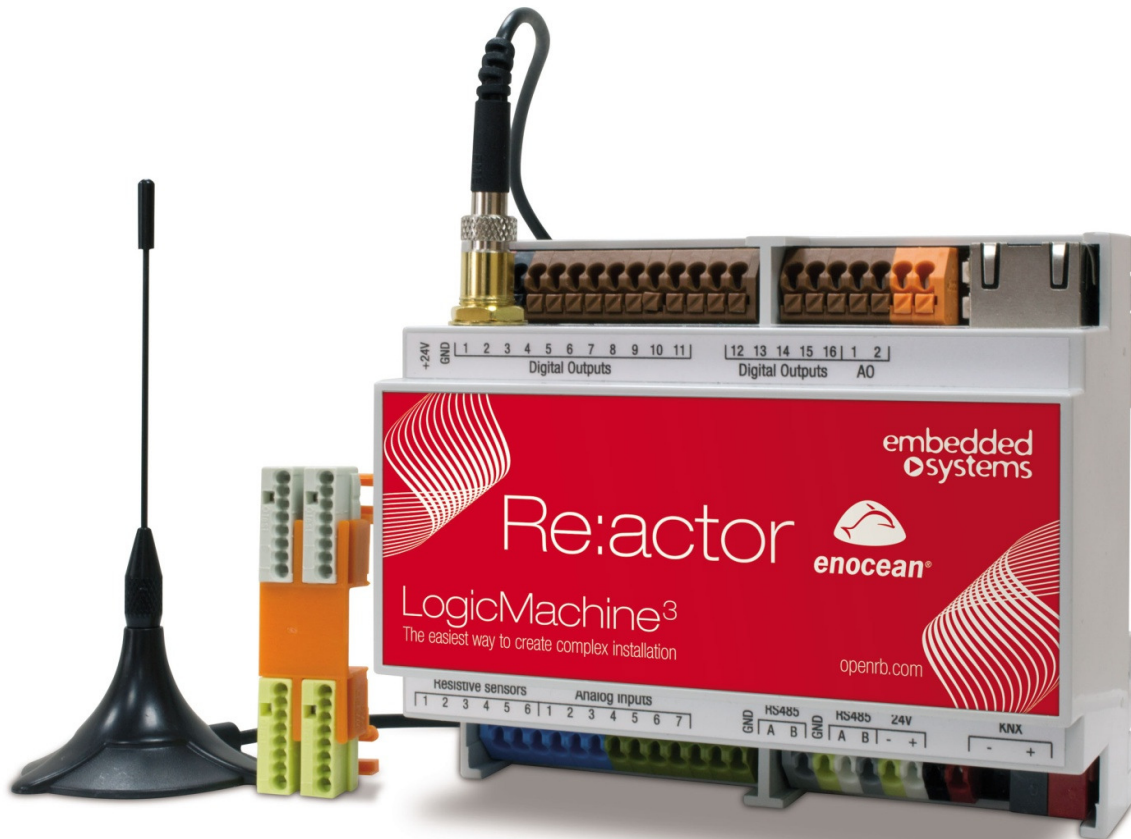


LogicMachine3 Re:actor

Product Manual



Document Issue 1.0
June, 2013

Technical Support:
support@openrb.com

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Introduction

Logic Machine is your easiest way to program complex logic in KNX/EIB, Modbus, BACnet, EnOcean networks. The Logic Machine will enable you to efficiently customize building automation processes, easily delivering unlimited flexibility benefit to end users in a cost-effective way.

Logic Machine is an embedded platform with integrated TPUART, Ethernet, USB interfaces. Logic Machine allows to use it as IP Router, cross-standard gateway, logic engine, visualization WEB SCADA server. Scripting templates provides user-friendly, flexible configuration interface. Via applying custom scripts the Logic Machine can simultaneously act as thermostat, security panel, lighting controller, etc

Technical support

Any faulty devices should be returned to Embedded Systems.

If there are any further technical questions concerning the product please contact our support, available Mon-Fri 9:00 – 17:00 GMT +02:00. Please write to support@openrb.com.

Firmware updates are available at www.openrb.com



Caution Security advice

The installation and assembly of electrical equipment may only be performed by skilled electrician. The devices must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with application that can result danger of people, animals or real value

Mounting advice

The devices are supplied in operational status. The cables connections included can be clamped to the housing if required.

Electrical connection

The devices are constructed for the operation of protective low voltage (SELV). Grounding of device is not needed. When switching the power supply on or off, power surges must be avoided.

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Device specification

Application

Logical functions; WEB SCADA visualization for PC and touch-devices; cross-standard gateway between KNXnet/IP, Modbus TCP/IP, Modbus RTU, BACnet MS/TP, BACnet IP, EnOcean, HDL, GSM and other protocols; integration with third party devices over RS232 or RS485 serial ports – DALI, AV, IR; Data logger with trends; HVAC

Types of product

Re:actor LM3-REACTOR

Standards and norms compliance

CE conformity: EMBS-CE-111231/01

EMC: EN61000-6-1

EN61000-6-3

PCT Certificate

Technical data:

Power supply: 7-36V DC

Power consumption: 1.5W

Interface:	EnOcean 868MHz	1
	10BaseT/100BaseTX	1
	RS485	2
	USB2.0	1
	TPUART2	KNX/EIB compatible
	Digital output	16 (380 mA continues current on output). Optoislated from KNX/EIB bus. Additional 24V power source is supported.
	Resistive sensor inputs	6 (PT100, PT1000, 0 Ω...20M Ω)
	Analog/binary inputs	7 (0-30V with configurable threshold voltage, 12bit resolution)
	Analog outputs	2 (0-10V, 12bit resolution, 20mA max current)
	Connections:	
	KNX bus:	Bus Connection Terminal
		0.8mm ²
	Power supply:	Clamp, 1.5mm ²

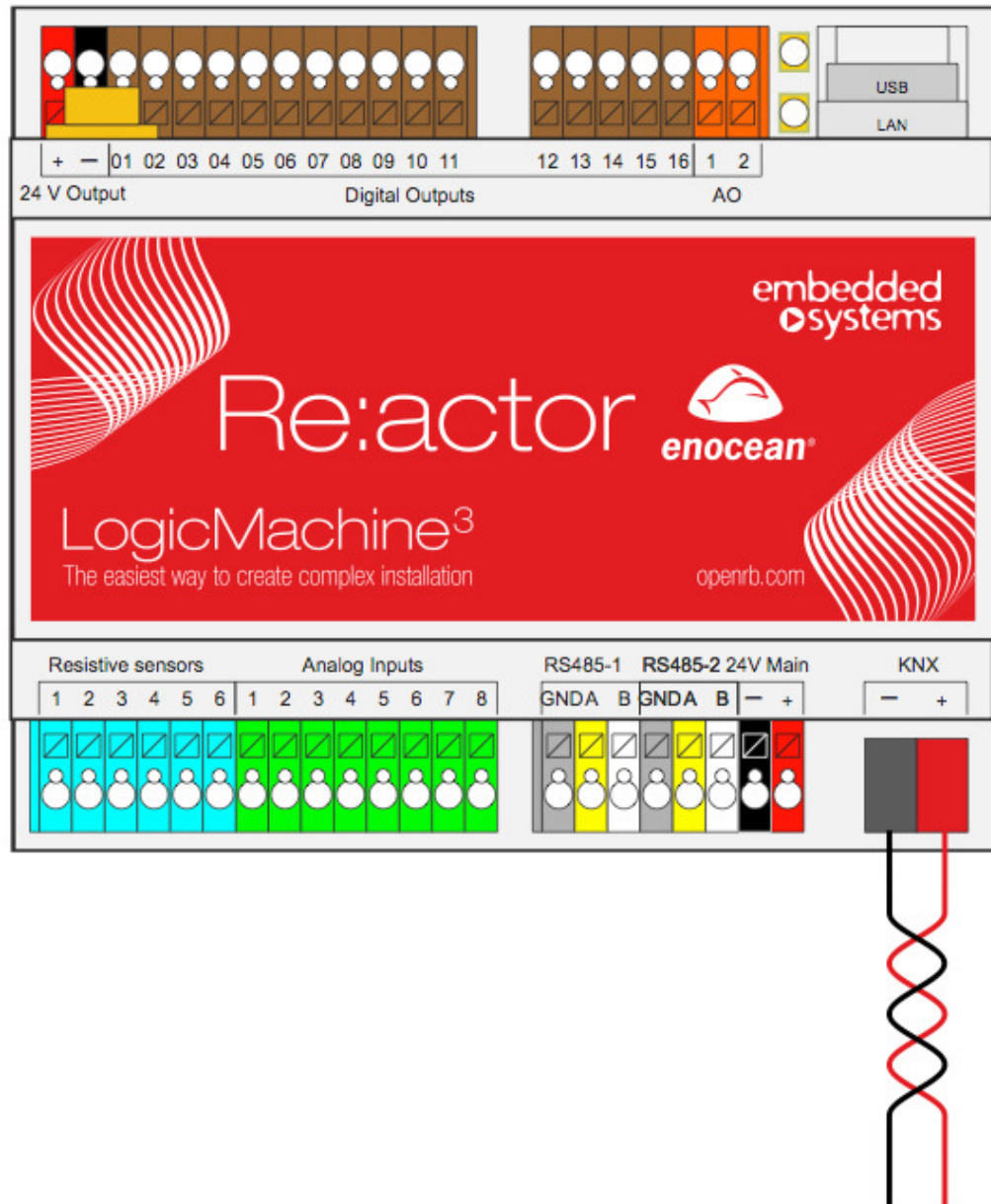
	Serial:	Clam, 1.5mm2
	IO:	Clam, 1.5mm2
Operating elements	LED	1 – CPU load 1 - Activity
Enclosure:	Material:	Polyamide
	Color:	Gray
	Dimensions:	104(W)x90(H)x51(L) mm
Usage temperature:	-5C ... +45C	
Storage temperature:	-25C ... +55C	
Weight:	150g	
Warranty:	2 years	
Warranty:	2 years	

LogicMachine3 Re:actor kit contains:

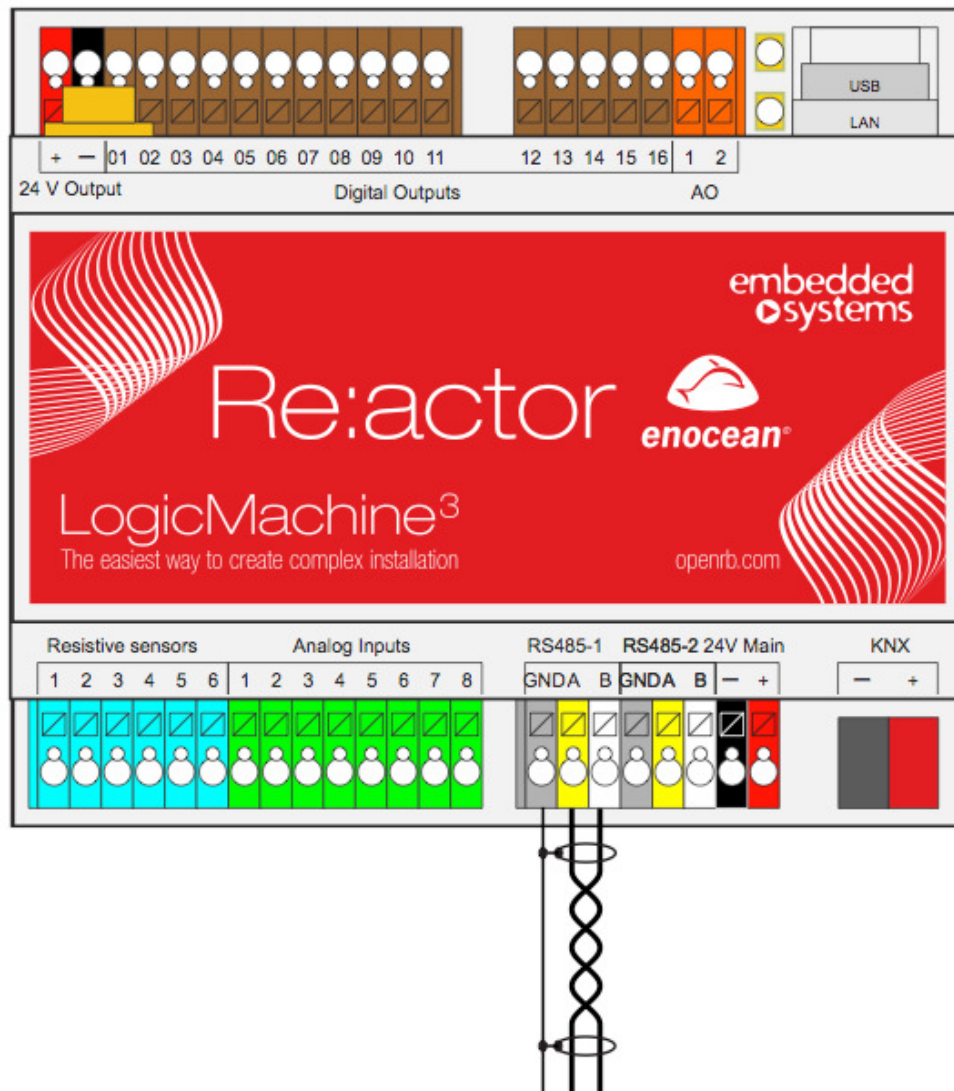
- Embedded board with preinstalled software
- Plastic DIN-rail case
- 868MHz antenna
- 4 x 8pin extension connectors

Terminal connection schemes

KNX TP



RS485

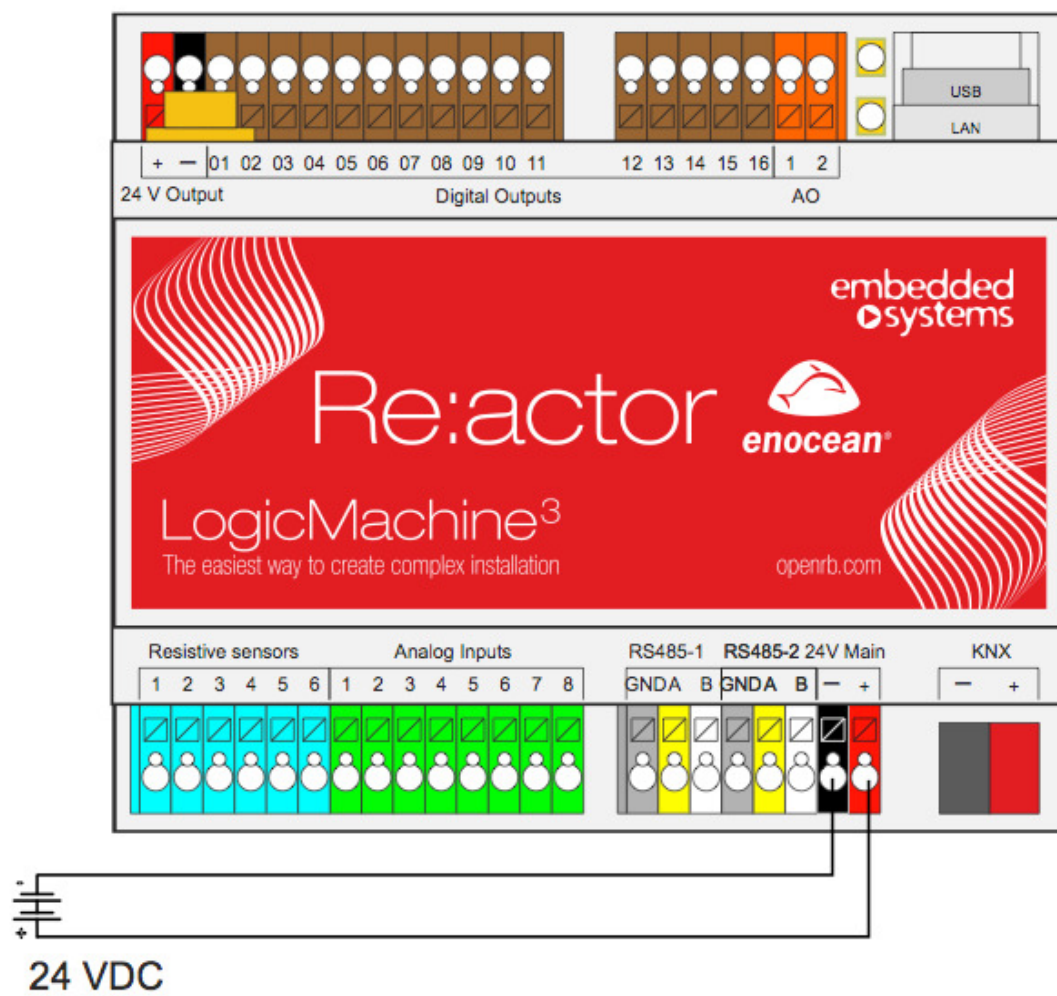


The EIA-485 differential line consists of two pins:

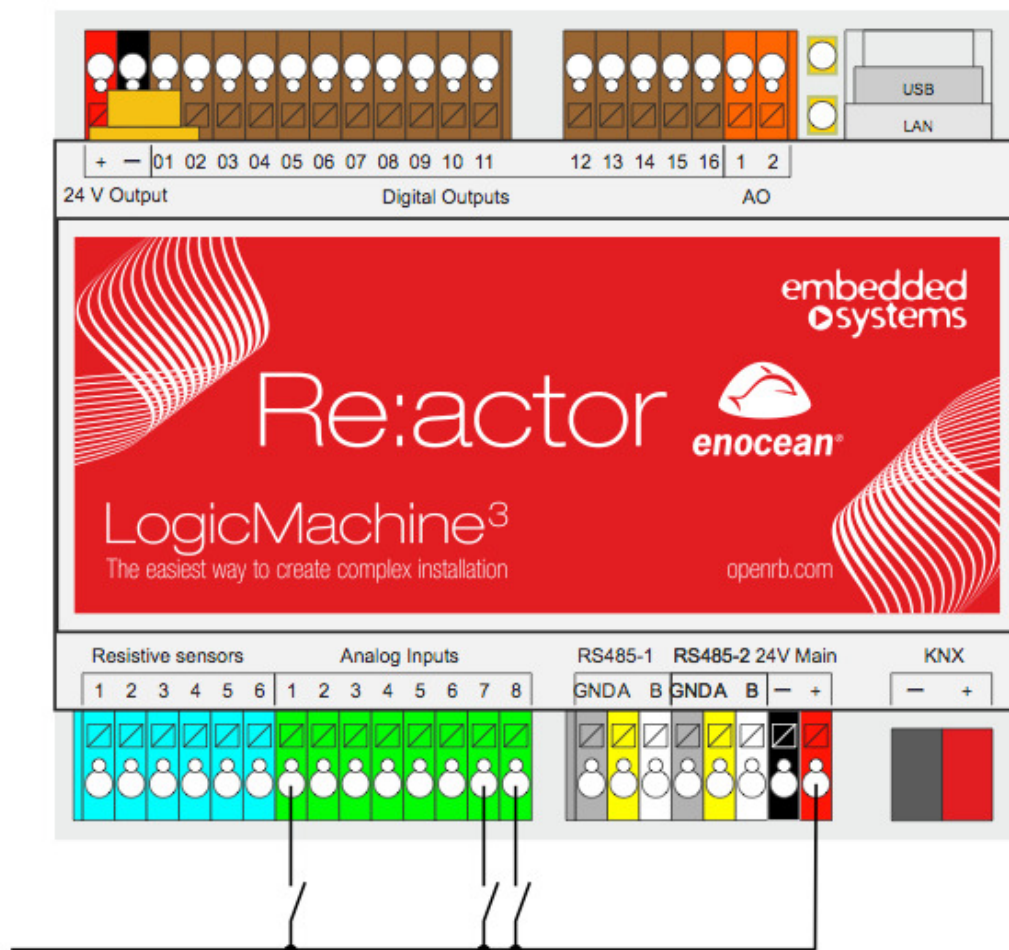
A aka '-' aka TxD-/RxD- aka inverting pin

B aka '+' aka TxD+/RxD+ aka non-inverting pin

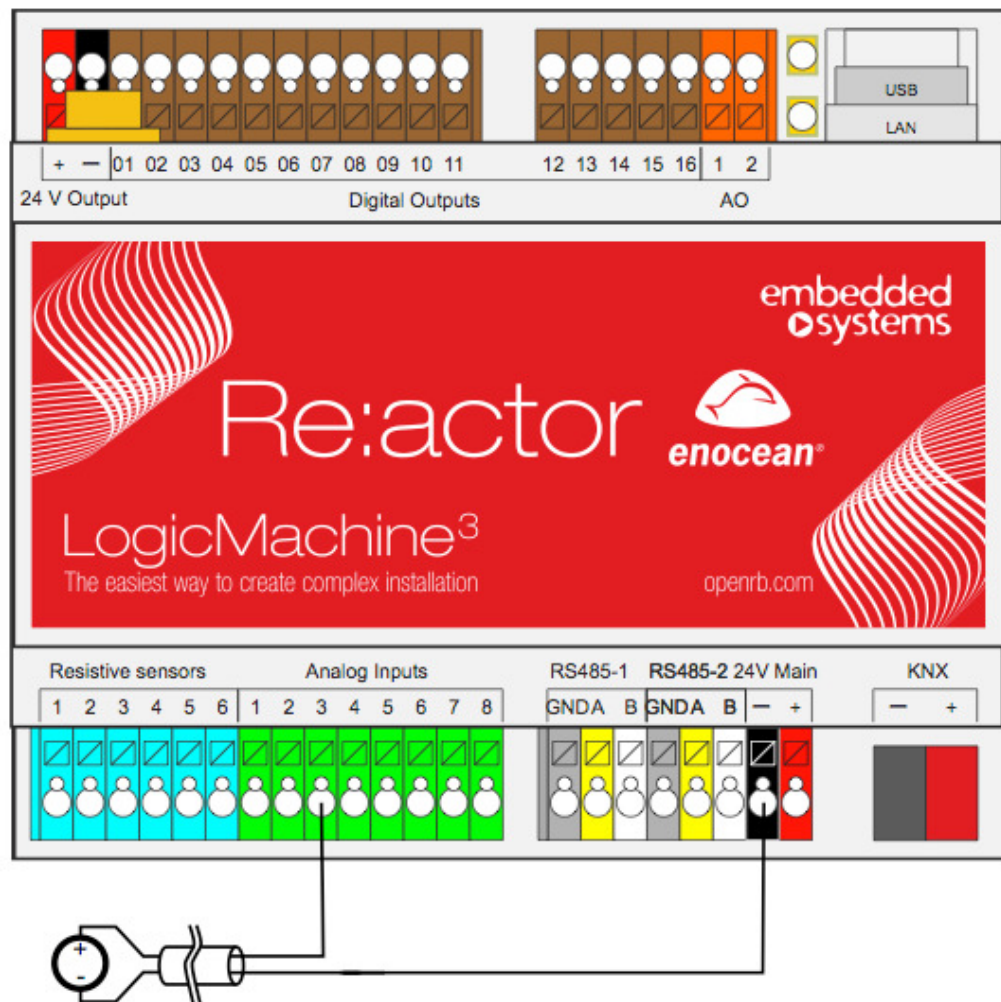
24V power supply



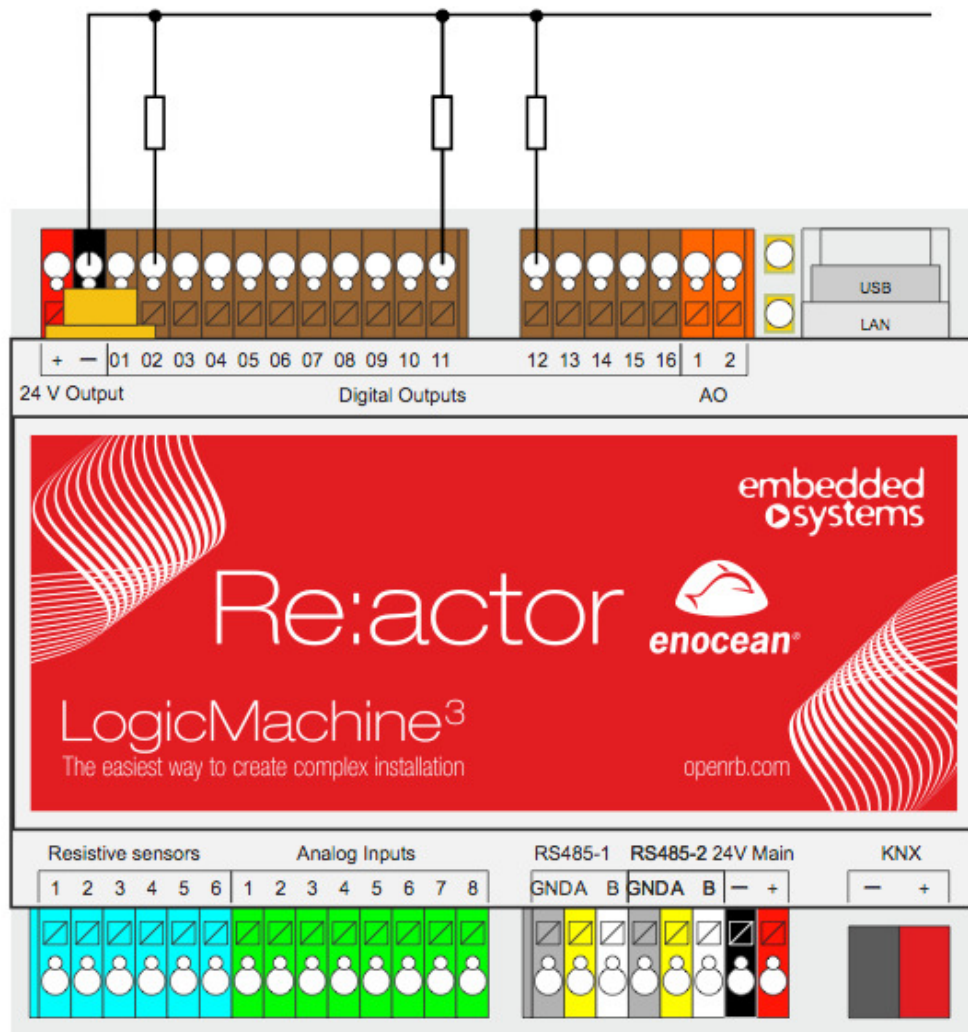
Analog inputs (e.g. reed contact)



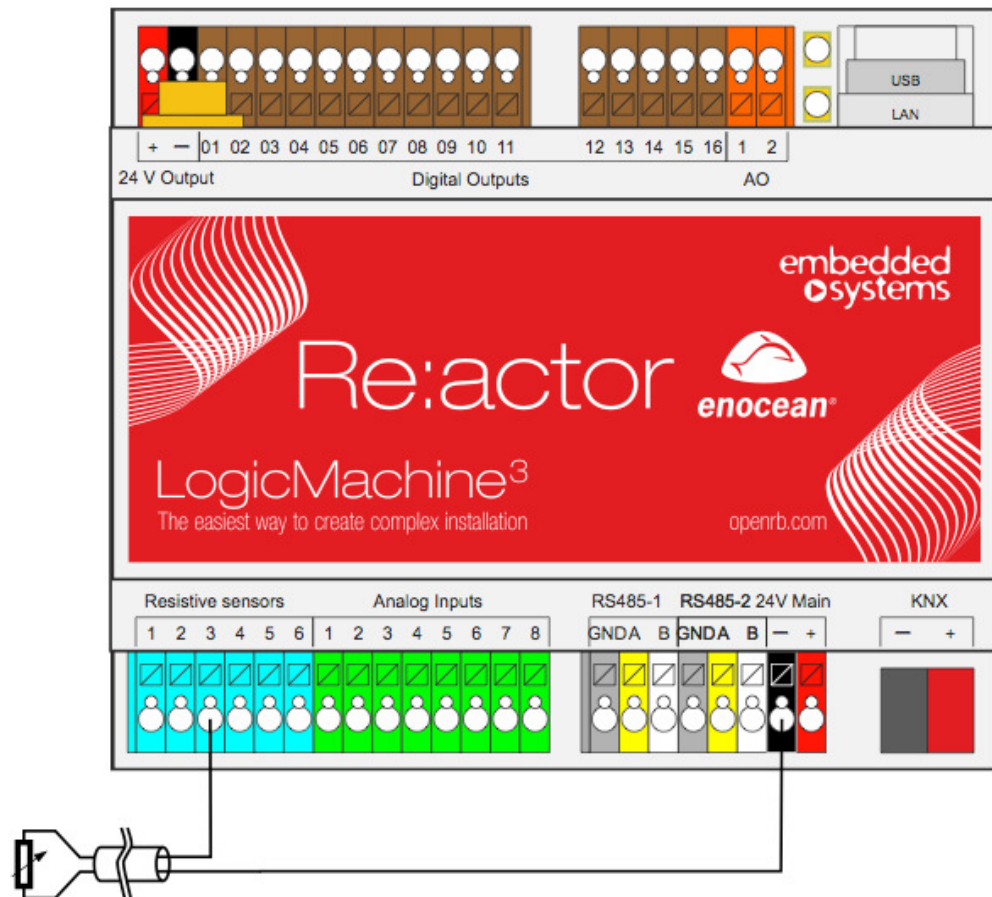
Analog inputs, 0-10V



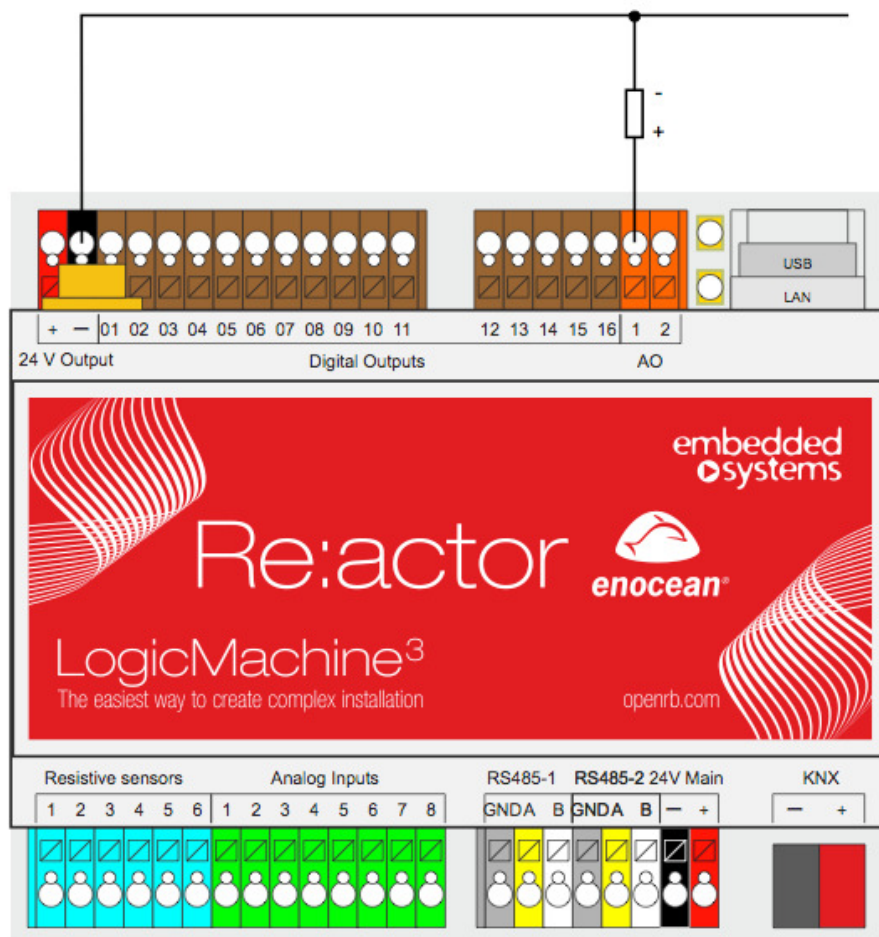
Digital output



Resistive sensor input



Analog output



Factory default, discover IP

There is a reset button on the side of Logic Machine 2. You can either reboot the device by pressing this button or reset the configuration to factory defaults:

- *Press and hold for <10 sec* – reboot the device
- *Press and hold for >10 sec* – reset networking with IP to factory default
- *Press and hold for >10 sec and again press and hold for >10 sec* – full reset of configuration to factory defaults

There is also another possibility to discover IP address – LM3 has built-in zeroconf utility by default, so using the following applications you can find out the IP:

- Windows PC – *ServiceBrowser*
- Linux PC – *Avahi*
- Android – *ZeroConf Browser*
- iOS – *Discovery*

For more info please see here: <http://openrb.com/discover-ip-of-logic-machine-or-streaming-player/>

Standards supported



Logic Machine is compatible with the following standards:

- KNX/EIB TP, KNXnet/IP
- Modbus TCP, Modbus RTU
- BACnet IP, BACnet MS/TP (in development)
- GSM (Huawei E173 and similar modem support through USB) for sending SMS notifications and controlling the installation by receiving SMS commands.
- EnOcean (built-in bi-directional transceiver)
- DMX (in the box, through RS485)
- DALI (support is done over RS485 by using external RS485-DALI interface)
- Ekey biometrical access systems (RS485)
- HVAC systems can be controller through RS232 interface by using scripting
- SMTP/Email, SSL
- SIP (works as PBX for controlling calls, in development)
- XML (export object values, alerts or errors)
- RSS (read Error or Alert tab content)
- JSON, XMPP
- ..

The system is made so that each of the standards can be used with each other, so Logic Machine can act as BACnet to EnOcean gateway or Modbus to GSM etc.

Quick startup guide

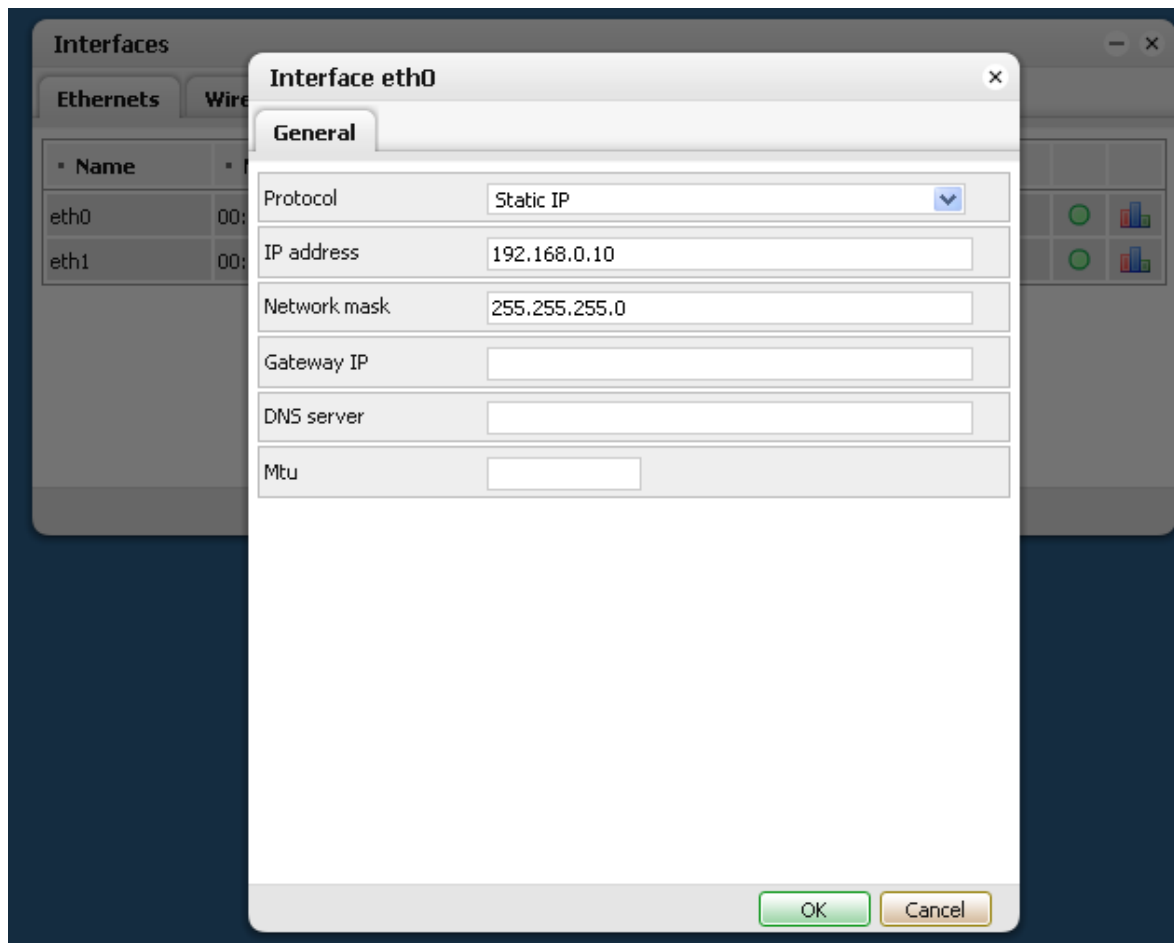
- 1) Mount the device on DIN rail
- 2) Connect the KNX bus cable
- 3) Connect 24V power supply to the device (red pole to 24V+, grey pole to *GND*)
- 4) Connect Ethernet cable coming from the PC

Default IP configuration

<i>Logic Machine/Network Configuration</i> Login name	admin
<i>Logic Machine/Network Configuration</i> Password	admin
<i>User mode visualization/Touch visualization</i> Login name	Read-only: visview Write: viscontrol Write + admin level: visadmin
<i>User mode visualization/Touch visualization</i> Password	Read-only: visview Write: viscontrol Write + admin level: visadmin
IP address on LAN	192.168.0.10
Networks mask on LAN	255.255.255.0

Change IP settings

In *Network* → *Interfaces* window click on the specific interface to change the IP settings.



- **Protocol**– specific protocol used for addressing
 - **Static IP** – static IP address. By default 192.168.0.10
 - **DHCP** – use DHCP protocol to get IP configuration.
 - **Current IP**– the IP address got from DHCP server. This field appears only if the IP address is given otherwise it's hidden.
- **Network mask** – network mask. By default 255.255.255.0 (/24)
- **Gateway IP** – gateway IP address
- **DNS server** – DNS server IP address
- **MTU**– maximum transmission unit, the largest size of the packet which could be passed in the communication protocol. By default 1500

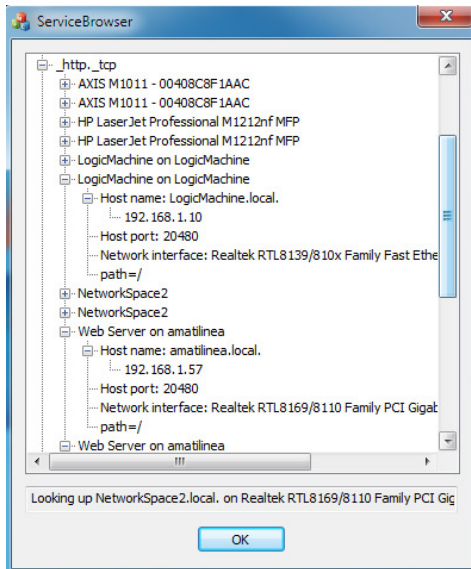
When changes are done, the following icon appears in the top-right corner. This should be applied changes to take effect.



Discover Logic Machine IP address

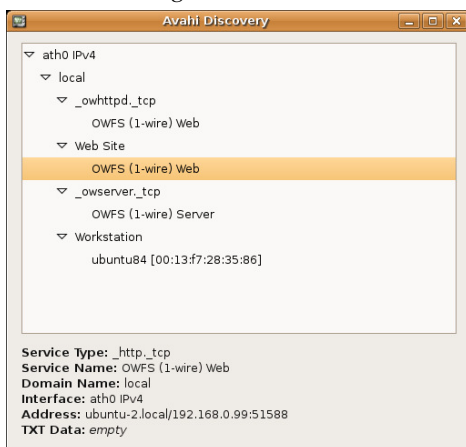
Windows PC

Easiest way is by using the utility **ServiceBrowser** which can be downloaded here:
<http://marknelson.us/2011/10/25/dns-service-discovery-on-windows/>



Linux PC

The utility called **Avahi**, can be downloaded here:
www.avahi.org



Android

The freely available app called **ZeroConf Browser**, can be downloaded in *Play Store*:
<https://play.google.com/store/apps/details?id=com.grokkt.android.bonjour&hl=en>





iOS/Mac OS

The freely available app called **Discovery**, can be downloaded in *App Store*:

<https://itunes.apple.com/en/app/discovery-bonjour-browser/id305441017?mt=8>



For iPad install the iPhone/iPod version of the utility.



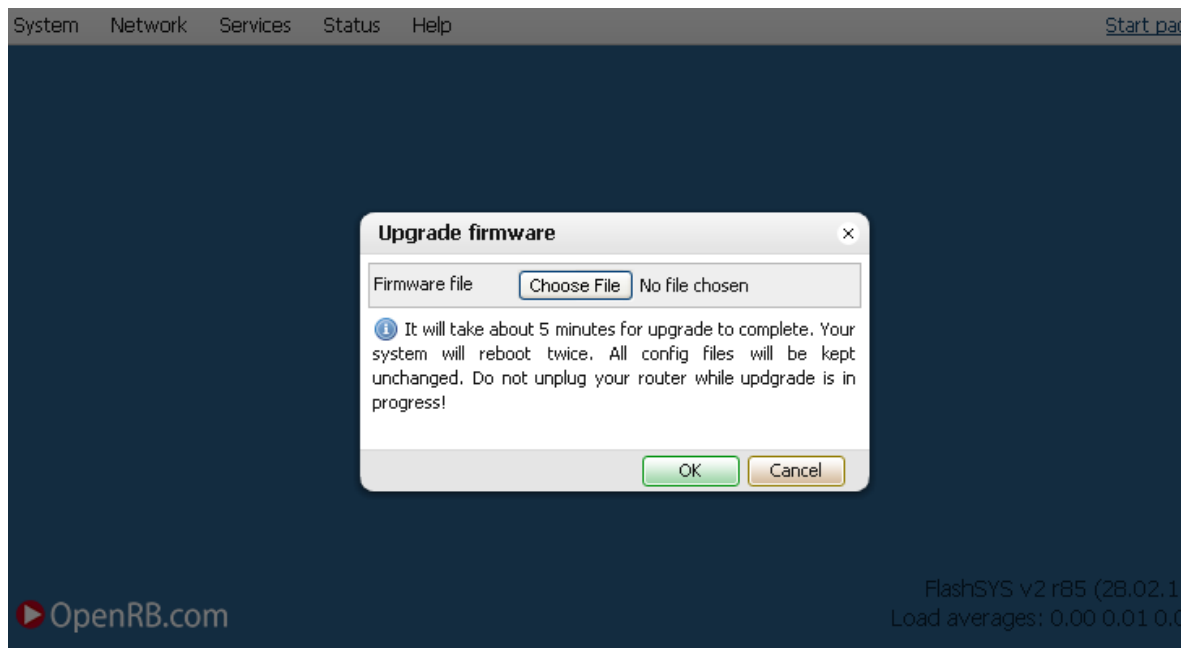
Firmware upgrade

Note! Before each upgrade please backup your visualization, scripts and object in *Logic Machine* → *Tools* → *Backup*, as the database is cleaned during the upgrade.

