



White Paper

Power over Ethernet in the Security Market

Convergence of Video, Data and Power

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What is Power over Ethernet?

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

Field proven Power over Ethernet technology saves time and cost of installing separate power cabling, AC outlets and wall warts, as well as eliminates the need for a dedicated UPS for individual devices.

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

The Power over Ethernet technology is designed in a way that does not degrade the network data communication performance or decrease the network reach.

There are two main implementations of Power over Ethernet:

The end-span – Power over Ethernet enabled Ethernet switch. Power is supplied directly from the data ports.

The mid-span – A stand alone, plug-and-play device, residing between an ordinary Ethernet switch and the terminals, often referred to as a “Power Hub”. Power is added on the spare wires, with data uninterrupted.

Power over Ethernet is a proven technology, with over 2 million ports installed. As of June 2003, Power over Ethernet is part of the Ethernet network standard (IEEE 802.3af).

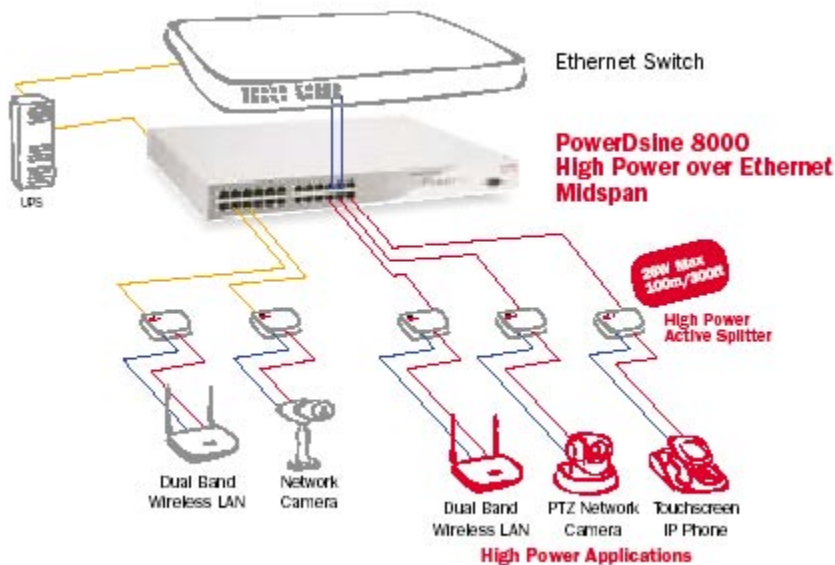


Figure 1: Architecture of Power over Ethernet in the Enterprise



The Revolution of Ethernet Based Security Systems

Security Systems are only useful if they can communicate and control the environment they secure. The video streaming from the CCTV system should be watched and/or recorded otherwise it is useless. Access control devices enable access to approved personnel, while restricting others and must have a central database of the personnel.

As such, the use of the readily available and cost effective LAN based solutions is becoming more and more common.

Professional CCTV systems, which are based on digital streaming of video over Ethernet, becomes natural - as limiting factors of technology, such as quality and rates of video passing over Ethernet are solved. However, once end devices, such as a network camera or and access control terminal are up and connected to the LAN, they still require power to run.

Power over Ethernet technology enables LAN enabled devices to be powered over the network-cabling infrastructure, thus avoiding the need for separate power and data cable infrastructure and costly AC outlets near cameras. Furthermore, it allows the removal of the electricians from the installation team.

Network cameras are traditionally installed in open high places, such as corridor ceilings, airport or lecture halls, etc. The adding of power infrastructure is a costly and long affair, requiring dedicated electricians team for pulling of power cables, changes of building plans and safety approvals.

Once operating, each device used to be connected to a specific electric net, which if down, meant an appearance of unacceptable "holes" in the security coverage.

By allowing the network cameras to be installed where they are most effective and not where the AC sockets are, the actual number of cameras may also be reduced, further reducing the surveillance implementation costs.



Summary of the Key Benefits of Power over Ethernet in the Security Market:

• **Lower IP based security system installation costs**

Using Field Proven Power over Ethernet technology, the electrical wiring costs are eliminated. Those costs consist of AC wiring, electricians' fees and AC outlet costs. Alternatively, safe power is supplied to the IP camera or other device over the existing, standard Ethernet wires.

