

IEEE802.3at Power over Ethernet Plus (PoE+) Standard

Overview

Power over Ethernet (PoE, IEEE 802.3an), which combines power and data transmission within a single cable, has made great advances since 2003.

The original PoE standards supported delivered power of up to 12.95 watts, but with the introduction in 2009 of IEEE 802.3at PoE+, equipment that requires up to 25.5 watts can now be supported. However, higher power transmission using the data cable means more heating in the conductors. This is both a risk factor and a cost factor, as is the associated increase in attenuation that occurs as the temperature rises. The increase of attenuation could harm the performance and could even cause network downtime in worst case. Hence, when planning applications that utilise PoE+, great care must be taken in choosing the optimal cabling system; and in certain situations it may be necessary to impose limitations.

When correctly implemented the problems of heating and increased attenuation can be managed. By paying strict attention to current standards, data-transmission is not impacted and costs do not spiral

1. Introduction

Power over Ethernet (PoE) permits transmission of data and DC current via the 8-wire Ethernet cable (Cat. 5e or higher), thus providing a universal and remotely controllable power supply and data connection. In PoE, the power sourcing equipment (PSE) supplies power only to designated users, and it monitors and limits the maximum power that can be taken by each one. PoE is implemented as an integral power feature of the network switch, or via peripheral devices (referred to as midspans) that are installed between the switch and the network physical devices (PDs).

The transmission medium for data and electrical power consists of cables that support the IEEE802.3af standard. A major application for communication cabling is the remote powering of terminal devices with operating ratings up to 12.95 watts, such as wireless access points (WAPs), voice-over-IP (VoIP) telephones and internet protocol (IP) cameras. The use of PoE for these applications avoids the need for traditional power adapters.

The rapid growth of PoE quickly led to a desire to provide power supplies for higher powered terminal devices requiring more than 12.95 watts. As a result, the PoE+ working group developed the IEEE802.3at standard, which was introduced in 2009.

2. Advantages of PoE+ compared with PoE

The IEEE802.3at standard defines the requirements for increasing the power to the consumers (PDs) to 25.5 watts via two Ethernet cable pairs and can be drawn at a distance of up to 100 metres. This is of importance for such items as pan-tilt-zoom (PTZ) cameras, which require higher powers to operate internal motors which control the camera position. In addition to PTZ cameras, other types of equipment also obtain their full required power of 12 to 24 watts over PoE+, such as:

- safety systems for buildings and surface/underground railway carriages
- VOIP video telephones
- POS terminals
- Multiband wireless access points (IEEE 802.11n)
- RFID readers (radio-frequency identification)
- PoE computers

Many companies are already benefiting from the advantages offered by using a single network to handle voice, data and power, and their number is constantly growing.

The trend to PoE continues

According to research by Dell'Oro, in 2011 approximately 20 % of all users were using PoE via Ethernet switch ports. Internet telephony is increasingly being equipped with cameras for transmission of video telephony – and many companies such as Brocade, Cisco and D-Link concur in forecasting a spread of PoE+ in 2012. 25.5 watts can be delivered over PoE+, which is two times as much as with the previous PoE standard. The growing sales figures clearly illustrate the trend towards PoE+, which can also support a greater number of terminal devices.

Assured compatibility

The IEEE standards group has defined precise limitations. PoE+ extends the previous 802.3af standard, and it will operate within this defined framework. The target infrastructures for PoE+ are systems in accordance with ISO/IEC 11801 Class D / ANSI/TIA/EIA-568.C.2 Cat.5e (or higher). Further features are:

- PoE+ energy sources (PSE) operate in modes that are compatible with the requirements of IEEE STD 802.3af.
- PoE+ provides the energy consumer (PD) with a maximum of 25.5 W
- Support for midspan PSEs running over 1000Base-T.
- Trouble-free operation of PoE+ PDs together with 802.3af PSEs in the power range covered by 802.3af.

New power categories were also defined for “consumers” (PDs) and power modules (PSEs), paying special attention to backward compatibility, and to providing support for conventional PoE devices or devices with low power consumption

3. Impact on the cabling infrastructure – challenges

The doubling in usable current with PoE+ (by comparison with conventional PoE) also leads to increased requirements for the cabling system that is used.

Differences between PoE and PoE+:

	PoE	PoE+
PSE current (A)	0.35 A	Type 1: 0.35 A Type 2: 0.6 A
PSE voltage (Vdc)	44-57 V	Type 1: 44-57 Vdc Type 2: 50-57 Vdc
PD current (A)	0.35 A	Type 1: 0.35 A Type 2: 0.6 A
PD voltage (Vdc)	37-57 V	Type 1: 37-57 Vdc Type 1: 47-57 Vdc
Power	12.95 W	25.5 W
Cable requirement	Cat. 3 or higher	Cat. 5 or higher

Type 1 devices with low power consumption / Type 2 devices with high power consumption

The PD classes in IEEE standard P802.3at are classified as follows:

Class	PD Class	Electrical power of PD
0	Standard, Type 1	0.44 W to 12.95 W
1	Type 1	0.44 W to 3.84 W
2	Type 1	3.84 W to 6.49 W
3	Type 1	6.49 W to 12.95 W
4	Type 2	12.95 W to 25.5 W



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