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POWER OVER ETHERNET

It's Electrifying!

Power over Ethernet is taking video surveillance installations by storm. Here's how you can make the most of the technology.

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Introduction

All networked products – whether computers, phones or network cameras – have two things in common. First, they require a network connection, and second, they require power. The network connection is normally provided via network sockets at the location of the product, while power typically means "find the nearest power socket."

However, simply plugging networked products into the nearest wall socket creates a number of problems. A primary concern is the location and number of available AC outlets. AC outlets are often in easy-to-reach locations, so employees may unknowingly unplug cameras to use the AC outlets themselves. In addition, cameras are often installed near the ceiling – in areas where power outlets are generally not available. Retrofitting so that AC outlets and electrical wiring are in the "right" places can be extremely difficult, and it can add significant cost and time to the installation process. Also, in the case of a power outage, it can often take a long time to locate the correct fuse or circuit breaker in a large building.

Fortunately, Power over Ethernet (PoE) is rapidly gaining ground in the security industry. PoE combines power and data transfer in a single conventional network cable, which eliminates the need for local power at the device level and creates a simple, cost-effective solution for installing the network and power supply. If a system is designed and installed correctly, this can be done with no drop of network performance.

1 About the Standard

The functionality of Power over Ethernet is regulated by the IEEE 802.3af standard, which covers all power, connection and disconnection requirements for PoE-enabled products. The standard actually covers two different means of carrying power, and all PoE-enabled products must be compliant with both methods. The first method uses the spare wires (4, 5, 7 and 8) in the network cable, while the other uses the data wires (1, 2, 3 and 6) and "Phantom" feeding. Phantom feeding means that power and data share the same physical wires. The standard also addresses the connection and disconnection of devices. This means that if there is no device connected to the network socket, or if a device does not support PoE, no power will be supplied to that port.

The standard also provides for 48 Volts Direct Current (VDC) and a maximum of 15.4 Watts per port. Due to normal losses over a cable run, a PoE-enabled device must not use more than 12.95 Watts.

2 System Requirements

In order to implement a PoE system, devices need either built-in functionality or an external splitter. The splitter is a small device that divides network and power into two separate functions, and provides PoE functionality to products without built-in support.

In a standard network video installation, Ethernet cables are run from the network switch, through a patch panel, out of the data room, terminating in network sockets throughout the building or facility. Network cameras are then connected to these sockets using a short connection cable.

If a switch is already installed, the simplest way to add PoE is by using a midspan, which is a standalone injector that simply adds PoE functionality to an existing network. Midspans are available from companies such as PowerDsine. In new installations, it is best to add an endspan, which is a switch with built-in PoE functionality, available from leading manufacturers such as Cisco, 3Com, HP and Netgear.

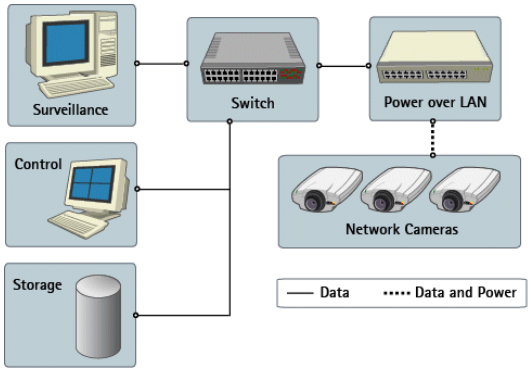

Figure 1: Network video system architecture using Power over Ethernet, with a multi-port midspan

As with any other IP-based system, a surveillance system using PoE should be designed with at least 15-20 percent spare capacity, so that the system can be easily expanded. Populating all ports on a midspan or endspan right from the start would limit the ability to quickly add a camera or swap a port.

3 Pros and Cons

In addition to cost savings at installation, there are several other benefits associated with PoE systems. For example, it is easier to change the position of a camera because it is no longer necessary to install a new power outlet in every location. It is also easier to implement a backup UPS (Uninterruptible Power Supply) in the server room, so the entire camera network system can continue operating during a power outage. Additionally, PoE can be regarded as a true global standard for power, as opposed to regular wall sockets, of which there are numerous regional and local variations – as anybody who has travelled globally is well aware.

Despite these benefits, there are still a few technological restrictions. These include limitations in cable runs and the use of outdoor housings, PTZ (Pan/Tilt/Zoom) cameras, wireless cameras, and add-on products.

As with a normal network cable, the maximum distance from the switch or midspan to the device is about 328 feet (100 meters). Some systems may operate at longer distances, but functionality and performance cannot be guaranteed.

When using PTZ or dome cameras, the power specification is higher than can be provided by the PoE standard. Therefore, additional power will be needed at the device. The same is true for network cameras in an outdoor protective housing. Because the housing is normally equipped with either a heater or a fan to regulate the internal temperature, the required power level is greater than that provided by the PoE standard.

Additionally, some network cameras can power third-party devices, such as microphones or speakers, through separate connectors on the camera. This functionality is only available if the cameras are powered using the regular power supply, because the camera will consume more power than the standard allows.

To deal with the limitations on power in the IEEE 802.3af standard, a new standard is being developed. Official work on the new IEEE 802.3at standard began in September 2005, with the focus on extending the current solution by using all four pairs of a conventional network category 5 cables,

to provide up to 30 watts of power. The higher power available with this future standard should make it possible to connect new types of self-powered equipment to the camera, making the standard even more applicable to video surveillance.

Wireless cameras, of course, do need to be powered locally. This is simply a requirement of the technology's design. However, there are several wireless access points with embedded PoE functionality available, which simplifies installation.

Although there are still a few limitations to the technology, the benefits of PoE are generally far greater, particularly for large-scale applications. PoE can greatly reduce installation time and costs, and makes a security system far more reliable. As the technology advances, PoE will be able to handle even higher-powered applications over increased distances. These are compelling reasons for security dealers and installers to embrace the technology today and educate their customers about the advantages of combining data and power over a single network cable.

About Robert Moore

As the Canadian sales manager for Axis Communications, Robert Moore is responsible for new business development and sales in the country. He also manages Axis' relationships with key distribution and channel partners.