

Enhancing and Optimizing Operating Systems: A Case Study of Windows XP

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Abstract: The windows registry provides an extensive range of tweaks, tricks and hacks for optimizing, enhancing and securing windows. When, it comes to optimizing and enhancing windows, no other tool comes close to the Registry Editor (RE). In this study, we outline several comprehensive procedures for enhancing and optimizing the performance of windows with emphasis on windows XP. We believe these outlines will help computer users especially system administrators, to make a maximal use of the computer resources.

Key words: Registry, registry editor, windows, operating system, DWORD, hive

INTRODUCTION

The operating system (also called system software) is the basic software that controls the computer or instructs the computer on how to work. It controls and coordinates the add-ons (peripherals) such as the disk drive or printer. There are several operating systems in existence. The next subsection outlines some of these Operating Systems (OSs).

Type of operating systems: Within the broad family of OSs, there are generally four types, categorized based on the types of computers they control and the sort of applications they support (Curt and Dave, 2000; Mark, 2002).

Real-time Operating System (RTOS): Real-time operating systems are used to control machinery, scientific instruments and industrial systems. An RTOS typically has very little user-interface capability and no end-user utilities, since, the system will be a sealed box when delivered for use.

Single-user, single task: As the name implies, this operating system is designed to manage the computer so that only one user can effectively do one thing at a time. The palm OS for palm hand held computers is a good example of a modern single-user, single-task operating system.

Single-user, multi-tasking: This is the type of operating system most people use on their desktop and laptop computers today. Microsoft's Windows e.g., Windows

9X, Windows XP, Windows Vista, etc. and Apple's Mac OS platforms are both examples of operating systems that will let a single user have several programs in operation at the same time. For example, it's entirely possible for a Windows user to be writing a note in a word processor, while downloading a file from the Internet, while printing the text of an e-mail message.

Multi-user: A multi-user operating system (either multi user single task or multi user multiple tasks) allows many different users to take advantage of the computer's resources simultaneously. The operating system must make sure that the requirements of the various users are balanced and that each of the programs they are using has sufficient and separate resources so that a problem with one user doesn't affect the entire community of users. UNIX, VMS and mainframe operating systems, such as Multiple Virtual Storage (MVS) are examples of multi-user operating systems.

Functions of the OS: An operating system has three major functions (Curt and Dave, 2000; Mark, 2002; Hennessy and Patterson, 2006):

- It co-ordinates and manipulates the computer hardware, such as the Central Processing Units (CPU), memory, printers, disks, keyboard, mouse and monitor, etc.
- It organizes files on a variety of storage media, such as floppy disks, hard drive, CD, digital video disk and tape
- It manages hardware errors and the loss of data

Components of the operating system: An operating system consists of three components (www.computer.howstuffworks.com/operatingsystems.html; Barton, 1961):

- The Kernel, which consists of programs that directly, manipulate the hardware
- The supervisor surrounds the kernel and it is the interface between the user's job and system resources. It accepts users commands and translates it to kernel instructions in order to manipulate the hardware
- The program, which consists of instructions given by the user. Program refers to in this case is a program resident in the RAM or loaded to the RAM

Justification for optimizing and enhancing windows XP: Microsoft has maintained two sets of operating systems that used both the same windows name for many years. From Windows 95 and 98 to Windows Me, an inexpensive operating system that could be used for both home and business applications was produced and named Windows XP.

For the server and workstation market, Microsoft produced Windows NT and Windows 2000. But maintaining two different operating systems kernels for these two markets caused problems for users, due to this fact some applications worked under one operating system, but not on the other since the Windows 95/98/ME line of operating systems used a different kernel than the windows NT and 2000 operating systems.

Windows XP therefore, is the result of merging the features of Windows 9X operating system and that of the Windows NT/2000 kernel. In addition Windows XP has many more features that are Curt and Dave (2000) and Terry (2000):

- It has universal hardware support base (done by vendors, not Microsoft)
- Abundance programs have been designed to run on Windows XP
- It has new features such as System Restore and device driver rollback
- It has direct advantages over older version of OS such as:
 - It runs on a far larger range of computers. XP will run on almost every computer with Intel or AMD processor from 1998 to present
 - It is cost effective. A computer with XP will (or did) cost far less than a Mac would
 - Easy to use as compare with even Windows Vista. Though, ultimately debatably, most people find XP easier to use, have no desire to spend time learning other OSs like Linux or Vista

- It supports Wide Area Network (WLAN) features The most valuable enhancement in Windows XP is the way it intuitively handles 802.11b wireless Local Area Network (LAN) connectivity making it easier for users to roam between WLANs
- Windows XP also, steps up WLAN security by simplifying Wired Equivalent Privacy (WEP) configuration and integrating and documenting RADIUS support on WLANs as a way of keeping wireless attackers at bay
- Mainstream support for Windows XP will continue until April 14, 2009 and extended support will continue until April 8, 2014 (www.en.wikipedia.org/wiki/Windows_XP)

Truly Windows XP is a revolutionary operating system that needs to be enjoyed by every computer user.

MATERIALS AND METHODS

The registry is a database that stores settings and options for the 32 bit version of Microsoft Windows including Windows operating system. It contains information and settings for all the hardware, operating system software, most non-operating system software and per-user settings.

The registry also provides, a window into the operation of the kernel, exposing runtime information such as performance counters and currently active hardware.

This information contained in the Registry is stored in hierarchical structures called hives. The information in these hives are stored in the form of binary or string and are therefore, retrieved on per-user, per-application and per-system basis through the use of the Application Program Interface (API) registry functions (www.en.wikipedia.org/wiki/Windows_XP; Jim, 2003; Robert, 1999).

