gtslearning

**CompTIA A+ Certification
802 Support Skills**

Study Notes

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Table of Contents

About This Course

gtslearning's CompTIA A+ Support Skills courses are intended for students wishing to qualify with CompTIA A+ Certification. A+ certification is designed to help students become entry-level IT technicians.

> *Successful candidates will have the knowledge required to assemble components based on customer requirements, install, configure and maintain devices, PCs and software for end users, understand the basics of networking and security/forensics, properly and safely diagnose, resolve and document common hardware and software issues while applying troubleshooting skills. Successful candidates will also provide appropriate customer support; understand the basics of virtualization, desktop imaging, and deployment.*

CompTIA A+ syllabus

This course is designed to prepare you for the 220-802 A+ exam. It focuses on supporting Microsoft Windows, configuring SOHO networks with internet access, troubleshooting, and features of mobile devices such as smartphones.

*To obtain CompTIA A+ Certification, you must pass **both** the 802 exam **and** the 220-801 exam. You must complete the 801 Support Skills course to prepare for the 801 exam. The 801 exam focuses PC, laptop, printer, and network hardware technologies and support procedures.*

What are the Course Prerequisites?

Ideally, you should have successfully completed gtslearning's "PC Fundamentals with CompTIA Strata" course or have some basic experience of using a PC, Windows, and browsing the web. It is also recommended that you complete the 801 Support Skills course before starting this course. Specifically, it is recommended that you have the following skills and knowledge before starting this course:

■   Start the computer and navigate the desktop.

■   Use Windows Explorer to create directories and subdirectories and move, copy or rename files and directories and use Internet Explorer to view websites.

■   Identify types and characteristics of PC components, including motherboard, CPU, memory, and storage, input, and output devices.

■   Install and configure peripheral devices.

■   Identify types and characteristics of portable computers.

■   Install and configure print and imaging devices.

■   Understand fundamental principles of implementing LANs and internet access.

Optionally, you can take a prerequisites test to check that you have the knowledge required to study this course at www.gtssupport.com/flower27/220-802/index.htm.

Course Outcomes

This practical "hands-on" course will teach you the fundamental principles of supporting Windows and troubleshooting computer systems and basic networks. As a PC technician, you will be expected to support old and new systems, so it is important that you have a full understanding of legacy hardware and software, as well as the latest technologies.

On course completion, you will be able to:

■   Install and configure Microsoft Windows XP, Microsoft Windows Vista, and Microsoft Windows 7.

■   Manage and optimize Windows using command line tools and administrative consoles.

■   Configure and manage users, groups, and shared resources in a typical SOHO network.

■   Use anti-virus tools to prevent and recover from malware infections.

■   Configure access control measures, such as authentication, security policy, encryption, and firewalls.

■   Diagnose and resolve Windows, PC hardware, network, and printer troubleshooting scenarios.

■   Configure mobile devices, such as smartphones and tablets.

How Certification Helps Your Career

Certification proves you have the knowledge and skill to solve business problems in virtually any business environment. Certifications are highly valued credentials that qualify you for jobs, increased compensation, and promotion.

IT is Everywhere	IT Knowledge and Skills Gets Jobs	Retain your Job and Salary	Want to Change Jobs?	Stick Out from the Resume Pile
IT is ubiqitous; a critical requirement of most organizations. Globally, there are over 600,000 IT job openings.	Certifications are essential credentials that qualify you for jobs, increased compensation, and promotion.	Make your expertise stand above the rest. Competence is usually retained during times of change.	Certifications qualify you for new opportunities, whether you see limited advancement in your current job or need to change careers.	Hiring managers can demand the strongest skill set.

CompTIA A+ certification is held by many IT staff in organizations. Worldwide, more than 800,000 individuals are CompTIA A+ certified and 31% of IT staff within a random sampling of US organizations within a cross section of industry verticals hold A+ Certification.

Indeed, A+ Certification is often a prerequisite qualification for employment and is mandated or recommended by many leading computer manufacturers and vendors, such as Cisco and HP and Ricoh, the US State Department, and US government contractors such as EDS, General Dynamics, and Northrop Grumman.

CompTIA Career Pathway

Completing this course will help you to pursue a career in computer and network support. This course will particularly benefit you in pursuing a career in supporting desktop personal computer users, in job roles such as Support Engineer, Maintenance Engineer, Desktop Engineer, Computer Administrator, or PC Support Analyst.

CompTIA offers a number of credentials that form a foundation for your career in technology and allow you to pursue specific areas of concentration. Depending on the path you choose to take, CompTIA certifications help you build upon your skills and knowledge, supporting learning throughout your entire career.
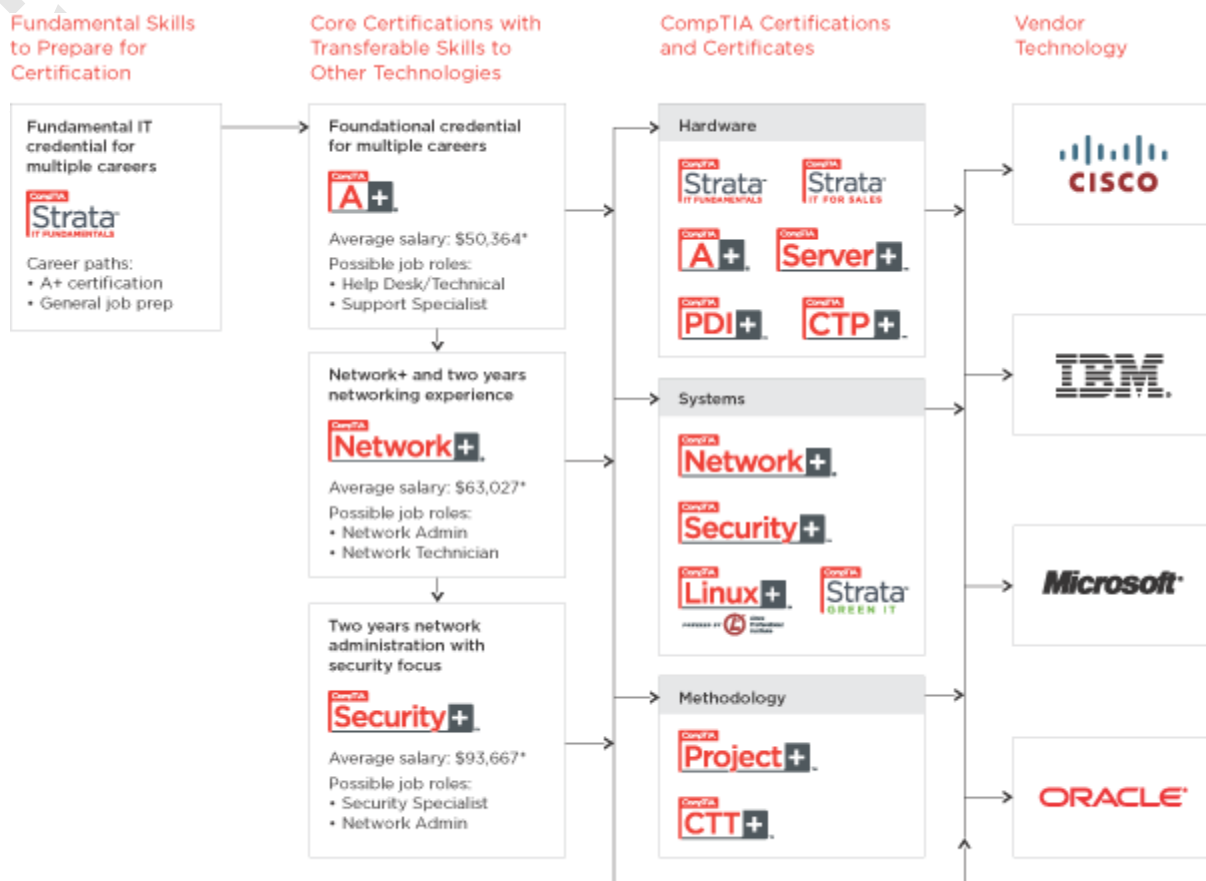
*Source: Computerworld Salary Survey 2010—U.S. salaries only

Study of the course can also help to prepare you for other, similar technical support qualifications and act as groundwork for more advanced training. Other qualifications available include:

■ **CompTIA Network+** - a foundation-level certification of competency in network installation and configuration.

■ **CompTIA Server+** - validates the skills of advanced IT technicians (individuals with 18-24 months' experience with Industry Standard Server Architecture [ISSA]).

■ **CompTIA Security+** - validates knowledge of communication security, infrastructure security, cryptography, operational security, and general security concepts.

■ **Cisco Certified Network Associate (CCNA)** - a foundation-level certification of competency in Cisco networking appliance installation and configuration.

- **<u>Microsoft Certified Systems Administrator / Engineer / IT Professional (MCSA / MSCE / MCITP)</u>** - Windows-specific qualifications; passing CompTIA's A+, Network+, and either Server+ or Security+ Certification can satisfy the requirements for the elective part of the certification, as well as providing a solid groundwork for the further study required for MCSA / MCSE (Windows Server 2003 track) or MCITP (Windows Server 2008 Server Administrator / Enterprise Administrator track).

- Other corporations such as Novell, HP, CompuCom, and Ricoh also recognize CompTIA A+ as part of their certification tracks or require that their service technicians obtain the certification.

- **Help Desk Support Analyst** - The Help Desk Analyst certification series, administered by the Help Desk Institute (<u>www.thinkhdi.com</u>), certifies learners' customer service and Help Desk management skills. Various levels of certification are available, including Customer Support Specialist, Help Desk Analyst and Help Desk Manager.

About the Course Material

The course material has been prepared as an aid for your use throughout the training course. You may keep this manual for your own reference after the course is finished. We hope you will find the course material useful for future reference.

The course comes in two parts. This "Study Notes" volume contains the main text of the book for you to refer to in class and to review at home as you prepare for the exam. The course text is divided into several **modules**, each covering a different subject area. Each module is split into a series of **units** containing related topics for study. Each unit has a set of review questions designed to test your knowledge of the topics covered in the unit.

At the back of the "Study Notes" volume there is an index to help you look up key terms and concepts from the course.

The accompanying "Labs and References" volume contains a list of the CompTIA **certification objectives** (and where in the study notes you can find useful material to prepare for each objective), tips for taking the CompTIA exams, the practical **labs** for you to complete in class, **answers** to the end of unit review questions, and a **glossary** of terms and concepts used in computer support.

If you are viewing this course as an ebook, the "Labs and References" volume is located after the index - use the bookmarks panel to navigate between sections.

When you have completed the course and want to prepare for the exam, you can take a practice test at <u>www.gtssupport.com/flower27/220-802/index.htm</u>.

Course Conventions and Icons

The following conventions have been used in this course. These are especially useful for following the practical lab exercises.

- ■ Bullet and number lists - steps for you to follow in the course of completing a task or hands-on exercise and review questions are indicated by *numbered* bullet points. *Other* bullet points indicate learning objectives and feature lists.

- ■ File and command selection - in the labs, files, applets, dialogs and other information that is displayed on the screen by the computer is shown in sans serif bold. For example: Click **OK**, Select **Control Panel**, and so on.

- ■ Sequences of commands - in the labs, a sequence of steps to follow to open a file or activate a command are shown in bold with arrows. For example, if you need to access the system properties in Windows, this would be shown in the text by: **Start > Control Panel > System**.

- ■ Commands - commands or information that you must enter using the keyboard are shown in Courier New Bold. For example: Type `webadmin@somewhere.com`. Courier New Bold-Italic represents some sort of variable, such as your student number. For example, if your student number is "5", you would follow the instruction `ping 10.0.0.x` by entering `ping 10.0.0.5`.

- ■ Using the mouse - when instructed to click, use the main mouse button; when instructed to alt-click, use the secondary button (that is, the button on the right-hand side of the mouse, assuming right-handed use). Sometimes you need to use both the keyboard and the mouse - for example, `Ctrl`+click means hold down the `Ctrl` key and click the main mouse button.

The following symbols are used to indicate different features in the course book:

Icon	Meaning
	A tip or warning about a feature or topic.
	A reference to another unit, where more information on a topic can be found.
	Space for you to make your own notes.
	Review questions to help test what you have learned.
	A hands-on exercise for you to practice skills learned during the lesson.

Module 1 / Supporting Windows 1

A+ Certification 220-802 Domain Areas	% of Exam
1.0 Operating Systems	33%
2.0 Security	22%
3.0 Mobile Devices	9%
4.0 Troubleshooting	36%

Unit	Domain Objectives / Examples
1.1 Windows Operating System	**1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems.** *Windows XP Home, Windows XP Professional, Windows XP Media Center, Windows XP 64-bit Professional • Windows Vista Home Basic, Windows Vista Home Premium, Windows Vista Business, Windows Vista Ultimate, Windows Vista Enterprise • Windows 7 Starter, Windows 7 Home Premium, Windows 7 Professional, Windows 7 Ultimate, Windows 7 Enterprise • Features (32-bit vs. 64-bit, Aero) • Upgrade paths (Differences between in-place upgrades, Compatibility tools, Windows Upgrade OS Advisor)*
1.2 Administration Tools	**1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems.** *Features (Administrative Tools, File structure and paths, Category view vs. classic view)*
	1.3 Given a scenario, use appropriate command line tools. *OS (shutdown, [command name] /?)*
	1.4 Given a scenario, use appropriate operating system features and tools. *Administrative (Computer Management) • Run line utilities (regedit, cmd, mmc, notepad)*
	1.8 Explain the differences among basic OS security settings. *System files and folders*
1.3 Managing Users	**1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems.** *Features (User Account Control)*
	1.4 Given a scenario, use appropriate operating system features and tools. *Administrative (Users and Groups)*
	1.5 Given a scenario, use Control Panel utilities. *User Accounts*
	1.8 Explain the differences among basic OS security settings. *User and groups (Administrator, Power User, Guest, Standard User)*

Unit	Domain Objectives / Examples
1.4 Managing Storage	**1.2 Given a scenario, install, and configure the operating system using the most appropriate method.** *Partitioning (Dynamic, Basic, Primary, Extended, Logical) • File system types/formatting (FAT, FAT32, NTFS, CDFS, Quick format vs. full format)*
	1.3 Given a scenario, use appropriate command line tools. *OS (fdisk, format, diskpart)*
	1.4 Given a scenario, use appropriate operating system features and tools. *Disk Management (Drive status, Mounting, Extending partitions, Splitting partitions, Assigning drive letters, Adding drives, Adding arrays)*
	4.3 Given a scenario, troubleshoot hard drives and RAID arrays with appropriate tools. *Tools (format, fdisk)*
1.5 Managing Files	**1.3 Given a scenario, use appropriate command line tools.** *OS (md, rd, cd, del, copy, xcopy, robocopy)*
	1.4 Given a scenario, use appropriate operating system features and tools. *Run line utilities (Explorer)*
	1.5 Given a scenario, use Control Panel utilities. *Folder Options (View hidden files, Hide extensions, Layout)*

Module 1 / Unit 1
Windows Operating System

Objectives

On completion of this unit, you will be able to:

■ Describe the main features and system requirements of Windows XP, Windows Vista, and Windows 7.

■ Distinguish between different editions of Windows XP, Windows Vista, and Windows 7.

■ Configure elements of the GUI (desktop, Start menu, and taskbar).

What is an Operating System?

A PC requires an **Operating System (OS)** in order to function. The operating system provides the interface between the **hardware**, **application programs**, and the **user**. The operating system handles many of the basic system functions, such as interaction with the system hardware and input / output.

An operating system is generally made up of a number of core files (the **kernel**) with additional **device drivers** and **programs** to provide extended functionality. The earliest operating systems for PCs (Microsoft's Disk Operating System [DOS]) used a command-line interface or simple menu systems. Windows and later applications were marked by the use of a **Graphical User Interface (GUI)**[1]. This helped to make computers easier to use by non-technical staff and home users.

The market for operating systems is divided into three main functions:

■ Business client - OS designed to work as a client in business networks.

■ Network Operating System (NOS) - OS designed to run on servers in business networks.

■ Home client - OS designed to work on standalone or workgroup PC in a home or small office.

Windows is the dominant client OS, estimated to be installed on 90% of the world's desktop and laptop computers. Other desktop operating systems include Apple Mac OS and the various types (often referred to as distributions or "distros") of Linux, an open-source OS.

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[1] *Actually, some DOS applications presented a GUI (of a kind). Windows is sometimes described as a WIMP (Window, Icon, Menu, Pointing device) interface.*

Windows 7

Microsoft released Windows 7, the successor to Windows Vista and Windows XP, in 2009. While Windows Vista was relatively unsuccessful, Windows 7 is the most popular operating system in use on desktop PCs and laptops[2].

Desktop, Taskbar, and Start Menu

One of the main functions of an OS is to provide an interface between the user and the computer hardware and software. Windows has a number of interface components designed both for general use and for more technical configuration and troubleshooting. Collectively, the user interface is referred to as the **shell**.

Make sure you know how to navigate Windows and know the routes to open the various administration and file management tools.

The top level of the user interface is the **Desktop**. This is displayed when Windows starts and the user logs on.
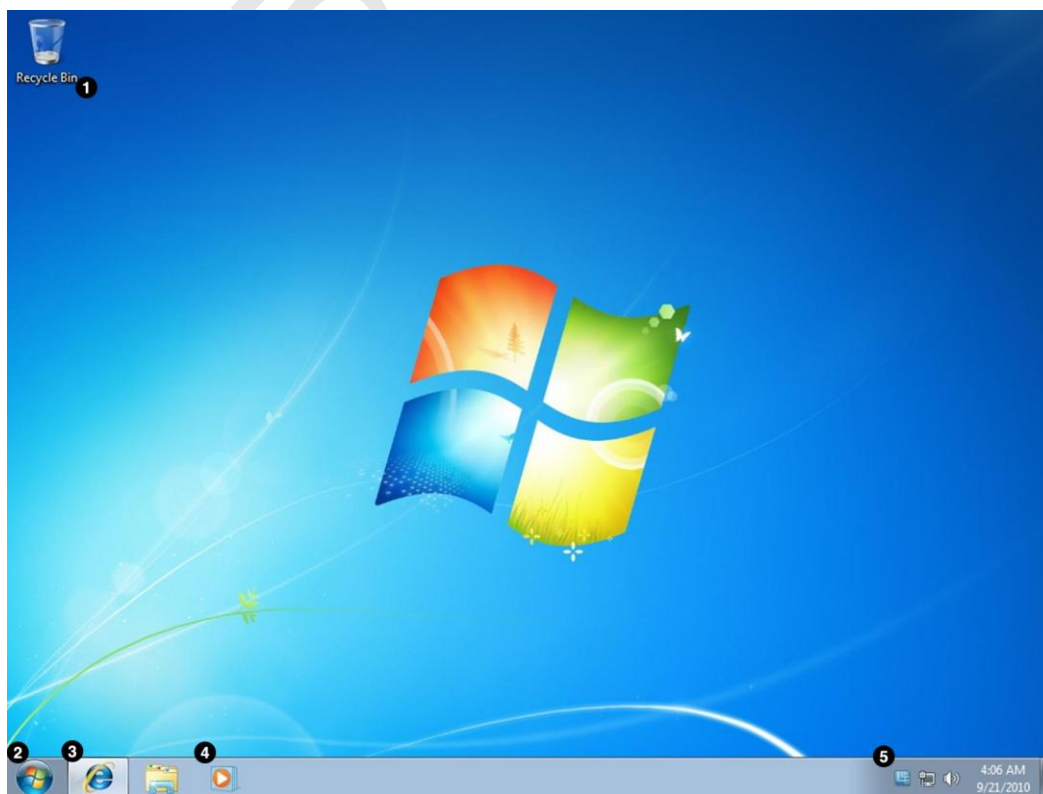
Windows 7 desktop showing 1) Shortcut icon; 2) Start orb; 3) "Pinned" program (Internet Explorer) with open windows; 4) Pinned programs with no open windows; 5) Notification Area

The Desktop contains icons to launch applications and possibly user data files.

