The Successful Migration to Next Generation PCs

An IDC White Paper Sponsored by AST Computer
Based on Research of NT Adopters

Executive Summary

Corporate America is fast embracing Windows NT for its desktop computing needs as it seeks a true multi-tasking, robust, 32-bit OS architecture with reliability, security, and high performance. The Pentium Pro, offering superior speed and performance, is far and away the preferred platform for NT. These were among the key findings of a recent IDC global survey of 1,500 U.S., European and Asian corporate NT adopters and active evaluators. Based on this research, this IDC White Paper assesses the state of the U.S. corporate migration to the next generation of PCs. Issues explored include: user needs/applications for advanced systems and 32-bit processing; deployment strategies and acquisition intentions; recommended configurations; potential success factors and barriers to adoption; and assessments on key technologies, cost factors, and vendor attributes. With the accelerated price performance improvements of the Pentium Pro, the expanding suites of 32-bit applications, and the recent release of Windows NT Workstation 4.0, market momentum continues building for NT/Pentium Pro systems. IDC predicts 1998 to be the pivotal cross-over year when U.S. Pentium Pro PC sales will exceed Pentium PC sales overall; and when NT installations will surpass Windows 95 installations on desktops in large corporations.

Advanced PC Corporate Adoption/Usage

The upward migration to advanced NT/ Pentium Pro systems is occurring rapidly, among the 500 medium and large U.S. corporations IDC recently surveyed. Corporate users surveyed included in their 12 month plans a 150% increase in the use of Windows NT. During this same time period, users stated intentions to decrease their use of Windows 3.X by about 50% and increase Windows 95 by 50%. Respondents also respectively cited reliability, security, performance, and robustness as the most important reasons for choosing Windows NT over Windows 95.

The preferred CPU platform of choice to run NT is the Intel Pentium Pro, among those corporations polled by IDC. By the end of 1997, 50% of the respondents stated that at least half of all their new PC purchases will be Pentium Pro systems. Users identified performance, speed, and the match of true 32-bit hardware and software as the foremost respective benefits of running Windows NT on the Pentium Pro platform.

Key Findings of Advanced PC Study

- Corporate user plans by late 1997:
  - 150% increase in Windows NT/usage
  - 50% decrease in Windows 3.X; and
  - 50% increase in Windows 95
- Within 2 years, majority of internal application development will be 32-bit
- Reliability, security, and performance are top reasons for choosing NT over Win 95
- 25% will gradually roll out NT company wide; 50% will roll out NT selectively
- Key NT applications are general office, SW development, technical/engineering, customized business and multimedia
- Performance and speed are top benefits of running NT on Pentium Pro PCs
- Cost, hardware requirements, and incompatibility with existing SW/ peripherals are key barriers to adoption
- By year-end 1997, half said at least 50% of new PC purchases will be Pentium Pros

Study Methodology

International Data Corporation (IDC), the world's leading information technology market research firm, in the summer of 1996, surveyed 500 U.S. corporations on their advanced desktop PC usage and plans. This was immediately followed by parallel research programs implemented in both Europe and Asia to gain a global market perspective and identify regional differences among corporate users. The global study's overall objective was to assess the success factors and potential pitfalls of commercial desktop procurement, implementation and management among more than 1,500 worldwide business enterprises. More specifically, the research analyzed how U.S., European and Asian corporations are currently using and adopting advanced NT/Pentium Pro systems and what users found as key drivers and constraints. While this IDC White Paper focuses on the U.S. advanced PC survey results, details of both the European and Asian studies are available in separate IDC White Papers from AST. (800 447-0023 x 100; Internet: http://www.ast.com)

IDC interviewed via phone, 500 IT and department managers (responsible for buying PCs and/or evaluating NT systems) in medium (100-499 employees) and large (more than 500 employees) U.S. corporations. The study focused on advanced adoption so organizations adopting less than 10% NT systems among their total systems within the next two years were eliminated.

IDC writers contributing to this White Paper were David Card, Maureen McManus, Bruce Stephen and Chris Yalonis.

