Windows XP Technical Overview

Microsoft Corporation
Published: May 2001

Abstract

This paper provides a technical overview of what's new in the Microsoft® Windows® XP operating system. It shows how new technologies and features make it easier to get work done, share information, manage your desktop, stay productive while traveling with a mobile computer, obtain help and support, and perform many other computing tasks. Because this paper is an overview, it does not address any area in detail but provides a broad look at the many new technologies and features in Windows XP.

Microsoft Corporation • One Microsoft Way • Redmond, WA 98052-6399 • USA

Contents

Introduction

Windows XP is the next version of Microsoft Windows beyond Windows 2000 and Windows Millennium. Windows XP brings the convergence of Windows operating systems by integrating the strengths of Windows 2000—standards-based security, manageability and reliability with the best features of Windows 98 and Windows Me—Plug and Play, easy-to-use user interface, and innovative support services to create the best Windows yet.

This paper provides a broad technical overview of what's new in Windows XP. It shows how new technologies and features make it easier to get work done, share information, manage your desktop, stay productive while traveling with a mobile computer, obtain help and support, and perform many other computing tasks.

Windows XP is built on an enhanced Windows 2000 code base, with different versions aimed at home users and business users: Windows XP Home Edition and Windows XP Professional. Unless otherwise noted, this paper addresses technologies and features common to both versions of the operating system.

Intelligent User Interface

While maintaining the core of Windows 2000, Windows XP features a fresh new visual design. Common tasks have been consolidated, and simplified, and new visual cues have been added to help you navigate your computer more easily. This section introduces the innovations in the user interface that make it easier to use your computer at work or at home.

Fast User Switching for Multiple Users of a Computer

Designed for the home, Fast User Switching lets everyone use a single computer as if it were their own. There is no need to log someone else off and have to decide whether to save another user's files. Instead Windows XP takes advantage of Terminal Services technology and runs each user session as a unique Terminal Services session, enabling each user's data to be entirely separated. (The additional memory overhead for each session is approximately 2 megabytes (MB) of RAM; however, this size does not account for any applications that may be running in the sessions. In order to run reliable multi-user sessions, a total of at least 128 MB of RAM is recommended.)

Enabled by default if you're using Windows XP Home Edition, Fast User Switching is also available on Windows XP Professional if you install it on a stand alone or workgroup-connected computer. If you join a domain with a computer running Windows XP Professional, you will not be able to use Fast User Switching.

Fast user switching makes it easier for families to share a single computer. For example, if a mother uses the computer to work on finances and has to leave for a short period of time, her son can switch to his own account and play a game. The financial application is left running and open in the mother's account. All of this is done without logging off. Switching users is easy with the new Welcome screen easily customizable with pictures for each user who logs on to the computer, as shown in Figure 1 below.

Figure 1. Welcome Screen in Windows XP

New Visual Style

Windows XP has new visual styles and themes that use sharp 24-bit color icons and unique colors that can be easily related to specific tasks. For example, green represents tasks that enable you do something or go somewhere, such as the Start menu.

Redesigned Start Menu

The Start menu was designed to adapt to the way you work. Your five favorite programs display first, and your default e-mail and Web browser are always available, as shown in Figure 2 below. It groups your most frequently used files and applications together for quick and easy access. One click also gets you to Help and Support, and tools to configure your system. In addition, you can further customize the Start menu to suit your needs.

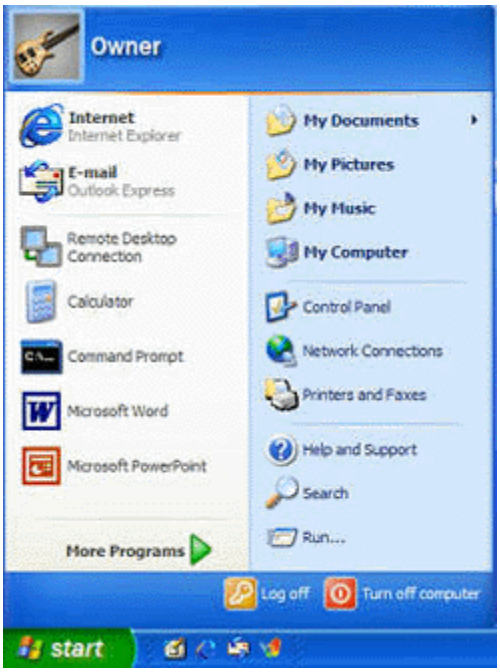

Figure 2. Windows XP provides a redesigned Start menu that groups frequently used applications

Search Companion

Windows XP makes it easier to search by grouping search related tasks into a Search Companion as shown in Figure 3 below.

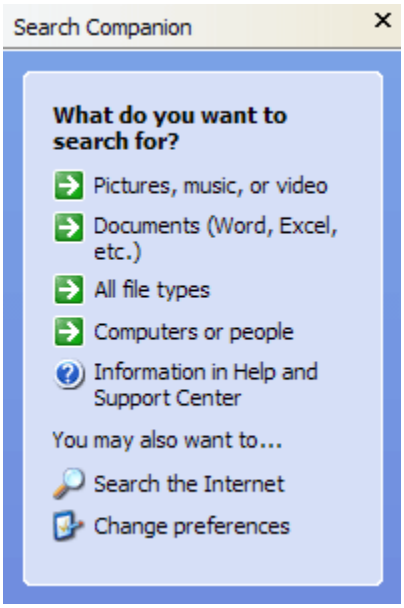

Figure 3. Searching is made easier with the Search Companion

My Documents

Windows XP makes it easy to keep track of your files by letting you arrange them in various groups. You can view your documents by type as shown in Figure 4 below. You can also group files according to the last time you modified them such as today, yesterday, last week, two months ago, earlier this year, or last year.

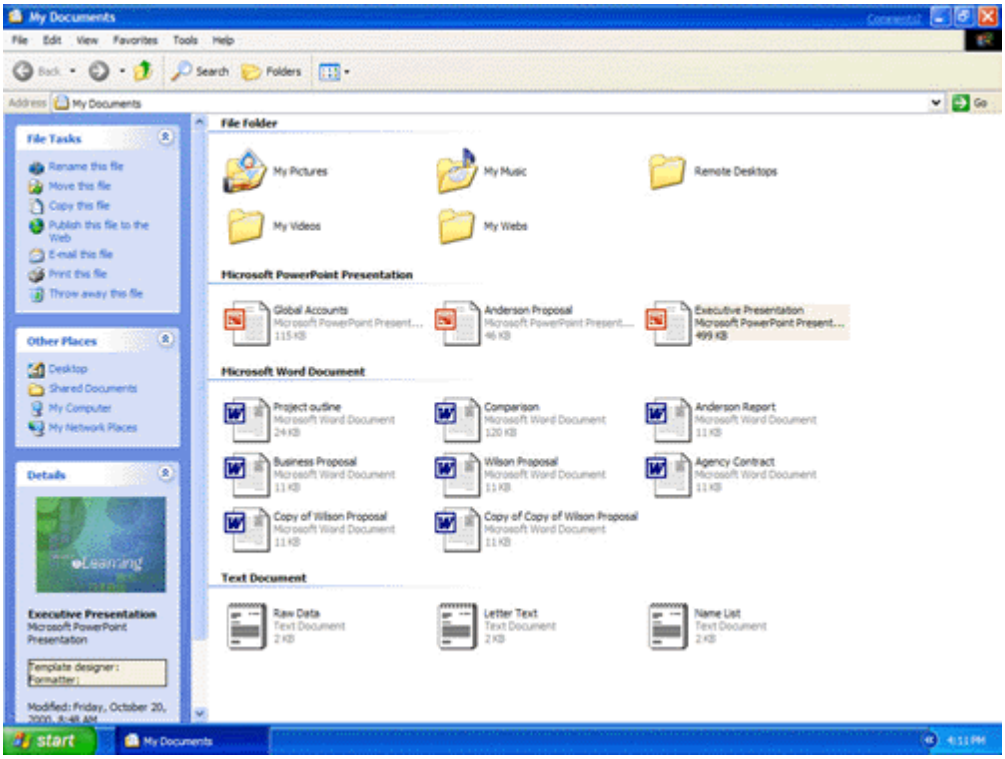

Figure 4. Windows XP can arrange files in groups

Webview

Windows XP uses Webview technology helping you better manage files and the file namespace. For example, if you select a file or folder, you see a list of options allowing you to rename, move, copy, e-mail, remove it, or publish to the Web. This functionality is similar to what you see in Windows 2000 if you right-click on a file or folder; Windows XP takes this information and brings it into view directly on the desktop, as shown in Figure 5 below.

