Windows XP in a Nutshell

David Karp
Tim O'Reilly
Troy Mott
Publisher: O'Reilly
First Edition April 2002
ISBN: 0-596-00249-1, 634 pages
This compact and comprehensive book systematically unveils what resolute users of the new Windows XP operating system will find interesting and useful, with little-known details, utility programs, and configuration settings all captured in a consistent reference format.

A hands-on guide, *Windows XP in a Nutshell* cuts through the hype and gives practical details you can use every day. It’s written by David A. Karp, the best-selling author whose no-nonsense “Annoyances” books and web site (Annoyances.org) have helped thousands of users solve problems and improve their experience with Windows®. The co-author is none other than Tim O'Reilly, founder of O’Reilly & Associates, whose books have revolutionized computer book publishing with their commonsense approach and depth of detail.

At the heart of the book is a 200-plus-page reference section titled "Windows XP Applications and Tools," containing:

- Detailed information on most of the commands and utilities available with Windows XP, including Start Menu accessories, command prompt tools, hidden system administration utilities such as the Registry Editor, Microsoft Management Console, and TweakUI.
- A comprehensive "Where to Find It?" section designed to give Windows 9x/Me and Windows NT/2000 users a guide to the XP counterparts to previously familiar features, plus information on installing and upgrading.
- The Task and Setting Index, which provides users with quick access to locations of the hundreds of settings in Windows XP, organized alphabetically.
- A complete reference to the command prompt-- not only covering the basics of the command line and the different ways to use it, but also the advanced commands and scripting features at Windows XP's disposal.

Packed with numerous tips and tricks, while warning of potential pitfalls, *Windows XP in a Nutshell* enables anyone to get the most out of all the resources available in XP.
Windows XP in a Nutshell
by David A. Karp, Tim O'Reilly, Troy Mott

This errata page lists errors outstanding in the most recent printing.

If you have technical questions or error reports, you can send them to booktech@oreilly.com. Please specify the printing date of your copy.

This page was updated July 18, 2002.

Here's a key to the markup:

- [page-number]: serious technical mistake
- {page-number}: minor technical mistake
- : important language/formatting problem
- (page-number): language change or minor formatting problem
- ?page-number?: reader question or request for clarification

Confirmed errors:

(Page 15)
Some of the callouts in Figure 2-4 are wrong. The arrows in the picture for items #6, #7, and #8 should be changed as follows:
6. should point to the gray area between the scrollbar thumb (current #6) and the down arrow (#5)
7. should point to the scrollbar thumb (current #6)
8. should point to the up arrow (current #7)

Page 21
The last sentence in the (5) Grayed-out (inactive) controls paragraph should read: "In the dialog box shown in Figure 2-5, the currently selected screensaver doesn't have any applicable settings, so the Settings button is disabled."

Page 124
Reference to Appendix C should be to Chapter 6.

Page 161
At the end of the first paragraph, "Comp.exe" should be "fc.exe."
Page 207
The word "Several" shouldn't be capitalized.

Page 211
1st paragraph, 1st sentence: "then" should be "than"

Page 249
The text "new values" should not be set apart in a mono-spaced font

Page 290
The "System Properties" section is out of order (alphabetically).

Page 325
"Windows Mesenge" should be "Windows Messenger"

Page 472
Fourth paragraph, first line: "it's" should be "its"

Page 505
In tip #7, "Try something new with My Computer," there's a step missing. In order for this tip to work, you'll also need to navigate to HKEY_CLASSES_ROOT\ CLSID\ {20D04FE0-3AEA-1069-A2D8-08002B30309D}\ shell and change the (default) value to open.

Page 517
The showhello code example should read as follows:

Sub showhello(strMessage, strMessage2)
    Wscript.Echo strMessage & " " & strMessage2
End Sub
showhello "Hello", "World"

Page 527
The code example near the top of the page should read as follows:

'display a popup with yes/no buttons and question mark icon
Set objShell = CreateObject("Wscript.Shell")
intValue = objShell.Popup("Do you wish to continue?",,,36)
'test if the Yes button was selected
If intValue = 6
    'do something
End If

Page 555
The first paragraph on this page discusses the missing My Computer icon on the desktop, but the tip immediately following is wrong. Instead, it should read as follows: "By default, the My Computer icon is not shown on the Windows XP desktop, but it's there if you need it. Go to Control Panel -> Display -> Desktop tab -> Customize Desktop and turn on the My Computer option."