• **Simple means for resetting digital cameras**

Digital CCD cameras are complicated devices, which tend to need resetting from time to time. A "dark" camera, once discovered to require a reset, forces the IT manager to locate the network camera, reach it, and then reset it. By using Power over Ethernet, it is a trivial matter of resetting, via the camera's respective Power over Ethernet port - Instead of climbing up high ceiling installations.

• **Easy changes to camera positions as needed.**

Altering a camera position, no longer requires a new AC installation. It is even possible to experiment with the camera position to achieve ultimate coverage results.

• **UPS backup for the security network**

By backing up of the Power over Ethernet Midspan in the communication room, the entire camera network can continue operation during a power outage. This is a real must for a high-end surveillance system.

• **Assured safety with advanced line terminal detection**

Line detection is the technology, which enables safe installation without worrying about high voltage damages 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. The line detection is one of the reasons the Midspan is much more than an intelligent power source.



Network Video Installation Using Power over Ethernet

Network Video systems are being installed today in many different environments. Most common among these:

- Transport terminals, airports
- Large retail stores, shopping malls, casinos
- Law enforcement surveillance in public events
- Government and security facilities CCTV
- Universities, schools remote monitoring

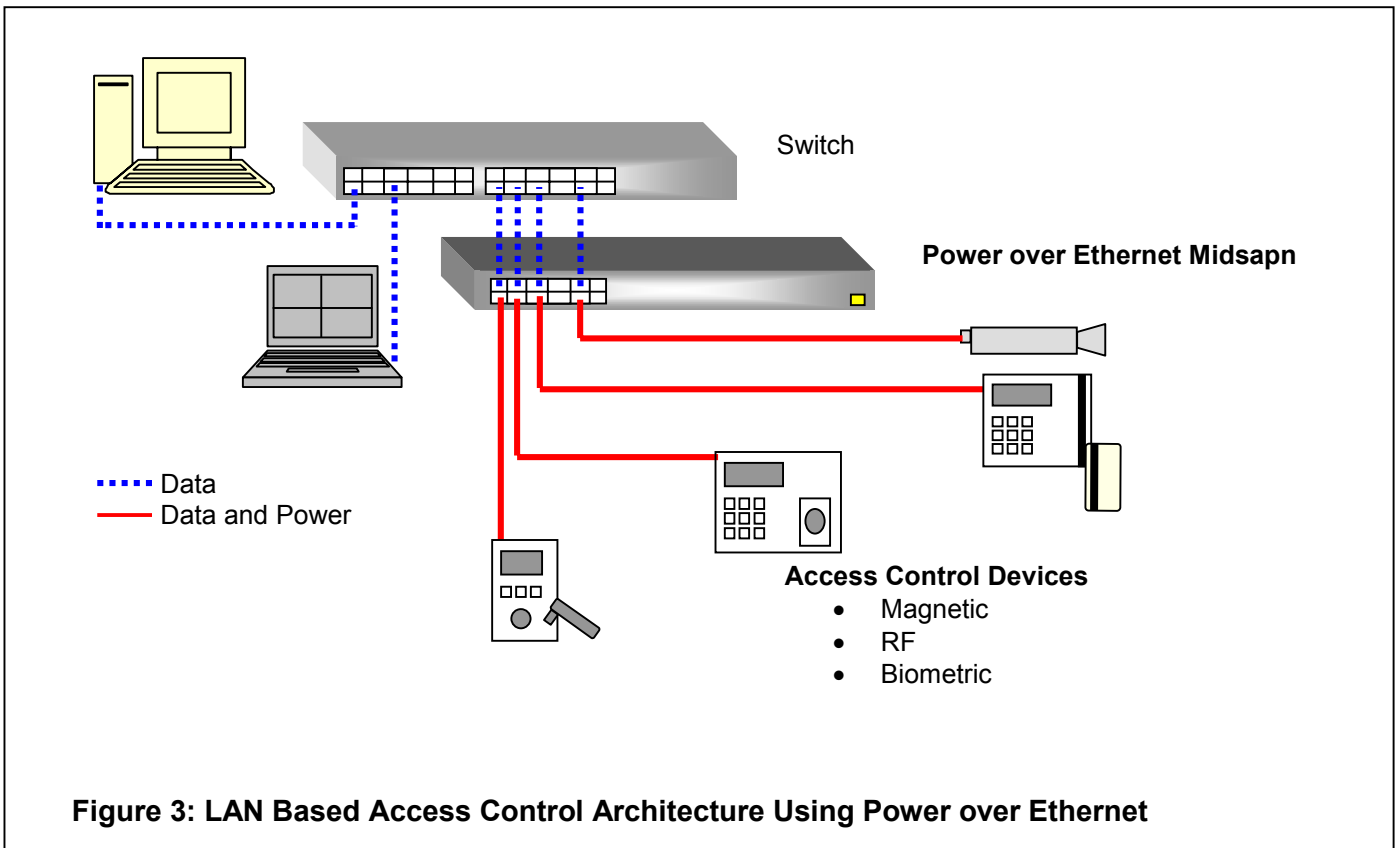
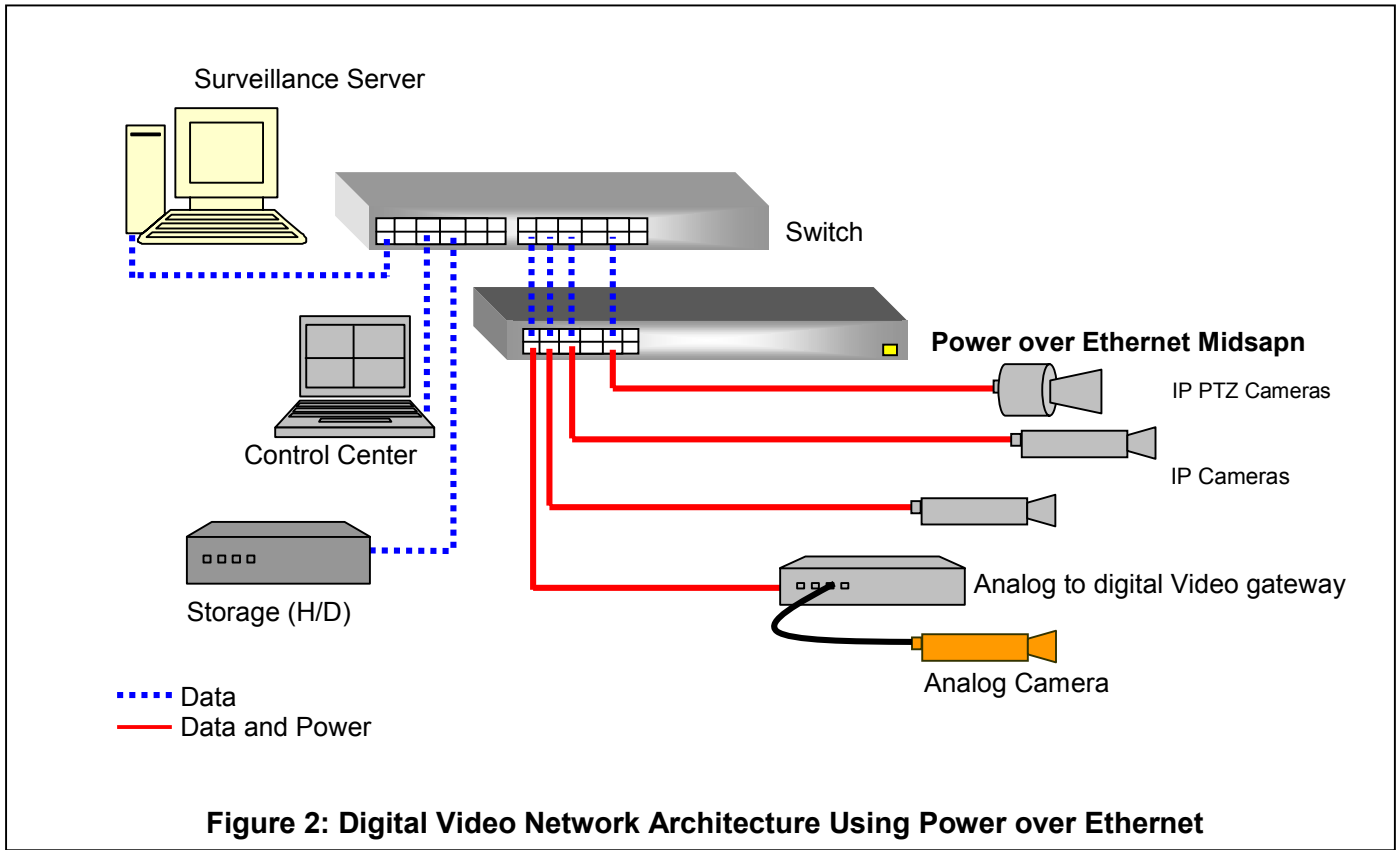
There are differences in the requirements from the surveillance system for each type of environment. A train station installation, for example, with a high camera count and the need for minimum maintenance, is very different from a warehouse installation, with difficult accessibility and the need for durability, and so on.

