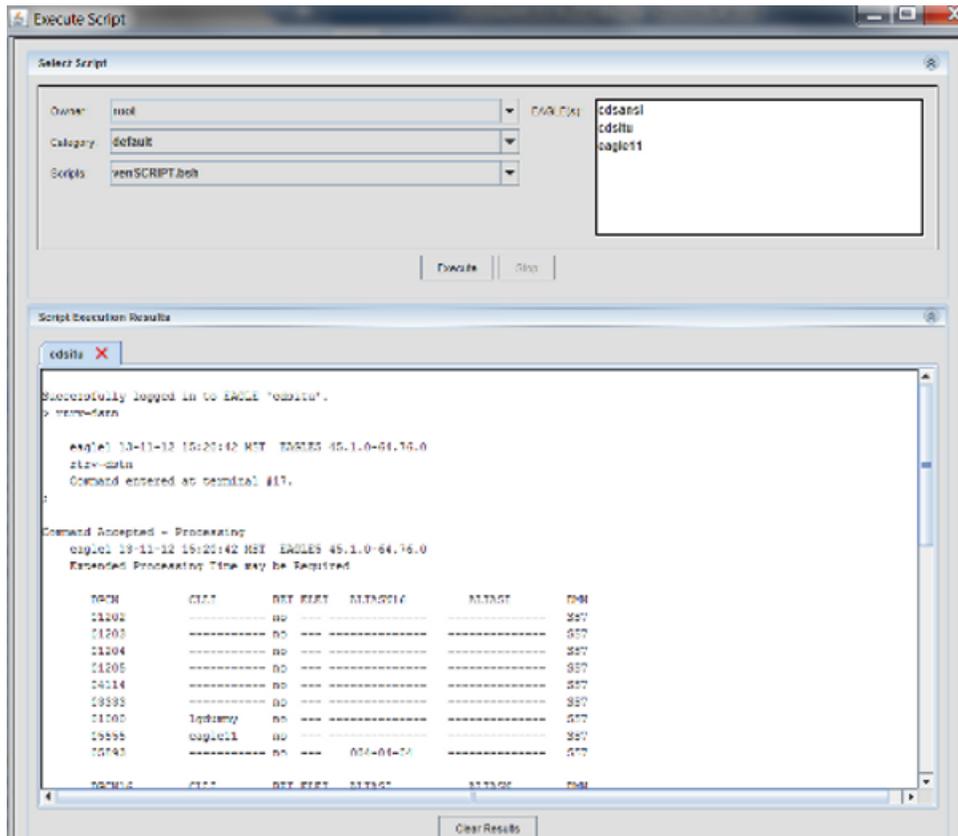


Figure 63: Execute Script Screen

### Select Script pane

The **Select Script** pane allows a user to select a desired script and EAGLE(s). The **Owner** drop down lists all the E5-MS users and it is enabled for an admin and disabled for a non-admin user. So, an admin has the ability to select a user in Owner drop down, then a category belonging to that user in **Category** drop down and then select the desired script to execute. A non-admin user select their own scripts and execute them.

Below the **Select Script** pane, two buttons namely **Execute** and **Stop** is provided. Selecting a desired script and EAGLE(s) and clicking on the **Execute** button executes the script if the user has access to all the commands used in the script. In case there are one or more commands in the script on the user does not have access, then script execution fails and an appropriate error message is shown to the user. The **Stop** button is disabled by default and is enabled when script execution is in progress. Clicking on it, a user is able to stop a script execution. On clicking the **Stop** button, script execution stops on all the EAGLE(s) which were selected by the user while sending the script for execution. While a script execution is in progress, **Select Script** pane is disabled so that a user cannot change the

previously made selections. The pane is enabled again for the user to select desired script and EAGLE(s) when script execution has been completed/stopped.

### Script Execution Results pane

The **Script Execution Results** pane displays the script execution results for various EAGLE(s). Each EAGLE's execution results are in a separate tab, which is created when the first script is sent to that EAGLE for execution. Once an EAGLE's tab has been created, execution results of all the scripts executed on that EAGLE is displayed in that tab only till the time the tab is open. Note that only the latest 5000 lines of results are shown in an EAGLE's tab. In case the lines are more than 5000, then older lines are removed to display the latest results.

A user has the ability to close an EAGLE's tab. However, when a script is being executed on an EAGLE, the corresponding tab is not allowed to be closed.

A **Clear Results** button is provided at the bottom of the screen, which is used to clear the results from the currently selected EAGLE tab.

## Schedule Management

**Schedule Management** Screen enables users to schedule CMI scripts. There is an **Add Task** button at the bottom of the screen the user can schedule scripts. This button is enabled only if the user's user group is provided the **Schedule CMI Script** operation by the E5-MS System Administrator.

Selecting **CMI** in the drop down adjacent to **Add Task** button and clicking on the button opens a the **CMI Scheduler**. As shown in CMI Scheduler Screen.

Figure 64: CMI Scheduler Screen

The CMI Scheduler window has two panes:

- **Select CMI Task** pane - enables a user selecting the desired script for execution and the EAGLE(s) which the script is executed.
- **Time** pane - enables a user select the frequency of script execution.

### Select CMI Task pane

This pane enables a user select the desired script and EAGLE(s). Three drop downs is available to aid a user in selecting a desired script for scheduling:

- **Owner** - This drop down has the listing of all the E5-MS users. This is enabled for an admin user and disabled for a non-admin user. So, an admin is able to select a desired user in this drop down.
- **Category** - This drop down has the listing of all the categories for the user selected in **Owner** drop down.
- **Scripts** - This drop down has the listing of scripts as per the owner and category selected in **Owner** and **Category** drop downs.

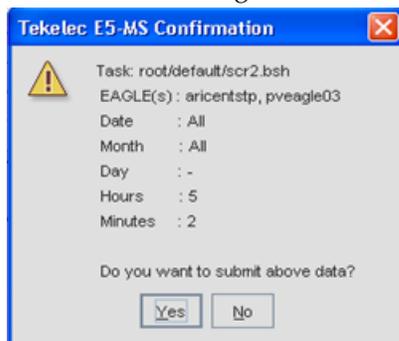
The EAGLE(s) assigned to the user's user group is displayed in the **EAGLE(s)** list. Selection of a script and at least one EAGLE is mandatory for the script to be scheduled.

### Time pane

This pane provides the user various means of selecting a desired frequency of scheduled script execution. A user can select following timing options:

- Date of execution - All the dates/Particular dates OR All the days of week/Specific day(s) of week.
- Time of execution - All the hours of day/Specific hour and All the minutes/Specific minute.

After selecting a script, EAGLE(s) and the frequency of execution and submitting the values using **Submit** button on the window, a confirmation box is shown to the user with the values filled up by the user. On clicking **Yes** on the confirmation box the script is scheduled.



**Figure 65: CMI Scheduler Confirmation**

**Note:** By default, the scheduled script is **enabled** i.e. it runs at the given frequency. However, the user has the ability to disable the scheduled execution of a script by un-checking the box in the **Enabled** column for that script. This will stop the scheduled execution of the script. The user has the ability to start the scheduled execution again by checking the box in **Enabled** column.

**Note:** While scheduling scripts, following points should be kept in mind:

- A script should not be scheduled for execution for every minute of the all the days i.e. the value in **Scheduled Time** column on **Schedule Management** page should not read "All the days, every minute of the day". A script scheduled with this frequency will try to run every minute and might make E5-MS server unstable.

- E5-MS admin ensures there is a gap of at least 2 minutes between every two scheduled CMI script executions. This is because in case two scripts try to login to the same EAGLE at (almost) the same time, then only one of them succeeds in logging into EAGLE. This is because EAGLE does not present the list of free IPSM terminals to a login session when another session has already been presented the list of free IPSM terminals and in the process of choosing a terminal and logging in. So, it is recommended to have a time gap between every two script executions.

## CMI Informational/Error Message List

S. NO.	CMI Functionality	Error Message
1.	Send Command	No EAGLE(s) selected for login! Please select EAGLE(s) in the 'Available EAGLE(s)' list.
2.		Please wait...Already logging in to EAGLE '<eagle name>'
3.		Already logged in to <eagle name>.
4.		No EAGLE(s) selected for logout! Please select EAGLE(s) in the 'Logged-in EAGLE(s)' list.
5.		Command execution failed! No EAGLE(s) in the 'Logged-in EAGLE(s)' list.
6.		No EAGLE(s) selected for command execution! Please select EAGLE(s) in the 'Logged-in EAGLE(s)' list.
7.		Either command is incorrect or user does not have access on command!
8.		EAGLE '<eagle name>' is already executing a command! Please try later.
9.		Please select a command in 'Command' combo box!
10.		Cannot close the results tab while EAGLE is logged-in!
11.		Logged out of EAGLE '<eagle name>' due to your access to it being revoked by administrator
12.		Successfully logged in to EAGLE '<eagle name>'!
13.		Successfully logged out to EAGLE '<eagle name>'!
14.		Login to EAGLE '<eagle name>' failed!
15.		Logout of EAGLE '<eagle name>' failed!
16.		Logged out of EAGLE '<eagle name>' due to inactivity!
17.	Category Management	Category 'default' can not be renamed!
18.		Category 'default' can not be deleted!
19.		Mandatory field 'Category Name' is blank! Please provide a valid category name.

S. NO.	CMI Functionality	Error Message	
20.		Category name must have minimum 3 characters!	
21.		Category name must not have more than 255 characters!	
22.		Category name cannot be set as 'All'! This is a reserved keyword.	
23.		Only alphanumeric characters (0-9, a-z, A-Z) are allowed for category name! Please provide a valid category name.	
24.		A category by name '<category name>' already exists! Please provide a unique category name.	
25.		Category creation failed! Please contact the E5-MS administrator.	
26.		Renaming of category '<category name>' failed! Category does not exist.	
27.		Renaming of category '<category name>' failed! Please contact the E5-MS administrator	
28.		Deletion of category '<category name>' failed! Category does not exist.	
29.		Deletion of category '<category name>' failed! Please contact the E5-MS administrator.	
30.		Deletion of category '<category name>' failed! One or more scripts with identical names already exist in category 'default'.	
31.		Script Management	Script viewing failed! Script '<script name>' does not exist.
32.			Script modification failed! Script '<script name>' does not exist.
33.	Script execution failed! Script '<script name>' does not exist.		
34.	Script deletion failed! Script '<script name>' does not exist.		
35.	Create / Modify Script	User '<user name>' does not have access on command(s): <command names>.	
36.		Mandatory field 'Save As' is blank! Please provide a valid script name.	
37.		Script name must have minimum 3 characters!	
38.		Script name must not have more than 255 characters!	
39.		Only alphanumeric characters (0-9, a-z, A-Z), underscore and hyphen are allowed for script name! Please provide a valid script name.	
40.		Script '<script name>' already exists in category '<category name>'! Please provide a unique script name.	
41.		Script saving failed! Script has no content.	
42.		Script saving failed! Syntax errors found in the script.	

S. NO.	CMI Functionality	Error Message
Execute Script 43. 44. 45.		Script execution failed! Please select at least one EAGLE for script execution.
		EAGLE ' <eagle name>' is already executing a script! Please try later.
		Cannot close the results tab while script is being executed on the EAGLE!

# Chapter 10

## Link Utilization Interface

---

### Topics:

- *Overview.....128*
- *Functional Limitations.....128*
- *Link Utilization GUI.....128*
- *Schedule Management.....138*
- *LUI Measurements Error and Informational Messages.....138*

This chapter provides information about the Link Utilization Interface (LUI). This interface is used for configuring capacity information in the E5-MS for links in EAGLE systems.

## Overview

The Link Utilization Interface gathers configured capacity information from each EAGLE system. It creates and periodically executes polling scripts that retrieve the capacity information, ensuring the information is current. The information is stored in the E5-MS database, along with the data collected by the Measurements Module so the E5-MS Users can request ad-hoc utilization reports on links, linksets, and cards.

## Functional Limitations

The LUI functionality is available upon successful installation of these modules:

- Measurements Module
- Fault Management
- Configuration Management Interface (CMI)

## User Access Control

Administrators and usergroups assigned **Link Utilization** operation have access to Link Data, On Demand Polling, Threshold Configuration of LUI module and the polling script entries on **Schedule Management** screen. The LUI module automatically detect **New EAGLE(s)** added to E5-MS module and create polling scripts so it is mandatory that a user assigned **Link Utilization** operation have access to all EAGLE(s).

The usergroup assigned the **Link Utilization** operation are automatically assigned access to all **Existing EAGLE(s)** and the commands (`rtrv-slk`, `rept-stat-card`, `rept-stat-iptps`) needed in LUI module. Any EAGLE added to E5-MS are automatically be assigned to the usergroups.

## Link Utilization GUI

Link Utilization is located in the E5-MS applications tree node. There are three elements under Link Utilization as shown in [Figure 66: Link Utilization Tree Node](#)



**Figure 66: Link Utilization Tree Node**

The elements are the:

- Link Data
- On Demand Polling
- Threshold Configuration

The user is granted access to this application by the System Administrator.

## Link Data

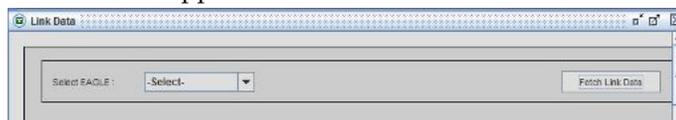
Before performing this procedure, the user must be associated with a Usergroup that is authorized to use the **Link Utilization** application.

The procedure below will provide a user the steps to view information about each link supported by an EAGLE system.

1. Select **Link Data** under the **Link Utilization** tree node in the main menu on the left side of the E5-MS GUI page link.

### Link Data

A screen will appear, as shown in Link Data Screen.



**Figure 67: Link Data Screen**

The Link Data screen provides the following:

- **Select EAGLE** to view the available link data: This field contains a drop-down list of the EAGLE systems to which the E5-MS is connected.
  - **Fetch Link Data** button: Clicking the **Fetch Link Data** button retrieves the link information for the selected EAGLE system.
2. **Select** the EAGLE system of the drop-down list to view the link data.
  3. Click **Fetch Link Data** button, to retrieves the link information for the selected EAGLE system. The Data Link screen populates with a table as shown in the example of Link data for EAGLE: eagle11.

 A screenshot of the 'Link Data' application window after data has been fetched. The 'Select EAGLE:' dropdown menu now shows 'eagle11'. Below the dropdown menu is a button labeled 'Fetch Link Data'. Underneath, there is a section titled 'Reset User Defined Capacity' and a sub-header 'Link data for EAGLE: eagle11'. Below this is a table with the following data:
 

LOC	LINK	LSN	TYPE	USER DEFINED CAPACITY	LINK CAPACITY
1121	A	21101400	LRH1	50000	50000
1121	A1	21101400	LRH1	50000	50000
1121	A2	21101400	LRH1	50000	50000
1121	A3	21101400	LRH1	50000	50000
1121	B	21101400	LRH1	50000	50000
1121	B1	21101400	LRH1	50000	50000

**Figure 68: Link data for EAGLE: eagle11**

**Note:** An error message

EAGLE not selected! Please select an EAGLE to view link data.

will display, if the user clicks on **Fetch Link Data** button without selecting an EAGLE system from the drop-down.

## Link Data Screen Elements

Element	Description
LOC Field	The location of the card on which the link resides.
Link Field	Identifies the signaling link within the linkset identified in LSN
LSN	The name of the linkset that contains the link.
Type	The type of the link.
USER DEFINED CAPACITY:	A hypothetical capacity of the link BPS value for Non-IP link and SLKTPS value for IP link that can be modified by the user.
LINK CAPACITY	Link capacity value as configured on the EAGLE or calculated by LUI agent based on the available information from EAGLE polling.

## Modifying Link Capacity

Before performing this procedure, the user must be associated with a Usergroup that is authorized to use the **Link Utilization** application.

This procedure describes how to manually change the hypothetical, user-defined link capacity information associated with a link in a selected EAGLE system to which the E5-MS is connected. This information is stored in the E5-MS, not in the EAGLE 5 system.

1. **Double click** on a row in table showing link data for an EAGLE. In the following example, you will see the [Figure 69: Modify User Defined Capacity](#) screen for the link data of the EAGLE11.

The screenshot shows a window titled "Modify User Defined Capacity". Inside the window, the following information is displayed:

- CLI : eagle11
- LOC : 1102
- LINK : A
- LSN : ls1102a00
- TYPE : LIMT1
- USER DEFINED CAPACITY : 56000
- LINK CAPACITY : 56000

At the bottom of the window, there are two buttons: "Update" and "Cancel".

**Figure 69: Modify User Defined Capacity**

This window provides:

- **CLLI:** The identity of the EAGLE containing the link for which the hypothetical capacity value is to be modified.
- **LOC:** the location of the card on which the link resides.
- **Link:** identifies the signaling link within the linkset identified in **LSN**.
- **LSN:** the name of the linkset that contains the link.
- **Type:** the type of the link.
- **USER DEFINED CAPACITY:** the hypothetical capacity value of the link (BPS value for Non-IP link and SLKTPS value for IP link) that can be modified by the user.
- **LINK CAPACITY:** link capacity value as configured on the EAGLE or calculated by LUI agent based on the available information from EAGLE polling.

The screen displays the CLLI, LOC, LINK, TYPE, LSN, USER DEFINED CAPACITY and LINK CAPACITY for the selected link. Two buttons **Update** and **Cancel** are at the bottom of the screen.

2. Enter the new hypothetical capacity value fro BPS or SLKTPS into the **USER DEFINED CAPACITY** field.
  - The textbox must not be blank.
  - Value entered in the textbox must be a positive non-zero integer.
  - Value entered in the textbox must be of maximum 14 digits.

If the user enters a valid integer value starting with zero(s) in the **User Defined Capacity** field, then the integer value following the zero(s) is updated as the new user capacity value in the table. For example, if the user enters capacity value as "0001200" then this will be updated as 1200.

If the user enters a valid integer value starting with zero(s) in the **User Defined Capacity** field, the leading zero(s) are ignored. For example, if the user enters capacity value as "0001200" then this will be updated as 1200.

3. Click on **Cancel** button to cancel the changes in the hypothetical capacity value for the link. The **Link Data** screen will be displayed.
4. Click on the **Update** button to save the new hypothetical capacity value in the EAGLE E5-MS database.

The **Link Data** screen will be displayed with updated link data table.

All links with modified hypothetical capacity values will be displayed in yellow colored rows. If the new capacity value provided does not follow the restrictions in , appropriate error messages will be displayed as follows.

- If the capacity field is blank the message displayed is USER DEFINED CAPACITY field is blank! Please provide a valid value for the field.
- If the capacity value provided by user is not a positive integer the message displayed is Capacity value provided for USER DEFINED CAPACITY field is not valid! Please provide only positive non-zero integer value (maximum 14 digits) for this field.
- If the capacity value provided by user is of more than 14 digits, not starting with 0, the message displayed is USER DEFINED CAPACITY value is more than 14 digits!

**Reset User Defined Capacity** button: clicking the **Reset User Defined Capacity** button causes a confirmation dialog box to be displayed. Once the user clicks the **Ok** button, the link capacity values for BPS value for Non-IP links and SLKTPS value for IP links are populated under the **USER DEFINED CAPACITY** column.