Whenever, a user makes changes to control panel settings, or File Associations, System policies, or installed software, the changes are reflected and stored in the Registry. The physical files that make up the Registry are

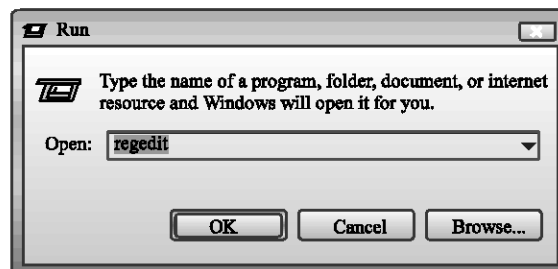


Fig. 1: Opening the registry editor at run command

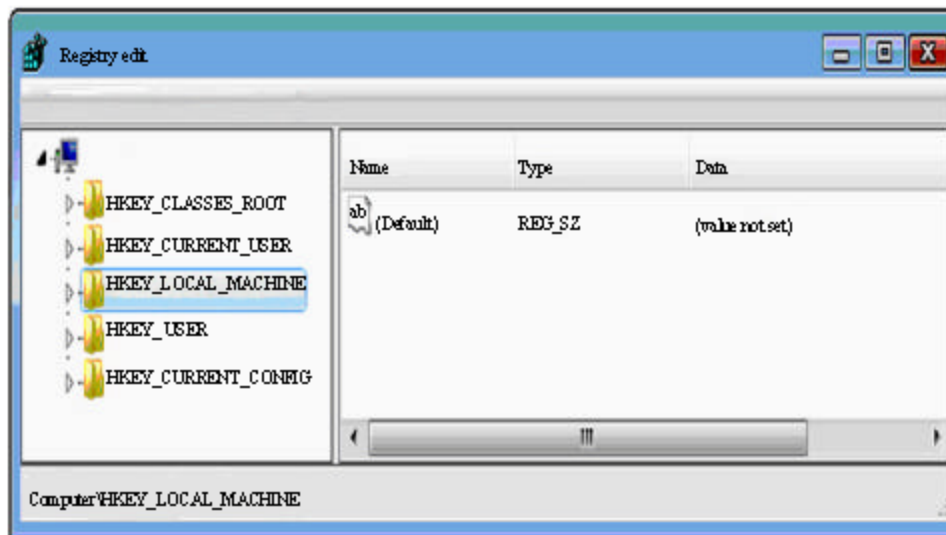


Fig. 2: The registry editor showing the five main hives

stored differently depending on the version of windows (Preston, 2005; www.winguides.com/registry; www.pctools.com/guides/registry). These files cannot be edited directly unless with the use of a special program named Windows Registry Editor (Regedit), which you won't find on the start menu (Terry, 2000). You can edit the Registry by typing regedit at the run command prompt as shown in the Fig. 1.

Prompt: When, the Windows Regdit is ran, the Registry is presented to you as one seamless hierarchy that looks much like a folder tree you would see in Windows explorer, as shown in Fig. 2. These folders, called hives are located in the \Windows\system32\config and \Documents and Settings\username folders.

The Registry Editor (RE) allows users to perform the following functions (www.en.wikipedia.org/wiki/Windows_Registry, RoseMarie and Henry, 2001; www.Computer.howstuffs.com/OperatinSystems.htm; Ariba, 2006).

- Creating manipulating, renaming and deleting registry keys, subkeys, values and value data
- Importing and exporting. REG files, exporting data in the binary hive format, where REG stands for Registry
- Loading, manipulating and unloading registry hive format files (Windows NT-based systems only)
- Setting permissions based on Access Control Lists (ACLs) (Windows NT-based systems only)
- Bookmarking user-selected registry keys as Favorites
- Finding particular strings in key names, value names and value data
- Remotely editing the registry on another networked computer

The registry therefore, provides an extensive range of tweaks, tricks and hacks for optimizing, enhancing and securing windows. If you take the proper precautions (such as backing up the Registry before editing it); learn to use the proper tools; perhaps most importantly, learn when editing the Registry is the proper choice, you will find that the Windows Registry is one of the most powerful tool at your disposal. In fact, there are many changes you can effect on the Operating system in no small way to enhancing its performance and security by using the RE.

Window XP marks the biggest change to the windows OS before the advent of the windows Vista. As at the end of November 2008, Windows XP is the most widely used OS in the world with a 66.31% market share (David, 2001; Jeremy, 2006). Windows XP is known for its improved stability and efficiency over the 9X version of Microsoft Windows (Curt and Dave, 2000; Terry, 2002; David, 2001; Jeremy, 2006). It combines the stability of NT/2000 operating system with the user-friendliness and hardware support of the consumer Windows line-and its does so literally, because those two operating systems have been combined for the first time in XP (Curt and Dave, 2000). Because of the richer interface and greater support for graphics and multimedia, you can easily change the way the operating system works or looks. Also, it has variety of tools for recovering from errors and therefore, can easily be customized without fear of damaging the OS.

RESULTS AND DISCUSSION

The following are tested registry hacks for enhancing and optimizing windows:

Increasing the performance of an (NT File System) NTFS

volume: Whenever you view a directory on an NTFS volume, the file system updates the date and time stamp to show the last time the directory has been accessed. If you have a large NTFS volume, this continual updating process can slow system performance. This registry hack can be used to disable automatic updating thereby resulting in high system performance. This can be done as follows:

- Run the Registry Editor and go to
- HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem
- Look forNtfsDisableLastAccessUpdate.
- If it is not present, create it as a DWORD
- Set the value to 1
- This is shown in the Fig. 3

Optimizing hard disk when idle (win XP/.NET): This setting will rearrange files on the hard drive when the computer is idle. This hack helps increase the data transfer rate, decrease power consumption and increase data seek time within the hard disk. It therefore, helps improve the performance of the user computer. The following steps can be followed to do this:

- Run the Registry and go to
- HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\Currentversion\OptimalLayout
- Create a DWORD value, or modify existing value, called EnableAutoLayout
- Set its data value to 1 to enable it as shown in Fig. 4

Making better the use of RAM by hacking the registry:

If your system does not have enough RAM, or if it uses what it has improperly, your system slows down. This is due to movement of data and programs to a paging file on your hard disk and your hard disk is slower than the RAM. A certain amount of this is normal, but if you use a paging file too much, or even if the paging file cannot handle the memory load, you will run into system slowdown and other problems. If you notice your system is running slowly after XP has been running for some time, or if the RAM seems to be getting lower, the reason may be left behind Dynamic Link Libraries (DLLs) from programs that are no longer running, but XP still keeps in memory. Sometimes XP keeps DLLs in cache memory even when, the program that referenced them is no longer running and this cuts down on the memory available to other applications.

