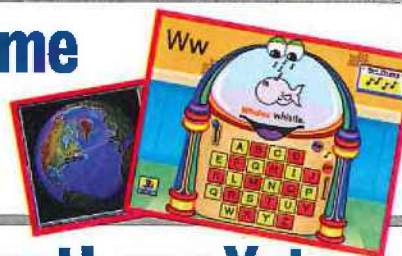




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Really
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■ How
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It Run?

95

And Compares It with

OS/2

WIN 3.1

NT

■ Is It
More
Stable?

■ Will
It Work
With
Your
System?



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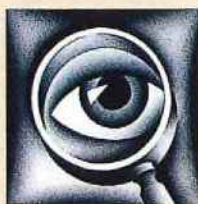
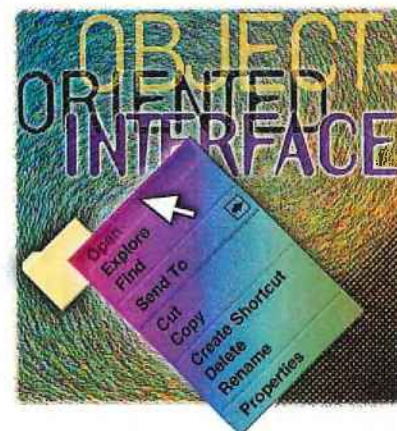
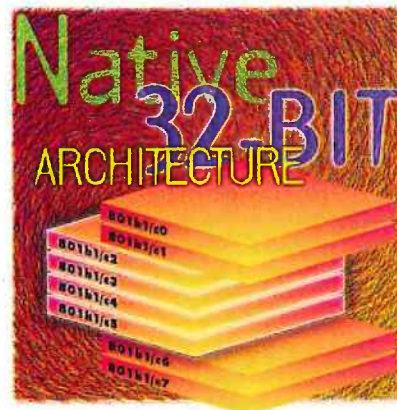
Winners and Losers in '95.....95

COVER STORY

Your Next OPERATING SYSTEM

BY MICHAEL J. MILLER

At long last, Microsoft has delivered Windows 95. But is it right for you or not? To help you decide, we put the shipping version of Windows 95 through hours of exhaustive testing, measuring its performance, stability, capacity, and compatibility against the dominant operating systems on today's PCs: Microsoft Windows 3.1, Microsoft Windows for Workgroups 3.11, IBM's OS/2 Warp Connect Version 3, and Microsoft Windows NT Workstation 3.51. We also compare their user interfaces, contrast their bundled applications, survey their networking features, and lift the covers of their underlying architectures. An operating-system upgrade is serious business. Here's what you need to know about 32-bit platforms to make the right choice 102



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Your Next OPERATING SYSTEM

By Michael J. Miller

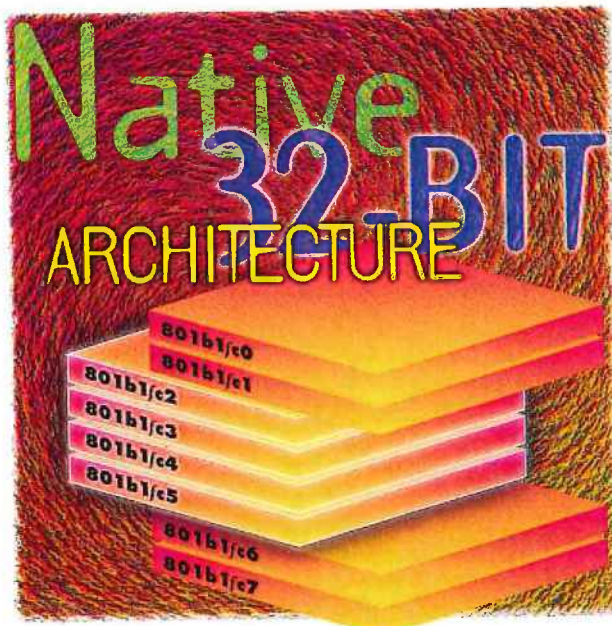
The wait for Windows 95 is over at last. Microsoft has delivered final code for its long-awaited operating system, and now you can get on with the serious business of figuring out whether or not this is the OS you should be running.

