

# TECHNICAL REPORT

This year we've heard a lot of bickering over which 32-bit bus is better — the Extended Industry Standard Architecture (EISA) designed by a consortium of systems manufacturers or the Micro Channel Architecture (MCA) developed by IBM. Yet despite all the dissension, a side-by-side evaluation of the two technologies reveals many more similarities than differences.

Both EISA and MCA provide a 32-bit connection with the system processor. Both have substantially higher bandwidth than Industry Standard Architecture (ISA) systems. And both seem optimally suited for such tasks as networking, graphics, and data I/O control. There will be performance differences between EISA and MCA systems, to be sure. But in all likelihood, this will be the result of enhancements brought to bear by individual systems manufacturers, rather than because of any inherent advantages of the bus itself.

**A BALANCING ACT.** Before delving into a discussion of the two alternatives, it's important to take a look at what both IBM and its rivals hope to attain — technically speaking — by introducing a new 32-bit standard.

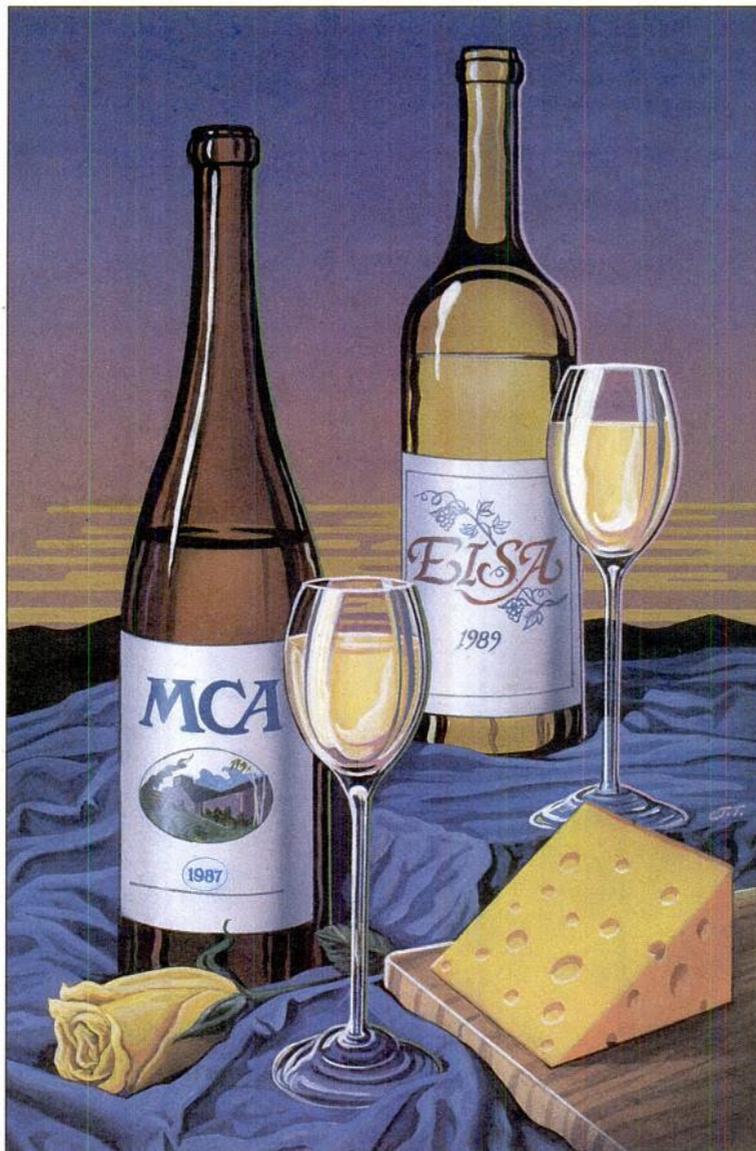
In an 8-bit world (an 8-bit processor with an 8-bit-wide data path) things were evenly matched. In those 8086- and 8088-based systems, data moved within the microprocessor 8 bits at a time, and an 8-bit bus delivered data to and from the processor at exactly the same rate.

When the AT was announced in 1984, the microprocessor — an 80286 chip — was capable of moving data 16 bits at a time. The system bus was also enhanced, enabling it to handle 16 bits at a time.

When 80386 systems were introduced, the balance was thrown out of kilter. While the 32-bit microprocessor was capable of moving data 32 bits at a time, no similar improvements were made to the bus architecture. Since there is an inherent limit to the speed that data can travel over the I/O bus, the 16-bit bus was unable to keep up with the expanded performance capabilities of the new processor.