This paper focuses on the approach to optimize the digital video network with Power over Ethernet.

Fortunately, most Network devices installations, in most environments, share a very similar infrastructure design.

The Ethernet lines run from the network switch, sometimes through a patch panel, out of the communication room and connect to the digital cameras and analog to digital video gateways (see Figure 2). Adding Power over Ethernet enables the cameras to be powered solely through the same cabling infrastructure, providing the most cost effective solution.

When the switch is already installed, the simplest means to add Power over Ethernet is by adding a dedicated Power over Ethernet Midspan.





How to Select the Appropriate Power over Ethernet Midspan

Once installed, the cameras' Ethernet cabling is pulled to the communication rooms, where the switches (and Midspans) are installed.

When choosing a Power over Ethernet solution, the following aspects should be considered:

- ⇒ Number of devices connected to the midspan – referred to as ports density
- ⇒ Power consumption of each device
- ⇒ Future expansion plans

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

- Ethernet cable maximum length, which is 100 m (330 ft)
- Number of cameras needed, per size of the site.
- The geographic stretch of the facility.

Typically, surveillance systems converge to:

1. A high-density site – **over 9 cameras** pulled to the communication room.
2. Smaller or spread installations – **3 to 4** cameras pulled to the communication room.
3. Remote sites and single camera installations – **1 to 2** cameras pulled to the communication room.

PowerDsine offers to the security market two Power over Ethernet Midspan families:

Power over Ethernet 6000 Midspan Series: Perfect fit for the fixed and low power PTZ digital cameras networking market. These products are 1 port unit, and 6 12 and 24 multiple ports units, supporting devices that consume up to 12.9W each.

High Power over Ethernet 8000 Midspan Series: Addresses the higher power consuming devices, such as PTZ network cameras and biometric access control devices. These units are available in 1 port, 6 and 12 ports units.

In order to optimize the distribution of Midspans, the following guidelines should be followed:

1. Concentrating cameras or access control terminals to optimize the installation

Rather than attempting to install the shortest cabling, try to pull network camera cabling to a single communication room rather than distributing small number of camera ports in every communication room. This will enable a selection of a PoE Midspan with a higher port density and save rack space and installation costs.

See the example, presented in Figure 4.

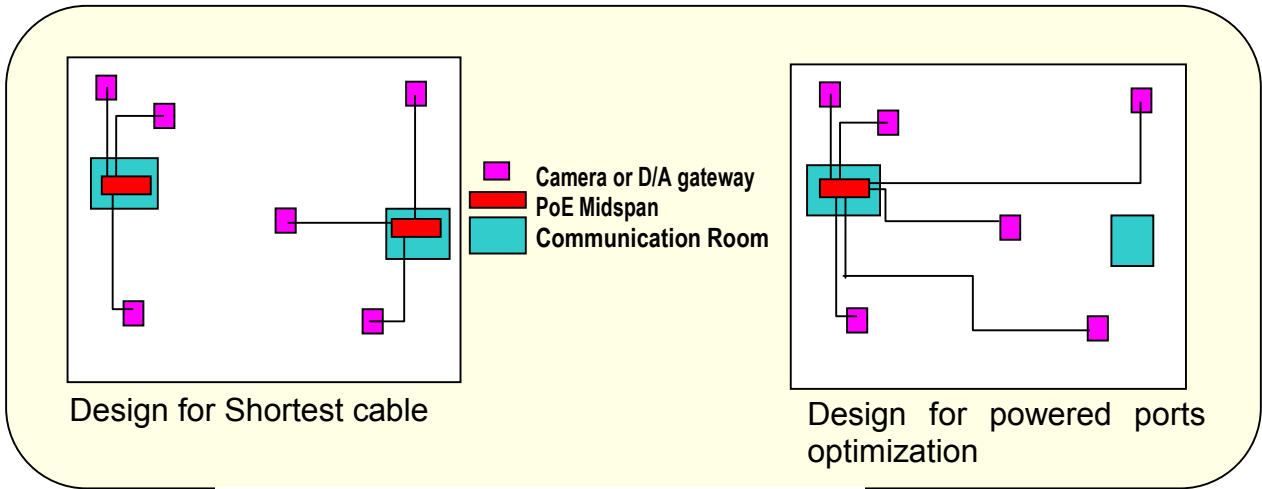


Figure 3: Concentrating of Powered Cameras

2. Selecting the appropriate Midspan

Number of ports: Once the number of cameras or access control terminals per communication room has been estimated, the following table is applied in order to select the appropriate Power over Ethernet products:

Camera Ports Density	Appropriate	Recommendations
1-2	1-port (6001, 8001)	
3-4	6-port (6006, 8006)	Save 2 ports for expansion
9	12-port (6012, 8012)	Save 2 ports for expansion
16	24-Port and additional units following the same guidelines. (6024 only)	

Midspan type:

Power over Ethernet 6000 Midspan Series is capable of supporting fix IP cameras and video servers. These hubs should be used for fix cameras installation.

