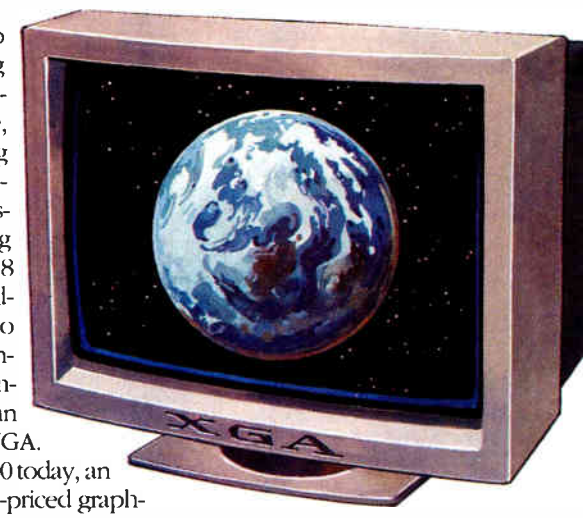
READY OR NOT, HERE COME XGA GRAPHICS

IBM OFFERS A STANDARD FOR NEW-AGE PC GRAPHICS AS VENDORS PUSH THE LIMITS ON SUPER VGA

BY JONAH McLEOD



SEMICONDUCTORS

The advent of graphical user interfaces, primarily Windows 3.0, is driving the demand for personal computer graphics with higher resolution and more colors than ever before. As the number of pixels on a screen increases and the variety of colors possible on each pixel explodes, the compute power of graphics controllers must take a quantum leap forward. Graphical user interfaces are straining existing VGA controller chips.

The ultimate solution is the extended VGA, or XGA, standard announced by IBM Corp. late last October. XGA provides resolution of 1,024 by 780 pixels, against 640 by 480 in Big Blue's venerable Video Graphics Array, and 64,000 colors per pixel, compared with just 16 for VGA. The new standard replaces IBM's previous contender for the high-resolution crown, the 8514/A, which belly flopped with the industry.

The market for XGA is ripe—in an industry hungry for high-performance graphics, graphic-chip shipments are growing nearly 30% annually, analysts say. What's more, XGA promises to bring standardization and intelligent graphics coprocessing to a market lacking both. But it may take 18 months or so for a groundswell of XGA solutions to appear, and in the meantime chip makers are pushing the performance of an interim standard, Super VGA.

That's because at $1,000 today, an XGA board is a very high-priced graphics solution. By contrast, Super VGA boards, with resolution of 800 by 600 pixels, typically cost $200. Suppliers are wondering how long to milk the Super VGA market. The trick is determining how rapidly the price of XGA will fall below $500, the mark that throws a product into the millions-of-units-a-year category. Industry watchers expect to see XGA solutions from others besides IBM as early as the Fall Comdex show. Prices should start dropping within 18 months, according to the market model for graphics-standards migration: it took 18 months to two years for VGA to displace the earlier CGA as the de facto standard and become a mass-market item.

If XGA follows this model, it will bring some much needed standardization to the marketplace. In their effort to devise solutions that go beyond VGA quality, vendors have come up with a host of proprietary schemes, says Bob Brummer, product manager for high-resolution graphics at Chips & Technologies Inc. in San Jose, Calif. This proliferation of so-called Super VGA chips adds better resolution and more colors to the basic VGA spec, he says. But each chip requires its own unique software drivers and interacts with the host central processing unit in its own way.

For example, Microsoft Windows ships only with software drivers for Headland Technology Inc.'s Super VGA chip. All other chip makers provide software drivers for their own implementations, which the user must load into the operating system. With XGA, by contrast, only one software driver is needed for all chips and all application software.

There is no doubt that XGA will become an industry standard; IBM is actively lobbying the Video Electronics Standard Association, an ad hoc group, to adopt XGA. Moreover, the company is backing off its VGA strategy of keeping that standard's specifications under wraps, forcing chip designers to reverse-engineer the devices. Instead,

IBM has been aggressive in providing all the information needed to build XGA-compatible chips.

One important capability XGA brings to PC graphics is intelligence. Borrowing from the concept of a graphics coprocessor, a staple of workstation design, an XGA coprocessor, not the CPU, draws the image, thus freeing the CPU for other computing tasks.

"In [VGA and] Super VGA, the host 80386 does all the line drawings," says Brummer of Chips & Technologies. That's why VGA chips are considered dumb input/output devices, says Brian Herbert at NCR Microelectronics Inc. in Colorado Springs, Colo. They simply draw a pixel map that the CPU then builds on screen. By contrast, "XGA can execute line-drawing and bitblt [bit-boundary block transfer] commands," says Brummer. A few Super VGA chips approach the coprocessor concept. For example, in NCR's 77C22, the CPU sends a monochrome pattern and the 77C22 expands it into full color, says Herbert. "Sending the less complex monochrome image cuts the amount of bus traffic, so you can move more information over the bus with fewer bytes."

The only company to date with an XGA solution is, of course, IBM, which late last year rolled out an XGA add-in board for the Personal System/2. "IBM has a two-chip architecture," says Bill Knapp, director of advanced products at Cirrus Logic Inc. in Fremont, Calif. "They put the RAM-DAC [random-access memory plus digital-to-analog converter] onto the graphics controller chip." IBM chose a high-priced RAM-DAC, he says; hence the high price tag of its solution.