Business Rationale for Upgrading

Corporate PC users' demand for improvement seems forever insatiable, as the minimum and maximum computing requirement levels continue to escalate. They seek better CPU performance; more memory; faster data access times; as well as more powerful OS and application suites. In the late 1990s, user requirements for better technology are driven by an increase in the size of applications and graphics-intensive files; expanded multimedia data types (color images, audio, and full-motion video); the inclusion of more software such as Web browsers and utilities; and the constant IT mandates to cut costs and improve productivity. In addition, the tremendous growth in the Internet, World Wide Web, and corporate intranets is driving technology to handle infobases now approaching Terabyte size ranges.

Organizations' appetites are also being stoked by the recent and unprecedented price performance improvements in advanced PC systems. IDC PC pricing research indicates the cost of Pentium Pro systems will decline a full one-third to nearly half (or 33%-47%) from the beginning to the end of 1996, depending on chip speed. In short, there has never been a time with more need for advanced desktop PCs, nor a time when cost justification to upgrade was stronger for the business enterprise.

Primary User Needs Driving Advanced PC Purchases

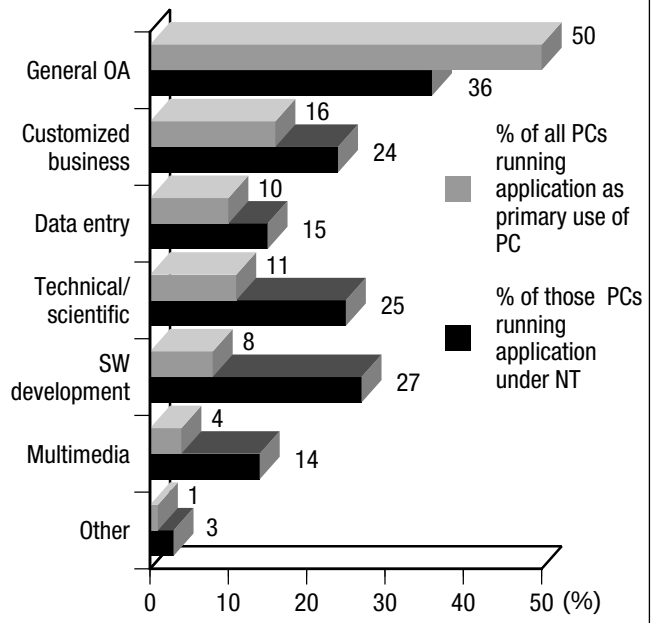
- Speed; Performance; Robustness
- Compatibility/Migration to 32-bit applications and client/server architecture
- Large databases; Internet and Intranets
- Reliability; Greater Stability
- Overhead requirements; productivity
- Multi-tasking, -processing, -threading
- Keep up with leading technology
- Intensive applications — multimedia, engineering, CAD, custom

Who's Upgrading and How?

The primary departments driving advanced desktop computer system purchases among IDC respondents are MIS/DP (24.6%), engineering (18.8%), and R&D (13.0%)—traditional leading technologists, as might be expected. Other major corporate groups include accounting/finance, marketing, manufacturing/operations, sales, and customer support/service. Somewhat surprising, are the current NT applications users identified, which are distinctly led by general office automation packages (WP, e-mail spreadsheets)—or today's general mainstream desktop applications—as shown in Figure 1. Software development, technical/scientific (CAD, engineering), and customized business applications (customer or decision support) follow general OA in today's leading NT applications. In addition to intensive applications like software development and technical/engineering, multimedia is another strong application area advanced NT PCs dominate over standard PCs.

Corporate enterprises also vary on their NT deployment strategies over the next year. About one-quarter of all survey respondents will roll out Windows NT gradually on a company-wide basis. Another half will selectively initiate NT based on department, applications, or power users' needs. Of interest, MIS/DP department heads perceive their end users as both more influential (purchase decisions) and more

Figure 1
Current PC Applications, Share for NT PCs



Source: International Data Corporation, 1996

technically sophisticated (requiring less training) than they did three years ago.