You can use a simple Registry hack to have XP automatically remove from cache memory DLLs that are no longer needed by programs. To do this follows these steps:

- Run the Registry Editor and go to
- HKEY_LOCAL_MACHINE\SOFTWARE\microsoft\windows\currentVersion\Explorer Create a new DWORD value named AlwaysUnloadDLL (Fig. 5)
- Gives it a data value of 1
- Exit Registry
- Reboot for the new setting to take effect

If there are problems with some programs by issuing error messages with this setting effect; delete the new key or give it a value of 0.

Aside this registry hack, here are some additional tips for making better use of your existing RAM:

- Reduce the number of colors
- Avoid DOS applications
- Reduce the number of icons on your desktop
- Reduce applications and services running in the background

Changing the amount of time before time out: When an application hangs and no longer responds, XP displays a dialog box that prompts you to kill the application or wait a while longer. By default, the dialog box appears after the application has not responded for 5 sec. This can cause problems. For instance, if a program is doing heavy-duty calculation in the background, it won't respond until the calculation is done, so the operating system will report that the application is hung, even though it is not. A Registry hack can be used to increase or decrease the amount of time it takes before XP reports that the program has hung. This can be done as follows:

Run the Registry Editor and go to:

- HKEY_CURRENT_USER\Control
- Panel\DesktopSelect the HungAppTimeout entry and edit it to input a new value, in milliseconds. The default is 5000 millisecond
- Exit the Registry
- You may need to reboot for the new setting to take effect

Placing windows Kernel in RAM: Any item that runs in RAM is faster than an item that has no access to hard disk and virtual memory. Rather than have the kernel that is the foundation of XP using the slower paging Executive functions, use this hack to create and set the Disable Paging Executive DWORD to a value of 1.

Perform this hack only if the system has 256 MB or more of installed RAM. This can be done as follows (Fig. 6):

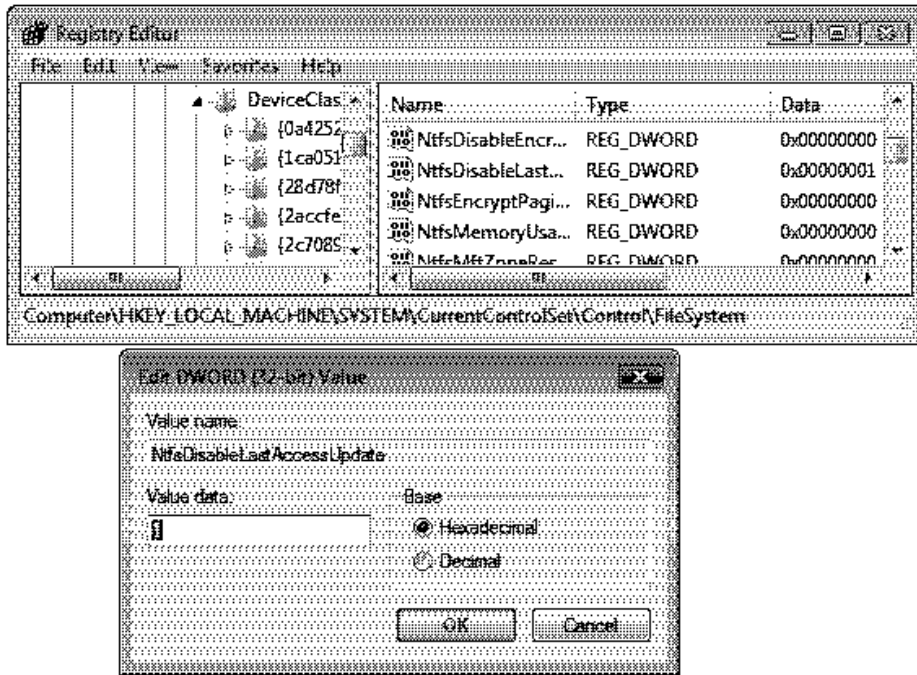


Fig. 3: Registry Editor showing how to increase the performance of an NTFS volume