## Polling Scripts Creation

Every polling script shall consist of three EAGLE commands which runs on the EAGLE to fetch link capacity data. These commands are:

- **RTRV-SLK**

This command is required to retrieve all the links and parameters. LOC, LINK, LSN, SLC, TYPE, BPS, and SLKTPS of configured links are available from this command output and defined in the column headers of the output. Some capacity values are not available from this command. Default values are used. For example, the SS7IPGW, IPGWI, IPLIM and IPLIMI do not show a SLKTPS value. In order to get SLKTPS for these link types we can use the maximum possible capacity values using the REPT-STAT-CARD command or the configured value using the REPT-STAT-IPTPS command. As shown in [Figure 70: RTRV-SLK Command Output](#).

```

cdsitu X
Command Accepted - Processing
eagle1 . EAGLE5

LOC LINK LSN      SLC TYPE      ANAME      SLKTPS/      MAXSLKTPS
      RSVDSLKTPS

1213 A   lgdummy   0   IPSP      lgdummy     1000      1000
1213 B   m3uastp2  0   IPSP      m3uastp2    100       100
1213 A1  stp11m2pa 0   IPSP      stp11m2pa  1000     5000
1214 A   mgtsm3ua  0   IPSP      mgtsm3ua   100       100
1214 A1  stp11m2paj 0   IPSP      stp11m2paj7 1000     5000

LOC LINK LSN      SLC TYPE      L2T      PCR PCR   E1  E1
      SET BPS   ECM  N1  N2      LOC PORT TS
1203 A   ls1203mgts 0   LIME1  11  64000 BASIC ---- - 1203 1  1
1203 B   ls1203mgts 2   LIME1  11  64000 BASIC ---- - 1203 2  1
1203 A1  ls1203mgts 1   LIME1  11  64000 BASIC ---- - 1203 1  2
1204 A   ls1204stp2 1   LIME1  11  64000 BASIC ---- - 1204 1  1

SLK table is (9 of 1200) 1% full.

;
Command Executed

```

**Figure 70: RTRV-SLK Command Output**

- **REPT-STAT-CARD**

This command is used to further define type and capacity of different link types. If a link, fetched from the EAGLE using RTRV-SLK command, does not display capacity value, its location is searched in the output of the REPT-STAT-CARD command. Through location of the card, its hardware type and the APPL/GPL running on it can easily be found. And now with the help of link type, its card type and the GPL, the capacity is fetched from a pre-defined set of values maintained in a structure on E5-MS. As shown in [Figure 71: REPT-STAT-CARD Command Output](#)

```

cdsitu X
Command Accepted - Processing
eagle1
CARD  VERSION  TYPE  GPL  PST  SST  AST
1103  134-076-000  DSM  SCCPHC  IS-NR  Active  -----
1105  134-076-000  DSM  DEIRHC  IS-NR  Active  -----
1108  134-076-000  IPSM  IPSHC  IS-NR  Active  -----
1109  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1110  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1111  134-076-000  DSM  SCCPHC  IS-NR  Active  -----
1113  134-076-000  ESMCAP  OAMHC  IS-NR  Active  -----
1114  -----  E5TDM  IS-NR  Active  -----
1115  134-076-000  ESMCAP  OAMHC  IS-NR  Standby  -----
1116  -----  E5TDM  IS-NR  Active  -----
1117  -----  E5MDAL  IS-NR  Active  -----
1203  134-076-000  LIME1  SS7HC  IS-NR  Active  -----
1204  134-076-000  LIME1  SS7HC  IS-NR  Active  -----
1209  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1210  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1213  134-076-000  E5ENET  IPSG  IS-NR  Active  -----
1214  134-076-000  E5ENET  IPSG  IS-NR  Active  -----
1309  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1310  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
Command Completed

```

Figure 71: REPT-STAT-CARD Command Output

- REPT-STAT-IPTPS

This command is used to get CONFIG capacity values for IPGWx type of IP links, as `rtrv-slk` command gives SLKTPS value for IPSG link types only. Polling scripts with the `rept-stat-iptps` command capability are generated after the first `rtrv-slk` poll defining the different links, link sets and their respective types. This polling script replaces the earlier script. The subsequent execution of these polling scripts shall run `rept-stat-iptps` command for all the IPGW link sets and shall try to fetch SLKTPS value for IPGW linksets. As shown in [Figure 72: REPT-STAT-IPTPS Command Output](#).

```

cdsitu X
Command Accepted - Processing
eagle1 EAGLE5
IP TPS USAGE REPORT

      THRESH  CONFIG/  CONFIG/      TPS  PEAK      PEAKTIMESTAMP
      RSVD    MAX

-----
LSN
lgdummy    100%    1000*    1000 TX:    0    0    00-00-00 00:00:00
           RCV:    0    0    00-00-00 00:00:00
stp11m2pa  100%    1000*    5000 TX:    0    5    13-10-24 13:46:22
           RCV:    0    5    13-10-24 16:25:51
stp11m2paj 100%    1000*    5000 TX:    0    5    13-10-24 15:50:51
           RCV:    0    5    13-10-24 14:46:21
labstp2    100%     0*      0 TX:    0    0    00-00-00 00:00:00
           RCV:    0    0    00-00-00 00:00:00
m3uastp2   100%    100*    100 TX:    0    0    00-00-00 00:00:00
           RCV:    0    0    00-00-00 00:00:00
mgtsm3ua   100%    100*    100 TX:    0    0    00-00-00 00:00:00
           RCV:    0    0    00-00-00 00:00:00
-----

Command Completed.

```

**Figure 72: REPT-STAT-IPTPS Command Output**

The polling scripts are scheduled for regular execution. The timing and frequency of those script executions is configurable. By default, LUI polling script execution time is 01:00 AM as per current implementation. To change the schedule of polling script execution or to stop further execution of polling scripts, see *Modifying Polling Script Execution Schedule*.

## On Demand Polling

Before performing this procedure, the user must be associated with a Usergroup that is authorized to use the **Link Utilization** application.

On-Demand Polling retrieves link capacity information for each EAGLE system for which polling scripts were created and saved..

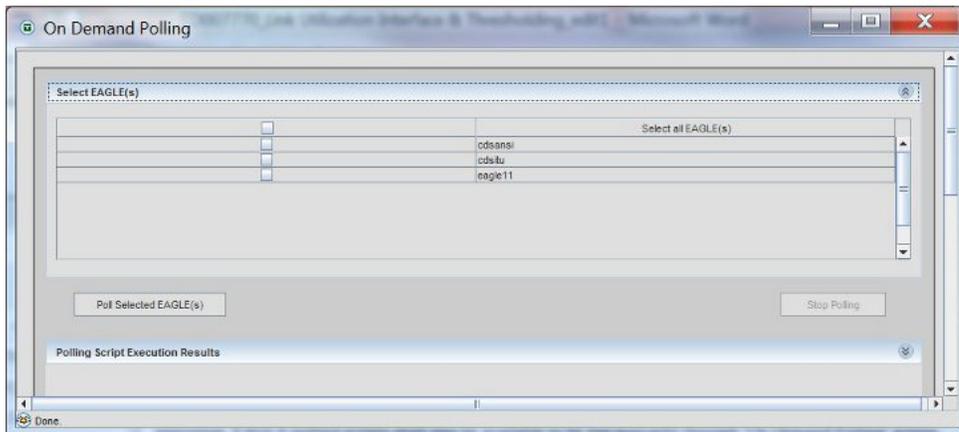
Before polling the EAGLE systems, a check is made for any other instance of the same EAGLE system polling script is running for the selected EAGLE system. If another instance of the EAGLE system polling scripts is found running for the selected EAGLE system, on-demand execution of the corresponding scripts is aborted and an information message

An instance of polling script for EAGLE <CLLI> is already running. Please try later.  
will be displayed on GUI.

The procedure below will provide a user the steps to run On Demand Polling scripts from the E5-MS.

1. Select **On Demand Polling** under the **Link Utilization** tree node in the main menu on the left side of the E5-MS GUI page link as shown in [Figure 73: On Demand Polling](#)

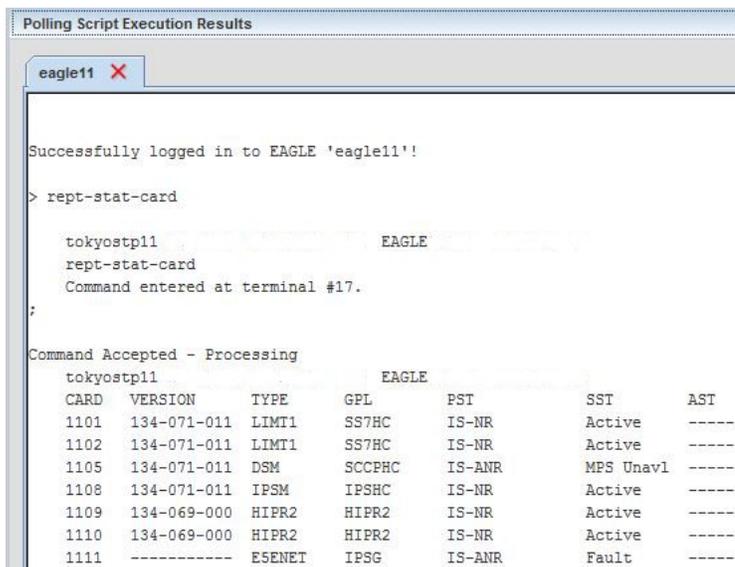
On Demand Polling



**Figure 73: On Demand Polling**

2. Click the check boxes from the **Select all EAGLE(s)** list which on-demand polling is being performed. A single, multiple, or all connected EAGLE systems may be selected.
3. Click on the **Poll Selected EAGLE(s)** button to begin polling.
  - The real-time status of EAGLE system polling script execution is displayed in the **Polling Script Execution Results** at the bottom of the screen.
  - While the on-demand execution for selected EAGLE system(s) is in progress, all check boxes and **Poll Selected EAGLE(s)** button are disabled.
  - If the another polling script starts execution of a scheduled EAGLE system polling script while the EAGLE system is being polled via an on-demand request, the scheduled script will not execute.
  - Once the polling of selected EAGLE system(s) is completed, the check boxes and the **Poll Selected EAGLE(s)** button will be enabled.
  - If no polling script is found, then instead of **Select all EAGLEs** checkbox, **No Polling scripts available!** message will be displayed on the GUI and both **Polling Selected EAGLE(s)** and **Stop Polling** buttons will be disabled.

The output of the polling is shown in [Figure 74: Polling Script Execution Results](#)



```

Polling Script Execution Results
eagle11 X
Successfully logged in to EAGLE 'eagle11'!
> rept-stat-card

tokyostp11          EAGLE
rept-stat-card
Command entered at terminal #17.
;

Command Accepted - Processing
tokyostp11          EAGLE
CARD  VERSION  TYPE  GPL  PST  SST  AST
1101  134-071-011  LIMIT1  SS7HC  IS-NR  Active  -----
1102  134-071-011  LIMIT1  SS7HC  IS-NR  Active  -----
1105  134-071-011  DSM  SCCPHC  IS-ANR  MPS Unavl  -----
1108  134-071-011  IPSM  IPSHC  IS-NR  Active  -----
1109  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1110  134-069-000  HIPR2  HIPR2  IS-NR  Active  -----
1111  -----  ESENET  IPSC  IS-ANR  Fault  -----

```

Figure 74: Polling Script Execution Results

4. Clicking the **Stop Polling** button to stop polling scripts execution of EAGLE system immediately and the login session with the EAGLE system will be terminated on the EAGLE system on which polling is in progress at that time.

The information message `Script execution stopped in EAGLE <CLLI>` will be display in the tab with the EAGLE name.

## Thresholding Configuration

The Thresholding Configuration functionality is available upon successful installation of these modules:

- Measurements Module
- Fault Management
- Configuration Management Interface (CMI)
- Link Utilization Interface

The **Thresholding Configuration** feature provides the ability to enable or disable the three measurement types: link, linkset and card. Using this capacity information along with the measurements gathered from EAGLE system, the **Thresholding Configuration** feature calculates percent utilization for all the entities of the type link, linkset, and card. **Thresholding Configuration** allows configuration of thresholds by link, linkset, and card measurement types. For each measurement type, the threshold alarm value, alarm severity, and threshold clear value can be configured independently from the other measurement types. The alarms generated by **Thresholding Configuration** feature are visible on the **Alarms** screen under **Fault Management** in E5-MS.

## Thresholding Configuration

Before performing this procedure, the user must be associated with a Usergroup that is authorized to use the **Link Utilization** application.

This procedure is used to sort the Threshold Alarm messages, Threshold Clear messages and Threshold Informational messages from the E5-MS.

1. Select **Thresholding Configuration** under the **Link Utilization** tree node in the main menu on the left side of the E5-MS GUI page link.

Thresholding Configuration

A screen will appear, as shown in Thresholding Configuration Screen.

<input type="checkbox"/> Enable All	Measurement Type	Threshold Alarm Value	Severity Level	Threshold Clear Value
<input checked="" type="checkbox"/>	CARD	75	Major	25
<input checked="" type="checkbox"/>	LINK	35	Minor	20
<input checked="" type="checkbox"/>	LINKSET	-Select-	Minor	-Select-

Submit

Done.

**Figure 75: Thresholding Configuration Screen**

2. **Enable** each Measurement Type within the check box or **Enable All** check box on the column header. By default, the check box on the column header and for all the three rows are unchecked i.e., the thresholding functionality is disabled for all the measurement types. **Measurement Type** contain three pre-populated entries - LINK, LINKSET and CARD one in each row.
3. Select the **Threshold Alarm Value** from a drop down values 1 to 99. This is the threshold value which the percent utilization calculated for the entities corresponding to the associated **Measurement Type** are compared. By default, value **Select** is populated in the drop down.
4. Select **Severity Level** from a drop down with the values **Select**, **Critical**, **Major** and **Minor**. By default, the value is set to **Select**.  
If **Critical** selected, a pop up a confirmation box stating Are you sure you want to display a CRITICAL alarm when threshold is exceeded?
5. The **Threshold Clear Value** from the drop down values 1 to 99. This is the threshold value with which the percent utilization calculated for the entities, with outstanding **Threshold Alarms**, corresponding to the associated **Measurement Type** are compared. By default, value **Select** is populated in the drop down.
6. Click the **Submit** button at the bottom of the configuration table.  
If all the values provided by the user are valid, then the configuration data is submitted and an informational message is displayed  
Threshold configuration data successfully updated!

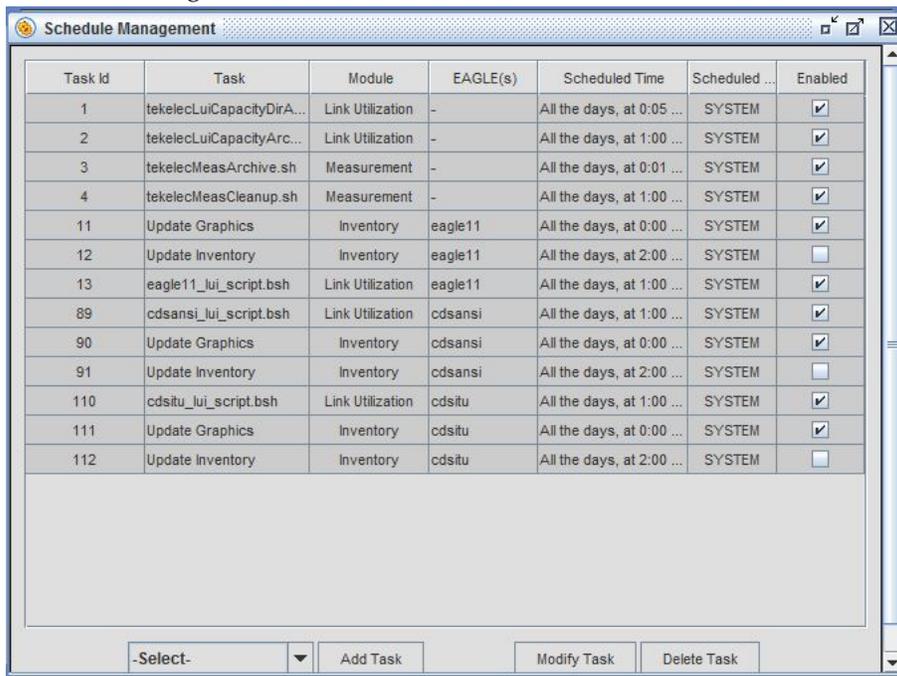
When the data on **Threshold Configuration** screen is entered incorrectly, the user clicks the **Submit** button appropriate error messages will occur if:

- The **Threshold Alarm Value** drop down for a measurement type contains **Select**. Error message Threshold alarm value for measurement type <measurement type> not selected!

- The **Threshold Clear Value** drop down for a measurement type contains **Select**. Error message Threshold clear value for measurement type <measurement type> not selected!
- The **Threshold Alarm Value** field contains a value, which is greater than or equal to the value in **Threshold Alarm Value**. Error message Threshold clear value will be greater than threshold alarm value!
- The **Severity Level** drop down for a measurement type contains **Select**. Error message The severity level for measurement type '<measurement type>' not selected!

## Schedule Management

Schedule Management screen located in the tree node on the left side of the E5-MS GUI provides the same polling script and is scheduled to run at 01:10 AM every day. The frequency of polling script execution can be changed by modifying the date and time for the entry on **Schedule Management** screen. To disable polling, the user must remove the check from the box in the **Enabled** column on Schedule Management screen.



Task Id	Task	Module	EAGLE(s)	Scheduled Time	Scheduled ...	Enabled
1	tekelecLuiCapacityDirA...	Link Utilization	-	All the days, at 0:05 ...	SYSTEM	<input checked="" type="checkbox"/>
2	tekelecLuiCapacityArc...	Link Utilization	-	All the days, at 1:00 ...	SYSTEM	<input checked="" type="checkbox"/>
3	tekelecMeasArchive.sh	Measurement	-	All the days, at 0:01 ...	SYSTEM	<input checked="" type="checkbox"/>
4	tekelecMeasCleanup.sh	Measurement	-	All the days, at 1:00 ...	SYSTEM	<input checked="" type="checkbox"/>
11	Update Graphics	Inventory	eagle11	All the days, at 0:00 ...	SYSTEM	<input checked="" type="checkbox"/>
12	Update Inventory	Inventory	eagle11	All the days, at 2:00 ...	SYSTEM	<input type="checkbox"/>
13	eagle11_lui_script.bsh	Link Utilization	eagle11	All the days, at 1:00 ...	SYSTEM	<input checked="" type="checkbox"/>
89	cdsansi_lui_script.bsh	Link Utilization	cdsansi	All the days, at 1:00 ...	SYSTEM	<input checked="" type="checkbox"/>
90	Update Graphics	Inventory	cdsansi	All the days, at 0:00 ...	SYSTEM	<input checked="" type="checkbox"/>
91	Update Inventory	Inventory	cdsansi	All the days, at 2:00 ...	SYSTEM	<input type="checkbox"/>
110	cdsitu_lui_script.bsh	Link Utilization	cdsitu	All the days, at 1:00 ...	SYSTEM	<input checked="" type="checkbox"/>
111	Update Graphics	Inventory	cdsitu	All the days, at 0:00 ...	SYSTEM	<input checked="" type="checkbox"/>
112	Update Inventory	Inventory	cdsitu	All the days, at 2:00 ...	SYSTEM	<input type="checkbox"/>

Figure 76: Schedule Management

## LUI Measurements Error and Informational Messages

The following error and informational messages are associated with the LUI Measurements feature.

Table 5: LUI Measurements Error and Informational Messages

Scenario	Error or Information Message
If there is no change in the configuration data and the check boxes corresponding to <b>LINK</b> , <b>LINKSET</b> , and <b>CARD</b> on the <b>Threshold Configuration</b> screen are already unchecked and the user clicks the <b>Submit</b> button.	No configuration data to update
When no constraint on the <b>Threshold Configuration</b> screen is violated and the user clicks the <b>Submit</b> button.	Threshold configuration data successfully updated!
The <b>Threshold Alarm Value</b> drop down for a measurement type contains <b>Select</b> .	Threshold alarm value for measurement type measurement type not selected!
The <b>Threshold Clear Value</b> drop down for a measurement type contains <b>Select</b> .	Threshold clear value for measurement type measurement type not selected!
The <b>Threshold Clear Value</b> field contains a value, which is greater than or equal to the value in <b>Threshold Alarm Value</b> field.	Threshold clear value cannot be greater than or equal to the threshold alarm value!
The <b>Severity Level</b> drop down for a measurement type contains <b>Select</b> .	The severity level for measurement type measurement type not selected!
In case <b>E5-MS</b> admin tries to remove an <b>EAGLE</b> from a usergroup which has <b>Link Utilization</b> operation assigned.	All <b>EAGLE(s)</b> are mandatory with <b>Link Utilization</b> operation.
In case <b>E5-MS</b> admin tries to remove either of command classes <b>DATABASE</b> or <b>SYSTEM MAINT</b> from a usergroup which has <b>Link Utilization</b> operation assigned.	Command classes <b>DATABASE</b> and <b>SYSTEM MAINT</b> are mandatory with <b>Link Utilization</b> operation.

