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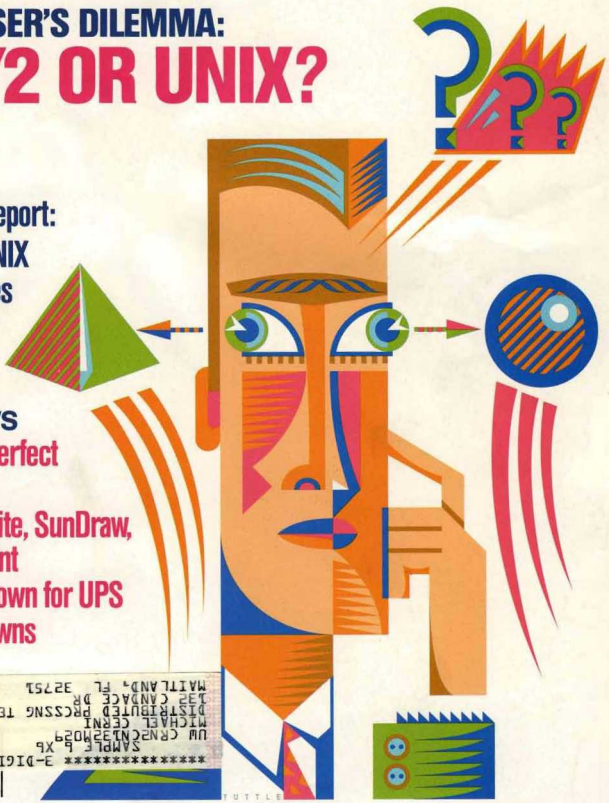

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Update

DISK CONTROLLERS STANDARDIZED WITH EATA

By Steve Goldman

EATA is to ATA as EISA is to ISA. Confused? Then this article may be of interest to you.

It all started when manufacturers of PC peripherals decided they had a common problem. There were plenty of accepted interface standards for disk drives, but no standards had yet emerged for the disk controller boards that connected the disk drives to the computer bus. None, that is, except for a de facto standard set by the ST506 controller, shipped with the original PC AT computers.

Back in the days when DOS was the only operating system found on PCs, having a standard interface for disk controllers was not so important. All communications between DOS programs and hardware devices, such as disk controllers, were passed through the Basic Input/Output software (BIOS) that came packaged in a ROM chip along with every PC. But with the proliferation of multiuser operating systems such as UNIX, which ran on PCs, the advantage of a disk controller standard became apparent.

The PC's BIOS software, which normally handled the disk controller interface, was not designed for the needs of multiuser operating systems. Each variant and version of UNIX required different software drivers to be written, because the BIOS could not be used. And with each new disk controller, new drivers were required for each operating system. It became apparent that if a standard could be created based on the original PC disk controller, then the number of software drivers required would be vastly reduced.

Running Out of Steam

To make matters worse, the old reliable WD1003 disk controller was running out of steam. The performance of this controller, which was adequate for most DOS applications, was not suitable for multiuser environments, which placed a much greater load on the disk channel. New controllers were being introduced that, with architectural innovations such as on-board processors and caches, provided the higher performance levels required by multiuser systems. Disk controllers for the new high-capacity ESDI and SCSI drives, which could satisfy the increased storage capacity demands of multiuser systems, were also becoming available. With the introduction of each new disk controller, new drivers needed to be written for each operating system. It became apparent that if a disk controller interface standard could be created based on the original PC disk controller, then the number of software drivers required would be vastly reduced.

But, like the original PC in which it was used, the WD1003 interface began to have growing pains.

The most pertinent question is whether that interface can be used on controllers that attach to other types of disk drives. The answer is yes. In fact, several companies have for some time shipped large numbers of high-performance ESDI disk controllers that use the WD1003 type interface. The obvious advantage of using this interface is that the disk controller can "plug and play." No special software drivers need to be installed because virtually all PC operating systems are shipped with standard drivers that know how to communicate with the WD1003. In addition, if the disk controller interface looks to the computer like a WD1003, then the computer's ROM BIOS, which normally assumes that a WD1003 controller is present, will not have to be overridden. This avoids the many compatibility problems that plague board-level integrators.

In addition to disk controller manufacturers, a number of disk drive manufacturers also have used this standard controller interface to allow easy integration of their drives into PCs. These drives, which employ what is called Integrated Drive Electronics (IDE), have a disk controller embedded in the drive along with the normal drive electronics. IDE drives use the standard WD1003 interface to avoid using special software drivers and the consequent compatibility problems.

Growing Pains

But, like the original PC in which it was used, the WD1003 interface began to have growing pains. The need to plan a growth path for the interface prompted a consortium of computer peripheral manufacturers—including DPT, Quantum, CDC, Maxtor, Seagate, Adaptec, and WD—to meet earlier this year as a subcommittee of the Common Access Method (CAM) group. The CAM committee was formed by a group of software and hardware manufacturers that had the goal of standardizing peripheral-device support within operating systems and computers.

