Video Applications for Public Safety: Improve Effectiveness and Reduce Costs

What You Will Learn

Public safety organizations need innovative ways to increase citizen service and operational effectiveness despite flat budgets. New advances in video surveillance cameras, analytics, and automated response make video a powerful tool that departments can use to extend their vision and increase the speed and precision of decision making. By using networked video solutions to protect assets, prevent perimeter breaches, and collect evidence, law enforcement agencies benefit from:

- Improved citizen service levels through increased situational awareness and faster response to crime
- Increased quality of life for citizens because they feel safer
- Enhanced officer safety
- A force multiplier: more eyes in more places
- Reduced liability exposure
- Enhanced video evidence
- Ability to merge fixed and mobile video with audio and still photos into one file jacket for case prosecution
- Reduced operational costs

This white paper summarizes the public safety challenges that video addresses, explains advances in video technology relevant to public safety, and describes video solutions from Cisco and its technology partners that are proven and available today.

Value of Video for Public Safety

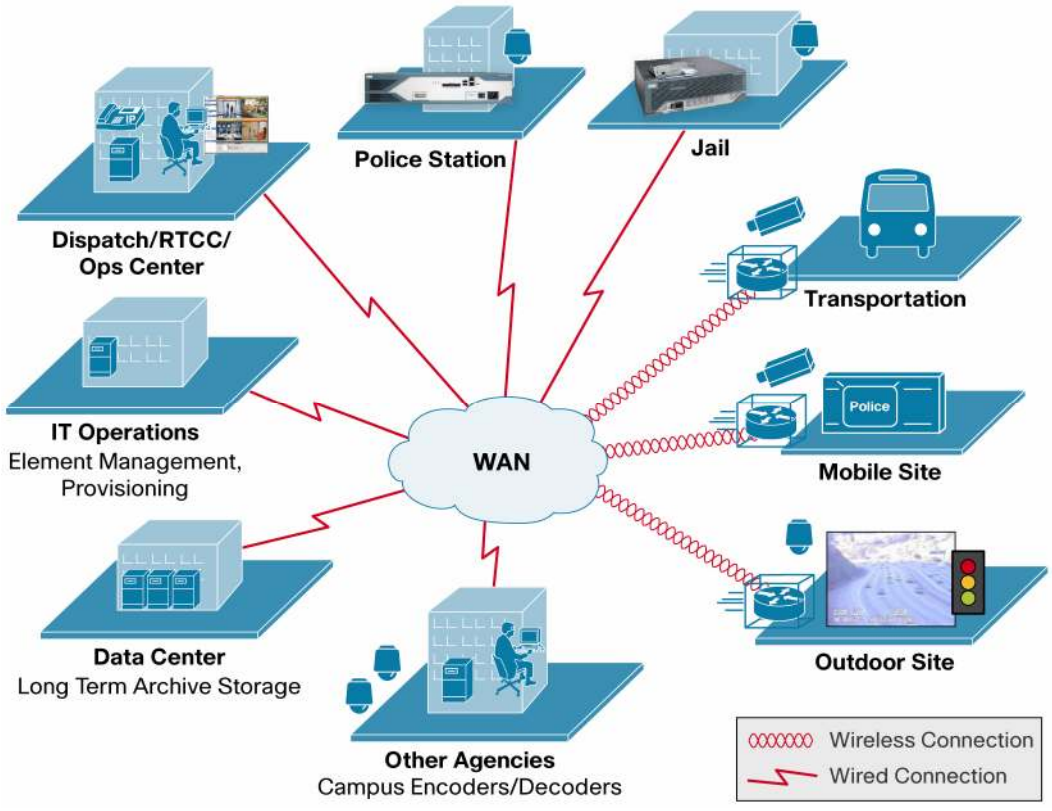
When video is transmitted over IP networks, it helps to solve major public safety challenges:

- **Improving citizen service:** When first responders receive automatic notification of events such as gunshots without waiting for citizens to call, they can respond more quickly to come to victims' aid, protect bystanders, and interview witnesses.
- **Enhancing quality of life:** Communities that have video surveillance cameras report that citizens feel safer. This perception can even contribute to economic benefits such as higher property values.
- **Increasing the speed and precision of decision making:** Earlier awareness of events enables public safety agencies to act preemptively to prevent incidents or to reduce their depth and duration.
- **Providing powerful evidence:** A clear video clip creates powerful evidence for prosecution or exoneration and sometimes avoids the need to go to court.
- **Applying appropriate force:** Video provides situational awareness so that the command center does not dispatch two people when 10 are needed, or 10 when two are needed.

