M2MLIGHT USER GUIDE
Version 1.4
Date: Oct 30 2019

1. INTRODUCTION

This platform is aimed at enthusiasts who have a basic knowledge of Internet of Thing (IoT) devices. M2mlight.com is a free basic platform service for IoT devices. You can store your cameras, sensors, actuators and alerts data in the cloud. Then, using your desktop or smartphone via the Internet, you can see the videos, graphs, maps and statistics of these devices.

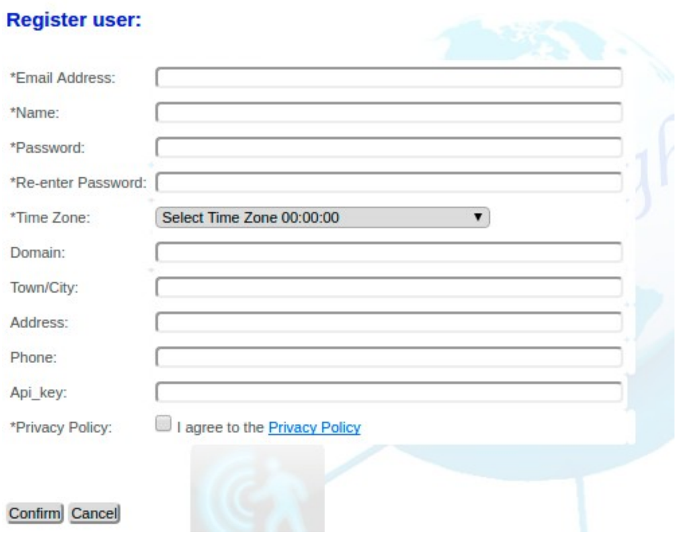
Cameras, sensors and actuators can receive and send data using a microcontroller like Arduino, Raspberry Pi or Esp8266; and then, through a gateway or router can send this information to the m2mlight platform in the cloud.

HTTP and RTSP protocols are used for cameras; and, sensors, actuators and alarms use the HTTP and MQTT protocols

Examples of using this platform you can see in this link caletagreen.com.

2. REGISTER USER

In order to use this platform you need to register as a user using the option **Login** and then **Register User.**


Register user:

*Email Address:	
*Name:	
*Password:	
*Re-enter Password:	
*Time Zone:	Select Time Zone 00:00:00
Domain:	
Town/City:	
Address:	
Phone:	
Api_key:	
*Privacy Policy:	☐ I agree to the Privacy Policy

A user account has the following main fields:

- **Email Address:** required. Your Email Address will be your user identifier in m2mlight.com. All messages from cameras, sensors, actuators and alerts will be sent to this address.
- **Name:** required. Your user name.
- **Password:** required. Your password of at least 7 characters
- **Time Zone:** required. Pick your Time Zone. It is important to stored your data with the appropriate time.
- **Domain:** optional. The domain of your home or small business. For example: caletagreen.com. This field is not required but it is necessary if you want to use the subdomains option.
- **Town/City, Address and Phone:** optional.
- **Api_key:** informative. This api_key is an unique identifier of the user.
- **Privacy Policy:** required. You have to indicate that you agree to the Privacy Policy of this website. You can read this policy in the indicated link.

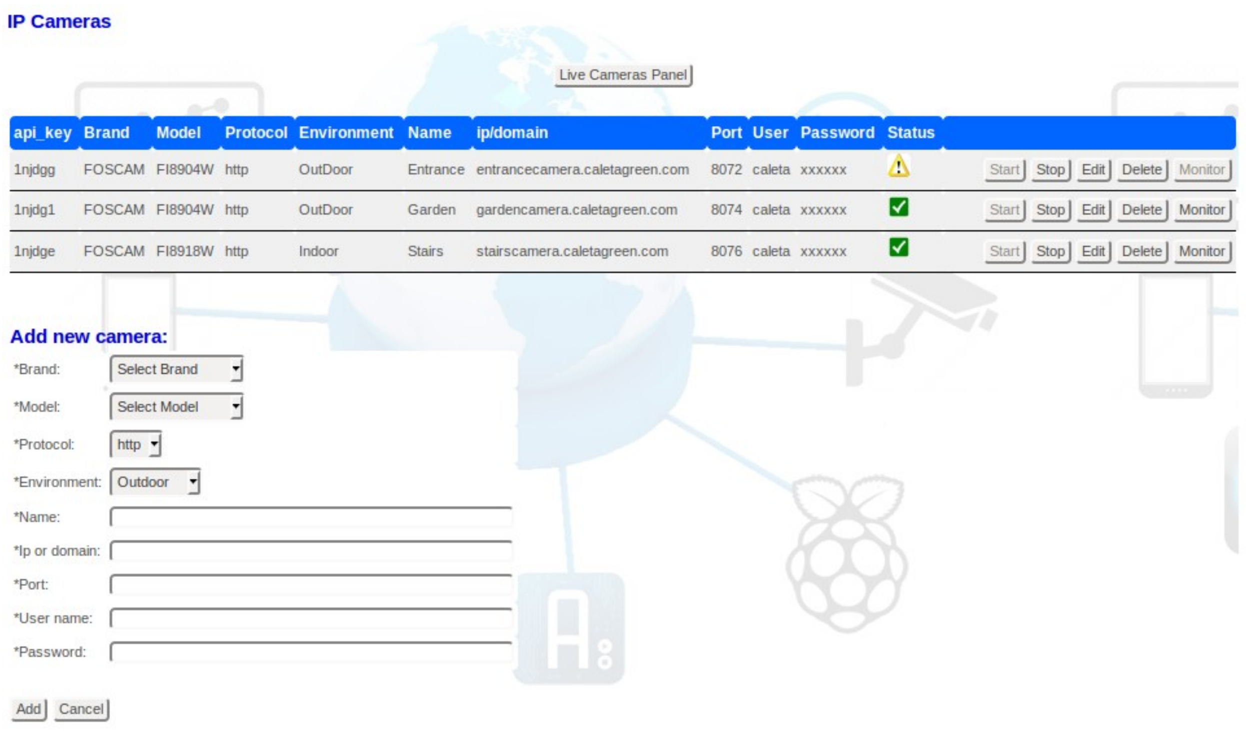
If you want to change your account information, including your password, you have to use the **Account** option.

3. IP CAMERAS

An IP camera is a device connecting directly to an Ethernet network.

The IP CAMERAS option allows you to manage your Ip cameras. You can add, delete and edit a camera. It permits you to stop and start the motion characteristic of a camera. Also, you can monitor and see camera videos.

In the second part of this dialog, you can add or register a new camera. The maximum number of cameras that you can register is 4.


IP Cameras

api_key	Brand	Model	Protocol	Environment	Name	ip/domain	Port	User	Password	Status	
1njdgg	FOSCAM	FI8904W	http	OutDoor	Entrance	entrancecamera.caletagreen.com	8072	caleta	xxxxxx	⚠	Start Stop Edit Delete Monitor
1njdg1	FOSCAM	FI8904W	http	OutDoor	Garden	gardencamera.caletagreen.com	8074	caleta	xxxxxx	✓	Start Stop Edit Delete Monitor
1njdge	FOSCAM	FI8918W	http	Indoor	Stairs	stairscamera.caletagreen.com	8076	caleta	xxxxxx	✓	Start Stop Edit Delete Monitor

Add new camera:

*Brand:	Select Brand
*Model:	Select Model
*Protocol:	http
*Environment:	Outdoor
*Name:	
*Ip or domain:	
*Port:	
*User name:	
*Password:	

A camera has the following required fields:

- **Brand:** you have to choose the brand of your camera. The brands listed are those supported by m2mlight at this moment.
- **Model:** the model of your camera.
- **Protocol:** the stream protocol. It can be http or rtsp.
- **Environment:** it can be Outdoor or Indoor
- **Name:** the camera name. You can not have two cameras with the same name.
- **Ip or domain:** the IP address or the domain of the camera. It is the internal IP address or sub-domain. The system checks that it is a valid value.
- **Port:** the camera port number
- **User name:** the camera user name
- **Password**: the camera password

