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White Paper

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Power-over-Ethernet

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Power-over-Ethernet Overview

Power-over-Ethernet enables the delivery of data and power to Ethernet connected devices for simplified installation and significant cost savings.

What is Power-over-Ethernet?

Power-over-Ethernet (PoE) is a technology that enables powered devices, such as a VoIP phone, wireless access point, surveillance cameras, etc., to receive electrical power and data over the same Ethernet cable, supporting the same 100m transmission distance. This eliminates the need for a separate alternating current (AC) electrical connection and power lines to supply power for the device.

PoE minimizes the number of cables that must be strung in order to install a network device, resulting in reduced costs, less downtime, increased flexibility, and simplified maintenance. PoE devices support 10/100/1000BaseT communication speeds.

For PoE to work, electrical current enters the Ethernet data cable at the power-sourcing equipment (PSE), and exits at the powered device end (PD) in such a way that the power and data communications can coexist on the same cable. Devices are classified into two different groups depending on which wires in the Ethernet cable are used to power the device. Mode A devices use pins 1, 2, 3, and 6 for data communications and those same pins to power the device. Mode B devices separate the data and power by using pins 1, 2, 3, and 6 for data communication and pins 4, 5, 7, 8 to power the device.

Power-over-Ethernet network segments use Category 5 (Cat 5) or higher rated Ethernet cable, which consists of four twisted pairs of copper wire. Power-sourcing equipment such as a PoE enabled switch or PoE Injector utilizes a power supply and is network connected to a powered device. The power-sourcing equipment detects the presence of a connected device, determines if the device is a powered device, and then passes electrical current into the Category 5 cable. The powered device functions solely from the power it receives through the Ethernet cable, bypassing the need for installation of separate electrical wiring and/or additional power supplies.

Standards Development

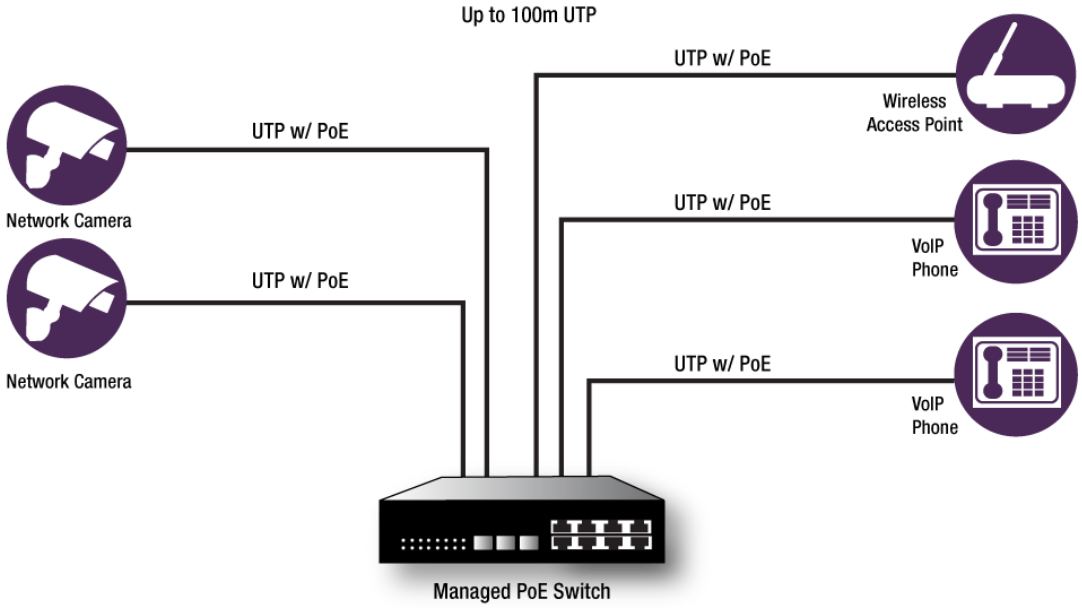
Standards for the use of PoE were first adopted in 2003. The IEEE standards for PoE require that Category 5 or higher cable be used for high power levels, or Category 3 cable for lower power levels.

IEEE 802.3af – 2003 (PoE)
Provides up to 15.4 Watts at 48 VDC to the device

IEEE 802.3at – 2009 (PoE+)
Provides up to 34.2 watts @ 48 V of DC power to the device

IEEE 802.3bt (PoE++ Draft)
Draft standard to provide higher wattage by utilizing all 4 pairs of wires.

PoE Applications



Three Main PoE Applications

1. Network Cameras
2. Wireless Access Points (WAPs)
3. Voice-over-IP Phones (VoIPs)

Benefits of PoE

In addition to cost savings, PoE provides multiple benefits, including design flexibility, increased reliability, and simplified global deployment due to the use of a common power connection in all regions of the world.

Cost Savings
PoE significantly reduces the need for electricians to install conduit, electrical wiring, and outlets throughout the facility. Even where power is available, such as in VoIP phone installations, using PoE can eliminate the cost of AC power adapters. The resulting lower cost of PoE deployment can provide a significant return on investment.

Design Flexibility
PoE enables wireless LAN designers to have increased flexibility when planning out the location of access points, as they are not limited by the need for proximity to electrical outlets. This also makes it easier and less costly for future modifications, such as relocating access points for fine-tuning coverage or increasing capacity.

Increased Reliability
By their very nature, systems requiring fewer electrical cords and power plugs tend to be more reliable, because there is less chance for a malfunction or human interference. For example, critical equipment plugged into an electrical outlet could be shut down by someone unplugging it to use the outlet for other purposes, such as running a vacuum cleaner or fan. Or, an electrician called in to rewire the electrical circuits could inadvertently cut power to an access point. PoE increases system reliability, by reducing the existence of such situations that could disrupt network operations.

Simplified Global Deployment
Today, there are 15 different types of electrical plugs in use around the globe, each having a unique combination of plug or outlet types and voltage/frequencies. The global standard means that PoE enables power delivery to be the same everywhere in the world, regardless of power plug and voltage variations in different countries. PoE benefits manufacturers by eliminating the need to produce a wide range of power connections.

Enhanced Operational Support
Many PoE devices utilize the SNMP (simple network management protocol), which enables remote management of the electrical power supplied to access points. For example, the power to a PoE-enabled access point can be shut off remotely following detection of a security breach. Other SNMP-based features allow systems to be monitored for power supply and consumption levels, which helps to ensure efficient network operations.

Summary

In conclusion, it is clear that Power-over-Ethernet is an innovative technology that provides a more convenient, flexible and cost efficient method for powering network devices.

Implementation of the IEEE 802.3af standard adopted in 2003, enabled organizations around the world to share a method of power delivery that is common to all regions.

Ratification of the PoE Plus IEEE 802.3at standard in 2009, increased the power available to each port. This enabled deployment of new categories of PoE devices, including multi-band wireless access points, video phones (VoIP), motorized remote security cameras with tilt, pan and zoom capabilities, and more.

The IEEE 802.3bt Draft standard, in the process of review, further increases the power available. Ratification of the standard expands the utility of PoE to a wider range of devices including building lighting, thin client terminals, point of sale equipment, and video conferencing equipment.

Today, there are many state-of-the-art solutions that support PoE – including products such as: injectors, switches, media converters, and network interface cards (NICs) – that are available from connectivity integration providers like Transition Networks. For more information about Transition Networks' PoE solutions, visit transition.com.