![RACOM - RADIO DATA NETWORKS]

Application notes

Link to ISP

No IDU unit needed !

Gb Eth + PoE

Switch / Router

Network management via HTTP(s) or SSH

WiFi hotspot

PC/SERVER

more LAN devices

Surveillance IP camera

RAy – Microwave link

version 1.0
11/27/2013
fw 1.1.x.x

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1. Simple Network Management Protocol in RAy Units

RAy utilises SNMP versions **SNMPv1** and **SNMPv2c** – using **community string** for authentication, which is by default "**public**", but can be changed. SNMP uses UDP protocol for communication; delivery checks are implemented from version 2 onwards.

> **Note**
>
> The RAy MIB module complies with the Severity level 3 validation.

By default RAy uses UDP port 161 (SNMP) for queries. The manager, which sends the query, dynamically chooses a port from which it sends its query to RAy port 161. RAy replies from port 161 to the dynamically selected port of the manager.

RAy launches the SNMP agent automatically on start-up if enabled. RAy also sends alarm states (traps) to the manager via the port 162 (SNMPTRAP).

> **Note**
>
> To see the RAy MIB table, download it from the RAy web interface (**Maintenance → Backup → SNMP MIB → Download**) and use any document reader you prefer.

1.1. RAy SNMP Settings

The SNMP agent is switched off by default. You can enable or disable it in the **Settings → Service access → Services** menu.

Fig. 1.1: RAy SNMP settings

The SNMP community string and SNMP trap IP can be configured too. Thresholds for all SNMP traps can be configured in the RAy web interface, **Settings → Alarm limits**. Whenever a defined limit is exceeded, a trap is sent.

> **Note**
>
> No trap is sent when the measured value returns to its admissible range.

Configurable traps:

- Inside temperature [°C]
- Memory usage [%]
- Voltage min [V]
- Voltage max [V]
- RSS [dBm]
- SNR [dB]
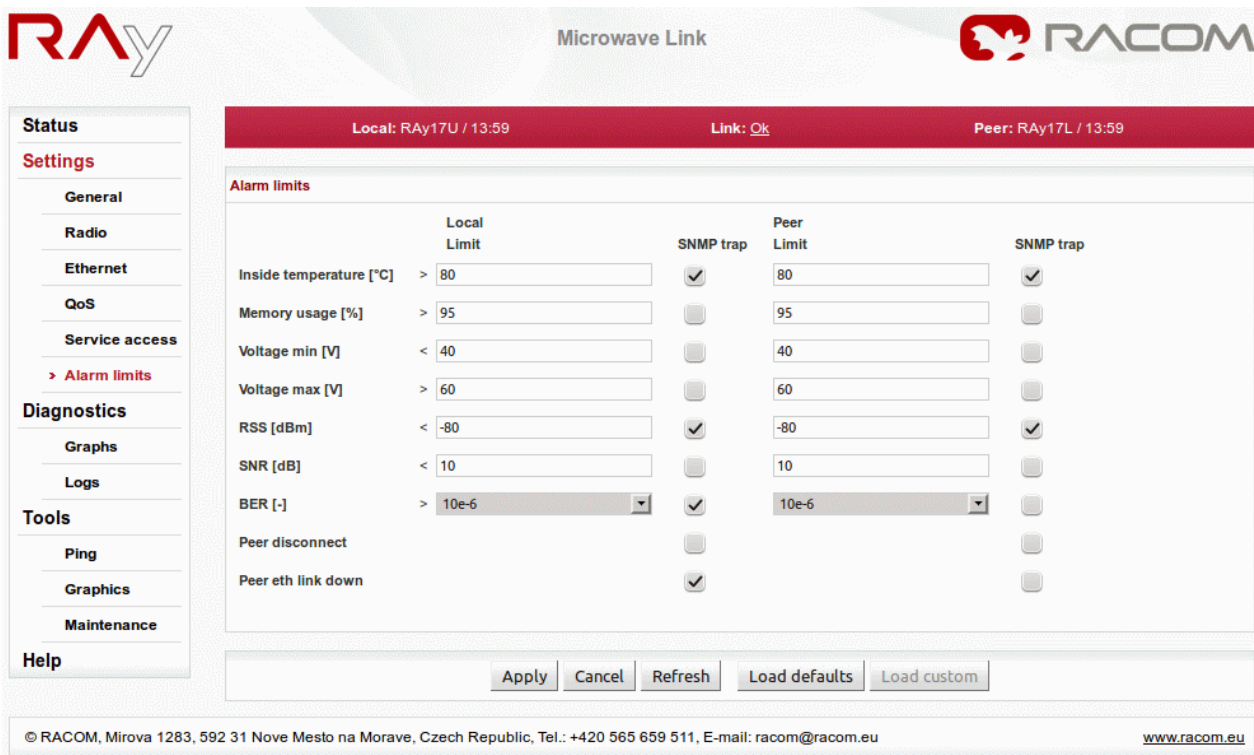- BER [-]
- Peer disconnect
- Peer Eth link down

Fig. 1.2: RAy Alarm limits

1.2. Network Management System – ZABBIX

To access our SNMP values, any Network Management System (NMS) can be used. However, we recommend using the ZABBIX open source monitoring system. It can be downloaded at: http://www.zabbix.com/download.php.

