TVET CERTIFICATE III in COMPUTER SYSTEM TECHNOLOGY

COMPUTER SOFTWARE MAINTAINANCE

COSCS301

Maintain computer software

Competence

Credits: 8

Learning hours:

80

Sector: ICT

Sub-sector: Computer Maintenance

Issue date: December, 2019

Purpose statement

This core module describes the skills, knowledge and attitude required to maintain a computer system. The learner will be able to select and arrange different materials, equipment and tools used when doing computer system maintenance.

Table of Contents

Total Number of Pages: 161

Learning Unit 1 – Prepare tools, Material and Equipment

Learning Outcome1.1: Identify tools, Material and equipment

- **Content/Topic 1: Identification of tools and materials**

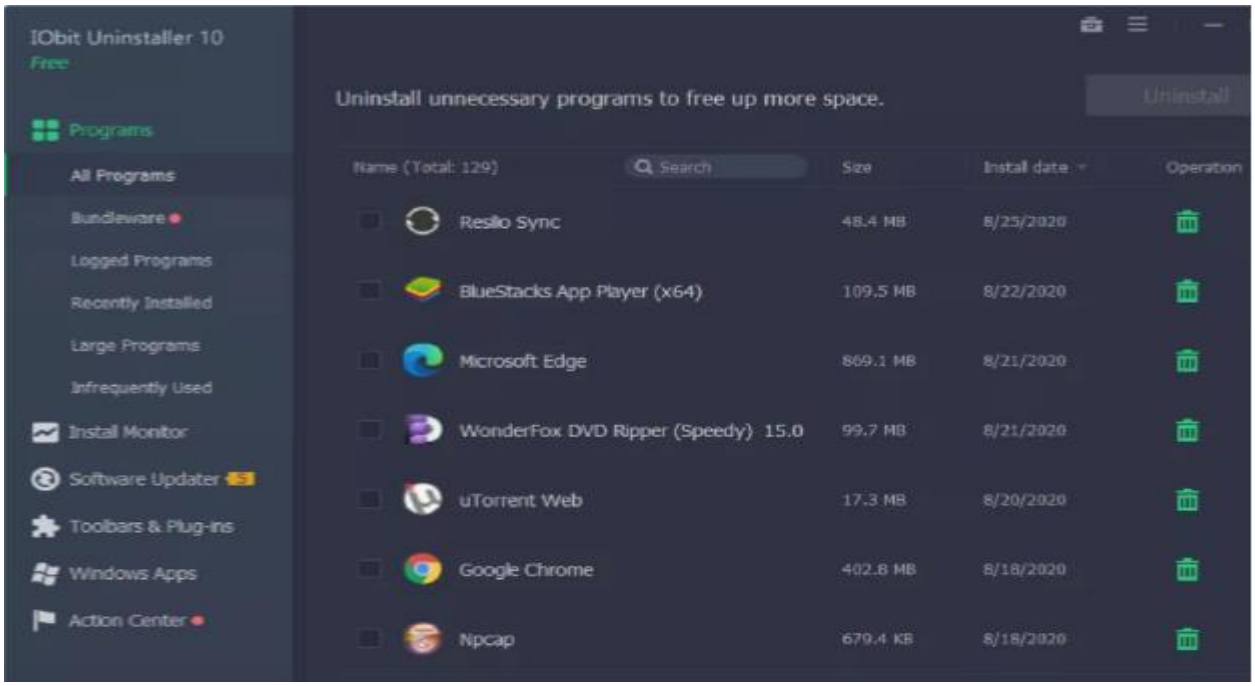
Remove tool software

Remove tool is a tool that removes some malware from Windows systems, particularly those systems without antivirus programs installed.

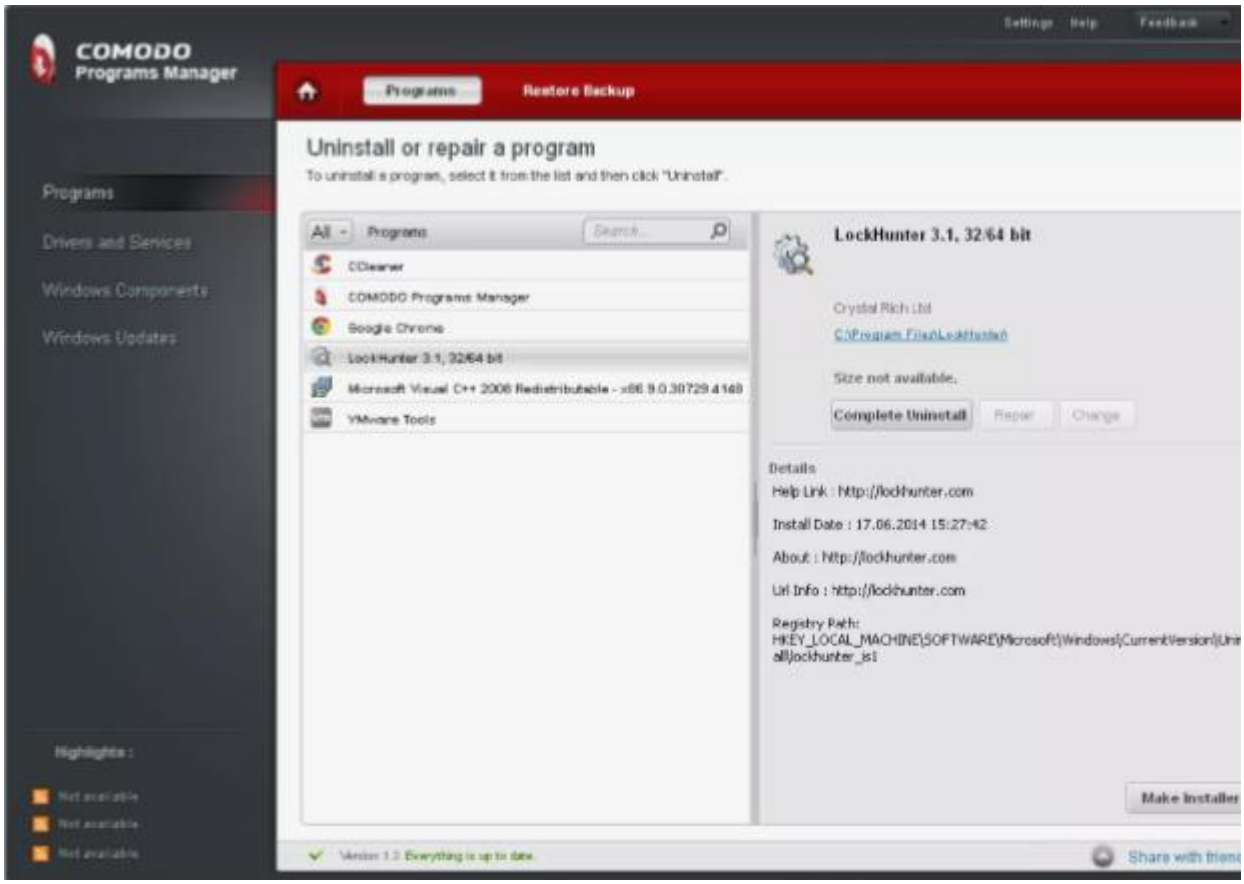
Here are Uninstallers (removal tools) for common Windows antivirus software

