# User manual for the “Om7Sense Gateway”.

2020-05-29 (version 4.1)

User Manual

Om7SENSE

THE ENERGY MANAGEMENT REVOLUTION

# Contents

# 1. Introduction

Om7Sense Gateway collects data from multiple energy and sensoric measuring devices, stores this data long-term and allows visualization of the data in both tabular form and visualized as charts. The general term for such measuring devices is "Facility Items", and these can be PDUs, Branch Monitors, or other sensoric devices. These "Facility Items" all have ports which need to be intelligently monitored or in some case controlled. The current measurement or reading of such a port is probably important, but any changes to this value are typically significantly more important to the operations staff. Very often the change in relation to another port value, probably on a different "Facility Item", is even more important. Om7Sense Gateway includes a very powerful feature for notifying the user about changing values based on "Rules". Rules will generally be inserted by the Om7Sense Gateway admin, who enters simple commands to initiate events that get triggered when "Facility Item" port values change over or below thresholds set by the admin. The events generated by these "Rules" will then be visible on the relevant Om7Sense Gateway pages, also listed in the "Notifications", and also included in e-mails and SYSLOG entries, if these have been set up. Users want immediate information over data changes, not only from individual ports but from a combination of "facility items" which have a logical dependency on each other. Color coding for all displayed elements immediately shows their status, and therefore any changes are shown immediately based on the "Rules".

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*To summarize: The Facility management group needs detailed data when the situation demands it, otherwise they should be able to rely on a rule based product that provides the relevant system status at this point in time.*

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In addition to real time events, the Om7Sense Gateway generates reports based on the logical organisation of the data center. Reports can be created based on an intuitive questionnaire that determines the data the report is based on. Also the data center PUE on a daily basis is available from Om7Sense if enough data is available.

%The administration of many intelligent energy measuring devices, potentially from multiple manufacturers, is greatly %simplified by using Om7Sense, which also provides simple backup and firmware upgrades and organisation.

Monitoring systems have, in the past, been built around monolithic concepts and have a very technical user interface, very often found in DCIM systems. These old monolithic architectures have however been found to be very inflexible, and tie resources due to their huge administration overhead. The Om7Sense Gateway user interface has been designed from the beginning to be as simple as possible to use. The design staff have committed to building a product that is useable without a large investment in training.

Distributed monitoring and control systems have often been demonstrated to provide a better, more intelligent and more flexible
way to collect and manage the large amounts of data provided by current energy

and sensor sources. These distributed monitoring and control systems analyse and display data from associated parts of the data center, and are often described with the term “Smart Rack”. “Smart Rack” is a single, very intelligent rack, or a group of associated racks with their PDUs, and sensors. This “Smart Rack” will provide detailed analysis data to a specific customer group, and will be connected in a standard hierarchical layout to concentrators which then provide a wider group of management and administrators with a more generic type of data; the data history and trends over the complete data center playing a greater role here than specific events.

The Om7Sense products provide energy monitoring and control for PDUs and sensors from many different manufacturers in a complete solution. The installation is made as simple as possible, as is the connection to the external devices. If the device is attached to Om7Sense Gateway via a private network, the new PDU (with default settings) be will set it up and registered automatically. This not only provides a very simple device installation, but also makes the devices invisible from the standard network subnet thus producing an extra security layer for the energy measurement products and their associated sensors. It also alleviates the need for an operator to wire up and configure each sensor, so no further IP addressing or account set-up is necessary. Because the products are based on industry IoT standards, they are very reliable and can be mounted within or near to the devices providing the data, or installed as an application or a virtual machine on existing servers.
The intended user groups are both IT and Facility Management staff. Users want the measured information presented in a form that is readily accessible, which immediately focuses on unusual activities, without clouding the screen with redundant data. The Om7Sense design team go to great lengths to achieve this objective.

Multiple Om7Sense products can be linked together to exchange data. The central node is defined as the “Link Master”, and the other nodes “Link Sources”. Users working on the “Link Master” can manage all the devices physically connected to the “Link Sources” as if the data devices were local.

Om7Sense includes an advanced notification architecture. When the device data exceeds defined Om7Sense thresholds (warning or critical), then an internal Om7Sense alarm will be generated. This status is immediately displayed on the Om7Sense overview page, and is also sent to predefined applications (eMail, SYSLOG, apps). Om7Sense also displays the list of notifications, which are in some cases just information, but also include the alarms. Users with the necessary access rights can add comments to the notifications, track the state of actions taken to fix issues and directly access information on devices linked to the alarm.

Om7Sense users are allowed different access rights depending on their login attributes. These range from full rights to minimal read-only access. Users with the necessary rights can modify device and port names, switch ports and set rules and threshold values.

# 2. Installation

Om7Sense is available in various different configurations, for customers that have servers available, Om7Sense is can be installed within a VirtualMachine or inside a Docker container. For customers that do not have a server available, the Desktop and Pro products are pre-installed on dedicated hardware appliances. Om7Sense has the same basic functionality in all cases.

Om7Sense is web based, and the user will normally log into the application via a standard browser. The devices that Om7Sense is monitoring will typically also be connected via the Ethernet to the software. Installation of Om7Sense will typically include entering the attached device IP addresses. This can be performed by importing a spreadsheet with the data, or individually entering each device and its IP address. In the special case when the PDUs are not yet installed, the preinstalled hardware versions of Om7Sense include additional Ethernet ports so that the the PDUs can be automatically installed.

The products are licensed based on the number of devices actively being monitored. The license is completely independent of number of ports or sensors attached to these devices. The license is installed in the Om7Sense during the installation, and can be changed at a later date.

The Om7Sense machine products are Ethernet based products. All products include an Ethernet port labeled "ETH0" (this is the virtual connection on the Virtual product) for the connection into the network (does not apply when installed as an application).

## 2.1. Virtual gateway

The exact installation and operation of a virtual Om7Sense Gateway will depend on the server that is provided by the customer. &AppName will provide basically the same user interface via the web interface independent of the installation type. Minor differences will be found depending on whether Om7Sense is installed with admin rights or not, or if it is installed as a docker container.

The Docker based installation will need an additional Database, which will need to be provided by the customer and be accessable from the docker container. MSSQL and MySQL databases are supported.

### 2.1.1. Virtual Gate requirements

The Om7Sense Gateway Virtual product is available as an "OVA" file for installation in a virtualization product, or as a special version for installation in a customer environment. Depending on the customer requirements, this special Om7Sense can run with or without root system access.

The requirements to install and use the Om7Sense virtual product on a server are as follows:

1. vSphere / ESX / ESXi minimum 4.1. Or Player /Fusion for testing only. The virtual machine is based on Debian Linux 10 with OpenJDK 11 and MySQL.

2. Compatible to qemu / kvm (e.g. proxmox VE) from 3.0
3. vCPUs 2 (minimum, can be increased)
4. Memory minimum 4GB recommended
5. Hard Disk minimum 32GB (should not be reduced). 48GB is recommended.
6. Network adapter 1, (Complete Ethernet communication)
7. Video card 4MB ( not really used)

Only ETH0 is available for the Virtual Gate product, and therefore auto detection of devices is not possible.

