

PoE Switch – Total Power Consideration

General Description

With the growing demand for PoE-based devices, the offering of PoE switches has also grown. To add to this, the options to provide PoE+ as well as High Power PoE, make selecting the right switch an even more complicated task than before.

This document is written to clarify some of the points that need to be considered when offering a particular switch for a certain job. The document only discusses the need from a power point of view and not from a networking capabilities one (which still must be followed).

PoE Standard and Options

The IEEE standard for PoE requires a minimum category 5 cable. Power is supplied in common mode over two or more of the differential pairs of wires found in the Ethernet cables and comes from a power supply within a PoE-enabled networking device, such as an Ethernet switch, or can be injected into a cable run with a midspan power supply.

The original IEEE 802.3af-2003 PoE standard provides up to 15.4 W of DC power (supported by voltage ranging 37-57VDC) to each device and knowing some power is dissipated in the cable.

The updated IEEE 802.3at-2009 PoE standard, also known as PoE+ or PoE plus, provides up to 25.5 W of power. The 2009 standard prohibits a powered device from using all four pairs for power, however some vendors have announced products that state compatibility with the 802.3at standard and offer up to 65 W of power over a single cable by utilizing all four pairs in the category 5 cable; these are often referred to as High Power PoE.

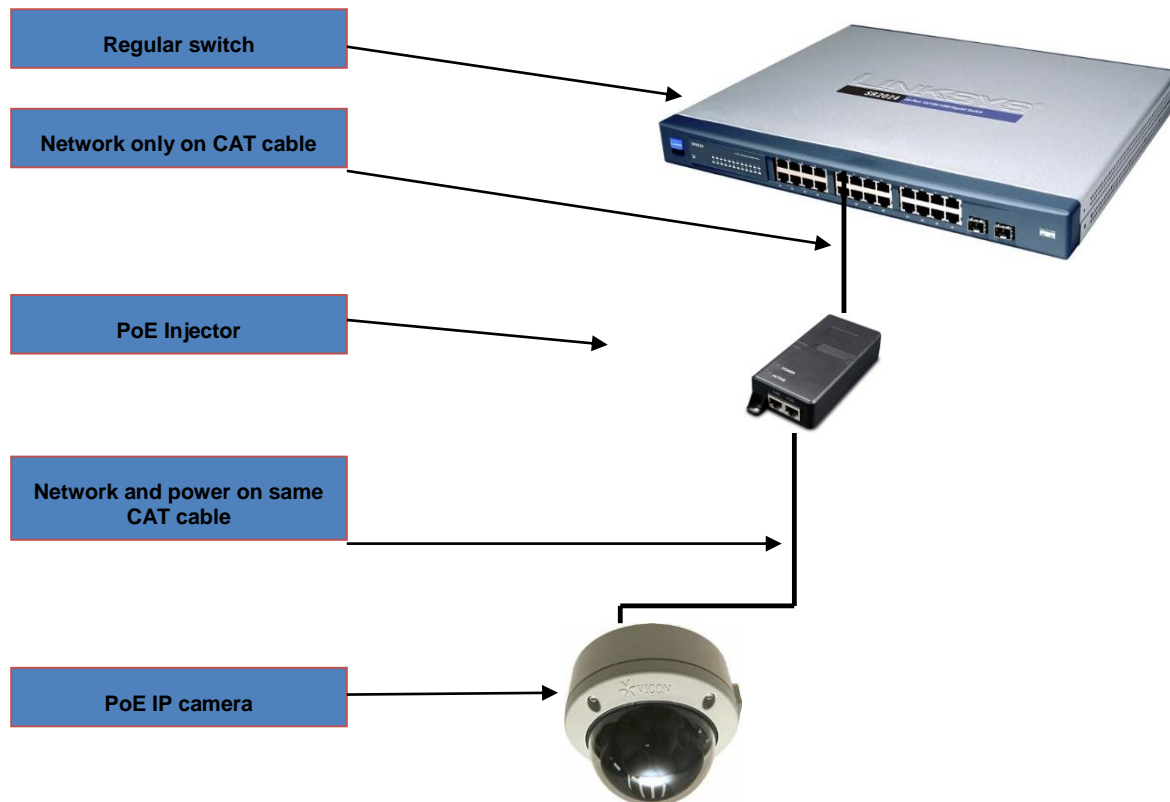
All PoE standards are subject to the same distance limitations for Ethernet, which means the CAT cable length must not exceed ~300 ft or ~ 100 meter.



