ethernet alliance

Power Over Ethernet Plus

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Abstract

The standard for Power over Ethernet (PoE), IEEE Std. 802.3af™-2003, helped increase the value of an Ethernet port by connecting and powering devices such as IP Phones using a common network infrastructure. An upcoming PoE standard known as Power over Ethernet Plus (PoE Plus) or IEEE P802.3at promises to deliver more power to enable a new breed of Ethernet devices and continue to support IEEE 802.3af. This document provides an overview of PoE Plus.

1.0 Overview of Power Over Ethernet

Power over Ethernet (PoE) first began shipping in 2003 and will continue its expansion as it enjoys adoption into an ever increasing number of applications. The growth prediction for Power over Ethernet (PoE) ports, which is composed of powered devices (PD) and power sourcing equipment (PSE), is shown in Figure 1. Powered devices refer to end devices that require power such as IP phones or WiFi Access Points, while power sourcing equipment are devices that deliver power such as PoE switches. Growth is anticipated at an average rate of 29 per-

cent year on year for powered devices and an average rate of 26% year on year for power sourcing equipment.

To date, the majority of the growth for powered devices results from IP phones usage by enterprise customers who are deploying converged voice and data networks that operate across a common infrastructure, resulting in cost saving. However, an increasing number of powered devices require power greater than the allowable 12.95 watts specified in IEEE 802.3af. These powered devices are IEEE 802.11n WiFi Access Points, pan-tilt-zoom (PTZ) security cameras, and IP Phones with advanced features such as video conferencing. These powered devices will benefit from IEEE P802.3at that is expected to be ratified soon.

IEEE P802.3at helps combine other services such as video used for perimeter security in a single infrastructure. For example, a close caption TV (CCTV) camera used for perimeter security requires multi-wiring and analog-based receiver/recorder such as a VCR. While a pan-tilt-zoom security camera that supports IEEE P802.3at only requires one wire, an RJ-45, to capture the scene, transmit the video, and power the camera. This gives enterprise customers enormous savings, a simplified infrastructure, and greater security coverage.

This document discusses the details of the upcoming IEEE P802.3at standard and its relation to the IEEE P802.3af standard.

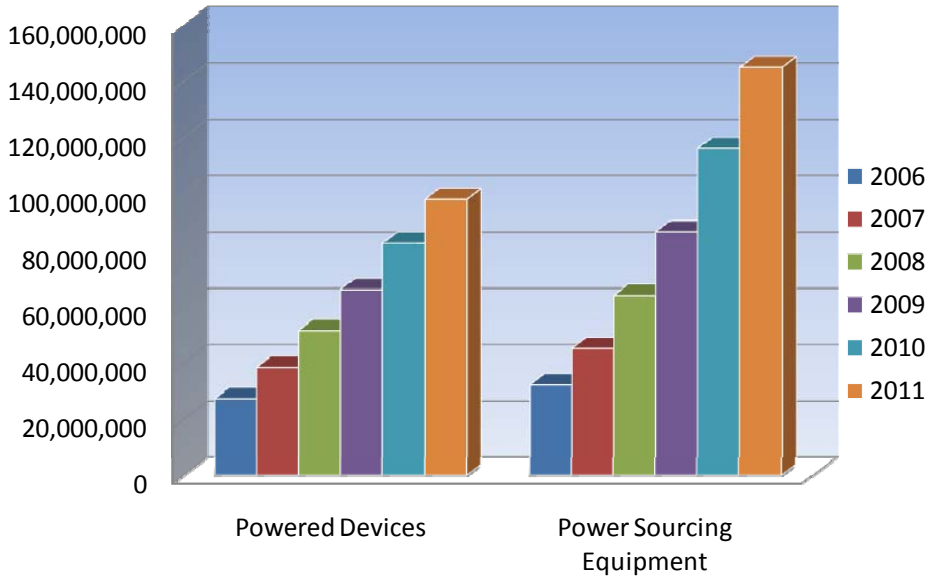

Figure 1— Power Over Ethernet Ports

Source: Dell'Oro 2007 Forecast Report and IDC's 2007 Forecast for Network Cameras

2.0 PoE Plus

The IEEE P802.3at working group defined the following objectives in September 2005 as binding objectives for the IEEE P802.3at Power over Ethernet Enhancements Task Force:

- IEEE P802.3at must use Category 5[1] (Cat 5) only. IEEE P802.3af supports Category 3 (Cat 3) and Cat 5.
- IEEE P802.3at must abide to the power safety rules and limitations pertinent to IEEE P802.3af.
- IEEE P802.3at power sourcing equipment must be compatible with IEEE P802.3af.
- IEEE P802.3at should provide the maximum power to powered devices as allowed within practical limits.
- IEEE P802.3at powered devices connected to IEEE P802.3af power sourcing equipment must indicate to users that an IEEE P802.3at power sourcing equipment is needed.
- Research the operation of Midspans for 1000BASE-T.
- Research the operation of Midspans and Endspans for 10GBASE-T.
- Creation of a powered device MIB.

2.1 Cabling and Current

PoE Plus requires Cat 5 (8-wire) instead of Cat 3 (4-wire) because more power can be transmitted over two 4-wire cables. In addition Cat 5 cables were selected because of lower impedance thereby reducing power dissipation. The Cat 5 cable is required to operate in ambient temperatures of no more than 50 degrees Celsius.

1. Category 5 as specified in ANSI/TIA/EIA-568-A-1995.

Based upon IEEE P802.3at/D3.0, March 2008, the IEEE P802.3at task force decided to set a maximum current of 600mA, almost twice than the maximum current in IEEE P802.3af (350mA). All parameters used to determine overload conditions and maximum consumption levels are adjusted for IEEE 802.3at.

2.2 Voltage Levels

The IEEE P802.3at draft standard also increased the minimum voltage from 44V to 50V to support battery-based powered devices such as a laptop. This modification in voltage increases the available power by 16 percent.

2.3 Wattage

Currently, the maximum wattage specified in IEEE P802.3at for a powered device is 25.5W, which is almost twice the maximum wattage specified in IEEE P802.3af. In addition, there were consideration in the IEEE P802.3at Task Force to modify the maximum wattage to 60W. However, this would also increase the environmental requirements for power sourcing equipment and powered devices.

2.4 Classification

Table 1 shows the powered device classification defined in IEEE P802.3at. This classification is the same as powered device classification defined in IEEE P802.3af to ensure backwards compatibility.

Table 1— Powered Device Classification

Class Signature	Powered Device Classification	Power Available for the Powered Device
0	Default, Type 1	0.44W to 12.95W
1	Type 1	0.44W to 3.84W
2	Type 1	3.84W to 6.49W
3	Type 1	6.49W to 12.95W
4	Type 2	12.95W to 25.5W

Type 1 powered devices are IEEE 802.3af powered devices and have a maximum wattage requirement of 12.95W. Power sourcing equipment power up a Type 1 powered device using a 1-Event Physical Layer Classification.

Type 2 powered devices, which require power from 12.95W and up to 25.5W, are required to support the following classification:

1. 2-Event Physical Layer Classification:

   In this method, the power sourcing equipment emits 2 classification pulses to detect the powered device. Powered devices that support IEEE P802.3at and requires more than 12.95W sends a class 4 signature to the power sourcing equipment.

2. Data Link Layer Classification:

   In this method, the power sourcing equipment emits a single classification pulse and provides power to the powered device. The powered device can then begin communicating to the power sourcing equipment using a data link layer protocol such as Link Layer Discovery Protocol (LLDP). The powered device and power sourcing equipment can begin negotiating for power using LLDP.

IEEE P802.3at requires that powered devices support both classification methods, while power sourcing equipment are required to support only one method.

3.0 Moving Forward

Today, PoE is commonly used for VoIP deployments. PoE ports shipments grew to 45M in 2007 and is expected to grow up to 145M in 2011. The promise of consolidating voice with data using PoE is now realized and is being adopted by many enterprise companies. The next wave of devices to be powered by PoE will be video cameras. An important application on the horizon for video cameras in business will be for video surveillance to monitor airports, manufacturing, warehouses, and retail shops.

As enterprise customers continue to invest in their data network infrastructure to enhance unified communication, productivity, and support growth, selecting the right PoE solution can power their business.

Because of the higher wattage support offered by PoE Plus, new applications such as physical perimeter security using power pan-tilt-zoom cameras will appear. Businesses can take advantage of physical perimeter security solutions that are reliable, provide fast response, and deliver complete physical visibility.

The growth of PoE is assured and it will help increase the value of Ethernet.

2. Dell'Oro's Q4FY07 forecast report.