Toshiba Business Displays

SNMP Documentation

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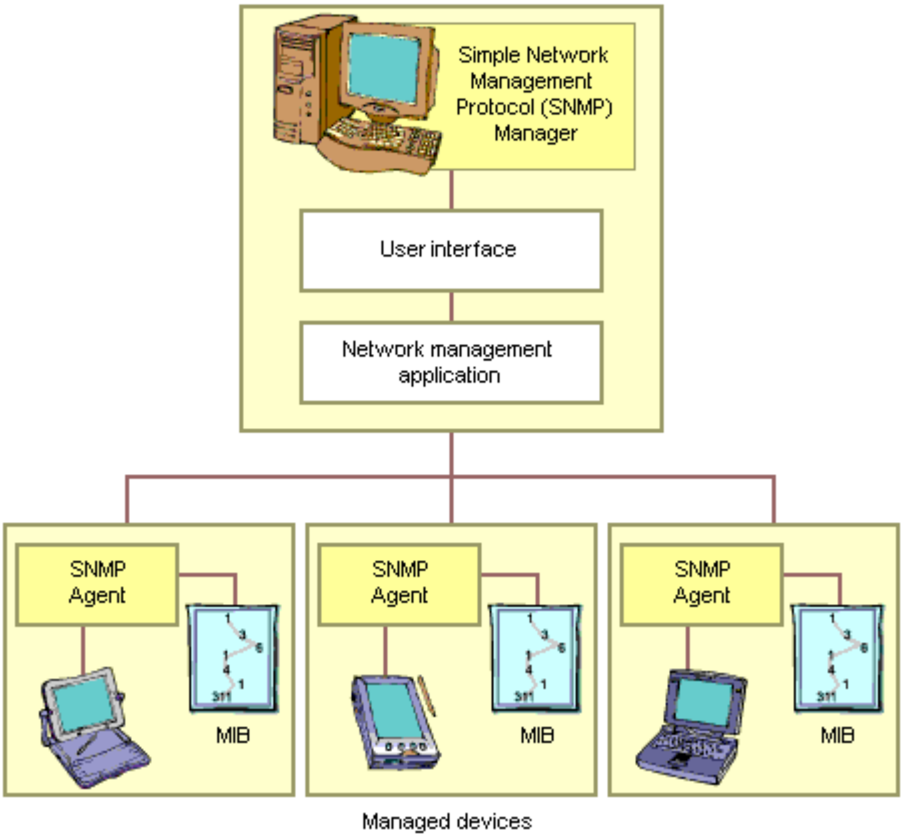
1. Introduction

Simple Network Management Protocol (SNMP) is a widely used protocol for monitoring the health and welfare of electronic equipment in the network. It is a way that devices can share information about their current state, and also a channel through which an administer can monitoring pre-defined values. While the protocol itself is very simple, the structure of programs that implement SNMP can be very complex.

In general, a network being profiled by SNMP will mainly consist of devices containing SNMP agents. An agent is a program that can gather information about a piece of hardware, organize it into predefined entries, and respond to queries using the SNMP protocol.

The component of this model that queries agents for information is called an SNMP manager. An SNMP manager server generally has data about all of the SNMP-enabled devices in its network and can issue requests to gather information and, in some cases, set certain properties.


Simple Network Management Protocol (SNMP) Manager
User interface
Network management application
SNMP Agent
MIB
SNMP Agent
MIB
SNMP Agent
MIB
Managed devices

1.1. SNMP Managers

An SNMP manager is a computer that is configured to poll SNMP agent for information. The management component, when only discussing its core functionality, is actually a lot less complex than the client configuration, because the management component simply requests data.

The manager can be any machine that can send query requests to SNMP agents with the correct credentials. Almost all of the commands defined in the SNMP protocol are designed to be sent by a manager component. These include GetRequest, GetNextRequest, GetBulkRequest, SetRequest, InformRequest, and Response. In addition to these, a manager is also designed to respond to Trap, and Response messages.

1.2. SNMP Agents

SNMP agents do the bulk of the work. They are responsible for gathering information about the local system and storing them in a format that can be queried, updating a database called the "management information base", or MIB.

The MIB is a hierarchical, pre-defined structure that stores information that can be queried or set. This is available to well-formed SNMP requests originating from a host that has authenticated with the correct credentials (an SNMP manager).

SNMP agents respond to most of the commands defined by the protocol. These include GetRequest, GetNextRequest, GetBulkRequest, SetRequest and InformRequest. In addition, an agent is designed to send Trap messages.

1.3. MIB

The most difficult part of the SNMP system is probably the MIB, (Management Information Base). The MIB is a database that follows a standard that the manager and agents adhere to. It is a hierarchical structure that, in many areas, is globally standardized, but also flexible enough to allow vendor-specific additions.

The MIB structure is best understood as a top-down hierarchical tree. Each branch that forks off is labeled with both an identifying number (starting with 1) and an identifying string that are unique for that level of the hierarchy. You can use the strings and numbers interchangeably.

To refer to a specific node of the tree, you must trace the path from the unnamed root of the tree to the node in question. The lineage of its parent IDs (numbers or strings) are strung together, starting with the most general, to form an address. Each junction in the hierarchy is represented by a dot in this notation, so that the address ends up being a series of ID strings or numbers separated by dots. This entire address is known as an object identifier, or OID.

Hardware vendors that embed SNMP agents in their devices sometimes implement custom branches with their own fields and data points. However, there are standard MIB branches that are well defined and can be used by any device. An example

1.3.6.1.2.1

This can also be represented in strings like:

iso.org.dod.internet.mgmt.mib-2

The section 1.3.6.1 or iso.org.dod.internet is the OID that defines internet resources. The 2 or mgmt that follows in our base path is for a management subcategory. The 1 or mib-2 under that defines the MIB-2 specification.

Most of the paths queried from the SNMP Manager begins with 1.3.6.1.2.1.

1.4. SNMP Protocol version

The SNMP protocol has gone through many changes since it was first introduced. The initial spec was formulated with RFC 1065, 1066, and 1067 in 1988. By the simple fact that it has been around so long, this version is still widely supported. However, there are many security issues with the protocol, including authenticating in plain text, so its use is highly discouraged, especially when used on unprotected networks.

Work on version 2 of the protocol was initiated in 1993 and offers some substantial improvements on the earlier standard. Included in this version was a new "party-based" security model meant to address the security issues inherent with the prior revision. However, the new model was not very popular because it was difficult to understand and implement.

Because of this, a few "spin-offs" of version 2 were created, each of which kept the bulk of the version 2 improvements, but swapped out the security model. In SNMPv2c, community-based authentication, the same model used in v1, was reintroduced. This was the most popular version of the v2 protocol. Another implementation, called SNMPv2u, uses user-based security, although this was never very popular. This allowed for per-user authentication settings.

In 1998, the third (and current) version of the SNMP protocol entered as a spec proposal. From a user's perspective, the most relevant change was the adoption of a user-based security system. It allows you to set a user's authentication requirements as one of these models:

- **NoAuthNoPriv**: Users connecting with this level have no authentication in place and no privacy of the messages they send and receive.
- **AuthNoPriv**: Connections using this model must authenticate, but messages are sent without any encryption.
- **AuthPriv**: Authentication is required and messages are encrypted.

In addition to authentication, an access control mechanism was implemented to provide granular control over which branches a user can access. Version 3 also has the ability to leverage the security provided by the transport protocols, such as SSH or TLS.

1.5. SNMP Protocol commands

One of the reasons that SNMP has seen such heavy adoption is the simplicity of the commands available. There are very few operations to implement or remember, but they are flexible enough to address the utility requirements of the protocol.

The following PDUs, or protocol data units, describe the exact messaging types that are allowed by the protocol:

- **Get**: a Get message is sent by a manager to an agent to request the value of a specific OID. This request is answered with a Response message that is sent back to the manager with the data.
- **GetNext**: a GetNext message allows a manager to request the next sequential object in the MIB. This is a way that you can traverse the structure of the MIB without worrying about what OIDs to query.
- **Set**: A Set message is sent by a manager to an agent in order to change the value held by a variable on the agent. This can be used to control configuration information or otherwise modify the state of remote hosts. This is the only write operation defined by the protocol.
- **GetBulk**: sent from manager to agent as if multiple GetNext requests were made. The reply back to the manager will contain as much data as possible (within the constraints set by the request) as the packet allows.
- **Response**: This message, sent by an agent, is used to send any requested information back to the manager. It serves as both a transport for the data requested, as well as an acknowledgement of receipt of the request. If the requested data cannot be returned, the response contains error fields that can be set with further information. A response message must be returned for any of the above requests, as well as Inform messages.
- **Trap**: A trap message is generally sent by an agent to a manager. Traps are asynchronous notifications in that they are unsolicited by the manager receiving them. They are mainly used by agents to inform managers of events that are happening on their managed devices.
- **Inform**: To confirm the receipt of a trap, a manager sends an Inform message back to the agent. If the agent does not receive this message, it may continue to resend the trap message.

With these seven data unit types, SNMP is capable of querying for and sending information about your networked devices.

2. Toshiba SNMP implementation

The SNMP Agent implemented in the Toshiba monitor supports all SNMP versions (v1, v2, v3).
In the agent configuration, the default version is chosen as v3.
Below table shows usage information of different versions.

Version No	Community	Username	Encryption Type	Encryption Password	Authentication Type	Authentication Password	Access Type
v1	public	not used	not used	not used	not used	not used	rw
v2	public	not used	not used	not used	not used	not used	rw
v3	not used	snmp	DES	Usersnmp123	MD5	Usersnmp123	rw

NOTE: SNMP service stops to work when a telnet session is active on the monitor.

