



The Role of Power over Ethernet (PoE) in the Modern Connected Enterprise

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To attract a younger, more collaborative workforce, enterprises are transforming their offices by creating flexible, comfortable environments where wall-to-wall cubicles once stood. At the same time, they are also searching for new ways to manage costs and drive operational efficiencies. Digital buildings that leverage Power over Ethernet (PoE) technologies to connect systems and devices on the IP network can deliver both. Read on to learn about digital building trends and the power of PoE for the enterprise space.

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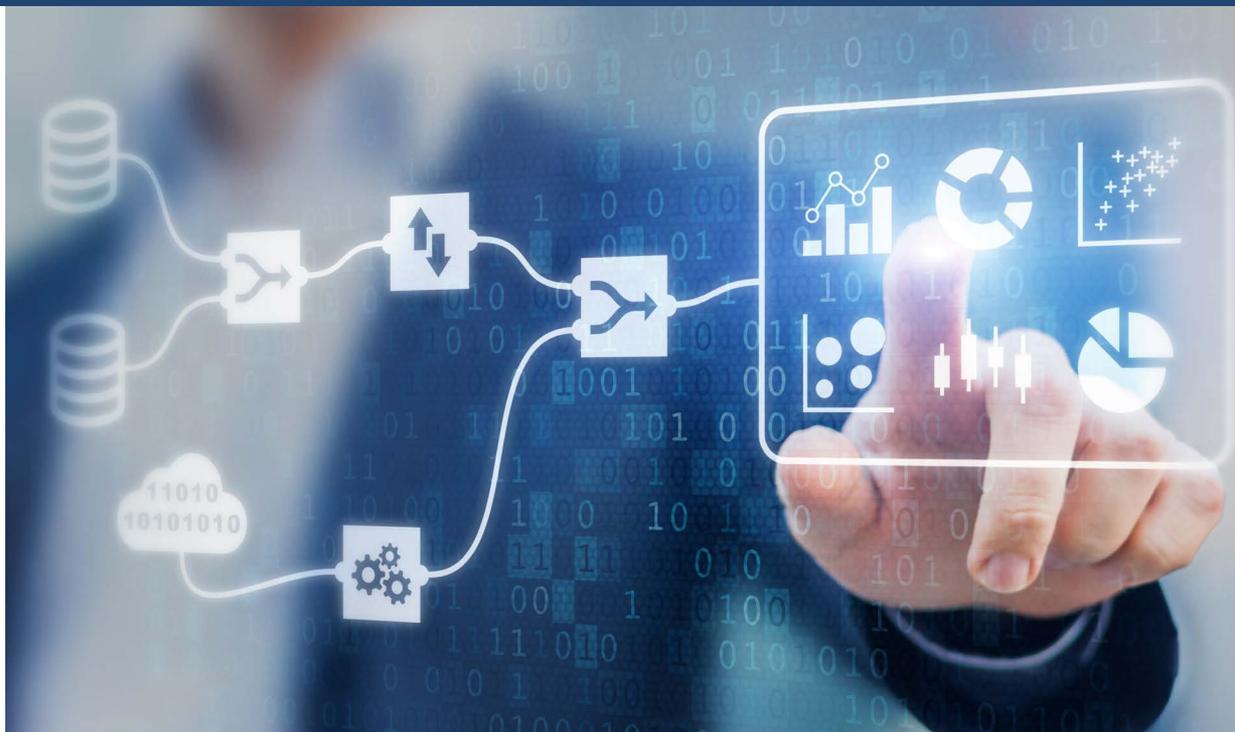
PoE in the Modern Connected Enterprise

Digital buildings leverage smart systems to gather the data and automate the processes to increase operational efficiencies and improve working environments. The systems that make up these digital buildings converge on the IP network, and as a result of this network convergence, can react to a wide variety of activities that impact efficiency, productivity and comfort.

Centralized management oversees the network, and systems such as wired/wireless connectivity, audio/video, lighting, environmental controls, and security can be managed and controlled on premise or remotely via mobile devices.

Connected Devices on a Converged IP Network Infrastructure

- Lights and ventilation automatically adjust based on not only if a room is occupied, but based on how many people are in a room
- Office lighting, as well as voice and data connections, are activated and set to personal preferences when a badge is scanned at an access control reader
- Digital signage shows available meeting rooms or offices based on sensor readings, rather than scheduling tools



PoE in the Modern Connected Enterprise *(Continued)*

To realize the benefits of a digital building, it's imperative that the IP network is always-on *and* always-there. The systems and devices located both inside (VoIP phones, lighting, etc.) and outside the physical space (security cameras, door entry scanners) rely on the IP network for data — and these days — for power as well. Power over Ethernet (PoE), which was first introduced in 2002, has become the foundation for a high-performing building.

Power over Ethernet (PoE) is a standards body-approved technology that safely allows electrical power and data to transmit concurrently on a single twisted-pair cable (Category 5e or above). The latest PoE standard (IEEE 802.3bt) allows for a twisted pair cable to carry data *and* up to 99W of electricity to devices such as wireless access points, security cameras, and digital signs, in addition to traditional VoIP phones, and LED lighting.