- **Enabling mobile and rapidly deployable communications:** Wireless video surveillance kits, which can include cameras, drone cars, mobile access routers, and more, can be rapidly deployed in temporary venues such as disaster scenes and sports and entertainment events. The same technology enables remote monitoring of areas that are impractical to patrol in person, such as construction sites, critical infrastructure in remote locations, and critical resources.
- **Extending command center's visibility to vehicles:** Transmitting video from the vehicle's exterior and interior can increase situational awareness and provide evidence for prosecution.
- **Providing tactical awareness for responders:** Dispatchers or command center personnel can push video from an incident scene to responders' vehicles, giving them the situational awareness to plan an appropriate response.
- **Providing a force multiplier:** Video analytics software performs better than people for monotonous tasks such as detecting movement. Conversely, people perform better for exception processing, such as determining whether a very small image shows a human or animal intruder. IP video surveillance solutions enable law-enforcement agencies to deploy people and machines for what they each do best.
- **Enabling public-private partnerships:** In some cases, local employers can set up their video surveillance cameras to automatically alert law enforcement when they detect certain types of activity, such as people in areas where people are not allowed after hours.

In summary, video applies more eyes to more problems with greater reliability and lower costs (Figure 1):

Figure 1. Next-Generation Distributed Public Safety Operations



Why Now? What's Changed?

Video in public safety has ceased to mean grainy images and stacks of VHS tapes to search through and store. Recent advances in video cameras, IP networks, analytics software, and video management software have transformed video into a powerful tool for applications ranging from evidence gathering to automated perimeter and asset protection to arraignments. Following are examples of advances that increase the value of video for law enforcement and other public safety agencies.

Video over IP

Video networks used to be separate from the networks used for environmental sensors, building access controls, and communications systems. Today, video can travel over the government's IP network along with voice and data traffic. The enabler is the quality of service (QoS) present in today's networks, which gives priority to video and voice traffic so that image and sound quality remains excellent. Costs decrease because the department no longer needs to maintain a separate network. And the value of video increases because video surveillance cameras can be integrated with sensors, access controls, and communications systems to enable automated response (see sidebar, "Cisco Open Platform for Safety and Security"). An acoustic sensor, for example, can trigger network-attached video surveillance cameras to begin streaming video from the area surrounding a gunshot; zoom into areas of interest; and transmit the information stream to first responders for rapid awareness and accurate intervention.

Used with the appropriate back-end management software, video over IP also enables policy-based information sharing across all levels of government, a requirement for U.S. Department of Homeland Security grants.

Cisco Open Platform for Safety and Security

The Cisco Open Platform for Safety and Security is a comprehensive architecture that helps public safety agencies protect employees, citizens, assets, and mission-critical processes by using commercial, off-the-shelf (COTS) products that are integrated into the resilient IP network. The platform combines voice, video, data, and physical security systems to create a holistic, common operating picture. Use of COTS products reduces costs and enables public safety agencies to integrate more capabilities from different vendors, as mission needs change.

Enhanced Camera and Sensor Capabilities

Cisco partner SightLogix uses innovative camera technology to provide 10 times the processing power to cover 10 times the area previously possible. Greater coverage and more sophisticated analytics can significantly reduce nuisance alarms and costs.

Location-Based Information

First responders need two types of information for swift and appropriate response: the nature of the event and its location. SightLogix edge sensors georegister all detected targets to associate them with their precise location. This enables public safety agencies to continuously and simultaneously track and report an intruder's exact location in relation to the protected facility, displaying the location in real time on a site map of the facility. Used in vehicles, georegistration

can identify the precise location where a gun was thrown out of a moving car, for example, or where an intruder is hiding.

