By Jamey Swigert

The Evolving Role of Structured Cabling in Modern Buildings

For years, the specter of declining port counts and increasing reliance on Wi-Fi has cast a pall over the future of the structured cabling industry. While port counts for traditional LAN devices may continue to decline, new connections are being made at a staggering rate, with a multitude of systems, sensors, and solutions migrating from specialized wiring to a structured cabling infrastructure. Take heart: the future of the ICT industry has never looked brighter!

BSRIA, a global market intelligence agency that tracks construction and building services, paints a rosy picture for the structured cabling industry–although the pieces that make up that picture are quite different from the past. In their May 2017 report, *Convergence and digitalization of commercial buildings in the US,* BSRIA projects that as traditional LAN connections disappear, new types of connections are being added to networks in record numbers. Applications including lighting, security and audiovisual are joining the network in large numbers. This rapid growth in connections will not only maintain the status quo of the structured cabling market but promises to push it to new heights.

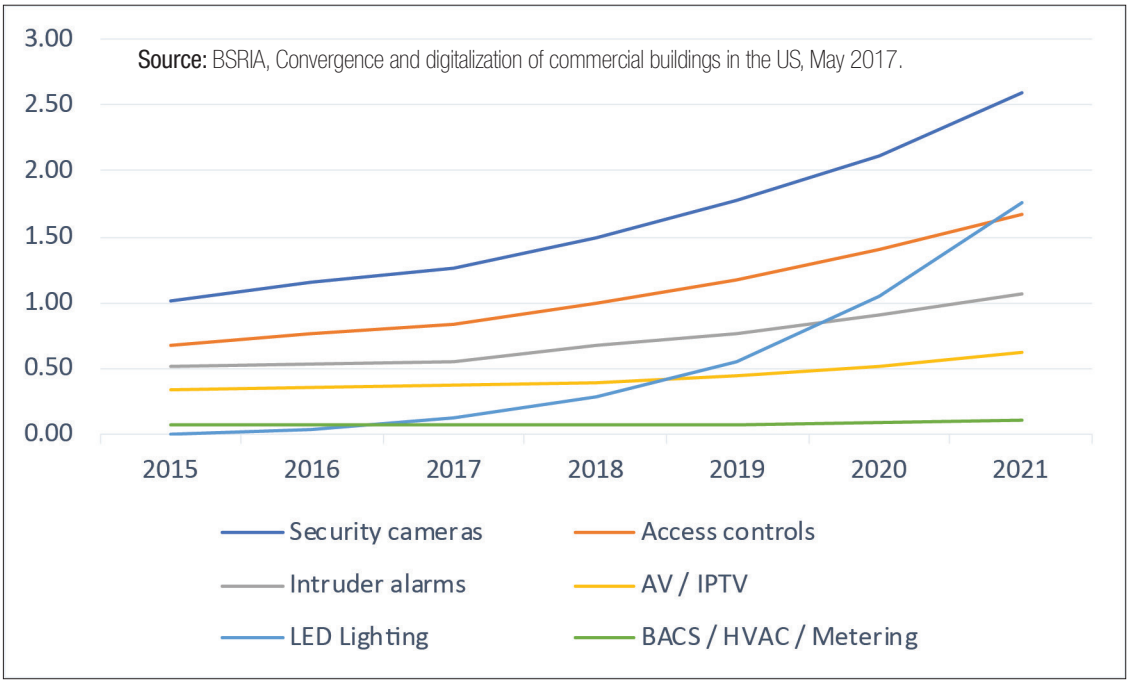


Figure 1: Distributed Building Services, million nodes/outlets in commercial buildings by type of product, 2015-2021.

BSRIA predicts significant growth among connected building systems, with "explosive growth" expected for networked lighting (see Figure 1). Three years ago, lighting was virtually nonexistent on the network. Today connected lighting is becoming a reality. Within the next three years lighting is anticipated to account for nearly 2 million connections in the US alone.

The Path to the Digital Building

Many of us probably do not remember the days when an organization's network connected desktop computers and that was it. In the mid-1990s, Voice over IP (VoIP) telephones and IP cameras both began the migration to the IP network. Although early models of both were limited in their functionality, it began the shift that continues to pick up momentum today.

The first network camera that ran over Ethernet was introduced in 1996, beginning the shift to networked applications outside of computing. Telephone systems soon followed suit, bringing a monumental shift in organizational structure. Telecommunications departments were merged into IT departments and telephone technicians who grew up on tip-and-ring were soon learning about VLANs and DHCP.