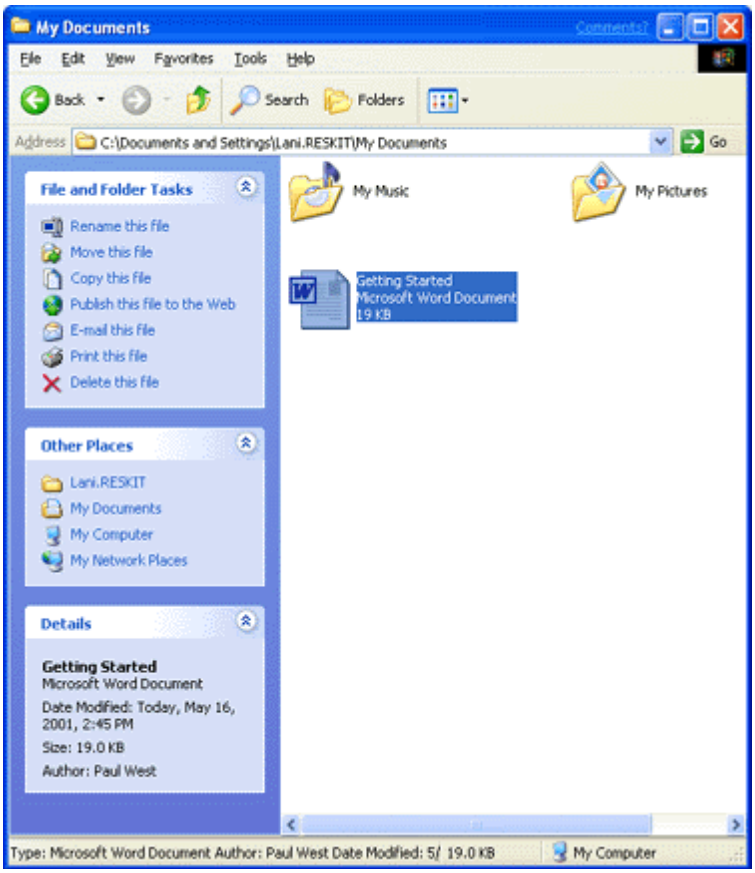

Figure 5. Webview provides easy access to tasks.

File grouping

Windows XP introduces an easier-to-manage taskbar by grouping multiple instances of the same application. For example, instead of having nine instances of a Microsoft Word file each arranged horizontally on the taskbar, Windows XP groups them together on one taskbar button. In this scenario, you see only one taskbar button, showing the number of files that are open for the application. Clicking the button shows the vertical list of all file names, as shown in Figure 6 below. In addition, the files can all be cascaded, tiled, or minimized at the same time.

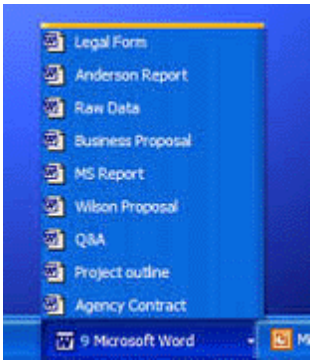

Figure 6. Windows XP groups applications together on the taskbar

User Interface Enhances Productivity

The new user interface takes the Windows operating system to a new level of usability, enabling you to complete tasks more easily and faster than ever before. The rest of this paper highlights new technologies in Windows XP.

Comprehensive Digital Media Support

This section introduces technical enhancements in Windows Media™ Player 8 and briefly describes new capabilities for digital image processing.

Windows Media Player 8

Windows XP features Windows Media Player 8, which brings together common digital media activities including CD and DVD playback, jukebox management and recording, audio CD creation, Internet radio playback, and media transfer to portable devices.

Windows Media Player 8 includes new features such as DVD video playback with rich media information and full screen controls, CD-to-PC music copying and automatic conversion of MP3 files. Windows Media Audio 8 provides nearly three times the music storage of MP3 with faster audio CD burning and intelligent media tracking for more control over digital media. Within Windows XP, the new “My Music” folder makes common music tasks easier to perform.

In addition, Windows Media Player 8 includes the following:

- **Ability to lock down Windows Media Player features in a managed network.** Windows Media Player has a standard corporate skin that can be deployed in a network. If the Active Directory® service is enabled, administrators can specify a corporate skin, restrict playback formats and codecs, and specify other customizations on a per-group or per-user basis. (This requires client computers to run Windows XP Professional.)
- **Digital broadcast support.** Supports analog and digital TV (including HDTV). This includes signal demodulation, tuning, software de-multiplexing, and guide store. In addition you can enable IP data broadcasting such as extract streams from a digital TV signal.
- **Accelerated video rendering.** Standardized MPEG-2 video acceleration provides smoother and faster playback using a subset of DirectX® APIs.
- **Video mixing renderer.** This supports alpha blending letting you phase in multiple videos, overlay them, or integrate close captioning of text. Video is treated as a texture and can take advantage of 3-D graphics. For example, you could overlay videos on each side of a cube as it rotates.
- **Expanded support for more audio cards and their features.** For example, card manufacturers can provide support for Dolby Digital.

Windows Movie Maker

Windows Movie Maker version 1.1 provides base-level features for Windows Media capture and file creation, simple editing of video and audio, and the saving and publishing of Windows Media files. Although the utility produces output only in the Windows Media format, it will import all file formats and compression types supported by the DirectShow architecture.

If your computer does not contain any video capture hardware, all other non-video capture-related features of the application are fully functional and they allow for the importing and editing of media assets that exist on your computer.

Windows Movie Maker has many practical uses. If you want to archive your home video library collection onto the hard drive of a PC, you can record, edit, organize, and share the home video library from a PC. You could also share the home video with family and friends via e-mail or over the Web. If you want to make a video slide show, you can combine still images and publish into a Windows Media format.

Digital Photo Support

Windows XP makes it easier to use digital devices and provides many options to manipulate images such as publishing pictures to the Web, e-mailing photos (with an option of compressing them for you for smaller file size), displaying pictures in an automatic slideshow, and allowing you to zoom in on images.

Greater Application and Device Compatibility

This section shows how Windows XP makes it easier to install and operate devices and outlines some of the newer hardware technologies supported by the operating system. It also discusses how advances in application compatibility ensure that most applications will run on the new operating system.

Device and hardware support has been improved in many ways for Windows XP, underlining the support for greater system stability and device compatibility. Like Windows 2000 before it, Windows XP simplifies the process of installing, configuring, and managing computer hardware. Windows XP includes Plug and Play support for hundreds of devices not covered by Windows 2000, and enhanced support for Universal Serial Bus (USB), IEEE 1394, Peripheral Component Interface (PCI), and other buses.

Plug and Play—the way the operating system detects hardware and installs drivers for it—has been improved in Windows XP, resulting in better usability and performance, especially when installing devices. And while the driver model is largely unchanged from Windows 2000, Windows XP draws from the Windows Millennium driver model to add Windows Image Acquisition (WIA), a rich interface that facilitates image acquisition from still image and serial devices such as scanners and digital cameras built on the small computer system interface (SCSI), IEEE 1394, and USB standards. WIA replaces TWAIN at the application services layer to provide better communication between applications and devices.

Improving Device Installation

Several new features of the operating system are designed to make it easier to install and work with devices, including:

- **AutoPlay**. This enables you simply to connect a new device or insert media, and start using it right away. When Windows detects the connection of new devices or media—such as flash cards, Zip disks, and CDs—it determines the content, such as pictures, music, or video, and automatically starts the appropriate application. AutoPlay is configured in the Properties dialog box for the media device, as shown in Figure 7 below.

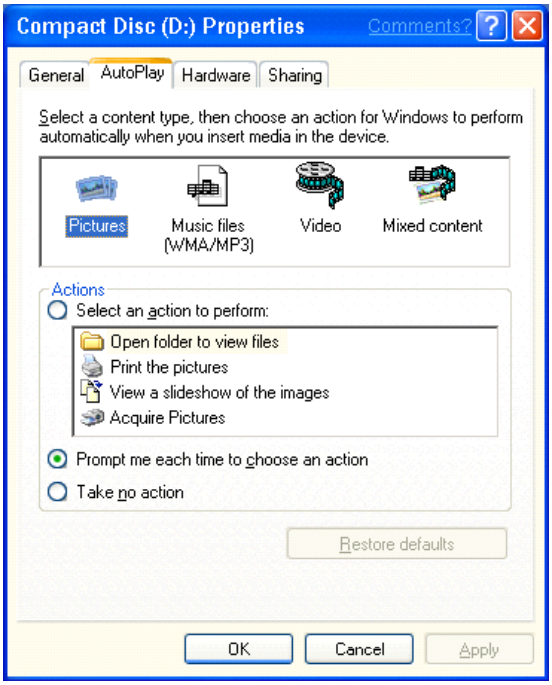

Figure 7. Configuring Autoplay

- **Windows XP Uninstall**. This provides an added safeguard if you upgrade from Windows 98 or Windows Me and you find that important devices or applications that worked under the previous operating system do not work as expected under Windows XP. This option is not available for those who upgrade from the Windows NT® Workstation 4.0 or Windows 2000 Professional operating systems.

