

The Latest Developments in PoE Technology: PoE Plus Has Arrived

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An industry-wide Power over Ethernet (PoE) standard was officially ratified in 2003 with IEEE 802.3af, and since then the use of PoE technology has rapidly grown. Analysts estimate that by 2012 one quarter of all Ethernet ports will be PoE-capable¹. As knowledge of PoE's capabilities and benefits has spread, more and more system operators have taken advantage of PoE technology. However, the IEEE 802.3af standard has a few limitations that make it unsuitable for certain demanding applications. In response, the IEEE 802.3at standard, also known as PoE Plus, was ratified to further expand the scope and capabilities of standardized PoE devices. This white paper will identify the key additional advantages offered by PoE Plus and explore the enormous potential of this new technology in scenarios that previously could not take advantage of PoE.

PoE: A Brief History

It is would be more efficient if Ethernet cables could deliver both data and power. PoE makes this possible.

Ethernet technology has been used for decades and Ethernet cables can now be found in enterprise offices, residential homes, and industrial automation. In most systems Ethernet cables already go nearly everywhere, so it would naturally be more efficient if these Ethernet cables could deliver both data

¹ VDC Research, "Power over Ethernet, Global Market Opportunity Analysis" Third Edition, 2008

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and power. This would completely eliminate the need to find a local power supply for each of your devices, dramatically expanding device deployment flexibility and eliminating power cabling costs. The PoE idea was so promising that many vendors, such as Cisco, 3Com, and Intel, developed proprietary PoE technology. Users who adopted proprietary solutions were on the “bleeding edge” of technology—while they enjoyed the benefits of PoE technology, they also needed to deal with countless headaches such as interoperability and compatibility issues, vendor lock-in, and inconsistent support. The fact that these proprietary solutions were used at all, despite their many hazards, testifies to the fundamental usefulness of PoE technology.

Fortunately, in 1999 the IEEE began to work on a PoE standard, which was finalized in 2003 with IEEE 802.3at. With a standardized, documented, and widely available technology, PoE technology truly took off. PoE can supply power to devices in locations where it was previously difficult, if not impossible, to deliver power. Examples of such devices include remote network switches, security cameras, and outdoor WLAN access points².

Emerging Limitations of IEEE 802.3at

IEEE 802.3af was a great start, but many Ethernet-connected devices simply need more power.

As useful as PoE has proven to be, it has become clear that the IEEE 802.3af standard falls short when it comes to certain demanding scenarios. Power sourcing equipment (PSE) with 802.3af PoE technology can only provide a maximum of 15.4 W of power to powered devices (PD). There are many Ethernet-connected devices, such as the following, that simply need more power:

PTZ/Outdoor Cameras: Low-power IP cameras are well-served by existing 802.3af PoE technology. However, cameras with Pan/Tilt/Zoom (PTZ) functionality are increasingly popular, and these cameras use more power in

² For more detailed information on PoE IEEE 802.af and its benefits, see “PoE Switches for Industrial Networking” (http://www.moxa.com/support/request_catalog_detail.aspx?r_id=2047)

order to operate their motors. Cameras that are ruggedized for operations outdoors, especially in harsh conditions, also need more power in order to use their heating units. It would be nice to be able to use 802.3af PoE technology to supply power to each outdoor camera, but 802.3af just isn't up to the task of providing enough power for these devices.

LED Display Boards: Ethernet-connected LED display boards display up-to-date messages from the network. These display boards use bright light-emitting diodes, which demand substantially more power than the 15.4 W available over an 802.3af PoE line.

Long Distance LAN Devices: Basic wireless access points can get by with 15.4 W of power. However, high-performance wireless devices that provide wider coverage use high gain antennas and multiple RFs, all of which demand much more power. These high-powered wireless devices are particularly common in widely distributed, remote applications. This is precisely the type of application where power supplies and cables are a major cost—yet the power supplied by 802.3af-compliant PSEs is too weak to offer a viable alternative to conventional power sourcing.

How “PoE Plus” Transforms PoE Applications

In September 2009, the IEEE ratified 802.3at (“PoE Plus”), which dramatically improved PoE's ability to meet the requirements of more demanding applications. With PoE Plus, it's possible to use just an Ethernet cable to deliver power to more power-hungry devices. PoE Plus offers the following key advantages over conventional PoE:

More Powerful: IEEE 802.3at technology increases the power delivered to PDs to 34.2 W, which is nearly double the power delivered by the old PoE technology. With this extra power, it is possible to use the Ethernet cable to deliver power to devices such as outdoor cameras, LED display boards, WiMax devices, and even some embedded computers or terminal computers.