High Power over Ethernet 8000 Midspan Series is capable of powering PTZ IP cameras and access control devices, as well fix IP cameras.

PowerDsine products support “mix and match” installation strategy.

3. Room for Expansion

In a similar fashion to Ethernet ports, 1 to 2 spare ports should be available for future growth, in case the surveillance network requires an additional camera to cover a new spot.



Power over Ethernet Installation Tips

The following are some tips, based upon PowerDsine multi-site experience:

- **Power all possible cameras using Power over Ethernet.** It may be tempting to use some AC outlets that are available, apparently to save some installation costs. This has the following implications:
 - ☞ Midspans provide a simple convenient means to reset cameras, which are hidden or hard to reach.
 - ☞ The “vacuum cleaner” effect – cleaning personnel unplugging cameras, to use an existing AC outlet, as they are easy to find, creating coverage breaks in the security.
 - ☞ Maintaining UPS capability. This creates a back up capability of the entire digital camera network (by backing up the Midspan).
- **Install all midspans in communication rooms.** To minimize tampering with the units and enable central management. 6-port, 12-port and 24-port units should preferably be rack mounted. 1-port midspans can be placed on top of equipment, or wall mounted.
- **Use color-coding for powered camera cabling,** to indicate that these cables are not to be touched by maintenance personnel.
- **Use the per-port LED indications** on the PoE Midspans, to verify the state of the powered devices:
 - ☞ Green (Power Active) LED indicates that power is being provided. This is a good way to know that a camera is connected correctly.
 - ☞ Orange (Power not Active) LED indicates that a non-powered device is connected to this port or that the camera may be malfunctioning (or tampered with). This may also indicate that an installation error has occurred. The uniqueness of the PowerDsine PoE Midspan is that this is a completely safe state, though it is recommended to check the cause.
 - ☞ Green blinking (HighPoE) is indicating that a PoE device is connected to a High power port. this is a normal mode of operation.



PowerDsine's Power over Ethernet Midspan Family

PowerDsine's family of Power over Ethernet midspan devices, with hundreds of thousands of ports already deployed by PowerDsine and by our satisfied partners, provides the most field-proven reliable solution.

PowerDsine provides a full line of Power over Ethernet midspan devices, from 1 to a 24-port device powering Voice over IP applications, wireless Ethernet Access points and network cameras.

PowerDsine PoE Midspans, intended for network cameras and Access control, such as the **Axis and Sony cameras**, are the 1, 6 and 12-port and 24-port units.

Power over Ethernet 6000 Midspan Series



- 24-port / 12-port / 6-port / 1-port midspan
- Full 802.3af compliance
- 1U high, 19 – in. rack mountable*
- Safe Detection algorithm
- LED Status indications
- SNMP management option*
- Wall mountable or free standing**

* Except for 1-port

** 1-port only

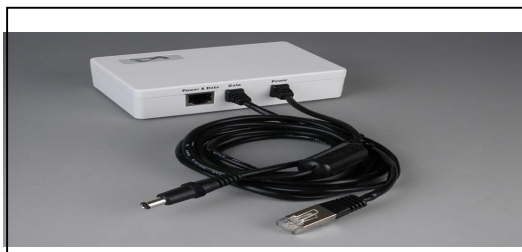
Power over Ethernet 8000 High- Power Midspan Series



- 12-port / 6-port / 1-port High Power over Ethernet midspan
- 30.8W power injection capability
- Powering 802.3af compliant devices
- 1U high, 19 – in. rack mountable*
- Safe Detection algorithm
- LED Status indications

* Except for 1-port

Power over Ethernet 401 / 601 / 801 Active Splitter



- Enables operating non PoE ready devices using 6000 / 8000 midspan
- Output voltage of 5V/12V/18V/48V
- Output voltage of 12V for the 801 midspan series

Remote SNMP Management of PoE Midspans (6000 series only)

A unique optional feature of PowerDsine's Midspans is SNMP remote management. This feature allows for remote control of the Midspan technology and the gathering of essential telemetry, collected by the units. Using the SNMP remote management enables central control of multi building installations enabling an immediate alert and response to a change in the well being of the essential security system in the field.

