CHAPTER 1

The Microsoft Windows Operating System Family

The Microsoft Windows operating system family provides users and developers with a rich set of services that take full advantage of the broad range of available hardware platforms, from small form-factor portable systems to multiprocessor servers. Windows 95 is for users of Intel–based desktop and laptop PCs. Windows NT Workstation and Windows NT Server are advanced operating systems for workstations and network servers, respectively, and support both Intel and reduced instruction set computing (RISC) microprocessors, as well as symmetric multiprocessing (SMP).

The scaleable architecture of the Windows operating system family supports the same user interface, applications, and development tools across an ever-expanding range of hardware. At the same time, the Windows operating systems meet the spectrum of customer requirements, from productivity applications to powerful, secure, mission-critical applications.

Windows 95 and Windows NT Workstation

Because it is not currently possible to have one operating system that fully exploits the broad range of available hardware, the Microsoft Windows operating system family, shown in Figure 1, has two distinct design points: one centered on mainstream systems, and the other centered on leading-edge systems.

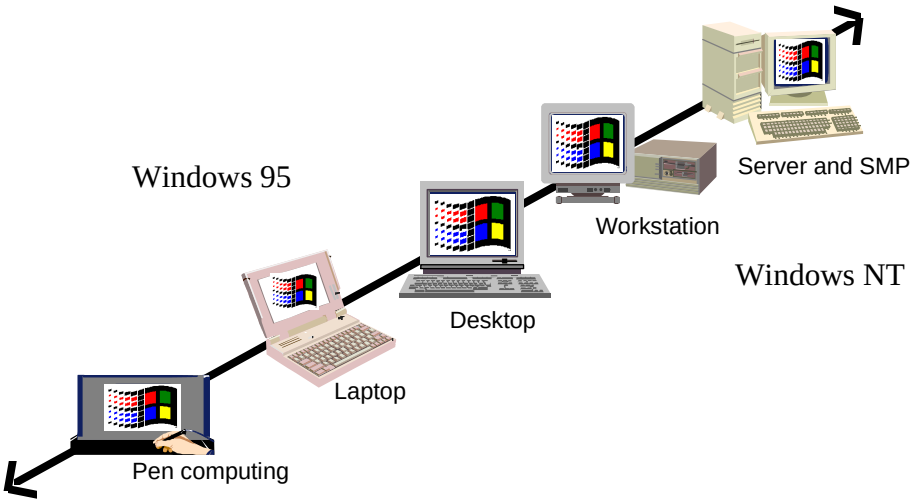

Figure 1. A consistent platform for development, deployment, and training

For mainstream systems (currently represented by products such as subnotebook and entry-level desktop machines), Windows 95 delivers responsive performance for a broad range of applications while conserving the amount of system resources used. Windows 95 is designed for use on Intel–based PCs and supports the Intel 80386DX, 80486, and Pentium processors used in mainstream desktop and portable PCs.

For leading-edge systems, Windows NT fully exploits the capabilities of the hardware and provides the most advanced services for the most demanding applications. Windows NT is designed for use on Intel–based and workstation PCs—for example, a MIPS R4400 or Digital Alpha AXP–based system, a dual-processor workstation, or a multiprocessor RISC server.

Because of the requirements placed on new enterprise solutions, all major operating system developers—including Microsoft, IBM, Sun (and most UNIX vendors), and Novell—have recognized the necessity of moving to a micro-kernel architecture for their leading-edge operating systems. Microsoft made this commitment over five years ago and began shipping Windows NT to developers in July 1992 with general availability in July 1993. This architecture allows vendors to enhance systems to respond to the rapidly changing requirements of evolving business solutions while maintaining the flexibility needed to exploit new hardware and peripherals.

Both Windows 95 and Windows NT Workstation provide a common base of functionality that is required by all customers, including ease of use, power, connectivity and manageability. Microsoft is committed to and will deliver parity in basic functionality (such as the user interface) to each platform as quickly as possible.