Page 582
Although the alphabetical listing of filename extensions is not intended to include every extension in existence, the following extensions should've been included here:
    .pot  PowerPoint Template
    .pps  PowerPoint Presentation that opens into slide show
    .ppt  PowerPoint Presentation (document)
    .pst  Outlook personal folder file
Windows XP in a Nutshell

Preface
Considerations and Scope
Organization of the Book
We’d Like to Hear from You
Windows XP Resource Links
Acknowledgments

I: The Big Picture

1. The Lay of the Land
   1.1 The Big Picture
   1.2 What’s New in Windows XP
   1.3 Windows XP Home and Professional Editions
   1.4 Windows Update

2. Using Windows XP
   2.1 The Desktop
   2.2 Point and Click Operations
   2.3 Starting Up Applications
   2.4 Styles and Consequences of Styles
   2.5 Windows and Menus
   2.6 Keyboard Accelerators
   2.7 Common Controls
   2.8 Files, Folders, and Disks
   2.9 The Command Line
   2.10 Online Help
   2.11 Shutting Down

II: Alphabetical Reference

3. The User Interface
   Address Bar
   Buttons
   Checkboxes
   Clipboard
   Combo Boxes
   Context Menus
   Control Menus
   Desktop
   Details
   Dialog Boxes
   Drop-Down Listboxes
   File Open/Save Dialogs
   Icons
   Input Fields
   Labels
   Listboxes
   Log Off
   Menus
   My Computer
   My Network Places
   Notification Area
   Progress Indicators
   Properties
   Radio Buttons
Recycle Bin
Run
Scroll Bars
Send To
Shortcuts
Shut Down
Start Menu
Status Bar
System Tray
Tabbed Dialogs
Taskbar
Text Boxes
Title Bars
Toolbars
Tray
Trees
Turn Off Computer
Windows

4. Windows XP Applications and Tools
   4.1 Using the Command Prompt
   4.2 Alphabetical Reference to Windows Components
Accessibility Options
Accessibility Wizard
Activate Windows
Active Connections Utility
Add Hardware Wizard
Add or Remove Programs
Address Book
Administrative Tools
At
Attrib
Backup
Boot Configuration Manager
Cabinet (CAB) Maker
Calculator
Character Map
Chat
Chkdsk
Chkntfs
Clipbook Viewer
Command Prompt
Component Services
Computer Management
Connection Manager Profile Installer
Control Panel
Create Shared Folder
Date and Time Properties
DDE Share
Device Manager
DirectX Management Tool
Disk Cleanup
Disk Defragmenter
DiskPart
Display Properties
Dr. Watson
Driver Verifier Manager
Object Packager
ODBC Data Source Administrator
On-Screen Keyboard
OpenFiles
Outlook Express
Paint
Pentium Bug Checker
Performance Log Manager
Performance Logs and Alerts
Phone and Modem Options
Phone Dialer
Pinball
Ping
Power Options
Printers and Faxes
Private Character Editor
Product Activation
Program Manager
Query Process
Regional and Language Options
Recycle Bin
Registry Console Utility
Registry Editor
Remote Assistance
Remote Copy
Remote Desktop Connection
Route
Rundll32
Run As
Scanners and Cameras
Scheduled Tasks
Scheduled Tasks Console
Security Template Utility
Send a Fax
Services
Shutdown
Signature Verification Tool
Solitaire
Sound Recorder
Sounds and Audio Devices
Speech Properties
Spider Solitaire
SQL Server Client Network Utility
Start Menu
Subst
Synchronization Manager
System Properties
System Configuration Editor
System Configuration Utility
System Information
System Restore
Task Manager
Taskbar and Start Menu Properties
Taskkill
Tasklist
Telnet
Telnet Administrator
Tracert
User Accounts
Utility Manager
Volume Control
Windows Explorer
Windows File Checker
Windows Help System
Windows IP Configuration
Windows Media Player
Windows Messenger
Windows Movie Maker
Windows Picture and Fax Viewer
Windows Script Host
Windows Update
WordPad

5. Task and Setting Index
Accessibility
Address Bar
Administrative Tools
Advanced Power Management (APM)
Animation
Applications
Autocomplete
Autodial
Automatic Windows Update
Background
Br-Ca
CD Drive
Certificates
Cl-Co
Color Profiles
Colors
Com-Con
Control Panel
Cookies
Country
Cr-Da
Desktop
Devices
Dialing
Dig-Dis
Display
Do-Dr
DVD
Ef-Em
Encrypted NTFS Files
En-Ex
Favorites
Fax
Files
Firewall
Folders
Fonts
FTP
Go-Ha
Hard Disk
Windows Explorer

