



COMPANIES SWITCH TO INTERNET PROTOCOL CAMERAS

EFFECTIVE SECURITY REQUIRES ACCURATE, identifiable video surveillance. The need to see events as they occur—especially at remote locations, in real time or after the fact—is what good security is all about.

Digital Internet protocol (IP) cameras use network technology to send images to a central head-end where security personnel can use the images in an assortment of ways. IP technology makes it possible to transport video images for much greater distances than is possible with conventional analog technology. The challenge is how to transmit IP-based video signals between two points that are separated by distance when it is not practical to install cable.

It is not always possible or affordable to trench cable, even where multiple outdoor cameras and the head-end are located on the same property. When such a project involves more than one property owner, the price tag can be even higher.

One possible answer is to use a short- to medium-range wireless system, such as point-to-point microwave or a radial wireless system that

transmits in a 360-degree pattern. Another possibility involves the use of wireless mesh technology.

Mesh technology

Most residential and business users are acquainted with Wi-Fi technology that provides a single point of connectivity between a laptop, PC or a local or wide area network (LAN/WAN). For a critical security system, professionals will sometimes add a second antenna for better reception, or even install expensive repeaters. A wireless system that uses mesh technology, however, can be more reliable and more practical.

Mesh enables the use of multiple wireless nodes, each one acting as a repeater of sorts. Every wireless node in the system is able to pick up and retransmit data sent by other nodes.

Wireless transmission can be interrupted when something in the environment causes a network

disruption. In an ordinary Wi-Fi network using IEEE 802.11, this can be a real problem. A mesh, however, will route data around the blockage. In this instance, every wireless node acts as a router, moving data so it ultimately reaches its intended destination. This is commonly referred to as “self healing.”

The ability to self-heal is one of the things that makes a mesh system attractive for security use. The redundancy provided by this kind of arrangement is an absolute must when working with video surveillance.

IP wireless connectivity

“Early on, we recognized the advantages associated with IP technology. A megapixel solution exceeds analog from a video sense, so we get better image resolution,” said Dan McKimm, president of ProTech Security of North Canton, Ohio. “The intelligence within an IP camera also allows us to store and buffer video within the camera itself. This gives us built-in redundancy if something should happen to the network.”

According to McKimm, if something happens to a digital video server, the client can still retrieve video images from the camera itself.

“If the connection fails for any reason and we lose video, our IP camera contains a ring buffer which is a [data] storage device that can store a specific number of video frames. Because it’s a ring buffer, data written first is overwritten last,” McKimm said.

Better pictures, redundancy and a longer transport range are not the only advantages IP cameras bring to the table. A quality IP camera inherently offers greater light sensitivity in nighttime situations. This is a tremendous advantage when installing in remote locations where lighting may not always be ensured.

By adjusting the rate at which images are processed and sent to a digital video recorder (DVR) or network attached storage (NAS) device, the camera’s imager can generate an amazingly high-quality image. By slowing its image processing rate, it gathers more reflected light from the surrounding environment. This enables end-users to more easily identify perpetrators, license plate numbers and other details that could otherwise be lost to an analog-based system.

Although IP cameras are well on their way to becoming a de facto standard in the video surveillance market, there are still thousands of analog cameras in use. And analog is still used in new installations every day, usually because of the cost difference between analog and IP technology.

“As much press as IP cameras get, they still account for only 10 percent or less of all cameras sold. They’re still a niche,” said John

Monti, vice president, marketing and business development with Pixim, of Mountain View, Calif. “The problem is cost. Our message to the industry is you need cleaner, more accurate video that works in all lighting and saves on bandwidth and storage costs.”

National firm turns to IP wireless

When a fast-food restaurant chain purchased two bakeries in Zanesville, Ohio, located only a few miles apart, it became apparent to the security director that the corporation needed remote video surveillance to maintain the integrity and safety of incoming and stored product at a nearby intermodal rail yard. ProTech Security was the vendor chosen for the job.

“We’re sending video images from the Zanesville Port Authority [rail yard] to a central point between one and two miles away. We presently have two cameras on duty overlooking all the tankers that bring the flour into the [intermodal] facility.

“We watch to see who’s out there. You would think there would be very little activity, as this client is actually in the middle of nowhere, but it’s amazing to see how much foot traffic is out there,” said Art Morrison, operations manager with ProTech Security.

In a network environment, communications is bidirectional, which means signals travel from a camera to a recording device and vice versa. Bidirectional signaling is necessary for network management. Another reason for the bidirectional flow of data in some remotely managed video surveillance systems involves the control of pan/tilt/zoom mechanisms and the zoom feature incorporated in some camera lenses.

For this application, ProTech Security chose a wireless IP-networking solution called HotPort, developed and offered by Firetide of Los Gatos, Calif.

