VCA Levels UP

Video content analysis is available on edge-based and server-based devices. Edge-based VCA is capable of utilizing the bandwidth, as video images are processed on the camera itself. Server-based VCA allows for more advanced calculations since it has a larger processor. Though all VCA are prone to false alarms, advances in algorithms and use of high resolution cameras will continue to reduce those rates. Before deploying VCA in any environment, users must fully understand their environments to see if it is suitable or if it will actually assist in their operations.

Smart Video Situational

Video content analysis assists users when monitoring different environments. This feature highlights the pros and cons of intelligence in the front and back end.

■ BY CHRISTINE CHIEN

Ensures
Awareness

Two years ago, ObjectVideo waged a series of legal battles with some of the most prominent names in video surveillance, for the infringement of intellectual property relating to video analytics; among the defendants were Bosch, Sony, Samsung, and Pelco to name a few. These lawsuits shook the security industry and gave rise to an influx of video surveillance companies who quickly entered into patent licensing agreements with ObjectVideo, in fear of becoming its next target. According to previous reports, Raul Fernandez, CEO of ObjectVideo had not expected the lawsuits to halt the developments of video analytics or to suppress the adoption of the technology. Ironically, no major breakthroughs in the technology have emerged since the whole fiasco. Now, video content analysis (VCA) seems to be stuck in a peculiar situation where the technology is maturing, but with nothing out of the ordinary coming from it. However, its more advanced features are now able to reduce the rates and incidences of false alarms and are better managed in different devices. The industry is becoming more realistic and "down-to-earth" about the capabilities of VCA, instead of chasing after and/or promoting "new and cool" features that will most likely be unreliable once they are put to the test.

The limited breakthrough in the technology however, will not be putting a stop to its growth. According to MarketsandMarkets, the video analytics market is expected to grow from US$180 million in 2011 to $867.8 million by 2017,

at an estimated CAGR of 30.4% from 2012 to 2017.

Current forms of VCA are available in front-end (edge-based) or back-end devices. Pros and cons exist for both the front and back end, and each have its most suitable use scenario. According to Mahesh Saptharishi, President & CTO of Video IQ, there are two primary factors that influence the performance of any VCA system — the quality and resolution of the video being analyzed and the amount of processing available to run VCA algorithms. Lower resolution video, such as video with considerable noise and heavily compressed streams all adversely affect performance. Sophisticated VCA algorithms require a substantial amount of processing to run effectively. More recently, advances in the science of pattern-based video analysis have helped dramatically increase performance while requiring a significantly lower processing budget.

FRONT-END DEVICES
Advantages

The advantages of using front-end devices are most apparent in two ways — it saves bandwidth and is cost effective. "If there is a large number of cameras requiring analytics, placing analytics on the edge makes sense. Edge placements keep the costs down by relieving network traffic burden, actual costs of the analytics, and costs involved in server farms," stated John Sepassi, Account Executive at IntelliVision. The use of front-end devices works exceptionally well for remote locations or extended facilities where there is poor or non-existent bandwidth back to the monitoring location, "as it eliminates maintaining a remote server and needs only a low bandwidth connection to send snapshots of alarm instances," said Sadiye Guler, Founder President of intuVision.

"When video analytics are placed inside a camera, and a high degree of video processing is used to analyze the raw video as it comes off the imager, every video

❝The most common VCA systems base their alarms on motion detection (frame difference) or pixel analysis (background modeling).❞

Mahesh Saptharishi,
President & CTO, Video IQ

frame at full resolution is available for the video content analysis," commented John Romanowich, CEO of SightLogix. The ability to analyze every video frame makes VCA on the edge more sensitive to feint objects. "Given the same algorithm, edge analytics using the original data works better than server-based analytics, which works on compressed data from an IP camera. This is because video compression is 'lossy' and feint objects such as a person in dark clothing on a dark night may just be visible in the original video but filtered out and lost during transmission of compressed video to the server," said Geoff Thiel, CEO of VCA Technology. Having the loads divided among multiple devices relieves network traffic burden as analytics are performed at the camera level, and only relevant video is sent back to the recorder for storage.

Disadvantages

Major disadvantages of using VCA at the front end include its inability to run analytics that require high CPU, but also the analytic configuration that is needed for each device. "Low processing resources result in lower performance and less features, management of VCA on large numbers of cameras becomes
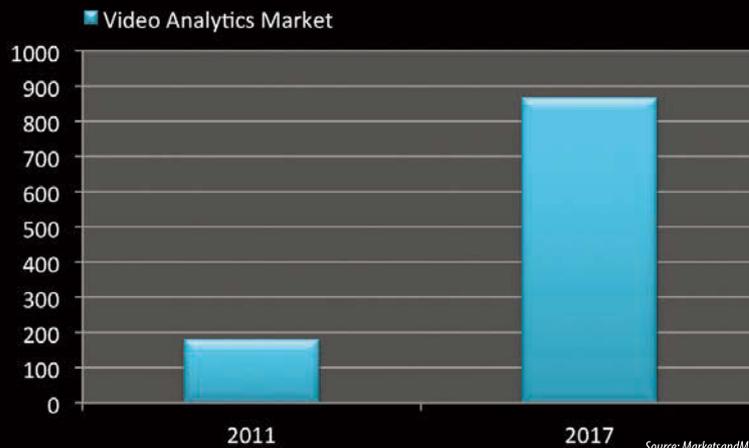
▲ The video analytics market is expected to grow from US$180 million in 2011 to $867.8 milliion by 2017.

difficult, maintenance is hard because each new bug fix or feature requires a firmware upgrade, and new features may not be supported by existing cameras because of the higher processing requirements," stated Zvika Ashani, CTO of Agent Video Intelligence. Users also have to be sure their VMS is compatible and supports all the features and functions of the VCA in their cameras for it to operate at its full capacity.