PoE also provides the ability to deploy powered devices at any location, regardless if electrical outlets are present. This eliminates the need to add new electrical power outlets — an act that requires professional installation and conduit permits. In addition, utilizing Ethernet as the main cabling medium simplifies the notion of transforming a traditional building into a smart building: enterprises can re-use their existing network switches to power PoE systems and devices.

Key Benefits of PoE for Enterprises:

- Flexibility for growth
- Operational efficiency
- Improved network control
- Easier, more cost-effective installation



75%
of security
cameras are
integrated into the
organization's
IP network

PoE for IP: How Enterprises Power the IP Network

PoE is efficient, easy to install and works with most enterprise systems and devices. It runs over the same copper cabling that supplies bandwidth, meaning that a single cable can provide both data connection and electric power to devices such as wireless access points, IP cameras, and VoIP phones.

Common Enterprise PoE Use Cases:

Connected enterprises rely on the IP network — and PoE — to provide both data and power to devices located anywhere from cubicles to conference rooms, entry ways to parking lots.

Connected Devices on a Converged IP Network Infrastructure:

- Audio/Video
- Badge Scanners
- Environmental Controls
- Lighting
- Security Cameras
- Wireless Access





Two high-growth application for enterprise PoE are security and lighting.

To attract a younger, more collaborative workforce, enterprises are transforming their offices by creating flexible, comfortable environments where wall-to-wall cubicles once stood. At the same time, they are also searching for new ways to manage costs and drive operational efficiencies. Digital buildings that leverage Power over Ethernet (PoE) technologies to connect systems and devices on the IP network can deliver both. Read on to learn about digital building trends and the power of PoE for the enterprise space.

SECURITY: The demand for IP-networked security infrastructure is at an all-time high. Building or property security is a multi-faceted solution that typically includes some combination of integrated video surveillance, intrusion detection, and access control. Cameras, sensors, and access control are typically integrated and powered via Power over Ethernet, so the same network cable that delivers data to the device also delivers power.

LIGHTING: Today's lighting systems also include sensors and controls connected to the IP network to provide new levels of control, while delivering a wealth of information on room usage, occupancy, atmospheric conditions, and more.

Spotlight on PoE Lighting:

The Waldiger Corporation gave new life to old fixtures with a high-performing, cost-efficient PoE lighting upgrade.

[Read the case study.](#)



Navigating the Opportunities and Obstacles of Enterprise PoE

Connecting enterprise-wide systems to the IP network requires a physical infrastructure that is not only strong, but also sufficiently scalable to enable change and growth.

Telecommunications Rooms

Most modern enterprise workspaces require a telecommunications room (TR) on every floor in order to support the proliferation of connected devices on the IP network. All of the systems and switches that connect to devices to provide them with power and enable them to collect and deliver data are housed in the TR, and the growing number of connected devices in the enterprise has led to overcrowded TRs filled with switches, control systems, patching and cabling that are hard to manage and lacking the number of ports needed for all the devices.



Cables with smaller diameters as well as angled connectors help address these issues. For example, 28AWG patch cords are smaller in diameter and require half the space of standard patch cords. They increase port number visibility, and create more space for plug access, more clearance to route cords, and allow new configurations for more effective use of high-density panels while aiding airflow and cooling.

Copper Cabling

PoE uses standard copper category cables and it is important to understand how these cables — as well as the connectors — can handle the associated current and power levels.

The most common impact associated with PoE is heat rise within the cables, which can impact cable performance. The greatest impact occurs when cables are bundled. Some temperature rise will increase cable insertion loss, and extreme temperature increases past the recommended cable operating range can cause long term damage to the cable. Arcing can also occur when a plug is removed from a connector with live PoE, which damages plug and jack contacts, and make transmission through them impossible.

Panduit recommends the use of Category 6A cabling due to the fact it supports the highest data rate of 10GBASE-T and has no bundle size limitations with any current or future Power over Ethernet application. If different cable types are used for PoE other than Category 6A, follow the guidelines in [this document](#) to reduce bundle size. These bundles can be grouped together so the total number of cables being routed remains the same.

Q: Do enterprises need special equipment to run PoE?

A: *A PoE switch and category cabling are all that is needed to power PoE-enabled devices. That said, PoE does cause heat rise within the cable and connectors, which can affect network performance. Category 6A cabling has the best thermal properties to handle temperature rise issues.*

To learn more about enterprise cabling considerations for PoE, read the white paper [power over ethernet with panduit copper cabling](#).

“Not all PoE cabling and infrastructure is the same, and quality will make a meaningful difference to the performance of a network and its longevity.”





Connecting Systems and Devices with Long-Range PoE

PoE runs over a standard copper channel, which is limited by structured cabling standards to 100 meters. Any channel longer than 100 meters can experience performance issues, impact network performance and impact performance of the device or system it is enabling. This 100-meter length limitation is in place for PoE, as well.