# Chapter 11

## Northbound Interface (NBI)

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### Topics:

- [Overview.....141](#)
- [Functional Description.....141](#)
- [Northbound Interface GUI.....144](#)
- [NBI Agent Configuration GUI.....149](#)

This chapter provides information about the E5-MS Northbound Interface, which is a feature of the E5-MS product that forwards alarms from EAGLE systems and the E5-MS to one or more client Network Management Systems.

## Overview

The Northbound Interface application is an optional feature to the E5-MS that processes alarms received by the E5-MS from the EAGLE systems. If this application is grayed out in the E5-MS from the Tools icon at the top of the E5-MS GUI, the client or user does not have the application available. The feature forwards events to NMS(s) in form Simple Network Management Protocol version 2c (SNMP v2c) traps. The FTP North Bound Interface allows E5-MS raw measurement reports to be forwarded to a database.

Alarms forwarded through the SNMP interfaces include:

- Alarms collected on the South Bound interfaces (Eagle STP alarms)
- E5-MS alarms
- Alarms generated by features such as EAGLE EMS Measurements Based Threshold Alarms Tier 1.

NBI is able to support trap forwarding to NMS at a rate of 112 alarms per second. The rate has been derived for 14 mated pair of EAGLE(s) (i.e. 28 EAGLE(s)) with each sending alarms to E5-MS at a rate of 4 alarms per second

A (Secured) FTP NBI is offered on the E5-MS system. This interface allows the "export" of the measurement reports collected from the different elements managed.

An additional enhancement is offered with North Bound Interfaces for an additional filtering criteria. To the existing resource, sub-resource, severity and acknowledgement, you can add the UAM/UIM Number and the date/time of the event to this list.

## Functional Description

The Northbound Interface processes alarms received by the EAGLE as well as alarms generated within the E5-MS. The E5-MS forwards the latest event for each (unique combination of) resource and sub-resource available with it to a NMS on receipt of a resynchronization request in the form of SET request. The resynchronization occurs in following manner:

1. NMS sends a SNMP SET request (that sets an object value to 1) indicating request for event resynchronization.
2. NBI halts normal forwarding of autonomous events to the requesting NMS. However, these autonomous events continue to be stored in the queue as outstanding autonomous events.
3. NBI fetches open events from alert table with timestamp less than equal to the time when normal forwarding was halted and forward them to the NMS as SNMP v2c traps after checking them against matching/filtering patterns.
4. After the resync process is complete, NBI sends a trap indicating the completion of resync process.
5. NBI forwards all the outstanding autonomous events, after checking them against matching/filtering patterns, received during this period to the NMS on a FIFO basis from the queue.
6. The object value is reset to 0 and normal trap forwarding is resumed.

## Autonomous Events Trap Forwarding

NBI SNMP agent forwards all autonomous events received at E5-MS in form of SNMP v2c traps to all configured NMS, once the events are filtered using matching/filtering patterns. A NBI circular queue is maintained at E5-MS for storing autonomous events. One thread per NMS is maintained for forwarding autonomous events. Each thread maintains its own head on the circular queue; this is required to ensure that processing for one NMS do not interfere with other NMS configured. Three states are maintained per NMS as follows Normal, Resync and Transition mode. Autonomous event are forwarded in normal mode. Other modes are discussed in resynchronization.

The SNMP v2c traps forwarded to northbound NMS(s) are as per TEKELEC EAGLE EMS MIB definition and have the following varbinds:

- alertTime - timestamp when E5-MS system received the event for the managed sub-domain.
- alertResourceName - provides the source of the alert in a human readable form.
- alertSubResourceName - provides the sub-source of the alert in a human readable form.
- alertSeverity - defines severity of the alert.
- alertAcknowledgeMode - indicates whether the alert is acknowledged or not.
- alertTextMessage - the message body of the alert.
- alertSequenceNumber - incrementing sequence number allowing NMS to determine if an event has been missed.

All the traps are forwarded to the NMS(s) on respective ports as configured in NBI. The trap header includes the community string as configured in NBI for that particular NMS.

Only those autonomous events which pass matching/filtering criteria as per rule defined in [Northbound Interface GUI](#) are forwarded by E5-MS to NMS.

All autonomous events are forwarded by E5-MS to a particular NMS if no matching/filtering criteria are configured in NBI for that NMS. Status Update events generated at the E5-MS are not be forwarded to NMS.

EAGLE inventory discovery events (for e.g. discovery/addition of Frame, Shelf, CARD etc.) are not be forwarded to NMS.

The E5-MS generates heartbeat traps and send it to all the NMS(s) periodically to indicate that the connection is still up. The periodicity may be different for different NMS(s) due to the heartbeat value configured in the NBI. No response is needed from NMS for the heartbeat trap.

## Heartbeat Trap

NBI SNMP agent sends a heartbeat trap i.e. system alive message to NMS at configured interval. This interval is configurable from the NBI GUI. Each NMS can set the value of heartbeat interval as per there requirement. A separate thread gets spawned per NMS for sending heartbeat trap.

## Resynchronization

If the NMS gets out of sync with E5-MS, the E5-MS NBI SNMP agent provides provision of listening to an SNMP set request from NMS. When receiving a SNMP set request, the E5-MS triggers resynchronization if another SNMP set request is not under progress at the NMS. E5-MS SNMP agent switches to resync mode for that NMS, during which following steps are performed:

- Autonomous events are buffered in queue and are not processed.
- Resync start trap is sent to NMS.
- Active alarms are picked from DB which are less than or equal to resync trigger time and are send as resync traps once the alarms get filtered using matching/filtering patterns.
- Resync stop trap is sent to NMS.
- Mode gets toggled from 'resync' to 'transition'. In transition mode, outstanding autonomous events get sent to NMS.
- Once all outstanding autonomous events gets sent then SNMP agent toggles mode from 'transition' to 'normal'.

## E5-MS SNMP Agent Configuration

E5-MS provides a GUI for configuring SNMP agent read and write community. These community strings authenticates NMS Get/Set request to E5-MS agent. The GUI is launched from the menu screen as shown in NBI Tree Node. This is available to only authorized users having **NBI Agent Configuration** security operation assigned. NBI agent by default shall listen for SNMP Get/Set request on 8002 port which shall not be configurable.



Figure 77: NBI Tree Node

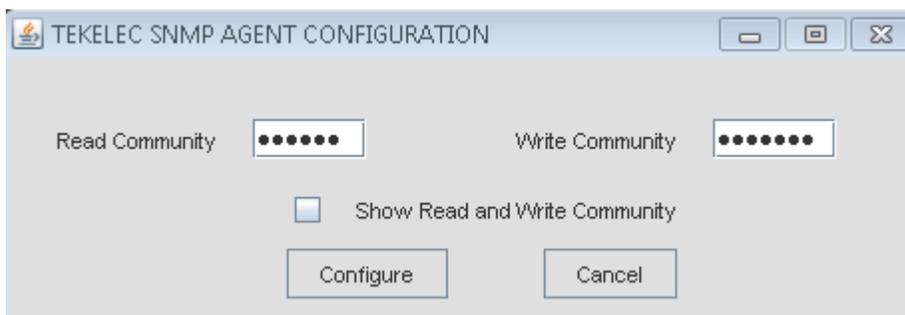


Figure 78: NBI Agent Configuration

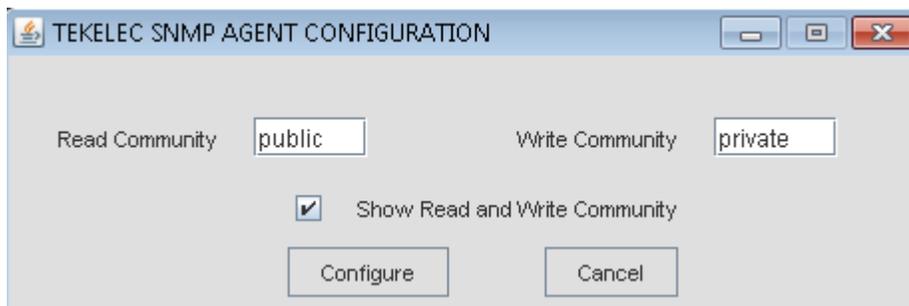


Figure 79: NBI Agent Configuration Plain Text

## Functional Limitations

The functionality usage differences between the E5-MS and the existing EAGLE EMS is due to the underlying framework changes; however, all the function remains intact.

- A maximum of 10 Network Management Systems (NMS(s)) can be configured with NBI.

**Note:** If the clients tries to configure more than 10 NMSs, the error message `Limit for number of NMSs i.e. 10 is already reached!`

- The `QUEUESIZE` will accommodate twice the number of events expected to be queued in duration of 2 hours i.e., 2,000,000 event at an alarm rate of 180events/sec. Once a 2 million event threshold is met, there will be a loss of events.

## Northbound Interface GUI

A Northbound Interface (NBI) GUI provides provision to configure an NMS along with matching/filtering patterns. These configurations are used by NBI module to send autonomous/resync events received at E5-MS to NMS. Autonomous/resync events are filtered using matching/filtering patterns before they are sent to NMS.

The **TEKELEC E5-MS SNMP NBI** GUI provides access two collapsible panels **Existing NMS(s)** and **NMS Configuration**. The user can collapse and expand each panel by clicking on its title bar.

The screenshot shows the TEKELEC EAGLE-EMS SNMP NBI configuration window. It is divided into two main sections: 'Existing NMS(s)' and 'NMS Configuration'.

**Existing NMS(s)**

NMS Label	Host Name/IP	Community	Port
Test1	10.25.24.50	public	162
Eagle2	10.25.24.51	public	162
Eagle3	10.25.26.6	public	162
Test2	10.26.13.135	public	162

**NMS Configuration**

NMS Name:\*  Community\*:

IP\*   Host Name\*

HeartBeat(sec)\*:  Port\*:

**Match/Filter Criteria**

Criteria	Operation	Value
<input type="checkbox"/> Resource:	Equal	<input type="text"/>
<input type="checkbox"/> SubResource:	Equal	<input type="text"/>
<input type="checkbox"/> Severity:	Equal	CRITICAL MAJOR MINOR WARNING INFO CLEAR
<input type="checkbox"/> Acknowledge:	Equal	UNACKNOWLEDGE
<input type="checkbox"/> UAM/UIM:	Equal	<input type="text"/>

Buttons: Add, Modify, Delete, Reset

Figure 80: TEKELEC E5-MS SNMP NBI

## NMS Configuration Data

The NMS Configuration is located within the TEKELEC E5-MS SNMP NBI screen. The mandatory data fields are recognized with an asterisk(\*) to Add a NMSs The following field must be filled:

1. NMS Name: A logical name for the NMS.
2. Hostname or IP: Depending upon the radio button selected a unique IP address or hostname of SNMP Manager to receive Traps.
3. Community: SNMP Community contained in Traps.
4. Port: Destination UDP port.
5. Heartbeat: Number of seconds between Heartbeat (i.e. system alive message) trap.

The Add button at the bottom of the screen is available once the screen is launched. The Modify, Delete and Reset buttons are shaded out until the user makes their selection from the Existing NMS(s).

## NMS Configuration Element Rules

Element	Validation Rules
NMS Name* Field	<ul style="list-style-type: none"> <li>• Only alphanumeric characters, hyphen and underscore are allowed.</li> <li>• It must have an alphabet as its first character.</li> <li>• Length is between 5 to 20 characters.</li> </ul> <p>Invalid rules generate one of the following error messages:</p> <ul style="list-style-type: none"> <li>• NMS name can contain only alphanumeric characters, hyphen and underscore!</li> <li>• NMS name can contain a minimum of 5 and a maximum of 20 characters.</li> <li>• NMS name must have an alphabet as its first character.</li> </ul>
Community* Field	<ul style="list-style-type: none"> <li>• String length cannot exceed 127 characters.</li> <li>• Blank string not allowed.</li> </ul> <p>Invalid rules generate one of the following error messages:</p> <ul style="list-style-type: none"> <li>• Community string is blank.</li> <li>• Community string length cannot exceed 127 characters.</li> </ul>
IP*	<ul style="list-style-type: none"> <li>• Blank is not allowed.</li> <li>• Valid IP address.</li> </ul> <p>Invalid rules generate one of the following error messages:</p> <ul style="list-style-type: none"> <li>• Invalid IP Address. Valid IP address format is '0-255.0-255.0-255.0-255'.</li> <li>• IP Address is blank!</li> </ul>
Host name*	<ul style="list-style-type: none"> <li>• Composed of series of labels concatenated with dots. For e.g. "en.wikipedia.org"</li> <li>• Each label must be between 1 and 63 characters long.</li> <li>• The entire hostname (including the delimiting dots) has a maximum of 255 characters.</li> <li>• Hostname labels may contain only the ASCII letters 'a' through 'z' (in a case-insensitive manner), the digits '0' through '9', and the hyphen ('-').</li> <li>• No other symbols, punctuation characters, or white space are permitted.</li> </ul> <p>Invalid rules generate one of the following error message:</p> <ul style="list-style-type: none"> <li>• Invalid Host Name.</li> </ul>
Heartbeat(sec)*	<p>The ability to configure heartbeat (in seconds) is through heartbeat combo box (textbox cum drop-down) on NBI Configuration Interface. The user can either select a value from the drop-down</p>

Element	Validation Rules
	<p>or enter a value in the textbox. The heartbeat combo box will list the following entries- 60, 120, 300, 600, 900, 1800, 3600, 5400 and 7200.</p> <ul style="list-style-type: none"> <li>• Only numeric value between 5 and 7200 are allowed.</li> <li>• Blank is not allowed</li> </ul> <p>Invalid rules generate one of the following error message:</p> <ul style="list-style-type: none"> <li>• Heartbeat is blank.</li> <li>• Heartbeat can contain only numeric value between 5 and 7200.</li> </ul>
<b>Port</b>	<ul style="list-style-type: none"> <li>• Only numeric value between 0 and 65535 is allowed.</li> <li>• Blank is not allowed.</li> </ul> <p>Invalid rules generate one of the following error message:</p> <ul style="list-style-type: none"> <li>• Port number is blank.</li> <li>• Port number can contain only numeric value between 1025 and 65535. It can also be 162.</li> </ul>

## Match/Filter Criteria Data

**Matching/Filtering Criteria** is disabled by default. Checkbox is provided to either enable all criteria in one go or individually enable required criteria. Enabling **Matching/Filtering Criteria** set **Operation** to **Equal** by default.

The following are optional search **Criteria** of the alarms:

- **Resource:** Source of alarm.
- **Sub-resource:** Physical/logical component of source on which the alarm was actually raised.
- **Severity:** Criticality of alarm.
- **Acknowledge:** Alarm is acknowledged or not at E5-MS.
- **UAM/UIM:** UAM/UIM number of alarm received from EAGLE.

The **Operation** fields have the option of **Equal** or **Not Equal** values and use semicolons (;) to assistance in the filtering. The asterisk (\*) can be use the **Resource** and **SubResource** criteria, such as \*XXXX, XXX\* and \*XXX\*.

Rules to send an autonomous/resync event to a NMS are as follows:

- Logical AND (&&) operation are performed to all criteria configured, matching (i.e. operation = Equal) and filtering (i.e. operation = Not Equal).
- Logical OR (| |) operation are performed between multiple values configured per criteria
- Values other then ones specified in match criteria (i.e. Equal operation) shall automatically become filtering criteria and vice versa.

## Match/Filter Criteria Element Rules

**TIP:** When you hover the mouse over the fields for a rule message will appear: Please enter values in format X or X-X, X-X;X-X and where X can be numeric. For wildcard search please use \*.

Criteria	Operation	Value Rules
Resource	Equal or Not Equal	<ul style="list-style-type: none"> <li>Blank is not allowed</li> <li>Multiple resources can be separated via (;) semicolon character</li> <li>Special characters underscore (_), hyphen (-) and asterisk (*) are allowed.</li> </ul> <p><b>Note:</b> The asterisk (*) can be use for example *XXXX,XXX* and *XXX*.</p> <p>Invalid rules generate one of the following error message Resource criteria can contain (;) separated alphanumeric characters and special characters: (_), (-) and (*) (As a begin or last character or single *)"</p>
SubResource	Equal or Not Equal	<ul style="list-style-type: none"> <li>Blank is not allowed</li> <li>Multiple resources can be separated via (;) semicolon character</li> <li>Special characters underscore (_), hyphen (-) and asterisk (*) are allowed.</li> </ul> <p><b>Note:</b> The asterisk (*) can be use for example *XXXX,XXX* and *XXX*.</p> <p>Invalid rules generate one of the following error messages:</p> <ul style="list-style-type: none"> <li>Cannot add an empty string as Sub-resource in Match/Filter pattern.</li> <li>NMS Sub Resource can contain (;) separated alphanumeric chars and special chars: (_), (-), (,), (/) and (*) (As a beginning and last character or single *)</li> </ul>
Severity	Equal or Not Equal	<p>Severity levels:</p> <ul style="list-style-type: none"> <li><b>Critical</b></li> <li><b>Major</b></li> <li><b>Minor</b></li> <li><b>Warning</b></li> <li><b>Info</b></li> <li><b>Clear</b></li> </ul> <p><b>Note:</b> User can select multiple severities at a time either matching or filtering criteria.</p>
Acknowledge	Equal or Not Equal	<p>Only applicable to resync events and not to autonomous events as <b>Acknowledge/Unacknowledge</b> is an E5-MS operation. Autonomous event trap forwarding are not impacted in case this criterion is configured.</p>
UAM/UIM	Equal or Not Equal	<ul style="list-style-type: none"> <li>All UAM/UIM can be matched/filtered by specifying asterisk (*)</li> </ul>

Criteria	Operation	Value Rules
		<ul style="list-style-type: none"> <li>• Multiple UAM/UIM can be specified semicolon separated as follows X;Y; A-B;Z</li> <li>• UAM/UIM range can be specified as A-B</li> <li>• Asterisk can't be clubbed with any other pattern.</li> <li>• UAM/UIM cannot be blank</li> <li>• All UAM/UIM entered are in range 1-1500</li> <li>• 'From' value of UAM/UIM should be less than 'To' value in case UAM/UIM range is specified</li> </ul> <p>Invalid rules generate one of the following error messages:</p> <ul style="list-style-type: none"> <li>• UAM/UIM cannot be blank.</li> <li>• Any range of UIM/UAM can't be blank.</li> <li>• MAXIMUM NUMBER OF CHARACTERS is 200.</li> <li>• Invalid input, UAM/UIM should be in range 1-1500.</li> <li>• 'From' value of UAM/UIM should be less than 'To' value of UAM/UIM.</li> </ul>

## NBI Agent Configuration GUI

*Figure 77: NBI Tree Node* GUI is available to users with authorized access from the System Administrator, as shown in NBI Agent Configuration Tree node. As shown in *Figure 78: NBI Agent Configuration* is launched. The GUI is used to configure NBI agent read and write community strings. The read and write community text fields will blot out as soon as the user entered the strings.

# Appendix

# A

## E5-MS System Administration

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### Topics:

- *Security Administration.....151*
- *Setting Up an E5-MS Workstation.....151*
- *Security Administration Screen.....153*
- *Management of Usergroups and Users.....154*
- *User Management.....162*
- *Password Management.....165*
- *Login Restrictions Management.....167*
- *Password GUI.....168*
- *Account Recovery.....170*

This appendix describes the GUI and text-based user interface that performs E5-MS configuration and initialization.

## Security Administration

The E5-MS customer is in charge of the system administration and the OS administration. Updates to the OS with the latest security patches will not impact the software behavior.

The customers will provide Hardware and Operating system, and have ownership of the Root account or any privileged accounts (Group Users). Oracle requires a privileged account to perform installation, configuration, maintenance, support and upgrades. It is recommended that the customer give privileges to Oracle personnel according to their needs/requirements but the customer will be the system administrator of the platform.

The default settings (including password) of the software components delivered by Oracle follow strong security rules (i.e complex passwords).