Main features of remote management:

- On/Off control for resetting units

Enables the IT manager to remotely reset a “dark” or non-responding camera, which would not respond otherwise. This important feature prevents the need to go to far-away communication rooms in a spread installation.

- Security power-off shut down of the network

Sometimes it may be necessary to quickly halt an entire access control network in the facility. A single command will stop all power remotely to the network, locking all entrances.

- Telemetry of cameras state

A maintenance and security dream: the remote management feature will alert to a change in the status of the camera, fall in power consumption, disappearance etc. to identify discontinuities in the security network coverage.

- Telemetry of power consumption

Collects power consumption information, to decide the appropriate UPS for your network, saving cost of needless UPS power. Get information on real status of power consumption.

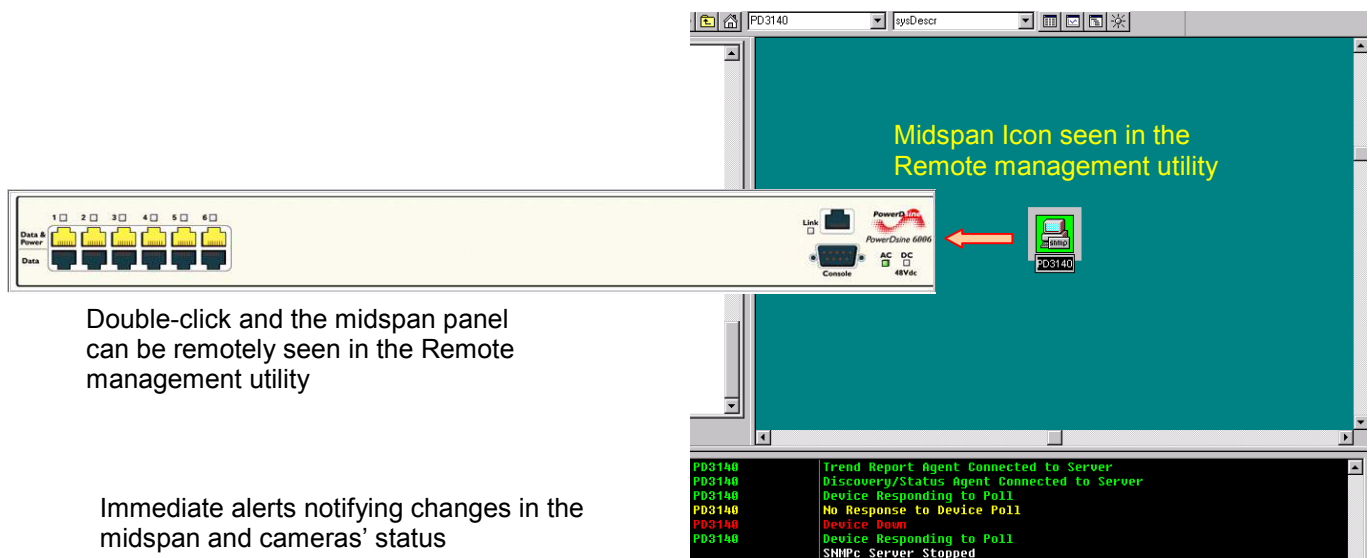


Figure 4: SNMP Management Screen



Conclusion

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

PowerDsine Power over Ethernet Midspan family for the security market provides security managers the simplest, safest, most cost effective solution for installing the network. The advanced features of the PoE midspans also vastly simplify the on-going maintenance of the security network, enabling reliable, continuous operation with minimum downtime. The paper discussed the means to maximize the power Hubs benefits.

The SNMP remote management capability enables remote control of the midspan technology and the gathering of essential telemetry, collected by the units. Central control of a multi-building installation for an immediate alert and response to a change in the status of a camera, or other powered devices.

The advanced detection mechanism, as well as the full IEEE 802.3af compliance today, guarantees the PowerDsine PoE Midspan interoperability with many powered devices.

For more information on the PowerDsine Power over Ethernet Midspan products and our additional 802.3af compliant products, as well as the IEEE 802.3af standard for DTE Power via MDI, look us up at: www.powerdsine.com

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