

Remote Control SNMP

User Guide



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Contents

Overview	2
General Info on SNMP	2
Traps and Control	3
SNMP Support in the greenMachine	3
LYNX MIBs	3
greenMachine SNMP Traps	4
Example: Receiving an SNMP Trap	5
greenMachine SNMP Control (Get/Set)	6
Product specific MIB Structure	7
Addressing of greenMachine settings.....	7
System Attributes	7
Product Specific Parameters.....	7
Example: Verification of SNMP Get/Set.....	8
Network Security	10
Further Reading.....	11

Overview

This document provides an overview and introduction to the SNMP capabilities of the greenMachine. More general information on SNMP can be found by the links at the end of this document.

General Info on SNMP

SNMP (Simple Network Management Protocol) is a standardized protocol (IETF RFC1157) that has been developed for the supervision and management of IP network equipment. Three major versions of SNMP have been defined over the years. The capabilities of SNMPv1 have been extended by SNMPv2. While all communication over the network is basically open (and can potentially be monitored by 3rd parties), SNMPv3 adds some possibilities for secured login and transmission. SNMPv3 does, however, not provide any significant functional additions. See section “Network Security” below and [1].

In an SNMP infrastructure, a “Master” talks to several “Agents” (Clients) over the IP network. A static interface document describes all the capabilities that an Agent provides to the Master. This interface document is called a MIB (Management Information Base). A MIB is a structured collection of

information in the form of a tree. Strictly speaking, there is only one MIB on the world, where many common types of information are pre-defined. Every manufacturer can register their own node in that tree, and define the structure behind that node on their own behalf. Accordingly, the LYNX part of the global MIB starts at 1.3.6.1.4.1.14755. The MIB is structured as a tree and contains multiple branches and leafs. Each node (branch or leaf) can be identified by a specific OID (Object Identifier). A fully-qualified OID is expressed as a chain of individual numbers (representing the nodes), connected by dots. And since each node does not only have a numerical but also a textual name, each OID can be expressed in any mixture of numerical and/or textual form. So, the following OIDs are absolutely identical:

```
.1.3.6.1.4.1.14755
.iso.org.dod.internet.private.enterprise.lynx-technik
.iso.3.6.1.private.1.lynx-technik
```

More general information about SNMP and MIB structures can be found in [2].

Traps and Control

The functionality of SNMP is divided into two parts:

- (1) The SNMP Agent can send spontaneous messages to the Master, to announce any unexpected change. These spontaneous alarm messages are called „SNMP-Traps“.
- (2) The Agent can offer the ability for the Master to actively ask for the current status of a certain value (read-only), or even to modify such values (read-write). This General Control capability is often referred to as „SNMP Get/Set“.

SNMP Support in the greenMachine

The greenMachine family fully supports SNMPv2c. Any greenMachine can work as an SNMPv2c Agent - all you need is the MiniNova APP activated on that machine. Once enabled, the SNMP Agent supports the regular SNMPv2c command-set.

The SNMP community strings are set to the standard values “public” (for reading) and “private” (for writing). You can change this value in the Settings Subpage of the Configure Page of your greenMachine in the greenGUI.

LYNX MIBs

The current set of LYNX MIB files is available for download from the internet [3], either as a combined ZIP package (all MIB files) or as individual files from the “SNMP” sub-folder. These files are organized as follows:

- LYNX-SMI.mib General definitions. Entry point into LYNX MIB tree

- LYNX-TYPES.mib Various type definitions used through other MIB files
- LYNX-TRAPS.mib Definition of the general TRAP-type, used for sending alarms from individual LYNX CardModules (see below)
- PRODUCT_CODE_swXXX.mib
For every individual LYNX Product (CardModule), one MIB file is provided. The file name follows this pattern: <PRODUCT> is the regular product name, <CODE> is the technical four-digit product code, and <XXX> is the tree-digit firmware version number.
As an example, the MIB-file GMAPP-Callisto-Framesync_14c2_sw760.mib contains the complete SNMP control interface definition of the “callisto Framesync” (code 14c2) for firmware version 760 (see below for details).

greenMachine SNMP Traps

Every greenMachine provides an individual set of Events. Such Events will be set to ACTIVE state by the greenMachine to signalize an unusual state (such as e.g. “Video Proc 1: No Input” or similar). The individual set of Events per machine can be seen in the greenGUI on the “Events” subtab of the “Control” tab.

