Benefits Of Enhanced IDE Breakthrough Technology

Enhanced To Offer More Than Ever Before

■ by *Gary Marks*

The computer marketplace is segmented into various classes of machines divided by user expectations in terms of cost, performance, compatibility and ease-of-use. The largest distinct segment today is the personal computer market, characterized by single-user products supporting a broad user base. The use of these machines in business and home environments has dictated an emphasis on cost and compatibility. Historically, cost and compatibility in the personal computer marketplace have been more important to mainstream users than very high performance. The PC user has simply not been willing to bear the added cost or potential lack of compatibility that high performance solutions imply.

Given this criteria, the mainstream volume personal computer market has standardized on the IDE interface for its primary storage needs. The success of the IDE interface in the PC market has resulted primarily from a perfect match between IDE's offerings and the requirements of the market it serves. Specifically, its low cost of connection, compatibility, and ease-of-use, compared to alternative interfaces such as the SCSI, have been essential attributes in satisfying an expansive price-sensitive user group. In addition, because of the broad user base it serves, the personal computer market has traditionally required only hard disk support to meet its mass storage requirements. IDE has therefore evolved as a drive-only interface.

As the personal computer market matures, it continues to display an increased emphasis on enhanced performance and connectivity capabilities, while maintaining its focus on cost, compatibility and ease-of-use. Because of this, the market criteria has grown to include higher performance attributes without sacrificing the needs of its price-sensitive customers. It is in the realm of higher performance characteristics and connectivity that today's traditional IDE interface face challenges. Other existing interfaces, such as SCSI, provide greater flexibility and performance options to meet these requirements, while failing to provide IDE's benefits of compatibility, cost and ease-of-use.

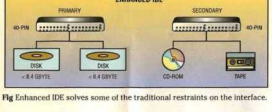

Fig Enhanced IDE solves some of the traditional restraints on the interface.

Enhanced IDE

Enhanced IDE removes many of the existing limitations and issues associated with the current IDE interface. Eliminating these limitations enables IDE to grow with the industry's increased mass storage requirements without sacrificing its key cost, compatibility and ease-of-use attributes. The historical limitations of IDE relative to other interfaces, such as SCSI, have not threatened IDE's dominance of the PC marketplace to date. Upcoming personal computer systems, designed around high performance processors, more complex operating systems, and

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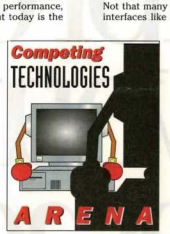

SCSI Takes The High Road, IDE The Low

Promises Optimum Performance

■ by *Steve Goldman*

There was a time when it was not so simple to choose a disk interface. Not that many years ago, integrators had to weigh the relative merits of interfaces like ST506 (RLL or MFM), SMD, ESDI, SCSI, IPI-1 and IPI-2, as well as several proprietary interfaces, when picking a disk drive. In addition, tape drive connections were even more arcane. Over the years, as SCSI peripherals increased in sophistication, the SCSI interface grew in popularity until it replaced all other interfaces as the top choice for high-end systems.

Meanwhile, single-user desktop PCs have embraced IDE disk drives instead of SCSI drives because of their low cost and ease of installation. Recently, however, SCSI has threatened to replace IDE as the interface of choice for low-end as well as high-end systems. This prompted IDE proponents to propose several enhancements to the IDE specification in order to stem the defections to SCSI. And, at least for the moment, it looks like the plan may work for the low-end PC market.

In order to understand the dynamics behind the pendulum swing between IDE and SCSI, it is necessary to take a closer look at the relative merits of each interface. SCSI drives are designed for optimum performance and flexibility. On the other hand, IDE drives were designed primarily for ease of installation and low cost. IDE achieves this by emulating a WD1003 controller—the disk controller used in the original IBM AT to control ST506 hard drives. Because of this WD1003 emulation, however, several limitations have been imposed on IDE drives.