The Om7Sense Gateway will automatically receive its IP address via the virtual ETH0 port from the VM server. The address that it receives will be printed on the console screen, to aid the user to identify the address.

## 2.2. Preinstalled Hardware gateway

The additional Ethernet ports on the Hardware gateways do not have to be used. The installed PDUs can be added to the Om7Sense configuration manually or by using the supplied imprt function.

When the user wants to have the PDUs on separate Ethernet networks, and they also are not yet configured with addresses then the Hardware products offer extra functionality, as described below.

The Desktop and Pro products include extra Ethernet ports which can be used for device auto connection (PDUs), or alternatively for Om7Sense management. The functions of the Om7Sense Ethernet ports are shown below.

- ETH0
  - Factory setting: DHCP Client
  - This port is used for connection to the network, and can be set to a static IP address via Om7Sense setup if required.
- ETH1 (only available on Desktop and Pro)
  - Factory setting: DHCP Server 10.190.16.100 - 10.190.16.150
  - PDUs or other devices in factory mode can be connected here, and will be auto-discovered. Alternatively, the management system can be connected.
- ETH2 (only available on Desktop and Pro)
  - Factory setting: DHCP Server 10.190.17.100 - 10.190.17.150
  - PDUs or other devices in factory mode can be connected here, and will be auto-discovered. Alternatively, the management system can be connected.
- ETH3 (only available on Pro)
  - Factory setting: DHCP Server 10.190.18.100 - 10.190.18.150

– PDUs or other devices in factory mode can be connected here, and will be auto-discovered. Alternatively, the management system can be connected.|

PDUs can be configured in a running Om7Sense at any time and will appear, after detection, in the dashboard view. They will be automatically detected when connected via ETH1, ETH2 or ETH3. As an alternative, the PDUs can be accessed via the Ethernet ETH0, in this case they will need to be manually entered via the "setup" menu.
**TIP: Simple method to get the ETH0 IP address** When a management system is connected via ETH1, ETH2, or ETH3, the Om7Sense gateway can be accessed by simply polling the URL "http://gate.om7sense.com". The Om7Sense login page will then also display the IP address received by ETH0.

### 2.2.1. Desktop Gate connectors

Diagram to help initial setup. Connecting the Network and Management system (laptop) in this way will give easy access to the DHCP IP address delegated to the ETH0. The URL "http://gate.om7sense.com" must be entered in the browser, and the ETH0 IP address will then be displayed.
PDUs or other devices can be connected to either ETH1, or ETH2.

*Note: the devices must be supported by Om7Sense for auto-detection and must be set up as a DHCP client, with factory setup.*

Om7Sense will supply all the devices with IP addresses, and will then attempt to identify them. This can take up to 30 seconds. The device will then appear in the Om7Sense dashboard window.
Supported PDUs or other devices can be auto detected by connecting them to ETH1, ETH2 or ETH3. The PDUs can be connected via an Ethernet switch if necessary.

### 2.2.2. Pro Gate connectors

The Om7Sense Pro product is a 19 inch rack-mounted server. It includes 4 Ethernet ports (ETH0, ETH1, ETH2, ETH3). The four Ethernet ports are in a group at the back of the server.
PDUs or other supported devices can be connected to ETH1, ETH2, or ETH3, and are then separated from the external network. Om7Sense Management is also possible via these ports.

*Note that they must be setup as DHCP client, with the factory installed authorisation setup.*

Om7Sense will supply the attached devices with IP addresses, and will then attempt to identify them. This can take up to 30 seconds. The device will then automatically appear in the Om7Sense Gateway "devices" window.

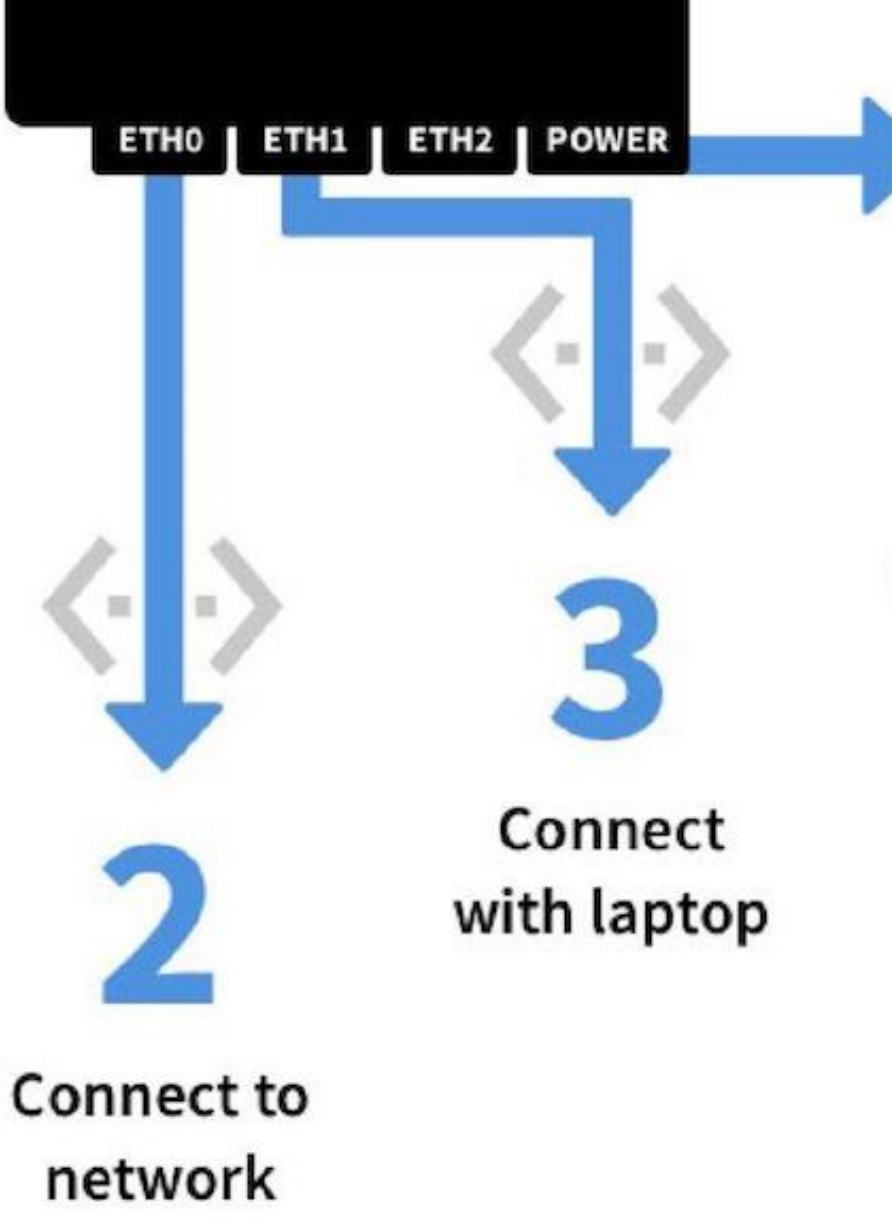



**Figure 1.** Desktop initial connection to get ETH0 IP address

## 3. Operation

All operation of Om7Sense is done via browsers over IP. The connection can be via ETH0 or one of the other Ethernet ports. The views will scale to use the screen size of the user device - this includes the very small smartphone screens. The views will automatically update when data values change, or new chart values should be displayed.