6. The Command Prompt
   6.1 Using the Command Line
   6.2 Command Prompt Choices
   6.3 Wildcards, Pipes, and Redirection
   6.4 Alphabetical Reference to DOS Commands
      cd or chdir
      cls
      copy
      date
      del or erase
      dir
      echo
      exit
      find
      md or mkdir
      more
      move
      prompt
      rd or rmdir
      ren or rename
      set
      sort
      time
      type
      ver
      xcopy
   6.5 MS-DOS Batch Files
      call
      choice
      errorlevel
      for
      goto
      if
      pause
      rem
      shift

III: Advanced Topics

7. Networking
   7.1 Networking Terminology
   7.2 General Procedures

8. The Registry
   8.1 What's in the Registry
   8.2 Adding and Deleting Registry Keys and Values
   8.3 Organization of the Registry
   8.4 Hives
   8.5 Backing Up the Registry
   8.6 Exporting and Importing Registry Data with Patches
   8.7 Ten Cool Things You Can Do in Your Registry

9. The Windows Script Host
Preface

Windows XP is the latest product in a long line of operating systems from Microsoft. Although it's superficially similar to earlier versions of Windows, there's quite a bit new under the hood, and on the surface as well. A consumer-friendly, almost cartoonish interface sits on top of the most complex Windows version yet. A graphical user interface, like the one in Windows XP, is not a substitute for good, thorough documentation. Naturally, colorful icons and animated interface elements make the interface more inviting and help uninitiated users stumble through the basics of opening programs and printing documents. There are only so many hours in the day, though, and spending most of them trying to figure out the new networking system, sorting through the thousands of settings in the Registry, discovering all of the hidden tools, or even learning to be productive with the new Windows Movie Maker, is really not good use of your time.

By taking the undocumented or otherwise hidden features and settings in Windows XP and placing them in context with more conspicuous and familiar components, this book provides the complete picture necessary to truly understand the operating system and what is involved in completing just about any task.

There are many books on Windows XP, but most of them get bogged down with elementary tutorials and the scrappiest tasks most of us could perform in our sleep. That's where this book comes in. Windows XP in a Nutshell provides a condensed but thorough reference to Windows XP, with an organization that helps you get right to the task at hand.

For example, there are literally hundreds of settings and features in Windows XP, scattered throughout dozens of dialog boxes. Some are plainly accessible through the Start menu or in the Control Panel, while others are hidden under layers of application menus. A few aren't apparent at all without knowledge of hidden features. In Chapter 5, all these settings are listed in the same place, sorted alphabetically from A-Z. So, instead of wading through menus and flipping through dialogs looking for a way to stop Windows from disconnecting your dial-up connection to the Internet (or for the setting that affects sounds in web pages) just look in Chapter 5, under "Dialing" and "Sounds," respectively.

Considerations and Scope

Our focus is on user applications, however, not on system or network administration. While we give you a basic understanding of these deeper levels and what's available, specific installation details and detailed configuration information for system and network administrators are largely beyond the scope of the book. There are also settings that depend on decisions made by your network administrator or Internet Service Provider (ISP), especially with networks systems. Whenever possible, we give you the information you need, but there are times when all we can tell you is where to go for additional information.

We have tried to speak universal truths about Windows XP, but sometimes we are forced to make assumptions about your settings or installed options. Microsoft gives so many configuration options that the truth is, for better or worse, that each user's machine represents a slightly different installation of Windows XP. Of all the code and data Microsoft ships on the Windows XP CD-ROM, only about half is used in any particular user's configuration. What we say about Windows XP may or may not be quite true about Windows XP as it's installed on your system.

For example, there's a setting in Control Panel \Folder Options that instructs Windows to open icons with either a double-click or a single-click, according to your preference. While most users tend to prefer the double-click option, and double-
clicking is the default on most systems, your system might be different (it might even be the default, depending on the operating system you had installed previously). Although both setups are clearly defined in Chapter 2, some procedures elsewhere in this book will instruct you to double-click where you may only need to single-click. This "knowledge gap" is an unfortunate consequence of the malleable nature of the Windows operating system.