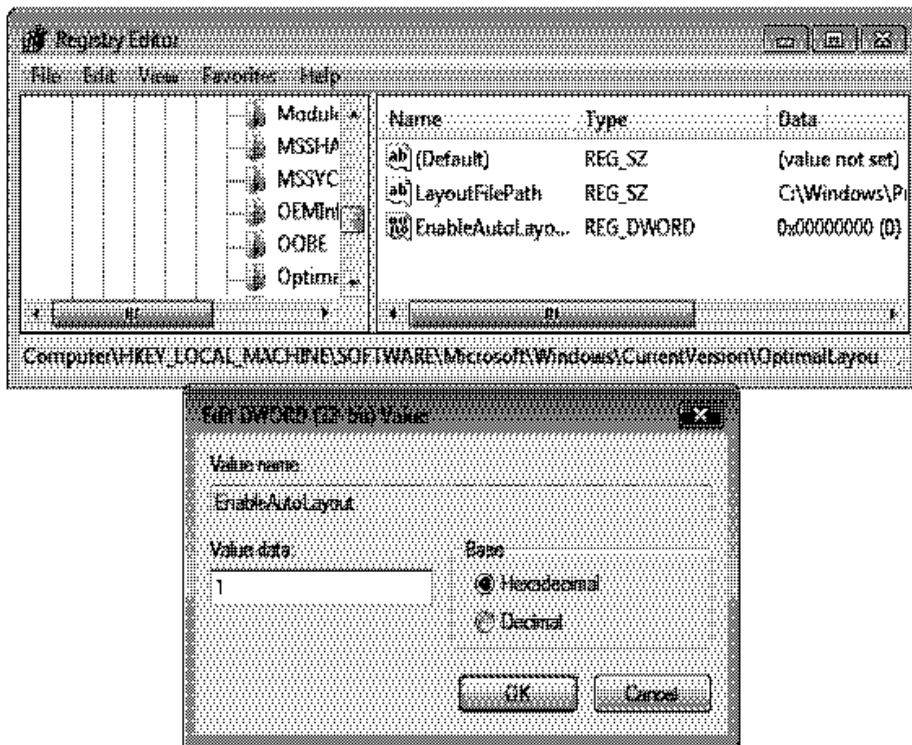


Fig. 4: Registry Editor showing how to optimizing hard disk when idle (win XP/ .NET)

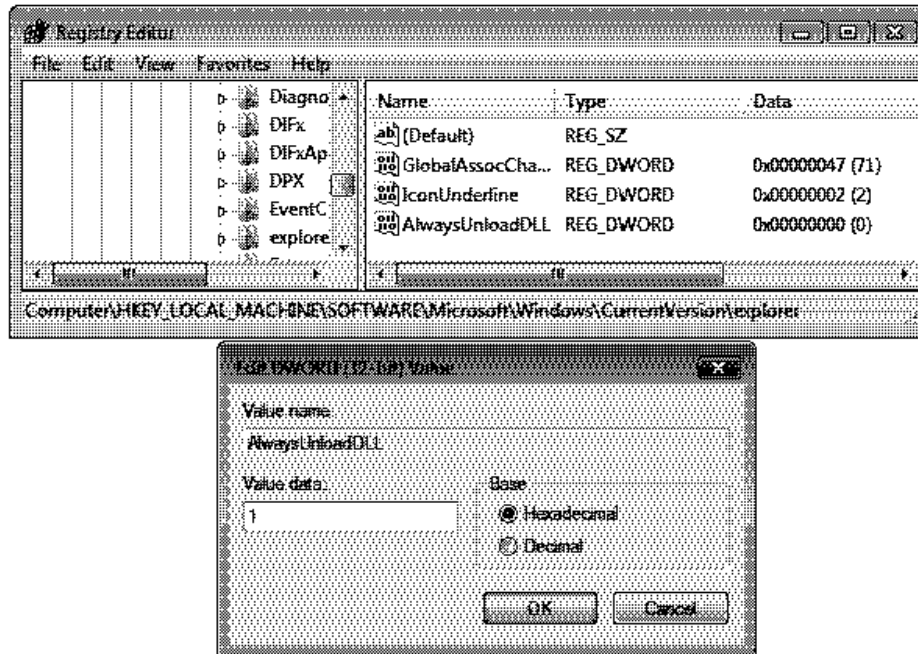


Fig. 5: Registry Editor showing how to optimizing the RAM

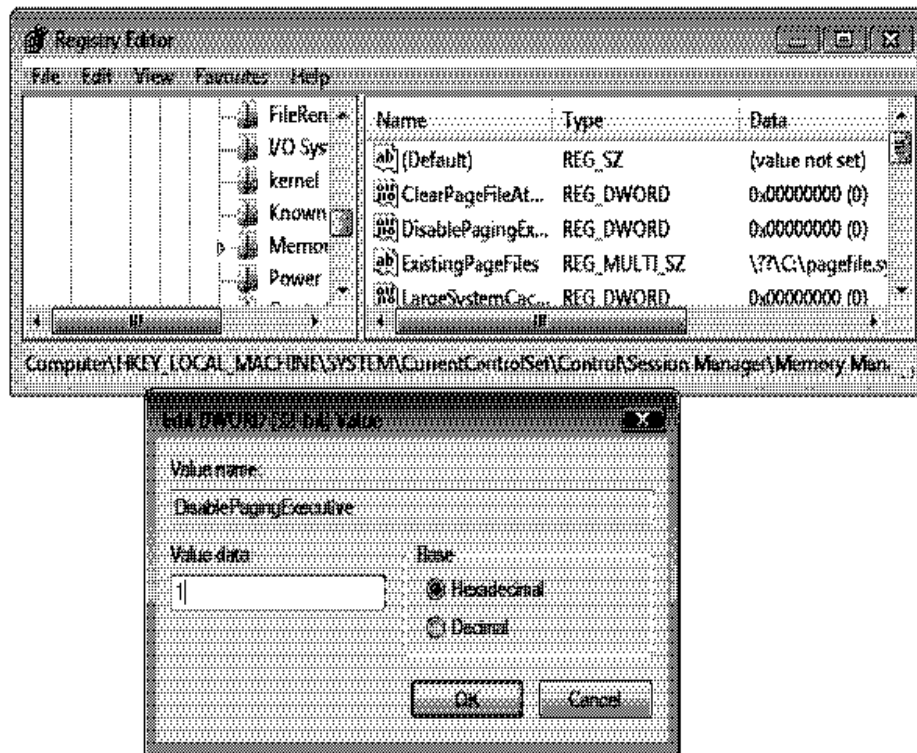


Fig. 6: A hack showing how to place Windows kernel in RAM

- Open the Registry and go to
- HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SessionManager\MemoryManagement\DisablePagingExecutive
- Set the value to 1
- Exit the Registry and reboot

Speeding up network browsing: When you use My Network places to browse for other machines on your network, it usually takes a long time to display the list of shared resources for the target machine. This is because, Windows XP first check for the scheduled tasks on the target machine before listing the share resources present on the computer. This unnecessary checking easily, adds some delay. You can decrease the time browsing takes by modifying the Registry to run off this checking. To do this, follow these steps:

Run the Registry Editor and go to:

- HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\RemoteComputer\NameSpace
- Delete the following key (the value for it is the scheduled Tasks) {D6277990-4C6A-11CF-8D87-00AA0060-F5BF}
- Close the Registry and reboot

You would now be able to browse to another computer on the network without much delay.