Video Analytics

Analytics technology from Cisco partners, such as SightLogix SightSensor™ and ObjectVideo VEW, can reliably recognize events of interest such as unattended packages and vehicles moving faster or slower than defined thresholds. Detection of a predefined event can trigger a response such as notifying a security guard, accelerating response and reducing staffing requirements. The combination of video analytics and automated response relieves operations personnel from having to constantly monitor a bank of monitors and possibly miss a significant event because of information overload.

Greater Accuracy

To hold personnel accountable for incident detection, public safety agencies need to provide actionable information. But if 20 sensors each send 100 nuisance alarms daily, a person cannot reasonably be held accountable for identifying legitimate violations. Video surveillance cameras from SightLogix and embedded video analytics in the Cisco 3200 Rugged Integrated Services Router have the intelligence to differentiate between human-initiated disturbances and environmental variables such as moving tree branches, fast clouds, wind gusts, and poor lighting that would otherwise create false positives. Filtering of environmental variations enables accurate intervention by providing reliable information regarding the target's precise location, size, speed, and direction.

Public Acceptance of Video

The public has grown accustomed to video surveillance, including in-car mobile video cameras, red light photo enforcement cameras, and CCTV cameras. In fact, Westgate City Center, a "city within a city" in Glendale, Arizona, always takes potential tenants to the command center to show off the video surveillance system. Residents say that it makes them feel safer.

Following are new video solutions for public safety that take advantage of advances in video technology. All are proven and available from Cisco and its partners today.

In-Car Video

Need

Most existing in-car systems capture video on VHS tapes, which provide limited value:

- The video evidence captured in the car can be used only after the fact, not to increase situational awareness as an incident unfolds.
- Searching a VHS tape for a particular scene is time-consuming.
- The agency cannot control who views the video, introducing the possibility that crucial video evidence can be leaked to the media or posted on public video-sharing websites. Unauthorized publication of video can damage the public's perception of an agency and result in costly lawsuits.
- Metadata such as time or location is overlaid on the video rather than integrated into the video frame, allowing tampering and potentially breaking the chain of evidence.
- Tapes can and do get lost as they are moved from the car to the evidence room or central repository and then to the district attorney's office.

- Labor-intensive processes increase costs. Examples include checking tapes in and out, maintaining log sheets, locating critical video clips, and making copies for investigation and trial.
- Replacing VHS tapes with USB drives or DVDs does little to overcome these problems.

Solution

MARvista, from Cisco partner Insight Video Net, overcomes the limitations of VHS systems with a powerful, yet easy-to-use in-car video management system. Video captured from cameras facing outward and to the rear seat is stored digitally on an in-vehicle Cisco 3200 Series Rugged Integrated Services Router, generally stored in the trunk. The Cisco 3200 Rugged Integrated Services Router can also replace in-vehicle laptops when configured with a single-board computer, integrated cellular communications, and video encoder boards. The integrated solution meets departmental requirements for small size, ease of maintenance, and protection from obsolescence.

MARvista works in conjunction with Insight Video Net's Central Management System (CMS) software to capture video, audio, and event metadata to create a rich evidentiary record. Officers interact with the system using a touch-screen interface. The ability to integrate bookmarks, snapshots, GPS data, and triggered events into the video file provides the evidence required to prosecute or exonerate.

Officers upload the video file over a wired or wireless connection to the CMS. Or, in communities with wireless mesh networks, video can be streamed in real time from the in-vehicle Cisco 3200 Series Rugged Integrated Services Router to an operational command center to provide situational awareness as an incident unfolds. Department staff use the CMS to search for video based on a range of criteria, based on their rights and permissions. The highly encrypted format and unique audit trail preserve the chain of evidence, increasing prosecutions and reducing departmental costs.

Insight Video Net's CMS software provides video history management, including policy-based access privileges, reports of who interacted with which video, and automated enforcement of retention policy. Automated workflow, lower cost storage, and reduced storage requirements help public safety agencies remain effective despite tight budgets.

The MARvista in-car video solution fulfills the following law-enforcement needs:

- Captures video evidence to protect the department from unfounded lawsuits.
- Provides peace of mind that evidence can be easily and reliably located. When shown a video of their behavior, people contesting a driving-under-the-influence citation or alleging police brutality, for example, will likely drop their charges. This reduces the time that officers need to spend in court and the number of cases the district attorney need to take to trial.
- Enforces policy-based viewing privileges, helping to prevent important video from being leaked to the media or showing up on public video-sharing sites.
- Minimizes the time and effort that IT staff or evidence clerks need to manage video.
- Enforces mandated video retention policy for how long video must be retained for different types of incidents.
- Helps ensure a verifiable chain of evidence by providing proof that the video has not been tampered with.

