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Apple Workgroup Server 95: PDS Card Description (5/93)

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TOPIC ----------

Installed in the PDS slot of the Apple Workgroup Server (AWS) 95 is a card designed to provide the fastest possible I/O for the system. There are three major parts to this card. This PDS card will work in the Quadra 900, but not in the Quadra 700 or 800.

DISCUSSION ----------

SCSI DMA

The PDS card in the AWS 95 is equipped with two NCR 53C96A SCSI controller chips running at 33 MHz along with supporting circuitry to enable SCSI Direct Memory Access (DMA). DMA means that data can be transferred from the SCSI bus to main memory by the SCSI controllers without constant attention from the CPU. This enables the main CPU to go on performing other tasks in parallel. This strategy greatly enhances server performance by effectively increasing disk I/O throughput.

The PDS card has three SCSI connectors, two internal and one external. There are two internal connectors so that it is possible to connect disk mirroring or RAID devices that can use two SCSI busses in parallel for better performance. The four SCSI busses are numbered, 1 through 4:

1 Main logic board internal
2 Main logic board external
3 Accelerator card internal
4 Accelerator card external

These numbers will appear in the AWS 95 version of HD SC Setup. These numbers are also important in specifying disk drives inside A/UX.

The total AWS 95 system now has four separate SCSI busses, two on the main logic board and two on the accelerator card. Because each bus can support seven devices the theoretical limit on SCSI devices is 28. However, there is only enough space and connectors for 20 devices. The separation of SCSI busses is available because A/UX 3.0.1's SCSI disk drivers have been written to handle them. The Macintosh OS is unable to distinguish SCSI devices with the same ID, but on different busses. It is also important to note that the I/O acceleration is only provided to SCSI devices attached to the PDS card, not to those attached to the main logic board because the DMA circuitry is only on the card. When adding disk drives to the AWS 95 system it is important to make sure that they are attached to the SCSI connectors on the PDS card, not to the main logic board.

L2 cache

This is high-speed static RAM (SRAM) which decreases access time for data from the disk. Most server applications spend a lot of time reading and writing the same data for different users. By implementing a large secondary cache, the most used data resides in high-speed SRAM instead of the much slower disk drive. The PDS card cache caches both instructions and data.

L2 stands for level 2. This means that the cache is farther away from the processor than the 8K on-chip cache in the 68040, which is considered level 1, L1, or primary cache. On the PDS card in the AWS 95 the L2 cache is direct-mapped write-through cache. This kind of cache is more useful for reads than writes because writes just pass through and go all the way to main memory. Read performance is significantly enhanced because the processor doesn't have to go all the way to main memory for instructions or data that are in the cache. Direct-mapped cache means that the cache occupies a fixed address space. This makes it easier to implement in system software because the cache is invisible to software. All cache management is done transparently in hardware so applications do not need to be re-written to be cache-aware.

- TAG RAM
  The AWS 95 PDS card has 128 K of SRAM built in. It can be optionally upgraded to 256 K or 512 K through three SIMM sockets. When upgrading from 128 K to 256 the user must also install a tag RAM SIMM. When upgrading from 256 K to 512 K there is no need to add more tag RAM.

Parity checking

Most server customers are very concerned about data integrity. By implementing parity checking the operating system can detect any errors in the RAM hardware and flag them immediately. Parity checking insures that data is not lost between the CPU and the system memory. By default, parity checking is turned off in the AWS 95 software. There is a check box within the A/UX Startup application allowing the administrator to turn on or off parity checking in the system. Parity checking may slightly affect overall server performance. AWS 95 systems will be shipped from Apple with 9-bit parity DRAM installed. Standard non-parity DRAM can be installed, however parity checking will no longer work when non-parity DRAM is present.

Upgrade Kit

Apple will offer a kit to upgrade a Macintosh Quadra 900 or 950 to the AWS 95 platform. The upgrade kit includes the PDS card and the software on CD-ROM.

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