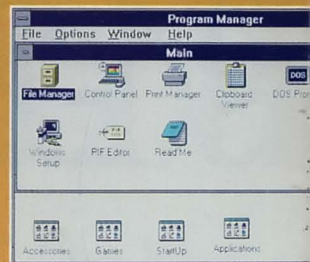


BYTE

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**Sneak Preview:
Windows 3.1**

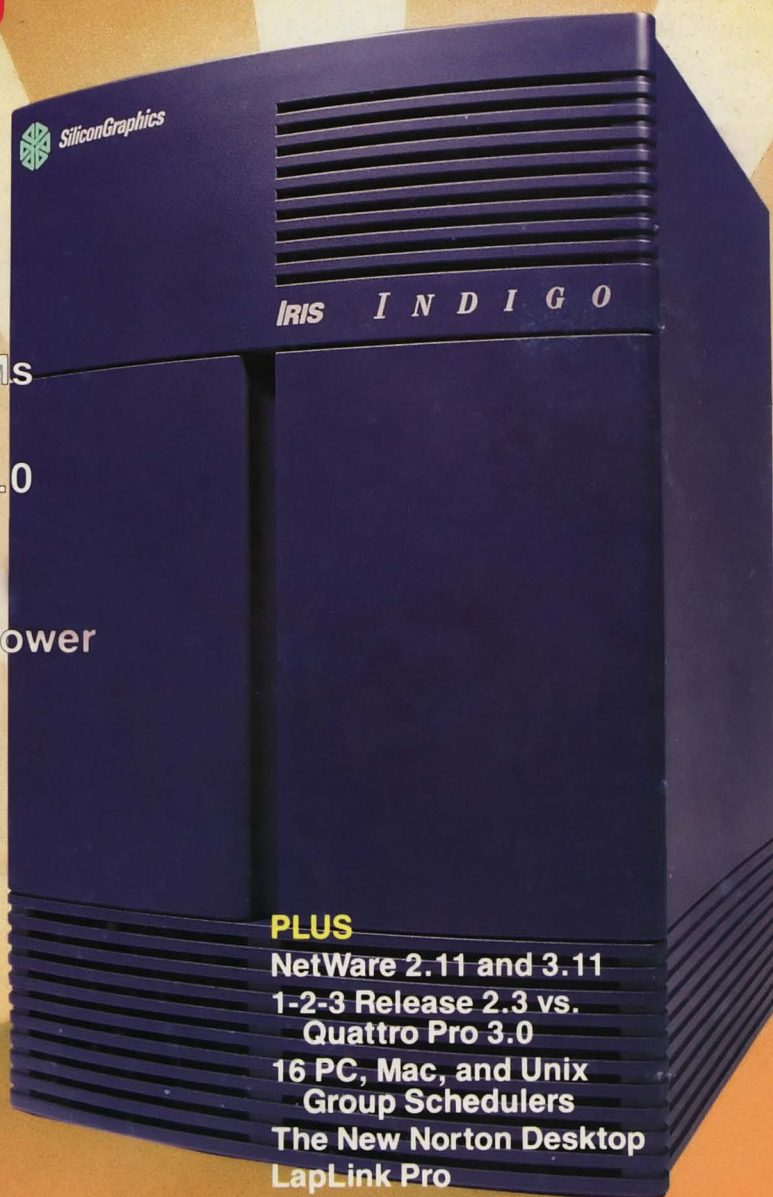
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Silicon Graphics' New Indigo

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Unix Goes Indigo

BEN SMITH



The Silicon Graphics Indigo brings three dimensions to general computing

Iris Indigo. Although small in stature, this distinctive system is not easily upstaged. It brings the power of the SGI graphics systems (see "Personal Iris: The Dream Maker," July 1990 BYTE) to the general computing, personal workstation budget. The basic stand-alone system costs \$9995 (a diskless system is \$7995). It is no longer necessary to justify an SGI workstation with a display-intensive application. The Indigo is designed (and priced) for ordinary office applications as much as for high-end three-dimensional graphics applications.

The Indigo will run the personal productivity applications (e.g., word processors and spreadsheets) that will be compliant with the Advanced Computing Environment RISC specification. But it will also run the multitude of existing "home-court" applications for animation, CAD/CAM/CAE, chemistry, and the geosciences. In addition, the Indigo comes with high-end data-analysis and visualization and excellent audiovisual generation and editing applications. You can

interface to professional video systems with the live video option.

The Indigo is a completely new design, from the 14½- by 10- by 11-inch deep-blue case to the core of the new version of Iris, the SGI license of Unix. You don't need any tools to totally disassemble the machine. As with other SGI machines, the hard disk drives (in this case, 3½-inch 236- and 432-megabyte drives) can be exchanged without disassembling the system; they merely slide into three available bays behind the front access door and lock into position with the press of a lever. You can remove the entire front cover by pressing two latches at the top. A single thumb-screw closes the steel CPU and bus cage.

The CPU and graphics cards slide into the card cage with the aid of locking handles at the edge. The rear edge of the CPU card contains all the I/O ports: thick Ethernet, two RS-422 serial ports (38.4-kilobit-per-second with Macintosh-style connectors), and five audio I/O ports (i.e., microphone, headphones, analog in, analog out, and digital in and out).

The bidirectional Centronics parallel port and the SCSI connector are part of the backplane circuitry. The proprietary backplane and bus (GIO32) is synchronous and independently clocked for 33.3 MHz, providing 133-megabyte-per-second data transfer. The CPU board contains a 33-MHz Mips R3000A CPU and R3010 FPU with 32 kilobytes of instruction cache and data cache. The CPU board can handle from 8 MB to 96 MB of interleaved memory. A Motorola 56001 digital signal processor provides 16-bit audio processing.