Supporting New Hardware Technologies

Windows XP also supports many new hardware technologies including:

- Expanded PS/2 and USB interface keyboards, which have additional keys for multimedia functions, Web browsing, power management, and/or other functions.
- New audio/visual (A/V) devices using the IEEE 1394 interface such as digital VHS recorders.
- New USB array microphones (of the type used in conferencing applications and Internet telephony) that mix audio streams through kernel-mode Global Effects (GFX).
- Wireless networking devices, in particular two adapters from Sierra: the AirCard 300, which enables 19.2 kilobit per second (kbps) Internet connections wherever digital cell phone service is available; and the AirCard 400, which enables 128 kbps connections in cities served by the new Ricochet network.
- Support for high resolution monitors built to display up to 200 dots per inch (dpi).
- The Intel Itanium 64-bit processor, for which Microsoft has developed the 64-bit version of Windows XP. For more information see 64-bit support below.

Windows XP also includes enhanced support for:

- USB microphones, which benefit from Acoustic Echo Cancellation (AEC), a signal processing feature that reduces feedback, echo and other ambient noise from an input channel.
- Multifunction devices, such as scanner-fax-printer combinations, which benefit from greater driver coverage and simplified driver installation.
- Still-image devices that conform to WIA architecture.
- High-density storage devices and media (DVDs and CDs).

Native Support for DVDs and CDs

Recent advances in storage technology have made it easier and more affordable to work with CDs and DVDs. Windows XP introduces native support for reading and writing to DVD-RAM drives, and can read the soon-to-be-adopted Universal Disk Format (UDF) 2.01, the common standard for DVD media, including DVD-ROM discs and DVD videos. (In contrast, Windows 2000 can only read UDF 1.02– and 1.5–compatible disks).

Further, by means of the image mastering API (IMAPI), Windows XP allows you to master CDs in the CD-R or CD-RW formats, using simple drag-and-drop functionality and wizard-facilitated processes.

When you save or copy a file to CD, the operating system first pre-masters the complete image on your hard drive, and then streams the data to your CD burner for recording. Pre-mastering effectively minimizes the buffer underruns that generate errors in the recording process and render media useless (an all-too-frequent occurrence when recording “on the fly”).

Application Compatibility

As Windows XP represents the convergence of the consumer line of Microsoft operating systems (Windows 95, Windows 98, and Windows Millennium) and the business line of Microsoft operating systems (Windows NT, Windows 2000), the new operating system offers extensive compatibility with third-party applications for both home and business users. Windows XP will be compatible with almost all of the top 1,000 applications that ran under Windows 9*x*, and almost every application that ran under Windows 2000, with the exception of anti-virus programs, system utilities, and backup applications (for which in most cases updates will be available from their manufacturers when Windows XP is released). For the various specialized applications not tested by Microsoft in the development of Windows XP, Microsoft will offer an Application Compatibility Toolkit through the MSDN® developer program, which will help developers make their applications Windows XP–compatible.

Application fixes included in Windows XP help resolve application compatibility problems, such as those that occur when applications incorrectly detect the operating system version or when they reference memory after it has been freed. Fixes are invoked automatically by the operating system to make otherwise incompatible applications function; no user intervention is required.

In addition, as new applications appear or new fixes become available, application updates can be downloaded automatically from the Windows Update Web site using the Automatic Updates feature (introduced with Windows Millennium).

Application Compatibility Mode

For applications originally designed for earlier versions of Windows that do not work on Windows XP, you can take advantage of an application compatibility mode as shown in Figure 8. below. This works by emulating the environment of an earlier OS dating back to Windows 95.

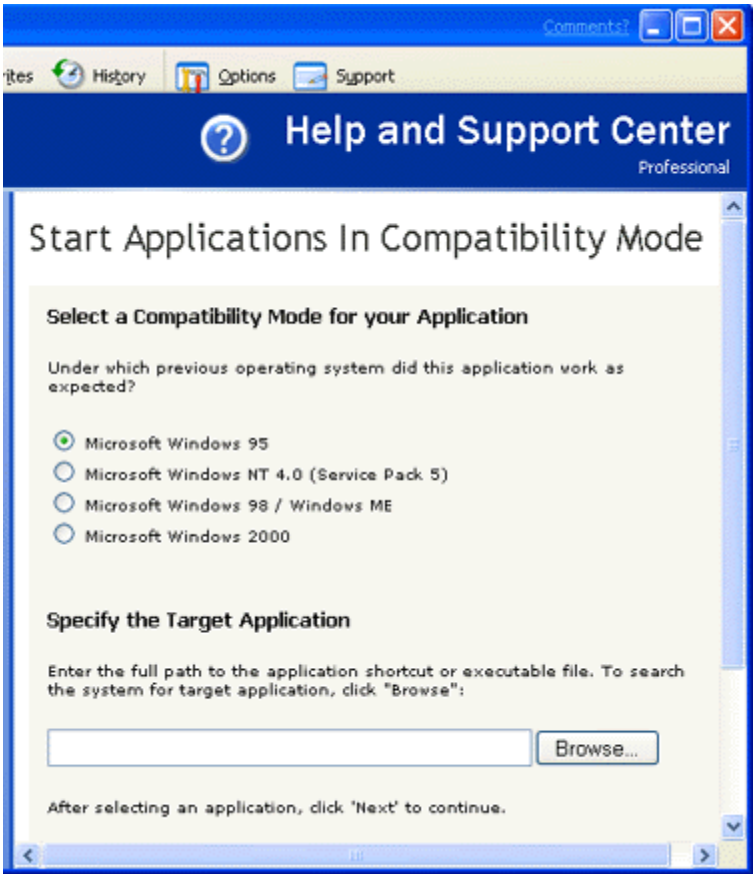

Figure 8. Windows XP can simulate conditions of earlier operating systems.

COM and Shared DLL Isolation Support

Windows XP has a new folder under Windows called “WinSxS” (Windows Side-by-Side). This area is used to store versions of Windows XP components that are built to reduce configuration problems with Dynamic Link Libraries (DLL) (DLL hell). Multiple versions of components are stored in this folder. Windows XP allows Win32® API components and applications to use the exact version of Microsoft components with which they are tested and not be impacted by other application or operating system updates. It does this by relying on XML files that contain metadata about application configuration such as COM classes, interfaces, and type libraries.

Enhanced File and Print Services

This section introduces file and print features in Windows XP.

WebDAV—Working with Data on the Internet

Windows XP enables lets you publish documents on Internet servers and update them later. This is done using WebDAV (Web Digital Authoring & Versioning) technology—a standard Internet file access protocol that travels via HTTP over existing Internet infrastructure (firewalls, routers, and so on.). Windows XP includes a WebDAV redirector which means you can access servers on the Internet just as you would a file share or server share at home or at work.

While traditional file sharing protocols are limited in their ability to provide you with access to your data in every location, WebDAV uses Internet protocols that enable access to data repositories anywhere on the Internet. WebDAV lets you get to your data from wherever you are while using standard software applications.

For example, if you wanted to share a file with a colleague located at another location, you could use WebDAV over the Internet to collaborate on the same file; or maybe you're an ISP and you want to host storage for customers that they can access directly using their own applications, then WebDAV is your solution. In general, you can use the WebDAV redirector to publish your own Web data, or to use Internet repositories for storing data and sharing information.

Encrypting the Offline Files Database

You now have the option to encrypt the Offline Files database—also known as the Client-side Cache (CSC). This is an improvement over Windows 2000 where the cached files could not be encrypted. Windows XP offers you the option of encrypting the Offline Files database to safeguard all locally-cached documents from theft while at the same time providing additional security to your locally cached data.

For example, you can use offline files while keeping your sensitive data secure. And if you're an IT administrator you can use this feature to safeguard all locally-cached documents from theft. CSC is an excellent safeguard if your notebook computer gets stolen with confidential data saved in the offline files cache.

This feature supports the encryption and decryption of the entire offline database. Administrative privileges are required to configure how the offline files will be encrypted. To encrypt offline files go to Folder Options under Tools in My Computer and check "Encrypt offline files to secure data" under the Offline Files tab.

