PC Graphics Chip Sets— Emerging Technology and Trends: Standards

WHAT'S THE NEXT PC GRAPHICS STANDARD?

It is a tradition in the IBM environment that a new-and-improved graphics hardware standard comes into vogue every two years. Though the video graphics array (VGA) is the current fashion, the next style is being readied, and the stakes are high for the winner. The main contenders are IBM and third-party IBM-compatible vendors, third-party Texas Instruments-compatible vendors, and, to a lesser extent, vendors of enhanced VGA products.

Texas Instruments (TI) contends that boards based on its 34010 chip are the best choice because it offers the best performance at a low price and has good software support. Although it does offer good price, performance, and compatibility, it is unclear why the market needs something other than the de facto IBM standard. Dataquest believes that, even though TI may serve a high-performance niche in specialized PC graphics markets, its push into the mass market may further confuse the user.

There is a coalition called VESA (for Video Electronics Standards Association) that wants to market standardized medium-resolution (800 x 600) products. Basically, this is a VGA-type market, with enhancements, and should have moderate success, distinct from the TI or IBM standards.

The IBM standard is based on its 8514/A graphics board, which was introduced in 1987, but is only now beginning to show impressive results. It is clearly the de facto standard for high resolution on IBM's PS/2 machines. Chip vendors are already offering 8514/A-compatible products. TI is competing with third-party 8514/A vendors for this market. Dataquest believes that the 8514/A-type products are most suited for the next-generation mainstream graphics market.

STANDARDS IN THE IBM ENVIRONMENT

A graphics hardware standard allows a world of software to run on a family of machines from various vendors. The need for consistent display standards is acute in the IBM environment, where improvements in special resolution and number of colors is a constant but problematic process (unlike the Macintosh environment, where resolution density is fixed and the QuickDraw standard has been unwavering).

Under IBM, there have been two standards: the enhanced graphics adapter (EGA) standard was introduced in 1984 and was superseded in 1987 by the introduction of the VGA. The EGA was the best-selling product until 1988; now the VGA is the dominant standard. But there is considerable lag between when a standard is first introduced and its widespread availability and use. This lag is a result of the following requirements:

- Widespread software support
- Availability of third-party graphics chips, boards, and monitors

- Readiness of the distribution channel
- Acceptance by the user community

We expect the VGA to continue to be the best-selling product for the foreseeable future, although the next standard after VGA will build up momentum over the next 18 months.

There is a historical trend worth noting that follows the introduction of a new graphics standard by IBM. The steps are as follows:

- Phase I—IBM introduces a new graphics standard.
- Phase IIA—Third-party vendors introduce a semicompatible product.
- Phase IIB—Third-party vendors introduce a fully compatible product.
- Phase IIC—Third-party vendors introduce a fully compatible, but enhanced, version.
- Phase III—The original standard becomes a full commodity product.
- Phase IV—A new graphics standard is introduced.

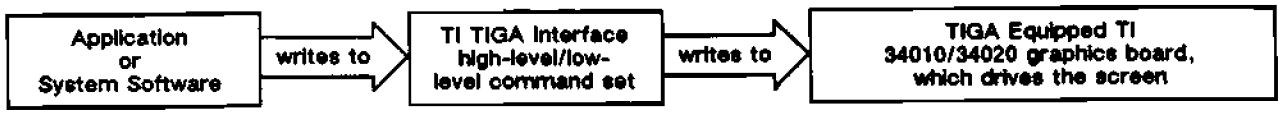
This cycle can take about three years. In terms of current standards, the industry is at about Phase III with the VGA and Phase IIB with the 8514/A. However, there is still considerable argument with regard to the acceptance of the 8514/A as the next standard after VGA, from certain camps that have alternative products to sell.

Current Situation of Standards

According to the trade press and third-party vendors, there are arguments among various camps regarding the next standard after VGA. Discussions of the camps follow.

The TI 34010/34020 TIGA

The Texas Instruments Graphics Architecture, or TIGA, is a new software interface from TI that will run on its 34010/34020 graphics processors. It will allow software written to the TIGA standard to run on any TI 34010/20-based graphics board that has been made TIGA compatible. This works as follows:



TI is promoting the above scheme as the next-generation mainstream graphics standard, as opposed to IBM's 8514/A standard.

IBM's 8514/A

The 8514/A is IBM's 1,024 x 768 resolution add-on board, and is based on proprietary VLSI parts. Software writes to the 8514/A as follows:

Third-Party Consortium's VESA

VESA is a screen-addressing scheme from a consortium of third-party graphics vendors. The scheme is an extension of IBM's VGA standard for offering resolution higher than that offered on VGA, at 16 or 256 colors. It is intended as an interim step between the basic VGA (640 x 480 resolution, 16 colors) and the next 1,024 x 768 resolution standard. The consortium consists of graphics board, chip, and monitor vendors.