### 3.1. Login page

The login page is displayed when a new user connects to Om7Sense via a browser. It will also appear if a user attempts to access Om7Sense after the session timeout has been exceeded. When the connection is made via one of

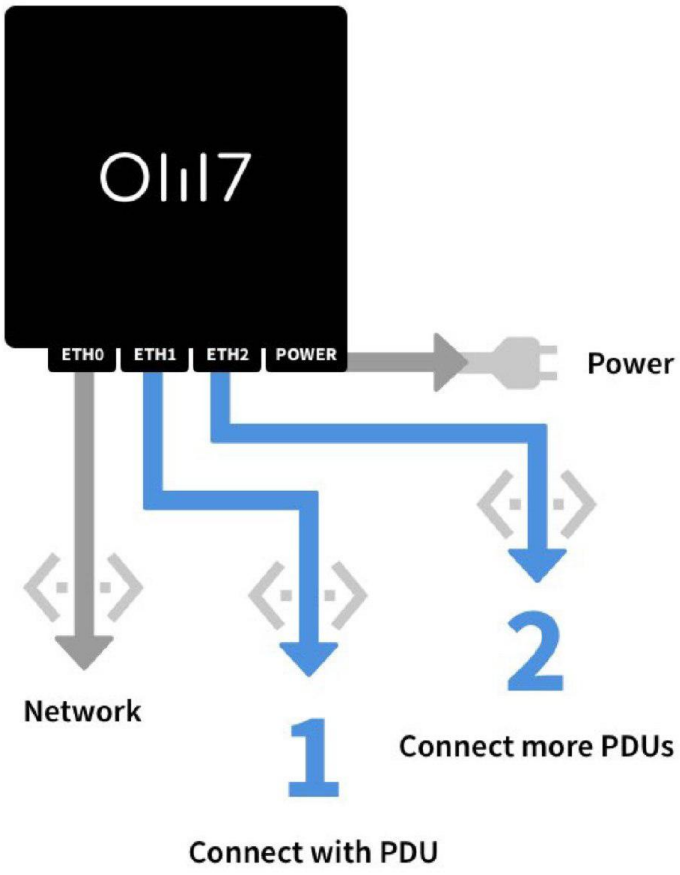



**Figure 2.** Devices connected to the desktop gateway

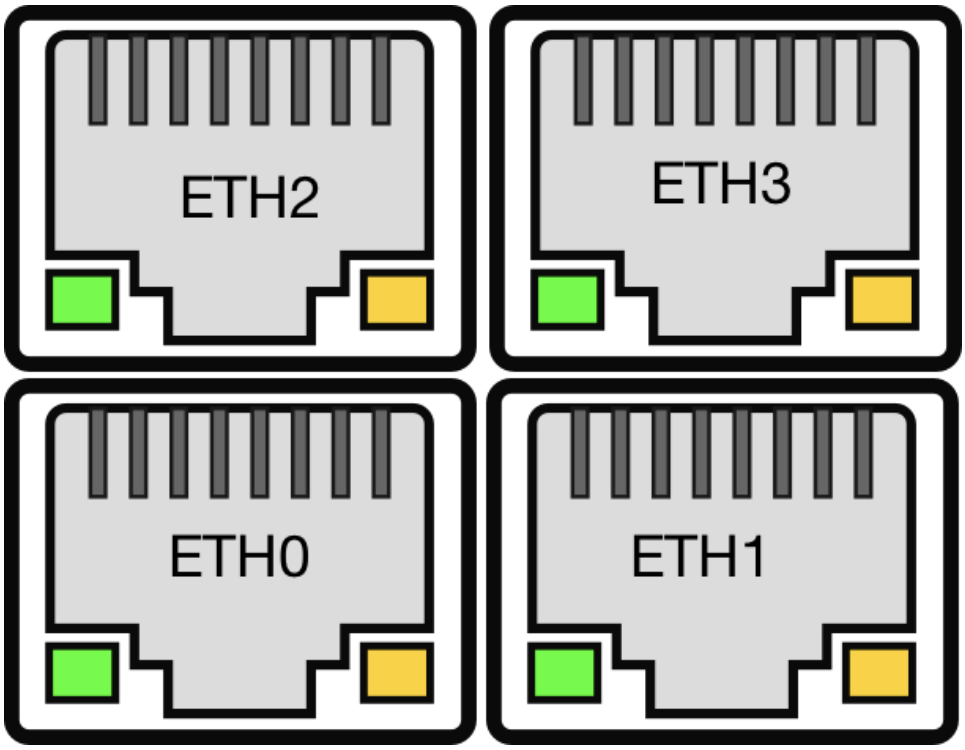
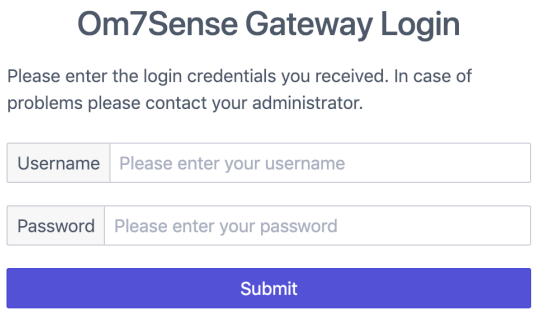



**Figure 3.** View of Ethernet ports at rear of the Pro

the extra Ethernet ports, then the login page will also display the Internet address detected on ETH0. This provides a very easy way for a user to detect the external address after a new installation of Om7Sense.




### 3.1.1. local users

The user information is stored within Om7Sense in a database, and are only locally relevant. The user accounts are immediately usable after the initial Om7Sense start.

**Default user accounts** These accounts are available for use. The passwords can be entered after login using the "settings" view.

| user | password | access rights |
|---|---|---|
| admin | admin | read/write access to all Om7Sense functions |
| monitor | admin | read only access to all device data. |
| power | admin | read only access plus PDU switching. |
| settings | admin | read only access plus device setup. |
| switchon | switchon | read only access. Devices can be powered on. |
| switchoff | switchoff | read only access. Devices can be powered off. |

Om7Sense, when purchased, is licensed for an agreed number of "Facility Items", e.g. PDUs. If the device count is exceeded, then a warning message will also be seen and no further devices can be added.

### 3.1.2. Active Directory users

Om7Sense can be setup to connect to a Active Directory server for Authentication and Authorization. The setup will depend on the customer environment, and is not described in this manual. Users that should be enabled for Om7Sense should then be entered in the server, and will need to be members of a group mapped to a Om7Sense role within Om7Sense

The user must be entered as the Active Directory email name e.g. fb@om7sense.com . The password will be checked on the Active Directory server, and when authenticated. The Om7Sense role (admin, monitor, etc) will be mapped from the groups of which this ActiveDirectory user is.