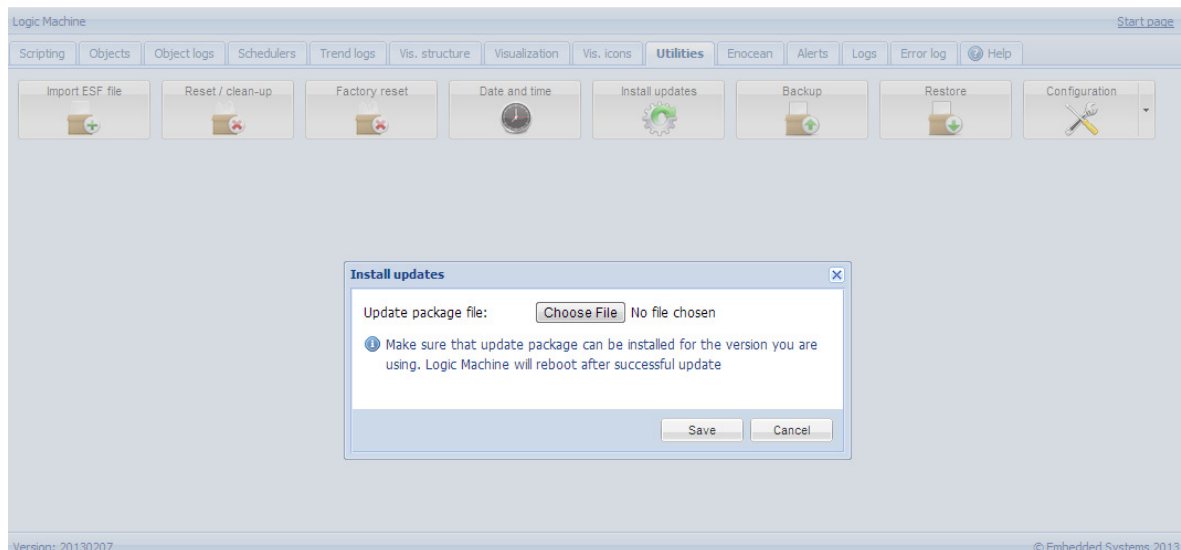
Note! After each upgrade, we strongly recommend to clean your browser cache.

Use web browser to perform upgrade of the software of Logic Machine. Firmwares are available in a form of images and could be downloaded from support page of www.openrb.com.

Complete system upgrade can be done in *Network Configuration* → *System* → *Upgrade firmware*



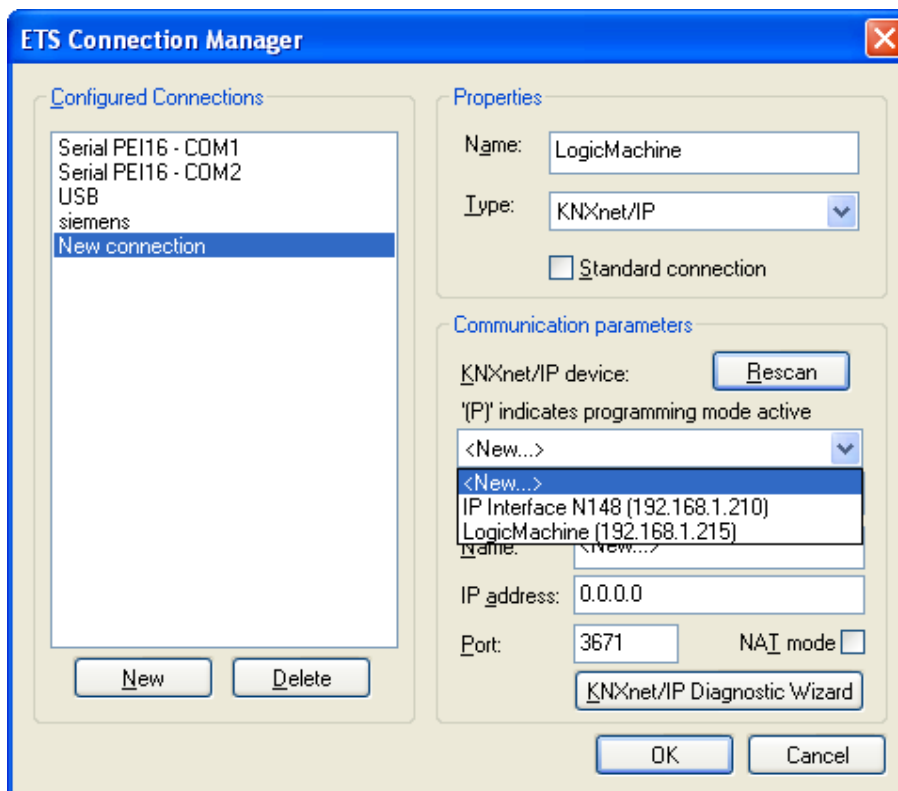
Logic Machine visualization upgrade can be done in *Utilities* tab and press on *Install updates* icon. After *.LMU file is chosen from the corresponding location press *Save* button. The device will be rebooted after 5 seconds and new firmware will be installed.



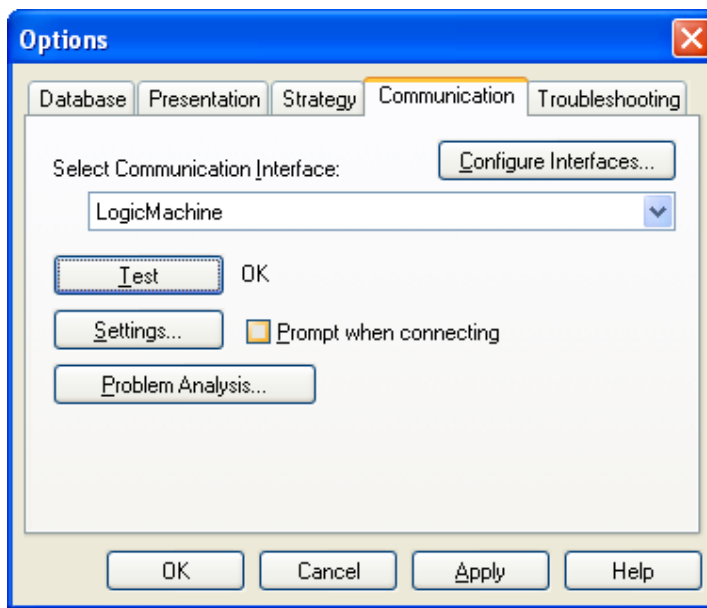
Logic Machine for KNX/EIB network configuration management with ETS

To use Logic Machine with KNXnet/IP functionality and program other KNX bus devices, the device should be added into *ETS Connection Manager*.

- Go to *Extras* → *Options* → *Communication* → *Configure interfaces*



- Put some freely chosen *Name* for the connection
- Chose *Type = KNXnet/IP*
- Press **Rescan** button and then choose from the drop down menu found Logic Machine
- Press **OK**
- Back in *Options* → *Communication* window select newly created interface as **Communication Interface** from the drop-down menu.
- To test the communication with ETS, press **Test** button.



- Make sure that bus status is Online – press  button in ETS.

KNX and IP Router settings

KNX specific configuration is located in *Network configuration* → *Network* → *KNX connection* window.

KNX connection

General SRC filter DST group filter DST indiv. filter Secure tunnel

Mode: TP-UART

ACK all group telegrams: ☐

KNX address: 15.15.255

KNX IP features: ☒

Multicast IP: 224.0.23.12

Multicast TTL: 1

Multicast interface: eth0

Maximum telegrams in queue: 100

OK Cancel

General tab

- **Mode** [*TP-UART / EIBnet IP Tunneling / EIBnet IP Tunneling(NAT mode) / EIBnet IP Routing*] – KNX connection mode. LogicMachine3 Re:actor has TPUART interface by default built-in. **Note!** If there is no KNX TP connected to the device, it will automatically offer to switch to KNXnet/IP qmode.
- **ACK all group telegrams** – acknowledge receipt of telegram to all group communication
- **Parameter**–KNX corresponding interface in OS of the system
- **KNX address** – KNX physical address of the device
- **KNX IP features** – Use this device with KNX IP features e.g. for KNXnet/IP network configuration
- **Multicast interface** – multicast interface to use when sending KNX telegrams to other KNX networks over TCP/IP
- **Multicast IP** – multicast IP address
- **Maximum telegrams in queue** – count of maximum telegrams in the queue

Source filter tab

The screenshot shows the 'KNX connection' dialog box with the 'SRC filter' tab selected. The dialog has five tabs: 'General', 'SRC filter', 'DST group filter', 'DST indiv. filter', and 'Secure tunnel'. In the 'SRC filter' tab, there is a 'SRC policy' dropdown menu currently set to 'No filter'. Below this is an 'Address list' section with a large empty text area for entering addresses. At the bottom of the dialog, there is an information icon and a note: 'One individual / group address per line. Use * (e.g. 1.1.* or 1/1/*) to filter all addresses in the given line. Note: KNX IP features are required for filter to work'. At the very bottom are 'OK' and 'Cancel' buttons.

- **SRC policy** [*No filter / Accept selected individual addresses / Drop selected individual addresses*]- policy to apply to the list of source addresses
- **Address list** – list of individual or group addresses. One address per line. Use * (e.g. 1.1.* or 1/1/*) to filter all addresses in the given line. **Note!** *KNX IP features* should be on for filter to work

Destination group filter tab

- **DST group filter** [*No filter / Accept selected individual addresses / Drop selected individual addresses*]- policy to apply to the list of destination group addresses
- **Address list** – list of group addresses. One address per line. Use * (e.g. 1/1/*) to filter all addresses in the given line. **Note!** *KNX IP features* should be on for filter to work

KNX connection

General SRC filter **DST group filter** DST indiv. filter Secure tunnel

DST group filter No filter

Address list

One individual / group address per line. Use * (e.g. 1.1.* or 1/1/*) to filter all addresses in the given line.
Note: KNX IP features are required for filter to work

OK Cancel

Destination individual filter tab

KNX connection

General SRC filter DST group filter **DST indiv. filter** Secure tunnel

DST indiv. filter No filter

Address list

One individual / group address per line. Use * (e.g. 1.1.* or 1/1/*) to filter all addresses in the given line.
Note: KNX IP features are required for filter to work

OK Cancel

- **DST indiv. filter** [No filter / Accept selected individual addresses / Drop selected individual addresses] – policy to apply to the list of destination addresses
- **Address list** – list of individual addresses. One address per line. Use * (e.g. 1.1.*) to filter all addresses in the given line. **Note!** *KNX IP features* should be on for filter to work

Secure tunnel tab

You can make a secure tunnel between two KNX networks. In comparison with standard tunnels, which use UDP protocol, this tunneling uses TCP what makes it very reliable thanks to package delivery acknowledgement. This ensures that sender always knows if the package is delivered to the recipient.

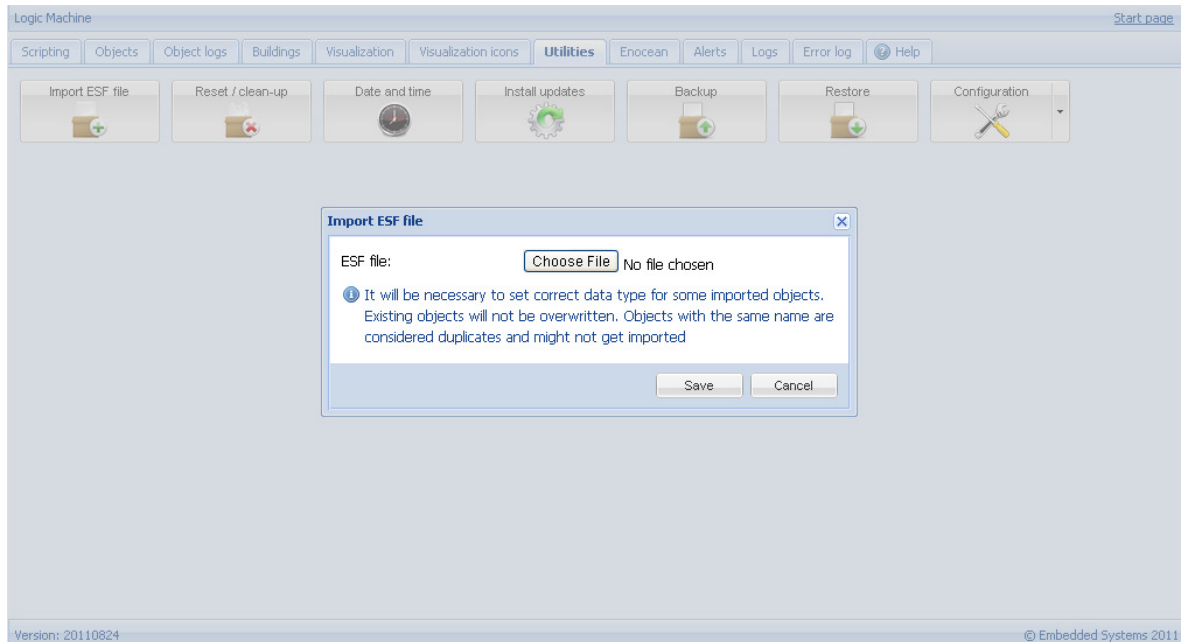
The screenshot shows a dialog box titled "KNX connection" with a close button (X) in the top right corner. It has five tabs: "General", "SRC filter", "DST group filter", "DST indiv. filter", and "Secure tunnel". The "Secure tunnel" tab is selected. Below the tabs are five input fields: "Secure tunnel" (a dropdown menu currently showing "Client"), "Server IP", "Local IP", "Network mask", and "Password". Below these fields is an information icon (i) followed by text: "Secure tunnel creates an encrypted network between several KNX nodes." Below this are four lines of explanatory text: "Password must match for every node in a single network.", "Local IP - IP address of the node on the secure tunnel network.", "Server IP - real IP address of the server node.", and "Local IP and Server IP must be on different subnetworks." At the bottom right of the dialog are "OK" and "Cancel" buttons.

- **Secure tunnel** [Disabled / Client / Server] – secure tunnel mode
- **Server IP** – in case of secure client, server IP should be specified here
- **Local IP**– local IP address
- **Network mask** – network mask
- **Password**– password

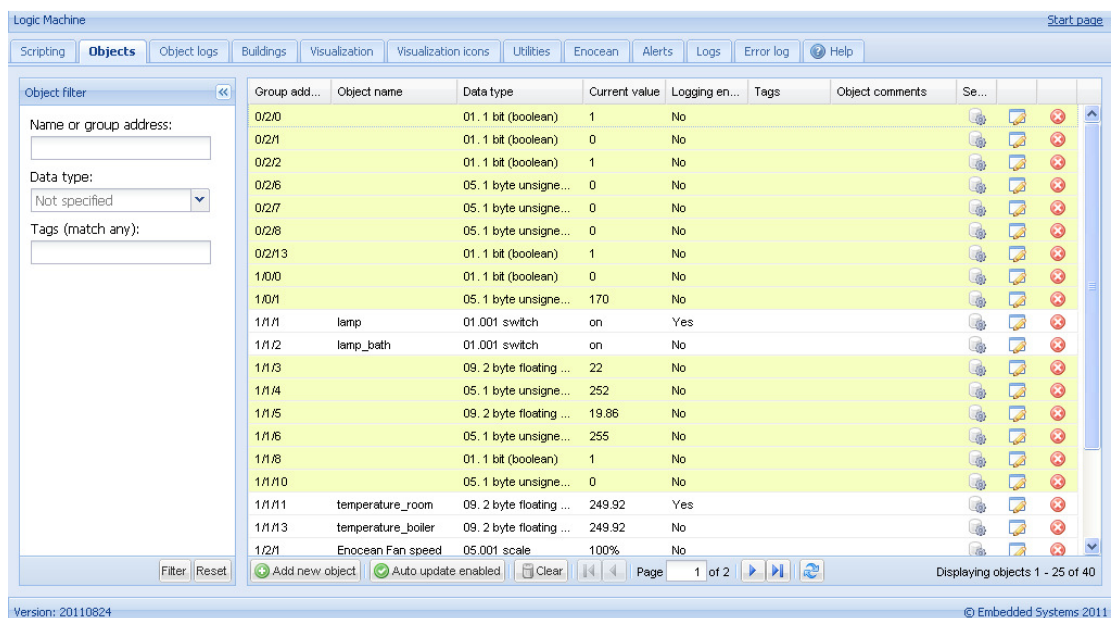
Quick guide - create visualization for iPad/PC

Import objects

Fastest way is to import *.ESF file from ETS in *Utilities* → *Import ESF file*.

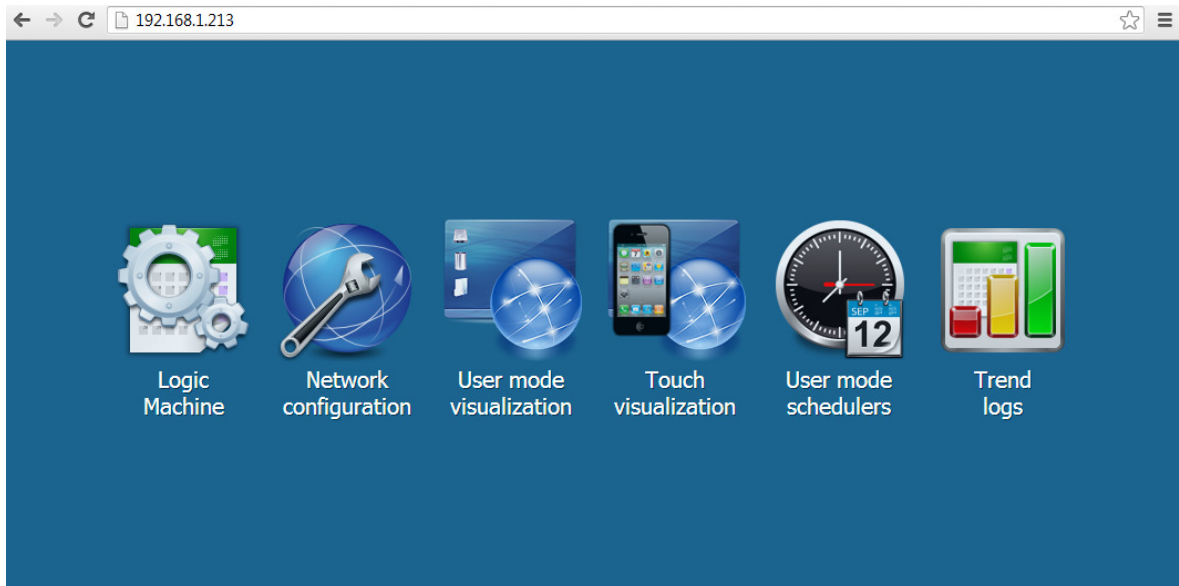


Or connect LM to the bus and it will detect objects automatically in *Objects* tab once they are activated. Objects can be added manually as well.




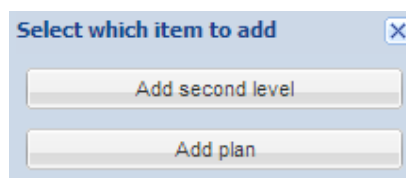
Create “floor” structure and add objects to the map

Connect to Logic Machine (*Logic Machine*) with default access parameters (**IP:** 192.168.0.10;
login/password: admin/admin)

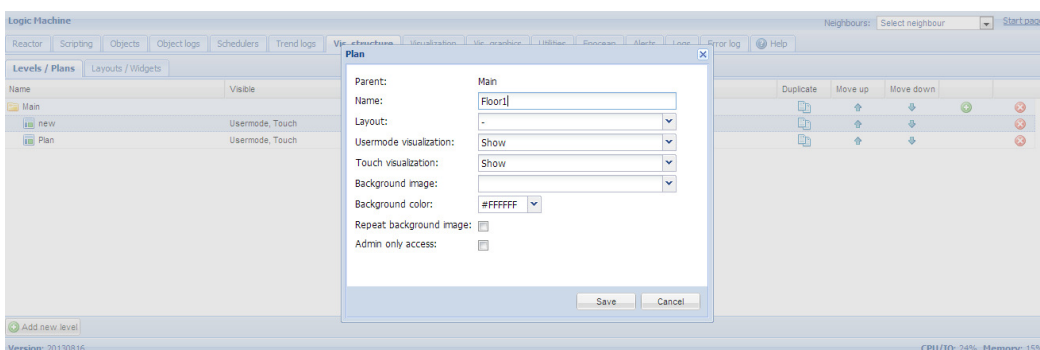


Create “building/floor” structure and add objects to the map

In *Vis.structure* menu the structure of the visualization is defined and visualization backgrounds are uploaded. Use icon to add floor. 

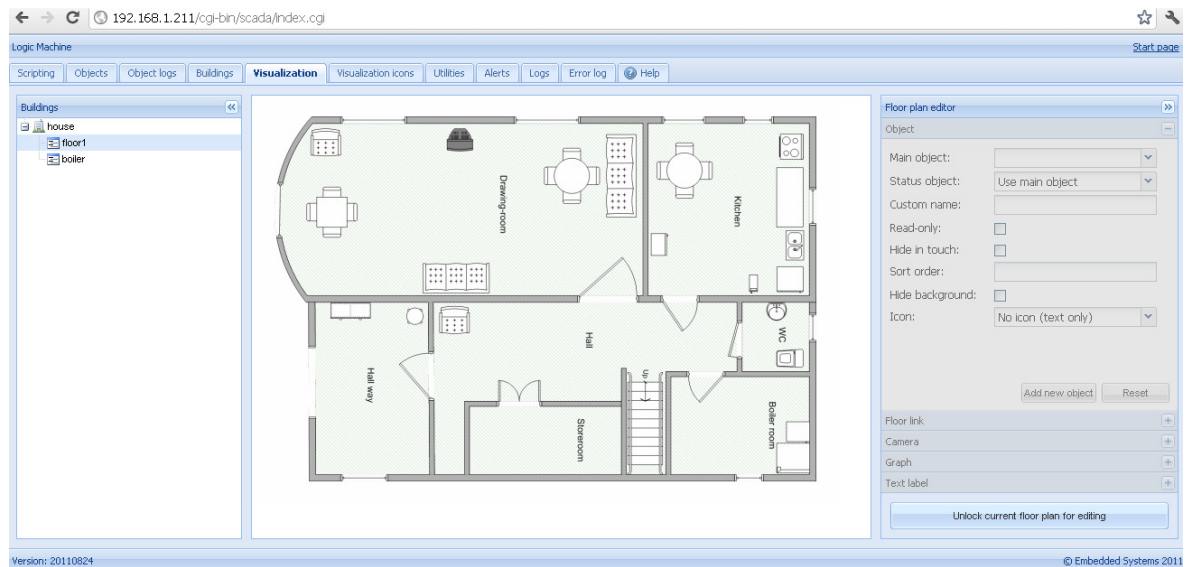


Choose either to add as second floor level or add plan for this particular floor level.

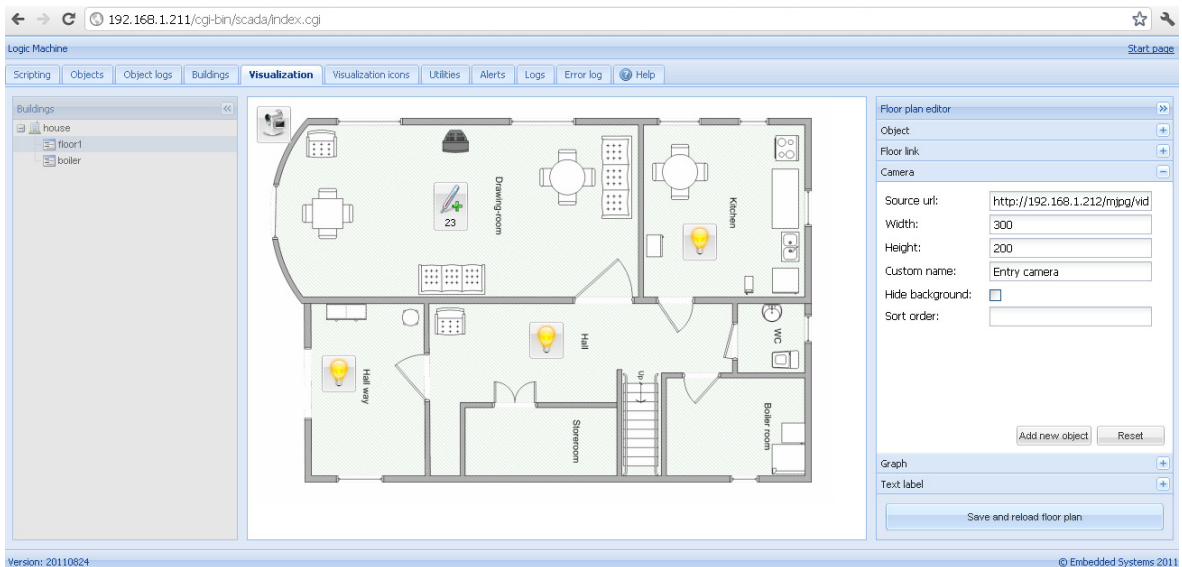


Add objects to newly created visualization map

After the building and floor structure is defined in *Buildings* tab, it is visualized in *Visualization* tab. Controlled and monitored objects can be added and managed in this section. Both side bars can be minimized by pressing on left/right arrow icon making the map more visible especially on small displays.



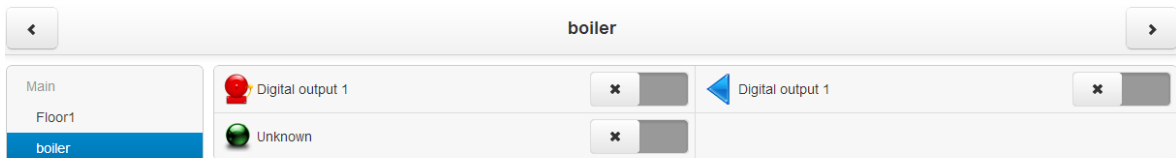
Existing objects can be added to the map by clicking on *Unlock current floor plan for editing* button. Once the object parameters are defined, press *Add new object* button and newly created object will appear. You can move the object to the location it will be located. Note that while being in editing mode, the object will not work.



When all necessary objects and cameras are added, press *Save and reload floor plan* button so everything starts functioning.

Launching visualization on touch device (iPad in this case)

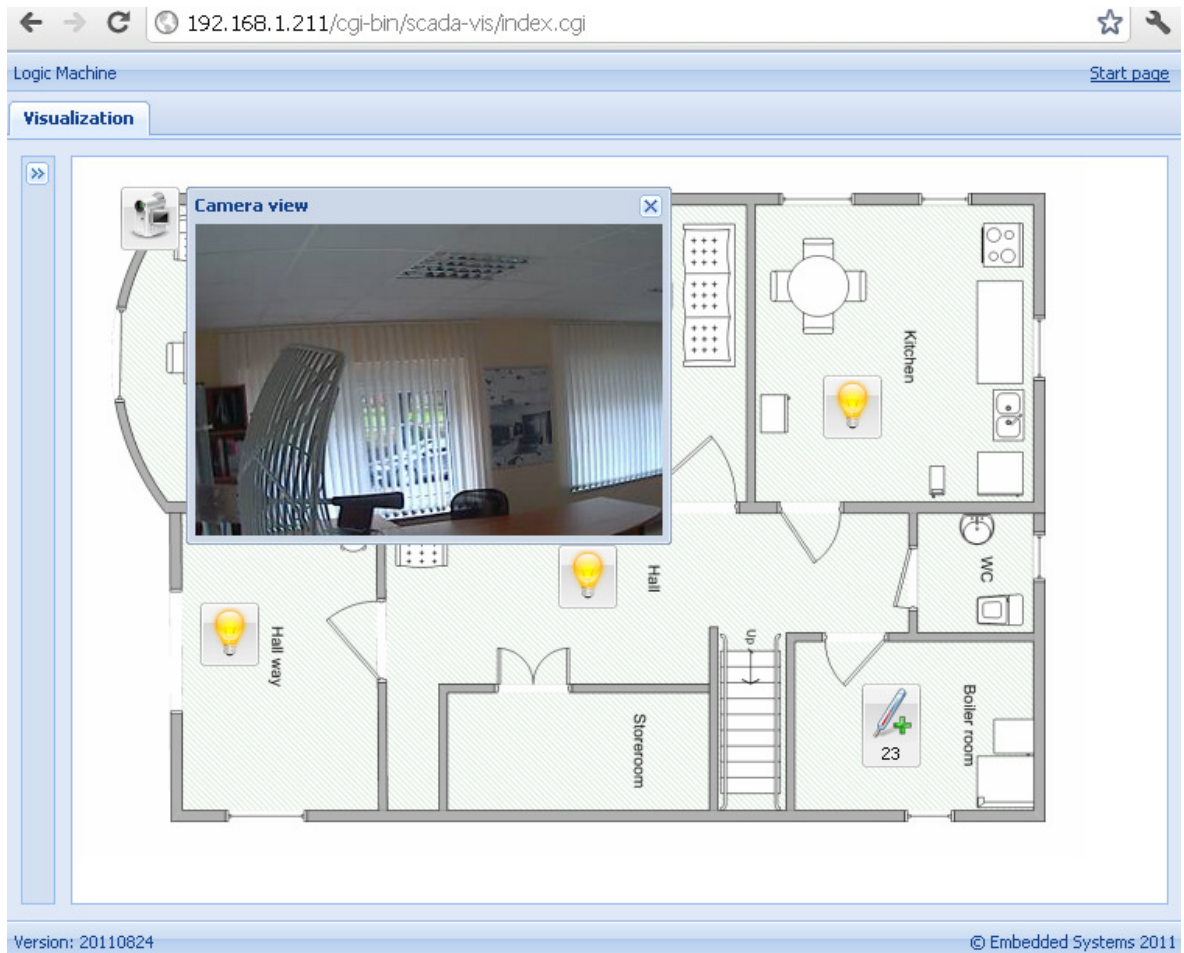
- Make sure your iPad is connected wirelessly to the Logic Machine (either through separate access point or directly to Logic Machine's USB WiFi adapter).
- In the browser enter Logic Machine's IP (default 192.168.0.10).
- Click on the *User mode visualization* or *Touch visualization* icon.
- Save the application as permanent/shortcut in your iPad



Launching visualization on PC, iPad or any other touch device with large enough screen

- Make sure your PC/touch device is able to access Logic Machine and enter it's IP in the browser (default 192.168.0.10).
- Click on the *User Mode Visualization* and enter the "floor" you want to see.

- Then minimize side bar by pressing on left-arrow icon to make the map more visible.

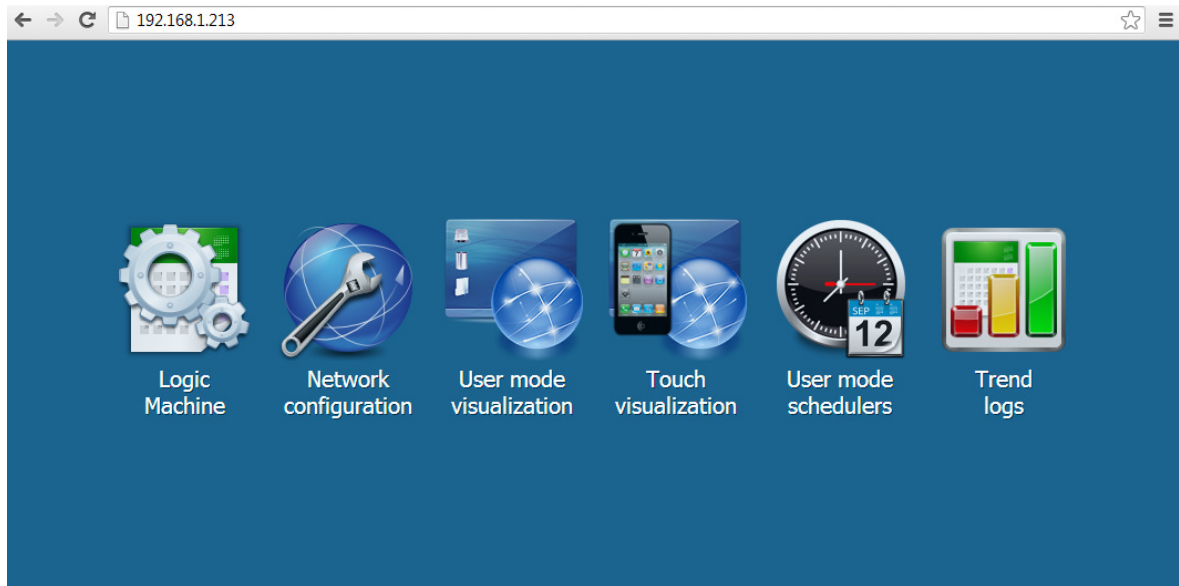


Graphical User Interface Login

KNX/EIB Logic Machine has IP address 192.168.0.10 set by default to LAN interface. Use this address as www address in the browser's address field.

Note! Make sure that the PC connecting to the Logic Machine has IP set from the same subnet.

After successful login a default page appears.



- ***Logic Machine*** – visualization creator, scripts, object relations, alerts, KNX objects and KNX objects, designing building view and visualization maps
- ***Network configuration*** – IP and KNXnet/IP specific configuration
- ***User mode visualization*** – defined visualization maps with objects
- ***Touch visualization*** – Visualization system for iPhone/iPod/iPad/Android touch screen devices
- ***User mode schedulers*** – User defined schedulers
- ***Trend logs*** – Trends for data logs

1. Logic Machine configuration

Login	Password
admin	admin

This is a home directory for Logic Machine configuration management. The main menu consists of the following menus:

Reactor – LM3 Re:actor specific IO settings

Scripting – scripting repository management

Objects– list of KNX network objects

Object logs– KNX bus object historical logs

Schedulers– administrator interface for user mode schedulers

Trend logs – administrator interface for trend logs

Vis.structure – building definition and image file upload

Visualization– Visualization management, control and monitoring

Vis.icons– icon management

Utilities – utilities including import from ETS, reset object DB, backup, update system installation

Alerts – alert messages defined with *alert* function

Logs – log messages defined with *log* function

Error log – error messages in KNX bus

Help – documentation for scripting syntaxes

1.1. Reactor

Reactor IO configuration and mapping to KNX is done under *Reactor* tab. No additional software is needed to configure KNX mapping of IO ports.

Logic Machine									
Reactor Scripting Objects Object logs Schedulers Trend logs Vis. structure Visualization Vis. graphics Utilities EnOcean Alerts Logs Error log Help									
Internal I/O									
Number	Name	Linked to object	Event s...	Active	Input/output value	Set value	Configuration	Lock	Log
Digital output									
1	Digital output 1	1/1/4 Digital output 1			on		Mode: Binary; Output: normal		
2	Digital output 2	1/1/5 Digital output 2			on		Mode: Binary; Output: normal		
3	Digital output 3	1/1/6 Digital output 3			on		Mode: Binary; Output: normal		
4	Digital output 4	1/1/7 Digital output 4			on		Mode: Binary; Output: normal		
5	Digital output 5	1/1/8 Digital output 5			on		Mode: Binary; Output: normal		
6	Digital output 6	1/1/9 Digital output 6			on		Mode: Binary; Output: normal		
7	Digital output 7	1/1/10 Digital output 7			on		Mode: Binary; Output: normal		
8	Digital output 8	1/1/11 Digital output 8			on		Mode: Binary; Output: normal		
9	Digital output 9	1/1/12 Digital output 9			on		Mode: Binary; Output: normal		
10	Digital output 10	1/1/13 Digital output 10			on		Mode: Binary; Output: normal		
11	Digital output 11	1/1/14 Digital output 11			on		Mode: Binary; Output: normal		
12	Digital output 12	1/1/15 Digital output 12			on		Mode: Binary; Output: normal		
13	Digital output 13	1/1/16 Digital output 13			on		Mode: Binary; Output: normal		
14	Digital output 14	1/1/17 Digital output 14			on		Mode: Binary; Output: normal		
15	Digital output 15	1/1/18 Digital output 15			on		Mode: Binary; Output: normal		
16	Digital output 16	1/1/19 Digital output 16			on		Mode: Binary; Output: normal		
Analog output									
1	Analog output 1	1/1/20 Analog output 1			0V		Mode: 0-100% (1 byte); Minimum voltage: 1V; Maximum voltage: 10V; Transition time: 2 sec.		
2									
Resistance input									
1	Resistance input 1	1/1/21 Resistance input 1			250°C		Mode: PT1000 (°C); Send delta: 1°C; Send mode: Bus write		
2									
3									
4									
5									
6									
Analog input									
1	Analog input 1	1/1/22 Analog input 1			11.08V		Send delta: 2V; Send mode: Bus write		
2									
3									
4									
5									
6									
7									

1.1.1. Digital output

You can set up digital output either as binary output or PWM. Binary output is usually used to control external relays/contactors. PWM output is used to control external devices like thermoelectric valves.

Binary (On/Off) output

Digital output 1

Name: Digital output 1

Link to object: 1/1/4 Digital output 1

Status object:

Lock object:

Write to bus: ☒

Mode: ☒ Binary (On/Off) ☐ PWM (0-100%)


Invert output: ☐

On delay (seconds): 0

Off delay (seconds): 0

Comments:

Save Cancel

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [Binary(on/Off); PWM(0-100%)]** – output mode
- **Invert output** – defines either to invert the output value
- **On delay (seconds)** – delay in seconds when getting in On state
- **Off delay (seconds)** – delay in seconds when getting in Off state
- **Comments** – comment of the object

PWM (0-100%) output

Digital output 1

Name: Digital output 1

Link to object: 1/1/23 (New object) [dropdown] [green + button]

Status object: [dropdown] [green + button]

Lock object: [dropdown] [green + button]

Write to bus: ☒

Mode: ☐ Binary (On/Off) ☒ PWM (0-100%)


Minimum output (%): 1 [up/down arrows]

Maximum output (%): 100 [up/down arrows]

PWM period (seconds): 60 [up/down arrows]

Comments: [text area]

Save Cancel

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [Binary(on/Off); PWM(0-100%)]** – output mode
- **Minimum output (%)** – minimum output value
- **Maximum output (%)** – maximum output value
- **PWM period (seconds)** – pulse-width-modulation period
- **Comments** – comment of the object

1.1.2. Analog output

Analog output can be used either as 1byte (0-100%) or 2byte (voltage) output.

Analog output 1

Name: Analog output 1

Link to object: 1/1/20 Analog output 1

Status object:

Lock object:

Write to bus: ☒

Mode: ☒ 0-100% (1 byte) ☐ Voltage (2 byte)


Minimum voltage: 1

Maximum voltage: 10

Transition time (seconds): 2

Comments:

Save Cancel


- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [0-100%(1byte); Voltage(2byte)]** – output mode
- **Minimum voltage** – minimum voltage value
- **Maximum voltage** – maximum voltage value
- **Transition time (seconds)** – transition time between two values
- **Comments** – comment of the object

1.1.3. Resistive input

Resistive input can be either PT1000 temperature sensor, PT100 temperature sensor or show the data in raw form.

The screenshot shows a configuration window titled "Resistance input 1". It contains the following fields and controls:

- Name:** A text box containing "Resistance input 1".
- Link to object:** A dropdown menu showing "1/1/21 Resistance input 1" and a green "+" button.
- Lock object:** A dropdown menu and a green "+" button.
- Write to bus:** A checked checkbox.
- Mode:** Three radio buttons: "PT1000 (°C)" (selected), "PT100 (°C)", and "RAW (Ω)".
- Send delta:** A spin box set to "1".
- Send timer (seconds):** A spin box.
- Value compensation:** A spin box set to "0".
- Comments:** A large text area.
- Buttons:** "Save" and "Cancel" buttons at the bottom right.

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [PT1000; PT100, RAW]** – type of input sensor
- **Send delta** – send the data upon specific delta value has changed
- **Send timer (seconds)** – time interval to send the reading
- **Value compensation** – compensation of the value
- **Comments** – comment of the object


1.1.4. Analog input

Analog inputs can be used either as Voltage, Binary On/Off, Binary Short/Long or Step dimmer.

Voltage input

The screenshot shows a configuration window titled "Analog input 1". It includes the following fields and controls:

- Name:** A text box containing "Analog input 1".
- Link to object:** A dropdown menu showing "1/1/22 Analog input 1" and a green button with a plus sign.
- Lock object:** An empty dropdown menu and a green button with a plus sign.
- Write to bus:** A checked checkbox.
- Mode:** Four radio buttons: "Voltage" (selected), "Binary: On/Off", "Binary: Short/Long", and "Step dimmer".
- Send delta:** A text box containing "2".
- Send timer (seconds):** An empty text box.
- Value compensation:** A text box containing "0".
- Comments:** A large empty text area.
- Buttons:** "Save" and "Cancel" buttons at the bottom right.

