

Smarter Small Buildings

Product Selection Guidance for Small Building Control

Considerations for Product Features & Capabilities

The table of considerations below can be used by building owners to help define the roof-top (RTU) control solution features required to meet the needs of their building or building portfolio. The considerations listed in the table are not exhaustive, but are meant to spur conversation with different stakeholders within an organization (e.g., IT, maintenance, energy management, etc.) to determine their requirements. The owner can then use the defined requirements in discussions with manufacturers to help determine if a solution meets the needs of the building(s) and stakeholders.

Considerations	Comments
Accessibility	
Will users be able to access devices through a web-based platform and / or a mobile interface or app?	<ul style="list-style-type: none">• A web-based platform can be accessed from a desktop to perform management functions “at scale”: central management of schedules, setpoints, thermostat configuration, alert management, etc.• Mobile interfaces allow technicians to easily see equipment status and adjust thermostat settings in the field.• You may wish to select a product that offers both mobile-based access and desktop-based access.• Once you’ve selected a few ‘top candidates’, request a live demonstration of the product’s interface for your team members that will be using the control solution, to evaluate the user-friendliness of different solutions.
Connectivity	
Do the thermostats connect to the internet directly, or through a gateway in the building?	<ul style="list-style-type: none">• Thermostats may connect to the internet directly or through a gateway.

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- Consult with your IT team to determine their requirements. For example, IT may prefer one gateway per building to reduce the number of devices to manage. IT may also have other cybersecurity requirements.
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If the control solution uses a wireless connection to a gateway, what is the maximum range between the gateway and the thermostat?

- Having a greater range will likely reduce the number of gateways or repeaters that are needed for a given installation.
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How do the thermostats and/or gateway connect to the internet? (wifi, ethernet, cellular, other protocols (BACnet, etc.))

- IT departments may want to monitor and restrict the IP traffic to / from these networked devices. IT may require devices to be on a dedicated network, either through a dedicated wired network (via dedicated hardware or VLAN), or a dedicated wireless network.
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Does the system support two-way communication with utilities (e.g., using openADR or IEEE 2030.5)?

- This capability facilitates the automation of control strategies that shed or shift electricity demand in response to a signal from the utility.
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Product Line Comprehensiveness

Does the manufacturer offer a complete product line, including smart thermostats, ethernet and cellular gateways (if needed), cloud platform and applications, and any additional components that may be needed to implement more advanced control strategies like economizer control and demand-controlled ventilation?

- Networked thermostats are an important ‘building block’ to efficiently control rooftop units. Most manufacturers will provide this as a baseline; however, manufacturers may also offer a solution that uses room temperature sensors communicating to a controller, which provides the same functionality as a networked thermostat.
 - Once your rooftop units are equipped with networked thermostats and the system meets your basic needs, you might want to enhance the system with additional features: enhanced ventilation controls (economizer, CO₂ sensors), additional temperature sensors, etc.
 - Selecting a manufacturer that has all these components and features available could make future enhancements easier.
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Scalability

Is there a limit to how many building sites can be accessed through the central interface? If a solution uses a gateway to connect to a cloud application, how many thermostats/RTUs can be connected to a single gateway?

- Consider whether the manufacturer's interface will be able to handle the total number of buildings that could eventually be connected to the networked control system.
- The number of devices that can connect to a gateway could impact how many gateways are needed for large installations (e.g., campuses).

Compatibility

Can the control components be integrated with components from another manufacturer? For instance, can thermostats be accessed via an open protocol such as BACnet, or via a web API?

- This may be an important cost consideration, both for the initial installation and for future purchases. Integrating control components from different manufacturers will likely complicate installation, but it may also prevent you from becoming locked in to a single manufacturer.

Will this control solution work for the full range of HVAC systems and other energy end uses in my building(s)?

- You will want to ensure that thermostats provide a sufficient number of stages of heating and cooling control for your RTUs.
 - It is also a good idea to ask if the control system can be utilized for other system types (e.g., VAV systems) and other energy end uses (e.g., lighting), even if there is no need for those capabilities at the present time.
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Trending

How far back are historical data stored? Are there subscription options to increase this? Can historical data be viewed directly through the user interface?

- Historical data can be useful for numerous reasons, including as a benchmark of past performance against which current performance can be measured. Historical data can also be very useful for maintenance technicians as a diagnostic tool.
- Generally, having at least a year of historical data is beneficial.

Control Capabilities ¹

Tier 1 - Does the control system provide the following capabilities?

- Centralized monitoring of zone temperatures, setpoints, schedules, equipment status, and critical alarms
- Centralized adjustment of setpoints and schedules
- Centralized data collection and visualization (multi-building and multi-site)
- Remote access and configuration

- These capabilities are commonly found in modern control systems utilized in small and medium-sized buildings. Often the capabilities are enabled by a combination of smart thermostats and a cloud-based monitoring and control application.

Tier 2 - Does the control system provide the following capabilities?

- Variable speed fan control
- Economizer control
- Demand-controlled ventilation
- Optimal start/stop

- These control capabilities may be embedded in the smart thermostat, in the RTU controller, or in a separate controller that interfaces to the thermostat and unit controller. Additional components may be needed to implement them.
- For example, implementing a demand-controlled ventilation strategy will likely require the installation of a carbon dioxide sensor in the space or return ductwork.
- A variable speed drive or ECM (electrically commutated motor) may be needed for variable speed fan control.

¹ The “Tiers” listed here indicate examples of capabilities at increasing levels of complexity/sophistication. They are not mutually exclusive groupings of capabilities; a given product may include features from more than one of the tiers.

Tier 3 - Does the control system provide the following capabilities?

- Automated grid-responsive strategies (e.g., load shedding and shifting)
- Coordination of units to limit peak demand

- These capabilities are less common but offer the potential to significantly reduce utility bills by reducing electricity demand.

Analytics

Does the control system provide the following analytic capabilities?

- Economizer FDD (errors with sensors, actuators, and damper position)
- Enhanced monitoring through feedback on equipment status (e.g., confirmation that fan and compressor are operational)
- FDD for vapor compression cycle

- Analytics help ensure that HVAC systems and equipment (including controllers) are performing as expected.
- Examples of analytics that may be offered include fault detection and diagnostic messages such as economizer not operating when it should, economizer operating when it should not, stuck damper, sensor fault (e.g., sensor out of range, sensor value not changing, etc.).
- Other analytic features might include built-in data visualization capabilities and energy analysis that can facilitate building and equipment performance assessments.

Managed Services and Subscriptions

Does the manufacturer or vendor of the product also offer services such as remote monitoring, periodic performance reporting, etc.? Are there subscriptions that are required with the product, or that provide enhancements to the base offering?

- Additional services may be cost effective for organizations that do not have staff to monitor their control system.

Delivery Model

Who sells the control solution, and who installs and services it?

- Often the control solutions are available either direct from the manufacturer or through their channel partners or network of authorized distributors.
 - Local contractors commonly purchase the product from distributors and perform the installation and servicing. Ask if a contractor's technicians have experience installing the product being considered.
 - Manufacturer websites typically have a "Contact Us" or "Find a Distributor" link to help get you started.
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