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Powering PoE Compliant PCs

By TMCnet Special Guest

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Abstract

This article will examine the requirements and challenges associated with implementing the latest high-power IEEE 802.3at technology in a wide variety of portable platforms. The new pending standard is poised to greatly reduce the need for batteries in notebooks and other remote/mobile products. Achieving this, however, requires a more than doubling of the power-delivery capabilities of the earlier IEEE 802.3af solutions with important system-level implications. Overall power consumption and power concentration are two key parameters to be considering when deciding to power companywide applications such as laptops, and in many cases a smart combination of low- and high-power devices and the utilization of Midspans in combination with PoE switches can give the right balance to allow servicing these new high power applications in a cost effective manner.

Introduction to Power over Ethernet

Since the end of the 19th century, power and data were sent together on the same electrical cable. This is the principle of operation for Bell's 1875 telephone. Nevertheless, communication systems initially developed with only data in mind in the 1970's, such as Ethernet (IEEE802.3), did not have provisions for power. In the end of the 20th century, with the data transmission rates becoming large enough to ensure the transmission of data packets, and the evolution of VoIP protocols, it became clear that Ethernet had to adapt to enable VoIP to be as simple to use and reliable as traditional and digital telephony.

At the same time, Wireless LAN protocols became sophisticated enough (again, with enough bandwidth), to be a replacement for wired Ethernet in some applications. This required the WLAN Access Points to be placed in strategic positions, where AC power is not necessarily available.

These two applications, VoIP and WLAN, triggered the IEEE802.3 work group to create the IEEE802.3af task force in 1999, in order to enable the transmission of data and packets on the same CAT3 (or above) Ethernet cable.

IEEE802.3af Applications and Beyond

After four years of work, the IEEE802.3af task force created the first PoE standard, which allowed supplying 12.95W to powered devices. This was enough to power most of the target applications, including not only VoIP

phones and WLAN access points, but also network cameras, embedded thin clients, barcode RFID readers, access control applications and others.

Nevertheless, this low power limit prevented Power over Ethernet from powering several devices with higher end features in the market. These include video phones, multi-channel access points, outdoor applications such as fiber to the home optical network terminators, IEEE802.16 subscriber stations and even notebooks. To address these, in 2004 the IEEE802.3 working group created the PoEPlus study group, which in 2005 became the IEEE802.3at, with the goal of providing at least 24W for devices powered over Ethernet cables.

Power over Ethernet is now geared towards transforming the RJ45 connector into the universal power socket IEEE802.3at in draft 3.0 and expected to be ratified by July 2009. The maximum power available to power devices is expected to be between 25W and 55W.

Powering Computers over Ethernet

Two applications that can immediately benefit from high power over Ethernet are thin clients and laptop PCs.

Thin clients, which in some cases are already powered over Ethernet (like Chip PCs Jack PC <http://www.chippc.com/thin-clients/jack-pc/>), can use the additional power offered by IEEE802.3at to power not only their processors but also the thin client's screen.

This allows deployment of thin clients in locations where AC is not currently installed (for ad-hoc installations, for example), and also allows full backup and operation of a thin client system in cases of a power failure (especially useful when thin clients are used in call centers).

In a way the power limitation PoE creates for thin clients forces these to be built power constrained to be gin with, saving operation costs.

Since thin clients are typically not mobile applications, one could use pre-standard IEEE802.3at midspans or switches to power thin clients today.

Laptop PCs, which normally consume around 60W, including charging their batteries, could use High PoE so a user can trickle charge the laptop's batteries without the need to carry an external power supply. Laptops, unlike thin clients, are mobile. This means that one should not expect to see PoE-powered laptops until the ratification of IEEE802.3at.

Ramifications

If when the application is WLAN it is easy to power all the Access Points necessary in a floor or building with a few high power ports, in the case of thin clients and Laptops, the situation is quite different: every port requires high power.

The overall power consumption is, of course, the major issue. The power concentration on the switching closet can be come fairly high: with 60W taken by each device, for example, thousands of watts may need to come from the switching closet.

And unlike in VoIP installations, in which the switch replacement is almost

inevitable, due to the QoS constraints VoIP imposes, there is not much change between the bandwidth or QoS requirements between old and new laptops, or between a desktop PC and a Thin Client.

This means that in most cases upgrading the Ethernet Switch is an unnecessary expense. Also, unlike in VoIP upgrades in which typically a whole section of the company moves from traditional to IP telephony, users normally change laptops one by one.

Solutions

The mix between high power and lower power devices, such as IP phones, can help diminish the average power consumed by a device in a switch or midspan. This helps reduce the power concentration, which eases the task of refrigerating the switch closet.

To upgrade a network to support PoE in little steps, without replacing the switches, one can use midspans, and not PoE switches, in these emerging high power applications. Midspans come in 1-, 6-, 12-, 24- and 48-port versions, allowing power of Ethernet insertion between the Ethernet switch and the powered device, with remote secure network management.

Conclusion

IEEE802.3at can revolutionize, from mid-2009, the way PC's are powered at the Enterprise.

A smart PD allocation between PoE sources and the usage of midspans can make the migration of a system so it can power not only IP phones and WLAN access points, but also thin clients and laptops in a non-disruptive and cost effective manner.

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