

Server Impact Factor (SIF) And Salient's Design Tool Wizard

Understanding NVR system design and Salient's Server Impact Factor method of calculating hardware requirements.

Salient Systems Corp.
10801 N. MoPac Exp.
Building 3, Suite 700
Austin, TX 78759
Phone: (512) 617-4800

A key element of video surveillance design is properly sizing a server to run the Video Management Software (VMS). The type of server required cannot be determined based on the VMS minimum system requirements. The actual server processing performance and disk space necessary are going to vary greatly for each deployment. Some of the factors that determine what type of server and storage configuration is required are:

- Types of cameras used
- Camera count
- Clients connected to view live video
- Resolution and recorded Frames Per Second (FPS)
- The type of compression used (MJPEG, MPEG4 or H.264)
- Recording schedule and retention time

The calculation used to size a server is going to be different depending on the VMS platform.

The ability to accurately calculate the processing load of a camera configuration is critical in order to deliver a solution that performs to the customers' expectations but also is not oversized for the job it's intended to perform. From an integrators perspective, working with a VMS vendor who can provide a detailed and accurate method of determining system performance provides two key benefits:

1. During a project's design phase, the integrator can confidently propose *right-sized* systems, which are not over built in order to accommodate for unknown factors. Proposing a correctly sized server can dramatically reduce the solution's cost to the customer, increasing the chances of winning the customer's business.
2. Post deployment customer satisfaction is increased when the system performs as specified and retains video for the correct number of days.

Challenges when calculating solution performance

Accounting for all the variables that affect system performance can be difficult at best. Because of differences between coding standards, programming languages used and architectural differences there is no universal, industry standard method of predicting hardware performance that applies to multiple VMS platforms.

Additionally, 'Minimum System Requirements' are not a useful guideline when applied to video management software. Unlike other software packages such as accounting software or a video game, the amount of processing power, storage and other relevant hardware attributes required by the VMS is going to be completely dependent on the camera and recording configuration.

Consider the following two camera configuration scenarios.

Camera configuration #1			Camera Configuration #2		
Resolution	FPS	Compression	Resolution	FPS	Compression
CIF	1	MJPEG	1.3 Megapixel	30	MJPEG

Cameras recording under *Camera Configuration #1* will require less processing power than the cameras under *Camera Configuration #2* due to the lower frame rate and resolution of the video. Additionally, the cameras in *Camera Configuration #2* will require more storage space because of the higher recording frame rate and resolution. Along with the greater storage space requirement there will need to be faster disks and, if applicable, a faster RAID controller to write a larger volume of data. As this example illustrates, the minimum hardware required to run a VMS is going to depend not only on attributes unique to the VMS but also the intended camera and recording configuration.

The above example only takes a few parameters of a video security configuration into account. Because of the many variables of a recording configuration, it is important to gauge the true minimum system requirements based on the camera and recording configuration required for the installation.

A Video Management Platform provider must test many configuration scenarios on a variety of hardware platforms in order to provide an accurate basis for calculating minimum system requirements.

Traditional Methods of Quantifying Performance

DVR manufacturers have long used various measures to quantify the performance of their DVR. The traditional measure of system performance has been Images Per Second (IPS) or Frames Per Second (FPS). Both measures represent the total number of images which can be recorded on the DVR.

The statistic presented for IPS/FPS is measured at a certain resolution and compression, and is global for the DVR. For instance, a 16 channel DVR may advertise 480 IPS. The fine print will show the performance is based on CIF resolution images recorded using MPEG4. The total 480 CIF/MPEG4 IPS of performance must be divided by all the cameras recording to the DVR to determine whether the DVR will support the intended recording configuration.

In the following example our camera configuration includes 8 cameras recording at CIF resolution and 30 frames per second, as well as 8 cameras at 4CIF resolution recording at 7 frames per second.

Number of Cameras	Frames Per Second	Resolution Multiplier	Total IPS Required
8	30	1 (1CIF)	240
8	7	4 (4CIF)	224

In this example the recording configuration would be supported by the DVR because the total IPS used by the cameras equals 464, which is less than the maximum IPS the DVR supports of 480.

Because DVRs are a fixed hardware platform, supporting analog cameras (with few resolution choices) and often supporting only a single compression method, using IPS/FPS has worked well.