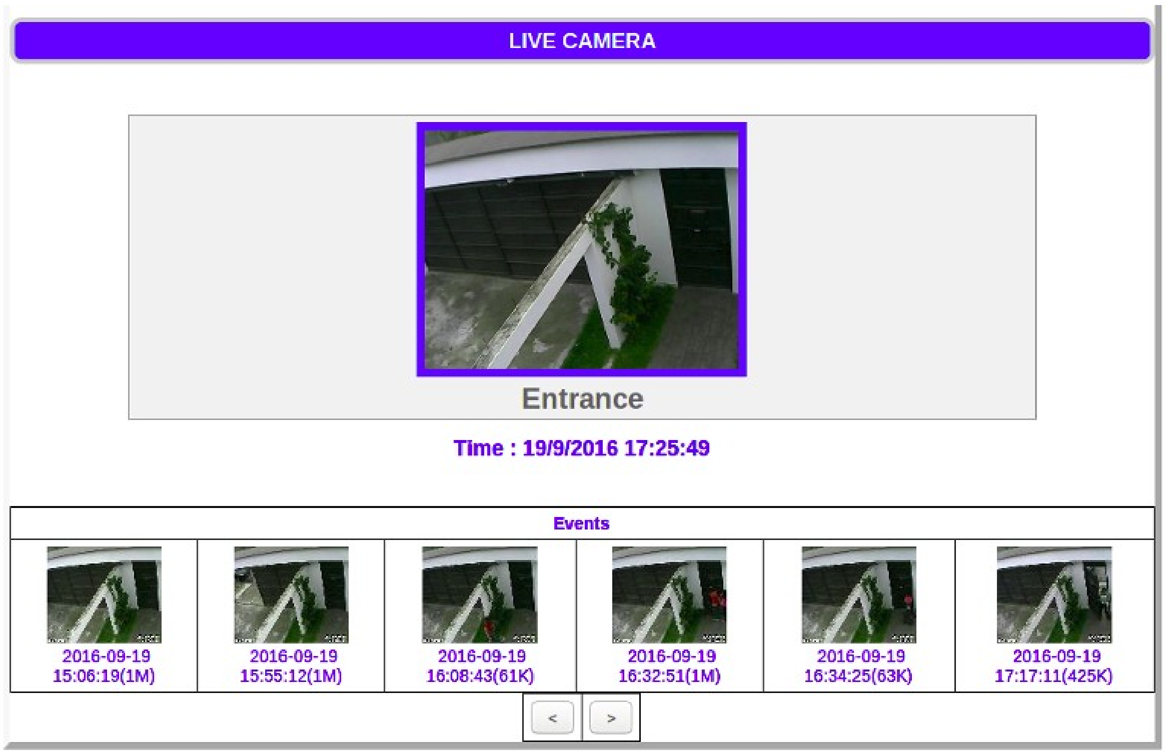
In the first part of this dialog, you will find the list of your cameras. Using the **Edit** button you can update the camera properties. With the **Delete** button you remove a camera and its motion registers; you need to confirm this previously. The **Stop** button allow to stop motion property and the **Start** button allow to start motion property.

Api_key is the unique identifier of the camera and you can not change this value.

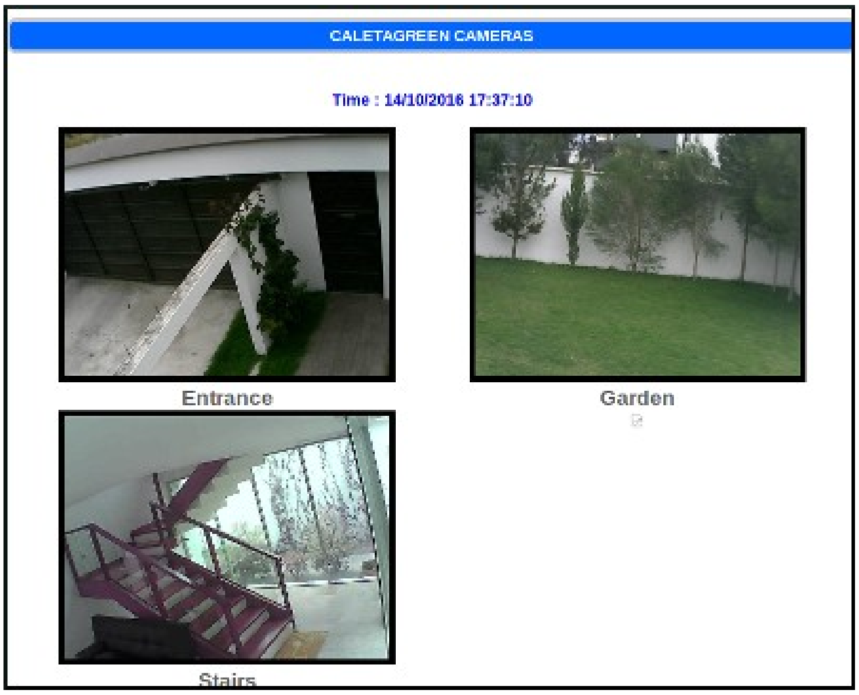
The **Status** of a camera can be:

✓	Motion property is enable
✖	Motion property is disable
⚠	Camera is disconnected for any reason

Daemons process check periodically each camera and set this status.
Using the **Monitor** button you can see online the camera and its motions videos of the last month.



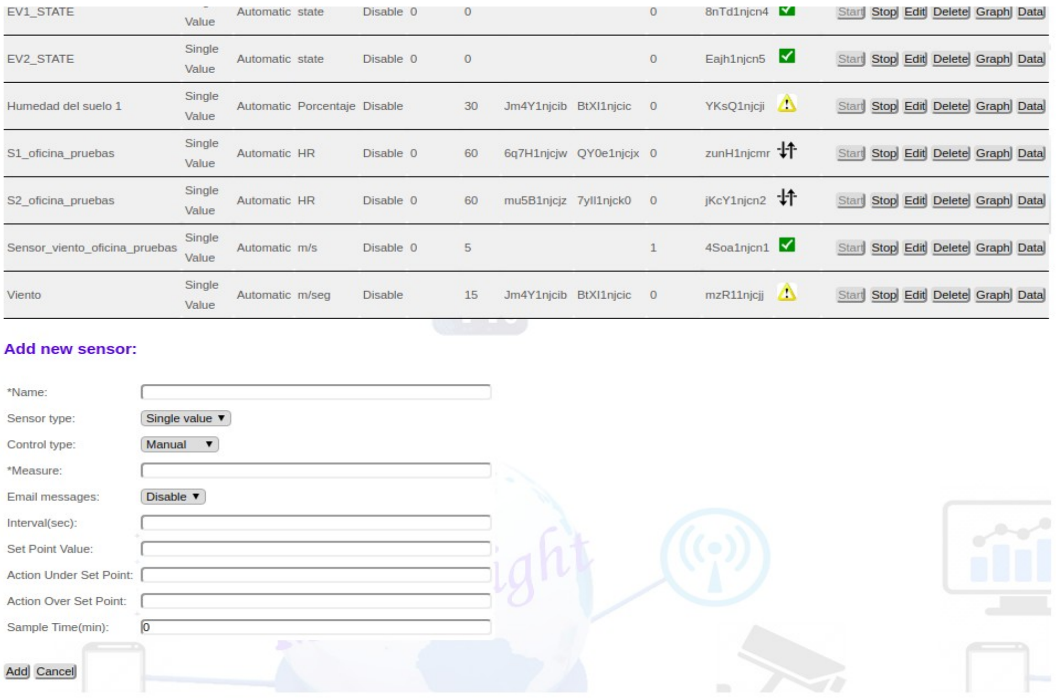
With the **Live Cameras Panel** button, you can see all cameras on line.



4. SENSORS

A sensor is a device that detects changes in the ambient conditions and transmits this information. For example, there are sensors of temperature, light, humidity, motion, electric current, power consumption, etc.

The SENSORS option allows you to manage your sensors. You can add, delete and edit a sensor. With this option you define sensors that have periodically values: singles values or location values (longitude and latitude). In this platform, coordinates values obtained from GPS devices are considered sensors.



