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Apple Workgroup Server 95: A/UX 3.0.1 Information (5/93)

Revised: 6/17/93
Security: Everyone

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Article Created: 24 May 1993

TOPIC ----------

A/UX 3.0.1 is the native operating system of the Apple Workgroup Server (AWS) 95. A/UX 3.0.1 is an optimized version of A/UX 3.0, Apple's implementation of industry standard AT&T UNIX System V with BSD 4.2 extensions. A/UX uses the full System 7 interface.

DISCUSSION ----------

Performance

Apple has spent considerable effort ensuring that this system runs server applications as fast as possible. The major efforts are detailed below:

- Slimmer code paths
  Apple has gone to great lengths to eliminate any performance bottlenecks in the system. This includes a full rewrite of the AppleTalk code and optimization of most of the file manager and SCSI toolbox.

- SCSI Direct Memory Access (DMA) support
  DMA support is necessary for asynchronous I/O. It means that memory control is off loaded from the main processor. There is a special DMA controller the allows the operating system to move data to and from the disk subsystem without constant attention from the main CPU. In the conventional Macintosh implementation the CPU must explicitly fetch data from the SCSI bus and place it in main memory one block at a time. However, with a DMA architecture the CPU can hand off a large quantity of data to the DMA controller which then takes care of moving the data to or from the hard disk while the CPU can continue on a perform other tasks in parallel. The main CPU doesn't have to wait for the relatively slow hard disk before going to the next task.

The A/UX 3.0.1 SCSI disk driver has been modified to allow selection among the four SCSI busses available on the AWS 95 platform. Referring to disk drives is different on the AWS 95 than under traditional A/UX. Each disk must be identified not only by its SCSI address, but also by the SCSI bus that it is attached to. The SCSI busses are numbered 1 through 4. In previous versions of A/UX a SCSI drive with address 5, drive 0, slice 0 would be specified through the device file /dev/dsk/c5d0s0. Now you must also specify the bus number. The new format is /dev/[r]dsk/cb0ad#s#, where "b" is the SCSI bus (numbered from 1 to 4) and "a" is the SCSI address (numbered from 0 to 6). The SCSI busses are numbered in the order they are searched in the Mac environment: main logic board internal, main logic board external, PDS card internal, and PDS card external. The busses are numbered from 1 to 4 instead of from 0 to 3 to avoid the problem of forcing leading zeros when generating device file names. The old format, /dev/[r]dsk/c#d#s#, where c# is the SCSI address, d# is the logical unit number, and s# is the slice number will continue to work. The c# field will specify both the SCSI bus and the SCSI address of the device. The current device files (/dev/dsk/c[0-6]d#s#) will refer to the device that is visible to the Macintosh OS regardless of what SCSI bus the drive resides on. This is for backwards compatibility.

For example, these path names map in the following way:

Pathname	SCSI ID	SCSI bus
/dev/dsk/c203d0s0	3	main logic board external
/dev/dsk/c403d0s0	3	PDS card external
/dev/dsk/c3d0s0	3	wherever it is found first

- Faster Semaphores
  A/UX allows many processes to run at the same time (in parallel). Often, these processes are interdependent. The database must make sure that the data is wants to write successfully is written before it can process a request to retrieve that data for a different user. Parallel processes can communicate with each other through semaphores. A semaphore is a signal sent from one process to another. In the example above, the database engine will wait for a semaphore from the operating system acknowledging that the data has been successfully written. Semaphores under A/UX 3.0.1 have been optimized for speed because they are used frequently by server processes.

- Intelligent I/O
  Input/Output (I/O), moving data to and from the disk drives and the network, is the primary bottleneck in most server systems. Apple has spent significant effort in the AWS 95 and in A/UX 3.0.1 to optimize the performance of I/O. By using UNIX and a hardware DMA architecture the AWS 95 can perform asynchronous I/O transfers. This is a primitive method of multi-processing. It means that the SCSI or Ethernet controllers can transfer data to or from the network or the disk subsystem at the same time, while the main CPU is performing other tasks. The CPU simply asks the DMA controller to transfer a certain block of data and then goes on to the next task while the transfer takes place in

parallel. When the transfer is complete the system can send a semaphore to the application to mark the completion of the transfer so the application can then access the data from main memory.

- Optimized AppleTalk
  The AppleTalk networking code has been re-written in A/UX 3.0.1 to allow a significant performance speed-up. The network software is now able to transfer clusters of packets together instead of one at a time. Many delay loops have been removed. And network code has been trimmed wherever possible.

- General I/O tuning
  A/UX 3.0.1 has had its I/O performance enhanced wherever possible. The installer will set initial kernel parameters differently depending on which configuration, file/print server or database server, is being installed.

Login

When the AWS 95 is first powered on it will immediately launch A/UX (through an alias in Startup Items). A/UX 3.0.1 will go straight to the Finder, logging in as root if (and only if) there is no password on the root account (the default installation). If the administrator chooses to add a password to the root account, A/UX 3.0.1 will stop at the standard A/UX Login screen and wait for a password. In the File/Print server configuration there is a text file called "Autologin" in the Preferences Folder of the Login System Folder which contains the name of the account for the system to automatically login to. By default it is set to root. This file is not present in the database configuration.

An important note is that the root user must be logged in at the console and running the Macintosh environment for the AppleShare server to run since AppleShare Pro is still a Macintosh application. The Oracle database server can run in the background without having a user logged in at the console.

Tech Info Library Article Number:12354