To help you decide, PC Labs has put the shipping version of Windows 95 through exhaustive tests, systematically measuring its performance, stability, capacity, and compatibility against the dominant operating systems on today's PCs: Microsoft Windows 3.1, Microsoft Windows for Workgroups 3.11, IBM's OS/2 Warp Connect 3.0, and Microsoft Windows NT Workstation 3.51.

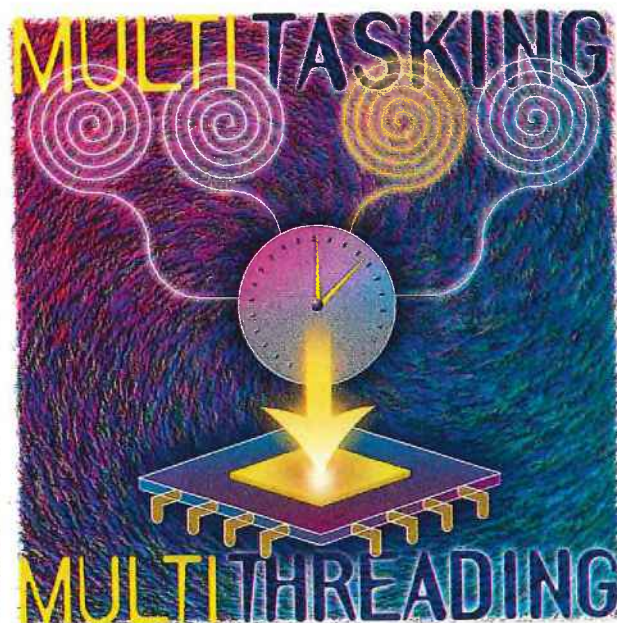
DOS'S DAYS ARE NUMBERED

One thing is clear: Even though the overwhelming majority of *PC Magazine* readers are running Windows 3.1 today, we're firmly convinced that the days of MS-DOS and Windows 3.1 are numbered. The advent of new, more sophisticated operating systems and the market acceptance of fast PCs with ample RAM and hard disk storage at reasonable prices mean that you no longer have to cope with the limitations of DOS and Windows 3.1.

Whatever advanced operating system you'll be



Today's 32-bit operating systems are a logical match for the native 32-bit architectures of advanced microprocessors like the 386, 486, and Pentium. Under a 32-bit OS, programs can manipulate 32-bit chunks of data and address large memory areas in a logical, streamlined manner. Application code can be smaller and, depending on the type of operation it is performing, noticeably faster. A 32-bit architecture is also a big win for programmers, who no longer have to wrestle with the Byzantine complexity of 16-bit segments and offsets.



Windows 3.1's simple *cooperative multitasking* scheme is often everything but cooperative. The three 32-bit contenders poised to succeed it offer *preemptive multitasking*, a far more robust way for the OS to divvy up system resources. The unit that is multitasked is a program *thread*, a fully functional subset of a program. Your apps can have multiple threads performing separate tasks at the same time. The net result is far smoother multitasking, better program response, and less waiting for the hourglass to go away.

using in the next few years, many of its characteristics are already clear. All the contenders are, at least in large part, 32-bit designs that support 32-bit applications with far more advanced features than the 16-bit DOS and Windows software we're used to. At the same time, these new OSs can run most of those existing 16-bit applications. All provide more protection for these new applications, so that one errant program won't be as likely to crash the whole system. All offer true multitasking (the ability to run multiple programs at the same time) as well as multithreading (the ability to have a single program do multiple things at the same time). All provide (or, in the case of Windows NT, will soon provide) a new user-friendly interface with object-oriented characteristics. And all offer broad network connectivity out of the box.