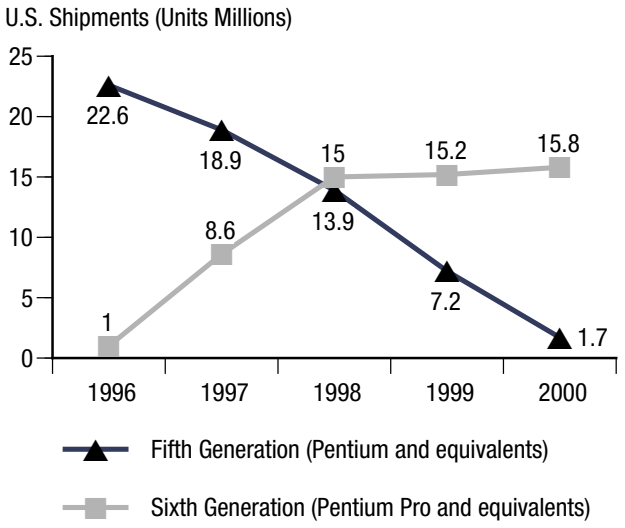
Pentium Pro—The Platform for and Bridge to the Future

The Pentium Pro chip, formerly the "P6", released by Intel in late 1995, was primarily created to meet the needs of advancing 32-bit architectures. This 6th generation of Intel's microprocessor family was specifically designed to optimize the performance of 32-bit code while maintaining backward compatibility with previous x86 code. In essence, the chip is a bridge between today's predominate world of 16-bit OS (Windows 3.X) and applications and the emerging world of 32-bit OS (NT, Win 95) and applications, which are fast becoming the industry standards.

The Pentium Pro processor, which contains about 55 million CPU transistors (or about 2X the Pentium), implements a design that is both superscalar and superpipelined. It also features Intel's "Dynamic Execution" which includes branch prediction, speculative and out-of-order execution, and register renaming. But the Pro's L2 cache system is perhaps its most unique feature and most essential factor to its performance increases. In addition to its 16K of internal cache, the Pro integrates external "cache on-board." This allows full synchronous bus speed without I/O contention and increased data flow and "pre-tuning" between the L2 cache and the CPU. This new dual-chip module speeds memory access and enables 4-way glueless multiprocessing for enhanced Pentium Pro processor performance.

As prices further decline, IDC predicts that demand for Pentium Pro will significantly increase, especially in the corporate arena. Current street prices for NT/Pentium Pro systems have now fallen to under $3,000 — within the range of most corporate IT budgets. Accelerating price competition and increasing product selection will continue through 1997 which will further fuel the market. IDC anticipates Pentium based system shipments will peak in 1996; and the Pentium Pro based systems, with 15 million units, will surpass Pentium sales (13.9 M) as the dominant PC platform in the total U.S. market by 1998 (see Figure 2).

Figure 2
Pentium Versus Pentium Pro Processor PC Shipments



PCs = PC server, desktops and portables
Source: International Data Corporation, 1996

Why Upgrade to 32-Bit Applications?

Migration to the 32-bit desktop enables true multitasking, improved stability, virtual memory, multiprocessing, and robustness which translates into lower cost of ownership and improved productivity.

Most of IDC's corporate survey respondents have already or are adopting 32-bit architecture. More than half (53%) of

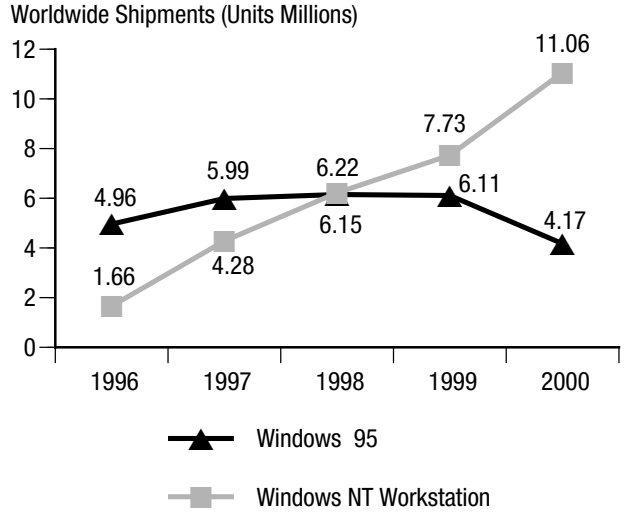
those IDC surveyed currently do 32-bit application development. Of those development projects, 79% are for NT; 46% are for Windows 95; and 7% are for UNIX. Key drivers of 32-bit adoption cited by the respondents included new application availability, price declines, performance gains, and the success of NT 4.0. Within two years , three-quarters of all internal PC application development will be 32-bit.