Consider another oddity in Windows XP: categories in Control Panel. This new addition in Windows XP (discussed further in Chapter 2) splits the components of the Control Panel into distinct categories, rather than simply listing them alphabetically, as in previous versions of Windows. What's more, the Control Panel can be accessed in any of three different ways, (as a menu in the Start menu, as a standalone folder window, or as an entry in the folder tree in Windows Explorer) and the category interface (which can be disabled completely, if desired) is used only in some cases. This means that it's difficult (and laborious) to predict when you'll need to open the "Appearance and Themes" category before you can get to the Display Properties dialog. We've compensated for this ambivalence by enclosing the category name in "maybe" brackets, like this: Control Panel ➔[Appearance and Themes] ➔Display Properties.

Also, for all the statements (from Microsoft and others) that Windows XP is "integrated" and "seamless," the fact is that the system is actually amazingly modular, customizable, and "seamy." This is a good thing. This book shows a lot of different ways to modify Windows XP to suit your needs, a theme that is expanded further in the Annoyances books (O'Reilly & Associates), also by David A. Karp. This almost infinite customizability and modularity of Windows XP means that many of our statements about the product — such as saying that the My Computer window has an icon for Control Panel, or that the Desktop corresponds to the \Documents and Settings\Administrator\Desktop folder, or that Windows XP is faster than Windows Me — may, strictly speaking, be false, or at least serious oversimplifications.

Basically, Windows XP is a platform and set of capabilities, not a single stable product with a fixed set of features. In this book, we give you the information you need to tap into all of Windows XP's capabilities, not just those that are showcased on Microsoft's web site or the Windows Desktop.

**Organization of the Book**

This book is divided into four parts.

**Part I**

This part of the book is designed to give you the lay of the land and to introduce the concepts used throughout the rest of the book. It consists of two chapters: Chapter 1 gives a brief review of Windows XP, what's new in this release, and where it fits into the grand scheme of things. Chapter 2 covers the basics of using Windows, such as starting applications, manipulating files, and getting around the interface. If you're familiar with any modern version of Windows, much of this is probably old hat.

**Part II**

This part of the book contains alphabetically organized references for each major element of Windows XP. Once you're at a given point in the system, what can you do there?
**Chapter 3** is a thorough examination of the elements that make up the Windows XP graphical user interface. In addition to the basics of windows, menus, buttons, listboxes, and scrollbars, you'll learn about the new visual styles in Windows XP, how to make the most of the Taskbar, and how to use any component of Windows with only the keyboard.

**Chapter 4** is the comprehensive reference that covers all the programs that come with Windows XP, those listed in the Start menu and Control Panel, and as those available only if you know where to look. For GUI-based applications, we don't document every menu, button, and dialog box — the GUI is often self-evident. Instead, we focus on nonobvious features and provide helpful hints about power user features and things that will make your life easier. For command-line based programs, we cover every option, since these programs are not as obviously self-documenting (though many do support the conventional /? command-line option for help).

**Chapter 5** is the way to find that elusive setting or feature without having to know ahead of time where Microsoft has decided to hide it away. Every option in every dialog box, as well as many common tasks, are presented in a single, straightforward reference. Options that affect how Windows plays sounds, for example, are scattered in a half-dozen different dialogs; here, they're all under "S."

**Chapter 6** provides complete documentation on this often overlooked and underestimated part of the operating system. In addition to learning the ins and outs of the Command Prompt application, you can look up any command and find exactly what options it supports. Batch files, a quick and easy way to automate repetitive tasks, are also covered.

**Part III**

This part, encompassing the final three chapters, covers the more advanced topics in Windows XP:

**Chapter 7** is your one-stop shop for setting up home networking, connecting to the Internet, and everything in between. Furthermore, security is a genuine concern for home users and businesses alike, and is covered throughout the chapter as well.

**Chapter 8** describes the organization of the Windows XP Registry, the central configuration database upon which Windows and all of your applications rely to function and remember your settings. The Registry Editor, the primary interface to the Registry, is covered here, along with some of the more interesting entries scattered throughout this massive database.

**Chapter 9** describes the Windows Script Host (WSH), the built-in scripting subsystem that is surprisingly flexible and powerful. Use the scripting language of your choice to automate common tasks and access features not available elsewhere.

**Part IV**

This section includes various quick reference lists.

**Appendix A** covers everyone's least-favorite activity. In addition to documenting the various installers and options, the chapter includes a number of pitfalls and solutions that will apply to nearly every installation.

**Appendix B** presents some of the factors you should take into consideration before you upgrade to Windows XP, as well as some of the adjustments you'll need to make after you take the plunge. Among other things, you'll learn how to make Windows XP look and feel more like previous versions of Windows by turning off some of the most annoying bells and whistles.