2.1. Managed Data

The specific data that can be monitored and managed with SNMP on Toshiba Business Displays is:

- **Firmware version**: the firmware version of the unit;
- **Profile version**: the version of the profile settings of the unit;
- **Mac address**: MAC address of the wired network interface;
- **Temperature**: current unit temperature
- **CPU usage**: current CPU usage % (relevant for Embedded Signage use cases);
- **Memory usage**: currently used memory (relevant for Embedded Signage use cases);
- **USB storage**: number of connected USB storages, total and available space for each;
- **Current source**: currently selected input source (HDMI, DVI, etc)
- **Current StartURL**: the StartURL which is set (relevant for Embedded Signage use cases);
- **Sys Uptime**: current system uptime;
- **Volume**: current volume level;
- **Network type**: type of currently connected network interface (wired / wireless);
- **Active Stanby**: status of Active StandBy option;
- **Power status**: in case Active StandBy, returns whether monitor is in standby or active; if Active StandBy is not active, SNMP agent won’t answer in StandBy state.
- **Signage ID**: currently set Signage ID;
- **Browser memory limit**: currently set browser memory limit (relevant for Embedded Signage use cases);
- **GPU raster**: status of GPU raster (relevant for Embedded Signage use cases);
- **4k Browser**: status of 4k browser option (relevant for Embedded Signage use cases);

2.2. Toshiba MIB

A specific MIB has been implemented under the OID **1.3.6.1.4.1.20008**.
This OID corresponds to

iso(1)
identified-organization(3)
dod(6)
internet(1)
private(4)
enterprise(1)
Toshiba Electronics Europe GmbH(20008)

Under the node 20008 six object identifiers were implemented specifically for Toshiba Business Displays:

- hardware
- network
- storage
- power
- panel
- signage
- browser

Each of the above object defines some specific properties that are exposed by the monitor in order to be queried by the SNMP manager.

Below the whole MIB implemented today:

```
TOSHIBA-ES-MIB DEFINITIONS ::= BEGIN

IMPORTS
      OBJECT-TYPE, Integer32,
      MODULE-IDENTITY, enterprises                FROM SNMPv2-SMI
      RowStatus, StorageType, DisplayString       FROM SNMPv2-TC
      InetAddressType, InetAddress                FROM INET-ADDRESS-MIB
;

toshibaES MODULE-IDENTITY
   LAST-UPDATED "201712050000Z"
   ORGANIZATION "Toshiba Electronics Europe GmbH"
   CONTACT-INFO ""
   DESCRIPTION "Toshiba Electronics Europe GmbH"
   REVISION    "201712050000Z"
   DESCRIPTION
   "First draft"
   ::= { enterprises 20008}

hardware      OBJECT IDENTIFIER ::= {toshibaES 1}
network       OBJECT IDENTIFIER ::= {toshibaES 2}
storage       OBJECT IDENTIFIER ::= {toshibaES 3}
power         OBJECT IDENTIFIER ::= {toshibaES 4}
panel         OBJECT IDENTIFIER ::= {toshibaES 5}
signage       OBJECT IDENTIFIER ::= {toshibaES 6}
browser       OBJECT IDENTIFIER ::= {toshibaES 7}


temperature OBJECT-TYPE
   SYNTAX Integer32
   MAX-ACCESS read-only
   STATUS current
   DESCRIPTION "Monitor temperature."
   ::= {hardware 1}

memoryUsage OBJECT-TYPE
   SYNTAX Integer32
   MAX-ACCESS read-only
   STATUS current
   DESCRIPTION "Memory usage."
   ::= {hardware 2}

source OBJECT-TYPE
   SYNTAX DisplayString
   MAX-ACCESS read-only
   STATUS current
   DESCRIPTION "The current source"
   ::= {signage 1}

volume OBJECT-TYPE
   SYNTAX Integer32
   MAX-ACCESS read-only
   STATUS current
   DESCRIPTION "Current volume value"
   ::= {signage 2}
```

```
fwVersion OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "The firmware version"
    ::= {signage 4}

profile OBJECT-TYPE
    SYNTAX Integer32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "The profile version"
    ::= {signage 5}

startUrl OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "The current starturl"
    ::= {browser 1}

macAddress OBJECT-TYPE
    SYNTAX DisplayString
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "Mac address of the network card"
    ::= {network 2}

usbStorage OBJECT IDENTIFIER ::= {storage 1}

count OBJECT-TYPE
    SYNTAX Integer32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "Number of USB attached"
    ::= {usbStorage 1}

usbORTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF UsbOREntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "The (conceptual) table listing the capabilities of
            the local SNMP application acting as a command
            responder with respect to various MIB modules.
            SNMP entities having dynamically-configurable support
            of MIB modules will have a dynamically-varying number
            of conceptual rows."
    ::= { usbStorage 2 }

usbOREntry OBJECT-TYPE
    SYNTAX     UsbOREntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
            "An entry (conceptual row) in the usbORTable."
    INDEX      { usbORIndex }
    ::= { usbORTable 1 }

UsbOREntry ::= SEQUENCE {
    usbORIndex         INTEGER,
    usbORName          DisplayString,
    usbORPath          DisplayString,
    usbORFileSystem    DisplayString,
    usbORTotalSpace    Integer32,
    usbORAvailableSpace Integer32
}

usbORIndex OBJECT-TYPE
    SYNTAX     INTEGER (1..2147483647)
```

```
   MAX-ACCESS not-accessible
   STATUS     current
   DESCRIPTION
          "The auxiliary variable used for identifying instances
          of the columnar objects in the usbORTable."
   ::= { usbOREntry 1 }

usbORName OBJECT-TYPE
   SYNTAX     DisplayString
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
          "Name of the USB"
   ::= { usbOREntry 2 }

usbORPath OBJECT-TYPE
   SYNTAX     DisplayString
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
          "Path of the USB"
   ::= { usbOREntry 3 }

usbORFileSystem OBJECT-TYPE
   SYNTAX     DisplayString
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
          "File system of the USB"
   ::= { usbOREntry 4 }

usbORTotalSpace OBJECT-TYPE
   SYNTAX     Integer32
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
          "Total space of the USB"
   ::= { usbOREntry 5 }

usbORAvailableSpace OBJECT-TYPE
   SYNTAX     Integer32
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
          "Free space of USB"
   ::= { usbOREntry 6 }

END
```

2.3. SNMP Manager utility commands

To start talking with SNMP Agent installed on the Toshiba ES monitors is enough to open a terminal on Ubuntu Linux and run some simple commands.
In order to run the commands, Ubuntu SNMP Daemon installation is requested. Please refer to this link:
https://www.digitalocean.com/community/tutorials/how-to-install-and-configure-an-snmp-daemon-and-client-on-ubuntu-14-04

Here follow some basic SNMP commands that uses SNMP v3 protocol.

2.3.1. Snmpget

The snmpget command can be used to retrieve data from a remote host given its host name, authentication information and an OID. As a simple example, to get monitor temperature:

```
snmpget -v3  -l authPriv -u snmp -a MD5 -A "Usersnmp123"  -x DES -X "Usersnmp123" <monito_ip> TOSHIBA-ES-MIB::temperature
```

2.3.2. Snmpgetnext

The snmpgetnext command, which is similar in usage to the snmpget command, is used to retrieve the next OID in the MIB tree of data. Instead of returning the data you requested, it returns the next OID in the tree and its value.

2.3.3. Snmptranslate

The snmptranslate tool is a very powerful tool that allows you to browse the MIB tree in various ways from the command line. The MIB should be installed in your local /home/<user>/.snmp/mibs dir to be recognized.

```
snmptranslate -m TOSHIBA-ES-MIB -Tp
```

3. SNMP monitoring software

SNMP is a standard protocol, and many existing monitoring software are compatible with it. Toshiba makes available a customized version of an existing and fully featured network monitoring system: LibreNMS.

LibreNMS is an open source, powerful and feature-rich auto-discovering PHP based network monitoring system which uses the SNMP protocol. It supports a broad range of operating systems including Linux, FreeBSD, as well as network devices including Cisco, Juniper, Brocade, Foundry, HP and many more.
The Toshiba version, called Toshiba DS Monitoring tool, includes some customization related to the custom MIB implemented in the Toshiba Digital Signage units.
The standard release of LibreNMS, available on the official website, doesn’t fully support the snmp features included in Toshiba DS units, therefore its use is discouraged.

Here, as a reference, a complete description of how to install Toshiba DS Monitoring Tool on Ubuntu 16.04. At this moment, only Linux platform is supported for installation.

3.1. Pre-requisites

Toshiba DS Monitoring Tool must be installed on an Ubuntu 16.04 Server machine (Ubuntu 16.04 Desktop is suitable as well).
Then, on this machine, you need to install several packages through this command

```
sudo apt install apache2 composer fping git graphviz imagemagick libapache2-mod-php7.0 mariadb-client mariadb-server mtr-tiny nmap php7.0-cli php7.0-curl php7.0-gd php7.0-json php7.0-mbstring php7.0-mcrypt php7.0-mysql php7.0-snmp php7.0-xml php7.0-zip python-memcache python-mysqldb rrdtool snmp snmpd whois vim
```

Once completed, please set the correct timezone on your machine using this command:

```
sudo timedatectl set-timezone <timezone>
```

Example:

```
sudo timedatectl set-timezone Europe/Rome
```

The timezone must be the same you will configure in php.ini in step 4.

3.2. Installation steps

Please follow these steps to install the Toshiba DS Monitoring Tool software.

3.2.1. Step 1 – Add user and group

```
sudo useradd librenms -d /opt/librenms -M -r

sudo usermod -a -G librenms www-data
```

3.2.2. Step 2 – Install the application

```
cd /opt

sudo git clone https://github.com/tsb-support/Toshiba_DS_Monitoring librenms

cd librenms

sudo composer install
```

3.2.3. Step 3 – Configure MySQL

```
sudo systemctl restart mysql

sudo mysql -uroot -p
```

NOTE: Please change the 'password' below to something secure.

```
CREATE DATABASE librenms CHARACTER SET utf8 COLLATE utf8_unicode_ci;

CREATE USER 'librenms'@'localhost' IDENTIFIED BY 'password';
GRANT ALL PRIVILEGES ON librenms.* TO 'librenms'@'localhost';
FLUSH PRIVILEGES;
exit
```

```
sudo vi /etc/mysql/mariadb.conf.d/50-server.cnf
```

NOTE: at the moment LibreNMS (and Toshiba DS Monitoring Tool) is not compatible with MySQL strict mode. Therefore, for now, please disable this after mysql is installed.

Within the `[mysqld]` section please add:

```
innodb_file_per_table=1
sql-mode=""
lower_case_table_names=0
```

```
sudo systemctl restart mysql
```

3.2.4. Step 4 – WEB SERVER: configure PHP

Ensure date.timezone is set in php.ini to your preferred time zone. See http://php.net/manual/en/timezones.php for a list of supported timezones.

