

ABOUT INCREASING OUR SYSTEM PERFORMANCE IN ECONOMICAL APPLICATION BY SPEEDING UP THE SYSTEM BOOT WITH WINDOWS XP

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ABSTRACT: *Do we ever wonder how fast our computer actually is? Of course, it says that it is a Pentium at 3.0 Ghz on the box in which the system came but the speed of the CPU is not the only factor in determining how fast our system actually is. The true speed of our computer is determined by the speed of all of our hardware, such as the speed of data written and read from the hard drive, the speed of the RAM, and the speed of the front side bus of the motherboard.*

KEY WORDS: *Boot, Bios, Post, Windows, Device, Service*

1. INTRODUCTION

We'll analyze the system to determine exactly how fast it is and how we can make it faster. We need to understand the limitations of our hardware and also to be able to identify possible bottlenecks in our system, before starting to make our computer run faster. Windows XP has a lot of great features and visual enhancements that makes it attractive. However, with all of the new features and attractive effects, the operating system has a higher system overhead, which means our hardware has to work even harder. If we do not always have the fastest hardware, this will help us to get the most out of our current hardware by reducing the heavy workload put on it during the boot up process.

Every personal computer has a system basic input/output system, or BIOS, which is what takes control of our computer the moment we turn it on. The screen that we first see when we turn on our computer is called the *power on self-test screen*, better known as the *POST screen*. If we purchased our computer from one of the major computer manufacturers, this screen is often hidden by the manufacturer's logo. To get rid of this logo from the screen, just press the ESC button on our keyboard; we'll then see what is going on in the background. At this stage in the system boot, the BIOS is probing the hardware to test the system memory and other device connections. Once

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the POST is completed, the BIOS proceeds to look for a device to boot from. Once it finds our hard drive, it will begin to load Windows.

The BIOS also acts as a main system component control panel, where low level settings for all of our hardware devices are made. The device boot order, port addresses, and feature settings such as plug and play are all found in the BIOS setup screens. For example, if we want to change the order of the drives that our computer checks to boot from, then we will want to modify the device boot order. I have to modify this setting almost every time I install Windows because I want my computer to boot off of the CD-ROM to launch the Windows XP setup application instead of booting off of the operating system on my hard drive.

BIOSs on each and every PC may be made by different companies or accessed in different ways. Nevertheless, the most common way to access the setup screen is to press F2 or the Delete key when the POST screen is displayed. If our PC doesn't allow us to access the setup screen in this way, consult our computer documentation or contact our computer manufacturer for instructions. While we are making changes in the BIOS, we have to make sure do not accidentally change any other settings. If we accidentally change a value of a setting and do not know what to change it back to, simply exit the BIOS setup screen as the on-screen directions indicate and select Do NOT Save Changes.

2. CHANGING THE BOOT ORDER OF OUR DRIVES ^[2]

Most computers are set up so that when we first turn on our computer, it will check to see if we want to boot from other drives besides our hard drive. It will automatically check to see if we have a bootable CD in our CD drive. If our computer has a floppy drive, it will check to see if we have a boot disk in the floppy drive. Then, once it has checked all possible locations for a boot disk, the system will default to our hard drive and start booting Windows. What are the benefits of changing the boot order of our system devices? If we modify the order of the boot devices so that the hard disk is placed at the top of the list, the system does not have to waste time checking other devices for boot records. Just by changing the order of the devices, we can save anywhere from one to several seconds off of our boot time, depending on the speed of our hardware. What are the consequences of changing the boot order? Changing the boot order will not hurt our system in any way if we do it correctly. If we remove our hard drive from the list and save the BIOS settings, we will get a pleasant surprise when our computer reboots – a statement that the computer cannot find any operating system. If we happen to get that message, then just reboot by pressing Ctrl+Alt+Delete and go back into the BIOS settings and make sure that we select our hard drive as a boot device. Once we have done that, our system will be back to normal.

Another possible issue that we may encounter is simply a matter of inconvenience. Once we change the boot order of the system devices so that the hard drive is listed first, we will no longer be able to use system restore CDs or floppy boot disks. If something has happened to our computer and we need to boot off of those drives to restore our system or run diagnostics, just go back to the BIOS and lower or remove the hard disk from the first boot device.

