Power Without the Struggle: How to Get the Best from PoE

by Lain Crouch

Power over Ethernet (PoE) compatibility is now a standard feature on most network cameras, and is gaining popularity across the spectrum of IP surveillance and access control applications. Indeed, a growing proportion of IP devices now do not offer a conventional power connection at all. However, PoE technology has much more to offer than the obvious cost and time savings of being able to wire equipment for power and data using a single connection. This article shines a spotlight on these little known features of PoE and how you can use them to get the most out of your networked security installation.

Wired for power

Before elaborating on the more subtle aspects of PoE, it is worth giving a summary of the different PoE-enabled devices that are available, as this is the best way to understand the basics of the technology and how it is used.

Any equipment that is designed to receive its electrical power requirement from its network connection is known as a powered device, or PD. PDs are typically application-specific devices found at the edge of the network. They include network cameras, access control panels and card readers, wireless access points and VoIP phones. They must be installed at specific locations, often far from the nearest power outlet, so there is a clear benefit to reducing their installation requirements to a single network cable.

Even if a remote IP device is not PoE-

compatible, it can often be upgraded by the addition of a PoE splitter. As the name suggests, these split the incoming connection into a conventional network port, and a separate power supply, which is converted into a level suitable for the device. For example Veracity's OUTBREAK splitter can deliver a standard network connection and separate 12 volt supply for an IP camera, effectively

converting it into a PoE powered device.

At the other end of each PD's network cable, there must be another device which can deliver the electrical power onto it. Such devices are collectively referred to as power sourcing equipment (PSEs) and are divided into two types, known as midspans and endspans, according to their location on the cable. A midspan injector is used to

Figure 1. Upgrading a network link to PoE
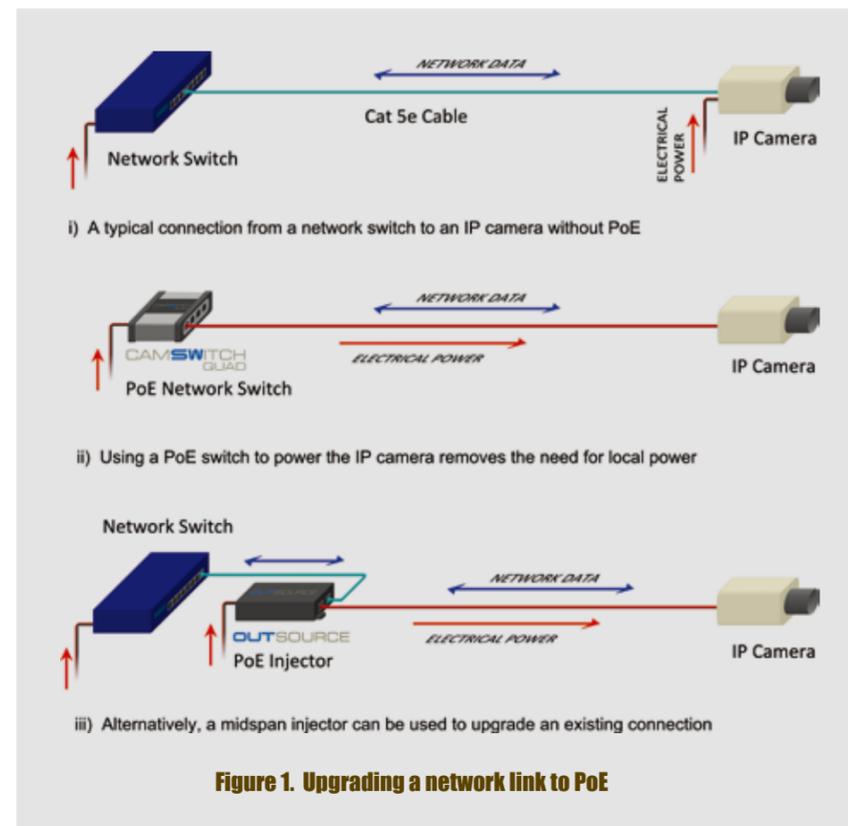
add PoE capability to an otherwise data-only connection. So a network switch channel can simply be patched through a nearby midspan, to add PoE capability before the cable run continues out to the PD. An endspan combines both PoE injection and network data connection and is typically a PoE network switch. In this case all that is required is a direct network cable connector between the PoE switch and PD.
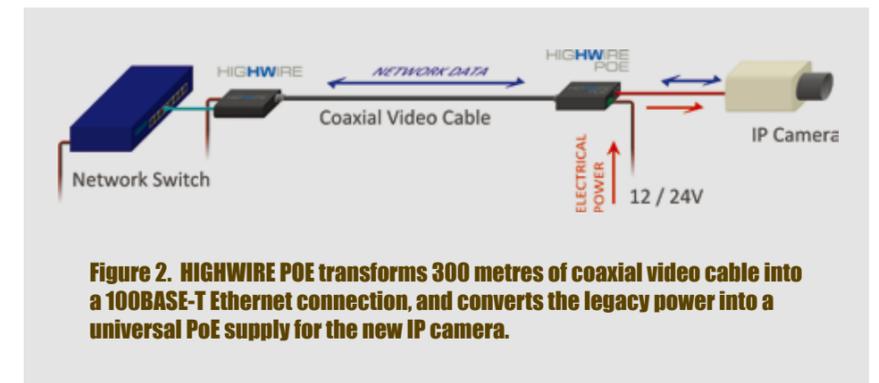
Both midspan and endspan PSEs are available in a range of sizes and capabilities to suit the needs of the application, from single-port injectors or edge PoE switches to multi-port rack-mounted devices featuring sophisticated management. The choice between the two also depends on the application: midspans offer flexibility of configuration and upgrading, but they require extra space and the overall cost may be higher.