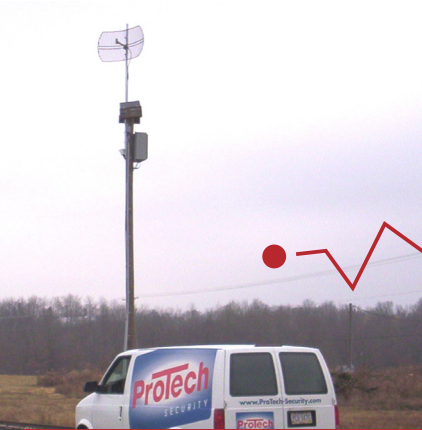
“The reason we went with Firetide is that we really like the wireless mesh technology. It’s an up-and-coming technology that can be used in video deployment,” Morrison said. “The throughput is quick and self healing and you can deploy outdoor and indoor nodes on the system. The outdoor nodes provide PoE [power over Ethernet] right at the source, and it’s very scalable.”

Mesh technology at work

The technology used by ProTech Security to transmit video images several miles to one of the bakeries’ security departments makes use of wireless mesh technology, rather than metallic or fiber optic cable.

Firetide’s manufacturer claims a data throughput of 25 megabits per second (Mbps). However, according to ProTech Security’s Morrison, they are able to derive a throughput of up to 35 Mbps per node.





The wireless network technology used by ProTech Security of North Canton, Ohio, transmits bidirectional data with a throughput of up to 35 Mbps per wireless node.

Video images from an intermodal rail yard in Ohio are sent to security personnel more than a mile away using a network-type wireless technology made by FireTide of Los Gatos, Calif.

color will usually render larger size images than those that do not.

Image resolution is a factor to consider when installing a network camera system. In practice, image quality is largely determined by resolution and percentage of compression.

“When video goes from analog to IP, there are [a lot] of changes and one of them is compression efficiency,” Monti said.

Because of inherent bandwidth and storage limitations on a network, the compressibility of the video becomes a key factor in the cost of ownership. The cost of the whole video security system hinges on how well compression takes place. Most digital network cameras use the M-JPEG and the MPEG compression protocols.

Another factor determining the quality of the image is color saturation, which can range from grayscale to full red-green-blue color. The closer the image is to full color, the higher the bandwidth requirements.

Using the FireTide mesh technology, video images are carried at a rate of 2 to 30 frames per second (fps). The higher the fps rate, the more the video presentation will appear normal to the human eye.

There are tradeoffs that make it necessary for security technicians to scale the fps back to 10 or 15 fps and sometimes even less. In practice, 15 fps is usually used as a standard when installing a remote video surveillance system. When everything is working well, 15 will render a nearly complete chain of motion on the monitor. In some applications, however, as little as 5 fps is used to manage network bandwidth. “The camera can be programmed to limit the amount of bandwidth it uses, which is crucial when dealing with [information technology] personnel in large corporations,” McKimm said. “Security companies need to form a partnership with the end-user’s IT personnel, and this can only be accomplished by assuring them that they can provide a camera that will never throttle beyond the amount of network bandwidth they allow for video.”

Because surveillance video resides on the network, more than one authorized person can view it at the same time. Not only that, it can be stored and maintained off-site using an assortment of data storage methods. ■

“FireTide will typically give you a throughput of 500 [kilobits per second] per camera if you average it out up to 1 Mbps. A radio at simplex will give you 35 Mbps. So, doing the math, this will support up to 35 cameras at best on a good day,” Morrison said. “A good way to go is a two-radio system. This allows you to take advantage of the full 70 Mbps throughput that they can offer.”

In ProTech Security’s bakery installation, two cameras are being wirelessly transported back to one of the two bakeries. An internal WAN is then used to send the same video data to the second site where security personnel also can maintain a close watch on incoming and stored raw materials.

Cameras essentially plug into an Ethernet port on the back of a wireless transceiver, which acts as the node. The mesh network itself acts as a network switch, so no further hardware is needed other than a transceiver at the other end.

The system supports both indoor and outdoor applications. Outdoor nodes are designed for adverse environments where indoor nodes are not. The frequency of operation for the Hot-Port system that ProTech Security used is selectable: 2.4 GHz or 5 GHz.

Wireless image quality

The images that digital IP cameras generate usually range from 160 × 120 pixels to 640 × 480 pixels. These images are collected and stored by a DVR, NAS or some other network-oriented storage system.

As a general rule, the smaller the image, the less storage space it requires. In the case of a 160 × 120 pixel image, the typical file size is 19.2 kb. The larger image contains approximately 307.2 kb of data. A megapixel camera that can be used to create VGA

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