EV1_STATE	Value	Automatic	state	Disable	0	0			0	8nTd1njcn4	✓	Start Stop Edit Delete Graph Data
EV2_STATE	Single Value	Automatic	state	Disable	0	0			0	Eajh1njcn5	✓	Start Stop Edit Delete Graph Data
Humedad del suelo 1	Single Value	Automatic	Porcentaje	Disable		30	Jm4Y1njcib	BtXI1njcic	0	YKsQ1njcji	⚠	Start Stop Edit Delete Graph Data
S1_oficina_pruebas	Single Value	Automatic	HR	Disable	0	60	6q7H1njcjw	QY0e1njcjx	0	zunH1njcmr	⇅	Start Stop Edit Delete Graph Data
S2_oficina_pruebas	Single Value	Automatic	HR	Disable	0	60	mu5B1njcjz	7yll1njck0	0	jKcY1njcn2	⇅	Start Stop Edit Delete Graph Data
Sensor_viento_oficina_pruebas	Single Value	Automatic	m/s	Disable	0	5			1	4Soa1njcn1	✓	Start Stop Edit Delete Graph Data
Viento	Single Value	Automatic	m/seg	Disable		15	Jm4Y1njcib	BtXI1njcic	0	mzR11njcjj	⚠	Start Stop Edit Delete Graph Data

Add new sensor:

*Name:	
Sensor type:	Single value ▾
Control type:	Manual ▾
*Measure:	
Email messages:	Disable ▾
Interval(sec):	
Set Point Value:	
Action Under Set Point:	
Action Over Set Point:	
Sample Time(min):	0

Add Cancel

For a sensor, you can upload data and see its status. For example, you can see if the sensors values are out of the defined Set Point Value.

In the second part of this dialog, you can add or register a new sensor. The maximum number of sensors you can register is 10.

A **sensor** has the following fields:

- **Name:** required. The sensor name. You can not have two sensors with the same name.
- **Sensor type:** you have two alternatives, Single value (default) or Location. If you choice Location the measure field is always Degrees (longitude and latitude).
- **Control type:** you have two alternatives, Manual (default) or Automatic. If you choice Automatic will exist a synchronization with a remote controller. MQTT messages will be sent to controller and the system will wait for a positive response.
- **Measure:** required. A standard unit used to express the size, amount, or degree of something. For example: Watts.
- **Email-messages:** you can choice enable or disable. Enable, if you want to receive email messages when the sensor is not registering values or value reach the Set Point. Disable, if you do not receive email messages.
- **Interval (sec):** optional. The interval in seconds of two consecutive sensor values.
- **Set Point Value:** optional. The sensor value that controls an actuator.
- **Action Under Set Point:** optional. The actuator api_key that is triggered if sensors values are

under the set point value.

- **Action Over Set Point:** optional. The actuator api_key that is triggered if sensors values are over the set point value.

- **Sample Time (min):** optional, default is 0. The time to obtain an average of a sample of values. It is used when the sensor values are widely dispersed over time.

In the first part of this dialog, you will find the list of your sensors. Using the **Edit** button you can update the sensor properties. With the **Delete** button you remove a sensor and its register values; you need to confirm this previously. The **Stop** button set the disable status and the **Start** button set the enable status. If you has defined Automatic option, all these actions will be executed if there is a positive response from the controller.

The **Status** of a sensor can be:

✅ Sensor is enable and it is registering values

❌ Sensor is disable

⚠ Sensor is not registering values

⇅ Sensor values have reached the Set Point

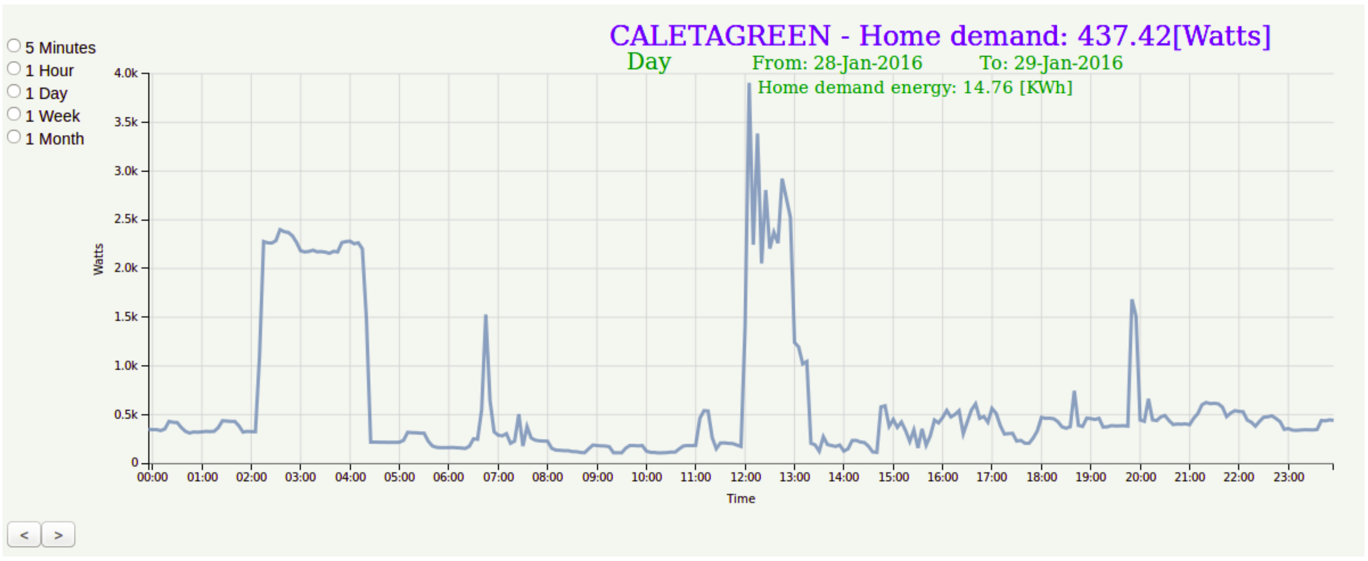
Daemons process check periodically each sensor and set this status. If a sensor has not registered a value in the cloud in the last 10 minutes, the system changes its state and sends a email message to user if Email-messages property is enable.

For a sensor, the minimum interval between two inserted values is 10 seconds. Namely**,** if you try to insert a value in a range of less than 10 seconds, the value will not inserted.

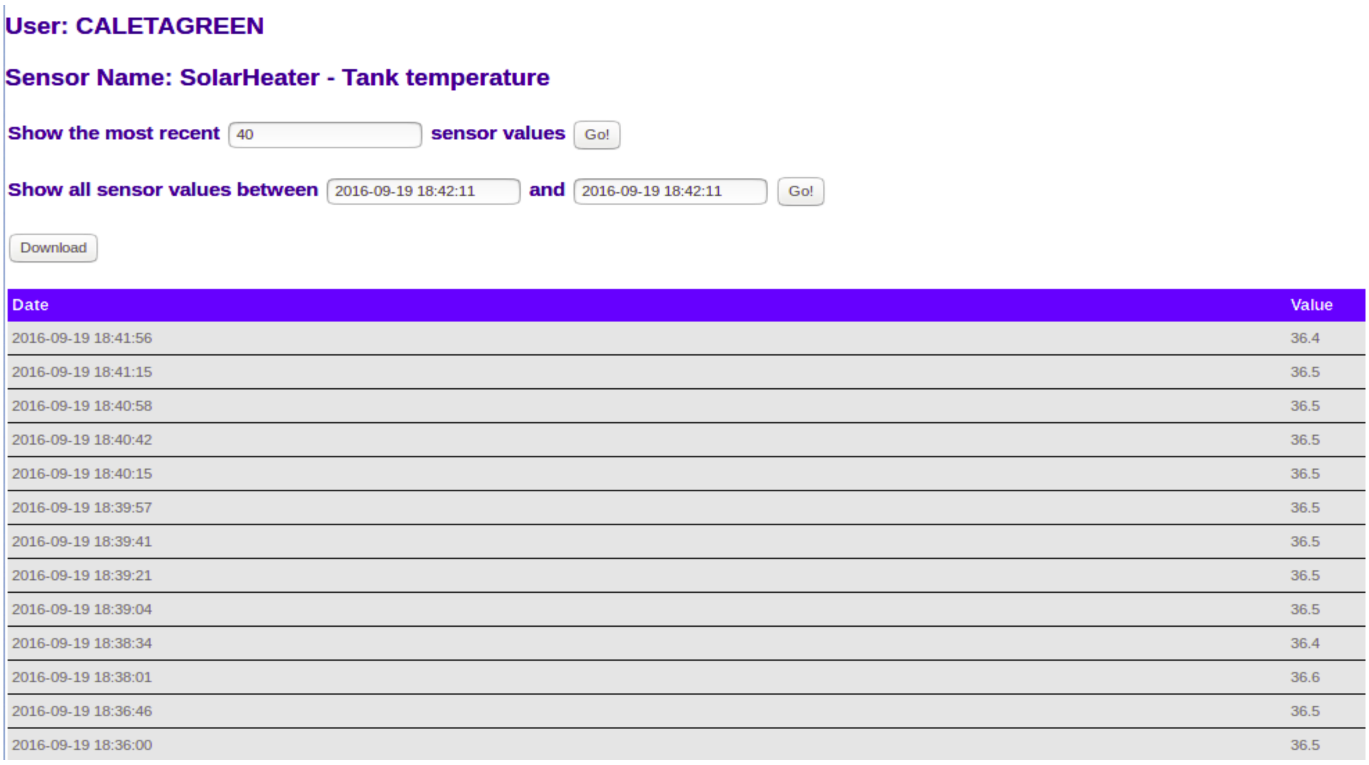
Also, for a sensor, the minimum interval between two emails sent is 3,600 seconds (one hour)**.** Namely**,** if there are continuous news, you will receive a separate email for at least one hour.

