

Power-over-LAN Midspans and Active Splitter

1 What is Power over LAN™?

Power over LAN is a technology that integrates data and power over standard LAN infrastructure. It is the means to supply reliable, uninterrupted power to Network Cameras, wireless LAN access points and other Ethernet devices, using existing, commonly used Category 3 (4 pairs) and Category 5 cable infrastructure.

Power over LAN 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 LAN 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 LAN-compatible devices, on their network.

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

There are two main implementations of Power over LAN:

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

The mid-span – A patch-panel like 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.

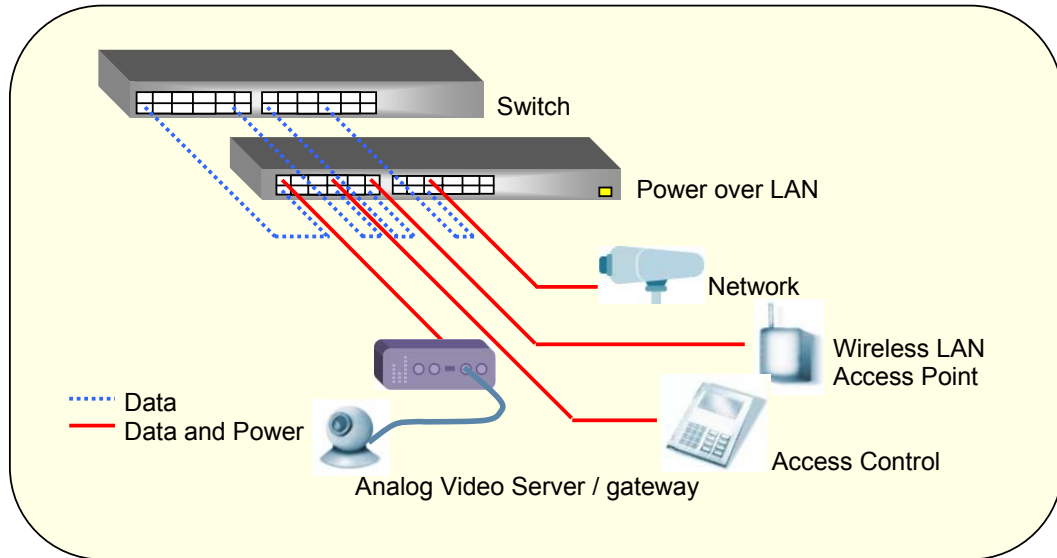


Figure 1: Architecture of Power over LAN in the Enterprise

2 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 is meant to be watched and/or recorded, otherwise it is useless. Access control devices enable access to authorized personnel, while restricting others and must have a central personnel database. As such, the use of the readily available and cost effective LAN infrastructure was imminent.

As limiting factors of technology, such as quality and rates of video passing over Ethernet, have been solved, the arrival of professional CCTV systems, which are based on digital streaming of video over Ethernet, is a natural progression.

Once end devices, such as a network camera or an access control terminal are up and connected to the LAN, they still require power to run.

Power over LAN 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, not to mention 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 was a costly and long affair, requiring dedicated electrician teams for pulling of power cables, changes of building plans and safety approvals.

Once operating, each device was 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.

There are additional key benefits for Power over LAN in the Security market:

- **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 LAN 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 Power over LAN midspan is much more than an intelligent power source.

3 Installing a Network Video Installation Using Power over LAN

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, 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 LAN. Fortunately, most network device 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 LAN enables the cameras to be powered through the same cabling infrastructure, providing the most cost effective solution. When the switch is already installed, the simplest means to add Power over LAN is by adding a dedicated Power over LAN midspan.

