FOXMAN-UN
SNMP Southbound Interface
Configuration and Operation

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Contents

1   Purpose and Scope

This Application Note provides the background information required by customers to correctly set up their SNMP based equipment.

It also provides information on how to access the management GUI or CLI of specific SNMP equipment directly from the FOXMAN-UN Network Browser and NEM Configurator.

2 FOXMAN-UN SNMP Southbound Interface

2.1 General

The SNMP southbound interface is provided via an agent manager type SNMP, running as a separate process called «snmpnetworkagentmgrd», under the control of and being started by the «procwatch» process. Towards FOXMAN-UN, it behaves like a standard FOXMAN-UN agent manager, towards the device as an SNMP manager. It will support alarm list retrieval and notifications. The respective inventory will be retrieved via the ENTITY MIB (v2 or v3, RFC 2737 or RFC 4133, respectively) or IF-MIB (RFC 2863). The references to the entity being the alarm source (via alarmActiveResourceId, 1.3.6.1.2.1.118.1.2.2.1.10) are expected to point to a useful entry in the entity physical table. Some specific devices support Enterprise MIB.

> ℹ️ **Please note:**
> Throughout this section FOXMAN-UN SNMP Southbound Interface, the term «port» will be used for FOXMAN-UN ports (where not otherwise mentioned), which in other documents are sometimes also referred to as «TTPs», i.e. trail termination points.

2.2 Device Identification

SNMP device identification works via interpreting the value of MIB-II::sysObjectId (.1.3.6.1.2.1.1.2.0 acc. to RFC 1213). It should be a uniquely identifiable OID from the enterprise MIB section (.1.3.6.1.4.1.<enterprise id>).

2.3 Security

The FOXMAN-UN SNMP southbound interface supports SNMP v1, v2c and v3. All types of devices are depicted as SNMP devices in FOXMAN-UN (no type distinction made). Devices are tested for v3, v2c, and v1, in that order when SNMP security profile is set to "auto" in the FOXMAN-UN. The first positive answer is used to identify the (version of the) device. This means that for devices with multiple version support, a failed initial v3 call due to, say, wrong security settings will possibly identify that device as v2c or v1. V1/v2c community strings are supported; only the read community is relevant though, as no write access is as yet implemented. V3 User-based Security Model (USM) is supported; it should be noted, however, that the agent manager has one USM table. Devices must therefore not have matching security names with differing configurations. V3 View-based Access Control (VAC) is not supported at the moment.

2.4 Supported Equipment

In the current release of FOXMAN-UN, the following SNMP equipment are supported. The MIB details that are supported by FOXMAN-UN for accessing the equipment are as listed in the devices' config files located at «$NEM_HOME/etc/snmp». Also refer to [1KHW002499] FOXMAN-UN Release Note, i.e. the release note of the current FOXMAN-UN release.