Valid examples are:

"America/New_York", "Australia/Brisbane", "Etc/UTC"

php.ini is located in one of the following paths

```
vi /etc/php/7.0/apache2/php.ini
```

and / or

```
vi /etc/php/7.0/cli/php.ini
```

Execute these commands to enable/disable the required Apache modules

```
a2enmod php7.0
a2dismod mpm_event
a2enmod mpm_prefork
phpenmod mcrypt
```

3.2.5. Step 4 – WEB SERVER: configure Apache

```
sudo vi /etc/apache2/sites-available/librenms.conf
```

Add the following config, edit `ServerName` as required:

```
<VirtualHost *:80>
  DocumentRoot /opt/librenms/html/
  ServerName  librenms.example.com

  AllowEncodedSlashes NoDecode
  <Directory "/opt/librenms/html/">
    Require all granted
    AllowOverride All
    Options FollowSymLinks MultiViews
  </Directory>
</VirtualHost>
```

NOTE: If this is the only site you are hosting on this server (it should be :)) then you will need to disable the default site.

```
sudo a2dissite 000-default

sudo a2ensite librenms.conf
sudo a2enmod rewrite
sudo systemctl restart apache2
```

3.2.6. Step 5 – Cron job

```
sudo cp /opt/librenms/librenms.nonroot.cron /etc/cron.d/librenms
```

3.2.7. Step 6 – Logs

LibreNMS keeps logs in `/opt/librenms/logs`. Over time these can become large and be rotated out. To rotate out the old logs you can use the provided logrotate config file:

```
sudo cp /opt/librenms/misc/librenms.logrotate /etc/logrotate.d/librenms
```

3.2.8. Step 7 – Permissions

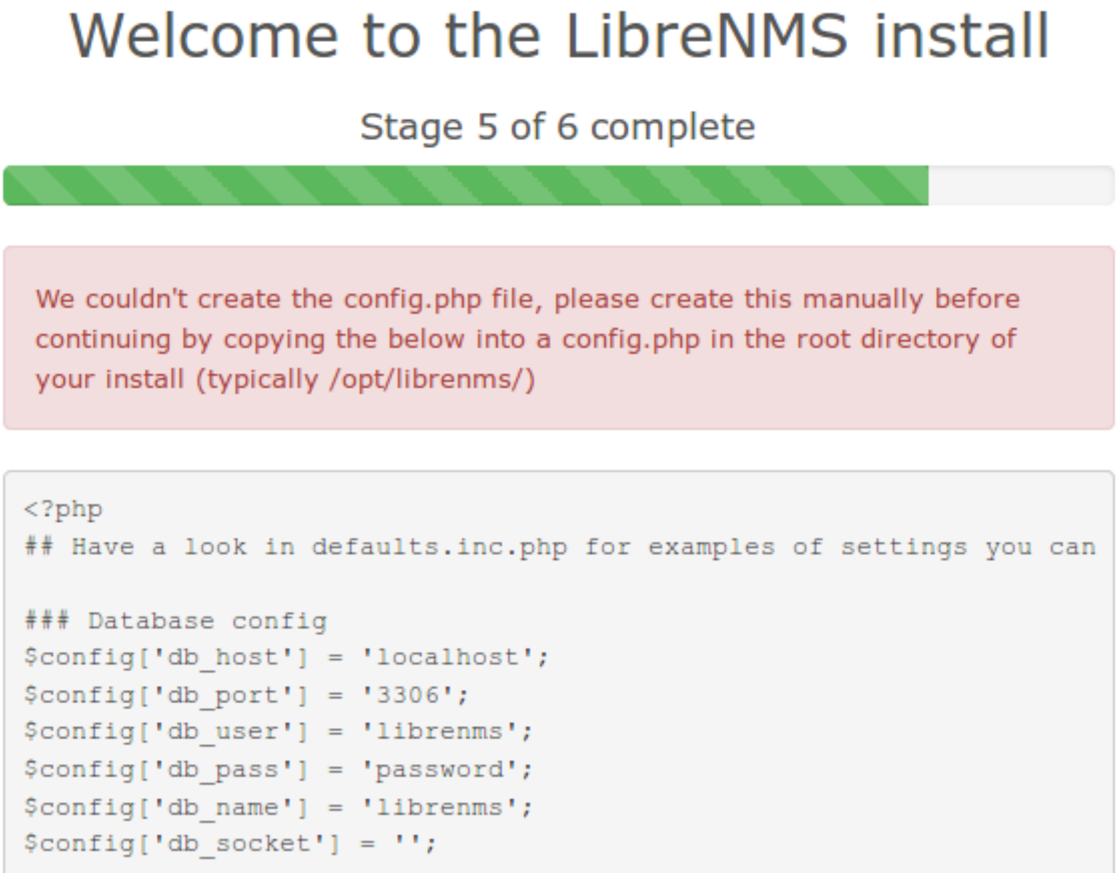
```
sudo chown -R librenms:librenms /opt/librenms

sudo setfacl -d -m g::rwx /opt/librenms/rrd /opt/librenms/logs
/opt/librenms/bootstrap/cache/ /opt/librenms/storage/

sudo setfacl -R -m g::rwx /opt/librenms/rrd /opt/librenms/logs
/opt/librenms/bootstrap/cache/ /opt/librenms/storage/
```

3.2.9. Step 8 – Web installer

Now head to the web installer and follow the on-screen instructions.

```
http://<your_server_ip>/install.php
```

The web installer might prompt you to create a config.php file in your librenms install location manually, copying the content displayed on-screen to the file.



Welcome to the LibreNMS install

Stage 5 of 6 complete

We couldn't create the config.php file, please create this manually before continuing by copying the below into a config.php in the root directory of your install (typically /opt/librenms/)

```
<?php
## Have a look in defaults.inc.php for examples of settings you can

### Database config
$config['db_host'] = 'localhost';
$config['db_port'] = '3306';
$config['db_user'] = 'librenms';
$config['db_pass'] = 'password';
$config['db_name'] = 'librenms';
$config['db_socket'] = '';
```

If you jump in this case, please remember to set the permissions on config.php after you copied the on-screen contents to the file. Run:

```
sudo chown librenms:librenms config.php
```

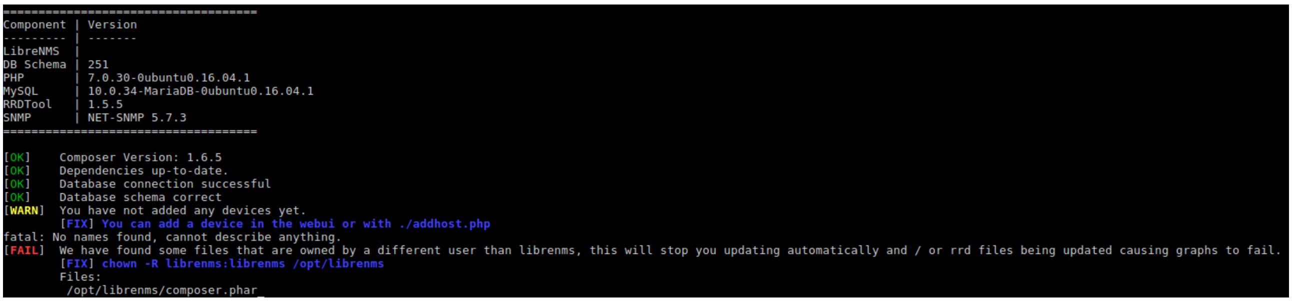
3.2.10. Step 9 – Troubleshooting

If you ever have issues with your installation, run validate.php as root in the librenms directory:

```
cd /opt/librenms
```

```
sudo ./validate.php
```

In case you get this error



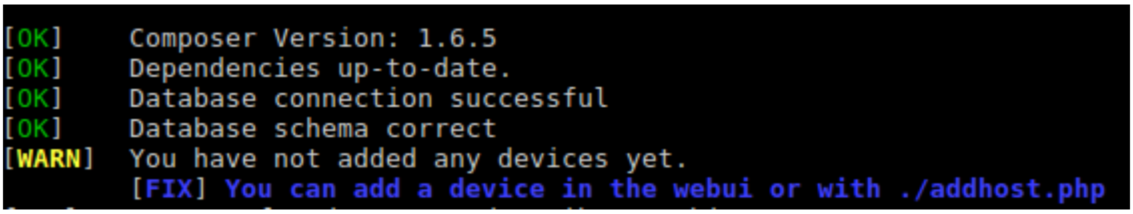
```
====================================
Component | Version
--------- | -------
LibreNMS  |
DB Schema | 251
PHP       | 7.0.30-0ubuntu0.16.04.1
MySQL     | 10.0.34-MariaDB-0ubuntu0.16.04.1
RRDTool   | 1.5.5
SNMP      | NET-SNMP 5.7.3
====================================

[OK]    Composer Version: 1.6.5
[OK]    Dependencies up-to-date.
[OK]    Database connection successful
[OK]    Database schema correct
[WARN]  You have not added any devices yet.
        [FIX] You can add a device in the webui or with ./addhost.php
fatal: No names found, cannot describe anything.
[FAIL]  We have found some files that are owned by a different user than librenms, this will stop you updating automatically and / or rrd files being updated causing graphs to fail.
        [FIX] chown -R librenms:librenms /opt/librenms
        Files:
         /opt/librenms/composer.phar_
```

please execute again

```
sudo chown -R librenms:librenms /opt/librenms
```

and run again the validation.

