



Optimizing Surveillance Networks with 802.3bt: Meeting the Power Demands of Modern Security Systems

INTRODUCTION

The evolution of surveillance systems has been significant, from analog cameras and coaxial cables to modern devices like HD IP cameras and pan-tilt-zoom (PTZ) cameras. These advanced IP cameras, equipped with features like heaters and cooling fans for extreme environments and PTZ functionality for wide-area coverage, have significantly increased the power demands of surveillance systems.

While these enhancements improve the effectiveness and capability of surveillance systems, they also increase the need for reliable and sufficient power. Devices such as [wireless bridges](#) and access points used for connectivity by users in remote areas further contribute to the overall power demand of those connected to the system.

The IEEE 802.3bt Power over Ethernet (PoE) standard, often called PoE++, is a robust solution that can deliver up to 90 watts per port. This capability is crucial in meeting the rising power needs of modern surveillance networks. This whitepaper will delve into the benefits of 802.3bt and how it facilitates the deployment of high-powered camera systems and wireless internet connectivity in challenging, remote installations.

HISTORICAL CONTEXT OF POE IN SURVEILLANCE

Since the early 2000s, integrators have relied on PoE to deliver data and DC power over a single Ethernet cable. As Ethernet infrastructures became the foundation for IP-based security networks, PoE technology simplified installations by eliminating the need for separate electrical outlets. This approach became particularly useful in remote locations where power sources are scarce or lack other resources. By consolidating power and data into one cable and connected network device, PoE enables flexible and scalable surveillance deployments, reducing the complexity of network installations and enhancing reliability.

THE INCREASING POWER DEMANDS OF MODERN CAMERAS

The requirements for surveillance cameras have shifted significantly with the push for higher resolutions and the development of enhanced features. These changes are driven by the need for more detailed images to analyze and identify critical information from video footage. Higher-resolution surveillance cameras can capture finer details from greater distances, improving recognition and analysis and aiding the public and law enforcement with valuable video evidence.

Modern cameras often include features like motorized pan-and-tilt capabilities, internal heaters designed for cold environments, and cooling fans to support these performance enhancements. These features greatly increase power demands beyond what earlier [PoE standards](#), such as 802.3af and 802.3at, can supply.

HOW 802.3BT REDUCES POWER LOSS AND IMPROVES EFFICIENCY

One key consideration when deploying PoE is power loss during data transmission. Factors like cable length, type, cable quality, DC resistance, PoE power classifications, and the voltage from the source to the Power Sourcing Equipment (PSE) influence how much power is lost along the Ethernet cable. For example, longer cable runs increase resistance, leading to higher power losses.

802.3bt helps mitigate these losses by using all four twisted pairs for power distribution, unlike earlier standards such as 802.3af and 802.3at, which used only two pairs. By distributing power across all four pairs, 802.3bt reduces voltage drop and heating during data transmission, allowing more energy to reach high-demand devices like PTZ cameras and wireless access points. This efficiency is especially beneficial for using data over longer distances.

Below is a summary list of PoE IEEE 802.3 standards showing power loss.

Type 1	Type 2	Type 3	Type 4	
Name	PoE	PoE+	PoE++ UPoE	High Power PoE
PoE Standard	IEEE 802.3af	IEEE 802.3at	IEEE 802.3bt	IEEE 802.3bt
Max. Power Per Port	15.4W	30W	60W	90W
Power to PD	12.95W	25.5W	51W	71.3W
Twisted Pair Used	2-Pair	2-Pair	4-Pair	4-Pair
Supported Cables	Cat5e	Cat5e	Cat6a	Cat6a

PoE chart by Types

Pro Tip:

- Avoid running Ethernet cables near high-power sources, as this can introduce noise and degrade power and data transmission.
- Use shielded [CAT6](#) or higher-rated cables to prevent signal degradation, especially if the run approaches the 330-foot Ethernet limit.
- Ensure grounding systems are in place to protect cables from electrical surges, particularly in outdoor deployments.

REMOTE INSTALLATIONS AND WIRELESS CONNECTIVITY

In many surveillance deployments, cameras are installed in remote locations where wired connections are impractical. In these instances, wireless communication using wireless bridges or access points (APs) is often the only way to connect the surveillance camera to other organizations or network members. However, these types of wireless devices also require PoE power.

A combination of 802.3bt (PoE++) for cameras and 802.3at (PoE+) for wireless bridges or access points is often necessary. Fortunately, 802.3bt is backward compatible with 802.3af and 802.3at, making it an easy and ideal solution for mixed environments where older technology and newer devices coexist.

