NextStep for Intel

The black box is an orphan, but Next's GUI operating system lives on in the world of Intel systems

BEN SMITH

Next no longer makes computers. But it continues to do what it has always done best—developing and delivering system software that offers many of the benefits of object orientation that Taligent and Cairo still only promise. Unlike these others, NextStep provides easily customized and easily linked functional modules today, as it has for over four years.

NextStep for Intel Processors brings the NextStep environment to 486- and Pentium-based PCs. Data General, Dell, Epson America, Hewlett-Packard, NEC, and Siemens Nixdorf are the first PC vendors to sign on, and these offer NextStep installed. The end-user version of NextStep for Intel Processors costs $795.

I ran NextStep on an Epson Progression NX with a 66-MHz 486DX2 processor, 36 MB of RAM, and a 525-MB SCSI hard drive. I tested its performance and ran the PC on a network alongside a Nextstation Turbo. It ran well. NextStep brings to PCs the consistency of design Nextstation users have long enjoyed. From system administrative databases, down through graphics resources, through system library functions, even to the kernel level, NextStep is object-oriented. Best of all, there are consistent application elements that can be plugged together to build sophisticated applications. And the performance penalty for all of NextStep's levels of abstraction is minor, if even noticeable.

But NextStep's lack of an established user base, and the consequent lack of shrink-wrapped applications, won't vanish overnight just because the operating system now lives on the most popular hardware platform on earth. These, not any technical issues, are the problems that NextStep will need to overcome to succeed on or off PCs.

NextStep 3.1

It isn't just the object-oriented design and the Mach-based operating system that have made NextStep so popular with its users and developers; it is also the visual design, the graphical elements that come with the system, and the ease of use that these elements provide the user. Because the interface is so well thought out, developers have little incentive to diverge from the user-interface guidelines. So NextStep applications have the same high level of consistency that you find in Mac applications.

NextStep's application menus and submenus are an example of the quality of design of the interface: The screen remains uncluttered because only the menus of the current application appear on the screen. The graphics and text within a background window remain active. Users can tear often-used submenus from the main menu so that they can be retained on the screen; however, menus and their submenus attract each other when they are in close proximity. Finally, you can easily set command-key equivalents for menus.

NextStep also provides a standard software installer and many other common utilities. By providing commonality among the applications and utilities, Next has made its operating system very easy to learn—despite its Unix underpinnings.

Not-So-Neat PCs

On the Nextstation, Next controlled both sides of the hardware-software equation. The company could provide direct support for all Next hardware in the operating system and ensure that everything worked well together. The integration between software and hardware was well crafted

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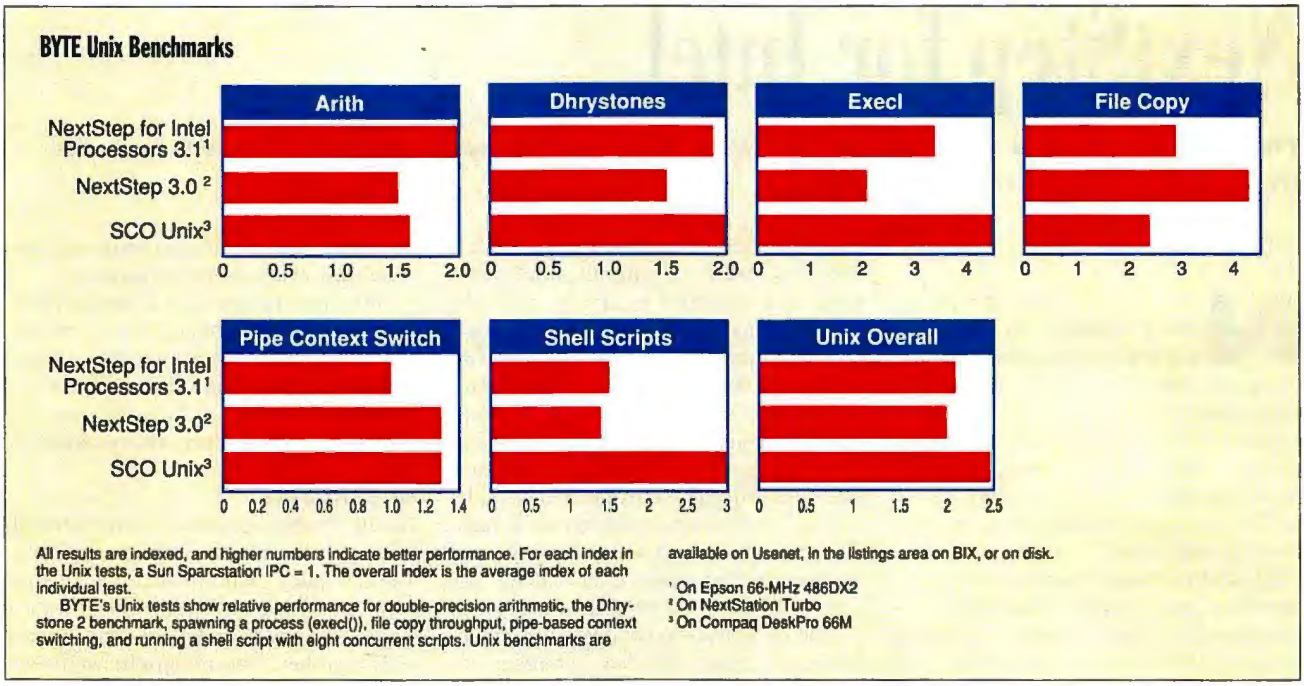

All results are indexed, and higher numbers indicate better performance. For each index in the Unix tests, a Sun Sparcstation IPC = 1. The overall index is the average index of each individual test.