For the foreseeable future, IDC believes Microsoft will continue to drive the competitive framework in shrink-wrapped operating systems. At present, the Microsoft scenario of NT as the enterprise client while Windows 95 largely addresses the consumer desktop and mobile portable PCs is unfolding at a rate even faster than IDC initially anticipated. Among large businesses (its primary target), Windows NT really picks up momentum against Win95 in 1997; with more than 6.2 million shipments, NT is even projected to surpass Win95 shipments in 1998 (see Figure 3) by IDC estimates. IDC also believes many corporations will run mixed OS environments as:

- Windows 95 is the easiest and lowest cost-of-entry path to a 32-bit desktop—due to its reduced systems requirements, broad application and device compatibility, and easy installation. Win 95 will continue to serve the mainstream desktop (typically uniprocessor PCs with under 16 MB RAM) primarily in the high volume segments.
- Windows NT provides the most powerful 32-bit desktop—with high performance, industrial strength reliability and security. Windows NT will further penetrate the advanced corporate desktop as a client OS (typically multiprocessor systems running 16 MB RAM or more) primarily in the high value medium and large business enterprise.

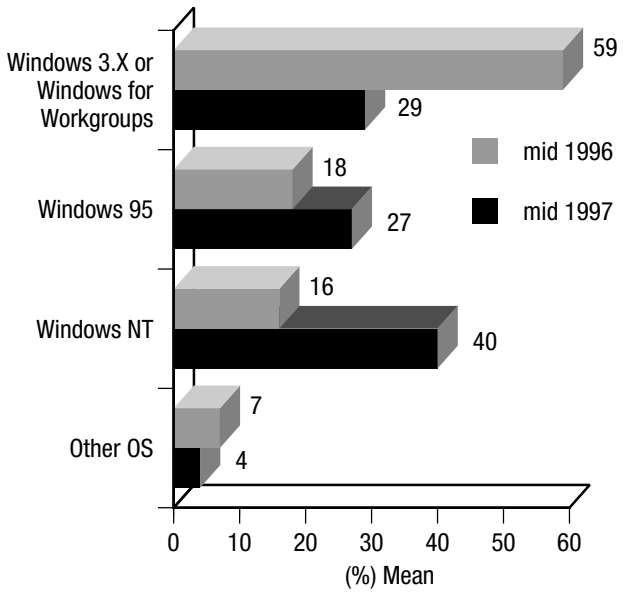
Again, IDC user research bears out Corporate America's preference of Windows NT over Windows 95 or any other OS. Corporate users surveyed included in their 12 month plans a 150% increase in the use of Windows NT (see Figure 4). During this same period users stated their intentions to decrease their use of Windows 3.X or Windows for Workgroups by about 50% and increase Windows 95 by 50%. Users respectively cited reliability (17.2%), security (17.2%), performance (16.2%), and robustness (10.1%) as the most important single reasons for choosing Windows NT over Windows 95. Planned support for all other operating systems, including UNIX and OS/2, will also drop by nearly half, according to IDC survey respondents.

Figure 3
Windows NT Versus Windows 95 in Large Business*



*More than 500 employees worldwide
Source: International Data Corporation, 1996

Figure 4
Current and Planned OS Mix



Source: International Data Corporation, 1996

By comparison, similar NT adoption trends were found in IDC's separate regional research among 500 European and 500 Asian corporations. Europe and Asia lag the U.S. in current 32-bit OS corporate implementations—in both Windows 95 and Windows NT. However, both regions

significantly outpace the U.S. in their corporate Windows NT and Win95 planned rates of adoption. European corporate respondents, for example, stated their intentions to increase Windows NT by 525%, or more than 3X faster than their U.S. counterparts, by year end 1997. This supports the notion of Corporate America as the earliest adopters of newer technologies; but also shows the strength and opportunity among the International markets. Complete survey results of both the European and Asian studies are available in separate IDC White Papers through AST. (See back page for contact information)

Enter Windows NT 4.0: The Ease of Windows 95 with the Power of NT

With the recent release of Windows NT Workstation 4.0, corporate customers increasingly migrate directly to NT and bypass Windows 95. Windows NT 4.0, which began shipping in September 1996, offers the ease of Windows 95 with the power of NT via:

- Improved ease of use with the Windows 95 user interface, including Start button, Taskbar, Shortcuts, Network Neighborhood, My Computer;
- Built-in access to the Internet and corporate intranets (integrated TCP/IP, Internet Explorer, and Peer Web Services);
- Better performance through the integration of the Win32 graphics-related APIs into the NT kernel (also a simplified Win32 subsystem); and
- Improved management utilities and fault-tolerance (User Profiles, System Policies, Task Manager, Setup Manager, and updated Windows NT Diagnostics).