### 3.2. Overview

The general view appears when logged into the Om7Sense Gateway. On the left hand side at the top of the view there are four buttons to select specific views and on the right there are links to *rules*, *setup* and *logout* pages.

Initially, there are neither devices ("Facility Items") nor rules present, so that the "Devices" and "DC" are empty. Devices can be automatically detected when connected to any of the Om7Sense Pro or Desktop hardware Ethernet ports, otherwise they will need to be entered by the administrator by using the "settings" functions.

As devices or logical entities are entered they will appear in the overview, this can take several minutes depending on device speed. The contents are then continuously monitored and updated by Om7Sense. It should normally not be necessary to refresh this view from the browser.

Entries at all levels within Om7Sense are displayed with the most important information inserted and with a background color that reflects their current entity, device or port status. If multiple statuses are detected within Om7Sense, then the color with the highest priority will be displayed. In the *DC* view, the color will escalate up through the logical levels and be displayed at all levels above the cause. The colors are listed below:

| **Color** | **Description** | **priority** |
|---|---|---|
| grey | Active device no longer responding, or entity is degraded | 10 |
| white | Device detected, but no data available. No action required. | 9 |
| red | Om7Sense has detected a value in a *critical* state | 8 |
| yellow | Om7Sense had detected a value in a *warning* state | 7 |
| orange | Device has reported a *critical* state | 6 |
| brown | Device has reported a *warning* state | 5 |
| green | Device or entity ok. No rules exceeded. | 1 |

The color coding provides a very simple way to have an immediate overview of changes within the complete installation. In most cases a change of status will also cause a notification, which, depending on Om7Sense *settings* will export an email, or syslog entry.

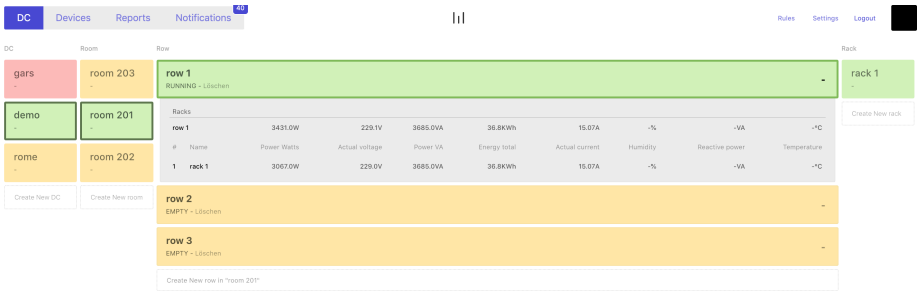
## 4. DC view

A very important Om7Sense Gateway feature is provided by the "DC view", which provides a way to access the energy data organised around the customer

Data Center “DC”. Important values are displayed within the DC organisational unit e.g Rack, Room, and thresholds can be set within them. Om7Sense Gateway thus provides a very powerful customer orientated status tuned to their individual requirements.
The “DC view” provides a logical power overview of the organisation in one or more Data Centers. Important energy values are displayed, and their status are made visible within the individual logical groups. Complete or sections of racks can be switched by a Om7Sense Gateway user with the necessary access rights. The user can within this hierarchical view scroll down from the top level view into the required level, e.g.rack with its installed rack devices.

*note: The initial setup does not include any entity items.e.g. DC, room, etc. These will need to be entered.*

The rule status is always escalated up through the levels, to provide an immediate overvier of the DataCenter status. The Data Center hierarchy is reflected by the elements that are available from Om7Sense. They are listed below:




## 4.1. DC (Data Center)

- A *DC* item is a entry to decribe a Datacenter location. There can be multiple *DC* items entered in the Om7Sense Gateway, *rooms* are normally entered into the *DC*.
- To enter a new *DC* item, click on the *Create New DC* button, and enter a new name for the *DC*. The new *DC* will not initially include any *rooms*.
- Select the *DC* by klicking it. *Rooms* in this *DC* will then be displayed, and also any *facility items* e.g. PDUs and their ports. A selection of *room* port values are displayed, and also their total value within this *DC*.
- Additional *rooms* can added to the *DC* by clicking th e button *Create New Room*.
- The status of the *DC* is shown by its color.

## 4.2. room

- Display the selected *room* by clicking on the relevant *room* icon on the right side of the view.
- A *Room* is a logical item emulating a DataCenter room, and will normally contain a number of *rows*.
- To enter a new *room*, click on the *Create New Room* button, and enter a new name for the *room*. The new *room* will not initially include any *rows*.
- Select the *room* by klicking it. *Rows* in this *Room* will then be displayed, and also any *facility items* e.g. PDUs and their ports. A selection of *row* port values are displayed, and also their total value within this *Room*.
- Additional *rows* can added to the *room* by clicking the button *Create New Row*.
- The *DC* in which thie *room* is located is marked by a dark border around the *DC* icon.
- The status of the *room* is shown by its color.

## 4.3. row

- Display the selected *row* by clicking on the relevant *row* icon on the right side of the view.
- A *Row* is a logical item emulating a row of racks in a DataCenter room, and will normally contain a number of *racks*.
- To enter a new *row*, click on the *Create New Row* button, and enter a new name for the *row*. The new *row* will not initially include any *racks*.
- Select the *row* by klicking it. *Racks* in this *DC*, and *room* will then be displayed, and also any *facility items* e.g. PDUs and their ports. A selection of *Rack* port values are displayed, and also their total value within this *Row*.
- Additional *racks* can added to the *row* by clicking the button *Create New Rack*.
- The *DC* and *room* in which this *row* is located is marked by a dark border around the *DC* and *room* icons.
- The status of the *row* is shown by its color.

## 4.4. rack

- Display the selected *rack* by clicking on the relevant *rack* icon on the right side of the view.
- A *Rack* is a logical item emulating a rack in a row of within a DataCenter room, and will normally contain a number of *Rack Devices*. The *Rack*

*Devices* will probably be servers, or other IT equipment.

- To enter a new *rack*, click on the *Create New Rack* button, and enter a new name for the *rack*. The new *rack* will not initially include any *Rack Devices*. The PDU installed in this *rack* should be selected in this phase. The PDUs configured in the Om7Sense Gateway must be entered via the *settings* page or automatically when connected via ETH1, ETH2, ETH3.
- Select the *rack* by klicking it. *Racks* in this *DC*, *room* and *rack* will then be displayed, and also any *facility items* e.g. PDUs and their ports.
- Additional *Rack Devices* can added to the *rack* by clicking the button *Create New Rack Device*.
- The *DC*, *room* and *row* in which this *rack* is located is marked by a dark border around the *DC*, *room* and *row* icons.
- The status of the *rack* is shown by its color.