Disable universal plug and play services: Windows XP includes support for Universal Plug and Play (UnPnP), which allows UnPnP devices to be connected over a network. There are currently limited UnPnP devices available and due to a recent security flaw it may be advisable to disable these services.

Disable universal plug and play device host: This can be done as follows (Fig. 7):

- Open your registry
- Find the key
- HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\upnphost
- Set the value of start to 4 to disable the service, or 3 to enable it

Disable UnPnP discovery service:

- Open your registry and find the key
- HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\SSDPSRV (Fig. 8)

- Set the value of Start to 4 to disable the service, or 3 to enable it
- Restart Windows for the change to take effect.

Removing unruly application and uninstalled entries:

Unruly programs commonly leave bits of themselves behind, even after you uninstalled them. They might leave behind DLLs that load every time you start windows, as well as Registry entries, even though the original program is gone. In both instances, your system's performance takes a lot of loading resources for programs that no longer exist. The program also might leave behind unnecessary files and folders, which takes up hard disk space. This is a way to clean up after these unruly applications:

- Run the uninstallation routine
- Run the Registry Editor
- Search through the Registry for any keys and values the program left behind
- Delete them (Frequently, you can find the setting for the program at HKEY_LOCAL_MACHINE\SOFTWARE\Publisher\ProgramName, where Publisher is the name of the software company that made the program and program name is the name of the software package)

After uninstalling the program, make sure that no part of the program are still being run at startup. To do that deletes their entries from HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run and HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run.

Removing stubborn uninstalled entries from already uninstalled programs:

Inexplicably, even after you've uninstalled some programs, their entries still remain listed in the Add or Remove Program dialog box. There is an easy way to remove those entries; first, try to uninstall the program from the Add or Remove Program dialog box. If it doesn't uninstall, carry out the following:

- Run the Registry Editor
- Open HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall
- Look for the name of the uninstalled program (it will be the program name) and delete it. In some cases, instead of the program name, you'll see an entry like this {3075C5C3_0807-4924-AF8-FF27052C12 AE}

In this case, open the DisplayName subkey in that entry; it should have the name of the program in this instance, Norton Antivirus 2002. When, you find the right entry, delete it.

