With recent advances in camera resolution and the powerful benefits offered by today’s analytics technologies, security departments worldwide are upgrading their surveillance solutions. They can cover more area in greater detail, detect out-of-norm conditions, and generally improve their overall security capabilities, without hiring more people.

Storage Workloads in Video Surveillance

Despite its value to the business, the storage infrastructure now faces a new set of strenuous workloads.

The current camera of choice is a 4k, 8-megapixel camera that produces approximately 4 times the output of a 1080p high-definition camera. Security departments are upgrading to this new technology rapidly because it provides a much wider and more detailed view of their site.
Video Capture and Asset Management

The video data from the cameras is managed by the video management server (VMS) or network video recorder (NVR), and is written to storage (#1 in the diagram). However, with these 4k cameras, the amount of data “coming down the pipe” necessitates more horsepower at both the server and storage layers. Lower-grade technologies can experience failures when trying to handle a high-bandwidth, large-block random write pattern that pounds the system 7/24/365.

In-Camera Analytics

In-camera analytics (#2 in the diagram) is a relatively new approach. Today’s cameras with embedded analytics can identify several hundred objects. Distributing the processing out to the cameras helps to reduce workload on the VMS and eliminates unnecessary data transfer by using motion detection technology. However, in-camera analytics generate metadata files as descriptors for activity seen and captured by the camera. In some ways it acts an indexing system, allowing the security team to find certain objects, colors of clothing, movement, events, and so on. These files are stored in a large (and constantly growing) metadata database that is queried for identifying certain objects or movements within specified time periods. This workload is high I/O, random small-block reads.

In-Line Analytics

In-line, or real-time, analytics (#3 in the diagram) demands a more powerful server, but most of the workload stays between memory and the GPU. In larger datasets, this could spill over to the storage layer, requiring flash storage to keep up with the rapid recall (I/O) demands.

Most of the real-time analytics work is done in the server, in memory and big GPUs, which requires a bigger server, but isn’t necessarily difficult for the storage system.

Post-Ingest Analytics

In addition to the seriously challenging high-bandwidth, large-block, random writes that the VMS pumps out, there’s an equally challenging random read operation going on as a result of post-ingest analytics (#4 in the diagram). In many cases, about 85% of the analytics function happens after the video is ingested.

Manual recall of video streams also happens concurrently with all of the other operations, which adds another random read operation to the workload of the storage system.

In short, the storage layer of the surveillance infrastructure model needs to accommodate a variety of challenging workloads. To handle the ever-changing needs of the surveillance technology ecosystem, a high-performance, multi-workload storage infrastructure is required.