3. USING THE QUICK BOOT FEATURE OF THE BIOS ^[2]

All systems initialize in more or less the same way. During the power on self-test mentioned earlier, the BIOS checks the hardware devices and counts the system memory. Out of all of the different types of system memory, the random access memory, better known as RAM, takes the longest to be counted. Counting the RAM takes time, and on a machine that has large amounts of RAM, this calculation can take several seconds. For example, a machine that has 2048MB of RAM may take up to 10-11 seconds just to count the memory. On top of the RAM counting, a few other tests need to be done because our computer wants to make sure that all of the hardware in our computer is working properly. All of these system tests are not needed every time we boot, and can be turned off to save time. Most BIOS's offer a feature called quick boot. This feature will allow the user to turn off these tests. Other BIOSs only allow us to turn off the memory check, which will still cut down on a lot of time. Use of the quick boot feature or the disabling of the memory check will not harm our system. In fact, there are even some computer manufacturers that ship their computers with these settings already optimized for performance. The only downside to disabling the tests is the rare situation in which our RAM self-destructs; the BIOS will not catch it and we may receive errors from the operating system or our system could become unstable. If we notice that our system becomes unstable and crashes frequently or will not even boot, try going back into the BIOS and re-enable the tests to find out if our system's memory is causing the problems.

3.1. Modifying the operating system boot

Other hacking methods are still available that will shave a few more seconds off the boot time. For example, we can cut timeout values and slim down the system to get rid of all of the extra features and services that we do not use or need. We have the following ways to do so:

Lowering OS timeout values. If we have more than one operating system installed on our computer, we'll have to deal with the OS Selector that the Microsoft installer configures during installation of another operating system. By default, the OS Selector gives us 30 seconds to select an operating system before it reverts to the default operating system. The only way not to wait 30 seconds is to select the operating system we want to use right away. If we use one operating system most of the time, we would definitely save time if we set that operating system as the default and lowered the timeout value to 1 or 2 seconds. That way, we should not have to select an operating system every time we turned on our system or wait 30 seconds before doing so. With Windows XP, both Professional and Home, changing the timeout value is simple if the operating system that we use primarily is already the default.

3.2. Disabling the system boot screen

So, are we enjoying the fun blue bars moving across our screen when our system starts up? Not? Are we finding that we can live without the daily reminder that

we are running Windows XP? If so, then we might want to consider removing the boot screen. One added advantage to doing so: We shall be getting a boost of performance in return. Disabling the boot screen might only save a fraction of a second off our boot time. But keep in mind, every fraction of a second counts. This performance improvement works on a very simple principle. It takes time for the computer to do anything. Taking away some work that it has to do, such as loading the boot screen, will free time that it can spend loading our system files instead. The process for disabling the system boot screen is similar to the process for modifying the default operating system in the boot file. If we do not have any other operating systems installed on our system, then we will have to create our own boot.ini file to place in our drive root (that is, the c:\ drive). I am going to show how to create a file first, and will then show how to modify the boot.ini file if we already have one in our drive root or have multiple operating systems installed.

3.2.1. Creating the boot.ini file ^[1]

This section will show us, how to create a boot.ini file for our computer if we have just one operating system installed and we do not already have a boot.ini file in our drive root. To get started, let's go over what the boot.ini file looks like.

The boot.ini file that disables the boot screen looks like the following:

```
[boot loader]
timeout_0
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" /fastdetect /noguiboot
```

The above boot.ini file is pretty standard except for the addition of the /noguiboot to the last line of the file. That is the parameter that tells Windows to start up without using the graphical user interface boot screen. To get started, open up a copy of Notepad, found in the Accessories menu of the All Programs entry, in the Start Menu and follow these steps:

1. On the first line of the file, type in [boot loader].
2. On line 2 of the file, key in timeout_0 so Windows does not show the boot selection screen at all. We don't want this anyways because we only have one operating system installed on our computer.
3. On line 3 of the file, type in default_multi(0)disk(0)rdisk(0)partition(1)\WINDOWS so that Windows knows where to look on our hard drive to start the operating system.
4. On line 4, type in [operating systems].
5. On line 5, type in multi(0)disk(0)rdisk(0)partition(1)\WINDOWS_"Microsoft Windows XP Professional" /fastdetect /noguiboot to start up Windows with the /noguiboot parameter to disable the boot screen.
6. Click the File menu bar item and select Save As.
7. Type Boot.ini in the File name box and change the Save as type to All Files.
8. Then, change the Save in directory to our drive root, which is usually Local Disk (C:).
9. Click the Save button and we are now finished.