The differences between the two platforms are a result of their different design goals. Windows 95 is focused on making computing easier for anyone using a wide range of personal and business applications on desktop and portable computers. To protect their current investment, these users require the highest level of compatibility with today's applications and device drivers. Windows NT Workstation is focused on providing the most powerful desktop operating system for solving complex business needs. For developers; technical/engineering/financial users; and business operations application users, Windows NT Workstation delivers the highest level of performance to support the most demanding business applications. It also provides the highest levels of reliability, protection, and security for critical applications while exploiting the latest hardware

innovations, such as RISC processors and multiprocessor configurations. This focus on solving business needs is also reflected in the emphasis on maintenance and regular system updates.

Over time, as mainstream systems become more powerful, technologies implemented first in the leading-edge Windows operating system will migrate to the mainstream operating system. Sometimes technical innovations will appear first in the mainstream operating system because of timing of releases or because some features improve ease of use for general users. However, the guiding principle for product planning is that the leading-edge operating system will provide a superset of the functionality of the mainstream operating system.

For application developers, Microsoft provides only one Windows programming platform, defined by Win32—the 32-bit Windows application programming interface—and OLE. By following a few simple guidelines, developers can write a single application that runs across the Microsoft Windows operating system family. Optionally, developers can target a specific operating system whose functionality is important to a particular application, but targeting is not a requirement.

Which Operating System?

The decision about which of the Microsoft Windows operating systems to deploy should be based on the tasks to be accomplished. The two operating systems provide a complementary set of capabilities that can accommodate a broad range of usage scenarios.

Windows 95 Usage Scenarios

The following examples illustrate scenarios where Windows 95 is the best choice.

- Most office environments require people to perform a variety of general tasks, such as word processing, database queries, or spreadsheet analyses, using productivity applications, such as the Microsoft Office suite. These people may also be using applications that are specific to their particular business. Their companies have an installed base of personal computers, peripheral devices and applications, and Windows 95 allows them to maximize their investment in that computing infrastructure.
- Many companies have employees who spend a high percentage of their working hours away from the office—for example, at customer sites, in hotels, or out in the field—and rely on personal computers to help them perform their jobs. Windows 95 meets the requirements of these mobile computer users for the same application and device compatibility as their office-based colleagues, but also places lower demands on their hardware, including amount of memory, battery power, and use of disk space.
- Most users of computers in the home find them both challenging and unfriendly. However, they want to be able to take advantage of new capabilities, such as multimedia, and to easily access online information services. Windows 95 is easy for all family members to use, yet has the power to do what they want to do. Built into the operating system are rich multimedia capabilities; the highest levels of compatibility for running MS-DOS–based applications, such as games; and

connectivity to information services, such as the Internet or other online services. In addition, technology such as Plug and Play allow some users to effortlessly add new components, such as printers, modems, and other peripherals, to their systems.

Windows NT Workstation Usage Scenarios

The following examples illustrate scenarios where Windows NT Workstation is the best choice.

- Engineers, scientific researchers, statisticians, and other technical users often need to use processing-intensive applications for data analysis and large design activities. Windows NT Workstation, with its support for SMP and its portability to high-performance platforms, such as those based on Pentium, Alpha, or MIPS CPUs, can provide the performance of a leading-edge workstation or minicomputer at a fraction of the cost. Moreover, with Windows NT Workstation, users can also run personal productivity applications on their systems.
- For industries that need to protect sensitive data or application files, such as banking and defense, Windows NT Workstation provides a secure desktop. The NTFS file system, combined with appropriate security procedures, helps prevent unauthorized access to systems and data, and the security model in Windows NT Workstation is designed to be compliant with C2-level certification. With these features, a single Windows NT system can be shared by multiple users and still maintain security for all files on the system.
- Many companies require high levels of availability and performance and cannot afford downtime, regardless of which application is running. Often these types of systems are being "right-sized" from mini and mainframe systems. For example, many manufacturing companies use 16-bit applications to manage their production lines. With Windows NT Workstation, these Win16–based applications can be run in separate address spaces (often referred to as separate virtual machines). Then even if one application fails, the other applications continue to run. Windows NT Workstation also provides complete protection for 32-bit applications and automatic recovery (reboot, if necessary) if the system goes down.