NOISY ARRIVAL

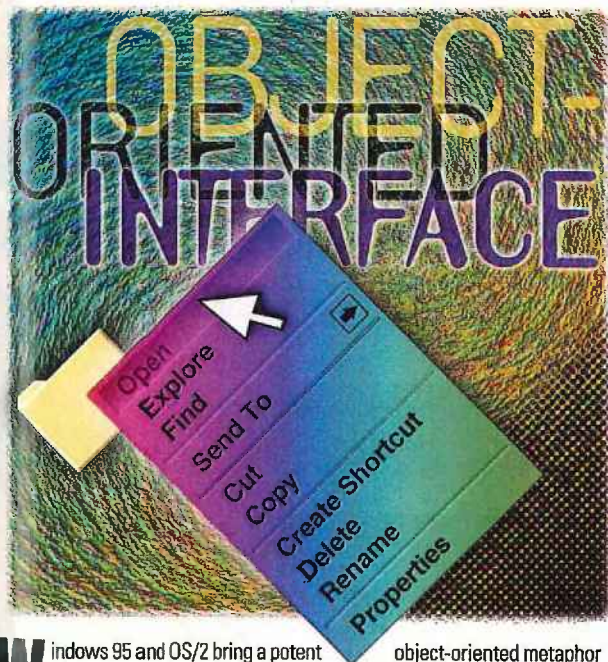
Windows 95 comes into this market surrounded by a glow of novelty, but in many ways, it simply builds upon the fea-

Will Windows 95 be your next OS? What about OS/2 Warp Connect? Or Windows NT? Should you stay with Windows 3.1? It's time for a tough choice.

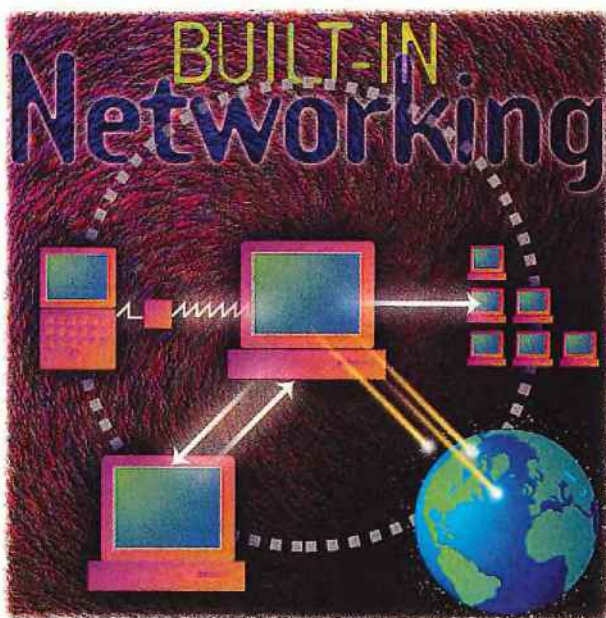
tures of earlier operating systems. The basic architectural design of a 32-bit, protected, multitasking, multithreaded OS isn't new. OS/2 has been offering these features for years; it was followed by Windows NT, and both were preceded by variants of Unix. The new set of networking features in Windows 95 builds on features offered in Windows for Workgroups 3.11 and Windows NT. Even Windows 95's user interface has precedents: A desktop look with files and folders was popularized by the Macintosh more than ten years ago, and the taskbar follows in the tradition of utilities like

Starfish Software's Dashboard and OS/2 Warp's Launch Pad. It's the slick combination of all those features—along with others like the convenient Plug and Play standard—that makes Windows 95 worthy of the attention.

The most important question is one of execution: How well does Windows 95 do in the critical measures of performance, stability, and compatibility compared with its competitors? Are any of the alternatives worth the effort it takes to switch over?



Windows 95 and OS/2 bring a potent object-oriented metaphor to the user interface. Your screen becomes a true desktop, and you can use it to host objects representing programs, files, drives, devices, and directories. An object-oriented shell also has the intelligence to tell you about the objects it contains. Right-clicking on any object brings up a context menu with details on all its properties and all the things you can do to it. Windows NT still uses the old Windows 3.1 interface, but a slick Windows 95-style shell is in the works.