The successful output should be the following



```
[OK]    Composer Version: 1.6.5
[OK]    Dependencies up-to-date.
[OK]    Database connection successful
[OK]    Database schema correct
[WARN]  You have not added any devices yet.
        [FIX] You can add a device in the webui or with ./addhost.php
```

The web UI is then reachable from

```
http://<your_server_ip_or_hostname>/
```

or

```
http://<ServerName>
```

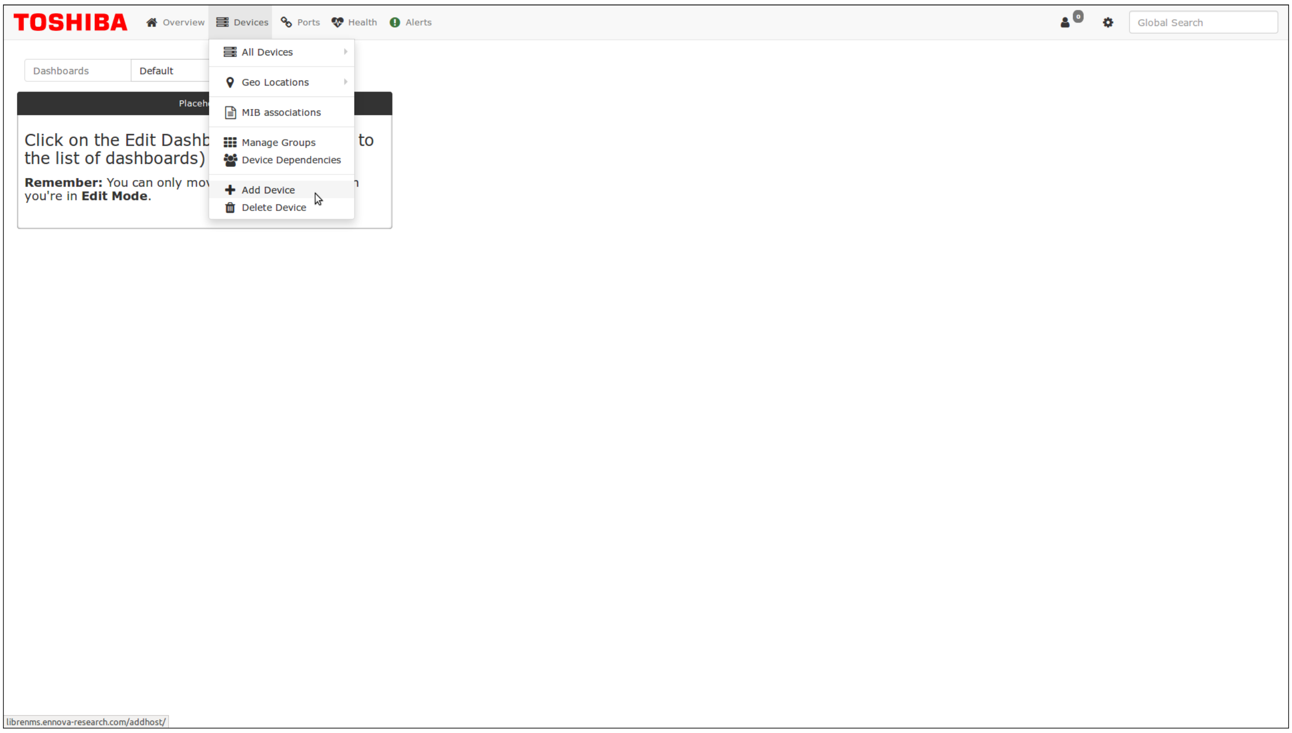
like the `ServerName` you configured in the Apache virtual host in step 4.

That's it! You now should be able to log in to *http://<your_server_ip_or_hostname>/*. Please note that we have not covered HTTPS setup in this example, so your Toshiba DS Monitoring Tool install is not secure by default. Please do not expose it to the public Internet unless you have configured HTTPS and taken appropriate web server hardening steps.

You can now login in Toshiba DS Monitoring Tool with the credential you have chosen and add the first device.

3.3. Device configuration

To add a new device, click on menu Devices -> Add Device



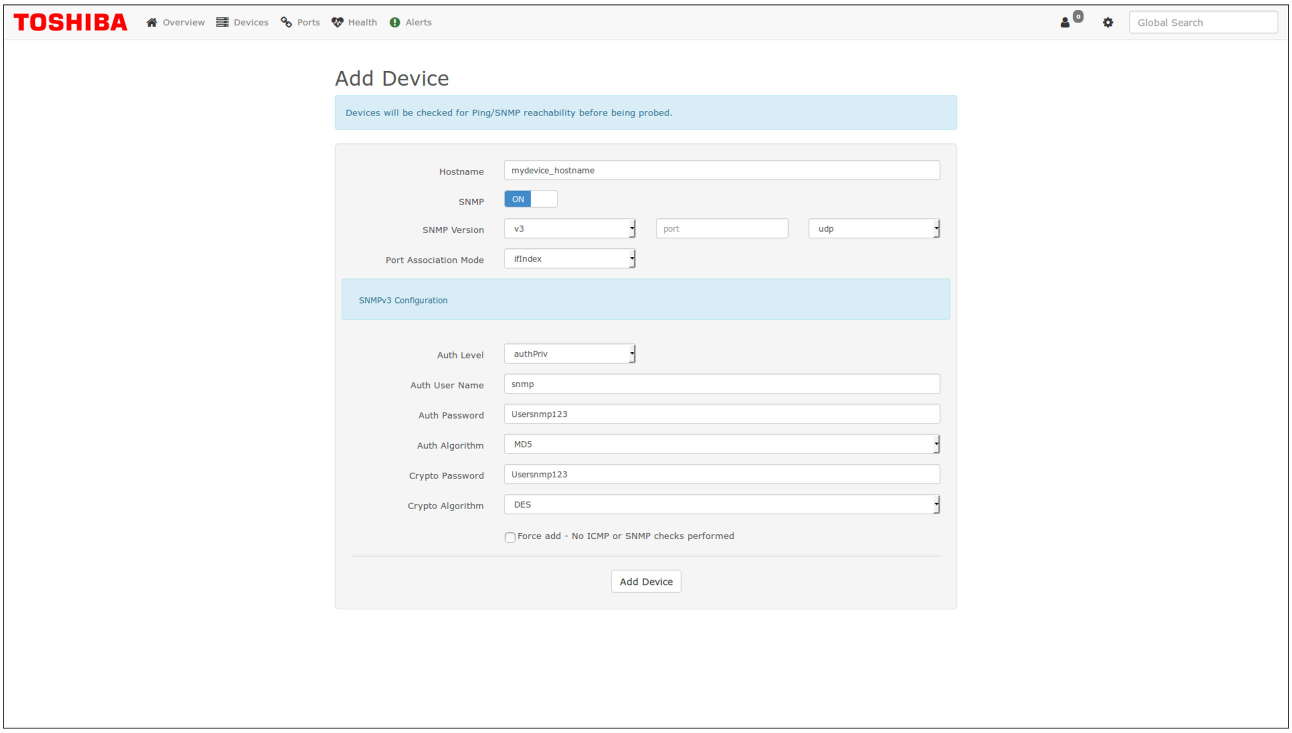
Click on the Edit Dashb to the list of dashboards)

Remember: You can only mov n you're in **Edit Mode**.

Then insert device information:

- Hostname or IP Address
- SNMP Version: v3
- Leave port blank and protocol UDP
- Port Association mode: ifIndex
- SNMP information:
  - Auth Level: authPriv
  - Auth User Name: snmp
  - Auth Password: Usersnmp123
  - Auth algorithm: MD5
  - Crypto Password: Usersnmp123
  - Crypto Algorithm: DES

Please don’t check the option “Force add”, the device specific info will be verified automatically by the tool.



Add Device

Devices will be checked for Ping/SNMP reachability before being probed.

Hostname: mydevice_hostname

SNMP: ON

SNMP Version: v3 | port | udp

Port Association Mode: ifIndex

SNMPv3 Configuration

Auth Level: authPriv

Auth User Name: snmp

Auth Password: Usersnmp123

Auth Algorithm: MD5

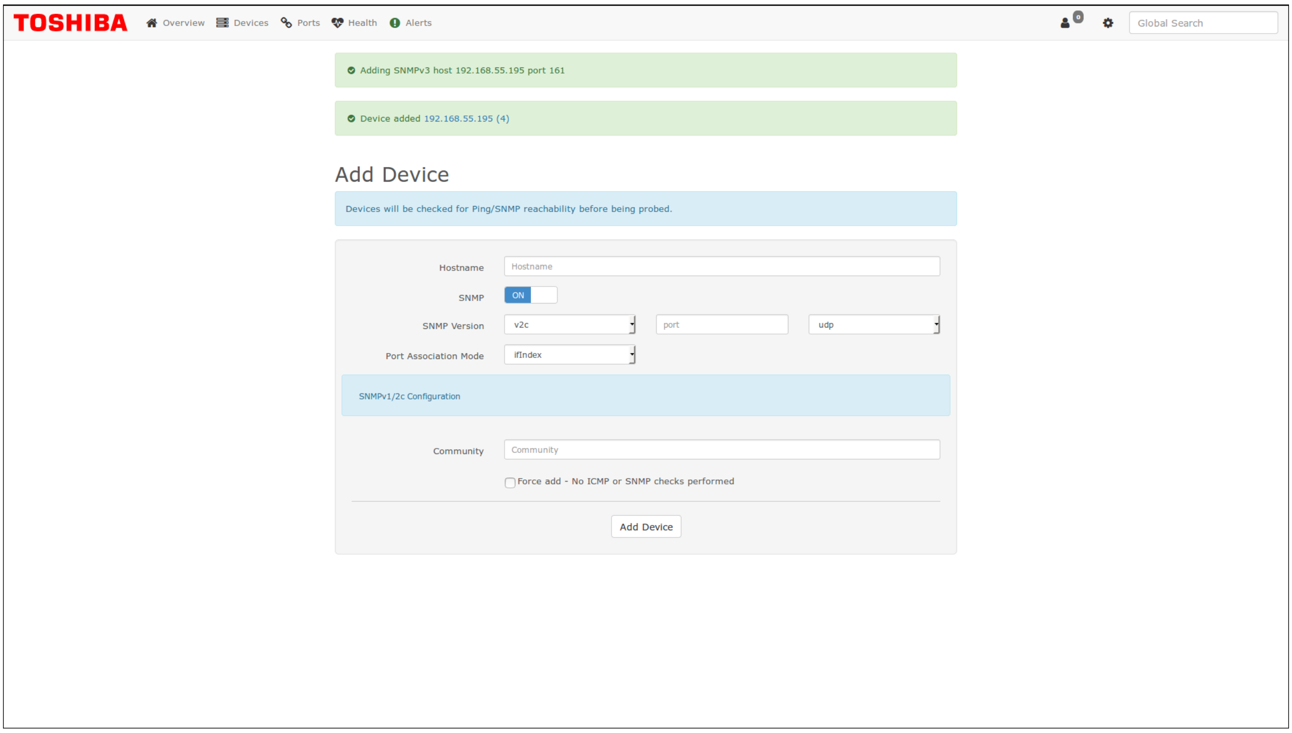
Crypto Password: Usersnmp123

Crypto Algorithm: DES

□ Force add - No ICMP or SNMP checks performed

Add Device

Click Add Device and wait for confirmation



Adding SNMPv3 host 192.168.55.195 port 161

Device added 192.168.55.195 (4)

Add Device

Devices will be checked for Ping/SNMP reachability before being probed.