Api_key is the unique identifier of the sensor and you can not change this value. You can add sensor values using this api_key and the Server functions or M2MData library.

The **Graphics** button allow you to see line graphs of these data, graphs by 5 minutes, an hour, a day, a week or a month. These graphics work with most popular browsers: Chrome and Firefox.



Using the **Data** button you can display and download stored data.



User: CALETAGREEN

Sensor Name: SolarHeater - Tank temperature

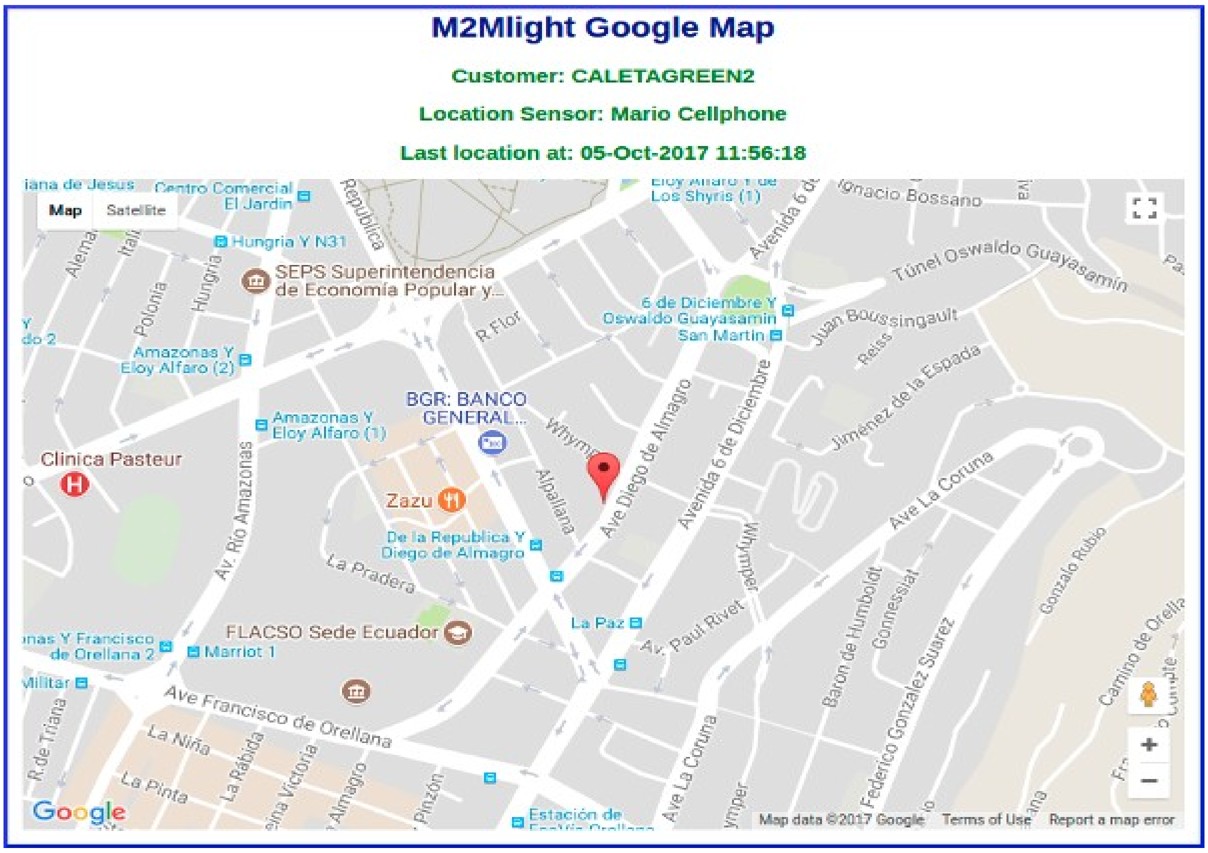
Show the most recent 40 **sensor values** Go!

Show all sensor values between 2016-09-19 18:42:11 **and** 2016-09-19 18:42:11 Go!

Download

Date	Value
2016-09-19 18:41:56	36.4
2016-09-19 18:41:15	36.5
2016-09-19 18:40:58	36.5
2016-09-19 18:40:42	36.5
2016-09-19 18:40:15	36.5
2016-09-19 18:39:57	36.5
2016-09-19 18:39:41	36.5
2016-09-19 18:39:21	36.5
2016-09-19 18:39:04	36.5
2016-09-19 18:38:34	36.4
2016-09-19 18:38:01	36.6
2016-09-19 18:36:46	36.5
2016-09-19 18:36:00	36.5

In the case of location sensors, with the **Map** button, you can see a Google Map with the location.



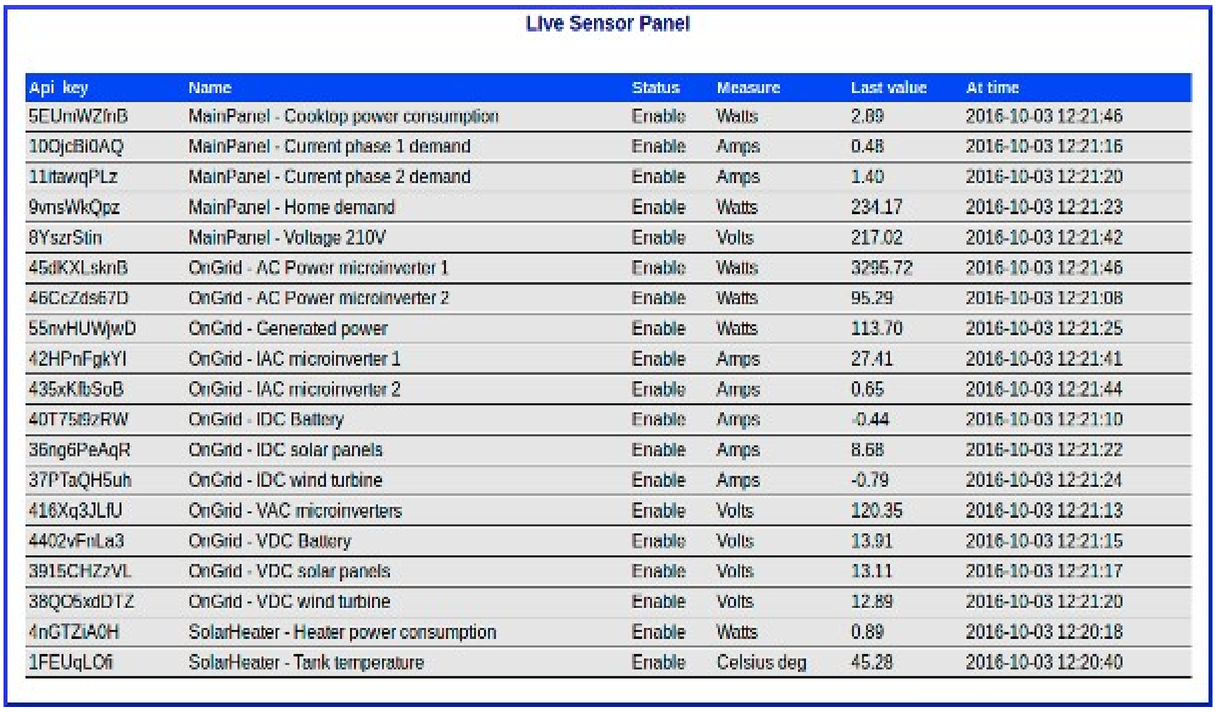
M2Mlight Google Map

Customer: CALETAGREEN2

Location Sensor: Mario Cellphone

Last location at: 05-Oct-2017 11:56:18

With the **Live Sensor Panel** button, you can see all sensors values on line in one screen. The screen is refreshed every 5 seconds.



