
Benchmark Report
Fault-Tolerant Configurations
AHA-3985 PCI RAID Adapter
vs.
NetWare

ECX-QE
Applications Engineering



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Abstract

This report summarizes the results of a performance comparison between Novell NetWare's® embedded volume mirroring configuration and Adaptec's AHA-3985 PCI RAID adapter. The AHA-3985 provides performance and recovery time improvements through advanced fault-tolerance functionality in a typical NetWare installation as measured by Ziff-Davis' NetBench® version 3.01.

Introduction

In today's information intensive decision making process, information accuracy and accessibility is essential. The failure of a file server, even temporarily, can critically impede the successful operations of an organization. The solution to the availability problem is RAID (Redundant Array of Inexpensive Disks). RAID employs a data redundancy scheme, so that in the event of a hard disk failure, there is no interruption in data accessibility and no information is lost. While the benefits of redundantly storing data is readily apparent in the presence of a failure, system performance and flexibility during non-critical times must also be considered when selecting a storage subsystem.

RAID Levels

Within every installation of NetWare, LAN administrators have the option of mirroring data partitions such that in the event a drive fails, there is a complete copy of the data already online. This is commonly known as RAID level 1 or mirroring. Adaptec's AHA-3985 PCI RAID adapter fully supports RAID level 1 as well as the more advanced RAID level 5. RAID 5 is the striping of data across an array of drives with redundancy parity data spread across all drives. It is this parity data that allows the system to reconstruct the data of a down drive using only the data on the remaining drives. Because the data is striped across a number of drives, total I/O throughput is improved, giving RAID 5 superior I/O performance.

Benchmark Description

Performance

To measure the performance levels of the different configurations, Ziff-Davis' NetBench® version 3.01 was set up using 20 client machines. The clients were arranged in 4 groups of 5 and connected to the server through a quad-port Ethernet adapter. (A complete listing of hardware and software used in this benchmark report can be found in Appendix A.) From NetBench, the Disk Mix test was selected as being representative of a real world situation. The user's manual describes Disk Mix as ...

A NetBench 3.01 test that provides you with the primary measure of your server's file I/O performance. The Disk Mix runs a series of tests based on information gained from profiling actual applications. As a result, the Disk Mix exercises your file server the way real users do, but much more intensely.....

The Disk Mix mirrors the way leading PC applications perform network file operations. Based on information gained by profiling leading DOS applications, the Disk Mix uses different block sizes and different operations during the test to place a diverse load on the server. It opens and closes files, creates and deletes them, reads and writes file data, intersperses read and write operations, and traverses directories. The files include data from both text and binary file types. In addition, the Disk Mix uses both shared and private server directories and files to simulate both shared file access and private file access.

To compare the I/O performance of NetWare's native mirroring feature and the AHA-3985's RAID configurations, the Disk Mix test was run on an array of drives and the total I/O rate in kilobytes per second was recorded. For the native NetWare mirroring configuration, an Adaptec AHA-2940 was used as the SCSI interface adapter. **It is important to note that the Disk Mix test intensely exercises the file server, such that a load of 20 clients is equivalent to 40 - 100 average users, depending on the definition of average user.**

Reconstruction Time

After a device failure, the system administrator typically replaces the failed unit with a new or spare unit. The system then reconfigures the new unit with data to bring the array back to full fault-tolerant condition. During this time, the data volume is vulnerable to another device failure. Therefore minimizing the reconstruction time, reduces the data's exposure to loss and server down time. This benchmark records the time required for NetWare to reconstruct a mirrored drive and compares it to the time the AHA-3985 needs to reconstruct a mirrored drive and a RAID 5 array.

Results

Performance

Figure 1 below graphs the results of the Disk Mix test for the different configurations in kilobytes per second. The AHA-3985 provides I/O performance improvements during normal operations in both RAID 1 and RAID 5 configurations of 19% and 28%, respectively. This translates into better system performance seen by end users when accessing a data volume controlled by the AHA-3985.