The balance between bus bandwidth and processor is crucial to the optimal performance of a 32-bit system. A balanced system implementation makes data available at the same rate the processor can accept it, so more data can be moved into and out of the processor. The 32-bit data paths provided by EISA and MCA allow data to be moved over the full 32-bit path the microprocessors are capable of supporting.

**YES, MASTER.** Although there is some disagreement over whether the "bus-master" cards currently available or under development for EISA and MCA are truly bus-master cards, their function and benefits are clear. The 80386 and 80486 processors are both capable of working with other processors on a system bus that supports multiple processors. A bus-mastering scheme, therefore, allows the use of separate processor cards



that carry out certain processing tasks, freeing up the CPU to perform other functions.

By offloading processor-intensive functions from the main processor, a number of specialized operations can be performed simultaneously by a single system. For example, a bus-master printer controller card could take data to be printed off the system bus, do the manipulation required for page processing, and handle passing the information to the printer, thus accelerating printing. Without the capability to offload these processing tasks, the main processor is responsible for performing the manipulations required to prepare graphic and/or text files for printing.

**COMPARING SPECS.** Currently, the EISA bus can transfer data in burst mode at 33 megabytes per second, according to Intel documentation. Original MCA bus transfers were capable of performance in the 20-megabyte-per-second range, but some new models tout speeds of up to 40 megabytes per second.

The difference between today's 33-megabyte EISA and 40-megabyte MCA transfer rates makes the two buses "virtually equal," according to Michael Krieger, senior manager of advanced products at AST Research Inc., one of the companies involved in the EISA consortium known as the Gang of Nine. At either speed, tremendous amounts of data can be moved through the system.

But moving data at either speed assumes "you have memory that can take it that fast," Krieger said. Most computers in use today don't have enough high-speed memory to take full advantage of the higher data transfer rates. Over the next few years, however, the memory constraints are expected to decline significantly, with memory costs dropping fairly rapidly once new chip foundries begin pouring new memory chips into the market.

At a technology demonstration in September, IBM announced two new modes of data transfer that will eventually allow MCA users to transfer data at 160 megabytes per second — a significant increase over the current MCA and EISA specifications.

The planned speed improvements for MCA will undoubtedly be exceeded by EISA developers, though, according to Jeff Miller, vice president and general manager of the storage products operation at Adaptec, maker of interface boards for all three buses. "My sense is that when EISA comes out, it will outperform anything that is currently available in MCA, but IBM [has] said what it is planning for future advances. We'll see a kind of leapfrogging. At any point in time, one bus may be ahead, but six months later the other bus will be ahead [in performance]," Miller added.

Richard House, product manager for National Instruments, maker of data acquisition/analysis instrument control interfaces for several different architectures, takes a similar view. "IBM may have announced faster MCA versions, but they don't exist today. By the time they do, EISA may be going faster, too."

From a pure performance standpoint, industry observers agree that both buses provide roughly the same advantages.

"I don't think that the poor guy sitting at a desk wanting to plug a PC into a Novell network will be affected much [by choosing one bus or the other]," said Fredric B. Gluck, product line manager at

## Uncorking The Future

*Users Begin a  
Taste-Test of the 32-Bit  
Hardware*

**BY MARK BROWNSTEIN**

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"Although you can get into some interesting discussions with guys on either side, what seems to come out is that both MCA and EISA are good, solid improvements over the AT bus," added Adaptec's Miller. "Both can and probably will fill the needs of higher performance computing platforms."

Still, each camp continues to cite performance advantages that its bus offers over that of the competition.

Announced in April of 1987, IBM's MCA has what many thought would be an insurmountable two and a half year head start on EISA. Clearly, IBM did not take full advantage of that lead — we've seen neither a substantial number of products that take advantage of MCA's capabilities, nor significant enhancements to the bus from when it was first introduced. What the added time has provided is the opportunity for developers to work with and understand the bus — something they are only beginning to do with EISA.

"MCA looks to be more mature. When you talk about the years of time it's been out and under scrutiny, how long it's been in development, and the number of systems shipped [MCA has an advantage]," said Dan Brown, vice president of storage products at Western Digital. "Some of the announcements [by IBM] in the not-too-distant future will shed more light [on the MCA vs. EISA dispute] and will make people realize how much of a roadmap [IBM has] put together," he added.