The first action of the CAM committee was to pick a generic name for the WD1003 interface. "AT Attachment" (ATA) was chosen because the interface could be used on devices other than disk drives. The characteristics for this interface were then carefully described so that disk controllers and IDE drives could be built to commonly agreed upon specifications.

The second task was to design a growth path for ATA which would

allow higher performance devices to be built, while preserving the compatibility with the myriad existing software packages and operating systems. This enhancement to the ATA interface was called Extended AT Attachment (EATA).

Disk controllers using the EATA interface can do everything that their ATA forefathers could do and, by loading an enhanced software driver, they can also shift gears into the faster EATA protocol. This protocol, although very similar to the old WD1003 protocol, supports the higher data transfer speeds that will be required by tomorrow's ISA and EISA bus PCs. For example, new EISA machines shipped with EATA standard interface controllers can boot-up and run any operating system without special drivers or modifications of any type to existing software packages. After system boot-up, special software drivers can then be loaded, allowing the controller to use EISA bus-master capabilities to transfer data at 33 megabytes per second.

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In addition, an extension to the WD1003 protocol was added for SCSI host adapters. SCSI (the ANSI-standard Small Computer System Interface) allows not only magnetic disk drives, but also tape, CD-ROM, WORM, scanners, printers, and other peripheral devices to communicate across a single ribbon cable bus. This bus then connects to the computer's bus via a SCSI host adapter. The adapter is typically a card that plugs into the computer backplane in the same way as a disk controller card.

This means EATA SCSI adapters can be built that use the ATA disk protocol, support for which is built into all standard PC BIOSs. These adapters can boot up from disk in the ATA mode in any ISA or EISA PC, and under any operating system. Once the system has booted, EATA drivers can then be loaded to allow communication to non-disk devices. By providing a way to pass SCSI commands through the WD1003-like hardware interface, EATA protocol allows the simple construction of one device that performs both as a standard software-compatible disk controller for SCSI drives and as a multipurpose peripheral controller for non-disk devices.

A Similar Concept

The concept of EATA is very similar to that of EISA, the extension to the Industry Standard Architecture used on the first IBM PC AT computers. Although IBM moved on to the MicroChannel Architecture, the rest of the industry was reluctant to throw away the applications packages, operating systems, and peripheral cards that over the years had grown around the PC AT. Thus EISA, too, was developed by a consortium of computer companies that saw the benefits of a smooth migration path into the future.

Just as EISA bus computers can use peripheral cards, and run applications and operating systems used by the millions of ISA bus machines in existence today, EATA controllers will also run with all the same software as the current standard ATA disk controllers. New cards and software are being developed to take full advantage of EISA and EATA; but until the last ISA bus computer and ATA disk controller is gone, there will be a tremendous advantage to maintaining compatibility with the past.

With EATA, PC users can maintain compatibility with the standard ATA controllers, but the highest possible levels of performance can be attained by advanced EATA disk controllers and SCSI host adapters.

When will peripheral controllers be available that utilize the EATA interface? In a sense, they already are. Every disk controller using the WD1003 interface is EATA compliant.

The obvious advantage of EATA for computer dealers and manufacturers is that they can retain all their existing customers, even as they move ahead into new high-performance disk interfaces such as ESDI and SCSI. It does not matter which variant of UNIX or any other operating system their clients wish to use. Because special software drivers are not required, all existing applications are guaranteed to work on the new hardware.

In addition, because they do not need to be bootable, when EATA drivers are written they are much simpler than drivers for other disk controllers or host adapters. EISA bus controllers can boot up as a mild-mannered WD1003 lookalike disk controller and then, once the appropriate EATA software drivers have been loaded, turn into a 33-megabyte per second EISA Bus Master peripheral controller. EATA controllers also have a better chance of compatibility with other hardware and software devices in the system because the EATA register set is exactly the same as in the existing ATA disk controllers.

The PC industry has enjoyed tremendous growth during the past several years, partly because of the large number of compatible sources for hardware and software. The catalyst that makes it possible is the standards process. Interface standards allow vendors and customers to concentrate their efforts on innovative features and functionality rather than fighting interface wars. Standards may be set by committee. Sometimes, de facto standards arise. But, whatever the source, once a standard exists it is always better to provide backward-compatible enhancements than to start from scratch, leaving behind established software and operating systems in the hope a brand new standard can be created. This is the philosophy behind EATA. □

Steve Goldman is president of Distributed Processing Technology (DPT) in Maitland, Fla. He has been a member of ANSI X3T9.2 (the SCSI committee) since 1983 and is the author of the original caching commands in the SCSI standard. Goldman recently proposed the "Wide SCSI" (16/32-bit) interface for the SCSI II standard.