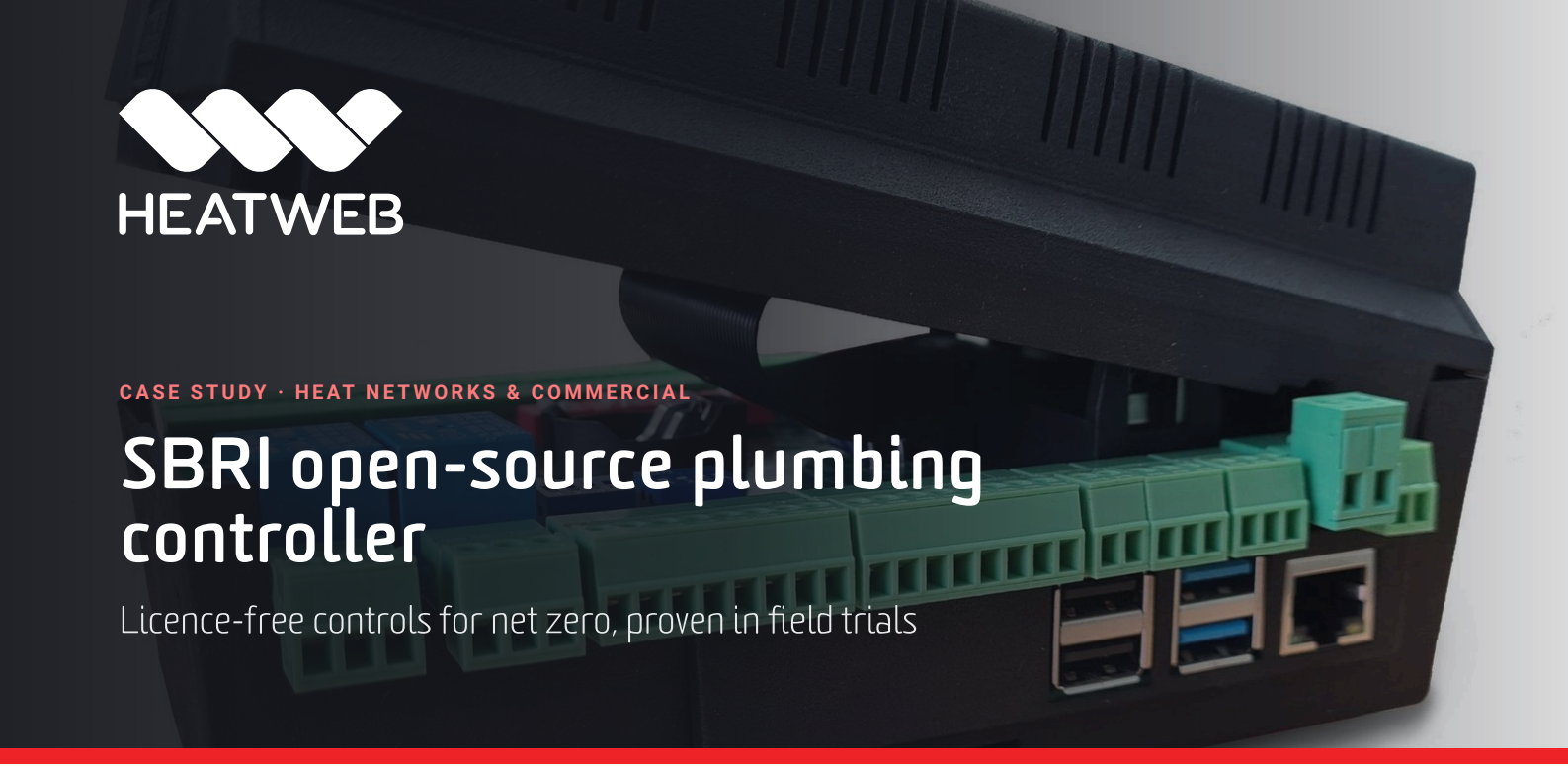


HEATWEB

CASE STUDY · HEAT NETWORKS & COMMERCIAL

SBRI open-source plumbing controller

Licence-free controls for net zero, proven in field trials

AT A GLANCE

PROGRAMME
SBRI project 10032027, Open Digital Solutions for Net Zero Energy

SECTOR
HVAC and heat networks

SYSTEM
Open-source plumbing controller: I/O board, Raspberry Pi CM4, Node-RED and MQTT

FIELD TRIALS
The Barbican, the Excel Centre, the National Trust, Swansea University SHED

FINAL REPORT
May 2023, downloadable from the case study web page

HEATWEB SERVICES
Hardware, software and cloud development, field trials

Under SBRI project 10032027, Open Digital Solutions for Net Zero Energy, we turned our prototype heat interface unit controller into a certified, open-source range of hardware, software and cloud systems that can monitor and control almost any HVAC or heat network application, licence-free.