1. **IObit Uninstaller**

With IObit Uninstaller you can search for installed software, find and remove the programs taking up the most space or the ones you hardly use, uninstall browser toolbars and plugins, remove downloads made from Windows Update, and even see which of your programs could be updated to a newer version. The best feature in IObit Uninstaller is the right-click context menu integration. You can right-click any program on your desktop and choose to remove it with IObit Uninstaller, without ever having to find the program's uninstall utility yourself. In fact, you can even use the Easy Uninstall feature to delete programs that are running. Just drag the green dot on top of the program window and IObit Uninstaller will know exactly what to do to remove it. After a program is deleted, you have the option to scan the registry and file system for leftover data that the installer may have missed, which is a great way to keep your computer free of clutter. This is also true if you uninstall a program without using IObit Uninstaller—it will still prompt you to remove any leftover files and registry items that the regular uninstaller might have missed. IObit Uninstaller can also create a System Restore point before making any changes, includes a file shredder, can force-remove a program, supports batch uninstalls, deletes bundled programs, and includes other useful tools, too. IObit Uninstaller runs on all recent and older versions of Windows. This includes Windows 10, 8, 7, Vista, and XP.



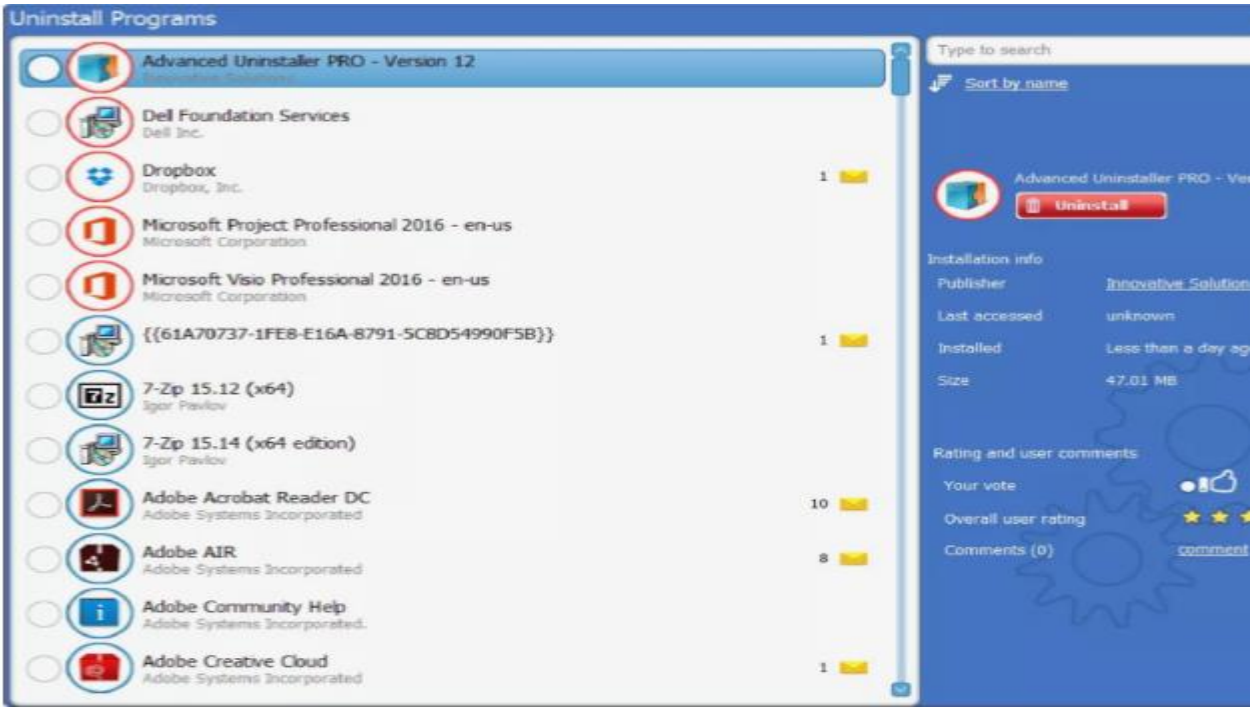
1. **Comodo Programs Manager**



Comodo is probably best known for their antivirus software, but they also have a wonderful program uninstaller called Comodo Programs Manager. The main feature in Comodo Programs Manager that certainly stands out is the way it monitors program installs. After installing Comodo Programs Manager, any new software install will be monitored in real-time to keep track of every registry and file system change. Then, when you're ready to uninstall the program, Comodo Programs Manager knows exactly where to look for a thorough cleaning. You can also restore a program from a backup if you accidentally removed it, remove programs from the right-click context menu in Windows Explorer, view the install folder of any program, and sort the list of installed software by name, company, size, the frequency of use, install folder, and install date. Comodo Programs Manager can remove Windows Updates, drivers, and Windows features in addition to regular programs. Comodo Programs Manager is only compatible with Windows 8, 7, Vista, and XP. You'll need a different program from this list if you're looking for one that's compatible with Windows 10.

2. **Advanced uninstaller Pro**

Advanced Uninstaller PROThis program is basically like the others in this list. Common features like scanning for leftover registry items, context menu integration, and a search utility are included. A feature called Monitored Installations is also available, which takes a snapshot of your computer before and after a program install. This allows Advanced Uninstaller PRO to easily identify the changes an install made, thus allowing it to remove every single file that the program modified during its installation process. The only thing I don't like about Advanced Uninstaller PRO is that it can seem very cluttered with all the extra tools it has, such as a registry cleaner and file shredder. Both 32-bit and 64-bit versions of Windows XP through Windows 10 are supported.



3. Revo Uninstaller

Revo Uninstaller is another software uninstaller program that has both a regular installable version as well as a portable one. Hunter Mode is a unique feature that lets you manipulate a program by simply selecting its open window. You can uninstall the software, view its installation folder, kill the process, and even stop it from running at startup using this mode. When uninstalling a program with Revo Uninstaller, you can run it in advanced mode, which scans the file system and registry for leftover items that are no longer needed but didn't get properly uninstalled with the built-in uninstaller. You can then delete some or all of the leftover items. Automatic restore point creation is a big plus. Also, there's a junk file cleaner and privacy cleaner included, among other extra tools.

