Keeping Watch on the City: IP Video Surveillance

A guide for public officials on the advantages of IP video surveillance for metropolitan surveillance.

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Introduction

Crime, vandalism and terrorism like the London bombings of July 7 and 21, 2005, have many cities looking at video surveillance solutions. Video surveillance plays an important role in deterring and helping solve crime by monitoring city streets and transit systems, and providing valuable evidence for prosecution. The Chicago Police Department, for instance, calls its growing web of video surveillance an important crime-fighting tool, responsible for playing a role in more than 1,200 arrests since February 2006.[1]

With this surge of interest in public video surveillance, older analog video surveillance systems are falling by the wayside. Their shortcomings are well known: poor image quality, the need for constant monitoring, expensive installation and maintenance, limited capabilities for motion detection, and all the awkwardness of video tape, particularly in search and retrieval of specific incidents and in handling and storage. Digital video recorders (DVRs) have helped, but fail to deliver all the true advantages of IP networking.

IP (networked) video surveillance, on the other hand, introduces a wide range of new benefits and capabilities to video surveillance. These benefits include easier, less expensive installation; wireless cameras; higher image quality; more automation; video analytics; and greater cost effectiveness.

By installing or transitioning to IP video surveillance, cities can significantly improve the effectiveness of their video surveillance. This paper discusses the growing use of video surveillance in cities, people's attitudes towards it and the advantages of IP video surveillance for metropolitan video surveillance. We also include two brief case studies that help illustrate some of these benefits.

Authors:

Eric Fullerton, Chief Sales and Marketing Officer, Milestone Systems Inc., the world's leading innovator and thought leader of open platform IP video management software.

Søren E. Kannov, Large Project Sales Manager, Milestone Systems Inc.

[1] "Camera on Every Corner: Protection or Invasion," ABC News, July 29, 2007.

Who's doing it

Metropolitan applications of video surveillance are growing around the world. The French transportation system, for instance, uses video surveillance on streets to regulate traffic flows, detect traffic jams, and to observe roadside disturbances. In Paris, the Metro has installed 2,500 video cameras on municipal buses to identify criminal acts as they occur. A similar video surveillance system is operating on the national rapid transit (RATP). It has been responsible for detecting 83% of all criminal incidents.[2] The result has been a noticeable decline in petty crime.

Britain, of course, leads the world in video surveillance. The UK has one percent of world's population, but 20% of its surveillance cameras. London has 6,000 cameras in the Underground (its subway system) alone. Elsewhere in Europe, the Spanish Interior Minister has installed video surveillance equipment in public areas in the Basque region in an effort to combat street violence and politically motivated vandalism. Italy is using video surveillance in public areas and government buildings in Rome, the Vatican, and other high profile tourist areas. In Copenhagen, politicians and police alike have increased calls for more video surveillance after a video surveillance system enabled police to quickly arrest three suspects shortly after a stabbing death in January 2008. According to Per Larsen, Copenhagen police operations chief (quoted in The Copenhagen Post, January 15, 2008), "Video recordings are the ultimate source of evidence."

Even smaller cities are seeing the value of video surveillance. The city of Wodzislaw Slaski in Poland now has an IP video surveillance system that the city says has improved the safety of citizens and reduced road offenses in the city's traffic.

Metropolitan video surveillance is also growing in the United States. In July 2007, New York City officials, for example, unveiled the Lower Manhattan Security Initiative. Modeled after London's "Ring of Steel," this initiative includes 3000 new surveillance cameras, automated roadblocks, and license plate readers. Chicago is following suit with 560 anti-crime cameras already deployed on city streets. It revealed plans in September 2007 to add a sophisticated video analytic system that will detect abandoned bags, suspicious behaviors (e.g., a vehicle circling a key building), and vehicles sought by police.

In Baltimore, a program called CitiWatch includes a state-of-the-art central control center monitoring nearly 400 cameras. Most are mounted atop streetlight poles and provide continuous surveillance in downtown tourist areas, some of the city's most violent neighborhoods, and five of the city's public housing projects. On the West Coast, Los Angeles uses surveillance cameras on its Metro Rail system, in city buildings, and on various freeways and busy intersections.