The Desktop also contains the Start menu and taskbar, which are used to launch and control applications.

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[2] *The Windows XP install base is almost as large though obviously declining as Microsoft reduce support options available for it.*

The **Start menu** lists all the programs installed on the computer within **Program Groups**, represented as submenus. There are also items for accessing recently-used programs and documents, searching for files and folders, accessing the help system, and shutting down the PC.

Start menu and taskbar showing 1) Click All Programs to view all application shortcuts or use the Instant Search box below; 2) Items can be pinned to the Start Menu and recently used shortcuts appear below; 3) Shortcuts to system folders and settings; 4) This button offers different ways to close a session (shut down, hibernate, and so on); 5) Pinned Taskbar icons; 6) Other icons show open windows; 7) Notification Area containing background process icons and the clock

Apart from containing the Start button, the **Taskbar's** main function is to show the programs (windows) currently running on the desktop. On the left are "pinned" icons for frequently used programs such as email and web browser. Pinned items always remain on the Taskbar (a program with open windows is shown with a highlight). You can add or remove or reposition pinned items by dragging and dropping.

At the end of the Taskbar is the **Show Desktop** toggle icon. Pointing at this icon makes all windows transparent ("Aero Peek") while clicking it minimizes or restores all open windows.

Taskbar icons also enable peeking at the window contents by pointing to them and have a close button for the window. The shortcut menu for each icon displays a "Jump List" of recently used files or common tasks.

Desktop windows also support some gesture controls. If you "shake" a window by its title bar all other windows are minimized; Windows will also snap automatically into a suitable position when dragged to a part of the desktop or alongside one another.

The area on the right-hand side of the taskbar is called the **Notification Area** (or sometimes by its old name of **systray** or **system tray**). This displays the current time and icons for programs that run without a window, such as anti-virus software, volume control, battery meter, network status, and so on. These icons have shortcut menus for enabling, disabling, and configuring the related application or setting.

The Start menu and taskbar can be customized by alt-clicking and selecting **Properties**. This allows you to show or hide various options and add or remove program shortcuts. You can also use drag-and-drop to add or remove shortcuts from the menu.
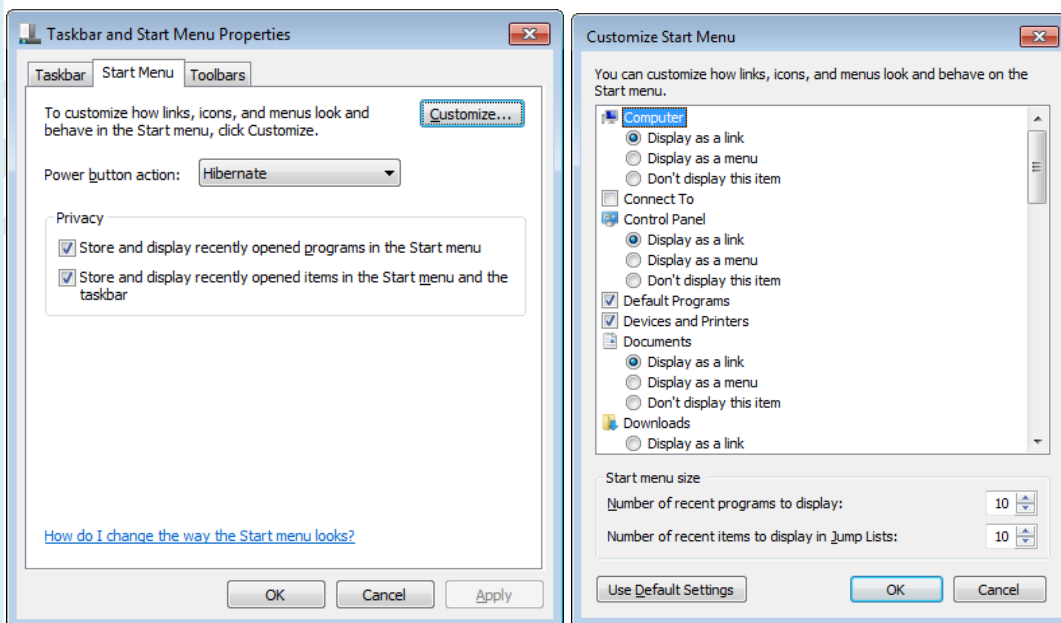
Configuring Start menu properties
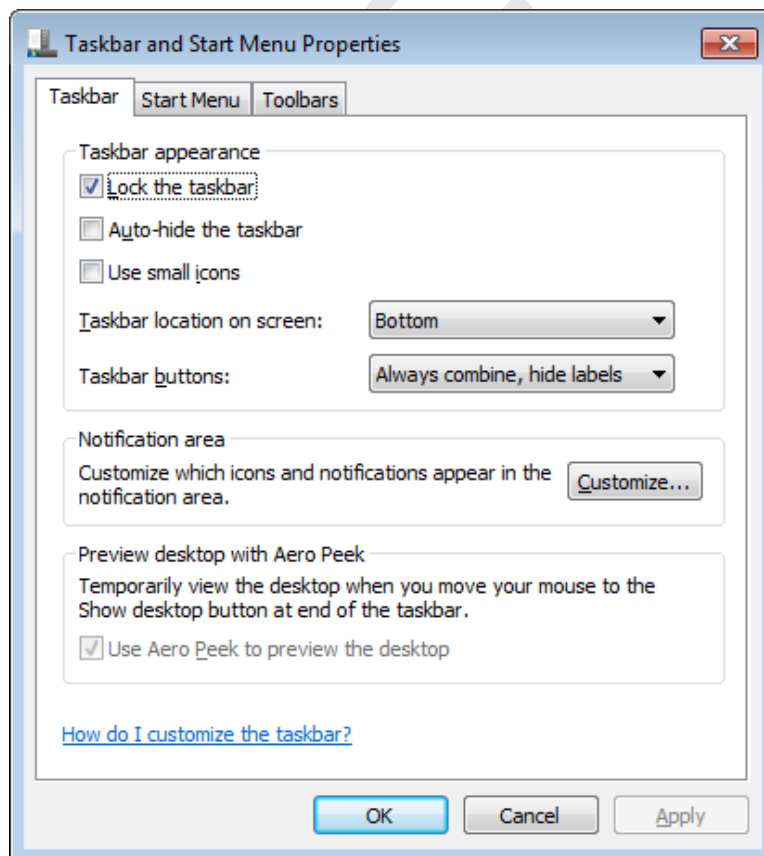
Configuring Taskbar properties

The taskbar can be dragged to different sides of the screen and resized using the mouse. There is also an Auto-Hide property, which means the taskbar only pops into view if the mouse is moved where it should be.

Make sure that you can operate a PC without using the mouse. Check websites for extra tips and shortcuts. The Microsoft Knowledge Base (support.microsoft.com/search) has an exhaustive list of keyboard shortcuts.

Aero

The Windows desktop is controlled by the **Desktop Window Manager (DWM.EXE)** process. Compared to older versions of Windows (Windows XP and earlier), Aero specifies a number of improvements to the way the desktop works and looks (themes). It includes things such as design guides for wizards and notifications, but the following features are most obvious to users:

■ Scalable icons and previews of window / file contents.

■ Aero Glass theme - translucent title bars and window borders.

■ Flip3D window manager, displaying 3D previews of open windows (activated by pressing **Start+Tab**).
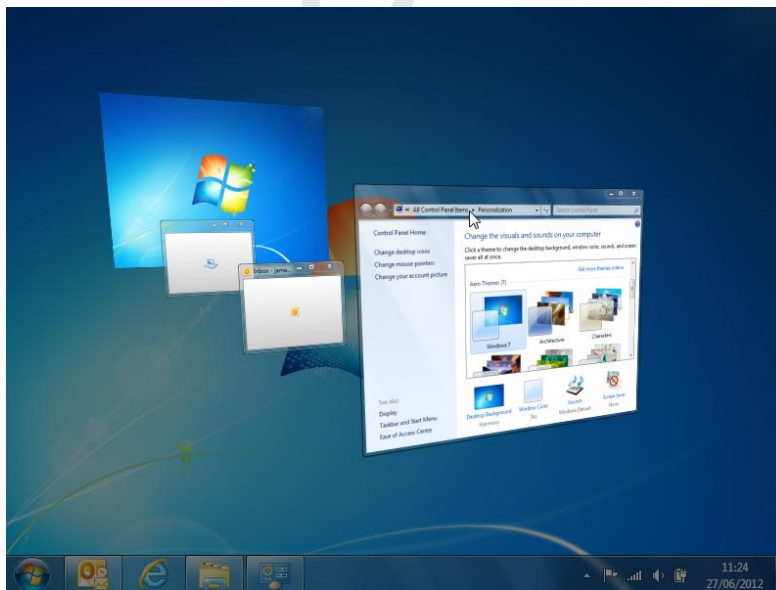
Windows Aero theme and Flip3D window selection

These effects require a fairly substantial graphics adapter but Windows selects appropriate settings on installation and individual effects can be customized and enabled or disabled by the user.

Gadgets

The Desktop can also host mini-applications, referred to as **gadgets**. Default gadgets include things such as a clock, calendar, RSS news ticker, weather report, and so on. You can configure gadgets by alt-clicking or via the **Desktop Gadgets** applet in Control Panel.

Windows 7 Editions

Editions are used by Microsoft to create different markets for Windows. Some editions of Windows are cheaper and have fewer features than others; some are designed for home use and others for use in businesses[3].

Windows 7 Starter Edition

This edition in only available pre-installed on netbooks and sub-notebooks. Unlike previous Starter editions, it is no longer limited to running three end-user applications concurrently. It still comes with a very limited range of features. The basic desktop theme cannot be customized for instance and there is no DVD playback (without third-party software). Also, the Starter edition can join a homegroup (a means of sharing files in Windows 7) but cannot be used to configure one.

Windows 7 Home Editions

The Windows 7 Home Editions are aimed (obviously) at home or small office users, where computers are configured in a workgroup network. There is no support for joining Active Directory networks run by Microsoft Windows Server. There are Home Basic and Home Premium versions. The Home Basic edition is not available to retail customers in "first world" countries. Home Basic cannot be activated outside of a defined list of regions.

Home Premium comes with the full range of Aero features, supports touch screen and tablet (ink) input, and comes with some extra tools (notably Media Center, High Definition video editing, and DVD playback and authoring).

Windows 7 Business Editions

Windows business networks are based around the use of Windows Server, which runs a network service called Active Directory. Business editions of Windows include client software that can join an Active Directory (or domain) network. The business editions also include file encryption, offline folders, and a server to allow the computer to be controlled remotely (Remote Desktop).

The business editions come with a feature called **XP mode**. XP mode allows the user to run a copy of Windows XP "within" the Windows 7 installation as a **virtual machine**, providing compatibility for older software and hardware.

There are two business editions: Professional and Enterprise. The Enterprise edition is only available to volume license customers (that is, it is not available for retail purchase). Compared to the retail Professional edition, it adds drive encryption (BitLocker), a language pack to enable the use of different languages for the Windows interface elements, and support for UNIX applications.

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[3] *"N" editions released in the European Union do not feature tools such as Media Player or Movie Maker as part of Microsoft's settlement with the EU over monopolistic trade practice.*

Windows 7 Ultimate

The Windows 7 Ultimate edition is essentially a retail version of Windows 7 Enterprise. The only significant additional features compared to the Home Premium and Business editions are the BitLocker drive encryption product and support for multiple interface languages. The only real reason for its existence is to provide an in-place upgrade path for Windows Vista Ultimate users.

64-bit Editions of Windows 7

Each edition of Windows 7 (except Starter) is available as 32-bit or 64-bit (x64) software. 64-bit editions of Windows 7 also require 64-bit hardware device drivers authorized by Microsoft ("signed"). If the vendor has not produced a 64-bit driver, the hardware device will not be usable.

Windows 7 System Requirements

Before installing or deploying an OS, it is necessary to ensure that the computer(s) meets the minimum hardware specification. The minimum requirements quoted in the table below will allow you to install and run Windows, but you should not expect outstanding performance at the minimum specification. System requirements will be considerably higher for many software **applications**.

Component	Minimum Specification
CPU	1 GHz.
Memory	1 GB RAM.
Display	Support for DirectX9 graphics (or later) and Windows Display Driver Model (WDDM) 1.0 for Aero support.
Hard disk	16 GB free space.
Installation Media	DVD-ROM or cross-network.
Audio	Sound card and speakers are recommended.

Unlike previous versions of Windows, Microsoft have not published official *recommended* specs but a dual-core CPU and 2 GB system RAM should provide acceptable performance for a machine running Office-type software.

The following additional requirements apply to specific features:

■   64-bit - CPU supporting AMD64 or EM64T, 2 GB RAM, and 20 GB free hard disk space.

■   Tablet / touch screen - runs only on dedicated hardware.

■   Media Center - a TV Tuner card and an IR receiver for the remote control are recommended.

In addition to the system requirements, you must ensure your system and all attached devices are in the Windows Logo'd Products catalog (sysdev.microsoft.com/en-US/Hardware/LPL/default.aspx).

Windows 7 System Limits

The various editions of Windows 7 have different restrictions in terms of CPU types and features and memory supported:

Feature	Home Basic	Home Premium	Professional	Enterprise	Ultimate
64-bit Edition	Yes	Yes	Yes	Yes	Yes
SMP	No	No	2-way	2-way	2-way
Multi-core	Yes	Yes	Yes	Yes	Yes
Memory (32-bit)	4 GB	4 GB	4 GB	4 GB	4 GB
Memory (64-bit)	8 GB	16 GB	192 GB	192 GB	192 GB

All editions support HyperThreading, hardware-assisted virtualization, and Data Execution Prevention. DVD playback and recording is supported[4] but Blu-ray requires third-party software.

The Starter edition is only available to system builders (OEMs) and Microsoft is currently only licensing it for installation on netbooks and sub-notebooks. There is no 64-bit version of the Starter edition.

Windows Vista

Microsoft released **Windows Vista** in 2007 as the successor to Windows XP. Vista introduced the Aero graphics system (better suited to scaling to different resolutions and capable of displaying windows in 3D) and came with updated media tools, a reworked desktop search engine, and a greater selection of mini-applications for home use.

Vista also refocused on security, with greater control over use of the local administrator account (User Account Control) and use of privilege restrictions to try to defeat malware.

Windows Vista Editions

Like Windows 7, there are numerous editions of Vista (including Home/Home Premium, Business/Enterprise, and Ultimate).

Windows Vista Home Editions

The Vista Home Editions are aimed at workgroup users. There is no support for joining Active Directory networks.

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[4] *All editions can use DVD as a data disc; all editions except Home Basic include a DVD Maker tool for creating video or picture DVDs with navigation menus.*

There are Home Basic and Home Premium versions. Home Premium supports more network client connections (10 compared to 5) and touchscreen and tablet (ink) input, and comes with some extra tools (notably Media Center, Meeting Space (a conferencing application for local networks), High Definition video editing, and DVD authoring). Also, the Home Basic edition does not include the Aero interface.

Windows Vista Professional Editions

The Active Directory client editions of Vista are Business and Enterprise. These include fax / scan tools, file encryption, and a Remote Desktop server.

The Enterprise edition is only available to Software Assurance licensing customers. Compared to the retail Business edition, it adds drive encryption (BitLocker) and support for UNIX applications.

Windows Vista Ultimate

The "professional" editions of Vista do not include the multimedia tools supplied with the "home" editions, such as Media Center, DVD Maker, Movie Maker, and games. The Ultimate edition comes with all the features of Vista Home Premium and Vista Enterprise.

Windows Vista Desktop

The Vista desktop is broadly similar to Windows 7. In place of pinned Taskbar icons, there is a Quick Launch toolbar that can be configured with shortcuts to commonly-used programs.
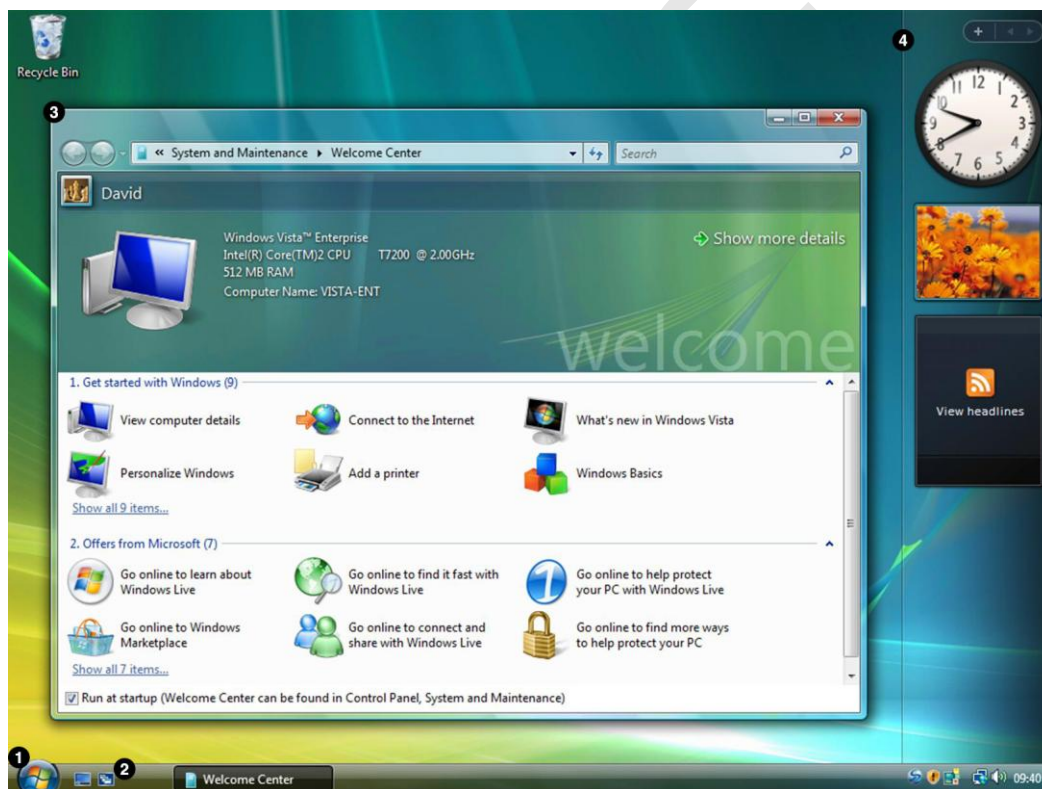
Vista desktop showing 1) Start orb; 2) Switch Between Windows button; 3) Welcome Center; 4) Sidebar with clock, slide show, and RSS news feed gadgets

Aero Glass and Flip3D features are not available in the Home Basic edition.