- **Ant-virus**

Anti-virus is a software (computer program) that scans files or your computer's memory for certain patterns that may indicate an infection. The patterns it looks for are based on the signatures, or fingerprints, of known viruses. Once a virus is detected in the wild, the Anti-Virus companies then

release these new patterns for your Anti-virus software to use. These updates come out daily by some vendors. Virus authors are continually releasing new and updated viruses, so it is important that you have the latest definitions installed on your computer.

• Once you have installed an anti-virus package, you should scan your entire computer periodically. Always leave your Anti-virus software running so it can provide constant protection.

Some of the best antivirus programs available right now include the following:

1. **Bitdefender**

Bitdefender Total Security is a comprehensive security suite that provides optimal protection against viruses and all types of malicious software. Compatible with the four major operating systems and smart homes, this user-friendly antivirus software also includes a free VPN with a 200MB daily limit, parental controls, webcam protection, a password manager, and a tool specifically designed to fight ransomware. This security suite is very competitively priced and will provide 24/7 protection for up to five devices

2. **Norton**

Symantec's Norton has been around for almost three decades and is without a doubt one of the most recognizable names in cybersecurity. Its security software suite Norton Security Premium is compatible with all four major platforms as well as smart homes and comes with a variety of excellent features. Although it doesn't include a free VPN service, it offers parental controls and a whopping 25GB of online storage space. This is great for owners of multiple gadgets, as one license protects up to 10 devices.

3. **Panda**

Panda is another excellent antivirus program that offers excellent protection from all known cyber threats. Known for its fast performance, this antivirus software is only compatible with Windows, macOS, and Android. Despite not supporting iOS, the suite comes with a VPN service with a 150MB daily limit, a password manager, parental controls, and a standalone USB antivirus program. Designed to provide protection for up to five devices, Panda Antivirus also includes a full Android malware scanner.

4. **McAfee LiveSafe**

McAfee LiveSafe is unique in that a single license is valid for an unlimited amount of devices. Compatible with all four major operating systems, this security suite provides superior malware protection for Windows and Android-powered machines without affecting their performance. Although the parental control function is not as advanced as the competition, the inclusion of McAfee's True Key password manager more than makes up for it. Equipped with facial recognition functionality, it will keep all your login data extra-safe.

5. **BullGuard**

Another security software suite designed primarily for Windows and Android, BullGuard offers a high level of antivirus and anti-malware protection without slowing down your computer. Although there's no VPN included in the package, there are plenty of bells and whistles here, including a game booster, cloud backup, parental control, and safe browsing functionality. However, macOS users can only run antivirus scans, while the suite is incompatible with iOS. A single license is valid for up to five devices.

Depending on the installation method of the Anti-Virus these can be in the following forms: On Access, On - Demand, and hardware.

• On-access scanners check for viruses when files or floppy disks are "accessed". They are designed to run transparently in the background. When well implemented they should be invisible to the user they shouldn't even realize they are running an antivirus product until it intercepts a virus. It has been our experience that on-access scanners are the most popular type of anti-virus product.