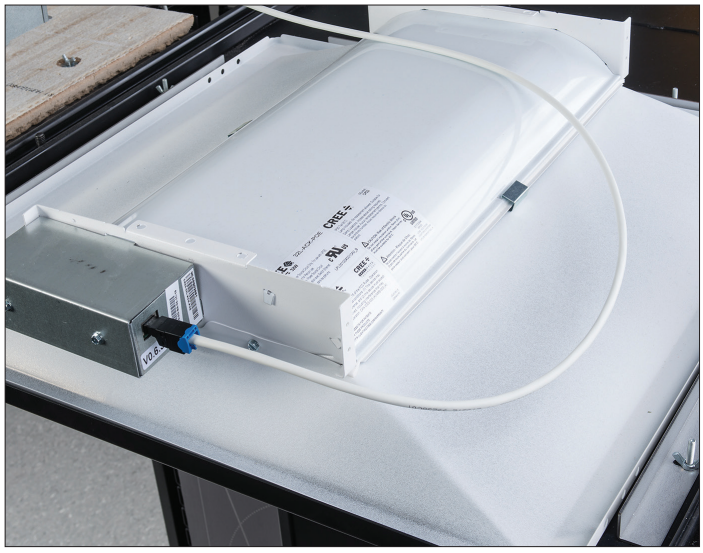
More recently, the concept of a digital building has spurred an accelerated pace of consolidation onto a single cabling platform. LED lights fed by Power over Ethernet (PoE) from the closet switch have moved from a conceptual idea to major topic of conversation and that conversation is beginning to convert to installation. Network connected sensors offer the promise of optimizing real estate, improving productivity, decreasing utility costs and increasing revenues. Badge access, other security, and even life safety systems have migrated to primarily IP-based communication over structured cabling.

Building automation system (BAS) vendors are all developing or launching next generation systems that communicate over category cable using IP. Generally, BAS connects HVAC, lighting, and security to create efficiencies based on occupancy, space usage and other conditions. Perhaps most significantly, BAS software has the potential to integrate all these building systems at the software level into a "single pane of glass" that can be used by facilities managers to optimize, configure and manage systems for building owners and occupants.

Lighting: The Next Big Thing in Buildings

Intelligent lighting is on track to be the next big thing in buildings. Intelligent lighting goes well beyond just lights. Today's lighting systems all use LEDs for energy-efficient illumination, but also include sensors and controls that enable a plethora of capabilities when those lights and sensors are sharing the network. Lighting vendors promote systems that:

- Turn the lights on when someone enters a room, count the number of people in the room and then tell the BAS to increase ventilation in that room based on the number of people.
- Allow building occupants to use their smartphone or computer to set the lights in their work area to the brightness and color that makes them most productive.
- Automatically adjust the brightness and color of light throughout the day to match natural daylight rhythms.
- Direct employees to an open conference room or work area based on sensor readings throughout the building.
- Turn lights on and off and adjust color and brightness to personal preferences when access control detects that an employee has entered the building.
- Direct occupants to exits during an emergency.
- Provide visual alerts to staff if noise levels exceed a pre-set level.



Source: Panduit

PoE Lighting goes beyond illumination to add intelligence to the lighting system in a building.

In the same way that VoIP drove exciting changes to enterprise telecommunications networks, PoE lighting is shaping up as the platform that defines new building capabilities. Because of the sheer volume of lights in an average office building, school, or hospital, lights become a highly dense framework that is ideal for deploying sensors throughout the space.

In terms of connectivity, lighting installations vary by vendor. Some systems require a 1:1 port/fixture ratio, with each light individually connected to the switch; other vendors offer a node-centric platform, where multiple lights connect into a node, which then connects into the switch. Regardless of the architecture used by the vendor, lighting represents a huge opportunity for the structured cabling industry.

Industrial: Bringing Ethernet to the Plant Floor

Looking outside of corporate offices and education spaces, infrastructure convergence is also happening in industrial environments. The factory floor is in the middle of a migration to Ethernet and structured cabling. For a long time, there was a hard dividing line between the "carpeted space" and the "cement floor." On one side, IT teams managed switches in IDFs and hired structured cabling contractors to install the cabling for data networks. On the other, electricians ran control and signaling cable alongside power in wire baskets to connect MCC cabinets to PLC and control cabinets. That delineation has started to blur. IT staff now venture onto the plant floor to diagnose network connectivity issues and cabling contractors, who once avoided the plant floor, are now running optical fiber and copper to manufacturing equipment. The improved connectivity is leading to higher efficiency and less downtime. The advantages of Ethernet and the use of structured cabling as a cabling standard can no longer be ignored.

Source: Panduit

HDBaseT has moved A/V to the IP Network.

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A/V: The Next Silo to Fall

A/V is the next technology to collapse onto the LAN. It has moved beyond projectors and pull-down screens to a sophisticated application with ever increasing image quality and minimal latency. Today's A/V is equally at home in boardrooms and conference rooms and classrooms. Use of digital signage is rapidly increasing and has moved beyond simply conveying information to become digital art installations. Out-of-home advertising, delivered via cloud-based digital signage systems, is set to explode, bringing customized, targeted ads to retail shops, subways, lobbies, gas pumps and anywhere else a media company can grab your attention.