When older buildings are repurposed for office use, there is often not enough room to accommodate the placement of a telecommunications room (TR) within the 100-meter range supported by copper cabling standards. Architects for new construction buildings are well aware of this need, and typically account for it in their designs, but may still have areas, such as building entryways, that are located more than 100 meters from the nearest TR. And, as enterprises grow, even new buildings can find themselves bursting at the proverbial seams. Work stations might be set up where water coolers were once located, or perhaps out-of-the way storage rooms could be converted into makeshift office space that is well outside of range. In addition, remote connected devices located outside of the work space — such as parking structure security cameras and lighting, or entry way badge scanners and intercoms are commonly out of range.

Long-range PoE Applications:

- Access Card Readers 
- Lights 
- Security Cameras 
- Sensors 
- VoIP Phones 
- 

Common Approaches

Common approaches for extending PoE beyond the standard 100-meter range to meet the needs of outlying devices have proven costly and complex for enterprises.

One approach involves installing Intermediate Distribution Frames (IDFs), which places the switch closer to the end device. Multiple IDFs might be required to support only a few devices, which can significantly increase equipment and installation expenses.

A second approach uses both copper and fiber cables. A typical application uses media converters, which are connected via fiber cabling. Fiber cables can extend data further than the 100-meter copper channel but can't carry PoE. For long-range applications that require PoE, fiber is run to a media converter, where the signal is converted, and power is injected, and copper then connects to the device to deliver both data and PoE. This scenario is costly and complex.

PoE of the Future

Another long-range PoE option that is on the horizon is Single Pair Ethernet (SPE). Currently being studied by standards bodies, SPE will be a low bandwidth, low power solution that uses a single pair of copper cable, rather than typical 4-pair Ethernet cabling. SPE will be able to transmit up to 1 GB of data and 15W of power, with a reach of 1,000 meters – 10 times the channel reach available with today's four-pair copper cabling.

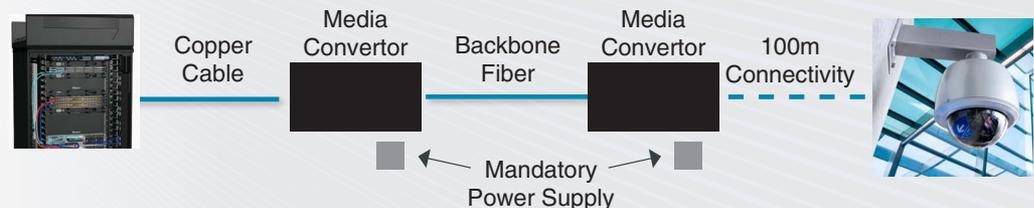
Companies spend up to **80%** more than needed when installing security cameras...

WHY?

- 1 Too many costly, and unnecessary **IDF stops** along the way.



- 2 **Backbone fiber** requires media converters and additional power supply.



- **Save costs**

Lowest cost option compared to using fiber cable and media converters or hybrid fiber cable alternatives

- **Extend reach through copper**

Transmit power and data over PoE up to 2,000 feet/610 meters using standard 4-pair twisted copper cable

- **Connect devices located indoors and outdoors**

Deliver data rates up to 100Mbps in an operating temperature range of -40° F to +158° F to support cameras, phones, access card readers and lights inside or outside the building

- **Support non-PoE switches**

Meet network connectivity needs for legacy solutions or modern solutions

Panduit's Perspective

Enterprise needs for long-range PoE have changed, but the ways to deliver PoE have not kept pace. Panduit offers a fresh approach to extending PoE — one that enables enterprises to extend PoE more than three times as far as standard PoE without incurring the costs of additional labor and additional unnecessary products.

Panduit PoE Extenders leverage a robust, validated architecture and provide customized solutions for up to 2,000 feet/610 meters of network connectivity over one standard, twisted 4-pair copper cable. Paired as a transmitter and a receiver, the PoE Extender solution eliminates the costs of additional labor and extra product pieces while also providing deployment flexibility for IP devices throughout the network.



Take PoE Where You Need it to Be

PoE Extenders are the simplest, most cost-effective way to extend data and power three times the distance using standard twisted-pair copper cabling.

	IDFs	Fiber cabling with media converters	Panduit PoE Extenders
Equipment Cost	\$\$\$	\$\$	\$
Installation Complexity	High	Medium	Low
Off the Shelf Products	Y	N	Y
Space Needed for Install	Major	Minor	Minor



Additional Resources

PoE is the new power grid in digital buildings, and Panduit has long been a pioneer in developing enterprise PoE solutions.

Panduit PoE Solutions

- [Visit Panduit.com](#) for case studies, tech briefs and information on Panduit PoE solutions

Panduit PoE Extender Series

- Watch the video [PoE Extenders: Up to 2,000 Feet of Data](#) to learn more about how enterprises can send data and power far beyond the standard 100-meter reach

Panduit in the News

- [Read the article](#) The Evolving Role of Structured Cabling in Modern Buildings from ICT Today for insights from Panduit for insights on bringing PoE to enterprise applications including lighting and AV

Panduit Corp.
World Headquarters
Tinley Park, IL 60487

800.777.3300

www.panduit.com

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