The Zabbix website provides the following short description:

Zabbix is the ultimate open source availability and performance monitoring solution. Zabbix offers advanced monitoring, alerting, and visualization features today which are missing in other monitoring systems, even some of the best commercial ones.

If you have chosen the Zabbix software, please read the following pages where we offer a basic Starting Guide to RAy and Zabbix co-working. The sections may in any case be helpful for some generally applicable hints and tips.

Note

The following guide was tested with Zabbix release 2.0.6. It should work on any newer 2.0.x release. If you use any of the 1.8.x releases, some tasks may need a different approach.

Take the opportunity to remotely access and test a live Zabbix demo[1]. Contact us for access[2] details.

1.2.1. Installation and Documentation

Due to security requirements and the mission-critical nature of the monitoring server, in our view UNIX is the only operating system that can consistently deliver the necessary performance, fault tolerance and resilience.

Zabbix is tested on the following platforms:

- Linux
- IBM AIX
- FreeBSD
- NetBSD
- OpenBSD
- HP-UX
- Mac OS X
- Solaris
- Windows: 2000, Server 2003, XP, Vista, Server 2008, 7 (Zabbix agent only)

For further details, visit Zabbix Documentation at http://www.zabbix.com/documentation.php. It contains a large body of information about installation steps, configuration, performance etc. If you are unsure how to proceed with any task, refer to the Zabbix documentation first. You can find an installation guide there, too.

This Guide does not present all Zabbix settings, but should help you incorporate the RAy SNMP functionality into the Zabbix software.

Note

The following guide requires using MySQL database used in Zabbix. If you choose another one, you will need to alter at least the trap handling bash script provided.

Windows Installation

If you need to use Windows platform as the host operating system for Zabbix, you can install VMware/VirtualBox software and install Zabbix Appliance. The Zabbix Appliance can be downloaded from

---

[1] http://www.racom.eu/eng/products/m/ripex/demo/zabbix.html
[2] http://www.racom.eu/eng/products/remote-access.html#load(product=zabbix)

http://www.zabbix.com/download.php. Please remember that Zabbix Appliance is not intended for serious production use at this time.

VMware download: https://www.vmware.com/support/
VirtualBox download: https://www.virtualbox.org/wiki/Downloads
See the respective documentation on how to install and use virtualisation software.

1.2.2. Templates

After successful installation, you can import any of the predefined templates. Each template is the collection of Zabbix Items corresponding to a set of OIDs, triggers, graphs and applications. The template can be easily linked to any monitored host (RAy) and you can access the desired values very quickly.

What Templates do we Provide?

The Templates list:

*   Name: RAy10 Template
    *   Consists of all specific OIDs provided by RACOM for RAy10 units and several OIDs for the Ethernet statistics
*   Name: RAy Template
    *   Consists of all specific OIDs provided by RACOM for all other types of RAy units (RAy11, RAy17, ...) and several OIDs for the Ethernet statistics
*   Name: RAy SNMP Trapper Template
    *   Consists of all RAy SNMP traps
*   Name: Name: PING Template
    *   Pings a defined host and triggers whenever the host is unreachable

All templates can be downloaded from the RAy download site at http://www.racom.eu/download/hw/ray/potencial/eng/02_fw/RAy_Zabbix_templ.zip

How do I Import the RAy Templates?

In order to import the template, click on the **Configuration → Templates** button at the top of the Zabbix web page. At top right corner you will see the **Import Template** button, click on it.
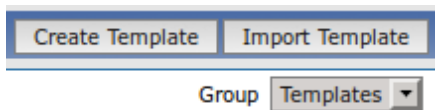

Fig. 1.3: Importing Template button

⚠ **Important**

Before importing the template file, see Section 1.2.5, "Value Mappings". You should define the correct value mappings before importing the template.