Hostname: Hostname

SNMP: ON

SNMP Version: v2c | port | udp

Port Association Mode: ifIndex

SNMPv1/2c Configuration

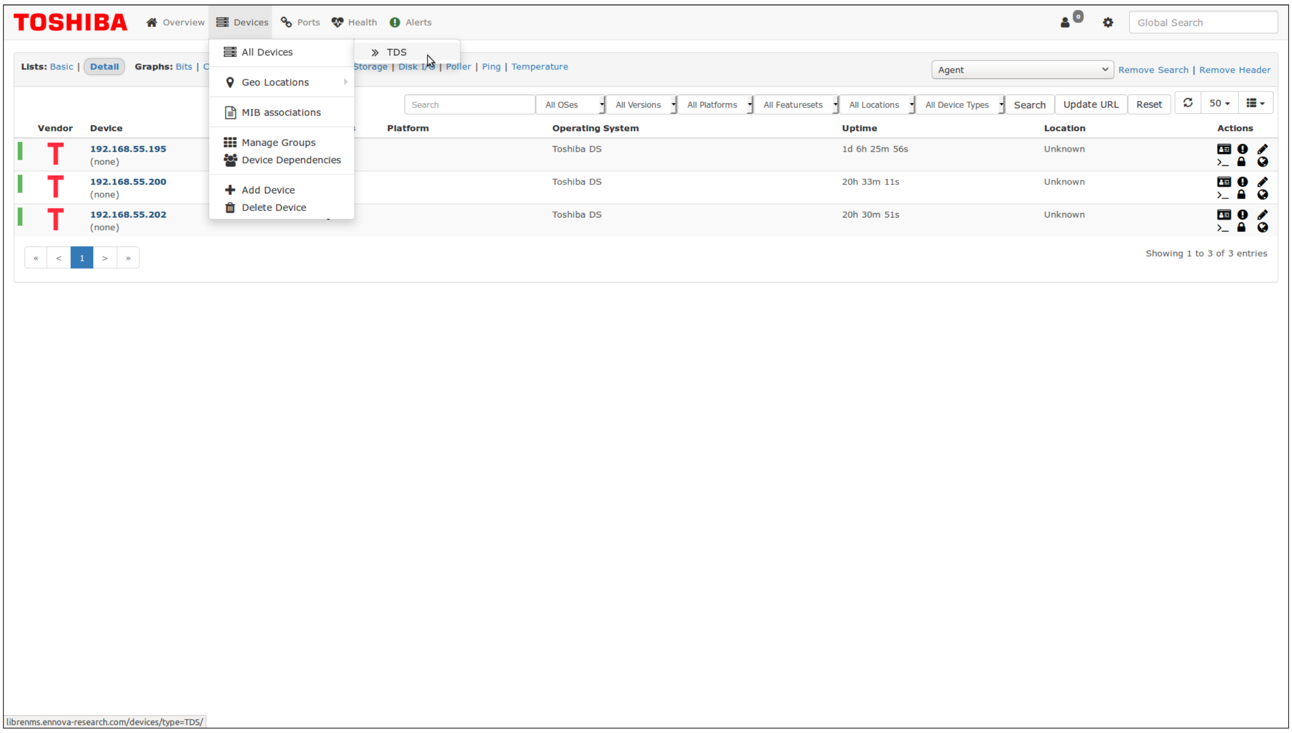
Community: Community

□ Force add - No ICMP or SNMP checks performed

Add Device

The device is now in the system as a Generic device.

Please wait some minutes so the tool can discover the device features and recognize the device OS and the parameters to poll. The group of devices with the same OS will be listed in the menu Devices -> All devices -> TDS.

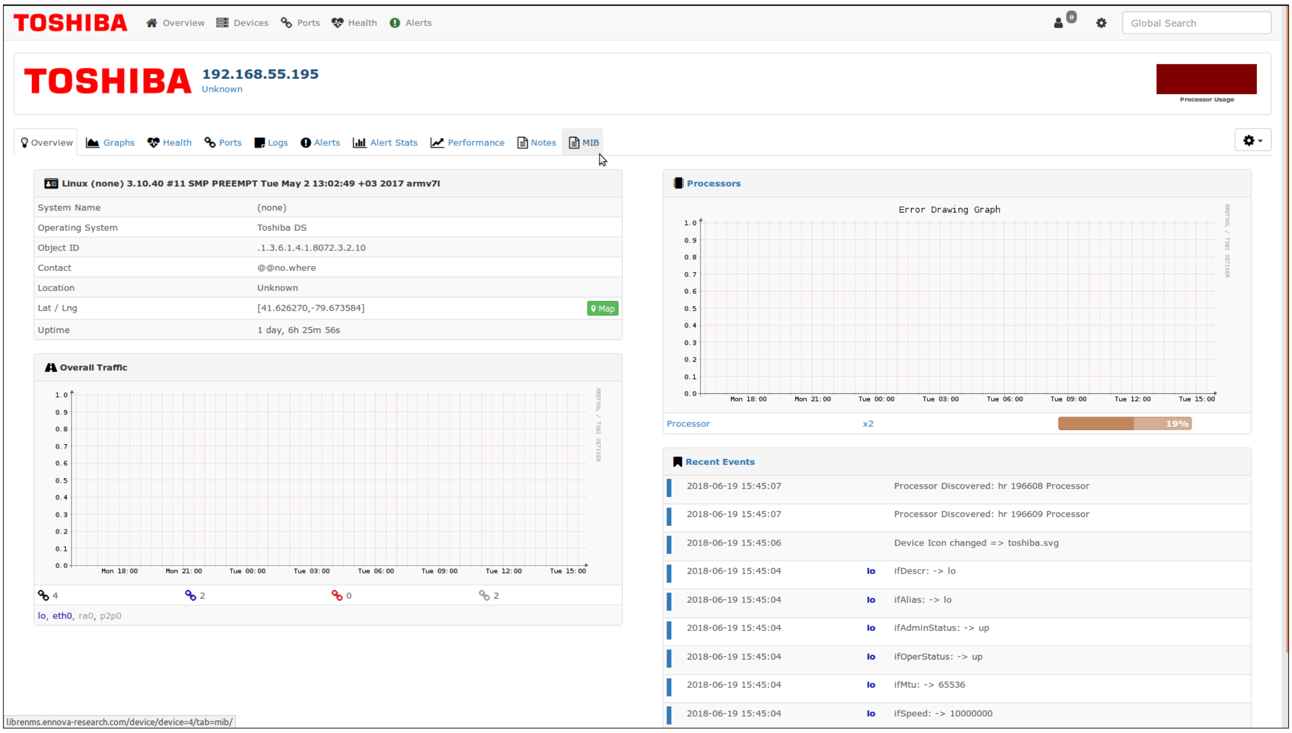


Vendor	Device	Platform	Operating System	Uptime	Location	Actions
T	192.168.55.195 (none)		Toshiba DS	1d 6h 25m 56s	Unknown	
T	192.168.55.200 (none)		Toshiba DS	20h 33m 11s	Unknown	
T	192.168.55.202 (none)		Toshiba DS	20h 30m 51s	Unknown	

Showing 1 to 3 of 3 entries

Then wait some minutes (usually 5 more or less) so the tools can start to poll the device parameters and generate information in the MIB page and in the Graphs page.

The MIB page is accessible clicking on a device and then clicking the "MIB" tab



TOSHIBA 192.168.55.195
Unknown

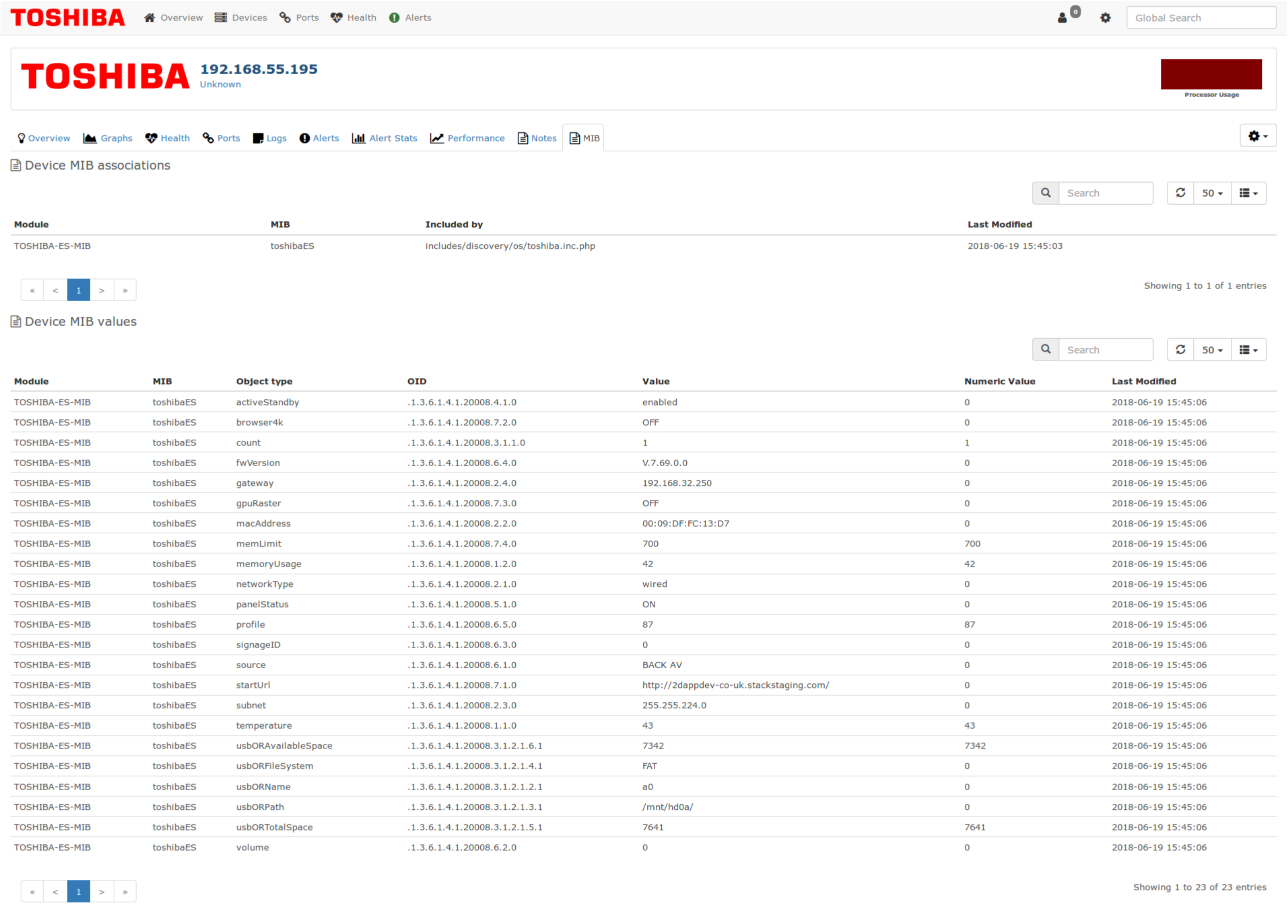
Linux (none) 3.10.40 #11 SMP PREEMPT Tue May 2 13:02:49 +03 2017 armv7l