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [Voltage; Binary On/Off; Binary Short/Long; Step dimmer]** – input mode
- **Send delta** – send the data upon specific delta value has changed
- **Send timer (seconds)** – time interval to send the reading
- **Value compensation** – compensation of the value

Binary On/Off

Analog input 1

Name: Analog input 1

Link to object: 1/1/23 (New object) [dropdown] [green + button]

Lock object: [dropdown] [green + button]

Write to bus: ☒

Mode: ☐ Voltage ☒ Binary: On/Off ☐ Binary: Short/Long ☐ Step dimmer


On press (rising edge): Toggle [dropdown]

On release (falling edge): No action [dropdown]

Midpoint voltage: 10 [up/down arrows]

Comments: [text area]

Save Cancel

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode** [Voltage; Binary On/Off; Binary Short/Long; Step dimmer] – input mode
- **On press (rising edge)** [Send 0; Send 1; Toggle] – action on rising edge
- **On release (falling edge)** [Send 0; Send 1; Toggle] – action on falling edge
- **Midpoint voltage** – voltage midpoint to determine the On/Off state

Binary Short/Long

Analog input 1

Name: Analog input 1

Link to object: 1/1/23 (New object) [v] [+

Lock object: [v] [+

Write to bus: ☒

Mode: ☐ Voltage ☐ Binary: On/Off
☒ Binary: Short/Long ☐ Step dimmer


Short press: Send 0 [v]

Long press (1 second): Send 1 [v]

Midpoint voltage: 10 [up] [down]

Comments: [text area]

[Save] [Cancel]

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the  button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode** [Voltage; Binary On/Off; Binary Short/Long; Step dimmer] – input mode
- **Short press (rising edge)** [Send 0; Send 1; Toggle] – action on short press
- **Long press (1 second)** [Send 0; Send 1; Toggle] – action on long press
- **Midpoint voltage** – voltage midpoint to determine the Short/Long state

Step dimmer

Analog input 1

Name: Analog input 1

Link to object: 1/1/23 (New object)

Lock object:

Write to bus: ☒

Mode: ☐ Voltage ☐ Binary: On/Off ☐ Binary: Short/Long ☒ Step dimmer

Dimmer step (%): 10

On preset (%): 50

Midpoint voltage: 10

Comments:

Save Cancel

- **Name** – name of the port
- **Link to object** – group address to link the object with. By pressing the button, the field will be automatically filled with the next free group address.
- **Status object** – status object group address.
- **Lock object** – lock object group address
- **Write to bus** – defines either to write or not to bus on value change
- **Mode [Voltage; Binary On/Off; Binary Short/Long; Step dimmer]** – input mode
- **Dimmer step (%)** – value on which the brightness value will change by one step
- **On preset (%)** – brightness preset when getting in On state
- **Midpoint voltage** – voltage midpoint

1.2. Scripting

Scripting menu allows adding and managing various scripts, depending on the type of the script. Lua programming language is used to implement user scripts. Most of the Lua language aspects are covered in the first edition of "Programming in Lua" which is freely available at <http://lua.org/pil/>

Note! Data format — in most cases data is stored and transferred between Logic Machine parts using hex-encoded strings (2 bytes per 1 byte of data).

There are six main types of scripts:

Event-based – scripts that are executed when a group event occurs on the bus. Usually used when nearly real-time response is required.

Resident– scripts that use polling to check for object state changes. Usually used for heating and ventilation when data is gathered from more than one group address.

Scheduled– scripts that run at the required time and day. Can be used for various security systems and presence simulations.

User libraries – user defined scripts to call from other scripts

Common functions – common functions to call from other scripts

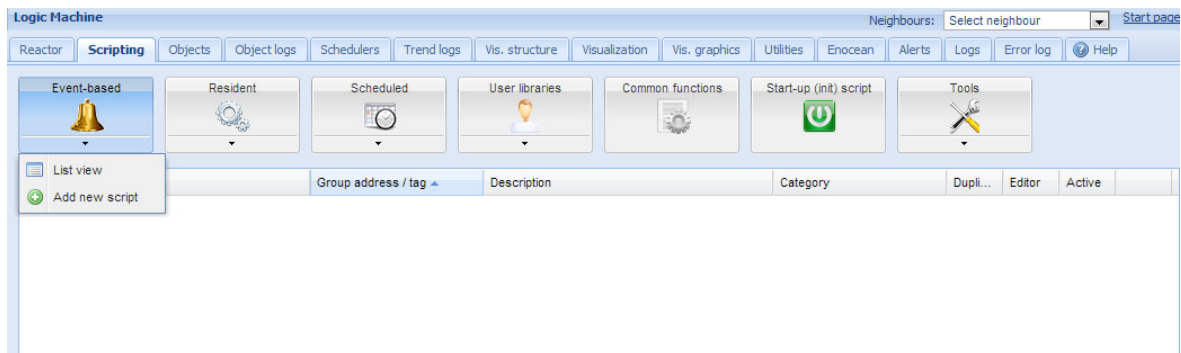
Start-up (init) script – initialization script that is run upon system starting.

1.1.1. Adding a new script

When pressing on the arrow on the lower side of the *Event-based*, *Resident* or *Scheduled* buttons, two possibilities appear:

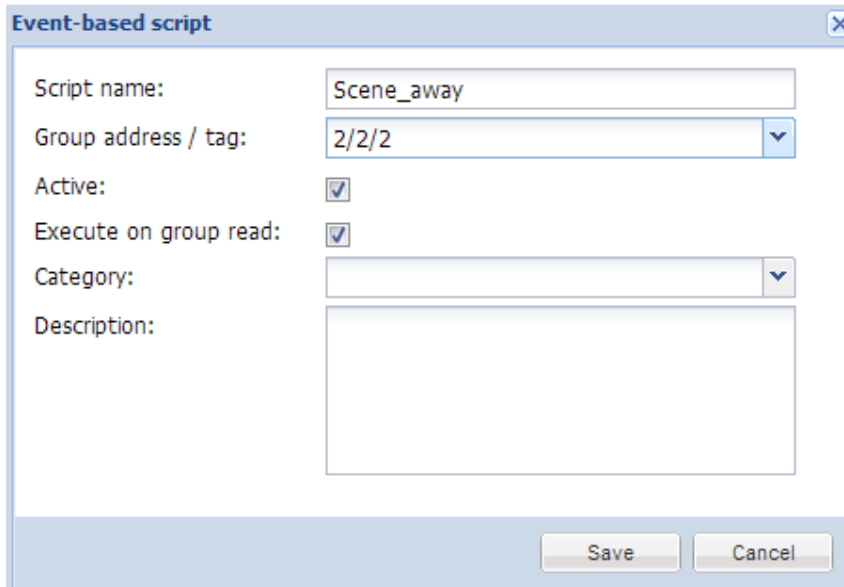
List view – sort scripts in list view

Add new script – add new script to the list



The following fields should be filled when adding a new script:

Event-based



Event-based script

Script name: Scene_away

Group address / tag: 2/2/2

Active: ☒

Execute on group read: ☒

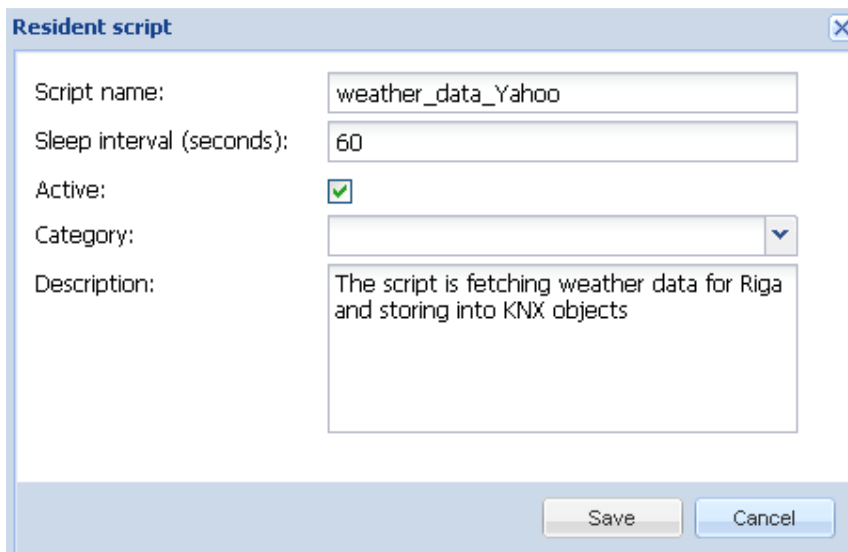
Category:

Description:

Save Cancel

- **Script name** – the name of the script
- **Group address / Tag** – specific group address or tag name on which the script will be triggered
- **Active**– specifies whether the script is active (green circle) or disabled (red circle)
- **Execute on group read**– specifies whether the script is executed on KNX group read telegram
- **Category** – a new or existing name of the category the script will be included. This will not affect on script action, helps only by grouping the scripts and watching by categories in *Tools* → *Print* script listings page
- **Description**– description of the script

Resident



Resident script

Script name: weather_data_Yahoo

Sleep interval (seconds): 60

Active: ☒

Category:

Description: The script is fetching weather data for Riga and storing into KNX objects

Save Cancel

- **Script name** – the name of the script
- **Sleep interval (seconds)** – interval after which the script will be executed.
- **Active**– specifies whether the script is active (green circle) or disabled (red circle)
- **Category** – a new or existing name of the category the script will be included. This will not affect on script action, helps only by grouping the scripts and watching by categories in *Tools* → *Print* script listings page
- **Description**– description of the script

Scheduled

Scheduled script

Script name: Floor heating off

Minute: ? 0

Hour: ? 8,19

Day of the month: ? *

Month of the year: Every month of the year ▼

Day of the week: Every day of the week ▼

Active: ☐

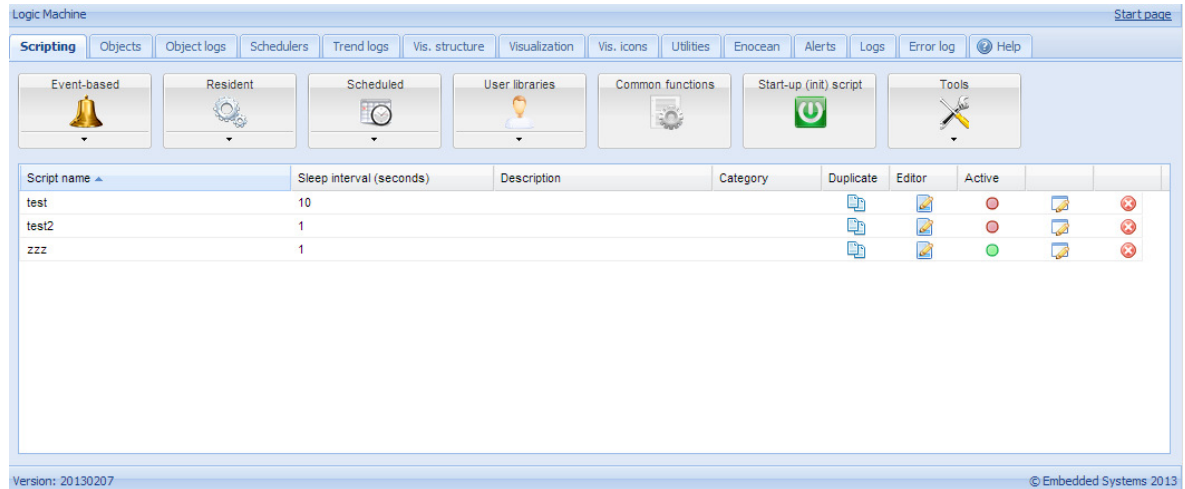
Category: ▼

Description: Turns floor heating OFF at 8:00 and 19:00

Save Cancel

- **Script name** – the name of the script
- **Minute** – Minute
- **Hour** – Hour
- **Day of the month** – Day of the month
- **Month of the year** – Month of the year
- **Day of the week** – Day of the week
- **Active**– specifies whether the script is active (green circle) or disabled (red circle)
- **Category** – a new or existing name of the category the script will be included. This will not affect on script action, helps only by grouping the scripts and watching by categories in *Tools* → *Print* script listings page
- **Description**– description of the script

List of scripts



There are five actions you can do with each of the script:

Duplicate – Duplicate the script with its source code

Editor – Enter scripting editor to write specific code for the particular program

Active – Make script active (green) or deactivate it (red)

Edit – Edit script name, description, category and other parameters

Delete – Delete the script. When pressing this icon the confirmation is asked to accept the delete.

1.1.2. Event-based scripting

Event-based scripting can be used to implement custom logic for group address events. User-defined function is executed when a "group write" or "group read" (if checked while adding the script) event occurs for given group address. Event information is stored in global **event** variable. Variable contents:

- dstraw (integer) — raw destination group address
- srcraw (integer) — raw source individual address
- dst (string) — decoded destination group address (for example: 1/1/4)
- src (string) — decoded source individual address (for example: 1.1.2)
- type (string) — type of event, either "groupwrite", "groupread", "groupresponse". Currently user-defined scripts are bound to "group write" events only.
- dataraw (integer/string) — raw binary data
- datahex (string) — data as a hex-encoded string which can be used to convert value to Lua variable

Note! **event** variable is available only in Event-based functions, not in Resident and Scheduled.

Note! All event-based scripts are executed in a single queue-like manner. Make sure event scripts do not contain infinite loops, sleep calls or other blocking parts.

Note! To get event value in scripts, use the following command: **a = event.getvalue()**

1.2.3. Resident scripting

Resident scripts are executed infinite amount of times. Scripts are put into inactive state after each call and are resumed after delay timer expires.

Note! even though resident scripts are executed in parallel they should not have infinite loops or it will not be possible to reload scripts after editing.

1.2.4. Scheduled scripting

Scheduled scripts are executed when the system time matches the specified script start time. Scheduled script is run only once after each timer call.

Scheduled scripting date/time format

Scheduled scripting uses standard [cron](#) format for date/time parameters. Valid values are:

***** — execute script every minute, hour or day.


***/N** — execute script every N minutes, hours or days. N is an integer, script is executed when current value divided by N gives 0 in modulo. For example, script with hour parameter set to */8 will be executed when hour is 0, 8 and 16.

N — execute script exactly at N minute, hour or day.

N-K — execute script when minute, hour or day is between N-K range (inclusive).

N,K — it is possible to specify several N and N-K type parameters separated by comma. For example, script with minute parameter set to 15,50-52 will get executed when minute is 15, 50, 51 and 52

1.2.5. Script editor

When a script is added  icon appears in *Editor* column that allows opening a script in scripting editor and re-working it with built-in code snippets.



The idea is that not knowing the syntaxes you get a helper for writing your own scripts. Code snippets save also a time and make the coding much more convenient. After clicking on appropriate snippet, it automatically adds code to the editor field.

There are five main groups of Script editor:

Helpers – predefined code snippets, like if-then statement. Helpers consist of three main sub-groups:

Conditionals – If Else If, If Then etc.

Loops and iterators – Array, Repeat..Until etc.

Math – Random value, Ceiling, Absolute value, Round etc.

Objects/KNX bus – Get object value, Group read, Group write, Update interval etc.

Storage – Get data from storage, Save data to storage

Script control – Get other script status, enable or disable other scripts

Alerts and logs – Alert, Log variables, Formatted alert

Time functions – Delay script execution

Miscellaneous – Sunrise/sunset etc.

Serial – Communication through internal Logic Machine IO ports

Modbus – Create RTU/TCP connection, Write register, Read register etc.

DMX – Communication with DMX devices

Group addresses – existing group addresses on the KNX bus

Objects by name – chose object by name

Tags – choose object by tag

Data types – choose object by data type

1.2.6. Object functions

grp provides simplified access to the objects stored in the database and group address request helpers.

Most functions use `alias` parameter — object group address or unique object name. (e.g. '1/1/1' or 'My object')

grp.getvalue(alias)

Returns value for the given alias or Lua `nil` when object cannot be found.

grp.find(alias)

Returns single object for the given alias. Object value will be decoded automatically only if the data type has been specified in the 'Objects' module. Returns Lua `nil` when object cannot be found, otherwise it returns Lua `table` with the following items:

- *address* — object group address
- *updatetime* — latest update time in UNIX timestamp format. Use Lua `os.date()` to convert to readable date formats

When object data type has been specified in the 'Objects' module the following fields are available:

- *name* — unique object name
- *datatype* — object data type as specified by user
- *decoded* — set to `true` when decoded value is available
- *value* — decoded object value

grp.tag(tags, mode)

Returns Lua `table` containing objects with the given tag. Tags parameter can be either Lua `table` or a string. Mode parameter can be either 'all' (return objects that have all of the given tags) or 'any' (**default** — returns objects that have any of the given tags). You can use *Returned object functions* on the returned table.

grp.alias(alias)

Converts group address to object name or name to address. Returns Lua `nil` when object cannot be found.

1.2.7. Returned object functions, group communication functions

Objects received by using `grp.find(alias)` or `grp.tag(tags, mode)` have the following functions attached to them:

Always check that the returned object was found otherwise calling these functions will result in an error. See the example below.

object:write(value, datatype)

Sends group write request to object's group address. Data type is taken from the database if not specified as second parameter. Returns Lua `boolean` as the result.

object:response(value, datatype)

Similar to `object:write`. Sends group response request to object's group address.

object:read()

Sends group read request to object's group address. Note: this function returns immediately and cannot be used to return the result of read request. Use event-based script instead.

object:update(value, datatype)

Similar to `object:write`, but **does not send** new value to the bus. Useful for objects that are used only in visualization.

1.2.8. Group communication functions

These functions should only be used if it is required to access objects by group address directly, it is recommended to use single or multiple object functions.

grp.write(alias, value, datatype)

Sends group write request to the given alias. Data type is taken from the database if not specified as third parameter. Returns Lua `boolean` as the result.

grp.response(alias, value, datatype)

Similar to `grp.write`. Sends group response request to the given alias.

grp.read(alias)

Sends group read request to the given alias. Note: this function returns immediately and cannot be used to return the result of read request. Use event-based script instead.

grp.update(alias, value, datatype)

Similar to `grp.write`, but **does not send** new value to the bus. Useful for objects that are used only in visualization.

1.2.9. Object function examples

Find object by name and write new value.

```
1.myobject=grp.find('My object')
2.-- grp.find will return nil if object was not found
3.if myobject then
4.myobject:write(1)-- update object value with 1
5.end
```

Find object by address and write new value.

```
1.myobject=grp.find('1/1/15')
2.-- verify that the requested object was found
3.if myobject then
4.myobject:write(52.12, dt.float16)-- explicitly set data type to dt.float16 (2-byte
   floating point)
```

5. **end**

Switch all binary objects tagged 'lights' off.

```
1. lights = grp.tag('lights')
2. lights:write(false)
```

Group write to the specified group address and data type.

```
1. grp.write('1/1/1', true, dt.bool)-- write 1-bit 'on' to 1/1/1
2. grp.write('1/1/2', 50, dt.scale)-- write 1-byte 50% to 1/1/2
```

1.2.10. Data type functions, data types

knxdatatype object provides data encoding and decoding between Lua and KNX data formats.

knxdatatype.decode(value, datatype)

Converts hex-encoded data to Lua variable based on given data type. Data type is specified either as KNX primary data type (integer between 1 and 16) or a secondary data type (integer between 1000 and 16000). Return values:

- success — decoded data as Lua variable (type depends on data type), value length in bytes
- error — nil, error string

1.2.11. Data types

The following data types can be used for encoding and decoding of KNX data. Data representation on Lua level and predefined constants (in bold) is given below:

- *1 bit (boolean) - **dt.bool*** — boolean
- *2 bit (1 bit controlled) - **dt.bit2*** — number
- *4 bit (3 bit controlled) - **dt.bit4*** — number
- *1 byte ASCII character - **dt.char*** — string
- *1 byte unsigned integer - **dt.uint8*** — number
- *1 byte signed integer - **dt.int8*** — number
- *2 byte unsigned integer - **dt.uint16*** — number
- *2 byte signed integer - **dt.int16*** — number
- *2 byte floating point - **dt.float16*** — number
- *3 byte time / day - **dt.time*** — table with the following items:
 - day — number (0-7)
 - hour — number (0-23)
 - minute — number (0-59)
 - second — number (0-59)
- *3 byte date - **dt.date*** — table with the following items:
 - day — number (1-31)
 - month — number (1-12)
 - year — number (1990-2089)

- 4 byte unsigned integer - *dt.uint32* — number
- 4 byte signed integer - *dt.int32* — number
- 4 byte floating point - *dt.float32* — number
- 4 byte access control - *dt.access* — number, currently not fully supported
- 14 byte ASCII string - *dt.string* — string, null characters ('\0') are discarded during decoding

1.2.12. Data storage function

storage object provides persistent key-value data storage for user scripts. Only the following Lua data types are supported:

- boolean
- number
- string
- table

storage.set(key, value)

Sets new value for the given key. Old value is overwritten. Returns boolean as the result and an optional error string.

storage.get(key, default)

Gets value for the given key or returns default value (*nil* if not specified) if key is not found in the data storage.

Note: all user scripts share the same data storage. Make sure that same keys are not used to store different types of data.

Examples

- The following examples shows the basic syntax of **storage.set**. Result will return boolean **true** since the passed parameters are correct

```
result=storage.set('my_stored_value_1', 12.21)
```

- This example will return **false** as the result because we are trying to store a function which is not possible.

```
1.testfn=function(t)
2.return t * t
3.end
4.result =storage.set('my_stored_value_2', testfn)-- this will result in an error
```

- The following examples shows the basic syntax of `storage.get`. Assuming that key value was not found, first call will return `nil` while second call will return number `0` which was specified as a default value.

```
1.result =storage.get('my_stored_value_3')-- returns nil if value is not found
2.result =storage.get('my_stored_value_3', 0)-- returns 0 if value is not found
```

- When storing tables make sure to check the returned result type. Assume we have created a storage item with key `test_object_data`.

```
1.objectdata={}
2.objectdata.temperature=23.1
3.objectdata.scene='default'
4.result =storage.set('test_object_data', objectdata)-- store objectdata variable as
'test_object_data'
```

- Now we are retrieving data from storage. Data type is checked for correctness.

```
1.objectdata=storage.get('test_object_data')
2.if type(objectdata)=='table'then
3.if objectdata.temperature> 24 then
4.-- do something if temperature level is too high
5.end
6.end
```

1.2.13. Alert function

`alert(message, [var1, [var2, [var3]]])`

Stores alert message and current system time in the main database. All alerts are accessible in the "Alerts" module. This function behaves exactly as Lua `string.format`.

Example

```
1.temperature = 25.3
2.if temperature > 24 then
3.-- resulting message: 'Temperature levels are too high: 25.3'
4. alert('Temperature level is too high: %.1f', temperature)
5.end
```

1.2.14. Log function

`log(var1, [var2, [var3, ...]])`

Converts variables to human-readable form and stores them in the main database. All items are accessible in the "Logs" module.

Example

```
1.-- Log function accepts Lua nil, boolean, number and table (up to 5 nested levels) type
   variables
2.a ={ key1 ='value1', key2 =2}
3.b ='test'
4.c =123.45
5.-- Logs all passed variables
6.log(a, b, c)
```

1.2.15.Scheduled scripting date/time format

Scheduled scripting uses standard *cron* format for date/time parameters. Valid values are:

* — execute script every minute, hour or day.

*/N — execute script every N minutes, hours or days. N is an integer, script is executed when current value divided by N gives 0 in modulo. For example, script with hour parameter set to */8 will be executed when hour is 0, 8 and 16.

N — execute script exactly at N minute, hour or day.

N-K — execute script when minute, hour or day is between N-K range (inclusive).

N,K — it is possible to specify several N and N-K type parameters separated by comma. For example, script with minute parameter set to 15,50-52 will get executed when minute is 15, 50, 51 and 52

1.2.16.Time function

os.sleep(delay)

Delay the next command execution for the *delay* seconds.

os.microtime ()

Returns two values: current timestamp in seconds and timestamp fraction in nanoseconds

os.udifftime (sec, usec)

Returns time difference as floating point value between now and timestamp components passed to this function (seconds, nanoseconds)

1.2.17.Data Serialization

serialize.encode (value)

Generates a storable representation of a value.

serialize.decode (value)

Creates a Lua value from a stored representation.

1.2.18.String functions

This library provides generic functions for string manipulation, such as finding and extracting substrings, and pattern matching. When indexing a string in Lua, the first character is at position 1 (not at 0, as in C).

Indices are allowed to be negative and are interpreted as indexing backwards, from the end of the string. Thus, the last character is at position -1, and so on.

The string library provides all its functions inside the table `string`. It also sets a metatable for strings where the `__index` field points to the string table. Therefore, you can use the string functions in object-oriented style. For instance, `string.byte(s, i)` can be written as `s:byte(i)`. The string library assumes one-byte character encodings.

string.trim (str)

Trims the leading and trailing spaces off a given string.

string.split (str, sep)

Splits string by given separator string. Returns Lua table.

string.byte (s [, i [, j]])

Returns the internal numerical codes of the characters `s[i]`, `s[i+1]`, ..., `s[j]`. The default value for `i` is 1; the default value for `j` is `i`. Note that numerical codes are not necessarily portable across platforms.

string.char (...)

Receives zero or more integers. Returns a string with length equal to the number of arguments, in which each character has the internal numerical code equal to its corresponding argument. Note that numerical codes are not necessarily portable across platforms.

string.find (s, pattern [, init [, plain]])

Looks for the first match of `pattern` in the string `s`. If it finds a match, then `find` returns the indices of `s` where this occurrence starts and ends; otherwise, it returns `nil`. A third, optional numerical argument `init` specifies where to start the search; its default value is 1 and can be negative. A value of `true` as a fourth, optional argument `plain` turns off the pattern matching facilities, so the function does a plain "find substring" operation, with no characters in `pattern` being considered "magic". Note that if `plain` is given, then `init` must be given as well. If the `pattern` has captures, then in a successful match the captured values are also returned, after the two indices.

string.format (formatstring, ...)

Returns a formatted version of its variable number of arguments following the description given in its first argument (which must be a string). The format string follows the same rules as the `printf` family of standard C functions. The only differences are that the options/modifiers `*`, `l`, `L`, `n`, `p`, and `h` are not supported and that there is an extra option, `q`. The `q` option formats a string in a form suitable to be safely read back by the Lua interpreter: the string is written between double quotes, and all double quotes, newlines, embedded zeros, and backslashes in the string are correctly escaped when written. For instance, the call

```
string.format('%q', 'a string with "quotes" and \n new line')
```

will produce the string:

*"a string with \"quotes\" and\
new line"*

The options *c*, *d*, *E*, *e*, *f*, *g*, *G*, *i*, *o*, *u*, *X*, and *x* all expect a number as argument, whereas *q* and *s* expect a string. This function does not accept string values containing embedded zeros, except as arguments to the *q* option.

string.gmatch (s, pattern)

Returns an iterator function that, each time it is called, returns the next captures from pattern over string s. If pattern specifies no captures, then the whole match is produced in each call. As an example, the following loop

```
1. s = "hello world from Lua"
2. for w in string.gmatch(s, "%a+") do
3.     print(w)
4. end
```

will iterate over all the words from string s, printing one per line. The next example collects all pairs *key=value* from the given string into a table:

```
1. t = {}
2. s = "from=world, to=Lua"
3. for k, v in string.gmatch(s, "(%w+)=(%w+)") do
4.     t[k] = v
5. end
```

For this function, a '^' at the start of a pattern does not work as an anchor, as this would prevent the iteration.

string.gsub (s, pattern, repl [, n])

Returns a copy of s in which all (or the first n, if given) occurrences of the pattern have been replaced by a replacement string specified by repl, which can be a string, a table, or a function. gsub also returns, as its second value, the total number of matches that occurred.

If repl is a string, then its value is used for replacement. The character % works as an escape character: any sequence in repl of the form %n, with n between 1 and 9, stands for the value of the n-th captured substring (see below). The sequence %0 stands for the whole match. The sequence %% stands for a single %.

If repl is a table, then the table is queried for every match, using the first capture as the key; if the pattern specifies no captures, then the whole match is used as the key.

If repl is a function, then this function is called every time a match occurs, with all captured substrings passed as arguments, in order; if the pattern specifies no captures, then the whole match is passed as a sole argument.

If the value returned by the table query or by the function call is a string or a number, then it is used as the replacement string; otherwise, if it is *false* or *nil*, then there is no replacement (that is, the original match is kept in the string).

Examples:

```
x = string.gsub("hello world", "(%w+)", "%1 %1")
--> x="hello hello world world"

x = string.gsub("hello world", "%w+", "%0 %0", 1)
--> x="hello hello world"

x = string.gsub("hello world from Lua", "(%w+)%s*(%w+)", "%2 %1")
--> x="world hello Lua from"

x = string.gsub("home = $HOME, user = $USER", "%$(%w+)", os.getenv)
--> x="home = /home/roberto, user = roberto"

x = string.gsub("4+5 = $return 4+5$", "%$(.-)%$", function (s)
    return loadstring(s)()
end)
--> x="4+5 = 9"

local t = {name="lua", version="5.1"}
```

```
x = string.gsub("$name-$version.tar.gz", "%$(%w+)", t)
--> x="lua-5.1.tar.gz"
```

string.len (s)

Receives a string and returns its length. The empty string "" has length 0. Embedded zeros are counted, so "a\000bc\000" has length 5.

string.lower (s)

Receives a string and returns a copy of this string with all uppercase letters changed to lowercase. All other characters are left unchanged. The definition of what an uppercase letter is depends on the current locale.

string.match (s, pattern [, init])

Looks for the first match of pattern in the string s. If it finds one, then match returns the captures from the pattern; otherwise it returns *nil*. If pattern specifies no captures, then the whole match is returned. A third, optional numerical argument init specifies where to start the search; its default value is 1 and can be negative.

string.rep (s, n)

Returns a string that is the concatenation of n copies of the string s.

string.reverse (s)

Returns a string that is the string s reversed.

string.sub (s, i [, j])

Returns the substring of s that starts at i and continues until j; i and j can be negative. If j is absent, then it is assumed to be equal to -1 (which is the same as the string length). In particular, the call *string.sub(s, 1, j)* returns a prefix of s with length j, and *string.sub(s, -i)* returns a suffix of s with length i.

string.upper (s)

Receives a string and returns a copy of this string with all lowercase letters changed to uppercase. All other characters are left unchanged. The definition of what a lowercase letter is depends on the current locale.

Patterns

Character Class:

A character class is used to represent a set of characters. The following combinations are allowed in describing a character class:

- **x**: (where x is not one of the magic characters `^$()%.[]*+-?`) represents the character x itself.
- **.**: (a dot) represents all characters.
- **%a**: represents all letters.
- **%c**: represents all control characters.
- **%d**: represents all digits.
- **%l**: represents all lowercase letters.
- **%p**: represents all punctuation characters.
- **%s**: represents all space characters.
- **%u**: represents all uppercase letters.
- **%w**: represents all alphanumeric characters.
- **%x**: represents all hexadecimal digits.
- **%z**: represents the character with representation 0.

- **%x**: (where x is any non-alphanumeric character) represents the character x. This is the standard way to escape the magic characters. Any punctuation character (even the non magic) can be preceded by a '%' when used to represent itself in a pattern.
- **[set]**: represents the class which is the union of all characters in set. A range of characters can be specified by separating the end characters of the range with a '-'. All classes %x described above can also be used as components in set. All other characters in set represent themselves. For example, `[%w_]` (or `[_%w]`) represents all alphanumeric characters plus the underscore, `[0-7]` represents the octal digits, and `[0-7%l%-]` represents the octal digits plus the lowercase letters plus the '-' character.
- The interaction between ranges and classes is not defined. Therefore, patterns like `[%a-z]` or `[a-%%]` have no meaning.
- **[^set]**: represents the complement of set, where set is interpreted as above.

For all classes represented by single letters (`%a`, `%c`, etc.), the corresponding uppercase letter represents the complement of the class. For instance, `%S` represents all non-space characters. The definitions of letter, space, and other character groups depend on the current locale. In particular, the class `[a-z]` may not be equivalent to `%l`.

Pattern Item:

A pattern item can be:

- a single character class, which matches any single character in the class;
- a single character class followed by '*', which matches 0 or more repetitions of characters in the class. These repetition items will always match the longest possible sequence;
- a single character class followed by '+', which matches 1 or more repetitions of characters in the class. These repetition items will always match the longest possible sequence;
- a single character class followed by '-', which also matches 0 or more repetitions of characters in the class. Unlike '*', these repetition items will always match the shortest possible sequence;
- a single character class followed by '?', which matches 0 or 1 occurrence of a character in the class;
- `%n`, for n between 1 and 9; such item matches a substring equal to the n-th captured string (see below);
- `%bxy`, where x and y are two distinct characters; such item matches strings that start with x, end with y, and where the x and y are balanced. This means that, if one reads the string from left to right, counting +1 for an x and -1 for a y, the ending y is the first y where the count reaches 0. For instance, the item `%b()` matches expressions with balanced parentheses.

Pattern:

A pattern is a sequence of pattern items. A '^' at the beginning of a pattern anchors the match at the beginning of the subject string. A '\$' at the end of a pattern anchors the match at the end of the subject string. At other positions, '^' and '\$' have no special meaning and represent themselves.

Captures:

A pattern can contain sub-patterns enclosed in parentheses; they describe captures. When a match succeeds, the substrings of the subject string that match captures are stored (captured) for future use. Captures are numbered according to their left parentheses. For instance, in the pattern `"a*(.)%w(%s*)"`, the part of the string matching `"a*(.)%w(%s*)"` is stored as the first capture

(and therefore has number 1); the character matching "." is captured with number 2, and the part matching "%s*" has number 3.

As a special case, the empty capture () captures the current string position (a number). For instance, if we apply the pattern "()aa()" on the string "flaaap", there will be two captures: 3 and 5. A pattern cannot contain embedded zeros. Use %z instead.

1.2.19. Input and output functions

io.exists (path)

Checks if given path (file or directory) exists. Return boolean.

io.readfile (file)

Reads whole file at once. Return file contents as a string on success or nil on error.

io.writefile (file, data)

Writes given data to a file. Data can be either a value convertible to string or a table of such values. When data is a table then each table item is terminated by a new line character. Return boolean as write result when file can be open for writing or nil when file cannot be accessed.

Example: Write event status to log file located on plugged USB flash drive:

```
1. value = knxdatatype.decode(event.datahex, dt.bool)
2. data = string.format('%s value is %s', os.date('%c'), tostring(value))
3. -- write to the end of log file preserving all previous data
4. file = io.open('/mnt/usb/log.txt', 'a+')
5. file:write(data .. '\r\n')
6. file:close()
```

Output:

```
Mon Jan 3 05:25:13 2011 value is false
Mon Jan 3 05:25:14 2011 value is true
Mon Jan 3 05:25:32 2011 value is false
Mon Jan 3 05:25:33 2011 value is true
```

Example: Read data from file (config in format key=value)

```
1. for line in io.lines('/mnt/usb/config.txt') do
2.   -- split line by '=' sing
3.   items = line:split('=')
4.   -- two items, line seems to be valid
5.   if #items == 2 then
6.     key = items[ 1 ]:trim()
7.     value = items[ 2 ]:trim()
8.     alert('[config] %s = %s', key, value)
9.   end
10. end
```

1.2.20. Script control functions

script.enable('scriptname')

Enable the script with the name `scriptname`.

`script.disable('scriptname')`

Disable the script with the name `scriptname`.

`status = script.status('scriptname')`

Returns true/false if script is found, nil otherwise

1.2.21.JSON library

Note: json is not loaded by default, use `require('json')` before calling any functions from this library.

`json.encode (value)`

Converts Lua variable to JSON string. Script execution is stopped in case of an error.

`json.pencode (value)`

Converts Lua variable to JSON string in protected mode, returns nil on error.

`json.decode (value)`

Converts JSON string to Lua variable. Script execution is stopped in case of an error.

`json.pdecode (value)`

Converts JSON string to Lua variable in protected mode, returns nil on error.

1.2.22.Conversion

Compatibility layer: `lmcore` is an alias of `cnv`.

`cnv.strtohex (str)`

Converts given binary string to a hex-encoded string.

`cnv.hextostr (hex [, keepnulls])`

Converts given hex-encoded string to a binary string. NULL characters are ignored by default, but can be included by setting second parameter to true.

`cnv.tonumber (value)`

Converts the given value to number using following rules: numbers and valid numeric strings are treated as is, boolean `true` is 1, boolean `false` is 0, everything else is `nil`.

`cnv.hextoint(hexvalue, bytes)`

Converts the given hex string to and integer of a given length in bytes.

`cnv.inttohex(intvalue, bytes)`

Converts the given integer to a hex string of given bytes.

cnv.strtohex(str)

Converts the given binary string to a hex-encoded string.

cnv.hextostr(hexstr)

Converts the given hex-encoded string to a binary string.

1.2.23.Bit operators

bit.bnot (value)

Binary not

bit.band (x1 [, x2...])

Binary and between any number of variables

bit.bor (x1 [, x2...])

Binary or between any number of variables

bit.bxor (x1 [, x2...])

Binary xor between any number of variables

bit.lshift (value, shift)

Left binary shift

bit.rshift (value, shift)

Right binary shift

1.2.24. Input and Output Facilities

The I/O library provides two different styles for file manipulation. The first one uses implicit file descriptors; that is, there are operations to set a default input file and a default output file, and all input/output operations are over these default files. The second style uses explicit file descriptors.

When using implicit file descriptors, all operations are supplied by table *io*. When using explicit file descriptors, the operation *io.open* returns a file descriptor and then all operations are supplied as methods of the file descriptor.

The table *io* also provides three predefined file descriptors with their usual meanings from C: *io.stdin*, *io.stdout*, and *io.stderr*. The I/O library never closes these files.

Unless otherwise stated, all I/O functions return *nil* on failure (plus an error message as a second result and a system-dependent error code as a third result) and some value different from *nil* on success.

io.close ([file])

Equivalent to *file:close()*. Without a file, closes the default output file.

io.flush ()

Equivalent to *file:flush* over the default output file.

io.input ([file])

When called with a file name, it opens the named file (in text mode), and sets its handle as the default input file. When called with a file handle, it simply sets this file handle as the default input file. When called without parameters, it returns the current default input file. In case of errors this function raises the error, instead of returning an error code.

io.lines ([filename])

Opens the given file name in read mode and returns an iterator function that, each time it is called, returns a new line from the file. Therefore, the construction

for line in io.lines(filename) do body end

will iterate over all lines of the file. When the iterator function detects the end of file, it returns *nil* (to finish the loop) and automatically closes the file.

The call *io.lines()* (with no file name) is equivalent to *io.input():lines()*; that is, it iterates over the lines of the default input file. In this case it does not close the file when the loop ends.

io.open (filename [, mode])

This function opens a file, in the mode specified in the string mode. It returns a new file handle, or, in case of errors, *nil* plus an error message. The mode string can be any of the following:

- "r": read mode (the default);
- "w": write mode;
- "a": append mode;
- "r+": update mode, all previous data is preserved;
- "w+": update mode, all previous data is erased;
- "a+": append update mode, previous data is preserved, writing is only allowed at the end of file.

The mode string can also have a 'b' at the end, which is needed in some systems to open the file in binary mode. This string is exactly what is used in the standard C function *fopen*.

io.output ([file])

Similar to `io.input`, but operates over the default output file.

1.2.25. Mathematical functions

This library is an interface to the standard C math library. It provides all its functions inside the table `math`.

math.abs (x)

Returns the absolute value of `x`.

math.acos (x)

Returns the arc cosine of `x` (in radians).

math.asin (x)

Returns the arc sine of `x` (in radians).

math.atan (x)

Returns the arc tangent of `x` (in radians).

math.atan2 (y, x)

Returns the arc tangent of `y/x` (in radians), but uses the signs of both parameters to find the quadrant of the result. (It also handles correctly the case of `x` being zero.)

math.ceil (x)

Returns the smallest integer larger than or equal to `x`.

math.cos (x)

Returns the cosine of `x` (assumed to be in radians).

math.cosh (x)

Returns the hyperbolic cosine of `x`.

math.deg (x)

Returns the angle `x` (given in radians) in degrees.

math.exp (x)

Returns the value e^x .

math.floor (x)

Returns the largest integer smaller than or equal to `x`.

math.fmod (x, y)

Returns the remainder of the division of `x` by `y` that rounds the quotient towards zero.

math.frexp (x)

Returns `m` and `e` such that $x = m2^e$, `e` is an integer and the absolute value of `m` is in the range `[0.5, 1)` (or zero when `x` is zero).

math.huge

The value HUGE_VAL, a value larger than or equal to any other numerical value.

math.ldexp (*m*, *e*)

Returns $m2^e$, (*e* should be an integer).

math.log (*x*)

Returns the natural logarithm of *x*.

math.log10 (*x*)

Returns the base-10 logarithm of *x*.

math.max (*x*, ...)

Returns the maximum value among its arguments.

math.min (*x*, ...)

Returns the minimum value among its arguments.

math.modf (*x*)

Returns two numbers, the integral part of *x* and the fractional part of *x*.

math.pi

The value of pi.

math.pow (*x*, *y*)

Returns x^y . (You can also use the expression x^y to compute this value.)

math.rad (*x*)

Returns the angle *x* (given in degrees) in radians.

math.random ([*m* [, *n*]])

This function is an interface to the simple pseudo-random generator function rand provided by ANSI C. (No guarantees can be given for its statistical properties.)

When called without arguments, returns a uniform pseudo-random real number in the range [0,1). When called with an integer number *m*, math.random returns a uniform pseudo-random integer in the range [1,*m*]. When called with two integer numbers *m* and *n*, math.random returns a uniform pseudo-random integer in the range [*m*, *n*].

math.randomseed (*x*)

Sets *x* as the "seed" for the pseudo-random generator: equal seeds produce equal sequences of numbers.

math.sin (*x*)

Returns the sine of *x* (assumed to be in radians).

math.sinh (*x*)

Returns the hyperbolic sine of *x*.

math.sqrt (*x*)

Returns the square root of *x*. (You can also use the expression $x^{0.5}$ to compute this value.)

math.tan (*x*)

Returns the tangent of *x* (assumed to be in radians).

math.tanh (x)

Returns the hyperbolic tangent of x.

1.2.26. Table manipulations

This library provides generic functions for table manipulation. It provides all its functions inside the table module. Most functions in the table library assume that the table represents an array or a list. For these functions, when we talk about the "length" of a table we mean the result of the length operator.

table.concat (table [, sep [, i [, j]]])

Given an array where all elements are strings or numbers, returns *table[i]..sep..table[i+1] ... sep..table[j]*. The default value for *sep* is the empty string, the default for *i* is 1, and the default for *j* is the length of the table. If *i* is greater than *j*, returns the empty string.

table.insert (table, [pos,] value)

Inserts element *value* at position *pos* in *table*, shifting up other elements to open space, if necessary. The default value for *pos* is *n+1*, where *n* is the length of the table, so that a call *table.insert(t,x)* inserts *x* at the end of table *t*.

table.maxn (table)

Returns the largest positive numerical index of the given table, or zero if the table has no positive numerical indices. (To do its job this function does a linear traversal of the whole table.)

table.remove (table [, pos])

Removes from *table* the element at position *pos*, shifting down other elements to close the space, if necessary. Returns the value of the removed element. The default value for *pos* is *n*, where *n* is the length of the table, so that a call *table.remove(t)* removes the last element of table *t*.

table.sort (table [, comp])

Sorts table elements in a given order, in-place, from *table[1]* to *table[n]*, where *n* is the length of the table. If *comp* is given, then it must be a function that receives two table elements, and returns true when the first is less than the second (so that not *comp(a[i+1],a[i])* will be true after the sort). If *comp* is not given, then the standard Lua operator *<* is used instead.

