BEMS: **B**uilding **E**nergy **M**anagement **S**ystem

Notice

Definition & Concept

The Building Energy Management System (BEMS) is a set of elements working together in order to get the data from the environment and the devices of the whole solution, and turn them into control signals to properly adjust the functioning of the active devices of the solution (LHTES and SMHRU). In other words, it works as the senses and the brain of the E2VENT solution.

The BEMS solution can be divided into two sets of elements, considering the location and ownership of the elements. Inside the first group we can include the sensors of the building, the weather station, and the sensors and actuators inside the active devices. The second group contains the proper elements of the BEMS that present the following structure:

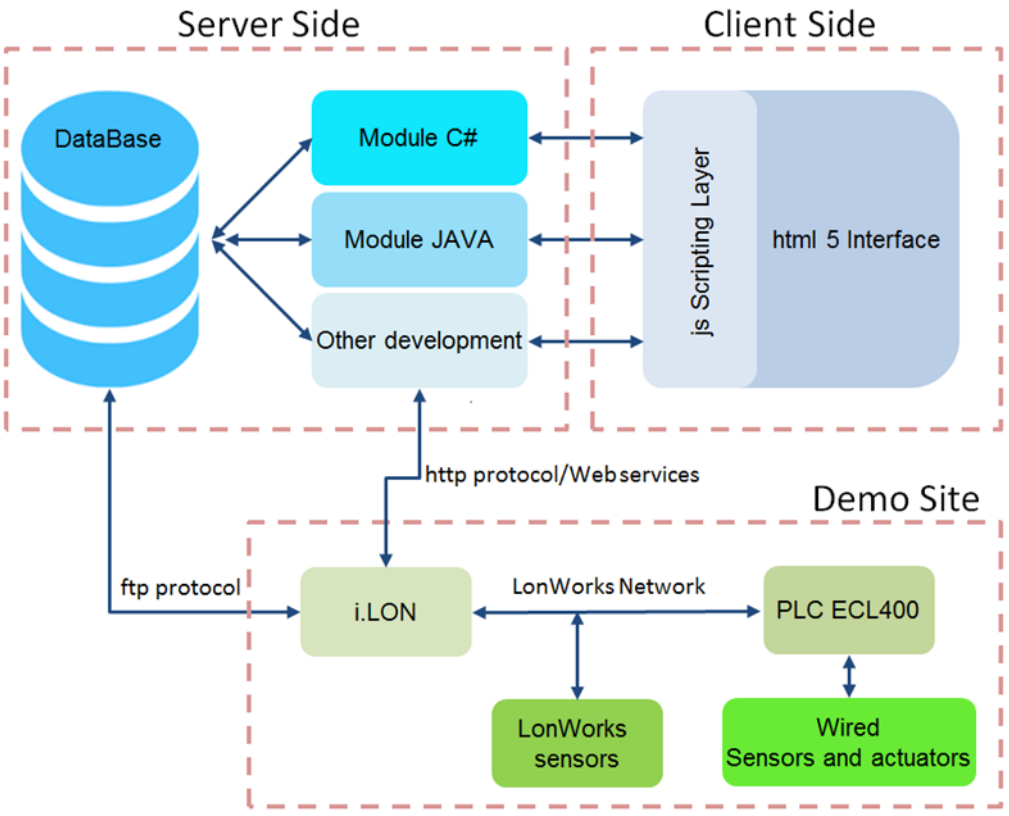
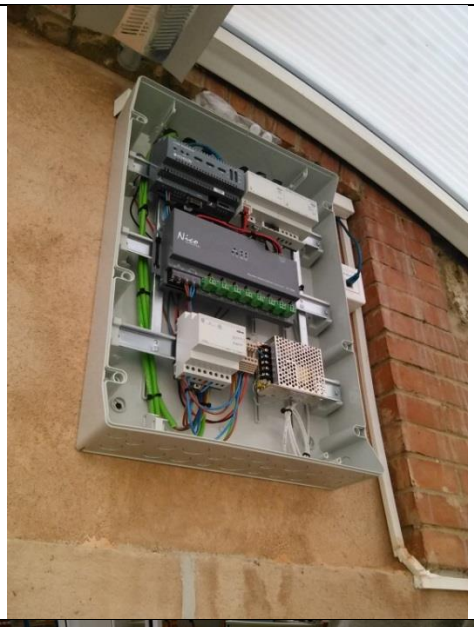


Figure 1: Schema of the BEMS

Technical presentation

There are two installed sets of elements in each location:

	Central i.Lon that manages the data flow and the protocol for the LonWorks network in the building. It can be installed inside the electric cabinet of the building with other devices.
	BEMS cabinet with the PCL controller that manages the active devices. It also gets the measurements from these devices. It is a box of 9.25 Kg. The dimensions are 300x 425 x 125mm that makes it suitable to be installed inside ventilated façades or indoors without generating issues.

The BEMS cabinet has three cable hoses, one for a single SMHRU device, one for a single LHTES device, and the third one that includes the connection to the LonWorks network inside the demo site, and the electric feed (that is afterwards redistributed to the active elements). The cables are multi-pin headed and are easily connected to the devices in order to minimize installation issues.

Figure 2: Connectors of the cabinet.

Pictures of the device

Figure 3: (left) 2 devices installed inside the ventilated façade and (right) one device indoors, showing the internal elements.