System Name	(none)
Operating System	Toshiba DS
Object ID	.1.3.6.1.4.1.8072.3.2.10
Contact	@@no.where
Location	Unknown
Lat / Lng	[41.626270,-79.673584]
Uptime	1 day, 6h 25m 56s

Recent Events

2018-06-19 15:45:07		Processor Discovered: hr 196608 Processor
2018-06-19 15:45:07		Processor Discovered: hr 196609 Processor
2018-06-19 15:45:06		Device Icon changed => toshiba.svg
2018-06-19 15:45:04	lo	ifDescr: -> lo
2018-06-19 15:45:04	lo	ifAlias: -> lo
2018-06-19 15:45:04	lo	ifAdminStatus: -> up
2018-06-19 15:45:04	lo	ifOperStatus: -> up
2018-06-19 15:45:04	lo	ifMtu: -> 65536
2018-06-19 15:45:04	lo	ifSpeed: -> 10000000

The MIB page should look like this



Device MIB associations

Module	MIB	Included by	Last Modified
TOSHIBA-ES-MIB	toshibaES	includes/discovery/os/toshiba.inc.php	2018-06-19 15:45:03

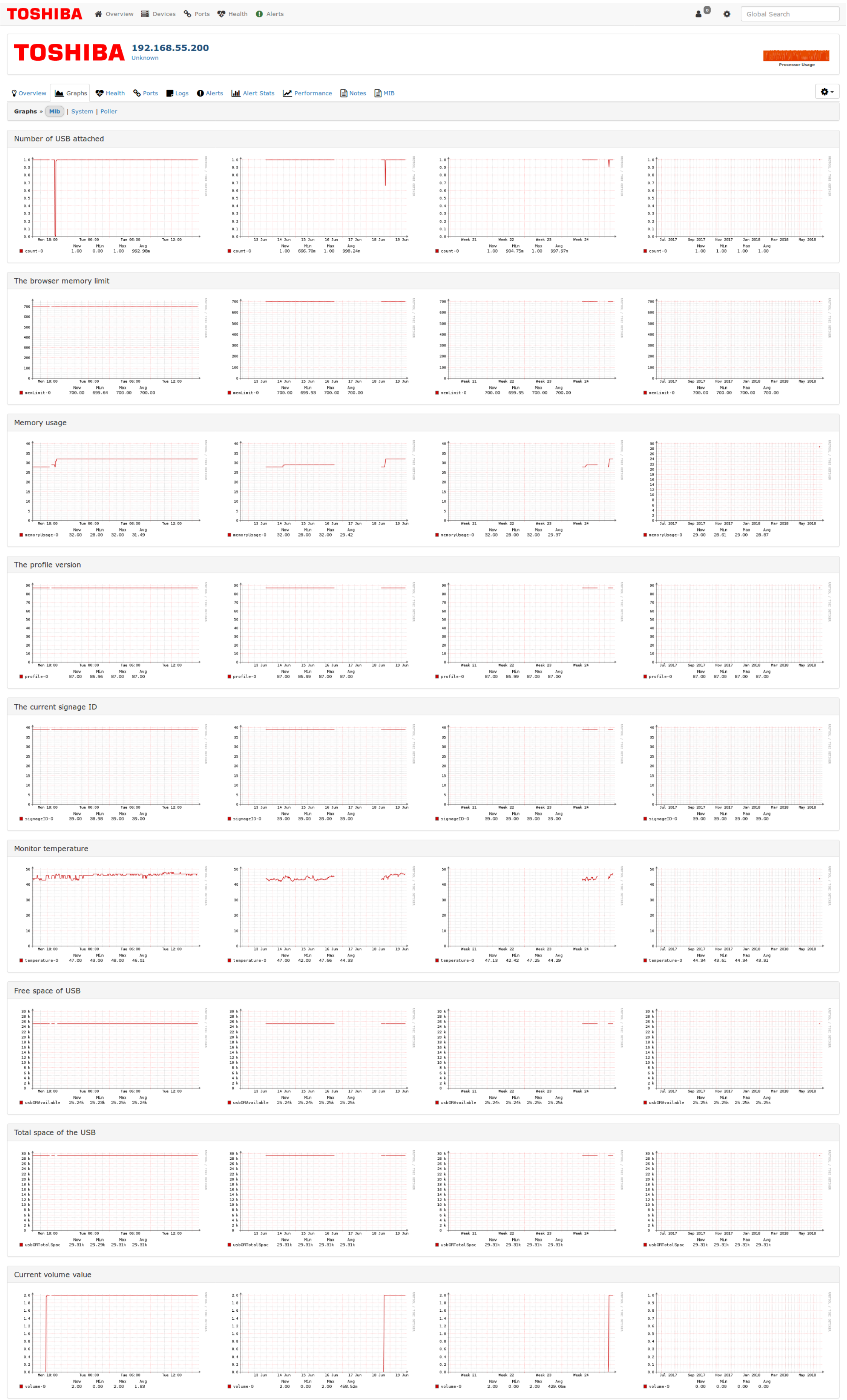
Showing 1 to 1 of 1 entries

Device MIB values

Module	MIB	Object type	OID	Value	Numeric Value	Last Modified
TOSHIBA-ES-MIB	toshibaES	activeStandby	.1.3.6.1.4.1.20008.4.1.0	enabled	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	browser4k	.1.3.6.1.4.1.20008.7.2.0	OFF	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	count	.1.3.6.1.4.1.20008.3.1.1.0	1	1	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	fwVersion	.1.3.6.1.4.1.20008.6.4.0	V.7.69.0.0	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	gateway	.1.3.6.1.4.1.20008.2.4.0	192.168.32.250	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	gpuRaster	.1.3.6.1.4.1.20008.7.3.0	OFF	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	macAddress	.1.3.6.1.4.1.20008.2.2.0	00:09:DF:FC:13:D7	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	memLimit	.1.3.6.1.4.1.20008.7.4.0	700	700	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	memoryUsage	.1.3.6.1.4.1.20008.1.2.0	42	42	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	networkType	.1.3.6.1.4.1.20008.2.1.0	wired	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	panelStatus	.1.3.6.1.4.1.20008.5.1.0	ON	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	profile	.1.3.6.1.4.1.20008.6.5.0	87	87	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	signageID	.1.3.6.1.4.1.20008.6.3.0	0	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	source	.1.3.6.1.4.1.20008.6.1.0	BACK AV	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	startUrl	.1.3.6.1.4.1.20008.7.1.0	http://2dappdev-co-uk.stackstaging.com/	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	subnet	.1.3.6.1.4.1.20008.2.3.0	255.255.224.0	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	temperature	.1.3.6.1.4.1.20008.1.1.0	43	43	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	usbORAvailableSpace	.1.3.6.1.4.1.20008.3.1.2.1.6.1	7342	7342	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	usbORFileSystem	.1.3.6.1.4.1.20008.3.1.2.1.4.1	FAT	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	usbORName	.1.3.6.1.4.1.20008.3.1.2.1.2.1	a0	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	usbORPath	.1.3.6.1.4.1.20008.3.1.2.1.3.1	/mnt/hd0a/	0	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	usbORTotalSpace	.1.3.6.1.4.1.20008.3.1.2.1.5.1	7641	7641	2018-06-19 15:45:06
TOSHIBA-ES-MIB	toshibaES	volume	.1.3.6.1.4.1.20008.6.2.0	0	0	2018-06-19 15:45:06

Showing 1 to 23 of 23 entries

The Graph page is accessible clicking on a device and visiting the “Graphs” tab.
It should look like this



TOSHIBA 192.168.55.200
Unknown

Graphs » Mib | System | Poller

Number of USB attached

```
              Now     Min      Max     Avg
■ count-0     1.00    0.00     1.00    992.98m

              Now     Min      Max     Avg
■ count-0     1.00    666.70m  1.00    998.24m

              Now     Min      Max     Avg
■ count-0     1.00    904.75m  1.00    997.97m

              Now     Min      Max     Avg
■ count-0     1.00    1.00     1.00    1.00
```

The browser memory limit

```
              Now     Min      Max     Avg
■ memLimit-0  700.00  699.64   700.00  700.00

              Now     Min      Max     Avg
■ memLimit-0  700.00  699.93   700.00  700.00

              Now     Min      Max     Avg
■ memLimit-0  700.00  699.95   700.00  700.00

              Now     Min      Max     Avg
■ memLimit-0  700.00  700.00   700.00  700.00
```

Memory usage

```
                 Now     Min     Max     Avg
■ memoryUsage-0  32.00   28.00   32.00   31.49

                 Now     Min     Max     Avg
■ memoryUsage-0  32.00   28.00   32.00   29.42

                 Now     Min     Max     Avg
■ memoryUsage-0  32.00   28.00   32.00   29.37

                 Now     Min     Max     Avg
■ memoryUsage-0  29.00   28.61   29.00   28.87
```

The profile version

```
              Now     Min     Max     Avg
■ profile-0   87.00   86.96   87.00   87.00

              Now     Min     Max     Avg
■ profile-0   87.00   86.99   87.00   87.00

              Now     Min     Max     Avg
■ profile-0   87.00   86.99   87.00   87.00

              Now     Min     Max     Avg
■ profile-0   87.00   87.00   87.00   87.00
```

The current signage ID

```
               Now     Min     Max     Avg
■ signageID-0  39.00   38.98   39.00   39.00

               Now     Min     Max     Avg
■ signageID-0  39.00   39.00   39.00   39.00

               Now     Min     Max     Avg
■ signageID-0  39.00   39.00   39.00   39.00

               Now     Min     Max     Avg
■ signageID-0  39.00   39.00   39.00   39.00
```