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[2] Nieto, Marcus, "Public Video Surveillance: Is It An Effective Crime Prevention Tool?", California Research Bureau (1997).

Popular with the public

Despite fears of a “Big Brother is watching you” attitude from the public, research shows people are generally positive towards video surveillance in public places. An 2007 ABC News/Washington Post Poll showed that by almost a 3-to-1 margin, Americans support the increased use of surveillance cameras in public places. In 1999 the Crime Prevention Council (Det Kriminalpræventive Råd) and Danish Gallup conducted a telephone survey questionnaire with 514 randomly selected respondents. The results indicated that an overwhelming majority are positive to video surveillance of public spaces where one is already “publicly visible.” Respondents indicated that surveillance makes one feel more secure.

Public acceptance of video surveillance skyrocketed in Britain after the murder of toddler James Bulger near Liverpool in 1993. In surveillance footage that shocked the country, the killers, a pair of 10-year-old boys, were shown leading the trusting 2-year-old away from a shopping center. The boys were soon caught and the video clearly illustrated the value of surveillance in public areas.

IP video surveillance and the importance of open platform software

IP video surveillance systems are the new standard for video surveillance and rapidly replacing closed circuit television (CCTV) systems that use analog video recording. Based on the TCP/IP network protocol, IP video surveillance enables your municipality to build your own video surveillance system using standard video and computer hardware.

One of the first steps in implementing an IP video surveillance system is selecting the brains to run it — a video surveillance management application. This is essential for providing efficient video monitoring and analysis, as well as opportunities for integration with other applications, such as video analytics.

The best IP video surveillance management software is “open platform.” Open platform software uses published external programming interfaces, such as the Application Program Interface (API), to enable third-party applications that can expand the functionality of your system.

Milestone Systems XProtect® products are a good example. They provide a flexible platform supporting a wide variety of IP camera manufacturers' offerings in video cameras and video servers. Value-added integration with other systems via APIs provides the ability to share data from other systems, devices and components for a truly powerful solution.

Lets You Add Video Analytics

Proof of how valuable an open platform can be is the video surveillance system used at Liberty Island in New York. Video cameras feed into a computer system running video analytics software that analyzes the imagery and works with the video surveillance management software to automatically alert staff of suspicious events, such as abandoning a bag or backpack. The video analytics software can even distinguish between ferryboats which are allowed to approach the island and private vessels which are not. It can also count people to detect if somebody is trying to stay on the island after closing or if people are grouped too tightly together—an action that might indicate a fight or gang activity.

Even more advanced programs providing behavior analysis are becoming available. These actually learn the normal human patterns in a location such as a street corner or public landmark. They can highlight and log behaviors of individuals who act or move in unusual ways.

ShotSpotter Gunshot Location System

For areas of gang activity and frequent gun use, an open platform enables you to add solutions like the ShotSpotter Gunshot Location System (GLS). This product uses a patented technology to detect weapons-fire events over large, complex environments. The system uses wireless and/or wired sensors to identify, locate and give a visual

image of the location of a gunshot event within seconds. ShotSpotter GLS interoperates with camera and surveillance systems, so it can direct pan/tilt/zoom (PTZ) cameras and interact with 911 and other dispatching technologies.

Alerting Capabilities

Many IP video management solutions include the ability to direct alerts to specific people or devices. Such alert capabilities enable faster response to incidents. The ability to access cameras through the software is also important for enabling more intelligent response. Employees, with appropriate authorization, should be able to log on via the Web any time and view what any particular camera is recording. In Baltimore's central command center, for example, staff can use the system's software to take control of the camera, zoom in, and if necessary, send an alert through the police communications network. In one case, a man was seen putting on a ski mask on a street corner and a car was immediately dispatched and a robbery foiled.