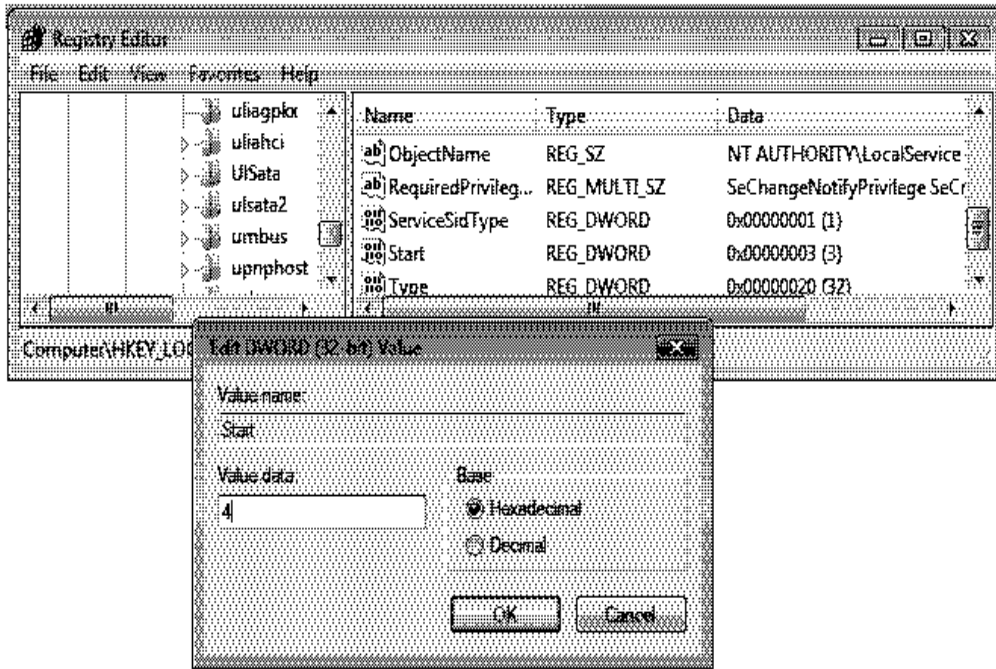


Fig. 7: A tweak showing how to disable Universal Plug and Play device host

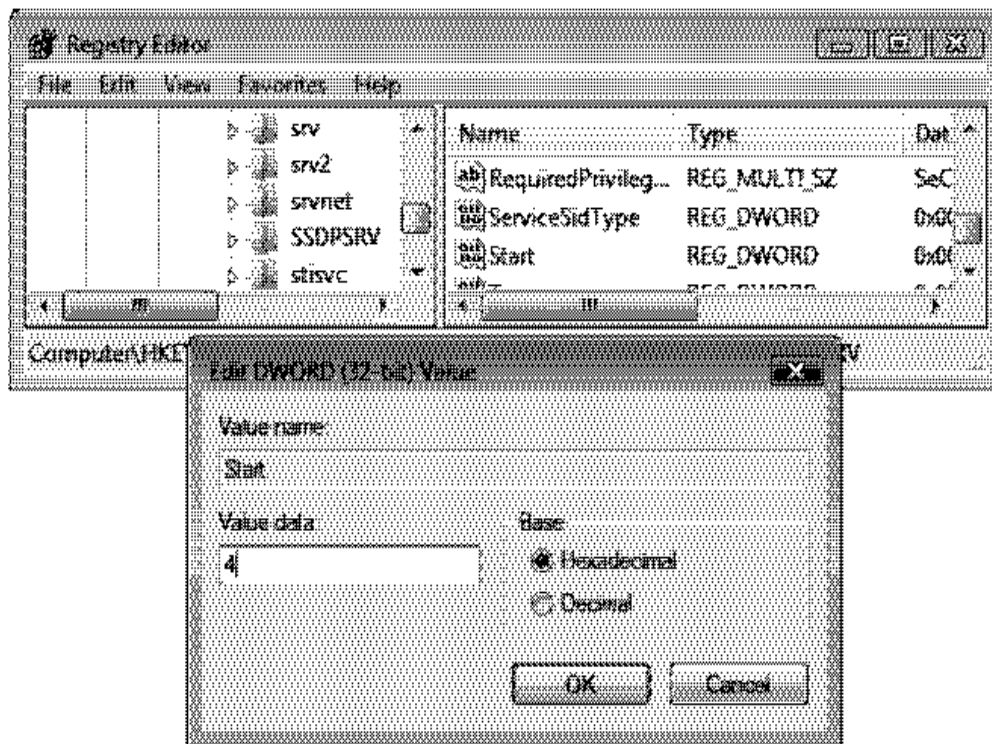


Fig. 8: A tweak showing how to Disable UnPnP Discovery service

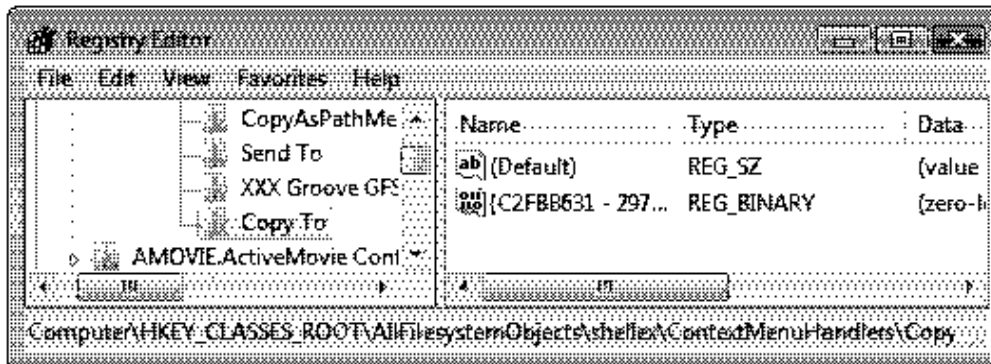


Fig. 9: A hack showing how to add Copy To folder to the context menu option

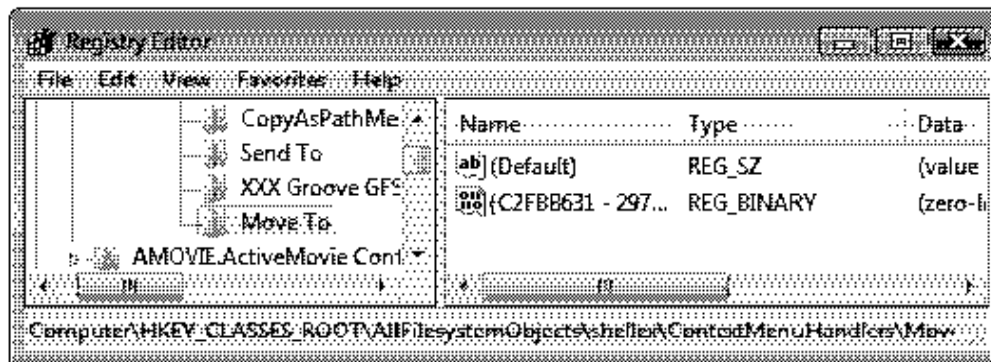


Fig. 10: A hack showing how to add Move To folder to the context menu option

Adding copy to folder and move to folder to context menu option: A lot of time is spent copying and removing files between folders. With a Registry hack, time can be saved; we can add Copy To Folder or Move To Folder options to the right click context menu. When, you choose one of the options from the menu, you browse to any place on your hard disk to copy or move the file to and then send the file there. To add the option, carry out the following (Fig. 9 and 10):

- Run the Registry Editor
- HKEY_CLASSES_ROOT\AllFilesystemObjects\ShellEx\ContextMenuHandlers
- (ShellEx tells you it is shell extension key that lets you customize the user shell or interface)
- Create a new key called COPY to. Set the value to {C2FBB630-2971-11d1-A18C-00C04FD75D13}
- Create another key called MOVE TO. Set the value to {C2FBB631-2971-11d1-A18C-00C04FD75D13}
- Exit the registry

The changes should take place immediately. To copy to folder and move to folder options will appear when you right-click on a file and choose one of the options, you will be able to move to or copy the file using a dialog box.