The challenge

Better control, more transparency and greater efficiency need a controller that connects to almost every HVAC sensor and device, with an open software environment for control and communications. Our Version 1 prototype combined a heat interface unit controller, Node-RED software and the open MQTT protocol.

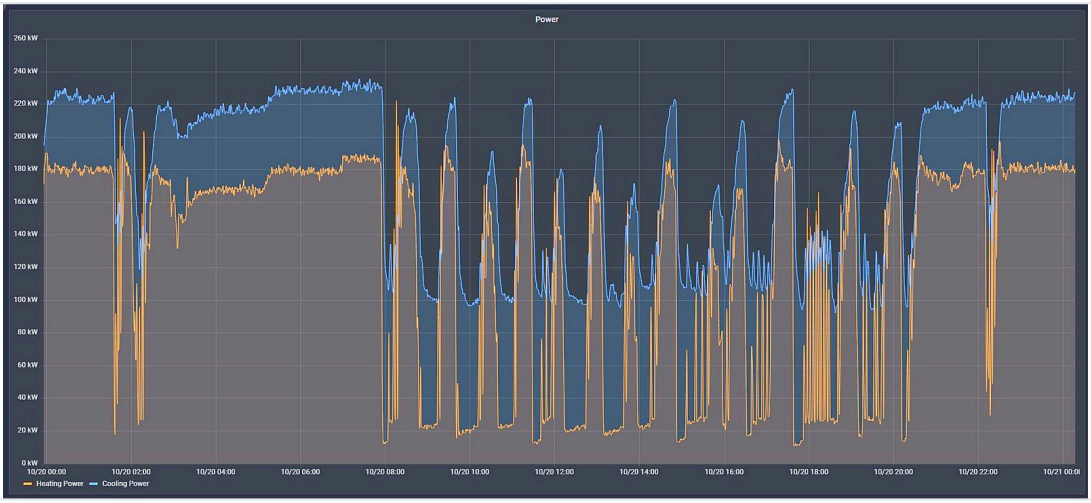
The aim was to develop it into a complete, certified product range, with the software, cloud systems and community around it, able to run any HVAC application, licence-free, forever.

What we did

- Developed the plumbing I/O board (version 4), Raspberry Pi CM4 base boards and an enclosure refined through 3D-printed prototypes.
- Built an open-source controls stack on Docker, Node-RED and MQTT, installed with a single command from GitHub, plus a wiring editor that generates applications from a wiring diagram.
- Designed an open cloud infrastructure on InfluxDB and Grafana, run open source or as a fully hosted turnkey service.
- Demonstrated buffer store control, HIU monitoring and fan coil control in field trials at the Barbican, the Excel Centre, the National Trust and Swansea University's SHED.

What we found

- Adding basic visibility to existing systems produced some huge energy and CO_2 savings: one space had been heated and cooled at the same time for years because of a simple control error.
- Every type of HIU can be monitored, from simple mechanical units to RS485 electronic systems, with performance checked in the cloud through statistical analysis, graphs and graphics.
- With Swansea University's SHED, the open controls delivered the UK's first heat network driven by CO_2 heat pumps.



A space heated (orange) and cooled (blue) at the same time, revealed by monitoring.

400 kW
wasted by one unnoticed control error, enough to power 100 homes

< 48 h
estimated payback on the monitoring equipment

147
HIUs monitored for Thameswey Housing at Harrington Place

The outcome

- The project turned into the services Heatweb provides today: open-source controls hardware, HVAC and heat network optimisation, asset management, BEMS interventions and renewable consulting.
- Every PCB was tested and found to comply with the EMC Directive 2014/30/EU, and everything was recorded openly: software, hardware designs, instructions and field trial records.
- The final report (May 2023), as a 23-page summary or the full 29-page report, can be downloaded from the case study web page.

About Heatweb. Heatweb Solutions is a UK provider of engineering support for heat networks and commercial HVAC: monitoring, fault diagnostics, technical compliance, optimisation, commissioning and maintenance.

Talk to an engineer

The full case study: www.heatweb.co.uk/blog/case-study/sbri-open-source-plumbing-controller/

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