



State-of-the-Art Fully Integrated Smart Building Embraces PoE of Everything with Siemon



According to recent reports, the global smart building market is expected to reach nearly \$110 billion over the next six years. With 63% of building owners, operators and executives having plans in place to implement smart buildings, it's clear that smart buildings are rapidly becoming the gold standard in commercial enterprise construction.

Nowhere is the smart building concept being embraced more than by commercial developers that own, operate and finance income-producing properties. Many of these companies are beginning to understand the advantages of integrating low-voltage building applications to deliver sustainability, operational efficiency and enhanced occupant experiences that enrich their portfolios and ultimately drive higher property values and occupancy rates.

While many are looking to deploy smart building technologies, making the decision to embark on a fully integrated smart building where all buildings systems converge and communicate over an IP-based platform with all endpoint devices powered via power over Ethernet (PoE), is a significant and challenging undertaking. And it's one that can only successfully come to fruition through collaboration with an expert partner ecosystem—from planning and design, to implementation and delivery—and a robust Siemon digital building architecture as the foundation. That's exactly how one leading urban developer serving the life science industry approached their new cutting-edge 88,000 square-foot headquarters.

Starting Early, Starting Right

When it comes to developing a fully integrated smart building, the process must start during the very early planning phase with all stakeholders embracing the concept and recognizing the importance of the network infrastructure. This often requires educating stakeholders and demonstrating how converged and integrated systems can benefit building owners, operators and occupants.

"With their lease set to expire in November 2019 and no means to expand, the client decided to purchase property and develop a state-of-the-art facility from the ground up as a showcase for their clients," says Mike Barbera, president of Intersect Management, LLC who was charged with managing the design and construction for the new build. "We worked with our consultants, design and network infrastructure partner Siemon very early in the planning stage to discuss strategies, identify specific partners and educate the key stakeholders on how to enable building control and management through a single pane of glass."

To help achieve buy-in at the decision-making level and ensure the right approach, Barbera along with Bob Allan, Siemon's former Global Business Development Manager for Smart Buildings, Matt Scharkozy, Siemon's Regional Sales Director and Bob Mobach, telecommunications designer and consultant for the project, visited the RBC WaterPark Place in Toronto, home to Cisco's Canadian headquarters. This 1.2 million square-foot facility is considered one of the first truly smart buildings in North America where all IP-based systems are integrated, including networked LED lights outfitted with advanced sensor technology and powered via PoE.

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Leveraging an Expert Partner Ecosystem

"When we met with Cisco and the developer of the Toronto facility to gain insight on how they approached the design of their smart building, I think that was really the turning point," says Bob Allan. "That's when it became clear that we needed to really think outside of the box, and the decision was made to integrate and power all lights and building system devices over an IP-based network using PoE technology."

Achieving the lofty goal of "PoE of everything" was not without challenge. It required collaboration among all technology partners to ensure the right scopes of work, detailed layouts and bills of material that would meet project deliverables and maximize integration and efficiency for return on investment.

"One of the biggest challenges was identifying manufacturers of all the building systems who could deliver on the latest IP-based and PoE-enabled technologies. There was only one access control manufacturer who could even provide the PoE-enabled door system we required, and we had to work closely with many of the manufacturers to make modifications to their products," says Barbera. "This was especially true when it came to lighting."

The client did not want a traditional office space with drop ceilings and generic 2X2 lights, but rather an open ceiling design with a wide range of architectural LED lighting fixtures from 20 different lighting manufacturers. The requirement to have all lights connected to the network and powered via PoE entailed significant coordination and customized design.

To support the 2500 PoE lights and 100 different lighting system configurations throughout the new facility, Brad Sandman, Division Manager for IES Communications, the Siemon Certified Installer (CI) selected for the project, and Bob Mobach introduced Igor to Barbera and the client after visiting Igor's headquarters to research and verify the solution. A collective decision was made to select Igor's groundbreaking vendor-agnostic node design that provides both data and power to all LED lighting fixtures, low-voltage sensors and wall controllers, allowing the facility to achieve a fully-connected smart PoE lighting system throughout. Igor's web-enabled,

Ethernet based supervisory controller and cloud-based portal also enables the monitoring and control of the entire lighting system from a centralized location, as well as data analytics and reporting on sensor, energy and system use data.