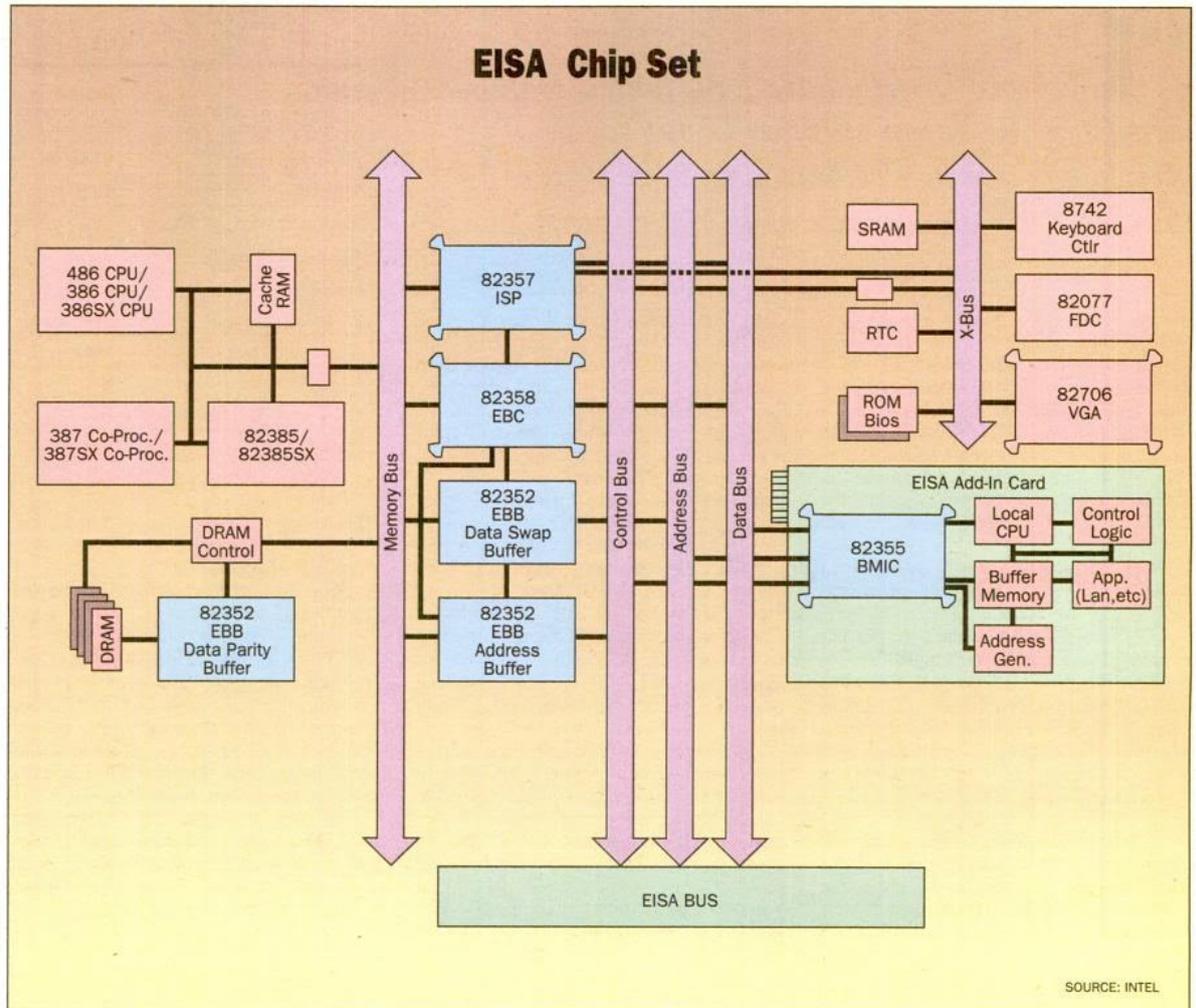
Although it may take developers time to ramp up production of boards that take full advantage of EISA, many board makers and system manufacturers find that work done on MCA projects can be used in EISA development as well.

Advanced Logic Research of Irvine, California, for example, is now shipping both MCA and EISA machines. According to Dave Kirkey, vice president of marketing and sales, ALR was able to get its EISA system out quickly precisely because of its MCA development efforts. ALR was far along in its MCA development when EISA was proposed, said Kirkey. He added that the company basically took its design for MCA systems and ported it to the EISA bus.

