Storage and RAID Considerations for Video Surveillance

System Builders' Guide to High-, Mid- and Low-Tier Applications

Over the years, the migration of analog to digital content has established a new paradigm of video surveillance applications. Security personnel and information technology teams are increasingly tasked to work together to design solutions that meet more complex requirements. For instance, although approximately 95% of video surveillance I/O operations are write-based*, most enterprise-class storage systems are designed to support faster read access, and write times are often compromised due to data protection considerations.

The specifications for these write-based driven applications are different than those of traditional read/write based systems. First, the level of risk associated with footage loss is the most important determinant for the type of storage application customers should consider. Other factors include capacity, resolution and data protection.

The RAID level that is selected greatly depends on the final prioritization of the above. To derive at the most optimal storage solution, you need a good understanding of what tier your customer falls in, along with what budget is available.

Video Surveillance Application Tier			
Typical Requirements	**High-Tier** 24/7 Operation	**Mid-Tier** In-between high and low	**Low-Tier** Cost Sensitive
Resolution Quality	640x480	480x352	320x240
# of Streams	64+	8-64	8 or less
Data Availability	Critical	Important	Low
Scalable Capacity Measured In	Petabytes	Gigabytes	Terrabytes

High-Tier

This tier requires 24/7 operation. The risk is high if any footage is lost as companies (airports, prisons, casinos, and others) maintaining applications in the high tier can be under significant compliance regulations to maintain data. Large storage capacity requirements are critical, due to the longer retention periods for data that are usually measured in petabytes instead of gigabytes. The number of video streams can also be very high; for instance, an application with 100 cameras can generate over 30 terabytes of data weekly. This tier typically requires the highest resolution possible and resulting bit-rates. And, no matter what the cost, protecting data on the hard drives is critical as the content cannot be easily reproduced if at all. Another consideration for this type of environment is the ability of the storage system to sustain video streams regardless of array condition, this can include guaranteed minimum performance levels in degraded modes and while rebuilding.

* Source: Pelco TECHNICAL WHITE PAPER: Reducing Costs While Enhancing Reliability of Video Surveillance Storage Systems

To support 24/7 operation, RAID 6 is the best choice as it provides double parity protection for up to two drive failure, and allows administrators ample time to replace failed hard disk drives before data is compromised.

Mid-Tier

The risk associated with the inability to capture a video stream is lower for organizations (corporations, campuses, and other) building mid-tier applications, but they still face high capacity requirements, as footage may need to be archived and referenced on-demand. The quality of data might vary - some might require high resolution while others are satisfied with lower quality footage. Data protection and drive failure prevention is still important, but what is different than in high-end applications, is that a small percentage of frame drop outs can be acceptable, although not desired, in the event that the array needs to be rebuilt.

If the archival requirements demand high data availability, the customer would be best suited for RAID 6. If the customer has onsite IT for drive replacements or is not in a critical 24/7 environment, RAID 5 might be a more viable option as it allows you to gain more in net storage than with RAID 6.

Low-Tier

This tier is primarily concerned with cost, has little risk involved if frame dropout occurs, and deals with low capacity requirements as daily rewrites can be acceptable. Companies (retailers, small offices, and others) working with applications in this tier can work with lower resolution images, and are not concerned about data protection in the event of drive failure.

The most cost-effective RAID level is RAID 0, which enables you to achieve the highest performance with the least amount of drives and the most net storage out of your systems. However, if one of your drives fail, the data will be lost when using RAID 0. If the customer needs data protection, but is still on a very tight budget, RAID 10 or 5 might be other levels to consider.

### LSI 6Gb/s SATA+SAS Configuration and Test Results

To help you select components for your customer's video surveillance applications, LSI configured and conducted several tests to show you how to gain desired performance levels. Reference the following configurations when considering storage solutions.

System Configuration

- Supermicro X8DTL-6F server
- Dual Xeon CPUs
- 2x2GB DRAM
- Microsoft Windows Server 2003 Enterprise Edition, Service Pack 2
- LSI 3ware 9750-8E (Driver Version = 5.01.00.016, Firmware Version = FH9X 5.12.00.006)
- LSI 620J connected with two x4 multilane cables (equipped with 6Gb expander backplane)
- Seagate 6Gb SAS drives, quantity 24 (Model #ST973352SS)

Test Configuration

- Queue Depth of 1 for each worker using IOmeter

- 256 KB stripe

- 100% sequential writes

- Write cache for best results per RAID type (WT/WB)

- RAID 0, RAID 5, RAID 6

- Run time 2 minutes

- Ramp time speed 30 sec
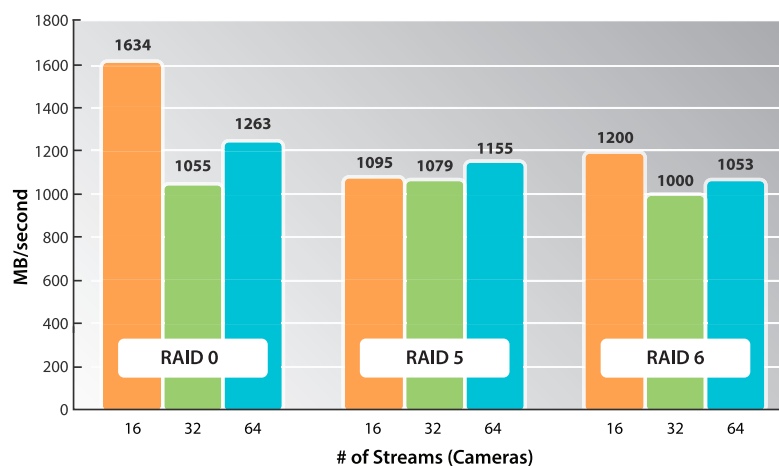
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