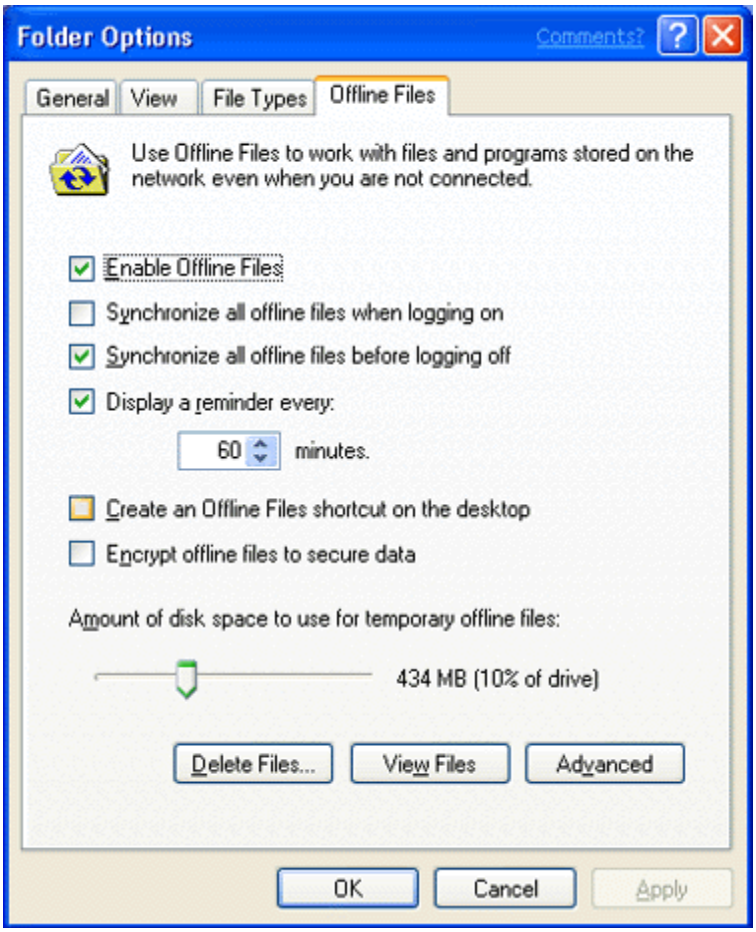

Figure 9. Configuring Offline Files

FAT32 on DVD-RAM

This feature enables recognition, mounting, and formatting of 32-bit File Allocation Table (FAT32) volumes on Digital Video Disk-Random Access Memory (DVD-RAM) disks in super-floppy format.

You can use a DVD-RAM disk with a FAT32 format and Windows XP will recognize, mount and format your FAT32 volumes on DVD-RAM disks in super-floppy format; that is, the disk volume has no partition table. You can use a DVD-RAM disk with FAT32 formatting with any common removable media drive; (for example: magneto-optic and Jazz). FAT32 formatting also provides built-in, reliable support for DVD-RAM media, and allows these devices to plug into Windows XP and 'just work'.

Printer Access With NetCrawler

Print Access with NetCrawler enables NetCrawler to find and automatically install and connect to all of the shared printers that it finds on a home or business network. The NetCrawler enables users who are unfamiliar

with networking to have easy, automatically configured access to the computers and devices in a workgroup. It does this by searching out and providing links to network resources. NetCrawler "crawls" the "Entire Network" folder.

For example, if you set up a new computer at the office (or at home) and you want to print some documents, NetCrawler finds the available printers and displays them for you. Shares that have not been seen by NetCrawler in 48 hours will be aged-out of My Network Places by deleting shortcuts to those resources.

NetCrawler is on by default when you install Windows XP Home Edition, and on Windows XP Professional when your computer is in workgroup-mode and not logged on to a domain.

NetCrawler checks for new resources whenever you log on to a network, and whenever you open or refresh your Printers and My Net Places folders. It doesn't "crawl" in the following situations: when a Remote Access Server (RAS) or Virtual Private Network (VPN) connection is active; when you are logged on to a Terminal Server session; if your machine is a member of a domain; or if the shell restriction "NoNetCrawling" is set.

Fax Sharing

Fax Sharing lets you send and receive faxes using your fax hardware (a fax-capable modem or fax board)-or over a computer network offering fax sharing services. You can send a fax using the Microsoft Outlook messaging and collaboration client, or from any other application that supports printing. The Windows XP fax sharing feature set provides tight integration with the contact list in the Outlook, the ability to preview a fax before it is sent, and, when faxing over a network, the option to receive an e-mail confirming the fax was received. Fax Sharing also lets you send a separate fax cover page or attach one to any document you're sending. The ability to track and monitor your fax service is also part of the package. New wizards make it simple to configure fax software and send a fax. Administrators can fully control fax capabilities using the Microsoft Management Console (MMC), and the COM API, while developers can use the object model to send faxes programmatically. Fax sharing in Windows XP is fully interoperable with the Back Office Server (BOS)/Small Business Server (SBS) 2000 shared fax service.

Improved Networking and Communications

This section shows how Windows XP makes it easier to set up networks without having to be an expert in networking.

Universal Plug and Play

With the addition of Device Plug and Play capabilities to the operating system, it's much easier to set up, configure, and add peripherals to a PC. Universal Plug and Play extends this simplicity to include the entire network, enabling discovery and control of devices, including networked devices and services, such as network-attached printers, Internet gateways, and consumer electronics equipment.

Universal Plug and Play is more than just a simple extension of the Plug and Play peripheral model. It is designed to support zero-configuration, "invisible" networking, and automatic discovery for a breadth of device categories from a wide range of vendors. With Universal Plug and Play, a device can dynamically join a network, obtain an IP address, convey its capabilities, and learn about the presence and capabilities of other devices-all automatically; truly enabling zero configuration networks. Devices can subsequently communicate with each other directly; thereby further enabling peer to peer networking.

The varieties of device types that can benefit from a Universal Plug and Play enabled network are large and include intelligent appliances, wireless devices, and PCs of all form factors.

The scope of Universal Plug and Play is large enough to encompass many existing, as well as new and exciting scenarios including home automation, printing and imaging, audio/video entertainment, kitchen appliances, automobile networks, and proximity networks in public venues.

Universal Plug and Play uses standard TCP/IP and Internet protocols, enabling it to seamlessly fit into existing networks. Using these standardized protocols allows Universal Plug and Play to benefit from a wealth of experience and knowledge, and makes interoperability an inherent feature. Because Universal Plug and Play is a distributed, open network architecture, defined by the protocols used, it is independent of any particular operating system, programming language, or physical medium (just like the Internet). Universal Plug and Play does not specify the APIs applications will use, allowing operating system vendors to create the APIs that will meet their customer needs.

Internet Connection Sharing

Introduced in Windows 98, Internet Connection Sharing (ICS) provides a convenient and economical method for more than one computer to be connected in a home by using a single dial-up connection as a gateway, whether for access to the Internet or to a corporate network. Instead of requiring that each device behind the gateway have a globally unique IP address, it is possible to allocate private addresses to such devices, and the gateway can translate private IP addresses in all traffic that passes through the dial-up connection.

Home Networking Wizard

The Home Networking Wizard automates network configuration and Internet Connection Sharing. It uses bridging mode to allow you to set up a local area network (LAN) without requiring you to know about networking protocols and physical networking requirements.

The wizard:

- Enables PCs on the network to use friendly names such as “Den Computer.”
- Automatically sets up and configures Internet Connection Sharing, Internet Explorer, and the Personal Firewall.
- Automatically detects which NIC card is your Internet connection.
- Uses the DHCP allocator to automatically detect network configurations and update settings as required.

Network Bridging

Home users often want to use different network media to connect their computers; for example, users may want a wireless infrared network connection for a notebook computer and an Ethernet connection from the computer in the den to the computer in the kitchen. In the past, the typical multi-segment IP network required assigning a subnet number to each segment, configuring hosts on each subnet, and configuring packet forwarding between the subnets.

Microsoft sought to simplify the setup and administration of a multi-segment home network.

Windows XP includes a media-access control (MAC) bridge component that can transparently interconnect network segments using the Spanning Tree Algorithm (STA). The MAC bridge incorporated in Windows XP allows the entire home network to operate as a single IP subnet.

Windows XP simplifies the setup and administration of a multi-segment home network with a media-access control (MAC) bridge component. This uses a Spanning Tree Algorithm (STA) that can transparently interconnect network segments. The MAC bridge incorporated in Windows XP allows the entire home network to operate as a single IP subnet.

A bridge is a network device to connect two or more physical networks. It maintains a list of hardware devices on the network and checks the address of each data transmission to see if the recipient is on the network.

The primary installation method for the bridge is through the Home Networking Wizard. However advanced users can quickly install, configure, and remove the bridge without having to run the wizard.

You may want to manually configure the bridge in the following scenarios if you have:

- Multiple adapters on your computer and want to bridge them.
- An existing bridge and want to remove it.
- An existing bridge on an ICS host and later want to remove a segment from the bridge.

