

BTune Edge Computer Installation Primer

To get the data-driven building optimization process started, we supply an edge computer to be installed on your premises with two ethernet connections: one to the Building Automation System (BAS) LAN, and the second to the internet. Having the edge computer on site generally means more robust data collection and a more rapid and simple setup process for all parties.

This edge computer periodically polls and collects the current values of selected BACnet objects using the BAS network and forwards those to a cloud server for storage and analysis. Following explicit permission from the client, we can also enable override of selected BAS points to implement energy efficiency measures.

A VPN overlay enables a point-to-point connection between the edge computer and the BTune cloud server. The overlay is established using UDP NAT traversal, minimizing the need for firewall configuration changes (typically no incoming firewall exceptions are required, and no outgoing exceptions either).



Image: Example BTune edge computer (power and ethernet connectors on rear of unit)



Deployment Information

These questions help us to pre-configure the edge computer to help the deployment run smoothly:

Physical Site Assessment

Is there a location with the following:

- An available ethernet port connecting to an existing switch on the BAS LAN?
- An available ethernet port connecting to an existing switch providing Internet access?
- Space to mount the edge computer? (The computer physical size is 120x120x50mm excluding plugs, and can be mounted to a VESA mount (75x75 or 100x100 hole pitch), or just placed on a flat surface)
- An available 240V power socket with enough space around for mains adapter plug-pack?
- Appropriate security (i.e., in a locked room) to prevent tampering?
- Appropriate ventilation / cooling (below 50°C under normal operating conditions)? The edge computer emits <40W of heat when running.
- Free from vibration and excessive dust? E.g., alongside the BAS controllers the interior of a switchboard is ideal.

Network Assessment

Connections:

• Can you provide network cable(s) as needed?

Local Access:

- Is there a standalone BAS LAN or is it integrated into the wider building network?
- Can the edge computer be installed on the BAS LAN?
- What access controls or segmentation is in place that may restrict access to devices from which we intend to collect data?

Cloud Access:

- Is there an existing Internet connection that can be used?
- What access controls or segmentation is in place that may restrict outbound access to the BTune cloud Infrastructure?

IP Addressing:

- Can a staticIP address on the BAS LAN be assigned for the edge computer's local access interface? (Please provide to enable configuration prior to dispatch.)
- Can a static IP address be assigned for the edge computer's internet access interface?
- Alternatively, please confirm that the internet access has DHCP, including configured gateway and DNS Servers? (Please provide to enable configuration prior to dispatch.)







Deployment Information

Legacy Controls Equipment Assessment

BACnet Compatible Devices:

- Are all desired BACnet devices accessible from the BACnet/IP network on the internal LAN segment?
- Are routed BACnet networks permitted to be accessed from the BACnet/IP segment on which the edge computer will be installed?
 - Up to 3 ethernet ports on the edge computer can be used for connecting to networks as required.

Particular Site Notes

• Are there any particular considerations for the target building? E.g., Labelling, planned shutdowns, audits, power quality, enhanced security?

Physical Installation

A BTune team member or a local network administrator plugs in the edge computer to the site's network(s) and the power source. BTune is available to provide remote technical support. Once customer support confirms that the deployed gateway can access devices on the required LAN segment, the initial site discovery and the remainder of the installation occurs remotely.

Power:

- Are power indicators lit?
- Is the power cable secure?

Installation:

- Is device securely mounted?
- Is the device labelled appropriately according to site standards?
- Are the cables tidied to prevent disturbances in future?

Network:

- Are the link and activity lights active on interfaces used for your deployment scenario?
- Is BTune customer support receiving communication from the edge device?
- Is BTune customer support able to access devices on the internal LAN segment?







BTune Edge Device & Network Security

The BTune edge device is programmed by our data acquisition partner, ACE IoT Solutions. To enable and support BTune's Automated System Optimization (ASO) solution, ACE IoT leverages the opensource VOLTTRON technology. Cybersecurity of the VOLTTRON technology is assessed and managed by a software security team at Pacific Northwest National Lab (PNNL). PNNL's team completed a threat assessment of ACE IoT's commercial deployment of VOLTTRON in 2020. A publicly available copy of the Threat Assessment is available at <u>Volttron.org.</u>

For ACE IoT's deployments, network security is provided by the following:

- HTTPS TLS 1.3 security for provisioning and control
- A Zero-Trust overlay network, provided using Tailscale software which is based on Wireguard. The
 network overlay enforces a zero trust, deny-by-default, encrypted, point to point communications
 between the edge computer and the cloud infrastructure. All data are encrypted with the Noise
 protocol. (<u>https://www.wireguard.com/protocol/</u>)
- Outbound NAT traversal compatible with most firewall infrastructures, occasionally granular rules are required to allow outbound-only access for edge to cloud communications.

Establishing the VPN

Network traffic from the edge gateway is protected within a secure overlay network. The overlay is established by:

- The edge computer uses an outbound connection to a co-ordination server.
- The edge computer deposits its public key, and its public IP address with the co-ordination server.
- The edge computer polls the co-ordination server for the public key the public IP addresses for the monitoring and data processing servers.
- The edge computer attempts to access the monitoring and data processing servers, using the overlay protected by the ephemeral public keys.

All software is running on Ubuntu as the operating system, with regular patches and updates applied remotely. System images are hardened in accordance with CIS Benchmark Guidelines.

ACE IoT utilizes static and dynamic code analysis and vulnerability detection systems to manage third-party dependencies. Regular scans of the deployed infrastructure.

Managing the Edge Computer

The cloud platform also provides management functions, including ongoing patch management, access and activity logging, as well as regular reliability and stability software updates to the application and operating system remotely via the VPN. No physical access to the edge computer is normally required once installed unless a major change is required, or a failure occurs







Typical Data Exiting Site

The data transmitted off site are limited to time-series operational values from the BAS e.g., room temperatures, valve positions, fan speeds, polled at regular intervals. The data is collected and analyzed on the cloud infrastructure. Generally, no personally identifiable information (PII) is collected. See snip below for example of typical data leaving a site:

^⑦ Time ↓	Left Axis {=="FPB-16.04 - Zone Temperatu	Left Axis {=="FPB-16.05 - Zone Temperatu	Eft Axis {=="FPB-20.10 - Zone Temperatu
2024-02-22 11:20:00	71.4	70.8	70.2
2024-02-22 11:15:00	71.5	70.8	70.2
2024-02-22 11:10:00	71.5	70.9	70.2
2024-02-22 11:05:00	71.5	70.9	70.2
2024-02-22 11:00:00	71.5	71.0	70.2
2024-02-22 10:55:00	71.5	71.0	70.2
2024-02-22 10:50:00	71.6	71.1	70.2
2024-02-22 10:45:00	71.6	71.1	70.1

Image: Sample of typical data exiting site

Software Running on Edge Computer

The edge computer runs a Unix operating system and uses a configurable software package to collect BAS operational data only for analysis by our team and is capable of issuing commands back to the BAS (subject to client approval) to improve building performance. The edge computer also hosts the VPN overlay endpoint software.

Volume of Data / Bandwidth

The required bandwidth varies depending on building size, poll rate, and complexity of control system. Generally, using the use of an existing ADSL or fiber connection is appropriate. If an internet connection is not available, we can provide a 4G cellular data connection if required.

Refer to following diagram for more network information. If you require further information, please get in touch with us directly via your BTune contact.







BTune Network Diagram



PROPOSED BTUNE NETWORK CONFIGURATION

Contact Us