The trend to move A/V to the IP network started more than 10 years ago with the launch of the HDBaseT chipsets, which convert audio and video signals (along with power, Ethernet, control and later USB) and transmit them across a point-to-point link using category cable. At the far end, the stream is converted back and connected to a display device using HDMI, DVI or another preferred A/V connection. HDBaseT switchers scale this technology from a one-to-one

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connection to a many-to-many connection, but the signals are still traversing a closed A/V network.

A/V's next generation, which may supplant HDBaseT in the coming years, is commonly referred to as A/V over IP (AVoIP). It builds upon the HDBaseT concept by encoding the A/V signals into Ethernet, routing them across a LAN, and decoding them back for the display device.

Two variations of A/V over IP are being developed:

- An uncompressed 4K signal with zero latency. This uses lots of bandwidth and requires a 10G network. However, the hardware is inherently upgradable to 8K and in some cases, holds the promise of interoperability—something sorely lacking from the A/V hardware industry and a bit strange for those of us coming from the IT/data networking world.
- Typically proprietary and non-interoperable, using varying degrees of compression to reduce bandwidth requirements to 1G but with slightly higher latency (often referred to as near-zero latency). These systems benefit from the ubiquity and lower price of 1G switch ports in comparison to 10G.

The impact of this next generation of A/V technology is emerging in several ways:

- Whatever devices are attached to a switch will eventually be managed by the IT department. Or at least, IT will be significantly involved in specifying requirements, evaluating products and influencing a decision.
- With cabling for HDBaseT devices being mostly point-to-point, there was a logical case to keep A/V cabling as a separate cable plant. Why route the cable connecting a podium computer to a ceiling-mounted projector through the cabling closet down the hall? But with AVoIP, the situation is reversed. The A/V devices become just one more network device like an AP, PoE light, sensor, printer or badge reader. Another application-specific cable plant is thus collapsed onto a converged category cabling infrastructure. One cable plant to rule them all, so to speak.

With a converged cable plant and more and more plug-and-play functionality, structured cabling contractors have begun selling and installing A/V. Higher average margins, a chance to differentiate themselves from competitors and the opportunity to win a larger share of a customer's wallet are all factors driving structured cabling contractors into the A/V world. Typically starting with very basic applications and working their way up the stack, cabling contractors have become a major force in the A/V market. This has pushed many established A/V integrators, who typically have a staff of technicians that are highly trained and experienced in configuration and control systems, to focus on more sophisticated applications and to develop partnerships with structured cabling contractors to fulfill the cabling portion of their project.

As resolution transitions from 1080p to 4K—and soon to 8K—the technical demands of sending zero latency audio and video packets with low bit error rate and minimal dropped packets mean that a just "good enough" cable installation is not going to cut it. Untwisting cable pairs too much at the jack, using non-compliant products, selecting the wrong category levels for an application—they will manifest as missing pixels, audio not synced to its video, screens that black out periodically and other issues that will be very apparent to the end user (much more apparent than a few hundred-millisecond delay in retrieving a file from a storage network, for example). Additionally, all this traffic will place more demands on network backbones, increasing the need for optical fiber, a cable media that even the more cabling-savvy A/V integrators shy away from. The expertise, experience and tradecraft that lives

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The Human Factor

In all these cases, the technological shift has caused significant changes to the trades involved in installing and supporting these systems. Telephone technicians employed at large end user organizations are arguably dying out as a profession. Few trade schools train telecommunications technicians any more. Network engineers have largely taken over the management of IP telephone systems inside organizations.

The convergence of building applications onto IP and structured cabling sometimes results in a convergence of two trades and two markets (e.g., the security market). Installers specializing in security systems have learned about structured cabling and Ethernet. Structured cabling contractors have added security as an offering and security firms have added LAN cabling to their repertoire.

Who will install lighting in 10 years? There is a battle looming to answer that question. Will the electricians find a way to protect this important part of their package or will the trend towards PoE-fed lights win out, likely resulting in an acceleration of electrical firms starting or merging with a low voltage practice? If lights become as easy to install and connect as a wireless access point, it is reasonable to think that system integrators will begin offering lighting alongside their network installation services.

In addition, the shift coming to the HVAC trade is nothing short of monumental. HVAC and BAS vendors see the tidal wave of change headed their way but worry if their tradespeople will be trained and ready to install and configure systems connected with structured cabling and communicating using IP. The degree of training that will be required to shift the HVAC trades away from wiring and communication protocols which have been in use for decades will be significant. But it's coming, and it's coming fast.

Change Brings Opportunity

Anyone working in a technology industry feels the pace of change increasing at what can sometimes seem like a daunting rate. It is almost palpable and can certainly lead to anxiety about our future, our profession and our livelihood, because with significant change comes winners and losers. The good news for the ICT industry is that we are well positioned to benefit from the convergence of so many important systems onto the structured cable plant. If we remain open to learning new technologies, embrace change and the opportunities it brings, and we maintain the professionalism of our industry through a dedication to installing quality products the right way, our future looks brighter than it has in a very long time.

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