Evaluating Windows 95

As you compare Windows 95 with other operating system products on the market, including Windows 3.1, you should examine the following areas to help identify the operating system that best meets your needs and the needs of your system's users:

- Ease of use
- Performance
- Compatibility of device and application support
- Support for networking and connectivity
- Support for manageability and administration
- Support for communications and messaging
- Support for mobile services and remote access

In the following sections, we briefly discuss these evaluation criteria. The remaining chapters in this guide show how Windows 95 provides the best desktop operating system for mainstream platforms in each of these areas.

Ease of Use

It is important to look at the ease-of-use aspects of an operating system from the perspectives of both a novice and an experienced user. Novice users include both people who have never used a PC and people who have used one infrequently, often because they find PCs intimidating. Novices might have trouble moving around the user interface and might need more information or coaching—for example, from an online Help system. Experienced users generally interact with more areas of the operating system than novice users, and they demand flexibility, speed, and power.

As you evaluate the ease of use of an operating system, it's helpful to answer these questions:

- Is the operating system easy to learn and use and efficient for the widest range of users?
- Can users discover new features and new, more efficient ways of performing tasks as they become more experienced?
- Does the operating system make it easy for novice users to complete common tasks, such as starting new applications, switching between two or more active applications, or manipulating files?
- Is the operating system flexible enough that experienced users can customize it to reflect the way they interact with the computer?

Performance

The term *system performance* refers to how the operating system performs overall while performing a set of broad tasks—for example, running a group of applications and programs that are normally run simultaneously. The term *performance* also refers to the ability of individual system components or subsystems to perform a more narrow set of tasks—for example, file input/output (I/O) operations.

Several available suites of benchmarks test the ability of operating systems to complete a set of tasks that are designed to mimic real-world use of a particular PC/operating system

combination. These benchmark suites produce numbers that represent the responsiveness of the operating system for a given set of commercially available applications. You can run the same set of applications in your environment and use the benchmark information to determine the relative performance of various operating systems.

However, benchmark suites don't tell the whole story. In addition to running application benchmark suites, you should isolate and separately test various components and subsystems of the operating system to obtain low-level results that indicate how well the operating system can support the services used by applications. Areas commonly isolated and benchmarked on standalone PCs include the performance of the local file system for disk and file I/O, the performance of the graphics subsystem and video display drivers for graphics and text I/O, and the performance of the printing subsystem for printing I/O. In addition, you should test desktop operating systems in networked environments for their ability to support network I/O throughput for the supported network clients, as well as server functionality responsiveness (if supported by the operating system).

All operating systems perform at their best on a PC that has the maximum amount of RAM. However, most users' PCs have less than the maximum amount. You should run performance tests against different hardware configurations, including memory ranges from 4 MB to 16 MB and PCs containing Intel 80386DX, 80486, and Intel Pentium–based CPUs. Because different hardware resources deliver different performance testing results, it's important to test not only on more than one PC configuration, but also on hardware that is currently mainstream in the industry.

As you evaluate the performance of an operating system, it's helpful to answer these questions:

- Does the operating system perform well on a wide variety of hardware and software?
- How well does the operating system complete benchmark tests on a suite of applications on a given hardware platform?
- How well does the operating system complete benchmark tests on individual components and device drivers provided as part of the system?
- Does the operating system perform well as far as network connectivity for supported network clients or provided network server functionality is concerned?

Compatibility of Device and Application Support

When it's time to replace an old operating system, a key question to consider is "Can my company still use its existing hardware and software with the new operating system?" Your company has probably invested a large amount of money in applications, printers, modems, and other PC-related peripheral devices. It's important to find out whether the replacement operating system can run with the existing hardware and software.

It's also important to know how broad a range of devices is supported by the operating system you choose. No doubt, as your company grows, your hardware needs will grow too. Your choice of an operating system should not unreasonably restrict the peripheral devices your company can buy later. The operating system you choose should include ample device drivers, not only to support the devices you currently own, but also those you will buy in the future.

When examining device support of an operating system, consider the number of devices supported, the industry standards that the operating system supports, and compatibility

with existing device drivers shipped with earlier operating systems or with the devices themselves.