The graphics card is unlike other SGI graphics hardware: It does *not* contain a dedicated geometry pipeline! Instead, all 3-D rendering operations are done with software in the main processor. This design simplifies the graphics board. The other radical simplification is that the standard Indigo graphics is 8-bit color. Most SGI applications assume 24-bit color. The apparent discrepancy is handled by the SGI REX chip, which creates dithered approximations of the 24-bit colors for 8-bit. The result is fast and cheap (see the BYTE logo in the screen shot).

The Overture

The innovations don't stop with the hardware. For the seasoned SGI user, the most obvious change is in the GUI: The old

THE FACTS

Iris Indigo

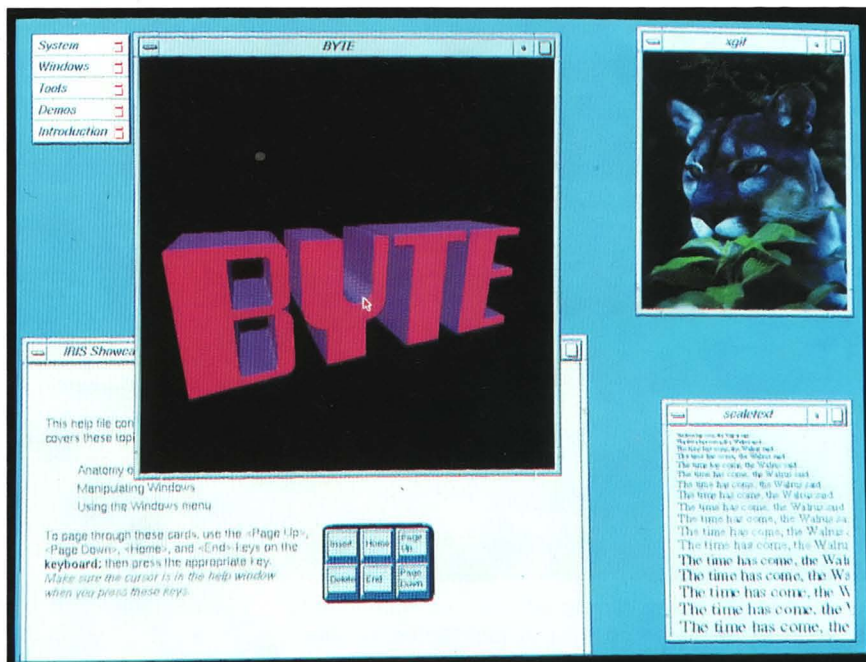
(includes 8-bit color and a 16-inch color monitor)

Diskless (with 8 MB of interleaved RAM): \$7995

Entry-level stand-alone (with 8 MB of interleaved RAM, a 236-MB hard disk drive, operating system, and bundled software): \$9995

Power user (with 16 MB of interleaved RAM, a 432-MB hard disk drive, operating system, and bundled software): \$12,500

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fax: (415) 961-0595
Circle 1270 on Inquiry Card.



The BYTE logo is written using the standard SGI Graphics Library. Gouraud shading generates 24-bit-color requests that are approximated by hardware dithering to 8-bit color. The xgif file is a standard X Window System application showing the quality achieved with standard 8-bit color. The "scale test" box is displaying the results of PostScript code.

News-based (PostScript) window manager has been dropped in favor of the OSF/Motif window manager, while still supporting Display PostScript and the SGI Iris graphics language.

This impressive feat of legerdemain is accomplished by a single display server that handles all three graphics protocols. Although not new to SGI systems, the three-way server has been vastly improved, and the emphasis is now on the X Window System and the Motif Toolkit 1.1.1. You no longer need to understand Display PostScript to modify your working environment.

Software developers will notice some changes (besides having to link the X libraries to window applications): The compiler is ANSI C; its error trapping helps develop better code and produces very fast executable files. Porting the BYTE rotating-logo program and benchmarks from an Iris 4D with an older version of the operating system and compilers was quick and easy. The only modifications to the source code were corrections to inconsistent function declarations that had escaped notice by the more primitive compiler of the Iris 4D.

The benchmarks ran faster than on an equivalent Mips machine despite the fact that the evaluation Indigo was only at the alpha level of development. The rotation of the Gouraud-shaded 3-D logo was con-

siderably slower than on the Iris 4D. By the time the Indigo is released, SGI expects to have graphics operations at the same performance level as on the Personal Iris.

Song and Dance

Welcome to graphical programming, the icon-based programming environment. You can visualize, slice and analyze, transform, and format your data and graphics without writing a word of programming code.

Explorer is a distributed computing development program that lets you drag and drop data-processing modules on a design window. By tying the modules together into a data-flow network, you can create specialized data-analysis and visualization applications.

Individual modules can run on any kind of machine that is suited to the task, with the data moving over the network. The final display can end up on any SGI machine that you are using, including the low-cost Indigo. The resulting design is automatically implemented in modular source code.

Scene Stealer

The SGI Indigo isn't just a novel-looking machine; it's a novel design for 3-D workstations: fast and inexpensive. The compact workstation box takes up far less space on your desk than the pizza-box workstation. If you don't want to put this attractive box on your desk, you can fit it in a deep bookshelf or even beside the desk. The machine is designed so that you can do your own hardware installation and maintenance without tools or technical know-how.

The shortcomings are few: The color dithering makes you long for true 24-bit color. You may find the Mac-style serial ports a little annoying.

The list of strengths is long and impressive. Along with the 33-MHz R3000 processor, the phenomenal memory and disk transfer rates give this machine very high performance marks. If the new scene is one of 3-D applications, the Indigo steals the show by making professional 3-D affordable and easy. ■

Ben Smith is a BYTE technical editor. He can be contacted on BIX as "bensmith."