The E5-MS OEM components are configured to ensure the maximum security. For instance, if several levels of security are possible, the most secured parameters or options (for instance, logging levels, permissions granularity).

## Setting Up an E5-MS Workstation

The customer workstation serving as a client PC must meet a certain criteria,

### Screen Resolution

For optimum usability, the workstation must have a minimum resolution of 800x600 pixels and a minimum color depth of 16 thousand colors per pixel.

### Compatible Browsers

The E5-MS can be viewed using either of the following web browsers provided by the customer:

- Microsoft® Internet Explorer version 8.0 or later
- Mozilla Firefox® version 16 or later.

### Certification Limitations

The following section provide a detailed description of the E5-MS Security GUI. The following are the limitations of the E5-MS application:

- The E5-MS application currently uses self signed certificate. When the user logins in the application a Warning - Security screen will display as shown in the Self Signed Certificate Warning

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<sup>3</sup> Microsoft is a registered trademark of the Microsoft Corporation.

<sup>4</sup> Firefox is a registered trademark of the Mozilla Foundation.

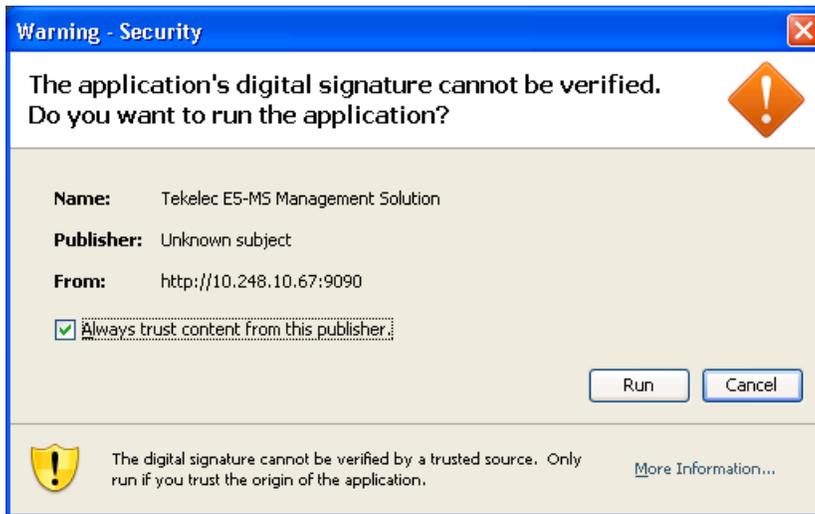


Figure 81: Self Signed Certificate Warning

- The self signed certificates are valid for 6 months. However, when the user selects the check boxes as shown in Self Signed Security Certificate Warning this to get rid of the warning again till the user manually deletes the certificate from trusted source.

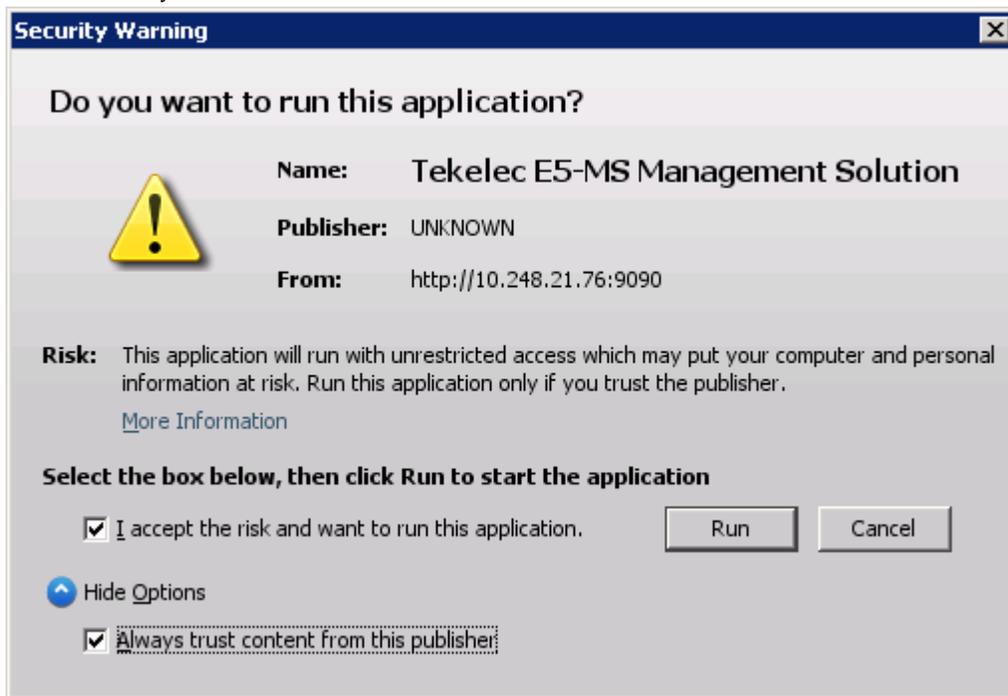


Figure 82: Self Signed Security Certificate Warning

- By default change self password permission are assigned to every group on creation, but this can be unassigned by administrator through the operation tree as it can't be disabled (zoho limitation). The following three functions are impacted, if unassigned:
  - User is not forced to change password on first login.

- User is not forced to change password on password expiry.
- User is not forced to change own password.
- The account expiry and password aging period can be configured for every user separately, when a user is created in User Administration GUI. Changing this to be applicable to all users through single configuration will increase the effort considerably, so currently the system wide applicable configuration is being kept as an objective.
- The following security operations of the E5-MS zoho framework are updated in the next release:
  - Blank state in operation tree creates ambiguity and needs to be fixed.
  - Operation tree doesn't throw any error message if related operations are not assigned. For e.g. no error messages is shown if user selects usergroup operations and not parent security administration GUI. In this scenario, user won't have access to security administration GUI, thus, he won't be able to do assigned usergroup operations.
  - Operation assignment on tree dynamically shuffles the tree hierarchy.
- Updating the values in file `clientparameters.conf` requires cleaning of java cache at client side, if not the old configured values as mentioned in the Login/Logout section. Use the following steps to clean java cache on a windows machine:
  1. Go to Start
  2. Select Control Panel
  3. Double click on Java icon
  4. In the General tab click Settings
  5. Click Delete Files

## Security Administration Screen

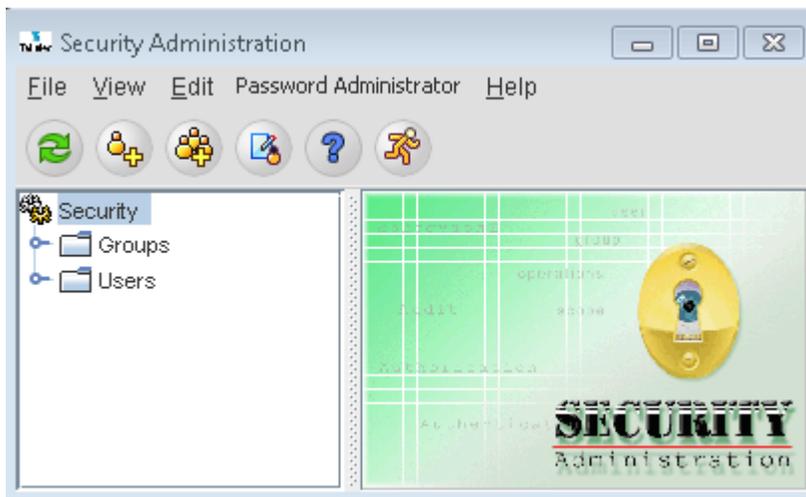
E5-MS Security module is centered on providing excessive security to E5-MS. Security management provides Administrator the ability to configure and set various rules and constraints related to user passwords, user session validity and user account validity. Some constraints are same for all users and some are configured separately for each user.

Once the System Administrator is logged in the E5-MS, they can access the Security Administration application by selecting **Security Administration** option under **Tools** menu on E5-MS client menu bar or pressing **ALT+S** on the E5-MS client window as shown in [Figure 83: System Administration Tree Node](#).



**Figure 83: System Administration Tree Node**

The Security Administration' GUI will display, as shown in Security Administration Screen.



**Figure 84: Security Administration Screen**

This page is accessed by the System Administrator to perform Usergroup and User access and permissions.

## Management of Usergroups and Users

The Security Administration GUI provides the System Administrator the ability to manage E5-MS security. E5-MS administrator creates new usergroups or new users control different security levels of E5-MS, by associating operations to usergroups. Once the user has logged in to E5-MS Client, all the operations available to the user is based on the usergroup that the user belongs. E5-MS administrator can configure various rules and constraints required to support password management in E5-MS through Security Administration GUI. Following sections provide detailed description of E5-MS Security GUI and procedures to create, modify and delete usergroups and users.

The System Administrator will see all the existing Usergroups and Users Usergroup once the **Security Administration** screen is open.



**Figure 85: Security Administration Screen Usergroup**

The System Administrator is responsible for adding and removing usergroups and from E5-MS. A usergroup **Admin** will always exist in E5-MS and all the operations are assigned by default. **Admin** usergroup cannot be removed or deleted and the assigned operations are not allowed to be modified. Deleting an **Admin** usergroup will result in the following error message: Usergroup Admin cannot be deleted!.

## Usergroup Management

In this section we will perform the following procedures:

- *Create a Usergroup*
- *View a Usergroup*
- *Modify a Usergroup*
- *Delete a Usergroup*

### Create New Usergroup

The **AddGroup** option is accessed by clicking on the icon symbol  or right clicking the usergroup tree on the left side of the Security Administration screen.

#### Create a Usergroup

Only E5-MS System Administrators can create Usergroups.

This procedure describes how a System Administrator add a Usergroup.

1. Click the icon symbol **Addgroup**  or right clicking the usergroup tree on the left side of the **Security Administration** screen **Usergroup**.

A page similar to the one shown in **Group Wizard** appears.

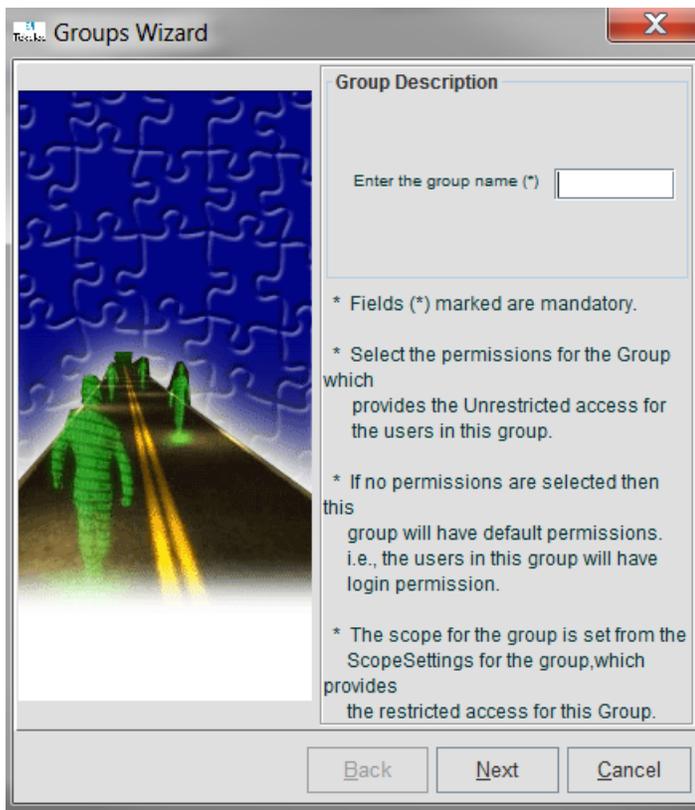


Figure 86: Group Wizard screen

2. Enter the name of the new Usergroup to be created in the **Enter the group name (\*)** field.

The new Usergroup name must be unique within the E5-MS. Existing Usergroup names were listed in the left pane under **Groups** page. The new Usergroup name must meet the following constraints:

- The name must have at least 3 characters.
- Only alphanumeric characters (0-9, a-z, A-Z) and spaces are allowed.

**Note:** Before clicking Next, read the guidelines outlined on the Group Wizard screen.

3. Click the **Next** button. A page similar to the one shown in *link to Usergroup Attributes*

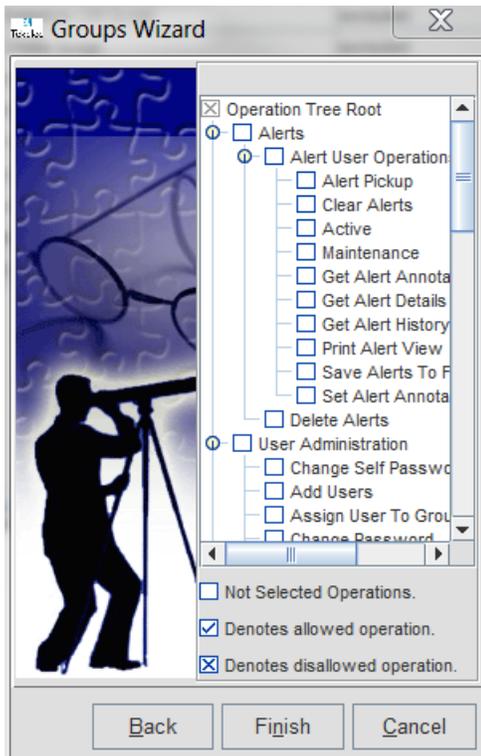
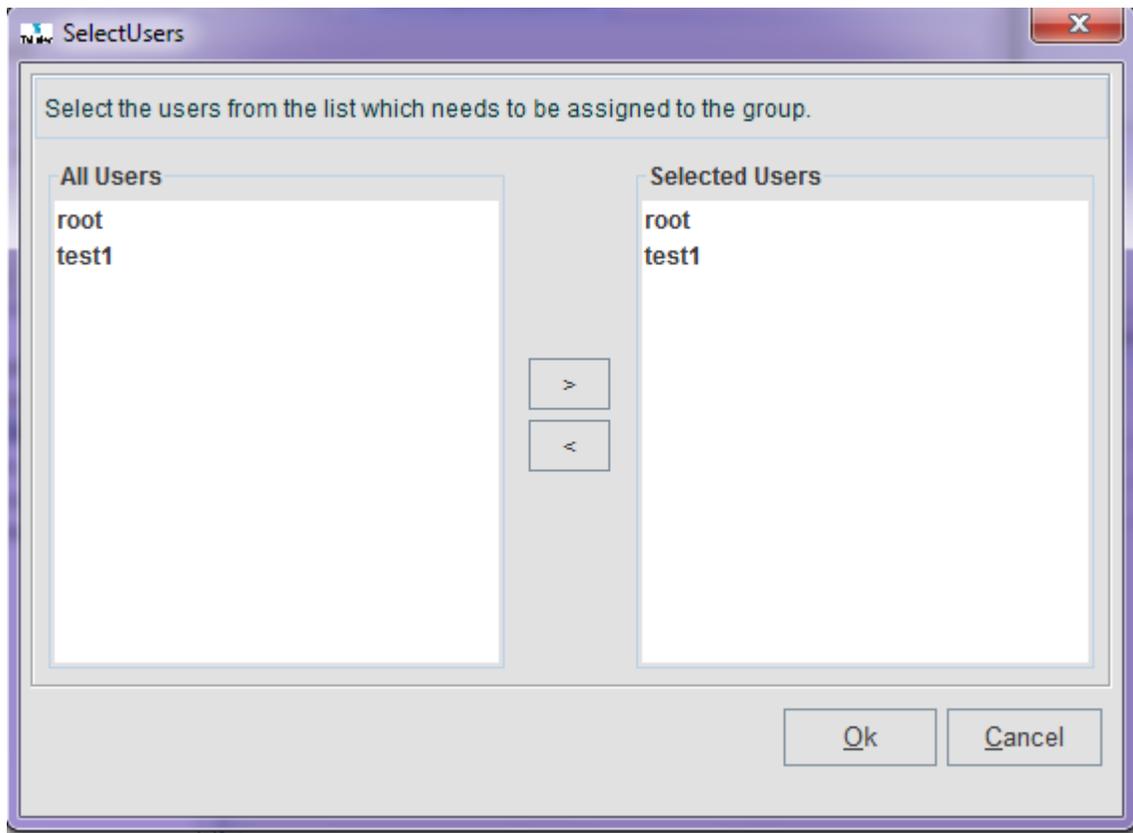


Figure 87: Usergroup Attributes

### Assign Users to a Usergroup

This procedure describes how a System Administrator assigns Users shown **Select Users** to a **Usergroup**. To perform this procedure System Administrator has to click **Setting Users** button available under **Members** tab to assign users to a user group.



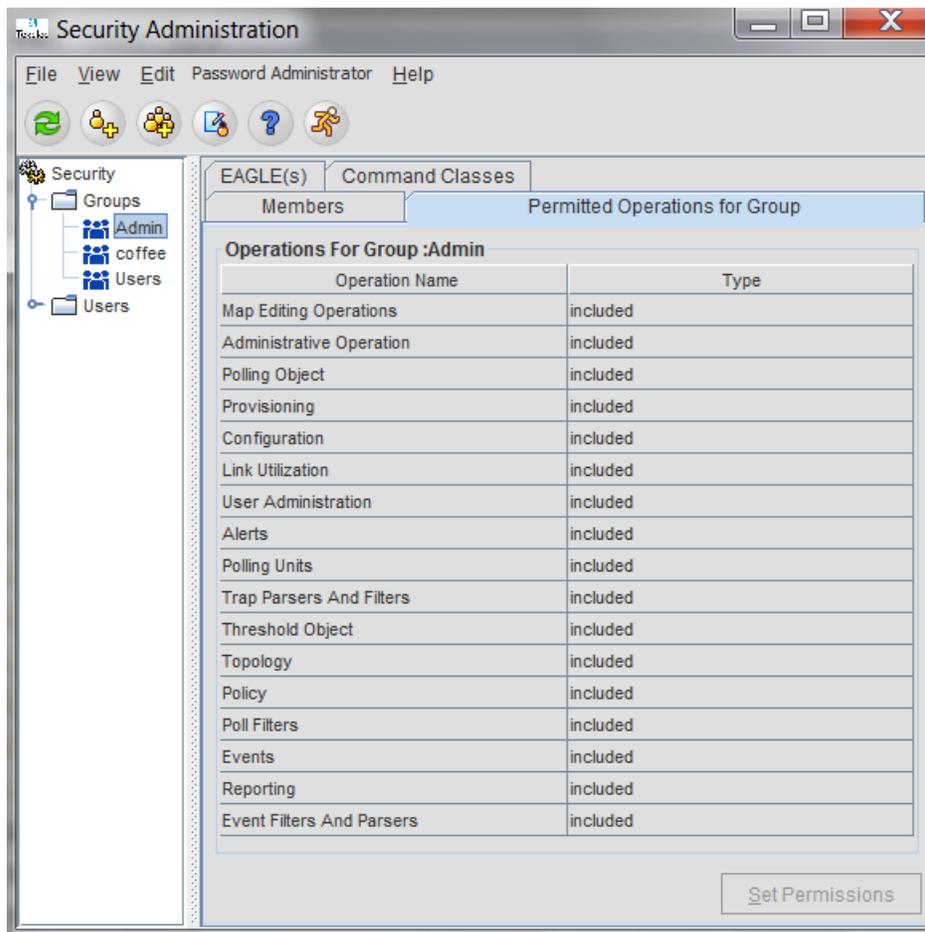
**Figure 88: Select Users**

All Users are list on the left side of the screen. The Users assigned to the Usergroup are listed in the right side of the screen. There are arrows in the between the All Users and Selected Users. These arrows will move an Users to the right or the left panes.

1. Select the User(s) from the list to the left.
2. Click the arrow pointing right to add the User(s) to the Selected Users pane.