Whenever an Event of an individual greenMachine changes its state (from passive to active and vice-versa), an appropriate entry is added to the machine’s Logfile.

An optional SNMPv2 Trap can be sent to the network when the event status changes. This can be controlled from the greenMachine’s “Events” Tab in the greenGUI in the relevant SNMP Trap column (item 1 in figure 1).

The SNMP trap will be generated and sent from the greenMachine to the host that has been specified in the Server’s SNMP target host (item 2, figure 1). You can enter a list of multiple IP addresses, separated by a colon ‘:’.

The greenMachine MIB defines exactly one type of SNMP Trap. All the details about the individual Event (what type of signal has actually failed?) are contained inside this generic Trap and need to be collected from there.

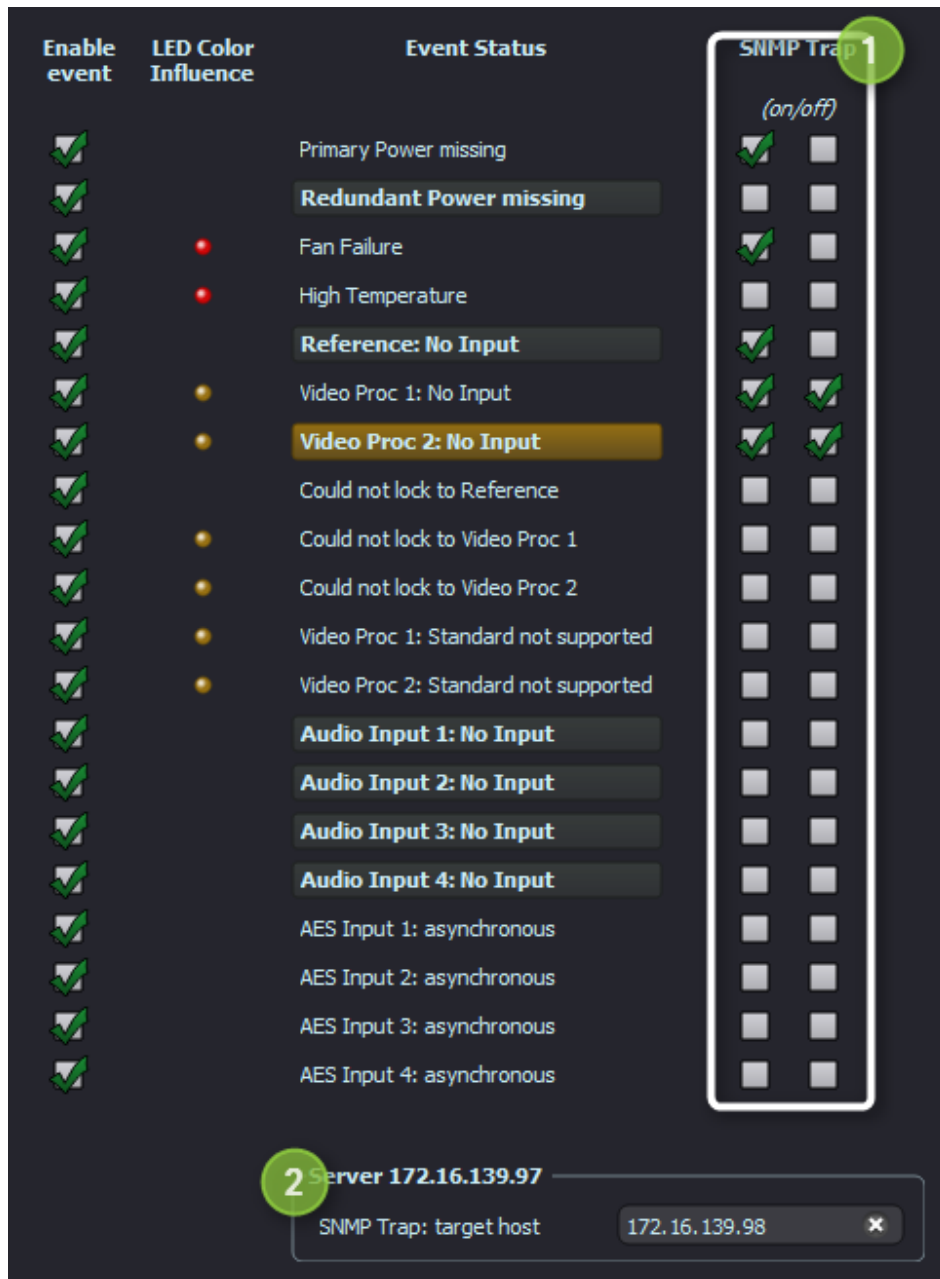


Figure 1: Events Tab of a greenMachine

Example: Receiving an SNMP Trap

The following steps show how a Trap can be received from a real greenMachine. This makes use of the freely available set of tools from the Net-SNMP project [4].

- (1) Activate the MiniNova APP on the greenMachine in question.

- (2) Use the greenGUI to navigate to the greenMachine, go to the Events-tab and enable the SNMP-Traps for any event (for example: "Video Input 1: No Input") as shown in item 1 of figure 1.
- (3) Set the SNMP target host of the greenMachine to the IP-Address of the system that runs the snmptrapd-tool (next step). See item 2 of figure 1.
- (4) On the target-system (as specified in the previous step), run the command-line tool snmptrapd (from the Net-SNMP tools) to receive and display incoming traps. *(Please note that this program opens UDP/IP port 162, which may require special administration privileges)*

```
% snmptrapd -f -Le -M +[path_to_directory_with_all_LYNX_MIB_files] -m all
NET-SNMP version 5.3.0.1
```