Integrated Help and Support Services

This section introduces how Microsoft's unified Help and Support Services Center brings together all support services in one place—with access to Remote Assistance, automatic updates, online Help, and other tools. As shown in Figure 10 below, Windows XP makes it easier to find the assistance you need.

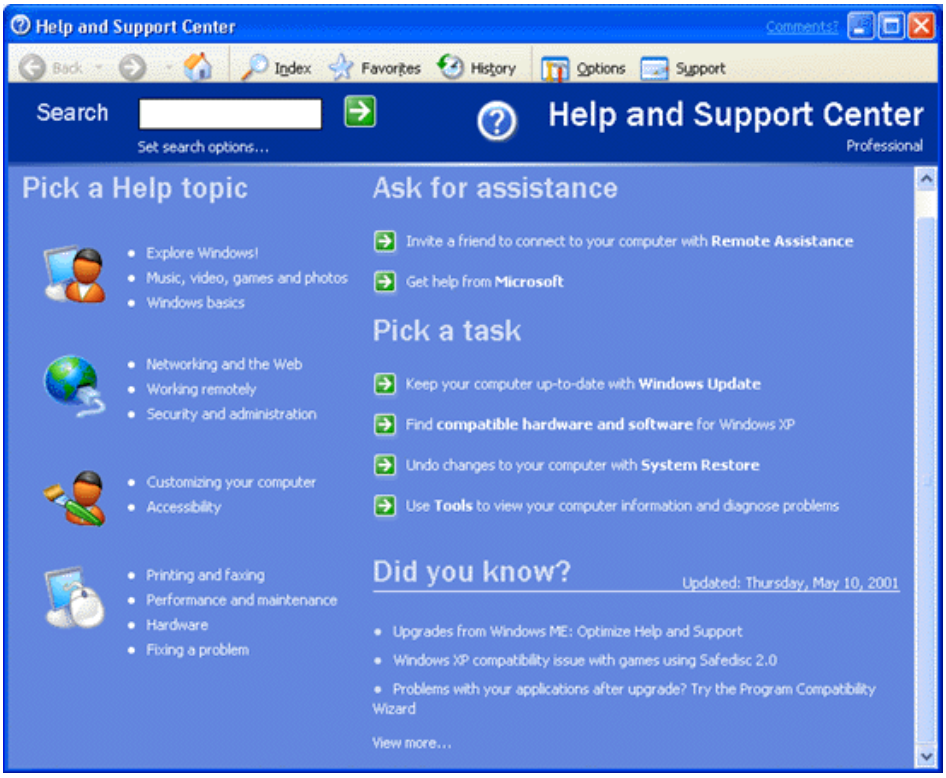

Figure 10. Windows XP provides one place to access help and support.

Getting Help with Remote Assistance

Computer users, particularly users without much technical expertise, often have configuration problems or usage questions that are difficult for a support professional or even just a friend or family member to diagnose and fix over the phone. Remote Assistance provides a way for users to get the help they need and makes it easier and less costly for corporate helpdesks to assist their users. Plus, experienced users can tap Remote Assistance to directly help their friends and family members.

The fastest way to use Remote Assistance is via instant messaging using the MSN® Messenger Service. You can also initiate Remote Assistance sessions via e-mail or you can fill out a form and save it as a file and then e-mail it using Web-based services such as Hotmail,.

After receiving a request for Remote Assistance, the helper can remotely connect to a problem-PC and view the screen directly to fix the problem. When you initiate a request for help, the Remote Assistance client sends an encrypted ticket based on XML to the helper who is prompted to accept the invitation. This process works as shown in Figure 11 below.

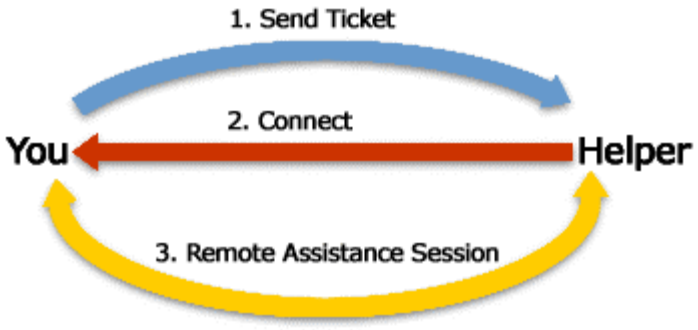

Figure 11. The Remote Assistance Session

A sample remote assistance session is shown in Figure 12 below. The helper's Start menu appears in the lower left hand corner. The inset screen shows the desktop of the user requesting Remote Assistance. The helper can view this desktop, chat with the user and send files such as a patch or hotfix. In this mode, the user retains full control of the mouse and keyboard. Or the user can grant a higher level of temporary permission to the helper by enabling remote control of the keyboard and mouse.

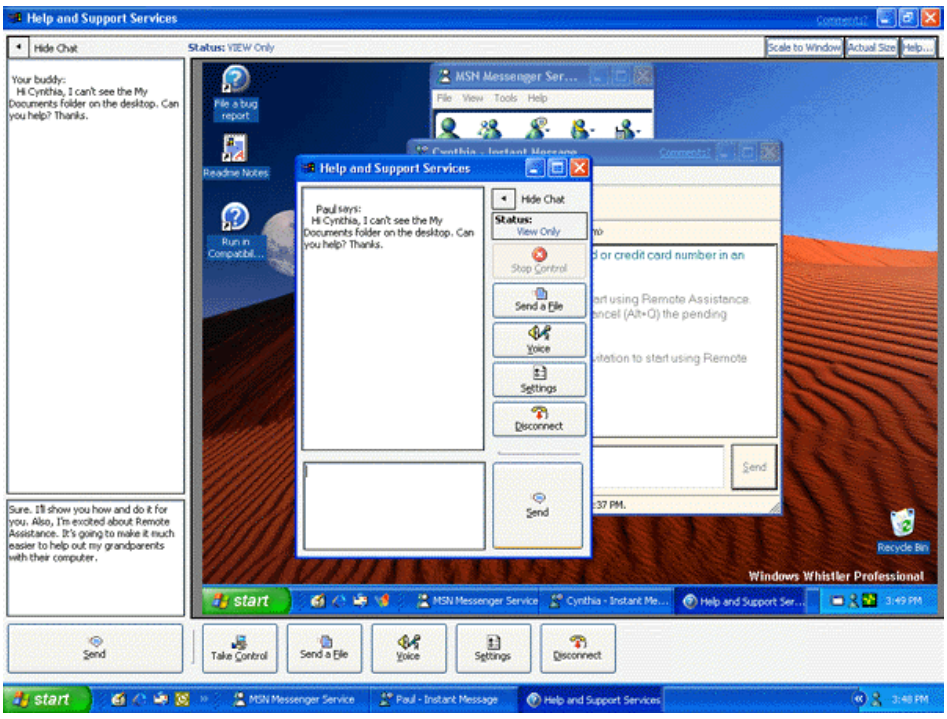

Figure 12. Remote Assistance provides interactive, real-time support.

The RA client has multiple security features to protect against unauthorized access to your computer and the remote session:

- The ticket providing access to the remote session is encrypted: only the target recipient can decode the ticket.
- The RA session expires based on the duration that you specify when you request the session. This timeout can be as short as a minute or as long as 99 days. The default period is one hour.
- When the session expires all authentication information is deleted automatically.
- By default, the RA client requests the user to create a password. You can either send this password in a separate e-mail to your helper or use a password that you know will be familiar to both you and your helper.

Searching for Help content

An extensible search mechanism will make it possible to find content from multiple remote and online providers who provide support content. A standard set of interfaces enables the Help and Support Services tool to accommodate and communicate easily with most search engines. For example, if you have problems setting up a new cable modem, you would be able to search for the term “cable modem” and receive links to local Help files, articles from the Microsoft Knowledge Base, or documents from a participating manufacturer’s Web site.

Getting precise Help information is further enhanced by full text capabilities that let you search across the entire Windows user assistance compiled HTML Help files database, using Boolean operators. For example, if you’re an IT administrator looking for help in deploying Active Directory using Group Policy, you can use this feature to obtain a more complete and precise search in Active Directory. And if you want to submit incident reports and look at Help or system information at the same time, multiple instances capabilities let you open two sessions of Help and Support Services.

Accessing system information

Finding the arcane details of your OS is made easier with system information in the Help and Support Center. You now have an easy-to-comprehend, highly accessible view of personalized software and hardware information specific to your computer. For example, this is especially useful if you are on the telephone with a product support engineer and you need to relate BIOS information about your computer. Now you can access system information and quickly relate relevant BIOS information to help resolve the issue.

