**PowerDsine**

# Installing an IP Telephony Network
# Using Power over LAN

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**What is Power over LAN™?**

Power over LAN is a revolutionary 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 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 (Uninterrupted Power Source) 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.

There are two main implementations of Power over LAN:

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

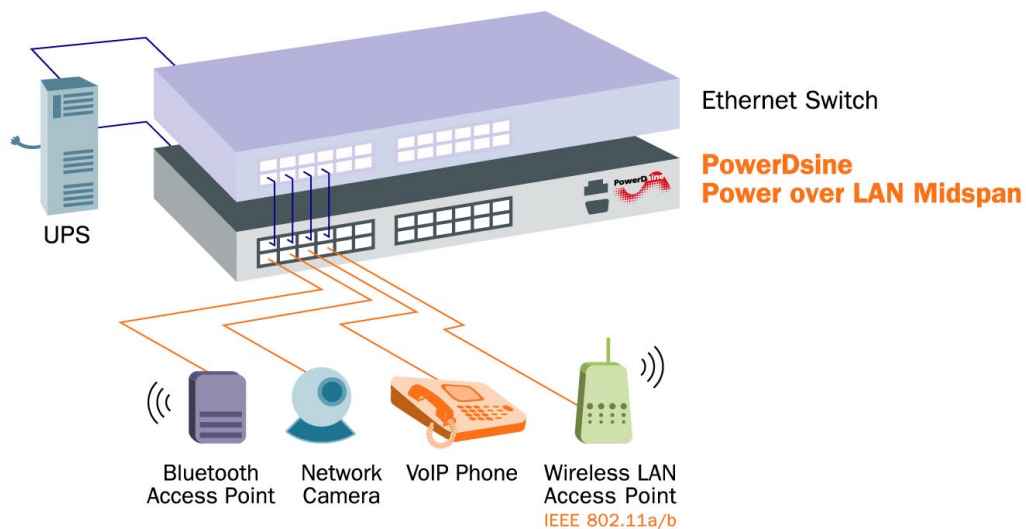**The end-span** – Power over LAN enabled Ethernet switch. Power is supplied directly from the data ports.



*Figure 1: Power over LAN architecture in the Enterprise*

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## VoIP Market Opportunity

The overall PBX market experienced a down year in 2001 but still represented sales just shy of $7 billion in the United States alone. This relatively large market is expected to grow over the next few years and could easily reach $8 billion by 2005. Total line shipments of 9.9 million in 2001 are predicted to grow to 13 million by 2006. As displayed in figure 2, the new line shipments for IP-enabled and IP-PBX systems are predicted to grow at a faster pace than circuit-switched line shipments and could completely displace circuit-switched new line deployments by 2005, according to Gartner Datquest.
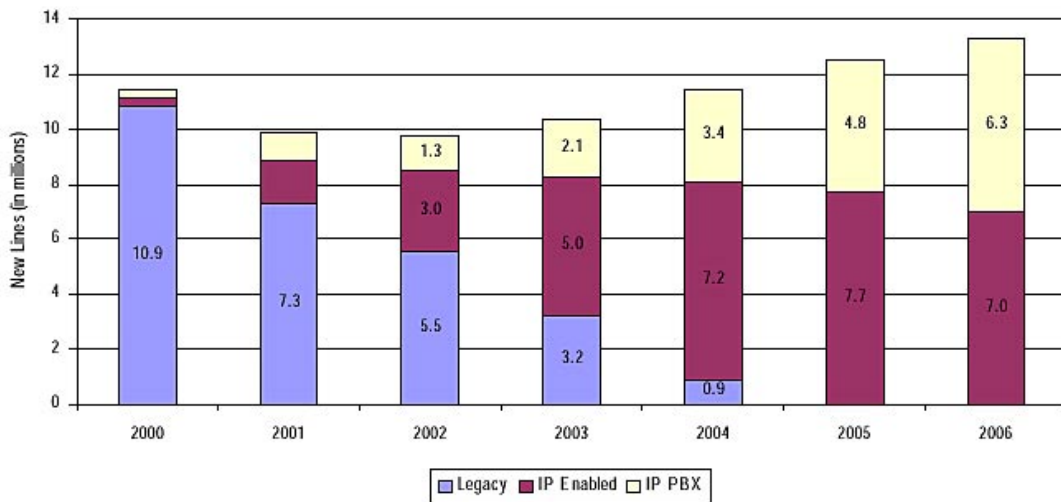
Source: Gartner Dataquest