Monitor temperature

```
                 Now     Min     Max     Avg
■ temperature-0  47.00   43.00   48.00   46.01

                 Now     Min     Max     Avg
■ temperature-0  47.00   42.00   47.66   44.33

                 Now     Min     Max     Avg
■ temperature-0  47.13   42.42   47.25   44.29

                 Now     Min     Max     Avg
■ temperature-0  44.34   43.61   44.34   43.91
```

Free space of USB

```
                  Now     Min     Max     Avg
■ usbORAvailable  25.24k  25.23k  25.25k  25.24k

                  Now     Min     Max     Avg
■ usbORAvailable  25.24k  25.24k  25.25k  25.25k

                  Now     Min     Max     Avg
■ usbORAvailable  25.24k  25.24k  25.25k  25.25k

                  Now     Min     Max     Avg
■ usbORAvailable  25.25k  25.25k  25.25k  25.25k
```

Total space of the USB

```
                  Now     Min     Max     Avg
■ usbORTotalSpac  29.31k  29.29k  29.31k  29.31k

                  Now     Min     Max     Avg
■ usbORTotalSpac  29.31k  29.31k  29.31k  29.31k

                  Now     Min     Max     Avg
■ usbORTotalSpac  29.31k  29.31k  29.31k  29.31k

                  Now     Min     Max     Avg
■ usbORTotalSpac  29.31k  29.31k  29.31k  29.31k
```

Current volume value

```
              Now     Min     Max     Avg
■ volume-0    2.00    0.00    2.00    1.83

              Now     Min     Max     Avg
■ volume-0    2.00    0.00    2.00    458.52m

              Now     Min     Max     Avg
■ volume-0    2.00    0.00    2.00    429.05m

              Now     Min     Max     Avg
■ volume-0    0.00    0.00    0.00    0.00
```

3.4. DS Controller installation

The DS Controller is a custom component that allows users to control a Toshiba DS Unit through RS232 LAN commands. It follows a different setup procedure than Toshiba DS Monitoring Tool, due to its special role. The DS Controller software is provided by Toshiba in offline mode.

3.4.1. Pre-requisites

Install nodejs v8.11.3 using these commands:

```
sudo curl -sL https://deb.nodesource.com/setup_8.x | sudo -E bash –
sudo sudo apt-get install -y nodejs
```

Install the PM2 process manager.
This useful tool assure that the DS Controller process will be always running.

```
sudo npm install -g pm2
```

3.4.2. Installation

In the home directory of Toshiba DS Monitoring Tool server, deflate the zip file provided by Toshiba

```
cd ~

tar -zxvf DSControllerWeb.tgz
```

Go into the extracted folder

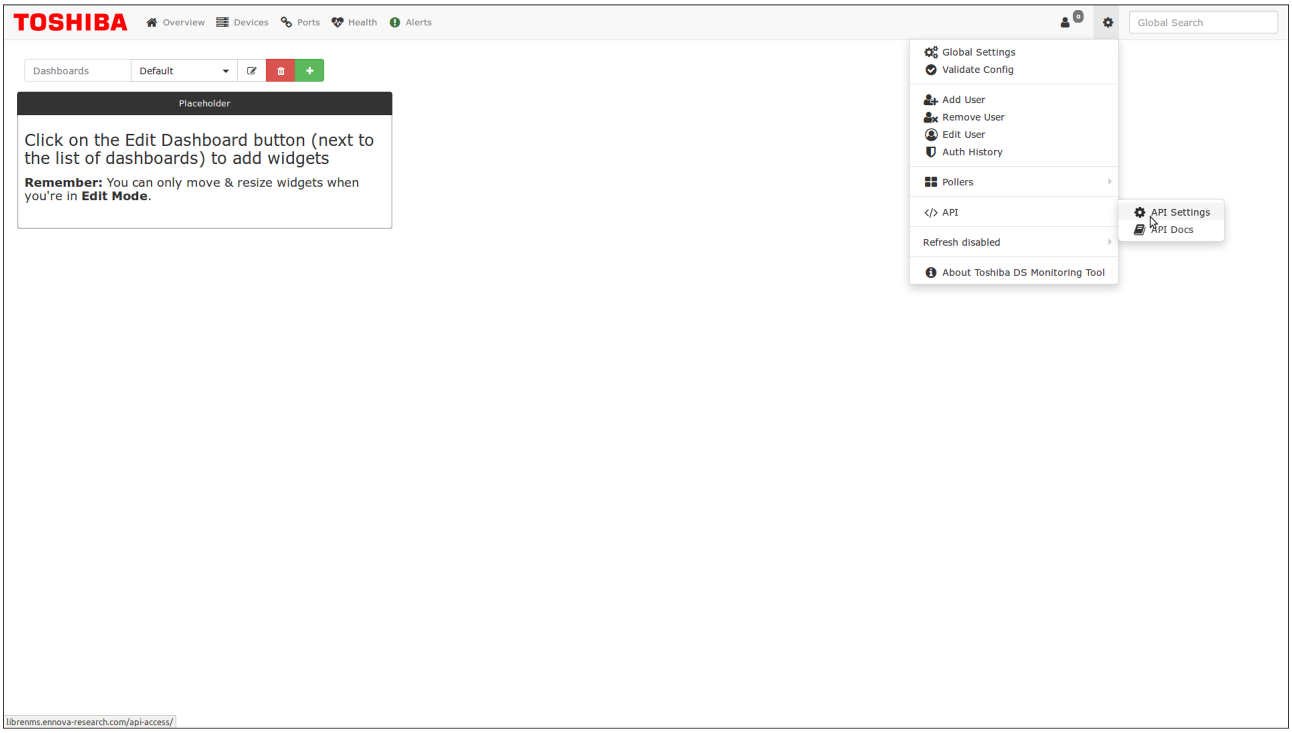
```
cd DSControllerWeb
```

and install the packages required by the project using this command

```
npm install
```

3.4.3. Configure API token

To enable the DS Controller, you have to generate an API token in Toshiba DS Monitoring tool’s API section.



Click on the Edit Dashboard button (next to the list of dashboards) to add widgets

Remember: You can only move & resize widgets when you're in **Edit Mode**.

Create an API Access token and then put it inside the configuration file app.json, located in DSControllerWeb/properties/ folder.
Remember to set also the correct hostname/ip address of your Toshiba DS Monitor tool installation

```
{
	"serverPort": 3000,
	"url" : "http://your_librenms_hostname/api/v0",
	"token" : {"X-Auth-Token": "insert your token here"}
}
```

3.4.4. Start process

In the DSControllerWeb folder launch this command

```
sudo pm2 start process.json
```

DS Controller in now configured and running.

3.4.5. Configure DS Controller URL in Toshiba DS Monitoring Tool

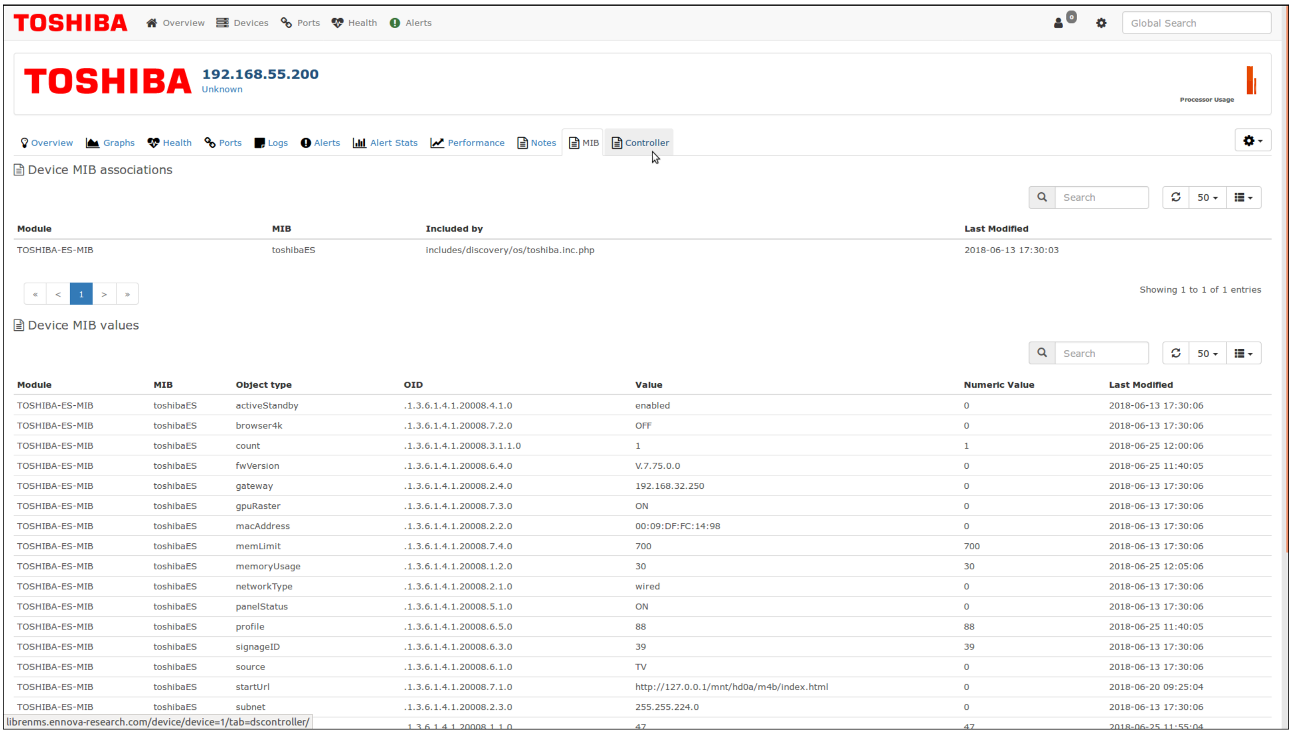
Toshiba DS Monitoring Tool requires to know where the DS Controller is reachable in order to show it in a specific page inside the single device management. You have to add a configuration property inside the config.php.

Edit config.php file located inside /opt/librenms/ and add this property at the end of the file.

```
$config['ds_controller_url']  = "http://<your_server_url_or_hostname>:3000/DSController/";
```

Note: the port 3000 is the same already configured by default in the app.json configuration file of the DS Controller.

If everything has been configured properly, you should see a new tab “Controller” inside every Device page, as shown in the next picture.