- Allows instant access to digital information collected about the case, creating a more complete picture and eliminating the administrative time needed to locate the files.
- Relieves the district attorney's office from needing one of each type of video system that municipalities use to review evidence and bring it to court.

Gunshot Location and Surveillance

Need

Approximately 60 to 80 percent of urban gunfire is never reported by citizens. When citizens do call in, the average delay between the gunfire and the call is 2.5 minutes. And reports often include imprecise information about shot direction, address, and number of shooters, hampering law enforcement's efforts to protect the public and apprehend the suspect.

Solution

A gunshot detection and location system relies on acoustic sensors and GPS. The GPS coordinates that the system calculates can be sent to video surveillance cameras that slew to the incident scene and nearby streets. The system also automatically alerts dispatch and call centers in seconds, providing precise details including the exact map location, nearest street address, indications of the number of shooters, number of rounds fired, and types of weapons discharged. Complete information provides the situational awareness that law enforcement needs to assess the severity of the incident.

Benefits of a gunshot detection and location system include:

- **Improved citizen safety:** First responders can reach the scene of an incident more quickly, sometimes even before a bystander has called 9-1-1. Automated notification can result in earlier help for victims, better protection for bystanders, preservation of crime scene data, and the ability to interview witnesses while the suspect is still nearby.
- **Forensic evidence:** Information captured by a gunshot detection and location system provides forensic evidence needed for targeted enforcement, reenactment of crime scenes, and support of convictions.
- **Support for strategic missions:** Investigators and crime analysts can use aggregated data from the system for strategic missions to suppress violent crime.

Critical Infrastructure Protection

Need

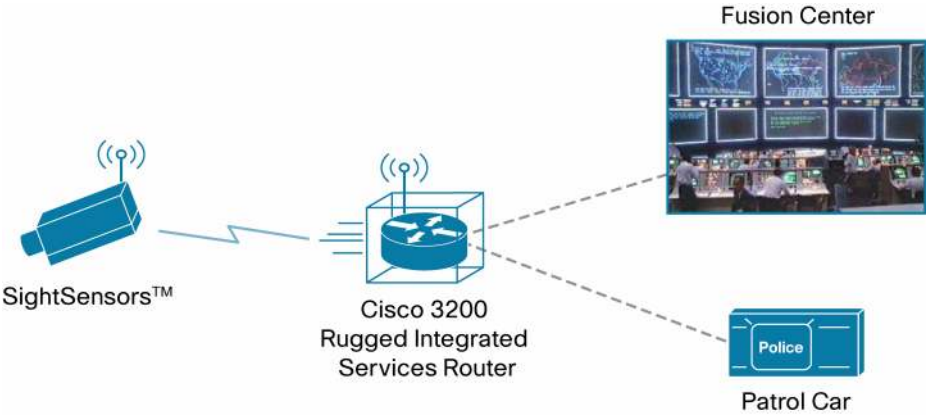
Early notification of boundary breaches increases the likelihood that first responders can act preemptively. Until now, law enforcement's only option for increasing critical infrastructure protection was to deploy more personnel, increasing costs.

Solution

Deployed in critical areas, video surveillance systems can serve as a force multiplier. Personnel can monitor live feeds from multiple cameras from any location with a network connection. Or, to reduce staffing requirements, video analytics software can monitor the video for specified events, such as the presence of a person in an area where people are not allowed, and then automatically take action such as sending an alert to a dispatcher's PC, radio, or smartphone. Video can also be streamed over the IP network into a local or state fusion center, enabling the information sharing required for a coordinated regional response.

The Cisco Open Platform for Safety and Security provides a framework to integrate video with other network-attached sensors deployed on critical infrastructure. For example, if a chemical sensor detects a chlorine leak, this can trigger nearby video cameras to begin streaming video to the operations center, first responders, and even the fusion center, giving personnel the situational awareness to plan an appropriate response (Figure 2).