Select the RAy template file and Import that file. Repeat this step for each template.
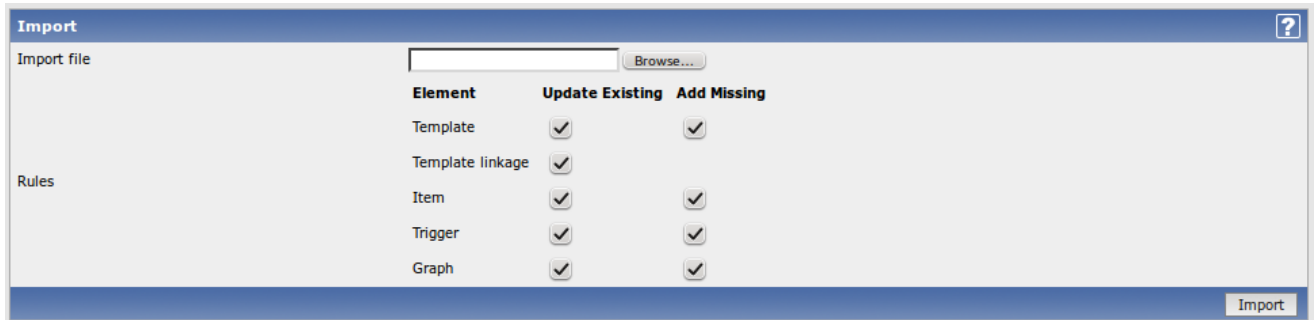
Fig. 1.4: Importing Template options

Now you can see all RAy templates at the Template list window among all other templates which are in Zabbix by default.

> **Note**
>
> If you already imported the template and you need to update it, just import the newer version with the same name and the current template will be automatically updated.

Each **Item** has its Description, SNMP OID number, community string, UDP port (161), key, update interval and other parameters. One of the key parameter is the update interval, because it defines how often Zabbix will request various replies from the RAy stations. These intervals are different for individual OIDs and are predefined based on our experience. You should consider changing it to suit your needs. For more details, read Section 1.2.3, "RAy Templates in Detail".

The individual items can be enabled or disabled.

Always monitor only the values which you really need and with reasonable update times.

The items are devided into the usage groups, called **Applications** in Zabbix. These applications serve for better clarification of the defined items.

If you wish to be notified whenever any monitored value is out of its threshold range, you can define a **Trigger** for it. These notifications are viewable on the Zabbix dashboard, item history or you can have e-mail/jabber/sms notifications enabled. Each notification can have one of six predefined severity levels (warning, critical, …).

We also provide several triggers within the templates. Triggers defined in templates cannot be edited within individual hosts, which means you cannot define various threshold ranges for hosts and each host would have the same threshold range. Please define your own triggers within each individual host.

> **Note**
>
> You can use a Clone option to create a copy of any template item or trigger for an individual host. In this case, you can edit its predefined values to meet your requirements for each host separately.

Graphs are automatically created for each monitored numeric value, but you can also create special graphs with several values on a single graph. We provide 5 predefined graphs containing some basic watched values like temperature, UCC etc.

For more information, see the Zabbix documentation. You can delete, add or edit any template component. The predefined state serves as a quick start, but you do not have to use them at all and you can create your own set of monitored values/items.

1.2.3. RAy Templates in Detail

Approximately 50 enabled items are included in RAy templates. Most of them are implemented by RACOM, but several of them are taken from well-known MIB files like IF-MIB or RMON.

Note

Some items are disabled by default because the values are not so important to watch at all.

The provided templates have predefined update intervals and for how many days each item keeps its history and trend values. All these three parameters define the requirements for the Zabbix server performance and the database size.

Update interval [seconds]	– Refresh the item every N seconds.
Keep history [days]	– Number of days to keep detailed history in the database. Older data will be removed by Housekeeper.
Keep trends [days]	– Keep aggregated (hourly min, max, avg, count) detailed history for N days in the database. Older data will be removed by Housekeeper. Note that trends are only stored for numerical items.

Based on these parameters, items are devided into four groups:

1. *Update interval = 1 day (86400 seconds), History = 30 days, Trends = 400 days*
2. *Update interval = 1 hour (3600 seconds), History = 30 days, Trends = 200 days*
3. *Update interval = 5 minutes (300 seconds), History = 60 days, Trends = 400 days*
4. *Update interval = 1 minute (60 seconds), History = 400 days, Trends = 400 days*

Group 4 consists of the most useful values to watch:

- *Input Ethernet data port throughput in bps (not supported by RAy10)*
- *Output Ethernet data port throughput in bps (not supported by RAy10)*
- *Current net bitrate in bps (not supported by RAy10)*
- *Current RF Power in dBm*
- *Receive RSS indicator in dBm*
- *Receive SNR indicator in dB*

From our experience, all these values are important to watch and have them updated each 60 seconds. It is also useful to be able to display these values in detail even if they are one year old.