The sort algorithm is not stable; that is, elements considered equal by the given order may have their relative positions changed by the sort.

1.2.27. Operating system facilities

os.date ([format [, time]])

Returns a string or a table containing date and time, formatted according to the given string format. If the time argument is present, this is the time to be formatted (see the *os.time* function for a description of this value). Otherwise, date formats the current time.

If *format* starts with '!', then the date is formatted in Coordinated Universal Time. After this optional character, if *format* is the string *"*t"*, then date returns a table with the following fields: year (four digits), month (1--12), day (1--31), hour (0--23), min (0--59), sec (0--61), wday (weekday, Sunday is 1), yday (day of the year), and isdst (daylight saving flag, a boolean).

If *format* is not *"*t"*, then date returns the date as a string, formatted according to the same rules as the C function *strftime*.

When called without arguments, `date` returns a reasonable date and time representation that depends on the host system and on the current locale (that is, `os.date()` is equivalent to `os.date("%c")`).

os.difftime (t2, t1)

Returns the number of seconds from time `t1` to time `t2`. In POSIX, Windows, and some other systems, this value is exactly `t2-t1`.

os.execute ([command])

This function is equivalent to the C function `system`. It passes `command` to be executed by an operating system shell. It returns a status code, which is system-dependent. If `command` is absent, then it returns nonzero if a shell is available and zero otherwise.

os.exit ([code])

Calls the C function `exit`, with an optional code, to terminate the host program. The default value for `code` is the success code.

os.getenv (varname)

Returns the value of the process environment variable `varname`, or `nil` if the variable is not defined.

os.remove (filename)

Deletes the file or directory with the given name. Directories must be empty to be removed. If this function fails, it returns `nil`, plus a string describing the error.

os.rename (oldname, newname)

Renames file or directory named `oldname` to `newname`. If this function fails, it returns `nil`, plus a string describing the error.

os.time ([table])

Returns the current time when called without arguments, or a time representing the date and time specified by the given table. This table must have fields `year`, `month`, and `day`, and may have fields `hour`, `min`, `sec`, and `isdst` (for a description of these fields, see the `os.date` function).

The returned value is a number, whose meaning depends on your system. In POSIX, Windows, and some other systems, this number counts the number of seconds since some given start time (the "epoch"). In other systems, the meaning is not specified, and the number returned by `time` can be used only as an argument to `date` and `difftime`.

os.tmpname ()

Returns a string with a file name that can be used for a temporary file. The file must be explicitly opened before its use and explicitly removed when no longer needed. On some systems (POSIX), this function also creates a file with that name, to avoid security risks. (Someone else might create the file with wrong permissions in the time between getting the name and creating the file.) You still have to open the file to use it and to remove it (even if you do not use it).

When possible, you may prefer to use `io.tmpfile`, which automatically removes the file when the program ends.

1.2.28. Extended function library

toboolean(value)

Converts the given value to boolean using following rules: *nil*, boolean *false*, 0, empty string, '0' string are treated as *false*, everything else as *true*

string.split(str, sep)

Splits the given string into chunks by the given separator. Returns Lua table.

knxlib.decodeia(indaddressa, indaddressb)

Converts binary-encoded individual address to Lua string. This function accepts either one or two arguments (interpreted as two single bytes).

knxlib.decodega(groupaddressa, groupaddressb)

Converts binary-encoded group address to Lua string. This function accepts either one or two arguments (interpreted as two single bytes).

knxlib.encodega(groupaddress, separate)

Converts Lua string to binary-encoded group address. Returns group address a single Lua number when second argument is *nil* or *false* and two separate bytes otherwise.

ipairs (t)

Returns three values: an iterator function, the table *t*, and 0, so that the construction

```
for i,v in ipairs(t) do body end
```

will iterate over the pairs (1,t[1]), (2,t[2]), ..., up to the first integer key absent from the table.

next (table [, index])

Allows a program to traverse all fields of a table. Its first argument is a table and its second argument is an index in this table. *next* returns the next index of the table and its associated value. When called with *nil* as its second argument, *next* returns an initial index and its associated value. When called with the last index, or with *nil* in an empty table, *next* returns *nil*. If the second argument is absent, then it is interpreted as *nil*. In particular, you can use *next(t)* to check whether a table is empty. The order in which the indices are enumerated is not specified, even for numeric indices. (To traverse a table in numeric order, use a numerical *for* or the *ipairs* function.) The behavior of *next* is undefined if, during the traversal, you assign any value to a non-existent field in the table. You may however modify existing fields. In particular, you may clear existing fields.

pairs (t)

Returns three values: the *next* function, the table *t*, and *nil*, so that the construction

```
for k,v in pairs(t) do body end
```

will iterate over all key–value pairs of table *t*.

tonumber (e [, base])

Tries to convert its argument to a number. If the argument is already a number or a string convertible to a number, then *tonumber* returns this number; otherwise, it returns *nil*.

An optional argument specifies the base to interpret the numeral. The base may be any integer between 2 and 36, inclusive. In bases above 10, the letter 'A' (in either upper or lower case) represents 10, 'B' represents 11, and so forth, with 'Z' representing 35. In base 10 (the default), the number can have a decimal part, as well as an optional exponent part. In other bases, only unsigned integers are accepted.

tostring (e)

Receives an argument of any type and converts it to a string in a reasonable format. For complete control of how numbers are converted, use *string.format*.

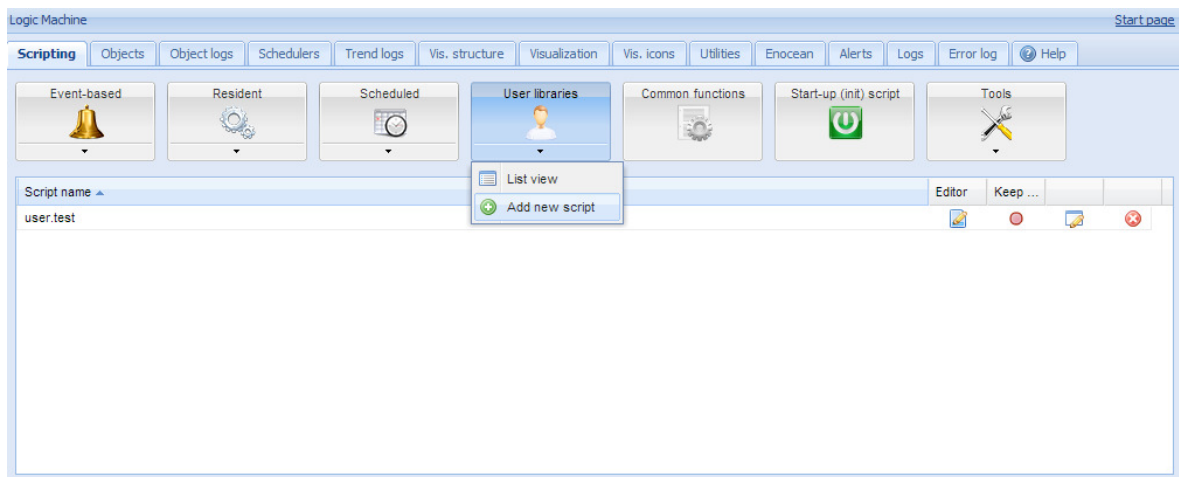
If the metatable of *e* has a `"__tostring"` field, then *tostring* calls the corresponding value with *e* as argument, and uses the result of the call as its result.

type (v)

Returns the type of its only argument, coded as a string. The possible results of this function are "nil" (a string, not the value *nil*), "number", "string", "boolean", "table", "function", "thread", and "userdata".

1.2.29. User libraries

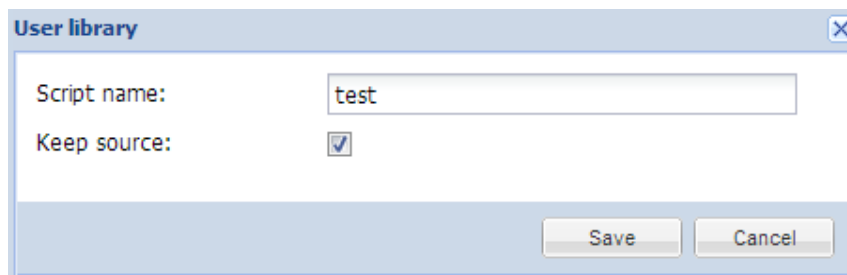
User libraries usually contain user defined functions which are later called from other scripts.



You have to include your library in the script with the following command: ***require('user.test')***

Secure the code

There is an option *keep source* available for user libraries. Once disabled, the code is compiled in the binary form and can't be seen for further editing. If this option is enabled, the source code is seen in the editor.



Include the library in the scripts

To use functions defined in user library, they should be included in the beginning of the script, for example, user library with the name 'test' should be included like this:

```
require('user.test')
```

1.2.30.Common functions

Common functions contains library of globally used functions. They can be called from any script, any time, without special including like with *user libraries*. Functions like sunrise/sunset, Email are included by default in *Common functions*.

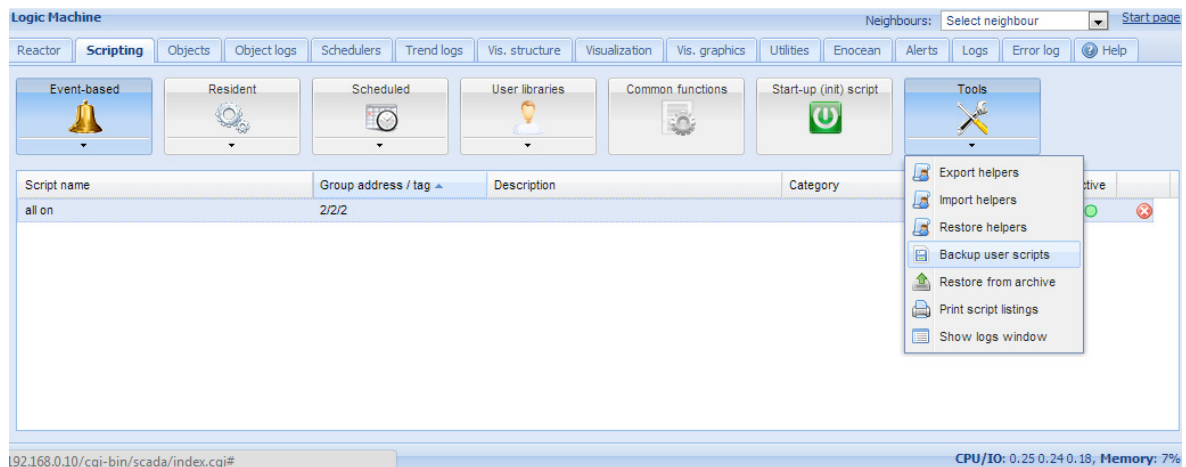


1.2.31.Start-up (init) script

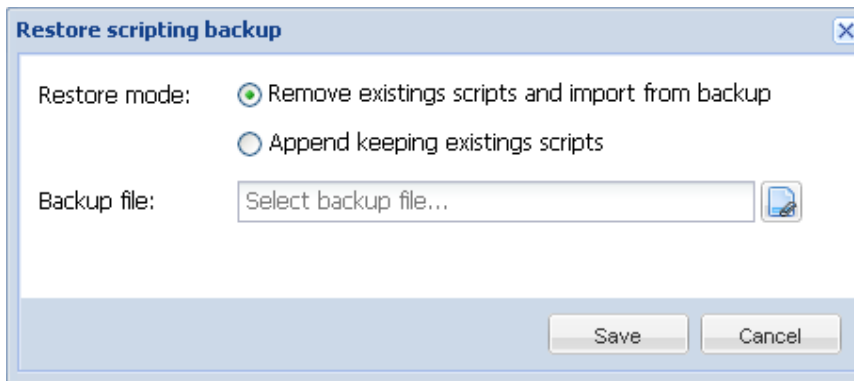
Init script is used for initialization on specific system or bus values on system start. Init script is run each time after system is restarted for some reason.



1.2.32.Tools



- **Export helpers** – export scripting helpers
- **Import helpers** – import scripting helpers
- **Restore helpers** – restore default scripting helpers
- **Backup user scripts** – backup all scripts in *.gz file
- **Restore from archive** – restore script from archive (*.gz) file with two possibilities:
 - Remove existing scripts and import from backup
 - Append keeping existing (s) scripts



- **Print script listings** – shows all scripts with codes in list format sorted by Categories.

Category: Presence

Presence simulator (id: 1)

Type: Resident

Active: Yes

Script sleep interval: 20

Synchronizes 0/0/2 value with 0/0/1

```
-- if object exists "presence" variable will be a table, nil otherwise
presence = knxobject.get('address', '0/0/1')

-- check that object exists and data has been decoded
if presence and presence.decoded then
  -- result will be either "value = true" or value = "false"
  alert('value = %s', tostring(presence.data))

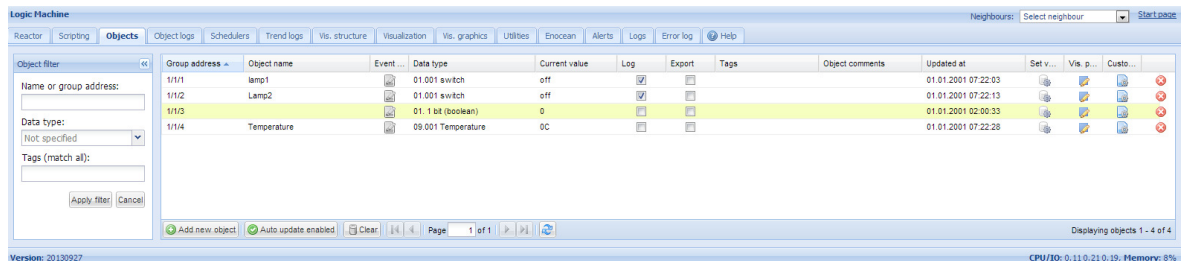
  -- update 0/0/2 with the same data
  knxobject.write('0/0/2', presence.data, dt.bool)
else
  alert('read error')
end
```

- **Show logs window** – show logs in separate window

1.3. Objects

List of KNX network objects appears in *Objects* menu. The object appears in the list by way of:

- sniffing the bus for telegrams from unknown group addresses (if enabled in *Utilities*)
- adding manually
- importing ESF file (in *Utilities*)



1.3.1. Object parameters

To change the settings for existing or new objects, press on the specific list entry.

The 'Object parameters' dialog box shows the following fields:

- Object name: Temperature
- Group address: 1/1/4
- Data type: 09.001 Temperature (dropdown menu)
- Units / suffix: C
- Log: ☐
- Export: ☐
- Poll interval (seconds): 30 (spinner)
- Tags: (empty text box)
- Current value: 23C
- Object comments: (empty text area)


At the bottom right are 'Save' and 'Cancel' buttons.

- **Object name** – Name for the object
- **Group address** – Group address of this object
- **Data type** – KNX data type for the object. This has to be set once the LM sniffs the new object for proper work.
- **Units / suffix** – units for the object which will appear on the visualization along with the value
- **Log** – enable logging for this object. Logs will appear in *Objects logs* menu.

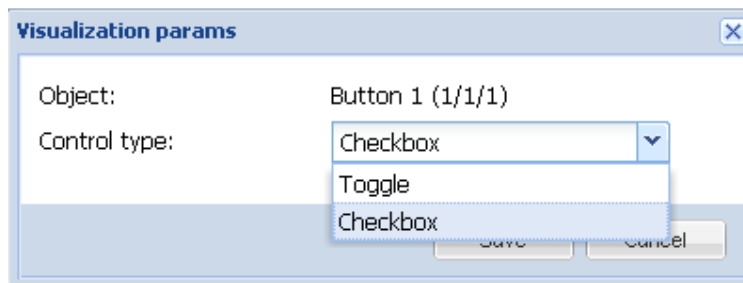
- **Export** – Make object visible by remote XML requests and in BACnet network (if KNX – BACnet gateway functionality is used)
- **Poll interval (seconds)** – perform automatic object read after some time interval
- **Tags** – assign this object to some tag which can be later used in writing scripts, for example, *All_lights_first_floor*.
- **Current value** – Current value of the object
- **Object comments** – Comment for the object

There is a possibility to sort the objects by one of the following – Name, Group address, Data type, Current value, Tags, Comments

1.3.2. Object visualization parameters

By pressing on the  button of the corresponding object you can set specific visualization parameters for this type of object.

1 bit

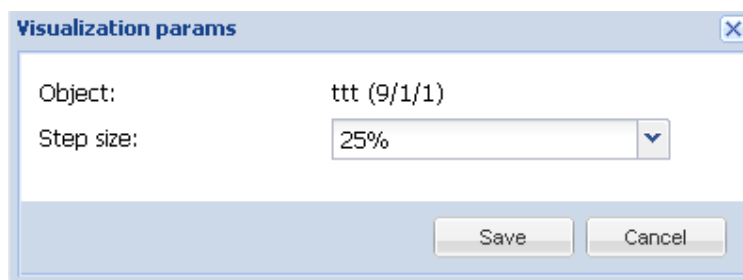


- **Control type** – type of the visual control element

- Toggle
- Checkbox



4 bit (3 bit controlled)



- **Step size** – step size for example for blinds control

2 bit (1 bit controlled), 1 byte unsigned integer (scale), 1 byte signed integer, 2 byte unsigned integer, 2 byte signed integer, 2 byte floating point (temperature), 4 byte unsigned integer, 4 byte signed integer, 4 byte floating point

Visualization params

Object: Send always 30% (2/2/3)

Control type: Slider

Minimum value: 0

Maximum value: 100

Save Cancel


- Control type – type of the visual control element
 - Slider

Direct input / Step +/-

12

- Minimum value
- Maximum value

1.3.3. Change the object state

In the object list, by pressing on the  button, you can change the state of the object. The appearance of the *New value* depends on what visualization parameters are set for specific object.

Set object value

Object name: Weather T High

Group address: 5/1/5

Data type: 09. 2 byte floating point

New value (21):

Save Cancel

Set object value

Object name: Output 1


Group address: 1/2/1

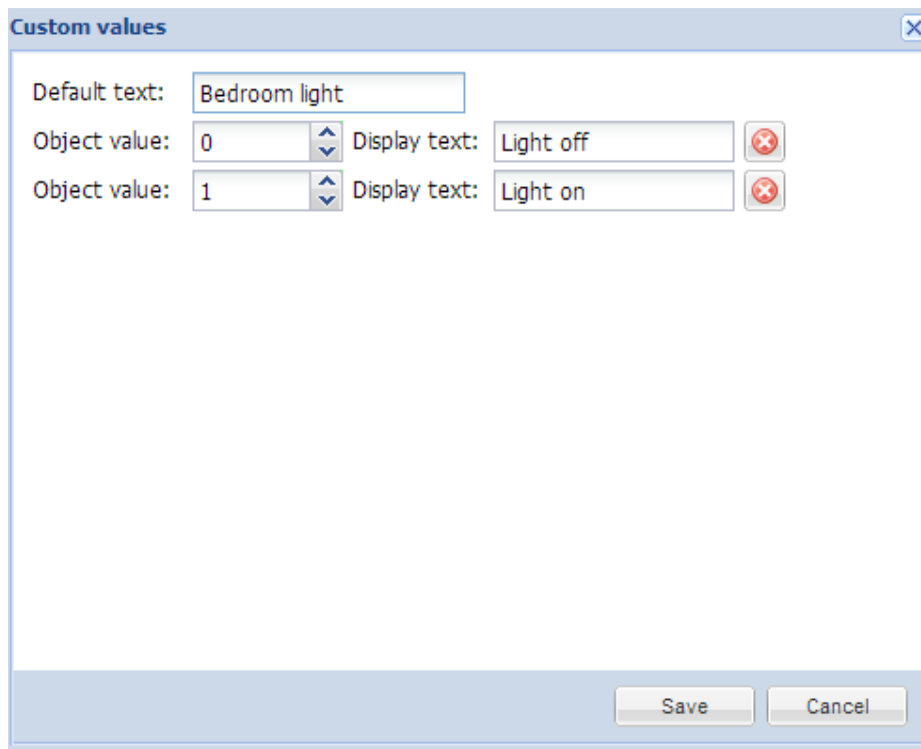
Data type: 01.001 switch

New value: false

Save Cancel

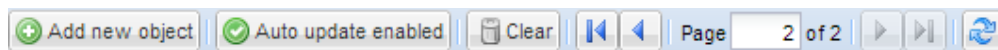
1.3.4. Custom values

If special value naming is necessary, use this icon  to set it up (only for Boolean and Integer data types)



The 'Custom values' dialog box is shown. It has a title bar with a close button. Inside, there is a 'Default text:' label followed by a text box containing 'Bedroom light'. Below this, there are two rows for 'Object value' and 'Display text'. The first row shows 'Object value:' with a spinner box set to '0' and a 'Display text:' box containing 'Light off'. The second row shows 'Object value:' with a spinner box set to '1' and a 'Display text:' box containing 'Light on'. Each 'Display text' box has a red 'X' button to its right. At the bottom right, there are 'Save' and 'Cancel' buttons.

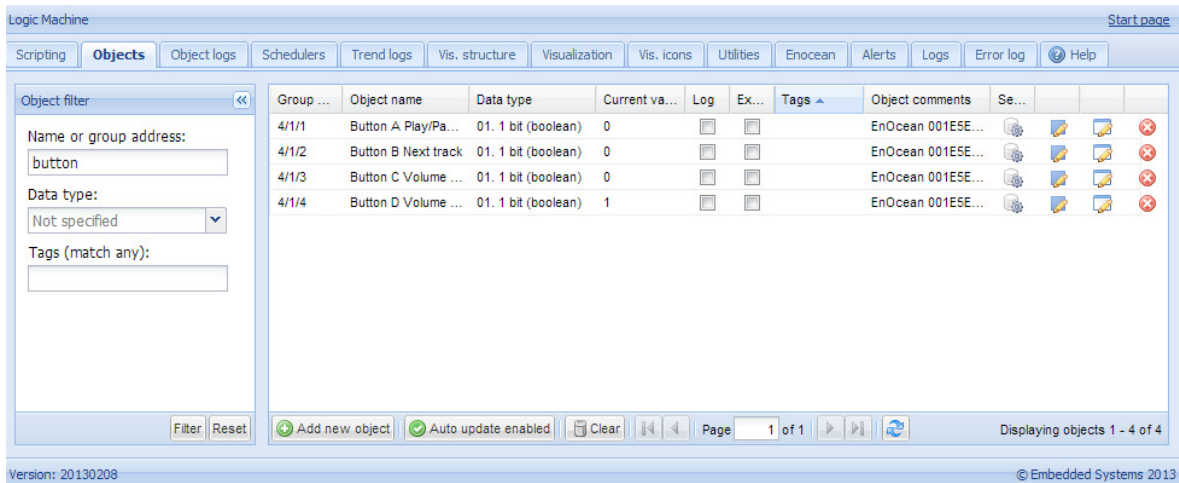
1.3.5. Object control bar



- **Add new object** – Manually add new object to the list
- **Auto update enabled** – Specifies either the object list is updated automatically or not
- **Clear** – Clear the list of group addresses
- **Next/Previous page** – move to next or previous page
- **Refresh** – refresh the object list

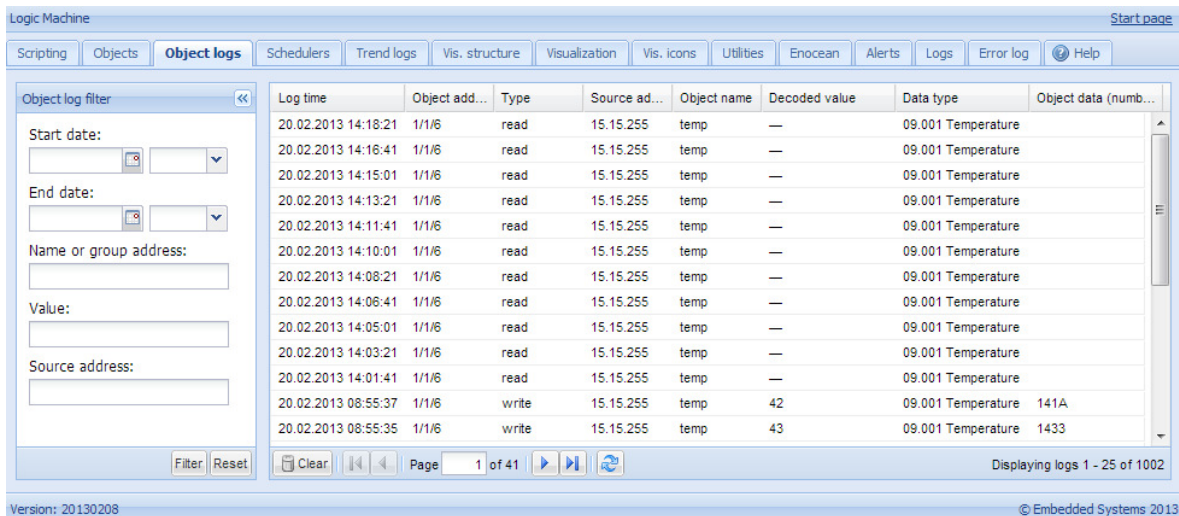
1.3.6. Filter objects

On the left side of the object list there is filtering possible. To perform the filtering type the name, group address, tag or specify the data type of the object and press on *Filter* button.



1.4. Object logs

Object historical telegrams are available in *Object logs*. Once logging is enabled for object, all it's further history will be logged.



Filtering is available when there is a need to find specific period information

- **Start date** – start date and time for log filtering
- **End date** – start date and time for log filtering
- **Name or group address** – specific name or group address of object
- **Value** – specific object value
- **Source address** – specific source address

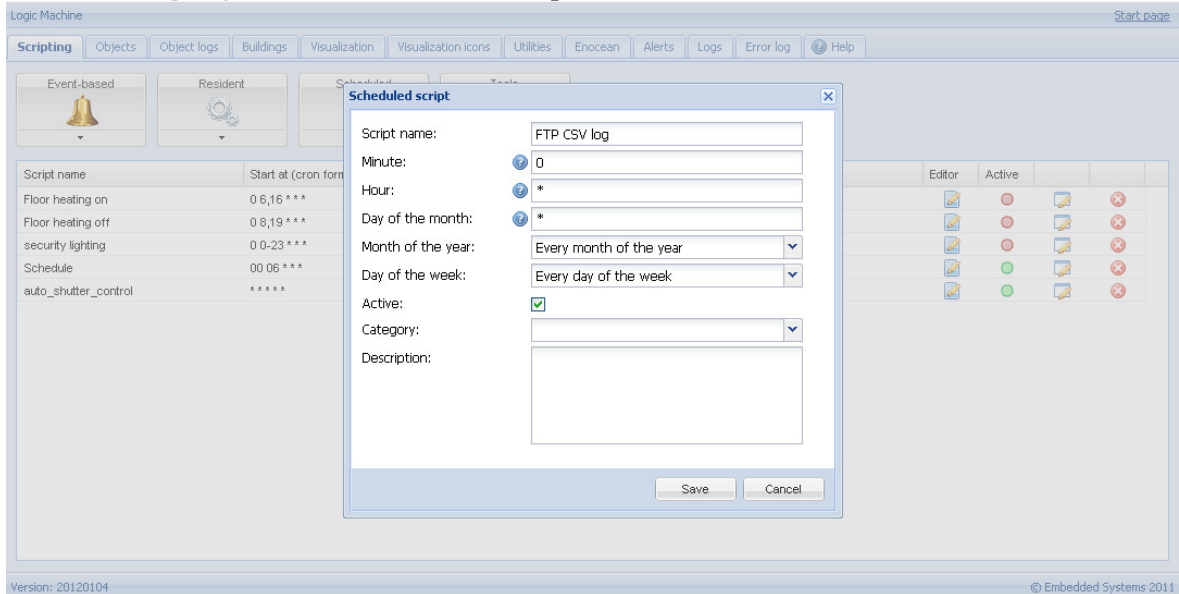
You can clear all logs by pressing on *Clear* button.

1.4.1. Export logs

Example

Once an hour, make CSV file with all objects logs and send to external FTP server with IP 192.168.1.11, login 'ftplogin', password 'ftppassword'.

- In *Scripting* -> *Scheduled* add the script which will run once an hour



- Add the following code in Script editor for this particular script.

```
1.require('socket.ftp')
2.
3.-- ftp file
4.ftpfile=string.format('ftp://ftplogin:ftppassword@192.168.1.11/%s.csv', os.date('%Y-%m-%d_%H-%M'))
5.-- get past hour data (3600 seconds)
6.logtime=os.time() - 60*60
7.
8.-- List of objects by id
9.objects={}
10.
11.-- objects with logging enabled
12.query='SELECT address, datatype, name FROM objects WHERE disablelog=0'
13.for _, object inipairs(db:getall(query))do
14.  objects[tounumber(object.address)]= {
15.    datatype=tounumber(object.datatype),
16.    name =tostring(object.name or ''),
17.  }
18.end
19.
20.-- csv buffer
21.buffer = {"date","address","name","value"}
```

```

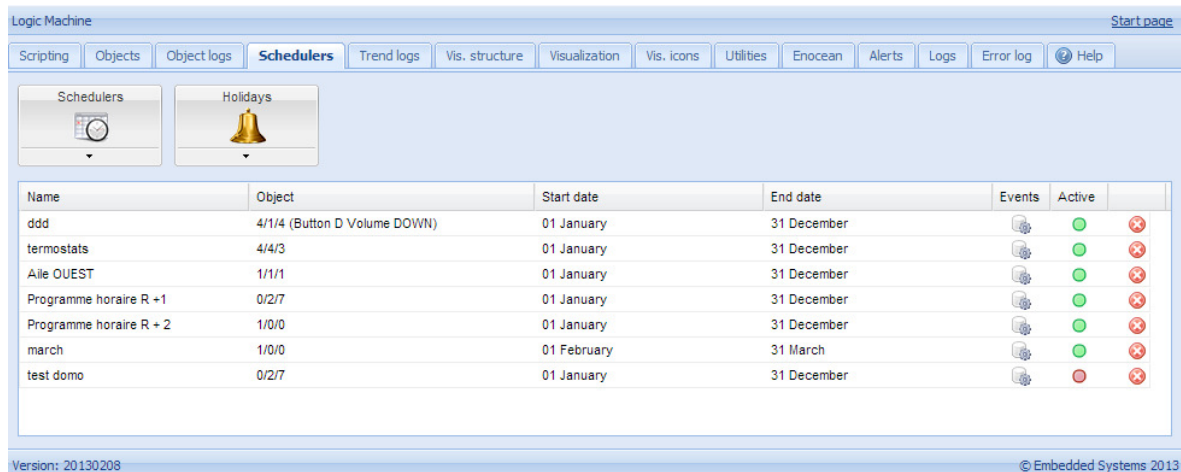
22.
23. -- get object logs
24. query='SELECT src, address, datahex, logtime, eventtype FROM objectlog WHERE
      logtime>= ? ORDER BY id DESC'
25. for _, row in ipairs(db:getall(query, logtime))do
26.   object = objects[tonumber(row.address)]
27.
28. -- found matching object and event type is group write
29. if object and row.eventtype=='write' then
30.   datatype=object.datatype
31.
32. -- check that object datatype is set
33. if datatype then
34. -- decode data
35.   data = knxdatatype.decode(row.datahex, datatype)
36.
37. -- remove null chars from char/string datatype
38. if datatype==dt.char or datatype==dt.string then
39.   data = data:gsub('%z+', '')
40. -- date to DD.MM.YYYY
41. elseif datatype==dt.date then
42.   data = string.format('%02d.%02d.%02d', data.day, data.month, data.year)
43. -- time to HH:MM:SS
44. elseif datatype==dt.time then
45.   data = string.format('%02d:%02d:%02d', data.hour, data.minute,
      data.second)
46. end
47. else
48.   data = ''
49. end
50.
51. -- format csv row
52. logdate=os.date('%Y.%m.%d %H:%M:%S', row.logtime)
53. csv=string.format('%q,%q,%q,%q', logdate, knxlib.decodega(row.address),
      object.name, tostring(data))
54.
55. -- add to buffer
56. table.insert(buffer, csv)
57. end
58. end
59.
60. -- upload to ftp only when there's data in buffer
61. if #buffer > 1 then
62.   result, err = socket.ftp.put(ftpfile, table.concat(buffer, '\r\n'))
63. end
64.
65. -- error while uploading

```

```
66. if err then
67.   alert('FTP upload failed: %s', err)
68. end
```

1.5. Schedulers

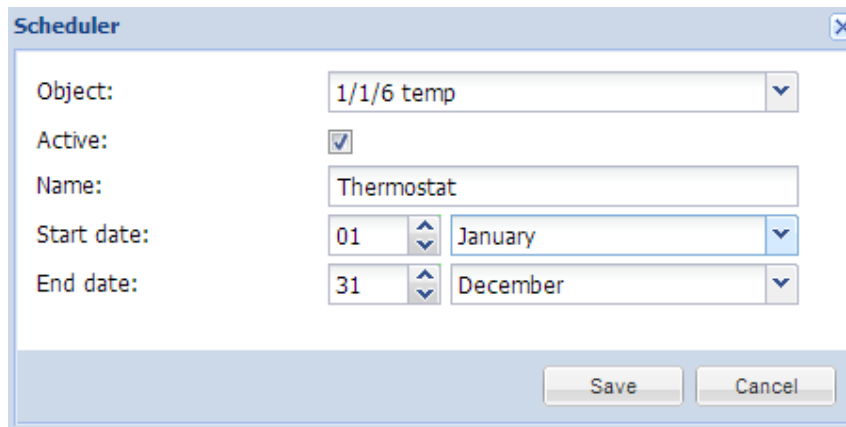
Schedulers contain administration of user mode schedulers. Schedulers allow for end user to control KNX group address values based on the date or day of the week.



Name	Object	Start date	End date	Events	Active	
ddd	4/1/4 (Button D Volume DOWN)	01 January	31 December			
thermostats	4/4/3	01 January	31 December			
Allé OUEST	1/1/1	01 January	31 December			
Programme horaire R +1	0/2/7	01 January	31 December			
Programme horaire R +2	1/0/0	01 January	31 December			
march	1/0/0	01 February	31 March			
test domo	0/2/7	01 January	31 December			

Version: 20130208 © Embedded Systems 2013

1.5.1. Add new scheduler



Scheduler

Object: 1/1/6 temp

Active: ☒

Name: Thermostat

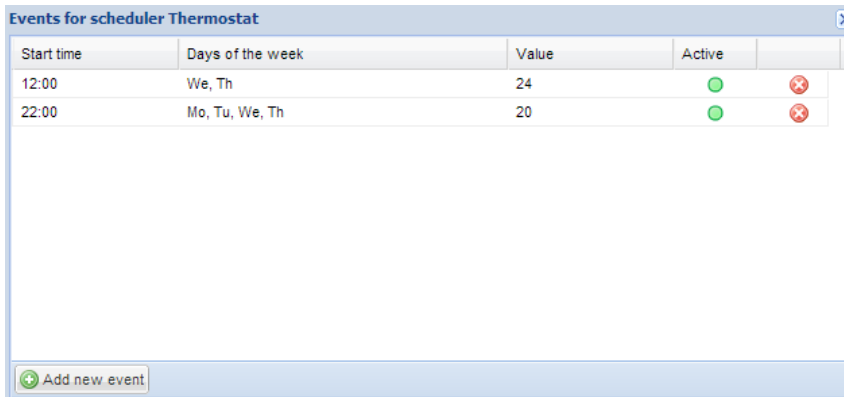
Start date: 01 January

End date: 31 December

Save Cancel

- **Object** – the object group address which will be controlled by scheduler
- **Active** – define this scheduler as active or not
- **Name** – name of the scheduler
- **Start date** – start date of the scheduler
- **End date** – end date of the scheduler

1.5.2. Scheduler events

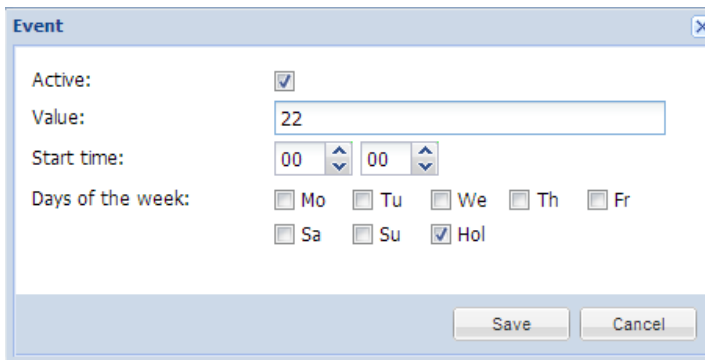


The screenshot shows a window titled "Events for scheduler Thermostat". It contains a table with the following data:

Start time	Days of the week	Value	Active	
12:00	We, Th	24	<input checked="" type="checkbox"/>	<input type="checkbox"/>
22:00	Mo, Tu, We, Th	20	<input checked="" type="checkbox"/>	<input type="checkbox"/>

At the bottom of the window, there is a button labeled "Add new event".

Event can be added both in administrator interface as well as by end user in the special *User mode schedulers* interface.



The screenshot shows an "Event" configuration window. It contains the following fields and controls:

- Active:** ☒
- Value:**
- Start time:**
- Days of the week:** ☐ Mo ☐ Tu ☐ We ☐ Th ☐ Fr ☐ Sa ☐ Su ☒ Hol

At the bottom, there are "Save" and "Cancel" buttons.

Active – define the event active or not

Value – value to send to the group address when the event will be triggered

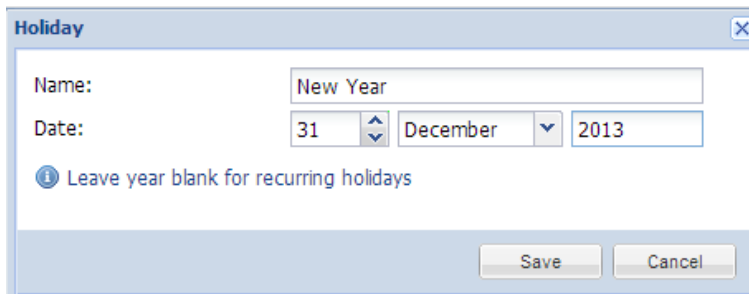
Start time – start time for the event

Days of the week – days of the week when the event will be triggered.

Hol – holidays which are defined in *Holidays* tab

1.5.3. Scheduler holidays

Once the event will be marked to run in *Hol*, Holiday entries will be activated.



The screenshot shows a "Holiday" configuration window. It contains the following fields and controls:

- Name:**
- Date:**

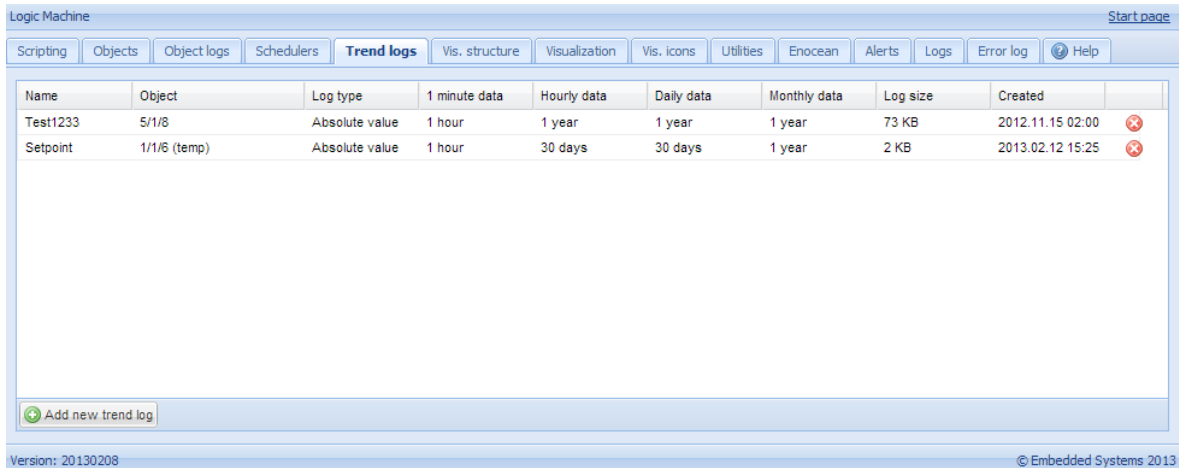
Below the date field, there is a message: "Leave year blank for recurring holidays". At the bottom, there are "Save" and "Cancel" buttons.

Name – the name of the holiday entry

Date – date of the holiday

1.6. Trend logs

Trends logs are administration of user mode trends, used to see historical object graphical values, compare with other period values.