Table 1:   **Supported Equipment**

Equipment	Supported MIBS
Hitachi Energy:	
EDS500 Industrial Switch (EDS500 Family) (EDS500NMD01), (EDS500NMD02), (EDS500NMD11), (EDS500NMD20), (EDS500NMD30), (EDS500NMD40), (EDS500NMD41), (EDS500NMD42), (EDS500NMD43), (EDS500NMD44), (EDS500NMD50), (EDS500NMD51), (EDS500NMD52), (EDS500NMD53), (EDS500NMD54), (EDS500NMD55), (EDS500NMD56), (EDS500NMD57), (EDS500NMD58), (EDS500NMD59), (EDS500NMD60), (EDS500NMD61), (EDS500NMD62), (EDS500NMD63), (EDS500NMD64), (EDS500NMD65), (EDS500NMD66), (EDS500NMD67), (EDS500NMD68), (EDS500NMD69).	EDS500-MIB.mib
Hitachi Energy DTM-M SHDSL Router	MIB-II RFC1213, standard traps supported, I/F table supported
Hitachi Energy Scada NG	MIB-II (RFC 1213), SNMPv2 (RFC 3418), ALARM-MIB (RFC 3877), ITU-ALARM-MIB (RFC 3877), IANA-ITU-ALARM-TC-MIB (RFC 3877), ITU-ALARM-TC-MIB (RFC 3877)
Hitachi Energy Industrial Switch (LR IS-32xx) Family (LR IS-3230) (LR IS-3260)	BRIDGE.MIB ETHERLIKE.MIB IFMIB.MIB KEYMILE-LR-IS-3000-50.MIB Q-BRIDGE.MIB RMON.MIB RSTP.MIB SNMP-FRAMEWORK.MIB
Hitachi Energy Industrial Switch (LR IS-34xx) Family (LR IS-3410) (LR IS-3420) (LR IS-3430) (LR IS-3440)	HYTEC-MIB.mib
Other Suppliers:	
FortiGate (311B) (100D) (300C)	FORTINET-CORE-MIB.mib FORTINET-FORTIGATE-MIB.mib
Billion (BiPac 8500/8501/8520)	MIB-II (RFC1213)
NEXANS (iSwitch G 1043) (FiberSwitch BM100)	MIB-II (RFC1213)
BKTel (OAS Optical Amplifier/Sender)	MIB BKTEL-HFC862-HMSNE-MIB (neModulTable) BKTEL-HFC862-NECE-MIB (neceCommonTable) BKTEL-HFC862-OA-V01-MIB (oaCommonTable) SCTE-HMS-COMMON_MIB SCTE-HMS-ALARMS-MIB
Elcon (BIG1022/BIG1024) (FOS 100 CPE)	MIB-II RFC1213, standard traps supported, I/F table supported switch_ts-v0.9.3.mib cpe_3-v1.0.4.mib
Delta Power Supply (DPS 600B-48-2/4)	MIB-II RFC1213, standard traps supported, I/F table supported
Ericsson (MiniLink)	ENTITY MIB, INTERFACE MIB, ERICSSON ALARM-IRP-MIB-v12

Table 1:   Supported Equipment (continued)

Equipment	Supported MIBS
BENNING (Power D400)	MIBS:DC-MCU-MIB
Cisco (Cisco Catalyst 2960 Switch) (Cisco 3845 Integrated Services Router) (Cisco 2811 Integrated Services Router)	IF-MIB
Alcatel-Lucent (OmniSwitch 6860) (OmniSwitch 6450)	IF-MIB
ServiceOn XMP1 (SOX) Network Manager	KEYMILE-XMP1-MIB
Plisch (DAB TDA3000 Series)	PLI-TRISPLUS-MIB IRT-COMMONVARBINDS-MIB IRT-DAB-ACTIVERESERVE-MIB IRT-DAB-DUALDRIVE IRT-DAB-NPLUS1-MIB IRT-DAB-SINGLETRANSMITTER-MIB IRT-DVBT-ACTIVERESERVE-MIB IRT-DVBT-DUALDRIVE-MIB IRT-DVBT-NPLUS1-MIB IRT-DVBT-PASSIVERESERVE-MIB IRT-DVBT-SINGLETRANSMITTER-MIB IRT-TRANSMITTER-SMI-MIB RFC1213/15-MIB (ifTable)
AKCP (Sensor Probe 2)	akcp.mib if-mib
SAIA-PCD	SNMPv2-SMI IF-MIB
Ciena (Ciena 6130)	omeTraps.mib
CXR FOE1T1 (TNLO)	foe1t1.mib
Eltek (SmartPackS)	SP2-MIB
Proscend (Proscend 5600/6200) Note: For Proscend 5600 series, the latest FW version should be used (56100000.134.20131204-B241-R764.bin)	VPN-WAN-MIB.mib VPN-VSERVER-MIB.mib VPN-VPN-MIB.mib VPN-VLAN-MIB.mib VPN-UTILITIES-MIB.mib VPN-SYSTEM-MIB.mib VPN-SWITCH-MIB.mib VPN-STP-MIB.mib VPN-SOAM-MIB.mib VPN-ROUTE-MIB.mib VPN-RIP-MIB.mib VPN-QOS-MIB.mib VPN-QINQ-MIB.mib VPN-OSPF-MIB.mib VPN-NAT-MIB.mib VPN-MANAGEMENT-MIB.mib VPN-MACFILTER-MIB.mib VPN-LOAM-MIB.mib VPN-LAN-MIB.mib VPN-IPFILTER-MIB.mib VPN-IGMP-MIB.mib VPN-GMS-MIB.mib VPN-GMS-MIB.mib

Table 1:   Supported Equipment (continued)

Equipment	Supported MIBS
Proscend (Proscend 5600/6200) (cont'd)	VPN-DNS-MIB.mib VPN-DMZ-MIB.mib VPN-DHCP-MIB.mib VPN-DDNS-MIB.mib rfc1213.mib P-MIB.mib

2.5   ENTITY MIB (RFC 4133)

Only the entity physical table (.1.3.6.1.2.1.47.1.1.1) is used/read, that is, no entity logical table (.1.3.6.1.2.1.47.1.2.1) and consequently also no logical to physical mapping table (.1.3.6.1.2.1.47.1.3.1) are inspected. All entities (of interest) are expected to be in the same (default) context. As FOXMAN-UN only supports units and ports, only those layers are being interpreted, all others are ignored.