We can now close Notepad. The next time we reboot our computer, we will not see the boot screen.

3.2.2. Modifying an existing boot.ini file

If we have a multi-boot system or already have a boot.ini file, then all we have to do is open up our boot.ini file in Notepad and follow these steps:

1. Locate the Windows XP line in our boot.ini file that will look similar to "multi(0)disk(0)rdisk(0)partition(1)\WINDOWS_“Microsoft Windows XP Professional” /fastdetect”.
2. Type /noguiboot at the end of the line one space after /fastdetect.
3. Click File and select Save.

These instructions will remove our boot screen. But should we change our mind after we made the change, it is very easy to get the boot screen back. Simply remove the /noguiboot from the boot.ini file. If we are working from the file that we created or copied from the CD-ROM, just delete it.

4. DISABLING UNNEEDED HARDWARE DEVICES

Every time we turn on our computer, it has to load and initialize all of our computer hardware. Keep in mind: Our computer has a lot of devices that we do not always use. These extra devices are loaded and initialized during every boot. When it does so, our computer’s performance is slowed down. Windows XP is now a lot more efficient and smarter during the boot-up cycle. In previous versions of Windows, the system would load one hardware device driver and then load another device driver in a series. The only problem with loading the hardware this way was that it could slow down the boot dramatically if one hardware device was taking a long time to initialize.

One well-known culprit of this is the network card which pauses to wait to get an IP from a DHCP server. Windows XP has a new way of initializing the hardware devices when the system boots up. Instead of loading the hardware device drivers in series, it now loads some of them in parallel. This allows the boot to be much faster. Although the hardware devices are loaded in parallel instead of series, the addition of more devices that the system has to load drivers for will probably still slow down the boot. To disable hardware devices, we will want to use the Device Manager.

4.1. What hardware devices should i disable?

Each user uses (or doesn’t use) devices differently, depending on the system setup. Nonetheless, some classes of devices are more commonly disabled than others. Knowing which ones will help, we make a decision as to what devices we should disable. The following classes of devices are frequently disabled:

- Network Adapters: Especially on Notebook computers, there are often more than one network device. Disabling the network devices that we do not use will definitely save we some booting time.

- Fire wire: If we have 1394 connections, otherwise known as fire wire, we might consider disabling them. Unless we are using our fire wire port to connect our digital video recorder to our computer, or have other external fire wire devices, we have no need to have this device enabled.
- Modems: Do we have a broadband connection? If so, then consider disabling our modem. If we rarely use it, disable it. If we ever need to use it again, just re-enable it.
- Multimedia devices: Our computer has lots of multimedia devices. Take a look at the “Sound, video, and game controllers” section in Device Manager. We will find a lot of device drivers that are loaded during our boot. Some are used by all users, but others will find a few that they do not use. For example, I do not use my game port or my MIDI device, so I disabled both of those.
- PCMCIA: If we are a laptop user, consider disabling our PCMCIA card controller, located under “PCMCIA adapters.” The PCMCIA (Personal Computer Memory Card International Association) slot is a special expansion slot that is rarely used today on laptops except for wireless and wired network cards and card reader attachments for compact flash and other solid state memory cards. Most laptops now have built-in network adapters and some even have built-in wireless adapters. If we do not use our PCMCIA adapter, it is yet another device that can be safely disabled.

5. REMOVING EXTRA FONTS FOR SPEED ^[4]

Windows XP has over 250 different font variations that it loads for use when the system boots up. Of these 250 variations, only a handful are used on a regular basis. Most likely, we really only use the core Windows fonts, such as Tahoma, Times New Roman, Arial, Verdana, Trebuchet, and MS Sans Serif. All of the other fonts can be removed from the fonts folder. As we can imagine, loading over 250 fonts is something that will take the system more time to do. Users who have installed a fonts CD, which usually has hundreds of fonts, on their systems are increasing the amount of work their computer has to do during startup. Simply put, loading a lot of fonts will take more time, because the system has to load and index each font. Thankfully, there is a very simple answer to this: Just remove the fonts that we do not use from our font directory. We can go about removing the unneeded fonts from our font directory in a number of different ways. The best way is to move the unused fonts to a separate folder on our system so that if we ever want to use one of those extra fonts again, we just have to copy it back to the fonts folder.