Sidebar

The **Sidebar** is a strip that can be positioned on the right (default) or left of the desktop to host **gadgets**. You can configure the Sidebar by alt-clicking it or by selecting its taskbar icon.

| Open |
| **Bring Gadgets to Front** |
| Add Gadgets... |
| Properties |
| Help |
| Exit |
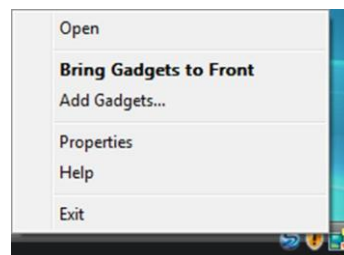
Configuring the Sidebar

Windows Vista System Requirements

For good workstation throughput, you should be considering a dual-core processor and 1 GB RAM or more.

Component	Minimum and Recommended Specification
CPU	800 MHz (1 GHz 32-bit or 64-bit recommended).
Memory	512 MB RAM (1 GB recommended for all editions other than Home Basic).
Display	SVGA or higher (800 x 600). Support for DirectX9 graphics and 32 MB graphics memory recommended. Aero requires 128 MB graphics memory, pixel shader 2.0, and 32-bits / pixel.
Hard disk	20 GB with 15 GB free space (40 GB recommended for all editions other than Home Basic).
Installation Media	DVD-ROM or cross-network.
Audio	Sound card and speakers are recommended.

As well as determining the system requirements to support Windows Vista, ensure that any third-party hardware devices you have will also support it. At launch, third-party support for Vista was quite patchy. While the situation improved as regards newly released devices, older hardware may not have suitable drivers.

The following additional requirements apply to specific features:

■ x64 - CPU supporting AMD64 or EM64T.

■ Tablet / touchscreen - runs only on dedicated hardware.

■ Media Center - a TV Tuner card and an IR receiver for the remote control are recommended.

Windows Vista System Limits

The various editions of Windows Vista have different restrictions in terms of CPU types and features and memory supported:

Feature	Home Basic	Home Premium	Business	Enterprise	Ultimate
64-bit Edition	Yes	Yes	Yes	Yes	Yes
SMP	No	No	2-way	2-way	2-way
Multi-core	Yes	Yes	Yes	Yes	Yes
Memory (32-bit)	4 GB	4 GB	4 GB	4 GB	4 GB
Memory (64-bit)	8 GB	16 GB	128 GB	128 GB	128 GB

All editions support HyperThreading, hardware-assisted virtualization, and Data Execution Prevention. DVD playback and recording is supported[5] but Blu-ray requires third-party software.

Windows XP

Windows XP, released in 2002, is the earliest Windows version you are expected to support. While 10 years old at the time of writing, it is still almost as widely deployed as Windows 7.

Windows XP desktop

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[5] *All editions can use DVD as a data disc; the Home Premium and Ultimate editions include a DVD Maker tool for creating video or picture DVDs with navigation menus.*

Windows XP Editions

Like its successors, there are also various editions of Windows XP.

Windows XP Professional

The "standard" version of Windows XP for business clients is **Windows XP Professional**. This is the preferred client for Windows Domain (Active Directory) networks.

Microsoft released several editions alongside the Professional edition, designed for different markets.

Windows XP Home Edition

Windows XP Home Edition is a cheaper, stripped down version of Windows XP Professional. It does not support an Active Directory Client, Remote Desktop server, or Encrypting File System, and has a simplified user access control model. It supports up to 5 client connections in a workgroup rather than Professional's 10.

Windows XP Media Center Edition (MCE)

Only available to OEMs (Original Equipment Manufacturer), this version makes the computer a "digital media hub" capable of TV reception and recording. MCE is based on Windows XP Professional, but features an extra shell that can be operated using a TV-style remote control. The use of a suitable tuner card allows TV and radio reception and playback, as well as DVD/CD playback and storage of audio and video data. There have been several versions of MCE (one each year from 2002 to 2005 in fact). The last version cannot be used as an Active Directory client, but does feature a tweaked desktop color theme and supports the other features of the Professional edition.

Windows XP MCE 2005

Windows XP Tablet PC Edition

Windows XP Tablet PC Edition is a version optimized for Tablet PCs. It provides support for handwriting recognition and the touchscreen interface through its "Ink" features. Otherwise it is identical to Windows XP Professional Edition.

Windows XP x64 Edition

A version of the Professional edition optimized for x64 platforms.

Windows XP with Advanced Security Technologies (SP2)

In 2004, Windows XP SP2 was released. This **service pack**[6] introduced a new **Security Center** applet for the Control Panel, an improved **Windows Firewall** (now activated by default), and improvements to Internet Explorer, including a **pop-up window blocker** and an **Information Bar** to warn about harmful content.

Windows XP System Requirements

The following requirements are for Windows XP Professional and Home editions.

Component	Minimum and Recommended Specification
CPU	32-bit x86 (233 MHz or higher). 300 MHz (or better) recommended.
Memory	64 MB RAM (128 MB recommended).
Display	SVGA or higher (800 x 600).
Hard disk	1.5 GB free disk space + paging space. It is therefore recommended that you have at least 2 GB of free space available.
Installation Media	CD-ROM or cross-network.

The following additional requirements apply to the various editions of XP:

- x64 - CPU supporting AMD64 or EM64T and 256 MB system memory.

- Tablet - runs only on dedicated hardware.

- MCE - this requires considerably more computing power (a 1.6 GHz CPU and 256 MB memory at *least*) and disk space for good usability. To receive TV broadcasts, it also needs a TV Tuner card and an IR receiver for the remote control.

---

[6] *A service pack collects patches and fixes that have been released so far and may add new features.*

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Page 15

Windows XP System Limits

The various editions of Windows XP have different restrictions in terms of CPU types and features and memory supported:

Feature	Home	Professional	MCE	Tablet Edition
64-bit (x64) Edition	No	Yes	No	No
SMP	No	2-way	No	2-way
Multi-core	Yes	Yes	Yes	Yes
HyperThreading	Yes	Yes	Yes	Yes
Virtualization (VT-x / AMD-V)	Yes (SP2)	Yes (SP2)	Yes (SP2)	Yes (SP2)
Data Execution Prevention	Yes (SP2)	Yes (SP2)	Yes (SP2)	Yes (SP2)
Physical Memory (32-bit)	4 GB	4 GB	4 GB	4 GB
Physical Memory (64-bit)	N/A	128 GB	N/A	N/A

Third-party software may be required to support DVD / Blu-ray playback and recording[7].

Windows Upgrade Paths

Replacing an earlier version of Windows with a newer one is an **upgrade**. Broadly speaking, an upgrade can take place in two ways:

■ In-place - the existing OS is upgraded. This preserves the existing applications, data files, and user settings.

■ Clean install - an ordinary installation is performed over the existing OS (which would normally be deleted first). If data or settings from the old system need to be preserved, these would need to be backed up and migrated to the new environment. Applications would also need to be re-installed.

Generally speaking, in an enterprise environment in-place upgrading of client machines is probably pretty inefficient; most network administrators tend to favor performing clean installations.

On smaller networks or for home use, in-place upgrades are simpler. An in-place upgrade must follow a supported **upgrade path** however.

Installation steps and procedures are covered in detail in Unit 2.4.

---

[7] *In 2007, Microsoft released a patch to support DVD recording under XP SP2 and SP3.*

Upgrading to Windows XP

The table below summarizes the in-place upgrade paths to specific editions of Windows XP from various older Windows products.

Product	Upgrade Path
Windows 95	Upgrade to Windows 98 then Windows XP Professional or Home Edition
	Upgrade to Windows 2000 then Windows XP Professional
Windows 98 / Windows 98 Second Edition	Windows XP Professional / Windows XP Home
Windows *Me*	Windows XP Professional / Windows XP Home
Windows NT4 Workstation (SP5)	Windows XP Professional
Windows 2000 Professional	Windows XP Professional
Windows NT Workstation 3.51	Upgrade to Windows NT 4.0 (SP5) then Windows XP Professional
Windows XP Home Edition	Windows XP Professional

You cannot "downgrade" from Windows XP Professional to Home Edition. You cannot upgrade any product to Windows XP Media Center Edition.

Upgrading from Windows 2000 to Windows XP

Upgrading to Windows Vista

Windows Vista only supports in-place upgrades from Windows XP 32-bit versions and other editions of Vista[8]. The table below summarizes the in-place upgrade paths for the various editions.

Product	Upgrade Path
Windows XP Professional	Windows Vista Business or Ultimate
Windows XP Home Edition	Windows Vista Home Basic, Home Premium, Business, or Ultimate
Windows XP Media Center Edition (MCE)	Windows Vista Home Premium or Ultimate
Windows XP Tablet PC	Windows Vista Business or Ultimate
Windows Vista Starter	Windows Vista Home Basic, Home Premium, Business, or Ultimate
Windows Vista Home Basic	Windows Vista Home Premium, Business, or Ultimate
Windows Vista Home Premium	Windows Vista Ultimate
Windows Vista Business	Windows Vista Ultimate
Windows Vista Enterprise	Windows Vista Ultimate

You cannot upgrade from a 32-bit version of Windows to a 64-bit version nor can you upgrade from Windows XP x64 Edition to any 64-bit edition of Vista.

Upgrading to Windows 7

Windows 7 only supports **in-place** upgrades from Windows Vista and other editions of 7. As with Vista, you can only perform an in-place upgrade to an equivalent or higher edition. For example, you *cannot* perform an in-place upgrade of Windows Vista Ultimate to Windows 7 Home Premium.

You can run a graphical tool to check the compatibility of software and hardware on the target machine against Microsoft's database.

Click the **Check Compatibility Online** link from the setup disc to open the **Upgrade Advisor** site (windows.microsoft.com/en-us/windows/downloads/upgrade-advisor). Download and install the Upgrade Advisor then run it to scan the computer. Make sure any peripheral devices such as printers or webcams that you want to use under Windows 7 are already connected.

---

[8] *If you have purchased Windows Vista upgrade media, any previous version of Windows 2000 or XP is valid for licensing purposes but will require a clean install if an in-place upgrade option is not available.*
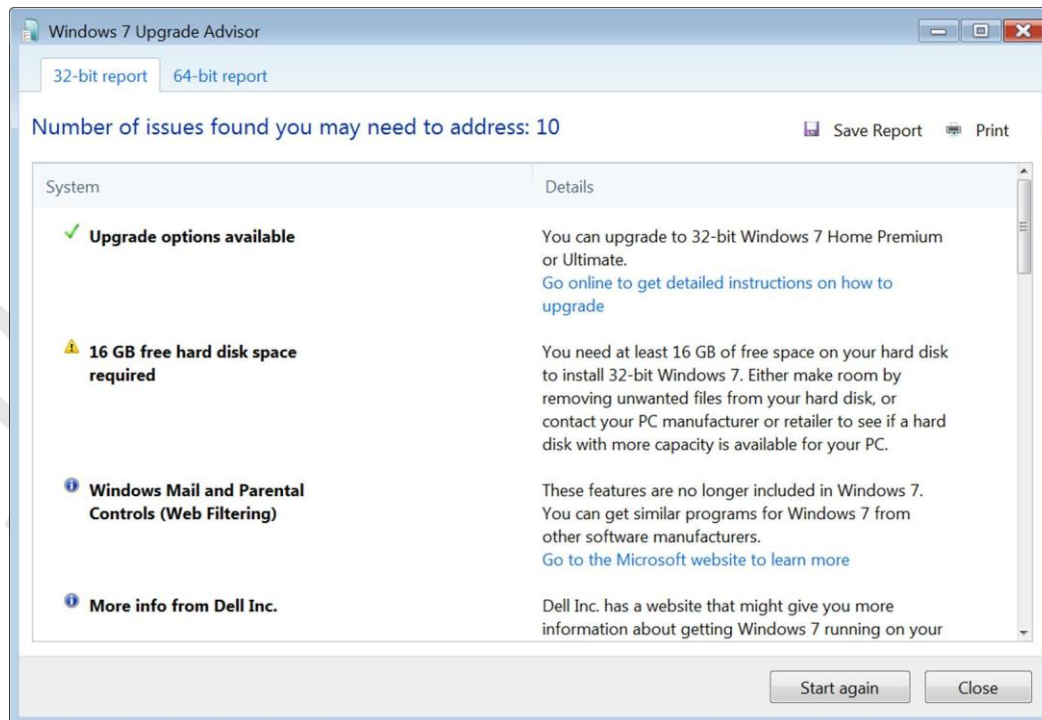
Windows 7 Upgrade Advisor report

The Upgrade Advisor then reports on any compatibility issues or upgrade paths required for installation of 32-bit or 64-bit Windows.

Review Questions / Module 1 / Unit 1 / Windows Operating System

Answer the following questions. The correct answers are in the accompanying "Labs and References" manual.

1) If you plan to upgrade a computer to Windows XP, what should you check?

2) How much free disk space is required to install Windows XP Home edition?

3) Which version of Windows does NOT support gadgets?

4) Which version(s) of Windows support Aero Peek?

5) You are advising a customer on purchasing an upgrade of Windows XP to Windows 7. The customer has expressed admiration for the "Flip 3D" effect on your demonstration system. Which edition of 7 should you advise the customer NOT to buy?

6) In terms of system hardware, what is the main advantage of a 64-bit version of Windows?

7) True or false? Windows XP does not support CPU extensions to improve virtualisation performance such as VT-x or AMD-V.

8) You want to upgrade a Windows XP system to Vista. The XP system has a 1 GHz Pentium 4 CPU, 512 MB RAM, an onboard graphics adapter, and a 20 GB hard disk. Does this PC meet the minimum system requirements?

9) You want to make full use of a 2-CPU Xeon-based workstation. Which editions of Windows 7 should you consider?

10) Which versions of Windows can be upgraded directly to Windows XP Professional?

Module 1 / Unit 2
Administration Tools

Objectives

On completion of this unit, you will be able to:

■ Use administrative tools (Control Panel, Command Prompt, Computer Management).

■ Navigate between drives and directories and identify the location of system files and folders.

■ Use the shutdown command.

■ Understand the structure of the Registry and make edits to it.

Control Panel

There are a number of tools used to configure Windows settings and hardware devices. Some of the tools are accessible to ordinary users; others need "administrative" privileges to run.

The **Control Panel** is the best place to start configuring your system. Each icon in the Control Panel represents an **applet** used to configure some part of the system. Most applets are added by Windows but some software applications, such as anti-virus software, add their own applets. Configuration information stored in the Windows Registry is held on a **per system** or **per user** basis, and the icons within Control Panel reflect this, although some parts of some applets contain both system and user settings.

Wherever possible, modify system settings through Control Panel rather than edit the Registry.

You can access Control Panel through the Start menu or through (My) Computer on the desktop. In addition, certain applets are accessible by viewing object properties straight from the desktop or from Explorer.

In Windows 7, Control Panel applets are arranged by category by default though you can display "All items" via the breadcrumb or the "View by" menu. Note that options with the 🛡 icon on or next to them will require you to authorize use of the command through User Account Control (UAC).

Windows 7 Control Panel showing 1) Task groups; 2) Configuration applets; 3) Navigation breadcrumb; 4) Search box

Under Windows XP, Control Panel can be viewed in either Category View or Classic View. Category view presents a simplified wizard style interface, suitable for home users. Classic view shows each applet individually.
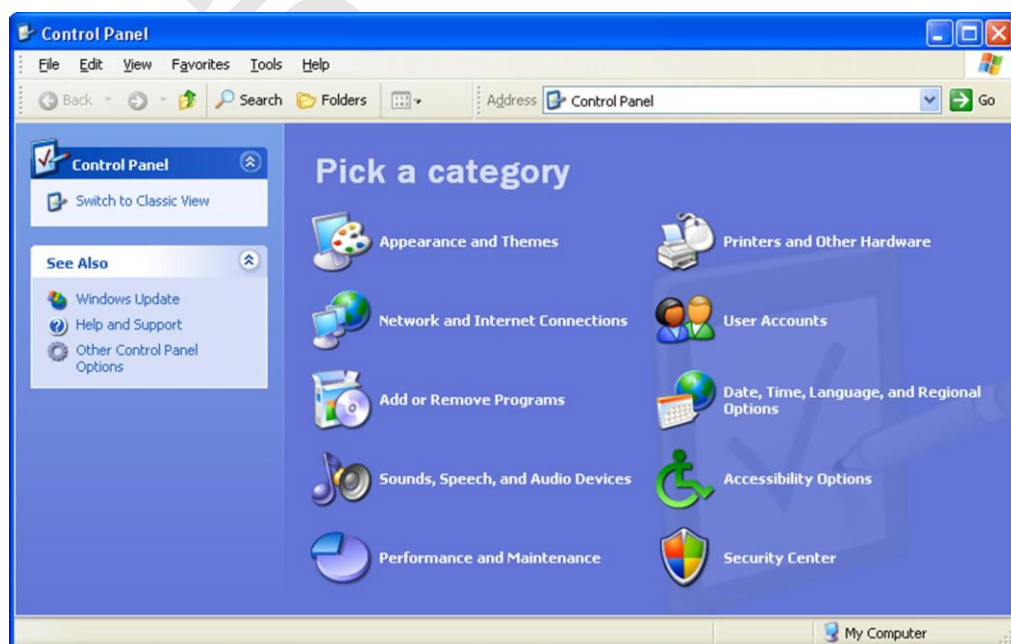
Windows XP Control Panel - Category View

System Properties

The System settings include network identification and domain membership, hardware settings and configuration, user and hardware profiles, and performance and recovery options.

My Computer

My Computer provides access to your local drives (whether hard, floppy, optical, or flash-based [USB or memory card]), printers, and any network drives that have been **mapped**.

One of the cosmetic changes in Vista is that the "My" designation has been dropped; so "My Computer" is listed simply as "Computer", "My Documents" just appears as "Documents", and so on. In Windows 7, "My" Documents has been restored but not "My" Computer.

To browse resources, open **My Computer** then the icon that represents the resource you want to view.

By alt-clicking the My Computer icon itself and selecting the **Properties** option from the menu, you can access the **System** properties described below. Alternatively, you can open the **System** icon in Control Panel.

General System Properties

In Windows XP, the **General** tab of the System Properties dialog gives information about the system, such as the processor type and registered owner.