- (5) Trigger the Event in question on the greenMachine (here: remove video input 1). This will make the greenMachine generate the Event and the appropriate Trap. The Trap will be sent from the greenMachine over the network to the configured target host. There it will be received by the snmptrapd program. This program will generate the command line output as shown here:

```
2010-12-17 09:23:22 172.16.114.222 [UDP: [172.16.114.222]:57843]:
DISMAN-EVENT-MIB::sysUpTimeInstance      = Timeticks: (5588422) 15:31:24.22
SNMPv2-MIB::snmpTrapOID.0               = OID: LYNX-TRAPS-MIB::deviceEvent
LYNX-TYPES-MIB::dpSerialPort             = INTEGER: 1
LYNX-TYPES-MIB::dpStack                  = INTEGER: 0
LYNX-TYPES-MIB::dpFrame                   = INTEGER: 0
LYNX-TYPES-MIB::dpSlot                    = INTEGER: 1
LYNX-TYPES-MIB::dpIpAddress               = Hex-STRING: AC 10 77 D1
LYNX-TYPES-MIB::devicePositionAsciiString = STRING: "172.16.119.209:1.0.0.1"
LYNX-TYPES-MIB::eventClass                = INTEGER: 2
LYNX-TYPES-MIB::eventLevel                = INTEGER: error(2)
LYNX-TYPES-MIB::eventID                   = INTEGER: 3
LYNX-TYPES-MIB::eventON                   = INTEGER: on(1)
LYNX-TYPES-MIB::eventAsciiMsg             = STRING: "Video Input 1: No Input"
LYNX-TYPES-MIB::eventAsciiExpl            = ""
LYNX-TYPES-MIB::deviceName                 = STRING: "DVA5724 Analog Video DAmP"
LYNX-TYPES-MIB::deviceTypeCode            = INTEGER: 1488
```

NOTE: In this example, the command line program snmptrapd has been configured to deliver all details of the Trap as a text-output. Alternatively, that same tool could be configured to trigger many different types of actions, e.g. send emails or trigger other programs to execute any complex operation.

greenMachine SNMP Control (Get/Set)

The greenMachine SNMP interface allows to monitor (Get) and to control (Set) all available parameters. The exact list of controllable parameters is documented in the MIB files.

