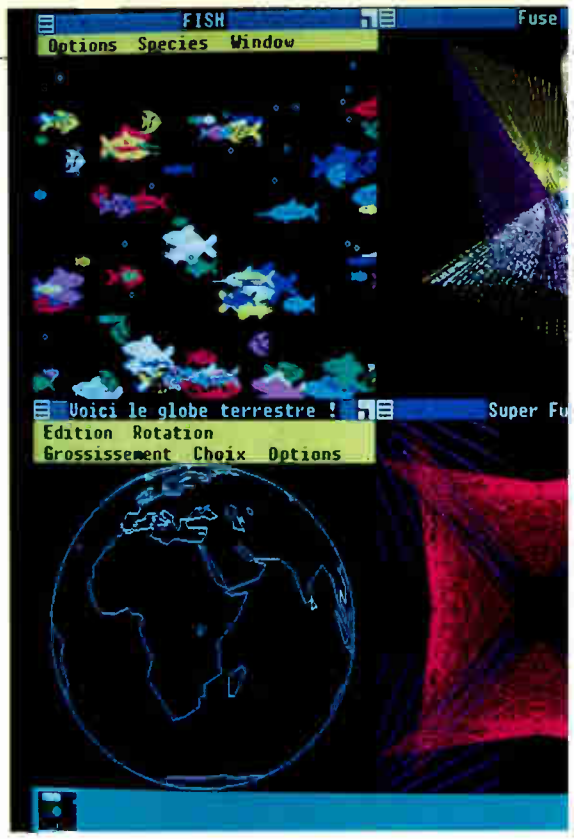
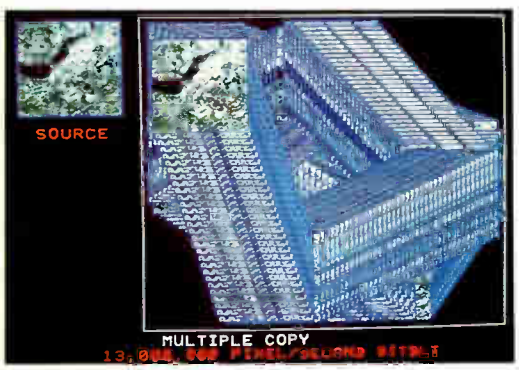
BY TOM MANUEL



The PC community is groping toward standards for high-resolution graphics



The Matrox Electronic Systems Ltd. PG-1281 graphics board brings work-station-level color display to personal computers; it boasts resolution of 1,280 by 1,024 pixels.

MOVING

Just as it's getting firmly entrenched as an industry standard, IBM Corp.'s Video Graphics Array personal computer graphics technology is already becoming passé. Manufacturers and users alike are eager to push displays past VGA in terms of resolution and number of available colors. The higher-performance technology is here, in the form of graphics boards and monitors that go way beyond VGA's resolution of 640 by 480 pixels and 16-color simultaneous display. But up until now, each piece of hardware has had a different software interface, necessitating special drivers for every board.

Out of this hodgepodge, several efforts are under way to standardize personal computer graphics beyond VGA, with four main alternatives emerging. Since VGA is quite adequate for many applications and is not about be replaced, these higher-performance alternatives will complement VGA and coexist with it.

One approach moves a little beyond VGA by adding extended-resolution modes to VGA-type video controllers. A brand-new organization—the Video Electronics Standards Association—was formally established in April by a number of PC-graphics hardware and software vendors to set standards in this arena. A second route is to make IBM's advanced 8514/A graphics-processor-based system an industry standard. Several independent chip and board vendors are going down this track.

Rapidly emerging as a third high-performance contender is Texas Instruments Inc.'s graphics architecture interface specification for its extremely popular TMS340 graphics-system processor family. TI's specification, the TIGA-340 interface, is gaining widespread support among graphics-board, PC-system, and software manufacturers.

A fourth alternative is to standardize an interface for one of the many graphics processors now on

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The Genoa Systems Corp. high-resolution 6400 graphics board displays many windows.

BEYOND VGA

from its superior performance on both text and graphics—and also because it represented a standard in an arena that sorely needed one. All three components of a graphics subsystem are compatible in VGA—controllers, monitors, and software. If VGA's 16 colors and 640-by-480-pixel resolution are acceptable—and for many applications, they are—then life is easy for users. They can buy standard hardware and select from a wide variety of applications that work with it.

However, there are quite a few applications, such as computer-aided design, high-end presentation graphics, desktop publishing, and computer art, that will be improved by higher resolution and more colors. Here the user does not have a clear choice. If his needs revolve around one major application—CAD, for example—he can select a popular program such as AutoCAD or VersaCAD and find many high-resolution controllers and monitors that these packages support. But if he plans to run a variety of applications, he will have to stitch together his own solution—or wait until the industry settles on a standard (or two).

