

Ethernet Expands Existing Infrastructure

Ethernet is compatible with all transmission data, thus allowing easy integration of separate devices into a single system. It maximizes existing cabling infrastructure to save costs.

BY MARIKO HIGASHIYAMA

Ethernet is picking up speed. “Markets in Asia Pacific and the Middle East are developing at a rapid rate, and the choice of transmission cabling is generally that which is most suited to the site,” said Corin Moorhead, Product Manager, COE. “Ethernet has become appealing for newer sites with existing Ethernet network cores.”

Ethernet can run on any cable used in a system design, said Sara Bullock, International Sales Director, AMG Systems. It can be used for video-only transmission as well as integrated solutions.

Using one transmission method helps regulate the overall system. “When all devices use Ethernet, it allows one server the ability to control and access all the devices, thus allowing for full integration of different systems,” said Ben Chiang, Product Manager, EtherWAN Systems.

Ethernet normally runs on either twisted pair or fiber. “The limitation with twisted pair is that the maximum transmission distance is 100 meters, whereas it is unlimited with fiber cable, depending on the transmission technology used. Multimode fiber usually can transmit 100 megabits (Mb) up to

two kilometers, and 1 gigabit (Gb) up to 550 meters,” Bullock said. Compression of data solves most bandwidth issues.

COMPRESSION AND ETHERNET

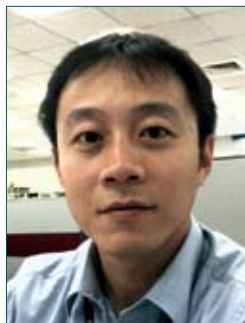
With the advent of IP video, bandwidth has become an important consideration for deciding which wired transmission method to utilize, Moorhead said.

Video signals must be compressed, since Ethernet’s maximum bandwidth is 10 Gb. “Because one video signal takes 140 Mb, the capacity is soon exhausted,” Bullock said.

Currently the most bandwidth UTP cables can carry is 1,000 Mb per second (Mbps); a common analog camera has about 10 MHz at

most, while an uncompressed HD camera has about 1,300 Mbps, said Darius Lukocius, Sales Manager, EMEA, OT Systems. The quality of the transmission is affected because large files transmitted on limited bandwidth leads to signal compression and loss. “The only way to prevent this is to upgrade to a transmission medium with a higher bandwidth, such as from UTP to fiber optics.”

In terms of speed, Ethernet transfers data at fixed speeds of 10 Mb and 100 Mb, or 1 Gb and 10 Gb. Unless large quantities of video are injected into the cables, Ethernet poses no problems in terms of speed. But once large quantities of video are being transmitted, there will be some latency, and the switching will be delayed, Bullock said



Ben Chiang, Product Manager at EtherWAN Systems



Sara Bullock, International Sales Director, AMG Systems



Corin Moorhead, Product Manager, COE

ETHERNET EXTENDERS

One of the biggest concerns when integrating transmission solutions is utilizing the existing infrastructure. This reduces waste, instead of removing the old wiring and replacing it with a new system. "An Ethernet extender can help utilize cables connected to analog devices," Chiang said. "IP protocols from a network camera can be transformed to DSL, carried 2,400 to 2,600 meters over the existing commercial cable infrastructure and then converted back into Ethernet to be saved to an NVR."

This technique allows for more flexibility when adding Ethernet to an existing installation. "If the existing cables were fiber cables, it would be extremely costly and time-consuming to extend the system using fiber cables," Chiang said. "Additional issues come in the form of government limitations concerning placing cables underground, which must be done when installing fiber cable for a large project."

An example of a large system would be traffic light controls, Chiang said. They rely on Ethernet extenders and emergency phone cables to transmit data, which helps save extra wiring costs.

POE

PoE uses the same cables for video transmission to power devices, which saves on additional power cabling. "Power can come from a PoE injector or from a switch," Bullock said.

The PoE market has been growing 50 percent yearly since 2008, and is expected to reach 185.6 million PoE ports by 2011, according to an IDC report. The high power (IEEE 802.3at) PoE market has tripled

annually since 2008, and is expected to reach a total of 34.3 million PoE ports by 2011, said Mike Liu, Product Director, Korenix Technology.

PoE switches transmit data and power to multiple devices plugged into the same switch. "High Power IEEE 802.3 at PoE standards is the current trend in the PoE market due to its ability to provide up to 30 watts power per port via network cables, along with the highest quality data," Liu said.

Some points need to be considered when choosing a PoE switch. "Environmental conditions, reliability and available power are some of the key considerations in whether to use an industrial-grade PoE device over a commercial grade device," Liu said. "There needs to be a wide operating temperature and rugged fanless design, vibration and shock resistance, as well as high-potential isolation protection for performing reliably in industrial environments."