This capability alone unlocks the possibility of using PoE in applications that were previously too demanding for PoE technology.

More Efficient: PoE Plus is not only more powerful, it is also more efficient. IEEE 802.3at defines a new method of communication and identification between PSEs and PDs. In 802.3af, classification on the hardware layer (Layer 1) was optional. In 802.3at, this identification is mandatory. What's more, 802.3at adds an additional data-layer (Layer 2) classification mechanism, known as the Link Layer Discovery Protocol (LLDP). LLDP allows the PSE to repeatedly request status information from the PD and dynamically allocate power in response. This means that PDs will use more power efficiently and only request maximum power when it is needed. Power efficiency is particularly useful for applications that must be frugal in their power consumption, such as remote applications powered by batteries or solar cells. However, less power consumption will translate into an improved bottom line no matter the application, simply by reducing the power bill.

	PoE	PoE Plus
Standard	IEEE 802.3af	IEEE 802.3af
Power supplied	15.4 W (12.95 W delivered)	34.2 W (25.5 W delivered)
Power allocation	PD on/off	0.1W Increments
Layer 1 (Hardware) Classification	Optional	Mandatory
Layer 2 (Data) Classification	None	LLDP
Supported Powered Devices	IP Cameras, IP Speakers, Sensors, Some Wireless APs	All PoE devices, and PTZ Outdoor Cameras, WiMax APs, LED Display Boards, Some Computers

PoE and PoE Plus At-a-glance

Now that PoE Plus is available, entire categories of applications previously off-limits for PoE have come into play. Outdoor applications that make heavy use of ruggedized, power-consuming devices can now leverage PoE technology. Applications with limited power resources, such as those powered by battery or solar cells, can now exploit PoE's advanced power allocation mechanisms to maximize their efficiency.

PoE Plus in Action: One Deployment Scenario

Intelligent Traffic System (ITS): Intelligent traffic management and video surveillance has emerged as a popular program for many local municipalities. Traffic cameras, sensors, intelligent lights, and embedded computers are often deployed along freeways and roads in order to monitor and improve traffic safety. This means the cameras will be exposed to the elements, and deployed at remote locations. The cameras would need a wide operating temperature range in order to work reliably in this operating environment.

Robust Gigabit Ethernet infrastructures with PoE Plus support are the perfect backbone for ITS networks. Long-distance fiber gives the network enough range to cover the entire traffic grid. Meanwhile, PoE technology allows devices to be deployed anywhere Ethernet cables go, even if a power supply is not available. Using PoE technology also completely eliminates the extra cost of power supplies and power cables.



A complete intelligent traffic system integrates cameras, lights, embedded computers, and sensors—all of which can be powered with PoE Plus

The extra power supplied by PoE Plus allows municipal authorities to deploy cameras even where conditions are severe enough to require highly ruggedized self-heating camera units, and the makes it possible to deploy PTZ cameras in high-traffic locations. PoE Plus also offers enough power to supply local intelligence and front-end control in the form of embedded computers. With this flexibility, systems can perform advanced automated actions such as triggering a camera's zoom function when a car runs a red light. Finally, with LLDP communications maximizing the power efficiency of all the PDs in this network, the entire system will consume less electricity.

The Foundation of a PoE Plus Network: Moxa's PoE Switches

A PoE Plus network begins with the power source equipment, which is responsible for delivering power to the powered devices. Moxa's EDS-506A-4PoE and EDS-206A-4PoE add PoE Plus capability to the time-tested EDS platform, which has proven itself in an array of rigorous industrial scenarios. The EDS-206A-4PoE unmanaged switch supplies power through 4 IEEE 802.3af/at compliant PoE/Ethernet combo ports with 10/100M, full/half-duplex, and MDI/MDI-X auto-sensing to provide an economical foundation for a PoE Plus system, or

future-proof an existing PoE system to support more powered devices. The EDS-506A-4PoE is a managed switch that adds advanced management and protocol support, such as multicast filtering, quality of service, automatic warning, and SNMP security. Both switches feature a flexible 24/48 VDC power input range and provide the option of wide operating temperature models for deployment in truly grueling environments.

IEEE802.3at Takes PoE to New Places

PoE creates systems that are more efficient, reliable, safe, and easy to maintain. Now that PoE Plus is available, PoE is a viable option for even more industrial applications than before. See how PoE Plus has expanded the scope of PoE solutions or request a quotation by visiting Moxa's PoE event site at www.moxa.com/event/Net/2010/PoE_Solutions/index.htm.

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