• On-demand scanners only execute when the user tells them to execute. In other words, they only scan for viruses when the user tells them, for example, to scan the floppy disk they have just inserted. The drawback with this method is that users have to remember to scan files and disks for viruses.

• Hardware anti-virus products tend to be unpopular. The reason for this is that it is considerably harder to install a hardware card into many hundreds of PCs than it is to install computer software. Furthermore, difficulties may arise if the hardware antivirus needs to be updated to deal with new threats (macro viruses for example).

- **Anti-malware**

Anti-Malware is a computer program designed to detect newer malware from spreading through zero-day exploit, malvertising or any sophisticated form of communication like social media or messaging.For protection against advanced malware and new dangerous threats, Anti-Malware is a must.

Anti-Malware becomes the second layer which then targets and detects the latest malware. It even has the capability of detecting unknown malware using Intrusion Detection and Behavioral Blocker techniques.

Anti-Malware solutions are referred to as second opinion scanners. They are designed to run alongside Antivirus without creating any conflict. MalwareFox, for example, is lightweight and requires fewer system resources to run the program. It has low memory usage and has fast scanning capabilities so it does not impact on any other software or programs that are running.

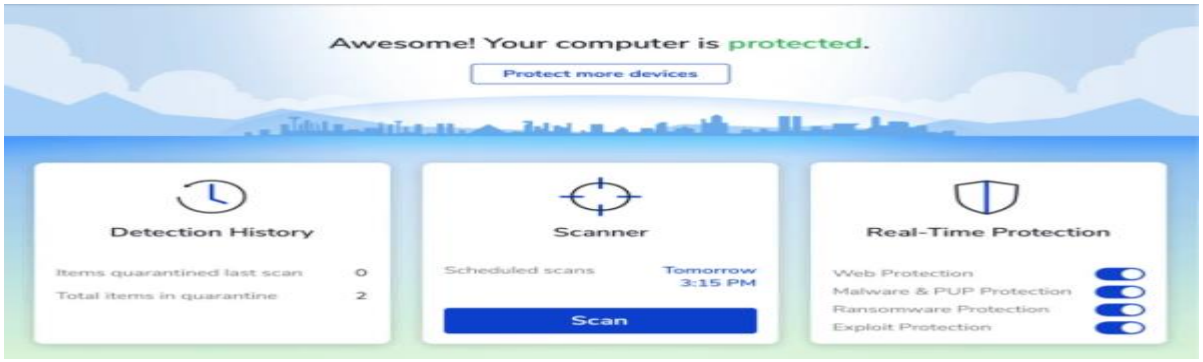
Examples of Anti-Malware Software: Removal & Protection

Norton 360

Norton 360 is by far the best anti-malware program I've tested. It uses artificial intelligence as part of its malware detection engine, protecting against ransomware, spyware, and many other viruses. It detected all-but-one of the inactive malware samples on my PC and instantly blocked 100% of the malware files when I launched them.

2. **Malwarebytes**

Malwarebytes is easy-to-use, highly customizable, and intuitive, and Malwarebytes Premium is a fully capable anti-malware and antivirus product, offering real-time protection and behavior analysis.

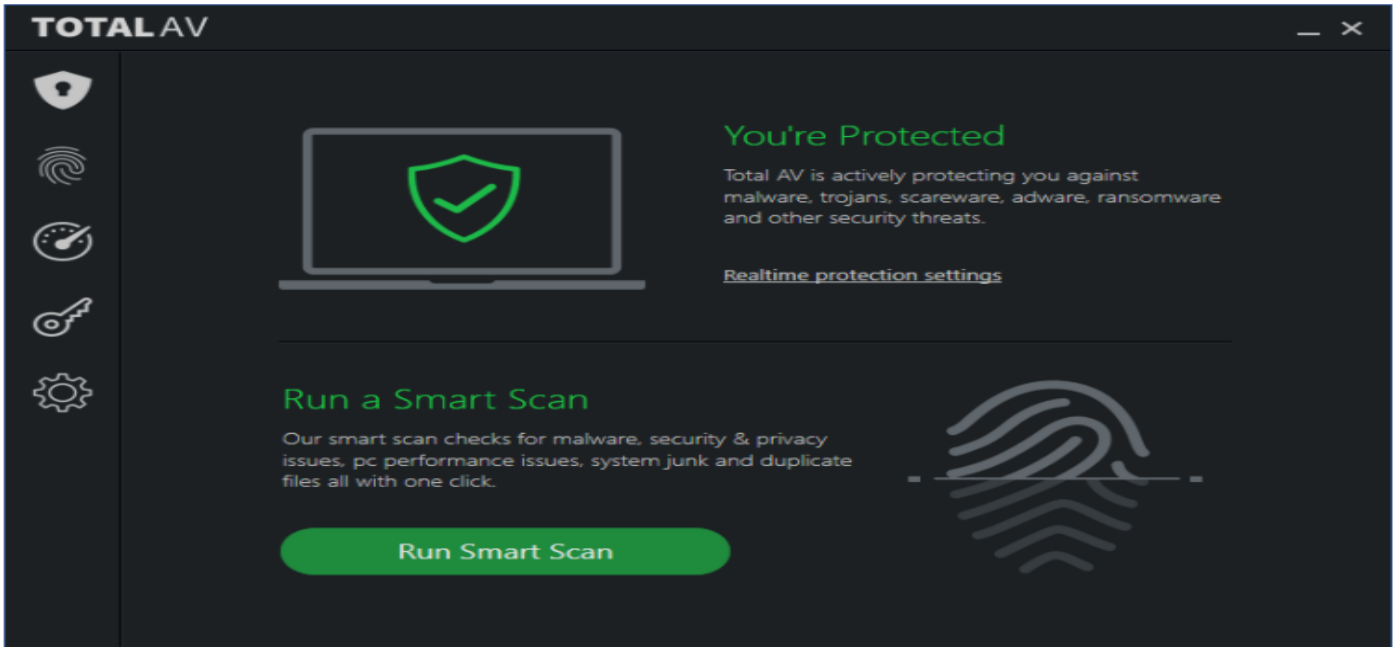


3. **McAfee**

McAfee is a well-known name in the cybersecurity world, and as we saw in our McAfee review, their latest antivirus product is easy to use, highly secure, and extremely customizable.