Version NT 4.0 upgrade also integrates support for many new technologies including Telephony API; DirectX APIs (DirectDraw, Direct Sound, DirectPlay, DirectInput); and the Distributed Component Object Model. With these and other additions, the latest NT OS version is poised to become the top choice for multimedia and graphics platforms as technologies such as DirectX take off.

Mirages and Minefields: Barriers to Migration

As in any IT migration, there are real and perceived problems and pitfalls. Among the barriers for adopting NT/Pentium Pro systems are: robust platform requirements and its associated costs; lifetime cost of ownership concerns; incompatibility with existing software/peripherals; and the missing pieces in the 4.0 release.

Designed for the high-performance desktop, Windows NT Workstation 4.0 presently lacks: Plug and Play support, power management, an automated upgrade from Windows 95, some TCP/IP components, Direct3D, and integrated support for portables. Future release plans (NT 5.0 or Cairo, slated for 1997/1998) and third-party support promise to alleviate many of these shortcomings.

Corporate users perceived the barriers to NT and Pentium Pro adoption as very similar and cost related, according to IDC research. More than 46% of respondents gave "initial cost of hardware and software" as the primary barrier to Pentium Pro migration, as well as "lifetime cost of ownership". Similarly, initial cost of hardware and software (27.9%); and "lifetime cost of ownership" (11.5%) topped the list of barriers to NT adoption. Incompatibility with existing software/peripherals (10.7%) and hardware requirements (9.0%) also were cited by users as hurdles to NT.

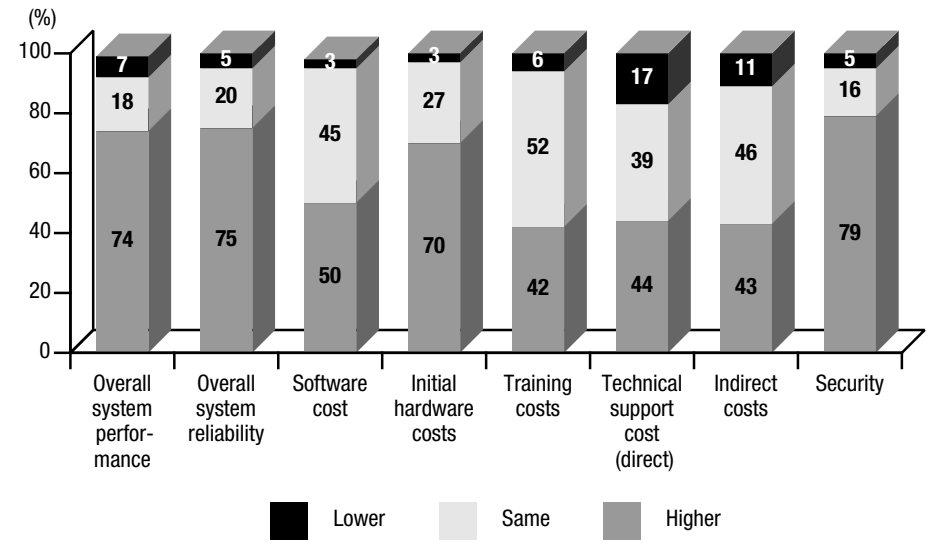
Overall, 69% of all IDC survey respondents rated total cost of ownership of a PC hardware platform and OS as "important". Thus, it was not surprising that the heaviest user backlash to upward migration to NT/Pentium Pro came in the areas of initial and on-going costs. However, actual prices of advanced PCs have declined dramatically the last few years while performance has increased substantially, as later detailed.

