Direct approach

A new solution for interfacing Ethernet-based traffic signal control equipment to existing twisted copper pair circuits is proving particularly valuable in these challenging economic times, where investing in brand-new systems may no longer be an option

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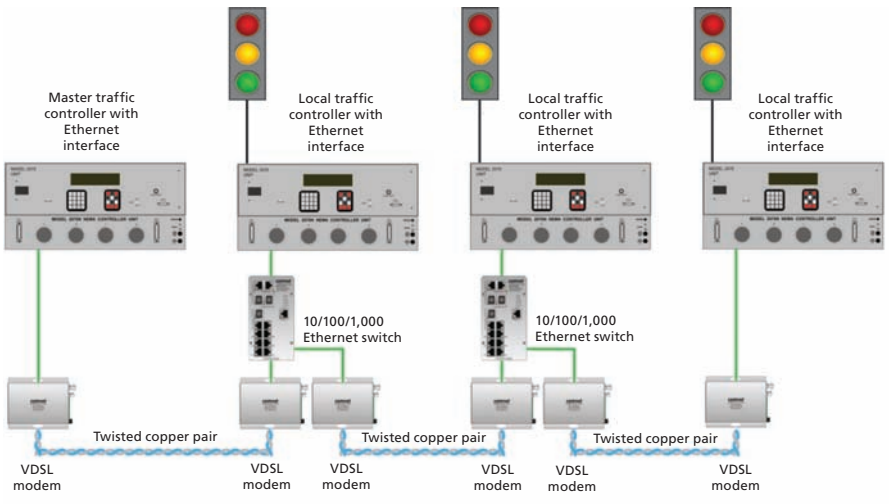
Many system owners that want to upgrade the capabilities of their closed-loop traffic signalization systems – or even completely rebuild their current ITS communications infrastructure – are finding budget constraints are prohibiting them from doing so.

For many years, a large number of signalization systems were deployed utilizing analog-based frequency shift keying (FSK), with the communications media being conventional twisted copper pair circuits. Other systems were RF-based, but employed the use of wider-bandwidth coaxial cable in lieu of the more widely used balanced 600Ω copper transmission circuit. As a result of the inherent bandwidth limitations of these circuits – particularly the twisted pair variant – the data rate capability is very low, but was adequate when baud rates in the order of 1,200 or 2,400bps were common.

Most ITS-specific hardware is now available with an Ethernet electrical interface, allowing the equipment to be easily integrated onto virtually any Ethernet-based network platform. Ethernet data rates are in the order of 10/100 or 1,000Mbps, and the communications equipment that supports these rates is now commonplace within the ITS industry. To this end, a user with an installed base of copper media desiring to upgrade their existing signalization system with a latest-generation traffic signal controller faces a major dilemma regarding how to effectively interface the two successfully, as twisted copper pair or coaxial cable are not directly usable with Ethernet.

The limiting factor with any Ethernet-over-copper network is the distributed capacitance inherent in either the twisted pair or coaxial cable. This creates a low-pass response relative to the applied data and effectively reduces the transmission distance versus data rate, known as distance/bandwidth limitation. As the data rate increases, the maximum usable length of the copper circuit must decrease, or serious data errors will result, hence why the Ethernet standard of 100m maximum transmission distance through CAT-5E copper exists.

One solution is to build a new infrastructure (e.g. a fiber-optic cable plant), although this is too costly for most ITS authorities. Recently, several innovative technologies have been developed to extend the useful transmission distance through copper. However, the majority of these devices are designed for deployment in benign, conditioned operating environments, and not the typical unconditioned roadside/out-of-plant environments encountered within ITS. Additionally, they are designed for use with CAT-5E copper wire and not the twisted pair found in early ITS systems.



Upgrade of earlier generation system to Ethernet with existing twisted copper pair

NEW TOOLS FOR THE BOX

ComNet has introduced a product line that addresses these issues head-on and allows the user to retain existing copper-based infrastructure. These modems use the latest in VDSL (Very high-speed Digital Subscriber Line) technology. One is a modem unit that allows the use of Ethernet over a conventional copper twisted pair circuit, up to a maximum of 3km (9,800ft) between modems, making it ideal for Ethernet-based signalization systems. The other is a modem unit that allows the use of Ethernet over conventional 75Ω coaxial cable, up to 2.6km (8,500ft).

These devices allow the latest-generation Ethernet traffic signal controllers to connect directly to the system owner's existing copper communication infrastructure. Point-to-point or the more commonly used point-to-multipoint network architectures are fully supported. The VDSL modem that can be used with 75Ω coaxial cable is designed for connecting IP-based CCTV cameras to an installed base of coax, for intersection monitoring or video detection systems.

Capable of running at a maximum Ethernet data rate of 100Mbps – and fully compliant with the NEMA TS-1/TS-2 standards for traffic signal control equipment – these small form factor units may be easily deployed within virtually any controller field cabinet. Installation is essentially plug-and-play and MTBF exceeds 100,000 hours, making the units extremely reliable. ■

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