1.6.1. Add new trend log

Object: 1/1/6 temp

Name: Setpoint

Log type: Absolute value

1 minute data: 1 hour

Hourly data: 30 days

Daily data: 30 days

Monthly data: 1 year

Save Cancel

Object – choose from list of object the one to make trends for

Name – name of the trend

Log type [*Counter*, *Absolute value*] – type of the log. *Counter* type is used to count the date, *Absolute value* – saves the actual readings

1 minute data – average value of 1 minute for specific time interval data will be shown on the trend. E.g. if 1 hour – trend step will be 1 hour with average 60 readings data

Hourly data – average value of hourly data for specific time interval

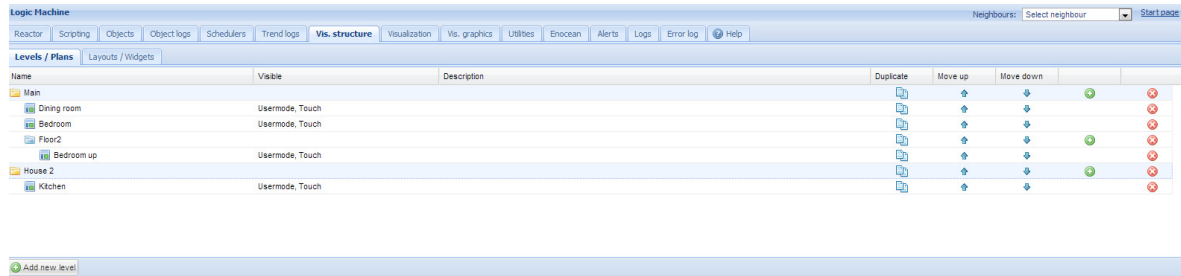
Daily data – average value of daily data for specific time interval

Monthly data – average value of monthly data for specific time interval

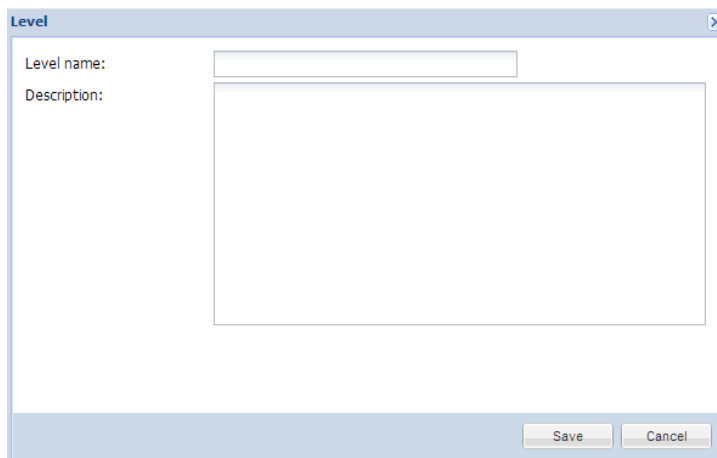
Note! One trend data point reading takes 8 bytes of flash memory. E.g. reading some value once in every 10 minutes, will consume ~0.4MB of flash each year.



1.7. Visualization structure

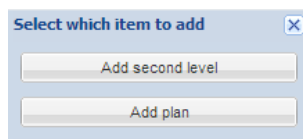
In *Vis.structure* menu the structure of the visualization is defined and visualization backgrounds are uploaded.



By default there is *Main* level added. To add a new level/building, press “Add new level” button.



Once a new level is added, you can add second level or upload floor pictures related to this particular building. To add a new entry, click on the green icon , to delete a specific entry press on the red icon .



Plan

Parent: Main

Name: Dining room

Layout: -

Usermode visualization: Show

Touch visualization: Show

Background image:

Background color: #FFFFFF

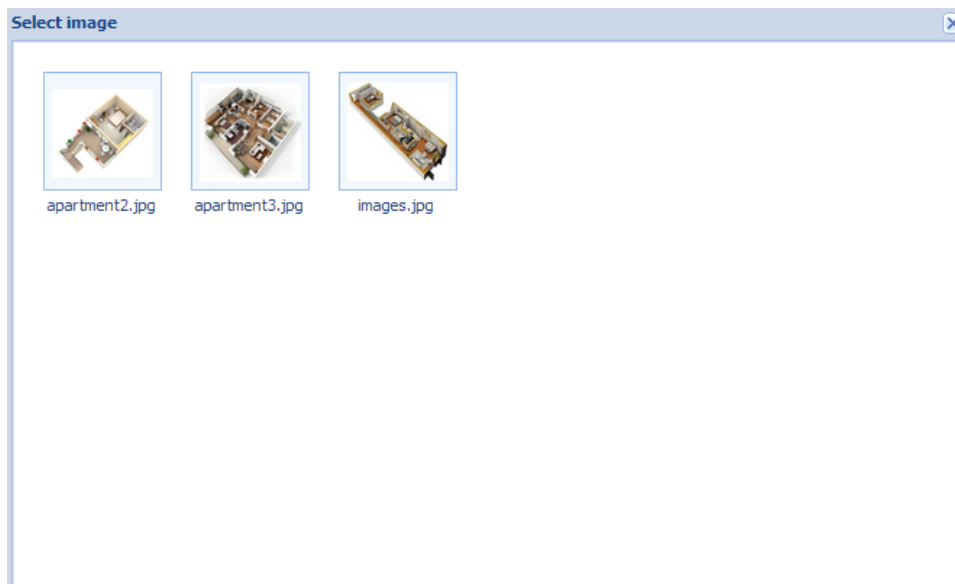
Repeat background image: ☐




Admin only access: ☐

Save Cancel

- **Plan name** – name for the plan
- **Layout** – layout for this specific plan. All object from Layout will be duplicated on this particular plan including background color and plan image if they are not defined separately for this specific plan
- **Usermode visualization [Show, Show and make default, Hide]** – visibility for this particular plan in Usermode visualization
- **Touch visualization [Show, Show and make default, Hide]** – visibility for this particular plan in Touch visualization
- **Background image** – choose background image from the list added in *Vis.graphics* → *Images/Backgrounds*
- **Background color** – choose background color of the plan
- **Repeat background image** – either to show the image once or repeat it and fill the whole plan
- **Admin only access** – enable admin only access for this floor

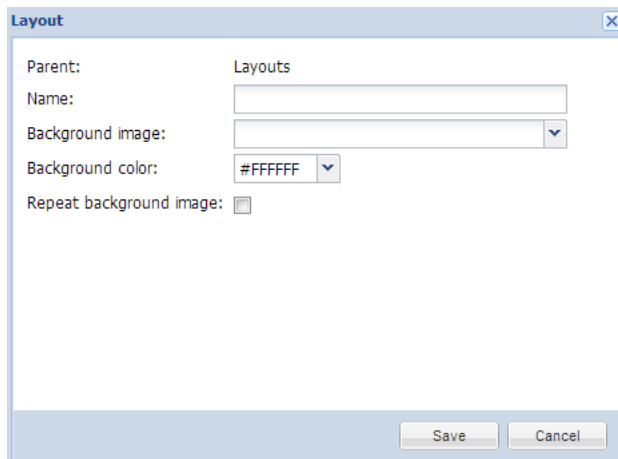
When clicking on Background image, the following window appears with background images which has to be added in *Vis.graphics* → *Images/Backgrounds* in advance:



You can duplicate the plan with all its objects and settings by pressing on  icon.
Levels can be sorted by pressing  and  icons.

1.7.1. Layouts / Widgets

Layouts are used as templates for further use when adding *Levels* in *Levels/Plans* tab.
Layouts will not be visible from the Usermode/Touch visualizations. When you add any background, objects to layouts level in *Visualization*, they will automatically appear on all linked Levels.

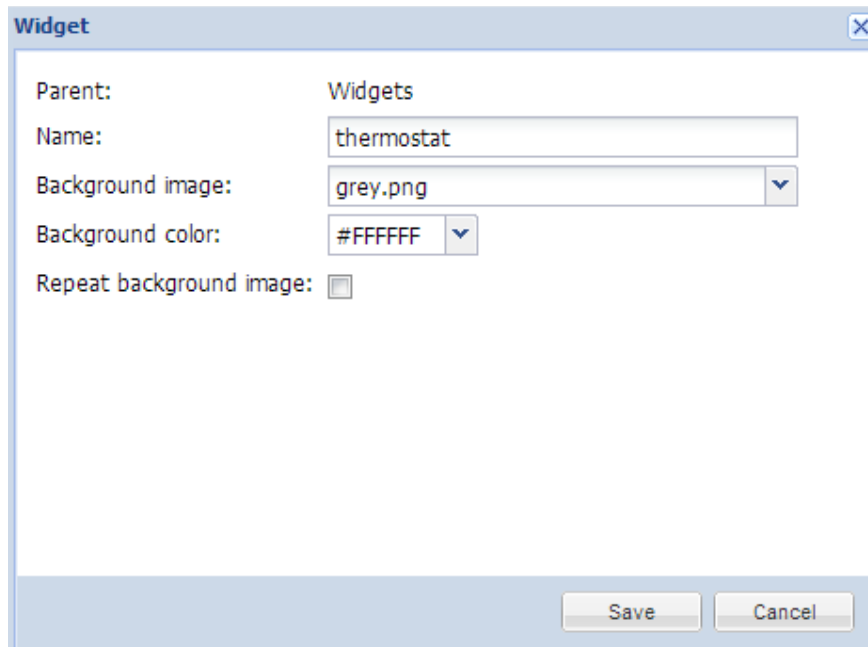


The 'Layout' dialog box is shown with the following fields:

- Parent: Layouts
- Name:
- Background image:
- Background color: #FFFFFF
- Repeat background image: ☐

Buttons: Save, Cancel

Widgets are used to combine several objects under one object in visualization.
Background image for the widget should be added in *Vis.graphics* → *Images/Backgrounds* in advance.

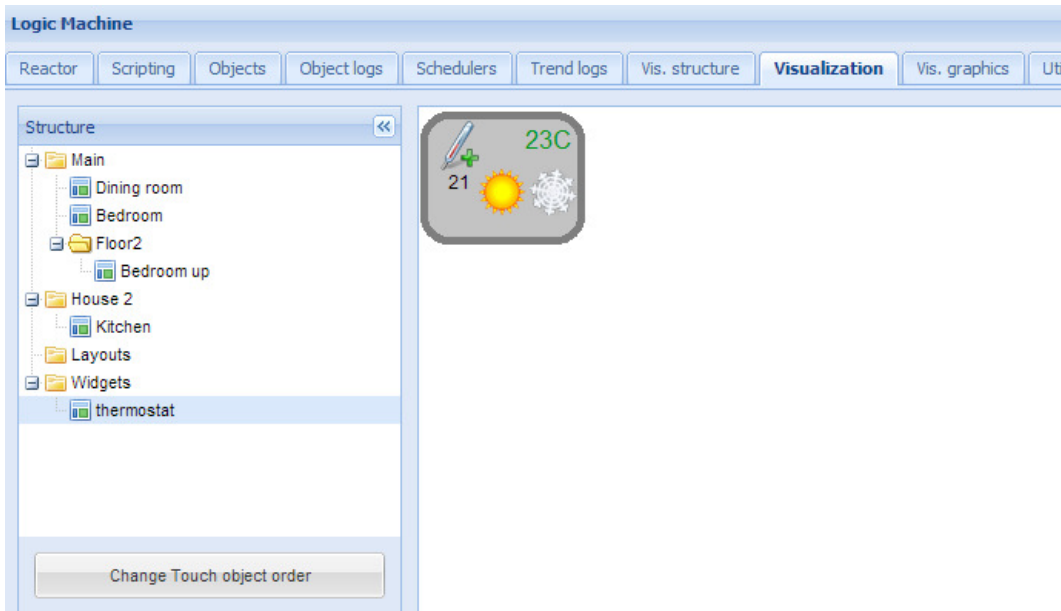


The 'Widget' dialog box is shown with the following fields:

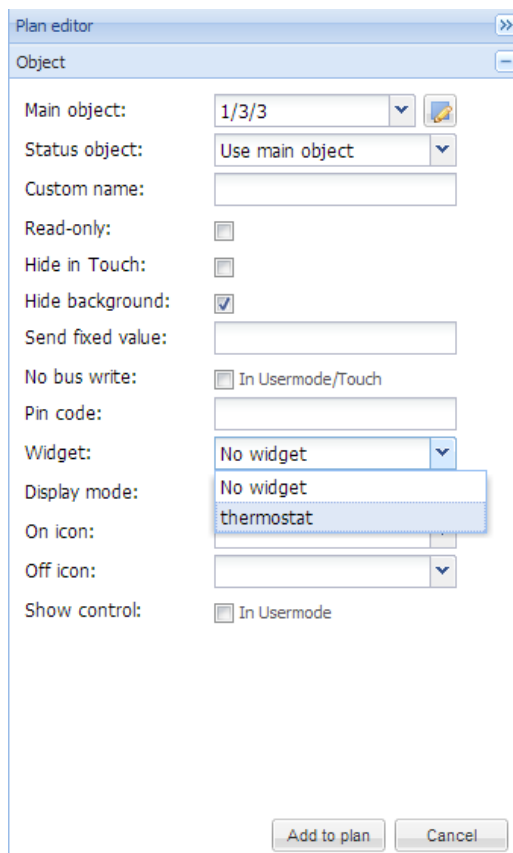
- Parent: Widgets
- Name: thermostat
- Background image: grey.png
- Background color: #FFFFFF
- Repeat background image: ☐

Buttons: Save, Cancel

When you have defined the widget in *Layouts/Widgets* tab, you can add objects to it in *Visualization* tab.



When you have added necessary objects to the widget, you can choose it when adding objects for main Levels e.g. Bedroom in Main level.



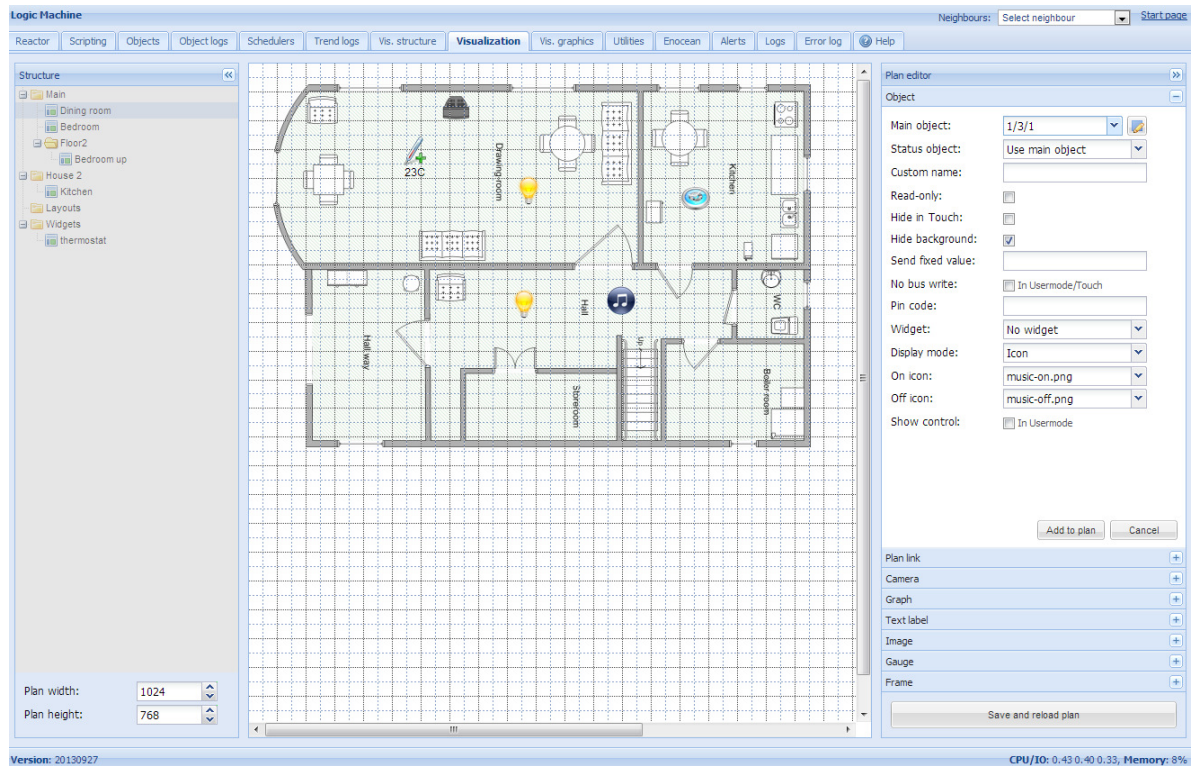
Once added, you can try out the widget in *Usermode visualization* by clicking on added object (temperature sensor icon on the left), the widget appears on click.



1.8. Visualization

After the building and floor structure is defined in Vis.structure tab, it is visualized in *Visualization* tab. Controlled and monitored objects can be added and managed in this section.

Both side bars can be minimized by pressing on  icon making the map more visible especially on small displays.



1.8.1. Plan editor

Plan editor is located on the right side of the visualization map. By clicking on *Unlock current plan for editing* button, the following main menus appear for configuration:

Plan editor >>

Object

Main object: 1/1/1 lamp1

Status object: Use main object

Custom name: Lamp

Read-only: ☐

Hide in Touch: ☐

Hide background: ☒

Send fixed value:

No bus write: ☐ In Usermode/Touch

Pin code: 1234

Widget: No widget

Display mode: Icon and value

On icon: lamp-on.png

Off icon: lamp-off.png

Show control: ☐ In Usermode

Text styles

Add to plan Cancel

Plan link +

Camera +

Graph +

Text label +

Image +

Gauge +

Frame +

Save and reload plan

- *Object* – new object to be added to the map
- *Plan link* – linking several floors with special icons
- *Camera* – IP web camera integration into visualization
- *Graph* – Real-time graph to monitor value of scale-type objects
- *Text Label* – text label to put on visualization
- *Image* – Add specific image on the visualization
- *Gauge* – Metering gauge
- *Frame* – add frame object to the visualization


On the left side of the plan *Vertical guide* and *Horizontal guide* fields appears, once the plan editor is unlocked. This is used to see guidelines for adapting specific plan to specific device resolution.

Vertical guide: 640

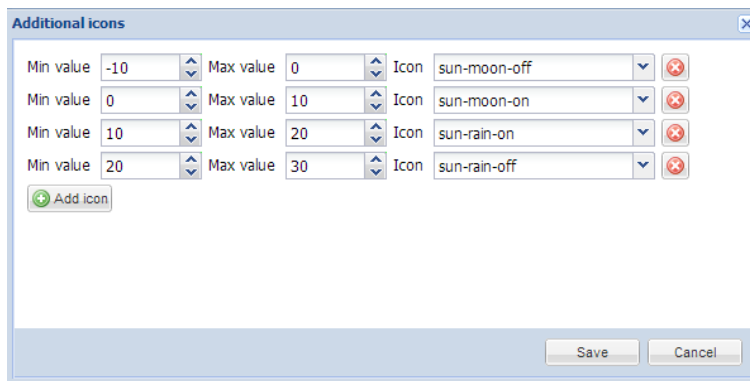
Horizontal guide: 440

1.8.2. Object

- **Main object** – list of existing group addresses on KNX/EIB bus, the ones available for configuration in *Objects* tab
- **Status object** – list of status objects on KNX/EIB bus
- **Custom name** – Name for the object
- **Read-only** – the object is read-only, no write permission
- **Hide in touch** – do not show this object in *Touch Visualization*
- **Hide background** – Hide icon background
- **Send fixed value** – Allows to send specific value to the bus each time the object is pressed
- **No bus write** – do not send telegram into the bus once clicked on this object in Usermode/Touch visualizations
- **PIN code** – PIN code which will be asked to provide when click on this object to perform group write
- **Widget** – specify widget which will be launched when click on this object
- **Display mode [icon and value; icon; value]** – how to display the object
- **Default Icon** – Default icon of scale-type objects. Icons library is located in *Vis.graphics* → *Icons* tab
- **On icon** – On state icon for binary-type objects. Icons library is located in *Vis.graphics* → *Icons* tab
- **Off icon** – Off state icon for binary-type objects. Icons library is located in *Vis.graphics* → *Icons* tab
- **Show control** – scale-type object specific setting defining either to show the control in Usermode visualization without icon



For scale-type objects additional button appears while specifying parameters – *Additional icons*. It's possible to define different icons for different object values in the window.



Once the object parameters are defined, press *Add to plan* button and newly created object will appear. You can move the object to the location it will be located. Note that while being in editing mode, the object will not work. When all necessary objects are added, press *Save and reload plan* button so the objects starts functioning.

You can edit each added object when clicking on it while in Editing mode.

1.8.3. Plan link

In order to make visualization more convenient, there are floor links integrated. You can add icons or text on the map, which links to other floors.

Plan editor

Object

Plan link

Plan: Bedroom up

Custom name:

Hide in Touch:

Hide background: ☒

Display mode: Icon

Icon: goto-down.png

Active state icon: goto-right.png

Add to plan Cancel

Camera

Graph

Text label

Image

Gauge

Frame

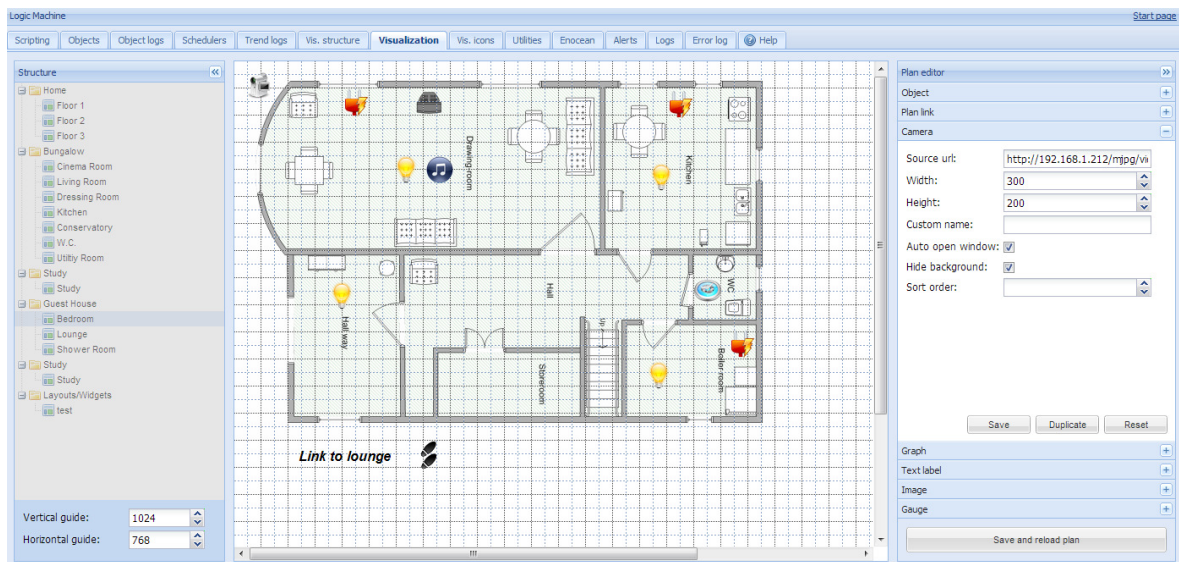
Save and reload plan

- **Plan** – Linked plan name or link to Schedulers / Trends
- **Custom name** – name for the link
- **Hide background**– Hide icon background
- **Display mode [Icon; Value]** – either to show icon or its value
- **Icon** – Icon which will be showed in visualization (if chosen, no further parameters are available)
- **Active state icon** – active state icon if the link is to current plan (in case you have several smaller plans on one visualization and want to display the current one)
- **Font size** – size of font
- **Text style** – text style – bold, italic, underscore
- **Custom font** – font name
- **Font color** – font color

Once the floor link parameters are defined, press *Add to plan* button and newly created object will appear. You can move the object to the location it will be located. Note that while being in editing mode, the object will not work. Press on *Save and reload plan* button so the objects starts functioning.

1.8.4. Camera

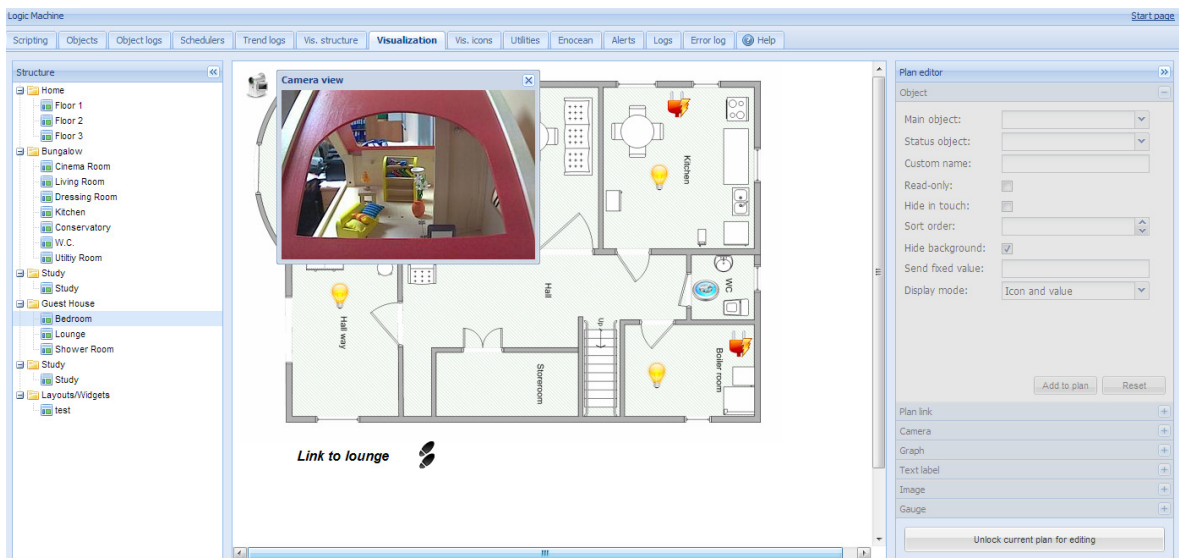
Logic Machine supports third party IP web camera integration into its visualization.



- **Source url** – source address of the video stream
- **Width** – sub-window width for displaying of picture
- **Height** – sub-window height for displaying of picture
- **Custom name** – name for the object
- **Icon** – icon for the object
- **Auto open window** – automatically open video window
- **Hide background** – hide icon background

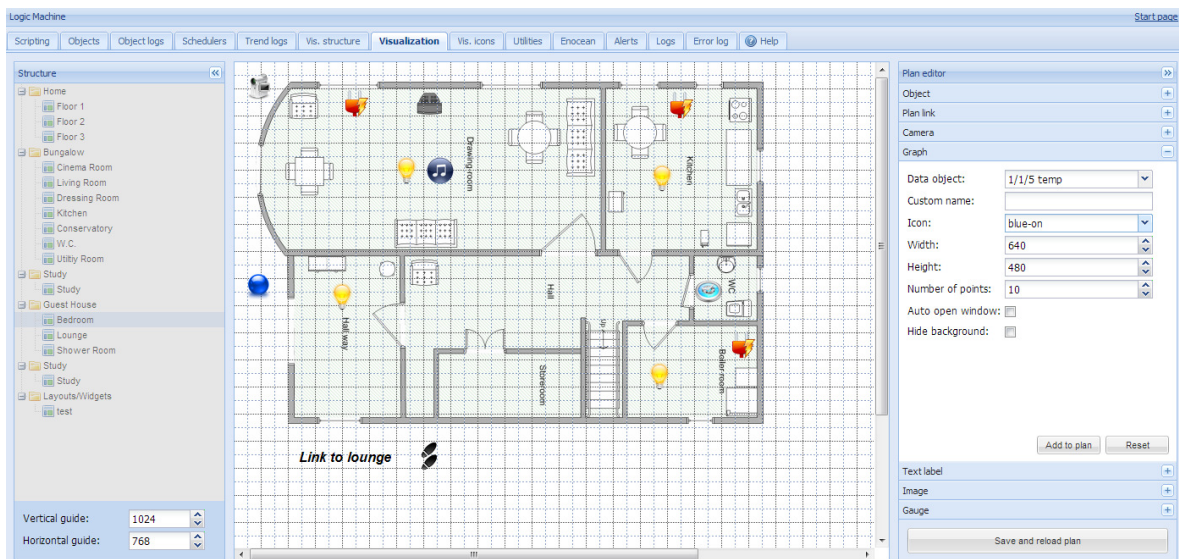
Note! If IP camera requires user name and password, enter the url in form ***http://USER:PASSWORD@IP***

Once the camera parameters are defined, press *Add to plan* button and newly created object will appear in look of video camera. You can move the object to the location it will be located. Note that while being in editing mode, the object will not work. Press on *Save and reload plan* button so the objects starts functioning. By pressing on video camera, a new sub-window appears with a picture from your IP web camera. The window can be freely moved to other location so not to cover other visualization objects.



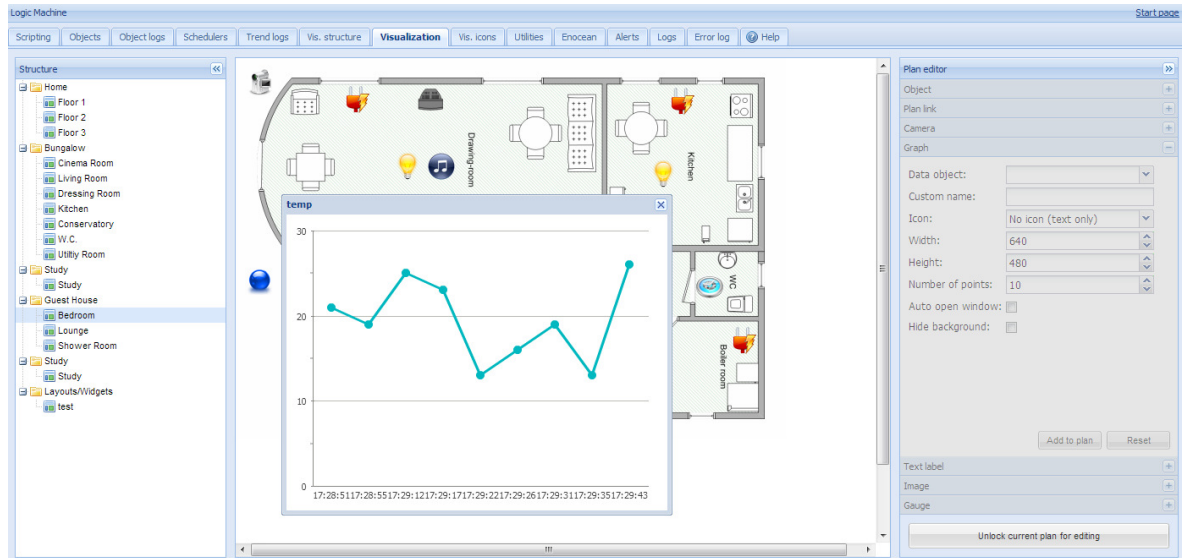
1.8.5. Graph

Real-time graphs can be integrated into visualization system to monitor the current and old value of scale-type objects. Make sure logging is enabled for the object in *Object* tab which values is planned to be shown in the graph.



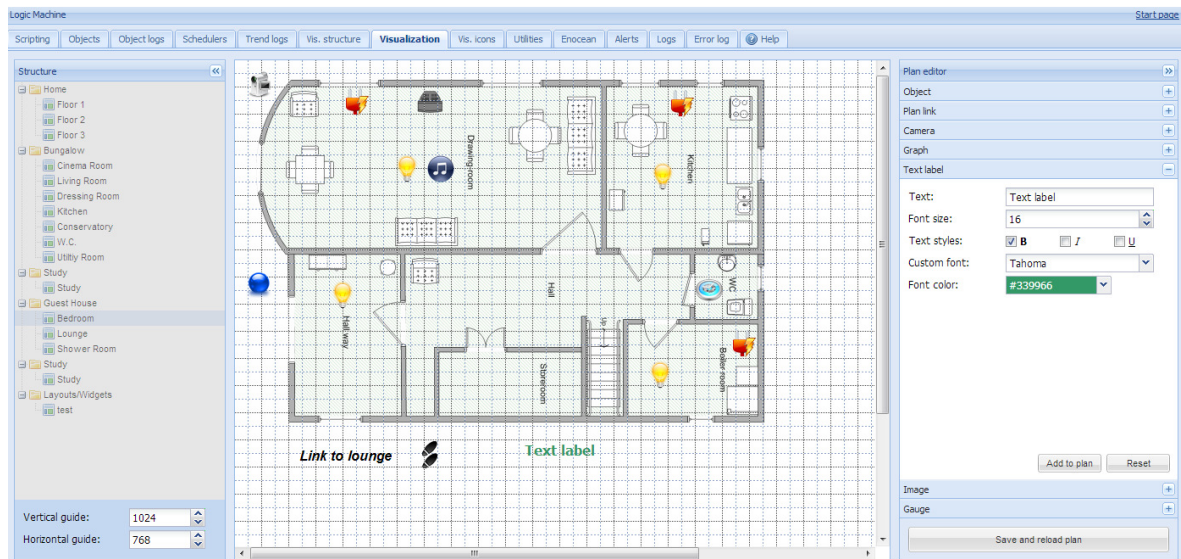
- **Data object** – group address of the object
- **Custom name** – name of the object
- **Icon**– icon to launch the graph
- **Width** – sub-window width for displaying the graph
- **Height**– sub-window height for displaying the graph
- **Number of points** – number of data points to show in the graph
- **Auto open window** – graph window is automatically opened
- **Hide background** – hide icon background

Once the graph parameters are defined, press *Add to plan* button and newly created object will appear. You can move the object to the location it will be located. Note that while being in editing mode, the object will not work. Press on *Save and reload plan* button so the objects starts functioning.



1.8.6. Text Label

Text labels can be added and moved across the visualization map.

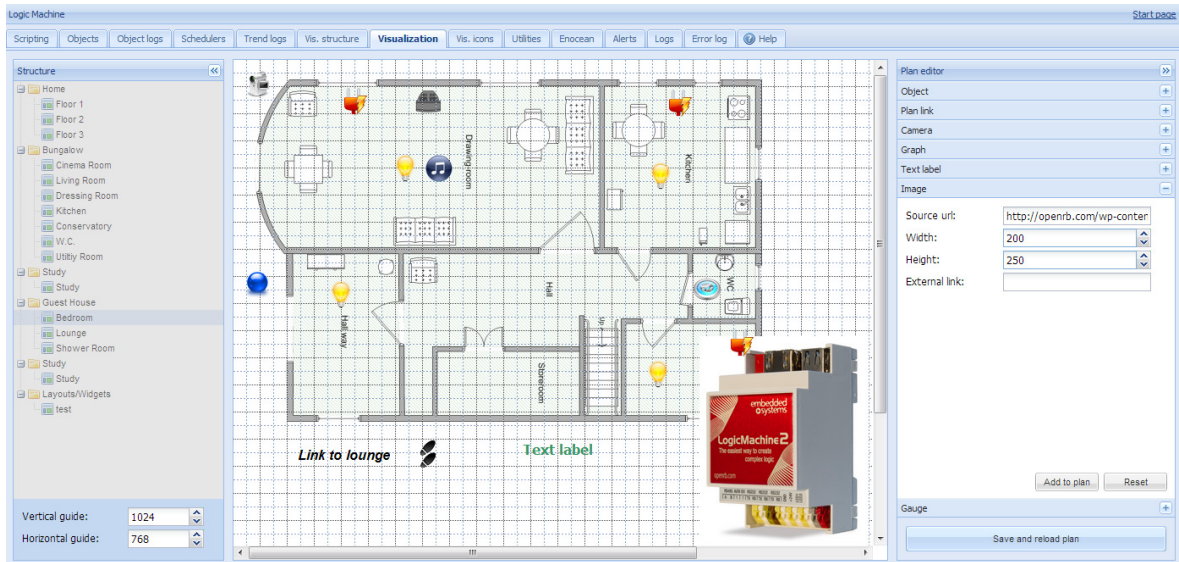


- **Text** – label text
- **Font size** – label font size
- **Text style** – style of the text – bold, italic, underscored
- **Custom font** – font name
- **Font color** – label font color

Once the label parameters are defined, press *Add to plan* button and newly created object will appear on the map. You can move the object to the location it will be located. Press on *Save and reload plan* button so the objects starts functioning.

1.8.7. Image

Image section allows adding images from the internet into the visualization map. Useful for example, to grab dynamic weather cast images.



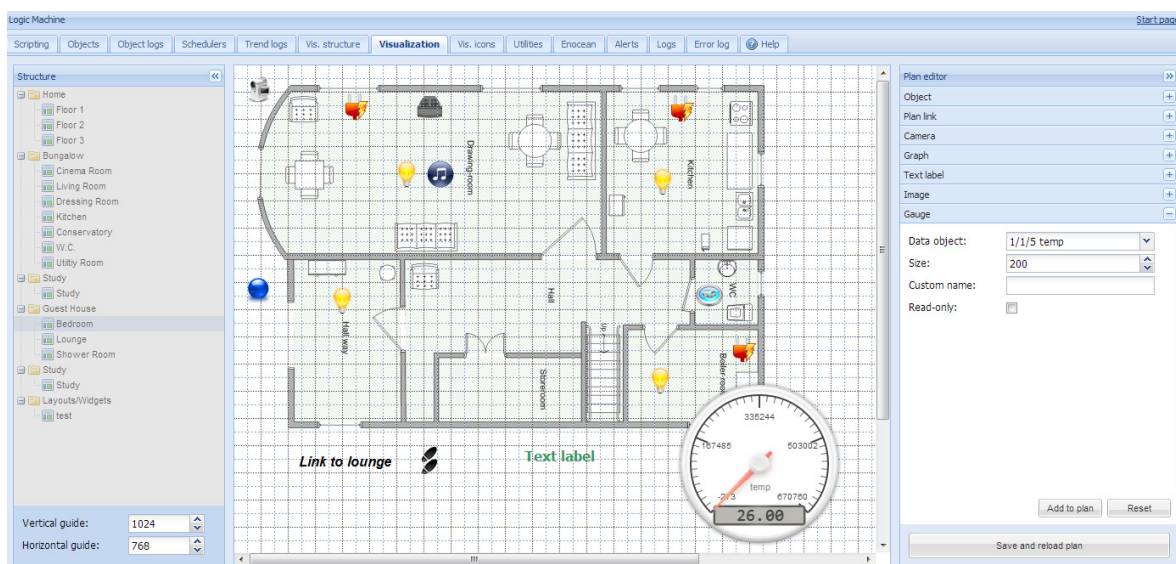
- **Image source [Local; Remote]** – image source location
- **Source url / Select image** – Source URL of the image or image from local database
- **Width** – width of the image
- **Height** – height of the image
- **External link** – external link URL when pressing on the image

Once the image parameters are defined, press *Add to plan* button and newly created object will appear on the map. You can move the object to the location it will be located. Press on *Save and reload plan* button so the objects starts functioning.

1.8.8. Gauge

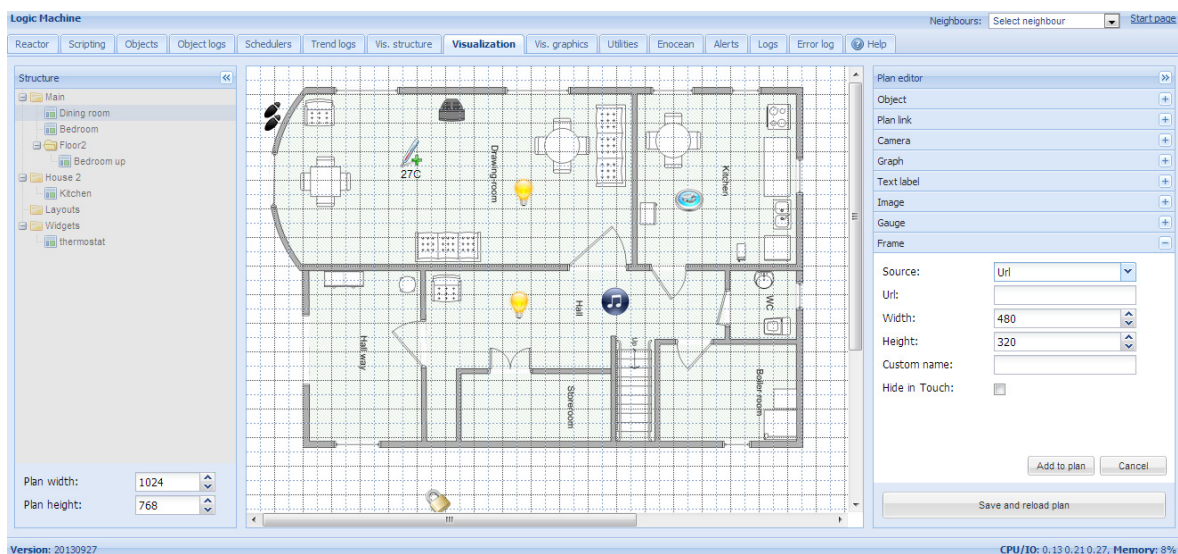
Gauge allows visualizing and changing object value in the gauge.

- **Data object** – KNX group address
- **Size** – size of the gauge
- **Custom name** – custom name for the object
- **Read only** – make the gauge read only

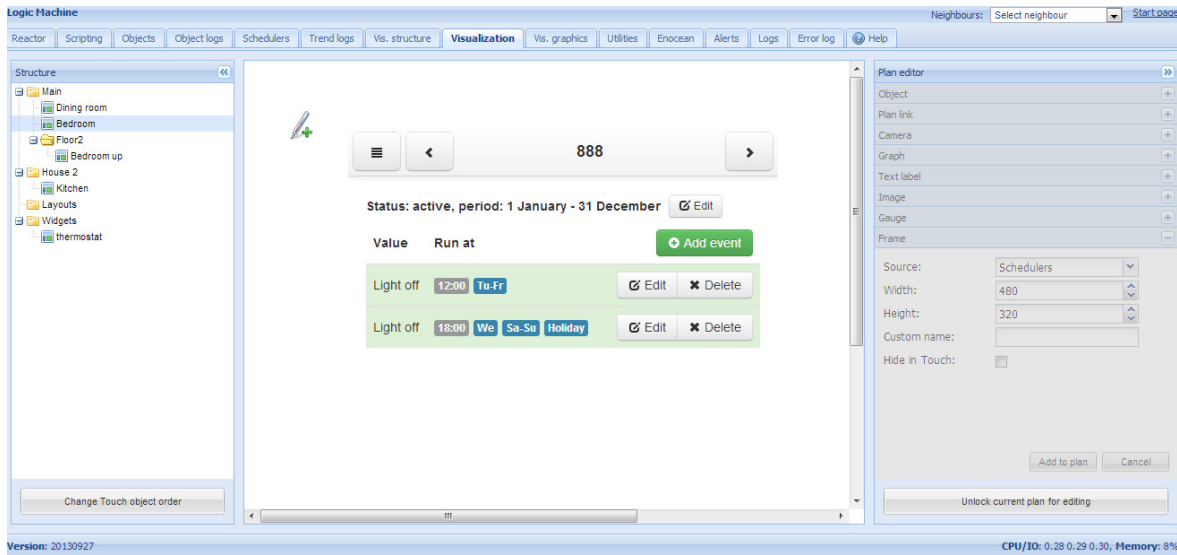


Once the gauge parameters are defined, press *Add to plan* button and newly created object will appear on the map. You can move the object to the location it will be located. Press on *Save and reload plan* button so the objects starts functioning.

