Smarter & Smarter Buildings

A new type of contractor is developing who needs to understand the mechanical, electrical and the IT side of a building's needs. Much of it has to do with the fact more systems including energy, HVAC, automation, security and, of course, corporate networks now run over Ethernet and IP.

By Lawrence Cummer

Smart buildings, in which automation is used to make the management and operation more efficient, are becoming more popular because of the potential to reduce energy consumption and ultimately cost.

According to Natural Resources Canada, most buildings including those that are already highly efficient can generate energy savings between five and 15% when actions are taken to ensure operation at peak efficiency.

"Energy is a huge issue today," says Savitri Ballai, business development manager at Graybar Canada's Mississauga, Ont. location. "Because we are spending so much on power and energy, any kind of smart building has to be related to reducing it. It is so much on the forefront and everyone is looking closely at how much they're spending."

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As energy prices continue to climb, Ballai says she has been seeing more facilities managers being tasked with reducing spend on power, and recently has seen three very large customers looking towards smart building-related technology.

More systems including energy, HVAC (heating, ventilation, and air conditioning) automation, security and, of course, corporate networks now running over Ethernet and IP are creating new opportunities for improvement, unavailable when all these systems had proprietary protocols.

In particular, it allows management software to more readily capture data that is key for efficient facility management, says Bernard Oegema facilities services specialist at IBM Global Technology Services in Markham, Ont.

"With IT-based analytics there is a very low cost to monitor just about anything in a building, so sensors are becoming ubiquitous. And, we are seeing Moore's Law start to apply to sensor technology, so we can affordably pick up temperature, humidity, air-flow, noise, video, motion, equipment, UPS, power — lots and lots of information.

"And all this information, if used intelligently, allows us to be proactive in order to allocate cost and be predictive."

And some very sophisticated automation can take place with that level of intelligence and analytics. Oegema gives the example of facilities connected directly to data from weather networks. If temperature is going to drop, facilities managers can prevent engaging air conditioning either through automation or decision-based alerts.

"IT and facilities are converging more every day," he says. "Having a converged network allows facilities managers to get a bigger picture of what's going on."

Greater facilities information being shared over existing networks can, with analytics, result in three benefits, says Oegema: cost-savings from operational efficiency, more intelligent resource allocation and better capital decisions. He notes also that the addition of highly predictive modeling tools, facilities managers can instantly determine the benefits of, for example, upgrading a particular building's insulation or reducing power to a particular underused facility, removing guesswork.

One network to rule them all: Once managed over disparate networks, a movement exists to move more facilities systems over one IP-based network, and even to incorporate some cloud-based services, says Rick Huijbregts, vice-president of smart and connected communities at Cisco Systems Canada Co. in Toronto.

"The network has already become the platform for all kinds of communications from people to people, to people to machines, to machines to machines," he says. IP, already the network of choice for IT, has emerged as an easy method for more integrated physical security, and is making inroads into building control systems, adds Huijbregts.

Not only are building management systems starting to incorporate IP-ports, but those very management systems are starting to act more like IT devices. "The building controller that is deciding whether I have warm air or cool air in my space is starting to act just like an IP phone or a printer," says Huijbregts. "It becomes just another edge device on an IP infrastructure."

He says pulling together these systems over one network makes sense, because through standardizing on IP lower-cost systems can be built, and communications problems between disparate networks can be eliminated.

While that makes sense, according to Robert Horne, executive vice-president at the Ottawa-based consultancy The Attain Group Inc., a single network infrastructure for IT and various facilities functions is great in theory, but is harder to do in practice in many office-based businesses.

He notes that since many typical businesses lease rather than own their facilities, they are not going to be comfortable running their corporate

networks over the infrastructure set up by their building management. "Ideally, if a large company owned the building, and therefore had a vested interest in the energy management they could have a single infrastructure and then partition a VLAN for security cameras and card access, and another for HVAC management and things like that."

Still, he adds that even when the company owns the building, for practical and liability reasons many choose not to move to a single shared infrastructure for facilities, security and IT.