Veracity's CAMSWITCH QUAD is a PoE switch designed specifically for networked video applications, and the OUTSOURCE midspan range enables enhanced PoE to be injected onto even Gigabit Ethernet connections. Figure 1 illustrates both alternatives.

Optimised power delivery

With Power over Ethernet switches and midspan injectors widely available to support the growing array of PoE-powered devices on the market, security installers have a straightforward option for delivering power to devices where no local outlet is available. But PoE is more than an option or afterthought: if it is regarded as the default means to wire power to IP devices, and if systems are designed with PoE in mind, then installers can fully exploit all the other advantages that PoE offers over conventional power wiring.

An important advantage PoE has over other means of low-voltage wiring is its universal application. The majority of PoE equipment on the market today is compatible with the IEEE 802.3af standard, which means that PDs and PSEs around the world can be relied upon to connect and power up immediately.

Figure 2. HIGHWIRE POE transforms 300 metres of coaxial video cable into a 100BASE-T Ethernet connection, and converts the legacy power into a universal PoE supply for the new IP camera.

Standard network cable such as Cat 5e is used, and inconvenience of dealing with a range of bulky or incompatible external power supplies is avoided.

Veracity's HIGHWIRE POE allows installers to take advantage of PoE's universal compatibility when replacing analogue CCTV with a digital networked installation. HIGHWIRE technology instantly converts existing coaxial infrastructure into an Ethernet network which new IP cameras may be connected to, saving the time and expense of installing new cabling. However these cameras often cannot be used with the legacy 24 volt AC or 12 volt DC power that is available. HIGHWIRE POE solves this problem as well, by converting the legacy supply into a universal PoE source for the new camera, as shown in figure 2.

PoE also stands out by employing safety measures that protect the users and equipment. PoE uses an isolated, safe voltage level, so cable does not have to be buried or installed by a qualified electrician. Further to this, the use of signature detection means that the PSE will only enable power delivery to recognised devices, and it also monitors power levels continually, so power can be cut in the case of an overload or short circuit, or if the device is disconnected. This means that non-PoE devices can be connected to PoE switches safely, as no power will be enabled. In this case the link will just be a regular data connection.

As well as being safe, PoE is also optimised for efficiency: its voltage is high enough to carry power efficiently to cameras over a regular gauge network cable. In addition, each PD can display a

power class - an indication of how much power it may require - which enables PSEs with a limited budget to allocate it effectively between its ports. Using a standard network cable at a safe voltage also enhances the flexibility of location that PoE devices can boast: cameras or wireless points can easily be relocated post-installation to meet the changing needs of the site, without the time and expense of installing new electrical outlets.

Finally, PoE's reliability sets it apart from other power delivery means for network equipment. Because PoE power is standardised and managed, and is less susceptible to the risks of accidental unplugging, or loose wires or DC connectors, installers can be confident of fewer surprises in operation. Moreover, the deployment of PoE across a network means that all remote devices draw their power from a single, central source. This means that an uninterruptible power supply (UPS) can be used for back-up, and that devices can be disabled and reset remotely.

Enhance your network

All of these aspects can be taken into consideration and capitalised on when a networked security system is designed. For example, the universal connection to devices and ease of relocation without new electrical cable means the installation should be more predictable and repeatable, so the time and expense built in as a planned contingency can be reduced. Also, device power requirements can be planned and budgeted for, with UPS back-up if desired, and the enhanced

power management and control available should reduce the frequency and expense of engineer call-outs post-installation.

In addition to this, however, is a feature inherent to PoE that transforms the way networks can be designed, in terms of both the network's structure and its physical layout: because power and data are carried on the same cable, this same power can be used for the nodes of the network itself, as well as the powered devices found at its edge. This is of particular relevance to IP surveillance and security networks, where equipment must often be distributed across large sites, so Ethernet's 100 metre cable length limit becomes an issue. By combining a PoE-enabled network with Veracity's OUTREACH range these limits can now be overcome, without losing the benefits of lower installation cost, and enhanced flexibility and reliability, that PoE brings.