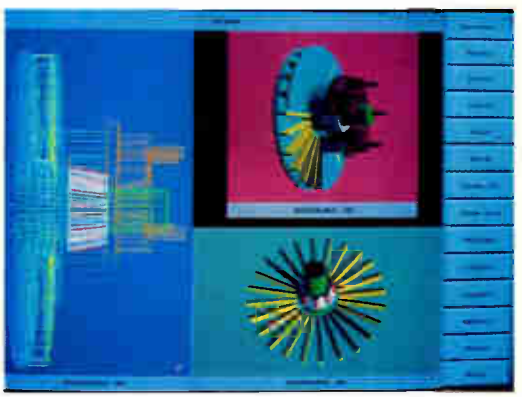
One of the main thrusts in standardizing higher-resolution PC graphics is in extending the modes of VGA. The initial members of the new VESA organization are starting the ball rolling by agreeing on a standard BIOS interface for what they are calling a "Super VGA" mode boasting resolution of 800 by 600 pixels and 16 colors. "This was an easy one," says Greg Reznick, vice president of systems marketing at Headland Technology Inc. in Fremont, Calif., and the newly appointed chairman of VESA. "We were all able to agree quickly on standardizing this mode." The fledgling VESA group is quickly gaining the support of a major segment of the PC-graphics industry: its 25 members represent a good cross-section of chip, board, system, and software players. Along with its Super VGA effort, VESA has also formed a subcommittee on 8514/A.

The details of the VESA VGA BIOS Extension have been published, and VESA members are starting to use the standard. It will allow software developers to write one driver for all Super VGA cards that conform to the standard. The VESA group plans similar standards for modes supporting other resolutions and color depths. Two such modes—for 640-by-480-pixel resolution with 256 colors and for 800-by-600-pixel resolution with 256 colors—have been proposed so far.

A couple of companies have jumped on the VESA bandwagon right away by introducing products. On the graphics-board side, the first was the market, such as Hitachi's ACRTC 63484, National Semiconductor's DP8500 Raster Graphics Processor, or NEC's graphics processors. There are no big independent standards activities under way around these architectures, although National has announced a joint effort with Graphic Software Systems of Beaverton, Ore., to standardize on the Direct Graphics Interface Standard (DGIS).

In one way or another, all this activity piggybacks on IBM's own efforts, which date back to April 1987, when Big Blue introduced enhanced graphics as an integral part of its Personal System/2 line of PCs. This was VGA, and it quickly became a de facto industry standard. IBM also introduced VGA capability on an adapter card for its older PC XT and AT machines, and the rest of the industry soon followed suit with built-in VGA-compatible graphics and VGA board products.

VGA's quick rise to the top came



Another example of PC graphics beyond VGA is Nth Graphics Inc.'s three-dimensional engine, which can render computer-aided design images in seconds.

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Headland Technology, formerly known as Video 7, which announced support of the VESA BIOS interface for the initial version of the Super VGA mode. Headland's entire line of VEGA VGA, FastWrite VGA, and V-RAM VGA products will support the VESA standard when upgraded with a new BIOS electrically programmable read-only memory. In reducing the software development effort by letting programmers write one driver for all VESA-compatible boards, Headland and other vendors hope to up the number of applications that use 800-by-600-pixel resolution.

Another Super VGA player is Genoa Systems Corp., which unveiled at the Spring Comdex show in Chicago last April an application-specific integrated circuit that will provide high-resolution graphics across all PC operating environments. Called the GVGA, the chip offers both noninterlaced and interlaced monitor support at resolutions up to 1,024 by 768 pixels for computers running MS-DOS, OS/2, Unix, and Xenix. The San Jose, Calif., company says the chip conforms to the VESA standard.

Meanwhile, IBM itself has been trying to push beyond VGA. At the same time that VGA made its debut, IBM also took the wraps off its 8514 monitor and the companion 8514/A graphics-processor-based controller for higher graphics performance on PS/2 systems. The 8514/A, as the whole subsystem is usually called, offers 1,024-by-768-pixel resolution with 16 colors. The 8514/A adapter card for PS/2 systems contains two proprietary IBM chips that form the heart of a powerful graphics coprocessor. IBM has yet to release any technical details on this duo.

But far from garnering the status of a de facto industry standard, 8514/A has not caught on in a big way. The main reasons for this seem to be the lack of published specifications for the register set, the performance loss that occurs when using the IBM-supplied software interface, and the flicker in the interlaced display. Also, a number of key functions, especially those involved with text handling, are missing.