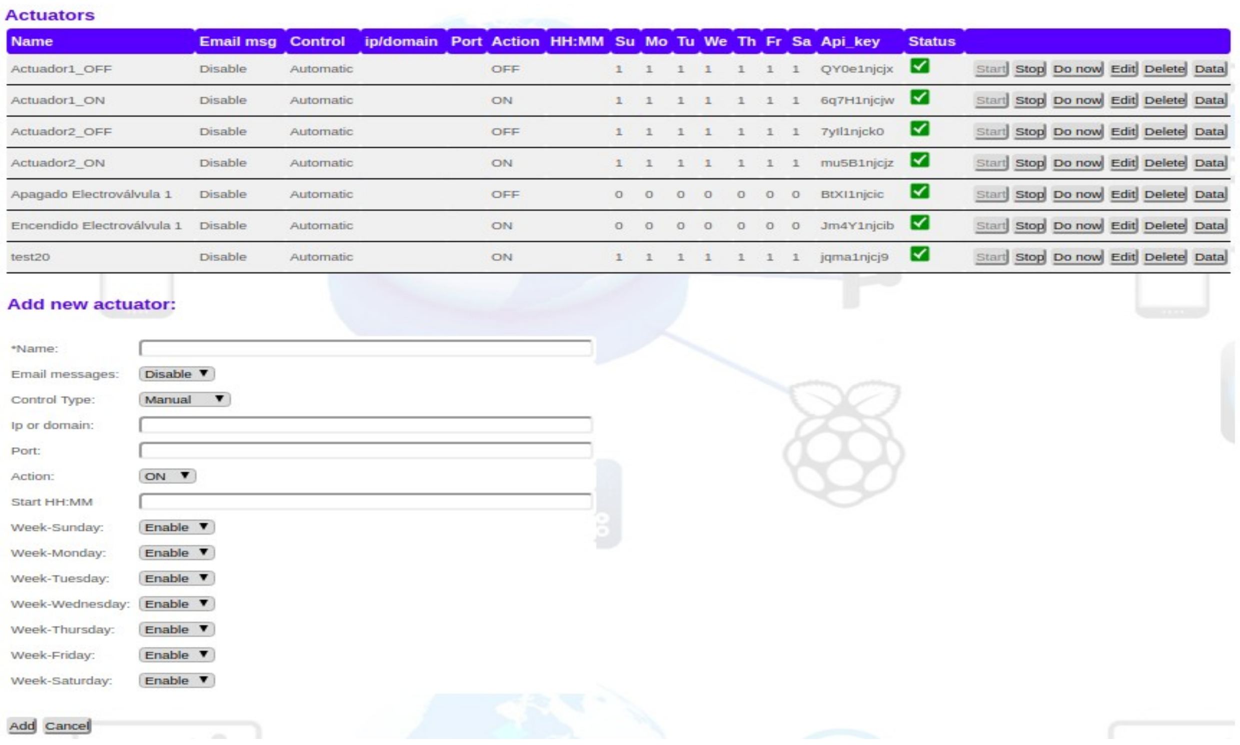
Live Sensor Panel

Api key	Name	Status	Measure	Last value	At time
5EUmWZfnB	MainPanel - Cooktop power consumption	Enable	Watts	2.89	2016-10-03 12:21:46
10OjcBI0AQ	MainPanel - Current phase 1 demand	Enable	Amps	0.48	2016-10-03 12:21:16
11itawqPLz	MainPanel - Current phase 2 demand	Enable	Amps	1.40	2016-10-03 12:21:20
9vnsWkQpz	MainPanel - Home demand	Enable	Watts	234.17	2016-10-03 12:21:23
8YszrStin	MainPanel - Voltage 210V	Enable	Volts	217.02	2016-10-03 12:21:42
45dKXLsknB	OnGrid - AC Power microinverter 1	Enable	Watts	3295.72	2016-10-03 12:21:46
46CcZds67D	OnGrid - AC Power microinverter 2	Enable	Watts	95.29	2016-10-03 12:21:08
55nvHUWjwD	OnGrid - Generated power	Enable	Watts	113.70	2016-10-03 12:21:25
42HPnFgkYI	OnGrid - IAC microinverter 1	Enable	Amps	27.41	2016-10-03 12:21:41
435xKlbSoB	OnGrid - IAC microinverter 2	Enable	Amps	0.65	2016-10-03 12:21:44
40T75t9zRW	OnGrid - IDC Battery	Enable	Amps	-0.44	2016-10-03 12:21:10
36ng6PeAqR	OnGrid - IDC solar panels	Enable	Amps	8.68	2016-10-03 12:21:22
37PTaQH5uh	OnGrid - IDC wind turbine	Enable	Amps	-0.79	2016-10-03 12:21:24
416Xq3JLfU	OnGrid - VAC microinverters	Enable	Volts	120.35	2016-10-03 12:21:13
4402vFnLa3	OnGrid - VDC Battery	Enable	Volts	13.91	2016-10-03 12:21:15
3915CHZzVL	OnGrid - VDC solar panels	Enable	Volts	13.11	2016-10-03 12:21:17
38QO6xdDTZ	OnGrid - VDC wind turbine	Enable	Volts	12.89	2016-10-03 12:21:20
4nGTZiA0H	SolarHeater - Heater power consumption	Enable	Watts	0.89	2016-10-03 12:20:18
1FEUqLOfi	SolarHeater - Tank temperature	Enable	Celsius deg	45.28	2016-10-03 12:20:40

If you do not want to see a sensor in this screen you can change the status to disable with the Stop button.

5. ACTUATORS

An actuator is a component that is responsible for controlling a mechanism or system. For example, turning on/off lights, turning on/off an sound alarm, opening or closing a door, etc.



Actuators

Name	Email msg	Control	ip/domain	Port	Action	HH:MM	Su	Mo	Tu	We	Th	Fr	Sa	Api_key	Status	
Actuador1_OFF	Disable	Automatic			OFF		1	1	1	1	1	1	1	QY0e1njcjx	✓	Start Stop Do now Edit Delete Data
Actuador1_ON	Disable	Automatic			ON		1	1	1	1	1	1	1	6q7H1njcjw	✓	Start Stop Do now Edit Delete Data
Actuador2_OFF	Disable	Automatic			OFF		1	1	1	1	1	1	1	7yIl1njck0	✓	Start Stop Do now Edit Delete Data
Actuador2_ON	Disable	Automatic			ON		1	1	1	1	1	1	1	mu5B1njcjz	✓	Start Stop Do now Edit Delete Data
Apagado Electroválvula 1	Disable	Automatic			OFF		0	0	0	0	0	0	0	BtXI1njcic	✓	Start Stop Do now Edit Delete Data
Encendido Electroválvula 1	Disable	Automatic			ON		0	0	0	0	0	0	0	Jm4Y1njcib	✓	Start Stop Do now Edit Delete Data
test20	Disable	Automatic			ON		1	1	1	1	1	1	1	jqma1njcj9	✓	Start Stop Do now Edit Delete Data

Add new actuator:

*Name:	
Email messages:	Disable ▼
Control Type:	Manual ▼
Ip or domain:	
Port:	
Action:	ON ▼
Start HH:MM	
Week-Sunday:	Enable ▼
Week-Monday:	Enable ▼
Week-Tuesday:	Enable ▼
Week-Wednesday:	Enable ▼
Week-Thursday:	Enable ▼
Week-Friday:	Enable ▼
Week-Saturday:	Enable ▼

The ACTUATORS option allows you to manage your actuators. You can add, delete and edit a actuator.

