

Increasing camera density per server by using more efficient HD video analytics

Video surveillance camera technology is consistently improving, with HD and 4K cameras being utilized around the world to ensure security teams have access to the clearest footage available.

In a recent IFSEC Global report[†], security professionals from a wide range of authority levels and vertical markets were surveyed regarding their video surveillance needs. When asked to identify the most important features and functions, 74% of respondents placed Full HD (62%) or 4K (12%) resolution in the top five. The same survey revealed that a majority of respondents (54%) consider video analytics as a key feature. It is clear that HD footage and video analytics are of the utmost importance to professionals where video surveillance systems are part of their daily activities.

Until now, it has generally not been practical to implement analytics on high-resolution video streams. This article outlines the problem and explains how Senstar Adaptive Analytic Resolution technology not only makes it possible but also easy to implement.

THE PROBLEM: INCREASED PROCESSING REQUIREMENTS

While recording high resolution video is desirable for richness of detail and accuracy, it comes with a high price in terms of system resource utilization. This tradeoff is magnified when analytics are added to the mix.

Senstar (formerly Aimetis) has been at the forefront of research and development into industry-leading video analytics that work in everyday, real-world situations. Senstar Adaptive Analytic Resolution technology is available in both server-based Outdoor People and Vehicle Tracking (OPVT) and embedded Outdoor Object Tracking (OOT) analytic products. Adaptive Analytic technology represents a significant breakthrough, delivering accurate and highly efficient analytics that can be used even with HD cameras.



WHY IS HIGH RESOLUTION VIDEO ANALYTICS CHALLENGING?

Given the same camera with the same lens, the higher the resolution of the video stream, the further away you can see in the frame.

Figure 1 shows a subject at the same location within the frame in three different resolutions. At 640x360 (the resolution typically used for a secondary video analytics stream), you can barely see the person at the back end of the parking lot.



Figure 1. Same subject at different resolutions*. At an HD resolution of 1280x720 (720p) you can start to see the person, while at 1920x1080 (1080p) you can see the person in more detail.

[†] <https://www.ifsecglobal.com/the-video-surveillance-report-2016-global-security-needs-and-plug-and-play-perceptions>

The higher the resolution, the more pixels you have in the frame, which triggers a corresponding increase in analytic computational overhead. This is the crux of the trade-off which limits traditional HD video analytic processing. A 720p frame has four times as many pixels as a 640x360 frame. A 1080p frame has nine times as many pixels as a 640x360 frame (see Figure 2).

A typical video analytic algorithm needs to process every single pixel in a frame, with a generally linear relationship between CPU load and video resolution. This means a 1080p frame will consume nine times (four times for 720p) the computing resources of a 640x360 frame



Resolution	Total Pixels	Relationship
640x360	230,400	1x
1280x720	921,600	4x
1920x1080	2,073,600	9x

Figure 2. Relative Computing Complexity for different resolutions

What does this mean in real-world terms? Consider a server with enough CPU resources to run video analytics at 640x360 on 36 cameras. With the same server, if you were to run video analytics at 720p resolution, you can only run nine cameras. At 1080p you can only run four cameras. That means the higher the video resolution, the farther away you can see, but at a significant cost in terms of the number of cameras you can use per server.

WHAT IS ADAPTIVE ANALYTIC RESOLUTION?

To use HD resolutions for detecting objects farther away while keeping computation costs low, Senstar OPVT and OOT analytics use Adaptive Analytic Resolution technology. It is built on the idea that HD resolution is only needed to detect objects at a distance and uses a lower resolution to track closer objects. Senstar Adaptive Analytic Resolution technology can represent the 720p frame shown in Figure 3 using only 158,216 pixels (83% fewer pixels than the original 720p frame and 31% fewer than a 640x360 frame) while still preserving enough information to detect and track objects both at a distance and in close proximity to the camera.



Figure 3. Adaptive Analytic Resolution processing

WHAT MAKES SENSTAR ADAPTIVE ANALYTIC RESOLUTION UNIQUE?

Using Senstar Adaptive Analytic Resolution technology, the OPVT server-based analytic can detect and track objects far away and close to the camera using HD resolutions but at a fraction of the CPU cost typically required to run video analytics at HD resolutions. The intelligent Adaptive Analytic algorithm automatically and efficiently downscales resolution where HD is not required, while accurately detecting and tracking objects as they pass through the high definition scene. It also achieves additional efficiencies by using the primary HD recording stream (a secondary analytic stream is not required).

Recall the earlier example of the server with enough CPU resources to run 36 cameras at a video resolution of 640x360. In the example, moving to a 720p HD video resolution reduced the number of cameras that could be run on the server from 36 to nine. If you were to use Senstar Adaptive Analytics at 720p, you can run 24 cameras on the same server (that is 15 more HD cameras, or 2.7 times the number of cameras compared to using a conventional, non-adaptive 720p resolution). At the same time, the Senstar Adaptive Analytic at 720p is as effective as a conventional 720p video stream in tracking and classifying both near and far objects.

USING SENSTAR ADAPTIVE ANALYTIC RESOLUTION TO INCREASE SERVER DENSITY

With Senstar Adaptive Analytic Resolution, you can have your cake and eat it too. You can have the precision of Full HD surveillance cameras and the power of Senstar's Outdoor People and Vehicle Tracking video analytic without breaking your server hardware budget.