Support URL for Software Deployment

Network administrators have the option of placing a support URL for specific applications in the Add/Remove Programs dialog box. When the application appears in the Add/Remove Programs on target computers, users can select the Support Information URL and go to a support Web page. This feature can assist in reducing calls to a Helpdesk or support team. For example, users could be directed to a page containing the top 10 frequently asked questions for an application.

Troubleshooting Tool

This diagnostic tool (Msconfig.exe) simplifies troubleshooting tasks that might normally be beyond the ability of many users. By automating the standard troubleshooting steps, the tool walks users through basic troubleshooting steps from one location. It’s the same tool used by Microsoft Product Support Services

technicians when diagnosing issues with the Windows configuration. You can use this tool to modify the system configuration through a process of elimination with check boxes, reducing the risk of typing errors.

The System Configuration Utility can also create a backup copy of your system files before you begin a troubleshooting session. Creating backup copies of your system files ensures that the modifications made during your troubleshooting session can be reversed. You can also restore a backup file using the System Configuration Utility.

Improved Mobile Computing

This section explains how Windows XP builds on the innovations for mobile users built into Windows 2000 such as power management and extensive hardware support. It also discusses usability improvements that make mobile computing easier and more efficient.

Power Management

As in Windows 2000, power management in Windows XP is based on the Advanced Configuration and Power Interface (ACPI) specification. Windows XP builds on the Windows 2000 implementation of ACPI to offer additional power management features that enable the operating system to control the use of power by computers and hardware. Many of the new power management features are beneficial to mobile computer users, such as:

- **Processor power control.** While the CPU runs at full speed on AC power, the mobile computer can be made to run with lower CPU speeds while on battery power. The reduced CPU speeds save on battery power, giving mobile users extended use of their notebook computers.
- **CardBus Wake-on-LAN.** Windows XP introduces support for CardBus Wake-on-LAN, a technology that allows IT departments to better manage notebook computers plugged into corporate networks. With CardBus Wake-on-LAN, notebook computers in Standby mode can be "woken up" for system updates, software installations, and so forth, and then returned to Standby. This function allows system administrators to address networked notebook computers as needed without requiring the notebooks to be left on full power. (Wake-on-LAN technology for desktop computers is also improved in Windows XP, allowing more refined control of wake-up events.)
- **Wake on Battery.** When a system in Standby is running on batteries and power drops to low, a wake event can be triggered that allows the system to enter Hibernation mode and preserve data.
- **Lid power and display dimming.** When the lid of a mobile computer is closed, the display is powered off, thus conserving battery power. And when a mobile computer is running on battery power, the LCD monitor is dimmed. Upon reconnection to AC power, the original brightness in the LCD resumes.

Usability Improvements for Mobile Users

Several new features make it easier to get work done when you're on the road including:

- **ClearType Support.** ClearType, a new text display technology triples the horizontal resolution available for rendering text through software resulting in clearer display of text on a standard LCD screen with digital interface.
- **Automatic Configuration for Multiple Networks.** This provides easy access to network devices and the Internet, allowing you to connect your mobile computer to both office and home networks without having to manually reconfigure TCP/IP settings. If a DHCP server is not found, TCP/IP will use an alternate configuration. The alternate configuration is useful in situations where the computer is used on more than one network and one of those networks does not have a DHCP server and an automatic private IP addressing configuration is not desired.

- **Connection Manager Favorites.** The Favorites feature for Connection Manager lets you eliminate repetitive configuration of the Connection Manager properties when switching between common dialing locations. This makes it easy to store and access settings. For example, if you travel between a home office and a business partner's site, you can use Connection Manager to establish settings for each location, including the nearest access telephone number, area code and dialing rules. You can then choose between saved settings to quickly set up network connections from each location.
- **Infrared (IrComm) Modem.** IrComm Modem is a driver that exposes the IrDA stack to cellular telephones. This lets you use legacy cellular telephones that have IrCOMM virtual serial ports. If you have an infrared-enabled cellular telephone with IrCOMM protocol and want to use it as a modem to access the Internet, the mobile computer will recognize the cellular telephone, enumerate it and install it as a modem. This lets you dial to the Internet in the same way you would with a built-in modem.

In addition, mobile users benefit from other features designed to enhance their experience with hardware, such as DualView, which is an extension to the multiple monitor support built into Windows 98, Windows Me, and Windows 2000. Some high-end display adapters and many notebook computers support two interfaces to the same display adapter. DualView enables the two interfaces to display different outputs at the same time. For example, on a notebook, you can connect a monitor and use both the notebook computer display and the external monitor to expand your desktop space. Or, if you are using your notebook for a presentation, you can use the notebook display to look up data or documents, without interfering with the presentation on the second monitor.

Remote Desktop

Remote Desktop is based on Terminal Services technology. Using Remote Desktop, you can run applications on a remote computer running Windows XP Professional from any other client running a Microsoft® Windows® operating system. The applications run on the Windows XP Professional–based computer and only the keyboard input, mouse input, and display output data are transmitted over the network to the remote location.

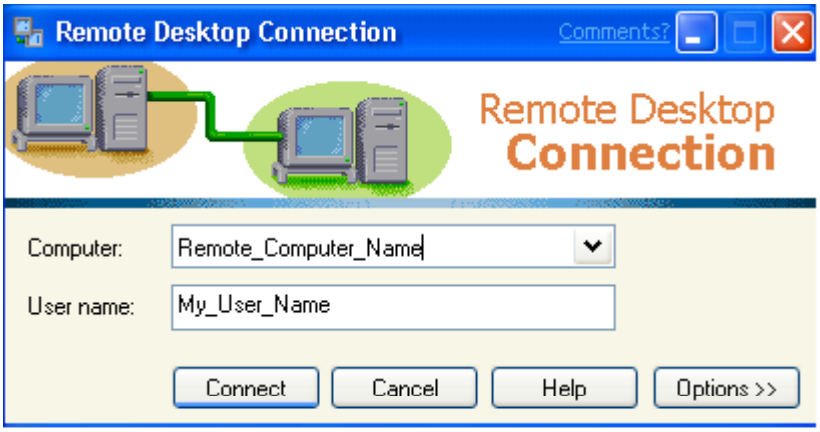

Figure 13. Starting Remote Desktop

Remote Desktop lets you take advantage of the flexibility provided by a distributed computing environment. A standard component of Windows XP Professional (although not included in Windows XP Home Edition), Remote Desktop lets you access your Windows XP computer from anywhere, over any connection, using any Windows-based client. Remote Desktop gives you secure access to all your applications, files, and network resources—as if you were in front of your own workstation. Any applications that you leave running at the office are running when you connect remotely—at home, in a conference room, or on the road.

Using Remote Desktop you can, for example, connect to your office computer from home and access all your applications, files, and network resources as though you were in front of your computer at the office. This ability allows more people in an organization to take advantage of the flexibility provided by a distributed computing environment.

Remote Desktop works well even under low bandwidth conditions because all your applications are hosted on the terminal server. Only keyboard, mouse, and display information are transmitted over the network.

If you're an IT administrator, Remote Desktop provides you with a rapid response tool: it lets you remotely access a server running Windows 2000 Server or Whistler Server and see messages on the console, administer the computer remotely, or apply headless server control.

Remote Desktop Protocol

The features provided by Remote Desktop are made available through the Remote Desktop Protocol (RDP). RDP is a presentation protocol that allows a Windows-based terminal (WBT), or other Windows-based clients, to communicate with a Windows-based terminal server. RDP is designed to provide remote display and input capabilities over network connections for Windows-based applications running on your Windows XP Professional desktop. RDP works across any TCP/IP connection including a dial-up connection, LAN, WAN, ISDN, DSL, or VPN.

Remote Desktop Resource Redirection

When you use Remote Desktop from a Windows XP-based client, or another RDP (Remote Desktop Protocol) 5.1-enabled client, many of the client resources are available within the Remote Desktop connection. These resources include:

- **File System Redirection.** This makes the local file system available on the remote desktop within a terminal session. The client file system is accessible through the Remote Desktop as if it were a network-shared drive; and no network connectivity—except the Remote Desktop—is required. The client drives appear in Windows Explorer with the designation "<driveletter> on tsclient".
- **Printer Redirection.** This routes printing jobs from the Terminal Server to a printer attached to the local computer. When the client logs on to the remote computer, the local printer is detected and the appropriate printer driver is installed on the remote computer.
- **Port Redirection.** This enables applications running within a terminal session to have access to the serial and parallel ports on the client. Port redirection allows these ports to access and manipulate devices such as bar code readers or scanners.
- **Audio.** You can run an audio-enabled application on your remote desktop and hear the audio output from speakers attached to the computer you're working on.

- **Clipboard.** The Remote Desktop and the client computer share a clipboard that allows data to be interchanged.

Reliability Improvements

This section explains how Windows XP builds on the reliability breakthroughs in Windows 2000 by making it easier for you to maintain your system.