A few graphics chip makers may follow IBM's lead, but not many have the analog expertise to pull it off. One that does is SMOS Systems Inc. in San Jose. The company's Dragon chip set, a six-chip solution aimed at laptop PCs, contains an integral RAM-DAC, says Robert Wong, director of standard products. Otherwise, vendors will be looking to RAM-DAC suppliers to roll out units suitable for XGA.

Two companies in the business of building RAM-DACs are Brooktree Corp. of San Diego and Sierra Semiconductor Corp. of San Jose. Brooktree's BT471, BT476, and BT478 contain 8-bit DACs that provide 256-color capability per pixel in many of today's Super VGA chip solutions. Sierra in late 1990 began offering its SC11481, 486, and 488 chips, which were designed to work with the Tseng Labs Inc. ET4000 Super VGA controller. Last month, it rolled out the SC11475/SC11477 RAM-DACs, which interface with most other Super VGA controllers. Since they provide 32,000 colors per pixel, the chips can approximate the IBM RAM-DAC. The only problem is that the higher number of colors takes so much computing power that the resolution must drop if the controller is to paint the screen every frame.

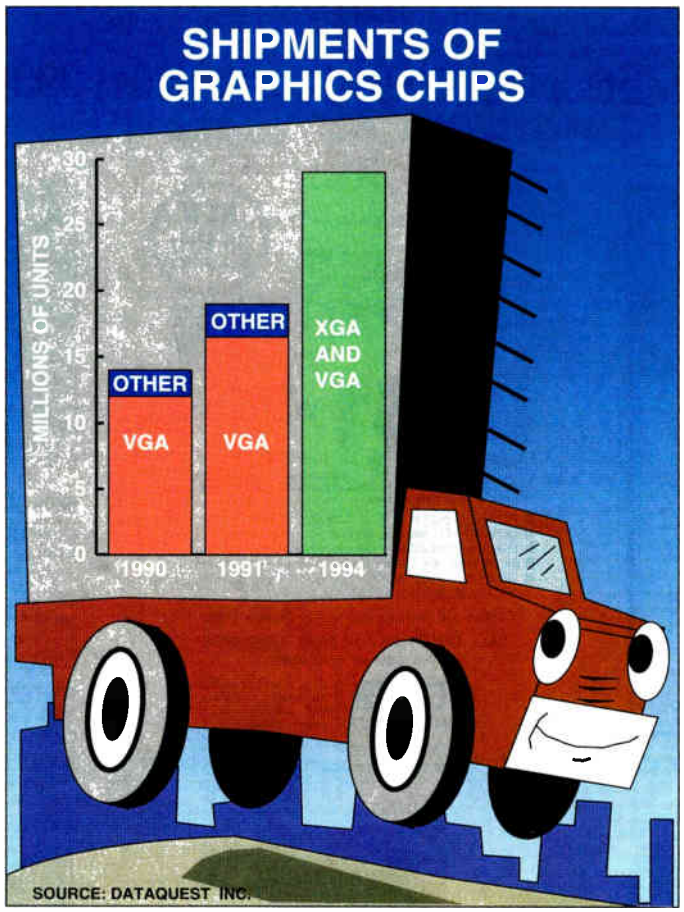
Sierra's RAM-DAC is just one way that Super VGA vendors are reaching for XGA-level performance. One of the latest to gain XGA's resolution and colors is Western Digital Corp.'s WD90C3X. The chip is implemented in 0.9-μm technology, which means its processing speed is sufficient for 1,024 by 768 pixels and 256 colors, says Chris Chang, product manager for the family at the Irvine, Calif., company. If the user is willing to swap resolution for color, the chip will drive 640 by 480 pixels and 64,000 colors.

In the quest to further the life of Super VGA, PC makers are experimenting with putting the graphics controller on the local bus, which runs between the CPU and the dynamic RAM. In most PC systems, the graphics controller is a plug-in card added to the AT bus, which means performance is hamstrung by the low AT bus speed. IBM built XGA on the much higher-speed MicroChannel bus. However, cost dictates the AT bus for the mass of the PC market, so using the local bus for graphics is one solution.

Headland Technology has tied its product strategy to the local bus. "Our HT216 chip is the local bus chip for the motherboard," says Jim Anderson, director of product marketing at the Fremont company. "The PC maker gets coprocessor performance at VGA price." NCR also plans to move its Super VGA chip onto the local bus.

But Brummer at Chips & Technologies is skeptical that this method necessarily affords a performance boost. "There is memory overhead in moving data from host processor to the display memory," he says. A more attractive solution, he says, is to build the Super VGA controller board using video RAM memory. Brummer points out that prices of 1-Mbit VRAMs have now been halved to $10 or $12. That's still a premium over DRAMs, but it's within the price range of a low-cost board.

While every graphics-chip vendor pushes its Super VGA chip closer to XGA performance, all are simultaneously working feverishly on an XGA solution. The market opportunity for the chip vendor with little Super VGA market share lies in leapfrogging the pack and being first with XGA. ❑



In 1994, vendors will ship 29 million graphics ICs; XGA's portion depends on how fast the price drops.