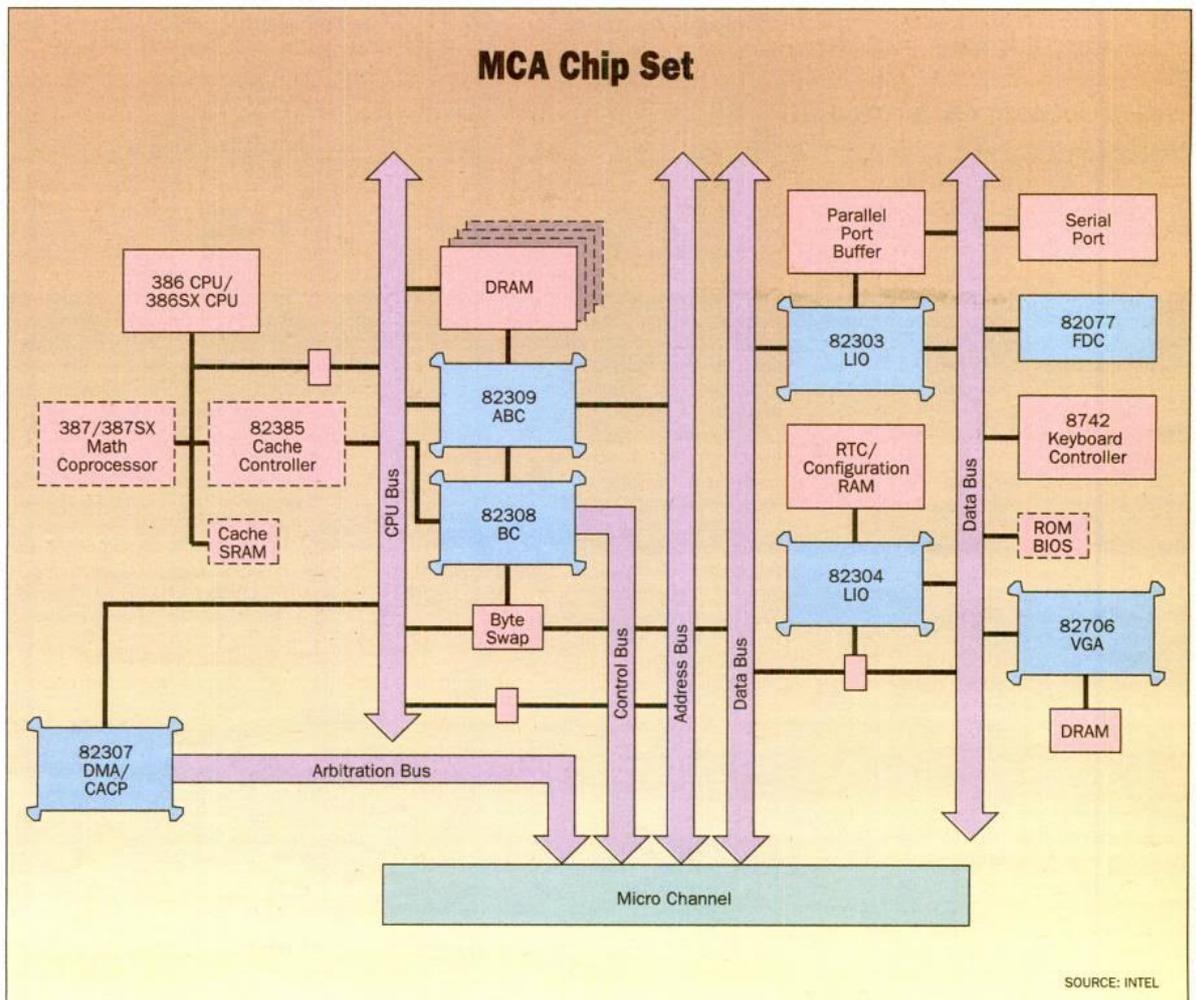
"To me, all the differences are in the connectors," said Kirkey of the company's 486 products. "From system-level design, there's no difference in performance [between EISA and MCA]."

One area of clear distinction between the two architectures is system board size. The MCA architecture uses a smaller sized board than does the EISA bus. While this enables developers to design more compact systems, it may also prove to be a disadvantage, since there's less room for components and not as much power as can be passed through to an EISA card.

There's a "size and cost advantage with EISA cards," said National Instruments' House. "Our EISA implementation couldn't fit on an MCA card without



Intel's EISA solution includes the EISA chip set and the Bus Master Interface Controller, for bus-master add-in board support.



Intel's next-generation Micro Channel-compatible chip set will support the i486 processor and 25- and 33-MHz 80386 chips.