At last, networking has become a standard OS component. When you switch to an advanced OS, you will also be getting connected. Out-of-box support for Novell and other common PC LANs is commonplace, and TCP/IP is fast becoming a standard part of OS bundles. Connectivity features may also include priceless aids for mobile users such as remote dial-up and high-speed cable connections. To hook up to the rest of the world, OS/2 Warp provides a World-Wide Web browser to get you on the Internet; Windows 95 offers a browser in Microsoft Plus!

In the sections that follow, we answer these questions. We start with an overview of each of the operating systems, summarizing the findings of our recent tests as well as our earlier examination of the features of each environment. (See "Getting Ready for Windows 95," May 16, 1995, which contains more details on each of the operating systems as well as a complete look at their architectures and networking features.) We then go into more detail on the underlying design of each system and follow that with in-depth testing of performance, stability, and compatibility.

THE BOTTOM LINE

What are you trying to accomplish with your computer? Answer that question, and you'll be well on your way to knowing which OS to use. There is no single "best" OS that's the right choice in all cases. That said, the right OS for you is the one that best runs the applications you want, taking into account its system requirements and your compatibility concerns.

If you have a machine with 4MB of memory that runs well enough for you, and you don't want to upgrade your hardware, stick with DOS and Windows. This setup

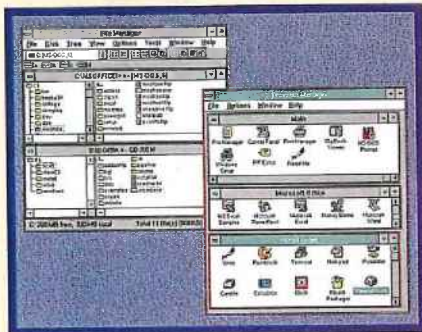
works pretty well for most people and has an enormous base of software support. While developers are now designing 32-bit applications, the huge installed base of Windows 3.1 and Windows for Workgroups 3.11 assures that you'll have application support for a long time to come.

If you have at least 8MB of memory and an extra 60MB of hard disk space, or are willing to upgrade, then Windows 95 is the compelling choice. It offers all its new features with little upgrade pain. In our tests, it installed relatively easily in most circumstances, did well in compatibility

Features of Your Next OS: *Despite their differences, all the new 32-bit*

MICROSOFT WINDOWS 3.1 & 3.11

USER INTERFACE



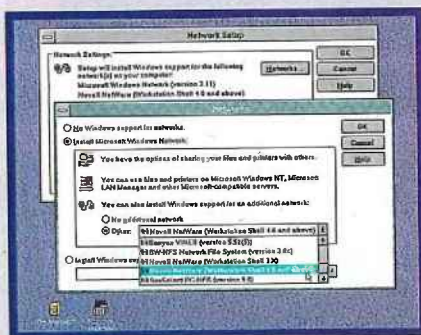
► Nothing new here. File Manager can't read Program Manager groups, and your groups stay stuck in Program Manager. You can't drag documents or programs to the desktop. There has got to be a better way.

MICROSOFT WINDOWS 95

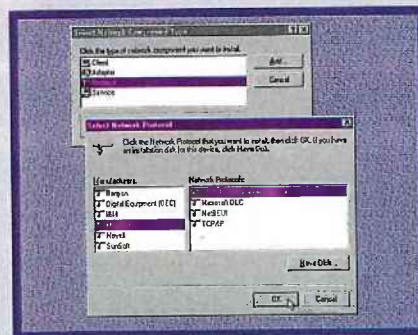
► The Windows 95 interface offers a true desktop with icons for programs, documents, directories, and system components. Context menus, accessed by right-clicking, give you the relevant actions and properties for any object.



NETWORKING

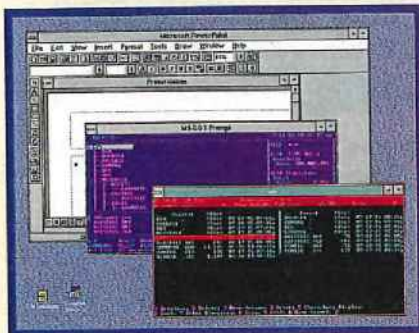


► Windows 3.1 is mildly network-aware, but Windows for Workgroups actually includes peer-network capability in the box. It also lets you configure Windows with many standard third-party networks such as Novell NetWare.

