Power over Ethernet for VoIP Applications

White Paper

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Unified Communications

Today's business environment requires constant improvement in technology to support the Unified Communications (UC) experience. Voice over Internet Protocol (VoIP) technology is expanding in scope and in reach, as the business environment continues to adopt and value improvements in VoIP technology; better sound, more mobility, improved connectivity and data sharing, even video conferencing and recent emergence of telepresence functionality, as factors to their success. But one question always remains; how will you power that?

Power over Ethernet technology enables IP Telephony devices to be powered over the existing network-cabling infrastructure, thus avoiding the need for separate power and data cable infrastructure and costly AC outlets or power bricks in user workspaces. Furthermore, it allows the removal of the electricians from the installation process.

By connecting VoIP devices to a remote SNMP management system, organizations can experience additional cost savings through remote device management and scheduling.

What is Power over Ethernet?

Power over Ethernet (PoE) is the technology that integrates data, voice and power over standard Ethernet infrastructure using Cat 5 or better cables. It is the means to supply reliable, uninterrupted power to Internet Protocol (IP) network cameras, IP phones, WLAN Access points, Thin Clients and other Ethernet devices.

Field proven Power over Ethernet technology saves the time and cost of installing separate power cabling, AC outlets and wall warts, as well as eliminating the need for a dedicated UPS for individual devices. The power delivered over the Ethernet infrastructure is automatically activated when a compatible terminal is attached to the network and identified, and blocked to legacy devices that are not compatible. This feature allows users to freely and safely mix legacy and PoE-compatible devices on their network. PoE technology is designed in a way that does not degrade the network data communication performance or decrease network reach.

There are two ways to implement Power over Ethernet:

Endspan PoE enabled Ethernet Switch. Power is supplied directly from the data ports, in a layer 2 device.

Midspan A standalone, plug and play device, residing between an ordinary Ethernet Switch and the end terminals, often referred to as a Power Injector or Midspan. Power is supplied through a layer 1 pass-through (Figure 1).

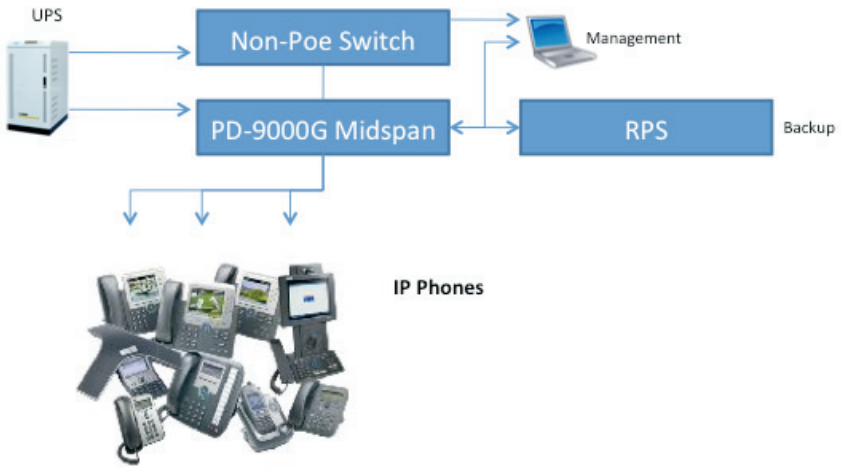

Figure 1: Architecture of Power over Ethernet in the Enterprise

Key Benefits of PoE in IP Telephony

Lower Installation Costs

Electrical wiring costs are greatly reduced. Those costs consist of AC wiring, electricians' fees and AC outlet costs. Alternatively, safe power is supplied to the IP phone or other device over the existing standard Ethernet wires.

Cost Savings through Remote Scheduling

SNMP Remote Power Management tools allow scheduled up and down-time for powered devices. Reductions in power consumption result, as do better control of device utilization outside of business hours.

Increased Reliability

Devices are connected automatically to an uninterruptible power supply (UPS) through the Ethernet cables, increasing reliability and reducing data loss. Further, a redundant power supply (RPS) offers complete reliability of an IP Telephony system for reductions in data loss and increased network security.

Assured Safety with Advanced line Terminal Detection

Line detection enables safe installation without worry of high voltage damage to laptops, desktops and other non-power ready devices, due to a misplaced connection. A faulty camera or an access control terminal can be detected and shut down, preventing damage to expensive switches and patch panels in the Ethernet network. Line detection is one of the reasons why a Power over Ethernet Midspan is much more than an intelligent power source.

VoIP Installation Using Power over Ethernet

IP Telephony systems are being installed today in many different environments. Most common among these:

- Large professional complexes, offices
- Transport terminals, airports
- Large retail stores, shopping malls, casinos
- Higher education campuses
- Healthcare facilities

There are differences in the requirements from the Unified Communications system for each type of environment. An office installation, for example, with its structured environment and high user count will be very different from an education or healthcare installation with more distributed structure and more flexible environment.

This paper focuses on the approach to optimize the VoIP system with Power over Ethernet. Fortunately, most UC device installations share very similar infrastructure.

The Ethernet lines run from the network switch, sometimes through a patch panel, out of the communication room and connect to the VoIP phones and other IP devices (see Figure 2 on page 4). Adding PoE enables devices to be powered over the same Cat 5 cabling infrastructure, providing the most cost-effective solution.

When a Switch is already installed, the simplest means to add PoE is by adding a dedicated PoE Midspan.