**Appendix C** gives a list of keyboard accelerators (also known as hotkeys or keyboard shortcuts) used in all parts of the Windows interface.
Appendix D covers the add-on suite of tools Microsoft has provided for "power users" of Windows XP. TweakUI is easily the most important tool in the bunch. It provides many features and settings that should have been included in the operating system in the first place.

Appendix E explains how to type the symbols and international characters normally only accessible with Character Map (discussed in Chapter 4).

Appendix F lists many file types and their descriptions. This appendix is useful when you’re trying to figure out how to open a specific file and all you know is the filename extension.

Appendix G lists the background services that come with Windows XP and their respective filenames. If you need to find a service, or simply need to determine the purpose of a particular program shown to be running in the Windows Task Manager (see Chapter 4), this appendix will provide the answer.

Conventions Used in This Book

The following typographical conventions are used in this book:

**Constant width**

is used to indicate anything typed, as well as command-line computer output and code examples.

**Constant-width bold**

is used to indicate user input in code.

**Constant-width italic**

is used to indicate variables in examples and so-called "replaceable" text. For instance, to open a document in Notepad from the command line, you’d type `notepad filename`, where `filename` is the full path and name of the document you wish to open.

**Square Brackets**

Square brackets around an option (usually a command-line parameter) means that the parameter is optional. Include or omit the option, as needed. Parameters not shown in square brackets are typically mandatory. See Section P.2.6, which follows, for another use of square brackets in this book.

**Italic**

is used to introduce new terms and to indicate URLs, variables in text, user-defined files and directories, commands, file extensions, filenames, directory or folder names, and UNC pathnames.

The following symbols are used in this book:

This symbol indicates a tip.

This symbol indicates a warning.

Path Notation

Rather than using procedural steps to tell you how to reach a given Windows XP user interface element or application, we use a shorthand path notation. For example, we don’t say, "Click on the Start menu, then click on Search, then For Files or Folders, and then type a filename in the Named: field." We simply say: Start ➔ Find ➔ Files or Folders ➔ Named. We generally don’t distinguish between menus, dialog boxes, buttons, checkboxes, etc., unless it’s not clear from the context. Just look for a GUI element whose label matches an element in the path.
The path notation is relative to the Desktop or some other well-known location. For example, the following path:
Start ➞ Programs ➞ Accessories ➞ Calculator
means "Open the Start menu (on the Desktop), then choose Programs, then choose Accessories, and then click Calculator." But rather than saying:
Start ➞ Settings ➞ Control Panel ➞ Add or Remove Programs
we just say:
Control Panel ➞ Add or Remove Programs
since Control Panel is a "well-known location" and the path can therefore be made less cumbersome. As stated earlier in this preface, the elements of the Control Panel may or may not be divided into categories, depending on context and a setting on your computer. Thus, rather than a cumbersome explanation of this unfortunate design every time the Control Panel comes up, the following notation is used:
Control Panel ➞ [Performance and Maintenance] ➞ Scheduled Tasks
where the category, "Performance and Maintenance," in this case, is shown in square brackets, implying that you may or may not encounter this step.
Paths will typically consist of clickable user interface elements, but they sometimes include text typed in from the keyboard (shown in constant-width text):
Start ➞ Run ➞ telnet
or:
Ctrl-Alt-Del ➞ Shut Down
There is often more than one way to reach a given location in the user interface. We often list multiple paths to reach the same location, even though some are longer than others, because it can be helpful to see how multiple paths lead to the same destination.
The following well-known locations are used as starting points for user interface paths:

- **Control Panel**
- **Start** ➞ Control Panel (if you're using the new Windows XP Start menu)
- **Start** ➞ Settings ➞ Control Panel (if you're using the classic Start menu)
- **Explorer**
  - The two-pane folder view, commonly referred to as "Explorer:" Start ➞ Programs ➞ Accessories ➞ System Tools ➞ Windows Explorer
- **My Computer**
  - The My Computer icon on the Desktop (which may or may not be visible)
- **My Network Places**
  - The My Network Places icon on the Desktop (which may or may not be visible)
- **Recycle Bin**
  - The Recycle Bin icon on the Desktop
- **Start**
  - The Start button on the Taskbar
- **xxxx menu**
  - Menu xxxx in the application currently being discussed (e.g., File or Edit)

**Command-Line Syntax**

Further conventions used for representing command-line options and arguments are described in the introduction to Chapter 7.