Figure 2. Streaming Video to Patrol Cars or Fusion Centers



Perimeter Security and Asset Protection

Need

Public safety agencies frequently need to lock down areas and establish clear and defined perimeters. Examples include data centers, petroleum refineries, water treatment facilities, police stations and other public buildings, railroad tracks, and airfield areas of operations. Examples of temporary perimeters include sports and concert venues, construction lay-down yards, hazmat incident scenes, and train wrecks.

Inadequate perimeter security on government and private buildings can be costly. For example, damage to critical infrastructure can affect the entire community. And the theft of tools and other materials in lay-down yards for building projects has been estimated to range from 5 to 10 percent. The cost of building delays resulting from theft generally far exceeds the cost of the assets themselves. Automated notification of law enforcement in response to perimeter breaches can help to prevent theft in lay-down yards, underscoring the value of public-private partnerships.

Solution

Law enforcement agencies can protect perimeters and assets at low cost by connecting wired or wireless video surveillance cameras anywhere they cannot or do not want to erect a fence. SightLogix video surveillance cameras georegister all video so that personnel know precisely where an event occurred, either to preempt a crime or for later investigation.

For asset protection, agencies can use video surveillance cameras to create a buffer zone that extends from the fence line to the protected area surrounding the asset. This gives law enforcement additional time to take action before the intruder leaves the vicinity.

Automatic License Plate Recognition

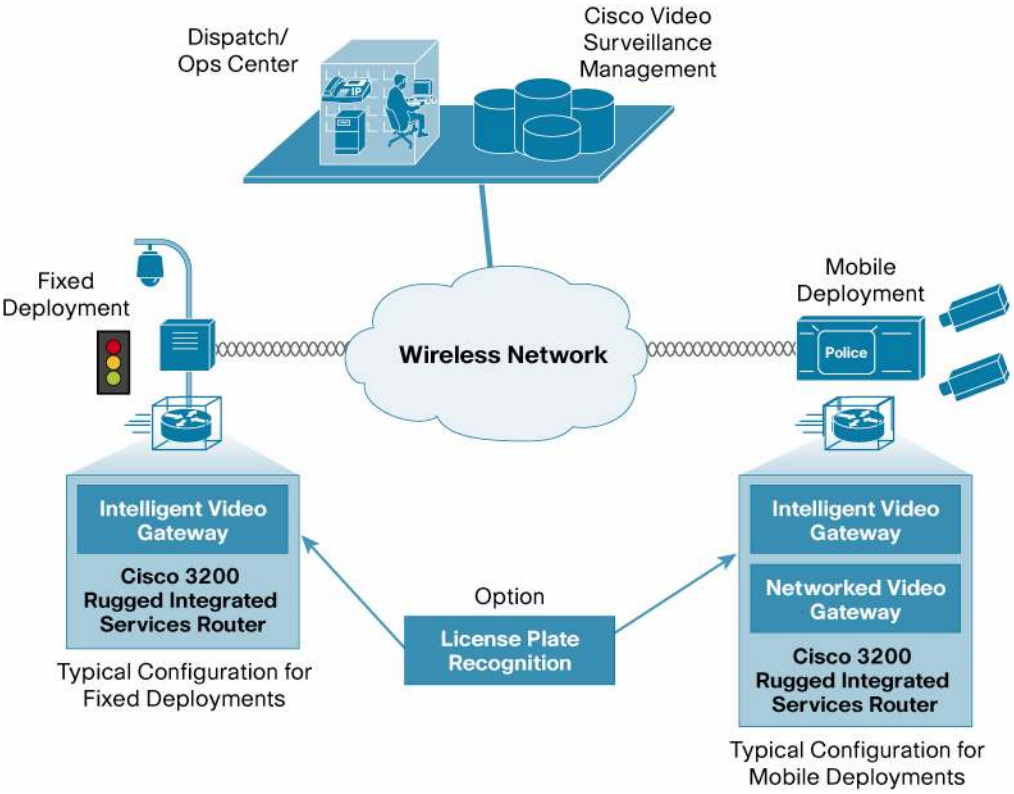
Need

One of the first applications of video in law enforcement, automatic license plate recognition (ALPR) helps to identify vehicles that were stolen, used in a crime, or registered to people with outstanding warrants. The barrier to widespread deployment has been limited recognition accuracy. In addition, local agencies have lacked an easy way to share their license plates databases. If the vehicle owned by a crime suspect was spotted in an adjoining county, for example, law enforcement in the home county had no way of knowing.