CHOOSING BETWEEN POE SWITCHES AND POE INJECTORS

When upgrading to 802.3bt, integrators often need to decide between using an industrial [PoE switch](#) or standard [PoE injectors](#). Each option has advantages, depending on the environment and type of deployment.

When to Choose an Industrial PoE Switch:

- **Network Scalability:** Industrial PoE switches are ideal for larger, scalable networks where multiple PoE-enabled devices need to be powered. A single industrial Ethernet switch can power several devices, simplifying the network and reducing the number of cables.
- **Remote Management and Automatic Reboot:** Managed PoE switches, like those from [Antaira](#), allow integrators to monitor the health of the switch and troubleshoot devices remotely. This feature eliminates the need for costly truck rolls (sending technicians to remote locations). Antaira's switches can also automatically reboot unresponsive PoE devices, ensuring continuous network uptime without manual intervention.
- **Cost Efficiency for Larger Deployments:** Although switches may come with a higher initial investment, they offer significant long-term savings by minimizing installation and maintenance costs. Their ability to manage and reboot devices remotely adds to their cost-efficiency.

When to Choose a PoE Injector:

- **Smaller Deployments:** For networks with only a few devices, PoE injectors are a cost-effective option. They allow power to be added to non-PoE switches without requiring significant upgrades.
- **Lower Initial Costs:** PoE injectors are less expensive than switches and are ideal for powering individual devices without complex network management.
- **Simple Installation:** PoE injectors are easy to install and do not require advanced configuration, making them suitable for smaller, straightforward deployments.

802.3BT USE CASES BEYOND CAMERAS

802.3bt PoE, while commonly used for powering IP cameras, is versatile enough to support various applications. Its adaptability ensures it can meet the power demands of multiple devices, from wireless access points to LED lighting, providing a robust and future-proof solution.

- **Wireless Access Points (WAPs) and Bridges:** PoE has long been used to power WAPs, and with Wi-Fi 6 access points, the power demands have increased. 802.3bt provides the power needed to support these next-generation devices and ensures readiness for future technologies like Wi-Fi 7.
- **Access Control Systems:** Devices like card readers, locks, and controllers benefit from 802.3bt's higher power availability, enabling robust security solutions without needing separate power sources.
- **LED Lighting:** PoE-powered LED lights can be positioned closer to cameras to improve nighttime visibility and maintain color fidelity in surveillance footage. 802.3bt simplifies the installation of lighting by reducing the need for electrical wiring.
- **Digital Signage and HD Monitors:** In isolated areas or temporary installations, digital signage and HD monitors can now receive both power and connectivity through a single Ethernet cable, removing the requirement for additional power sources.

SIMPLIFYING NETWORK INFRASTRUCTURE WITH 802.3BT

By consolidating power and data into a single cable, 802.3bt reduces the need for additional power supplies, outlets, and complex electrical wiring. This simplifies installations, lowers costs, and enhances the reliability and security of surveillance networks by minimizing potential points of failure.

FUTURE-PROOFING NETWORKS WITH 802.3BT

As surveillance technology develops and evolves, power requirements will increase, particularly with the growing use of AI-powered analytics and edge processing in cameras. By installing standard [industrial switches](#) and injectors that support 802.3bt, integrators ensure their networks are ready to handle these future demands without needing additional infrastructure upgrades.

CONCLUSION

The IEEE 802.3bt PoE standard represents a significant leap forward in powering modern surveillance networks. By delivering up to 90 watts per port, 802.3bt supports high-power devices like PTZ cameras, wireless access points, and LED lighting while reducing transmission power loss. Whether upgrading an existing surveillance network or planning to develop a new deployment, 802.3bt is a critical solution for enhancing your surveillance network device's scalability, reliability, and efficiency.

For more information on how Antaira's 802.3bt-compliant industrial PoE switches and injectors can optimize your surveillance network, visit www.antaira.com or contact our team members to explore tailored solutions for your needs. We have a diverse line of industrial switches for every application.

America Headquarters

Antaira Technologies, LLC.
Las Vegas, NV 89139, USA

info@antaira.com
antaira.com

Asia Office

Antaira Technologies, Co. Ltd.
New Taipei City 231, Taiwan

info@antaira.com.tw
antaira.com.tw

Europe Office

Antaira Technologies SP z.o.o.
02-962 Warsaw, Poland

info@antaira.eu
antaira.eu