For applications where a single cable run of more than 100 metres must be made, deploying PoE means that a Veracity OUTREACH can be used to extend the connection without restricting the network bandwidth. IP cameras may be located several hundred metres away from a control room, as they would be with an older analogue installation. However none of the benefits of PoE-enabled networking are lost: all power for the camera and network equipment can be sourced from the same central location, so no electrical cabling needs to be installed at the edge of the network.

As well as allowing network range to be extended, PoE enables the network to be distributed across a wider area without relying on AC-powered equipment. Veracity's OUTREACH QUAD is a network switch that is not only powered by PoE but has the ability to forward it to other devices. This means that up to four IP cameras, access control panels or other PoE devices can be branched off a single network cable run, allowing flexible location and reliable power at first installation, or easy addition of devices as they are required.

Figure 3 shows how OUTREACH and OUTREACH QUAD can be used to locate PoE-enabled Ethernet far beyond the 100 metre radius they would otherwise be restricted to. Only Veracity's Power
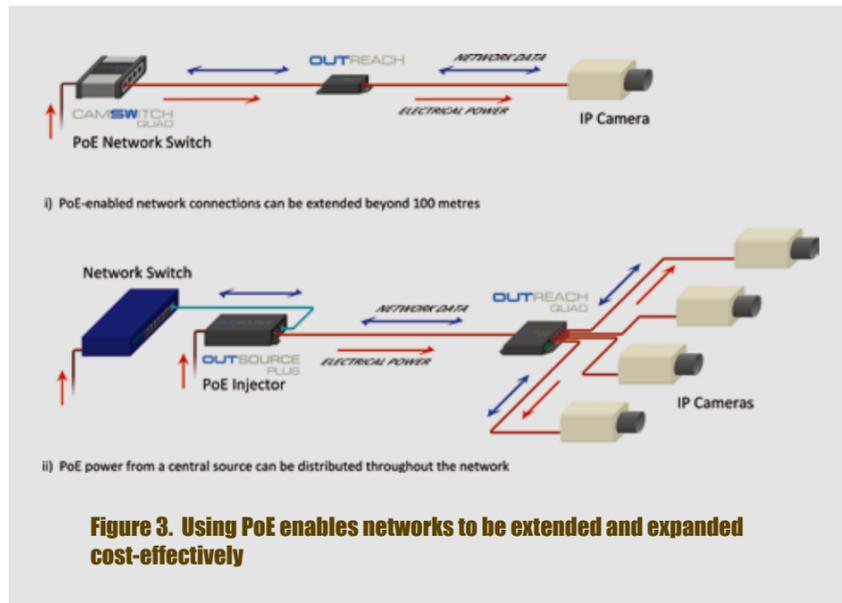
Figure 3. Using PoE enables networks to be extended and expanded cost-effectively

Promise technology (patent pending) makes it possible to reliably extend and distribute PoE power in this way, without any risk of overload or drop-out of equipment.

This self-powering ability of PoE-enabled networks is further enhanced by the advent of the recently-finalised PoE Plus standard (802.3at). PoE Plus is backwards-compatible with the present standard, but increases device power from 13 watts to over 25 watts. This means that a single cable run can be distributed by OUTREACH QUAD to several cameras or access panels, or to other powered accessories such as lamps and door interlocks. It also makes PoE possible for external cameras which require additional power for fans or heaters.

Lastly, it is worth noting the benefits of PoE deployment even for networks where it is not otherwise required, such as a typical small office LAN. As well as the potential for range extension, using PoE to power edge switches means they can be located wherever is convenient and can be reliably powered from a central UPS. Furthermore, Veracity's OUTREACH QUAD LITE provides a fast and low-cost means of adding ports to a network: simply connecting it to a PoE-enabled outlet makes four standard network ports available for extra PCs, printers or other equipment.

Conclusion

Power over Ethernet technology is universal, flexible, safe, efficient and reliable by design, and these features yield returns on investment even when PoE is simply used as a replacement for traditional DC or AC wiring. It can be designed into a network or added retrospectively, and its universal application combined with HIGHWIRE Ethernet-over-coax technology provides a one-stop solution to upgrading from analogue to digital video.

In addition to being a highly efficient means of delivering power to devices, PoE greatly enhances the scalability and flexibility of networks, even for installations where PoE is not required. By combining reliable network power with intelligent Power Promise management technology, the Veracity OUTREACH range of PoE-powered edge switches and repeaters can be deployed to enable an optimised PoE-enabled network to extend across the entire site.

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