“Often engineers or building managers will expect energy savings based on how they believe things will be used, but by having data, you can see what is actually happening. Without information, you simply don’t know where to start,” explains Dwight Stewart. “With our PoE-based software-defined system, you can make those improvements and adjustments in software quickly and easily. For example, by looking at analytics, we found that we could save 50% energy in a large common space by changing motion sensor timeouts from 5 minutes to 3 minutes. This can be verified because there is the data to prove it.”

The Igor control platform was also critical to meeting California’s Title 24 building energy efficiency requirements, such as lighting power density allowances for various types of spaces, mandatory time-out occupancy sensors and daylight dimming. The building also features PoE-enabled electro-chromatic glass that is electronically tintable and can be adjusted by controls inside interior conference rooms.

Ensuring a Robust Digital Building Architecture

While collaboration was key to meeting the “PoE of Everything” goal, achieving a fully integrated smart building also requires the right digital architecture capable of supporting all connected IP- and PoE-enabled devices, regardless of transmission speed or remote powering level. Deploying a single cabling system was also key to eliminating multiple cable types and easing the implementation of new devices and technologies.

“Every networked device in the facility is powered via PoE and connected via category 6A cabling. We even specified category 6A for the building automation system even though it didn’t require that level of performance. It was more about having one cabling type for the entire building to better support future moves, adds and changes,” says Bob Mobach.

Siemon’s end-to-end Z-MAX® category 6A system was selected for the cabling infrastructure, which included category 6A GT cable with a discontinuous foil construction that enabled easy installation and a smaller cable diameter, while providing superior 10 Gb/s transmission performance and improved heat dissipation. The Z-MAX system was used to connect and power all devices, including:

- Lighting nodes and architectural fixtures
 - Emergency lighting systems
 - Wireless access points (WAPs)
 - Security surveillance cameras
 - Door access control devices
 - Audiovisual displays and equipment
 - Sound masking systems
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- Public safety and cellular distributed antenna systems
 - Electrochromatic glass
 - Vending machines and cafeteria point-of-sale systems
 - Electrical-vehicle charging stations and smart parking devices
 - HVAC, elevator control and other building automation devices

Several of the devices were connected using Siemon’s Z-PLUG™ category 6A field-terminated plug that allowed for quick connections directly into the devices. The Z-PLUG’s shorter plug design with rounded edges also made it ideal for connecting to devices with limited space.

“Not only did the project require one type of cabling, but the goal was also to conceal the cabling. This required innovative pathways with a 7-inch raised floor system on almost every floor, overhead cable tray in dropped ceiling locations and strategic use of rigid conduit to support and conceal the cabling for devices throughout,” says Mobach. “Being able to directly plug into devices like the PoE lighting nodes helped us eliminate visible cables and the need for boxes and outlets. We used a ton of Z-PLUGs for this purpose and were very happy with the performance.”

While the use of Z-PLUG’s helped ease the installation, the complexity of the lighting system required a unique skillset and coordination among lighting manufacturers, Igor and both electrical and low-voltage installers.

“Nothing was standard from a lighting perspective, and we had to ensure that we had the right PoE wattage for every fixture. Even where we had fixtures that were the same, we had to calculate the wattage due to different lengths,” says Sandman. “While it was unique and complicated, we learned a lot and really became experts in PoE lighting.” IES is now in the process of becoming a Siemon Digital Lighting Partner (DLP), a certification that demonstrates skill in deploying high-performance network infrastructures that leverage PoE lighting as an integral component of an smart building.