PoE Source Options

There are a few options to provide Power over Ethernet and those are evolving with the standards:

1. Using a PoE Injector: The oldest method, where the standard network is fed into an injector that adds (or injects) power to the cable and then continues to connect to the camera.



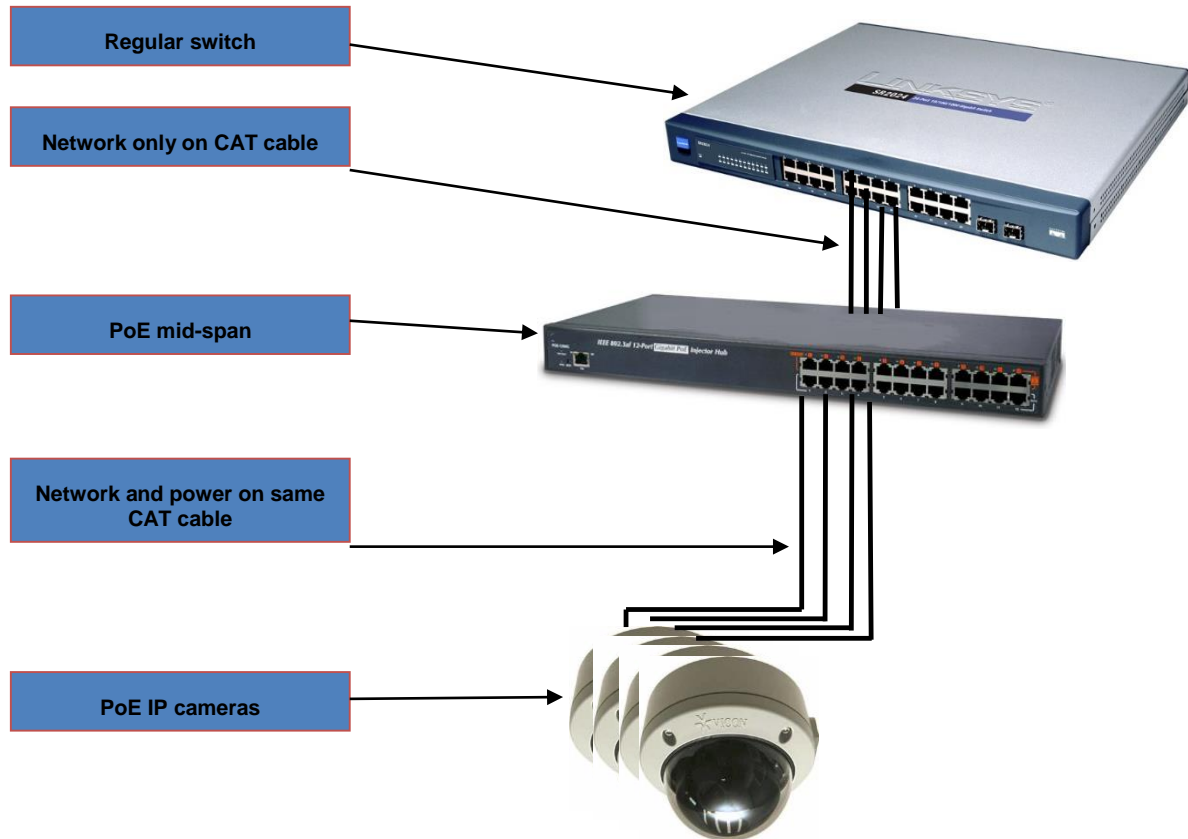
Advantages

- Simple to use
- Can be added onto existing networks with no need to change switches
- Can come in many shapes and sized
- Easy to mount anywhere

Disadvantages

- When multiple PoE devices are used, requires multiple injectors
- Price per camera is relatively high

2. Using a PoE Mid-Span: An expansion of the injector concept, where multiple devices can be connected and get PoE added onto their network connections from a single appliance.