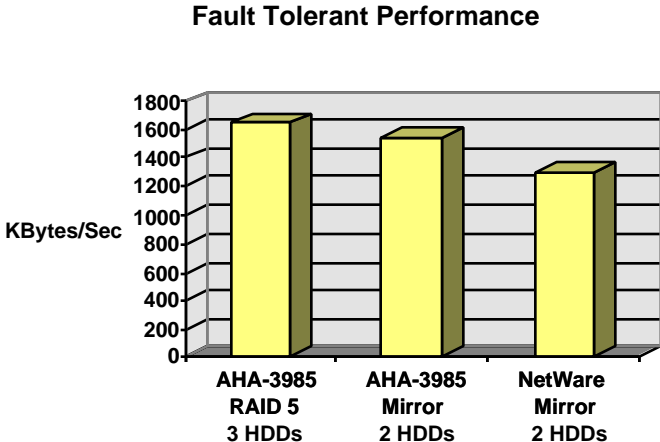


Figure 1

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Reconstruction Time

Figure 2 displays the time required for the system to reconstruct a new drive and return the system to full fault-tolerance status. The AHA-3985 and its software drivers are able to significantly shorten the reconstruction time by 60% and 40% over NetWare mirroring for RAID 1 and RAID 5 respectively. This improvement in reconstruction time allows the system to return to full fault-tolerant status more quickly, thus reducing the chances of data loss from a second hardware failure.

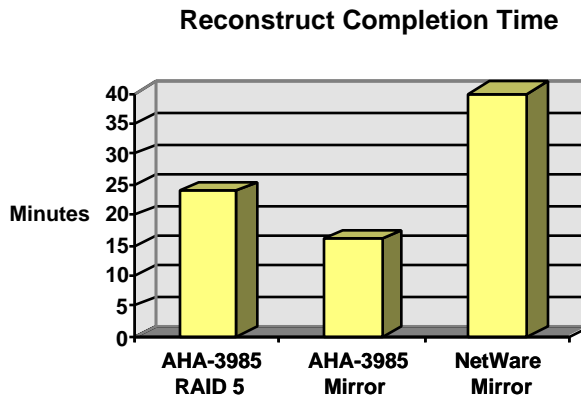


Figure 2

Conclusion

Clearly with the increasing reliance on LAN servers, availability to all data at any time has become a fundamental requirement in today's business environment. Within an entry level NetWare installation, system administrators have basically only had the option of mirroring data volumes using NetWare's native operating system support. The AHA-3985 PCI RAID adapter improves data I/O performance in mirroring configurations and provides the additional feature of RAID 5 for more flexible and cost effective data redundancy. In a typical NetWare configuration, the AHA-3985 is able to perform up to 28% faster than NetWare's native fault-tolerant mode of operation. The AHA-3985 restores a mirrored drive to fault-tolerant status 60% faster than NetWare, thus reducing the exposure to data loss.

Overall, the AHA-3985 provides system administrators with better performance, increased flexibility and more advanced features, such as hot spare support, than traditional NetWare mirroring, while minimizing the possibility of data loss due to additional devices failures.

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Appendix A

File Server Specifications

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| File Server: | Intel Plato Motherboard, BIOS 0.01.20.AX1 |
| Processor Type: | Intel Pentium |
| Number of Processors: | 1 |
| Processor Speed: | 90 MHz |
| Clock Speed: | 90 MHz |
| System RAM: | 32 MB |
| Secondary RAM Cache: | 256 KB |
| Hardware Hard Disk Cache: | N/A |
| Number of Hard Disk Controllers: | 1 |
| Type of Hard Disk Controllers: | Adaptec AHA-3985 (AHA-2940) ¹ |
| Type of I/O Bus: | PCI |
| Number of Hard Disks: | 3 (2) |
| Type of Hard Disks: | Seagate ST32550N F/W - 0014 |
| Hard Disk Sizes: | 2 GB |
| Controller Driver Version: | AHA3980.DSK/ARDRV.R.DSK - 1.01 (AIC7870.DSK - 1.20) |
| Disk Organization: | RAID 5 (Mirror) |
| Boot Channel Drive Controller: | AHA-1542, ISA |
| System Boot Drive: | Maxtor MXT-540S |
| Number of Network Controllers: | 1 |
| Network Interface: | Cogent eMaster+ PCI Quartet |
| Network Interface Driver: | EM964_4.LAN - Ver 1.10 |
| Network Operating System: | Novell Netware |
| Operating System Version: | 3.12 |
| Network Operating System Parameters: | Disk Read After Write = Off Immediate Purge of Deleted Files = On Enable IPX Checksums = 1 |

¹ () Indicates used for mirroring configurations.

Client Specifications

Network Type: 10Base-T, Ethernet
Number of Clients: 20
Number of Concentrators: 4
Type of Concentrators: Accton Etherhub-8mini
Number of Clients per Segment: 5
Network Interface Card: NE2000
Client CPU type: Intel 486
Client CPU Speed: 33 MHz
Client Network Software: MSDOS 6.0, IPX/SPX 3.10, NetX 3.32
Size of Client Network Cache: N/A

Controller Specifications

Controller Operating System: MSDOS 6.22, Windows for Workgroups 3.11
Network Software: LSL 2.14, NE2000 2.02, IPX/SPX 3.01, VLM 1.20

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