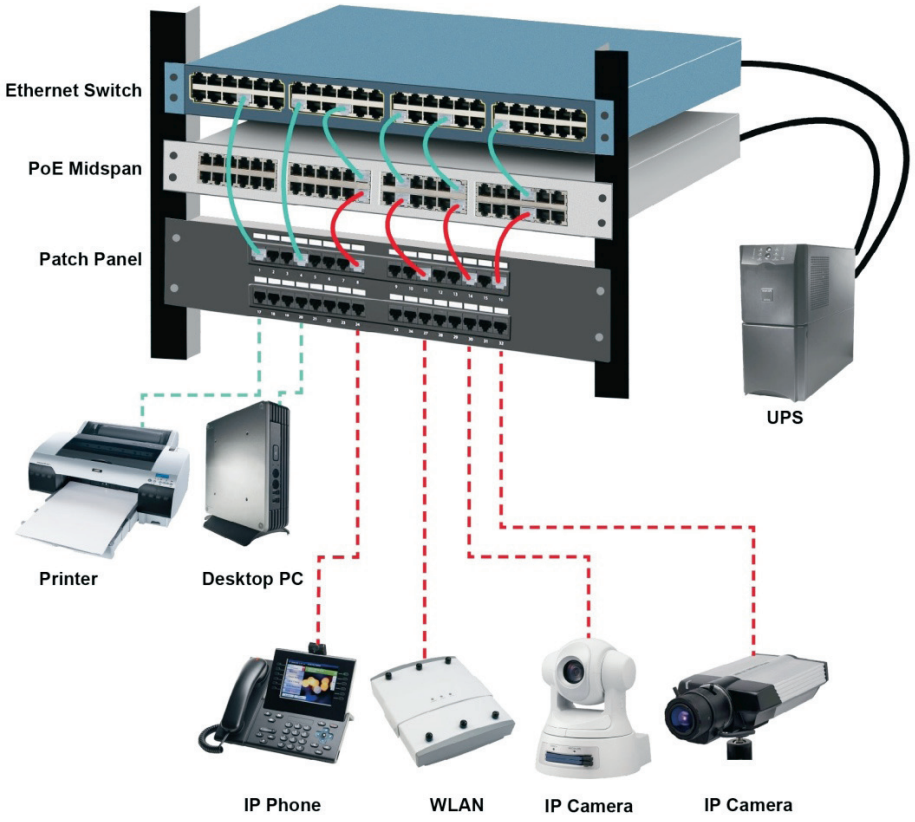

Figure 2: Unified Communications System

Installation Tips

The following are some installation tips, when installing IP based and PoE Powered Devices (PDs):

Power devices using PoE wherever possible.

- Midspans provide a simple convenient (plug and play) means to remotely power-down devices during periods of non-use and power-up again when needed.
- Maintaining UPS capability. This creates reliable power access to the devices and eliminates data loss.

It may be tempting to use some AC outlets that are available, hoping to save some installation costs. This has the following implications:

- **The vacuum cleaner effect** – Cleaning personnel like to unplug devices while cleaning, to use the AC outlet, as they are easy to find. This can cause data loss.
- **The free long distance effect** – Unsupervised service personnel may be tempted to use this opportunity to call home, which may incur International charges.

Install all PoE Midspans in communication rooms and data centers. To minimize tampering with the units and enable central management, 6-port, 12-port and 24-port units should preferably be rack mounted. Single port and 4-port devices can be placed on top of equipment or wall mounted.

Color code cables. This will assist in management and indicate that these cables are not to be touched by maintenance personnel.

Concentrate UC devices to optimize installation costs and effectiveness. Rather than attempting to install the shortest cabling, try to pull network cabling to a single communication room rather than distributing small numbers of device ports in network closets. This will enable selection and flexibility in choosing a Midspan and a higher port density Midspan will save rack space and installation costs.

Non-Standard Devices Using a Splitter

There are IP end terminals that were not originally designed to accept power from the Ethernet. These devices either only accept power through their DC jack while their RJ45 input only accepts data or they only accept voltage levels lower than the standard's 48 volts DC.

By using a passive or active splitter the device immediately becomes PoE ready without any modification required on either side.

How to Select the Appropriate PoE Midspan

Once installed, the VoIP phones Ethernet cabling is pulled to the communication rooms, where the Switches and Midspans are installed.

When choosing a PoE solution, the following aspects should be considered:

- The number of devices to be connected to the Midspan – referred to as port density
- Power consumption of each device
- Future expansion plans

The port density of phones that reach a specific communication room depends on the following parameters:

- Ethernet cable maximum length, which is 100 meters (330 feet) without a PoE extender
- Number of devices needed, per total site
- The geographic stretch of the facility

Non-IEEE802.3 compatible devices: Determine the number of non-standard devices that will need active splitters to reduce voltage or increase amperage.

Number of ports: Once the number of UC devices per communication room has been estimated, select the appropriate PoE Midspan.

Ports Density	Appropriate PoE Midspan
1-2	1-port
3-4	4-port
5-6	6-port
9	12-port
16	24-Port

Room for Expansion: In a similar fashion to Ethernet ports, 1 to 2 spare ports should be available for future growth.

Remote Management and Gigabit support: Determine whether you want to control the power supplied to the phones. Identify the required communication transfer rate (10/100/1000BaseT).

Conclusion

This paper serves as a guide for the optimization of an Ethernet based IP telephony Unified Communications system, utilizing Power over Ethernet. Using the information provided here will assure the installer, user, or IT manager an easier to set up and maintain PoE-based VoIP network. Installation becomes simpler, more reliable and outright cheaper.

PoE Solutions by Microsemi provide IT managers the simplest, safest, most cost-effective solution for installing the network. The advanced features of the PoE Midspans also vastly simplify ongoing maintenance of the network, enabling reliable continuous operation with minimum downtime. The paper discusses the means to optimize features of PoE Midspan.

Advanced detection guarantees safety and interoperability with many Powered Devices.

For more information on Microsemi's PoE Solutions, visit www.microsemi.com.

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