1.8.9. Frame

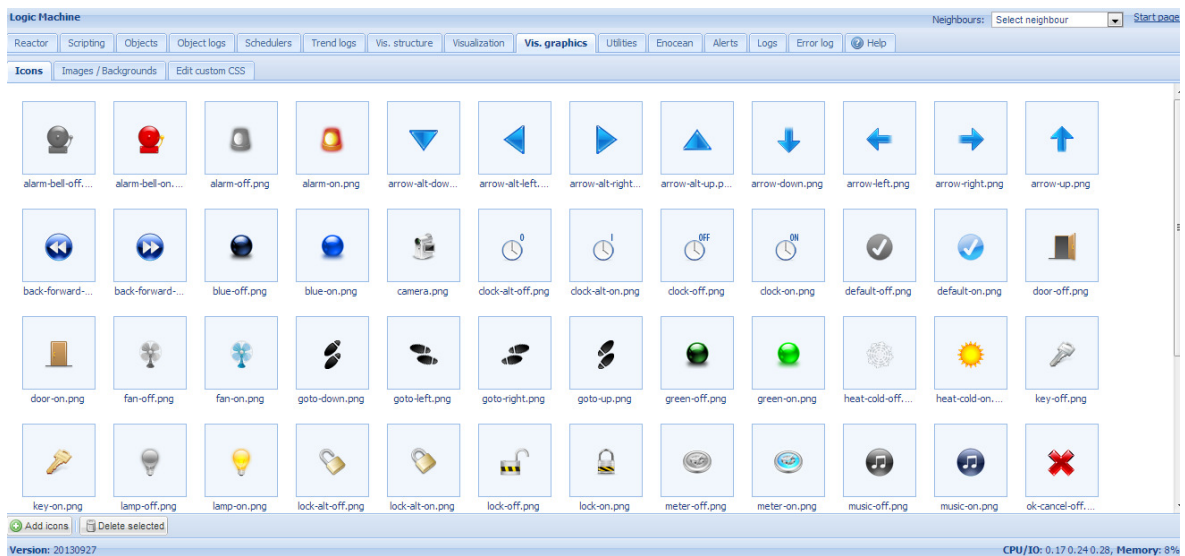


- **Source [Url, Schedulers; Trend logs]** – frame source
- **Url** – Source URL of the page to integrate
- **Width** – width of the frame
- **Height** – height of the frame
- **Custom name** – custom name of the frame object
- **External link** – external link URL when pressing on the image
- **Hide in Touch** – defines either to hide frame in Touch visualization



1.9. Vis. graphics

The list of predefined icons, list of images and backgrounds is available in *Vis.graphics* tab.



Press on *Add new icon* button to add a new entry. The system accepts any size icons. GIF is also supported.

Add new graphics [X]

Name (optional):

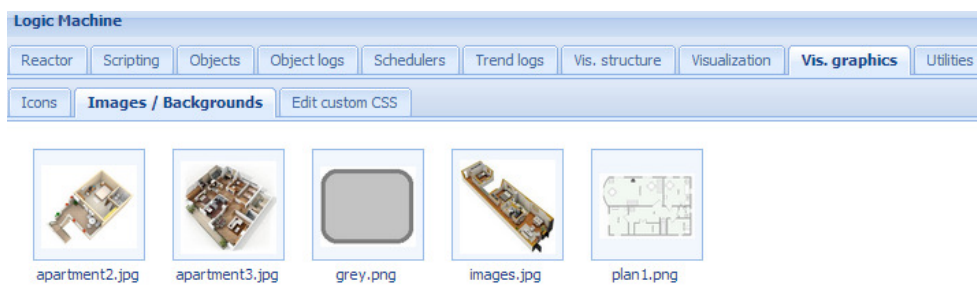
File: No file chosen

ⓘ Name can contain letters, numbers, underscore and minus sign
 ZIP archive containing multiple graphics can be uploaded, each item
 cannot exceed 2MB, whole archive size cannot exceed 16MB

Name (optional) – the name of the icon

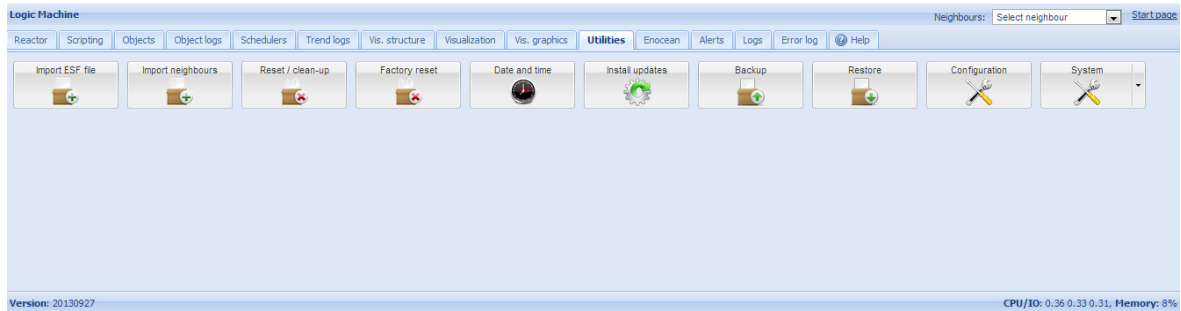
File – Icon file location

Images/Backgrounds tab is used to upload image files for visualization purposes

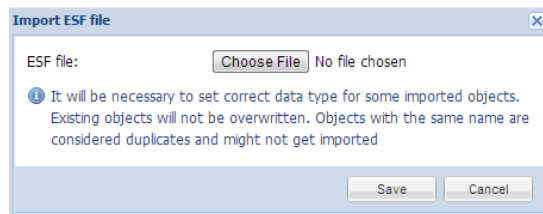


1.10. Utilities

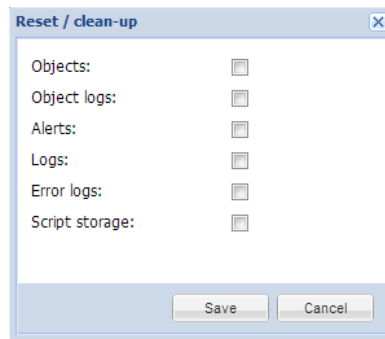
There are following utilities in the tab available:



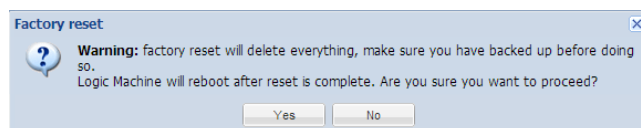
Import ESF file– imports ETS object file. It will be necessary to set correct data types for some imported objects. Existing objects will not be overwritten. Objects with the same name are considered duplicates and might not be imported



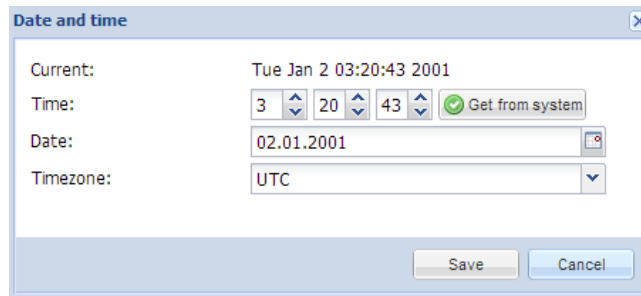
Reset object/clean-up – delete all objects from the Logic Machine, they disappear from visualization aswell



Factory reset– delete all configuration and return to factory defaults

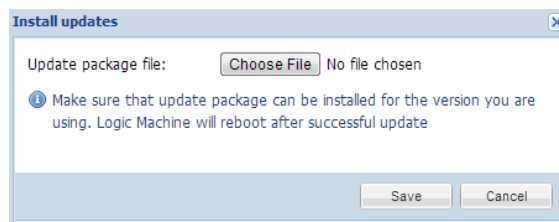


Date and time – data and time settings



The 'Date and time' dialog box shows the current date and time as 'Tue Jan 2 03:20:43 2001'. The 'Time' field is set to 3:20:43, with a 'Get from system' button. The 'Date' field is set to 02.01.2001. The 'Timezone' is set to UTC. There are 'Save' and 'Cancel' buttons at the bottom.

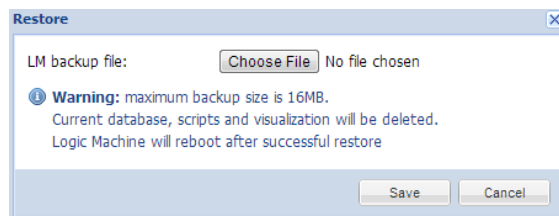
Install updates – install Logic Machine update file *.lmu. Logic Machine will reboot after successful update



The 'Install updates' dialog box has a 'Choose File' button and 'No file chosen' text. It includes a warning icon and text: 'Make sure that update package can be installed for the version you are using. Logic Machine will reboot after successful update'. There are 'Save' and 'Cancel' buttons at the bottom.

Backup – backup all objects, logs, scripts, visualization.

Restore – restore configuration from backup



The 'Restore' dialog box has a 'Choose File' button and 'No file chosen' text. It includes a warning icon and text: 'Warning: maximum backup size is 16MB. Current database, scripts and visualization will be deleted. Logic Machine will reboot after successful restore'. There are 'Save' and 'Cancel' buttons at the bottom.

Configuration – by clicking on the arrow, *KNX Connection* and *User Access* settings can be access. By clicking on the *Configuration button*, system general settings appear.

The screenshot shows a 'Configuration' dialog box with the following settings:

- Interface language: English
- List items per page: 25
- Automatic address range start: 1/1/1
- Discover new objects: Yes, bus sniffer enabled
- Object log size: 1000
- Default log policy: Log only selected objects
- Alert log size: 200
- Log size: 200
- Error log size: 200
- Usermode sidebar: Show as overlay (auto-hide)
- Usermode view: Center plans, enable auto-sizing
- Show alerts in Usermode: ☐

Below the settings, there is an information icon and a list of notes:

- If log size is changed to a smaller value, excess logs will be deleted on next auto clean-up (every 15 minutes)
- Log policy only affects new objects, current per-object log settings are kept unchanged

A warning message is displayed: **Warning:** excessive object logging degrades performance

At the bottom right, there are 'Save' and 'Cancel' buttons.

Interface language – interface language

List items per page –count of lines per page e.g. *Objects*, *Object logs*, *Alerts etc.*

Automatic address range start – start group address when using automatic addressing in scripts, IO settings and other

Discover new objects– either KNX object sniffer is enabled. If yes, once triggered all new objects will appear automatically in the Objects list

Object log size – max count of object logs

Default log policy– either to log status change for all objects or only for checked objects

Alert log size – max count of alerts logged

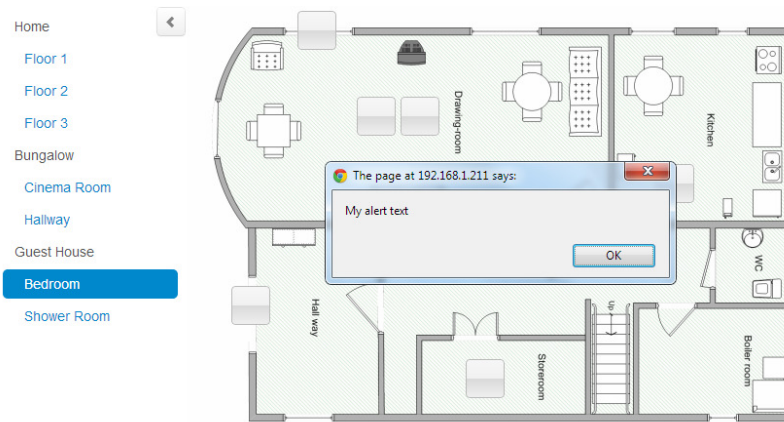
Log size– max count of logs

Error log size– max count of errors logged

Usermode sidebar [*Show docked*; *Show as overlay*; *Hide*] – defines how the side bar is located in Usermode visualization

Usermode view [*Align plans to top left, no size limit*; *Center plans, limit size*; *Center plans, enable auto-sizing*] – defines the look of Usermode visualization

Show alerts in user mode – once new Alerts is triggered it will pop-up in User mode visualization



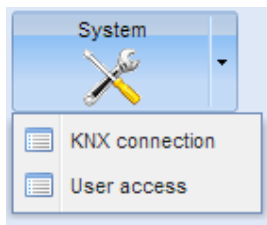
Note! Interface reload is required when changing "List items per page" or "Language" parameter

Note! If log size is changed to a smaller value, excess logs will be deleted on next auto clean-up (every 15 minutes)

Note! Log policy only affects new objects, current per-object log settings are kept unchanged

Warning! Excessive object logging degrades Logic Machine performance

System – by clicking on the arrow near *System* button, *KNX Connection* and *User Access* settings can be access. By clicking on the *System* button, network configuration window opens in new browser's tab.



1.11. Alerts

In *Alert* tab a list of alert messages defined with **alert** function in scripts is located. The messages are stored on the compact flash.

Alert time	Message
01.01.1970 10:20:42	read error
01.01.1970 10:20:22	read error
01.01.1970 10:20:02	read error
01.01.1970 10:12:58	read error

Page 1 of 93

Displaying alerts 1 - 25 of 2317

On the communication panel you can jump by pages and reload the page.



Example

```

1.temperature = 25.3
2.
3.if temperature > 24 then
4.-- resulting message: 'Temperature levels are too high: 25.3'
5.alert('Temperature level is too high: %.1f', temperature)
6.end

```

1.12. Error log

Error messages from scripts are displayed in *Error log* tab.

Logic Machine			Start page
Scripting	Objects	Object logs	Schedulers
Trend logs	Vis. structure	Visualization	Vis. icons
Utilities	Enocean	Alerts	Logs
Error log	Help		

Error time	Script name	Error description
22.02.2013 09:29:51	init-script	Line 6: attempt to index global 'temperature' (a nil value)
21.02.2013 06:08:46	weather_data_Yahoo	Line 20: attempt to index field 'current' (a nil value)
16.02.2013 07:12:08	weather_data_Yahoo	Line 20: attempt to index field 'current' (a nil value)
15.02.2013 23:51:55	weather_data_Yahoo	Line 20: attempt to index field 'current' (a nil value)
12.02.2013 15:23:39	init-script	Line 6: attempt to index global 'temperature' (a nil value)
11.02.2013 18:48:30	init-script	Line 6: attempt to index global 'temperature' (a nil value)
11.02.2013 17:47:40	init-script	Line 6: attempt to index global 'temperature' (a nil value)
08.02.2013 20:00:02	event-Volume down	cannot open /lib/genohm-scada/scripting/57.lua: No such file or directory
08.02.2013 13:53:11	init-script	Line 6: attempt to index global 'temperature' (a nil value)

Page 1 of 8

Displaying errors 1 - 25 of 200

1.13. Logs

Logs can be used for scripting code debugging. The log messages appear defined by *log* function.

Logic Machine

[Start page](#)

Scripting

Objects

Object logs

Buildings

Visualization

Visualization icons

Utilities

Alerts

Logs

Error log

Help

Log time	Message
15.05.2012 14:20:33	* arg: 1 * table: {f2} * number: 20 {f1} * number: 10 * arg: 2 * number: 127 * arg: 3 * string: test
15.05.2012 14:20:28	* arg: 1 * table: {f2} * number: 20 {f1} * number: 10 * arg: 2 * number: 127 * arg: 3 * string: test
15.05.2012 14:20:23	* arg: 1 * table: {f2} * number: 20 {f1} * number: 10 * arg: 2 * number: 127 * arg: 3 * string: test
15.05.2012 14:20:18	* arg: 1 * table: {f2} * number: 20 {f1} * number: 10 * arg: 2 * number: 127 * arg: 3 * string: test

Clear

Page

1

of 1

Displaying logs 1 - 4 of 4

Version: 20120419

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1.14. Help

Documentation for scripting syntaxes is displayed in *Help* tab.

The screenshot shows a web browser window with the address bar displaying `192.168.1.211/cgi-bin/scada/index.cgi`. The page title is "GenOHM KNX Logic Machine". A navigation bar at the top contains tabs: "Scripting", "Objects", "Object logs", "Buildings", "Visualization", "Visualization icons", "Utilities", "Alerts", "Error log", and "Help" (which is active). On the left, a "Help topics" sidebar lists: "Scripting" (expanded), "Basics and script types", "Object functions", "Data type functions", "Common functions, storage, alerts" (selected), "Scheduled scripting date/time format", and "Extended function library". The main content area features a red note: "Note: all user scripts share the same data storage. Make sure that same keys are not used to store different types of data." Below this is the "Examples" section. The first example shows `storage.set('my_stored_value_1', 12.21)` returning `true`. The second example shows a function `testfn` being stored, which returns `false` because it's a function. The third example shows `storage.get` returning `nil` and then `0` as a default value. The footer shows "Version: 20101207" and "© Embedded Systems 2010".

192.168.1.211/cgi-bin/scada/index.cgi

GenOHM KNX Logic Machine

Scripting Objects Object logs Buildings Visualization Visualization icons Utilities Alerts Error log Help

Help topics

- Scripting
 - Basics and script types
 - Object functions
 - Data type functions
 - Common functions, storage, alerts
 - Scheduled scripting date/time format
 - Extended function library

Note: all user scripts share the same data storage. Make sure that same keys are not used to store different types of data.

Examples

The following examples shows the basic syntax of `storage.set`. Result will return boolean `true` since the passed parameters are correct

```
result = storage.set('my_stored_value_1', 12.21)
```

This example will return `false` as the result because we are trying to store a function which is not possible.

```
testfn = function(t)
  return t * t
end

result = storage.set('my_stored_value_2', testfn) -- this will result in an
```

The following examples shows the basic syntax of `storage.get`. Assuming that key value was not found, first call will return `nil` while second call will return number `0` which was specified as a default value.

```
result = storage.get('my_stored_value_3') -- returns nil if value is not fo
```

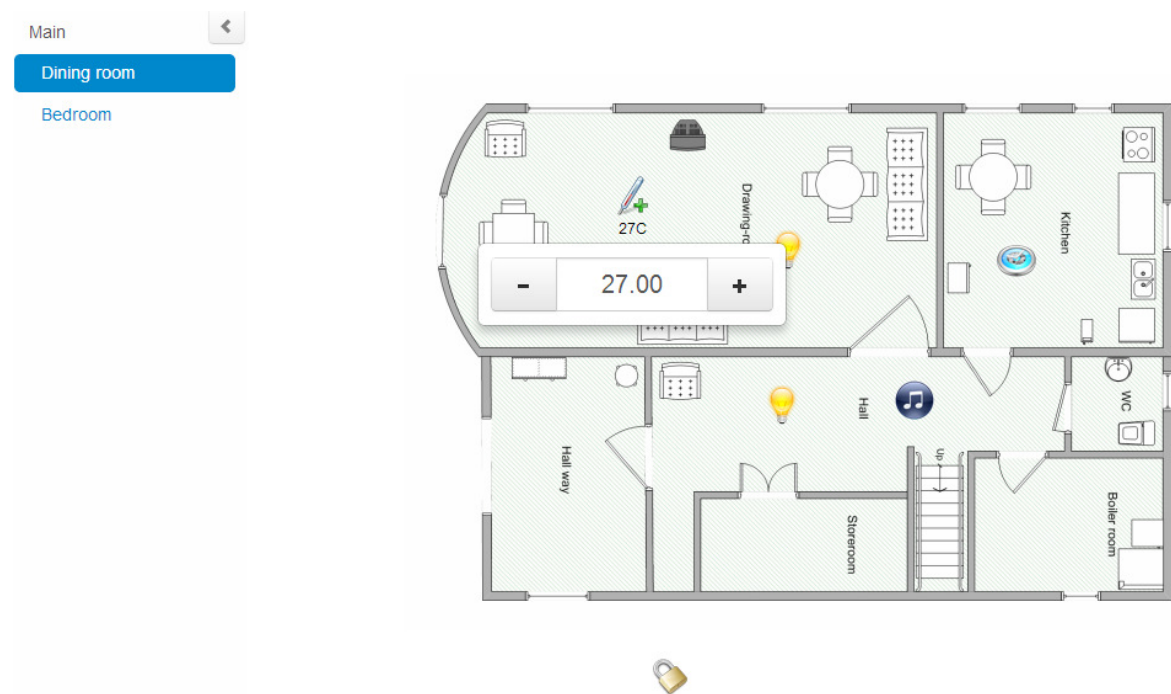
Version: 20101207 © Embedded Systems 2010

2. User mode visualization

User mode visualization contains created visualization maps.

There are three access levels: read, write, admin (password access can be also disabled)

Access level	Login	Password
Read-only	Visview	visview
Write	viscontrol	viscontrol
Write+admin level	visadmin	visadmin



2.1. Custom design Usermode visualization

Through Custom CSS styles it is possible to create different type of visualization maps.



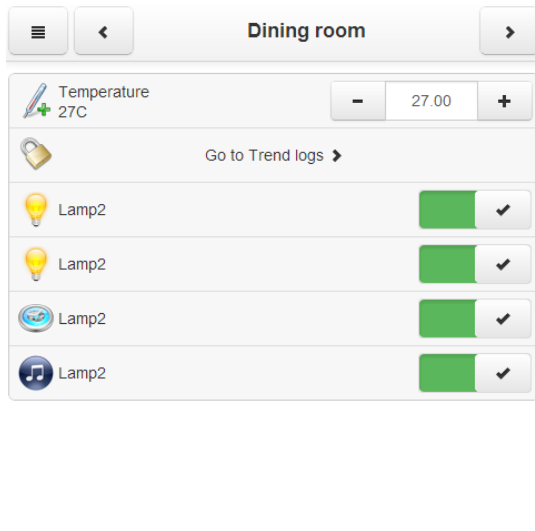
3. Touch visualization

Touch visualization is designed for iPhone/iPod/iPad/Android touch screen devices. All objects which are added in *Logic Machine* configuration by default are visible in touch visualization (if there is no *Hide in touch* option enabled).

There are three access levels: read, write, admin

Access level	Login	Password
Read-only	visview	visview
Write	viscontrol	viscontrol
Write+admin level	visadmin	visadmin

The main window is Building view where you can choose which Floor from which Building to control. Once you choose the floor, all objects which are assigned to it, are listed and can be controlled.

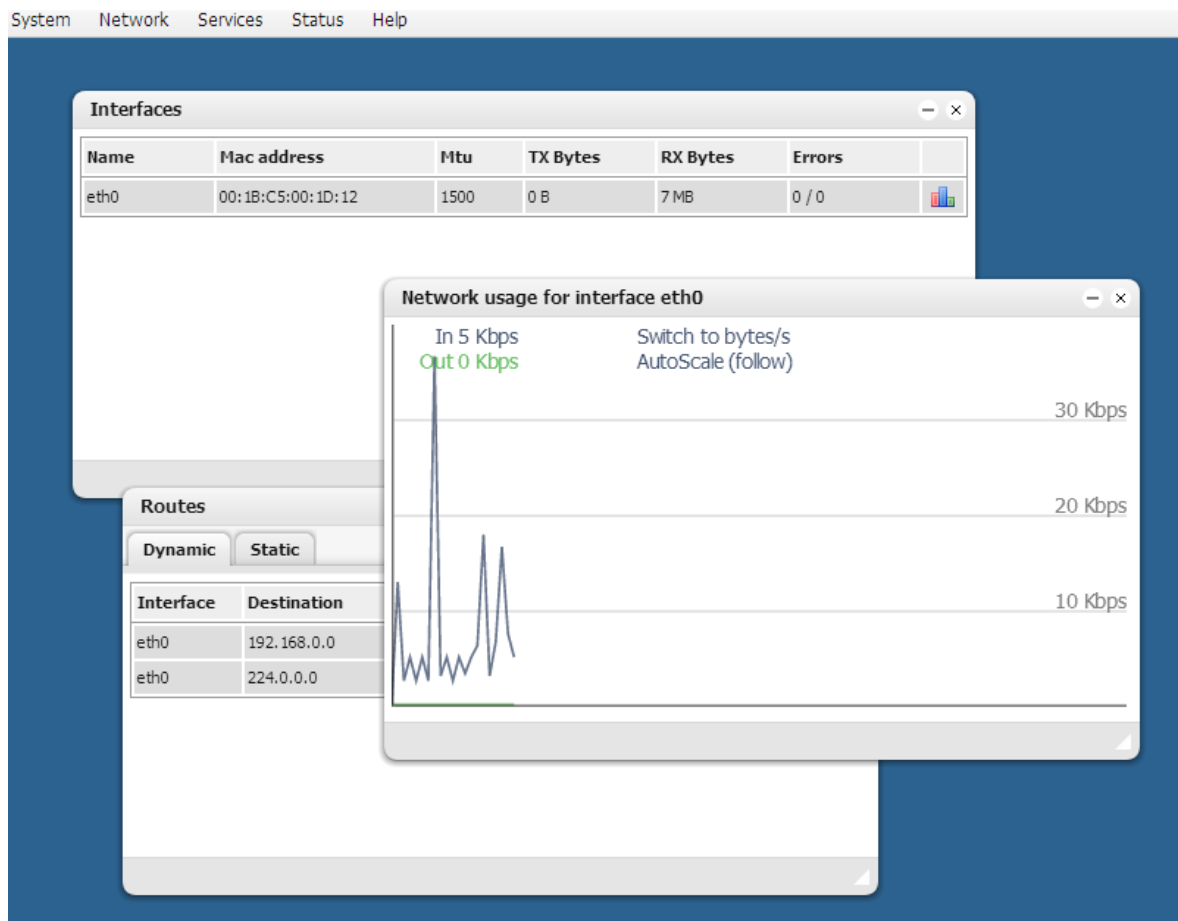


Launching visualization on touch device (iPad in this case)

- Make sure your iPad is connected wirelessly to the Logic Machine (either through separate access point or directly to Logic Machine's USB WiFi adapter).
- In the browser enter Logic Machine's IP (default 192.168.0.10).
- Click on the Touch Visualization icon.
- Save the application as permanent/shortcut in your iPad

4. System configuration

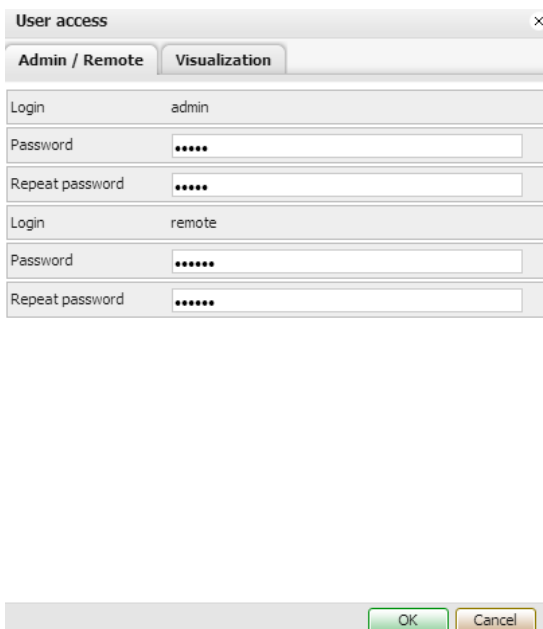
System configuration allows managing router functionality on KNX/EIB Logic Machine as well as do access control management, upgrade firmware, see network and system status and others.



Login	Password
admin	admin

4.1. Changing password

The login and password configuration window is located in *System* → *User access*.



User access

Admin / Remote | Visualization

Login: admin

Password:

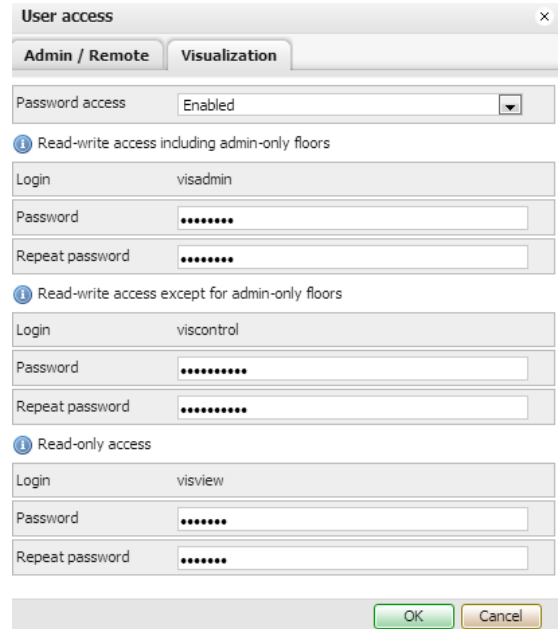
Repeat password:

Login: remote

Password:

Repeat password:

OK Cancel



User access

Admin / Remote | **Visualization**

Password access: Enabled

Read-write access including admin-only floors

Login: visadmin

Password:

Repeat password:

Read-write access except for admin-only floors

Login: viscontrol

Password:

Repeat password:

Read-only access

Login: visview

Password:

Repeat password:

OK Cancel

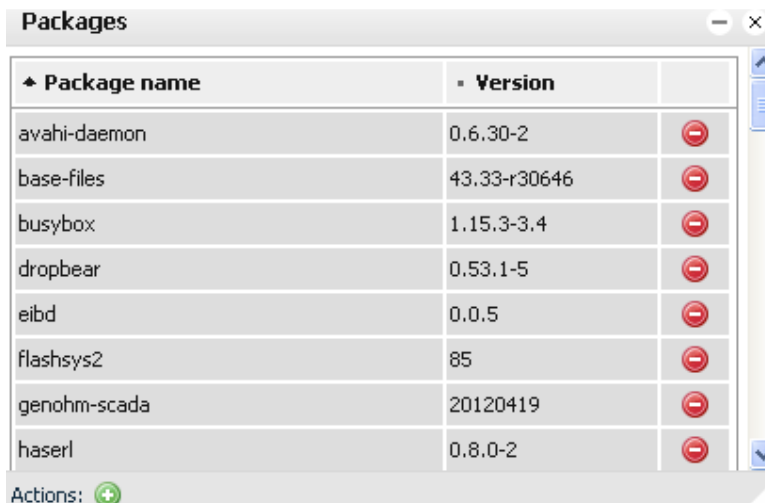
Access control is separated in 3 tabs:

Admin/Remote – access parameters for *Logic Machine*, *Network Configuration*, *RSS* and *XML*

Visualization – access parameters for *Touch* and *User mode visualization*

4.2. Packages

System → *Packages* shows the packages installed in the system. You can add new packaged by pressing on +

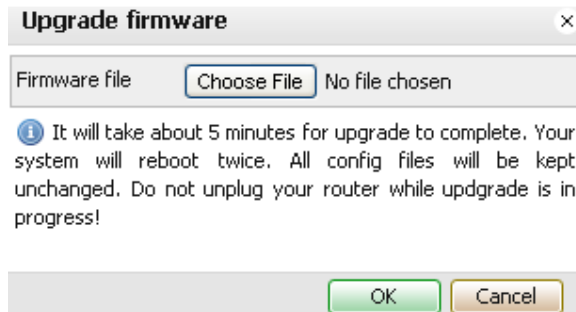


Package name	Version	
avahi-daemon	0.6.30-2	⊖
base-files	43.33-r30646	⊖
busybox	1.15.3-3.4	⊖
dropbear	0.53.1-5	⊖
eibd	0.0.5	⊖
flashsys2	85	⊖
genohm-scada	20120419	⊖
haserl	0.8.0-2	⊖

Actions: ⊕

4.3. Upgrade firmware

System → Upgrade firmware is used to do a full upgrade of the system (both OS part as well as Logic Machine part).



4.4. Reboot Logic Machine


You can restart the Logic Machine by executing *System → Reboot* command.

4.5. Shutdown Logic Machine

You can shutdown the Logic Machine by executing *System → Shutdown* command. It is advisable to shutdown the system before plug out the power, because the database is saved safely.

4.6. Interface configuration

Ethernet interface is listed in the first tab. There are possibilities to disable/enable or to take a look at the traffic flow graph using special icons on the right side.

Interfaces						
Name	Mac address	Mtu	TX Bytes	RX Bytes	Errors	
eth0	00:1B:C5:00:1D:12	1500	0 B	7 MB	0 / 0	

By clicking on the interface you get to the configuration.

Interface eth0		×
General		
Protocol	Static IP	▼
IP address	192.168.10.96	
Network mask	255.255.255.0	
Gateway IP	192.168.10.2	
DNS server	8.8.8.8	
Mtu		


OK	Cancel
----	--------

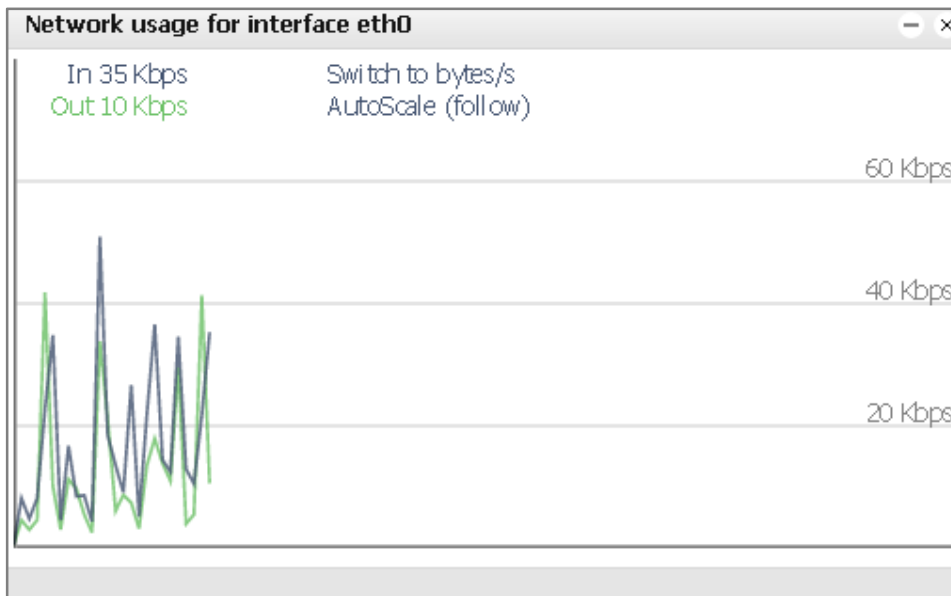
- **Protocol**– specific protocol used for addressing
 - Static IP** – static IP address. By default 192.168.0.10
 - DHCP** – use DHCP protocol to get IP configuration.

Current IP– the IP address got from DHCP server. This field appears only if the IP address is given otherwise it's hidden.

- **Network mask** – network mask. By default 255.255.255.0 (/24)
- **Gateway IP** – gateway IP address
- **DNS server** – DNS server IP address
- **MTU**– maximum transmission unit, the largest size of the packet which could be passed in the communication protocol. By default 1500

4.6.1. Ethernet interface data throughput graph

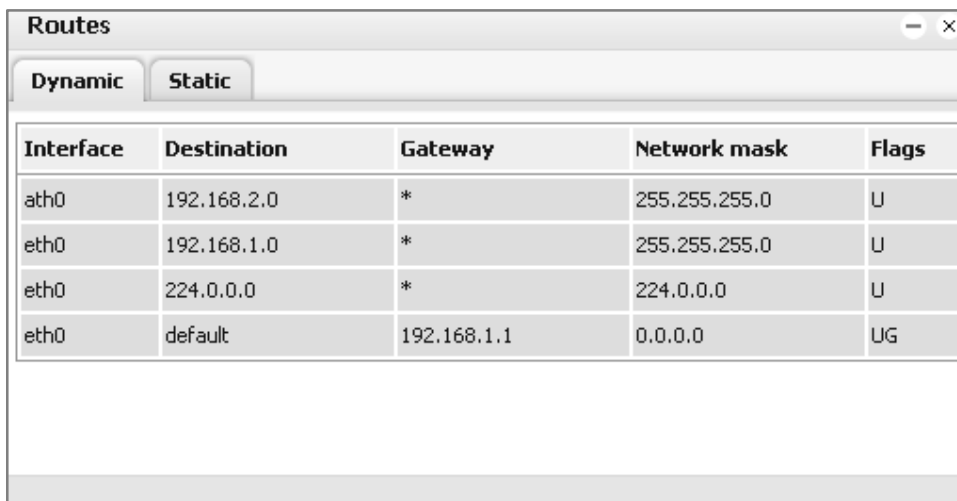
On the main window of the Ethernets tab, if you click on the  button, a new window is opened. It draws a real-time graph of the traffic flow passing the interface (both In and Out). There is a possibility to switch the units of measurement – bytes/s or bytes/s.



4.7. Routing Table

System routing table is located in *Network* → *Routes* menu. The window is divided in two parts – Static routes and Dynamic routes.

4.7.1. Dynamic routes

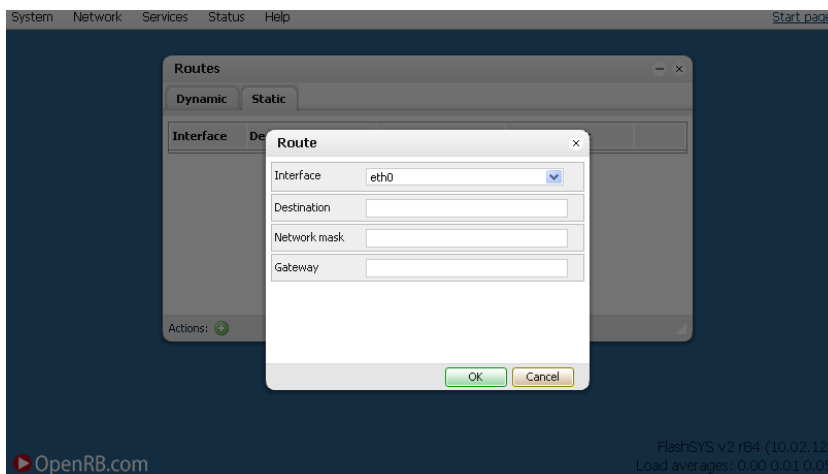


The screenshot shows a window titled "Routes" with two tabs: "Dynamic" and "Static". The "Dynamic" tab is selected, displaying a table with the following data:

Interface	Destination	Gateway	Network mask	Flags
ath0	192.168.2.0	*	255.255.255.0	U
eth0	192.168.1.0	*	255.255.255.0	U
eth0	224.0.0.0	*	224.0.0.0	U
eth0	default	192.168.1.1	0.0.0.0	UG

- **Interface** – interface name
- **Destination** – destination IP address
- **Network mask** – network mask
- **Gateway** – gateway IP address

4.7.2. Static routes



- **Interface** – interface name
- **Destination**– destination IP address
- **Network mask** – network mask
- **Gateway** – gateway IP address

4.8. ARP table

Address Resolution Protocol table is listed in *Network* → *ARP table*.

ARP table				
Interface	IP address	Mask	MAC address	Flags
eth0	192.168.1.208	*	00:0e:2e:cd:35:e9	0x2
eth0	192.168.1.100	*	00:1c:c0:54:88:cb	0x2

4.9. FTP server

You can enable access to FTP server of Logic Machine by enabling this service in *Service* → *FTP Server*.

FTP server

Server status

Enabled

Port

21

Username

ftp

Password

Leave password to blank to keep it unchanged

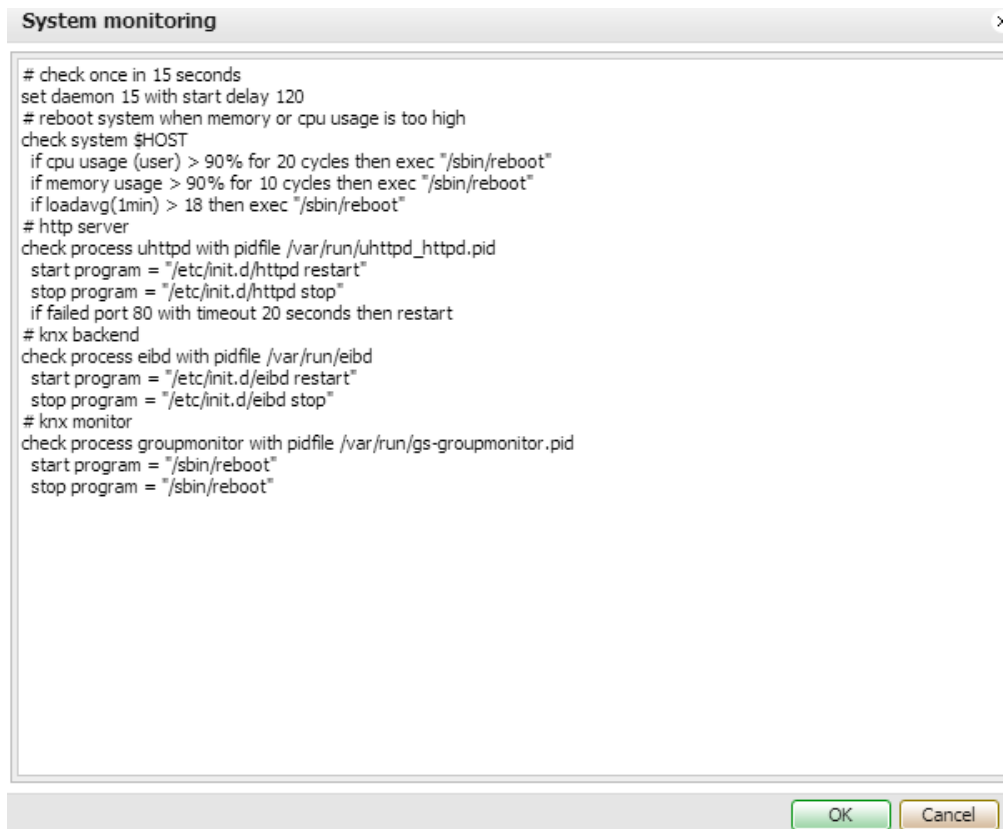
OK

Cancel

- **Server status** – secure tunnel mode
- **Port** – port of the service
- **Username** – login name, *ftp*
- **Password** – password, length 4-20 symbols

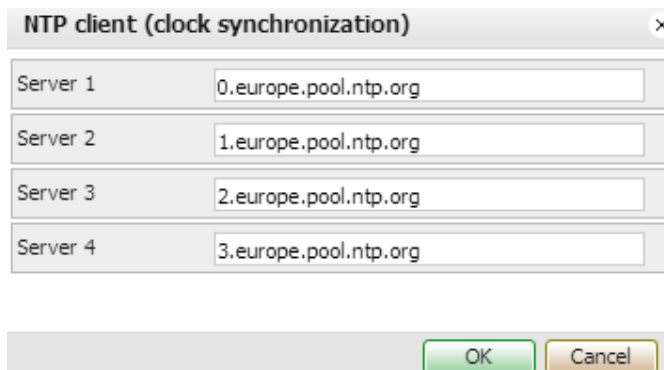
4.10. System monitoring

System monitoring is used to monitor system processes, hardware. In case of failure, the system will be rebooted or specific task restarted.