BACK-END DEVICES

Advantages

Similar to front-end devices, VCA in the back end offers a plethora of advantages. Back-end devices, usually server solutions, bring all the video data back to a central location to be managed, analyzed, and recorded, thereby providing a central location for backup, redundancy, monitoring, and network security. Server-based systems might be better for "highly sensitive sites and environments with challenging views and cluttered scenes, illumination changes, and reflections," according to Guler, as VCA on servers makes it easier to run more advanced and complex analytics that require higher processing power in real time. Using server-based VCA efficiently manages multiple analytics configurations and allows better analysis through reports, charts, snapshots, and recordings. "When the server is upgraded, the increased performance is immediately reflected in the analysis without having to change any cameras. Updating VCA algorithm software is carried out centrally and is relatively quick and straightforward," said Frank Brandtner, Head of Administrative Product Management at Geutebruck. Furthermore, the features of the VCA will not be dependent on the camera manufacturer, which can exclude many limitations. Running on the center provides greater flexibility by utilizing floating licenses, which are VCA licenses that can transfer from one camera to another, even based on scheduled operators. This means one license can run intrusion detection

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Geoff Thiel,
CEO, VCA Technology

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Larry Bowe,
President, PureTech Systems

overnight on camera A, and people counting on camera B during the day, to reduce total cost of ownership, according to Illy Gruber, Product Marketing Manager at Nice Systems.

Server-based analytics is highly flexible if its VMS is able to support hybrid solutions; the VCA will be able to work with both analog and network cameras. The flexibility allows the system integrators to choose any network camera as long as they are supported by the VMS, and there is no need for additional video encoders when using existing analog cameras, according to Vito Kuo, Integration Product Manager at Nuuo. "With a centralized system architecture, the entire process is simplified — one device instead of many cameras is performing all the analysis and a single analytics program is used to process all the video and there is no need to learn multiple interfaces," said Shahar Ze'evi, Senior Product Manager at American Dynamics (Tyco Security Products).

"VCA technology is advancing at an incredibly rapid pace and is only limited by the available computer processing power. The good news is Commercial Off the Shelf edge devices and servers are meeting the ever increasing need for horse power thanks to the processing-hungry video game market," said Larry Bowe, President of PureTech Systems.

Disadvantages

The downside of server-based VCA is often related to bandwidth or additional hardware costs. "If the network from the cameras to a central collection point cannot support streaming of reasonable quality video, say an average bitrate of 1.5 mbps with bursts up to 5 mbps for a 640 x 480 image, then it is best to perform the video analytics at the camera," Bowe advised. Also, server-based VCA can result in false alarms and misdetections since video compression creates loss of details and scene information, especially if the video is overly compressed or has poor quality.

In some cases, server-based VCA can put the server as a point of failure, according to Eric

Ho, Product Marketing Manager of APAC at Bosch Security Systems. "Typically a server will handle VCA detection for multiple cameras. Failure on a single server will result in loss of VCA detection on all the associated cameras."

STANDARD VS. HIGH END

General functions of VCA include abandoned object detection; congestion detection; counter flow; motion detection; behavior recognition; trajectory tracking; shape-based detection/object tracking; theft detection; virtual tripwire; people/vehicle counting; face recognition; ALPR/LPR.

Some of these functions are common and standard while others are only available in high-end or advanced VCA. "The most common VCA systems base their alarms on motion detection (frame difference) or pixel analysis (background modeling). These systems often rely on characteristics such as object height and width, and require manually fine-tuning the VCA to achieve desired performance levels," according to Saptharishi. Meanwhile, high-end VCAs are more universal and multi-faceted and offer a wide range of evaluation, analysis, and storage possibilities. "They can include advanced features such as conditional alarming or combination events such as 'Alarm if Event A in Camera-1 and Event B in Camera-2 happens' and ability to send device triggers on VCA alarms," said Guler. Advanced VCA incorporates background/foreground separation, auto-learning, and auto-calibration on top of frame comparison; special-purpose analytics or high-end analytics go one step ahead and use recognition techniques in the image such as 2D and 3D face recognition and optical character recognition for ALPR/LPR to compare to existing database, according to Sumit Aggarwal, Founder of i2V Systems. "High-end VCA also has special features for accurate counting: including simultaneous bi-directional counting for people walking in groups or side-by-side, ignore suitcases, children's carriages, and shopping trolleys,

"Advanced VCA uses detection methods, besides frame comparison, such as background-foreground separation, auto-learning and auto calibration to reduce false alarms."

Sumit Aggarwal,
Founder, i2V Systems

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Eric Ho,
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▲ The use of front-end devices work exceptionally well for remote locations or extended facilities where there is poor or non-existent bandwidth back to the monitoring location.

shadow filters for front of store applications where sunlight and shadows coming through windows can cause problems, on-screen counters, in-camera counting database, count reporting, etc.," added Thiel.

Depending on user preference and application requirements, video intelligence in the front and back end has its demand across different sectors. Edge devices can be used in locations where standard VCA is enough, while server-based VCA can be used to analyze areas in need of more precise calculations due to the changing environment. With the different features provided by both high-end and standard VCA, operators are able to more efficiently monitor areas under surveillance. **a&s**

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