Driver Rollback

This feature helps ensure system stability, much like the Last Known Good Configuration option first available in Windows 2000 Safe Mode and the System Restore, explained earlier. When you update a driver, a copy of the previous driver package is automatically saved in a special subdirectory of the system files (for every driver that you back up, a new value is added to the Backup keys located in the appropriate section of the registry). If the new driver does not work properly, you can restore the previous driver by accessing the **Driver** tab for the device in the Device Manager, and clicking **Roll Back Driver** as in Figure 14 below. Driver Rollback permits only one level of rollback (only one prior driver version can be saved at a time); this feature is available for all device classes, except printers.

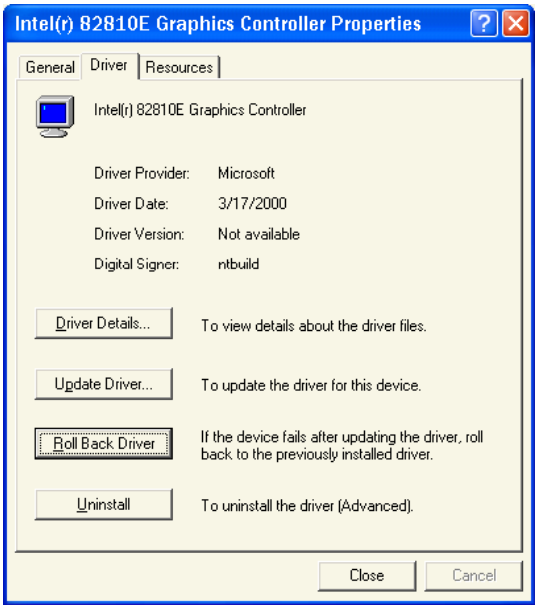

Figure 14. Windows XP supports easy roll back of drivers.

System Restore

System Restore lets you restore your computer to a previous state in the event of a problem, without losing personal data files such as documents, drawings, or e-mail. System Restore actively monitors changes to the system and some application files and automatically creates easily identifiable restore points so you do not have to remember to backup. Windows XP creates restore points each day by default as well as at the time of significant system events such as installing an application or driver. You can also create and name your own restore points at any time. System Restore does not monitor changes to or recover your personal data files.

Automated System Recovery

Automated System Recovery (ASR) feature provides the ability to save and restore applications. This feature also provides the Plug and Play mechanism required by ASR to back up Plug and Play portions of the registry and restore that information to the registry. This is useful in a variety of disaster recovery scenarios; for example, if a hard disk fails and loses all configuration parameters and information, ASR can be applied and the backup of the server's data is restored.

Dynamic Update

Reliability is enhanced with dynamic updates which provide application and device compatibility updates, driver updates, and emergency fixes for setup or security issues —when you run setup. Once the need for a Dynamic Update package has been determined by Microsoft, it is provided via the Windows Update Web service.

This is useful for users who may be installing Windows XP some time after it has been released. If you choose the Dynamic Update option in Setup, Setup downloads the updates for device and applications from Microsoft instead of the original files from the CD. Organizations will also benefit: IT administrators can download a Dynamic Update package, which may include an applications compatibility or security fix for their users. They can use the Dynamic Update package to ensure all users who install the operating system get these updated files.

AutoUpdate

AutoUpdate is an option for updating your computer without interrupting your Web experience. You don't have to visit special web pages, interrupt web surfing to allow bits to be downloaded or remember to periodically check for new updates. These downloads are throttled to minimize impact to network responsiveness, and are automatically resumed if the system is disconnected before an update is fully downloaded. Once the update has been downloaded to the PC, the user can then choose to install it.

Windows Update

Windows Update offers device driver support that supplements the extensive library of drivers available on the installation CD. Windows Update is an online extension of Windows XP, providing a central location for product enhancements, such as service packs, device drivers, and system security updates. For example, if you install a new device, Plug and Play will search for a driver locally and—if your computer is connected to the Internet—online at Windows Update. If your computer is *not* connected to the Internet and no suitable driver is found locally on the system, you will be prompted to go online and search for a driver. If an updated driver is found on Windows Update, the driver's .cab file is downloaded and the Windows Update ActiveX® control points Windows Plug and Play to the .inf file for installation.

Businesses can override or turn off this function and restrict use of Windows Update to system administrators, who have a section of Windows Update dedicated to searching, collecting and downloading updates that can then be distributed within a business using its own procedures.

Stronger Security Protections

This section introduces some of the new or enhanced security features in Windows XP.

Internet Connection Firewall

Windows XP provides Internet security through a built-in feature called Internet Connection Firewall that's designed for home users and small businesses. Internet Connection Firewall is a dynamic packet filter. It protects computers directly connected to the Internet, or connected behind an Internet Connection Sharing host computer that is running Internet Connection Firewall. When enabled, the Internet Connection Firewall blocks all unsolicited connections originating from the Internet. To accomplish this, the firewall uses the logic of the Network Address Translator (NAT) to validate incoming requests for access to a network or the local host. If the network communication did not originate within the protected network, or no port mapping had been created, the incoming data will be dropped.

Internet Connection Firewall is available for the following types of connections: Local Area Network (LAN), Point-to-Point Over the Ethernet (PTPOE), Virtual Private Network (VPN), or Dial-up. Internet Connection Firewall prevents the scanning of ports and resources (file and printer shares) from external sources. For example, if someone on the Internet runs a scanning program on your public connection, or attempts to connect to your system's resources, the firewall prevents release of any information from the ports and services available on your network.

Controlled Network Access

Windows XP provides built-in security to keep intruders out by limiting anyone trying to gain access to your computer from a network to "guest" level privileges. If an intruder attempts to break into your computer and gain unauthorized privileges by guessing passwords, they will be unsuccessful or obtain only limited, guest-level access.

Software Restriction Policies

Software restriction policies in Windows XP provide a transparent way to isolate and use untrusted, potentially harmful code in a way that protects you against various viruses, trojans, and worms that are spread through e-mail and the Internet. These policies allow you to choose how you want to manage software on your system: software can be "strictly managed," (you decide how, when, and where code gets executed), or software can be "unmanaged," (specific code is prohibited from executing).

By executing untrusted code and scripts in a segregated area (known informally as the sandbox) you get the benefit of untrusted code and scripts that prove to be benign, while the tainted code is prevented from doing any damage. For example, untrusted code would be prevented from sending e-mail, accessing files, or performing other normal computing functions until verified as safe.

Software restriction policies protect against infected e-mail attachments. This includes file attachments that are saved to a temporary folder as well as embedded objects and scripts. You're also protected against URL/UNC links which can launch Internet Explorer, or another application, and download a Web page with an untrusted embedded script. ActiveX™ controls downloaded from the Web are also monitored, and neutralized if necessary.

Security Improvements for Servers on Ethernet or Wireless LANs

Secure Wireless/Ethernet LAN enhances your ability to develop secure wired and wireless local area networks (LANs). This is done by enabling the deployment of servers on Ethernet or Wireless LANs.

With Secure Wireless/Ethernet LAN, a computer will not usually be able to access the network until the user logs on. However, if a device has “machine authentication” enabled, then that computer can obtain access to the LAN after it has been authenticated and authorized by the IAS/RADIUS server.

Secure Wireless/Ethernet LAN in Windows XP implements security for both wired and wireless LANs that are based on IEEE 802.11 specifications. This process is supported by the use of public certificates which are deployed by auto-enrollment or smart cards. This enables access control for wired Ethernet and wireless IEEE 802.11 networks in public places such as malls or airports. This IEEE 802.1X Network Access Control security feature also supports authentication of computers within the Extensible Authentication Protocol (EAP) operating environment.

IEEE 802.1X enables an administrator to assign permission for a server to obtain authenticated access to both wired Ethernet and wireless IEEE 802.11 LANs. So if a server is placed on a network, the administrator would want to ensure that it can only access the network if it has been successfully authenticated. For example, access to a conference room could only be provided to specific servers and denied to others.

Single Login with Microsoft Passport

In Windows XP, the Passport authentication protocols have been added to WinInet, the DLL that allows your computer to retrieve data from different locations, allowing the OS to transparently use Passport authentication. If you have a Microsoft Passport account, you can automatically use Passport for numerous tasks such as logging into any Web site that supports Passport or purchasing products on participating Web sites.

Credential Management

The Credential Management feature provides a secure store of user credentials, including passwords and X.509 certificates. This provides a consistent single-sign on experience for users, including roaming users. If you access an application within a company network, your first attempt requires authentication and you’re prompted to supply a credential. After providing this credential, it will be associated with the requesting application. In future access to this application, the saved credential will be re-used without having to re-enter the credential. It has three components: the Credential Manager itself which provides secure storage for credentials; the Credential Collection User Interface which provides a set of APIs that prompt the user for credentials; and the Keyring which allows users to add, remove, and modify credentials in Credential Manager.