*Figure 2: IP PBX Market Forecasts (Line Shipments)*

The IP Phone handset shipments in 2002 are expected to reach $1 million units with 30% growth compared to 2001. In 2003, an additional 60% growth is forecasted, with vendors like Cisco, 3Com, Nortel, Mitel, Avaya, Alcatel and Siemens which are the market leaders. All vendors understand the importance and need for Power over LAN in VoIP installations and designing their next generation IP Phones to be compatible with the Power over Ethernet standard, the IEEE802.3af.

The past years has been challenging for vendors in the telephony marketplace. Enterprises tasked with making any kind of voice solution decision first looked to maximize platforms in lieu of increasing capital expenditures for purchasing new technology.

In Gartner research, a demarcation has been set in the size of location, splitting enterprise alternatives into two categories: More-than-100-sets and fewer-than-100-sets. The end user requirements are somewhat distinct within these categories. The primary difference is the level of expected reliability and availability. In larger locations, redundancy, uninterrupted power supply (UPS) and Power over LAN capabilities are highly required due to the potential impact of failure, although this trend can be significantly seen in smaller locations as well.

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## Power over LAN and IP Telephony

The main key drivers for Power over LAN in the IP Telephony market are availability and simplicity of installation.

- **Availability is a key consideration in IP Telephony**

  Consider the promise of running telephony 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 LAN, corporations 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. A common goal is to consistently achieve 99.999% availability with 5.3 minutes of downtime per year or less. PowerDsine understands that high availability and reliability are absolute requirements for all mission-critical applications, including IP telephony solutions. By connecting a UPS to a Power over LAN Mid-span in the communication room, the entire IP Telephony network is becoming more reliable and ensures continuous operation during a power outage.

  To understand the theoretical availability for power (North America), the following characteristics are presented. The following data varies from site to site and some areas like Florida are expected to experience an order of magnitude higher of non-availability. The data is also representative of Japan and Western Europe:

  - The average number of outages sufficient to cause IT system malfunction per year at a typical site is approximately 15

  - 90% of the outages are less than five minutes in duration

  - 99% of the outages are less than one hour in duration

  - Total cumulative outage duration is approximately 100 minutes per year

  Based on the theoretical availability and the power protection strategy, the availability levels of five nines or higher requires to install Power over LAN mid-spans backed up by a UPS system with a minimum of one hour battery life. Power over LAN technology, when implemented in a VoIP installation, ensures full reliability and availability of the telephony network by eliminating power outages effects.

- **Simple Installation**

  Power over LAN offers a simple means for IP Phone handsets 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 plugged into 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.

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## Powering IP Phones

IP telephone can be powered via one of three options:

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

2. Power over LAN end-span - Power over LAN integrated into an Ethernet Switch, such as Avaya's P333T-PWR, which offers standard IEEE 802.3af Power over Ethernet.

3. Power supplied via an AC adapter

In the market, different Power over LAN products exists, however, not all are compatible with the Power over Ethernet standard IEEE 802.3af. Like all global standards, it is significantly important to maintain an open environment to enable interoperability between different terminal vendors.

In environments where an existing Ethernet Switch has been previously installed and is providing VoIP QoS capabilities, there is no need to purchase and install a new Ethernet Switch to provide Power over LAN functionality. In this case, the simplest means to power the IP Phones over the LAN infrastructure is to add a dedicated external Power over LAN Mid-span (see figure 3). The advantages include savings in installation costs, preservation of existing infrastructure while supporting pre-standard as well as IEEE 802.3af standard terminals.
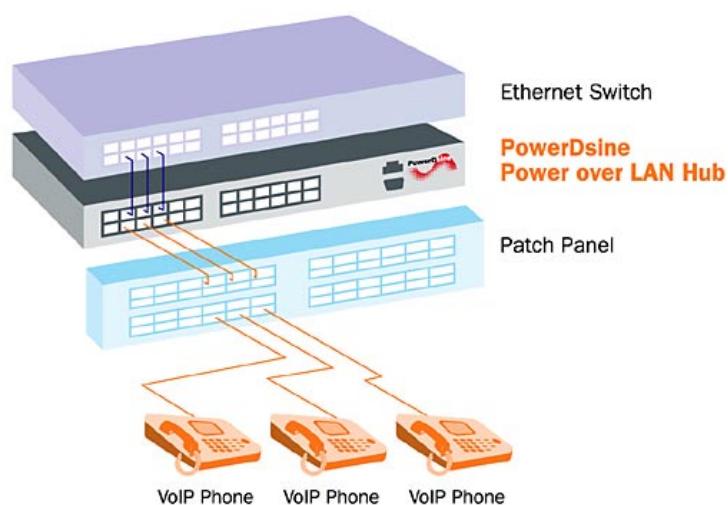