If you need to have even more accurate values, you can decrease the update interval. The smallest useful value for the throughput items is 10 seconds. Reading RSS or SNR can be done every second, because its value is always the current one.

Important

We calculated that with the predefined RAy template, you approximately need about 0.5 GB of data for one RAy link (two units). With RAy10 units, it is about 320 MB. Have this in

mind when considering the database size. It can be increased a lot in case of many traps being sent from the RAy units – we keep one year traps history.

Hints & Tips

The link reliability, link uptime, downtime or BER can be read because of our own OIDs. These values are updated every 5 minutes by default.

Watching the number of CRC errors can detect faulty cables and the number of dropped packets can warn you about high Ethernet traffic (bursts) so RAy drops some of them.

> **Note**
>
> Zabbix can round some float values. E.g. 99.9 % reliability is returned by the SNMP query as 99999. Zabbix item devides it by 1000 and you get 99.999, but Zabbix displays it as 100 %. See the raw values to see the precise values (Latest data → Graph → Values) or do not devide this value.

1.2.4. How to Import Monitored RAy Stations?

Now you have a working template, but you need to define hosts (RAy stations). Each RAy station has its own IP address. The following steps will guide you through the Host Configuration.

To create a host, go to **Configuration → Hosts** and click on the **Create Host** button. Define the Host name and its IP address.

Fig. 1.5: Defining the Host name and its IP address

You can optionally define a Group for the hosts. Creating a **Group** is straightforward. You can create a new one while creating a host or you can do so by going to the **Configuration → Groups** tab and clicking on the **Create Group** button.

Linking a template to the host(s) can be achieved under the same tab or you can open Template settings and link any desired host to it.

You have to set IP addresses and port numbers for an Agent interface, port 10050, and for an SNMP interface, port 161. Otherwise, you won't be able to use any SNMP item.

Fig. 1.6: Defining the Agent and SNMP interfaces

Where can I See the RAy Monitored Values?

To check monitored values, go to the **Monitoring → Latest data** tab and choose the desired host from the Menu.

Fig. 1.7: RAy latest data

For each item, you can see a graph or a history table. If a trigger is configured for the item, the graph shows a line with a threshold value.

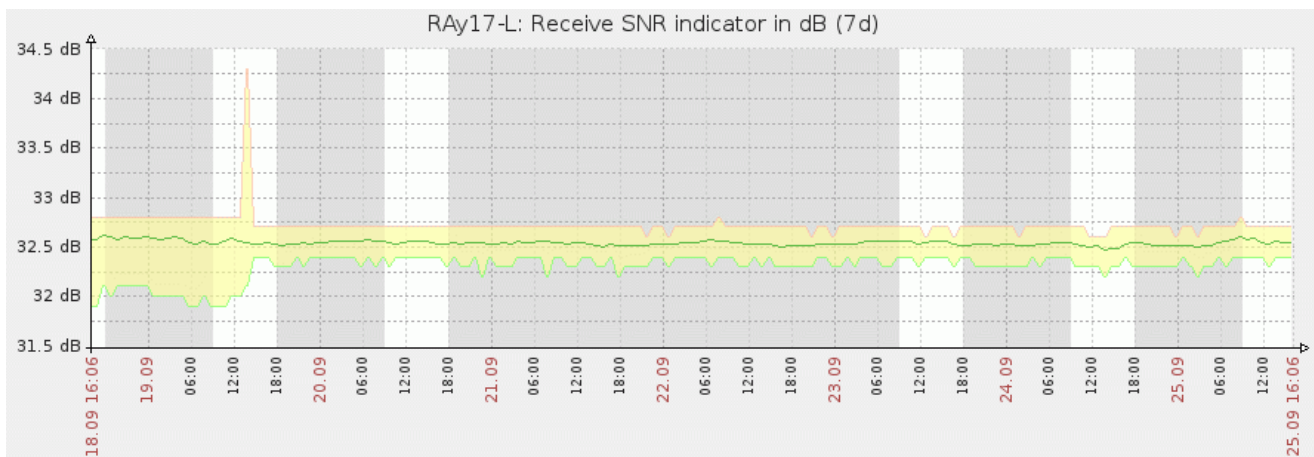*Fig. 1.8: RAy graph*

1.2.5. Value Mappings

RacomRay.bandwidth

0 → na

1 → bw–28MHz

2 → bw–14MHz

3 → bw–7MHz

Items:

Radio channel bandwidth (supported by RAy10 only)

RacomRay.channelArrangement

0 → na

1 → accp

2 → acap

Items:

Channel arrangement (not supported by RAy10)

RacomRay.channelArrangement   **Items:**

3 → ccdp

RacomRay.coding   **Items:**

0 → na   Channel coding level (supported by RAy10 only)

1 → low

2 → hi

RacomRay.duplex   **Items:**

0 → na   Ethernet duplex - index $1

1 → full

2 → half

RacomRay.lineStatus   **Items:**

0 → na   Radio link status (supported by RAy10 only)

1 → ok

2 → analyzer

3 → connecting

4 → searching

RacomRay.lineStatusII   **Items:**

0 → na   Radio link status (not supported by RAy10)

1 → setup

2 → single

3 → connecting

4 → authorizing

5 → ok

6 → analyzer

RacomRay.mdix   **Items:**

0 → na   Ethernet MDI-X / MDI - index $1

1 → mdi

2 → mdi-x

RacomRay.modulationIndex   **Items:**

0 → na   Tx modulation index

1 → qpsk   Rx modulation index

2 → qam16

3 → qam32

4 → qam64

5 → qam128

6 → qam256

RacomRay.OptionSetting	**Items:**
0 → na	Management interface: Telnet
1 → on	Management interface: VLAN on/off
2 → off	Management interface: HTTP
	Secure peer mode (not supported by RAy10)
	Channel matching
	Ethernet pause - index $1
	Ethernet autonego - index $1
	Ethernet asymmetric pause - index $1
	Search mode disabled on/off (supported by RAy10 only)
	Ethernet prioritized VLAN support (supported by RAy10 only)

RacomRay.rfPowerStatus	**Items:**
0 → na	RF Power amplifier
1 → ok	
2 → fail	

RacomRay.ServiceState	**Items:**
0 → na	Peer station user Ethernet link status
1 → up	
2 → down	

RacomRay.sshd	**Items:**
1 → na	Management interface: SSH
2 → onlykey	
3 → off	

RacomRay.systemStatus	**Items:**
0 → na	Unit status
1 → ok	
2 → warning	
3 → alarm	

How can I Edit an Item to Link with a Value Map?

Go to **Configuration → Templates** and choose one of the imported template. Open the item configuration window and click on the chosen item to view and edit its settings.

Choose the appropriate value map in the Menu "Show value" and save the changes.

Example: RacomRay.mdix

Fig. 1.9: Linking a value map to an item

1.2.6. How do I Know that Something Has Happened to the RAy Station?

There are two ways to check the RAy stations. You can actively query the station in the defined time intervals or you can just wait for the trap to be received.

Active Querying

This option is the one already mentioned. You have a defined item which is updated e.g. every 10 seconds. It means that every 10 seconds, Zabbix requests a reply to the SNMP GET message for the specific OID object and it stores this value in the database.

A trigger can be configured for each item. For instance, temperature threshold alarm is set to 50°C. Whenever Zabbix receives an SNMP RESPONSE message from any monitored host with temperature higher than 50°C, an alarm is triggered. If the alarm is triggered, it is displayed at the Zabbix Dashboard. The Alarm will be visible in the "**Last 20 issues**" table and you will see which host is having an issue in the "**Host status**" table.

When the temperature falls back into the allowed range, the issue will be deleted from the Zabbix dashboard.

SNMP Traps

The key aspect of the SNMP are the TRAPS. These OID objects are not actively monitored by the Zabbix manager but by the RAy itself. For example a RSS value is too low and RAy sends a trap to the defined IP address of your NMS (Zabbix) which triggers an alarm.

How to Configure Traps in Zabbix?

That, unfortunately, is rather tricky. There are several ways how to configure traps – only one of them will be explained in this guide.

Note

Another approach could be using SNMPTT functionality.

You have to install an snmptrapd, a daemon which receives SNMP traps and pass them into the Zabbix front-end.

You can use the script (*snmptrap.sh*) which is included in the RAy_Zabbix_templ.zip file downloadable from http://www.racom.eu/download/hw/ray/potencial/eng/02_fw/RAy_Zabbix_templ.zip[3] website. Copy the script file into /home/zabbix/bin/ directory and change the file privileges and make it executable.

```
# mkdir -p /home/zabbix/bin; chown zabbix /home/zabbix
# cp misc/snmptrap/snmptrapd.sh /home/zabbix/bin
# chmod +x /home/zabbix/bin/snmptrapd.sh
```

After that, you need to edit the file. By executing

```
$ which zabbix_sender
```

you will find the full path to this executable binary file. Change the path in the file, e.g.

```
ZABBIX_SENDER="/usr/bin/zabbix_sender";
```

Make sure, you have set other parameters correctly, e.g.:

```
ZABBIX_SERVER="localhost";
ZABBIX_PORT="10051";
KEY="snmptraps";
HOST="snmptraps";
```

SERVER and PORT could be different as per your configuration. KEY and HOST has default values, they will be changed depending on type of trap received.