### **Assign Attributes to a Usergroup**

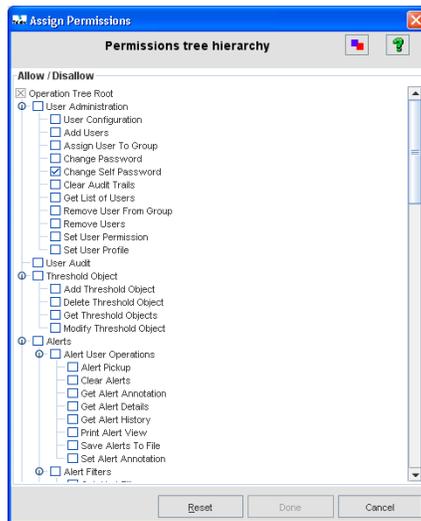
This procedure describes how a System Administrator assigns attributes as shown in **Permitted Operations for Group** to a Usergroup.



**Figure 89: Permitted Operations for Group**

All E5-MS operations are listed under Operation Names. The operations assigned to the Usergroup are listed as included and the one discarded are excluded. The **Set Permission** button at the bottom of the screen will allow the System Administrator to assigned or remove from the existing assignments.

1. Click the **Set Permission** button to open the **Assign Permissions** screen.



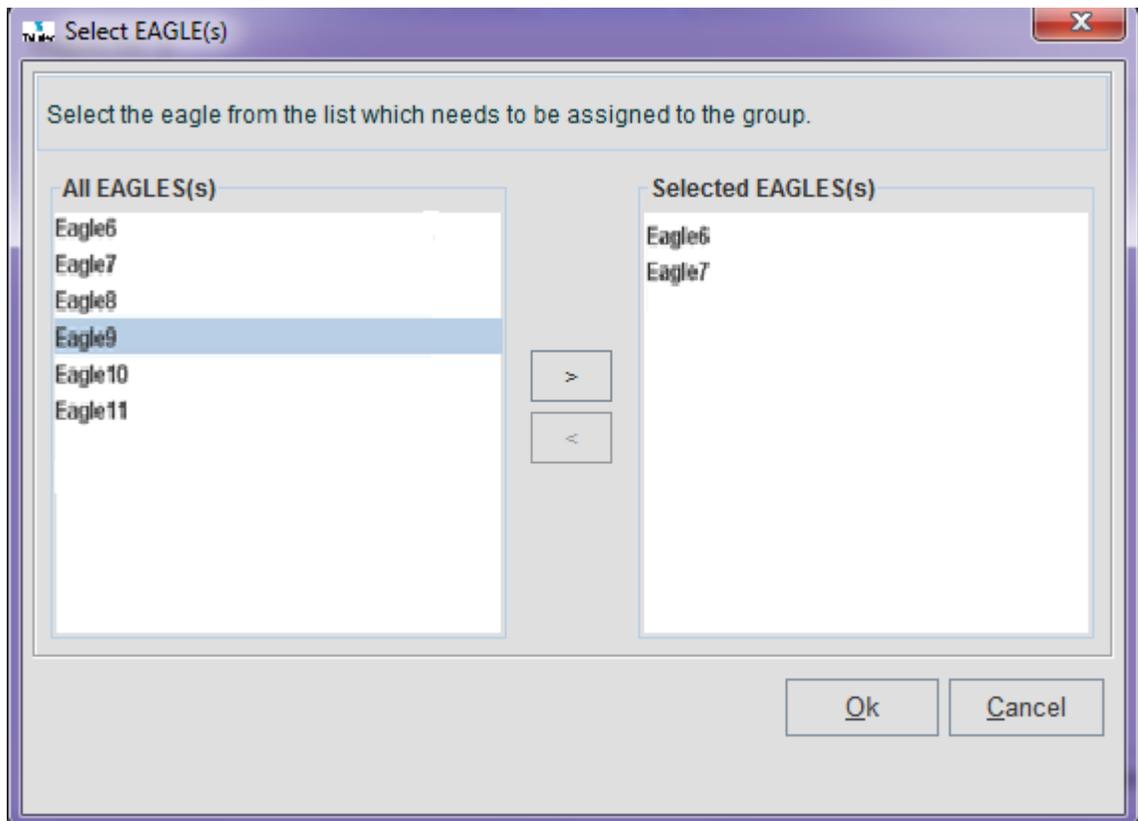
**Figure 90: Assign Permissions screen**

The Permissions tree hierarchy is logically arranged in a tree structure with parent and child operation under the Operation Tree Root. There are operations within the tree that are parent/child nodes, parent/child/child nodes and operations without a child nodes.

2. Check the box next to the operations assigned to this new Usergroup from the **Operation Tree Root**.
  - a) If a parent nodes are assigned to a usergroup and its child node assignment is left blank, then that child node is assigned (even if the child node is left blank)
  - b) If a parent node is assigned/not assigned (left blank), then its child nodes can be assigned or discarded.
  - c) If a parent node is discarded, then by default all its child nodes are discarded.
  - d) If an operation is not assigned to a usergroup, it will be shaded out within the E5-MS GUI. This will prevent the user from the accessing the operation.

### Assign EAGLE(s) to a Usergroup

This procedure describes how a System Administrator assigns EAGLE(s) as shown **Select EAGLE(s) to a Usergroup**.



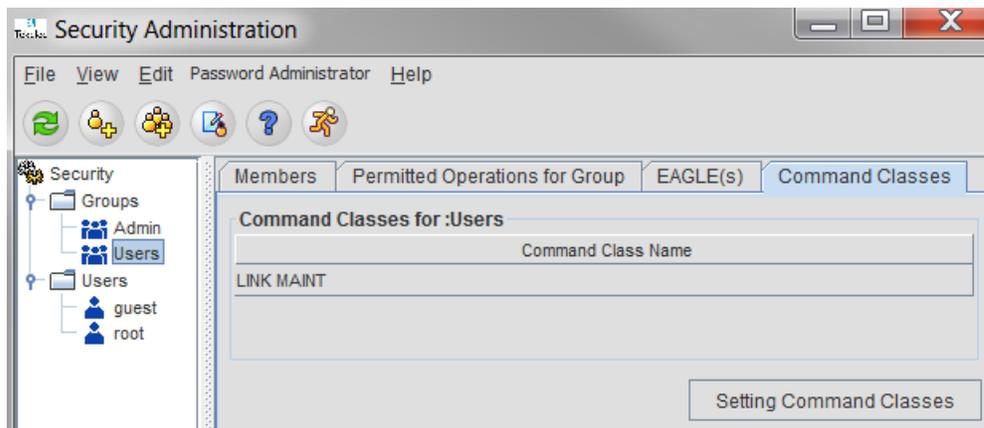
**Figure 91: Select EAGLE(s)**

All EAGLE(s) within the client's network are listed on the left side of the screen. The EAGLE(s) assigned to the Usergroup are listed in the right side of the screen. There are arrows in between the All EAGLE(s) and Selected EAGLE(s). These arrows will move an EAGLE to the right or the left panes.

1. Select the EAGLE(s) from the list to the left.
2. Click the arrow pointing right to add the EAGLE(s) to the Selected EAGLE(s) pane.

### **Assign Command Classes to a Usergroup**

This procedure describes how a System Administrator assigns Command Classes as shown **Select Command Classes** to a **Usergroup**.



**Figure 92: Select Command Classes**

All Command Classes are list on the left side of the screen. The Command Classes assigned to the Usergroup are listed in the right side of the screen. There are arrows in the between the All Command Classes and Selected Command Classes. These arrows will move an Users to the right or the left panes.

1. Select the Command Classes from the list to the left.
2. Click the arrow pointing right to add the Command Classes to the Selected Command Classes pane.

The EAGLE(s) and Command class can not modified by the assigned usergroup with access to **Link Utilization** module.

If the E5-MS administrator tries to remove an EAGLE from a usergroup which has **Link Utilization** module assigned, this error message will appear All EAGLE(s) are mandatory with Link Utilization operation. the operation is not allowed.

If the E5-MS administrator tries to remove either of command classes DATABASE or SYSTEM MAINT from a usergroup assigned Link Utilization operation , this error message will appear Command classes DATABASE and SYSTEM MAINT are mandatory with Link Utilization operation. and the operation is not allowed.

## User Management

An E5-MS user has access to the E5-MS only if the user is associated with an E5-MS Usergroup. When the user belongs to E5-MS Administrator Usergroup they can perform all the E5-MS operations. If the user does not belong to a E5-MS Administrator usergroup they can perform only the operations, associated the User's usergroup access to the E5-MS. A user has access to **Security Administration** GUI, if **Security Administration** operation is assigned to the user. A user has access on user operations in **Security Administration** window, if '**User Administration**' operation is assigned to the user.

In this section we will perform the following procedures:

- *Create a new User*
- *Modify a User Profile*
- *Assign Permissions for a User*

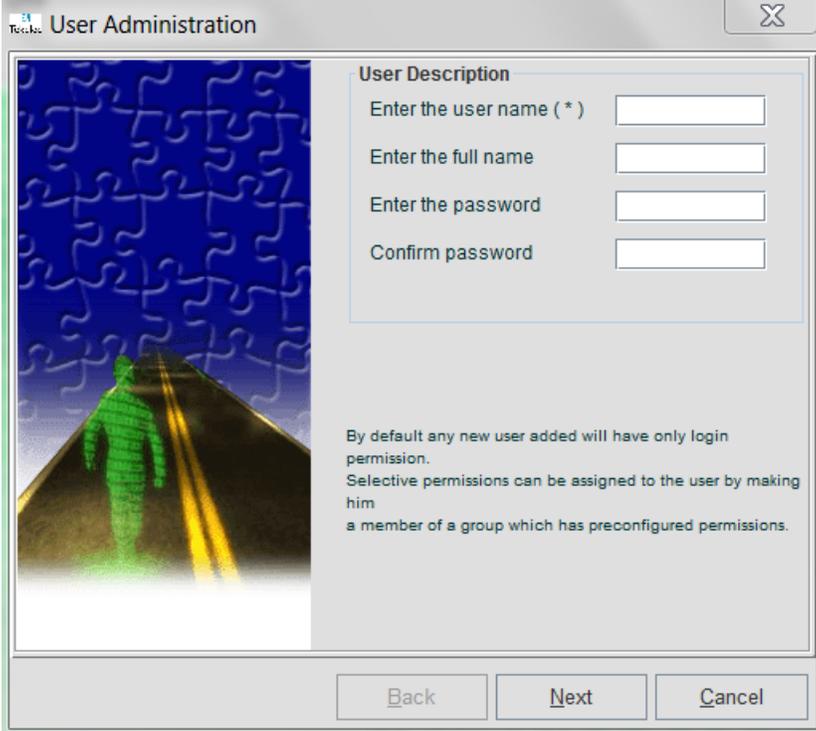
## Add a User

Only E5-MS System Administrators can add a new Users.

This procedure describes how a System Administrator add a User.

1. Click the icon symbol **Addusers**  or right clicking the usergroup tree on the left side of the **Security Administration** screen **Users**.

A page similar to the one shown in **User Administration** appears.



**Figure 93: User Administration screen**

2. Enter the name of the Enter the user name (\*) field.

This is the **UserID** the user will use to login the E5-MS. Usergroup to be created in the **Enter the group name (\*)** field. The User name must be unique within the E5-MS. The new User name must meet the following constraints:

- The name must have at least 3 characters.
- Only alphanumeric characters (0-9, a-z, A-Z) and spaces are allowed.

3. Enter the name of the user in the Enter the full name field.
4. Create a password for the new user. All the password constraints configured by the administrator are applicable on the password being set for a new user. Only the password satisfying all the constraints are accepted, others are rejected and an error message will display in the GUI. User account and password do not expire by default.

### Assign Attributes to a User

This procedure describes how a System Administrator assigns attributes as shown **Permitted Operations for User** to a **User**

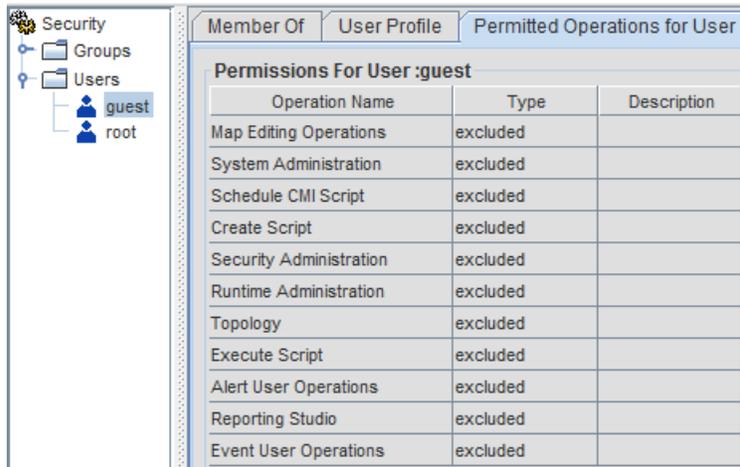


Figure 94: Permitted Operations for User

All E5-MS operations are listed under Operation Names. The operations assigned to the User are listed as included and the one discarded are excluded. Operation assignment to a user cannot be modified, since the operations of a user are the under usergroup operations.

### Modify User Profile

This procedure describes how a System Administrator modifies a **User Profile** .

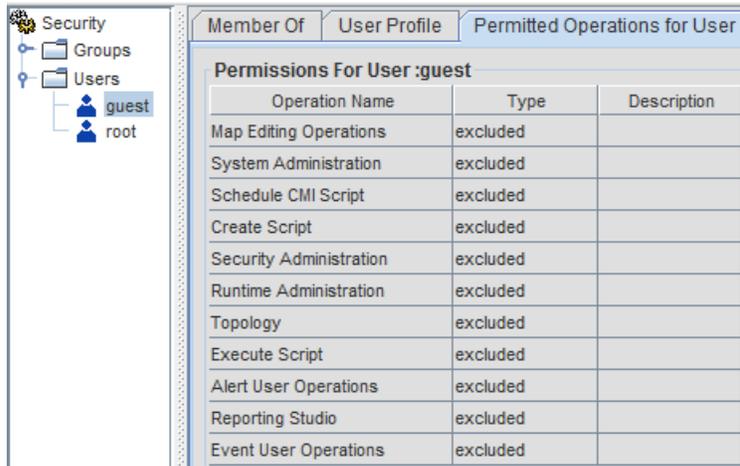


Figure 95: Permitted Operations for Group

The System Administrator accesses the user profile from the **User Profile** tab. Fields under user profile are made active by selecting the **Setting Profile** option. User status is changed to either **enable** or **disable**, which is enabled by default. If user status is changed to **disable**, that user exists in the database but cannot login to E5-MS. By default a user account and password never expires.

## Password Management

E5-MS Security module is centered on providing excessive security to E5-MS. The E5-MS security management application provides a System Administrator the ability to configure and enforce various rules and constraints related to user password composition, user session validity and user account validity. Some constraints are the same for all users while some are configurable separately for each user.

### Password Encryption

To maintain a secured channel in network communication and to secure the storage of sensitive information like passwords it becomes necessary to adopt a mechanism, which is secured by it, and withstand the security attacks. Keeping these objectives in mind, E5-MS shall support cryptogram mechanism to ensure a secured data communication. This is achieved with the help of RSA Data Security Algorithm for cryptography. RSA is a two-way encryption technique in which the original message (plain text) is encrypted with a public key at the sender end. The encrypted plain text (cipher text) so received is decrypted with a private key at the receiver end. Only the receiver knows the private key and thus foolproof communication mechanism is ensured.

### Password Composition Management

In order to increase password security, user password composition is made complex. User password following all the password constraints as configured by administrator is accepted; else a corresponding error message shall be displayed to the user. The following rules are applied to the new passwords entered by the users:

1. Password should have the required minimum length (as configured by E5-MS Administrator).
2. Password length should be between 8 to 16 characters.
3. Password should contain required minimum number of alpha, numeric and special characters (as configured by E5-MS Administrator).
4. Password should not contain associated user-name.

The E5-MS Administrator configures minimum required password length and minimum number of alpha (A-Z, a-z), numeric (0-9) and special characters that should be present in a user password. The configuration is done through GUI interface. These four attributes are stored in the database, with the default values as (8, 0, 0, 0) till administrator modifies them. A user can change user's password.

### Password Constraint Configuration

A new administrative operation named as 'Password Administration' is visible on the 'Security Administration' window of E5-MS client. This is visible only if the user has permissions to 'Security Administration'. Clicking on 'Password Configuration' menu item under 'Password Administration' menu launches 'Password Configuration' window. An E5-MS Administrator configures password composition and other password related constraints through this window.

### Password Constraint Imposition

The user password is validated when a user/administrator changes user's password. Following validations are applied on the new password:

1. Password should have the required minimum length (as configured by E5-MS Administrator).
2. Password length should be between 8 to 16 characters.
3. Password should contain required minimum number of alpha, numeric and special characters (as configured by E5-MS Administrator).

4. Password should not contain associated user-name.
5. Password should not match any of the 'n' previously used passwords. Where 'n' - the value configured by Eagle administrator.
6. Password should be modified only once within the minimum change interval configured for user password by Eagle administrator.

### Password Change Management

In order to manage the password changes, E5-MS manages two time period values namely Password Expiry period (separately for each E5-MS user) and Notification period (for all users).

Password Expiry period is the time after which user password expires. Once user password is set/reset, Password Expiry period is decremented till the value of password expiry period becomes zero. The notification period is the number of days prior to expiry of password expiry period, from when the E5-MS starts notifying the user about the password expiration. On expiry of password expiry period, user's status is updated as password expired in the database. If a user with expired password attempts to login to E5-MS, user shall be forced to reset user's login password. Once user password is reset successfully, the user is allowed to login with the new password.

In order to manage user account, E5-MS Administrator configures a time period value namely Account Expiry period (separately for each E5-MS user). Account Expiry period is the time after which user account expires. Once user account is created, account expiry period of a user is decremented and updated in database. Once the value of account expiry period becomes zero, user's account status is updated as account expired in the database and user can login to E5-MS.

E5-MS Administrator can set values for account expiry and password expiry periods on per user basis when a user profile is created. Also an administrator can modify these values on per user basis by editing user's profile. The enforcement of account expiry and password expiry rules can be disabled by selecting the "never expires" option corresponding to the rule(s) when a user profile is created/modified. The value of account expiry and password expiry periods are in the range of 0 and 999. A value "0" is considered as "never expires" option and so this disables the enforcement of rule(s) on the user.

Notification period value is configurable within the range of 0 to 30 days by E5-MS administrator. Same value shall be applicable for all users. If password expiry period left for a user's password is less than or equal to notification period, then a warning messages are displayed on user's successful login indicating the number of days left for password expiry. Disabling password expiry period for a user disables the enforcement of notification period and display of notification message on login to E5-MS to that user. By default this rule is disabled.

The E5-MS Administrator can restrict the number of previously used passwords for a user that cannot be reused as new passwords. The number of previously used passwords that cannot be reused are stored in a database and the value is modifiable by the E5-MS Administrator through a GUI interface. E5-MS Administrator can disable the enforcement this rule on all the E5-MS users by setting the value to zero (0) through GUI Interface. By default this rule is disabled and value of number of previously used passwords that cannot be used again shall be zero (0). Up to 12 recently used passwords for every user is stored in the database. The passwords are stored as comma separated encrypted strings with the latest password at the end. When the number of passwords for a user stored in the database is 12 and a new password is to be stored in the database, then the oldest password is removed and the latest password is appended at the end. When a user password is modified, the encrypted password string is compared with the encrypted previously user password strings, for that user, stored in the database. If the new string matches any of the stored strings, the new password is rejected and an error message indicating the same is displayed on the GUI.

The E5-MS Administrator can configure minimum password change interval for E5-MS users. An E5-MS user is allowed to change user's passwords only once within this interval. If a user attempts to modify users password more than once within the configured time frame, a corresponding error message is displayed on the GUI Interface. A user can contact E5-MS Administrator if it is required to change user's password more than once during this period. The range of this interval is from 0 to 30 days, with default being 0 day. The same value is applicable to all the users.

## User Status Icons

E5-MS provides the Administrator status icon of the user in the User Tree in security Administration window.

Icon	Description
	User account is enabled.
	User is disabled and cannot log in until he/she is re-enabled.
	User account has expired.
	User password has expired.
	User login is denied due to continuous unsuccessful login attempts.

## Login Restrictions Management

This section presents procedures available for E5-MS System Administrator responsible for all the Usergroups and User access levels. The System Administrator will have access to all management operations.