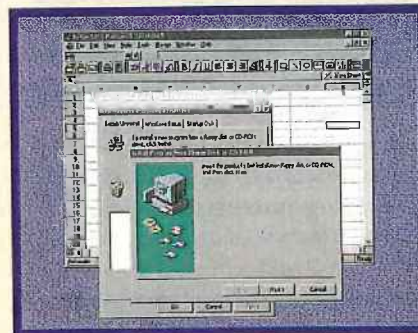


► Windows 95 comes out of the box with a nice suite of popular network protocols and an impressive collection of network adapter card drivers. Utilities like Network Neighborhood make server navigation extremely easy.

COMPATIBILITY



► In addition to running its native 16-bit and Win32s applications, Windows 3.1 supports most of your old-standby character-mode DOS applications, which you can run either in a windowed session or full screen.



► Compatibility with 16-bit Windows programs is near perfect, and installation is the same for 16-bit and native apps. You can also continue to use your 16-bit device drivers if you need to. DOS programs are well supported, too.

tests, and performed somewhere between Windows 3.1 and Windows for Workgroups 3.11 in many performance tests.

That's not to say that Windows 95 is perfect: It isn't. It makes trade-offs for the sake of backward compatibility and can't offer the level of crash protection offered by OS/2 or Windows NT. Like most new programs, it has a number of small glitches. And the total cost of upgrading is more than just the cost of the software; there are associated costs for hardware upgrades, the time to install, and retraining. Still, you end up with a more stable envi-

ronment, get a better interface, and have the ability to run new applications while still remaining highly compatible with the old. In short, we find Windows 95 the best choice for most PC users.

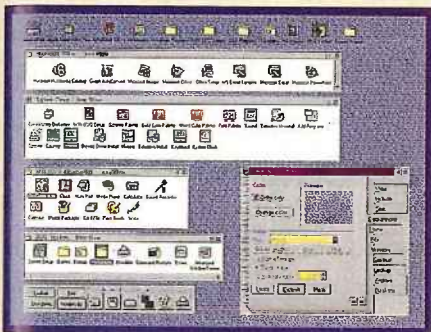
If you really want security and protection, and the ability to run most existing Windows programs and new Windows programs under development, then Windows NT should be your choice. It was the most robust operating system we tested, and the fact that its API is almost identical to that of Windows 95 guarantees that many applications will be available for it. The cost, how-

ever, is steep. Aside from being the most expensive operating system in this comparison, you'll need a fast machine with at least 16MB of memory to run it.

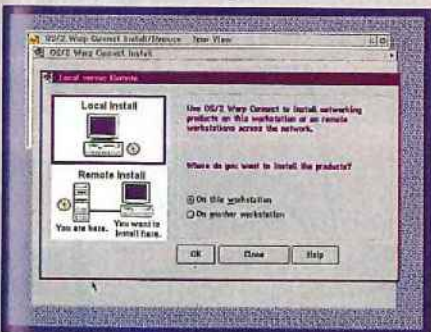
You'll also give up compatibility with DOS device drivers and applications—including many popular games—that write directly to the hardware. Currently, it offers only an unfinished version of the new user interface introduced in Windows 95, although a final version is scheduled for release by early 1996. Other features such as Plug and Play are further away. Windows NT makes sense for corporations

operating systems are converging on a similar set of features.

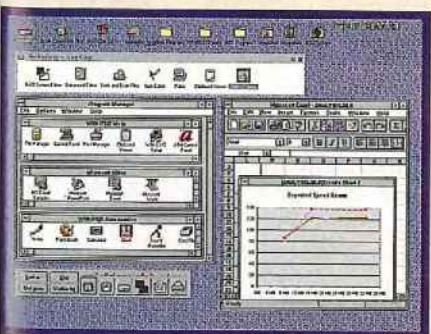
IBM OS/2 WARP



► OS/2 Warp gives you a rich shell environment complete with folders, icons, right-click-accessible context menus, the LaunchPad, and full drag-and-drop support. In fact, it looks a lot like Windows 95—but OS/2 Warp had it first.

