Apple RAID: RAID 1 Mirroring and RAID 0 Striping (2/95)

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TOPIC ---

This article describes RAID 1 - Mirroring and RAID 0 - Striping.

DISCUSSION ---

RAID 1 - Mirroring

Because reliability and data integrity are main concerns for server administrators, Apple RAID implements RAID 1, commonly referred to as mirroring. This implementation of RAID 1 occurs at the partition level rather than mirroring a complete disk drive. This lets you create multiple partitions on the same set of physical disks, and therefore, use those disks for different types of data needs.

To create a mirrored volume, Apple RAID creates duplicate copies of information on two equally sized partitions on two separate physical disks. During a write operation, the identical information is put on both disks. For read operations, all data is taken from the "primary" disk. If either disk fails, the other disk continues to process I/O, and all reads and writes occur on the surviving disk.

This feature provides a significant increase in a system's overall fault tolerance. An additional benefit of mirroring with Apple RAID is support for disk duplexing - where the mirrored disks are connected to different SCSI controllers and are attached to the host system with physically separate cables. This feature tolerates not only a disk failure, but also a failure of a SCSI controller or a cabling system. This capability is known as SFT II (System Fault Tolerance) in NetWare.

Apple RAID also provides the system administrator protection against data on two mirrored disks from becoming different or "out-of-sync". If there is a power failure between writes to disks containing a mirrored volume, it is possible (but unlikely) that different information could exist on the two mirrored partitions. This might occur if the system was not shutdown in a controlled manner (that is; not using the Special/Shut Down command).

If something like this occurs, then after a restart, the user is warned that the mirrored volume may be "out-of-sync". Under these conditions, the system software cannot conclusively determine which disk (if either) may have incorrect

data.

If this warning appears, Apple RAID lets users either "resync" the two disks, or split the mirrored volume into two separate HFS volumes, and manually determine which disk has the best information. From here, users can recreate a mirrored volume from the HFS volume with the best information. The detection recovery options for "out-of-sync" mirrored volumes is a significant benefit to customers requiring a high data integrity.

In summary, Apple RAID software's implementation of RAID 1, or mirroring, is very flexible and provides you with broad protection against disk failures.

RAID 0 - Striping

A second benefit of Apple RAID is potentially increased system performance through disk striping. A striped volume is created by spreading data across multiple disks (up to four) and multiple SCSI buses (up to two on the Workgroup Server 8150 and 9150). Instead of an I/O transaction occurring sequentially on one disk spindle, as with a normal HFS volume, striping allows for parallel access to disks in a striped volume. This may result in faster I/O transactions and/or greater data throughput. However, many factors effect the performance of a striped volume including:

- Type of disk drives.
- Software application being used.
- Size of the I/O transaction (in bytes or blocks).

For example, a graphics/imaging customer who consistently moves large sequential files (10+ MB), would configure their striped volume differently than a database user who may require many small I/O transactions (about 8 KB per I/O).

Apple RAID gives you the ability to control the size of each I/O transaction with a parameter called "Stripe Unit Size". There has been little investigation into optimizing the performance of a striped volume for different applications.

Refer to the following publications for additional information about RAID technology:

"RAID: An Introduction to Redundant Array of Independent Disks" by: Apple Computer, World Wide Performance Systems, May 1994.

"The RAID Book: A Source Book for RAID Technology" by: The RAID Advisory Board, Lino Lakes MN, June 1993, 1st Edition.

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