SCSI devices are designed to maximize host bus utilization. This is achieved through high data transfer rates of 10, 20 or 40 Mbytes/ sec, depending upon the SCSI cable width, and by utilizing intelligent host bus adapter cards. These SCSI adapters can use bus mastering, scatter/gather, and other techniques to optimize the time spent on the host bus and to minimize CPU overhead. Host bus utilization is important in high-end multiuser systems but until recently, has not been a concern with single-user PCs. With the advent of multimedia, however, the task of keeping up with the data required by audio and video has become more daunting. SCSI drives, with their high transfer rates and bus mastering adapters have begun to look more attractive.

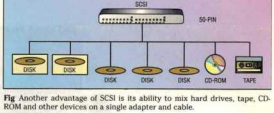

Fig Another advantage of SCSI is its ability to mix hard drives, tape, CD-ROM and other devices on a single adapter and cable.

Another advantage of SCSI is its ability to mix hard drives, tape, CD-ROMs and other devices on a single adapter and cable. On the other hand, IDE, up until now, has strictly been an interface for hard disks. Before the popularity of multimedia, SCSI's ability to control tape and CD-ROM drives was not an important feature for the low-end PC market. But now CD-ROM drives are quickly becoming a standard option on desktop PCs and the requirement to control these devices is prompting PC

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SCSI Still Better For Multiuser OS

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designers to look to SCSI. With their ability to process multiple overlapped I/O commands, SCSI drives offer significant architectural advantages over IDE. It is possible for a computer to issue simultaneous commands to every drive in a SCSI system. Each drive can then fully overlap its seek, rotational positioning, and read or write operations with the other drives. The data can be buffered on the drive and transferred at high speed over the shared SCSI bus when a time slot is available. In addition, SCSI host adapters and drives can rearrange the order of execution of I/O commands so that seek and rotational latency is minimized and throughput is maximized. This ability to reorder I/O and overlap the operation of multiple drives is instrumental in obtaining sufficient throughput in multiuser systems. IDE drives, tied to the old WD1003 ST506 controller protocol, can only single-task I/O operations. Once a command has been issued to an IDE drive, the operating system must wait until the command has been completed before issuing another command to any drive. Although single-tasked I/O would be intolerable in a multiuser system, the opportunities for multitasking are rather limited under Windows and non-existent under DOS. As a result, IDE presents no particular disadvantage in these environments.

With the rapid growth of multimedia in low-end PCs, SCSI has started to erode the market for IDE. In addition to its obvious advantages, plummeting prices for adapters and drives have reduced the barrier of entry for SCSI. Low-end SCSI chips, which cost between $10 and $25, have started to appear on motherboards, replacing IDE connections. The proponents of IDE drives have responded with Enhanced IDE. This interface adds allows the IDE the ability to control CD-ROMs and larger hard drives, and higher data transfer rates. With these improvements, IDE will once again become a viable interface for small single-user PCs.

> "In addition to its obvious advantages, plummeting prices for adapters and drives have reduced the barrier of entry for SCSI."

On the other hand, the architectural disadvantages of IDE, although not as noticeable under DOS, still severely limit the performance of multiuser operating systems such as Novell Netware, UNIX, and Windows NT. These systems realize large benefits from multitasked, overlapped I/O, bus mastering, scatter/gather memory access, and I/O command queuing, all offered by SCSI drives with intelligent host bus adapters. Because of this, most PC designers today believe that IDE and SCSI will retain their respective turfs—IDE's being low-end PCs and SCSI's being high-end systems.■

Steve Goldman *is president of Distributed Processing Technology (Maitland, FL).*

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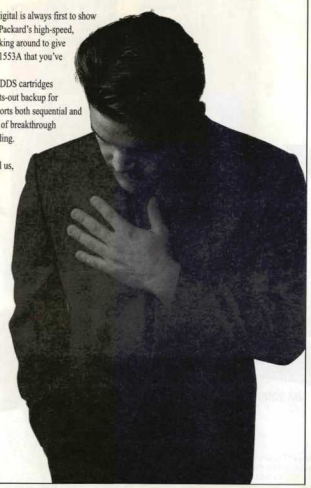

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