## 4.5. Rack Device (server in a rack slot)

- Display the selected *Rack device* by clicking on the relevant *Rack device* icon on the right side of the view.
- A *Rack Device* is a logical item emulating a server or other IT-device installed in a rack within a DataCenter room.
- To enter a new *Rack Device*, click on the *Create New Rack device* button, and enter a new name for the *Rack device*. The PDU installed in this *rack* should be selected in this phase. The PDUs configured in the Om7Sense Gateway must be entered via the *settings* page or automatically when connected via ETH1, ETH2, ETH3.
- Select the *Rack Device* by klicking it. *Rack Devices in this* DC*,* room*,* rows *and* rack* will then be displayed, and the major data from the PDU port data.
- The switch ports are also available for a *Rack Device*. The individal ports can be switched or all ports for this *Rack Device*.
- The *DC*,*room*, *row* and *rack* in which this *Rack Device* is located is marked by a dark border around the *DC*, *room*, *row* and *rack* icons.
- The status of the *Rack Device* is shown by its color.

At the bottom of each of these views is a button *create Report* which will allow a customized report including the energy data from components relevant at this level. The report should be given a unique name, and can be generated via the *reports* tab.

# 5. Devices view

This view provides information directly from the *Facility Items*, e.g. PDUs. The devices are listed as a series entries, one can be selected to zoom in for detailled information.

*note: The initial setup does not include any devices, so these will need to be entered. This can be automatically done if the devices are connected via ETH1, ETH2 or ETH3, otherwise they will need to be inserted manually via the settings page*

Devices with an alarm status are shown at the top of the list, and are colored. Depending on the device type the maximum value is displayed with both a slider and a value. The value unit will depend on the device type and manufacturer.

- The sum of the input currents will be shown for PDUs.
- The highest temperature measured will be shown for sensor boxes.

The search field at the top left of the view provides the means to search for device, port or chain names. When an entry is selected, the relevant page and entry will be displayed.

To look in detail at a device, the device row must be selected - the detail view for this device will then be displayed on the right side of the view.

The overview page also provides the two filter boxes at the top of the page to change the entry order, or limit which types of devices are displayed.

Each displayed device includes several fields, which are listed below:

- *Name:* This name is the name given to the device. In most cases, it will also be be displayed on the device. The value can be modified in the "detail" view, in "Configuration" mode.
- *Category:* The category is detected by Om7Sense, and cannot be modified.
- *Location:* The location is a string, which can be modified in the "detail" view, in "Configuration" mode. It will also be displayed on some devices.
- *Vendor:* The vendor name is detected by Om7Sense, and cannot be modified.

This view provides monitoring for a specific device, in "Informaation" mode. Device management is also possible, if user authorisation permits it, by selecting the "Configuration" mode at the top right of the view.

The data that is available in this view will depend on the device which is being displayed. In most cases, the data will be extracted dynamically from the device, and the displayed value will flash before being automatically updated. This data will automatically be collected within Om7Sense in 5 second blocks and the maximum, minimum and average calculated. These blocks are then stored on the internal database, and form the basis of charts that can be called by selecting the relevant value. Historical data will later be changed into hourly and daily blocks, to provide real long term information. *Note: The data is only written out to the storage at 5 minute intervals, so real charting data for a device is only available after several minutes.*

Any configuration changes made, e.g. Port Name, will be exported back to the device, so that the device status always reflects the status of Om7Sense. *Note: On some devices, names are not available, in these special cases Om7Sense will just store these names locally.*

At the top of the view, there is a button *Open product management*, which will call the attached device management interface in a separate browser tab. This allows additional direct and simple access to the device. When devices are attached via the ETH1, ETH2 or ETH3, they are protected by the Om7Sense firewall and cannot otherwise be accessed. This feature allows authorised Om7Sense users to access the management interfaces of the devices and protects the devices from unauthorised access.

## 5.1. Output Measurements, Information mode

The "Output Measurements" table will only be displayed for PDUs that provide measurement per port. The values displayed will depend on the PDU type, and are extracted dynamically during runtime - any changes are marked by flashes. If thresholds have been set then an icon can be seen next to the relevant value. When the threshold is exceeded, an alarm will be raised the entry color will be changed and then is then also visible on the *Overview* page.

## 5.2. Input Measurements, Information mode

The "Intput Measurements" table will only be displayed for PDUs that provide measurement per input. The values displayed will depend on the PDU type, and are extracted dynamically during runtime - any changes are marked by flashes. If thresholds have been set then an icon can be seen next to the relevant value. When the threshold is exceeded, an alarm will be raised the entry color will be changed and then is then also visible on the *Overview* page.

## 5.3. Switching, Information mode

The "Switching" table will only be displayed for PDUs that provide port switching. The displayed statuses are extracted dynamically during runtime from the PDU - any changes are marked by flashes in the view. Authorised users can toggle the switch status of a port by first klicking the port to "unlock" it and then toggling the "state" in the pop up window. The PDU can take several seconds to react to the toggle command. The table also displays the outlet type as an icon.

## 5.4. Environment Sensors, Information mode

Sensors connected to the device will be listed in the "Environment Sensors" table. Om7Sense will attempt to identify the attached sensor type, but this is not always possible. The values displayed will depend on the sensor type, and are extracted dynamically during runtime - any changes are marked by flashes.

If thresholds have been set then an icon can be seen next to the relevant value. When the threshold is exceeded, an alarm will be raised the entry color will be changed and then is then also visible on the *Overview* page.

## 5.5. General Setup, Information mode

This table shows the static data provided by the device. Some of these parameters, e.g. name, can be changed in *Configuration* mode.

## 5.6. Charts, Information mode

As previously described, all device data points are collected and processed for the charts. The relevant data point just needs to be selected, and its chart will be opened. All charts can be zoomed by using the mouse.

The measuring interval can be selected at the top of the chart:

- last four hours
- last three days
- last week
- last month
- last year

The minimum and maximum chartlines can also be displayed for each measuring interval and these will be displayed in blue and green.

The chart will be automatically updated when new data is available.

The view also includes the threshold values for the data point. Each warning or critical value can be defined, enabled or disabled. It should be noted that thresholds are available for "wildcard" data points, e.g. current on all ports within a rack, or just this port. A "wildcard" rule cannot be changed from within this view, but a new data point rule, which will overrule the "wildcard" rule can be created.

## 5.7. Setup Individual Outlets, Configuration mode

This table is only available for PDUs with measurable outlets. Depending on the PDU, various field values can be changed. It can take several seconds before the PDU reacts and responds to the new configuration.

## 5.8. Environment Sensors, Configuration mode

This table is only available when sensors are active on the device. Depending on the PDU, various field values can be changed. It can take several seconds before the PDU reacts and responds to the new configuration.

## 5.9. Setup Input Phases, Configuration mode

This table is only available for PDUs with measurable inlets. Depending on the PDU, various field values can be changed. It can take several seconds before the PDU reacts and responds to the new configuration.

## 5.10. Identification, Configuration mode

Information provided by the device. This cannot be modified as it read only.

## 5.11. Status, Configuration mode

This is device-specific and is normally read only.

## 5.12. General Setup, Configuration mode

The “name”, “extra Info.” and “location” information fields can be set here. If the device supports these functions, then Om7Sense will export the changed data, otherwise it is only stored locally.

