POWER OVER ETHERNET (POE) PRIMER

Powering IP Phones

An IP telephone can be powered via one of three options:

1. Power supplied via an AC adapter running from the phone to the user's power outlet.

2. Power over Ethernet mid-span - Power supplied over the Ethernet cable via an external Power over Ethernet Mid-span.

3. Power over Ethernet end-span - Power over Ethernet integrated into an Ethernet Switch, which offers standard IEEE 802.3af Power over Ethernet.

What is Power over Ethernet?

Power over Ethernet (POE) is a technology that integrates data, voice and power over standard LAN infrastructure. It is the means to supply reliable, uninterrupted power to Internet Protocol (IP) telephones, wireless LAN access points, network cameras and other Ethernet devices, using existing, commonly used Category 5 cable infrastructure.

Power over Ethernet technology saves time and cost of installing separate power cabling, AC outlets and wall warts (AC adapters), as well as eliminates the need for a dedicated UPS (Uninterrupted Power Source) for individual devices. A single UPS placed centrally close to the switches and the Power over Ethernet source will indeed protect both the switches and all the connected devices.

The power delivered over the LAN infrastructure is automatically activated when a compatible terminal is identified, and blocked to legacy devices that are not compatible, thus protecting them and the infrastructure. This feature allows users to freely and safely mix legacy and Power over Ethernet compatible devices, on their network.

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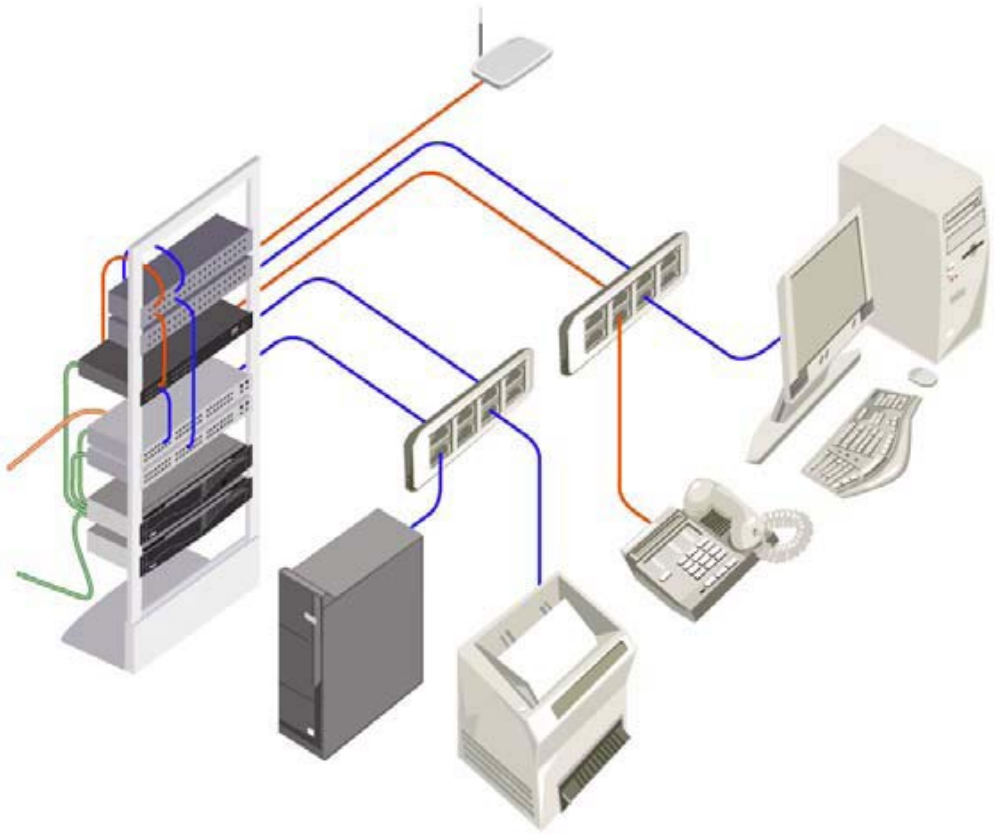

Figure 2: Power over Ethernet Architecture

There are two main implementations of Power over Ethernet Power Source Equipment (PSE):

The mid-span - A patch-panel like device, residing between an ordinary Ethernet switch or shared media device and the terminais. Mid-spans are also referred to as "Power Hubs" or "Power Injectors". Power is added to the spare wires on a category 5
Cable while the data is passed without interruption.

The end-span - Power over Ethernet enabled Ethernet switch. Power over Ethernet is integrated into the switch, and supplied directly from the data ports. Power over Ethernet technology was approved by the IEEE Standards Board on June 12, 2003 (IEEE802.3af-203).

WHY UTILIZE POWER OVER ETHERNET?

The main key drivers for Power over Ethernet are availability and simplicity of installation:

Availability is a key consideration:

Consider the promise of running telephones over data networks, where you can greatly benefit from new applications, such as unified messaging together with significant cost-savings in personnel and equipment using a single voice-data network.

Before Power over Ethernet, businesses could not commit their mission-critical voice systems to run on the data networks, losing data during a power outage is one thing, but losing data and voice during an outage is something else entirely. By supplying power over the same cable as the data network, these systems can now deliver the kind of reliability expected from a business class phone system. Everyone has high expectations for voice service availability. By connecting a UPS to a Power over Ethernet mid-span in the communication room, the entire IP Telephony network is becoming more reliable and ensures continuous operation during a power outage.