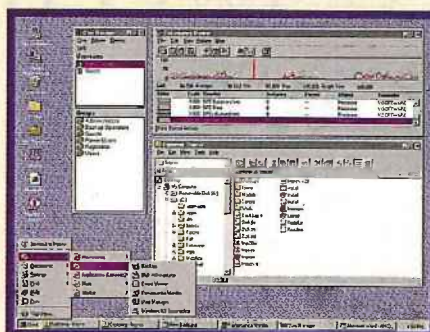


► Built-in client networking in OS/2 Warp Connect, which includes a robust TCP/IP stack, a NetWare client, and Internet access, is very complete. But installation can be complex. Be prepared for some tweaking.

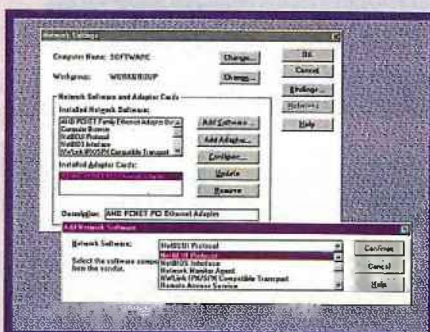


► OS/2 Warp's support for 16-bit Windows apps is impressive. Depending on which version you buy, OS/2 Warp runs them using IBM's WIN-OS/2 libraries or actual code from Windows 3.1. It can't run real-mode device drivers.

MICROSOFT WINDOWS NT



► Officially, Windows NT Workstation uses the Windows 3.1 interface. Unofficially, a Windows NT beta of the Windows 95 interface is already being circulated. Microsoft expects to ship the final version by the end of the year.



► Networking is an integral part of Windows NT Workstation. Out of the box, you get Client Service for NetWare, an IPX/SPX-compatible protocol, FTP Server capability, a TCP/IP stack, Remote Access client and server, and more.