Horne says security policies generally dictate that these systems are kept separate. VLANs in theory act as separate networks for these services to run on the same infrastructure, but Horne says it remains an area of dispute.

"That's where the big debate remains, and people always err on the side of caution. Imagine if someone could gain access to everything (on the network) through something as simple as temperature monitor."

Meanwhile others, especially in IT, side with Huijbregts. "For enterprises, the network is becoming kind of the nerve centre of the building," says Jay Borer, marketing manager for the Communications Markets Division at 3M Corp., based out of Austin, Tex.

"Communications networks are being looked at as every bit as important as plumbing and gas in the building. Those wireless and in some cases wired networks are going to be utilized for every aspect from door alarms, security monitors, controlling window blinds and lights, every potential system you can control."

Borer says this is driving an increase in extending fiber further into the enterprise, even as far as the desktop or devices being used for facility monitoring and control, and for finding more cost-effective ways to drop fiber, extending its use within facilities.

Borer says due to what he calls "the green effect," organizations are looking for ways to reduce the use of high-cost copper enterprise cabling solutions, and turning to fiber optic networks or passive optical LANs to extend fiber from the entry of the building all the way to the desktop.

"The energy consumption is reduced," Borer suggests, "If you look at it from an Ethernet-type switched network, where you'd traditionally have wiring closets on each floor, you can now have all of your electronics on a ground floor and can split out that signal on up to 64 separate lines. On a single strand of fiber you are serving up to 256 desktops."

Ballai says from the perspective of facilities automation she is not yet seeing a dramatic shift to fiber; however, she notes that economic caution could be holding back application of some technologies.

Today, she adds most building automation networks are still running and being built using UTP copper cabling. She is seeing fiber for building automation systems more frequently in some instances, like factories, where reduced interference is important.

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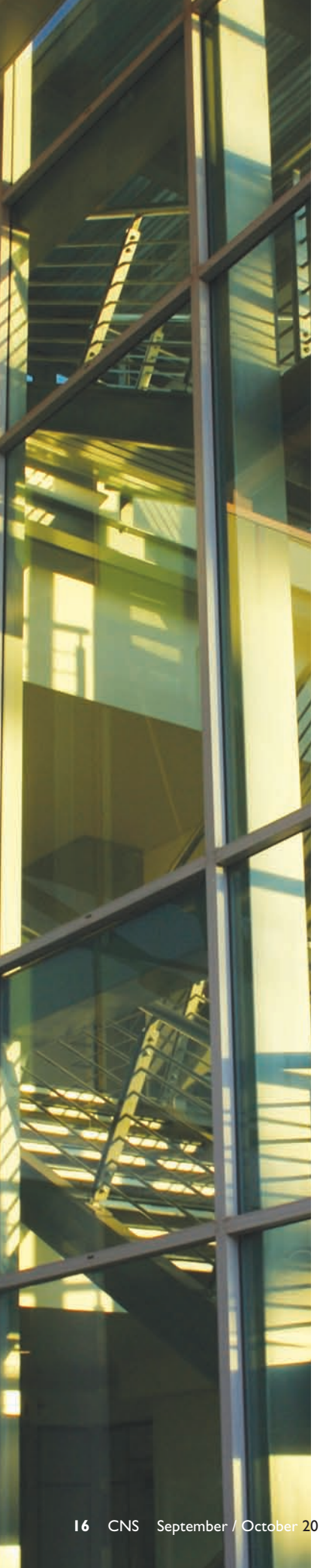

Power-over-Ethernet

Power over Ethernet (PoE) allows electrical power to travel alongside data over a network's Ethernet cabling. The power level offered by PoE is appropriate for various end devices from IP phones, WLAN access points and Ethernet switches, cameras, LCD monitors and thin client computers.

In addition, PoE can be used to power building controllers. For example, Surrey, B.C.-based Delta Controls last year became the first building automation company to launch a PoE IP HVAC controller to the market, which it premiered at Carleton University in Ottawa.

