

The Unknown Vulnerabilities of Power over Ethernet Cabling

By Robin Koffler, General Manager of Riello Galatrek Ltd

Power over Ethernet (PoE) (sometimes called power over LAN or Active Ethernet) is currently a hot topic. The new technological initiative is being hailed as the catalyst for IP telephony. Corporate migration to VoIP and the drive to cut costs are the reasons Ethernet cabling can now transport energy.

Ethernet is ubiquitous in the corporate world and this, coupled with the move towards convergence over a Local Area Network (LAN) or Wide Area Network (WAN), makes it an ideal medium. But with more and more equipment running at lower voltages, and across the humble corporate network, the need to invest in the right UPS (Uninterruptible Power Supply) is greater than ever. Power cuts today could result in the whole communications infrastructure grinding to a halt unless steps are taken to guard against vulnerabilities.

The maximum output limit for PoE is 15.4w, which means that support is limited to peripheral devices rather than large IT equipment such as PCs. IP telephone handsets feature complicated displays, memory and integrated functions (such as call waiting and caller display). They are supplied with their own power adapter which needs to be plugged into a wall socket. In a large corporation there are unlikely to be enough sockets available. PoE helps to avoid large-scale rewiring, which is good news for the finance director or IT manager but not so for the humble network engineer who needs to ensure a continuous flow of clean energy to keep the equipment working.

PoE is a way of transmitting a small amount of electrical power over standard category 5, 10BaseT and 100Base-TX Ethernet data cables. The Institute of Electrical and Electronic Engineers (IEEE) ratified the 802.3af standard in June 2003 giving vendors and buyers a stable platform from which to acquire solutions.

A Cat 5 injector initiates PoE by adding the necessary electrical voltage to the cable. The actual current is transmitted over two of the four twisted pairs of copper wires that make up a Cat 5 cable. The 802.3af standard defines two ways in which power can be transmitted. Firstly, power is sent via the spare pairs not being used for data transmission. Secondly, the data pairs can be used

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without affecting data transfer or available bandwidth performance by use of a switch. Electricity is supplied to a telephone handsets, for example, via either a powered switch or mid-span injector.

Manufacturers are building support into new equipment, but not all powered devices are PoE compatible at present, in which case a mid-span insertion device (power hub) needs to be placed between the switch port and device. Sometimes conversion technology (also known as an Ethernet splitter) is used for devices that are not PoE compatible.

With PoE the electrical current needs to be regulated to ensure the right level of voltage. The power that comes from the National Grid varies greatly in voltage, frequency and electrical noise. This can cause problems and lead to file damage, hardware corruption, data loss, or computer malfunction. The increasing complexity of computer systems and microprocessor-controlled equipment requires what is termed 'clean' or 'conditioned' power. Utility power voltages can deviate from -7.5% to + 7.5% from an absolute voltage value. So, a 208 phase voltage value, for example, can range from 192-223 volts.

This wide deviation causes surges, sags, electrical noise, harmonics, load interference which can damage electrical equipment and systems. Absolute power failure is not the only problem. But it can happen and is happening more frequently as the need for more and more energy puts a strain on resources. The correct UPS system must be implemented to ensure a continuous flow of clean energy.

All equipment, plus all the switches and routers, must be supported by a UPS so that the phones work when there's a power outage (similar to the functioning of conventional phones in these conditions). The following types of UPS systems are available and can be used solely or in conjunction to ensure maximum power management:

On Line or Double Conversion UPS

This type is voltage and frequency independent. The output power is maintained irrespective of fluctuations in the main supply. It can also operate as a frequency converter and is ideal for networked installations, large servers and networks processes.

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Off Line

This type of UPS tracks the mains power supply for voltage and frequency variations, conditions it so that output is constant.

Line Interactive

This type has a built-in electronic regulation device which stabilises and regulates voltage fluctuation. It is designed for small or confined installations: desktop PCs, point-of-sale (PoS), small servers and PBXs systems.

Large scale PoE implementations may require an upgrade to the current level of UPS. The existing system may not be large enough to power all of the infrastructure or, as in the case of a telecoms application, the runtime available may not be long enough. If the existing UPS is made up of several line interactive UPS it may be time to move up to an on-line UPS and maximum power protection.

A good UPS solution will incorporate a software-based management system that enables remote monitoring of power fluctuations via the network. This can enable the operation of wide spread equipment, attached to the system and the UPS itself, to be managed centrally.

Whilst power over Ethernet is a key enabler for next-generation technology it is not a panacea for cost-effective energy. If anything it adds to the problem of power management and must be implemented alongside a sound UPS strategy.

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