Search and Export Video

Video surveillance management software also makes it easier to search stored video and export evidence to Internet-connected devices. Officer David Hare of the Baltimore police force reports in Government Security Magazine that he can use their system's video surveillance management software to call up multiple incidents of recent violent crimes in minutes. Doing the same kind of search with video tape can take hours.

More flexible installation

Another advantage of IP video surveillance is that a municipality's IT department already has the necessary expertise for installing and maintaining the system. Cameras have IP addresses just like any other network device. IP networking enables you to leverage existing infrastructure such as servers, switches and cabling. There's no need for complicated proprietary hardware and dedicated monitors.

Place Cameras Almost Anywhere

IP network cameras can be placed almost anywhere using cost-efficient standard Ethernet cable and wireless technologies such as IEEE 802.11b. They can then be accessed via desktop computer, laptop, PDA and even cellular phone. In Savannah, Georgia, police officers view surveillance videos from laptops in their patrol cars.

In Baltimore, many of the city's surveillance cameras are wireless. According to Beth Hart, manager of the video surveillance system for the Baltimore Mayor's Office of Information Technology, the city "doesn't have optic fiber running under the streets," which made a "combination of wired and wireless technology" very appealing.

Small wireless IP surveillance cameras are also available for covert operations. One great advantage is they can be used in one area, then easily moved to another.

A particular advantage for wired IP network cameras is that they can be connected and powered by Power over Ethernet (PoE), a technology that enables power to be provided to a network camera using the same cable as that used for network connection. PoE eliminates the need for power outlets at the camera locations and enables easier application of uninterruptible power supplies (UPS) to ensure 24 hours a day, 7 days a week operation.

With wired installations, multiple cameras can use the same cable, attaching to the network just like you would any other network device. Changing camera placement is simple – just remove and plug into another network jack somewhere else. This makes it easy to put temporary cameras in any suddenly troublesome spot, such as a street corner being used for drug activity.

Scales Easily

IP video surveillance systems scale easily from one to thousands of cameras in increments of a single camera. This makes them ideal for metropolitan systems that grow in spurts. Installation can be done in stages and can even integrate existing analog equipment to create a hybrid system.

Future proofing

Choosing an open platform like IP networking gets you out of “proprietary jail” — being locked into using one vendor. Unlike a DVR-based solution which locks you into “black boxes” that require proprietary upgrade components, IP video surveillance is based upon open standards that give you a wide choice of products from a large number of manufacturers — not just one. This includes IP network cameras, switches routers, servers, storage systems and software.

With DVR-based system, there is also the very real risk that these products may not be supported in the very near future. With the speed of development in and popularity of IP video surveillance, DVR-based systems could be left in the dust.

The freedom of choice you get with an open platorm reduces initial investment, ensures better pricing and greater value, and makes additions and replacements easier and less expensive down the line. You can always select equipment from suppliers based on your needs, not because you’re locked into a particular system or platform.

Consider storage for example. With IP video surveillance systems, you can take advantage of the most cost-effective network storage solutions now. Then, when something better comes along, you can switch to that, no matter who you bought your earlier storage system from.

More future proofing comes with the potential to add new applications that become available in the future. London's Westminster City Council, for instance, has a vision to create a "Wireless City" using their video surveillance system that will help reduce crime; provide real time information to city officials to manage street services such as parking, premises licensing, and environment waste; assist with special events; and deliver community-based services such as e-learning. Some of the necessary applications are available now. Others are on the way.

Better video quality and camera features

IP network cameras are digital and provide up to 16 times the resolution of traditional analog cameras. Analog images are made of lines and each image is formed from two interfaced fields. When an image contains a lot of movement, it becomes blurry. With digital pixel image sampling, an entire image is captured at one time, providing crystal clear images even with a high degree of motion. This enables IP network cameras to provide rich detail (such as facial features or the numbers on a license plate), rather than blurry, hard-to-read images.

Multi-megapixel models that deliver full-motion digital video are available at analog camera prices. High-performance multi-sensor cameras (e.g., 8 megapixel quad-sensor 180° and 360° panoramic cameras) can drastically reduce user cost per unit area under surveillance by covering more ground per camera.