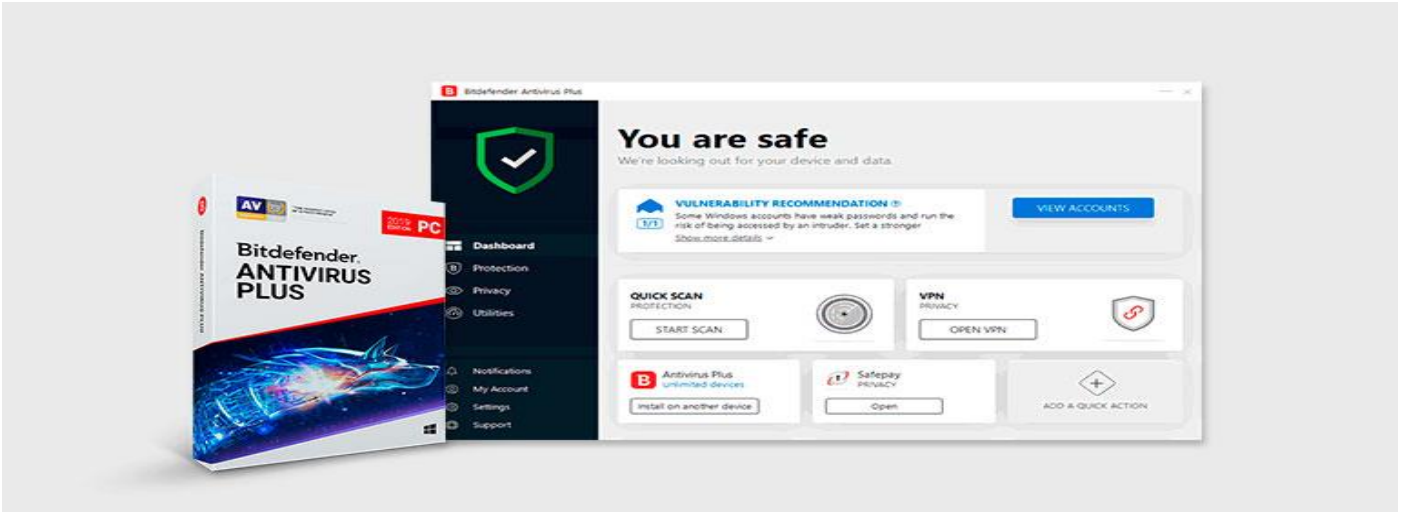
4. **TotalAV**

TotalAV is a newcomer to the anti-malware space, but its powerful malware fighting capabilities have helped it earn its high reputation in the cybersecurity world. Our most recent tests have shown TotalAV to have one of the best malware detection rates of all anti-malware software.



Bitdefender

Bitdefender did not disappoint when I tested it against a range of old and new malware sample files. It's artificial intelligence and machine learning-based anti-malware engine **detected 100% of the malware files in real-time**. It managed to detect, block, and remove all malware incredibly quick almost instantly placing files in quarantine and deleting them from my PC.



- **Anti-spy ware**

Is a type of program designed to prevent and detect unwanted spyware program installations and to remove those programs if installed. Detection may be either rules-based or based on downloaded definition files that identify currently active spyware programs.

Some Anti-Spyware vendors include:

a) Symantec
b) McAfee
c) Microsoft
d) Webroot

- **Adware protector**

Is a software utility that scans and removes unwanted advertisements when user is online.

Although it doesn't cause immediate damage to a computer, adware can seriously affect your experience when using a computer. Having an antivirus installed on your computer is not only the best adware removal solution, but it's also the best way to prevent it in the first place.

How to recognize an adware infection.

Adware is fairly easy to diagnose compared to other types of malware. Here are some clues that might pop-up:

- Ads within applications.
- Pop-up ads on your desktop.
- New browser windows that open up every so often.
- General performance slowdowns.
- New browser homepages and bookmarks.
- New toolbars.
- Your default search engine was changed.