In addition, IDC's primary research challenges perceptions regarding NT's total cost of ownership. Initial hardware costs and software costs for NT were ranked higher than other Windows versions, as expected (see Figure 5). However, corporate respondents more often ranked NT as "about the same" and "lower" by about 2:1 in training costs, technical support cost (direct), and indirect costs. IDC estimates these three critical after-purchase support functions represents the majority of a PC's total cost of ownership. NT's superior user rankings over other Windows versions in overall system performance; overall system reliability; and security also greatly contribute to lower potential total cost of ownership.

Cost of Advanced PC Systems

Cost is a critical selection criteria of advanced personal computers. Cost was rated "important" by most of IDC survey respondents, considered the foremost barrier to NT and Pentium Pro adoption, and ranked most important among what users seek in vendor attributes. But cost must be weighed in light of the total value and investment protection a system

Figure 5
NT Versus Other Windows Versions



Source: International Data Corporation, 1996

provides, as well as the pre- and post-sale service and support of its reseller and vendor.

In addition, initial purchase cost is typically a minor portion of a PC's total cost of ownership in a networked environment over its effective lifetime. IDC recently developed a Cost-to-Use (CtU) model to measure "real world" computing costs such as hardware, software, networking, operation staff, application development staff, system development, downtime, and installation. IDC CtU study results indicated that PC hardware and software was only 9% of a system's cost allocation over 5 years of use in an average IT enterprise of 50 users. The remaining 91% of a PC's total CtU was related to staffing costs. Operations staffing alone—including salaries and overhead associated with operations management, user support/ help desk, database administration, and storage/print management—accounting for 62% of the CtU, completely overshadowed all other costs. Application development, system design, installation, and training followed respectively in IDC's PC CtU study results.

The good news is the initial cost of advanced PCs continues to decline significantly as performance, features, and functions are on the rise. PC users are getting more bang for the buck than ever before. As an industry example, consider the advanced desktop offerings in late 1994 vs. late 1996 from AST Computer. AST's high-end Bravo series has dropped in price by more than one-third, from about $4,300 to about $2,850 in estimated street price (see Figure 6).

While AST's prices have declined 34%, its overall performance offering has more than doubled in the new Bravo MS-T Pro. AST's current high-end desktop features a 200 MHz Pentium Pro; 32 MB EDO RAM, 25 GB hard drive; a Matrox 64-bit graphics board; and an 8X CD-ROM. AST's software support on the Bravo MS-T Pro includes pre-loaded Windows NT 4.0; AST-CommandCenter (data and systems utilities like AST-

Figure 6
Price Performance of Advanced Desktop PCs: Yesterday and Today

Timeframe:	**September 1994**	**September 1996**
Product:	**AST Bravo MS Model 733C**	**AST Bravo MS-T Pro 6200 Model 2500C**
CPU:	Pentium 100 MHz	Pentium Pro 200 MHz
Hard Drive:	730 MB IDE hard drive	2.5 GB EIDE hard drive
RAM Memory:	16 MB DRAM	32 MB EDO RAM
Cache Memory:	256 KB asynchronous cache	256 KB synchronous burst mode cache
Graphics Board/ Memory:	Cirrus Logic 5434 2 MB graphic RAM	Matrox Millennium card 2 MB WRAM (up. to 8 MB WRAM)
CD-ROM:	2X CD-ROM	8X CD-ROM
Audio		16-bit Soundblaster, plus headset and microphone
OS Installed:	MS DOS & Win 3.11	Windows NT 4.0
Estimated Street Price: (U.S. Dollars)	$4,314	$2,856

Source: AST Computer

AssetPak and AST VirusShield); and AST-IntraAccess (NETCOM, Netscape Navigator, and HoTMetaL Light).

Perhaps the even better news regarding costs on advanced NT/Pentium Pro systems is that with its superior reliability and security, the true lifetime cost of ownership or CtU is likely lower than less robust PCs. Remember, IDC's survey base ranked NT much higher than other Windows versions in system performance, reliability, and security (refer back to Figure 5).

As operations staffing remain more than 60% of IDC's PC CtU model, the real cost factors of a personal computer are in the things that impact staffing requirements, not initial purchase price. Hence, imperative PC cost factors include such things as reliability (uptime), technical support (user support/help desks), training, and overall system performance—all areas that corporate respondents rated advanced NT systems as superior over other Windows versions.