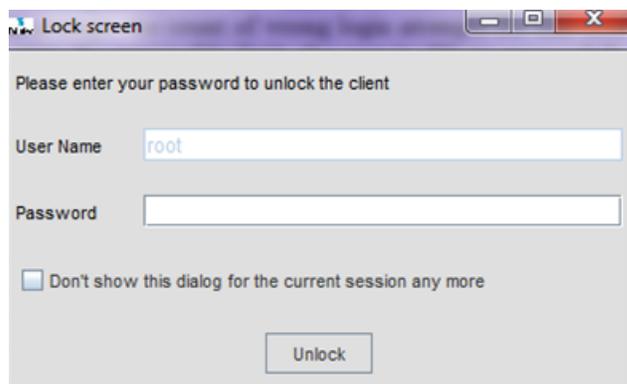
### System Administrator Login

Once the E5-MS is launched, the System Administrator is prompted at the [Figure 3: E5-MS Authentication Screen](#) to login. They will use **root** as the User ID and **public** as the password. The [Figure 4: Tekelec E5-MS Information Screen](#) screen will display with the last successful login date.

When a E5-MS user login to E5-MS the first time after user has been created by administrator, E5-MS user is required to change user's password to continue user's login to E5-MS. Once user's password has been successfully modified, user can then continue user's login to E5-MS.

The E5-MS Administrator can configure maximum permissible number of wrong login attempts that can be made by an E5-MS user through a configuration file. Every time a user makes a wrong login attempt, the count of wrong login attempts for that user increments by one. If the number of wrong login attempts is within the permissible limit, the user is able to successfully login to E5-MS and the count of wrong login attempts resets to 0. If the count of wrong login attempts made by a user equals maximum permissible limit, the user account is locked and a corresponding message is displayed to the user. A user whose account is locked is not allowed to login to E5-MS and an attempt to do so results in an error message on the GUI. E5-MS Administrator can disable the enforcement of this rule for all the E5-MS users by setting the value of number wrong login attempts allowed to zero(0) in the configuration file. By default the number of allowed wrong attempts is set to 5 in configuration file.

E5-MS Administrator can configure lockout time (in minutes) through a configuration file, after which user account is locked for being idle for this period. By default this period is set to 30 minutes. The same value is applicable to all users. The locked user is displayed a 'Lock Screen' window where user can enter user's password to login again to E5-MS. Once logged-in, user can continue user's locked session of E5-MS.



**Figure 96: Lock Screen**

E5-MS Administrator can configure maximum permissible inactivity period (in minutes) through a configuration file, after which user is terminated for being idle. By default this period is set to 60 minutes. The same value is applicable to all users. The idle user's client session is terminated after this period, and a corresponding message is displayed to the user. User is required to restart the client to start a new E5-MS session. Lockout time is less than termination time, but if administrator configures termination time less than lockout time, then lockout functionality is not in effect, and only termination time functionality works.

E5-MS Administrator can disable login rights of another E5-MS user(s) through GUI interface except E5-MS Administrators. E5-MS Administrator can disable a user(s) while modifying user's profile through Security administrator window. When a user is disabled by E5-MS Administrator, status of that user is updated as disabled. The user information i.e., usergroup and operation mappings continues to exist in database for the disabled user. A disabled user is not allowed to login to E5-MS because login rights of that user is disabled. An attempt to do so results in an error message on the GUI. When an E5-MS Administrator disables a user who is already logged-in, the user is logged out of E5-MS and prompted with a corresponding message. Also an E5-MS Administrator is not able to disable user's own login rights.

## Password GUI

When clicking 'Password Administration' menu present on the 'Security Administration GUI, opens up 'Password Configuration' GUI on E5-MS client. The GUI has two sections namely, 'Password Composition', and 'Password Restrictions'. A 'Disable All' check-box is also present on the GUI. All drop-downs on the GUI display the values that are present in the database for the respective fields.

The screenshot shows a 'Password Configuration' dialog box with a blue title bar and a close button. At the top left, there is a checked checkbox labeled 'Disable All'. Below this is a section titled 'Password Composition' with a light gray background. It contains four rows, each with a checked checkbox on the left and a label followed by a numeric input field on the right: 'Minimum length : 8', 'Minimum alpha characters : 0', 'Minimum numeric characters : 0', and 'Minimum special characters : 0'. A note below these fields states 'Note: Maximum allowed password length is 16.' Below the composition section is another section titled 'Password Restrictions' with a light gray background. It contains three rows, each with a checked checkbox on the left and a label followed by a numeric input field on the right: 'Number of old passwords that cannot be reused : 0', 'Minimum change interval for password : 0', and 'Password expiry notification period : 0'. A note at the bottom left of this section says 'Note: Selecting value '0' for a field is similar to disabling that field.' A 'Submit' button is located at the bottom right of the dialog.

Figure 97: Password Composition

This screenshot shows the same 'Password Configuration' dialog box, but with different values in the 'Password Restrictions' section. The 'Disable All' checkbox remains checked. In the 'Password Composition' section, the values are: 'Minimum length : 8', 'Minimum alpha characters : 1', 'Minimum numeric charecters : 2', and 'Minimum special charecters : 3'. The note below remains 'NOTE: Maximum allowed password length is 16.' In the 'Password Restrictions' section, the values are: 'Number of old password that cannot be reused : 5', 'Minimum change interval for user password : 5', and 'Expiry notification period : 7'. The 'Submit' button is still present at the bottom right.

Figure 98: Password Restrictions

Password Composition Section

In the 'Password Composition' section E5-MS Administrator can configure four constraints namely 'Minimum Length', 'Minimum Alpha Characters', 'Minimum Numeric Characters', and 'Minimum Special Characters'.

### Password Restrictions Section

In the 'Password Restrictions' section E5-MS Administrator can configure three restrictions namely 'Number of Old Passwords that cannot be reused', 'Minimum Change Interval for user password' and 'Expiry Notification period'. The values configured for the three restrictions are applicable to all the E5-MS users.

### Disable Functionality

Functionality to disable all/some fields are provided on 'Password Configuration' GUI that is in turn disable enforcement of rule(s) corresponding to the disabled field(s) on all E5-MS users except minimum (8 characters) and maximum (16 characters) password constraints. A check-box are provided corresponding to all the fields to disable.

By default all the constraints are disabled and corresponding check-boxes are checked and enabled. Selecting a check-box disables the corresponding drop-down of the field. Multiple check-boxes can be selected to disable multiple fields. No value corresponding to the disabled field(s) are updated in the database, when the page is submitted using 'Submit' button.

Drop-downs corresponding to the fields that have been disabled by E5-MS Administrator or by default shall appear as disabled with the corresponding check-boxes as selected. Selecting the 'Disable All' check-box shall disable all the other check-boxes present on the page, along with the corresponding drop-downs.

### Password Configuration Data Submit

The 'Password Configuration' GUI contains a 'Submit' button at the bottom of the page. When clicking the 'Submit' button, the data selected in the drop-downs (except values in the disabled fields) are submitted and a message *"Password configuration data successfully updated by user: <username>."* is displayed on the GUI indicating that the data have been updated in the database successfully.

The configuration data is not submitted in the following scenarios and a corresponding error message is displayed on the GUI.

1. When total count of minimum required alpha, numeric and special characters exceeds minimum allowed password length as configured by E5-MS Administrator.
2. When minimum length constraint is disabled by E5-MS Administrator and total count of minimum required alpha, numeric and special characters exceeds maximum allowed password length that is 16.

## Account Recovery

E5-MS Administrator can enable login rights of a user, whose account is locked because of exceeding permissible number of wrong login attempts, login rights have been disabled by E5-MS administrator, or password has been expired. An E5-MS Administrator is able to enable the login rights of such users by setting user's status to 'enable' in 'User Profile' window of corresponding users. If no E5-MS Administrator is able to login to E5-MS because of password expiry or account locking, a password recovery mechanism are provided by Tekelec Support person to recover E5-MS Administrator - 'root' account.

## E5-MS Administrator Password Recovery Mechanism

Incase no E5-MS Administrator is able to login to E5-MS, the customer can request a password recovery from Tekelec Support. This appendix describes the mechanism to recover password of E5-MS Administrator - 'root' password.

1. E5-MS Administrator 'root' is in locked state or customer decides that they need 'root' password recovered.
2. Tekelec Support representative either accesses the E5-MS remotely (if allowed by the customer) or travels to the customer site.
3. Once the Tekelec Support representative has access to the E5-MS as described in step 2, the following sub-steps are performed (by the Tekelec Support representative):
  - a. JRE\_HOME
  - b. E5MS\_HOME
4. Once the above specified parameters have been customized as per customer environment then support representative shall execute the script providing the new password for 'root' administrator, when prompted for. This script resets 'root' administrator's password and, therefore the 'root' administrator can login to E5-MS with the new password.

**Note:** Password configured via script shall not follow any password constraints.

5. On successful execution of script, start E5-MS server and login to 'root' with new password.
6. Change the 'root' administrator's password after successful login to E5-MS.
7. Exit server login.
8. The Tekelec support representative provides the newly-created password of 'root' to the customer, and instructs them to log in to the E5-MS with 'root' user using that password and to change the 'root' administrator's password after successful login to E5-MS.
9. The customer shall immediately be required to change the password for the 'root' user account.
10. The customer is advised to reset the other (pre-existing) E5-MS User passwords while logged in as new 'root' Administrator.

# Appendix B

## E5-MS Backup and Restore

---

### Topics:

- *Overview.....173*
- *System Requirement.....173*
- *Backup in E5-MS.....173*
- *Restore in E5-MS.....181*
- *File and their Locations.....182*

This appendix describes the configuration and execution of backup and restore for the E5-MS.

## Overview

E5-MS is used to manage and monitor EAGLE nodes in the network. E5-MS has database tables, configuration files and other data, that must to be backed up to take care of any data loss due to any reason. E5-MS provides both manual and daily automatic back up functionality. The scheduled backup interval can be configured as per user requirement. Backed up content can be restored by user manually whenever the need arise.

The System Administrators are involved with the installation, configuration of Tekelec's E5-MS product will manage the set up of the Backup and Restore.

Backup generates a copy of the existing configuration files, database tables and other data which can be used later to bring the E5-MS system to the previous configured state.

Restore uses a previously generated backup, bring the E5-MS system back to a state when the backup was generated.

## System Requirement

Backup shall approximately require space equivalent to 100 MB + size of E5-MS database dump file. The size of E5-MS database dump file shall depend upon the size of E5-MS database. E5-MS database size shall be variable depending upon the number of EAGLEs being managed i.e. database size shall grow on the basis of deployed E5-MS configuration (Small, Medium, or Large).

## Backup in E5-MS

Backup of the E5-MS system can be generated as per the requirement of the customer. Backup can be taken daily, weekly, day of the month etc. Tekelec recommends daily backup so that the E5-MS can be restored to a state close to the disaster point.

By default, automatic (scheduled) backup of E5-MS will be configured. It will create backup of selected configuration data and database every day at 2 AM.

A user will also have the ability to create backup manually as well as update schedule as required by modifying the required files.

## Backup Contents

All the required files and directories along with database will be backed up to preserve E5-MS state. As part of backup following E5-MS files and directories will get backed up:

- Directories: `conf/tekelec`, `users`, `commandManagerScripts`, `linkUtilizationScripts`, `reportingStudio`
- Files: `defaultconf/usernamePassword.conf`, `conf/clientparameters.conf`, `conf/securitydbData.xml`, `classes/hbnlib/hibernate.cfg.xml`, `classes/hbnlib/secondary/hibernate.cfg.xml`

Listed directories/files will be backed up as they are at the time of backup. The database tables will be backed up in a file named E5MS\_Database\_BackUp.sql.

**Note:** WebNMS backup does not consider empty directories for backup. So, the categories created by users in /opt/E5-MS/commandManager/scripts directory which do not have any scripts under them will not be backed up. Also it is suggested not to modify the content of files/directories to be backed up to ensure that upgrade process do not get impacted.

## Automatic Backup

### Configuration for Automatic Backup

The default configuration for automatic backup in E5-MS is given in /Tekelec/WebNMS/conf/BackUp.conf file. It is shown below:

```
<BACKUP
className="jdbc.MysqldumpBackup"
HOUR=" 2 "
DAY_OF_THE_MONTH=" * " />

<TABLES_TO_BACKUP
TABLES= "ALL">
</TABLES_TO_BACKUP>
<FILES_TO_BACKUP
DIR_NAMES="conf/tekelec,users,commandManagerScripts,
linkUtilizationScripts,reportingStudio"
FILE_NAMES="defaultconf/usernamePassword.conf,
conf/clientparameters.conf,conf/securitydbData.xml,
classes/hbplib/hibernate.cfg.xml,classes/hbplib/secondary/hibernate.cfg.xml">
</FILES_TO_BACKUP>
```

The significance of entries in the above configuration in the BackUp.conf file is explained below:

```
HOUR=" 2 "
```

The value indicates that the backup will be taken at 2 AM.

```
DAY_OF_THE_MONTH=" * " /
```

The value indicates that backup will be generated daily.

```
<TABLES_TO_BACKUP
TABLES= "ALL">
</TABLES_TO_BACKUP>
```

All database tables will be included in the backup.

```
<FILES_TO_BACKUP
DIR_NAMES="conf/tekelec,users,commandManagerScripts,
linkUtilizationScripts,reportingStudio"
FILE_NAMES="defaultconf/usernamePassword.conf,
conf/clientparameters.conf,conf/securitydbData.xml,
classes/hbplib/hibernate.cfg.xml,
classes/hbplib/secondary/hibernate.cfg.xml">
</FILES_TO_BACKUP>
```

All listed files and directories as mentioned in FILE\_NAMES and DIR\_NAMES tag respectively will be included in backup.

## Configuring Default Backup Destination

A user will have the ability to update the backup destination as per his requirement by manually updating the directory path given for BACKUP\_DESTINATION parameter in /Tekelec/WebNMS/conf/serverparameters.conf file. Following points must be taken care of while updating the same:

- While specifying the value (i.e. destination directory name), the absolute path should be specified and the directory path should exist.
- The path should be outside E5-MS home (/Tekelec/WebNMS). This is to ensure that the backup is not deleted in case of un-installation of E5-MS RPM.

## Default Backup Destination

By default, the E5-MS backup will be created in the directory "/var/backup". This entry has been provided in /Tekelec/WebNMS/conf/serverparameters.conf file.

```
#Path of directory where backup of E5-MS will be taken
BACKUP_DESTINATION /var/backup
```

## Manual Backup

A system user with privileges to execute /Tekelec/WebNMS/bin/backup/BackupDB.sh script will have the ability to take manual backup of E5-MS. The location where the backup will be generated can also be controlled by the user.

### Manual backup on the default location

Manual backup of E5-MS for the default backup location /var/backup can be taken using the command given below:

```
# sh /Tekelec/WebNMS/bin/backup/BackupDB.sh
```

### Manual backup on a desired location

It will also be possible to create backup at a desired location by providing the location as an argument to backup script as shown below. The directory provided by the user to create the backup should exist on the system before running the backup script, else backup might not work.

```
# sh /Tekelec/WebNMS/bin/backup/BackupDB.sh -d <Backup location>
```

For example:

```
# sh /Tekelec/WebNMS/bin/backup/BackupDB.sh -d /var/tklc/backup
```

The above command will generate a backup at location /var/tklc/backup.

## Configuring Backup Schedule

A user will have the ability to update the default schedule value in /Tekelec/WebNMS/conf/BackUp.conf file manually to achieve backup as per user's own requirements. For this, there are multiple scheduling options available, shown in Table E5-MS Backup Scheduling Options, that provide a user great flexibility is scheduling the backups.

**Note:** Updating backup schedule will require a server restart for the changes to take impact.

### E5-MS Backup Scheduling Options

The time at which the backup has to be executed, can be specified in any one of the following ways:

- Daily (for taking backup every day at 0200 hrs)
- Weekly (for taking backup on a fixed day every week (at 0200 hrs every Monday))
- Hour and Day\_of\_the\_week (for taking backup at a fixed day(s) and time every week)
- Hour and Day\_of\_the\_month (for taking backup at a fixed day(s) and time every month)

The following table provides examples as to how the above configuration options are used:

Scheduling Interval	Entry in BackUp.conf File
Daily	<pre>&lt;BACKUP className="jdbc.MysqldumpBackup" DAILY="true" /&gt;</pre>
Weekly	<pre>&lt;BACKUP className="jdbc.MysqldumpBackup" WEEKLY="true" /&gt;</pre>
Hour and Day_of_the_Week	<p>This parameter deals with two values - HOUR and DAY.</p> <p>The value for HOUR can be specified in comma separated form. The value can be any number from 1 to 24 (representing 24 hours).</p> <p>DAY_OF_THE_WEEK has also to be specified in comma-separated form. The DAY can be anything from SUN to SAT. Only the first three letters of the day have to be specified.</p> <p>For example, if backup is needed on Monday and Wednesday, it can be specified as shown below:</p> <p><b>Example:</b></p> <pre>&lt;BACKUP className="jdbc.MysqldumpBackup" HOUR="3,7" DAY_OF_THE_WEEK="MON,WED" /&gt;</pre>

Scheduling Interval	Entry in BackUp.conf File
Hour and Day_of_the_Month	<p>HOUR has to be specified as a list. For example, 2,5,22. It must be between 1 and 24.</p> <p>DAY_OF_THE_MONTH has to be given as a range (starting from 1 to a maximum of 31). The value of "*" is ALL.</p> <p><b>Example:</b> To perform backup at HOUR 3,7 and DAY_OF_THE_MONTH 10-20 -</p> <pre data-bbox="776 533 1419 667">&lt;BACKUP className="jdbc.MysqldumpBackup" HOUR="3,7" DAY_OF_THE_MONTH="10-20" /&gt;</pre>

## Backup to an External Location

For better disaster recovery capability, it is recommended that backup should be taken to an external device. For this, the external device (e.g. NAS drive) should be mounted to the server. Once the device is successfully mounted, the admin shall need to use the device location for backup. In case of automatic backup (refer to Automatic Backup section) the admin shall need to update the backup destination manually in `/Tekelec/WebNMS/conf/serverparameters.conf` file (refer to Configuring default backup destination). In case of manual backup (refer to Manual Backup), the admin shall need to provide the device's location after the `-d` flag while running manual backup (refer to Manual backup on a desired location).

## Normal Operations during Backup

When the backup process is executed, any operations should NOT be performed using the Clients until the backup process is complete.

When the backup process begins at the configured time, the following message (notification) shall be displayed on the status bar of E5-MS Client. A user will have to wait for the process to complete before performing any operations using the Client.

Backup operation is in progress. Please wait for sometime for your request to be processed by the server

## Time taken in Backup

Backup shall approximately take about 5 minutes or more depending upon the size of E5-MS database. E5-MS database size shall be variable depending upon the number of EAGLEs being managed i.e. the deployed E5-MS configuration (Small, Medium or Large).

## Status of Backup

The status of backup (automatic as well as manual) shall be logged in Audit Trails. A user with permission on 'User Audit' operation shall be able to view the audit messages showing start and completion of backup on 'User Audit' screen. Details of audit trails for various scenarios are below.

Scenario	Audit Trail Details					
	User Name	Operation Name	Audit Time	Status	Category	Description
Backup is started	SYSTEM	Backup Service	<time>	SUCCESS	E5-MS Backup	Backup is in progress
Backup completes successfully	SYSTEM	Backup Service	<time>	SUCCESS	E5-MS Backup	Backup is completed
Backup creation fails	SYSTEM	Backup Service	<time>	FAILURE	E5-MS Backup	Backup creation failed
Backup creation fails because of non-availability of space on backup location	SYSTEM	Backup Service	<time>	FAILURE	E5-MS Backup	Backup cannot be created, as there is not enough space left on the machine
Backup creation fails because of error in database connection	SYSTEM	Backup Service	<time>	FAILURE	E5-MS Backup	Backup creation failed due to database connection error

For manual backup, apart from the audit logs given above, the user shall also see the relevant log messages on console as shown in the Sample Outputs section.