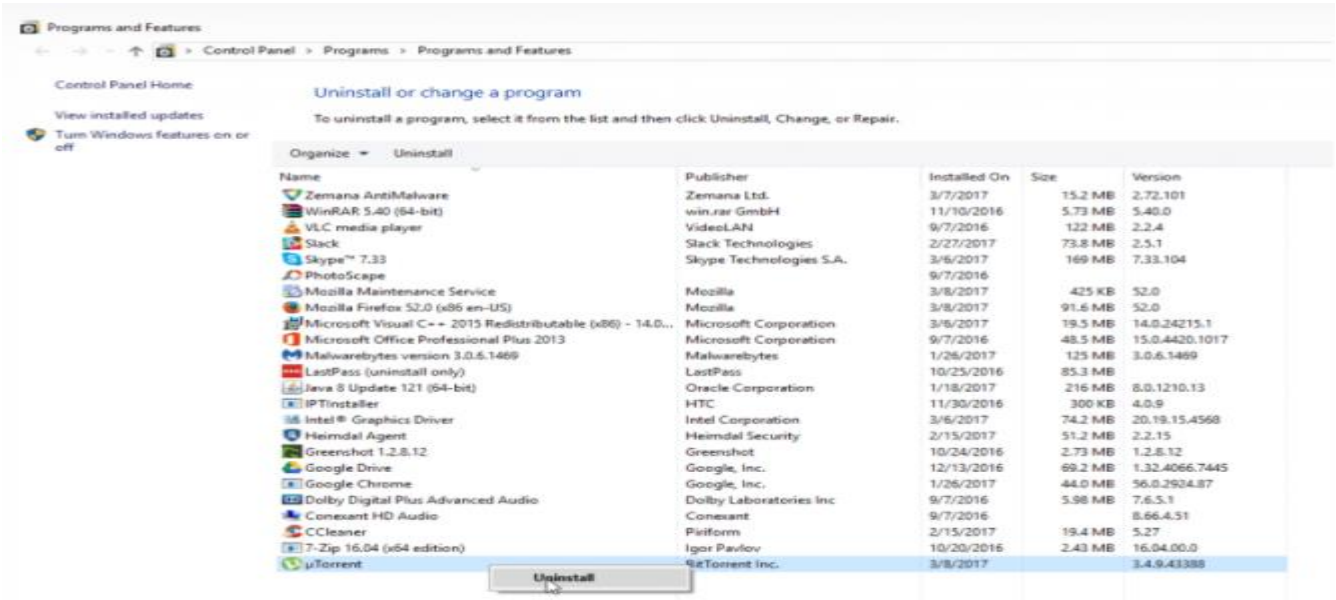
Remove adware from unethical companies

Adware from companies usually come as add-ons to free software you might download. For instance, if you download a music player, you might get an extra option in the installation page that asks if you also want to install a browser toolbar or some other type of software.

In most cases, the adware is that extra program you installed on top of the software you needed in the first place.

Quite often, all you have to do is to simply uninstall the extra software.

To do this, simply go to **Control Panel -> Uninstall a program -> Select program you wish to uninstall.**

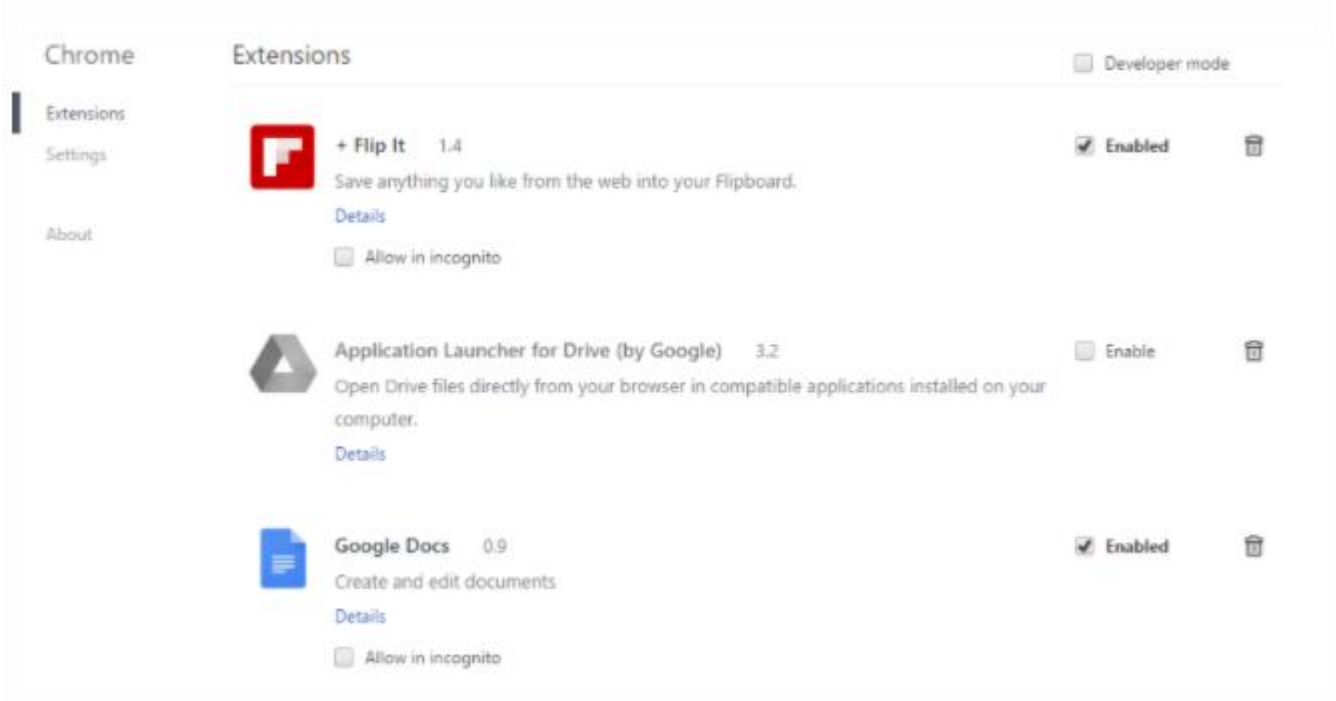


If that doesn't do the trick, then chances are the original program (the music player in our case) was the adware, and you'll need to uninstall that one.

How to remove adware browser extensions.

Some adware install themselves within your browser, in which case you won't find them in Control Panel.

To remove adware in Chrome browsers, go to Settings -> Extensions. Remove any browser extensions you suspect might feed you adware or track your personal information.