The fiber optic backbone infrastructure throughout the facility also had to be robust enough to transmit large amounts of data from

the variety of systems throughout the building. A combination of Siemon's singlemode and multimode fiber cabling systems were deployed from the entrance facility up to the main equipment room on the fifth floor and back down to telecommunications spaces and the four below-grade levels that feature parking and locker rooms.

"We needed a 40 Gig backbone to support all of the data, and we were especially bottlenecked by high-end digital signage throughout the facility. We ended up deploying 48 strands of singlemode and 48 strands of multimode for the backbone," says Mobach. "We also implemented complete redundancy with four different service providers coming into the building through diverse entrances with their equipment housed in a separate meet-me room setup, as well as two backbones coming into each telecommunications room."

Delivering On-time Innovation

While the planning and design for a fully integrated smart building is challenging enough, it also took a strong partner ecosystem to effectively deliver the solution and meet the owner's unique requirements within the aggressive time schedule.

One area of the new facility features a laboratory environment for life science customers, complete with custom, prewired mobile benches. Featuring an open ceiling environment, the cabling runs neatly through custom cable trays and conduit designed to circumvent HVAC, gas and other systems. A zone cabling approach was used to distribute the network connections to benches, incorporating a horizontal consolidation point that enables shorter cabling links from the zone enclosure to outlets and devices. Siemon's 24-port MAX® zone unit enclosure was used to house the consolidation point outlets. This low-profile enclosure meets plenum ratings and features a foam gasket to prevent dust ingress and protect the connections.

PowerGUARD® for a "PoE of Everything" Concept

Siemon's end-to-end Z-MAX category 6A system is ideal for supporting the "PoE of Everything" concept for the new facility due to its PowerGUARD® technology specifically designed to support advanced PoE.

- *The category 6A GT cables with PowerGUARD technology are qualified for mechanical reliability in high temperature environments up to 75° C, ensuring superior heat dissipation to reduce heat buildup within cable bundles delivering remote power that can lead to performance degradation.*
- *Siemon's Z-MAX jacks with PowerGUARD technology feature a patented crowned jack contact shape allowing users to connect and disconnect to the latest remote powering applications with zero risk of connector damage from electrical arcing.*
- *Siemon's Z-PLUG field-terminated plug with PowerGUARD technology features a fully-shielded, 360-degree enclosure and 75°C operating temperature that improves heat dissipation for PoE.*

"The building owner wanted plenty of flexibility in the laboratory environment with the ability to easily disconnect and move benches as necessary. That's why we ended up deploying a zone cabling approach with a consolidation point using the Siemon enclosures that each served four to eight users," explains Mobach. "Everything had to match, and Matt Scharkozy and the Siemon team were able to customize their enclosure with the same white color used for the custom square platform for distributing gas, power and network connectivity."

Delivering the solution within the very aggressive timeline also required significant effort and coordination for the installation team from IES Communications. "The biggest challenge was staying on schedule given the extreme complexity of the design and the aesthetic requirements of the building owner. Because the cabling and conduit could not be visible throughout much of the facility, all conduit had to be designed and deployed in advance of any concrete being poured," says Sandman of IES. "And it wasn't just coordination with other trades. Ensuring availability of materials was also critical to maintaining the schedule, and Siemon did an excellent job of collaborating with local distributors to avoid any lead time issues. This was especially important since we had almost zero storage on site."

As the project came to fruition, maximum effort and coordination among all trades became critical to meeting the strict move-in deadline. Temporary cooling was needed to get telecommunications spaces up and running as they were required for lighting throughout the facility, and the IES installation teams worked day and night to ensure cabling systems were ready for inspection. Following two years of construction, cabling of the facility was ultimately completed, tested and commissioned in time for all employees to move into the facility in September 2019. One of the first of its kind with a "PoE of Everything" concept, the new eye-catching headquarters complex is now revered as one of the most iconic smart buildings in California.

"This facility is now an unbelievable showpiece where the owner can demonstrate fully integrated systems," says Barbera. "And with every device powered via PoE over Siemon's category 6A cabling system, they are saving a significant amount on electricity while ensuring a facility that is easily expandable for future technologies."