HOW TO COMPARE EMS HARDWARE

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For those looking to invest in a property-wide energy management system, this white paper details EMS hardware considerations, inasmuch as hardware can be segregated from software. Please see the companion white paper, ***How to Compare EMS Networks*** for a comprehensive look at the entire EMS platform.

When you are evaluating EMS platforms, consider the features outlined herein, and evaluate them on a scale of importance for YOUR project.

There is a handy checklist at the end of this document for use as you compare EMS hardware. There's a space for you to assign an importance level based on your project.

Definition of EMS

An EMS (energy management system) is an electronic system that monitors, controls, and tracks energy usage in a building. An EMS is not the same as a BMS/BAS (building management or building automation system). At a high level, the purpose of an EMS is to save energy, and the purpose of a BMS/BAS is to automate controls like the elevators, fire and safety, HVAC, and metering.

What We Mean by "EMS Platform"

In the past, an energy management system referred only to the software a property used to save energy. With the Internet of Things explosion, EMS platforms now extend well beyond the software, to the hardware with which it communicates. The software and hardware functionalities are closely integrated. They no longer easily fall strictly into one category or the other.

The Deal Breakers

Begin your search by asking these critical questions.

What HVAC models does the EMS work with?

Ask this question early in the conversation, to assess whether your HVAC system(s) are compatible with the HVAC controls they offer.

Can the EMS accommodate multiple HVAC models at the same property?

Be prepared with a list of all HVAC systems on your property. It's common for a property to have more than one HVAC system model, if they have been replaced at different times.

Is the system occupancy based?

You can save the most energy when spaces are unoccupied. "Time of day" setbacks are yesterday's technology, particularly in high density residential spaces with unscheduled occupancy like dormitories, MDU's, hotels, senior living facilities, and military barracks. They've been replaced with occupancy-based systems. A system that is occupancy based should be of high importance to you in all cases.

Occupancy sensors feature a variety of technologies for different room setups and intended uses. Even among the same technologies, some are more precise than others.

PIR occupancy sensors detect heat and motion, and are the primary sensor types used in EMS systems. They're typically housed inside the thermostat. They should be properly calibrated based on the space. In sleeping areas, for example, they should be calibrated to extreme sensitivity in order to detect sleeping occupants.

Secondary occupancy sensors will be required in large spaces (spaces more than approximately 18 feet from the PIR sensor), or spaces with multiple rooms (such as a living room and a bedroom). A single PIR won't be able to detect occupancy in the entire space. Nor can PIR sensors detect occupancy around corners.

Door contacts are typically secondary occupancy detectors, complementing the PIR sensor. They do not contain heat or motion sensors. Rather, they consist of magnetic contacts that detect doors opening and closing, aiding in occupancy detection. There are two reasons a door contact should be used:

- If the space is large, or has multiple rooms, a door contact can complement occupancy sensors. A door contact should not be a routine add-on to the PIR sensor. That indicates an ineffective PIR sensor.
- The second reason to install door contacts has more to do with energy savings directly. Some door contacts are used to detect patio doors or windows that have been left open. A door contact can send a signal to the EMS system. This in turn can trigger an alert and/or trigger a response such as shutting off the air conditioning until the door or window has been closed.

Smart door locks (entirely different from door contacts) can also assist in detecting occupancy. In fact, sometimes they can distinguish between an occupant and maintenance/housekeeping.

Hardware

Does the EMS system feature humidity sensing or control? Is it standard or is there an additional charge?

High humidity is a beast to be tamed because of the damage it can cause. Excessive indoor humidity promotes invasive microbial growth in furniture, mattresses, wall cavities, ceiling tiles, carpeting, and tile grout. The mold and mildew smell is off-putting and can trigger health issues ranging from minor-like sneezing and eye irritation—to serious—such as lung infections and allergies in COPD patients.

Active Dehumidification Components

Active dehumidification is mechanical moisure removal, intended to maintain comfort and protect building materials (https://www.buildinggreen.com/primer/how-active-dehumidification-works). As the term indicates, Some some HVAC units are manufactured with "active dehumidification" components built right into them, in which case humidity control in your EMS system is not necessary.

Some HVAC units are manufactured with "active dehumidification" built right into them, in which case humidity control in your EMS system is not necessary. Systems with active dehumidification are pricey and therefore less common than those without this feature.

- Do your HVAC systems come with active dehumidification?
- Ask if the EMS offers humidity control, and if so, is it standard or will is there an additional fee?
- Will their humidity controls even work with your particular HVAC models?

If your systems don't feature "active dehumidification", and humidity is a concern in your region, then mark this question as "high importance".

Does your EMS platform integrate with devices from other manufacturers?

By their very nature, IoT devices communicate with each other. If your goal is a tricked-out property with all the latest technology, you want all the devices to easily integrate. Even if you don't want a state-of-the-art showplace with all the latest bells and whistles, you may want features that your EMS does not inherently offer. Ask if their solution integrates with third party technology, perhaps smart door locks, window shades, or voice activated devices.

(Read more about third party device integration in our white paper, How to Compare EMS Networks.)

Do you offer wired and wireless options?