For Firefox, in the top right corner, press the three-line Open menu -> Add-ons -> Extensions. Remove any suspicious extension you might have installed.

For Internet Explorer, go to Tools -> Manage Add-ons -> All add-ons. Uninstall the adware serving extension.

How to remove adware from malicious hackers.

Malware-related adware is more difficult to remove and will also slow down your system much more than the regular type of adware from unethical companies.

This will require you download some specialized tools and follow certain steps.

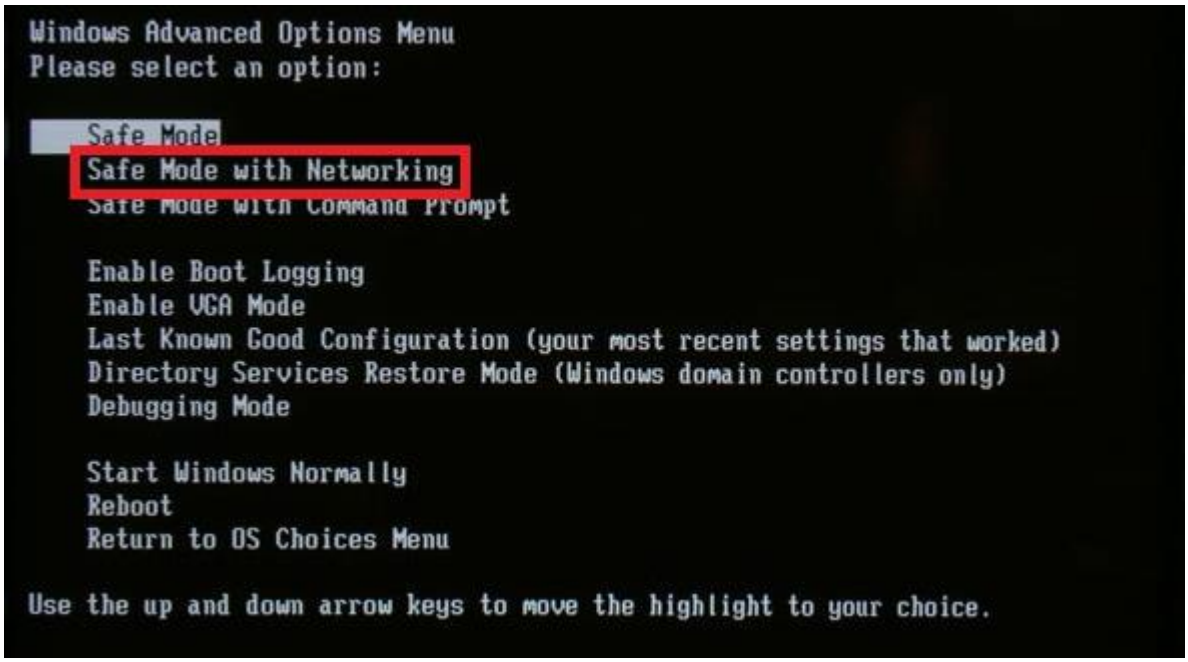
Free adware removal and cleaner tools

Here's what you'll need the following adware remover:

- Rkill
- AdwCleaner
- Zemana AntiMalware
- HitmanPro
- JRT, Junkware Removal Tool

Start your PC in safe mode

Starting your PC in Safe Mode with Networking will limit how much access the adware has to your system components, simplifying the adware removal process.Notes/Explanation



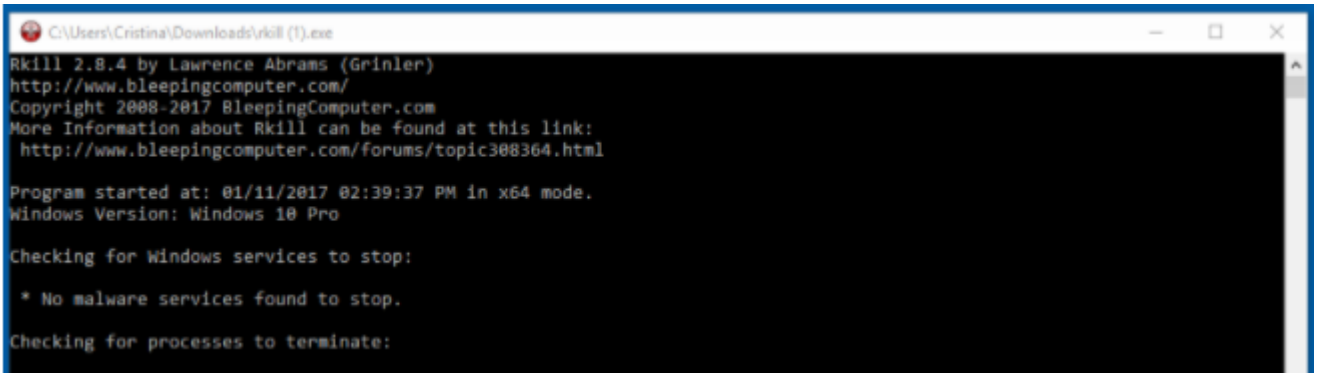
To start up your computer in Safe Mode with Networking, restart your computer and press F8 at the splash screen with the Windows logo.

Rkill will freeze any adware processes present

Some adware doesn't want to play nice and will try to prevent their removal. However, Rkill will freeze these processes, allowing you to remove the malware with the other remainingtools.

You don't need to configure Rkill in any way, just start up the program and you're set.

Note: Rebooting your computer will also restart the malicious processes, in which case you'll need to run Rkill again.