Under Windows Vista and Windows 7, the General tab is replaced by a System Properties home page displaying additional summary information about the computer, including the Windows edition, product key, and activation status.
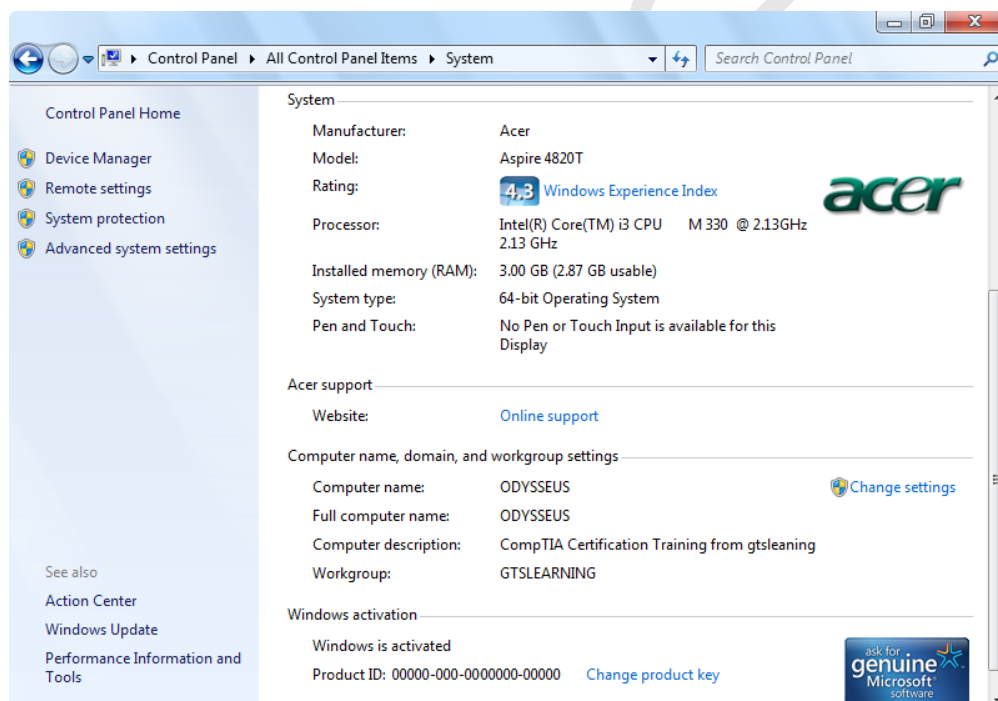
Windows 7 system properties

Click the **Tasks** or **Change settings** links to access the configuration dialogs.

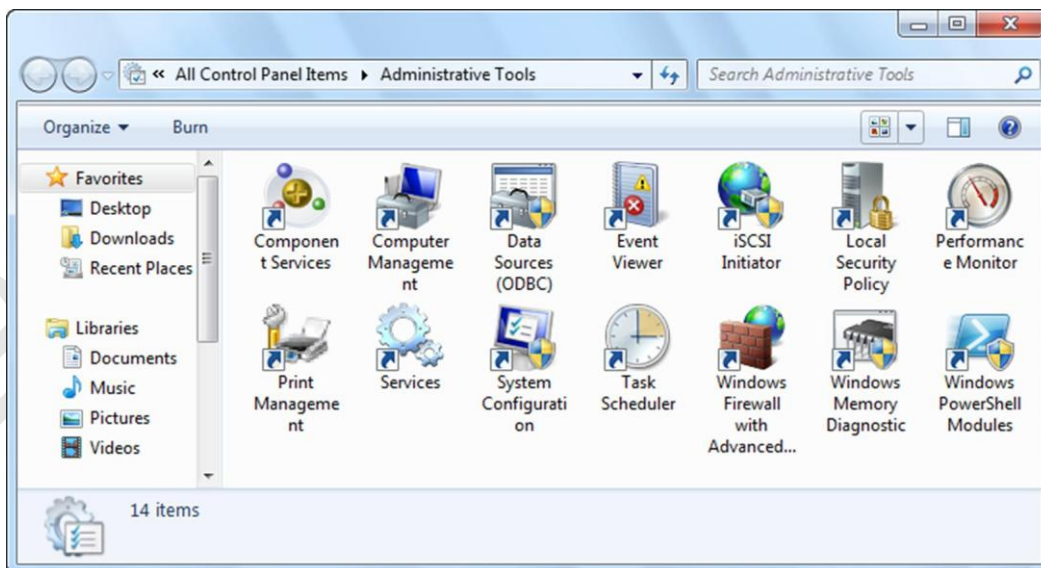# Microsoft Management Consoles and Administrative Tools

One of the options in Control Panel is the **Administrative Tools** shortcut[9].


Administrative Tools in Windows 7

Administrative Tools contains a number of shortcuts, giving you the ability to define and configure various advanced system settings and processes. There are also several tools to assist with troubleshooting the system.

Default Microsoft Management Consoles

Administrative Tools is a collection of pre-defined **Microsoft Management Consoles (MMC)**. Each console contains one or more **snap-ins** that are used to modify various settings. The principal consoles are:

■   **Component Services** - enables you to register new server applications or reconfigure security permissions for existing services.

■   **Computer Management** - allowing the administrator to configure local users and groups, disks, services, devices, and so on.

■   **Data Sources** - control data connections set up on the local computer.

■   **Event Viewer** - allows monitoring of Windows logs. System, security, and application events are recorded in these logs.

---

[9] *Administrative Tools can also be displayed on the Start Menu by adjusting its properties.*
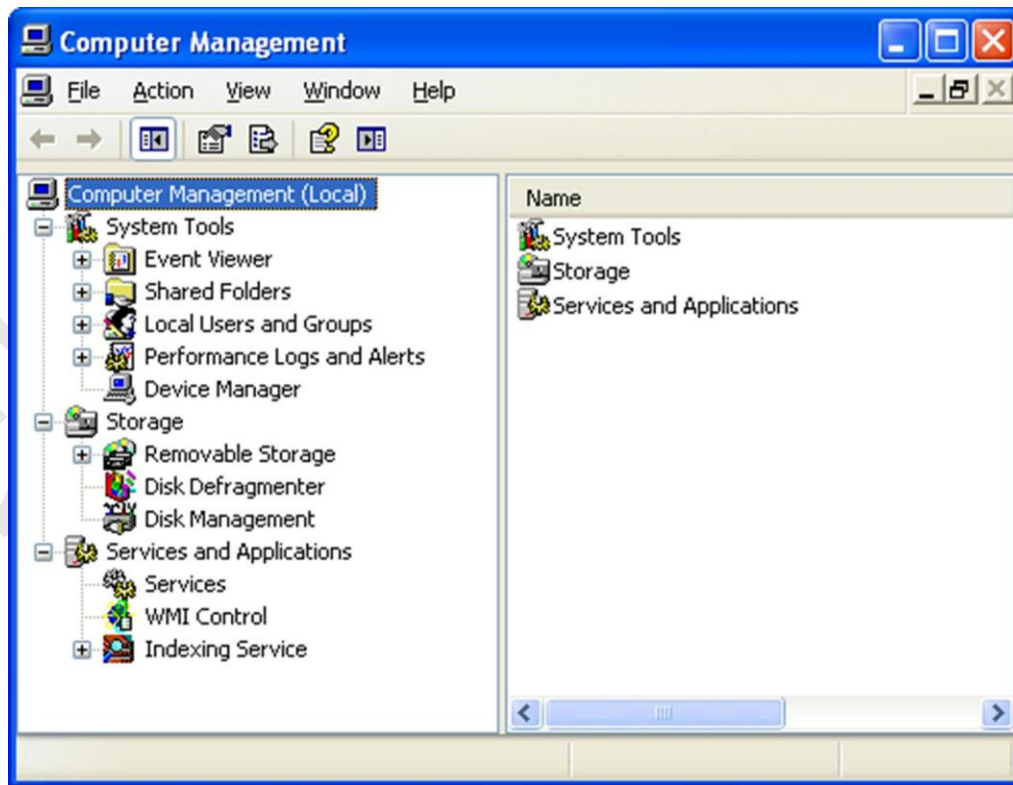
Local computer management in Windows XP

- ■ **Local Security Policy** - allows you to view and edit the current security policy (a computer that is a member of a domain will have the security settings defined in the domain security policy).

- ■ **Performance Monitor** - viewing the performance of the local computer. Vista/7 has an improved **Reliability and Performance Monitorin**g tool and also a **Memory Diagnostic Tool**.

- ■ **Services** - start, stop, and pause services.

Customizing MMCs

As well as using the default consoles, you may find it useful to create your own. To access management console itself, click **Start** > **Run**, type mmc and click **OK**. The standard, empty console appears. You can now use the **Console** menu to add or remove any **snap-ins**. Consoles may be configured for each administrator and the details saved as a file with an **MSC** extension in their Start menu folder.

Most MMC snap-ins can be used to manage either the local computer or a remote computer (a computer elsewhere on the network).
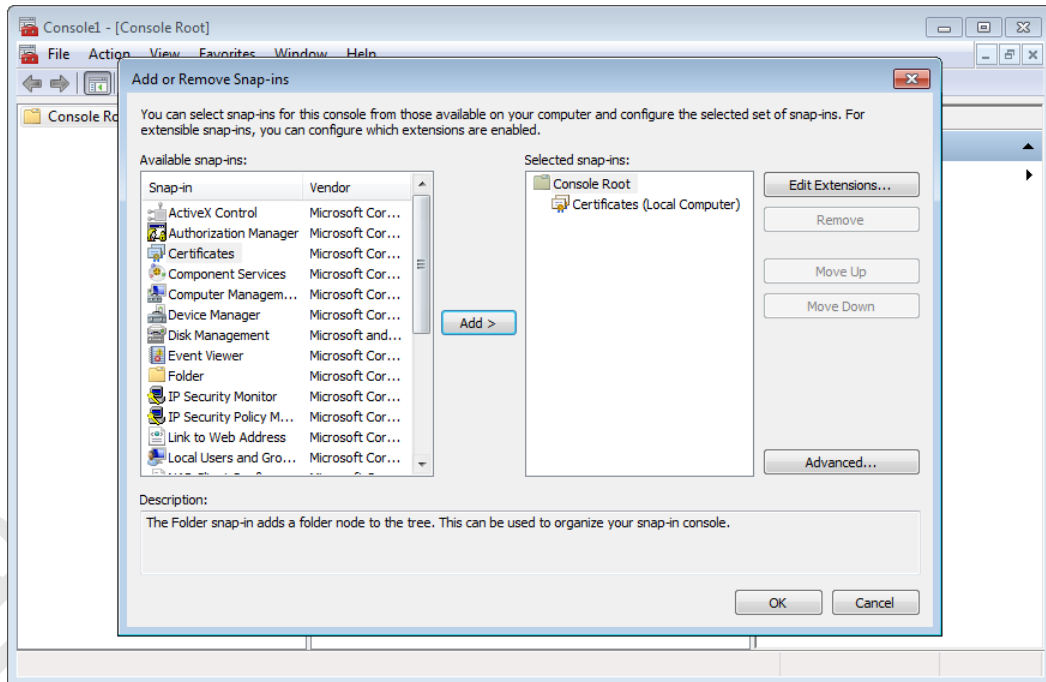
Adding a Snap-in in Windows 7

Command Prompt and Text Editors

Most configuration of Windows can be done via convenient GUI interfaces, such as the management consoles and Control Panel. In some circumstances though, it is necessary to use a **command prompt** to configure or troubleshoot a system. As you learn the commands better, you may also find it quicker to use the command shell for actions such as file management. Learning commands is also valuable if you have to write **scripts** to automate Windows.

Run Command

Using the **Start > Run** dialog, you can open any file or program by typing the path to the file. In the case of registered programs and utilities, you simply need to type the program file name or utility name.
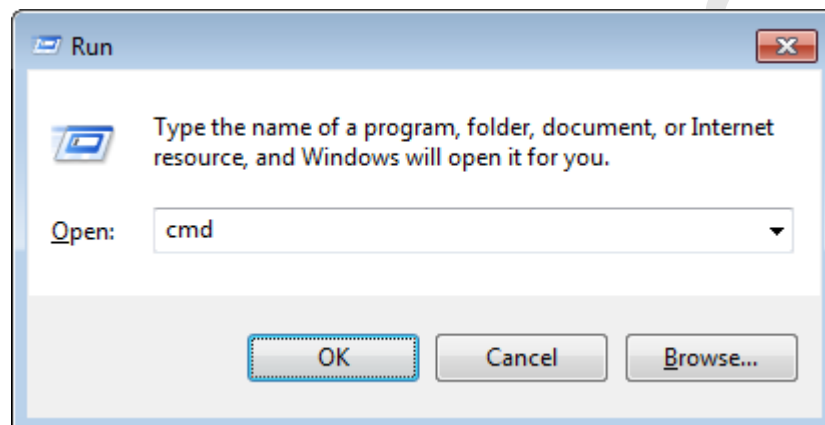
Run dialog box

In Windows 7, the **Instant Search** box at the bottom of the menu replaces the Run command[10] and will execute programs and configuration options using simple names.

Display the Run dialog quickly by pressing `Start+R`*. Activate Instant Search even more simply by pressing the* `Start` *key.*

You can also execute commands from the **Run** dialog. If a command is interactive, it will open a command prompt window (see below) for input. If a command is non-interactive, the command prompt window will open briefly and close again as the command executes.

The Run command is useful if you want to execute a program with switches that modify the operation of the software. For example, Microsoft Office programs can be executed using safe mode switches for troubleshooting.

Opening the Command Prompt

You can run any command from the **Run** dialog. However, to input a series of commands or to view output from commands, you need to use the command shell (CMD.EXE). To open the prompt, type `cmd` at the **Run** dialog or Instant Search box or use the shortcut in the **Accessories** program group on the **Start menu**.
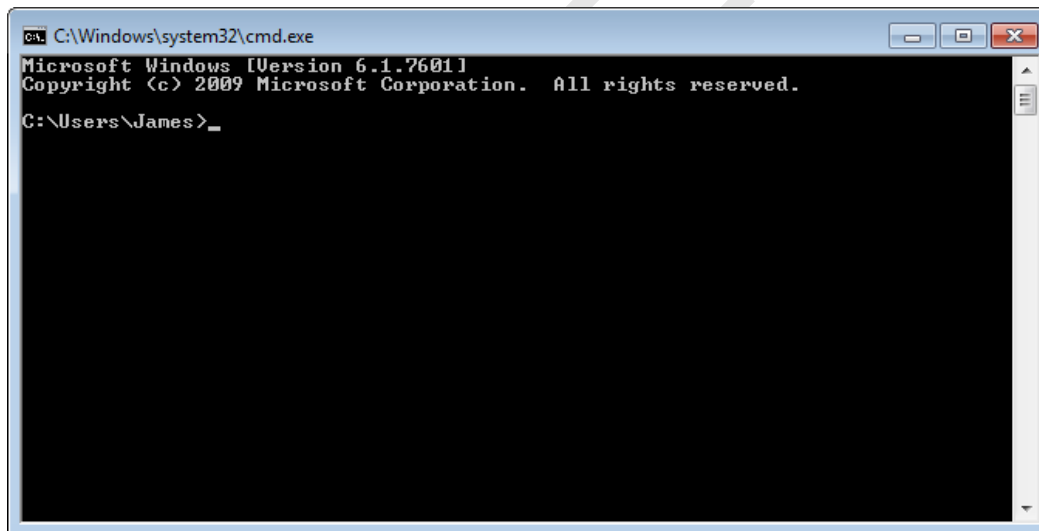
Command Prompt

In Windows Vista/7, you may need to run the command prompt with **elevated privileges** in order to execute a command. To do this, alt-click the command prompt shortcut and select **Run as administrator** then confirm the UAC (User Account Control) prompt. Alternatively, type `cmd` in the Instant Search box then press `Ctrl+Shift+Enter`.

---

[10] *You can still access the Run command using* `Start+R`*, entering* `run` *into the search box, or by opening the shortcut in the Accessories program group.*

To run a command, type it at the prompt (>) using the **command name** and any **switches** and **arguments** using the proper **syntax**. When you have typed the command, press **Enter** to execute it. The syntax of a command lists which arguments[11] you must use (plus ones that are optional) and the effect of the different switches. Switches are usually preceded by the forward slash escape character.

As you enter commands, the prompt fills up with text. If this is distracting, you can use the **cls** command to clear the screen.

Some commands, such as **nslookup** or **telnet**, can operate in **interactive** mode. This means that using the command starts that program and from that point, the prompt will only accept input relevant to the program. To exit the program you use the **exit** or **quit** command (or press **Ctrl+C**).

Other Command Prompts

Running a command prompt within Windows makes the commands from the Windows command shell (CMD.EXE) available.

The Windows XP troubleshooting utility **Recovery Console** is also used at a command prompt, but the environment is restricted compared to the full version of Windows. Conversely, the Windows Vista/7 **Recovery Environment (RE)** command prompt is basically the same as that of the full product. If you use a DOS or Windows 9x startup disk, the command environment is different again. Also, you will not be able to access NTFS drives.

Getting Help

The command prompt includes a rudimentary help system. If you type **help** at the command prompt then press **Enter**, a list of available commands is displayed. If you enter **help *CommandName***, help on that command is displayed, listing the syntax and switches used for the command. You can also display help on a particular command by using the **/?** switch (for example, **format /?** displays help on the **format** command).

```
C:\Windows\system32\cmd.exe                                              [_][□][✕]
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\James>format /?
Formats a disk for use with Windows.

FORMAT volume [/FS:file-system] [/V:label] [/Q] [/A:size] [/C] [/X] [/P:passes]
[/S:state]
FORMAT volume [/V:label] [/Q] [/F:size] [/P:passes]
FORMAT volume [/V:label] [/Q] [/T:tracks /N:sectors] [/P:passes]
FORMAT volume [/V:label] [/Q] [/P:passes]
FORMAT volume [/Q]

  volume            Specifies the drive letter (followed by a colon),
                    mount point, or volume name.
  /FS:filesystem    Specifies the type of the file system (FAT, FAT32, exFAT, NTFS
,
                    or UDF).
  /V:label          Specifies the volume label.
  /Q                Performs a quick format. Note that this switch overrides /P.
  /C                NTFS only: Files created on the new volume will be compressed
                    by default.
  /X                Forces the volume to dismount first if necessary.  All opened
                    handles to the volume would no longer be valid.
  /R:revision       UDF only: Forces the format to a specific UDF version
```
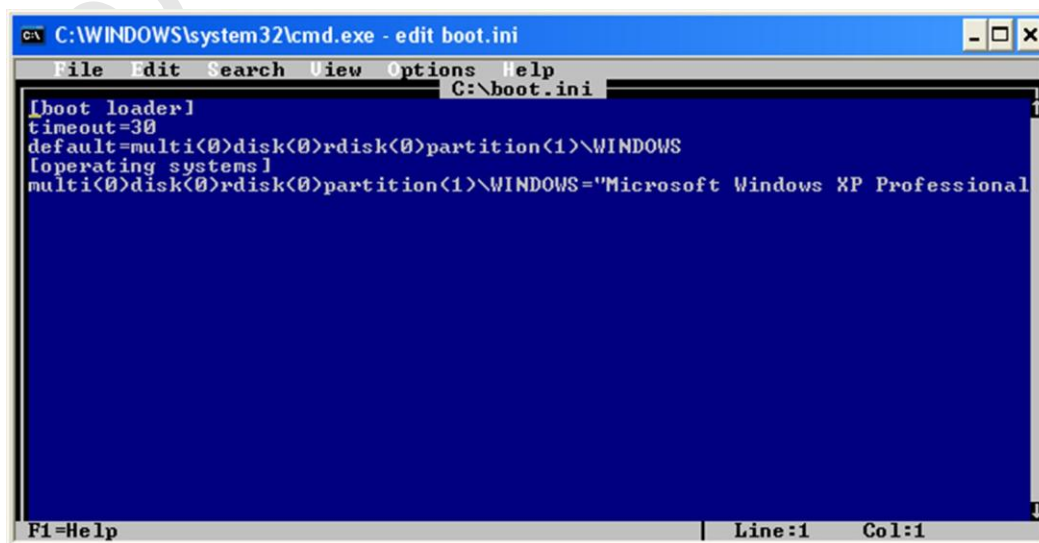
Help on the format command

---

[11] *If an argument, such as a file path, includes a space it needs to be entered within quotes ("...").*

Text Editor

Many files used by the operating system and applications are in a **binary** file format that can only be interpreted by the application. A **plain text** file can be modified in any text editor, but if it is saved through an application other than a basic text editor, it could be converted to a binary format and so become unusable.