Ease of Installation

Power over Ethernet offers a simple means for IP Phone handset installation, eliminating the need for a separate Ethernet link and dedicated AC Power outlet. A single cable is used to transport voice, data and power to desktops. The IP phone is connected to the Ethernet switch and the Mid-span, from which it gets data and power, and the PC is connected to an Ethernet port on the phone.

In environments where an existing ethernet switch has been previously installed, there is no need to purchase and install a new ethernet switch to provide Power over Ethernet functionality. In this case, the simplest means to power the IP Phones over the LAN infrastructure is to add an external Power over Ethernet Mid-span (see figure 2). The advantages include savings in installation costs, preservation of existing infrastructure while supporting pre-standard as well as IEEE 802.3af standard terminals.

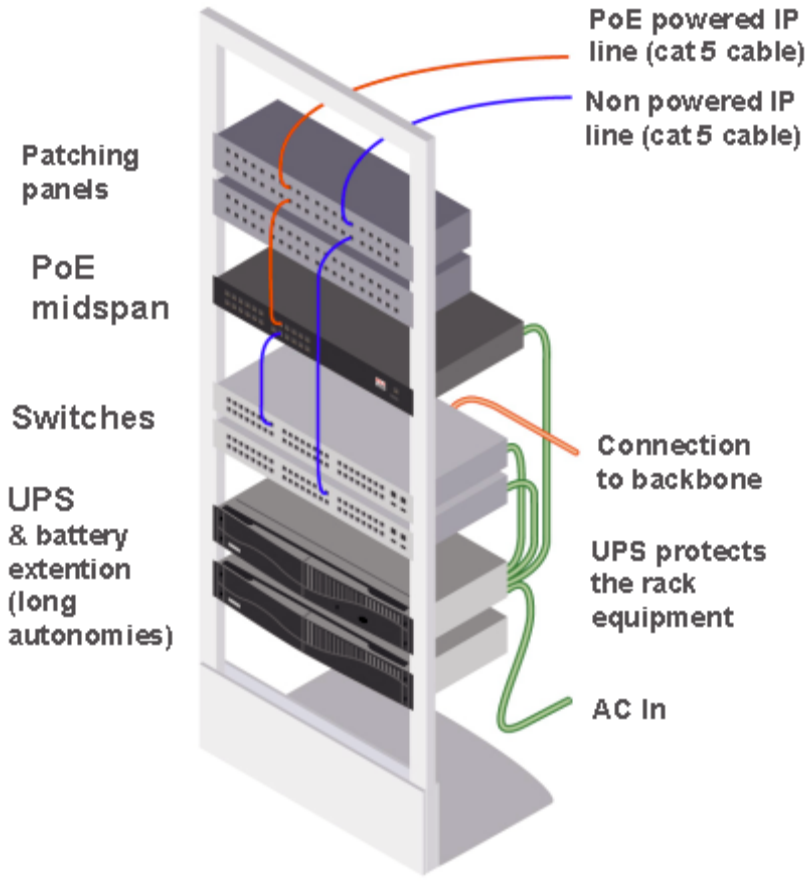

Figure 2 : Integration of Ethernet Switches, Power over Ethernet Mid-span, UPS in the Network Rack

Powering IP phones through an AC adapter, has significant drawbacks: not only this is more cumbersome as two cables (data and power) have to exist on each user's desk, but also (unless each user is equipped with a local UPS), any utility outage will result in the IP phone not being available. It is much more convenient to plan a centralized UPS at the Ethernet switch and the PoE Midspan level that will protect all the IP phones. This is of course also valid if the Ethernet switch/midspan are powered through an outlet that is power protected by a large centralized UPS at the business site level.

PROS OF MID-SPAN POWER

Retains the investment in your existing ethernet switches
Can be deployed only where POE is needed

CONS OF MID-SPAN POWER:

Unit takes additional rack space
Another potential point of failure

ALTERNATIVE TO AN "ALL POE" SOLUTION

It is possible to mix and match POE and locally-powered phones with no adverse affects. Some businesses choose to use POE for management phones. Combined with a battery backup system, this will keep the executive's phones up during power outages.

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TECHNICAL BACKGROUND OF POWER OVER ETHERNET

Because Ethernet 10Base-T and 100Base-TX utilize only two of the four wire pairs available in Cat5 and Cat3 wiring, a simple solution to powering VoIP phone sets was to utilize the spare wire pairs to provide DC current. Power can be injected either at the data switch or by a dedicated "inline" power device located between the switch and the VoIP phone set (also known as "midspan" powering).

IEEE 802.3af

Power over Ethernet is defined by the IEEE 802.3af specification. In 802.3af, a "resistive signature" algorithm is employed to guarantee that only power-using devices are powered: the power source sends out a specific "discovery" voltage (or current) on the wiring pairs used to carry the power, measuring for a current (or voltage) which implies a certain resistance at the device end. This discovery power is small enough to be safe for non-power-using devices. Having found an appropriate resistance, a slightly higher voltage is applied, again measuring for a current that confirms a certain resistance at the device. Having passed both tests, the power source applies full voltage; if the current falls outside of a specified min/max range (e.g. the device is disconnected or a short has occurred), power is removed and the discovery process reinitiated. Minimal additional circuitry is required by this algorithm, which has tested successfully against a wide range of non-power-using legacy devices.

802.3af also states what kind of power is to be provided via the Ethernet and how it is applied to the UTP wiring. This specification is in line with traditional telecom needs: 350mA of nominal 48Vdc current, enough to guarantee a little under 13 Watts of power to the device (at a maximum distance of 100 meters). Most POE switches are designed to only power a portion of the switch ports at any given time, so that the size of the power supply and resultant cost can be held to a reasonable level. Only in an extremely intense calling environment should this cause as capacity problems.