**“EISA proponents have long touted the benefits of an ‘open standard,’ but some developers say they’ve been able to introduce products largely because of IBM’s support.”**

surface-mount technology and custom ASICs.” This would result in added cost to manufacturers and buyers.

“There is a differentiation designed into the EISA and MCA products, ALR’s Kirkey said. ALR’s EISA system can support up to 128 megabytes of RAM. The MCA system supports 64 megabytes. “This is a function of the fact that the EISA system has a bigger system board,” said Kirkey.

“As you move to more sophisticated cards that have their own intelligence and processors, the cards are getting bigger,” AST’s Krieger said. “There’s 40 percent more real estate on an EISA card.”

EISA proponents have long touted as an advantage the benefit of evolutionary change. Because the EISA bus is compatible with the current AT bus, users will have the option of continuing to use standard AT cards in the new system — an impossibility with MCA.

Although it’s doubtful that cards will be swapped from ISA computers to EISA machines, the evolutionary nature of the new bus means that information centers can standardize on a single card for both ISA and EISA machines. Thus, for adapters that don’t require the 32-bit bandwidth or bus mastering of the EISA bus, a single card can be stocked for all ISA and EISA computers.

**STANDARDIZING I/O TIMING.** EISA was

designed, among other things, to standardize the timing of the I/O bus, improving card compatibility. As system speeds have increased in ISA machines, I/O speeds have also increased, causing real problems for some I/O cards that were built for slower bus speeds. With a standardized I/O bus, cards can be designed to work with a single I/O speed, rather than having to work within a range of speeds as is the case with ISA systems.

The EISA advantage will come from its well-defined specification, said Jerry Roby, president of IMC Networks of Tustin, California. “IBM’s implementation is sloppy, so cards developed for PS/2s may not work in [MCA clones] with tighter timing constraints,” Roby said.

Steven Fried, vice president of research and development at Microway, in Kingston, Massachusetts, also points to MCA timing problems. “MCA varies slightly with each model. It’s all clocked and running with different cycles. Your products may work in the Model 80 that you developed for, but not in the 20-MHz Model 70,” Fried said.

EISA proponents have long touted the benefits of an “open standard” supported by manufacturers of systems, peripherals, and software over the so-called “closed standard” proposed by IBM. But some developers argue that they’ve been able to introduce products largely because of

## Comparing the Buses

Feature	PC AT	EISA	MCA
PC AT (ISA) compatible	Yes	Yes	No
Add-in card area	63 sq. in.	63 sq. in.	36 sq. in.
Maximum transfer rate	2MB/sec.	33MB/sec.	20MB/sec.
Data-path width	8/16	32	16/32
Address-path width	24	32	24/32
Frequency	8 MHz	8 MHz	10 MHz
Arbitration	Centralized	Centralized	Distributed
Automatic configuration	None	Optional	Yes
Shared interrupts	No	Optional	Yes
Geographic addressing	No	Yes	Yes
Power per slot	Unspecified	4.5A at 5 volts	1.6A at 5 volts

SOURCE: INTEL

IBM’s support, and they question whether they’d get the same type of assistance from EISA backers.

“Our commitment is to IBM; they’ve been very good for us,” said John Simmonds, director of public relations for Boca Raton, Florida-based Core International, maker of a bus master card for MCA. In fact, Core and three other bus-master card manufacturers are so indebted to IBM for its assistance that they have said they will not offer comparable products for EISA.

Microway’s Fried said, “[IBM] has been very good and gracious [about helping us complete our project]. With EISA we do not know if all those companies will provide that kind of support.”

**WHAT IT ALL COMES DOWN TO.** EISA and MCA each represent solid technologies that have the potential to offer users substantial performance increases over the AT bus. Support from third-party developers, therefore, will be crucial in

the battle for the 32-bit bus standard.

Questions of availability of boards that take advantage of the advanced features of the two architectures remain to be answered. In the coming days and weeks, however, we’re likely to see product after product announced that exploits advanced capabilities of either EISA or MCA.

The market should be able to support both 32-bit alternatives. True-blue IBM shops will continue to buy the PS/2 line, while many of the companies that shied away from MCA will now have another option.

Given the inherent incompatibilities between the two buses, however, choosing one over the other implies a long-term commitment.

“We’ll never see the compatibility we had up till 1986 or 1987,” noted Microway’s Fried. “People will have to choose their markets and vendors very carefully.” □

— Barbara Darrow and Patrick Dryden contributed to this report.