## Sample Outputs

### Output while running Manual Backup

```
[root@e5ms2 backup]# sh BackupDB.sh -d /var/tklc/backup
```

```
Please wait! Backup of E5-MS is in progress...-
```

```
E5-MS database backup file "E5MS_Database_BackUp.sql"
successfully created.
```

```
Backup of directories successfully created.
```

```
E5-MS Backup is completed.
```

### Output while Restoring from a Backup

```
[root@e5ms-12 backup]# sh RestoreDB.sh /var/backup/  
E5MS_Database_BackUp.sql restore path :: /var/backup
```

```
WARNING! Attempting to restore the data!!! This will result in  
losing your current data!!! Do you want to continue [y/n]?
```

```
y
```

```
Script will attempt to restore E5-MS database from the dump  
file: /var/backup/E5MS_Database_BackUp.sql
```

```
E5-MS database restoration in progress...
```

```
Successfully restored E5-MS database.
```

```
The following files will be restored now to E5-MS:
```

```
/Tekelec/WebNMS//Tekelec/WebNMS/conf/tekelec  
/Tekelec/WebNMS/conf/tekelec/lui.properties  
/Tekelec/WebNMS/conf/tekelec/InventoryCommands.txt  
/Tekelec/WebNMS/conf/tekelec/security.properties  
/Tekelec/WebNMS/conf/tekelec/tekmeas.conf  
/Tekelec/WebNMS/conf/tekelec/lui_template_script.txt  
/Tekelec/WebNMS/conf/tekelec/ContinentZonalMap.xml  
/Tekelec/WebNMS/conf/tekelec/CmiParameters.conf  
/Tekelec/WebNMS/conf/tekelec/EagleCardNameNumMap.xml  
/Tekelec/WebNMS/conf/tekelec/ModulesConf.xml  
/Tekelec/WebNMS/conf/tekelec/common.config  
/Tekelec/WebNMS/conf/tekelec/fault.properties  
/Tekelec/WebNMS/conf/tekelec/NbiParameters.conf  
/Tekelec/WebNMS/conf/tekelec/server_conf.properties  
/Tekelec/WebNMS/conf/tekelec/reporting.properties  
/Tekelec/WebNMS//Tekelec/WebNMS/users  
/Tekelec/WebNMS//Tekelec/WebNMS/users/root  
/Tekelec/WebNMS/users/root/toolbar.dtd  
/Tekelec/WebNMS//Tekelec/WebNMS/users/root/listmenus  
/Tekelec/WebNMS/users/root/listmenus/dummy.txt  
/Tekelec/WebNMS/users/root/sysadminmenu.xml  
/Tekelec/WebNMS//Tekelec/WebNMS/users/root/policymenus  
/Tekelec/WebNMS/users/root/policymenus/nonperiodicpolicymenu.xml  
/Tekelec/WebNMS/users/root/policymenus/periodicpolicymenu.xml  
/Tekelec/WebNMS/users/root/AudioInfo.xml  
/Tekelec/WebNMS/users/root/mibmenu.xml  
/Tekelec/WebNMS/users/root/HomePageLayout.xml  
/Tekelec/WebNMS/users/root/increments.conf  
/Tekelec/WebNMS//Tekelec/WebNMS/users/root/mapmenus  
/Tekelec/WebNMS/users/root/mapmenus/dummy.txt  
/Tekelec/WebNMS/users/root/panelmenubar.dtd  
/Tekelec/WebNMS/users/root/FramesInfo.conf  
/Tekelec/WebNMS/users/root/alertsmenu.xml  
/Tekelec/WebNMS/users/root/maptoolbar.xml  
/Tekelec/WebNMS/users/root/clientparameters.conf  
/Tekelec/WebNMS/users/root/framemenu.xml  
/Tekelec/WebNMS/users/root/tllbrowsermenu.xml  
/Tekelec/WebNMS/users/root/TreeOperations.xml  
/Tekelec/WebNMS/users/root/Tree.xml  
/Tekelec/WebNMS/users/root/maptoolbar.dtd  
/Tekelec/WebNMS/users/root/frameoptions.xml
```

```
/Tekelec/WebNMS//Tekelec/WebNMS/users/guest
/Tekelec/WebNMS/users/guest/toolbar.dtd
/Tekelec/WebNMS//Tekelec/WebNMS/users/guest/listmenus
/Tekelec/WebNMS/users/guest/listmenus/dummy.txt
/Tekelec/WebNMS/users/guest/sysadminmenu.xml
/Tekelec/WebNMS//Tekelec/WebNMS/users/guest/policymenus
/Tekelec/WebNMS/users/guest/policymenus/nonperiodicpolicymenu.xml
/Tekelec/WebNMS/users/guest/policymenus/periodicpolicymenu.xml
/Tekelec/WebNMS/users/guest/AudioInfo.xml
/Tekelec/WebNMS/users/guest/mibmenu.xml
/Tekelec/WebNMS/users/guest/HomePageLayout.xml
/Tekelec/WebNMS/users/guest/increments.conf
/Tekelec/WebNMS//Tekelec/WebNMS/users/guest/mapmenus
/Tekelec/WebNMS/users/guest/mapmenus/dummy.txt
/Tekelec/WebNMS/users/guest/panelmenubar.dtd
/Tekelec/WebNMS/users/guest/alertsmenu.xml
/Tekelec/WebNMS/users/guest/maptoolbar.xml
/Tekelec/WebNMS//Tekelec/WebNMS/users/guest/state
/Tekelec/WebNMS/users/guest/state/dummy.txt
/Tekelec/WebNMS/users/guest/clientparameters.conf
/Tekelec/WebNMS/users/guest/framemenu.xml
/Tekelec/WebNMS/users/guest/tllbrowsermenu.xml
/Tekelec/WebNMS/users/guest/TreeOperations.xml
/Tekelec/WebNMS/users/guest/Tree.xml
/Tekelec/WebNMS/users/guest/maptoolbar.dtd
/Tekelec/WebNMS/users/guest/frameoptions.xml
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/kanav
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/kanav/Kanav
/Tekelec/WebNMS/commandManagerScripts/kanav/Kanav/kan.bsh
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/viv
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/usr4
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/usr4/default
/Tekelec/WebNMS/commandManagerScripts/usr4/default/scr1.bsh
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/usr4/cat1
/Tekelec/WebNMS/commandManagerScripts/usr4/cat1/scr1.bsh
/Tekelec/WebNMS/commandManagerScripts/usr4/cat1/scr4.bsh
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/arjun
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/arjun/default
/Tekelec/WebNMS/commandManagerScripts/arjun/default/hashhhh.bsh
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/k2
/Tekelec/WebNMS//Tekelec/WebNMS/commandManagerScripts/kan
/Tekelec/WebNMS/linkUtilizationScripts/aricentstp_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/tekelecstp_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/eagle9_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/tklc9010801_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/stpd1180801_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/eale5_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/tklc1071501_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/eagle3_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/pveagle03_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/eagle8_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/tklc1180601_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/eagle6_lui_script.bsh
/Tekelec/WebNMS/linkUtilizationScripts/tklc1170501_lui_script.bsh
/Tekelec/WebNMS//Tekelec/WebNMS/reportingStudio
/Tekelec/WebNMS/reportingStudio/Alarms_SpecificDuration_WithSeverity.rpt
/Tekelec/WebNMS/reportingStudio/Resources_Top10_PerCount.rpt
/Tekelec/WebNMS/reportingStudio/Events_SpecificDuration_WithSeverity.rpt
/Tekelec/WebNMS/reportingStudio/
LinkReport_withErlang_PercentUtilization.rpt
/Tekelec/WebNMS/reportingStudio/All_Events.rpt
/Tekelec/WebNMS/reportingStudio/Alarms_Top10_PerCount.rpt
/Tekelec/WebNMS/reportingStudio/Alarms_Top10_PerSeverity.rpt
```

```

/Tekelec/WebNMS/reportingStudio/
Events_SpecificDuration_WithSeverity_UAM_Number.rpt
/Tekelec/WebNMS/reportingStudio/
Alarms_SpecificDuration_WithSeverity_UAM_Number.rpt
/Tekelec/WebNMS/reportingStudio/EventSummary_SpecificDuration.rpt
/Tekelec/WebNMS/reportingStudio/
CardReport_withErlang_PercentUtilization.rpt
/Tekelec/WebNMS/reportingStudio/Resources_Top10_PerSeverity.rpt
/Tekelec/WebNMS/reportingStudio/All_Alarms.rpt
/Tekelec/WebNMS/reportingStudio/Events_SpecificDuration.rpt
/Tekelec/WebNMS/reportingStudio/Inventory_OOSCards.rpt
/Tekelec/WebNMS/reportingStudio/
LinkSetReport_withErlang_PercentUtilization.rpt
/Tekelec/WebNMS/reportingStudio/Inventory_AllCards.rpt
/Tekelec/WebNMS/reportingStudio/Measurement_Systot_STP.rpt
/Tekelec/WebNMS/reportingStudio/Events_SpecificDate.rpt
/Tekelec/WebNMS/reportingStudio/Alarms_SpecificDate.rpt
/Tekelec/WebNMS/reportingStudio/AlarmSummary_SpecificDuration.rpt
/Tekelec/WebNMS/reportingStudio/Alarms_SpecificDuration.rpt
/Tekelec/WebNMS/defaultconf/usernamePassword.conf
/Tekelec/WebNMS/conf/securitydbData.xml
/Tekelec/WebNMS/classes/hbnlib/hibernate.cfg.xml
/Tekelec/WebNMS/classes/hbnlib/secondary/hibernate.cfg.xml
All the files & directories specified in the FILES_TO_RESTORE tag
are successfully restored

E5-MS successfully restored.

```

## Restore in E5-MS

### How to Restore from Existing Backup

A system user with privileges to execute `/Tekelec/WebNMS/bin/backup/RestoreDB.sh` script will have the ability to restore E5-MS system to a previous state by using the backup generated earlier. Before restoring the contents, E5-MS server must be shut down. This is because the restore script deletes the database tables and re-creates them using the database backup file.

#### Restoring from the default/any backup location

Restore can be executed using the backup at the default/any backup location by using the command given below

```

$> sh /Tekelec/WebNMS/bin/backup/RestoreDB.sh
<path of data filename>

```

For example, for restoring from default backup following command can be issued:

```

$> sh /Tekelec/WebNMS/bin/backup/RestoreDB.sh
/var/backup/E5MS_Database_BackUp.sql

```

Sample output of restore script execution is shown in Sample Outputs.

## Default Restore Contents

The `RestoreDB.sh` script will use `/Tekelec/WebNMS/bin/backup/TablesToRestore.conf` to know what to restore (database and directories) using the configuration given below.

```
<RESTORE TABLES="ALL">
</RESTORE>

<FILES_TO_RESTORE
DIR_NAMES="conf/tekelec,users,commandManagerScripts,linkUtilizationScripts,
reportingStudio"
FILE_NAMES="defaultconf/usernamePassword.conf,
conf/clientparameters.conf,conf/securitydbData.xml,classes/hbplib/hibernate.cfg.xml,classes/hbplib/secondary/hibernate.cfg.xml">
</FILES_TO_RESTORE>
```

The significance of the entries in the above configuration in the `TablesToRestore.conf` file is explained below:

```
<RESTORE TABLES="ALL">
</RESTORE>
```

Restore all the database tables present in the backup.

```
<FILES_TO_RESTORE DIR_NAMES="conf/tekelec,users,
commandManagerScripts,linkUtilizationScripts, reportingStudio"
FILE_NAMES="defaultconf/usernamePassword.conf,
conf/clientparameters.conf,conf/securitydbData.xml,
classes/hbplib/hibernate.cfg.xml,
classes/hbplib/secondary/hibernate.cfg.xml">
</FILES_TO_RESTORE>
```

Restore all the files and directories listed in `FILE_NAMES` and `DIR_NAMES` tag respectively from the backup.

## Time taken in Restore

Restore shall approximately take few minutes (for e.g. 10 to 15 mins for very small database) or more depending upon the size of backup. The backup size shall be variable depending upon the size of E5-MS database backup file.

The size of E5-MS database backup file shall depend upon the number of EAGLEs being managed i.e. the deployed E5-MS configuration (Small, Medium or Large).

## Status of Restore

The status of restore shall be shown through relevant log messages on console shown in Sample Outputs.

## File and their Locations

The following files are used during backup and restore.

**Table 6: Backup and Restore related Files and Directories**

File/Directory	Description
/Tekelec/WebNMS/conf/BackUp.conf	The configuration file where backup contents and schedule are listed. It is recommended not to change backup content as it may create issues with upgrade process.
/Tekelec/WebNMS/conf/serverparameters.conf	File where the directory for backup is mentioned.
/Tekelec/WebNMS/bin/backup/BackupDB.sh	Script to be used to manually generate E5-MS backup.
/Tekelec/WebNMS/bin/backup/ResotreDB.sh	Script to be used to restore the E5-MS from a previously generated backup.
/Tekelec/WebNMS/bin/backup/TablesToRestore.conf	The configuration file where restore contents are listed for restore. It is recommended not to change restore content as it may create issues with upgrade process.

# Appendix C

## E5-MS Failover

---

### Topics:

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- *Failover Setup.....192*
- *Licensing.....198*
- *Limitations.....198*

This appendix describes the failover for the E5-MS.

## Overview

In E5-MS failover support is provided by providing two redundant servers configured as primary and standby servers. In failover setup, the primary and standby servers should have access to the replicated database. Mysql data files are kept at /Tekelec/Webnms/mysql/data directory.

The WebNMS configuration files are overwritten from the primary server onto the standby server once every BACKUP\_INTERVAL, if configured. There is no GUI to make changes to these configuration files, any changes will have to be done manually.

During the failover interval alarms and other intermediary data will be lost.

## Upgrade and Failover

After upgrading a system, a Topology update is executed to refresh all data and allow collecting all new fields or parameters introduced by the new release.

The secondary server is available with all the topology data.

## Requirements

Database replication should be setup between primary and standby E5-MS server databases before implementing failover. Refer to How to Setup FAILOVER.

Any version of MySql should not be previously installed and mysql group and user should not exist on the E5-MS server.

## How to Setup FAILOVER

To setup failover DB replication is a must. To enable DB replication one needs to set-up various GLOBAL PARAMETERS for MySql. This is done by editing the startMysql.sh file. Refer *Table Files and Location in FAILOVER* to check the changes done in the file /Tekelec/WebNMS/bin/startMySQL.sh

1. If the servers do not have their domain name registered with the DNS, manual entries will have to be made for both the servers, at both the servers and the client machines, in the system's hosts file. A sample entry:

1. 248.10.25 e5ms1

1. 248.10.21 e5ms2

<PRIMARY SERVER IP> <PRIMARY HOSTNAME>

<STANDBY SERVER IP> < STANDBY HOSTNAME>

**Note:** Append these entries to the hosts file. The order of insertion is irrelevant.

On the CentOS machine you can find the hosts file under /etc directory. And on a windows machine you can find the hosts file at C:\Windows\System32\drivers\etc\hosts location.

2. Open the startMySQL.sh file for both the servers, kept at /Tekelec/WebNMS/bin/, and ensure that the server-id provided is neither equals to 0 nor is same. In case the server id is same change the value of one of the server-id to any value from 1-2^32-1, but not same as the other server-id.
3. Execute startMySQL.sh files on both the servers.
4. Login to the database using root credentials
5. 1. To check that the servers have started properly, run SHOW MASTER STATUS;

This should return a result-set like:

```

+-----+-----+-----+-----+
| File           | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| e5ms3-bin.000001 | 98 | WebNmsDB      | mysql              |
+-----+-----+-----+-----+

```

6. 1 row in set (0.00 sec)
7. Execute the following statements on primary server:
  - a. - GRANT ALL PRIVILEGES ON \*.\* TO root@'<primary server hostname>' IDENTIFIED BY '<primary server's (mysql) root user password>';
  - b. GRANT ALL PRIVILEGES ON \*.\* TO root@'<standby server hostname>' IDENTIFIED BY '<primary server's (mysql) root user password>';
  - c. CREATE USER '<primary replication user>'@'localhost' IDENTIFIED BY '<primary replication user password>';
  - d. GRANT REPLICATION SLAVE ON \*.\* TO < primary replication user>@'%' IDENTIFIED BY '<primary replication user password>';
  - e. FLUSH PRIVILEGES
8. Execute the following statements on standby server
  - a. GRANT ALL PRIVILEGES ON \*.\* TO root@'<primary server hostname>' IDENTIFIED BY '<standby server's (mysql) root user password>';
  - b. GRANT ALL PRIVILEGES ON \*.\* TO root@'<standby server hostname>' IDENTIFIED BY '<standby server's (mysql) root user password>';
  - c. CREATE USER '<standby replication user>'@'localhost' IDENTIFIED BY '<standby replication user password>';
  - d. GRANT REPLICATION SLAVE ON \*.\* TO < standby replication user>@'%' IDENTIFIED BY '<standby replication user password>';
  - e. FLUSH PRIVILEGES;
9. On the standby server execute the following statements
  - a. CHANGE MASTER TO MASTER\_HOST='<primary server hostname>', MASTER\_PORT=3306, MASTER\_USER='<primary replication user>', MASTER\_PASSWORD='<primary replication user password>';
  - b. START SLAVE;
10. On the primary server execute the following statements
  - a. CHANGE MASTER TO MASTER\_HOST='<standby server hostname>', MASTER\_PORT=3306, MASTER\_USER='<standby replication user>', MASTER\_PASSWORD='<standby replication user password>';
  - b. START SLAVE

To check that the master has been set up properly execute `SHOW SLAVE STATUS\G` on both the servers;

A sample result-set is shown here:

```
Slave_IO_State: Waiting for master to send event
      Master_Host: 10.248.9.5
      Master_User: root
      Master_Port: 3306
      Connect_Retry: 60
      Master_Log_File: e5ms4-bin.000001
      Read_Master_Log_Pos: 5968460
      Relay_Log_File: e5ms3-relay-bin.000004
      Relay_Log_Pos: 235
      Relay_Master_Log_File: e5ms4-bin.000001
      Slave_IO_Running: Yes
      Slave_SQL_Running: Yes
      Replicate_Do_DB:
      Replicate_Ignore_DB:
      Replicate_Do_Table:
      Replicate_Ignore_Table:
      Replicate_Wild_Do_Table:
      Replicate_Wild_Ignore_Table:
      Last_Errno: 0
      Last_Error:
      Skip_Counter: 0
      Exec_Master_Log_Pos: 5968460
      Relay_Log_Space: 235
      Until_Condition: None
      Until_Log_File:
      Until_Log_Pos: 0
      Master_SSL_Allowed: No
      Master_SSL_CA_File:
      Master_SSL_CA_Path:
      Master_SSL_Cert:
      Master_SSL_Cipher:
      Master_SSL_Key:
      Seconds_Behind_Master: 0
1 row in set (0.00 sec)
```

Two important columns to check here are marked in bold above both these columns should contain **Yes**.

Once the above mentioned columns contain **Yes** for both the servers replication is complete and the databases are in sync and replication has been setup between the two databases.

11. Open the hibernate.cfg.xml file for both the servers, kept at `/Tekelec/WebNMS/classes/hbplib`, and ensure that system's hostname is provided in place of localhost for connection URL. As described in Files and Location in FAILOVER.
12. After this start the primary server by executing `startnms.sh` file present in the `/bin` directory.
13. Once the primary server is up, start the stand-by server.

## Synchronizing Databases

### Case 1

1. Execute `STOP SLAVE` on the new Active server (previously standby standby, before primary failed)
2. Execute `startMySQL.sh` on restarted server once it is up.
3. Execute `START SLAVE` on the new Active server

4. Check if the SLAVE started properly. Execute SHOW SLAVE STATUS.

**Slave\_IO\_Running: Yes**

**Slave\_SQL\_Running: Yes**

Two columns to check here are marked in bold above both these columns should contain **Yes**

Once the above mentioned columns contain **Yes** for both the servers replication is complete and the databases are in sync.

Once the databases are synchronized, start the failed E5-MS server(s).