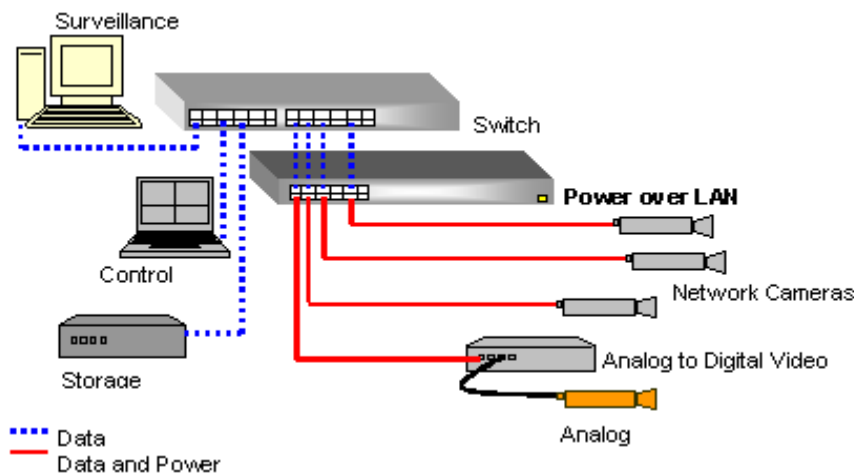


Figure 2: Digital Video Network Architecture Using Power over LAN

4 Installing a LAN Based Access Control Network Using Power over LAN

Access Control systems are being installed today in many different environments. Most common among these are:

- Transport terminals, Airports
- The Business Enterprise
- Government and Security facilities
- Universities, Schools

There are differences in the requirements from the Access Control system for each type of environment. An airport installation, with the need for high security while maintaining a high rate of approved personnel changes, is very different from an enterprise installation, with the need for work hours recording, and so on. This paper focuses on the approach to optimize the Access Control system with Power over LAN. Fortunately, most Access control 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 communications room and connect to the various Access Control terminals (See Figure 3). Adding Power over LAN enables the Access Control terminals to be powered through the same cabling infrastructure. When the switch is already installed, the simplest means to add Power over LAN is by adding a dedicated Power over LAN midspan.

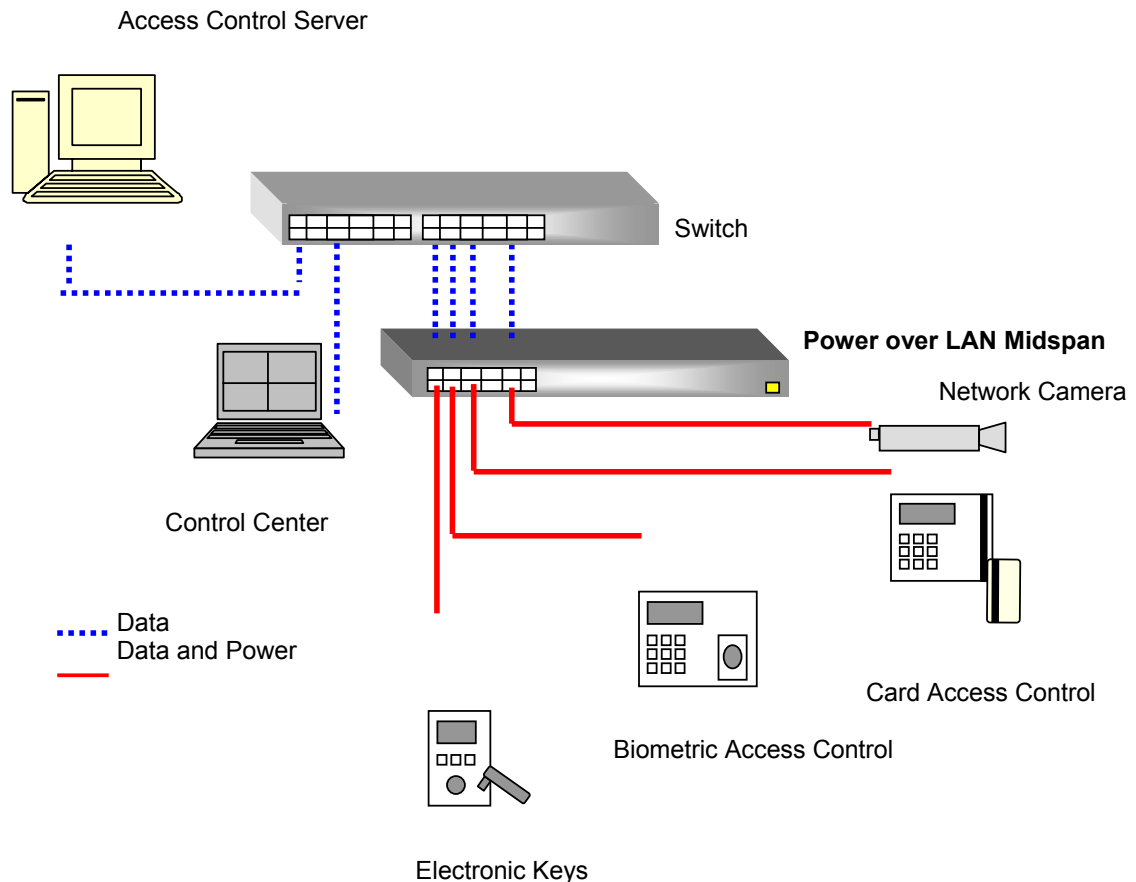


Figure 3: LAN Based Access Control Architecture Using Power over LAN

5 How to Select the Appropriate Power over LAN Midspan

Once installed, the cameras' Ethernet cabling is pulled to the communications rooms, where the switches (and Power over LAN midspans) are installed.

