

Enabling an Enterprise VMS

Over the past decade video surveillance has migrated from analog closed circuit television systems with point-to-point connections to modern digital systems that run on IP networks. Enterprise video surveillance systems can scale to hundreds or thousands of cameras spread across geographically dispersed facilities, but this presents bandwidth, processing and storage challenges. The cost to deploy and maintain such systems over their lifetime can be staggering, but new video analytics technology offers a compelling alternative.

Video analytics is the automated analysis of video content for user-defined events of interest. The technology is primarily used for physical security and business intelligence applications. Capabilities range from simple motion detection to sophisticated algorithms for detection of people, vehicles, objects and their behaviors or interactions. The best techniques ignore normal scene changes in a camera view as well as motion due to snow, rain and tree foliage.

Examples of physical security applications include perimeter breach, loitering or removal of an object, while business intelligence applications include measurement of customer traffic and analysis of customer behavior. However, video analytics does much more than optimize safety and security and enable better business decisions — it also reduces the total cost of IP video surveillance system ownership.

IP Video surveillance systems

The major elements of an IP video surveillance system are cameras, recorders, servers and software. Cameras are distributed across monitored locations, while recorders and servers are typically centralized for ease of management. A video management system (VMS) provides unified access to live and recorded video and aggregates hardware from multiple vendors.

New cameras employ MPEG-4 and H.264 compression to provide DVD or HD-resolution video at bit rates between 1M and 12Mbps. It is desirable to consolidate recorders and servers centrally for ease of configuration and maintenance. This video can then be distributed to one or more security/network operations centers and streamed on demand to responders and emergency personnel in the field.

A VMS is employed to provide recording, streaming, switching and multiplexing functionality. It can normalize streaming video from multiple sources into a common format as well as provide recording and playback services. It also functions as a video server by relaying video to multiple endpoints, each with different resolution and bit rate requirements.



VMS functionality increasingly runs as software on enterprise servers instead of on custom embedded hardware. A single server can handle the recording and streaming tasks for 64 or more cameras, with video stored on internal drives or on a storage-area network. Management software typically combines a database server and a Web server, which enables configuration and monitoring over the network and notification to mobile endpoints.

Infrastructure planning

A medium to large deployment can involve hundreds if not thousands of cameras distributed over tens or hundreds of locations. Most security policies require video to be stored for a week to a month, and some require it to be archived for a year or longer. The operational and maintenance costs over the lifetime of such a system can easily exceed the upfront capital expenditure.

For illustrative purposes, let's examine a 1,000-camera system spread over 10 sites streaming at 4Mbps per camera. If recording is done locally at each facility, it consumes 400Mbps on the LAN and 4.3TB of storage per day per site. With a one-month retention policy, over a petabyte of storage is needed for all sites. It is also likely that monitoring operations are centralized in a security/network operations center, which requires video to be streamed to a remote site with dedicated WAN links at hundreds of megabits.

Given these challenges, enterprises are forced to compromise a great deal. One option is to limit video surveillance to forensic evidence — i.e., no active streaming or monitoring, with recorded video reviewed only after an incident occurs. Other options include dropping the resolution and frame rate for video streamed over a WAN, which makes it difficult to detect security violations.

In short, the massive investment in security infrastructure pays poor dividends because incidents cannot be detected and intercepted as they are happening. Fortunately, video analytics present a compelling solution to this problem.

Video analytics to the rescue

Video analytics addresses infrastructure challenges by enabling content-aware storage and routing. The software is the equivalent of having a tireless, unblinking person watch each camera, detect relevant events, and make decisions on what events to store and when to stream video. An analytics-enabled VMS addresses the three big scalability challenges of enterprise video deployments — human resources, storage and bandwidth — more effectively and cost-efficiently than a system without this capability.



Analytics serve as a force multiplier, freeing personnel from continuous monitoring and eliminating the need to hire additional staff even as the number of cameras grows. The software reduces storage requirements by a factor of 100 by recording video only when events of interest occur. It also reduces bandwidth requirements by a similar factor by streaming video only to endpoints that have subscribed to those events.

Most surveillance video is either monitoring normal, routine activities such as people entering and leaving a parking lot, or no activity, such as around a remote fence line. Simple motion detection is sometimes used to reduce the amount of video recorded or streamed, but it is prone to false alarms and creates unwanted events. Advanced video analytics can be configured to look for a person loitering in a parking lot or crossing over a fence, and only record and stream video when that happens. The technology can also alert personnel to loss of video or tampering.

Video analytics software is best integrated with the VMS at each site. It intercepts the video feed from all cameras and then analyzes live video in real time with minimal latency. Events are stored in a database and posted to one or more alert consoles that have subscribed to those events. Video corresponding to those events is also streamed to these consoles. In effect, video analytics serves as a traffic cop, interacting closely with the VMS. In most cases, an analytics-enabled VMS can be deployed on existing infrastructure with minimal changes.

Video analytics provide a win-win situation, by enabling security personnel to prevent crime instead of investigating it after the incident, and by allowing IT staff to provide a compelling solution that is cost-effective to deploy and maintain. It greatly reduces the operational expense of a distributed video surveillance solution while allowing centralized administration and monitoring. This mature technology is transforming the way enterprises plan and deploy IP video surveillance systems.