6. DISABLING UNNEEDED SERVICES ^[1]

A service is a software application that runs continuously in the background while our computer is on. The Windows operating system has numerous services that run in the background that provide basic functions to the system. Network connectivity, visual support, and external device connectivity such as printer services are all examples of the types of services that the Windows services provide. Each of the services running in the background take up system resources, such as memory and

CPU time. Also, during the booting of the operating system, the service has to be loaded. On most computers, there are nearly 20 services that are loaded upon startup. Of these 20 services, only a handful are system-critical services. All of the others can be disabled. In order to disable a service, first we will need to know more about what the most common services do. We have to notice that before we begin changing our service setup, set a System Restore Point to easily restore our system to an earlier configuration. However, be careful when we restore from restore points. Any applications or files that were created after the system restore point will be deleted when reverting to an earlier restore point. To get the maximum amount of performance out of our system, we have the option of disabling all of the services on our computer that are not critical to the system. This would take away a lot of the nice features and conveniences of Windows, but we should have a much faster machine. The following is a list of system-critical services that should not be disabled. Feel free to disable all other services: Com+ Event System, Cryptographic Services, DCOM Server Process Launcher, DHCP Client, DNS Client, Event Log, IPSEC Services, Workstation, Shell Hardware Detection System Event Notification, Protected Storage, Network Connections, Plug _ Play, Print Spooler, Remote Procedure Call, Secondary Logon, Security Accounts Manager.

Recommended service setup^[1]. The bare-bones system service setup is a good setup for optimal performance. However, don't we want to have some of the conveniences of Windows XP? Check out the recommended services to disable shown in the following list. If we follow these recommendations, we will cut down on our boot time but we will also have the nice features and conveniences of Windows XP. Disable the following services: Background Intelligent Transfer Service, Distributed Link Tracking Client, Error Reporting Service, Fast User Switching Compatibility, Help and Support, Indexing Service, Messenger, Machine Debug Manager, Network Location Awareness (NLA), Portable Media Serial Number Service, Remote Registry (Only included with Windows XP Pro), SSDP Discovery Service, Terminal Services, Windows Image Acquisition (WIA), Wireless Zero Configuration (If we have a wireless network card, do not disable this one), Windows Time, WebClient, Task Scheduler.

7. OPTIMIZING THE LOCATION OF THE BOOT FILES^[3]

The speed at which our files are read depends on where the files are located on our hard drive. Also, when a file is fragmented (which is when one file is scattered all over the disk), it takes more time to access that file than if all of the pieces of the files are side by side. Using tools that are available in Windows and other third-party utilities, we can defragment and place the Windows boot files on the disk where they will be accessed faster. Windows XP has a new feature called the Prefetcher, which determines what files on the hard drive are used during the boot process and where they should be placed on the disk for optimal speed. Although this is not the only benefit that the Prefetcher provides, it makes optimizing the location of the boot files easy.

Using disk defragmenter ^[4]. Windows XP includes a boot defragmenter, but it is a little tricky to get it to run. By default, it is run only in the background and cannot be started directly by a user. After our computer has been idle for some time, between 5 and 30 minutes, the system will read the Prefetcher's boot data and start the defrag. The system defrag is run in the background and is invisible to the user. Eventually, if we leave our computer on long enough, it will defragment the boot files. Windows is getting smarter and smarter. However, there is still one problem: There is no possible way to directly initiate a boot defrag. The only way is to leave our computer on for a little while without using it at all. If we are impatient and do not want to wait, then I have a solution for us. As I mentioned earlier, the system will only initiate the boot defrag when the system is idle. Typing in a command that will start the boot is not possible. However, we can tell our computer, even when it is not idle, to process the idle tasks. This will indirectly start the boot defrag. Although because the boot defrag is most likely not the only idle task waiting to be run, there will be other processes run as well, which can cause our computer to appear to be doing a lot of hard work as it completes all tasks. During this time, our computer should not be used for any intensive activities, such as playing games. If we try to use our computer while the idle tasks are being processed, we will notice slow performance until the tasks are completed.

8. SUMMARY

Throughout this paper, we discovered many ways to lower the amount of time it takes our computer to boot up. First, we saw how to change some of the BIOS settings that can optimize our computer for maximum boot speed. Then, we discovered how we can remove our boot screen to shave off some more time. After that, we saw how we can disable other parts of Windows, such as hardware, fonts, and services, that we may never use, all of which take up time when our computer starts up. We found out how we can optimize the placement of the files used when our computer boots up, using the Prefetcher and other disk defragment tools.

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