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**Secure Your Megapixel Recording  
with Reliable Storage Solutions  
Surveon Whitepaper**



When there is no perfect storage solution, surveillance exists in name only. However the storage products are abundant, how to select the right storage solution?

Now we are going to introduce the storage, the trickiest part in surveillance. In the conventional analog architecture, most of the image formats are D1 and CIF. Thus the storage is not a problem. But compared to a popular application nowadays, live view in D1 format and recording in CIF format, the megapixel recording requires 20 to 30 times more storage space. When a storage capacity is around 16 channels of full HD videos, recordings of 384 cameras in CIF format can be saved in the same storage. This comparison shows how the megapixel solutions impact the surveillance market. Conventional DVR is often to be criticized by its performance, video loss and overheating problems. If a CCTV system integrator needs to design a 16 channels of megapixel cameras solution, the storage preparation is the same as the installation of 300 cameras + DVR. That is why the megapixel recording storage makes SI (System Integrator) feel fear and headache. For one, they are afraid that they cannot find a suitable solution and for two, they are concern about the storage reliability, performance, and the maintenance issues. This also explains, with the increasing popularity of megapixel project and professional storage systems, IT vendors or Netcom SIs, also started to learn things about network storage for large-scale projects, and began to move into the surveillance market.

#### **4 types of megapixel storage solutions:**

There are 4 main megapixel storage solutions, PC/NVR + HDD, PC/NVR + RAID Card + HDD, enterprise grade RAID subsystem + DAS (Direct Attached Storage) and enterprise grade RAID subsystem iSCSI (Internet Small Computer System interface) network storage.

#### **PC/NVR + HDD**

Built-in HDD is the most basic storage solution. But since megapixel storage demands more I/Os and records 24 hours for 365 days continuously, the reliability and performance of the PC/NVR + HDD solution are questionable. When deploying this solution on 10-channel megapixel recordings, there would be some problems.

#### **PC/NVR + RAID Card + HDD**

Using Redundant Arrays of Independent Disks (RAID) as a storage solution to write data through a parallel way can improve I/O speed and expand the storage capacity. When deploying with NVR, this solution is a more advanced one. RAID provides

more protections against data loss and ease of maintenance, for instance the fault tolerance RAID5 comprises block-level striping with distributed parity to back up hard drive data.

Since system integrators often choose consumer-level SATA disk and use 24 hours for all the year round continuously; multi-functioning hard disk may come to an end without warning. That is why deploying hot-swappable hard drive RAID as protection ensures data integrity and it is relatively easy to maintain.

NVR RAID can be divided into 3 categories, the first one is the "Software RAID" controller; the second one is "Firmware RAID" embedded on the chip; the third one is "Hardware RAID" controller, as an independent disk array to control and operate.

Affordable software RAID is suitable for price sensitive users, while hardware RAID with the best performance is for high-quality storage solutions. Since a RAID card is sold separately, the price is relatively expensive; and the hardware RAID installation is more complex, not every SI has enough IT background knowledge to do the work. Therefore, there are a variety of hardware and software RAID NVRs for SI to select from according to the demands of the megapixel projects in the market.

#### **HDD, enterprise grade RAID subsystem + DAS (Direct Attached Storage)**

The deployment of RAID NVR can be said as the basic requirement for megapixel storage solutions. However, this deployment has two difficulties that are hard to overcome.

The NVR technology nowadays usually supports only 8-12 hard disks, so that the storage space is limited, inadequate scalability. For a campus surveillance project with 120 high image quality cameras and 30 days of recording retention, it is required to have 40-60 hard disk storage space for independent NVRs to deliver high performance and reliability.

For middle to large scale projects, one can select professional / enterprise grade subsystem storage from HP, Dell, Infortrend, or EMC. When AXIS designs a network surveillance project, they also recommend the deployment of professional storage subsystem.

The most simple storage solution is DAS (Direct Attached Storage) and this is also the easiest solution to expand the NVR storage. I/O transmission speed, hardware

RAID protection (RAID5 / RAID6), and the techniques to ensure the performance and reliability even when a single HDD is down; these are factors why enterprise RAID subsystem storage is a must for megapixel surveillance projects.

For middle to large scale projects, DAS is the only storage solution that is conventional and easy. A number of vendors offer some easy solutions to solve the problems that the conventional CCTV SI encounter whether they cannot fully handle the professional network storage projects or not quite understand the enterprise grade storage installation from operations such as IBM and HP. Some NVR has solutions with scalability to meet the increasing high resolution surveillance project demands.

### **Enterprise RAID subsystem + iSCSI (Internet Small Computer System Interface)**

The biggest advantage of the network surveillance is easy to scale. But for most storage solution, it is not so easy to achieve. To fulfill the end to end network surveillance, it is common to use the iSCSI storage. People select the iSCSI hope to use "clouding technology" to achieve the centralized storage, and in the meantime to replace the past practice, storage at the edge. SAN (Storage Area Network) is the main framework for network storage, originated from the optical fiber transmission structure of the past; now is the iSCSI network protocol called IP SAN. In the security industry, the deployment of the optical fiber transmission storage still has some doubts, such as high price and high specification. Therefore, a network cable transmission is the top choice for high end storage solutions; its centralized storage can bring the benefits of reliability and scalability.

For example, supposing every NVR needs 6.5 pieces of HDD to meet the demand of storage in the past network storage architecture. To ensure the data integrity, every NVR should install 7+1 HDDs and HD quality takes 4 times more space than D1 quality does. Therefore 8 HDD times 4 is 32 pieces of HDDs required. Compared to the conventional distributed storage solution, the centralized storage solution only takes 24 pieces of HDDs. Deployment of the centralized storage can solve the overprovision problem that when designing the network surveillance storage often need to deal with.

Centralized storage can save space capacity, power, related costs and ease of maintenance. But the disadvantage is the configuration, setup and maintenance management should be handled by professionals with higher understanding of network, where many SI are not so familiar with.

#### **4 Storage Communications**

In addition to the storage solutions, the storage communications are lessons that users need to know in the surveillance projects. On the surveillance market, the 3.5" HDD are the most common and can be divided into 4 types, SAS, Near Line SAS, Enterprise SATA, and PC SATA; the pricing and stability of each protocol vary.

Business types such as retailers and SOHO have limited budgets; normally PC SATA is quite sufficient for them. However, generally speaking system installers tend to select the Enterprise SATA to go with the subsystem storage for complex projects. It is suggested to use SAS HDD for projects like this due to its better stability. Though some vendors offer special HDDs for surveillance, it is recommended to look for the features of the aforementioned 4 HDDs as the selection reference. There are a variety of storage products on the market, such as 2.5" HDD, solid state drive, SD card, and so on, but these are less common for megapixel surveillance projects.

#### **Conclusion**

The challenges of storage for megapixel surveillance are the high-speed I/O transmission devices, storage capacity and size, and how to find the right type of storage according to the project level.

Normally PC HDDs are for the consumer market. While conventional CCTV SIs are familiar with NVR installed with RAID or Enterprise RAID+DAS. DAS NVR can be expanded up to 100 hard disk drives but for those who needs scalability and virtualized solutions, iSCSI is still the top choice for middle to large scale projects. With the growing complexity of the storage management systems, it is recommend selecting Enterprise SATA HDD which should also be endorsed by NVR vendors to truly ensure the virtualizations of integration and operation without problems.