# 6. Reports

Reports can be generated based on data that has been collected by Om7Sense from the connected devices. The first step is create a report template, which includes the configuration data for the required output. There are basically two types of report:

- The device report lists the required data for the requested interval in graphical and list form all the ports of a specified device. Reports generated here will always include values for all the ports of the selected device. The report template should be generated in the *Reports* View by selecting the *Create Report* button.
- The DC item report lists the selected data points of a DC, Room, Aisle, or Rack for the requested interval in graphical and list form. Reports generated from these templates list only the specificall selected data points for the DC Item. The report template can be entered either in the *Reports* view by selecting the *Creat Report* button, or by selecting the function *create report?* using the button at the bottom of a *DC* view.

The devices must have already been entered via the *Connection* settings view, and in most cases it is necessary that data has been collected over a period of at least 24 hours.

## 6.1. Reports section

This part of the page contains a list of buttons for all previously defined report. Initially no reports are defined, but can be defined as previously described.

For each named report template, there are two buttons and a shaded overview text describing the basic report function. Selecting the *Generate* button will create a new browser tab with the relevant graphic and listing data in it. The required report time frame should be selected here, and the view will refresh with new data. Buttons at the top of this page also provide the way to print out the data using the printer defined on the system on which the browser is running, export as a excel formatted xls-file.

## 6.2. Report firmware versions section

This section can be selected to list the status of currently connected devices. *Note: this information is not available on all devices.*

- *Model:* The model information as read from the device, if available.
- *Version:* The version information as read from device, if available.

## 6.3. PUE section

The PUE (Power Usage Effectiveness) is always calculated for the data collected for complete previous days. For this reason, it is only possible to generate a

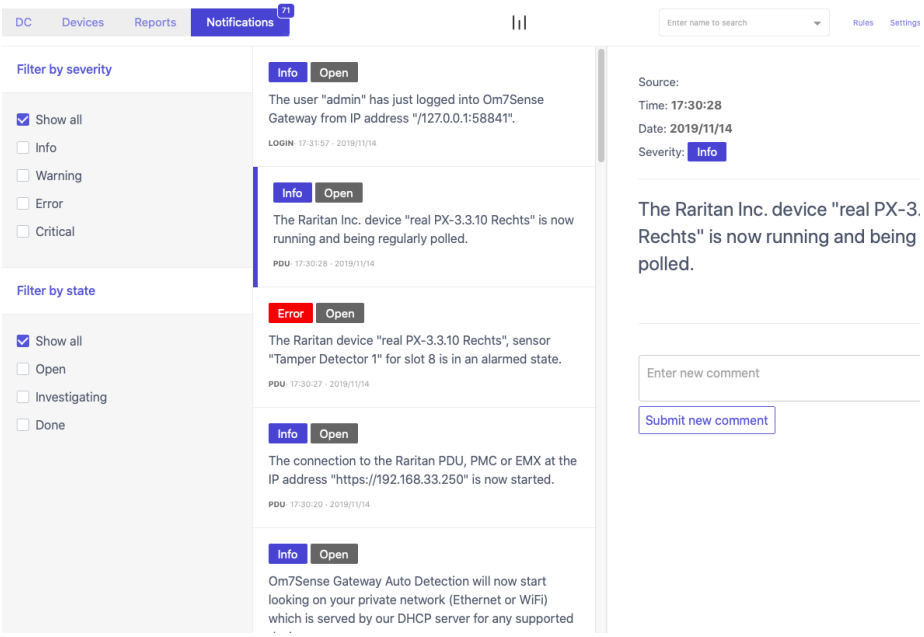
PUE based on historical data which is at least on day old. The required data is divided in two parts:

- *IT data.* This is the power consumed by the user devices within the data center. This will be typically collected from the PDU output ports. The configuration of which ports are selected for this *IT data*, is done in the *PUE items* sub function on the *settings* view.
- *Total data.* This is the input power into the data center. This can be measured data if there is a power meter available for this, but very often this data will have to be manually entered. The Total power consumed in a specific day can be entered by selecting the button *Manually entered total value*. This part of the Reports view provides collected PUE information, and also provides the possibility to manually enter *Total values*. These *Total values* can be measured and collected by the Om7Sense Gateway, when this is not possible then the values will need to be entered manually. The manually entered values then appear in the list on the left side of the page.

### 6.3.1. PUE results

The PUE for the specified days is both listed and displayed graphically. The calculation can only take place when both the *IT data* and *Total data* are available for the specified day, and that both values are real (significantly greater then 0).

# 7. Notifications




## 7.1. Notification View

The Notifications view lists all the Om7Sense internal events, and their severity. These events can also be sent via eMail or syslog if required (see “Settings”). The view is in three vertical parts.

- The left section provides various filter mechanisms to select which notifications are displayed. The Notifications can be filtered depending on their severity, or their state.
- The middle section displays a vertical scrolled list of Notifications. The list will be split into virtual pages, which can be selected by buttons at the bottom of the view.
  - The Notification severity is on the top left of each entry. The entry color will depend on the severity level. A detailled entry will be displayed on the right side if this klicked.
  - The possible Notification states are listed below, and can be changed by using the buttons in the detail section of the view.
  - The associated text for this Notification.
  - The date when this Notification was created.
- The right section is a detailled view of the selected Notification. The selected Notification state can be modified within this view, and also comments can be entered. This information will be stored with the Notification.

**Note:** Backup Notifications include a Link which can be used to directly access the relevant device backup. When this link is klicked, the browser will open a new Tab in which the content of the backup will be displayed. The backup will typically be restored to the device by being copied onto a physical media, e.g. USB-Stick. In this case, the page should be copied with cut-and-paste as a correctly named file on the required media, and then manually restored to the device.

## 7.2. Notification severity

Every Notification is generated with a predefined severity level. This level cannot be changed. The severity for a notification is listed as part of the title. The available severity levels are listed below:

| **severity** | **description** |
|---|---|
| Debug | only in debug mode. Development only |
| Log | very low information only |
| Info | information only |
| Warn | warning level, is not a serious error |
| Error | error level |
| Always | always logged. |

## 7.3. Notification state

Every Notification has a current state. The state is generated in an "open" state, this can be changed for high severity notifications. The available states are listed below:

| **state** | **description** |
|---|---|
| Open | This is the initial state for any newly created Notification. |
| Investigating | This state can be selected by the "investigating" button. |
| Done | This can be selected by the "done" button. |

State changes are also listed in the Notification comment field.

# 8. Rules

## 8.1. Overview

Om7Sense includes a very powerful concept to actively mark events from the devices or *DC items*, e.g. DC, room. via coloring, notifications, email, etc. The is concept is built around *rules*, and these can all be senn and modified on this page.

*Rules* can be created and modified at the data point for which they are defined, or via this page.

*Rules* can be created to match a large number of devices, or specifically for a single port on a named device. *Rules* for a large number of devices will generally be thought of as a *template*, and will be overruled by a more specific matching *rule*. This allows Om7Sense admins to create basic *rules* for all or part of the DC, and then focus on specific *rules* for special cases.