Solution

Now public safety agencies can deploy highly accurate ALPR systems that are integrated into the Cisco 3200 Rugged Integrated Services Router, reducing solution footprint and cost. An example is Vigilant Video CarDetector. Video surveillance cameras with ALPR can be deployed in patrol cars and city busses as well as at high-traffic parking areas and high-crime intersections, increasing public safety and revenues from enforcement of parking laws (Figure 3). Captured license plates can be transmitted wirelessly to a regional repository throughout the day, making it easier for neighboring jurisdictions to share information. ALPR repositories capture the date and location of scanned plates, making it possible to display a vehicle's past locations and predict where to find it now.

Figure 3. Architecture for Automated License Plate Recognition



Video Arraignment

Need

Today, most municipalities transport prisoners to court for arraignments and bonding. This process is costly and poses a safety risk to transportation escorts and courthouse employees.

Solution

With Cisco Unified Communications video solutions and Cisco Video Surveillance Management, arraignments can be conducted over the network, safely and inexpensively. In Albuquerque, New Mexico, for example, intake officers at the Bernalillo County Metropolitan Court use a Cisco video solution to remotely gather demographic, charge, criminal history, and community ties information to determine if a person is eligible for release on his or her own recognizance. The ability to conduct remote interviews and arraignments accelerates the judicial process, frees staff for other tasks, and reduces the costs of inmate transport vehicles and extra security personnel.

Tactical Operations

Need

Tactical operations often occur in areas that lack physical infrastructure for video surveillance cameras, such as poles, mounts, and electricity. This can impede security at crime scenes and during forest fires, active shooter events, visits from high-profile individuals, and other tactical operations.

Solution

SightLogix provides a video surveillance Rapid Deployment Kit designed for outdoor tactical operations (Figure 4). The kit, packaged in a portable case that one person can carry, includes cameras; a ruggedized laptop with Cisco Video Surveillance Operations Manager software, which is part of the Cisco Video Surveillance Management system; and network video recorder software. First responders can deploy the system in minutes to provide reliable, actionable intelligence for all mobile, remote, and ad hoc security operations. During crises, video can be streamed over a wireless network to local, county, state, or federal fusion centers. The U.S. Department of Homeland Security selected the solution from SightLogix and Cisco for the 2008 Commercial Equipment Direct Assistance Program (CEDAP) for public safety organizations.

Figure 4. SightLogix Rapid Deployment Kit

Port Security

Need

Securing the protection zone around vessels presents unique challenges. Two-thirds of the United States border is waterside. Bad lighting, variable weather conditions, visual occlusions, and large operational teams increase the frequency of nuisance alarms. Linking proprietary sensors and incident response systems to quickly marshal people and assets is often time-consuming and expensive. Another challenge for enforcing port security is the time needed to check workers' Transportation Worker Identification Credentials (TWIC).

Solution

SightLogix provides a wireless, thermal-infrared SightSensor that works well over water regardless of daytime reflection or nighttime darkness. The SightLogix solution operates in conjunction with Cisco Video Surveillance Manager on ruggedized laptops. To provide accurate information, the solution includes video analytics that consider the size, speed, and location of the target as well as the time of day and day of the week. The solution was demonstrated during Operation Golden Phoenix 2008, a four-day exercise led by the U.S. Department of Homeland Security Customs and Border Protection, the County of San Diego, California, the City of San Diego, and the U.S. Marine Corps Aircraft Group 46. The demonstration included both land and sea borders to represent a typical seaport environment.

IP-based video technology can also accelerate the processing of workers when they check in for their shifts. When someone swipes a TWIC in an unattended card reader, that person's image is sent to a central command center, where a worker can compare the person's image to the photograph on file. The port authority can easily program the video surveillance cameras to send an alert if workers enter certain areas after allowed hours.

Correctional Facilities

Need

Correctional facilities typically rely on guards to prevent inmates from exiting the grounds and unauthorized people from entering. Decreasing the posting distance between guards increases security but also increases costs. Another source of high costs and inefficiency in correctional facilities is the need to transport psychologists, social workers, and others to provide court-mandated services to inmates.