In Windows XP, there is a command prompt plain text editor called **EDIT.COM** suitable for changing system files. Unlike a word processor, it does not put any special characters in a file that may render it unreadable to the system.

The utility can either be used to create a new file (simply enter **edit** or **edit** *FileName*[12]) or to edit an existing file: edit C:\boot.ini

```
C:\WINDOWS\system32\cmd.exe - edit boot.ini                          _ □ ×
    File  Edit  Search  View  Options  Help
                            C:\boot.ini
[boot loader]
timeout=30
default=multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
[operating systems]
multi(0)disk(0)rdisk(0)partition(1)\WINDOWS="Microsoft Windows XP Professional




 F1=Help                                         Line:1      Col:1
```

Command prompt text file editor

The menu will respond to mouse clicks or you can use **Alt** to navigate it using the keyboard. Basic keyboard shortcuts, such as **Ctrl+V** to paste, are also supported.

When you have finished editing, remember to save the file. The program will prompt you if there are unsaved changes.

In Windows Vista/7, the **edit** command is no longer supported. Use the GUI text editor **notepad** to modify files (for example, run **notepad C:\boot.ini**).

---

[12] *Obviously if you enter an existing file name, the file will be opened for editing. Using a file name does not automatically create the file. You need to save the file first.*

Batch Files and Scripts

A **batch file** is a plain text file saved with a .BAT or .CMD extension. The file should contain commands entered onto separate lines. When the batch file is run, each command executes in sequence.

The command `@echo off` is usually added to the top of the file to suppress the display of commands. A batch file can also accept user input, by entering an argument as a **variable** of the form `%1`.

A **script** can be used to create a mini-program, working with all the functionality of the chosen scripting language. Scripts can automate many functions of Windows. Most Windows scripts use VBScript (Visual Basic Script), which are given the extension .VBS. JavaScript is also used (.JS).

Batch files and scripts are commonly used to set up the user environment or copy files for backup. They can be run manually, automatically at logon (as part of a login profile), or automatically at any time using the **Task Scheduler**.

Directory Structures and User Profiles

Under Windows, system objects are organized in a hierarchy. In Windows XP, the **desktop** is at the top of the hierarchy and contains shortcuts, files, **My Computer**, **My Network Places**, **Recycle Bin**, and the current user's **My Documents** object.
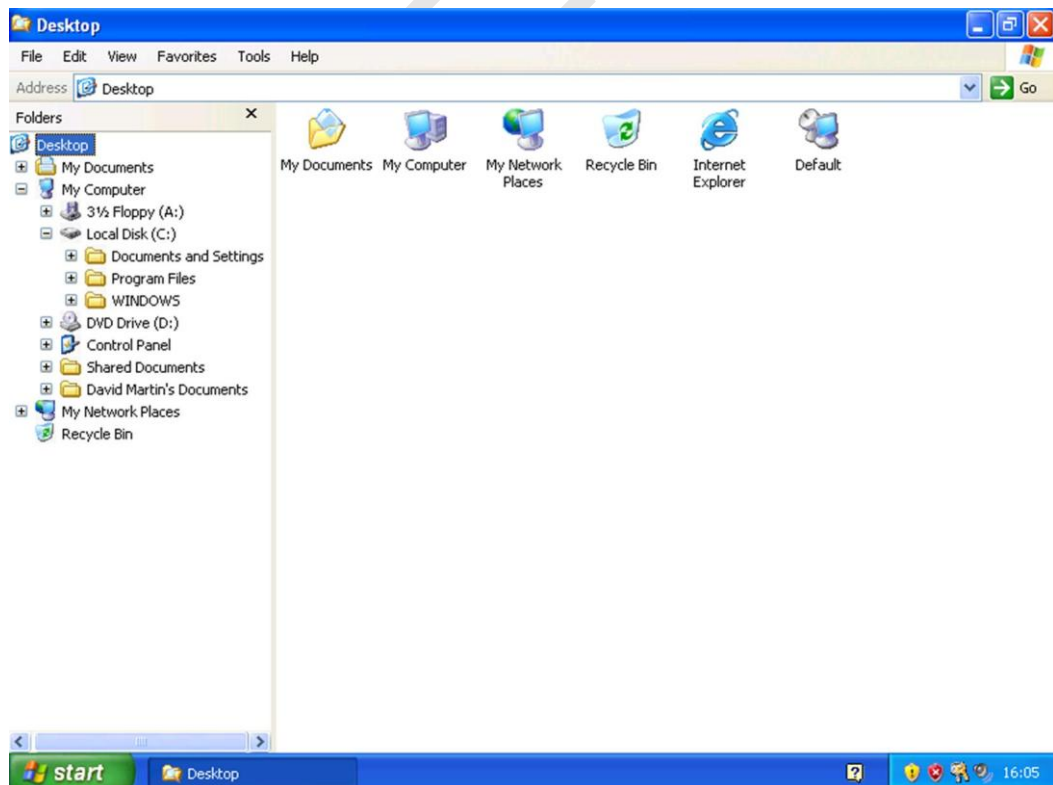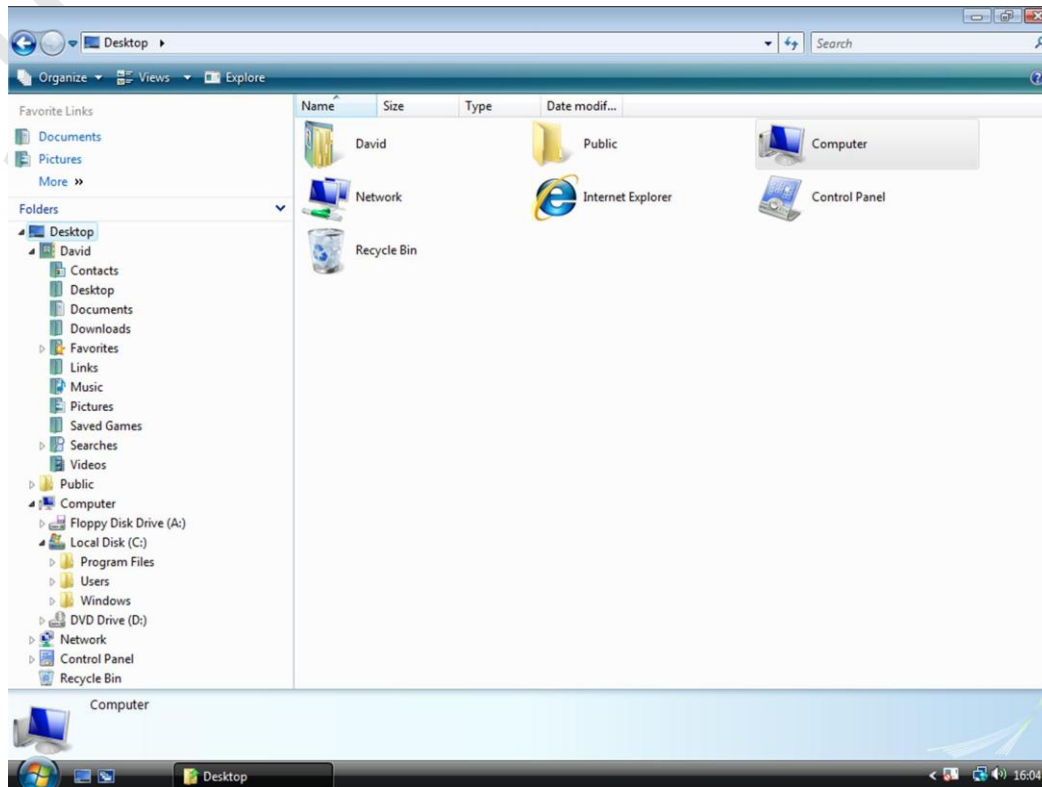

Windows XP folder hierarchy

My Computer contains local, removable, and network **drives** plus the Control Panel.

Standalone or workgroup installations of Windows XP also include a "Shared Documents" folder that is accessible to all users of the computer.

Vista has the same sort of hierarchy but some different terminology and organizational principles. The **desktop** is still the container object but within that are a **User** folder (named after the user account), a **Public** folder, the **Computer** object, the **Network** object, **Control Panel**, and the **Recycle Bin**. The User object contains numerous subfolders, including Documents, Pictures, Videos, Downloads, Contacts, and so on.

Windows Vista folder hierarchy

In Windows 7 each profile folder still contains subfolders for different types of file (renamed back to the XP conventions of "My Documents", "My Music", "My Pictures", "My Video", and so on). However, user access to the profile folder is largely mediated through the **Libraries** feature.

See Unit 1.5 for notes on the use of Libraries.

Drives in My Computer

Within My Computer, drives are referred to by letters and optional labels. A "drive" can be a single physical disk or a partition on a disk. A drive can also point to a shared network folder "mapped" to a drive letter. By convention, the A: drive is the floppy disk and the C: drive is the active (bootable) partition on the primary hard disk.

Every drive (partition or volume) contains a directory called the **root directory**. The root directory is represented by the backslash (****). For example, the root directory of the C: drive is **C:** Below the root directory is a hierarchical structure of directories called **subdirectories**. A sample directory structure is shown in the diagram:

Typical Windows directory structure
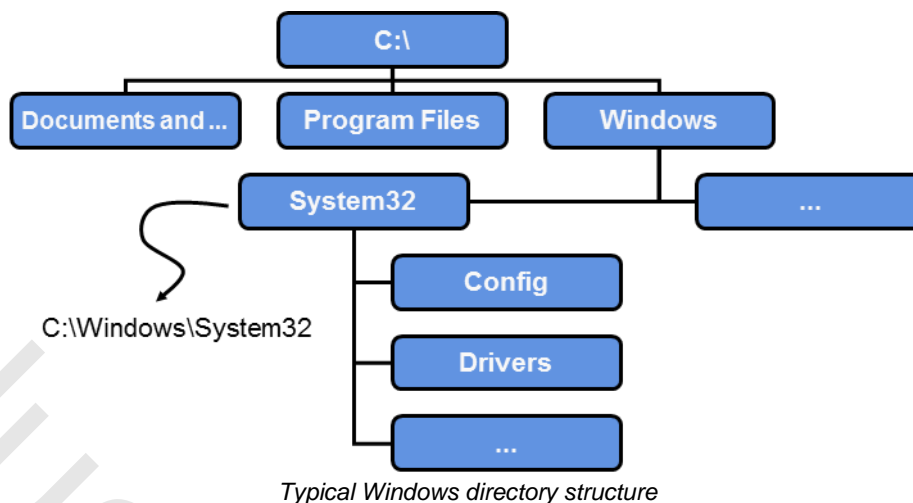
Files may be stored at each level, including the root level. The convention is to keep as few files as possible in the root directory.

Windows XP System Files and Folders

The root directory of a typical Windows XP installation normally contains the following files and subdirectories:

■ **Windows**[13] - the system root, containing drivers, logs, add-in applications, system and registry files (notably the System32 subdirectory[14]), fonts, and so on.

■ **Program Files** - subdirectories for installed applications software[15].

■ **Documents and Settings** - storage for users' profile settings and data. Each user has a folder named after their user account. This subfolder contains NTUSER.DAT (Registry data), My Documents, Temporary Internet Files, Cookies, recent file shortcuts, desktop shortcuts, temporary files created by applications, and so on.

   This folder also includes "All Users", which contains desktop and Start menu shortcuts for all users of the computer. Windows XP uses this profile's Documents folder to share files between different users (Shared Documents). It also contains a folder called "Default User", which is the template for new user profiles.

■ **Inetpub** - if the web server Internet Information Services (IIS) is installed, this folder is created to store the default website and settings.

---

[13] *If the computer was upgraded from Windows 2000, this folder is called WINNT.*
[14] *System32 contains most of the applications and utilities used to manage and configure Windows. This is true even of 64-bit versions of Windows (32-bit Dynamic Link Libraries [DLL] running under 64-bit Windows are stored in the SYSWOW64 folder).*
[15] *In 64-bit versions of Windows, a* **Program Files (x86)** *folder is created to store 32-bit applications.*

- **ntldr** - OS loader.

- **ntdetect.com** - detects hardware devices.

- **boot.ini** - multi-boot OS loader menu.

- **pagefile.sys** - Virtual Memory pagefile.

- **hiberfil.sys** - image of memory contents saved when the computer is put into hibernation.

- **io.sys / msdos.sys / config.sys / command.com / autoexec.bat** - Windows 9x boot and configuration files (these may be present if the PC is configured to dual boot or was upgraded).

A listing of the root directory would show all the first level directories on the disk and a few system files, including those above[16].

Windows Vista and Windows 7 System Files and Folders

Vista/7 comes with a few changes to the default system folders:

- **Windows** - the system root.

- **Program Files** - subdirectories for installed applications software.

- **Users** - replaces **Documents and Settings**. The internal layout of the profile folders is flatter, with subfolders for "Music", "Pictures", "Downloads", "Saved Games", and "Searches", in addition to "Documents". The profile folder also contains hidden subfolders used to store application settings and customizations, favorite links, shortcuts, temporary files, and so on. The "All Users" profile is called "Public"[17].

  In Windows 7, each profile folder still contains subfolders for different types of file (now renamed back to the XP conventions of "My Documents", "My Music", "My Pictures", "My Video", and so on). Access to the profile folders is mediated through **Libraries**.

- **Boot** - contains the **Boot Configuration Database (BCD)** and log files. This replaces BOOT.INI.

  In Windows 7, if the default installation options have been used, the **Boot** folder is stored in the hidden **System Reserved** partition.

- **C:\Windows\System32\winload.exe** - OS loader; replaces NTLDR.

- **C:\Windows\System32\winresume.exe** - OS loader invoked when the computer has been put into hibernation.

---

[16] *At least, it will if the directory browser is configured to show hidden and system files.*
[17] *Various hidden "Junction Points" are created using the old folder terminology ("My Documents", and so on). These are used for compatibility with pre-Vista applications. If junction points are unhidden, they appear like shortcut icons. Clicking one results in an "Access Denied" message however.*

- **pagefile.sys** - Virtual Memory pagefile.

- **hiberfil.sys** - image of memory contents saved when the computer is put into hibernation.

System Variables

When entering directory paths as arguments, you may not know exactly which locations were chosen for installation. The shell recognizes a number of system variables and replaces the correct path when one of these is used. Some of the common variables include:

- %SystemDrive% - for example, "C:"

- %SystemRoot% - for example, "C:\Windows"

- %UserName% - for example, "george"

- %HomeDrive% - for example, "C:"

- %HomePath% - for example, "\Documents and Settings\george"

You can view the full list of variables using the `set` command (without switches) at the command prompt. `set` also lets you create and modify new variables. You can also view variables through the **Advanced** page of the **System Properties** dialog by clicking the **Environment Variables** button.
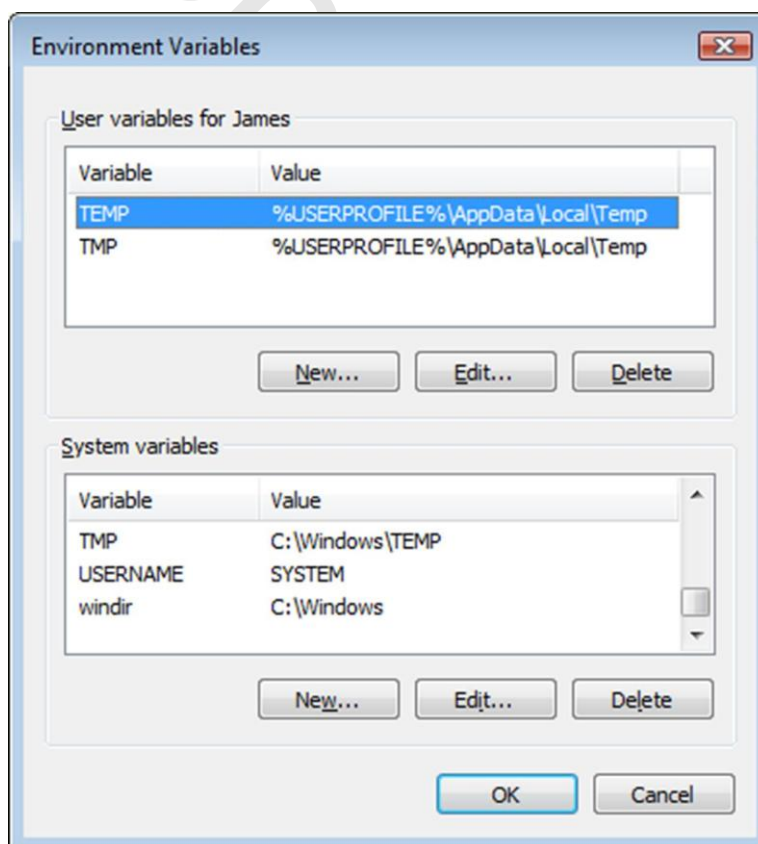
*Environment Variables dialog*

Shut Down

When the user wants to finish using Windows, simply disconnecting the power (a hard reset) runs a risk of losing data or corrupting system files. There are various choices for closing or suspending a session:

- Shut down (**/s**) - close all open programs (the user should save changes in any open files first) and services before powering off the computer.

- Standby / Sleep - save the current session to memory and put the computer into a minimal power state.

- Hibernate (**/h**) - save the current session to disk before powering off the computer.

- Log off (**/l**) - close all open programs (the user should save changes in any open files first) and services started under the user account but leave the computer running.

- Switch user - log on to another user account, leaving programs and files under the current account open.

- Lock - secure the desktop with a password while leaving programs running.

- Restart (**/r**) - close all open programs (the user should save changes in any open files first) and services before rebooting without powering down (a soft reset).

These options can be selected from the Start menu or by pressing **Ctrl+Alt+Del**.
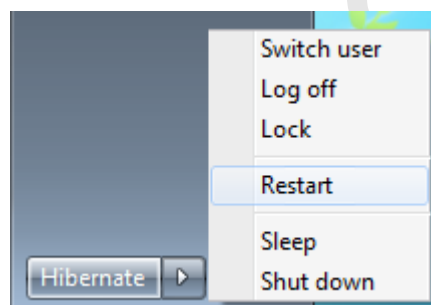
Options on the Windows 7 power button

See Unit 2.2 for notes on configuring these options via power settings and plans.

The computer can also be shut down at a command prompt using the **shutdown** command plus the relevant switch (shown above). If a shutdown is in progress, **shutdown /a** aborts it (if used quickly enough). The **/t** *nn* switch can be used to specify delay in seconds before shutdown starts; the default is 30 seconds.

Windows Registry

The Windows Registry provides a remotely accessible, unified database for storing operating system and device configuration information.