As you evaluate the device and application support of an operating system, it's helpful to answer these questions:

- Does the operating system provide broad support for your company's existing hardware and the associated MS-DOS–based and Windows–based device drivers?
- Are devices easily recognized, installed, and configured by the operating system?
- Does the operating system allow you to run your existing MS-DOS–based or Windows–based applications as well as MS-DOS 6.*x* or Windows 3.1?
- Does the operating system allow the easy exchange of information among applications, or does it support advanced interapplication communication mechanisms?
- Does the operating system provide services for new types of applications, such as multimedia, remote access, and communications-related applications?

Support for Networking and Connectivity

In a corporate environment, an operating system must be able to provide network support for a broad base of clients. You should compare each operating system's ability to support connectivity in a heterogeneous environment, as well as how successfully network functionality and other areas of the system, such as the user interface, are integrated in each operating system. Bear in mind that, in general, companies are not looking for the incorporation of proprietary network functionality in an operating system. They want the operating system to support industry-wide standards so that they don't have to rely on a single vendor to support a multivendor environment.

As you evaluate the networking support of an operating system, it's helpful to answer these questions:

- Is the operating system an open, layered networking architecture that lets you mix and match best-of-breed components at every layer?
- Does the operating system have built-in, native support for popular networks?
- Does the operating system natively support a wide range of network transports, such as TCP/IP and IPX/SPX; industry-wide communication protocols, such as RPC, NetBIOS, DCE, and named pipes; and existing network device standards, such as NDIS and ODI?
- Does the operating system provide a simple, consistent user interface for accessing the network and using network resources?
- Does the operating system support an open architecture that allows third-party and network operating system vendors to easily integrate or add network connectivity enhancements or application support?

Support for Manageability and Administration

PCs are now one of the largest expenses of an MIS organization. Medium and large businesses invest tens of thousands of dollars each year, not only on the hardware and

software for new and existing computer systems, but also for setup and administration of these systems. Currently, the available tools for managing and administering PCs in a networked environment have little consistency and almost no integration.

Standards organizations are now working to simplify system administration by developing standard methods for managing PCs. These standards will mean better and more integrated management tools for the network administrator. For an administrator to reap any benefits, however, the operating system must support management mechanisms that adhere to existing standards or its infrastructure must be designed for adaptability to a new standard.

As you evaluate the support for manageability and administration of an operating system, it's helpful to answer the following questions:

- Does the operating system provide the tools and platform infrastructure for supporting management mechanisms that adhere to existing industry standards, such as SNMP, and is it flexible enough to support future standards, such as DMI?
- Does the operating system provide tools and mechanisms for MIS organizations and administrators to customize and control the functionality and capabilities on the desktop?
- Does the operating system provide support for managing desktop PCs remotely over a network?

Support for Communications and Messaging

With the explosive growth of services such as CompuServe, America Online, and the Internet, the increase in demand for an operating system that provides access to online and mail services has been dramatic. The support and services provided by an operating system can open the door to the Information Age, allowing users to discover new communications and messaging possibilities.

As you evaluate the communications and messaging support of an operating system, it's helpful to answer these questions:

- Does the operating system support high-speed communications and background multitasking capabilities?
- Does the operating system provide support for communication hardware; for new communication functionality, such as sharing communication ports; for unified device configuration; and for emerging communications technology?
- Does the operating system provide support for industry-standard messaging services?
- Does the operating system provide broad communication and messaging capabilities, such as faxing, dial-up access to resources, and access to online information services, and consolidated information access?

Support for Mobile Services and Remote Access

To realize seamless mobility, users must be able to easily communicate and remain productive, whether they are in the office, at a customer site, or at home. Users must be able to communicate with coworkers and clients regardless of their location. In addition, transitions from home computer to portable computer to office computer must

not cause interruptions in workflow. Including support for mobility services as part of the operating system ensures tight integration and connectivity between portable computers and desktop PCs, allowing minimal work interruptions as users switch from one location and/or computer to another.

As you evaluate the support for mobile services of an operating system, it's helpful to answer these questions:

- Does the operating system support remote access to the key services or information you need on your corporate network?
- Does the operating system have robust support for the dynamic nature of mobile hardware, such as PCMCIA, power management, and docking stations?