The port density of cameras that reach a specific communications 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 – **9 to 16 cameras** pulled to the Communications room.
2. Smaller or spread installations – **3 to 4 cameras** pulled to the Communications room.
3. Remote sites and single camera installations – **1 to 2 cameras** pulled to the Communications room.

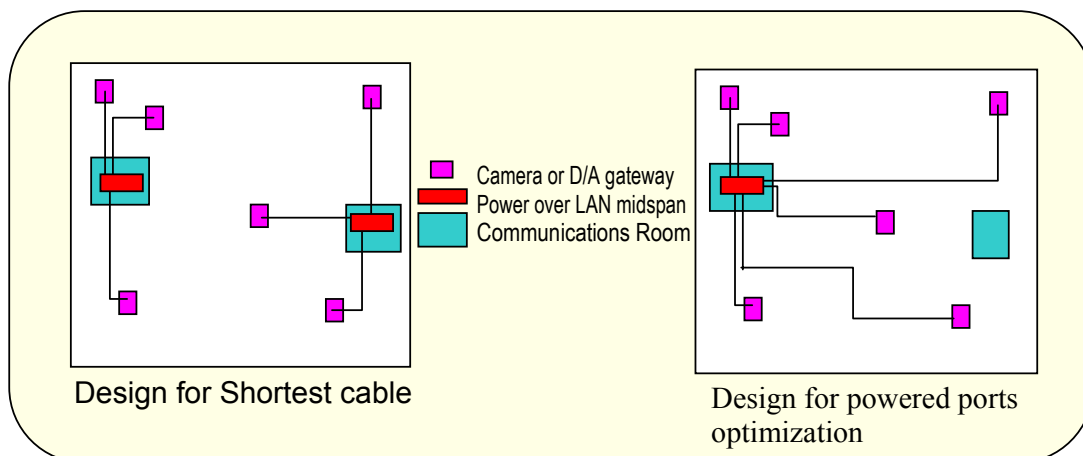
Power over LAN midspans, fitting the digital networking market, offer 1,6 and 12 port units. These units fit exactly the above port densities needs.

In order to optimize the distribution of Power over LAN midspans, the following guidelines should be followed:

1. Concentrating Camera 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 communications room rather than distributing a small number of camera ports in every communications room. This will enable a selection of a Power over LAN midspan with a higher port density and save rack space and installation costs.

See the example, presented in Figure 4.



2. Selecting the Appropriate Power over LAN midspans

Once the number of Cameras, or Access Control terminals, per communications room has been estimated, the following table is applied in order to select the appropriate Power over LAN products:

Camera Port Density	Power over LAN midspan to use	Recommendations
1-2	1-port	
3-4	6-port	Save 2 ports for expansion
9	12-port	Save 2 ports for expansion

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 LAN Installation Tips

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

- **Power all possible cameras using Power over LAN.** It may be tempting to use some AC outlets that are available, apparently to save some installation costs. This has the following implications:
 - ☞ 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 Power over LAN midspan).
- **Install all midspans in communications 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 Power over LAN 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 Power over LAN midspan is that this is a completely safe state, though it is recommended to check the cause.

12-Port Power over LAN midspan



- 12-port Power over LAN midspan
- Full 802.3af compliance
- 1U high, 19 – in. rack mountable
- Safe Detection algorithm
- LED Status indications

6-Port Power over LAN midspan



- 6-port Power over LAN midspan
- Full 802.3af compliance
- 1U high, 19 – in. rack mountable
- Safe Detection algorithm
- LED Status indications

1-Port Power over LAN midspan



- 1-port Power over LAN midspan
- Full 802.3af compliance (6001 series)
- Safe Detection algorithm
- LED Status indications
- Wall mountable or free standing

6 Conclusion

This paper serves as a guide for the optimization of a LAN based security network with Power over LAN. 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.

Power over LAN Midspans family for the security market provides security managers the simplest, safest, most cost-effective solution for installing the network. The advanced features of the Power over LAN 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 over LAN midspans benefits.

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