



Power Over Ethernet (PoE) – 802.3af

Power Over Ethernet (PoE) or sometime referred to as Power over LAN (PoLAN) is a relatively new technology that integrates power onto existing LAN infrastructure – commonly CAT 5 - transparently carrying Voice, Data and Power on the same cabling structure.

The 802.3af Standard

As part of the Ethernet family of standards from the IEEE, the 802.3af new standards sub committee was launched in 1999 – largely driven by PowerDsine, with all the major manufacturers including Avaya, Cisco and Nortel (14 all together), contributing to the standard.

There were four key areas identified that require very clear definitions and standards to be set.

- Set a physical technique for power distribution
- Set voltage, power and other parameters
- Define an end device power requirement detection standard. (signature recognition)
- Determine the standards required for mid span power.

The 802.3af standard was finally ratified on 12 June 2003, with formal publication in July 2003

What is Power Over Ethernet?

Most network devices require power - whether core LAN infrastructure devices such as network switches and routers, or some of the more peripheral components such as IP telephones, Web Cams, Access Points, PDAs etc... Power over LAN integrates power onto existing LAN infrastructure – commonly CAT 5 - transparently carrying Voice, Data and **Power** on the same cabling structure

What devices use Power Over Ethernet?

PoE fits into many Ethernet environments. Whilst Voice terminals in new VoIP networks are a major benefactor of this standard, and probably the key driver behind the new standard, there are many other areas that will greatly benefit from in-line power.

- IP telephone
- WaveLAN access points
- Print servers
- Web Cameras (security cameras)
- Fire alarms
- Potentially any LAN connected device....
- Power could even trickle charge laptop batteries

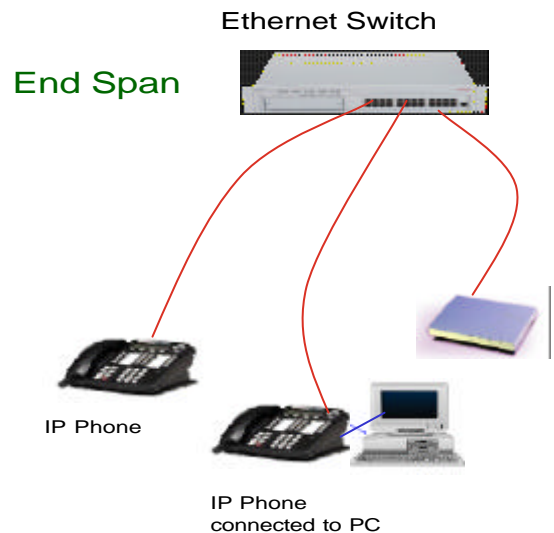
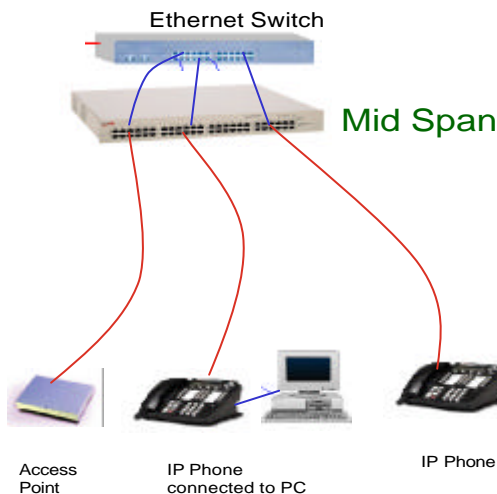
These end devices are known as Powered Devices . (PD)

Power Over Ethernet options

Basically there are four main options for distributing power to end points on a data network. The second two options are Power over LAN, where the end device is capable of receiving power on the same connection and cable as the data.