Windows update without registrations: Windows Update is a useful feature but to ensure your privacy you may not want to register your personal details before being able to use it. With this tip you can bypass the registration process. To update your windows without having to register it, this hack can be used:

- HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows NT\CurrentVersion
- Create a string value called RegDone or modify it if it already exists
- Set its value data to 1
- Exit the Registry and reboot the PC

Disabling the recycle bin: To disable the Recycle Bin,

- Run the Registry editor and go to:
- HKEY_LOCAL_MACHINE\SOFTWARE\microsoft\windows\currentVersion\Explorer\BitBucket
- Modify existing value, or create a DWORD value, called NukeOnDelete
- Set its data value to 1
- Exit the Registry
- Reboot for the new setting to take effect

Automatically turn on the num lock, scroll lock and caps lock: This Registry hack gives you the power to force any combination of keys on or off. This hack, when well done can enhance your typing speed as you will be able to combine certain keys effectively that could not have been possible previously. This can be done by the following this tweak:

- Run the Registry Editor
- Go to HKEY_LOCAL_USERS\Default\ControlPanel\Keyboard
- Find the string value Initial Keyboard Indicators. By default, it is set to 0, which means that Num lock, scroll lock and Caps Lock are all turned off
- Set it to any of the following values, depending on the combination of keys you want to turn on or off:

0 = Turns off Num lock, Caps Lock and Scroll lock
1 = Turns on Caps lock
2 = Turn on Num Lock
3 = Turns on Caps Lock and Num Lock
4 = Turns on Scroll Lock
5 = Turns on Caps lock and Scroll Lock
6 = Turns on Num lock and Scroll Lock
7 = Turns on all
- Exit the Registry
- Restart for the new settings to take place

Stopping errors messages from displaying on start up: If you constantly see an error message that you can't get rid of for example, from a piece of software that did not uninstalled properly and continues to give error messages on startup you can disable it from displaying on startup. To do this hack, follow these instructions (Fig. 11):

- Run the Registry Editor
- Go to:
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Windows
- Create a new DWORD called NoPopUpsOnBoot and give it a value of 1
- Exit the Registry
- Reboot for the setting to take effect

Automatically switch PC off when click shutdown: If you click shutdown and your PC doesn't automatically switch off, but tells you It is now safe to Turn off your Computer, use this Registry hack to make it be switching off automatically any time you click shutdown (Fig. 12):

- Run the Registry Editor
- Go to:
HKEY_CURRENT_USER\ControlPanel\Desktop

- Look for the value named PowerOffActive, or create it if it does not already exist
- Set the data value to 1
- Exit the Registry
- Reboot the PC (this depends on the motherboard you have)

Do not have XP clear the paging file at shutdown: For security reasons, you can have XP clear the paging file (pagefile.sys) of its contents whenever you shut down. Your paging files are used to store temporary files and data, but when your system shuts down, information stays in the file. Some people prefer to have the paging file cleared at shut down, because sensitive information such as unencrypted password sometimes ends up in the file. However, clearing the paging file can slow shutdown times significantly, so if extreme security is not a high priority, then do not clear your paging file (Fig. 13):

- Run Registry Editor
- Go to:
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\SessionManager\Memorymanagement
- Change the value of ClearPageFileAtShutdown to 0
- Close the Registry and
- Restart your computer to affect the new settings

Whenever, you turn off XP from now on, the paging file won't be cleared and you should be able to shutdown more quickly than before.

Managing native processor performance control: Windows includes built in processor performance control to manage the microprocessor so it is more efficiently utilized. This tweak allows you modify this feature.

- Open your registry and find the key below
- HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\W3\Parameters
- Create a new DWORD value, or modify the existing value, called 'hackFlags' and edit the value according to the settings below:
0 = Disable native XP support
1 = Use settings inherited from Intel software during XP upgrade
5 = System can support all modes when running on battery

Empty temporary internet files on exit: This setting controls whether Internet Explorer should delete all of the temporary Internet files stored during the session when the browser is closed.

- Open the registry and find or create the key:

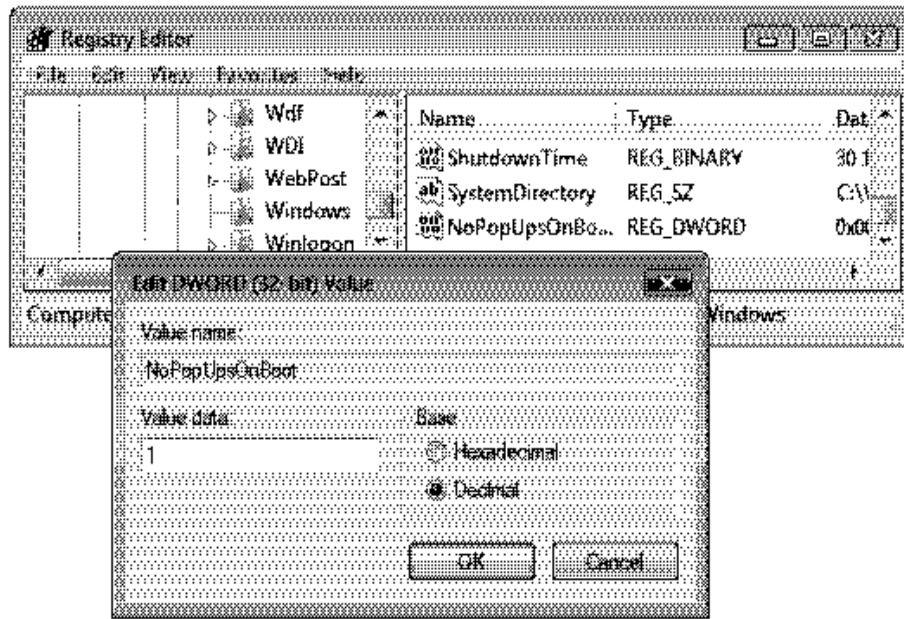


Fig. 11: A tweak showing how to stop Errors Messages displaying on start up

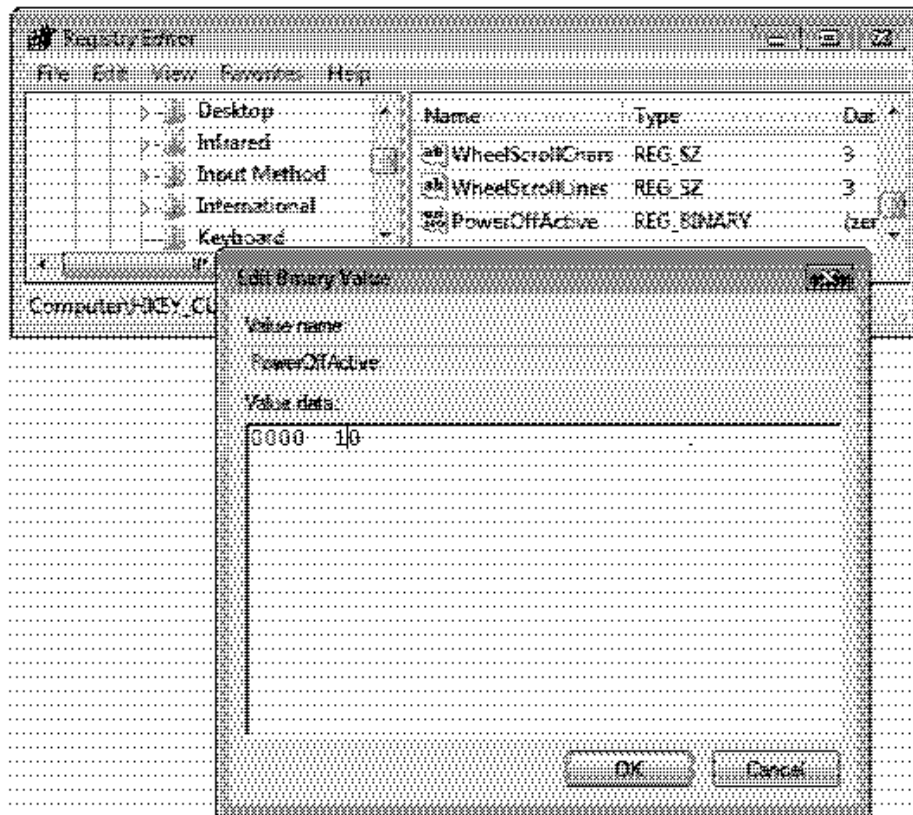


Fig. 12: A tweak showing how to automatically switch PC off when click shutdown

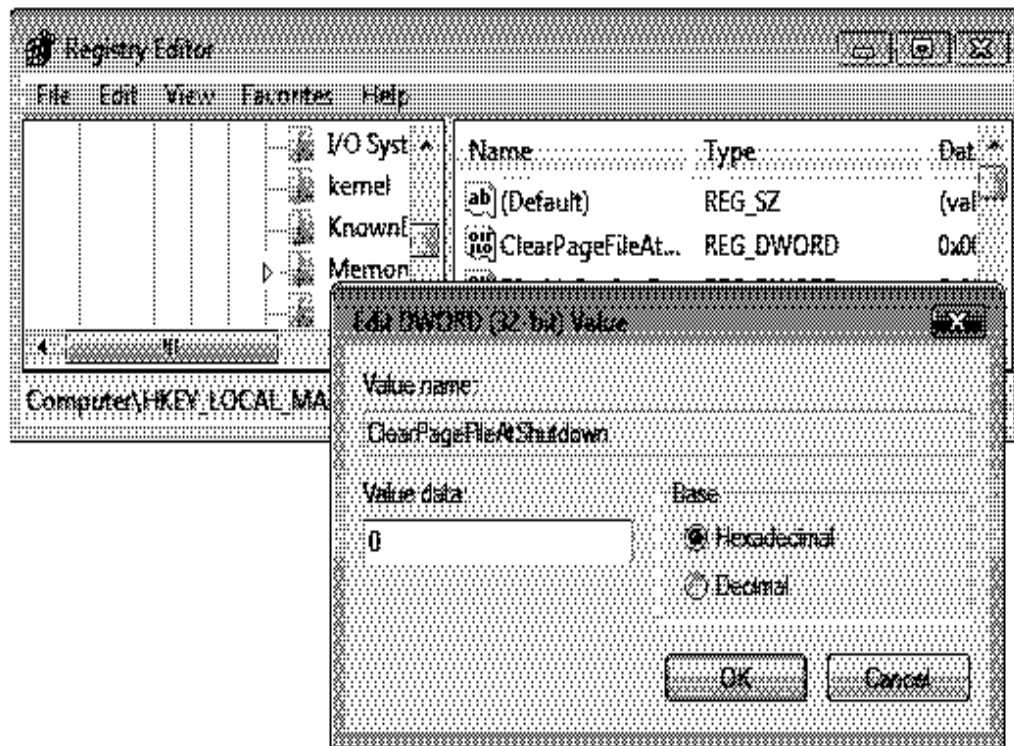


Fig. 13: A hack showing how to prevent Windows XP to clear the page file during shutdown

User key: HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\InternetSettings\Cache.

System key: HKEY_LOCAL_MACHINE_USER\SOFTWARE\Microsoft\Windows\CurrentVersion\InternetSettings\Cache:

- Create a new DWORD value, or modify the existing value, called Persistent
- Set the data value according as shown below:

Value name: Persistent.

Data type: REG_DWORD (DWORD value).

Data value: (0 = empty, 1 = do not empty).

- Exit your registry
- Restart or log out the Windows for the change to take effect

CONCLUSION

The Windows operating system is one of the most important aspects of the computer architecture. It supports both the hardware and the software that are used or can be used on the computer. There is therefore,

the need to get the best possible out of the operating system. Because of its advantages, such as its universal hardware support base and its direct advantages over other Operating Systems among others, the Windows XP was selected as a case study.

The Windows Registry provides an extensive range of tweaks, tricks and hacks for optimizing enhancing and securing windows OS. When it comes to optimizing and enhancing windows, no other tool comes close to the Registry Editor (RE). In this study, we outlined several comprehensive procedures for enhancing and optimizing the performance of Windows with emphasis on Windows XP. We believed these outlines will help computer users especially system administrators, to make a maximal use of the computer resources.

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