Product specific MIB Structure

The greenMachine MIB tree provides a dedicated branch for dedicated constellation types (Framesync or Transporter). Each such constellation type specific branch is then subdivided into one branch per released firmware for the greenMachine. As a consequence, when you update a particular greenMachine from one firmware to another, you will have to adapt your numerical OIDs to reflect this change (i.e. exchange the old numerical firmware version by the new numerical firmware version).

NOTE: The different firmware-specific sub-branches of a given product are very similar to each other (because newer firmware versions might introduce new features, but they will never deprecate older features). But the numerical OIDs are different.

Addressing of greenMachine settings

The settings of a greenMachine which can be accessed by SNMP are divided into three areas: system attributes, general settings and signal processing parameters. Both the general settings and the signal processing parameters are product specific parameters.

System Attributes

The system attributes include a system description, up-time and IP network settings. They are accessible in the standardized MIB branches "iso.org.dod.internet.mgmt.mib-2.system" (.1.3.6.1.2.1.1) and "iso.org.dod.internet.mgmt.mib-2.ip" (.1.3.6.1.2.1.4).

Name/OID ▾	Value	Type	IP:Port
sysDescr	LYNX GreenMachine GUI <HOME>	OctetString	172.16.137.250...
sysObjectID.0	.1.3.6.1.4.1.14755	OID	172.16.137.250...
sysUpTime.0	25 hours 54 minutes 13 seconds (9325300)	TimeTicks	172.16.137.250...
sysContact.0	support@lynx-technik.com	OctetString	172.16.137.250...
sysName.0	LYNX GreenMachine GUI <HOME>	OctetString	172.16.137.250...
sysLocation.0		OctetString	172.16.137.250...
sysServices.0	64	Integer	172.16.137.250...
ipAdEntAddr.172.16.137.250	172.16.137.250	IpAddress	172.16.137.250...
ipAdEntIfIndex.172.16.137.250	1	Integer	172.16.137.250...
ipAdEntNetMask.172.16.137.250	255.255.0.0	IpAddress	172.16.137.250...
ipAdEntBcastAddr.172.16.137.250	172.16.255.255	IpAddress	172.16.137.250...
ipAdEntReasmMaxSize.172.16.137.250	1500	Integer	172.16.137.250...

Figure 2: List of system attributes

Product Specific Parameters

The product specific parameters are addressed by OID .1.3.6.1.4.1.14755.2.*.*.1.1.*.6.16.0.{0,1}, having a product type number at the first wildcard, the firmware version number at the second wildcard and the numerical index of a specific parameter at the third wildcard.

The common prefix .1.3.6.1.4.1.14755.2 corresponds to the OID name "iso.org.dod.internet.private.enterprise.lynx-technik.products", which can be resolved by SNMP monitoring systems after having loaded the appropriate LYNX MIB files. The suffix .6.16.0.0 or .6.16.0.1 after the parameter index denotes an internal address of the device node within the greenMachine. This addressing scheme has been adopted from the APPolo|Control Server of LYNX

Series 5000 where multiple instances of the same device type can co-exist in one system and need to be distinguished in the SNMP OIDs.

The LYNX MIB files specify the parameter OIDs up to the parameter index; the internal node address is appended by the SNMP Agent in the greenMachine while processing GetNext requests.

General Settings

The controller parameters comprise information such as the device name, device temperature, power supply status and panel settings. They are grouped in a parameter table below product type number 49697. The complete list of those parameters is provided in the files "GM-Callisto_*.mib", available for download at [3].

Signal Processing Parameters

The available set of signal processing parameters depends on the constellation deployed to the greenMachine. The MIB files "GMAPP-Callisto-Framesync_*.mib" and "GMAPP-Callisto-Transporter_*.mib" provide a superset of all parameters defined for the respective firmware types. If only certain parts of the complete device functionality are selected in a specific constellation deployed to a greenMachine, only a subset of those parameters will be supported. The product type numbers in the addressing scheme explained above are 5314 and 5315, respectively.