Table 2:   Entity MIB (v3) PhysicalClass types and their mapping into FOXMAN-UN types if they exist

SNMP PhysicalClass	FOXMAN-UN Types
other(1)	<none>
unknown(2)	<none>
chassis(3)	<none>
backplane(4)	<none>
container(5) -- e.g., chassis slot or daughter-card holder	<none>
powerSupply(6)	unit
fan(7)	unit
sensor(8)	<none>
module(9) -- e.g., plug-in card or daughter-card	unit
port(10)	port
stack(11) -- e.g., stack of multiple chassis entities	<none>
cpu(12)	<none>

Due to the lack of a representation for all PhysicalClass types, additionally one must be careful when modeling the hardware in order not to create addressing problems. Here is a basic set of rules:

- Down to the slot level only a linear (non-branched) tree can be present (albeit of arbitrary depth); failure to comply with this rule will lead to an empty inventory.
- Units must be modeled inside slots, the slot's parent position field will be taken as the unit's "slot" addressing parameter.
- Ports must be directly attached under units (and only there); their port number is their parent position field (relative to the unit).

Examples of configurations not allowed:

- Two chassis/backplanes with same unit in an NE -> unit addressing clash on NE level.
- Sub-units (daughter cards) having same ports -> port addressing clash on unit level.

A possible configuration looks like this (MIB and FOXMAN-UN in comparison):

entity physical table

```
                                                    ┌──────────────┐
                                                    │ NE 1         │
                                                    └─┬────────────┘
  ┌──────────────┐                                    │
  │ chassis 1    │                                    │
  └─┬────────────┘                                    │
    │ ┌──────────────┐                                │
    └─│ backplane 1  │                                │
      └─┬────────────┘                                │
        │ ┌──────────────────┐                        │
        └─│ container 1 (slot 1) │                    │
          └─┬────────────────┘                        │
            │ ┌──────────────────┐    ┌──────────────┐│
            └─│ module 1 (card 1) │   │ unit 1       │┤
              └─┬────────────────┘    └─┬────────────┘
                │ ┌──────────┐          │ ┌──────────┐
                └─│ port 1   │          └─│ port 1   │
                  └──────────┘            └──────────┘
                │ ┌──────────┐          │ ┌──────────┐
                └─│ port 2   │          └─│ port 2   │
                  └──────────┘            └──────────┘
        │ ┌──────────────────┐                        │
        └─│ container 2 (slot 2) │                    │
          └─┬────────────────┘                        │
            │ ┌──────────────────┐    ┌──────────────┐│
            └─│ module 1 (card 1) │   │ unit 2       │┤
              └─┬────────────────┘    └─┬────────────┘
                │ ┌──────────┐          │ ┌──────────┐
                └─│ port 1   │          └─│ port 1   │
                  └──────────┘            └──────────┘
```
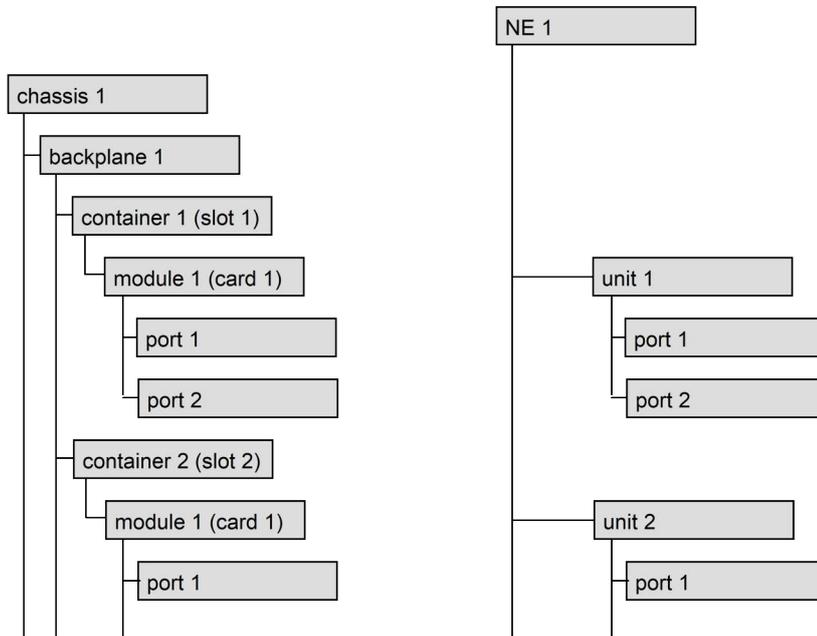
The following configuration will not work due to an addressing clash:

entity physical table

```
                                                    ┌──────────────┐
                                                    │ NE 1         │
                                                    └─┬────────────┘
  ┌──────────────┐                                    │
  │ chassis 1    │                                    │
  └─┬────────────┘                                    │
    │ ┌──────────────┐                                │
    └─│ backplane 1  │                                │
      └─┬────────────┘                                │
        │ ┌──────────────────┐                        │
        └─│ container 1 (slot 1) │                    │
          └─┬────────────────┘                        │
            │ ┌──────────────────┐    ┌──────────────┐│
            └─│ module 1 (card 1) │   │ unit 1       │┤
              └─┬────────────────┘    └─┬────────────┘
                │ ┌──────────┐          │ ┌──────────┐
                └─│ port 1   │          └─│ port 1   │
                  └──────────┘            └──────────┘
                │ ┌──────────┐          │ ┌──────────┐
                └─│ port 2   │          └─│ port 2   │
                  └──────────┘            └──────────┘
                │ ┌──────────────────────┐ ┌──────────────────┐
                └─│ container 3 (d.card 3) │ │ port 1 - clash   │
                  └─┬────────────────────┘ └──────────────────┘
                    │ ┌──────────┐
                    └─│ port 1   │
                      └──────────┘
```
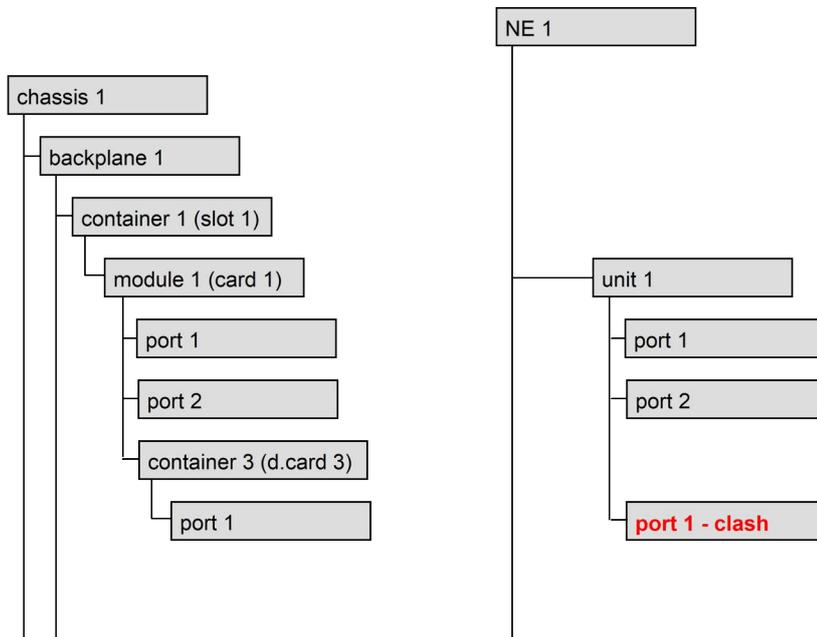
The complete table will be read on NE creation, re-establishment of connection and force polling. No «configuration change» notifications are supported.

i	**Please note:** FOXMAN-UN supports as per standard both v2 (RFC 2737) and v3 (RFC 4133) of the ENTITY MIB, as they do not differ in things relevant to FOXMAN-UN.