With this option you can do a remote control (manual or automatic) of an actuator.

Also, you can display and download registered actions of an actuator.

In the second part of this dialog, you can add or register a new actuator**.**

An **actuator** has the following fields:

- **Name:** required. The actuator name. You can not have two actuators with the same name.
- **Email messages:** you can choice enable or disable. Enable, if you want to receive email messages when an action occurs. Disable, if you do not want to receive email messages.
- **Control Type:** you can choice Manuel or Automatic. If you want to have automatic remote control you have to choice the Automatic option.
- **Ip or domain:** optional. Ip address or domain of controller device. For example, the ip address of an arduino with ethernet shield.
- **Port:** optional. The port of controller device.
- **Action:** it can be ON or OFF. This action name will be sent in the message to controller device.
- **Start HH:MM:** optional. The start time (HH:MM) for the action. It is the time to be executed the action daily.
- **Week-day:** enable or disable for each day. Enable means that the action must be executed this day. This property allows you to choice the days of the week when action will be executed.

In the first part of this dialog, you will find the list of your actuators. Using the **Edit** button you can update the actuator properties. With the **Delete** button you remove an actuator and its register values; you need to confirm this previously. The **Stop** button set the disable status and the **Start** button set the enable status.

The **Status** of an actuator can be:

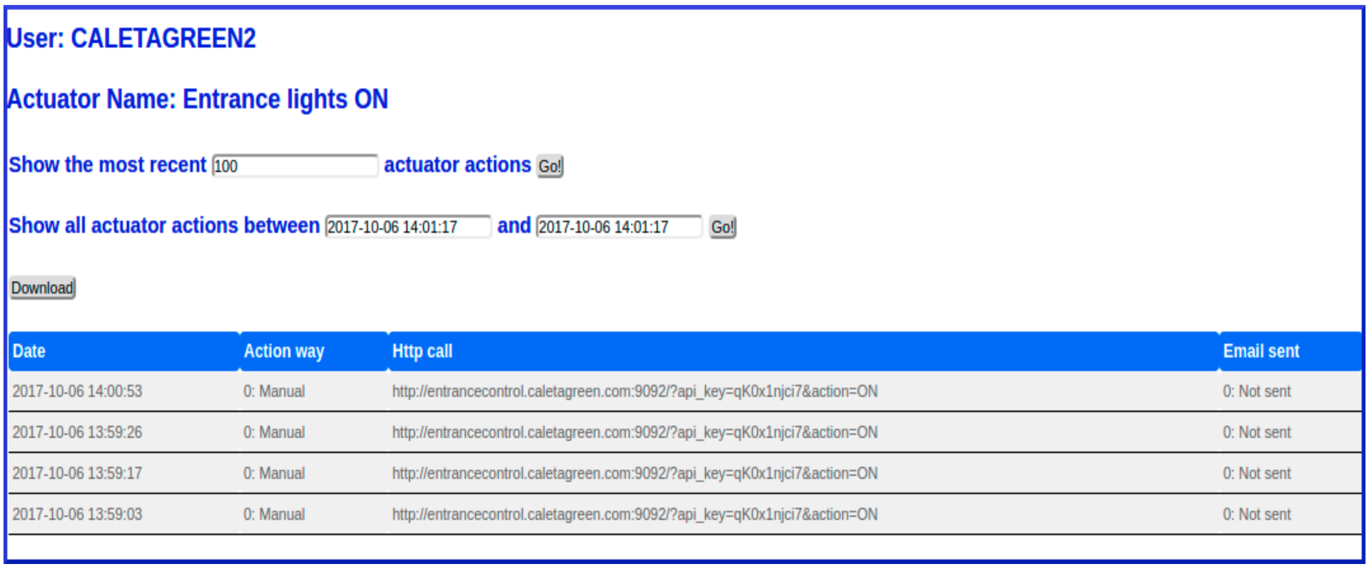
- ✓ Actuator is enable
- ✖ Actuator is disable

For an actuator, the minimum interval between two emails sent due to an actuator action is 10 seconds.

Api_key is the unique identifier of the actuator and you can not change this value. You can manage actuators using this api_key and the Server functions or M2MData library.

The **Do Now** button execute immediately an actuator action at defined start HH:MM. It sends a message (http call) to controller device. This message is displayed on the screen and registered as an actuator manual action.

For a sensor, the **Data** button allows to see the executed actuators actions.



User: CALETAGREEN2

Actuator Name: Entrance lights ON

Show the most recent 100 actuator actions Go!

Show all actuator actions between 2017-10-06 14:01:17 and 2017-10-06 14:01:17 Go!

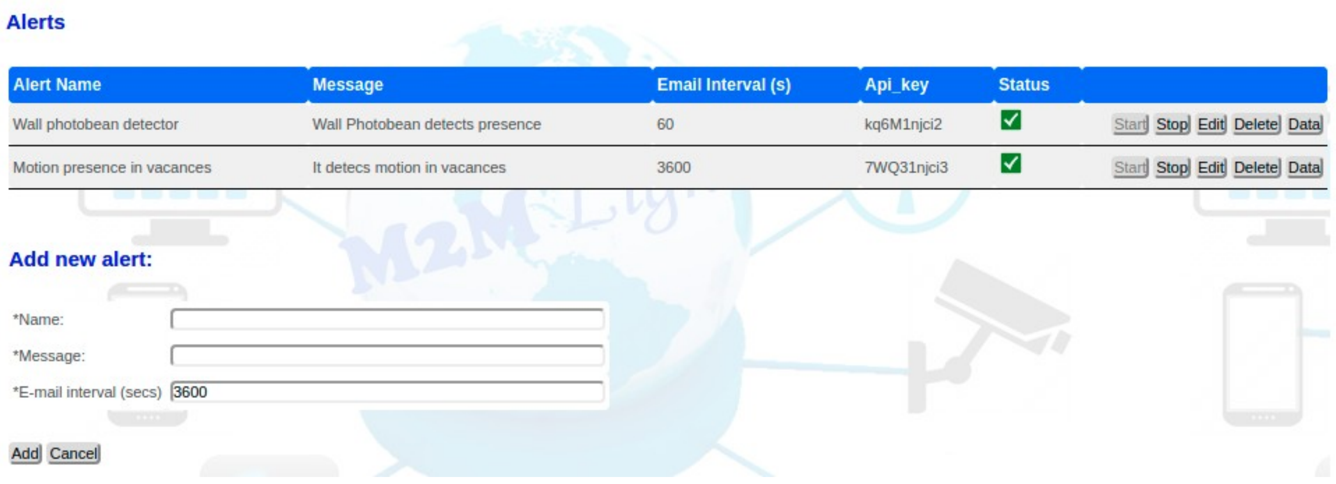
Download

Date	Action way	Http call	Email sent
2017-10-06 14:00:53	0: Manual	http://entrancecontrol.caletagreen.com:9092/?api_key=qK0x1njci7&action=ON	0: Not sent
2017-10-06 13:59:26	0: Manual	http://entrancecontrol.caletagreen.com:9092/?api_key=qK0x1njci7&action=ON	0: Not sent
2017-10-06 13:59:17	0: Manual	http://entrancecontrol.caletagreen.com:9092/?api_key=qK0x1njci7&action=ON	0: Not sent
2017-10-06 13:59:03	0: Manual	http://entrancecontrol.caletagreen.com:9092/?api_key=qK0x1njci7&action=ON	0: Not sent

6. ALERTS

An alert is a message sent by e-mail that gives you useful information. You can define an alert when certain event occurs. For example: sensors of motion and occupancy, proximity sensors, contact sensors (open door or window), etc.

The ALERTS option allows you to manage your alerts. You can add, delete and edit an alert. Also, you can to display and download history stored data.



Alerts

Alert Name	Message	Email Interval (s)	Api_key	Status	
Wall photobean detector	Wall Photobean detects presence	60	kq6M1njci2	✓	Start Stop Edit Delete Data
Motion presence in vacances	It detecs motion in vacances	3600	7WQ31njci3	✓	Start Stop Edit Delete Data

Add new alert:

*Name:	
*Message:	
*E-mail interval (secs)	3600

In the second part of this dialog, you can add or register a new alert**.**

An **alert** has the following fields:

- **Name:** required. The sensor name. You can not have two sensors with the same name.
- **Message:** required. The message to be sent.
- **E-mail interval:** interval between messages in seconds (default is 3,600 seconds that is equal to an hour). The minimum is 60 seconds.