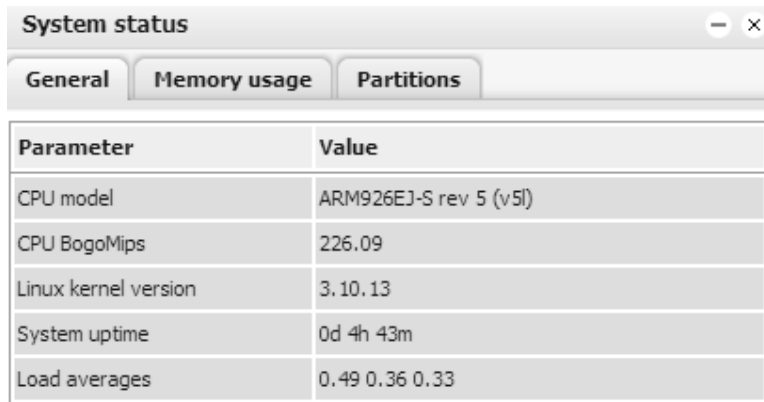
4.11. NTP client

NTP servers can be specified in Service → NTP client window.



4.12. System status

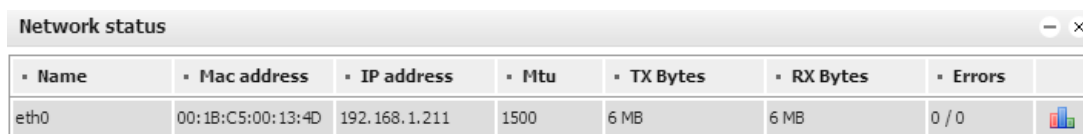
General system status with CPU usage, Memory usage, Partition information can be seen in *Status* → *System status* window.

A screenshot of the 'System status' window. It has a title bar with a minus and close button. Below the title bar are three tabs: 'General', 'Memory usage', and 'Partitions'. The 'General' tab is selected. Below the tabs is a table with two columns: 'Parameter' and 'Value'.

Parameter	Value
CPU model	ARM926EJ-S rev 5 (v5l)
CPU BogoMips	226.09
Linux kernel version	3.10.13
System uptime	0d 4h 43m
Load averages	0.49 0.36 0.33

4.13. Network status

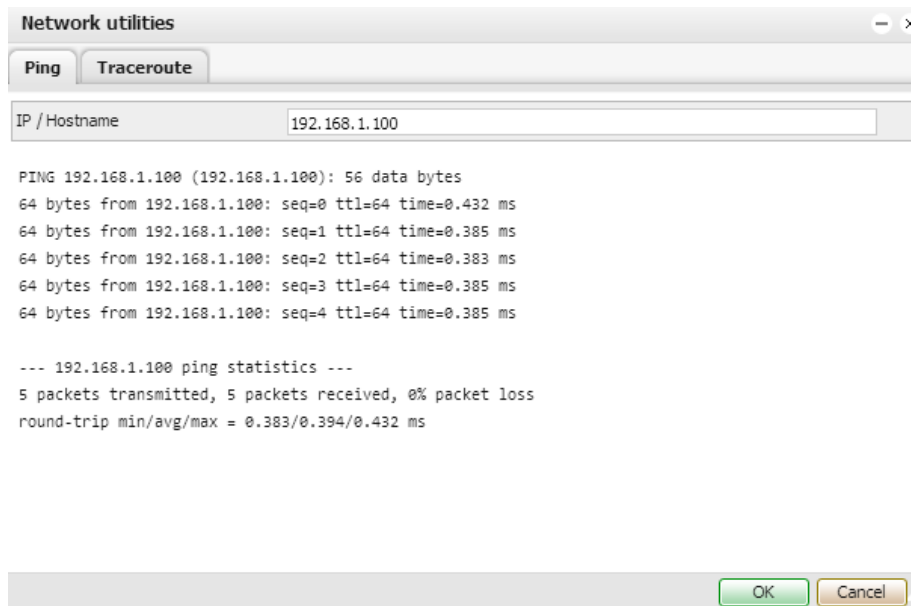
Network overview of IP setting and transferred data can be seen in *Status* → *Network status* window.

A screenshot of the 'Network status' window. It has a title bar with a minus and close button. Below the title bar is a table with eight columns: 'Name', 'Mac address', 'IP address', 'Mtu', 'TX Bytes', 'RX Bytes', 'Errors', and an empty column with a small icon. The first row of data is for the 'eth0' interface.

Name	Mac address	IP address	Mtu	TX Bytes	RX Bytes	Errors	
eth0	00:1B:C5:00:13:4D	192.168.1.211	1500	6 MB	6 MB	0 / 0	

4.14. Network utilities

Ping and *Traceroute* utilities are located in *Status* → *Network utilities* window. Both IP address and DNS names are accepted.



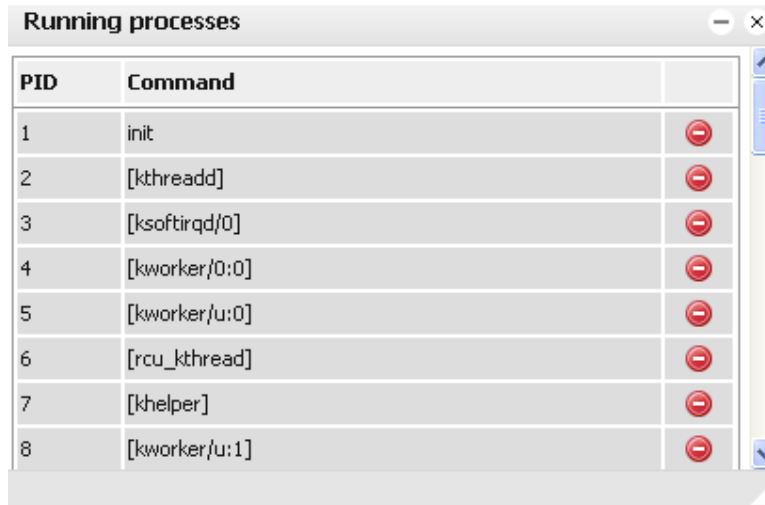
4.15. System log

Operating system log is available in *Status* → *System log*.



4.16. Running processes

System running processes can be seen in *Status* → *Running processes* window.



The screenshot shows a window titled "Running processes" with a table of system processes. The table has three columns: "PID", "Command", and a third column containing red circular icons with minus signs. The processes listed are:

PID	Command	
1	init	⊖
2	[kthreadd]	⊖
3	[ksoftirqd/0]	⊖
4	[kworker/0:0]	⊖
5	[kworker/u:0]	⊖
6	[rcu_kthread]	⊖
7	[khelper]	⊖
8	[kworker/u:1]	⊖

5. User mode schedulers

User mode schedulers contains user-friendly interface for end-user to manage scheduler tasks, for example, specify thermostat values depending of the day of the week, time and holidays.

5.1. Events

Each scheduler is mapped to specific group address in administration panel (*see section 1.4 of this manual*).

The screenshot shows a web interface for configuring an 'Outdoor lamp' scheduler. The interface is divided into three main sections:

- Left Sidebar:** Contains a blue button labeled 'Outdoor lamp' and two links, 'AC' and 'Holidays', in a light blue font.
- Central Panel:**
 - At the top, it says 'Status: active, period: 1 January - 31 December' with an 'Edit' button.
 - Below this is a table with two columns: 'Value' and 'Run at'.
 - The table contains two rows:
 - Row 1: 'Light off' | '12:00 Tu-Fr' (highlighted in light green)
 - Row 2: 'Light off' | '13:00 Sa-Su Holiday' (highlighted in light green)
- Right Panel (Add event):**
 - Has a checkbox 'Event is active' which is checked.
 - Below it is a 'Run at' section with two time pickers showing '12' and '00'.
 - Below the time pickers are buttons for days of the week: 'Mo', 'Tu', 'We', 'Th', 'Fr', 'Sa', 'Su', and a 'Holiday' button.
 - Below the day buttons is a 'Value' dropdown menu currently set to 'Light on'.
 - At the bottom are 'Save' and 'Cancel' buttons.

When adding the new task for specific scheduler you can specify day of the week, start time, value to send to the object.

5.2. Holidays

In *Holidays* special days are specified which are then used adding new events.

The screenshot shows a web application window titled "Holidays". On the left is a sidebar with three items: "Outdoor lamp", "AC", and "Holidays" (which is highlighted with a blue background). The main area contains a table with two columns: "Name" and "Date".

Name	Date
New Year	31 December 2013
New holiday	24 October

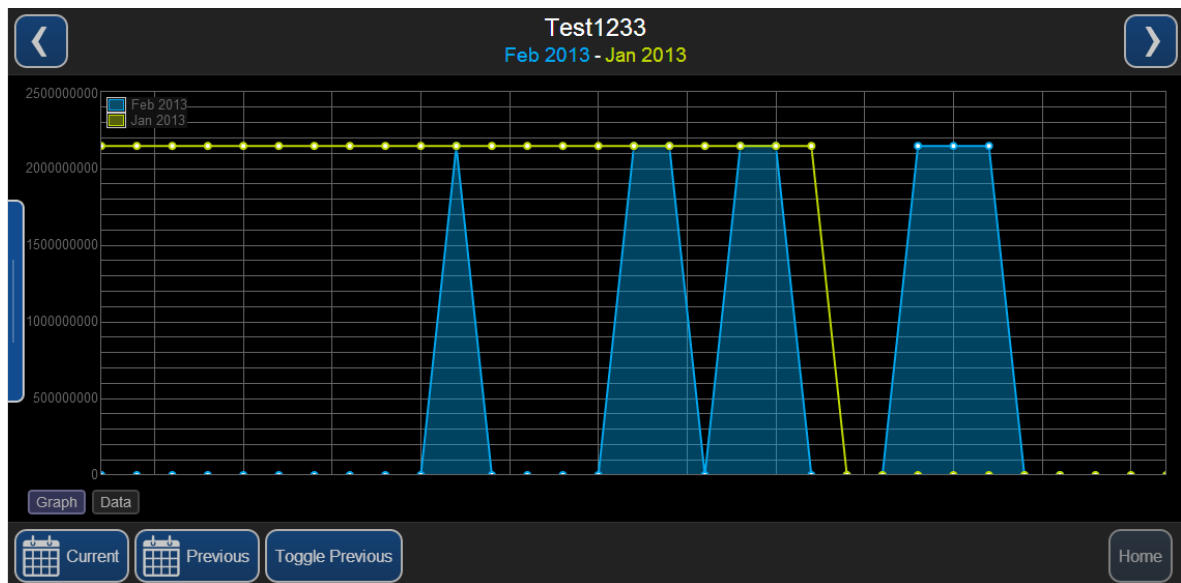
At the top right of the table area is a green button labeled "Add holiday". To the right of each row in the table are two buttons: "Edit" (with a pencil icon) and "Delete" (with an 'x' icon).

Click on *Add new holiday* button to specify a holiday.

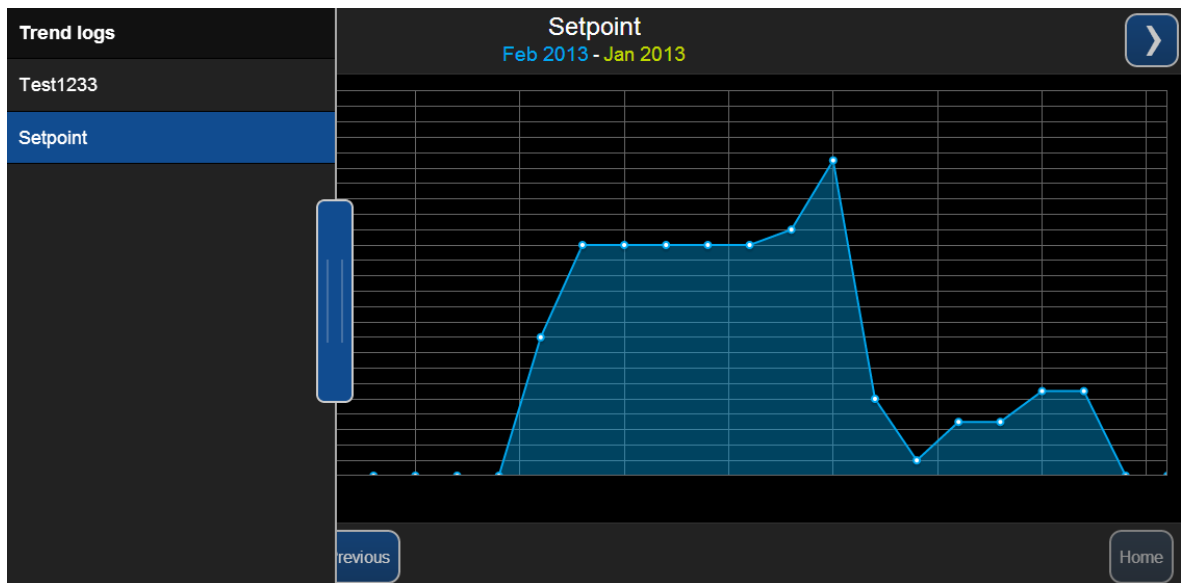
This screenshot shows the same "Holidays" interface as before, but with the "Add holiday" modal open on the right side. The modal has a "Name" input field containing "New holiday". Below it is a "Date" section featuring a calendar for "October 2013". The date "15" is selected and highlighted in blue. At the bottom of the modal, there is a checkbox labeled "Recurring every year" which is currently unchecked, and two buttons: "Save" (green) and "Cancel" (grey).

6. Trend logs

Trend logs are end user interface for trends (*defined in administrator interface in section 1.5*).



By clicking on the hidden blue menu you can change to different trends where each is mapped to a specific KNX group address.

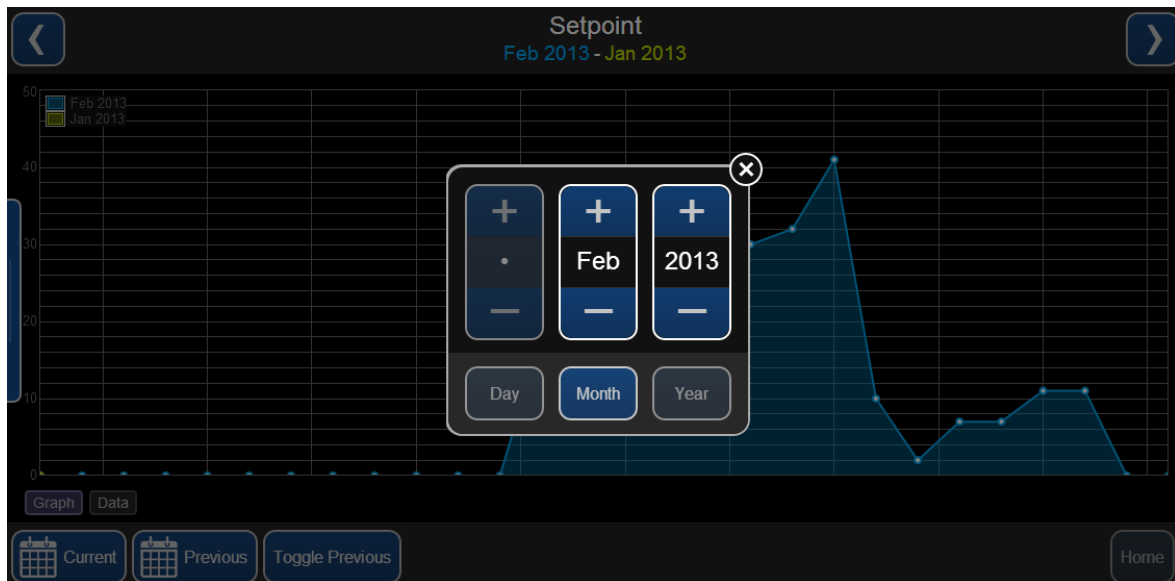


Current – Current trend is drawn in blue, you can choose either to show Day, Month or Year view

Previous – previous time period, you can choose either to show Day, Month or Year view

Toggle previous – when enabled a yellow trend line appears showing *Previous* trend above *Current* trend

Home – Logic Machine home screen.



Datapoints can be shown also in a way of table which can be later exported as CSV file.

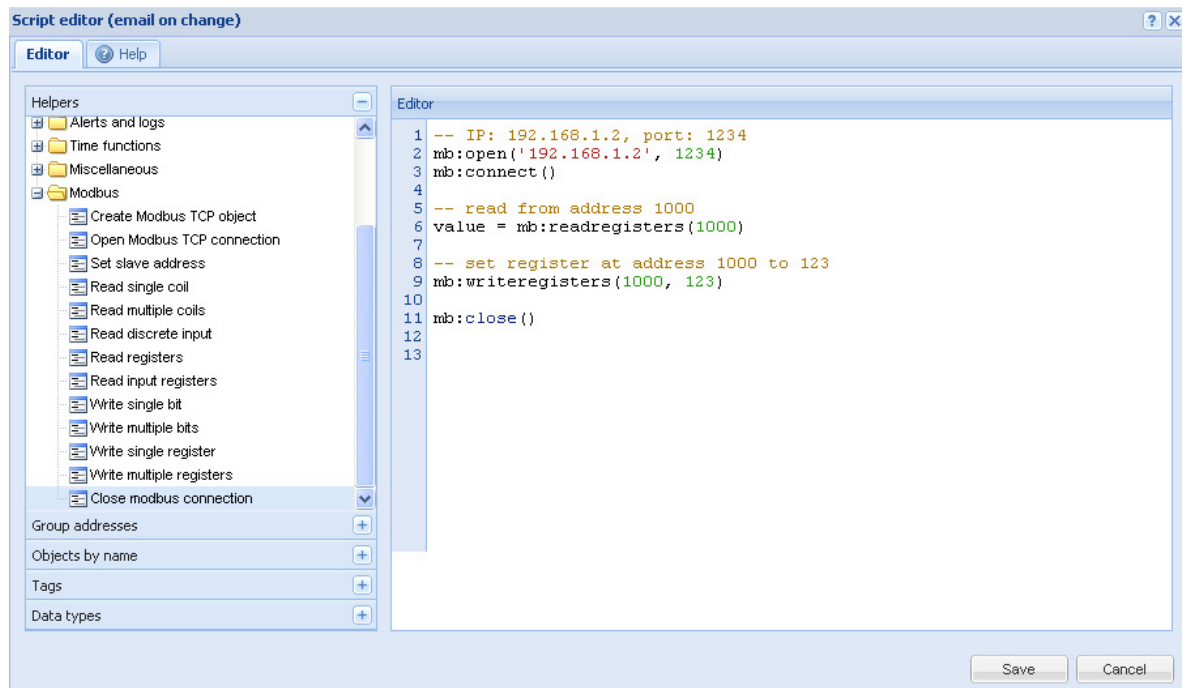
The table displays temperature data for Feb 2013 and Jan 2013. The table has columns for Date, Feb 2013, and Jan 2013. The data shows a peak in temperature around Feb 14th.

	Feb 2013	Jan 2013
2	0	0
3	0	
4	0	
5	0	
6	0	
7	0	
8	0	
9	0	
10	0	
11	0	
12	0	
13	0	
14	18	
15	30	
16	30	
17	30	
18	30	

7. Modbus RTU/TCP interconnection with LM2

Modbus RTU is supported over RS485 interface. Modbus TCP is supported over Ethernet port. Modbus communication is done directly from scripts (usually resident script is used to read Modbus value after some specific time interval and write them into KNX object).

Once script is added, you can add the code in the Script Editor. There are lots of predefined code blocks in the Helpers.



7.1. Master functions

mb:setslave(slaveid)

Sets slave id to read/write data from/to

mb:readcoils(start, count)

mb:readdiscreteinputs(start, count)

mb:readregisters(start, count)

mb:readinputregisters(start, count)

Reads count registers/coils from the start address. Returns all values on success and nil, error description on error

mb:writebits(start, v1, [v2, [v3, ...]])

mb:writeregisters(start, v1, [v2, [v3, ...]])

Writes values to registers/coils from the start address. Single write will be used when only one value is supplied, multiple write otherwise. Returns all of values written on success and nil, error

description on error

mb:reportslaveid()

Reads slave internal data. Returns values on success and nil, error description on error.

7.2. Visualizing Modbus objects

Use *grp.write* to assign Modbus object to KNX object and then use this new KNX object in the visualization.

7.3. Usage example (Modbus TCP)

Task: read three registers from Modbus TCP device and write the result in Alerts.

```
1.-- initmodbus on first script execution
2.ifnotmbthen
3.require('luamodbus')
4.mb=luamodbus.tcp()
5.end
6.
7.-- prepare connection to given ip and port
8.mb:open('192.168.1.100', 1502)
9.
10.-- open connection and check the result
11.ifmb:connect()then
12.-- read 3 input registers, function returns 3 variables
13.local x, y, z =mb:readinputregisters(1, 3)
14.
15.-- first variable will be nill if read failed
16.if x then
17.local message =string.format('1: %d; 2: %d; 3: %d', x, y, z)
18.    alert(message)
19.end
20.
21.-- end session
22.mb:close()
23.else
24.    alert('connection failed')
25.end
```

7.4. Usage example (Modbus RTU)

Task: read two parameters (3-phase system voltage, 3-phase system current) from Modbus Multimeter 32-bit registers and store the data in the KNX group addresses. Make sure to connect LM2 with Modbus device correctly, RS485 A with -, RS485 B with +.

```
1.-- initmodbus on first script execution
2.ifnotmbthen
3.require('luamodbus')
4.mb=luamodbus.rtu()
5.mb:open('/dev/ttyS2', 9600, 'E', 8, 1, 'H')
6.mb:connect()
7.end
8.
9.-- sets slave ID to read/write data from/to
10.mb:setslave(20)
11.
12.-- read 3-phase system voltage from 32-bit register
13.r1, r2 =mb:readregisters(0x1000, 2)
14.result =bit.lshift(r1, 16) + r2
15.grp.write('5/5/1',result)
16.
17.-- read 3-phase system current from 32-bit register
18.r1, r2 =mb:readregisters(0x100E, 2)
19.result =bit.lshift(r1, 16) + r2
20.grp.write('5/5/2',result)
```

Some Modbus devices keep enocded values in registers, you need to encode them first from HEX to use in the further scripts.For example, **value = 0x0cba** after executing the below commands will give temperature equal to **24.2**

```
1.hex =lmcore.inttohex(value, 2)
2.temp =knxdatatype.decode(hex, dt.float16)
```

Here is an example of function which is doing **byte shift**:

```
1.-- get single bit from a numeric value
2.function getbit(value, bnum)
3.  value = tonumber(value) or 0
4.  value = bit.rshift(value, bnum)
5.  return bit.band(value, 1)
6.end
7.
8.
9.getbit(value, 0) -- first bit, and so on
```

7.5. Modbus Slave examples

Add the following code to *Common functions*

```
1.  -- modbus proxy
2.  mbproxy = {
3.    -- supported function list
4.    functions = {
5.      'readdo',
6.      'readcoils',
7.      'readdi',
8.      'readdiscreteinputs',
9.      'readao',
10.     'readregisters',
11.     'readai',
12.     'readinputregisters',
13.     'writebits',
14.     'writemultiplebits',
15.     'writeregisters',
16.     'writemultipleregisters',
17.     'reportslaveid',
18.     'getcoils',
19.     'getdiscreteinputs',
20.     'getinputregisters',
21.     'getregisters',
22.     'setcoils',
23.     'setdiscreteinputs',
24.     'setinputregisters',
25.     'setregisters',
26.   },
27.  -- new connection init
28.  new = function()
29.    require('rpc')
30.    local mb = setmetatable({}, { __index = mbproxy })
31.
32.    mb.slaveid = 0
33.    mb.rpc = rpc.client('127.0.0.1', 28002, 'mbproxy')
34.
35.    for _, fn in ipairs(mbproxy.functions) do
36.      mb[ fn ] = function(self, ...)
37.        return mb:request(fn, ...)
38.      end
39.    end
40.
41.    return mb
42.  end
43. }
44.
45. -- set local slave id
```

```

46. function mbproxy:setslave(slaveid)
47.   self.slaveid = slaveid
48. end
49.
50. -- send rpc request for a specific function
51. function mbproxy:request(fn, ...)
52.   local res, err = self.rpc:request({
53.     fn = fn,
54.     params = { ... },
55.     slaveid = self.slaveid or 0,
56.   })
57.
58.   -- request error
59.   if err then
60.     return nil, err
61.   -- request ok
62.   else
63.     -- reply with an error
64.     if res[ 1 ] == nil then
65.       return nil, res[ 2 ]
66.     -- normal reply
67.     else
68.       return unpack(res)
69.     end
70.   end
71. end

```

Handler (resident script with 0 delay) configuration

1. *mb:open('/dev/ttyS2', 38400, 'E', 8, 1, 'H')*
set baudrate and other serial port parameters
2. *mb:setslave(10)*
set slave device id
3. *mb:setmapping(10, 10, 10, 10)*
set number coils, discrete inputs, holding registers and input registers
4. *mb:setwritecoilcb(function(coil, value)...*
callback function which is executed for each coil write
5. *mb:setwriteregistercb(function(coil, value)...*
callback function which is executed for each register write

Handler script example

```
1.      -- modbus init
2.      if not mb then
3.          require('luamodbus')
4.          mb = luamodbus.rtu()
5.          mb:open('/dev/ttyS2', 38400, 'E', 8, 1, 'H')
6.          mb:connect()
7.
8.      -- slave id
9.      mb:setslave(10)
10.
11.     -- init slave storage for coils, discrete inputs, holding registers and input registers
12.     mb:setmapping(10, 10, 10, 10)
13.
14.     -- coil write callback
15.     mb:setwritecoilcb(function(coil, value)
16.         if coil == 0 then
17.             grp.write('1/1/1', value, dt.bool)
18.         else
19.             alert('coil: %d = %s', coil, tostring(value))
20.         end
21.     end)
22.
23.     -- register write callback
24.     mb:setwriteregistercb(function(register, value)
25.         if register == 0 then
26.             -- send value limited to 0..100
27.             grp.write('4/1/5', math.min(100, value), dt.scale)
28.         else
29.             alert('register: %d = %d', register, value)
30.         end
31.     end)
32. end
33.
34. -- server part init
35. if not server then
36.     require('rpc')
37.
38.     -- incoming data handler
39.     local handler = function(request)
40.         local fn, res
41.
42.         fn = tostring(request.fn)
43.
44.         if not mb[ fn ] then
45.             return { nil, 'unknown function ' .. fn }
```



```

46.         end
47.
48.         if type(request.params) == 'table' then
49.             table.insert(request.params, 1, mb)
50.             res = { mb[ fn ](unpack(request.params)) }
51.         else
52.             res = { mb[ fn ](mb) }
53.         end
54.
55.         return res
56.     end
57.
58.     server = rpc.server('127.0.0.1', 28002, 'mbproxy', handler, 0.01)
59. end
60.
61. mb:handleslave()
62. server:step()

```

Example: event script which changes modbus slave coil (address 0)

Must be mapped to a group address with binary value.

```

1. value = event.getvalue()
2. mb = mbproxy.new()
3. mb:setcoils(0, value)

```

Example: event script which changes modbus slave register (address 5)

Must be mapped to a group address with scaling (0..100) value

```

1. value = event.getvalue()
2. mb = mbproxy.new()
3. mb:setregisters(5, value)

```

7.6. Modbus working with several slaves on the same RS485 connection

The example was designed to interconnect with 16 VRF system in one line through 1 Logic Machine2.

Resident script

```

-- modbus init
if not mb then
    require('luamodbus')

    mb = luamodbus.rtu()

    mb:open('/dev/ttyS2', 9600, 'E', 8, 1, 'H')
    mb:connect()

    mb:setslave(1)

-- a/c list
aclist = {

```

```

-- a/c: 0, id: 1
{ addrstat = '8/4/0', addrmode = '8/5/0', addrspeed = '8/6/0', addrtemp = '8/7/0' },
-- a/c: 1, id: 2
{ addrstat = '8/4/1', addrmode = '8/5/1', addrspeed = '8/6/1', addrtemp = '8/7/1' },
}

-- read 8 bits and convert to single byte
function readbyte(offset)
    local bits = mb:readdiscreteinputs(offset, 8)
    local result = 0

    for i = 1, 8 do
        if bits[ i ] then
            result = result + bit.lshift(1, i - 1)
        end
    end

    return result
end

-- write single byte and convert to 8 bits
function writebyte(offset, byte)
    local bits = {}

    for i = 1, 8 do
        table.insert(bits, bit.band(1, bit.rshift(byte, i - 1)) == 1)
    end

    mb:writebits(offset, unpack(bits))
end

-- local udp server init
if not server then
    require('socket')

    server = socket.udp()
    server:setsockname('127.0.0.1', 28016)
    server:settimeout(1)

    -- remote command handler
    function cmd(data)
        local id, cmd, value, ac, addr, offset

        -- command format id:cmd[:value]
        id, cmd, value = unpack(data:split(':'))
        id = tonumber(id) or 0

        -- check if ac is valid
        ac = aclist[ id ]
        if not ac then
            return
        end

        -- default offset
        offset = (id - 1) * 152

        -- on/off
        if cmd == 'ON' or cmd == 'OFF' then
            mb:writebits(offset, cmd == 'ON')
        end
        -- temperature settings
        elseif cmd == 'TEMP' then
            value = tonumber(value)

            -- value ok
            if value then
                -- calculate register offset and write encoded value
                offset = (id - 1) * 156
                mb:writeregisters(offset, encodetemp(value))
            end
        end
        -- operation mode
        elseif cmd == 'MODE' then
            value = tonumber(value)

            -- verify bounds
            if 0 <= value and value <= 3 then
                -- convert to a/c value and write
                writebyte(offset + 8, value + 1)
            end
        end
        -- fan speed
        elseif cmd == 'SPEED' then
            value = tonumber(value)

            -- verify bounds
            if 0 <= value and value <= 3 then
                -- convert to a/c value and write
                writebyte(offset + 16, value + 2)
            end
        end
    end
end

-- read current status for each a/c unit
for id, ac in ipairs(aclist) do
    local stat, mode, temp, speed, offset

    -- address offset
    offset = (id - 1) * 152

    -- on/off status
    stat = mb:readdiscreteinputs(offset)
    if type(stat) == 'boolean' and ac.stat ~= stat then

```

```

    ac.stat = stat
    grp.write(ac.addrstat, stat, dt.bool)
end

-- operation mode
mode = readbyte(offset + 8)
if type(mode) == 'number' and ac.mode ~= mode then
    ac.mode = mode
    -- send proper value to knx
    if 1 <= mode && mode <= 5 then
        grp.write(ac.addrmode, mode - 1, dt.uint8)
    end
end

-- fan speed
speed = readbyte(offset + 16)
if type(speed) == 'number' and ac.speed ~= speed then
    ac.speed = speed
    -- send proper value to knx
    if 2 <= mode && mode <= 7 then
        grp.write(ac.addrspeed, speed - 2, dt.uint8)
    end
end

-- temperature
offset = (id - 1) * 156 + 1
temp = readinputregisters(offset)
if type(temp) == 'number' and ac.temp ~= temp then
    ac.temp = temp
    grp.write(ac.addrtemp, decodetemp(temp), dt.float16)
end

-- read command from client
local data = server:receive()
if data then
    cmd(data)
end
end

```

Common function program

```

function decodetemp(value)
    local hex = lmcore.inttohex(value, 2)
    return knxdatatype.decode(hex, dt.float16)
end

function encodetemp(value)
    local hex = knxdatatype.encode(value, dt.float16).datahex
    return tonumber(hex, 16)
end

-- send request to modbus resident
function accmd(id, cmd, value)
    local request, client

    require('socket')

    -- check if value has been passed
    value = value and tonumber(value)

    -- create request string
    request = string.format('%d:%s', id, cmd:upper())
    if value then
        request = string.format('%s:%s', request, value)
    end

    -- send udp packet
    socket.udp():sendto(request, '127.0.0.1', 28016)
end

```

Example: on/off VRF system

```

value = knxdatatype.decode(event.datahex, dt.bool)
accmd(1, value and 'ON' or 'OFF')

```

Example: set mode of VRF system

```

value = knxdatatype.decode(event.datahex, dt.uint8)
accmd(1, 'MODE', value)

```

Example: set the speed

```

value = knxdatatype.decode(event.datahex, dt.uint8)
accmd(1, 'SPEED', value)

```

Example: set the temperature

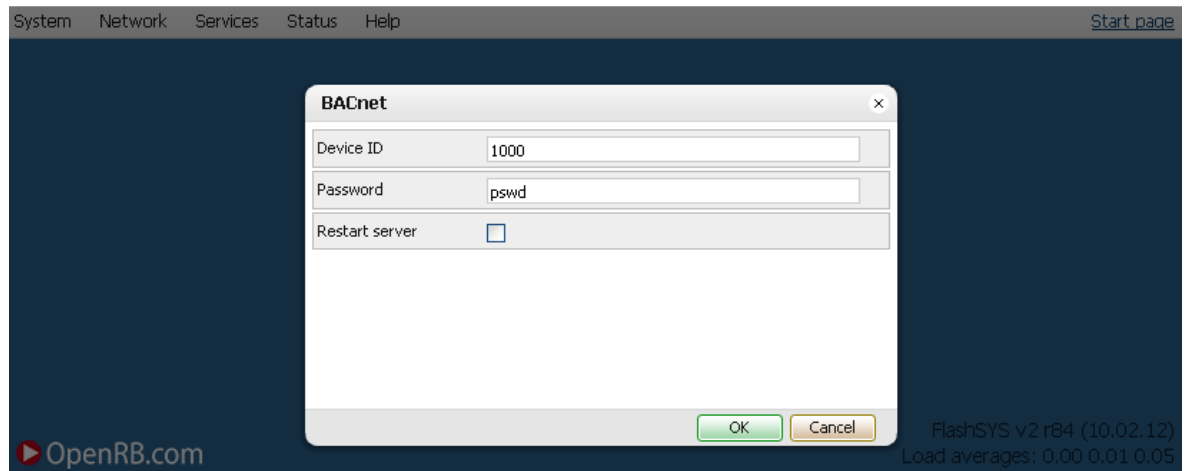
```

value = knxdatatype.decode(event.datahex, dt.float16)
accmd(1, 'TEMP', value)

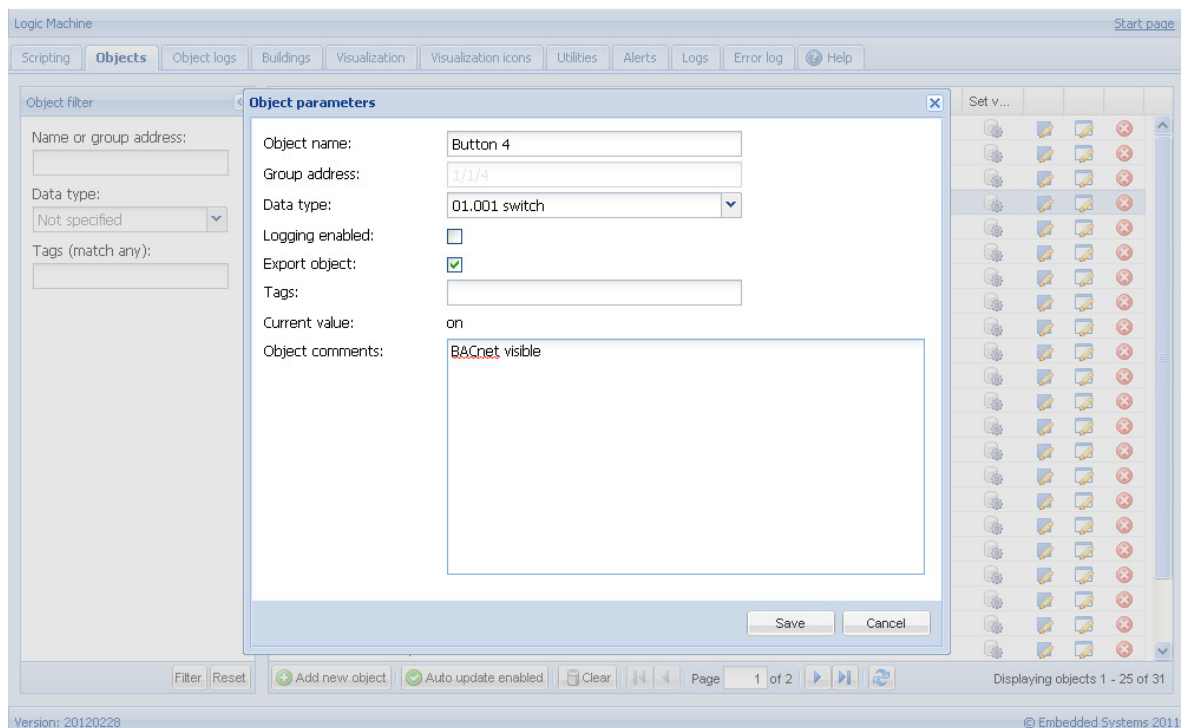
```

6. BACnetIP interconnection with LM2

You can configure BACnet *Device ID* and *Password* (used for remote device reloading) in **Network Configuration → Network → BACnet**.



To make KNX/EIB objects BACnet readable/writable, mark necessary objects in Logic Machine as “Export object”. Binary objects will appear as Binary Values, other numeric values will appear as Analog Values. Other types are not currently supported. KNX bus writes changes the Relinquish Default property



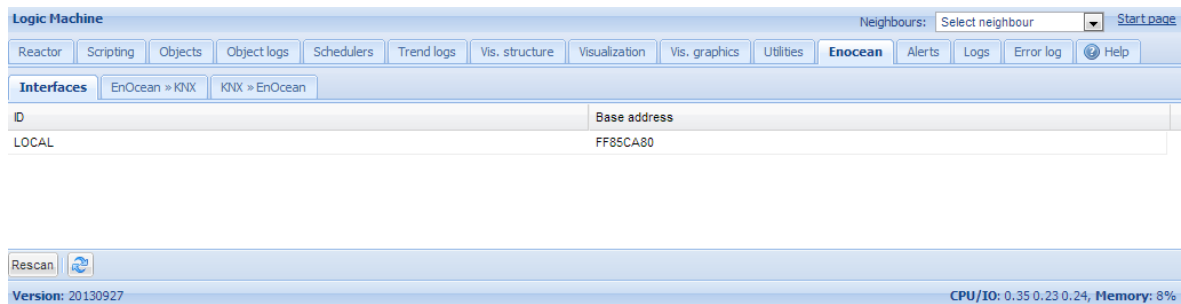
Note!BACnet service restart and Reinitialize Device requests will reload all objects, priority array will be reset to NULL.

7. EnOcean interconnection with Reactor

Logic Machine3 Reactor has EnOcean transceiver built-in with no limitation on supported count of devices.

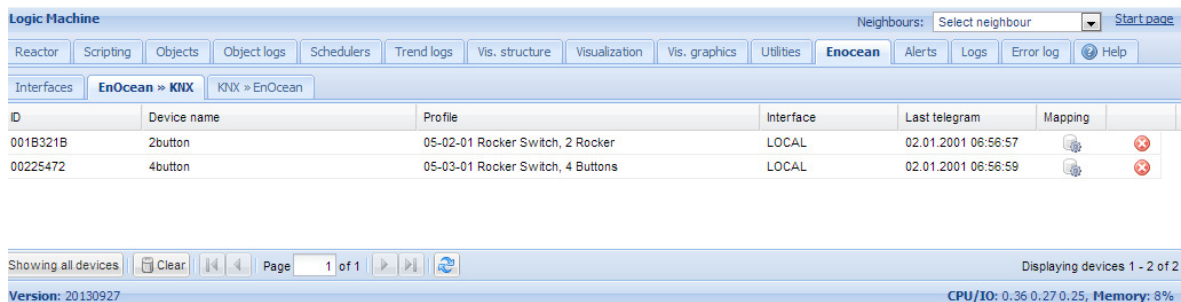
7.1. EnOcean interfaces

EnOcean interface Base address can be found in *EnOcean* → *Interfaces* tab.

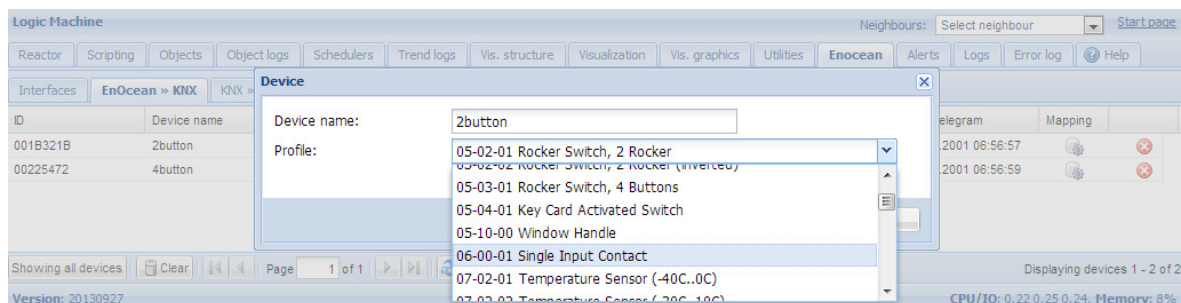


7.2. EnOcean to KNX mapping

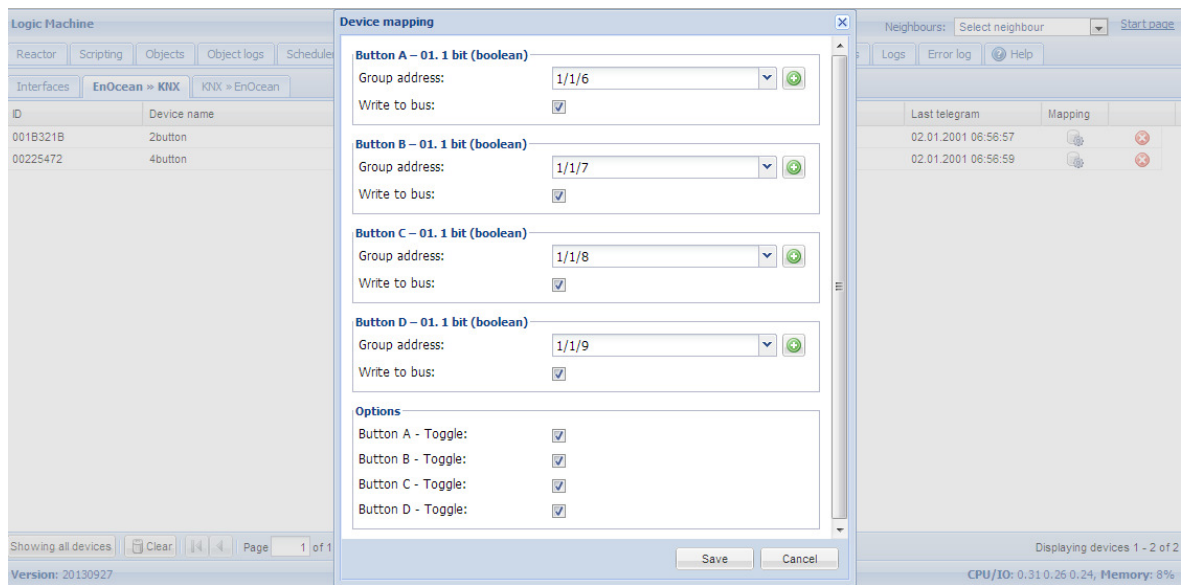
All telegrams received from EnOcean devices appears in *EnOcean* → *KNX* section.