Each of these standards can support interlaced or noninterlaced screens, which is irrelevant to the applications software or graphics standard.

THE STANDARDS BATTLE: 8514A, TIGA, AND VESA

Which one of the above standards or proposals is going to be the mainstream standard of the next few years?

To begin with, the VESA proposal is only an interim scheme that is to be used mainly with the current generation of 800 x 600 resolution-type multisynch monitors, and, in our view, it is not a long-term solution for 1,024 x 768 screens. The VESA proposal is acceptable for allowing enhanced VGA boards (which are mainly nonintelligent in nature) to come under one standards umbrella. The real battle is for an intelligent or processor-based 1,024 x 768 graphics standard, the two contenders for which are TI and IBM.

TI versus IBM

In Dataquest's view, there are four important fronts in the battle over the next graphics standard:

- Performance
- Compatibility

- User frustration
- Price

Performance

Historically, performance has been the most misused and abused area of comparison in all categories of graphics hardware before PC graphics—and this is again true in the current PC graphics battleground. Graphics performance numbers tend to be used like many statistics; that is, they are creatively selected and tailored to support any cause. So PC graphics performance numbers must be taken with a grain of salt. In general, however, several points can be safely observed:

- TI 34010 (and the resulting board) is a midrange to high-performance part. But being software-programmable as a general-purpose processor, it does not have the very high performance of a special-purpose processor hardwired to perform a specific function. The 34020 will be significantly faster—as will be the second iterations of competing parts.
- The IBM 8514/A chip set is a midrange part, specifically optimized for high performance in the IBM PC environment. It offers at least comparable, and often better, performance in the three important areas of BITBLT, line drawing, and character support.

The fundamental difference between the two competing parts is that, although the IBM part is hardwired to perform a limited set of functions quickly, it pays for this by not being as flexible as a general-purpose processor.

On the other hand, the TI part is a general-purpose, software-programmable microprocessor, which is why it is also usable in print controllers and fax machines. But it pays for this flexibility in raw drawing speed. (The old "no free lunch" principle—even the ill-fated, hardwired Intel 80786 was faster in some areas.)

The raging debate and hype (particularly from the TI camp) is that one part guarantees better performance than the other. We believe that the two parts are more similar in performance than dissimilar. Each is faster in some areas (TI does not own performance, although that is the message in the media), and each is expected to enhance its performance in the future. Furthermore, it would be naive to assume that third-party 8514/A parts will not be able to offer comparable performance in many cases and better performance in others.

Performance improvement is an ongoing process, provided one starts with a reasonable architecture, which is true for TI and IBM.

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Compatibility

The fundamental mandate is to be compatible with all software written for the MS-DOS and OS/2 market at 1,024 x 768 resolution. This can be achieved in a number of ways:

- Be TI/TIGA compatible, and hope that most future software will support TIGA either directly or under Windows and Presentation Manager (PM). This is a reasonable assumption.

- Be IBM 8514/A compatible, either directly or through Windows/PM. This is a good bet because we expect the 8514/A to become a de facto standard.

The User Frustration Factor

Although TI is doing a very good job of eliciting software support for TIGA, there can be little doubt about the support IBM will continue to command. It would appear that the question is which product is expected to have the most support. But even if the answer is IBM's 8514/A, there is a larger question with regard to what we call the UFF, or the user frustration factor.

Dataquest believes that the aggravating incompatibilities in the PC environment make the PC less friendly to the average user than the Macintosh environment. Do users really need yet another standard? If vendors continue to muddy the waters with competing standards—in order to sell hardware at the expense of user friendliness—will the IBM platform ever be as friendly as the Mac?

Price

The TI 34010 costs approximately $20 to $40. The 8514/A parts from clone vendors are expected to be priced in the same range, although it will be higher at first. (This price is a small premium over VGA prices). Although the prices are similar for the graphics engine, what is different is the glue logic required for the finished board and its associated cost—which is expected to be lower for the more highly integrated 8514/A solutions. Another important issue is the expected economies of scale. If the 8514/A catches on as is forecast, there should be significant cost reductions. The competitive environment will also heavily impact prices: more than five vendors are expected to sell 8514/A parts, versus the sole-sourced TI part. Of course, such a highly competitive environment affects more than just pricing.