IBM chose not to publish the hardware-register specifications in an attempt to encourage software developers to use the Adapter Interface, an application programming interface Big Blue supplies. If everyone followed this procedure, it would leave IBM some flexibility to change the 8514/A while keeping the interface consistent. However, to get maximum performance from 8514/A, some software developers have bypassed the application interface altogether and addressed the hardware registers directly. Microsoft Corp. did this with Windows and the Presentation Manager.

One major thrust is to extend the modes of VGA; VESA's choice is 'Super VGA,' with 800-by-600-pixel resolution

But now, enter a couple of independent hardware vendors that are willing to champion 8514/A and push it as a standard: Headland and Western Digital Imaging of Mountain View, Calif. The VESA organization, too, is contemplating supporting 8514/A as another standard.

Western Digital, a strategic business unit of Western Digital Corp., has released a specification for an 8514/A-equivalent chip set. The so-called PWGA-1 spec contains the first public release of the 8514/A register information, critical data for ensuring hardware and software compatibility if 8514/A is to become a standard. The company figured out the specs during its reverse engineering of the 8514/A controller and decided to share them as a way of making 8514/A a standard in much the same way that VGA is. If everyone making an 8514/A product uses the register specs, all the products will be compatible. And as the PC industry has so amply demonstrated, compatibility sells more products.

Western Digital's motivation, of course, is not a desire to enrich IBM. By announcing specifications for a chip set, the firm is showing its intention to offer 8514/A circuits and boards of its own. Headland Technology will also be offering an 8514/A chip set.

But 8514/A has some competition in the 1,024-by-786-resolution league. For example, Metheus Corp. of Beaverton offers a family of VGA graphics controllers, the models 1104, 1124, and 1128, that provide a resolution of 1,024 by 768 pixels with 16 to 256 colors. And Miro Datensysteme GmbH of Braunsweig, West Germany, offers PC/AT and PS/2 boards at the same level—the MiroGraph 511 VGA and MiroGraph 515 VGA, respectively.

In the midst of all this activity, Compaq Computer Corp. has come out with its own 1,024-by-768 Advanced Graphics System—the 1,024 graphics board and a monitor to go with it. As it is wont to do, the Houston PC company went beyond IBM's

At the high end of the resolution scale is the Lundy 1612 Personal Graphics Workstation, which offers 1,600 by 1,200 pixels with 16 colors. It's based on the Texas Instruments 34010 processor.

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high-resolution offering, supplying 256 colors rather than 16. The Compaq 1,024 board uses the TI 34010 graphics processor, which is the object of a standardization effort of its own. The processor, which TI brought to market two years ago, is now the chip most used for high-performance PC graphics—the Dallas-based company lists 51 PC add-in graphics boards using the 34010. And TI has just launched an all-out effort to make the 340 family an industry standard.

Last April at the National Computer Graphics Association show in Philadelphia, TI announced the completion and publication of its TIGA-340 (Texas Instruments Graphics Architecture) interface specification. Among the 28 supporters that TI says intend to provide compatible hardware and software products are some industry heavyweights, including Compaq, Hewlett-Packard, Intergraph, Microsoft, and Number Nine Computer.

As for the 340 hardware itself, TI continues to enhance it. Early this year it started offering a 60-MHz version, and now comes an upgrade, the 34020, which the company says boasts 20 times the performance of the workhorse 34010. Samples of the 34020 became available in April, and production will begin in the second half of this year.

The first products using the 60-MHz 34010 were introduced by Number Nine Computer Corp. at the NCGA. Two of the Cambridge, Mass., company's Pepper family of graphics boards use the souped-up processor, a zero-wait-state machine. These Pepper Pro1024 boards for the IBM Micro Channel Architecture and the industry-standard bus offer 1,024-by-768 resolution with 256 colors.

The multitude of other graphics chips and processors that can be used to provide resolutions beyond VGA are taking a back seat in the standardization movement. National Semiconductor Corp.'s DP8500 Raster Graphics Processor and Genoa's GVGA Super VGA ASIC at its highest levels of resolution are just two examples out of many—no major standardization efforts appear to be under way for any of them.

However, National, based in Santa Clara, Calif., is working with Graphic Software Systems to provide a standard graphics protocol for the DP8500 that uses DGIS, which is National's choice for a standard DOS graphics interface. This firmware will make the DP8500 compatible with more than 600 DGIS software packages. On another front, Graphic Software Systems recently announced a faster DGIS for the Texas Instruments TMS340 architecture.