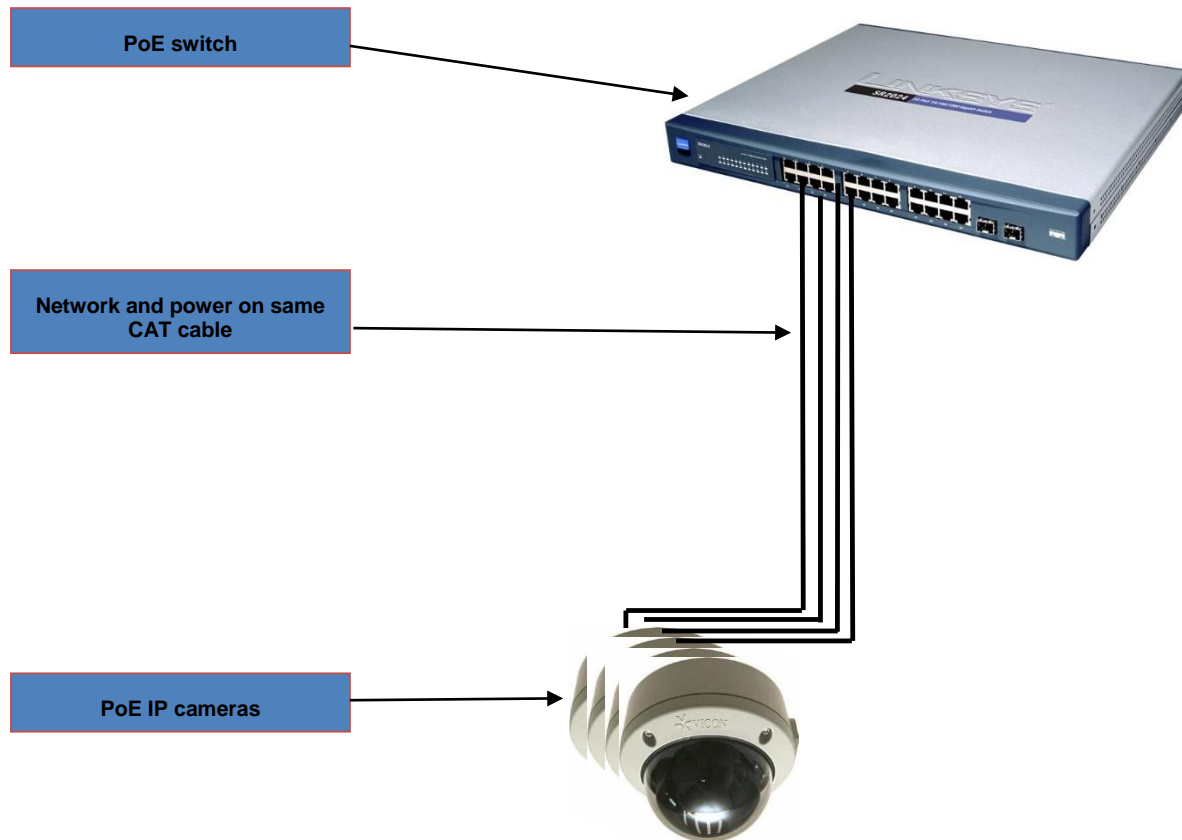
Advantages

- Smaller installation footprint
- Can house any size power supply required
- Can be added onto existing networks with no need to change switches
- Lower price per channel than injector

Disadvantages

- Price per channel still not cheap
- On failure powers down multiple cameras
- Proper installation requires a rack

3. PoE-Enabled Switches: This is the most common appliance today and combines both the network side and the power, delivering them directly to the cameras.



Advantages

- All-in-one box with no additional appliance
- Same interface (i.e., switch web console) can be used to manage both network and power
- Much lower price per channel

Disadvantages

- Usually limited in power supply options based on the physical size of the unit and , therefore, the power supply it can house (see "Switch Specifications" below)
- If PoE cameras are added to existing network with non-PoE switches, those will need to be replaced with these (or use option 2)
- On failure powers down multiple cameras

Switch Specification

Different switch manufacturers have created different ways to describe the total power that a certain PoE switch can provide. As explained above, the main limitation is the physical size of the network switch and the power supply it can contain.