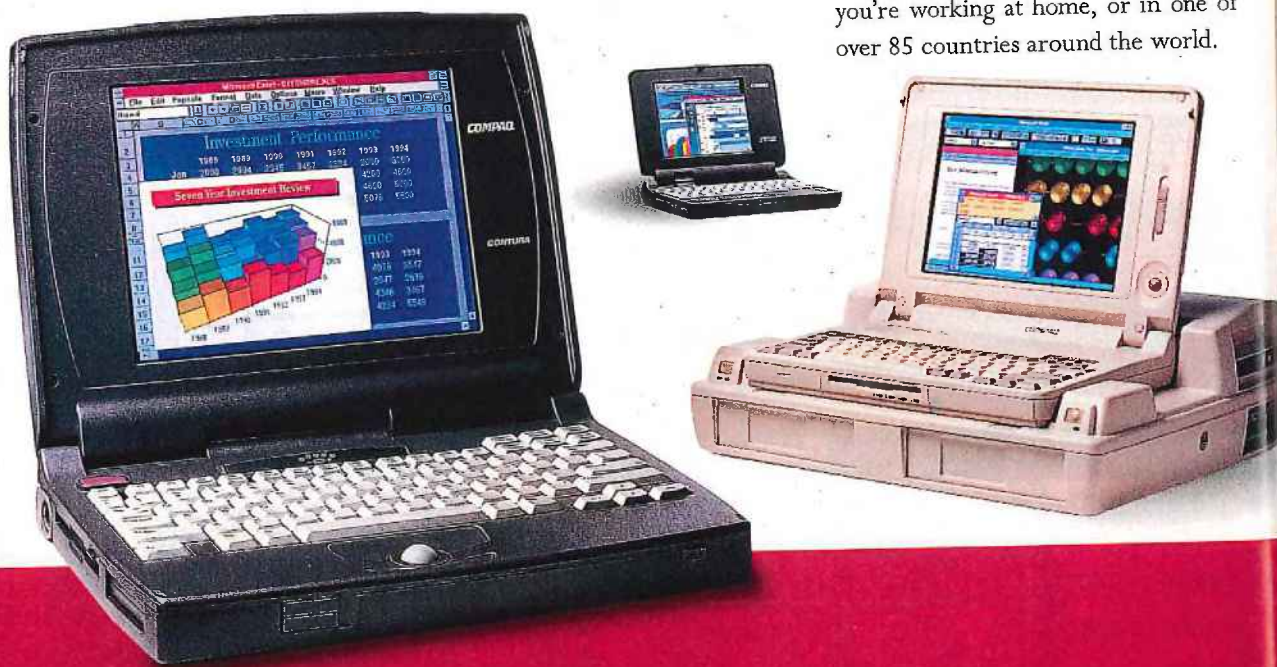


► Windows NT Workstation runs most 16-bit Windows apps, but it won't run real-mode device drivers. Native Windows NT applications have been scarce up till now, but many upcoming Windows 95 apps will be Windows NT-certified.

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developing mission-critical applications, but while it may be the operating system of the future, it doesn't yet appeal to the average individual user.

OS/2 Warp Connect 3.0 stakes out a middle ground. It's the right environment if you want somewhat more protection than Windows 95 but don't need the protection or have the system requirements for Windows NT. It does a very reasonable job of running existing Windows applications, although it's somewhat slower than Windows 3.1 or Windows 95.

It remains to be seen whether IBM can convince software vendors to adapt their 32-bit titles for OS/2 Warp or create significant new applications for the platform. Installation and hardware compatibility, while improving, still are problematic. OS/2 Warp Connect 3.0's built-in applications and broad networking support make it a good step up for businesses that currently run OS/2 applications. In addition, OS/2 Warp is likely to satisfy those who want to run a non-Microsoft environment on x86-compatible hardware, whether because they don't like Microsoft, are concerned about its increasing dominance in PC software, or just want an alternative.

For most people, the choice will come down to staying with Windows or upgrading to Windows 95. Given the support for Windows 95 among both hardware and software developers, it seems quite likely that Windows 95 will become the dominant PC OS over the next 12 months.

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Your Next OS

The Big Picture

Windows is showing its age and three competitors are poised to take its place. Compare their strengths, features, and vulnerabilities.

By Michael J. Miller

SINCE ITS INTRODUCTION FOUR YEARS AGO, Windows 3.1 has become the de facto operating system standard in the PC industry. Windows 3.1 or Windows for Workgroups 3.11 come preinstalled on over 80 percent of new PCs, and Windows applications account for over 60 percent of all PC software sold. Still, given that Intel introduced the 32-bit i386 microprocessor ten years ago, 16-bit Windows is definitely showing its age.

Windows 3.1 stands on the architectural foundations of Windows 3.0, which was introduced in 1990. It loads on top of DOS, which provides many basic OS services. On top of the DOS infrastructure, Windows adds a graphical operating environment and features like the simple cooperative multitasking scheme it uses to run multiple Windows and DOS applications.

The Windows architecture puts all applications and system code into a single address space. This means that a misbehaving application can scribble on the memory being used by the operating environment itself or by another application. The result is the dreaded General Protection Fault. Sometimes Windows recovers gracefully; most times it can't.

Windows 3.x is inherently a 16-bit operating system, so programs address

memory in 64K segments and manipulate data in 16-bit chunks. Aside from driving programmers to distraction, this system can be less efficient than 32-bit addressing when large amounts of data are involved. Limits to system resources are another consequence of a 16-bit foundation. Windows 3.x offers limited storage space for structures such as application file handles. When these small memory areas fill up, Windows can't load new apps, even when there's plenty of free memory left.

The Windows user interface, based on Program Manager and File Manager, is familiar to most PC users. The environment includes a Control Panel for managing the environment and a series of small applications,

including Notepad, Write, Paint, Terminal, and the ever-popular Minesweeper and Solitaire games.

Windows for Workgroups added a group of network features. The most prominent was peer-to-peer networking, which lets you share a drive or directory with other users, either using Windows' built-in networking features or over a larger server-based network, such as Novell's NetWare or Windows NT.

In addition, Windows for Workgroups added a client for Microsoft Mail and for Schedule +, Microsoft's e-mail and sched-



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