Installation process

Requirements and previous steps

Prior to the usage of the BEMS device, it is important to understand that:

BEMS – building energy management system of the E2VENT module developed by CARTIF

- The BEMS has been designed to control the LHTES and SMHRU solutions, but the control can be reconfigured for similar devices by demand.
- It is necessary to have temperature + CO2 + humidity sensors inside the zone/location to be managed, compatible with LonWorks.
- The cabinet can be allocated indoors or inside the ventilated façade. Pay attention to the size and weight of the cabinet.
- It is necessary to prepare a LonWorks network inside the home, with the sensors, and also the central network manager, that might require some electric work.
- In case of using the whole E2VENT solution, the Graphic User Interface has to be accessible in order to have the data available (from the database in the server in Cartif) and the control can be done through the web application (it needs permissions to avoid security issues). In Cartif we need to prepare a setup, creating the database and configuring the ancillary elements (security, backups and messages) to keep the system working.

Installation procedure inside the ventilated façade

Steps		Description
1	Installation of the support profiles.	Attach the box with any L profile with its corresponding screws. Just be careful about where are done the holes in the cabinet and in the wall.
2	Installation of the protective plate.	If the ventilation holes are going to be in the upper face of the cabinet, a protective plate can be installed to avoid the falling of big particles inside the cabinet.
3	Connection of the cabling.	Connect the cabinet with the LHTES and/or SMHRU, and with the external feed (in this case, through a hole in the wall).
4	Commissioning	It is necessary to test that the feed is on, the measurement devices work, and the controllers are selected in the correct positions.

Installation procedure inside the room

Steps		Description
1	Installation of the support profiles.	Attach the box with any L profile with its corresponding screws. Just be careful about where are done the holes in the cabinet and in the wall.
2	Connection of the cabling.	Connect the cabinet with the LHTES and/or SMHRU (in this case, through a hole in the wall), and with the external feed of the building.
3	Commissioning	It is necessary to test that the feed is on, the measurement devices work, and the controllers are selected in the correct positions.

For the installation of the device itself, the components inside the cabinet should be already installed and connected, and once the previous requirements have been met, the installation should be done in parallel with the active devices in case the cabinet would be installed inside

the ventilated façade, or at any moment inside the site. For the second case, a drill could be necessary to pass the cabling between the BEMS and the active solutions, but the previous holes for the air interchanging can be also used if present.

The next part of the installation is the commissioning of the system. The procedure is to use the GUI for fine tuning of the fans and for the functioning of the devices themselves. There are speed recommendation values in order to comply with the norm in terms of noise values.

Final use

The E2VENT system can be managed through the use of a GUI. It is a multi-lingual tool that can be used in order to:

- Handle and configure the active devices, and watch the current environment variables
- Get historic values of data, usage and Key Performance Indicators with graphics
- See the evolution of the comfort variables, including CO2, PMV and PDD

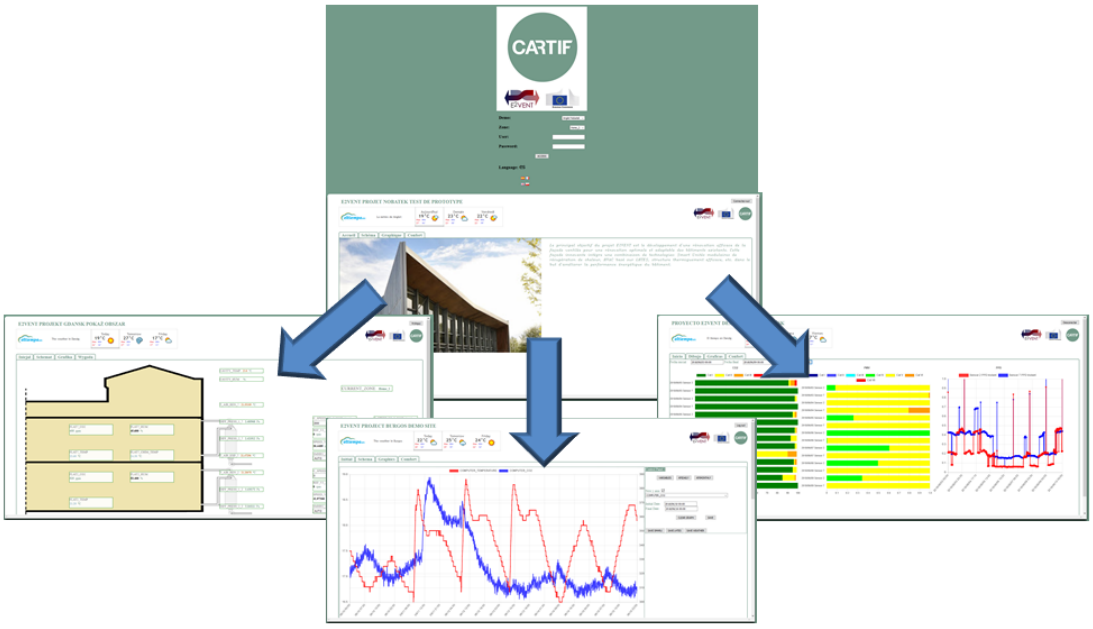


Figure 4: GUI functionalities

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 637261.