All the standardization efforts for high-resolution PC graphics fall in the range of resolution between VGA at the low end and 1,024 by 768 pixels at the top. But 1,024 by 768 is not where graphics resolution stops. Engineering and graphics work stations have been offering resolutions of 1,024 or even 1,280 by 1,024 for many years now. A few boards and monitors boasting these resolutions have been available for PCs, too. And some graphics subsystems beyond 1,280 by 1,024 are showing up as well.

There is, for example, a board-and-monitor product offering 1,280-by-1,024 resolution and four shades of gray from Relisys of Milpitas, Calif. The company, a wholly owned subsidiary of Taiwan's TECO Electric & Machinery Co., unveiled the product at Spring Comdex. It uses an ASIC produced by Gemini Technology Inc. of Richmond, B. C., Canada. Also offering 1,280-by-1,024-resolution color graphics is the TIGA-based TI-1210 board from IMAgraph of Woburn, Mass., the PG-1281 and PG2-1281 boards from Matrox Electronic Systems of Dorral, Quebec, Canada, and the MiroGraph 530 and 534 VGA boards from Miro Datensysteme. The West German boards use Hitachi Ltd.'s ACRTC 63484 processor.

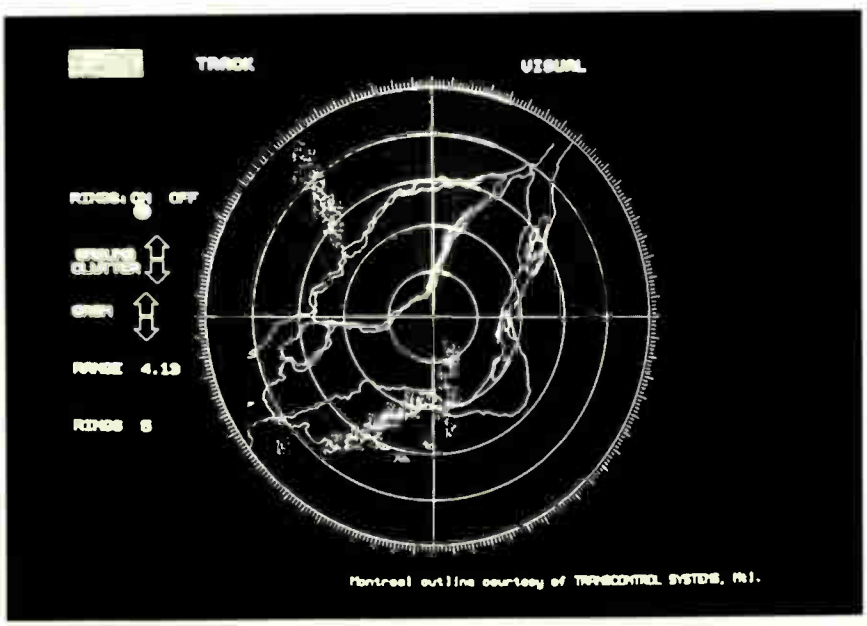
Even in the heady resolution realm beyond 1,280 by 1,024 there are a few products for PCs. For example, Lundy Electronics of Glen Head, N. Y., offers both a 1,600-by-1,200 color monitor and a 386-based graphics work station with a graphics controller powered by a TMS 34010. Another player is Aura System Inc. of Carlsbad, Calif., with graphics controllers for 1,664-by-1,280-pixel resolution and up to 256 colors. The products are based on the TMS 34010 at 40, 50, and 60 MHz.

Topping off the resolution climb are ultrahigh-resolution gray-scale monochrome monitors aimed primarily at publishing applications. MegaScan Technology Inc. of Gibsonia, Pa., makes a 200-dot/in. monitor subsystem with 8 bits of gray scale and 2,560-by-2,048-pixel resolution. And Flanders Research Inc. in Flanders, N. J., supplies the Exact-8000M series of two monitors reaching for the resolution sky at 3,300 by 2,560 pixels. But one-upping them all is MegaScan's UHR-3000, a 1-bit monochrome monitor with resolution of 4,096 by 3,300 pixels.

It is unlikely that very many PCs will need a display with this much resolution. However, there are applications in page display, medical imaging, some CAD work, and military imaging that justify this level of display quality. □

PUSHING BEYOND VGA

Graphics Type	Resolution	Number of Colors
IBM VGA	640 × 480	16
Enhonced VGA	640 × 480	256
VESA	800 × 600	16
Further enhonced VGA	800 × 600	256
IBM 8514/A	1,024 × 786	16
Unnomed	1,024 × 786	256



The Matrox PG2-1281 board for PS/2 systems delivers the resolution necessary for displaying detailed information such as that seen on this radar image.

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