BYTE's Unix tests show relative performance for double-precision arithmetic, the Dhrystone 2 benchmark, spawning a process (execl()), file copy throughput, pipe-based context switching, and running a shell script with eight concurrent scripts. Unix benchmarks are available on Usenet, in the listings area on BIX, or on disk.

[1] On Epson 66-MHz 486DX2
[2] On NextStation Turbo
[3] On Compaq DeskPro 66M

NextStep runs faster on *66-MHz 486DX2 PCs than it does on its native Nextstation Turbo, where it's powered by a 33-MHz Motorola 68040. NextStep for Intel Processors was faster on all tests but File Copy, an indication of the Nextstation's better disk caching and bus design. However, NextStep proved somewhat slower than SCO Unix System V release 4. Note that these tests do not measure display performance. Performance gaps between SCO Unix and NextStep are most pronounced on system functions, so it appears there is still room for kernel and system-call optimizations in NextStep.*

and solid. Setting up a new Nextstation on a network was effortless.

Things are different in the world of PCs, where thousands of vendors sell thousands of peripherals. Configuration is rarely easy; mixing and matching hardware is almost always difficult; and expecting hardware vendors to offer assistance with operating systems other than DOS or Microsoft Windows is unrealistic.

As a result of the lack of uniformity among motherboards and peripherals, Unix implementers on Intel platforms such as Next, SunSoft, and SCO have the arduous task of providing drivers that are general enough to work with most peripherals but specific enough to provide optimizations that can handle the work that Unix demands. What may be high-performance hardware for DOS or Windows may be impossible to configure, or a poor performer, for Unix.

Nonetheless, Next has done an excellent job of moving its operating system. System configuration was never a problem on the Nextstations, and Next has minimized PC system-configuration effort with a new (and now necessary) NextStep application: `configure`. This application more or less automatically sets up the operating system to handle hardware variations, including installing drivers.

When building networks with NextStep for Intel Processors, you have three options, just as you did on the Nextstation. First, you can hook into a Next-based network by just plugging in a cable, relying on Next's NetInfo to provide domain name services. Second, you can connect to a more standard Unix network, although you will have to edit some of the initialization and configuration files, just as you would on other Unix systems. Third, you can run a NextStep PC as a client on a NetWare LAN. Getting the NetWare connection up is a little more difficult than Unix networking, but it's possible to do without a manual.

Since NextStep is distributed on CD-ROM, installation doesn't require very much user interaction. However, you need to be sure that you have followed the brief hardware-compatibility guide or you won't get very far. As I wrote this review, there were drivers for only two SCSI controllers and just a handful of video boards that NextStep supported.

NextStep sits in its own partition, so you can share a hard drive between NextStep and DOS. Next provides a multiboot utility, so you can specify which operating system you wish to run at boot time. And you also have access to the DOS file system from within NextStep, although you can't run DOS or Windows applications directly. For that, you'll need SoftPC from Insignia Solutions. SoftPC for NextStep will ship on the September CD NextStep release but will require a separate license. Besides DOS file-system support, NextStep also supports the Mac file system, so you can read Macintosh floppy disks and Mac volumes on SCSI drives.

Making the Move

Other than the integral DSP (digital signal processor) capabilities of the now-obsolete Nextstation, there is little that the Intel version of NextStep doesn't provide for developers. Next claims that 80 percent of the applications that ran on Next hardware are already recompiled for Intel CPUs. Some of the remaining 20 percent will never make it through the transition, because they were specific to the Motorola hardware or DSP in the Nextstation.

But for applications that used NextStep libraries rather than hardware-specific code, the work is more or less already done by Next. Developers need do little more than recompile their source code and edit their documentation to reflect the difference in keyboards. Among the popular applications that have already completed the move are Altsys Virtuoso (an advanced FreeHand-like drawing program) and Mesa (a spreadsheet from Athena Design). However, some vendors, most notably Adobe, have hesitated to port significant

applications to NextStep for Intel Processors, reluctant to make the move to yet another platform.

Theoretically, developing new device drivers for NextStep is quick and easy using the object-oriented driver architecture and the Driver Kit. Next provides high-level driver objects (e.g., for Ethernet controllers), and hardware vendors need only add the specifics for each device. Since the device drivers can be loaded at run time (rather than being linked into the kernel as in older Unix implementations), peripheral manufacturers can distribute their drivers with their devices, and users can install and configure them easily. NextStep for Intel Processors is still new, and the list of supported hardware is short; it will take time to see how well its driver architecture works in the real world of thousands of hardware providers.