This applies to devices like smart thermostats, external occupancy sensors, and door contacts. Here are some tips for choosing between wired and wireless thermostats:

- If your project is a new construction, wired thermostats would be the appropriate choice because their location can be determined prior to wiring.
- If you are replacing existing thermostats and want the new thermostats in the same location, select wired thermostats.
- However, if you want the replacement thermostats to be placed in a different location in the room, you might want a wireless thermostat user interface. They're battery powered and are installed without regard to previous wiring location, saving installation and wiring time and expense.
- Wireless options are important when you need to avoid disturbing asbestos in the walls.

Wireless door contacts and occupancy sensors also solve pre-existing wiring dilemmas.

What is your thermostat voltage range?

- What voltage do your HVAC systems require?
- Can the EMS thermostats meet these requirements?

Research this as part of your comparison project. Preferably,

thermostats can accommodate from 18-277V. Some EMS thermostats only accommodate 24V as a standard, but by adding parts, they can accommodate other voltage requirements.

What communication protocol does your product use?

We mentioned ZigBee earlier in this white paper. ZigBee is an example of a communication protocol.

Other examples include WiFi, Z-Wave and Bluetooth. Understand their benefits and drawbacks so you can identify the protocol that is right for your project.

What is the warranty program?

Find out the details of the warranty program.

- Is the warranty included in the cost?
- What does it cover?
- What is out of the scope of the warranty?
- How long is the warranty period?

Find out when the warranty goes into effect. If product is shipped to a job site for installation in 3, 6, 9 months or longer (perhaps renovations are happening in phases), when does the warranty begin? On the day it was shipped, or the day it was installed on the wall? You'll want to know this when you make your EMS comparisons.

Other

Can I invest in hardware this year, then network in the future?

Perhaps you are interested in an EMS system but it's not in your current budget. Ask if they offer a non-networked system that you can network at some point in the future.

What kind of support do you offer?

EMS systems may be user friendly, but under the hood there is sophisticated technology. At some point, you'll likely need some technical assistance and you'll want assurance that someone has your back.

Communication Protocol	Advantages	Disadvantages
ZigBee	Mesh network 15 channels Mature Widely adopted Flexible protocol Multiple manufacturers	10 meter range Complex protocol Must ensure no WiFi channel overlap when commissioning Higher frequency-less effective through concrete construction
WiFi	Heavily used by computers and phones 23 channels Open protocol Mature Widely adopted for home use Multiple manufacturers	Security concerns for IoT devices when riding on IT network Bandwidth concerns due to heavy use by computers and phones Not widely adopted commercially 10 meter range
900 mHz (Z-wave)	30 meter range: better propagation in construction material Heavy IoT industry acceptance Widely adopted commercially and in-home	Proprietary protocol Only 3 channels (in US)-therefore less flexible Low data range-cannot transfer a lot of data Single manufacturer
BLE (Bluetooth)	Newer technology Most smart devices now have BLE Low power	Less mature Not widely adopted yet 5 meter range Star network only (would need a coordinator in every room)

- What kind of support plans are available, both before and after installation?
- What is their level of expertise?
- Do they have access to engineers and firmware designers if your situation requires escalation?
- What are the support team hours?
- Are they located locally or internationally?
- What other equipment beyond yours do they support? This may signify narrow-but-deep knowledge about your product versus wide-but-shallow knowledge about many products.
- How much do plans cost? They're usually subscription based.
- Do you need 24-hour accessibility to a support team? This may move you into a higher subscription level.

What about Installation?

- Who will perform the installation? If they do, what is the fee, and what does it include (including travel expenses, lodging either at your facility or elsewhere)?
- How long will the installation take?
- How many installers will it take, and how many days?

If you require that installers be assigned escorts, be sure to notify them. When estimating time and labor costs, it's important to know, because have escorts typically slows the installation work to some extent.

If it is a self-installation, how are you trained? How many days does a self-installation normally take?

Summary

An energy management system will be a significant investment. (The good news is EMS systems offer an attractive ROI... something else to inquire about!) Before getting into serious discussions with a dealer, do your homework. Invest time in gathering the information about your property (for example, make a list of all the HVAC models your property has; also, understand the voltage range the thermostats at your property will require).

What goals do you want to achieve from an EMS system: energy savings, guest comfort, humidity control or a combination? Give this serious thought.

Weigh your options. Make an informed decision. Select the EMS that's right for YOUR property.

Read our companion white paper, How to Compare EMS Platforms.

Feature	Your Priority	Notes
The Deal Breakers		
What HVAC models does the EMS work with?	High	
Can the EMS accommodate multiple HVAC models at the same property?	High	
Is their network secure?	High	
Is the system occupancy based?	High	
Hardware		
Does the EMS system feature humidity control? Is it standard or is there an additional charge?		
Does your EMS platform integrate with devices from other manufacturers?		
Do you offer wired and wireless options?		
What is your thermostat voltage range?		
What communication protocol does your product use?		
What is the warranty program?		
Other		
What is your estimated return on investment (ROI)		
What kind of support do you offer?		
What are your installation options?		
Can I invest in hardware this year, then network in the future?		

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