- Stand alone local power units or supplies
 - Mains voltage directly connected to device or a local external transformer.
- Bulk power supplies units in a frame room
 - Power 'hard wired' onto spare pairs in of data network
- Mid Span power supply.
 - A device that provides in-line power to the spare pairs within the structured cabling. Ports from a LAN switch are connected to a Midspan, which will add power to the spare pairs, without breaking the data pairs. The Midspan will then be patched to the structured cabling and PD's.
- End Span power
 - This is where the LAN switch is able to provide power either to the spare pairs or on the data pairs which are connected to the structured cabling.

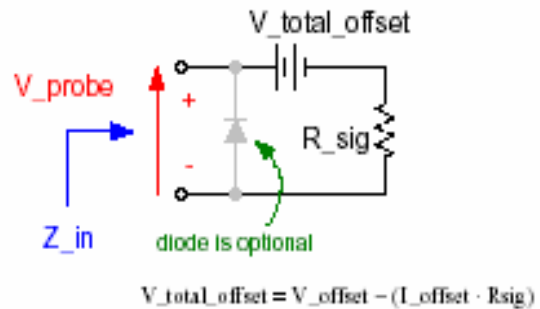
Mid Span and End Span are known as Power Sourcing Equipment (PSE)



Main Technical specifications of 802.3af

- End Span to provide power on either
 - data pairs 1,2 (+ve) and 3,6 (-ve)
 - spare pairs 4,5 (+ve) and 7,8 (-ve)
- Mid Span to provide power on
 - spare pairs 4,5 (+ve) and 7,8 (-ve)
- Powered Device (IP phone etc.) must be able to except power on both the data and spare pairs. Maximum power draw of 12.95W
- Power Output from Power Sourcing Equipment (PSE)
 - 350mA continuous
 - 44Vdc to 57Vdc
 - 14.4W continuous average output power
- Signature recognition method - Resistive:
 - Discovery Probe voltage from PSE - 2.8Vdc to 10vDC
 - Signature Impedance - 20k min, 30k max

Signature recognition specifications:-



What are the benefits of PoE

PoE will revolutionise the way manufactures design and build new products and will open a whole new dimension to network designing.

Whilst the need for PoE has been largely driven by the VoIP industry to power the new IP phones, the benefits spread much further. Remote devices like surveillance cameras and alarms will now only require a single data connection – cheaper and easier to install !

One of the key benefits is that by protecting the core LAN infrastructure with UPS – many other terminal equipments will benefit from the same resilience when using PoE, - at the same time as cutting back on power cabling and outlets.

Even Laptop manufacturers are looking implementing PoE – initially to provide a trickle charge to batteries to extend battery power operation, but ultimately to replace the need for mains power.

What's out in the market ?

Due to the fast pace of growth in the VoIP market, manufacturers have been forced to bring out a whole range of products that will be covered by the 802.3af specification. Most manufacturers are on the Taskforce and have naturally chosen to follow the recommendation as they have developed, – inevitably there have be changes, meaning hardware and software revisions were required.

However some manufactures have gone their own way, both in specification for the Powered Devices and the Powered Sourcing Equipment. These manufacturers have developed their solutions to what has been recognised as 'Pre-Standard'- many of the technologies were developed before 802.3af was established.

With a mix of solution now deployed some compliant to the IEEE standard and some Pre-Standard it can make it very difficult to integrate different components.

Generally, designs involving end equipment (PD's) that utilise Power Over LAN will be subject to 2 options. Upgrading an existing installation, or installing a new infrastructure.

With existing networks where it would be financially unacceptable to swap out most LAN switches, it will generally be better to install a Mid Span – in doing this it would be desirable to purchase both 802.3af standard PD's and midspans or at the very least ensure that there is a easy and practical upgrade path.

When looking a new infrastructure the obvious choice is to go for end spans. Again compliance with 802.3af for PD's and the end Span would be ideal, but if you choose and option where End Spans and PD's will work together but only to the 'Pre-Standard' it would be wise to check that there is an acceptable upgrade path.

There a several variations from the IEEE standard, which some manufacturers are still following, these being the Pre-Standard or even proprietary options. The main areas being:

- PD signature recognition by a Capacitive or tone loopback method.
- Reversals of polarity in the power.