When you boot a Windows machine, the Registry is populated with information about hardware detected in your system. This information is detected by **NTDETECT.COM** under Windows XP or **WINLOAD.EXE** under Windows Vista/7. During boot, Windows extracts information from the Registry, such as which device drivers to load and in what order.

Device drivers also send and receive data from the Registry. The drivers receive load parameters and configuration data. A device driver may also report which system resources it is using, for example, memory address and hardware interrupts. Finally, whenever you run a setup program or configure the system via Control Panel or Administrative Tools it will add or change data in the Registry.

The Registry does have a dedicated tool called `regedit` for direct editing, but it is not the tool you would use on an everyday basis to modify configuration data. Control Panel and Administrative Tools are better options for most tasks.

Registry Structure

The Registry is structured as a set of five subtrees (or **keys**) that contain computer and user databases. The **computer** database includes information about hardware and software installed on the computer. The **user** database includes the information in user profiles, such as desktop settings, individual preferences for certain software, and personal printer and network settings.

Root Key Name	Description
HKEY_LOCAL_MACHINE	Hardware and operating system data such as bus type, system memory, device drivers, and startup control data.
HKEY_CLASSES_ROOT	Object Linking And Embedding (OLE) and file association data.
HKEY_CURRENT_USER	Contains the profile for the user who is currently logged on, including environment variables, personal program groups, desktop settings, network connections, printers, and application preferences.
HKEY_USERS	Contains all actively loaded user profiles, including HKEY_CURRENT_ USER, which always refers to a child of HKEY_USERS, and the default profile.
HKEY_CURRENT_CONFIG	Contains system and software configuration information specific to this session.

Each individual key can contain **subkeys** and data items called **value entries**. Keys are analogous to folders and the value entries are analogous to files. A value entry has three parts: the name of the value, the data type of the value, and the value itself. The following table lists the different data types:

| Data Type	Description
REG_BINARY	Raw binary data. Most hardware component information is stored as binary data and displayed in hexadecimal format.
REG_DWORD	Data represented by a 4-byte number. Many parameters for device drivers and services are this type and can be displayed in binary, hex, or decimal format.
REG_SZ	A string or sequence of characters representing human-readable text.
REG_MULTI_SZ	A multiple string. Values that contain lists or multiple text values are usually this type. Entries are separated by NULL characters.
REG_EXPAND_SZ	An expandable data string, which is text that contains a variable to be replaced when called by an application. For example, for the following value, the string %SystemRoot% would be replaced by the actual location of the folder containing the Windows system files.

Registry Database Files

The Registry database is stored in binary files called hives. A hive comprises a single file (with no extension), a .LOG file (containing a transaction log), and a .SAV file (a copy of the key as it was at the end of setup). The system hive also has an .ALT backup file. Most of these files are stored in the %SystemRoot%**\System32\Config** folder, but hive files for user profiles are stored in the folder holding the user's profile. The following table shows the standard hives[18].

Hive	Files
HKEY_CURRENT_CONFIG	system, system.alt, system.log, system.sav
HKEY_CURRENT_USER	ntuser.dat, ntuser.dat.log
HKEY_LOCAL_MACHINE\SAM	sam, sam.log, sam.sav
HKEY_LOCAL_MACHINE\SECURITY	security, security.log, security.sav
HKEY_LOCAL_MACHINE\SOFTWARE	software, software.log, software.sav
HKEY_LOCAL_MACHINE\SYSTEM	system, system.alt, system.log, system.sav
HKEY_USERS\.DEFAULT	default, default.log, default.sav

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[18] *HKEY_CLASSES_ROOT is not stored in a hive but built from the \SOFTWARE\CLASSES keys in CURRENT_USER and LOCAL_MACHINE.*

Editing the Registry
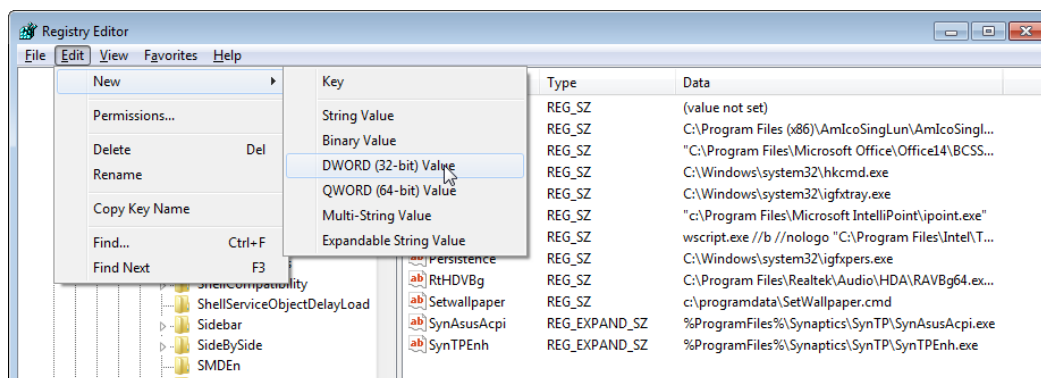
Editing the registry

The **Registry Editor** can be invoked by running `regedit` via the **Start > Run** menu or the command prompt. You can use it to view or edit the Registry and backup and restore portions of the Registry. Use the **Find** tool (`Ctrl+F`) to search for a key or value.

If you want to copy portions of the Registry database and use them on other computers, use the **Export Registry File** option from the **File** menu. The file will be exported in a Registry compatible format, and can be merged into another computer's Registry by double-clicking the file (or calling it from a script).

A registration file is a plain text file. If you merge changes from a .REG file back to the Registry, **additions** that you have made to the Registry will not be overwritten. Use the **Registry Hive Files** format to create a **binary** copy of that portion of the Registry. Restoring from the binary file will remove any additions you made as well as reversing changes.
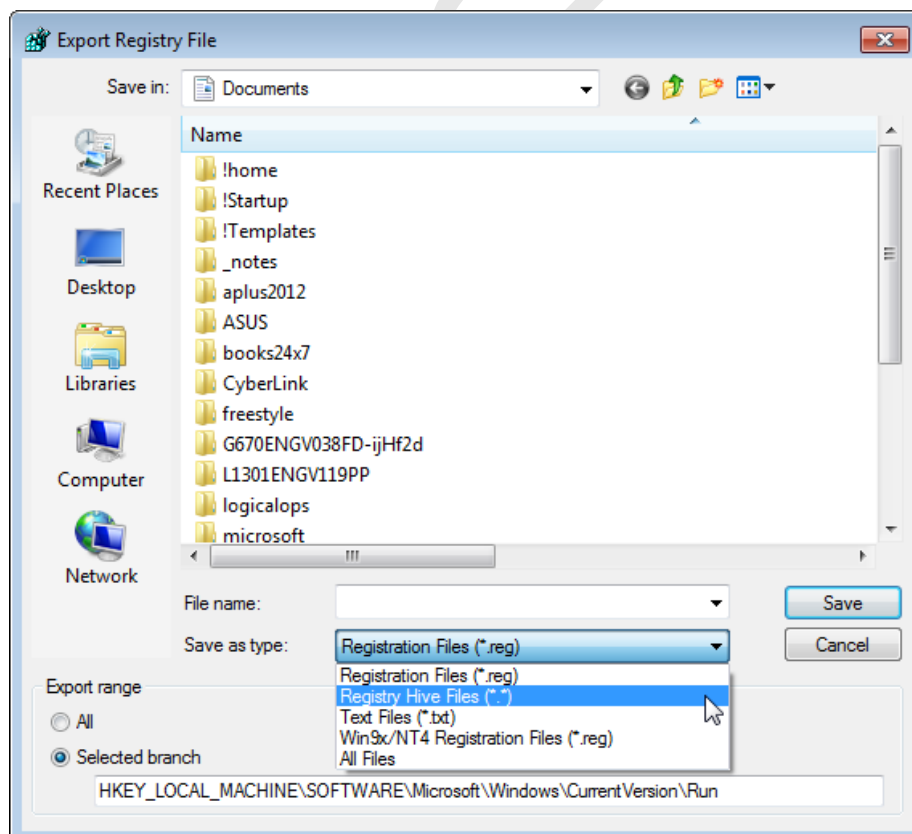
Selecting a file format for exporting a Registry key

Index

Where a term or phrase is abbreviated, the abbreviation is the form listed in the index. Note that index references are made to the nearest main heading for the topic in which the term appears.

**CompTIA A+ Certification
802 Support Skills**

Labs and References

Acknowledgements

Table of Contents

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CompTIA A+ 802 Objectives

The material in this course will help you to learn and practice the CompTIA **A+ Certification 220-802** exam covering the **2012 Edition** exam objectives and content examples.

It is CompTIA's policy to update the exams regularly with new test items to deter fraud. The exam objectives may therefore describe the current "Edition" of the exam with a date different to that of the objectives. Please note that this training material remains valid for the stated exam code, regardless of the exam edition.

The following tables list where the domain objectives of the 802 exam are covered in this course.

A+ Certification 220-802 Domain Areas	% of Exam
1.0 Operating Systems	33%
2.0 Security	22%
3.0 Mobile Devices	9%
4.0 Troubleshooting	36%

Domain 1.0 Hardware

Domain Objectives / Examples	Unit
1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems. *Windows XP Home, Windows XP Professional, Windows XP Media Center, Windows XP 64-bit Professional • Windows Vista Home Basic, Windows Vista Home Premium, Windows Vista Business, Windows Vista Ultimate, Windows Vista Enterprise • Windows 7 Starter, Windows 7 Home Premium, Windows 7 Professional, Windows 7 Ultimate, Windows 7 Enterprise • Features (32-bit vs. 64-bit, Aero) • Upgrade paths (Differences between in-place upgrades, Compatibility tools, Windows Upgrade OS Advisor)*	1.1 Windows Operating System
Features (Administrative Tools, File structure and paths, Category view vs. classic view)	1.2 Administration Tools
Features (User Account Control)	1.3 Managing Users
Features (Gadgets, Sidebar, Compatibility Mode, XP Mode)	2.1 Managing Applications
Features (ReadyBoost)	2.3 Managing Performance
Features (Shadow Copy, Windows Easy Transfer)	2.4 Maintenance and Backup
Features (System Restore)	3.2 Troubleshooting Boot Problems
Features (Event Viewer)	3.3 Troubleshooting Applications
Features (Defender, Security Center)	3.4 Viruses and Malware

Domain Objectives / Examples	Unit
1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems. *Features (BitLocker)*	3.5 Workstation and Data Security
Features (Windows Firewall)	5.3 Configuring Internet Access
1.2 Given a scenario, install, and configure the operating system using the most appropriate method. *Partitioning (Dynamic, Basic, Primary, Extended, Logical) • File system types/formatting (FAT, FAT32, NTFS, CDFS, Quick format vs. full format)*	1.4 Managing Storage
Boot methods (USB, CD-ROM, DVD, PXE) • Type of installations (Creating image, Unattended installation, Upgrade, Clean install, Repair installation, Multiboot, Remote network installation, Image deployment) • Load alternate third party drivers when necessary • Workgroup vs. Domain setup • Time/date/region/language settings • Driver installation, software and windows updates • Factory recovery partition	2.5 Installing Windows
1.3 Given a scenario, use appropriate command line tools. *OS (shutdown, [command name] /?)*	1.2 Administration Tools
OS (fdisk, format, diskpart)	1.4 Managing Storage
OS (md, rd, cd, del, copy, xcopy, robocopy)	1.5 Managing Files
OS (taskkill, tasklist)	2.1 Managing Applications
OS (sfc, chkdsk)	3.2 Troubleshooting Boot Problems
OS (bootrec) • Recovery Console (fixboot, fixmbr)	4.2 Troubleshooting Storage and Video
Networking (ping, tracert, netstat, ipconfig, net, nslookup, nbtstat)	5.4 Troubleshooting Networks
1.4 Given a scenario, use appropriate operating system features and tools. *Administrative (Computer Management) • Run line utilities (regedit, cmd, mmc, notepad)*	1.2 Administration Tools
Administrative (Users and Groups)	1.3 Managing Users
Disk Management (Drive status, Mounting, Extending partitions, Splitting partitions, Assigning drive letters, Adding drives, Adding arrays)	1.4 Managing Storage
Run line utilities (Explorer)	1.5 Managing Files
Administrative (Services, System Configuration, Component Services, Data Sources) • msconfig (General, Boot, Services, Startup, Tools) • Task Manager (Applications, Processes, Performance, Networking, Users) • Run line utilities (msconfig, services.msc)	2.1 Managing Applications
Administrative (Device Manager)	2.2 Manging Devices
Administrative (Performance Monitor) • Run line utilities (msinfo32, dxdiag)	2.3 Managing Performance
Administrative (Task Scheduler) • Other (User State Migration tool [USMT], File and Settings Transfer Wizard, Windows Easy Transfer)	2.4 Maintenance and Backup

Domain Objectives / Examples	Unit
1.4 Given a scenario, use appropriate operating system features and tools. *Administrative (Local Security Policy)*	3.5 Workstation and Data Security
Administrative (Windows Memory Diagnostics)	4.1 Troubleshooting System Components
Administrative (Print Management)	4.4 Troubleshooting Printers
Run line utilities (mstsc)	5.2 Configuring Shared Resources
Administrative (Windows Firewall, Advanced Security)	5.3 Configuring Internet Access
1.5 Given a scenario, use Control Panel utilities. *User Accounts*	1.3 Managing Users
Folder Options (View hidden files, Hide extensions, Layout)	1.5 Managing Files
Unique to Windows XP (Add/Remove Programs) • Unique to Windows 7 (RemoteApp and Desktop Connections)	2.1 Managing Applications
Display (Resolution) • Power Options (Hibernate, Power plans, Sleep/suspend, Standby) • Unique to Vista (Tablet PC settings, Pen and Input Devices)	2.2 Manging Devices
Display (Resolution) • System (Performance [virtual memory])	2.3 Managing Performance
Unique to Windows XP (Automatic Updates)	2.4 Maintenance and Backup
System (System Protection)	3.2 Troubleshooting Boot Problems
Unique to Vista (Problem Reports and Solutions) • Unique to Windows 7 (Action Center, Troubleshooting)	3.3 Troubleshooting Applications
Security Center	3.4 Viruses and Malware
Unique to Windows XP (Printers and Faxes) • Unique to Vista (Printers)	4.4 Troubleshooting Printers
Unique to Windows XP (Network Connections)	5.1 Configuring Network Connections
Folder Options (Sharing) • System (Remote settings) • Unique to Windows XP (Network Setup Wizard) • Unique to Vista (Offline files) • Unique to Windows 7 (Homegroup)	5.2 Configuring Shared Resources
Internet Options (Connections, Security, General, Privacy, Programs, Advanced) • Windows Firewall	5.3 Configuring Internet Access

Page 3

Domain Objectives / Examples	Unit
1.6 Setup and configure Windows networking on a client/desktop. *Establish networking connections (Wireless, Wired) • Configuring an alternative IP address in Windows (IP addressing, Subnet mask, DNS, Gateway) • Network card properties (Half duplex/full duplex/auto, Speed, Wake-on-LAN, QoS)*	5.1 Configuring Network Connections
Homegroup, File/print sharing • Workgroup vs. domain setup • Network shares/mapping drives • Remote Desktop	5.2 Configuring Shared Resources
Establish networking connections (VPN, Dial-ups, WWAN [Cellular]) • Proxy settings • Home vs. Work vs. Public network settings • Firewall settings (Exceptions, Configuration, Enabling/disabling Windows Firewall)	5.3 Configuring Internet Access
1.7 Perform preventive maintenance procedures using appropriate tools. *Best practices (Scheduled backups, Scheduled check disks, Scheduled defragmentation, Windows updates, Patch management, Driver/firmware updates, Anti-virus updates) • Tools (Backup, Check Disk, Defrag)*	2.4 Maintenance and Backup
Tools (System Restore, Recovery image)	3.2 Troubleshooting Boot Problems
1.8 Explain the differences among basic OS security settings. *System files and folders*	1.2 Administration Tools
User and groups (Administrator, Power User, Guest, Standard User)	1.3 Managing Users
NTFS vs. Share permissions (Allow vs. deny, Moving vs. copying folders and files, File attributes) • Shared files and folders (Administrative shares vs. local shares, Permission propagation, Inheritance) • User authentication (Single Sign-On)	5.2 Configuring Shared Resources
1.9 Explain the basics of client-side virtualization. *Purpose of virtual machines • Resource requirements • Emulator requirements • Security requirements • Network requirements • Hypervisor*	2.6 Virtualization

Domain 2.0 Security

Domain Objectives / Examples	Unit
2.1 Apply and use common prevention methods. *Physical security (Lock doors, Tailgating, Securing physical documents/passwords/shredding, Biometrics, Badges, Key fobs, RFID badge, RSA token, Privacy filters, Retinal) • Digital security (Anti-virus, Firewalls, Anti-spyware, User authentication/strong passwords, Directory permissions) • User education • Principle of least privilege*	3.5 Workstation and Data Security
2.2 Compare and contrast common security threats. *Malware • Rootkits • Phishing • Spyware • Viruses (Worms, Trojans)*	3.4 Viruses and Malware
Social engineering • Shoulder surfing	3.5 Workstation and Data Security
2.3 Implement security best practices to secure a workstation. *Setting strong passwords • Requiring passwords • Restricting user permissions • Changing default user names • Disabling guest account • Screensaver required password • Disable AutoRun*	3.5 Workstation and Data Security
2.4 Given a scenario, use the appropriate data destruction/disposal method. *Low level format vs. standard format • Hard drive sanitation and sanitation methods (Overwrite, Drive wipe) • Physical destruction (Shredder, Drill, Electromagnetic degaussing tool)*	3.5 Workstation and Data Security
2.5 Given a scenario, secure a SOHO wireless network. *Change default user names and passwords • Changing SSID • Setting encryption • Disabling SSID broadcast • Enable MAC filtering • Antenna and access point placement • Radio power levels • Assign static IP addresses*	5.1 Configuring Network Connections
2.6 Given a scenario, secure a SOHO wired network. *Change default user names and passwords • Enable MAC filtering • Assign static IP addresses • Disabling ports • Physical security*	5.1 Configuring Network Connections

Domain 3.0 Mobile Devices

Domain Objectives / Examples	Unit
3.1 Explain the basic features of mobile operating systems. *Android vs. iOS (Open source vs. closed source/vendor specific, App source [App Store and Market], Screen orientation [accelerometer/gyroscope], Screen calibration, GPS and geotracking)*	5.5 Mobile Devices
3.2 Establish basic network connectivity and configure email. *Wireless / cellular data network (enable/disable) • Bluetooth (Enable Bluetooth, Enable pairing, Find device for pairing, Enter appropriate pin code, Test connectivity) • Email configuration (Server address [POP3, IMAP, Port and SSL settings], Exchange, Gmail)*	5.5 Mobile Devices
3.3 Compare and contrast methods for securing mobile devices. *Passcode locks • Remote wipes • Locator applications • Remote backup applications • Failed login attempts restrictions • Anti-virus • Patching/OS updates*	5.5 Mobile Devices
3.4 Compare and contrast hardware differences in regards to tablets and laptops. *No field serviceable parts • Typically not upgradeable • Touch interface (Touch flow, Multitouch) • Solid state drives*	5.5 Mobile Devices
3.5 Execute and configure mobile device synchronization. *Types of data to synchronize (Contacts, Programs, Email, Pictures, Music, Videos) • Software requirements to install the application on the PC • Connection types to enable synchronization*	5.5 Mobile Devices