*Figure 3: Installing IP Phones with Power over LAN Mid-span*

Power over LAN End-span products are currently available in the market, however, the majority are not IEEE 802.3af compliant. Until non 802.3af compliant vendors commit and define a clear migration path to support the IEEE 802.3af standard, it is recommended that enterprises not yet purchase proprietary solutions. Enterprises will be best served by an infrastructure that continues to support an open, multiservice environment.

## Power over LAN in IP Telephony Installations

There are different types of IP Telephony installations, which vary in the following parameters:

1. Infrastructure type – VoIP system can be installed in a legacy infrastructure, using the existing Ethernet Switches and cabling infrastructure or in a totally new environment (Greenfield installation).

2. VoIP PBX – The PBX can be IP enabled PBX or Pure LAN PBX. IP Enabled PBX are been offered by the traditional PBX vendors by accommodating a range of IP-oriented components—voice over IP trunks and gateways, IP line and station cards, IP telephones, etc.—in order to IP-enable existing circuit switched telephony systems. Pure LAN PBX is based solely on IP Packets routing.

3. Installation size - Number of IP Phones installed

4. Variety of end terminals in the installation - Different types of terminals can be installed in a LAN infrastructure, such as wireless LAN access points, network cameras and security devices.

These parameters affect the type of Power over LAN solution which best suit the installation. The following lists a few examples of VoIP installations and the appropriate Power over LAN solution:

- **Pilot installation** - In a VoIP pilot installation, a small amount of IP Phones are installed first, typically 20 to 30 IP Phones. This enables the company to carefully examine the performance of the new PBX system, in parallel to the existing circuit switched PBX. The full deployment is gradual, usually done in stages and may take between one month to two years.
  This type of installation can be seen in medium to large enterprises, with over 100 workers, in which the enterprise is moving locations or upgrading voice/data needs to address specific application requirements. Power over LAN mid-span solutions best fits this type of installation as it enables the user to examine the VoIP system with minimum changes in the infrastructure, i.e. with no need to replace the existing Ethernet Switch, add Ethernet points and power outlets near the desktops to provide data and power to the IP phones.

- **Greenfield installation** – Greenfield installations are usually implemented in new buildings or new site locations with no existing voice and data infrastructure. In this type of installation, new Ethernet Switches should be installed as part of the infrastructure deployment.
  In this event, the appropriate Power over LAN solution is end-span, i.e. integrated in the Ethernet Switch. However, when choosing an end-span solution, it is highly recommended to verify that the Switch is IEEE 802.3af compliant. Enterprises will be best served by an infrastructure that continues to support an open, multiservice environment, which does not limit the customer to implement proprietary terminals of one vendor only.

- **Hybrid VoIP installation** - In this type of installation, IP components are added to the traditional circuit switched PBX without changing the existing infrastructure. As a result, the environment includes a mix of analog, digital and VoIP phones.
  For these installations, Power over LAN plug and play Mid-spans offer the ideal solution. It provides the IP Phone handsets a reliable powering solution without replacing the Ethernet Switches with ones that provide in-line power. The Mid-span solution also offers a future expansion opportunity, by adding more Mid-spans to the network if needed.

- **Small or spread installation** – Enterprises with multiple site locations and remote offices, often evaluate the adoption of IP telephony solutions. They can benefit from economies of scale by having a single voice application at a central location, serving multiple remote office locations. This can be hosted in the enterprise's own network or that of a network service provider. This design limits the quantity of telephony hardware deployed in branch offices, keeping capital costs and administration to a minimum. Low-port density Mid-span products provide a cost effective powering solution which best fits this approach.