The more powerful IP video surveillance management solutions (such as Milestone XProtext Enterprise) can handle unlimited numbers of multi-megapixel cameras and time-synchronize them. This is important because to analyze an incident you will typically need to view multiple cameras using simultaneous, time-synchronized playback (all cameras playing back on the same time line).

To reduce video storage requirements, IP network cameras can be equipped with image buffers to save and send only the images collected before an alarm occurred and after an alarm.

Superior Zoom

For superior digital zoom capabilities, you can select IP network cameras with pan/tilt/zoom controls (PTZ network cameras). These cameras enable staff to remotely take control of individual cameras and zoom in on an activity. Some cameras' zoom capabilities enable reading a cigarette pack from as far as 1,000 feet away.

In general, you'll find much more innovation in IP network cameras. Just as consumers are losing interest in film cameras, so is interest waning in analog surveillance cameras. They're a sunset technology and most of the industry's energy is turning to the much more promising possibilities of IP network cameras.

Improving crime prevention and prosecution

There is nothing like visible cameras throughout a city to send a clear message to people that they are being watched and their actions recorded. What's more, the growing number of cases where criminal convictions are aided by video evidence are making criminals think twice. This is especially true as more video from IP network cameras appears in court. The clearer, sharper images made positive identification of perpetrators easier and more conclusive, increasing the rate of conviction.

A Philadelphia murder in May 2005 demonstrated how effective video surveillance can be in investigations. A serial killer was caught on external post office surveillance cameras shooting a woman with absolutely no warning or provocation. Without the video, the serial killer could have gone on to add additional victims to his list.[3] From this and other experiences, the city announced in 2007 it was installing a 250-camera video surveillance system, with an option to add another 250 cameras at a later date.

In Chicago, a 14-year-old boy mistaken for a rival gang member was gunned down by gang members. Police surveillance cameras captured the getaway and helped put his killers behind bars. Chicago Police Commander Jonathan Lewin notes, "We see a reduction in crime in the areas around the cameras. The last three years are the first three-year period in over 40 years that we've had less than 500 homicides a year, and we think the cameras played a role in that."[4] He also points out that the video surveillance system "contributes to people's sense of well-being."

IP video surveillance also helps improve public safety. According to Brad Goodman, the network manager for Savannah's video surveillance system, their surveillance cameras located in the city's downtown area (the largest National Historic Landmark District in the United States) "are making a big impact" in public safety, particularly during festivals and parades.[5] Officers can monitor emerging problems or confrontations from remote locations and notify officers in the field. Using mobile Internet devices, first responders can see where to go and what to expect.

The video analytics made possible through IP video management software and add-on applications improve surveillance effectiveness. Where human observers have trouble dealing with an increasing number of video channels, video analytics free staff to perform other duties until notified of an incident that needs viewing. Automatic alerting features can even be used to send alerts when suspicious activities are detected. Other add-on applications can provide ancillary

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[3] "Catching a Killer, With Help from a Camera," ABC News, January 2, 2007.

[4] "Camera on Every Corner: Protection or Invasion?" ABC News, July 29, 2007.

[5] Barton, Denise, "Savannah, Ga., Uses Network to Fight High Crime Rate," Last Mile Online, Jan/Feb 2008.

detection of such things as smoke, fire, or leaking containers. Incident flagging, coupled with high quality image analysis, makes for fast search, retrieval and identification of suspects.

Protect public transportation and drivers

Many municipalities are also looking into using IP video surveillance on public transportation. Wireless cameras on trains and buses enable remote monitoring of incidents.

By using IP video surveillance on public transportation, cities can:

- Protect drivers
- Enforce rider regulations (riders who know they're being watched are more likely to follow rules, pay fares and obey drivers).
- Prevent theft and deter violence (cameras are a preventative measure and enable security to respond quickly and with better information to incidents).
- Enhance passenger safety by enabling faster response to incidents and deterring crime in the first place.
- Crime investigation (footage of incidents aid apprehension and prosecution)
- Reduce vandalism (graffiti, broken windows, etc.)
- Reduce employee theft of items like fuel, cash, lost property, tools, etc.