*Rules* are given names to help identify them and their purpose. They always include the following criteria:

- *Critical above:* Value measured greater then this value will cause a *Critical threshold* state to be detected. The device or *DC item* will be marked in red and a notification created.
- *Critical above enabled:* Enable or disable the *Critical above* threshold detection.
- *Warn above:* Value measured greater then this value will cause a warn *threshold* state to be detected. The device or *DC item* will be marked in brown and a notification created.
- *Warn above enabled:* Enable or disable the *Warn above* threshold detection.
- *Warn below:* Value measured below this value will cause a *Warning threshold* state to be detected. The device or *DC item* will be marked in brown and a notification created.
- *Warn below enabled:* Enable or disable the *Warn below* threshold detection.
- *Critical below:* Value measured below this value will cause a critical *threshold* state to be detected. The device or *DC item* will be marked in red and a notification created.
- *Critical below enabled:* Enable or disable the *Critical below* threshold detection.

# 9. Settings view

Only users with the correct authorisation can access the "Settings". The Settings view appeaars when the "Settings" button at the top of the Overview page is clicked. To return to the Overview page, click the Om7Sense icon at the top of the settings page.

The settings page has several tabs which are described below:

## 9.1. General tab

### 9.1.1. General settings

- *Gateway name:* The name that will be displayed as the header for all Om7Sense pages. The name is also used in the notifications, and therefore in the eMails and syslog entries. Click "Apply" to apply the name.
- *Language:* Select the language for Om7Sense. Click "Apply" to apply the new language.
- *Om7Sense Gateway Link target host:* Enter the host name to act as target for the data collected by this Om7Sense gateway. Click "Apply" to apply this target host name.
- *Om7Sense Gateway Link target port:* The default port for the target is 1883. If a non-standard port is required, then it should be entered here. Click "Apply" to apply this non-standard port.
- *Linking key:* Click here to produce a unique key for the link to the target host. The key that is displayed on the screen, should be copied onto the target gateway "Linking" page.
- *Enable remote management: Note: only available when Om7Sense is installed with system privileges, and not running as Docker.* This function is disabled as default. When it is enabled, the Om7Sense gateway will attempt to open a VPN to a Om7Sense server. Om7Sense can then directly access the gateway and assist or update, if required. It is recommended to normally disable this function.

### 9.1.2. System support

- *Current version of Om7Sense Gateway:* Version of the current running Om7Sense. This is in three parts:
  - Major version
  - Minor version
  - Patch version
- *Quick restart Om7Sense Gateway:* This function will restart the Om7Sense without restarting the operating system. The data and parameters are stored over the restart. *Note: This function is not available on all versions of virtual gateway.*
- *Restart the Om7Sense Gateway: Note: only available when Om7Sense is installed with system privileges.* This function will restart the complete

Gateway operating system (Warm restart).

- *Power off Om7Sense Gateway: Note: only available when Om7Sense is installed with system privileges* The complete Gateway will closed down, and the power turned off.
- *System update: Note: only available when Om7Sense is installed with system privileges.* Install system and Om7Sense updates from the management system. The update file will be provided by Om7Sense, and can only be installed on a Om7Sense system. When the "select file" button is clicked, the update file on the local file system must be selected. It will then be uploaded into the Om7Sense gateway. The software will restart, and this can take several seconds. After the update has completed, it will be necessary to login again.
- *Download a copy of the Om7Sense logs: Note: not available on Docker based systems.* In the event of problems during operation of Om7Sense, it could be helpful to have additional information to help the analysis. When this button is clicked then internal log files will collected and uploaded to the *Download directory* on the management system.

#### 9.1.3. Licensing settings

- *License installed:* A demo Om7Sense gateway does not have a license installed, and this allows just one device to be connected. It is possible to install a license at any time to provide support for more devices.
- *is License expired:* Standard licenses normally have no expiration date, but this can be done for demo licenses when requested.
- *License expiration date:* Not normally relevant unless a special demo license is being used.
- *Number of local devices allowed:* Local devices are connected via one of the Ethernet ports. Licenses can be updated to support more local devices.
- *Number of linked devices allowed:* Linked devices are connected to remote source Om7Sense gateways are displayed on this target gateway. Licenses can be updated to support more linked devices.

### 9.2. Linking tab

When this Om7Sense gateway is to be used as a target, then the "Linking keys" from the sources entered into this list.

### 9.3. Firmware tab

*To be provided.*

### 9.4. Network tab (not available for Docker based system)

The configuration of the ETH0 is done here. Any changes need to be committed by clicking the "Apply" button.

**Note: there is always emergency access to the Om7Sense gateway, on a pre-installed version, via ETH1, ETH2 or ETH3 as described in the installation section.**

- *IP Configuration:* The default setup is that ETH0 runs as a DHCP client, accepting the IP address from a DHCP server via the ETH0. ETH0 can however be set to run on a static IP address and then the "IP Address", "Subnet Mask", "Gateway Address" and "DNS Server" will need to be correctly set. These fields are not used in DHCP mode.

## 9.5. PUE items tab

The PUE (Power usage effectiveness) is calculated based on the ration of the *total power* to the power measured by the IT equipment *IT power*. The IT equipment are normally connected to PDU output ports, so the ports can be selected and the *IT power* collected directly. This is often not so easy for the *total power* as it not always measured online, and might need to be mannually entered.

All PDU with measurable output ports are listed on this page and can be selected or deselected. The following options are possible both as defaults for all ports or for individual ones.

- *Not set:* When new PDUs are added to the configuration, they will be inserted with this status, and will not be included in either *IT* or *Total* power. It provides a simple way to indicate to the admin that the ports should be configured.
- *Ignore:* The measured power from this port will not be used during the PUE calculation.
- *Total:* The measured power from this port will be added to the *Total power* and used in the PUE calculation.
- *IT:* The measured power from this port will be added to the *IT power* and used in the PUE calculation.

## 9.6. Web Access tab

Access to Om7Sense is always via a HTTP, or HTTPS connection from a browser. The default setup permits unsecure HTTP and also secure HTTPS connections. The default certificate suppled with the Om7Sense is not signed by a registered Certification Authority (CA) and will therefore not be possible to access by some browsers. This certificate can however be replaced by a user defined certificate and key.

- *Automatic Logout:* The session timeout in minutes is set here. When the session exceeds this timeout without user entry, then Om7Sense will log the user out and return to the login page.

- *Web Server encryption:* This drop down field has the following options:

- *Non-secure Web Server:* When this is disable, the port 80 access (unsecure) will be blocked and redirected to the HTTPS (port 443). This effectively removes the possibility to access Om7Sense via an unsecured connection.

- *Encryption certificate & key:* A file containing a valid certificate with its private key can be pasted into this field - this is normally a PEM file. The file must contain both the certificate and the private key are necessary to provide a secure TLS connection. Both parts should be concatenated into one file. If the certificate is invalid or the key is missing, then Om7Sense will return to using the default unsigned factory certificate. Om7Sense will need to be restarted before the new certificate will be used.