Examples:

- The parameter "displayName" of the controller node holds the customizable name of a greenMachine that is shown in the rolodex items of the greenGUI. The MIB file declares the OID of that parameter as .1.3.6.1.4.1.14755.2.49697.764.1.1.2. The GetNext handler of the SNMP Agent appends the node address and generates the OID .1.3.6.1.4.1.14755.2.49697.764.1.1.2.6.16.0.0.
- The parameter "videoProc1Source" of a greenMachine running as frame synchronizer has OID .1.3.6.1.4.1.14755.2.5314.764.1.1.122. The GetNext handler of the SNMP Agent appends the node address and generates the OID .1.3.6.1.4.1.14755.2.5314.764.1.1.122.6.16.0.1.

Both OIDs with and without the node address can be used equivalently in Get requests, and the SNMP Agent will return the same reply in both cases.

Example: Verification of SNMP Get/Set

The following example will show how to control (Get/Set) the Horizontal Flip parameter on the first output of a greenMachine with the Video Adjust APP deployed. The code name of the parameter is "Out1/HFlip". This code name can be found by right clicking on the parameter in the greenGUI.

The greenMachine at IP address 192.168.1.182 has the MiniNova APP activated.

- (1) Read the current setting of the “Out1/HFlip” parameter, using the command-line tool `snmpget` (from the NetSNMP tools [4])

```
% snmpget -v2c -c public -M ./mibs -m all 192.168.1.182.1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1
.1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1 = INTEGER: 0
```

The reply prints a current value of “0” which means that this Horizontal Flip parameter has the current value “OFF”

- (2) Set the current setting of the “Out1/HFlip” parameter to ON, using the command-line tool `snmpset` (from the NetSNMP tools [4])

```
% snmpset -v2c -c private -M ./mibs -m all 192.168.1.182 .1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1 i
1 .1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1 = INTEGER: 1
```

This command sets the specified parameter of type “integer” (“I”) to the current value of “1”. An immediate get-command (same as above) will verify the result:

```
% snmpget -v2c -c public -M ./mibs -m all 192.168.1.182 .1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1
.1.3.6.1.4.1.14755.2.5314.762.1.1.744.6.16.0.1 = INTEGER: 1
```

The reply prints a current value of “1” which means that this Horizontal Flip parameter has the current value “ON”

If you had a greenGUI connected to this greenMachine while executing the above commands, you could monitor the change of state of this parameter at runtime.

The same model can now be used to Get / Set any parameter of any greenMachine.

Network Security

The greenMachines support SNMPv2, and thus provide only limited security against intentional misuse and intrusion. The additional security level provided by SNMPv3 might be desirable if a LYNX Controller would be operated in an in-secure network environment and thus would have to be protected against attempts of malicious intrusion.

The general LYNX networking concept assumes, however, that this is not the case. Instead, it assumes that the appropriate level of security is already provided by the surrounding network infrastructure (e.g. by firewalls, physical separation or other appropriate means).

Accordingly, the greenMachine provides protection against unintentional mal-operation only, e.g. by authentication through username and password, respectively the SNMP community strings (see "General Info on SNMP").

Further Reading

[1] Overview and differences SNMPv1, SNMPv2, SNMPv3:

<http://tools.ietf.org/html/rfc1157>

http://en.wikipedia.org/wiki/Simple_Network_Management_Protocol

http://www.webnms.com/snmputilities/help/quick_tour/snmp_and_mib/snmpmib_snmpv3.html

<http://www.networkmanagementsoftware.com/snmp-tutorial>

[2] SNMP terminology, components, MIB

http://www.webnms.com/cagent/help/technology_used/c_snmp_overview.html#mib

https://blogs.oracle.com/jmxetc/entry/simple_is_not_easy

<http://publib.boulder.ibm.com/infocenter/aix/v6r1/index.jsp?topic=%2Fcom.ibm.aix.progcom%2Fdoc%2Fprogcom%2Fmib.htm>

[3] LYNX greenMachine MIB files

<http://www.lynx-technik.com/en/support/download-area/greengui/>

[4] The Net-SNMP project is a free collection of software tools that cover all SNMP functionalities

<http://www.net-snmp.org/>

<http://www.net-snmp.org/docs/man/snmptrapd.html>

<http://www.net-snmp.org/docs/man/snmptrapd.conf.html>

<http://www.net-snmp.org/tutorial/tutorial-5/demon/snmpd.html>

Please visit <http://www.green-machine.com>
for more information on the greenMachine™.