Reduce surveillance costs

The combination of IP video surveillance management software, video analytics and IP network cameras with PTZ capabilities enable watching over larger areas with less staff, making them the perfect solution for metropolitan surveillance. IP video surveillance enables centralizing video surveillance operations even for operations with thousands of cameras. This can save serious money for cash-strapped municipalities.

As previously mentioned, IP video surveillance also reduces the number of hours required to perform searches. Archived digital video data can be searched in minutes for specific events, rather than hours with video tape. What's more, you have none of the archiving headaches of video tape. IP video network surveillance is stored on servers.

Of course, the biggest cost savings of all come from IP networking. Instead of an expensive proprietary video surveillance solution, you can purchase commercial-off-the-shelf (COTS) components that are easy to install and maintain.

Case study: Police in Bellwood, Illinois, ensure city-wide public safety

1. The Challenge

The Chicago suburb Bellwood has more than 20,500 citizens and is adjacent to communities with high crime rates. Gang activities, guns, drugs, robberies, and even were potential threats to the safety of both citizens and police. Bellwood has a total of 60 sworn officers, and they have been receiving 28,000 emergency calls to '911' yearly.

2. The Solution

Current Technologies Corporation, a Certified Milestone Partner and Cisco Premium Partner, used a variety of different wireless technologies to reach into neighborhoods and completely cover the town with a pure IP video surveillance solution using IP network cameras. Milestone XProtect Enterprise software is the video management tool for scheduling the cameras, viewing and searching live and archived images, and exporting evidence for court proceedings. Police can view video remotely on laptops in their cars before responding to an incident.

3. The Advantages

Police visibility has been multiplied, and the total overview allows them to be proactive and respond faster to incidents. IP networking makes it is easy to move cameras or add more as needed, and allows integration with developing technologies. Citizens, property and officers themselves are safer and the town's image has improved notably. In an article on the well-being of 191 Illinois suburbs, Chicago magazine featured Bellwood as one of the ten communities to watch, noting its visionary approach to thwart crime. A number of residents have contacted Current Technologies Corporation and the police department with offers to donate money to purchase additional cameras in return for adding their properties to the growing security network.

Case study: A Brazilian city keeps watch over its people and property

1. The Challenge

The city of Valinhos in Brazil wanted networked security surveillance to improve safety, help city officers in action, and help reduce traffic problems, vandalism and robberies.

2. The Solution

The city installed an IP video surveillance system using Milestone Systems XProtect software and a variety of IP network cameras (including PTZ cameras) triggered by motion detection and video servers.

3. The Advantages

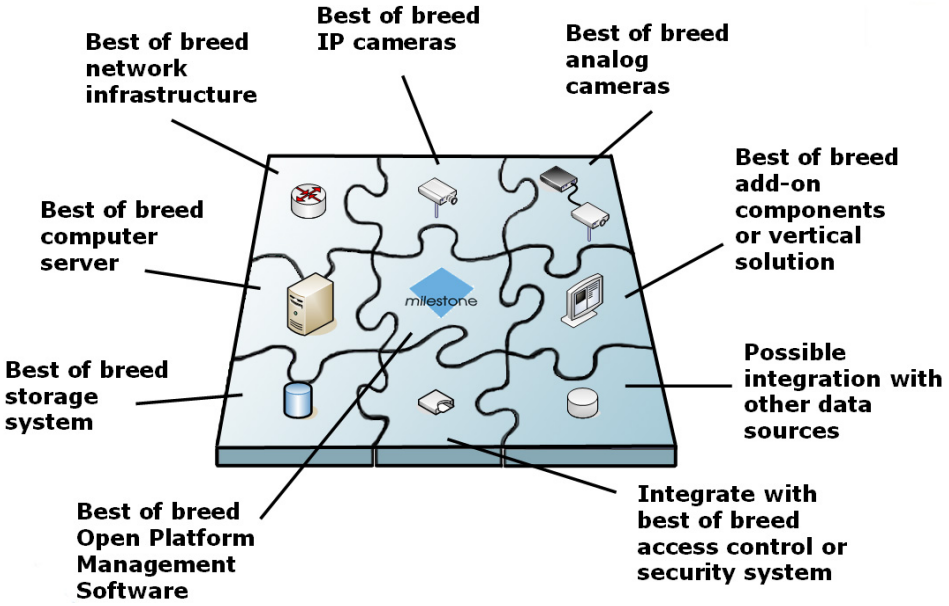
The IP video surveillance system is enabling central control of the city's security monitoring of people, property and businesses, as well as improving traffic control and the safety of public events. According to Antonio Fernando Galasso, Security Manager of Valinhos, “Just from installing the cameras to cover incidences on the streets, the crime percentage has dropped about 6%.” He also cites the “psychological inhibition factor” of having visible cameras as a distinct advantage.