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- **Highly sensitive installations** - There are few market segments, which can be identified as highly sensitive to down time, for example call centers, brokerage houses and production lines. As a result, when installing VoIP system in such sites, multiple backup systems are installed to assure full operation 100% of the time. In this case, the appropriate Power over LAN mid-span solution must include both AC and DC input power, to ensure 100% availability and full back up to the network.

## How to Select the Appropriate UPS

The level of power typically consumed in a communication room is approximately 25% of that consumed by networks with Power over LAN capabilities. For example, a typical 24-port Ethernet Switch consumes an average of 100W, whereas a simple installation of an Ethernet Switch providing a power solution to 24 IP Phones requires powering backup in the range of 400W.

In a typical communication room, eight stackable Ethernet switches are installed, providing service to 192 users, the power backup requirements can be fulfilled with a UPS of 1.5KW. However, to achieve the same level of reliability in a converged voice environment with Power over LAN, the UPS backup solutions should be in the range of at least 6KW.

To calculate the exact amount of power being used in a Power over LAN environment, with a view to saving costs by using the appropriate UPS, it is important to calculate the exact amount of power consumed by the IP Phones. This can be done using the SNMP mid-span product, which provides telemetry of power consumption of the device. With this information, one can calculate the exact amount of power consumed by the network in case of power failure, and adapt the size of the UPS accordingly. This tool enables an exact measurement of power consumption and allows the installer to purchase the appropriate UPS.

The managed version of the mid-span enables the user to define a power threshold. This capability offers a tool, which can be used to locate any deviation from the predefined level of power consumption by presenting a trap.

## How to Select the Appropriate Power over LAN Mid-span

PowerDsine® Power over LAN Mid-spans utilized for IP Telephony applications, are the 6, 12 and 24 port units. These units fit low and high port densities of IP Phones. Once the number of IP Phones per communication room has been estimated, the following table can be used to select the appropriate Power over LAN mid-span products:

| IP Phone handsets | Power over LAN mid-span to use | Recommendations |
|---|---|---|
| 1-6 | 6-port | Save 25-30% of ports for expansion |
| 6-12 | 12-port | Save 25-30% of ports for expansion |
| 12-> | 24-Port and additional units following the same guidelines. | Save 25-30% of ports for expansion |

*Figure 4: Selecting the appropriate mid-span*

As usually done in Ethernet Switches installations, 25-30% of the mid-span ports should be left unused for future growth, in case the IP Telephony network is expanded, or the number of users is increased. For example, two spare ports in the 6-port mid-span, three spare ports in the 12-port mid-span and 6 spare ports in the 24-port mid-span should be left unused.

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## PowerDsine Power over LAN Mid-span Family

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

PowerDsine provides a full line of Power over LAN mid-span devices, from 6 to 24-port devices, targeted for IP Phones from different vendors such as the **Cisco 79xx, Nortel i2004, Mitel 50xx, Avaya 46xx, Siemens Optipoint 400/600** and **Alcatel 4035/4037/4098**

### PowerDsine 6024 24-Port Power over LAN Mid-span



- 24-port power over LAN Mid-span
- Powers Cisco and IEEE 802.3af terminals
- Advanced auto-sensing algorithm for non powered device protection
- Web-based SNMP management option
- 1U high, 19'' rack mountable
- LED Status indications
- IEEE 802.3af compliant

### PowerDsine 6012 12-Port Power over LAN Mid-span



- 12-port power over LAN Mid-span
- Powers Cisco and IEEE 802.3af terminals
- Advanced auto-sensing algorithm for non powered device protection
- Web-based SNMP management option
- 1U high, 19'' rack mountable
- LED Status indications
- IEEE 802.3af compliant

### PowerDsine 6006-Port Power over LAN Mid-span



- 6-port power over LAN Mid-span
- Powers Cisco and IEEE 802.3af terminals
- Advanced auto-sensing algorithm for non powered device protection
- Web-based SNMP management option
- 1U high, 19'' rack mountable
- LED Status indications
- IEEE 802.3af compliant

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**Web based and SNMP Remote Management**

A unique option of PowerDsine's Power over LAN mid-spans is web-based SNMP remote management. This feature allows for remote control of the mid-span technology and the gathering of essential telemetry, collected by the units. Remote management provides an immediate alert and response to changes in the IP Phones in the field.