Next has partitioned NextStep into developer and end-user versions. To get the development package, you need to purchase an end-user license plus a $1995 add-on. The add-on contains the Interface Builder, Project Builder, Objective-C compiler, and other tools, all of which the end-user environment lacks.

Windows NT vs. NextStep

Windows NT	NextStep
• Multiuser, multitasking	• Multiuser, multitasking
• Microkernel architecture, but unproven in the hands of end users	• Production operating-system kernel four years in the field.
• Non-GUI environment is MS-DOS	• Non-GUI environment is Unix
• Windows GUI environment provides huge existing base of users already familiar with the interface	• NextStep GUI environment more cleanly integrated with operating system and arguably more intuitive
• Multiple file systems	• Unix file system shared with MS-DOS
• Local and remote interprocess communications	• Local and remote interprocess communications
• Runs 16-bit and 32-bit Windows, and DOS applications	• Runs NextStep applications
• Applications development is difficult	• Applications development is simple
• Object-oriented operating system, and object-oriented languages for development, but little mapping between the two systems	• Object orientation runs from operating system to development tools

Maximum Is Minimum

NextStep runs on Intel platforms—but not wimpy ones. Next's recommendations for a 16-bit-color NextStep system include a 486SX or better processor, 120 MB of available storage, 24 MB of RAM, and a high-end graphics system like Chips & Technologies' Wingine, Dell's DGX, Compaq's QVision, or ATI's Graphics Ultra Pro. The development system wants 330 MB of hard disk space. NextStep's trademark full-window drags (not outlines) require serious graphics hardware, and the very best Intel systems are required to give you smooth performance.

I tested NextStep for Intel Processors on a Wingine-equipped Epson Progression NX, a 66-MHz 486DX2 with 2 MB of VRAM (video RAM) yielding 1024- by 768-pixel resolution at 16-bit color. Screen operations were still smoother on the Nextstation Turbo than they were on the Progression NX. The Progression also included a Media Vision Pro Audio Spectrum sound card for sound support.

As the benchmark graph shows, NextStep for Intel Processors is somewhat slower than SCO Unix running on equivalent machines. However, these benchmarks measure processing and disk I/O only (not graphics), so they aren't measuring one aspect of performance where NextStep should be strongest.

NextStep proved a little faster running on the 66-MHz Intel CPU than on the Nextstation Turbo, at least for simple computations. As shown by the Dhrystone 2 and Arithmetic (floating-point loops) tests, the Intel version is about 30 percent faster, but it lags somewhat on file I/O. Subjectively, NextStep is very quick on PCs.

An important benefit to Next's move to Intel machines is the opportunity that the Pentium offers—multiprocessor multitasking. The Mach kernel is the lowest-level task of the operating system. It is the touchstone of microkernel operating systems. Because Mach provides an abstraction of the processor and its tasks, even many of the operating-system calls and other system services can naturally be distributed over several processors. As a result of the very small elements into which all processes can be broken, Mach can inherently make efficient use of multiprocessor systems independent of the type of communications between processors.

Ironically, Motorola's 680x0 line of processors isn't specifically designed for multiprocessing. The Pentium is designed to support multiprocessor systems, with processor synchronization logic. This is just what NextStep needs, even though it will be a few years before multiprocessor systems will be economical.

New Competition

Back when the Next machine was a workstation, NextStep faced competition from other workstation operating systems: variations of Unix with Motif, SunView, or OpenLook interfaces. Now, NextStep competes on the ultimate open platform and will need to find a space among PC Unix systems and options like OS/2 and Windows NT.

Against Solaris and SCO Unix, NextStep is comparable in performance and superior in its user interface. Its weak spot is that it is not part of the mass movement toward compatible X Window System–based GUIs.

How about Windows NT? It, too, is a microkernel-based, 32-bit, multitasking system for networking environments and requires top-of-the line hardware. But NextStep is more complete, already established by users and VARs, and it is easier to develop applications for NextStep than for NT. NT's interface is Windows, which is already familiar to millions of users. NextStep's interface is better, in my opinion, but it does not come with a large supply of pretrained users.

Next's shift from workstation manufacturer to software vendor was a smart move: NextStep for Intel Processors is a nice system. Those who'll benefit most are large corporations already using Nextstations, because of the ease with which NextStep applications can be built and customized. They will reap the immediate benefit of less-expensive hardware.

Extending NextStep's traditional base may take a little longer. While it's unlikely that an operating system with such a small following and so demanding of system resources will ever come to dominate the huge Intel arena, the move to a platform where even high-end hardware can get real cheap real fast will help to ensure this elegant operating system's future. ■

About the Product

NextStep for Intel Processors 3.1
User package.....$795
Developer add-on ...$1995

Next Computer, Inc.
900 Chesapeake Dr.
Redwood City, CA 94063
(800) 879-6398
(415) 366-0900
fax: (415) 780-3714
Circle 1225 on Inquiry Card.

Ben Smith is a BYTE Lab testing editor and the author of Unix Step-by-Step *(Sams, 1990). You can contact him on BIX as "bensmith."*