After that, the script parses the output of each received SNMP trap, looks to the MySQL database to select appropriate host and declares an associative array containing trap descriptions. Eventually, it sends the whole message to your Zabbix server.

The script logs trap information into the /tmp/trap_messages.log file.

Note

If you have MySQL database protected by a password, you need to change this line:

```
ZABBIXHOST=$(echo "select host from zabbix.hosts where host=\"$sourceIp\" order by 'hostid' ▶
limit 1;" | mysql -N 2> /dev/null)
```

to

---

[3] http://www.racom.eu/download/hw/ray/potencial/eng/02_fw/RAy_Zabbix_templ.zip

```
ZABBIXHOST=$(echo "select host from zabbix.hosts where host=\"$sourceIp\" order by 'hostid' ▶
limit 1;" | mysql -N -u<USER> -p<PASSWORD> 2> /dev/null)
```

Replace the <USER> and <PASSWORD> to correspond to your settings.

OK, now we have our script prepared, let's configure the Zabbix front-end:

If you have not yet done so, import the template file zbx_templates_trapper.xml. This template includes Zabbix trapper and should be linked to each monitored RAy station. It will cause all received traps for known hosts to be mapped to the appropriate host.

Note

If Zabbix receives a trap for an unknown host it will not be displayed.

The host MUST be configured using IP address as the Host name, e.g.:

Host name:	192.168.10.1
Visible name:	RAy17-L-1
Agent interface:	192.168.10.1, port 10050, IP
SNMP interface:	192.168.10.1, port 161, IP

Along with this template, 11 new items and triggers appear at each used host. That is exactly the number of SNMP traps defined at the RAy. Each trap should be recognized and the Zabbix should display the correct information message at the dashboard.

	Wizard	Name	Triggers	Key	Interval	History	Trends	Type	Applications	Status	Error
		BER exceeded the threshold	Triggers (1)	berAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Peer station ethernet link Up/Down	Triggers (1)	peerEthLinkDown		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Temperature exceeded the threshold	Triggers (1)	tempAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		SNR exceeded the threshold	Triggers (1)	snrAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		RF Power amplifier failure	Triggers (1)	rfPowerFail		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		RSS exceeded the threshold	Triggers (1)	rssAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Air line connected after being disconnected	Triggers (1)	airConnect		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Air watch dog	Triggers (1)	airWdog		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Memory use exceeded the threshold	Triggers (1)	memoryAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Power voltage is out of thresholds	Triggers (1)	powerAlarm		90		Zabbix trapper	RAY-TRAPS	Enabled	✅
		Air line disconnected	Triggers (1)	airDisconnect		90		Zabbix trapper	RAY-TRAPS	Enabled	✅

Fig. 1.10: RAy traps definition

RAy sends a trap whenever the watched value is out of range or other condition configured is met. By default, every trap displays itself for 5 minutes in the Zabbix dashboard. After this time period, it is cleared and can only be seen in the history. RAy does not send a trap when a particular value returns to its admissible range.

You can define Zabbix to send you an e-mail whenever any trap is triggered. See the Zabbix Documentation for e-mail configuration.

Please, find the file snmptrapd.conf, usually it's in the /etc/snmp/ directory. Edit or create the file as root with the following lines:

```
authCommunity execute public
authCommunity execute PUBLIC
traphandle default /bin/bash /home/zabbix/bin/snmptrap.sh
```

The first two lines will allow all received traps with community public or PUBLIC to be parsed and the third line will force the snmptrapd to use our script.

If you do not know what community names you will receive, add the following line to accept all community names.

```
disableAuthorization yes
```

Don't forget to restart the snmptrapd. Use -n to force snmptrapd not to translate SNMP OID numbers. Otherwise the script will NOT function correctly.

```
# snmptrapd -n
```

Note

On Ubuntu releases, you can define default snmptrapd parameters at:

- */etc/default/snmpd:*
  - TRAPDRUN=yes
  - TRAPDOPTS='-n -p /var/run/snmptrapd.pid'
- */etc/init.d/snmpd:*
  - TRAPDRUN=yes
  - TRAPDOPTS='-n -p /var/run/snmptrapd.pid'

Basic Trap Functionality Tests

Now Zabbix is ready to receive SNMP traps from all RAy stations and enter them into the database properly. In order to test it, force the trap to be sent from any RAy and see whether it appears in the Zabbix front-end. If not, check that the respective UDP port (162) is enabled at your firewall and check the settings again. You can also execute Tcpdump or Wireshark at the selected interface of your Zabbix server or somewhere along the intended packet path.