Main features of remote management:

- Telemetry of IP Phones status and presence

  The remote management feature will alert to a change in the status of the IP Phone such as fall in power consumption, disappearance and malfunction.

- Telemetry of power consumption

  Collects power consumption information, to measure appropriate size of UPS for your network, saving the cost of needless UPS capacity.

- Power-off IP Phones to save costs

  At times it may be desirable to power off selected IP Phones when not in use, such as over the weekend and holidays. This helps cost conscious enterprises and ensures the ultimate amount of security when the phone is not to be used.
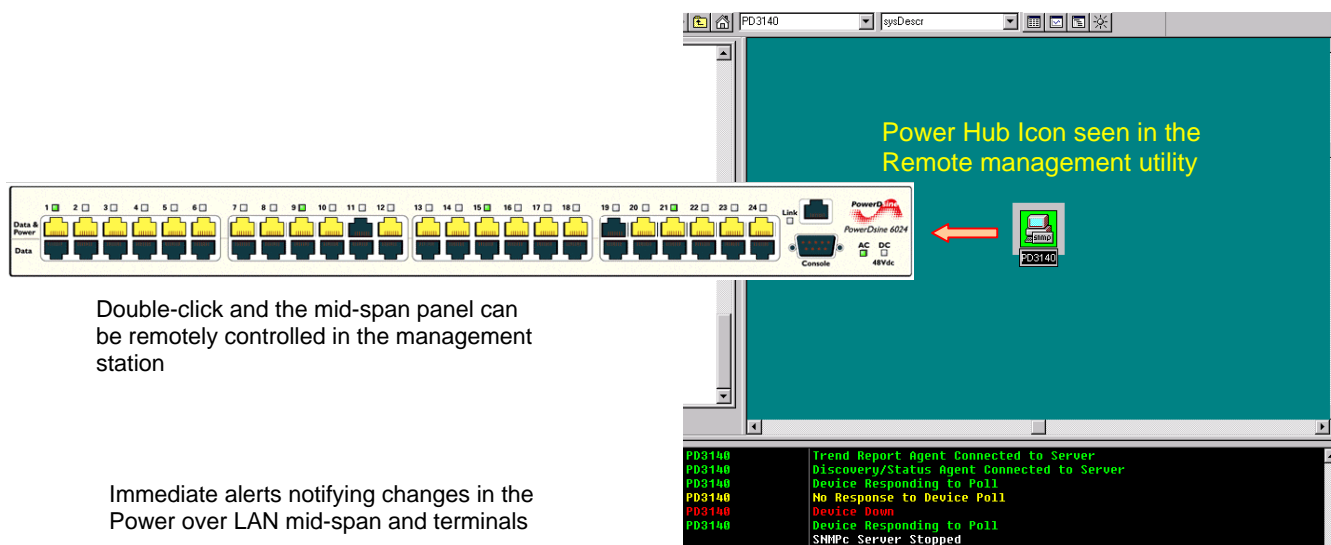


*Figure 5: Web-based SNMP Management Screen*

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## Summary

The move to IP Telephony is a key decision point in the evolution of an enterprise's network. Independent of either the evolutionary or revolutionary approach to migration, in the end, the enterprise will have converted its entire voice network to be VoIP based, while demanding equal characteristics of the traditional telephony, such as availability and voice quality.

PowerDsine Power over LAN products for IP Telephony installation provides IT managers and users the same level of availability they experience with the traditional circuit switched telephony systems.

The SNMP web-based remote management enables remote control of the mid-span unit and the terminals connected to it, while gathering essential telemetry. It offers a central control of a multi-site or multi-building installations for an immediate alert and response to a change in the status of IP Phones, as well as wireless access points, or other powered devices in the LAN network.

The advanced detection mechanism, as well as the full IEEE 802.3af compliance, guarantees the PowerDsine Mid-span interoperability with most powered devices, standard and pre-standard.

For more information on the PowerDsine Power over LAN™ mid-span 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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