The following columns from the entPhysicalTable are used in FOXMAN-UN:

Table 3:   entPhysicalTable : for the units

SNMP entPhysicalTable column	FOXMAN-UN unit variable
entPhysicalModelName	cfgName
parent slot's entPhysicalParentRelPos	slot

The unit variables «layer» and «subunit» are set fixed to zero (0), «neId» is set accordingly.

Table 4:   entPhysicalTable : for the ports

SNMP entPhysicalTable column	FOXMAN-UN port variable
entPhysicalName	label
entPhysicalModelName	portType
entPhysicalModelName of parent unit	unitType

The port variable «isActive» is set fixed to «true», «layerRate» to «unknown», «neId» is set accordingly.

Table 5:   FOXMAN-UN address of the port

SNMP entPhysicalTable column	FOXMAN-UN port address part
parent unit's parent slot's entPhysicalParentRelPos (unit's slot)	slot
entPhysicalParentRelPos	portNumber

The port address parts «subSlot» and «portTTPId» are set fixed to zero (0).

2.6   ALARM MIB (RFC 3877)

The snmpnetworkagentmgrd will read the following tables from the device: alarm model table (.1.3.6.1.2.1.118.1.1.2), alarm active table (.1.3.6.1.2.1.118.1.2.2) and ITU alarm table (.1.3.6.1.2.1.121.1.1.1).The alarm clear table (.1.3.6.1.2.1.118.1.3.2) is not used. In addition, it will need references to the entity physical table to fill out FOXMAN-UN alarm record fields (e.g. location). The agent manager will interpret the following ALARM MIB traps: alarmActiveState (.1.3.6.1.2.1.118.0.2) and alarmClearState (.1.3.6.1.2.1.118.0.3). The complete table is read on NE creation, re-establishment of connection and force polling, above traps are being interpreted in between.

> [i] **Please note:**
> The ARC MIB (RFC 3878) is not supported.

The following columns from the various tables are used in FOXMAN-UN:

Table 6:   Use of ALARM MIB table columns in FOXMAN-UN alarm records

SNMP ALARM MIB table	table column	FOXMAN-UN alarm record field
AlarmActiveTable	alarmResourceId	Address / SBU-Address / TP-Address / Location (mapped from entPhysicalTable analysis)
AlarmActiveTable	alarmActiveDateAndTime	AlarmOnTime
AlarmActiveTable	alarmActiveSpecificPointer <Pointer into AlarmModelTable>	
AlarmModelTable	alarmModelState	Severity (only applied if ITUAlarmTable row is not available)
AlarmModelTable	alarmModelDescription	AlarmText

Table 6:   Use of ALARM MIB table columns in FOXMAN-UN alarm records

SNMP ALARM MIB table	table column	FOXMAN-UN alarm record field
AlarmModelTable	alarmModelSpecificPointer <Pointer into ITUAlarmTable>	
ITUAlarmTable	ituAlarmPerceivedSeverity	Severity (if ITUAlarmTable is not available alarmModel-State will be taken)
ITUAlarmTable	ituAlarmEventType	Type (if ITUAlarmModel is not available it need to be provided by a config file)
ITUAlarmTable	ituAlarmProbableCause	Cause (if ITUAlarmModel is not available it need to be provided by a config file)

Table 7:   Other sources for content in FOXMAN-UN alarms records

FOXMAN-UN alarm record field	Source
AlarmId	From DB (NetworkMgr - Unique per NE)
NEId	From DB (SNMP Agent)
NEType	From DB (SNMP Agent)
LayerRate	Always set to "unknown"
AlarmOffTime	1. Time of AlarmClearState notification 2. Time of alarm resync detecting alarm being off
FailureId	A short string like "LOSS" instead of a longer text - provided by a configuration file
IsCleared	True if 1. Alarm is generated because of AlarmClearState notification 2. Alarm resync detected alarm being off
IsTrafficAffected	Provided by a configuration file

Table 8:   Contents of AlarmActiveState and AlarmClearState notifications

Name	Contents
alarmActiveModelPointer	OID to the corresponding row in the alarmModelTable for this active alarm. This point not only to the alarm model being instantiated, but also to the specific alarm state that is active.
alarmActiveResourceId	OID identifying the resource under alarm.

For the FOXMAN-UN alarm configuration to work, a plain text file specifying the severity, alarm/event type and probable cause texts in the form of

```
...
critical  equipment  Unit Not Available        major      communication
BER > 1E-3
...
```

must be provided. A more complete example can be provided on request.