Another basic test can be run using the following command:

```
zabbix_sender -z localhost -p 10051 -s "192.168.10.1" -k  tempAlarm -o "tempAlarm"
```

The IP address of your RAy station is 192.168.10.1, key is "tempAlarm" and the message for the Zabbix server is "tempAlarm". The command should trigger the host's "Temperature alarm". Note that you need to have a host configured with this IP address, otherwise the trap will not be shown.

It is important to set the KEY value correctly, otherwise the trap would not match the trigger. See more KEY values with their description below:

- *airConnect* – Air line connected after being disconnected
- *airDisconnect* – Air line disconnected
- *airWdog* – Air watch dog
- *berAlarm* – BER exceeded the threshold

- *memoryAlarm* – Memory use exceeded the threshold
- *peerEthLinkDown* – Peer station Ethernet link Up/Down
- *powerAlarm* – Power voltage is out of thresholds
- *rfPowerFail* – RF Power amplifier failure
- *rssAlarm* – RSS exceeded the threshold
- *snrAlarm* – SNR exceeded the threshold
- t*empAlarm* – Temperature exceeded the threshold

If you want to clear the trap alarm, just repeat the same zabbix_sender command, but change the message to contain the word "OFF". E.g. "ALARM OFF".

Fig. 1.11: RAy temperature trap triggered

You can also see Trap's output in **Monitoring → Latest Data → TRAPS of your RAy station → History**. The displayed information differs based on the trap received. See the detailed description in the respective Zabbix item.

1.2.7. What Else does Zabbix Offer?

There are many features provided by the Zabbix software. They are described in the Zabbix Documentation. Below are just a few of them.

You can create Screens. A Screen is a set of various graphs on one page for better overview of your network (temperature, UCC, RF power, …).

You can create Maps. If you administer many stations in many locations, a Map can be a good choice. You can define the background picture (e.g. real maps), various station pictures, station status, various statistics, etc. You can import any icon or background picture you want to use.
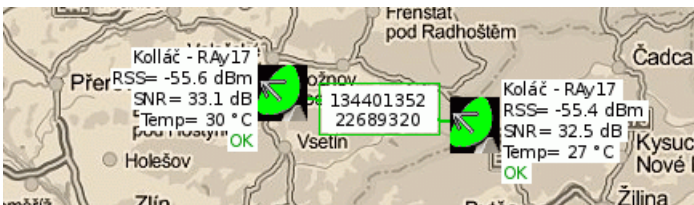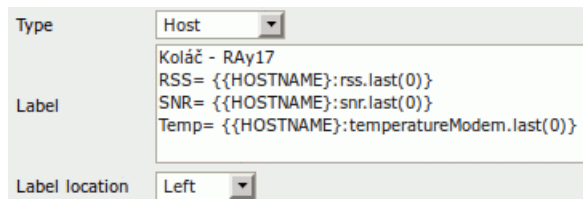

Fig. 1.12: Basic map with two RAy stations

A short example of RAy station configuration in Maps:

```
Koláč - RAy17
RSS= {{HOSTNAME}:rss.last(0)}
SNR= {{HOSTNAME}:snr.last(0)}
Temp= {{HOSTNAME}:temperatureModem.last(0)}
```
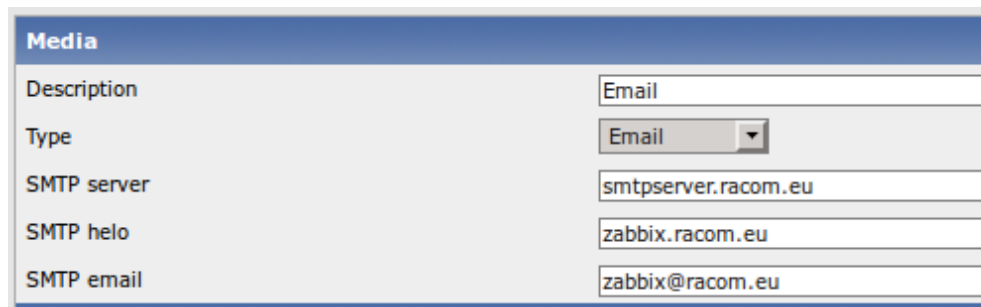
Fig. 1.13: Definition of RAy station in maps

Each map can be devided into several sub-maps. It can be useful for various levels of detail.