The NT/Pentium Pro Combination

Rich configurations are the key to NT workstation productivity. In a recent InfoWorld 32-bit application test suite, technology analysts found that memory was the key to optimal NT performance. In general, NT Workstation outpaced Windows 95 in high-memory configurations (32 MB) and offered particularly good performance on Pentium Pro systems, as NT has been optimized for Pro platforms. For example, as shown in Figure 7, in a Pentium Pro 200 with 32 MB RAM, NT's application performance ran roughly 20% faster than Windows 95.

IDC concurs with InfoWorld's bottom line hardware recommendation for NT: Anything less than a Pentium system would be a mistake and the more memory the better. A Pentium Pro with 32 MB of RAM will best optimize NT's capabilities. (Microsoft's "recommended system requirement" for Windows NT Workstation 4.0 is a Pentium processor, 16 MB RAM or more, and at least 110 MB of available hard disk).

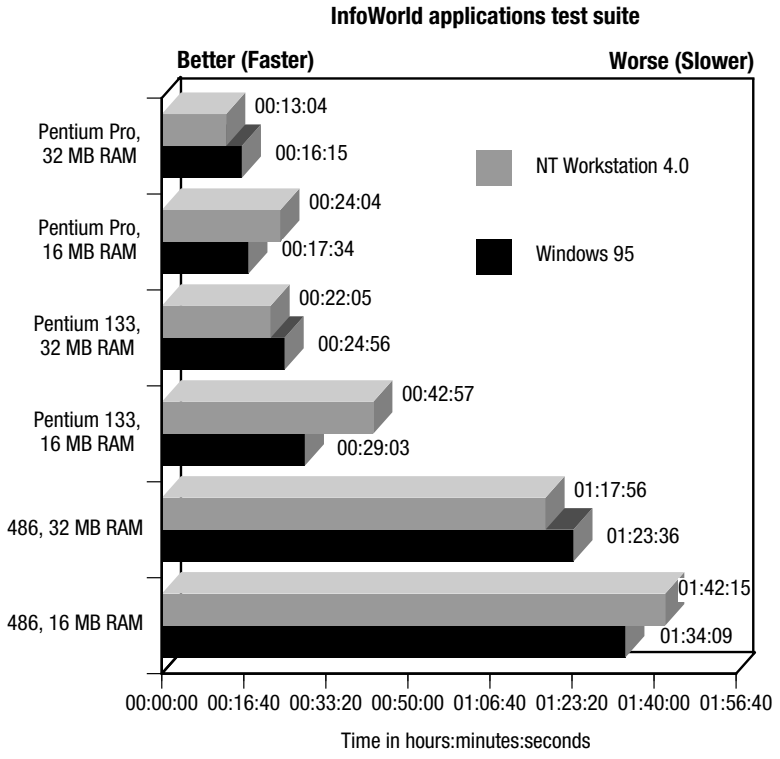
Among those corporations polled by IDC, the Pentium Pro was also the preferred platform to run NT. More than 60% of users surveyed considered the Pentium 133 (21.4%) and Pentium 120 (38.8%) as the "minimum processor performance platform" required to even run NT. Fifty percent of IDC respondents also stated that at least half of all their new PC purchases will be Pentium Pro systems by the end of 1997. Multitasking, robust architecture, true 32-bit architecture and security led the list of most important attributes of Windows NT, according to survey participants (see Figure 8). Users identified performance, speed, and the match of true 32-bit hardware/software as the foremost respective benefits of running Windows NT on Pentium Pro PCs.

Vendors Role—What to Look For

Perhaps the only thing as important as choosing the right advanced PC is choosing the right vendor partner behind it. Pre- and post-sales vendor support and services vary widely to both resellers and end users. About 70% of IDC respon-

Figure 7
Memory the Key to NT Workstation

With 32 MB of RAM, Windows NT Workstation 4.0 beat Windows 95 in all CPU types we tested. On a Pentium Pro system, NT workstation outperformed Windows 95 by 20%. With 16 MB of RAM, however, Windows 95 holds the edge.