2.7   AlarmActiveLastChanged

In order to detect missed traps the AlarmActiveLastChanged (.1.3.6.1.2.1.118.1.2.1.0) is polled. A changed value indicates a changed AlarmActiveTable which may contain alarms not yet/no longer known to FOXMAN-UN.

3 Manager Cross-launch for Supported Equipment

3.1 General

The SNMP equipments' management GUIs or CLI interfaces can be directly cross-launched from the FOXMAN-UN machine.

The browser application, or any suitable application that is installed on the machine where the FOXMAN-UN GUI is running, is entered in the file «$NEM_HOME/etc/crosslaunch.properties». There are, however, no «crosslaunch.properties» entries required to launch the devices' Telnet/SSH client windows.

The default user names and default passwords for the management software of the SNMP equipments are defined in the equipment's configuration files located at the directory «/$NEM_HOME/etc/snmp».

At the creation of the NE in the NEM Configurator, it is also possible to configure a password per NE. This password will be used instead of the default password. The user name is the same for all SNMP equipment of the same type.

3.2 Cross-launch Entry in the crosslaunch.properties

Once the SNMP equipment is added to a map, the NE menu in the NEM Network Browser for that equipment provides the entry «Activate WebInterface» as shown in the figure below. The expression «WebInterface» can be replaced by a different expression, depending on what is currently set in the «crosslaunch.properties» file. The argument «%D» is used for naming the application that is started when selecting that context menu entry. For more details, please refer to section .
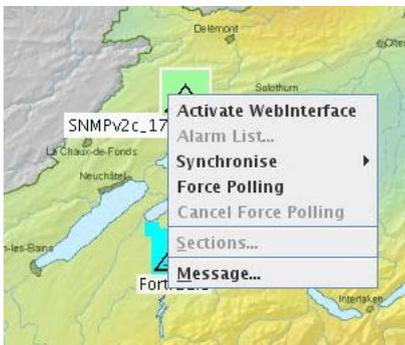

Figure 1:   Activate WebInterface

While the equipment is reachable (i.e. its status is «Manageable»), the context menu command «Activate WebInterface» (or similar) opens a browser window or any other suitable software, as specified in «crosslaunch.properties», and connects to the SNMP equipment as shown in the sample below:
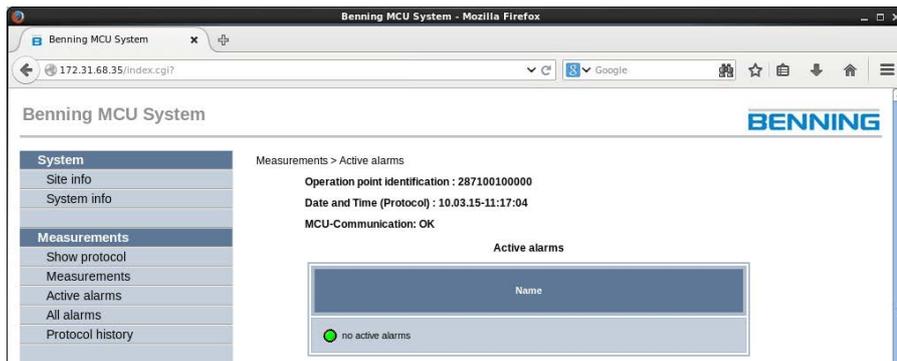
Figure 2:   Sample third party SNMP equipment Web Interface

3.2.1   Creating new Entries in crosslaunch.properties

If you need to create new entries or modify entries in the «crosslaunch.properties» file for SNMP equipment, you build these entries as follows:

```
#! There are no Spaces allowed !
%D = Designation which appears in the GUI
%S = Script or program path which will be launched
%O = Additional argument which will be passed to %S

%A Will be replaced with the IP Address
%N Will be replaced with the NE Name
%L Will be replaced with the NE Location
%I Will be replaced with the NE Identity (NE id)
%K Will be replaced with the FO Key (only for FOs; empty for NEs)
%U Will be replaced with the User Name (read from additional info)
%P Will be replaced with the Password (read from additional info)
%G Will be replaced with the Logged User
%H Will be replaced with the FOXMAN-UN Home (read from env var)
```

