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....The KEY network element

Power Over Ethernet/UTP

Power over Ethernet' (PoE) is on every IT manager's lips, so we thought should let you know what they are talking about. Ethernet is a type of network and protocol that computers use to communicate to each other. Ethernet switches are electronic boxes (located in the comms room) designed to route data traffic around the network. It is these switches that are now being designed to provide power and data (Power over Ethernet – PoE) around the network at the same time. This is what the IT manager's are talking about and this technology opens up many interesting avenues for you as engineers and Kedington as specialist contractors.

Until now, the thought of adding an IP-enabled camera, or a WiFi Access point, to an existing cable network meant considering not only placement, but also where the nearest power outlet was. To help solve the problem the IEEE last year ratified **802.3af**, one of the latest in the 802.xx series of Ethernet standards, which has the potential to make the power dilemma go away, or at least to greatly reduce the problem. The 802.3af standard specifies how switches, routers, and hubs should deliver power over standard Ethernet cabling to devices like IP phones, security cameras and wireless LAN Access Points. Power over Ethernet, or PoE, works with existing cables, including Category 3, 5, 5e or 6.

Like many good ideas that are executed before being standardized, PoE started off with proprietary implementations as varied as the companies implementing them. The RJ-45 connectors' pin-outs varied from manufacturer to manufacturer. And if that was not dangerous enough, the voltages being pumped over those little wires ranged from as little as 3.3 volts to as much as 48 volts. Now that there is an industry standard, consumers can buy off-the-shelf equipment and be assured that the different manufacturers' products will interact with each other.

The standard dictates that over the maximum recommended run of Ethernet cabling, there will be a guaranteed continuous power of up to 12.95 watts at each node, taking into account power loss due to resistive load of the copper conductors. (As a point of reference, IP phones and wireless access points consume anywhere from 3.5 to 10 watts.) Since the power requirements are so minimal, PoE technology can facilitate the protection of the complete network segment (switch cable and device) by a single uninterruptible power supply, typically installed in the comms room/cabinet. The cost savings in back-up power systems alone could easily justify implementing such an architecture.

PoE is deployed in one of two ways: as an end-span device where the technology is actually embedded into new routers or switches, or as stand-alone mid-span injectors. The latter allows existing networks to implement the PoE standard without upgrading existing switches or hubs. Connections to the switch are patched through a mid-span devices which inserts the power without affecting the data traffic.

A major concern for engineers has been the risk of damage to non PoE equipment, such as 10/100 LAN card, connected to a PoE end-span switch or mid-span unit. The standard addresses such an issue by specifying that PoE end-span switches, or mid-san devices, will only inject power feeds to compatible devices, -if the client device does not require a power feed no power is injected.

In a relatively short time, the PoE market has become pretty well established. Some estimates suggest that over 40 million ports have already shipped worldwide. And the application of this technology won't be limited to WiFi Access Points and IP phones. Other applications already in the works include:

- Keypads.
- Security devices, such as retinal or fingerprint scanners.
- Lighting control.
- Home automation systems.
- Security cameras.

On the face of it, the list of possible applications is almost endless. However there are limitations that need to be considered. The standard uses the spare pairs within the UTP cable to provide power to the device. This is fine for 100BaseT, 100 M bit traffic, because only two pairs are used. However 1000Base T, 1 G bit traffic, uses all four pairs making mid-span PoE impossible using the current techniques. [Note some vendors have recently released **proprietary** 1 G solutions] Also the maximum power that can be delivered under the current standard is 12.9 watts. While this is sufficient to power current generation Access Points, VoIP phones and static CCTV cameras etc, it is not sufficient to power more energy hungry devices such as pan tilt and zoom (PTZ) cameras.

The IEEE 802.3af standard has been a major step forward which has greatly simplified the implementation of many applications such as WiFi, CCTV etc. There are limitations in terms of power load and data speed. It is expected that future updates to the standard will go some way to increasing the power and possibly the provision of PoE over 1000BaseT channels. However, no dates have been set for an update to the standard.

Remember, this series of Technical Bulletins is designed to provide a basic technology update, and to present topics on one single page, so as it can be read over a single cup of coffee. For more advice please contact us.

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