The two most common ways for switch specifications to describe their power are:

1. The specification calls out different power options for different port usage. For example:
On a 24-port PoE switch: The power specifications might read it provides up to 15.4 W for up to 12 ports using PoE and up to 7.5 W for up to 24 ports using PoE. This means that if cameras connected to the switch require more than 7.5 W of power at ANY given time (for example, a heater that kicks in during winter), you need to consider this a 12-port PoE switch.
2. The specification calls out total power for the switch without relating them to ports. For example:
On an 8-port PoE+ switch: The specification might read up to (or total) power of 65 W. This means that effectively, if all ports are being used, we have a maximum ~8 W per port like in the previous example, BUT there are other options such as using a 25 W camera on one port and on the rest of the ports use cameras that pull up to ~5 W, getting to the same total.

Note: Even if your system is designed in a way that only some of the switch ports are used to power-up PoE devices, you may still use the other ports for non-PoE devices, such as powered cameras or computers if suitable.

It is very important, when making the recommendation to use a certain switch, not to assume that it will necessarily support the full PoE rated power level on each and every port simultaneously. Depending on the specifications and how they are presented, look at the devices that are going to connect to the switch and make the appropriate adjustments.

Practical Examples

Below are a few examples referring the standard switches we sell and our IP cameras:

Example 1:

- Vicon model number NETSWITCH-24POE
 - o This switch has 24 ports
 - o Spec states: Up to 15.4W per port. Max PoE power 180W.

Power on maximal load: $180W/24 \text{ ports} = 7.5W$

Options:

V920D series camera spec states they require 6.4W with the heater OFF and 11.8W with the heater on.

- We can use all 24 ports to power V920D series cameras if we know that the heater will not be required, as we keep under 7.5W
- We can only use up to 12 ports to power V920D series cameras if we suspect the heater will be required and will need the switch to provide enough power

Surveyor HD cameras spec states we need ~25W for the indoor unit and ~50W for an outdoor unit (when available with PoE capability)

- With this switch we cannot run a Surveyor HD, even if it's the only camera connected (requires more than maximum per port power)
- The Surveyor HD could be powered using a PoE+ injector for indoor or High Power one for outdoor

Example 2:

- Vicon model number NETSWITCH-8POE+
 - o This switch has 8 ports
 - o Spec states: Max PoE power 65W (no limit per port)

Power on maximal load: $65W/8 \text{ ports} = \sim 8W$

Options:

V920D series camera spec states they require 6.4W with the heater OFF and 11.8W with the heater on.

- We can use all 8 ports to power V920D series cameras if we know that the heater will not be required, as we keep under 8W
- We can only use up to 5 ports to power V920D series cameras if we suspect the heater will be required and will need the switch to provide enough power

Surveyor HD cameras spec states we need ~25W for the indoor unit and ~50W for an outdoor unit (when available with PoE capability)

- With this switch we can run two Surveyor HD indoor or one Surveyor HD outdoor and possibly one or two additional V920D series cameras. Note once we "eat" all the power, the other ports can still be used for non-PoE devices.

Summary

PoE is no longer a trend, it is part of the normal IP CCTV system requirement and works very well when designed correctly. The challenge is to make sure to synchronize between the switch specifications and the camera needs. As the PoE standard evolves, the power we can get from the PoE sources grows and the options grow with it.

From injectors through midspans and PoE switches, there is a solution for every need, as long as simple rules are followed the design stage to ensure we do not end up short of power.

It is very important, when making the recommendation to use a certain switch, not to assume that it will necessarily support the full PoE rated power level on each and every port simultaneously. Depending on the specifications and how they are presented, look at the devices that are going to connect to the switch and make the appropriate adjustments. Consider when a single port injector will make more sense than updating the entire switch to High PoE and when adding a second switch makes more sense than a midspan or vice versa.

As always, it all boils down to the price per port; the additional cost that PoE adds to every camera is expected to be as low as possible, but considering that the alternative is running wire and using a power supply, it is not expected to be free. The stronger the power source on the switch is, the higher the cost of the switch and each port will be.