In the first part of this dialog, you will find the list of your alerts. Using the **Edit** button you can update the alert properties. With the **Delete** button you remove an alert and its register values; you need to confirm this previously. The **Stop** button allow to disable an alert and the **Start** button allow to enable it. To send an e-mail the status must be enable.

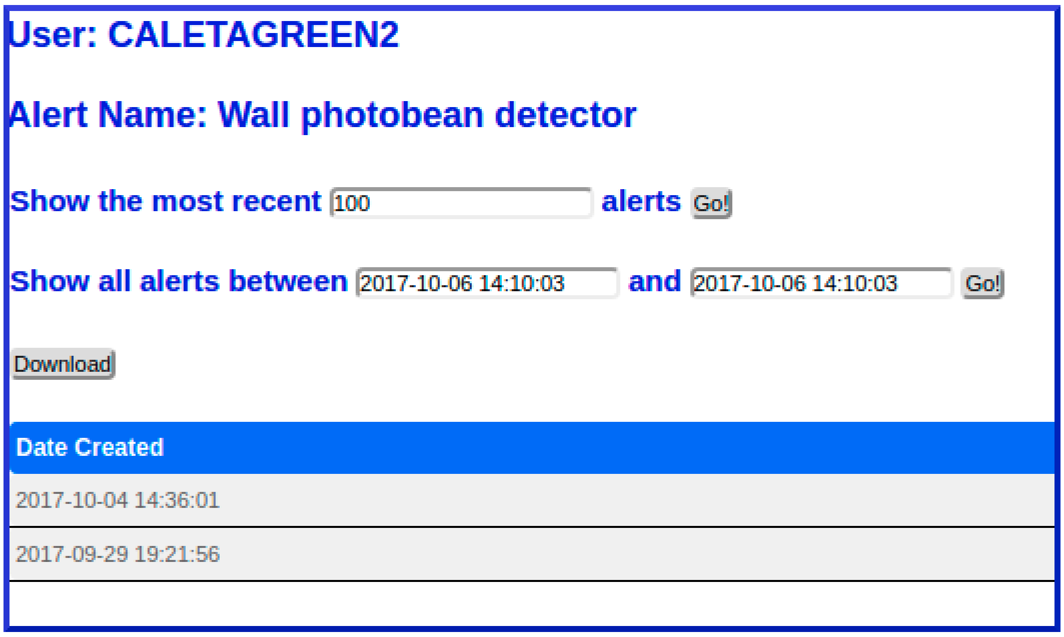
The **Status** of an alert can be:

- ✓ Alert is enable
- ✗ Alert is disable

Api_key is the unique identifier of the alert and you can not change this value.

You can add alerts values using this api_key and the Server functions or M2MData library.

Using the **Data** button you can display and download stored data alerts sent.



User: CALETAGREEN2

Alert Name: Wall photobean detector

Show the most recent 100 alerts Go!

Show all alerts between 2017-10-06 14:10:03 and 2017-10-06 14:10:03 Go!

Download

Date Created
2017-10-04 14:36:01
2017-09-29 19:21:56

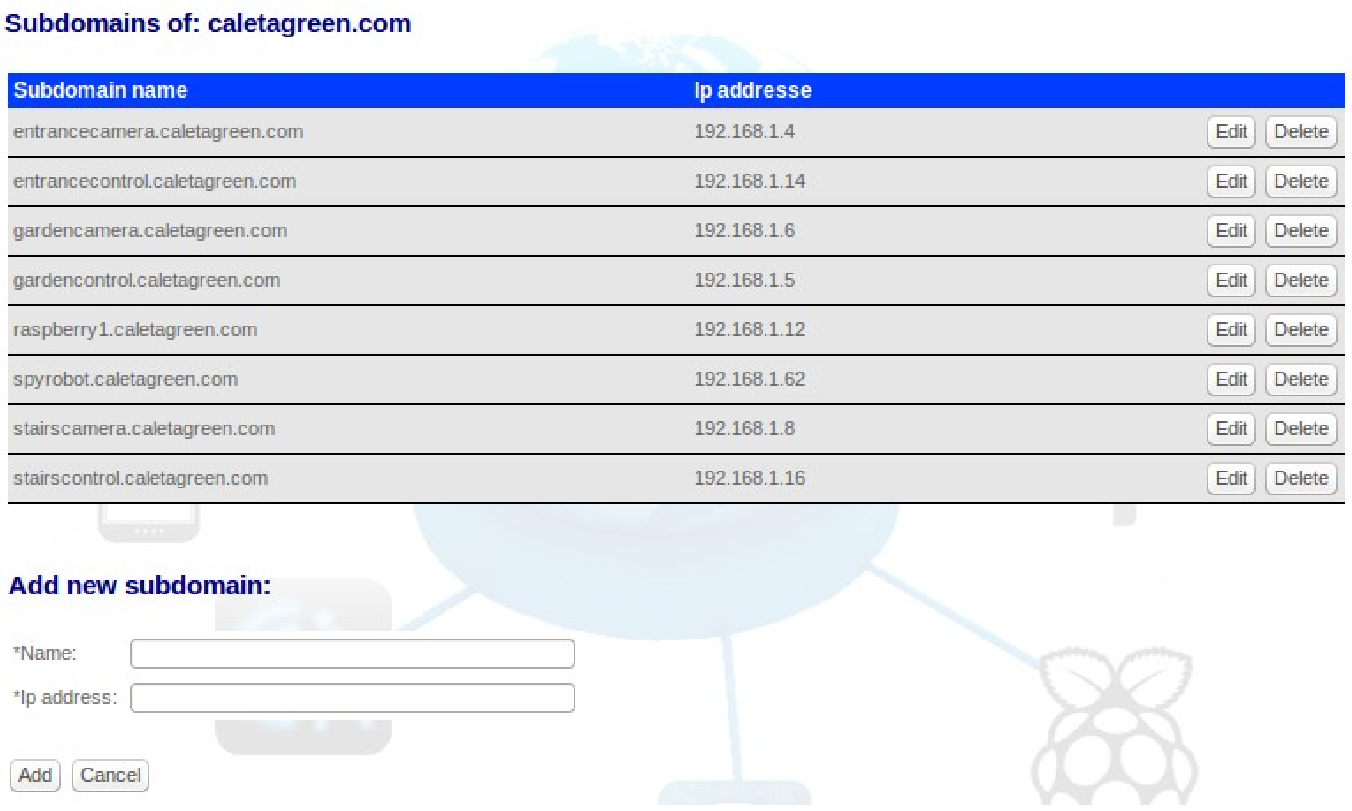
7. SUBDOMAINS

M2Mlight platform offers a DNS (Domain Name Server) service if you have a domain name. You can use this option if you need an internal DNS at your home.

First, register your domain name in your m2mlight account. Next register here your subdomains and set in your main router the DNS equal to pdns.caletagreen.com.

A subdomain is a domain that is a part of a main domain. For example, the subdomain gardencontrol.caletegreen.com is part of the domain caletagreen.com. It is useful when you need to give a name to an internal IP address and then using this name internal o externally together with a port.

This local DNS is not related to the others options of cameras, sensors, alerts, etc. That is, you can use this Subdomains option regardless of the other options.



Subdomains of: caletagreen.com

Subdomain name	Ip addresse	
entrancecamera.caletagreen.com	192.168.1.4	Edit Delete
entrancecontrol.caletagreen.com	192.168.1.14	Edit Delete
gardencamera.caletagreen.com	192.168.1.6	Edit Delete
gardencontrol.caletagreen.com	192.168.1.5	Edit Delete
raspberry1.caletagreen.com	192.168.1.12	Edit Delete
spyrobot.caletagreen.com	192.168.1.62	Edit Delete
stairscamera.caletagreen.com	192.168.1.8	Edit Delete
stairscontrol.caletagreen.com	192.168.1.16	Edit Delete

Add new subdomain:

*Name:

*Ip address:

With the second part of this dialog, you can add or register a new sub-domain. First, you need to register a domain using the Register User Dialog.

