RAID Overview

Vers 1 Created: 14/11/2007 / cwa Updated: 15/11/2007 / cwa

What is RAID?

The term RAID stands for Redundant Array of Inexpensive Disks. RAID is a method for logically treating multiple disks as a single volume. RAID is used to offer higher fault tolerance and/or higher throughput levels than a single drive or a group of individual drives.

Why Do We Need It?

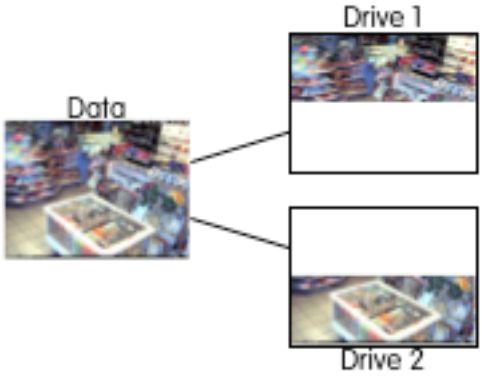
RAID can be used to provide real-time data recovery in the event of a Hard Disk failure, increasing uptime and reliability of a server. It can also be used to increase the throughput of a set of hard disks in high performance applications (such as video editing, complex data-basing, etc.).

In security applications, we do not want to lose video footage due to a Hard Disk failure. To negate this risk, we use RAID configurations for storage. In most MOBOTIX installations, a minimum of RAID 5 is used to ensure that the data storage device can withstand a single drive failure and still continue to record security footage.

How Does RAID Work?

RAID increases data protection and performance by duplicating data and/or spreading data over multiple physical hard disks.

Mirroring (RAID 1) will write the user data simultaneously onto two disks, effectively duplicating the data. This level of RAID provides redundancy but reduces capacity dramatically as a configuration with 2 drives, would only give the capacity of 1 drive. For example, if you have 2 x 250GB drives in a Mirrored configuration, you would only have 250GB of usable storage (even though you have 500GB of physical drive space installed in the system).



Striping writes user data evenly across all disks in the RAID array. There is no redundancy in a striped configuration (commonly called RAID 0). This RAID level provides maximum storage capacity, but means that the loss of a single drive will result in the loss of all data in the RAID array. These RAID configurations are commonly used for high performance tasks such as video editing, where redundancy is not the main concern, as they provide the highest possible read and write speeds.

RAID for Security Applications

The best type of RAID to use for a security application is a combination of high capacity, high performance and redundancy to protect against drive failure (RAID 5, 6, 50, 60). For example, most security installations utilise RAID 5 or RAID 6 (explained in the following table). RAID 5 allows the RAID array to survive a single Hard Disk failure and RAID 6 allows the RAID Array to survive 2 simultaneous Disk Failures. These types of RAIDs also work well when configured in a hot swappable configuration (covered on the following page).

Be aware that RAID 5 can only support one Hard Disk failure. In the case of 2 or more hard disks failing, the result is complete data loss. RAID 6 was introduced to ease this problem in higher drive-count disk arrays by providing dual parity data. Always user RAID 6 in any situation where you have more than 6 drives as it provides a higher level of safety. Naturally, the more disks in an array, the more likely it becomes that multiple disks will fail together or in rapid succession (before a replacement drive can be sourced).

The Different Levels of RAID

RAID Level	Description	Minimum # of Drives	Benefits
0	Data Striping (**NO** Data Protection)	2	Highest performance
1	Disk Mirroring	2	Highest data protection
5	Data Striping with Distributed Parity	3	Best cost/performance balance for multi-drive environments
6	Data Striping with Dual Distributed Parity	4	Highest fault tolerance - able to survive 2 disk failures
10	Data Striping of RAID 1 Arrays	4	Highest performance with highest data protection
50	Data Striping of RAID 5 Arrays	6	Increased capacity and performance for multi-disk RAID 5 arrays
60	Data Striping of RAID 6 Arrays	8	Highest fault tolerance with highest data protection

Hot Swappable Disks and Disk Sizes

RAIDs should always be set up using hard disks that are the same size. For example, to setup a RAID 5 array, you would need to use a minimum of 3 hard disks. You would want to ensure that all of these Disks where the same size (for example, 320GB) and speed (for example, 7,200RPM, SATAII with 3GB/s throughput) as this will allow the RAID to operate at the best performance levels.

Having a hot swappable drives in a RAID array means that a failed drive can be removed and replaced without having to power down the system allowing recording to continue. This is particularly useful in high security situations such as in a Bank as it means no recording downtime. Once a replacement drive is introduced to the system, the RAID card will rebuild the disk array.

During rebuilds there is considerable stress placed on the storage sub-system. In very high-count camera configurations the rebuild process may interfere with the normal security recording process. If you are building a system that absolutely can not afford to lose recording data, it would be advisable to have a secondary (temporary) storage location that can capture the data while the main server is rebuilding. Then once the rebuild is complete, data capture can be switched back to the main recording server and the footage that was recorded to the temporary location can be archived for retrieval as required.

Calculating Rebuild Times

When the RAID is performing a rebuild, you can assume roughly a rebuild time of 1.5-2.0 gigabytes per minute. So if you have a RAID that is 2TB, the rebuild time could be up to 25 hours. Rebuild times are affected by the system load, drive speeds and many other factors - the figures quotes here are only indicative of a typical RAID scenario.