Domain 4.0 Troubleshooting

Domain Objectives / Examples	Unit
4.1 Given a scenario, explain the troubleshooting theory. *Identify the problem (Question the user and identify user changes to computer and perform backups before making changes) • Establish a theory of probable cause (question the obvious) • Test the theory to determine cause (Once theory is confirmed determine next steps to resolve problem, If theory is not confirmed re-establish new theory or escalate) • Establish a plan of action to resolve the problem and implement the solution • Verify full system functionality and if applicable implement preventive measures • Document findings, actions and outcomes*	3.1 Troubleshooting Theory
4.2 Given a scenario, troubleshoot common problems related to motherboards, RAM, CPU, and power with appropriate tools. *Common symptoms (Unexpected shutdowns, System lockups, POST code beeps, Blank screen on boot up, BIOS time and settings resets, Attempts to boot to incorrect device, Continuous reboots, No power, Overheating, Loud noise, Intermittent device failure, Fans spin - no power to other devices, Indicator lights, Smoke, Burning smell, BSoD) • Tools (Multimeter, Power supply tester, Loopback plugs, POST card)*	4.1 Troubleshooting System Components
4.3 Given a scenario, troubleshoot hard drives and RAID arrays with appropriate tools. *Tools (format, fdisk)*	1.4 Managing Storage
Tools (chkdsk)	2.4 Maintenance and Backup
Common symptoms (Read/write failure, Slow performance, Loud clicking noise, Failure to boot, Drive not recognized, OS not found, RAID not found, RAID stops working, BSoD) • Tools (Screwdriver, External enclosures, File recovery software)	4.2 Troubleshooting Storage and Video
4.4 Given a scenario, troubleshoot common video and display issues. *Common symptoms (VGA mode, No image on screen, Overheat shutdown, Dead pixels, Artifacts, Color patterns incorrect, Dim image, Flickering image, Distorted image, Discoloration [degaussing], BSoD)*	4.2 Troubleshooting Storage and Video
4.5 Given a scenario, troubleshoot wired and wireless networks with appropriate tools. *Common symptoms (No connectivity, APIPA address, Limited connectivity, Local connectivity, Intermittent connectivity, IP conflict, Slow transfer speeds, Low RF signal) • Tools (Cable tester, Loopback plug, Punch down tools, Toner probes, Wire strippers, Crimper, ping, ipconfig, tracert, netstat, nbtstat, net, Wireless locator)*	5.4 Troubleshooting Networks
4.6 Given a scenario, troubleshoot operating system problems with appropriate tools. *Common symptoms (RAID not detected during installation)*	2.5 Installing Windows
Common symptoms (BSoD, Failure to boot, Improper shutdown, Spontaneous shutdown/restart, Boots to safe mode, Missing NTLDR, Missing Boot.ini, Missing operating system, Missing Graphical Interface, Graphical Interface fails to load, Invalid boot disk) • Tools (Recovery Console, sfc, Repair disks, Pre-installation environments, Safe Mode, Command prompt, Emergency Repair Disk, Automated System Recovery)	3.2 Troubleshooting Boot Problems

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Page 7

Domain Objectives / Examples	Unit
4.6 Given a scenario, troubleshoot operating system problems with appropriate tools. *Common symptoms (Device fails to start, Missing DLL message, Service fails to start, Compatibility error, Slow system performance, File fails to open) • Tools (msconfig, defrag, regsrv32, regedit, Event Viewer)*	3.3 Troubleshooting Applications
Tools (fixboot, fixmbr)	4.2 Troubleshooting Storage
4.7 Given a scenario, troubleshoot common security issues with appropriate tools and best practices. *Tools (Recovery Console, System Restore, Pre-installation environments) • Best practices for malware removal (Disable System Restore, Remediate infected systems [Scan and removal techniques (Safe Mode, Pre-installation Environment)], Enable System Restore and create restore point*	3.2 Troubleshooting Boot Problems
Common symptoms (Pop-ups, Browser redirection, Security alerts, Slow performance, Internet connectivity issues, PC locks up, Windows updates failures, Rogue anti-virus, Spam, Renamed system files, Files disappearing, File permission changes, Hijacked email, Access denied) • Tools (Anti-virus software, Anti-malware software, Anti-spyware software, Event Viewer) • Best practices for malware removal (Identify malware symptoms, Quarantine infected system, Disable System Restore, Remediate infected systems [Update anti-virus software, Scan and removal techniques (Safe Mode, Pre-installation Environment)], Schedule scans and updates, Educate end user	3.4 Viruses and Malware
4.8 Given a scenario, troubleshoot, and repair common laptop issues while adhering to the appropriate procedures. *Common symptoms (No display, Dim display, Flickering display, Sticking keys, Intermittent wireless, Battery not charging, Ghost cursor, No power, NumLock indicator lights, No wireless connectivity, No Bluetooth connectivity, Cannot display to external monitor) • Disassembling processes for proper re-assembly (Document and label cable and screw locations, Organize parts, Refer to manufacturer documentation, Use appropriate hand tools)*	4.3 Troubleshooting Laptops
4.9 Given a scenario, troubleshoot printers with appropriate tools *Common symptoms (Streaks, Faded prints, Ghost images, Toner not fused to the paper, Creased paper, Paper not feeding, Paper jam, No connectivity, Garbled characters on paper, Vertical lines on page, Backed up print queue, Low memory errors, Access denied, Printer will not print, Color prints in wrong print color, Unable to install printer, Error codes) • Tools (Maintenance kit, Toner vacuum, Compressed air, Printer spooler)*	4.4 Troubleshooting Printers

Exam Tips

Registering for the Test

CompTIA Certification exams are delivered exclusively by Pearson VUE. You can locate a test center using the link on CompTIA's website:

certification.comptia.org/Training/testingcenters.aspx

■ Arrive at the test center at least 15-30 minutes before the test is scheduled.

■ The test center administrator will demonstrate how to use the computer-based test system.

■ You must have two forms of ID - one with picture, both with signature, preferably with your private address (driving license, passport, and so on).

■ Books, calculators, laptops, smartphones, or other reference materials are not allowed.

■ Pens, pencils, and paper are not required! You must not attempt to write down questions or remove anything from the exam room.

■ It is CompTIA's policy to make reasonable accommodations for individuals with disabilities.

Taking the Test

■ There are up to 90 questions which must be answered in 90 minutes. The passing score is 700 on a scale of 100-900.

■ Read each question and its option answers carefully. Don't rush through the exam as you'll probably have more time at the end than you expect.

■ At the other end of the scale, don't get "stuck" on a question and start to panic. You can mark questions for review and come back to them.

■ As the exam tests your ability to recall facts and to apply them sensibly in a troubleshooting scenario, there will be questions where you cannot recall the correct answer from memory. Adopt the following strategy for dealing with these questions:

• Narrow your choices down by eliminating obviously wrong answers.

• Don't guess too soon! You must select not only a *correct* answer, but the *best* answer. It is therefore important that you read all of the options and not stop when you find an option that is correct. It may be impractical compared to another answer.

• Utilize information and insights that you've acquired in working through the entire test to go back and answer earlier items that you weren't sure of.

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Page 9

- Think your answer is wrong - should change it? Studies indicate that when students change their answers they usually change them to the wrong answer. If you were fairly certain you were correct the first time, leave the answer as it is.

■ Don't leave any questions unanswered! If you really don't know the answer, just guess.

■ The exam may contain "unscored" questions, which may even be outside the exam objectives. These questions do not count towards your score.

After the Test

■ A score report will be generated and a copy printed for you by the test administrator. The score report will show whether you have passed or failed and your score in each section. Make sure you retain the report!

■ 5 days after passing the exam, go to www.comptia.org/careerid and create an account (or log on to an existing account) using the information in your score report. When you have passed both A+ exams, you can use this site to order your certificate and ID card.

■ If 6 weeks have passed after ordering your certificate and you haven't received it, contact questions@comptia.org

Retaking the Test

If you do fail the certification test at the first attempt, then you can retake it at your convenience. However, should you fail the test at the second, third, or subsequent try, you will not be able to resit the exam for at least 30 days after your last attempt. Study your score report to see which areas of the exam you were weak on.

Labs

Lab 1 / Windows 7

These practical labs will reinforce your understanding of the topics covered in the study notes and allow you to practice PC support tasks. In the course of these labs you will use up to three different types of system, depending on the facilities available in your training center.

■ HOST PC - the computer you use for ordinary classwork. The HOST PC is installed with Oracle VirtualBox. VirtualBox allows for the installation of multiple operating systems on the HOST.

■ VMs - in most labs you will practice installation, configuration, and troubleshooting tasks on Windows 7 and Windows XP VMs installed on the HOST (rather than the HOST itself).

■ Workbench PCs - where the labs require hands-on with computer hardware, you will complete the exercises on older equipment (if available).

In this lab you will start using a Windows 7 VM. VMs allow multiple operating systems to be installed to the same HOST PC. You will be able to log on to the Windows 7 VM as an administrator.

Exercise 1: Logging On to the HOST

1) Start your HOST PC. Make a note of the user name and password you will use to access the HOST:

   User name: _____

   Password: _____

2) At the logon screen, select the appropriate user account and input the password then press **Enter**[1].

   When you log on, the desktop is displayed.

Exercise 2: Using VirtualBox

In this lab, you will learn how to configure and start the Virtual Machines (VM).

1) On the **HOST** PC, double-click the **Oracle VM VirtualBox** icon on the Desktop.

   The VirtualBox console is loaded. This shows the VMs available to you. Selecting a VM displays more information about it.

---

[1] *Logon options depend on the network and security options selected during installation. This computer is not joining a domain; if it were, you would need to press Ctrl+Alt+Del to display the logon box and there would be the choice of logging on to a domain account or to the local computer only.*
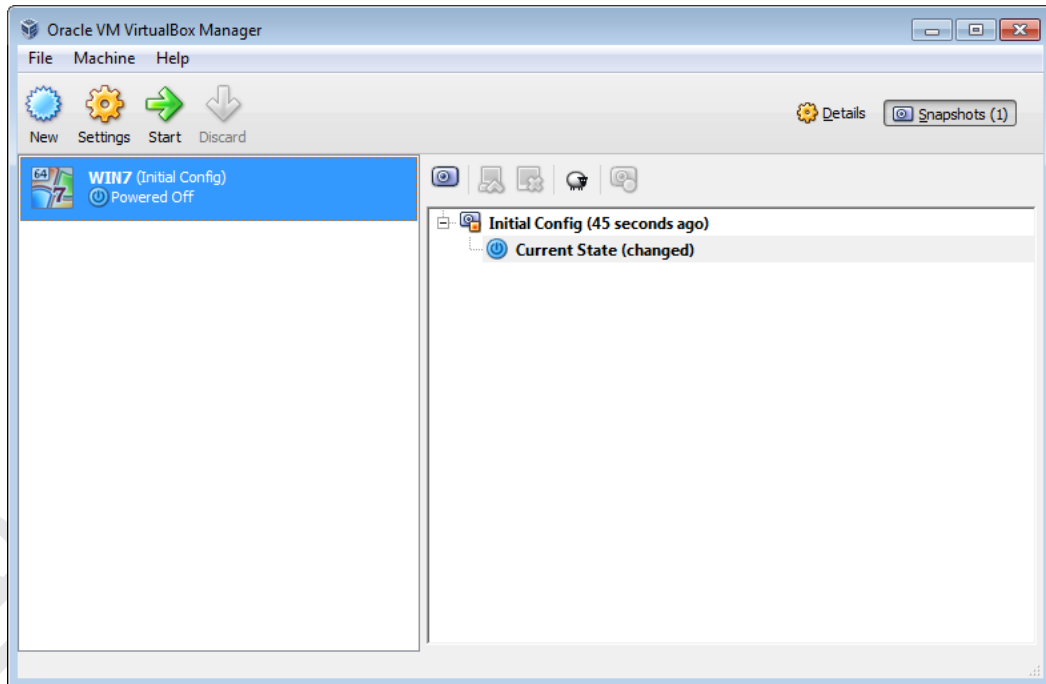
VirtualBox console

You currently have one VM called **WIN7**. This is installed with Windows 7.

2) With the **WIN7** VM selected, click the **Settings** button.

This dialog allows you to configure the VM's hardware. Some settings can only be changed when the VM is powered off; others you can change from the VM's window menu when it is running.

3) Adjust any "System" or "Display" settings if suggested by your instructor.

4) Click the **Storage** tab.
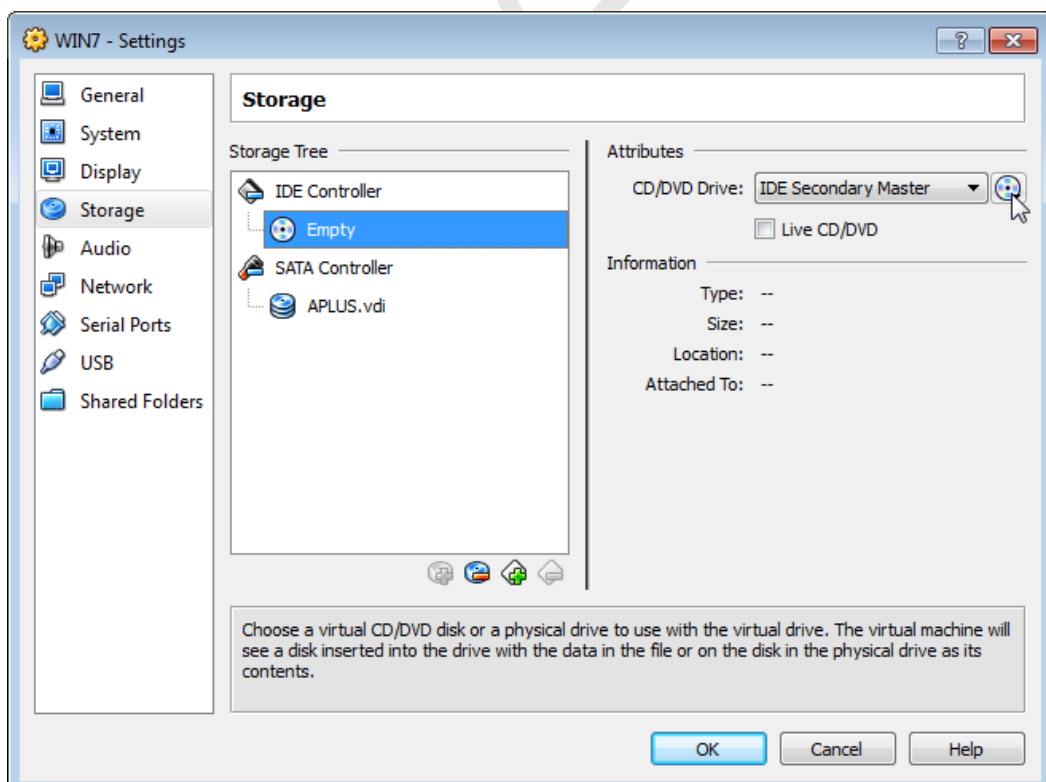
Configuring VM storage options

This tab allows you to add hard drives to the VM and to use disc images ISOs) in the optical drive (or share the HOST's drive).

5) Under "Storage Tree", select the "Empty" CD drive icon.

6) In the "Attributes" panel on the right, click the CD icon and either browse for the ISO file for "Windows 7" or put the Windows 7 setup disc in the HOST DVD drive and choose **Host Drive**.

7) Click **OK**.

8) With the **CLIENT** VM still selected, click the **Snapshots** button.

A snapshot is an image of the VM's disk at a particular point. You can use snapshots to discard the changes in a particular lab.
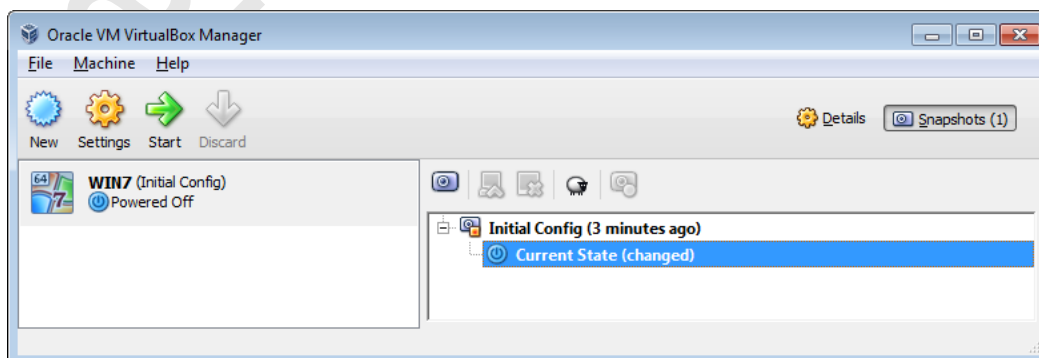
Configuring snapshots

9) Double-click the WIN7 VM to start it. A new window will open.

Note that you are prompted to press a key to boot from the Windows 7 setup disc. Do not press anything to allow the VM to boot normally.

10) When the logon screen loads, the user name should be **Bobby** already. Enter the password **Pa$$w0rd**.

That's a zero between the "w" and the "r".

11) On the VM window, click the **Machine** menu. You can configure some settings here (though you cannot change the installed hardware without shutting down the VM).

12) From the **Devices** menu, select **CD/DVD Devices > Remove disk from virtual drive**.

*If the mouse pointer gets "stuck" in a VM window, press **Right-Ctrl** to release it.*

13) Look at the taskbar and observe the notification area / system tray on the right. You should see icons for configuring the network and speaker volume, as well as the date and time.

14) Note that a message may appear in the notification area - click the

message icon [icon] to view the Action Center alerts.

Exercise 3: Start Menu, Taskbar, and Window Management

In this exercise, you will explore the Start Menu and Taskbar and practice arranging windows on the Desktop.

1) Alt-click an empty area on the taskbar and select **Properties**. Check the **Auto-hide** box, uncheck the **Lock the Taskbar** box, and click **Apply**.

2) Click the **Start Menu** tab. Note the option to configure what the power button does.

3) Click **Customize**. Scroll through the options then check the one to **Display System Administrative Tools on All Programs Menu**. Click **OK** to close both dialogs.

4) You can use click-and-drag to resize or move the taskbar. Experiment with this (make sure you click-and-drag on an empty part of the bar not on an icon), leaving the taskbar in whichever part of the screen you prefer. Alt-click it and select **Lock the Taskbar**. Note that you can no longer drag it around.

5) Click **Start** and observe the menu options available.

6) Click **All Programs** then run the mouse pointer up to the **Administrative Tools** program group then click on the **Computer Management** item to start the program.

7) Browse a couple of the tools.

    You will be exploring the tools listed here in more detail later in the course.

8) Point to the bottom of the screen to show the Taskbar and note the icon for the Computer Management window. Alt-click and select **Pin this program to taskbar**.

9) Point to the **Computer Management** icon again to show its jump list then point to the jump list and click the **Close** button on it.

10) Point to the **Taskbar** again and note that the **Computer Management** icon is present but not highlighted.