Sample entries can be found for all currently known EDS500 devices in the files «/opt/nem/client/etc/crosslaunch.properties» and «/opt/nem/etc/crosslaunch.properties» as follows:

```
500NMD01   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD02   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD11   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD20   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD30   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD40   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD41   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD42   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD43   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
500NMD44   %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
...
500NMD69_R0002_R0003  %D=WebInterface;%S=/usr/bin/firefox;%O=http://%U:%P@%A
```

The same sample entries for all currently known EDS500 devices for the NEM GUI running on Windows can be found in the file «C:\Program Files\FOXMAN-UI_R18\etc\crosslaunch.properties» (or similar, depending on installation path) as follows:

```
500NMD01   %D=WebInterface;%S=c:/Program Files (x86)/Mozilla Firefox/firefox.exe;%O="http://%U:%P@%A"
...
500NMD69_R0002_R0003  %D=WebInterface;%S=c:/Program Files (x86)/Mozilla Firefox/firefox.exe;%O="http://%U:%P@%A"
```

> **i**
>
> **Please note:**
>
> Under Windows, the crosslaunch.properties entry for starting the web browser calls the explorer.exe application, which opens the currently configured default web browser since argument %0 contains an http:// address.
>
> Under Windows, when the path to the application (i.e. the path for the argument %S) contains a space, the space has to be delimited by a «backslash-space», i.e. «\ ».

Example for Edge Browser:

```
500NMD01  %D=WebInterface;%S=C:\Program\ Files\ (x86)\Microsoft\Edge\
Application\msedge.exe;%O=http://%U:%P@%A
```

Example for Chrome Browser:

```
500NMD01  %D=WebInterface;%S=C:\Program\ Files\Google\Chrome\Application\
chrome.exe;%O=http://%U:%P@%A
```

To launch the UI of an EDS500 device, use the context menu of the device and click on "Activate WebInterface":
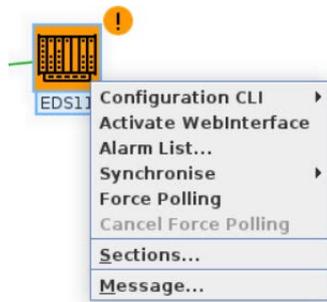

Figure 3:   NE Menu: Activate WebInterface

A sample Web UI of an EDS500 device may look as follows:

Figure 4:   Sample EDS500 Web UI

3.3 Telnet/SSH

FOXMAN-UN can launch the console window that supports a Telnet/SSH to the CLI of the following devices:

- EDS500 series (supported types see section 2.4 "Supported Equipment"),
- Cisco Catalyst 2960 Switch,
- Cisco 3845 Integrated Services Router,
- Cisco 2811 Integrated Services Router,
- Alcatel-Lucent OmniSwitch 6850,
- Proscend 5600.

The NE menu in the NEM Network Browser and NEM Configurator has an additional option «Configuration→Telnet/SSH» as shown in the figure below:
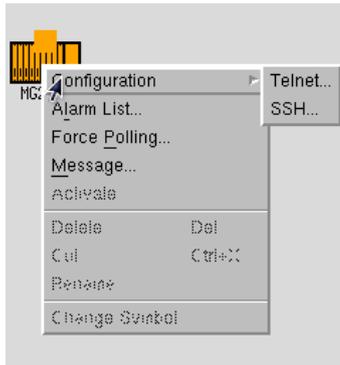

Figure 5:   NE Menu: Telnet/SSH

The windows are managed by the FOXMAN-UN Client and will close when the FOXMAN-UN Client disconnects.

| i |

Please note:
The Proscend 5600 Telnet/SSH Client does not support navigation with keyboard arrows.

→ In some cases, the modem hangs and becomes unmanageable. A manual power cycle is required.

4 References

RFC 1213 (MIB-II)
RFC 3877 (ALARM MIB, ITU ALARM MIB)
RFC 2737 (ENTITY MIBv2)
RFC 4133 (ENTITY MIBv3)
RFC 2863 (IF-MIB)

[1KHW002499]   FOXMAN-UN Release Note

Hitachi Energy Ltd
Bruggerstrasse 72
5400 Baden - Switzerland

Phone: please refer to https://www.hitachienergy.com/contact-us/Customer-Connect-Center
            (Customer Connect Center)
Email: communication.networks@hitachienergy.com

www.hitachienergy.com/communication-networks