"As they improve on trying to make buildings more sustainable and have better management capabilities we may see more movement, but the economy is doing this up-and-down, up-and-down thing. When things are more stable we may see more migration to IP-based building automation systems."

Despite the debate over whether to share services over a single network, Horne is seeing the communication networks being more frequently incorporated into the building design process at the same time as HVAC and other systems.

Since it is an area in which building designers often have little expertise, this trend has their engineering firms calling on cabling professionals and installation firms to boost their expertise during the building design and set-up stage.

Wi-Fi adoption and pathway concerns: In addition, Horne says he is seeing property managers use a building-wide communication network for the purpose of property management, and increasingly build in networks that incorporate Wi-Fi and cell extension.

Such networks are being used to provide tenants with a Web portal for service requests, for property management staff to use network-connected tablet devices for efficient work, for public Wi-Fi access and to extend mobile phone access to parts of the building cell towers higher floors where service will not reach. (Since, cell towers signals are directed downwards, once a building reaches about 10 stories they begin to lose service, Horne notes.)

In addition to these benefits, property managers are finding that having extensive cellular coverage or free public Wi-Fi in common areas is being seen as a marketing advantage when attracting tenants. The same network built for cell extension through the building also act as a LAN, carries Wi-Fi, and fire, police and emergency service signals.

Of course, extending cellular coverage or building a network of Wi-Fi end points still requires plenty of physical wiring on the back-end to support it, and that means pathways through the building.

Facilities systems and communications systems being developed simultaneously provide a better opportunity to build pathways into the building design, reducing interference. While communications used to be lumped in with electrical work, if considered at all, changes in the Construction Specifications Institute's MasterFormat division to include communications networks as its own specification makes these networks less of an afterthought.

While communications systems are being seen as more important during the building process, the lion's share of space and consideration in buildings design typically goes to HVAC systems, says Horne. Still, it's an important step that the groups are sitting down together at the design table often before ground is even being broken.

Collaboration and new skills: All agree integrations between facilities and communication, whether on a single, shared infrastructure or not, calls for greater collaboration and, in some cases, new skill sets.

It can be generational, Huijbregts says. He gives the example of a customer visit he recently conducted in which he met the operator of the building's mechanical and electrical systems, who was sitting monitoring four or five dusty CRT screens, each handling a different building function.

"He sits there and he plays Angry Birds on his iPad. He was probably 23 years old. As we started to talk with him, he actually said, 'I wish I could control these systems from my iPad upstairs in the daylight rather than stare at four screens in the basement where nothing happens.'"

Huijbregts says the world of facilities management is in a transition stage right now, where a large segment of managers are used to traditional methods, which they know like the backs of their

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hands, but an emerging wave of facilities managers are seeking new ways to work and that will drive greater integration between facilities management and IT.

It will also lead to greater use of cloud-based facilities management services, he says, but he confesses that a lot of investment has gone into existing legacy systems and he calls the move to more integrated systems "a work in progress."

He says a new type of contractor is developing who understands mechanical, electrical and the IT side of a building's needs. "They are becoming the orchestrators of bringing together what has traditionally (existed in silos)." While a common term for these advisors has not emerged, Cisco is calling them "master technology contractors", and points to companies like Johnson Controls Inc. as leading the way in their development.

Oegema says facilities management and IT often don't work well together in traditional scenarios, but that the smart building systems with analytics can provide benefit to them both and can bring them together. For example, break-glass detection being monitored by software could be shared with security, but IT and network managers would also want to know if a controlled space is being accessed.

Ballai says the role of facilities managers is becoming far more dynamic and, at times, strategic. They are being tasked to work with IT teams to find better ways to measure operations and look at the long-term sustainability of their buildings.

That is demanding of them a greater business and technology acumen than ever before, and collaboration with IT departments.

It's not just buildings getting smarter, Ballai suggests that facilities managers are learning new tricks to follow suit.

"What you are seeing is businesses looking for facilities managers who also have the technical knowledge for every aspect of the building systems (including communications). It will not just be the engineer and staff anymore, but everyone and the question is being asked how will that contribute to us having more efficient buildings?"

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