Solution

By deploying video surveillance cameras at the perimeter, correctional facilities can increase the posting distance between guards. With the Cisco Open Platform for Safety and Security, detection of motion in an area where people are not allowed during certain hours can trigger an immediate alert to a security guard on any type of communications device.

Correctional facilities can save the expense and risk of transporting psychologists and social workers to the facility by conducting in-person sessions with Cisco TelePresence, which creates an in-person meeting experience with life-size, ultra-high-resolution, full-motion images. Reduced travel time also helps caseworkers manage their caseloads more effectively.

Video Assessment for Public Safety and Security

Need

Detection devices such as radar, motion sensor, or video surveillance cameras sometimes provide false positives. Therefore, human intervention is required to assess the cause to marshal the appropriate response.

Solution

The Intergraph® Video Assessment application extends Intergraph's geospatial, computer-aided dispatch platform with a two-way interface to the Cisco Video Management System. Command-and-control operators can interactively control cameras using pan-tilt-zoom motion commands and receive live or recorded views from cameras. Operators can accurately assess the context of threats with a common operating picture that combines video with detection and assessment data from multiple sources on a geospatial map. In addition, the system regularly queries all third-party cameras to establish their state and status, alerting operators if a camera has been tampered with or disabled.

Integrated intelligence reduces the time that operators spend connecting the pieces of a security puzzle. For instance, if a door's access control alarm is triggered, the operator can quickly access the pre-alarm video to see if the alarm resulted from a simple mistake, such as an incorrectly swiped card, or an intrusion, such as an attempt to kick open the door. The department can even set up the application so that a device alarm automatically pops up a live feed from the nearest camera. This relieves operators from having to scan rows of camera feeds to determine what has occurred and where. Faster assessment helps operators determine a target's threat level, an essential capability for effectively managing resources.

Measure the Return on Investment from Video in Public Safety

For many communities, the primary benefit of video technologies is improved citizen service and quality of life from reducing crime and fear of crime. Video also provides operational benefits, including:

- **Reduced staffing costs:** Video surveillance cameras operate 24 hours a day and can be programmed to alert appropriate personnel when specified events occur. Software that automates the back-end video management reduces labor costs.
- **More appropriate application of force:** With greater situational awareness, command can dispatch appropriate force—for example, sending two officers instead of four.
- **Force multiplier:** Increasing the effectiveness of a 100-person force by 10 percent is like hiring 10 more officers. In most departments, these savings would amount to more than $1 million annually in fully burdened personnel costs.
- **Enhanced officer safety:** Real-time video provides tactical awareness to responders before they arrive at the scene
- **Lower litigation costs:** A suspect wanting to challenge a driving-under-the-influence charge or claim police brutality might drop the lawsuit when shown video of the incident.

Conclusion

Video provides important benefits for public safety, including increasing citizen safety, enhancing quality of life in the community, and serving as a force multiplier. Video has also become a powerful tool to increase the speed and precision of decision making because of advances in the cameras themselves, video analytics, and integration with other sensors and communications systems. Public safety agencies that take advantage of new video solutions can benefit from lower operational costs, greater situational awareness, and more effective response. Cisco and its ecosystem of partners, leading experts in networked video solutions for public safety, are delivering the solutions discussed in this white paper today. To learn more, please contact your local Cisco office or Certified Cisco partner.

For More Information

For more information about Cisco Physical Security Solutions, visit http://www.cisco.com/go/physicalsecurity.

For more information on the Cisco Open Platform for Safety and Security, visit http://www.cisco.com/web/strategy/government/national-open-platform.html.

For more information on the Cisco 3200 Series Rugged Integrated Services Router, visit http://www.cisco.com/go/3200.

For information on solutions from Cisco partner SightLogix, visit http://www.sightlogix.com/whitepapers.html.

For information on solutions from Cisco partner Insight VideoNet, visit http://www.insightvideonet.com.

For information on solutions from Cisco partner Intergraph, visit http://www.intergraph.com.

For information on solutions from Cisco partner Vigilant Video, visit http://www.vigilantvideo.com.

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