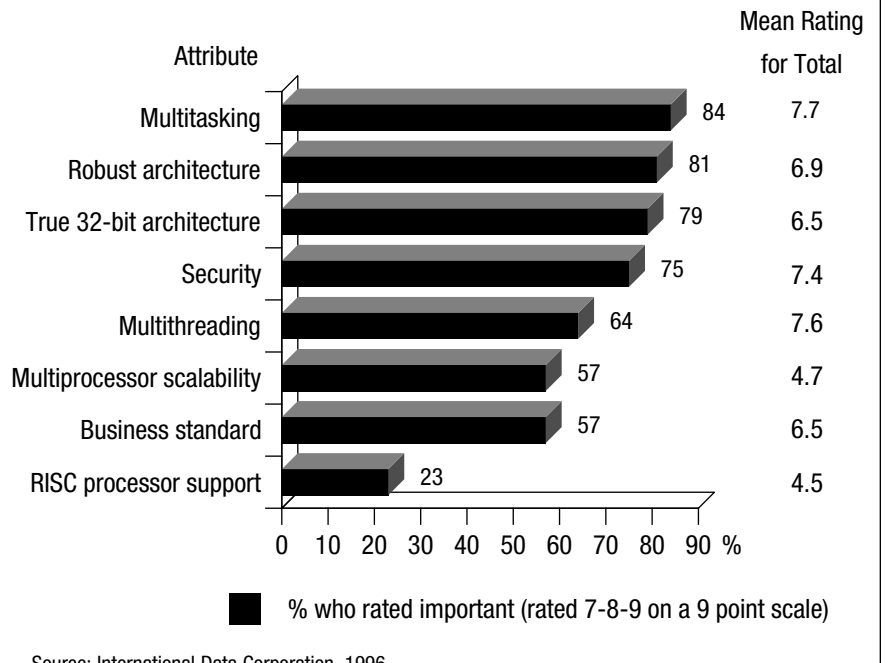
Source: InfoWorld, August 12, 1996, page 99

dents chose cost as the most important vendor attribute (3 top choices were allowed).

Technical support ranked as the second vendor attribute among more than half of those polled. Other distant criteria for selecting a vendor respectively included: current PC vendor, system features, reliability, reseller recommendation, engineering expertise, and availability. IDC recommends users look for PC vendors that push the price performance ratios and offer the most complete total value package. Closely examine what prospective vendors include in:

- Hardware (components, configurations, investment protection);
- Cost-of-ownership (virus protection, data and system management, real-time diagnostics);
- Productivity enhancement (Internet/Intranet);
- Vendor viability;
- Product quality and price/performance.

Figure 8
Importance of Windows NT Attributes



Source: International Data Corporation, 1996

Call to Action

It is a difficult and complex decision as to when and how to upgrade your IT infrastructure. Hesitating can be even more hazardous leading to potential forfeited opportunity costs and lost productivity. As we approach 1997, it is clear that the U.S. corporate migration to NT/Pentium Pro PCs is far beyond initial assessment. As IDC's primary research supports, today larger business enterprises are well into active evaluation and increasingly adoption of NT/Pentium Pro systems. Driving this migration:

- Pentium Pro, introduced more than a year ago, provides a stable platform for and to the future, as well as the speed and performance today's user needs/applications require;
- Windows NT, now in its third release, offers the enterprise a true, robust, multitasking 32-bit solution with reliability, security, and performance superior to Windows 95;
- The latest NT Version 4.0 also features much improved performance, ease of use, built-in Internet/intranet, and better reliability;
- True PC Cost-to-Use factors (more than 90% related to support staffing) favors the reliability, security and overall performance of the NT/Pentium Pro combination;
- The availability of 32-bit applications continues to expand and 32-bit processing is fast becoming the industry desktop standard; and
- Price performance improvements and product selection for NT/Pentium Pros will continue to accelerate in 1997.

With these factors converging and momentum building, IDC predicts that 1998 will be the pivotal cross-over year where: 1) Pentium Pro outstrips Pentium U.S. sales overall; and 2) NT surpasses Win95 among large corporations. America's IT infrastructure has never needed the power and performance of the NT/Pentium Pro system more. Nor has there been a better time to cost justify the additional reliability and security the next generation of 32-bit PC solution offers. Given its total value, performance/productivity benefits, and headroom to grow, now is the time to migrate to the NT/Pentium Pro platform.