## BEfailover Table

The BEFailover table consists of the following columns:

Field Name	Type	Constraints	Description
HOSTADDRESS	varchar(50)		Host's Address
NMSBEPORT	int(11)		WebNMS BE port
RMIREGISTRYPORT	int(11)		WebNMS registry port number
LASTCOUNT	bigint(20)		Value incremented after every HEART_BEAT_INTERVAL
SERVERROLE	varchar(10)	Can have one of the below values PRIMARY(States that this server is the primary server), STANDBY(States that this server is the standby server), FAILED(States that this server is not responding), and SHUTDOWN(States that this server is shutdown),	Describes the present role for a host.
STANDBYSERVERNAME	varchar(50)		Host address for standby server. Please note that this field shows the standby server host address only in case when the server was primary, has been shutdown and the standby has taken over as primary. This entry is used by the server to re-connect to the

Field Name	Type	Constraints	Description
			STANDBYSERVERNAME as and when this server comes up again

## Files and Location in FAILOVER

The following files are used for failover process.

**Note:** The files /Tekelec/WebNMS/bin/startMySQL.sh and /Tekelec/WebNMS/classes/hbplib/hibernate.cfg.xml needs to be manually updated at the customer site after the E5-MS is installed. Please refer How to Setup FAILOVER.

File/Directory	Description
/Tekelec/WebNMS/bin/startnms.sh	The script file is used to start E5-MS server. For failover, a property ( -Djava.awt.headless) is modified from -Djava.awt.headless= <b>false</b> to -Djava.awt.headless= <b>true</b>  For more details visit: <a href="http://www.omde.com/technetwork/articles/javase/headless-136834.html">http://www.omde.com/technetwork/articles/javase/headless-136834.html</a>
/Tekelec/WebNMS/bin/startMySQL.sh	The script file is used to pass arguments to MySQL server necessary to implement database replication ( <b>--server-id=1 --log-bin --binlog-do-db=WebNmsDB --binlog-ignore-db=mysql --relay-bin --log-slave-updates --slave-skip-errors</b> ).  <b>Note:</b> It is important here to note that before starting MySQL it is mandatory to check that the server-id put in the file above lie in the range of 1-4294967295 and also that they should not be same for the two databases being replicated.
/Tekelec/WebNMS/conf/serverparameters.conf	Added a property to enable database replication for E5-Ms( <b>DB_REPLICATION true</b> )
/Tekelec/WebNMS/conf/Failover.xml	The <b>HEART_BEAT_INTERVAL</b> , <b>FAILOVER_INTERVAL</b> and <b>BACKUP_INTERVAL</b> can be configured from this file.  Other than this the WebNMS configuration files/directories which are to be backed up or which are to be avoided are also specified in this file. As per WebNMS it is advisable to keep the value for FAIL_OVER_INTERVAL as 60 seconds.

File/Directory	Description
	Any changes made in the Failover.xml file would be effective only after server restart.
/Tekelec/WebNMS/classes/hbplib/hibernate.cfg.xml	<p>Un-commented c3p0 entries</p> <pre>(&lt;property name='hibernate.c3p0.acquireRetryAttempts'&gt;2&lt;/property&gt; &lt;property name='hibernate.c3p0.acquireRetryDelay'&gt;3000&lt;/property&gt; &lt;property name='hibernate.c3p0.breakAfterAcquireFailure'&gt;&gt;false&lt;/property&gt;)</pre> <p>Also replaced localhost with hostname for connection url</p> <pre>(&lt;property name="connection.url"&gt;jdbc:mysql://&lt; hostname&gt;:3306/&lt; databaseName&gt;?useUnicode=true&amp;useJDBCCompliantDateFormatter=true&lt;/property&gt;)</pre> <p><b>Note:</b> Check for the hostname provided in this xml before starting the server and ensure that the hostname provided is the hostname for the server where the database is installed. This file should be identical at primary and secondary servers except for the host name provided for connection url.</p>
/Tekelec/WebNMS/classes/hbplib/secondary/hibernate.cfg.xml	This file is an exact replica of the file above except for the hostname entry is for the standby server.
/Tekelec/WebNMS /jre/lib/security/java.policy	<p>Appended the file with the entries below:</p> <pre>permission java.awt.AWTPermission ".*"; permission java.security.SecurityPermission "createAccessControlContext"; permission java.net.SocketPermission "*.1024-65535","connect,accept,resolve,listen";</pre> <p>For details goto:  <a href="http://docs.oracle.com/javase/1.5.0/docs/guide/security/permissions.html">http://docs.oracle.com/javase/1.5.0/docs/guide/security/permissions.html</a></p>

## Primary Server

The server which starts first (among the two servers) becomes the primary server. In the database, details regarding the primary and standby servers are maintained in a table named BEFailOver. Refer *BEFailover Table* for details of the table. At a configured regular time interval, the primary server updates the BEFailOver table about its presence with a count named LASTCOUNT. With every update the count gets incremented. The periodic interval at which the primary has to update the database regarding its presence is known as HEART\_BEAT\_INTERVAL. If HEART\_BEAT\_INTERVAL is configured as

30 seconds, the primary server will update the BEFailOver table every 30 seconds. This interval is configurable. Refer *Failover and Location in Failover*.

## Standby Server

When a server is started, if no standby server is already registered with the primary server, the primary server registers this server as the standby server. At any time, only one primary server and one standby server can be configured. If a second standby server is started, the primary server will refuse registration. When the primary server registers a standby server, it makes an entry regarding the registration in the database.

Similar to the primary, the standby server updates the BEFailOver table about its presence at a specified periodic interval (HEART\_BEAT\_INTERVAL) in the LASTCOUNT which gets incremented with every update. The primary server monitors the LASTCOUNT of standby server as per the FAIL\_OVER\_INTERVAL. When the standby fails to update the LASTCOUNT, the primary assumes that the standby had failed and it cancels its registration as well as its entries from the BEFailOver table. This would enable E5-MS to connect a new standby server. It is important here to note that a new standby server will be able to register with the primary only when replication between the existing servers is stopped and failover is setup between the primary and the new standby server.

## Client

During failover, a pop-up is shown to already logged in users stating that the connection to the primary server is lost and the client is trying to connect to the standby server. Until the failover process is complete a user will not be able to use E5-MS.

The pop-up message shown is " Connection lost to primary server <primary server hostname> at :9090. Now client is trying to connect secondary server <secondary server hostname> at :9090"

## Failover Process

When the primary server fails, it fails to update the LASTCOUNT. The standby server keeps monitoring the primary's LASTCOUNT at a specified periodic interval known as FAIL\_OVER\_INTERVAL. The default value for FAILOVER\_INTERVAL is 30 seconds. If FAIL\_OVER\_INTERVAL is configured as 50 seconds, the standby will monitor the primary's LASTCOUNT every 50 seconds. Every time, when the standby server looks up the LASTCOUNT, it compares the previous and present counts. When the primary server fails to update the LASTCOUNT, consecutive counts will be the same and the standby assumes that the primary had failed. Here, a parameter named RETRY\_COUNT, the default value for RETRY\_COUNT is 1, comes into play which enables the user to specify the number of times the standby has to check the primary's LASTCOUNT (when the primary fails to update the LASTCOUNT) before assuming that the primary had failed.

Once the standby server finds that the primary had failed, it immediately changes its mode as PRIMARY and assumes all the functions that were being performed by the hitherto primary server.

To check if the failover process is successful, check for the SERVERROLE column in the BEFailover table. Whereas any end user will be able to connect to the standby server, the new active server, on successful switchover.

After switchover, when the old primary server is started it registers as the new standby server.

For the default entries configured, E5-MS takes around 2 minutes for a successful switchover. During the failover interval alarms and other intermediary data would be lost.

## Manual Failover

Once both the primary and standby servers are started in their respective modes, manually stop the primary server by the following command.

```
$> sh Shutdown.sh root public
```

After some time (based on FAIL\_OVER\_INTERVAL and RETRY\_COUNT), the stand-by server will become primary server.

Please note that if the server just shutdown is started before the standby has taken the role of primary it may lead to erroneous situation breaking replication setup between two MySQL servers. Such an action is highly unadvisable

## Failover Setup

To setup failover database replication is a must. Refer to *How to Setup FAILOVER* for failover setup.

However, in case one or both the server go down in an outage or a power failure, the databases will have to be synchronized. Refer to *Synchronizing databases*.

In case of a failed connectivity between primary and secondary, the secondary would be unable to read the last count of the primary and will assume the role of the primary while the primary will de-register the secondary and continue as primary.

## Tables Replicated

All E5-MS tables are replicated. Some of these important WebNMS tables are described below:

Table Name	Purpose
ANNOTATION	This table has the details on Alert Annotation and Alert History.
Alert	This table stores Web NMS Alert related properties.
AttributeAudit	This table contains the audit at the attribute level and contains information, like the number of retries, ending time of execution, etc.
AuthAudit	This table is used to store the log information regarding the authentication and authorization operations of a user in order to keep track of the operations performed by various users logged into the network.

Table Name	Purpose
BeFailOver	This table is used to store information for primary and standby servers
CORBANode	<p>The discovered CORBA object is mapped to the CORBANode. The properties are given in the corbaseed.file in &lt;Web NMS Home&gt;/conf directory.</p> <p>The CORBA Node object with the above mentioned properties is stored in the topology database. Only after the discovered device is stored in the topology database as a managed object, WebNMS starts managing the CORBA device.</p>
ConfigAttributes	The attributes defined in a particular task are stored in this table
configProvider	This contains the entries which are created by reading the configprovider.xml file and also contains the list of provider for the protocols used for configuring the device.
ConfigTaskDetails	This also contains the task related details like the total number of attributes contained in a task, type of the attribute namely, group, table, columnar, etc.
ConfigTasks	Whenever a task gets defined, it gets stored in this table. This contains information like name of the task, protocol to be used when executing the task, etc. It also stores information like whether or not rollback is needed, the rollback document, etc.
DataCollectionAttributes	This table holds the details about the data collection criteria, which you specify in the Data Collection tag, for the PolledData of a PollingObject. This includes a property of the ManagedObject compared with a value and only when that criteria satisfies, PolledData will be created and data collection done.
DeviceAudit	This table is used to store the device level audit details. This contains information, like device name, task name, starting time of execution, ending time of execution, etc. This also contains the status of configuration i.e., Success or Failure
DeviceList	Many devices can be grouped together so that the task can be executed over the group of devices at a later point of time. This grouping of devices are stored in this table.

Table Name	Purpose
DeviceListDetails	This contains the common properties of the device, like port to be used for configuration, value for timeout, retries, etc.
DeviceUserProps	This table contains the user properties specified for the device, like COMMUNITY in case of SNMP.
Event	The event table stores Web NMS Event related properties.
GroupTable	The aggregate (or group) relationship is modeled in the database using the Group Table.
IpAddress	This table represents an IP interface.
ManagedGroupObject	The aggregate (or group) relationship is modeled in the database using the Group Table.
ManagedObject	The ManagedObject Table is the core database object. It stores the Managed Objects and their properties or attributes. This base table contains all the basic elements required by NMS to manage an object, e.g., name, status, type, etc., An object that has been discovered will have an entry in the ManagedObject table, and the other corresponding tables based on the type of the Managed Object. The other tables that may have entries of a discovered Managed Object are Node Table, Network Table, Interface Table, etc.,
MapContainer	The following table gives you the attributes that are specific to MapContainers. The MapContainer object also consists of all the attributes that are listed as MapSymbol.
MapDB	This table consists all the map entries and their properties.
MapGroup	There are no specific attributes for MapGroup. The MapContainer object also consists of all the attributes that are listed as MapSymbol.
MapLink	The following table gives you the attributes that are specific to MapLinks. The MapLink object also consists of all the attributes that are listed as MapSymbol.
MapSymbol	The following table gives you the attributes of MapSymbols. All the attributes present in this table are also common to MapContainer, MapLink, and MapGroup objects.

Table Name	Purpose
NamedViewToAuthorizedViewTable	This table is used to stores the Named View defined for a particular view.
Network	This table represents an IP network.
Node	This table represents an IP Node.
OperationsTreeTable	This table is used to represent the tree hierarchy of the Operations. This information is used when assigning an Operation to a View where all the children for an Operation are also assigned to that View
PendingDevices	Similar to storing the pending tasks, the pending devices over which configuration has to be performed is stored in this table.
PendingTasks	When the ConfigServer is shut down, the list of pending tasks available for execution at the time of shut down are stored in this table. Whenever the server gets restarted, it reads this table and starts the configuration again.
PolledData	This is the table used for storing the PolledData. It contains the details such as name of the PolledData, Agent that has to be polled, data that has to be collected, whether multiple or not, etc. These details form the basis for data collection.
Polling Attributes	This table stores the match criteria details of PollingObject. The match criteria specification allows you to filter only the desired ManagedObjects.
PollingObjects	This table stores information about the PollingObject. It contains only two fields: name, and status
Providers	This table holds information about the protocol providers for data collection. The provider name and its associated class file name are stored.
STATSDATA	When Web NMS is started, the polling units will be stored in the PolledData table. After data collection, the collected data will be stored in the STATSDATA table if the type of the collected value is long.
STRINGDATA	When Web NMS is started, the polling units will be stored in the PolledData table. After data collection, the collected data will be stored in the STRINGDATA table if the type of the collected value is string.

Table Name	Purpose
SnmpInterface	This table stores additional information on the IP interface for nodes supporting SNMP
SnmpNode	This table stores additional information for nodes supporting SNMP.
TL1Interface	<p>The IP address of the Network Interface Card present in the TL1 Node is the TL1 Interface present in the TL1 Node. The properties of the TL1 Interface are given in the t11seed.file in &lt;Web NMS Home&gt;/conf directory,</p> <p>The TL1 Interface is created with the above mentioned properties and stored in the topology database as a TL1 Interface object. The values of the properties are fetched from t11seed.file and the device. The status polling of the TL1 device is dealt by the Topology module. This module uses the STATPOLLCOMMAND property in the TL1 Interface object, to query the status of the TL1 Interface and in turn the status of the TL1 Node.</p>
TL1Node	The discovered TL1 object is mapped to the TL1 Node. The properties are given in the t11seed.file file in <Web NMS Home>/conf directory
TaskAudit	This table is used to store the task level audit details. This contains information like task name, submitted time, device list, etc.
TaskToDeviceListMap	When a task is defined and devices are associated, the mapping between the tasks and device lists are stored in this table.
ThresholdObjects	This table holds information about the thresholds which you create for monitoring the collected data. Details such as threshold type, threshold value, etc. are stored in this table.
TopoObject	The TopoObject is the base class of all IP objects in the Topology database. The TopoObject table stores all the common set of Network, Node, Interface or IpAddress Objects
UserGroupTable	This table is used to store the assigned group of each user. A user can be present in more than one group
UserPasswordTable	This table maintains the user name and the password for the user
ViewPropertiesTable	The ViewPropertiesTable maps a view name to the properties of objects

Table Name	Purpose
ViewToOperationsTable	The ViewToOperations table maps the View Name to the corresponding operations. The Operation Name and the type of operation for a given View Name will be stored here.
ViewsToGroupTable	This table assigns a View Name to a Group, which specifies the access for the Group

### E5-MS Custom Replicated Tables

Table Name	Purpose
Tek_Secu_MapUserGrpEagleNode	This table contains the associations between user groups and eagles
Tek_Secu_MapUsergrpCmdClass	This table contains the associations between user groups and eagle command classes
Tek_Secu_PasswordConfig	This table stores the password configuration.
Tek_Secu_UserInfo	This table contains the basic user information.
Tek_inventory_card	This table consists of entries for eagle cards.
Tek_inventory_eagleNode	This table consists of entries for eagle nodes.
Tek_inventory_frame	This table consists of entries for eagle frames.
Tek_inventory_shelf	This table consists of entries for eagle shelves.
Tek_inventory_slot	This table consists of entries for eagle slots.
tek_cmi_cmd_param_lookup	This table contains eagle command parameters whose values need to be looked up from a fixed set of values, maintained in this table.
tek_cmi_cmd_param_map	This table contains mapping between eagle commands and their parameters.
tek_cmi_cmd_param_validation	This table contains validation rules applicable on various command parameters.
tek_cmi_cmd_param_values	This table contains command parameter values.
tek_cmi_cmd_params	This table contains all command parameters.
tek_cmi_cmdclass_cmd_map	This table maps command classes to commands.
tek_cmi_cmdclasses	This table contains command classes.
tek_cmi_commands	This table contains command.
tek_lui_config_data	This table contains the thresh-holding values.
tek_lui_link_data	This table contains link data.

Table Name	Purpose
tek_lui_measurements	This table contains the state and utilization details for various entities.
tek_lui_slk_capacity	This table contains capacity data.
tek_lui_slk_capacity_arch	This is an archive table for capacity data.
tek_lui_slk_reptstatcard	This table contains parsed rept-stat-card output.
tek_scheduler_task	This table contains all the E5-MS tasks, and related attributes, scheduled by E5-MS scheduler interface.
tekelec_meas_headers	This table contains CSV file's header information.
tekelec_meas_reports	This table contains the number and type of supported reports.

## Licensing

Failover in E5-MS is enabled via a valid E5-MS license only. Failover is FAK controlled, however MySQL replication cannot be controlled through licensing.

Both primary and standby servers will require separate licenses, as licenses are tied to the system's MAC address.

## Limitations

1. Unlike MySQL data replication which synchronizes the Active and Secondary E5-MS servers every second, the conf file which are not present in MySQL table are synchronized every 1 hour (default configured BACKUP\_INTERVAL). Note that the configuration file changes may not be as frequent. Once the configuration is set after the installation at the customer site, configuration change might be done rarely on need basis (once in many days). The configuration done in primary will be replicated in the standby after every hour. If configuration change was done in a conf file after last synchronization and failover happens due to a power failure (or any abrupt condition due to which conf file replication can't be ensured), the last configuration change will not be available in the standby server after standby takes over as the Active server. Please note that most of the configuration file changes are not affected while server is up. So, in case of failover for any change in the configuration files to take effect, both the primary and standby servers should be shut down. And the changes should be made in the primary server configuration files, they will be reflected to standby's configuration files once they are copied to the standby after the BACKUP\_INTERVAL, or you can make the change manually at both the servers.
2. In case of failover, a pop-up for lost connection is shown on the client, which also shows that the client is trying to connect to the standby server. The jar file of the E5-MS server is required at the client's cache for the client to automatically connect to server. During first time failover, when the client has not connected to the standby server even once, the jar file of secondary will not be present in client's cache. Hence the user has to manually connect to the new Active E5-MS server. Once the

jars of Active and Standby servers are present in the Client cache, manual intervention will not be required any further. The client will automatically connect to the new active server after the failover/switchback.

3. In case of manual failover, when the Active server is manually stopped, if the stopped server is re-started before the standby server takes over as the new Active server, started server registers itself as the primary server and also de-registers the already registered standby server (the standby servers entry is removed from the BEFailover table). In such a case, failover will fail and the standby server will have to be manually stopped and then restarted, such that it registers with the primary server, again.
4. The Eagles would need to have the IP of the standby server configured as FTP server so that it continues to send measurement reports to the standby once the primary has gone down.
5. The SNMP Eagles would need to have the IP of the standby server configured so that it is able to send traps to the standby server once the primary server goes down.
6. I-net Clear is a separate stand-alone installation and any I-net configuration data will not be available on the standby server and will have to be done manually.
7. In case of failed connectivity between primary and standby, the standby would be unable to read the last count of the primary and will assume the role of the primary while the primary will de-register the secondary and continue as primary. Manual intervention would be required to resolve this issue.
8. For clients which are not logged in during switchover will have to manually connect to the new active server.
9. If the number of retry counts is configured as  $n$  in hibernate.cfg.xml files, E5-MS allows  $n+1$  retries. As per WebNMS this behavior is by design. Also, E5-MS will try indefinitely to connect to the failed primary server, if the value is set to '0' or less.

## F

FTP

File Transfer Protocol

A client-server protocol that allows a user on one computer to transfer files to and from another computer over a TCP/IP network.

Feature Test Plan

## G

GUI

Graphical User Interface

The term given to that set of items and facilities which provide the user with a graphic means for manipulating screen data rather than being limited to character based commands.