

5 Steps to Ensure Successful Power Over Ethernet Deployment



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Power over Ethernet (PoE) is a technology that sends electrical power simultaneously with Ethernet data along a single Ethernet copper cable. PoE technology first saw wide-spread use in the IT world for equipment such as Voice over IP (VoIP) phones, IP cameras or printers. PoE's popularity was due to the three main benefits it offers:

- **Cost savings:** PoE uses one cable for data and power, which makes it more efficient and less expensive than using a separate cable for Ethernet and power. These cost savings are seen in both installation and maintenance.
- **Increased safety and reliability:** PoE provides additional safety over a power cable. To avoid damaging the end device, the PoE device sends a 10 volt signal to make sure there is a resistor of 25 ohm before applying full power, preventing accidentally shorts and injuries.
- **Flexibility:** PoE networks can be configured in all types of network topographies, such as ring, mesh, etc... This means there is no need to change devices if a network topography changes. In addition, the single cable for power and Ethernet means simple changes as needs evolve.

These benefits have led to an increase in PoE presence in industrial markets.

PoE Networks - A Quick Overview of Terminology

The first step to developing a network that uses PoE is to understand the terminology.

Device Types

In a PoE network, there are two types of devices, **Power Sourcing Equipment (PSE)** and **Powered Device (PD)**:

- **Power Sourcing Equipment (PSE)** is the piece of equipment that provides the power and Ethernet. This is typically a Ethernet Switch.
- **Power Device (PD)** receives the Ethernet and power from the PSE.

Furthermore, **Power Sourcing Equipment (PSE)** is divided into two categories: **mid-span** and **end-span** devices:

- A **mid-span** (or PoE power injector) PoE device acts a mediator between Ethernet switch that does not have PoE capabilities and an end device. Mid-span PoE devices receive Ethernet data from a switch



PoE/PoE+ Ethernet Switches can send electrical power simultaneously with Ethernet data along a single Ethernet copper cable.

and forward the data with power to an end device. The mid-span device injects power into the copper Ethernet cable.

- A **end-span** device is PoE ready and forwards Ethernet data together with power directly to an end device.

Power Capabilities:

Power Over Ethernet devices are standardized by their power outputs. These standards are governed by IEEE - and the two most common standards for PoE are IEEE 802.3af and IEEE 802.3at:

	IEEE 802.3af	IEEE 802.3at
Common Name	PoE	PoE+
Max power output at PSE	15.4 Watts	34.2 Watts
Max Power available at PD	12.95 Watts	25.5 Watts

New Trend: IEEE recently introduced a new standard that will allow even higher power PoE. This standard is called IEEE 802.3bt, known as 4PPoE (4 Pair Power over Ethernet). The new standard opens up the possibility for two new levels of power: the first will allow 55 Watts of power and the second will allow 90-100 Watts. Each twisted pair of wires will also allow for 1 amp current. IEEE also plans support for 2.5GBASE-T, 5GBASE-T and 10GBASE-T.

Power Negotiation

Most PoE-enabled devices are known as Active PoE devices that can negotiate voltage or wattage requirements by use of an injector in the Ethernet switch that supplies DC voltage to the cable through the Ethernet jack. Devices that cannot negotiate power requirements are called Passive PoE devices and are at a greater risk of damage because the injector does not communicate with the device to negotiate its voltage or wattage requirements.

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1. Determine Your Power Budget

Your **power budget** is the combined amount of power required by all the devices receiving power from the PoE capable PSE. Make sure that the total amount you need is lower than the amount the PSE is capable of supplying. If this is not the case, you will need a different or additional PSE.

2. Understand Your Devices' Capabilities

For reliable PoE/PoE+ systems, all devices must be compliant with either IEEE 802.3af or 802.3at standards, including end devices. It is recommended that all devices should be compliant with the same standard for simplicity of installation. For example, if all of your PoE end devices are compatible with IEEE 802.3af then an IEEE 802.3af switch or a mid-span device will be sufficient to power all of them. If, however, all of the PoE end devices require IEEE 802.3at or if you have a mix of IEEE 802.3at and 802.3af, then IEEE 802.3at switch or mid-span would be required.

If you want to future proof your installation - it is recommended to invest in devices suitable for higher power. This is recommended even if all of the PoE end devices only require power guaranteed by the lower power standard, as PoE+ is backwards compatible with standard PoE.

3. Measure the Distance Between Devices

Due to power dissipation in the copper Ethernet cable there is a distance restriction in which reliable data and power transmission through the cable is guaranteed. The standard distance for reliability is less than 100 meters (328 feet). The distance between a PSE and all its PDs should never exceed this.

4. Check Your PSE Voltage Input Requirement

Before purchasing PSE units, validate the required input voltage for PoE functionality. In most of the cases, 48 V DC is required to enable PoE and 54 V DC to enable PoE+.

If you only have a 24 V DC power source then there are 2 options that can solve this issue:

- The first option would be to purchase an additional DC/DC converter, which would step up the 24 DC voltage to either 48 or 54 V DC and

deliver it to the PSE.

- The second would be to purchase a PoE Ethernet switch with a built-in DC/DC converter. A PoE or PoE+ switch with a built in DC/DC converter can deliver the power required, to an end device, with a standard 24 V DC input.

5. Know the Required Data Transfer Rates

You must verify the required communication speed of your end devices. Different devices support different transfer rates. For example, if you need to connect Gigabit Ethernet (10/100/1000 Mbit/s) PoE vision cameras to a PoE PSE, that PSE must support Gigabit Ethernet speed on its copper Ethernet ports.



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