

# ***oBeMS Software***

The project is called oBeMS (open source Building energy Management System).

See the latest version of the Obems Manifesto which outlines why we wanted to do this project. I'll try and keep it up to date.

The ultimate goal of the project is to develop an open source BMS / BEMS system, though some people see all this as part of the 'Infrastructure Control Systems' sphere.

Development is on-going, and having ironed out the reliability issues, we expect to deploy the first 35 of systems to run unattended in Essex in the next few months.

The system is Linux based, using the Raspberry Pi for most parts of the system, but a PC would normally be used for the archive server because the high levels of disk activity would quickly overwhelm most SD cards. As far as possible the code is machine independent, and it should be easy to port the system to other Linux platforms.

## **Feature Summary**

Within the software, the framework is there in the code for control systems, but at the moment we're only using it for monitoring.

What we have in place now, is an architecture for accessing physical devices, sensors and actuators, by IP address and port number, so to talk to a device you send a message (usually a short ASCII string) to its IP address on a particular port, and you get another message back with some data, or confirmation that an action has been carried out etc.

At the current state of development we have a bunch of server processes for accessing things like pulse counters, A to D inputs, 1 wire bus temperature sensors, CPU temperature sensors etc. These are fairly trivial bits of code which access devices using various libraries or the file system to get at various IO pins, configure interrupts for pulses etc, but they become network accessible through the network IP address and port number interfaces.

Because of the IP address and port number interfaces, you can get at any device anywhere on the internet subject to firewall restrictions, though you can use port forwarding etc to get through NAT routers etc. These IO server processes can be written in any language. I tend to use C++ for everything, but there's no reason why you can't communicate with them from Python, Java, or whatever else you fancy.

Having taken care of the 'nervous system', you then implement the 'conscious' process. Ours goes by the name of ObemsClientTemplate. It's the bit of the code that 'looks out on the world using its sensors', and either presents that data to the user, or uses it to make decisions to control things. Because it's the 'executive' part of the system, it also has control of the watchdog timer, so if it runs amok, the system will be rebooted.

The clue is in the name though. What we have at the moment is a `_template_` with access to sensors, which builds up and garbage collects time series data, for analysis and control algorithms to use.

In summary then, we have a framework for doing local and remote IO over the internet, some sample code to access sensors from the framework, an example of some code that stores and

remotely archives time series environmental data, to which it's easy to add the analytical and control functions of your choice.

## License

Software license will likely be GPL v2 but I haven't got round to putting all of the associated text into the code yet.

## Look At Some Data

If you look at

<http://t4sustainability.co.uk:82/EnTable.html>

and click on the links in the left hand column, you can see each days energy consumption (red line) and PV energy production data (purple line) at our industrial unit. (Ignore the yellow line, this is just the aggregated output of two of the PV systems.) On each graph, the brightest lines are todays data, the second brightest line of that colour is yesterdays etc.

You can also see some temperature data on the Pis on

<http://t4sustainability.co.uk:81/TGraph.html>

and

<http://t4sustainability.co.uk:82/Graph.html>

We also archive the data from the Pis to a remote SQL server. There is a bit of CGI to give a web interface to this dataset, and you can see our industrial units archived PV energy production and energy consumption data on <http://t4sustainability.co.uk/cgi-bin/ObemsCgiDbViewer?Mode=ChkSubmit&DbName=SiteU1aPulse&Date=20160209&BgCol=000000&PvSys1MonoCol=00FF00&PvSys2PolyCol=00FFFF&ElecConsumed=on&ElecConsumedCol=FF0000&Calibration=on&CalibrationCol=00FFFF&InBoxTempCol=&PvSys3Col=FFC808&PvSwTotCol=C8C800&PvAllTot=on&PvAllTotCol=FF00FF&SubBtn=End>

This link will take you to todays data. You can use the [Next], [Prev], [Start] and [End] buttons to move around the data, and the [Configure View / Pick Date] button to choose the lined to graph and select any date of interest.

## Further Information

For further background information, see the presentation I gave on this for the European Space Agency Infrastructure Symposium in Madrid summer 2015. I hope it makes some sense without my commentary, but feel free to ask any questions !

John Beardmore.