Encrypting File System

The Encrypting File System (EFS) is based on public-key encryption and takes advantage of the CryptoAPI architecture in Windows XP. The default configuration of the EFS requires no administrative effort—you can begin encrypting files immediately. EFS automatically generates an encryption key pair for a user if one does not exist.

EFS can use either the expanded Data Encryption Standard (DESX) or Triple-DES (3DES) as the encryption algorithm. Encryption services are available from Windows Explorer.

You encrypt a file or folder by setting the encryption property for files and folders just as you set any other attribute, such as read-only, compressed, or hidden. If you encrypt a folder, all files and subfolders created in or added to the encrypted folder are automatically encrypted. It is recommended that you encrypt at the folder level.

Secure Data Storage on the Internet

Windows XP lets you store encrypted files on Web servers. These files get transmitted over the Internet and are stored on servers as encrypted bits. When you want to use your files, they're transparently decrypted on your computer. This lets you securely store sensitive data on Web servers without having to worry about your data being stolen or read while being transmitted. No one who has access to the Web server—not even the server administrator—can read your files. You can share these securely stored files with anyone you want: family members, friends, or team members at work.

Easier Manageability

This section introduces how Windows XP makes it easier to manage your files, folders, and desktop as well as quickly migrate files and settings to a new computer. In addition, it explains how Terminal Services technology enables Remote Desktop and Fast User Switching.

IntelliMirror

If your Windows XP computer is part of a network using the Active Directory™ service, you could have access to IntelliMirror® management technologies, which provides “follow-me” functionality for your personal computing environment. You have constant access to all your information and software, regardless of which computer you are using and whether or not you are connected to the network—with the assurance that your data is safely maintained and available.

Group Policy

Group Policy settings simplify the administration of users and objects by letting IT administrators organize them into logical units, such as departments or locations and then assign the same settings, including security, appearance, and management options, to all employees in that group. This approach also ensures that settings are consistent across all members of a group. There are over 300 new polices available for Windows XP Professional, in addition to those already available for Windows 2000 Professional.

Resultant Set of Policy

The Resultant Set of Policy (RSoP) tool in Windows XP Professional allows administrators to see the effect of Group Policy on a targeted user or computer. With RSoP, administrators have a powerful and flexible base-level tool to plan, monitor, and troubleshoot Group Policy.

Local Group Policy

Windows XP Professional adds more policies to Local Group Policy, a benefit that enables you to better customize user and computer settings. This powerful management feature lets you lock down and fine tune your desktop, introducing the possibility of many different customized scenarios. With Local Group Policy you can:

- Customize the user interface specifying configurations for the desktop, Start menu, and taskbar.
- Prohibit use of specific operating system components such as Personal Firewall or Windows Messenger.
- Protect against virus's using Software Restriction Policy Settings.

Note: If your computer is part of an Active Directory-enabled network, domain-based Group Policy may override Local Group Policy settings. In addition, Windows XP Home Edition does not provide Local Group Policy.

Migrating files and settings

Windows XP makes replacing an old computer easier with the Files and Settings Transfer Wizard. It enables you to migrate files, documents, and settings via a floppy disk (or other removable media), home LAN, or a

known UNC path. The wizard on your Windows XP computer walks you through the steps to run the wizard on your old computer to collect and transfer the settings, files, and documents. It also walks you through the application of those files, settings and documents, on your new computer. The wizard also enables you to select addition files, file types, or folders to transfer.

A limited set of application settings are also supported including Microsoft Office. Note the wizard does not migrate the applications; you will have to re-install the applications on the new computer (if they are not already installed).

Items migrated by default include: Internet Explorer settings, Outlook Express settings, store Outlook settings, store dial-up connections, phone and modem options, accessibility, classic desktop (optional) screen saver settings, fonts, folder options, taskbar settings, mouse and keyboard settings, sounds settings, regional options, office settings, network drives and printers desktop folder, my documents folder, my pictures folder, favorites folder, cookies folder, common office file types. More applications are expected to be supported for migration by the time Windows XP ships.

Windows XP also includes an updated version of the command-line tool, User State Migration Tool (USMT), that was available as part of the Resource Kit for Windows 2000. Both the wizard and the new version of the command-line tool, are driven by INF files, which can be customized by IT professionals to more specifically fit a particular business environment or target the migration of additional items.

Account Management Enhancements

The account management feature of the Control Panel lets you add, delete, and modify user accounts and passwords for a computer. This is useful for home users who wish to let other family members use a computer. **Note:** If you're connecting as part of a corporate network, you would use the Users and Passwords Control Panel for domain functionality.

Regional Options Enhancements

The Control Panel for regional and language options has been redesigned to make it easier to add and change Input Languages and keyboard layouts, switch Standards and Formats for displaying dates, amounts, and currencies, set the default Location for Web content, and change the Language for non-Unicode Programs. The most frequently used options are now easier to find and use.

You can configure the location setting to get Web content relevant to your location.

64-Bit Support

This section introduces Windows XP 64-Bit Edition, a high performance workstation aimed at those engaged in solving complex scientific problems, developing high-performance design and engineering applications, or creating 3-D animations.

The 64-bit edition is designed to exploit the power and efficiency of the new Intel Itanium 64-bit (IA-64) processor. Most of the features and technologies of the 32-bit version of Windows XP are included in the 64-bit release (exceptions include infrared support, System Restore, DVD support, and mobile-specific features like hot-docking). The 64-bit version will also support most 32-bit applications through the WOW64 32-bit subsystem and will be capable of interoperating with Windows 32-bit systems. Both versions will run seamlessly on a network.

Windows XP 64-Bit Edition provides a scalable, high-performance platform for a new generation of applications based on the Win64™ API. Compared to 32-bit systems, its architecture provides more efficient processing of extremely large amounts of data, supporting up to eight terabytes of virtual memory. With 64-bit Windows, applications can pre-load substantially more data into virtual memory to enable rapid access by the IA-64 processor. This reduces the time for loading data into virtual memory or seeking, reading, and writing to data storage devices, thus making applications run faster and more efficiently. The 64-bit version is built on the same programming model as the standard Win32 version, providing developers with a single code base.

Windows XP 64-Bit Edition will especially benefit users in the following scenarios:

- **Mechanical Design and Analysis.** Manage gigabytes of data in floating point intensive applications.
- **Digital Content Creation.** Complex 3-D graphics and animation, emerging HDTV and DTV that demand more computing power.
- **Other technical markets.** Including financial, EDA, and other scientific or technical applications.

Looking Forward: The Microsoft.NET Platform

This section provides a conceptual overview of how Windows XP lays the foundation for an important part in the future of computing: the Microsoft .NET Platform, which aims to provide a new level of connectivity that lets you get more out of networking and the Internet. The old model of under-utilized PCs confined to just browsing the Web is giving way to a new environment of smart, service-aware computers and devices that "know" about the network such as whether you're online or how much bandwidth you have. With Windows XP, your PC becomes the main "socket for services" — a rich two way interface that lets you do more than just receive information but also use it and act on it. This environment is enabled by a core set of services and protocols including:

- **XML.** The Extensible Markup Language ensures that structured data will be uniform and independent of applications or vendors, which makes it ideal as a foundation for integrating Web Services.
- **SOAP.** An XML-based protocol designed to exchange structured and typed information on the Web. SOAP enables rich and automated Web services based on a shared and open Web infrastructure.
- **UDDI.** Universal Discovery Description and Integration used to publish and find information about Web Services.

As the programmatic backbone for electronic commerce, Web Services are at the core of the way you can use .NET and Windows XP. For example, you could take financial information from a Web site, automatically port it into Excel, and use the information for financial planning. Or consider the possibilities of integrating Instant Messaging with smart devices. It's easy to imagine a scenario of a car alarm: Someone breaks into your car and triggers your alarm. You receive an Instant Message with options about what to do next: Call the police, ignore the alarm, or turn the alarm off.

Integrating Smart Devices

In Windows XP, the PC becomes the central hub for device control and coordination of intelligent devices that can be manipulated in a number of different ways. For example, no longer will you merely download files from a digital camera to your PC. Instead, connecting a digital camera will give you many more options such as printing images directly from the camera, pre-screening them before downloading them, or automatically e-mailing them, or instantly publishing them to the Web. Such connectivity makes possible a new set of experiences for the PC.

For more information, see the Microsoft .NET Web site at http://www.microsoft.com/net/

For More Information

For the latest information on Windows XP, see the Windows XP Web site at http://www.microsoft.com/windowsxp.

For the latest information on Windows 2000, see the Windows 2000 Web site at http://www.microsoft.com/windows2000/