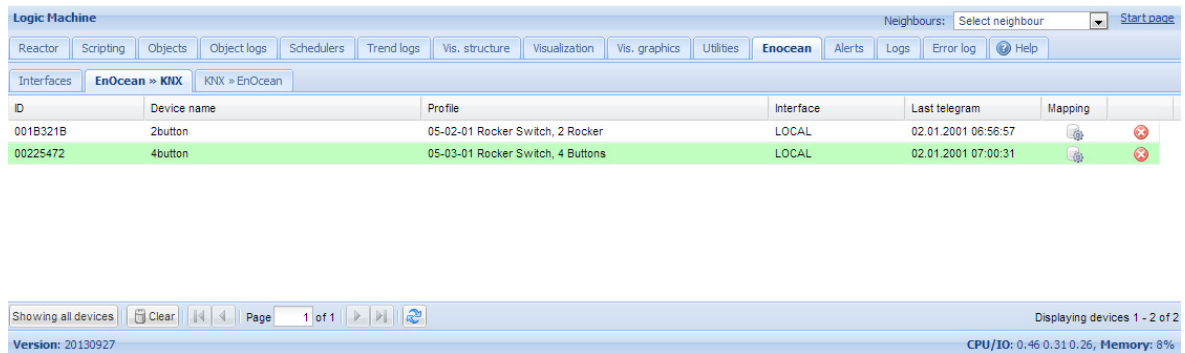
Once some specific device has to be mapped to KNX, the corresponding row has to be clicked and profile has to be chosen. There are all main profiles predefined in the list.



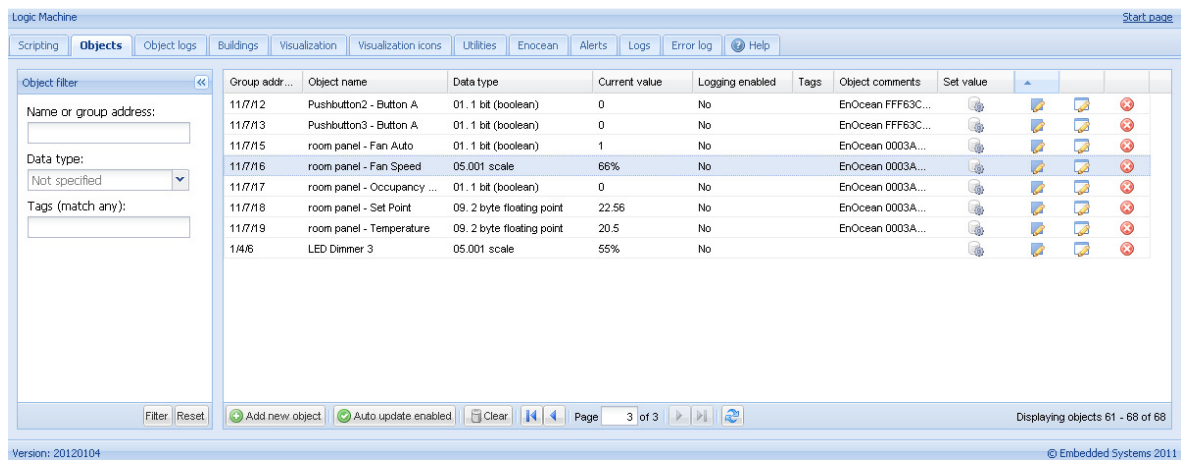
Once the device profile is set, you can map functionality of the specific device to KNX group addresses by clicking on *Mapping* icon.



When EnOcean gateway received telegram from specific device, the respective row gets light green.

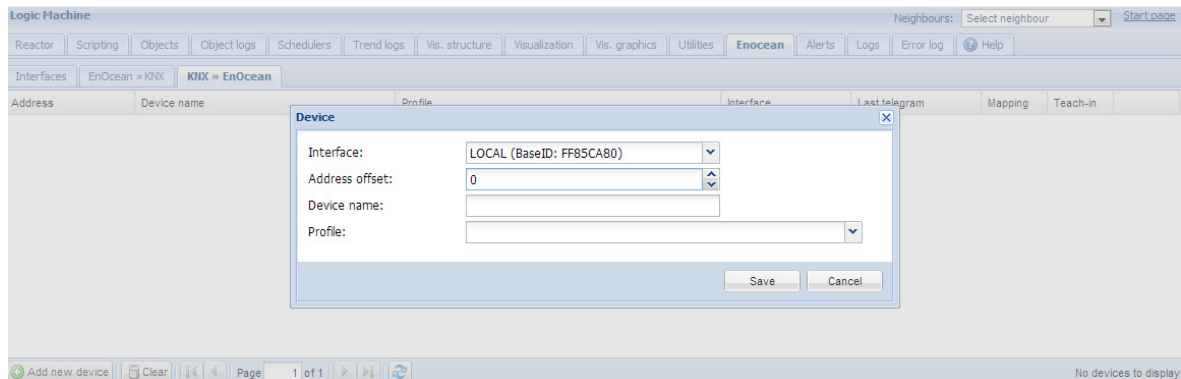


Respective KNX group addresses get updated with the new values.



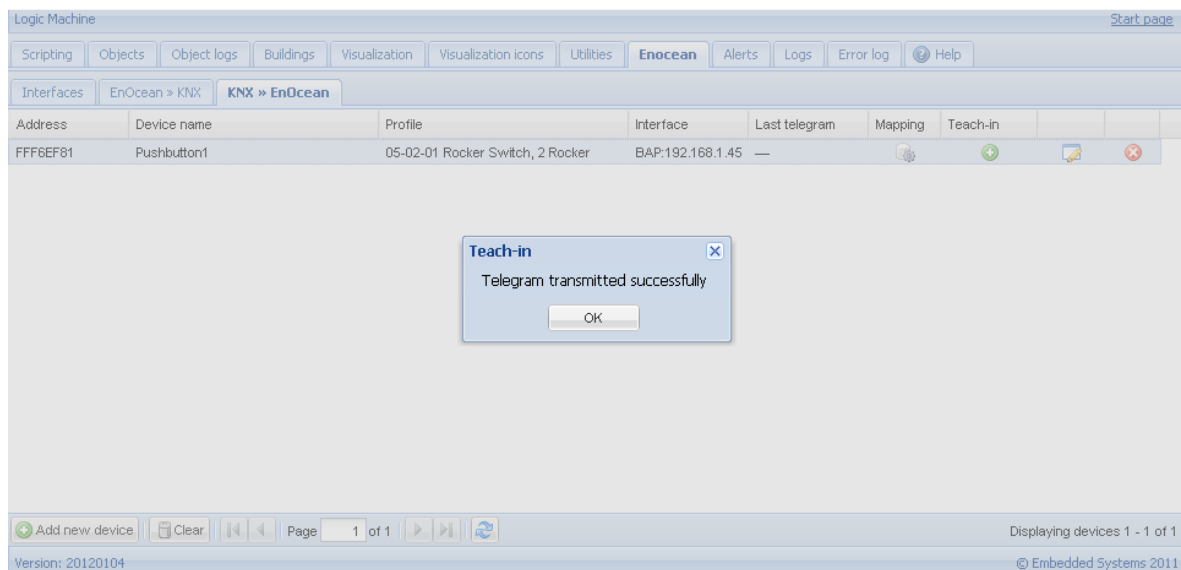
7.3. KNX to EnOcean mapping

You should click on Add new device button to add EnOcean device which will be communicated from specific KNX object.

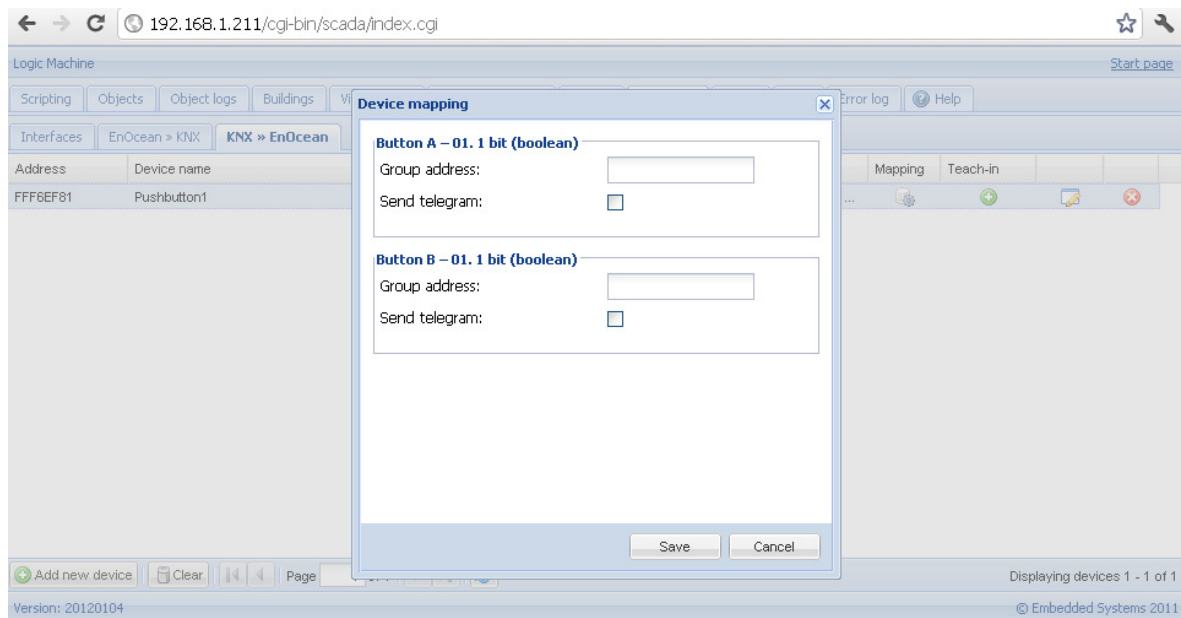


Once the device is added, you should pair it with specific device in EnOcean network, press Tech-in button.

Note!EnOcean device should be set in learning mode in order to pair it successfully.



Further this device can be mapped with specific KNX addresses. When KNX object value will be updated, the telegram will be sent to respective EnOcean device.



8. DMX interconnection with LM2

DMX protocol support is realized upon RS485 serial port.

Usage

```
d =DMX:init(parameters)
d:run()
```

Parameters

- **channels** – (optional, defaults to 3) number of DMX channels to use
- **resolution** – (optional, defaults to 20) number of DMX updates per second. Larger value gives smoother transitions, but increases CPU usage
- **transition** – (optional, defaults to 2) soft transition time in seconds
- **port** – (optional) RS-485 port name, usually you don't have to change this value

Common function

The following program has to be added in Common functions library.

```
DMX = {
  -- default params
  defaults = {
    -- storage key
    skey = 'dmx_chan_',
    -- RS-485 port
    port = '/dev/ttyS2',
    -- number of calls per second
    resolution = 20,
    -- total number of channels to use
    channels = 3,
    -- transition time in seconds, does not include DMX transfer time
    transition = 2,
  },
  -- value setter
  set = function(i, v)
    -- validate channel number
    if type(i) == 'number' and i >= 1 and i <= 512 then
      -- validate channel value
      if type(v) == 'number' and v >= 0 and v <= 255 then
        storage.set(DMX.defaults.skey .. i, v)
      end
    end
  end
end

-- DMX init, returns new DMX object
function DMX:init(params)
  require('luadm')

  local n = setmetatable({}, { __index = DMX })
  local k, v

  -- set user parameters
  n.params = params

  -- copy parameters that are set by user
  for k, v in pairs(DMX.defaults) do
    if n.params[k] == nil then
      n.params[k] = v
    end
  end

  n:reset()

  return n
end

function DMX:reset()
  local err, chan

  self.dm, err = luadm.open(self.params.port)

  -- error while opening
  if err then
    os.sleep(1)
    error(err)
  end
end
```

```

-- set channel count
self.dm:setcount(self.params.channels)

-- number of transaction ticks
self.ticks = math.max(1, self.params.transition * self.params.resolution)

-- calculate sleep time
self.sleep = 1 / self.params.resolution

-- reset channel map
self.channels = {}

-- fill channel map
for chan = 1, self.params.channels do
    self.channels[ chan ] = { current = 0, target = 0, ticks = 0 }

    -- turn off by default
    storage.set(self.params.skey .. chan, 0)
    self.dm:setchannel(chan, 0)
end

-- get new values
function DMX:getvalues()
    local chan, val

    -- check for new values for each channel
    for chan = 1, self.params.channels do
        val = storage.get(self.params.skey .. chan)

        -- target value differs, set transcation
        if val ~= self.channels[ chan ].target then
            self.channels[ chan ].target = val
            self.channels[ chan ].delta = (self.channels[ chan ].target - self.channels[ chan ].current) / self.ticks
            self.channels[ chan ].ticks = self.ticks
        end
    end
end

-- main loop handler
function DMX:run()
    local i, bs, bm, as, am, delta
    local res = self.params.resolution

    if not self.calibrated then
        bs, bm = os.microtime()
    end

    self:getvalues()

    -- transition loop
    for i = 1, res do
        self:step()
        self.dm:send()

        -- wait until next step
        os.sleep(self.sleep)
    end

    -- calibrate delay loop to match 1 second
    if not self.calibrated then
        as, am = os.microtime()
        delta = (as - bs) + (am - bm) / 1000000

        if delta > 1.05 then
            self.sleep = self.sleep - math.max(10, self.sleep / res)
        else
            self.calibrated = true
        end
    end

    -- single transition step
    function DMX:step()
        local chan, t

        -- transition for each channel
        for chan = 1, self.params.channels do
            t = self.channels[ chan ].ticks

            -- transition is active
            if t > 0 then
                t = t - 1

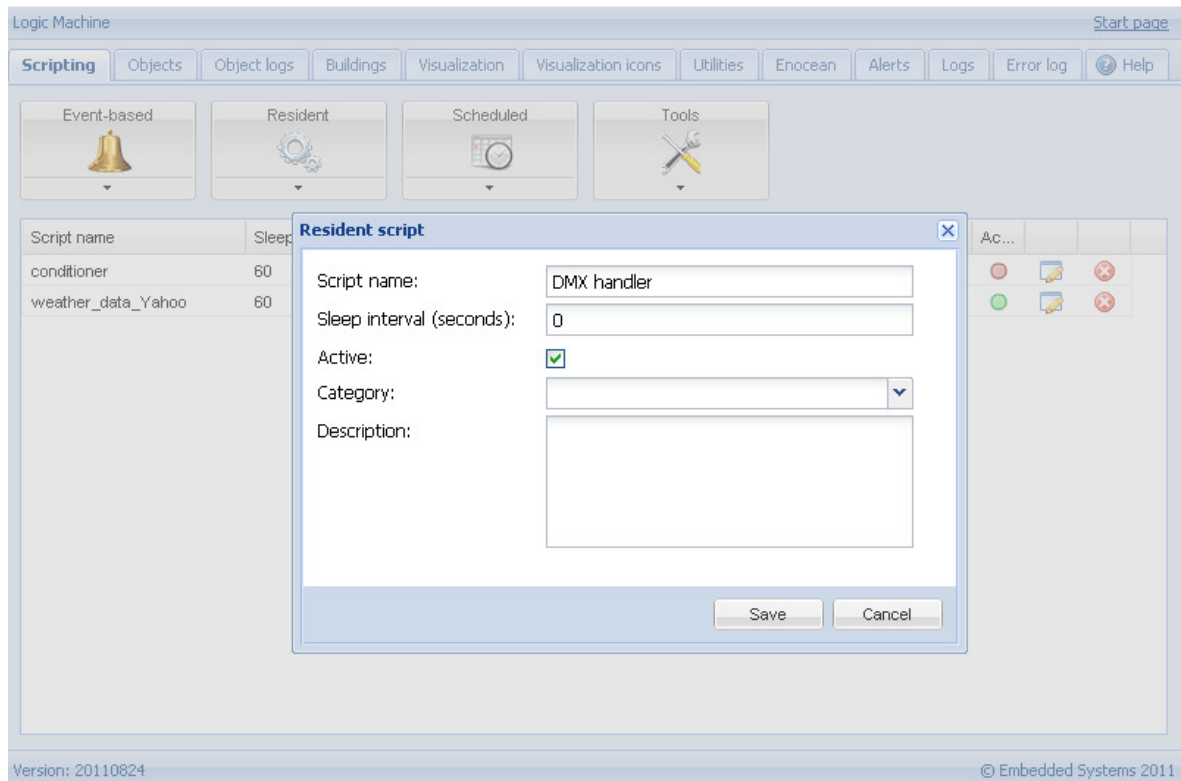
                self.channels[ chan ].current = self.channels[ chan ].target - self.channels[ chan ].delta * t
                self.channels[ chan ].ticks = t

                self.dm:setchannel(chan, self.channels[ chan ].current)
            end
        end
    end
end

```

DMX handler programs

DMX handler should be placed inside a resident script. Sleep time interval must be set to 0.



Once the resident script is added we can add the program source in Script Editor

```

1. if not d then
2.   d = DMX:init({
3.     channels = 3,
4.     transition = 2,
5.   })
6. end
7.
8. d:run()

```

Setter (used in other scripts)

```
DMX.set(channel, value)
```

- **channel** – DMX channel number [1..512]
- **value** – DMX channel value [0..255]

8.1. Examples

Predefined scene example: The following example should be placed inside a resident script. Sleep time defines scene keep time (at least 1 second).

```
1. if not scenes then
```

```

2.-- 3 channel scene
3.  scenes ={
4.{ 255, 0, 0 },
5.{ 0, 255, 0 },
6.{ 0, 0, 255 },
7.{ 255, 255, 0 },
8.{ 0, 255, 255 },
9.{ 255, 0, 255 },
10.{ 255, 255, 255 },
11.}
12.
13.  current = 1
14.end
15.
16.-- set current scene values
17.scene = scenes[ current ]
18.fori, v in ipairs(scene)do
19.DMX.set(i, v)
20.end
21.
22.-- switch to next scene
23.current = current + 1
24.if current > #scenes then
25.  current = 1
26.end

```

Random scene example:The following example should be placed inside a resident script. Sleep time defines scene keep time (at least 1 second).

```

1.-- number of steps to use, e.g. 3 steps = { 0, 127, 255 }
2.steps =5
3.-- number of channels to set
4.channels =3
5.-- first channel number
6.offset = 1
7.
8.fori= offset, channels do
9.  v =math.random(0, (steps - 1))* 255 /(steps - 1)
10.DMX.set(i, math.floor(v))
11.end

```

9. 3Gmodem connection with LM2

Logic Machine 3 has standard 3G modem driver built-in (Huawei and other vendor support). Currently this can be used for SMS notifications only – receiving and sending commands. Further 3G router support will be added.

Command syntax:

- a. Write to bus:
W ALIAS VALUE
- b. Read from bus:
R ALIAS

On read request, script will reply with SMS message containing current value of selected object.

ALIAS can be:

- a. Group address (e.g. 1/1/1)
- b. Name (e.g. Obj1). If name contains spaces then it must be escaped using double quotes (e.g. "Room Temperature")

NOTE:

- a. Object data type and name must be set in Objects tab. Otherwise script won't be able to read and write to object.
- b. Only ASCII symbols are accepted in the message.

9.1. Examples

Binary write (send the following SMS to switch kitchen lights on):

```
W 1/1/1 true
```

Scaling write (send the following SMS to set value 67% for red LED):

```
W LED1Red 67
```

Temperature (floating point) write (send the following SMS to make setpoint in the living room to 22.5 degrees):

```
W "Room Setpoint" 22.5
```

Read (send the following SMS to read the security panel value:

```
R 2/1/1
```

9.2. SMS handler program

A resident script for SMS handler should be created with sleep interval 0 following code.

Note! Change white list telephone numbers and SIM card's PIN code in the below script.

```
1.-- init
```

```

2. ifnot modem then
3. -- allowed numbers, SMS message from other number will be ignored
4.  numbers ={'1234567890', '0123456789'}
5. -- replace 0000 with SIM pin number, or remove the line below if PIN check is disabled
6. pincode='0000'
7. -- modem communication port, ttyUSB2 for Huawei E173
8.  comport ='ttyUSB2'
9. -- open serial port
10.  modem =AT:init('/dev/' .. comport)
11. -- command parser
12.  parser =function(cmd, sender)
13. local find, pos, name, mode, offset, value, jvalue, obj
14. cmd=cmd:trim()
15.     mode =cmd:sub(1, 1):upper()
16. if mode =='W'or mode =='R'then
17. cmd=cmd:sub(3):trim()
18. -- parse object name/address
19.     find =cmd:sub(1, 1)=='and'and'or'
20.     offset = find =='and'and 1 or0
21. -- pad with space when in read mode
22. if mode =='R'and find ==' 'then
23. cmd=cmd .. ' '
24. end
25. -- find name
26. pos=cmd:find(find, 1 + offset, true)
27. -- name end not found, stop
28. ifnot pos then
29. return false
30. end
31. -- get name part
32.     name =cmd:sub(1 + offset, pos - offset):trim()
33. if mode =='W'then
34.     value =cmd:sub(pos + offset):trim()
35. ifnot value then
36. return false
37. end
38. -- try decoding value
39. jvalue=json.pdecode(value)
40.     value =jvalue ~=nilandjvalueor value
41. -- send to bus
42. grp.write(name, value)
43. -- read request
44. else
45. obj=grp.find(name)
46. -- send read request and wait for update
47. ifobj then
48. obj:read()
49. os.sleep(1)
50. -- read new value
51.     value =grp.getvalue(name)

```

```

52.-- got value, send response
53.if value ~=nilthen
54.jvalue=json.pencode(value)
55.if obj.name then
56.        name =string.format('%s (%s)', obj.name, obj.address)
57.end
58.cmd=string.format('Value of %s is %s', name, jvalue)
59.modem:sendsms(sender, cmd)
60.end
61.end
62.end
63.end
64.end
65.-- incoming sms handler
66.  handler =function(sms)
67.    alert('incoming sms from %s (%s)', sms.sender, sms.data)
68.-- sms from known number, call parser
69.iftable.contains(numbers, sms.sender)then
70.    parser(sms.data, sms.sender)
71.end
72.end
73.-- set sms handler
74.modem:setsmshandler(handler)
75.-- send pin if set
76.ifpincode.then
77.modem:send('AT+CPIN=' .. pincode)
78.end
79.-- set to pdu mode
80.modem:send('AT+CMGF=0')
81.-- enable sms notifications
82.modem:send('AT+CNMI=1,1,0,0,0')
83.  alert('SMS handler started')
84.end
85.modem:run()

```

9.3. Send SMS messages to specific SIM numbers after group-read or group-write is triggered

Task: Assume we have an Event-based script which triggers a program once group-read or group-write is triggered for address 1/1/1. We want to send SMS to numbers 23335555 and 23335556 with 1/1/1 actual status.

```

1.require('socket')
2.
3.client =socket.udp()
4.

```



```
5.-- in the message field the number where SMS has to be send should be specified at the
   beginning
6.localmsg='23335555 1/1/1 changes its value to: ' .. tonumber(event.datahex)
7.client:sendto(msg, '127.0.0.1', 12535)
8.
9.msg='23335556 1/1/1 changes its value to: ' .. tonumber(event.datahex)
10.client:sendto(msg, '127.0.0.1', 12535)
```

10. HDL protocol integration in Logic Machine 3

Note! Please contact Embedded Systems team to receive a special package to integrate HDL support into your LM2. Once you have the file, add it in *Network configuration -> System -> Packages*.

10.1. HDL function

Add HDL script in *Scripting -> Tools -> User function library*

```
1.HDL ={\n2.-- destination ip\n3.dstip='192.168.1.7',\n4.-- packet constant data\n5.  magic ='HDLMIRACLE',\n6.lcode=string.char(0xAA, 0xAA),\n7.-- source device settings\n8.srcsubnet=1,\n9.srcdevice=254,\n10.devicetype= 0xFFFE,\n11.-- command types\n12.cmd={\n13.chanreg= 0x0031, -- single channel regulate\n14.chanregreply= 0x0032, -- single channel regulate answerback\n15.chanstat= 0x0033, -- read status of single channel targets\n16.chanstatreply= 0x0034, -- single channel targets status answerback\n17.}\n18.}\n19.\n20.HDL.init=function()\n21.require('json')\n22.require('crc16')\n23.require('socket')\n24.\n25.localip, chunk, chunks, data\n26.-- read interface data\n27.  data =json.pdecode(io.readproc('if-json'))\n28.\n29.ifnot data ornot data.eth0 then\n30.error('cannot get interface data')\n31.end\n32.\n33.-- ip header\n34.HDL.iphdr='' \n35.-- broadcast address\n36.HDL.bcast= data.eth0.bcast\n37.
```

```

38.-- split ip address into chunks
39.chunks= data.eth0.inetaddr:split('.')
40.
41.-- add ip address chunks
42.for i= 1, 4 do
43.    chunk =tonumber(chunks[i])
44.HDL.iphdr=HDL.iphdr ..string.char(chunk)
45.end
46.end
47.
48.HDL.decode=function(packet)
49.local len, data, src, crc
50.
51.-- primary header
52.if packet:sub(5, 14) ~=HDL.magic then
53.    return nil, 'magic'
54.end
55.
56.-- Leading code
57.if packet:sub(15, 16) ~=HDL.lcode then
58.    return nil, 'lcode'
59.end
60.
61.-- get data length and check against
62.len=packet:byte(17)
63.if len and len + 16 ~=packet:len() then
64.    return nil, 'len'
65.end
66.
67.-- get packet data and check crc
68.    data =packet:sub(17, len + 14)
69.crc=packet:byte(len + 15)* 0x100 + packet:byte(len + 16)
70.if crc16(data) ~=crc then
71.    return nil, 'crc'
72.end
73.
74.-- return parsed packet

```

Change HDL parameters in the function to correct ones

```

HDL = {
  -- destination ip
  dstip = '192.168.1.7',
  -- packet constant data
  magic = 'HDLMIRACLE',
  lcode = string.char(0xAA, 0xAA),
  -- source device settings
  srcsubnet = 1,
  srcdevice = 254,
  devicetype = 0xFFFE,
  -- command types
  cmd = {
    chanreg = 0x0031, -- single channel regulate
    chanregreply = 0x0032, -- single channel regulate answerback
    chanstat = 0x0033, -- read status of single channel targets
    chanstatreply = 0x0034, -- single channel targets status answerback
  }
}

```

10.2. Usage example – HDL dimmer control

Task of this example is to change HDL dimmer value on specific KNX group address change.

- Add new object in Objects tab
- Add Event-based script which will monitor newly created object
- In Scripting Editor specify the following code for this script

```

1. local value = dpt.decode(event.datahex, dt.scale)
2. HDL.chanreg(1, 12, 1, value, 1)

```

HDL.chanreg function description

`HDL.chanreg(dstsubnet, dstdevice, chan, value, delay)`

Parameters:

- *dstsubnet* – device subnet
- *dstdevice* – device address
- *chan* – channel number (1..n)
- *value* – value (0..100, or true / false)
- *delay* – transition time or delay in seconds (0..65535), by default is 0

Test the program

If you change the value for object 4/1/1 in Objects menu with Set Value, it will automatically change dimmer state in HDL network.

10.3. Usage example – HDL relay control

Task of this example is to change HDL dimmer value on specific KNX group address change.

- Add new object in Objects tab
- Add Event-based script which will monitor newly created object
- In Scripting Editor specify the following code for this script

```
1.local value =dpt.decode(event.datahex, dt.bool)
2.HDL.chanreg(1, 11, 1, value))
```

Test the program

If you change the value for object 4/1/2 in Objects menu with Set Value, it will automatically change the relay state in HDL network.

11. Communication with RS232/RS485 serial ports

The following are the naming of Serial ports for different versions of Logic Machine.

LM3		Reactor	
GND		GND	
RS-485 A	RS485-1	RS-485 A	RS485-1
RS-485 B		RS-485 B	
GND		GND	
RS-485 A	RS485-2	RS-485 A	RS485-2
RS-485 B		RS-485 B	
GND		24V-	
RS-485 A	RS485-3	24V+	
RS-485 B			
GND			
RS-485 A	RS485-4		
RS-485 B			
24V-			
24V+			

Functions

Include library before calling serial functions:

```
require('serial')
```

Opens given port, returns: port handle, or, in case of error, nil plus error message

```
port, err = serial.open(device, params)
```

Parameters:

- **device** port device name, required
- **params** parameters table, optional, (defaults are in bold):
 - **baudrate** 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400
 - **parity** "none", "even", "odd"
 - **databits** 5, 6, 7, 8
 - **stopbits** 1, 2
 - **duplex** "full", "half" (Note: "half" is required for RS-485)

Reads the specified number of bytes, execution is blocked until read is complete

```
res, err = port:read(bytes)
```

Parameters:

- **bytes** number of bytes to read

Reads until timeout occurs or the specified number of bytes is received, whichever happens first.

Returns data plus number of bytes read, or, in case of error, nil plus error message.

```
res, err = port:read(bytes, timeout)
```

Parameters:

- **bytes** number of bytes to read
- **timeout** maximum time to wait for read to complete, minimum value and timer resolution is 0.1 seconds

Flushes any read/unsent bytes

```
port:flush()
```

Closes serial port, no other port functions may be called afterwards

```
port:close()
```

Examples

Write to port

```
port:write('test data')
```

Blocking read (script will block until 10 characters are read)

```
data=port:read(10)
```

Timeout read (script will wait for 10 characters for 20 seconds)

```
data=port:read(10, 20)
```

Close serial port

```
port:close()
```

Resident script, RS-485 echo test

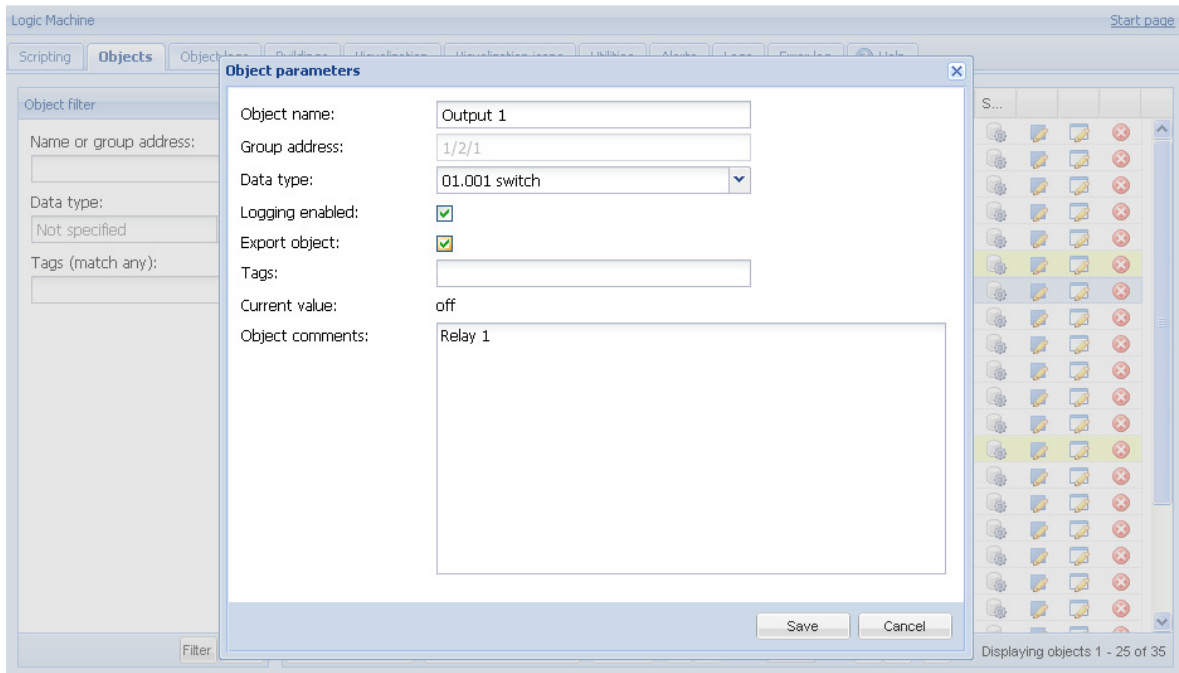
```
-- open port on first call
if not port then
    require('serial')
    port = serial.open('/dev/ttyS2', { baudrate = 9600, parity = 'even', duplex =
'half' })
    port:flush()
end

-- port ready
if port then
    -- read one byte
    char = port:read(1, 1)
    -- send back if read succeeded
    if char then
        port:write(char)
    end
end
end
```

12. Object value export via XML

Make KNX objects XML readable

In the *Objects* tab click on the objects which you want to receive the current value by XML request. Check the Export object



XML request from external PC

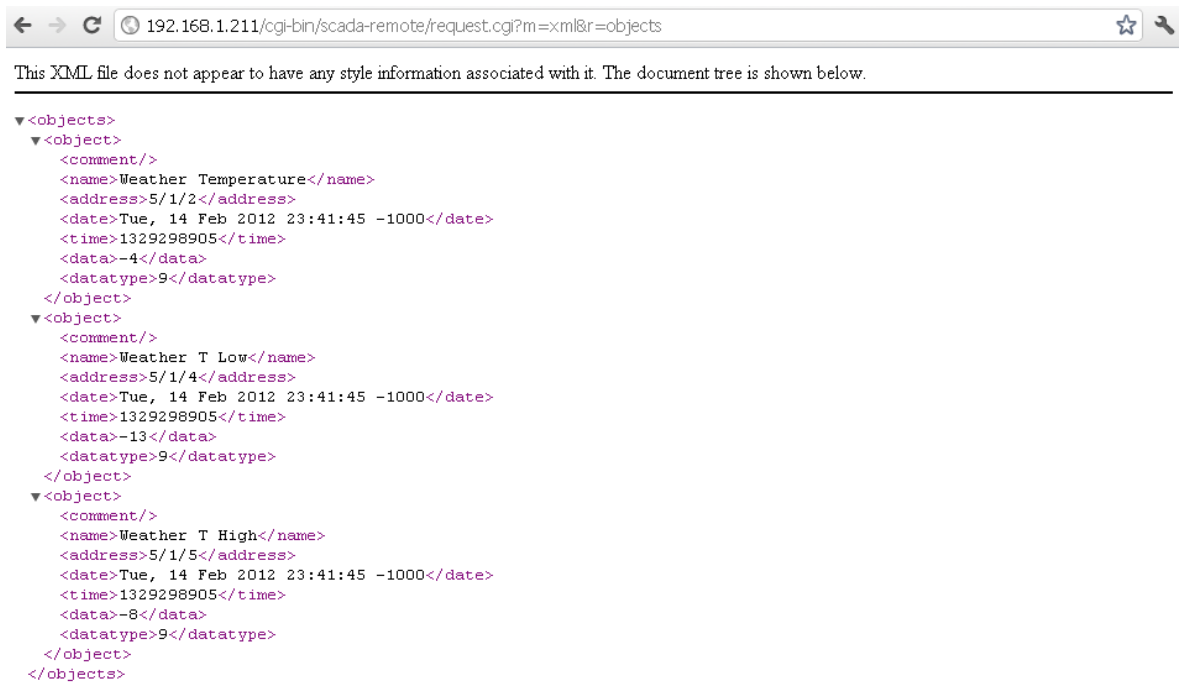
The XML request looks like this:

<http://remote:remote@192.168.1.211/cgi-bin/scada-remote/request.cgi?m=xml&r=objects>

Parameters:

- **address** – object address (e.g. “1/1/1”)
- **name** – object name (e.g. “My object”)
- **data** – decoded object value (e.g. 42 or “01.01.2012”)
- **datatype** – object datatype (e.g. 1 or 5.001) – standard KNX data types
- **time** – object update time (UNIX timestamp)
- **date** – object update time (RFC date)
- **comment** – object comment (e.g. “Second floor entry lights”)
- **tags** – optional array of object tags (e.g. “Light”, “Second floor”)

Note! To get list of objects that have been updated after specific time you can pass an optional “updatetime” parameter (UNIX timestamp format)



Login, Password for remote XML request

Login and password can be changed in *Network Configuration* → *System* → *GUI Login* → *Admin/Remote* tab.

GUI login

Admin / Remote Visualization

Login admin

Password

Repeat password

Admin user has access to Logic Machine and Network Configuration interfaces

Login remote

Password

Repeat password

OK Cancel

12.1. Alerts, Errors values

In similar way also Alerts and Errors can be read by XML requests.

Alerts XML request:

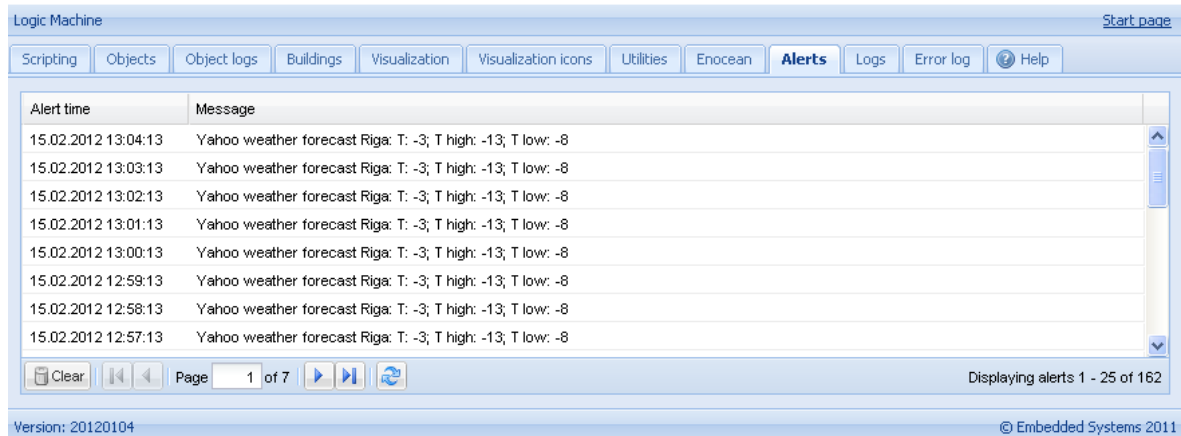
<http://remote:remote@192.168.0.10/cgi-bin/scada-remote/request.cgi?m=xml&r=alerts>

Errors XML request:

<http://remote:remote@192.168.0.10/cgi-bin/scada-remote/request.cgi?m=xml&r=errors>

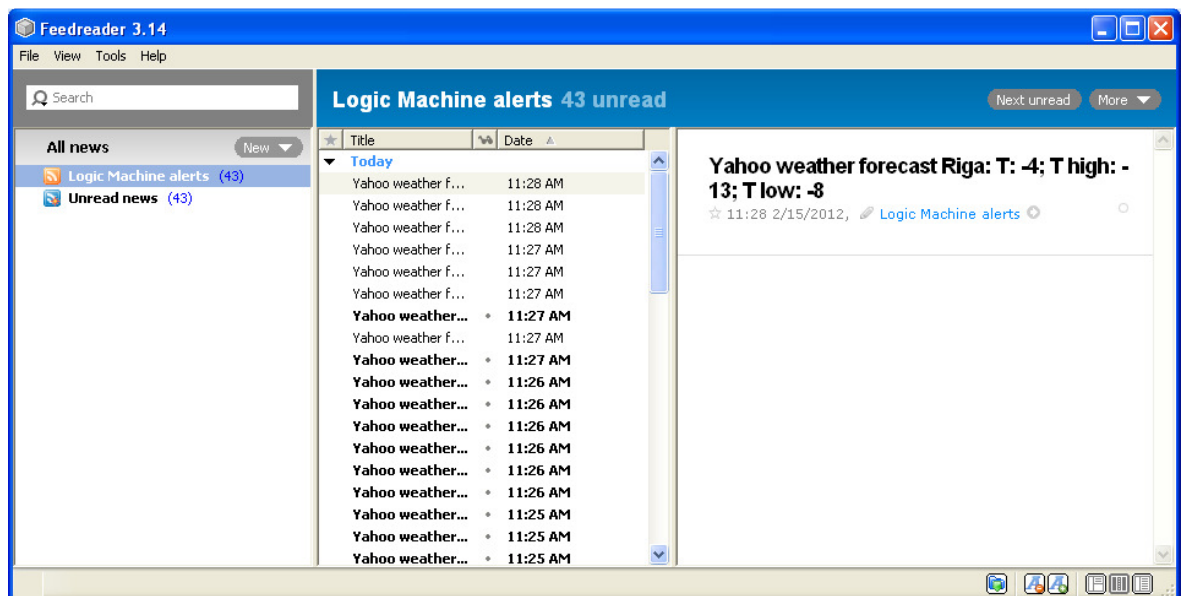
13. Read Alerts RSS feeds from Logic Machine

It is possible to read Alerts and Errors messages by remote RSS readers.



Add new RSS feed in the RSS reader

- Use the following URL:
- <http://remote:remote@192.168.1.211/cgi-bin/scada-remote/request.cgi?m=rss&r=alerts>
- 50 latest alerts will be shown
- *alert time* will be shown in *UNIX timestamp*, *alert date* will be shown as *RFC date*



Error tab content by RSS

RSS can be used to read Error tab content as well. In this case the URL would look like:

<http://remote:remote@192.168.1.211/cgi-bin/scada-remote/request.cgi?m=rss&r=errors>

Login, Password for remote RSS requests

Login and password can be changed in *System Configuration* → *System* → *User access* → *Admin/Remote* tab.

User access

Admin / Remote Visualization

Login admin

Password

Repeat password

Login remote

Password

Repeat password

OK Cancel