Device MIB associations

Module	MIB	Included by	Last Modified
TOSHIBA-ES-MIB	toshibaES	includes/discovery/os/toshiba.inc.php	2018-06-13 17:30:03

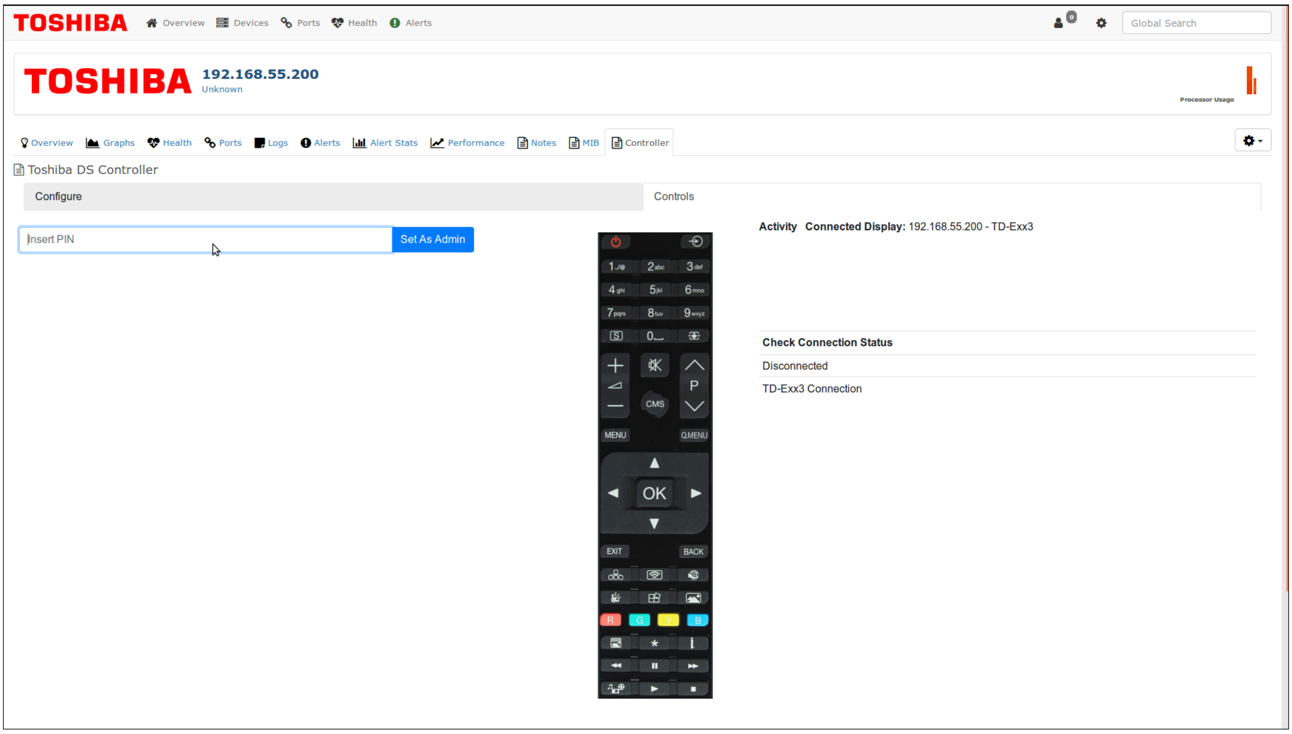
Showing 1 to 1 of 1 entries

Device MIB values

Module	MIB	Object type	OID	Value	Numeric Value	Last Modified
TOSHIBA-ES-MIB	toshibaES	activeStandby	.1.3.6.1.4.1.20008.4.1.0	enabled	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	browser4k	.1.3.6.1.4.1.20008.7.2.0	OFF	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	count	.1.3.6.1.4.1.20008.3.1.1.0	1	1	2018-06-25 12:00:06
TOSHIBA-ES-MIB	toshibaES	fwVersion	.1.3.6.1.4.1.20008.6.4.0	V.7.75.0.0	0	2018-06-25 11:40:05
TOSHIBA-ES-MIB	toshibaES	gateway	.1.3.6.1.4.1.20008.2.4.0	192.168.32.250	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	gpuRaster	.1.3.6.1.4.1.20008.7.3.0	ON	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	macAddress	.1.3.6.1.4.1.20008.2.2.0	00:09:DF:FC:14:98	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	memLimit	.1.3.6.1.4.1.20008.7.4.0	700	700	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	memoryUsage	.1.3.6.1.4.1.20008.1.2.0	30	30	2018-06-25 12:05:06
TOSHIBA-ES-MIB	toshibaES	networkType	.1.3.6.1.4.1.20008.2.1.0	wired	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	panelStatus	.1.3.6.1.4.1.20008.5.1.0	ON	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	profile	.1.3.6.1.4.1.20008.6.5.0	88	88	2018-06-25 11:40:05
TOSHIBA-ES-MIB	toshibaES	signageID	.1.3.6.1.4.1.20008.6.3.0	39	39	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	source	.1.3.6.1.4.1.20008.6.1.0	TV	0	2018-06-13 17:30:06
TOSHIBA-ES-MIB	toshibaES	startUrl	.1.3.6.1.4.1.20008.7.1.0	http://127.0.0.1/mnt/hd0a/m4b/index.html	0	2018-06-20 09:25:04
TOSHIBA-ES-MIB	toshibaES	subnet	.1.3.6.1.4.1.20008.2.3.0	255.255.224.0	0	2018-06-13 17:30:06
			.1.3.6.1.4.1.20008.1.1.0	47	47	2018-06-25 11:55:04

librenms.ennova-research.com/device/device=1/tab=dscontroller/

Clicking on this Tab the DS Controller automatically will connect to the Toshiba DS Unit IP address (if the Unit is ON) and you will be prompted to insert the Unit PIN to request Admin execution privileges and start to send commands via LAN.



Toshiba DS Controller

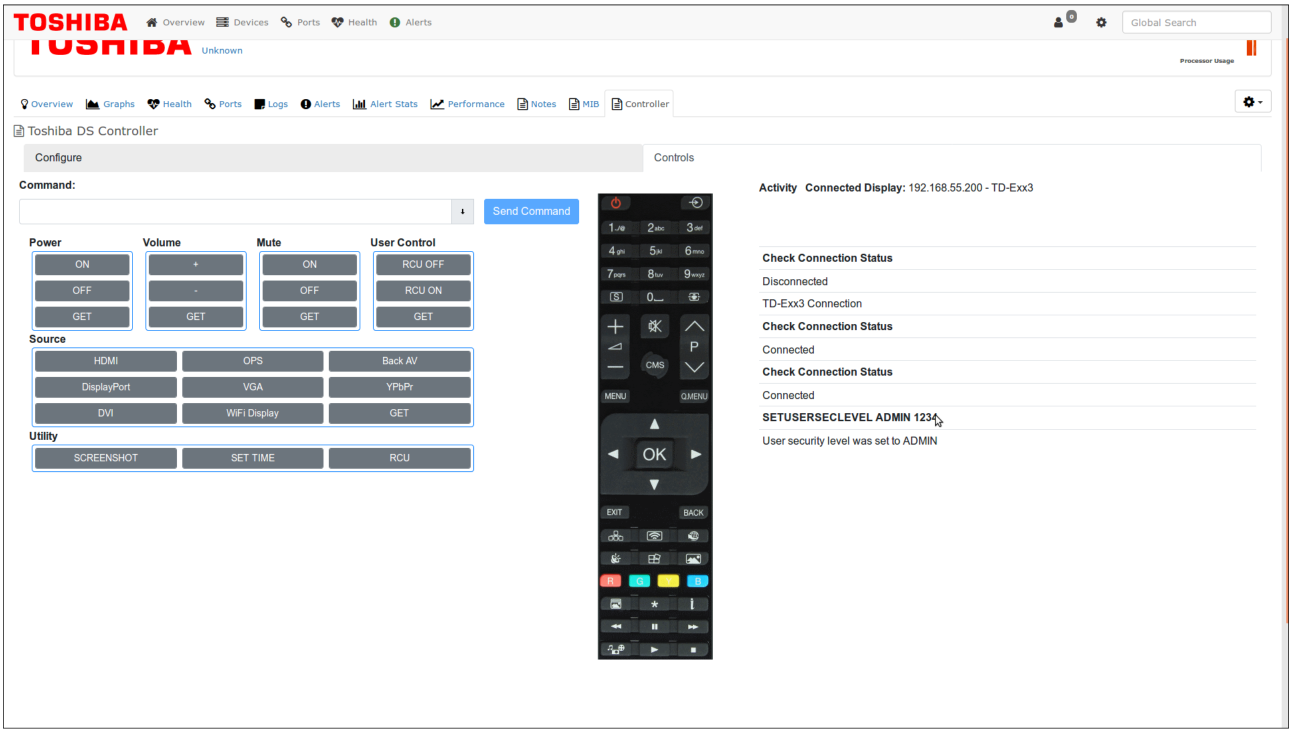
Activity **Connected Display:** 192.168.55.200 - TD-Exx3

Check Connection Status

Disconnected

TD-Exx3 Connection

After you insert the correct PIN the DS Control Dashboard will be displayed.



Activity **Connected Display:** 192.168.55.200 - TD-Exx3

Check Connection Status

Disconnected

TD-Exx3 Connection

Check Connection Status

Connected

Check Connection Status

Connected

SETUSERSECLEVEL ADMIN 1234

User security level was set to ADMIN

3.4.6. How to stop the process

To stop the DS Controller process, you have to launch this command in the DS Controller directory

```
cd ~
cd DSControllerWeb
sudo pm2 stop process.json
```

3.4.7. Update DS Controller

When Toshiba release a new version of the DS Controller, follow these steps in order to update correctly:

- backup the existent DSControllerWeb folder and move it in a backup folder

  ```
  cd ~
  tar -zcvf DSControllerWeb DSControllerWeb_backup.tgz
  ```

- Stop the DS Controller

  ```
  cd DSControllerWeb
  sudo pm2 stop process.json
  ```

- Remove the old DSControllerWeb folder

  ```
  cd ..
  rm -Rf DsControllerWeb
  ```

- Unzip the new package provided by Toshiba

  ```
  tar -zxvf DSControllerWeb.tgz
  ```

- Update packages

```
cd DSControllerWeb
npm install
```

- Start pm2

```
sudo pm2 start process.json
```