A sub-domain has the following fields:

- **Name:** the sub-domain name. You can not have two sub-domains with the same name.
- **Ip address:** the internal Ip address

In the first part of this dialog, you will find the list of your sub-domains. Using the **Edit** button you can update the sub-domains properties. With the **Delete** button you remove a sub-domain.

8. REST SERVICES AND M2MDATA ARDUINO LIBRARY

REST services (server functions) , MQTT protocols and the M2M Arduino library allow to use M2Mlight platform. First, you need to register the sensor, actuator or alert and then obtain the api_key in m2mlight.com.

You can find examples of this use in https://github.com/m2mlight/m2mData and projects located on www.caletagren.com.

These REST services and Arduino library can be used to send and receive values between the m2mlight platform and a program in a microcontroller or computer (arduino, raspberry, esp8266, etc.) or in a mobile device (tablet or smartphone).

The communication with the m2mlight platform can be using Ethernet (Arduino Ethernet or ENC28J60 shields), GSM (SIM800L module) or any device that connect to Internet.

You can download m2mData library and see more information in: https://github.com/m2mlight/m2mData

8.1. REST services

To upload/download data to m2mlight platform using http from a browser or program, you can employ the following REST services:

a) Sensors:

-> Name: **send_sensor_value**

Description: upload (save) a single sensor "value" of a sensor identified by "api_key"

Call example: https://m2mlight.com/iot/send_sensor_value?api_key=250hhCIHeO&value=200

Return: 0 if a value is successfully inserted, -1 for invalid api_key or disable status, -2 if the interval between two values is less than 10 seconds.

-> Name: **send_sensor_location**

Description: upload (save) a location sensor "latitude" and "longitude of a sensor identified by "api_key"

Call example: https://m2mlight.com/iot/send_sensor_location?api_key=26hyCIHeO&latitude=-0.158382&longitude=-78.45534

Return: 0 if values are successfully inserted, -1 for invalid api_key or disable status, -2 if the interval between two values is less than 10 seconds.

-> Name: **read_sensor_value**

Description: return the last stored value of a single sensor identified by "api_key"

Call example: https://m2mlight.com/iot/read_sensor_value?api_key=300uhxXsAH

b) Actuators:

-> Name: **send_email_action**

Description: send an email related to an actuator action identified by api_key. The minimum interval between two emails is 10 seconds.

Call example: http://m2mlight.com/iot/send_email_action?api_key=LrkD1njci8

Return: 0 if the mailing is successful

-> Name: **read_actuator_hour**

Description: return the start hour (HH:MM) of an actuator identified by "api_key"

Call example: http://m2mlight.com/iot/read_actuator_hour?api_key=180SgN4pHk

-> Name: **update_actuator_hour**

Description: update the start hour "start_hour" of the actuator identified by "api_key"

Call example: http://m2mlight.com/iot/update_actuator_hour?api_key=a6ruhxX&start_hour=10:30

Return: -1 if HH:MM format is not correct

c) Alerts

-> Name: **send_email_alert**

Description: send an email related to an alert identified by api_key. The minimum interval between two emails is the email_time_interval property

Call example: http://m2mlight.com/iot/send_email_alert?api_key=6trkDnjci8

Return: 0 if the mailing is successful

You can use these functions inside an C++ code (Arduino or Esp8266) or Python code (Raspberry). If you are using an Arduino is better to use the M2MData library.

If you are using a GSM/GPRS chip like SIM800L then you can connect to m2mlight.com directly with http commands or mqtt protocol. See example_use_sim800.ino.

8.2. M2MData Arduino library

The m2mData library is an Arduino library that allows you to store and retrieve data of sensors, actuators and alerts to/from m2mlight. You can use the http or mqtt protocol.

You can download this library from this link: https://github.com/m2mlight/m2mData

You need to create a m2mData folder in your Arduino Libraries and download the files: m2mData.h and m2mData.cpp

When Arduino is connected to Internet, you have the following functions:

a) Sensors

```
// Store a single "value" of a sensor identified with "api_key" using the http protocol
 void sendValue(char api_key[], float value);

 // Store coordinates values of a location sensor identified with "api_key"

 void sendCoordinates(char api_key[], float latitude, float longitude);
 // Return the last single value of a sensor identified with "api_key"
 float readValue(char api_key[]);
```

b) Actuators

```
 // Send an email about an action of an actuator identified with "api_key"
 void sendEmailAction(char api_key[]);

 // Return the star hour (HH:MM) of an actuator identified with "api_key"
 String readActuatorHour(char api_key[]);

// Update the start hour "start_hour" (HH:MM) of an actuator identified with "api_key"
void updateActuatorHour(char api_key[], char start_hour[]);
```

c) Alerts

```
 // Send an email of an alert identified with "api_key"
 void sendEmailAlert(char api_key[]);
```

9. MQTT Protocol

If you are connected to Internet, you can use mqtt messages to communicate to m2mlight.com

m2mlight.com is a mqtt broker, as such it receives and sends mqtt messages. If you choice Automatic in the control type option in yours sensor and actuators m2mlight send mqtt messages in order to a controller define its behavior with sensors, actuators and alerts.

A controller is a device that has a microcontroller (ATMEGA328, ESP8266, STM..,etc) and some sensors and actuators connected at its pines.

9.1 MQTT Messages from m2mlight.com to controller

a) To update information for a **sensor**:

- Topic: /user_api_key → Ex.: /3EI81njci3

- Payload: sensXXXX&o=I&a=YYY&s=Y&t=Y&e=YYY&u=YYY&v=YYY

  Where:

  - XXXX is a aleatory number created by m2mlight.com (message id)

  - Operation: o= I(insert) o U(Update) o D(Delete)

  - Sensor api_key: a (Ex. a= jKcY1njcn2)

  - Status: s (0=disable, other value=enable)

  - Sample time: t (Ex, t=120)

  - Set point: e (Ex. e=5)

- Action Under Set Point: u (Ex. u=6q7H1njcjw)
- Action Over Set Point: v (Ex. v=QY0e1njcjx)

b) To update information for an **actuator**:

- Topic: /user_api_key → Ex.: /3EI81njci3
- Payload: actuXXXX&o=Y&a=YYY&s=Y&c=Y&m=Y

Where:

- XXXX is a aleatory number created by m2mlight.com (message id)
- Operation: o= I(insert) o U(Update) o D(Delete)
- Actuator api_key: a (Ex. a= mu5B1njcjz)
- Status: s (0=disable, other value=enable)
- Action: a (0=OFF, 1=ON)
- Control Type: m (0=Automatic, 1=Manual)

c) To execute an action immediately for an **actuator**:

- Topic: /user_api_key → Ex.: /3EI81njci3
- Payload: dnow&akey=yuWQ1njcig&actnow=ON

Where:

- Actuator api_key: akey (Ex. akey= mu5B1njcjz)
- Action: actnow (Ex. actnow=ON)

9.2 MQTT Messages from controller to m2mlight.com

a) To load a “value” of a sensor with sensor_api_key of a user identified by user_api_key:

- Topic: /user_api_key/sensor → Ex.: /3EI81njci3/sensor
- Payload: sensor_api_key&value → Ex.: jKcY1njcn2&12.34

b) To send an “alert” of alert_api_key of a user identified by user_api_key:

- Topic: /user_api_key/alert → Ex.: /3EI81njci3/alert
- Payload: alert_api_key → Ex.: jqma1njcj9

c) To send a reply for an update of information about sensor or actuator:

- Topic: /user_api_key/reply → Ex.: /3EI81njci3/reply

- Payload: sensXXXX&OK or sensXXXX&KO or actuXXXX&OK or actuXXXX&KO

  Where XXXX is a aleatory number created by m2mlight.com (message id)

9.3. MQTT protocol in M2Mlibrary

In M2Mlibrary you have this function:

```
// Store a single "value" of a sensor identified with "api_key" using the mqtt protocol
 void sendValueMqtt(char api_key[], float value);
```

10. RELATED LINKS AND CREDITS

Some related links:

- https://github.com/m2mlight/m2mData
- http://caletagreen.com
- https://github.com/caletagreen/Automation

Some open source software, used in this platform, that deserve special credit:

- Motion: https://motion-project.github.io/
- Kurento: https://www.kurento.org/
- MQTT protocol: http://mqtt.org/
- PowerDNS: https://www.powerdns.com/