**Note: Web browsers are very security sensitive and not allow connections to Certificate Authorities (CA). To be able to use HTTPS in a reliable way, it is necessary to certify your key pair by a registered CA.**

**Note: Certificates have a maximum lifetime. When the certificate expiry date is reached the HTTPS connection will stop working, and no more secure access is possible. At the next Om7Sense restart the standard HTTP setting will be used, and the certificated can be replaced.**

- *Optional password for key:* If the private key is protected with a password, then this must be entered here.

## 9.7. Connections tab

New devices can be added or deleted into the ative Om7Sense configuration using this page. Single devices can be added or deleted manually, when muliple devices need to be added then the import mechanism is probably the optimum method. The device information should then be entered into CSV- oe Excel-file. This file is then read into Om7Sense Gateway.

### 9.7.1. Add new connection

This page provides a means to manually insert a supported device that will be accessed via ETH0. The currently entered devices are listed on the left with their current status. Devices can be deleted from this list and will then appear "grayed" on the overview page. They will only disappear completely after restarting Om7Sense.

To add a new device, the button *Add new connection* must be clicked and the data for the new device entered on the right side of the page. It is important to first select the correct device type, so that the correct additional fields can then be entered. After completion press *Apply*. The Om7Sense gateway will attempt to access the device, which can take several seconds before it goes into a "running" state.

*note: please note that SNMP devices will only respond to an SNMP request from Om7Sense when the read community is correct. For this reason, there will not be a Om7Sense error notification when a new SNMP device with wrong community is entered.*

*note: devices that Om7Sense connects using a Web based protocol (e.g. Exconnex) typically only allow one user to logged in from the same account. For this reason, it is probably advisable to create an additional web user with full admin access just for Om7Sense.*

### 9.7.2. Import connections from Excel or CSV

Multiple devices can be simply imported via a copy of the Excel template file available from the import page. The template includes two sheets. The first one will be used for the device data and is called "DE", the second sheet has hints on how the data should be entered. It is called "Ausfüllhinweise".

It is strongly recommended to enter you data in a copy of the template file, as it contains macros to assist with the data entry.

The columns in the "DE" Sheet are listed below:

- *IP-Adresse/Hostname:* The address or hostname of the remote PDU that should be added. This data is necessary, even if the device is not yet online at the address.
- *Gerätename:* The Om7Sense device name that will displayed for this device. Om7Sense will write this name out to the remote device (on supported devices).
- *Eindeutige ID:* This unique identification is used to identify this import entry. All entries in all import files must be unique and cannot be modified. It allows modifications to be made to existing imported device data. This identification is only used for the importing process, and is not available anywhere else in Om7Sense.
- *SNMP Community read:* Only needed for devices connected via the SNMP protocoll, otherwise leave empty. Selecting the correct hersteller will color this cell to show if entry is required, or not.
- *SNMP Comunity write:* Only needed for devices connected via the SNMP protocoll. The Write Community, is used to switch ports, change names, etc. Selecting the correct hersteller will color this cell to show if entry is required, or not.
- *Benutzername:* Required on non-SNMP devices, that require authentication. User name. e.g. Raritan. Selecting the correct hersteller will color this cell to show if entry is required, or not.
- *Kennwort:* Required on non-SNMP devices that require authentication. This Password is case sensitive. Selecting the correct hersteller will color this cell to show if entry is required, or not.
- *Model:* This field is provided to help the user to organize data entry. It is not used within Om7Sense, which detects automatically the active model type.

- *Hersteller:* This drop-down field must completed. Only one of the available conents may be used. Depending on which manufacturer is selected, some input fields will be colored to make them available.
- *Rechenzentrum:* This DataCenter field should be completed if the device should automatically be included.
- *Raum:* This Room field should be completed if the device should automatically be included.
- *Reihe:* This Row field should be completed if the device should automatically be included.
- *Rack:* This Rack field should be completed if the device should automatically be included.

## 9.8. SQL tab

The Remote SQL Server function is normally disabled, but when this is enabled raw data will exported to an external SQL server. The SQL schema that should be installed on the remote server is available from Om7Sense. The customer is responsible for data security on the remote SQL server. Any changes need to be committed by clicking the "Apply" button.

## 9.9. Syslog tab

The Om7Sense gateway can export any notifications to an external syslog server. The external server should confirm to the RFC 5424 standard. This function disabled as default, and will need to be activated with the "Activate" button. Any changes need to be committed by clicking the "Apply" button.

- *Server Address:* The TCP IP name or address of the target syslog server. The connection must be possible via ETH0.
- *Server Port:* If the remote syslog server is using the standard port number, then this field can be left at 0 otherwise enter the number.
- *Facility:* The remote system manager can specify under which facility the syslog entries from this Om7Sense appear.
- *Minimum Severity Level:* Select which notifications are exported. Notification messages have a severity level, and this can be used to filter which ones are exported.

## 9.10. SNMP Agent tab

This function is disabled as default, but can be enabled and then provides an agent that a remote SNMP manager can poll for device data. Port 161 is used for this function, as the SNMP devices are using the standard SNMP port. The MIB for this agent is available from Om7Sense Data from all connected devices is then included in the exported SNMP data, replacing the original manufacturer MIBs. Any changes need to be committed by clicking the "Apply" button.

## 9.11. Email tab

The Om7Sense gateway can send notifications by Email to a specified user via an external Email server. This function is disabled as default, but can be enabled. To minimize the number of Emails sent out, a "Delay Timer" can be defined to collect multiple notifications and send them in one Email. High severity level notifications can, however, be set to be sent immediately. Any changes need to be committed by clicking the "Apply" button.

## 9.12. Device backup

Some PDUs provide a mechanism to dump their configuration to a remote system. This dumped data (typically called a "backup") can then be played back into the same or an equivalent PDU to restore its configuration state. Om7Sense can currently provide this service with the Raritan PDU products, and will roll it out to other Products as the functionality becomes available.

When this function is enabled, then all products that support it will be polled for a backup at the requested interval. The backup will then be logged as a notification. A "link" in the notification text allows the backup contents to be simply copied onto the user system. This data should then be used to physically restore the PDU (typically via a USB stick).

## 9.13. Users tab

The default passwords for the six standard users were listed in the "Operation" section. The Om7Sense passwords for these users can be changed using this page.

The users allow specific access to the devices or ports:

- *Admin:* This user has read and write access to any Om7Sense device or port.
- *Settings:* This user can read any data from any device or port, and can also write new data to any device, or port - other than the switch ports.
- *Power:* This user can read any data from any device or port, and can also switch outlet ports.
- *Monitor:* This user has only read access to all devices and ports. The user cannot change any parameters, or switch any ports.
- *Switchon:* This user can read any data from any device or port, and can also switch outlet ports on.
- *Switchoff:* This user can read any data from any device or port, and can also switch outlet ports off.

# 10. Revisions

## 10.1. 3.0 2019-10-31

## 10.2. 4.0 2019-12-01

Additions: *Added section "DC view"* Added section "Rules"

## 10.3. 4.1 2019-02-05

- Added german translation