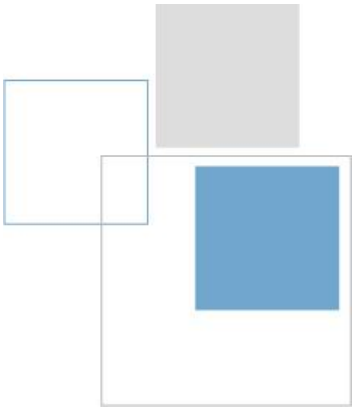
Milestone Systems

Innovator. Milestone Systems is internationally recognized as an innovator and thought leader in open platform IP video management software. Milestone's XProtect products operate as the core of surveillance systems: connecting, sharing and managing all devices through a single interface that is easy to learn and operate.

Easy to use. The XProtect platform is easy to use, proven in operation and scales to support unlimited devices. XProtect products support the widest choice of network video hardware and are designed with an Application Programming Interface (API) that integrates seamlessly with other manufacturers' systems.

Best-of-breed. Using XProtect, you can build scalable, "best of breed" solutions to reduce cost, optimize processes, protect assets and ultimately increase value in a company's products and services.





Milestone Systems is the industry leader in developing true open platform IP video management software. The XProtect™ platform gives users a powerful surveillance solution that is easy to manage, reliable and proven in more than 35,000 customer installations worldwide.

With support for the industry's widest choice in network hardware and integration with other systems, XProtect provides best-of-breed solutions to "video enable" organizations – reducing costs, optimizing processes, and protecting assets.

Milestone software is sold through authorized partners in approximately 90 countries.

Office Locations:

Milestone Systems Inc.
8905 SW Nimbus Avenue, Beaverton, OR 97008, United States
Tel: +1 (503) 350 1100

Milestone Systems A/S (Headquarters)
Banemarksvej 50, 2605 Brøndby, Denmark
Tel: +45 88 300 300

Milestone Systems DE
Am Kleefeld 6a, D-83527 Haag i.OB., Germany
Tel: +49 (0) 8072 442173

Milestone Systems Italy
Via Paisiello,110, 20092 Cinisello Balsamo, Milano, Italy
Tel: +39 02 6179 508

Milestone Systems UK, Ltd.
118 Codnor Gate, Ripley, Derbyshire DE5 9QW, Great Britain
Tel: +44 (0) 1773 570 709

Milestone Systems France
121 rue d'Aguesseau, 92100 Boulogne-Billancourt, France
Tel: +33 141 03 14 82

Milestone Systems Japan
c/o Royal Danish Embassy, 29-6, Sarugaku-cho, Shibuya-ku, Tokyo 150-0033, Japan
Tel: +81 (0)3 3780 8749

Milestone Systems Pte. Ltd.
30 Robinson Road, 13-03 Robinson towers, Singapore 048456
Tel: +65 6225 2686

Milestone Systems Middle East
P.O, Box 500809, DIC, Building 5 IEB, 6th floor Office 606, Dubai, United Arab Emirates
Tel: +971 50 8827093

Corporate web site: www.milestonesys.com

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