**Windows XP Resource Links**

There is a web site for this book, which lists errata, examples, or any additional information. You can access this page at:
http://www.oreilly.com/catalog/winxpnut/
or view David A. Karp's Windows resource on the Web at:
http://www.annoyances.org/

Acknowledgments

This is the third In a Nutshell book covering a version of Microsoft Windows. Although this book has evolved substantially from its progenitors, Windows 95 in a Nutshell and Windows 98 in a Nutshell (as Windows itself has evolved), its existence is due to the hard work of those who worked on those earlier volumes. Tim O'Reilly developed the original concept for the book; he and Troy Mott were the principal authors of the first edition. Andrew Schulman was also instrumental in helping get the first edition of this book off the ground, and it was he who insisted on the importance of the command line. Walter Glenn was a major contributor to the second edition. Thanks to John Fronckowiak, Stein Borge, and Ron Petrusha for their efforts, which formed the basis of the Windows Script Host chapter. This new edition was developed by David Karp and incorporates some material from his bestselling Windows Annoyances series. Tim O'Reilly was the editor of this new edition. He had help from Bob Herbtsman and Maeve O'Meara, who managed the day to day details of the project, and in Maeve's case, entered hundreds of last minute edits.

We are also indebted to the generosity of hundreds of Windows users who've shared tips, insights, and detailed documentation on particular aspects of the system they've uncovered, either through their own web sites, posts to the Annoyances.org discussion forums, or emails at 2:30 in the morning. We refer to some of these sites in the book, but many others have contributed to our understanding of Windows, taught us useful tips, or corrected our assumptions. David adds: This book was a big job, much more so than I anticipated. But it was an important book for me to write, giving me a new perspective and appreciation for the attention and focus required to document such a complex and confusing product as Windows XP. I'd like to thank my friends and family, not only for keeping me grounded with their incessant computer questions as they were discovering Windows XP in their own highly individual and bizarre ways, but for distracting me when I needed it most with movies, food, cards, fresh air, Wei Qi, skiing, and of course, the Simpsons. D'oh!
Part I: The Big Picture

Chapter 1. The Lay of the Land

In many ways, Windows XP is a bit of an anachronism. On one hand, it is technically only an incremental upgrade to Windows 2000, released only a year earlier. On the other hand, it is the first consumer-level operating system based on a powerful and robust platform previously available only to advanced users and network administrators.

Windows XP is easily the most technically sophisticated operating system Microsoft has ever released, but it is adorned with an almost cartoonish interface. It has an advanced, scalable networking system built in, but networking is easier to set up in Windows XP than in any other release. It has the heftiest system requirements of any Windows to date, but given the same hardware, it ends up outperforming its predecessors in almost every way. It also has more superfluous bells and whistles than any other OS, but will likely be the OS of choice for most power users for several years to come.

There's more to understanding Windows XP than simply knowing how to open applications and manage your files effectively. In this chapter, we'll cover what's new in this release and how Windows XP fits into the big picture. Move on to Chapter 2 and Chapter 3 for some of the more basic aspects of day-to-day use of the operating system, or skip ahead to the later chapters for more of the meatier content.

1.1 The Big Picture

The first few releases of Microsoft Windows in the early 1980s were little more than clunky graphical application launchers that ran on top of the Disk Operating System (DOS) (see Chapter 6 for details). Version 3.x, released in the late 1980's, gained popularity due to its improved interface (awful by today's standards, though) and ability to access all of a computer's memory. Being based on DOS, however, it was not terribly stable, crashed frequently, and had very limited support for networking and no support for multiple user accounts.

Soon thereafter, Windows NT 3.0 ("NT" for New Technology) was released. Although it shared the same interface as Windows 3.0, it was based on a more robust and secure kernel, the underlying code upon which the interface and all of the applications run. Among other things, it didn't rely on DOS and was capable of running 32-bit applications (Windows 3.0 could only run more feeble 16-bit applications). Unfortunately, it was a white elephant of sorts, enjoying limited commercial appeal due to its stiff hardware requirements and scant industry support.

In 1995, Microsoft released Windows 95. Although based on DOS like Windows 3.x (it was known internally as Windows 4.0), it was a 32-bit operating system with a new interface. It was the first step in migrating the enhanced capability of the Windows NT architecture to the more commercially accepted, albeit less capable, DOS-based Windows line. Soon thereafter, Windows NT 4.0 was released, which brought the new Windows 95-style interface to the NT line. Both of these grand