You can configure **E-mail notifications** if anything goes wrong with the monitored stations. Just go to **Administration → Media Types** and define your SMTP server settings for outgoing messages. After that, go to **Administration → Users** to define who will be notified.

Fig. 1.14: E-mail configuration example

SNMP Builder

SNMP Builder is an add-on for Zabbix to help users to use SNMP OIDs as items or to browse the entire MIB tree hierarchy.

Installation

Download the SNMP builder (.tar.gz)

- Zabbix version 2.0.x: https://github.com/atimonin/snmpbuilder

Within this site there is an installation documentation. Follow the steps described.

Simple guide for version 2.0.x (comments start with a double slash sign):

```
// $zabbix_frontend - path to Zabbix frontend (in Ubuntu /var/www/zabbix/)
// $your_src - directory with SNMP builder .tar.gz file
// $distname - name of the SNMP builder ditribution
1. $ cd $zabbix_frontend
2. $ tar xvzf $your_src/$distname/snmpbuilder-2.0_imgs.tar.gz
3. $ patch -p1 < $your_src/$distname/snmpbuilder-2.0.patch
4. $ cp -r $your_src/$distname/zabbix/* .
5. // Restart the Apache service:
        # service apache2 restart  OR
        # /etc/init.d/apache2 restart
```

If you have been successful, the SNMP Builder folder is added in the Zabbix front-end:
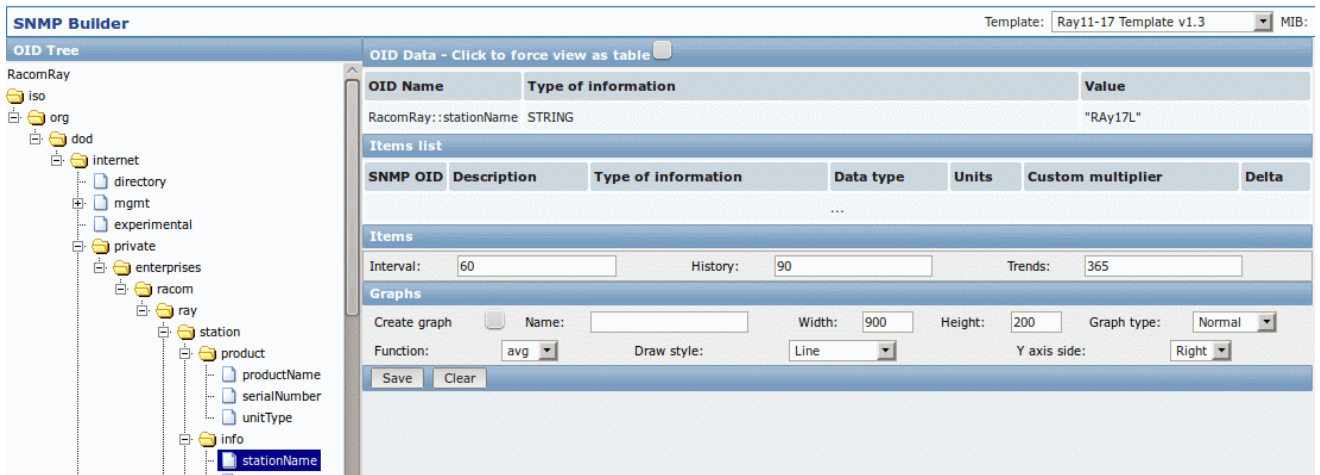
Fig. 1.15: SNMP Builder overview

> **i** **Note**
>
> The step three (patch) can end with an error message - in such a case, edit the `jsLoader.php` file manually. Follow the instructions in the `jsLoader.php.rej` file (probably adding lines with a plus sign on the beginning).

How to Work with the SNMP Builder and the RAy MIB?

To be able to see the RAy MIB table, you need to import it to the Zabbix server default MIB directory – usually /usr/share/snmp/mibs/. The directory is shown at the SNMP Builder front-end in the second menu "MIB".

Front-end settings:

- *Template:* choose the RAy template

- *MIB:* choose the RAy MIB. If you cannot see any MIB, you probably have a wrong path to the MIB directory – change variables `$mibs_dir` and `MIBS_ALL_PATH` accordingly in the `$zabbix_frontend/snmp_builder.php` file.

- *Host:* Fill in the RAy IP address

- *SNMP Version:* 2c

- *Community:* public

On the left side of the Zabbix front-end, you can see the OID Tree. You can navigate in there as you wish. If you click on any OID object, it should print a returned value on the right. By selecting these values, you can easily create various items with basic settings. Not all options are implemented in the SNMP Builder.

Appendix A. Revision History

Revision 1.1   2013-11-19
First issue – Simple Network Management Protocol in RAy Units