The voltage required for each application varies. "In a public transportation system, the power supply system is usually 24 V DC,

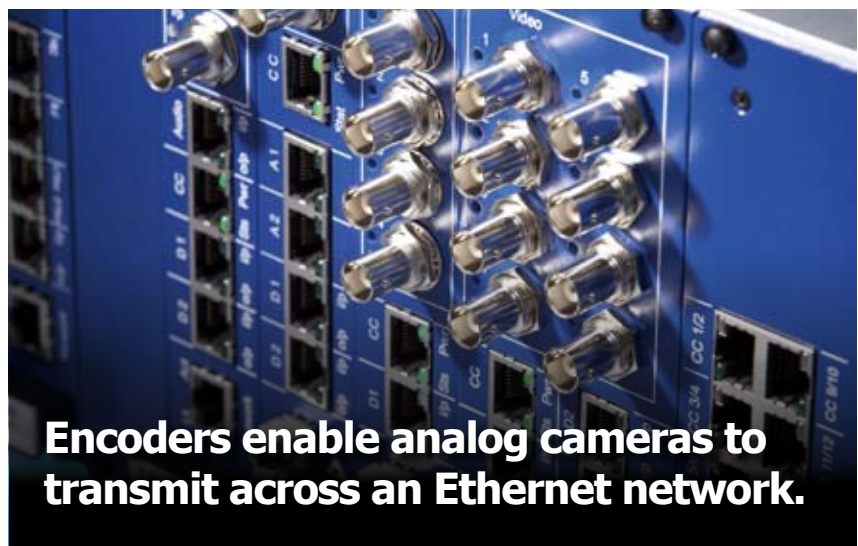
which does not fall in the range of 44 V DC to 57 V DC, as defined by the IEEE802.3af standard," Liu said.

In these circumstances, additional voltage transformers are needed. However, this may exceed cost and space limitations. "Being able to feed a wider range of power voltages from the power-sourcing equipment (PSE) would be the most direct solution," Liu said. "This becomes another challenge for the PSE manufacturers to meet the needs of diverse industrial applications."

REDUNDANCY

If part of the transmission network fails, redundant systems automatically reroute signals. "Some Ethernet switches can provide a dual-homing ring technology to ensure that if one video path is compromised, transmission will automatically redirect to avoid the broken link, and ensure video fidelity remains," Moorhead said. "Also, dual-redundant power supplies, optional dual-redundant fiber and Ethernet ports can help prevent signal loss."

Signal compensation must be



Encoders enable analog cameras to transmit across an Ethernet network.

carried out to maintain acceptable amplitude and signal to noise ratio, Lukocius said. "However, for budget-conscious systems, redundancy is not always provided."

BOOSTERS, REPEATERS, AMPLIFIERS

Boosters, repeaters and amplifiers strengthen signals during transmission. "After a certain transmitting distance, signal repeaters need synchronization to regenerate the signals to proper amplitudes and for sending them to the other segments," said Mark Wilson, VP of Marketing, Infinova.

They reduce noise, correct electrical characteristics and strengthen signals before retransmitting them to the next receiver, Lukocius said. For optical data, they can technically double the transmission distance. However, the actual distance depends on the data rate, cable capacity, connectors and splicing, since they weaken signals.

Generally, these devices do not alter data in any way and only serve to extend the distance of digital transmissions. This is how transmission distances of 40 kilometers and above can be achieved on a single-mode fiber cable. But for analog transmission, repeaters do influence the signal because every time the signal is boosted, noise is introduced into the system. "Hence, distances are limited because the signal-to-noise ratio above a certain distance is degraded so much that the original signal can not be retrieved," Bullock said.

CHALLENGES

Some of the biggest challenges for installers and integrators are the individual project sites. "The

availability of infrastructure to support the type of media — conduits, cable trays, ladders and telecommunication spaces — as well as requirements of active components along the transmission links and time and cost are all key considerations in choosing the right transmission solution," said Thong Hsi, Division Manager, Integrated Communication Device, ST Electronics. "The system requirements may dictate the type of transmission media to be used, but the actual installation environment and scenario may otherwise present these challenges to the chosen transmission solution."

It is crucial to calculate the transmission distance and how much data is to be sent to avoid signal loss. "The addition of repeaters and amplifiers can quickly rack up extra costs," Chiang said.

For mobile installations, flexible network cables are required to prevent them from breaking, said Michael Blotnicki, Business Development Manager, IP Video Systems, Europe, Plustek.

FUTURE OUTLOOK

Advances have been made in twisted pair cabling to ensure better signal. "Multichannel digital receiver hubs are used to fully and automatically equalize video signal loss due to cable attenuation. The result is that of a fiber-like signal being delivered to the recording and encoding equipment," said Guy Apple, VP of Marketing and Sales, Network Video Technologies.



Darius Lukocius, Sales Manager, EMEA, OT Systems



Mike Liu, Product Director, Korenix Technology

As far as fiber optic transmission is concerned, it will be boosted by demand for streaming real-time high-resolution video. "This trend is brought by the increasing popularity of HD cameras," Lukocius said. "Despite advancing compression technology, bandwidth is still a major restriction. To overcome this, fiber optics will be the best option."

The move to megapixel and HD cameras require higher bandwidth for transmission. "The debate currently is whether video analytics should be placed at the camera point — the edge of the network — or if video signals should be transmitted uncompressed, thus retaining all the information in the image, back to the control room for analytics to be applied," Bullock said. Transmission comes to the fore in the latter option, as uncompressed video requires more bandwidth.

Wired transmission continue to play an important role. "Wired and wireless transmissions have their respective places in the system, as well as advantages and disadvantages," Wilson said. "It is important to match and balance the suitability of each option against the requirements of every project, in order to achieve an optimal solution that is economically viable to the users."