11) Open the Start menu, alt-click the **Computer** item and note the menu commands. **Properties** opens the System Properties dialog. Select the **Manage** command.

[icon]

> *There are often different ways of accessing system utilities. You should learn the different methods.*

You should be able to work comfortably with multiple windows. Use the control icons on the title bar and practice moving and resizing them.

12) Check the shortcut menu options from the taskbar for arranging windows and the Show Desktop / Aero Peek icon in the Notification Area.

13) Drag windows to the left and right of the screen and note that they snap to fill half the screen. Drag a window to the top of the screen to maximize it.

14) Close any open windows.

15) Disable the **Auto-hide** property for the taskbar.

Exercise 4: Accessing Files on the HOST

In some labs in the rest of the course, you will need to use files from a folder on the HOST PC from the VM. You can do this using VirtualBox's **Shared Folder** feature.

1) Alt-click the folder icon at the bottom of the VM window and select **Shared Folders**.

Sharing a folder in VirtualBox

2) Click the **Add Share** button 🔲.

3) In the "Folder Path" box, type or select the `C:\labfiles` folder. Check the **Auto-mount** and **Make Permanent** boxes. Click **OK**.

4) Click **OK**.

5) On the VM, select **Start > Computer**.

You should see the "labfiles" folder mapped as drive E:.

Exercise 5: Closing the VM Session

When you use the VM during a lab, you can either save changes you made during the lab to the VM's disk or discard them. You will be told which option to take at the end of each lab. In this lab, save the changes made to the VM.

1) Select **Start > Shut Down**.

2) In the VirtualBox Manager, alt-click the **Current State** snapshot and select **Take Snapshot**. Enter the name `Shared Host Folder` and click **OK**.

Creating a snapshot

Lab 2 / System Administration Tools

In this lab you will explore the main tools used to configure and manage Windows. Complete this lab on the WIN7 VM.

Exercise 1: Control Panel

1) Start the VM and log on (`Bobby / Pa$$w0rd`).
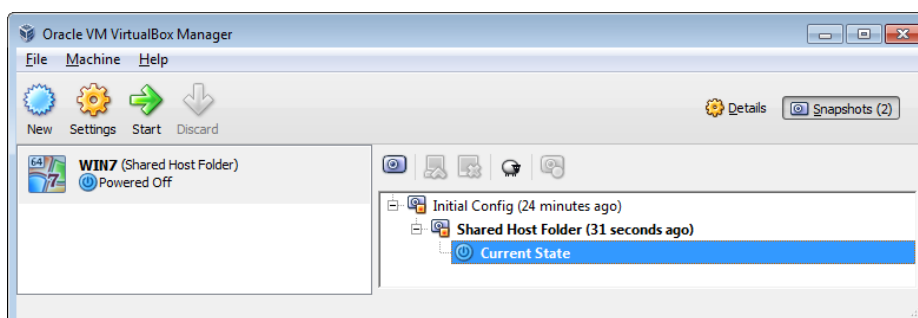
2) Press the `Start` key and start typing `control panel`.

> *The* `Start` *key is between* `Ctrl` *and* `Alt` *on the keyboard.*

> *When the mouse is within the VM window, keyboard commands work on the VM not the host. The only exception is that you should press* `Right-Ctrl` *in place of* `Ctrl+Alt`.

After a few letters, you will see the icon for Control Panel selected at the top of the menu.

3) Press `Enter` to open the Control Panel.
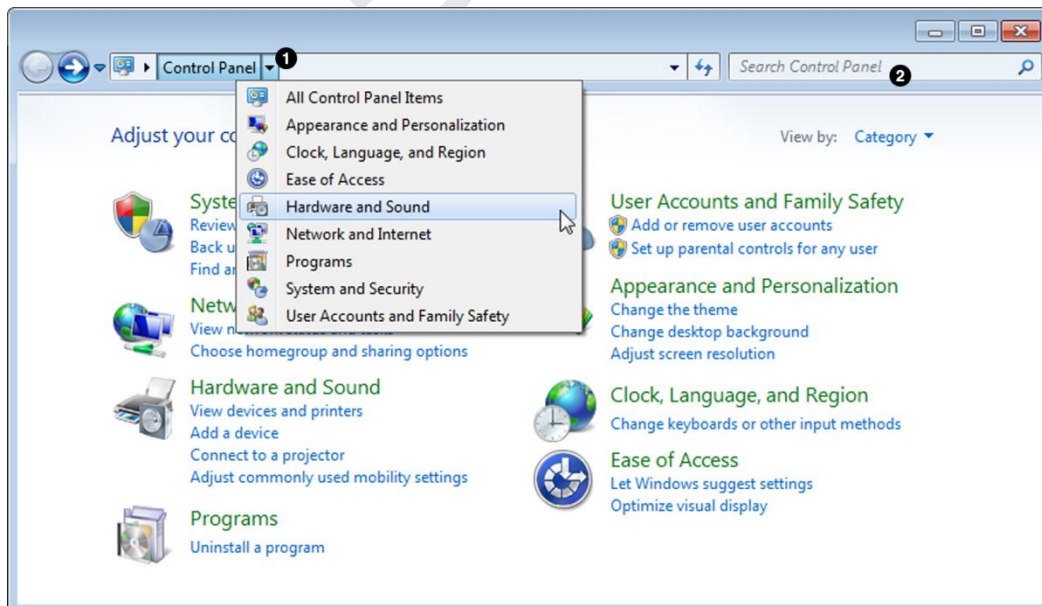
Control Panel - click the breadcrumb (1) to move between folders and use the Search box (2) to locate items

> *Notice that some options have a Windows shield icon on top of or next to them. This icon represents a setting that will invoke UAC.*

4) Locate and open the **Mouse** applet, using either the breadcrumb or search function (as shown above).

The most important settings are configuring between right- and left-handed use and setting the double-click timing. You can also change the trail speed and select from any pointer themes installed.

5) Take a look through the options and change any you wish to suit your own preferences.

6) Click **OK**.

7) Open the **Keyboard** applet.

The main settings here are to configure the responsiveness of the keys and to set the correct input locale.

8) Change the responsiveness settings if you wish.

9) Click **OK**.

10) Look at the settings under **Clock, Language, and Region**. You can use these to set the keyboard to the correct language type (US versus UK for instance), set the time zone, set the date and time correctly, or show a clock with a different time zone.

If you want to keep changes to the configuration of the mouse or keyboard, shut down the VM now and create a snapshot. Restart the VM and proceed with the remainder of the lab.

Exercise 2: System Properties

In this exercise, you will examine the system properties page.

1) Select **Start** then alt-click **Computer** and select **Properties**.

2) Open the **System** icon then browse through the information and options presented on the main page.

Exercise 3: Creating a Management Console

Management Consoles are configurable system utilities that can be adapted for different tasks. You saw one of the default management consoles in an earlier lab when you opened Computer Management. In this lab, you will use the MMC utility to create a custom console to manage hardware and services on the local machine.

1) Press the `Start` key and enter `mmc`. Click **Yes** at the UAC prompt. The **Console Root** will display.

2) Select **Add/Remove Snap-in** from the **File** menu.

3) Select **Device Manager**, click **Add**, choose **Local Computer**, and then **Finish**.

4) Repeat to add the **Services** snap-in for the local computer.

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Page 17

5) Click **OK**.

6) Click to view each of the new entries.

7) Select **Save** from the **File** menu.

8) Enter the file name `Local Management` and click **Save**.

9) Select **Exit** from the **File** menu.

   The console you created is accessed via your user account's Administrative Tools folder, accessible from the Start menu program group.

10) Re-open the Console by clicking **Start > All Programs** > **Administrative Tools** > **Local Management**. Click **Yes** at the UAC prompt.

11) Click **Device Manager**.

12) Are there are non-functioning devices?

Exercise 4: CPU-Z

CPU-Z is a freeware tool developed by CPUID (www.cpuid.com). It reports detailed information about the processor, motherboard, and memory installed on the PC.

1) Press `Start+R` to open the Run dialog (make sure you are still working within the VM), then enter `E:\cpuz_1.61_setup-en.exe` to launch the installer.

2) Click **Run** at the Security Warning.

   The desktop is dimmed and a **User Account Control (UAC)** prompt is displayed. Notice that as you are already logged on as an administrator, you only have to confirm the prompt, rather than supply a password.

3) Click **Yes** at the UAC prompt.

4) Run through setup using the default options but do not install the Ask toolbar.

5) Use the desktop icon to start CPU-Z, clicking **Yes** again when prompted.

6) Note the extra information compared to System Properties.

7) Click **OK** to close CPU-Z.

Exercise 5: Using the Command Prompt

In this exercise you will explore some of the basic features of the command line environment.

1) Press the `Start` key, type `cmd`, then press `Enter`.

2) Type `help` and press `Enter` to show a list of commands.

3) Alt-click the title bar and select **Edit > Select All**. Press **Enter**. This copies the contents of the command window.

4) Type **notepad** and press **Enter**.

5) Press **Ctrl+V** to paste the command output.

6) Close the file, saving it as **commands**.

7) Back in the command prompt, type **cmd /?** and press **Enter**.

    The syntax of the command interpreter is shown.

8) Read a couple of pages then press **Ctrl+C** to cancel and return to the prompt.

9) Type **exit** then press **Enter**.

Exercise 6: Exploring the Registry

The Registry is a database of computer and user configuration settings. Usually changes are made by program installers and uninstallers and the Windows administrative tools but in some circumstances you may need to make edits directly.

1) Press the **Start** key, type **regedit**, then press **Enter**.

2) Click **Yes** at the UAC prompt.

    You can now see the Registry keys in the left-hand pane.

3) Click the arrow next to HKEY_CURRENT_USER to see its subkeys.

4) Select the Control Panel subkey then expand it to see its subkeys.

5) If you cannot see the path you followed to get to this subkey at the bottom of the Registry Editor window, select the **Status Bar** from the **View** menu.

6) Open the **HKEY_LOCAL_MACHINE** key and expand **Software > Microsoft > Windows > CurrentVersion**.

7) Select **Setup** and observe the values.

8) Select **Run** and observe the values.

9) Open the **HKEY_CURRENT_USER** key and expand **Software > Microsoft > Windows > CurrentVersion**.

10) Note that there is no **Setup** key. Select **Run** and observe the differences.

11) Leaving the Registry Editor open, click **Start > Run**, type **msconfig**, and click **OK**.

12) Click the **Startup** tab. Compare the values to the Registry Keys.

13) Uncheck one of the items and click **Apply**. Select the Registry Editor and press **F5**.

14) In the **System Configuration** utility, check the box again to re-enable the item and click **Apply**. Refresh the Registry Editor.

15) Close the **System Configuration** utility and click **Exit Without Restart** when prompted.

16) Expand the HKEY_LOCAL_MACHINE key again.

17) Select the **System** key under HKLM. Notice that there are two control set subkeys and a current control set.

18) Expand HKEY_USERS. Notice that each user is listed by a unique identifier (SID) rather than a user name.

19) Expand one of the users to view the subkeys. Now expand the HKEY_CURRENT_USER key - are the subkeys the same?

_____

20) Select HKLM. From the **Edit** menu, select **Find**. Enter the search string `microsoft.com` , check the **Data** box only, and click **Find Next**.

21) When you find a value, press **F3** to search for the next. Repeat for a while to note which keys the data turns up in.

Exercise 7: Exporting and Modifying Desktop Settings

In this exercise, you will modify some Registry settings but first you will export the key to make a backup.

1) Expand **HKEY_CURRENT_USER** and select the **Desktop** subkey of the **Control Panel**.

2) What is stored in a key (or subkey)?

_____

3) What are the two components of a value?

_____

_____

4) Write down the data stored in each value below (or N/A if a value is not present).

- ScreenSaveActive

  _____

- ScreenSaveTimeOut

  _____

- Wallpaper

  _____

5) From the **Registry Editor** menu, select **File** > **Export**.

6) In the "File Name" box, type `wallpaper-reg`.

7) In the **Export Range** options, make sure that **Selected Branch** is selected, and click **Save**.

8) From the **Registry Editor** menu, select **File** > **Export**.

9) In the "File Name" box, type `wallpaper-bin`.

10) From the "Save as type" box, select **Registry Hive Files**.

11) In the **Export Range** options, make sure that **Selected Branch** is selected, and click **Save**.

12) Alt-click **Wallpaper** and select **Modify**. In the box, type `C:\users\public\pictures\sample pictures\penguins.jpg`.

13) Change **TileWallpaper** to `1`.

14) Close the Registry Editor. Is there any change?

   _____

15) Log off and on again. Has the change been applied now?

16) Alt-click the Desktop and select **Personalize**. Click **Screen Saver**.

17) Select the "Photos" screen saver and click **OK**.

18) Open the Registry Editor again and note the changes to the values you recorded above.

19) Select the following key:

   **HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\
   CurrentVersion\Run**

20) From the menu, select **Edit** > **New** > **String Value**.

21) Replace **New Value #1** with **Notepad** and press **Enter**.

22) Double-click **Notepad** to open the **Edit String** dialog box.

23) In the **Value Data** dialog box, type **C:\windows\notepad.exe**

24) Click **OK**.

25) Close the Registry Editor.

26) Log off and log on. What happens?

_____

27) Use **msconfig** to disable Notepad, choosing to **Exit without Restart**.

Exercise 8: Importing a Key Into the Registry

In this exercise, you will restore Registry settings from the backup files you made.

1) Open the **Registry Editor** then from the menu, select **File** > **Import**.

2) Select the **wallpaper-reg** file that should now appear in the file list and click **Open.** A message should appear saying that information in the reg file has been successfully entered into the Registry.

3) Click **OK**.

4) Log off and on again. The wallpaper should now have changed. Notice that the screen saver is still active however.

5) Open the **Registry Editor** then from the menu, select **File** > **Import**.

6) Change the file type to **Registry Hive Files**, select the **wallpaper-bin** file that should now appear in the file list, and click **Open.**

7) Read the warning and click **Yes**.

8) Click **OK**.

9) Log off and on again. The screen saver should be disabled again.

Exercise 9: Closing the VM Session

We will discard the changes made to the VM during this lab.

1) Click the **Close** icon on the VM window.

2) In the **Close Virtual Machine** dialog, select **Power off the machine** and check the **Restore current snapshot** box.

3) Click **OK**.
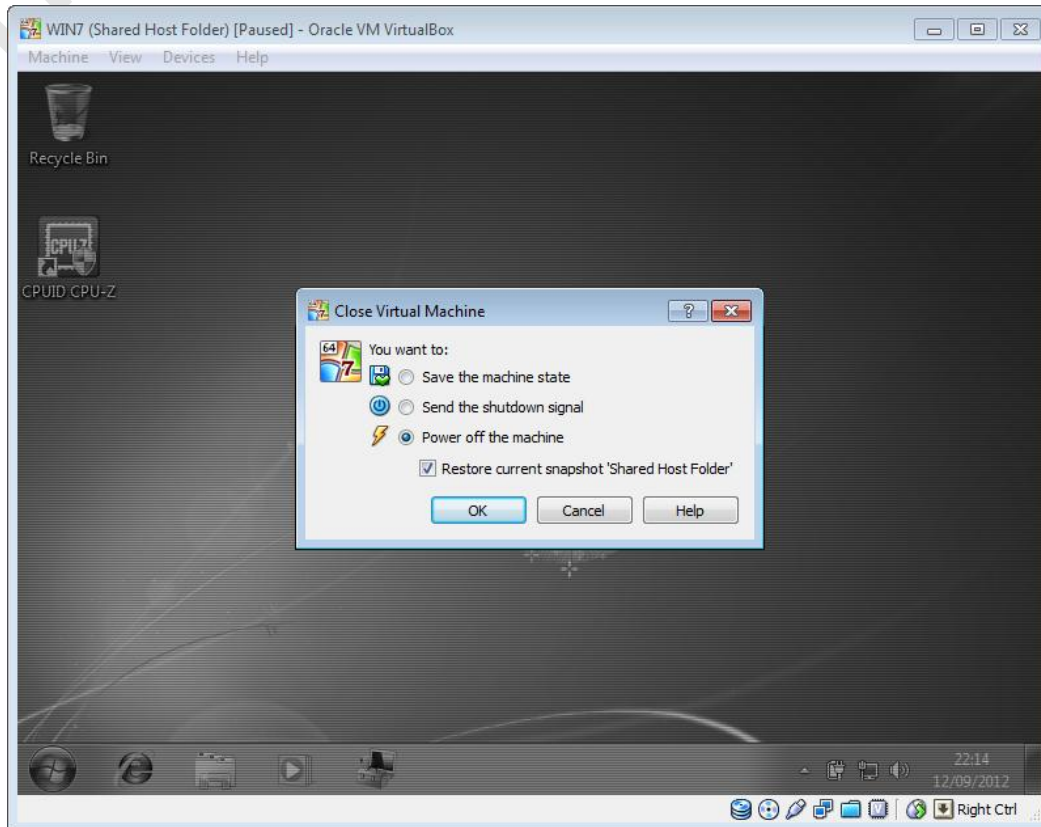
Discarding disk changes at the end of the lab

The VM window will close.

Glossary

⅛ Connector
Standard 3.5mm audio socket (the type of jack found on headphones and basic speakers).

10/100/1000BASE-T
Specifications for Ethernet running over twisted pair cable at 10/100/1000 Mbps.

32-bit
Most programs and operating systems run in 32-bit mode. Aside from allowing the computer to access more memory (4 GB), programs are protected from one another; each runs in its own address space.

64-bit
The PC is starting to move to a 64-bit platform. 64-bit offers some speed improvements, especially for tasks such as 3D processing, but its main advantage is the increase in address space and better support for virtualization (running multiple OS on the same hardware).The main 64-bit platform is called AMD64 or EM64T (by Intel). This platform is supported by 64-bit versions of Windows XP / Vista / 7 as well as various Linux distributions.

8.3 Filenames
The DOS file naming standard - an eight-character ASCII name followed by a three-character file extension (which identifies the file type). Windows supports long file names but can also generate a short file name, based on DOS 8.3 naming rules. This provides backwards compatibility for older applications.

802.11
See: Wi-Fi.

802.1X
802.1X (or EAP [Extensible Authentication Protocol]) is an authentication standard, developed to allow remote, wireless, and wired authentication to be centrally managed. A client device such as an access point passes authentication information to a RADIUS server on the wired network for validation. The authentication information could be a user name and password or could employ smart cards or tokens.

802.2
See: Ethernet.

8mm Tape Backup
8mm (¼") data tape storage systems appear similar to the tape cartridges used by many video cameras, although the media is higher quality.

AAA
Authentication, Authorization, and Accounting - the principal types of security control. A resource should be protected by all three types of control.

AC (Alternating Current)
When electricity is produced by a generator at the power station, the rotational movement of the magnetic coils causes the current produced to oscillate like a sine wave (it is said to alternate). Computers require direct current (at a constant voltage). A transformer is used to convert AC from the power outlet into the 3.3, 5, and 12V DC supply required by the computer.

AC Adapter
Portable power supply for portable computers. The AC adapter converts incoming AC mains power into the DC voltages required by the portable computer.

Access Control
Creating one or more barriers around a resource such that only authenticated users can gain access. Each resource has an Access Control List (ACL) specifying what users can do. Resources often have different access levels (for example, being able to read a file or being able to read and edit it).