- In today's market of VMS software a more sophisticated measure must be employed due to:
A variety of hardware choices, including Commercial Off The Shelf (COTS) servers
- A far greater range of camera resolutions available as a result of IP camera technology
- Multiple compression support (MJPEG, MPEG4, H.264 and others)

Salient's Method: Server Impact Factor (SIF)

Salient's Server Impact Factor is used to measure the amount of processing power a camera configuration will require. In addition, each Salient NVR is tested under a variety of recording configuration scenarios to determine the maximum SIF camera configuration it can support.

The SIF of a camera configuration is calculated using the following equation:

$$SIF = \text{Number of Cameras} * \text{Recording FPS} * \text{Resolution Multiplier} * \text{Compression Multiplier}$$

Number of Cameras is simply the number of cameras in a group of cameras being calculated.

Recording FPS is the number of Frames Per Second being recorded.

Resolution Multiplier is determined by calculating the multiple of CIF resolution images that make up a higher resolution image. For example, CIF resolution has a *Resolution Multiplier* of 1, 4CIF has a *Resolution Multiplier* of 4 and 5 Megapixel has a *Resolution Multiplier* of 65.

Compression Multiplier is used to factor the difference in processing power related to different compression techniques. MJPEG compression would have a lower compression multiplier than H.264, because it takes less processing power to encode and decode.

Each camera or group of cameras total SIF requirement is added together, and then used to determine the server(s) which can handle the processing requirements. For example, a recording configuration may require 340 SIF. The Salient S500 has a total SIF rating of 300, so the S500 would not be able to handle the processing demands of that recording configuration. The S500 XMP or the RM1000 both have SIF ratings of 500 or higher, so either of those systems could handle the demands of the required recording configuration.

Other factors

Processing performance of a video management platform is one of several performance factors which must be considered. When calculating hardware requirements, the processing power available may not be the limiting factor. It is important to determine whether other potential bottlenecks in the recording server hardware could prevent the design from achieving the desired performance. The following factors are important to consider:

- Disk space required
- Disk throughput (the amount of data that can be written to the disk per second)
- Bandwidth
- Memory requirements
- Other system specific considerations

When using Salient's Design Tool Wizard, SIF is one of five measures used to determine whether a server or set of servers will perform properly when configured with a given camera configuration.

Design Tool Wizard Method of Hardware Selection

The Salient Design Tool Wizard works by matching a set of Salient NVRs to your camera and recording configuration. Once the camera configuration has been entered the Design Tool Wizard calculates the following attributes of the system:

- Processing performance required (SIF)
- Disk space required for recording
- Disk throughput required
- Whether or not RAID storage is required
- Whether or not external (NAS or SAN) storage can be used
- Whether or not there will be directly-connected analog cameras
- Total number of IP and Analog cameras

Based on these factors the calculator will begin to eliminate NVR choices which will not support the camera and desired system configuration.

The Design Tool Wizard then determines how many of each type of server would be required to support the camera configuration. The best two or three groups of NVRs are then selected to be the results presented. The Design Tool Wizard selects the best groups of NVRs based on price and other factors such as how much rack space will be used.

The Design Tool Wizard then distributes the cameras entered in the camera configuration across the servers. This step is necessary to determine if the number of servers previously estimated is correct.

Finally the Design Tool Wizard displays the results, along with hardware specifications of the various server choices, making it easy to select the best Salient NVR configuration or determine a comparable COTS solution to use with CompleteView, Salient's VMS.

Try [Salient's Design Tool Wizard](#).

ABOUT SALIENT SYSTEMS

Salient Systems offers network friendly, comprehensive IP and analog video surveillance management systems (VMS) built on open architecture. As the recognized transition leader from analog to digital video, Salient Systems' VMS, CompleteView™, is scalable and provides everything needed to manage a multi-server enterprise from a single desktop. Salient delivers simple and scalable security today...and tomorrow. For more information about Salient Systems and CompleteView, visit www.salientsys.com.

ABOUT THE AUTHOR

Brian Carle is the Product Manager for Salient Systems Corporation. Prior to Salient he worked as the ADP Program Manager for Axis Communications.

For information about this white paper or CompleteView, email info@salientsys.com.