VENDOR ACTIVITY

Texas Instruments

TI continues to promote its TI 34010 very aggressively and recently announced its standard graphics interface, called TIGA. Future graphics boards based on the TI part will be TIGA compatible, and software support is expected to be good. A number of vendors, including Compaq, Dell, Hewlett-Packard, and Wyse, have announced products based on the TI part. (Compaq is having its board done by Renaissance GRX of Bellevue, Washington.)

Tseng

Tseng initially had aggressive plans to target the 8514/A with its own VLSI, as it did in the VGA market. However, how soon the company gets in the running is currently not known.

Chips and Technologies

Chips announced its 8514/A compatible single-chip solution, the 82C480, on June 27, 1989. The company is providing an interface driver, the Adapter Interface (AI), and will also release a register specification document, giving software developers the option of bypassing the AI. The 82C480 offers ISA and MCA bus support (no EISA), interlaced display support to 1,600 x 1,200 resolution, and noninterlaced display support up to 2,360 x 1,770 resolution.

Western Digital Imaging

Western Digital Imaging (WDI) was the first vendor to announce an 8514/A-compatible chip set. On June 7 WDI announced a two-chip set, called the Personal Workstation Graphics Array 1 (PWGA1). The PWGA1 offers ISA, MCA, and EISA bus support and supports both interlaced and noninterlaced monitors at up to 1,280 x 1,024 resolution. The company will provide register-level interface specifications for software vendors.

Headland Technology

Headland Technology (formerly Video 7) reportedly is developing its own 8514/A-compatible chip set. The company is not expected to finish development in 1989, but it is planning to have 8514/A compatibles for 1990. In the past, it has offered boards based on another vendor's chip sets, and it may do so again.

Integrated Information Technology (IIT)

IIT is a new Santa Clara, California-based semiconductor company, the first products of which were math coprocessors. It plans to sell a register-level compatible 8514/A and VGA on a single chip product this year, with plans to sample in August 1989. The full-custom single chip will be offered as a 144-pin package. It uses a common memory space for both 8514/A and VGA screens. The part is initially to be sold for less than $100, and the company plans to come down the price curve aggressively. IIT intends to be in the chip business only; board sales are not anticipated.

IBM

IBM, the inventor of the 8514/A, has been shipping the product since third quarter 1987, although shipments initially were very slow in ramping up. Since then, a significant body of software has been created that supports the device. IBM has shipped more than 100,000 of its 8514/A products and is expected to ship up to 150,000 in 1989 alone. Its backlog is considerable, and there is a wait of several weeks for products. So far, this activity has been without much of a marketing effort. IBM is now aggressively promoting the product for its PS/2 machines; it has no intention of offering it for the PC AT market. Furthermore, IBM is expected to implement it as a chip set on the motherboard of its higher-end PS/2s, starting early next year.

DATAQUEST ANALYSIS

In the battle between TI and 8514/A vendors, the question is not really about which is the better part. In Dataquest's opinion, TI has the more versatile part in general, while the IBM standard is specific to the PC and PS/2 environment. And all claims to the contrary, we believe that the IBM part does quite well—even better in many cases—against the TI part. Because the two choices are at least comparable in performance, we do not believe that performance should be the centerpiece of the argument when discussing the mainstream power-user market. (The TI 34010/34020, we believe, is well suited for certain line-drawing performance demanding markets such as CAD.)

For the mainstream market, the question is, if IBM compatibility is important, what is the more suitable part for IBM compatibility? The answer is the 8514/A.

But why is IBM compatibility important? Certainly, users will gain the peace of mind that any future software that supports high resolution will run on IBM and compatible hardware. That being the case, why do we need another standard? Dataquest contends that we do not. Establishing yet another standard is tedious and confuses a market that has had enough confusion (particularly with regard to bus structures—MCA versus EISA). With graphics standards aggravating an already tenuous situation, if the industry does not tread carefully, customers could migrate to Apple, Sun, and even IBM itself, at the expense of the IBM-compatible community.

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The Standard after Next: 3–D Graphics Driving the Technology

As the battle for the next PC graphics standard is being played out at the high end of the market, new applications and technology are beginning to hint at what we might expect from PC graphics in the future. The advent of 3–D graphics and a virtual reality interface, applications that are extremely computational–intensive, drives the need for faster and more powerful graphics–optimized computing engines. Reduced instruction–set computing (RISC) microprocessors are a logical choice for these applications.

One example of a product that may end up competing for the very high–end PC graphics market is Intel's recently introduced i860 microprocessor. The i860 includes specialized hardware graphics support and provides 10 to 100 times the computational power of the Intel 80386 microprocessor, which is capable of producing usable 3–D graphics. One PC vendor has already announced a high–end PC that will include an i860 socket on the motherboard, anticipating and facilitating the use of the device in graphics applications.