## ■ THE MARKETING ANGLE

# IBM’s Window of Opportunity Closing; EISA No Longer a Paper Tiger

BY ALICE LAPLANTE

Last year at this time, EISA was nothing more than a paper specification, trying desperately to compete with IBM’s very real Micro Channel Architecture (MCA), which had been on the market for over a year and a half.

Although some derided EISA as vaporware designed simply to freeze the market, most of the PC industry took the architecture seriously, and fall Comdex 1988 was dominated by discussions of the so-called “bus wars.” The consensus at the time was that IBM had a one-year “window of opportunity” during which it would have the chance to solidify the Micro Channel’s position in the market and put EISA manufacturers in the unenviable position of playing catch-up.

One year later, EISA systems have arrived — the so-called paper alternative to the Micro Channel is a reality and IBM’s one-year window has been clamped shut. But was Big Blue able to capitalize on its head start?

**INCREASING SALES.** IBM has made inroads, to be sure, with Storeboard figures showing that it now has some of the best-selling 286- and 386-based computers in the retail channel. But is this — as IBM is claiming — because customers finally understand the magic of the Micro Channel? The answer seems to be no.

Instead, the increased sales seem to be

the result of favorably priced new PS/2 machines, as well as substantial price cuts and enhancements to the existing PS/2 line, such as larger hard drives and more memory. What’s more, IBM has bolstered its faltering relationship with its dealer base and instituted more aggressive marketing and promotional programs — and both changes are paying off.

“IBM has learned its lesson from all the IBM bashing over the last couple of years,” said Matt Fitzsimmons, a Computerland dealer in White Plains, New York. “The relationship with its dealers and customers and quality of their products in terms of price/performance is a marked improvement over what it was 18 months to two years ago. It is almost like a different company in the PC arena,” he added.

“With prices like these, who wouldn’t put an IBM computer on their desk?” asked Rick Rose, president of Dataflex, an Edison, New Jersey-based IBM dealer.

For most buyers, the MCA vs. EISA debate doesn’t even enter into the picture. Although IBM has worked hard to demonstrate new technologies that capitalize on the Micro Channel Architecture, Big Blue has failed to convince many users of the inherent benefits of the MCA.

**MCA IRRELEVANT TO BUYERS.** “IBM did something really unique in focusing so much on the bus as a feature,” said Bruce Grant, head of technical support for

Microage Computer Stores, in Tempe, Arizona. “But what people will base buying decisions on is price/performance, and PS/2s now represent affordable options for a wide variety of performance levels.” In other words, said Grant, although the MCA theoretically provides the potential for higher functionality, the new architecture has come to be virtually irrelevant to many IBM customers.

David Brandenburger, an Entre Computer Center dealer, in Dallas, said that rather than the MCA, it is the IBM label that is selling PS/2s.

“IBM’s name means a lot,” he said. “The MCA is of secondary importance.”

Indeed, the biggest complaint against the MCA continues to be that its promise doesn’t justify its incompatibility. Customers can’t use their old boards in the systems and the majority of Micro Channel-specific boards don’t offer added capabilities; they just cost more. The promise of the MCA remained unfulfilled until the bus-mastering products exhibited at Comdex last year finally began shipping in the first quarter of this year.

Today, there are still only a handful of bus-master products available. Only four vendors — Core International, Aox Inc., BICC Data Networks Inc., and Pacific Image Communications — are shipping bus-master products. Although these companies claim to be doing a brisk business, the continued scarcity of bus-

master products is indicative of IBM’s inability to capitalize on its head start.

IBM obviously realizes this. In what might be considered a preemptive strike against EISA, Big Blue held a briefing in September to disclose more advanced capabilities of the MCA, revealing, among other things, a new software protocol that allows add-in products that take advantage of the Micro Channel’s bus-mastering capability to operate on a peer-to-peer basis, without involving the main processor. (See “IBM Beefs Up Micro Channel Capabilities,” October 2, Page 1.)

As a follow-up to these efforts, IBM is expected to once again demonstrate a show of force at Comdex with an updated version of last year’s “wall” of MCA bus-master cards, including some products that allow users to do multiprocessing on PS/2s.

But IBM’s latest marketing push may be too little, too late. If Compaq and other Gang of Nine members have done their homework, they stand to win big by IBM’s inability to flood the market with products truly exploiting the capabilities of the MCA.

If EISA backers are able to provide a variety of hardware and software that exploits the capabilities of the new bus, they could succeed where IBM has failed — in providing a concrete demonstration of what users have to gain from moving to the new standard. □