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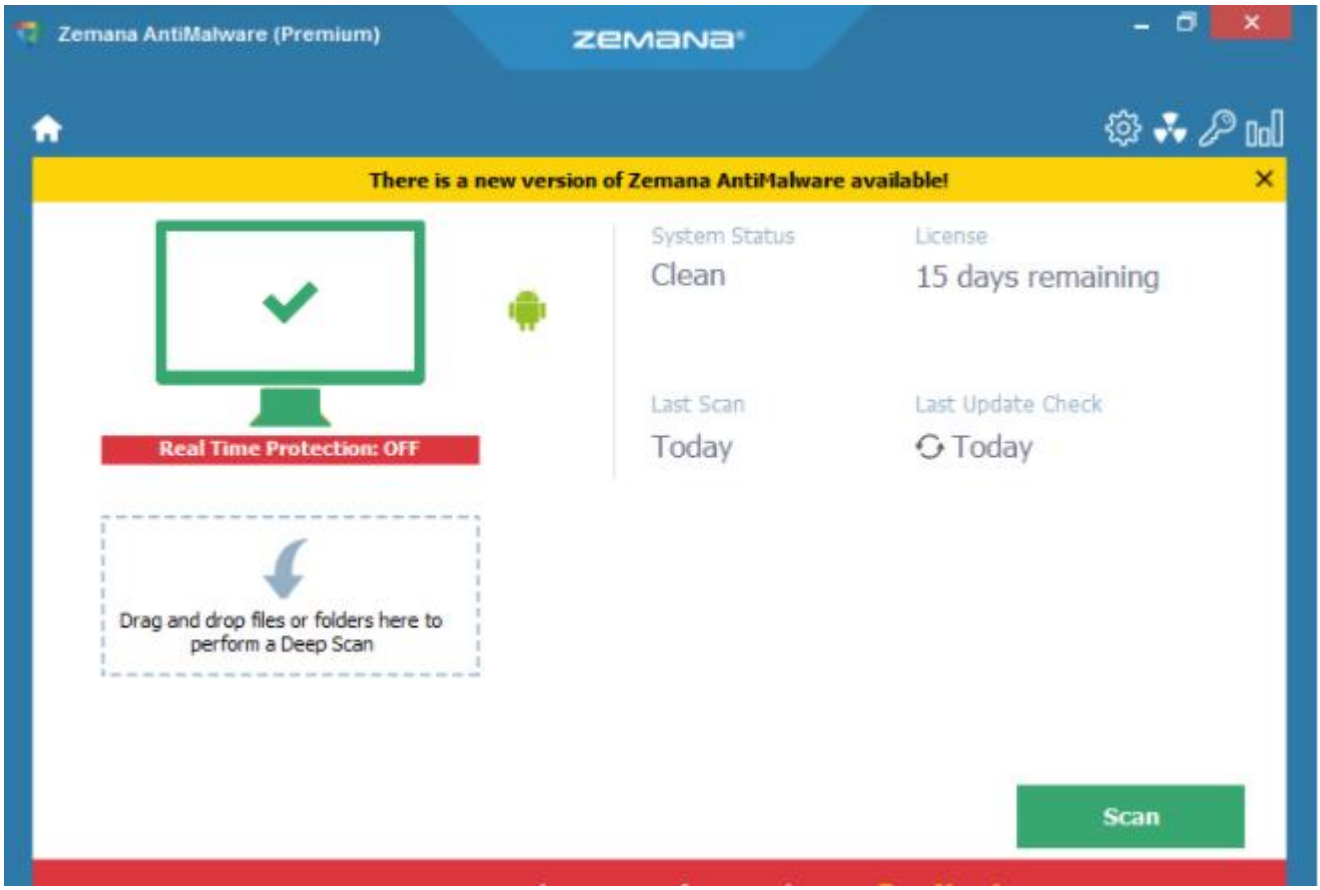

AdwCleaner

AdwCleaner is one of the best free adware remover was created to find and remove adware, so use it to scan and cleanup your system for any adware Zemana might have missed out.

How to prevent an adware infection

Adware are programs like any other types of software, so they only infect you after you've installed them.

Here are some practical tips on how to avoid an adware infection:

Avoid suspicious and spammy websites.

Source

- Don’t believe any ads and pop-ups that claim to have found a malware infection on your PC. These are fake and are known as scareware.

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17
SHARES

- Everybody hates ads, but we’ve kind of gotten used to them and have developed something called advertising blindness, which kind of stops us from noticing them. Chances are you can’t remember more than one advertising poster present on your way to work.
- Advertisers know this, so they try to make their ads stand out as much as possible, just so they can get some attention time from you.

However, some advertisers try to solve this problem not by making more entertaining or relevant ads, but by being obnoxious.

So when you're doing your own thing and peacefully browsing the web, you'll come across something like this:

Many times, you'll have to thank **adware** for that.

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Adware is fairly easy to diagnose compared to other types of malware. Here are some clues that might pop-up:

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- Pop-up ads on your desktop.
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- General performance slowdowns.
- New browser homepages and bookmarks.

- New toolbars.
- Your default search engine was changed.

Adware removal guide

According to Cisco, nearly 75% of organizations have suffered an adware infection. This high percentage of adware infections makes sense once you see how it spreads.

Depending on the type of adware you're infected with, there are two possible paths to remove them:

Remove adware from unethical companies

Adware from companies usually come as add-ons to free software you might download. For instance, if you download a music player, you might get an extra option in the installation page that asks if you also want to install a browser toolbar or some other type of software.

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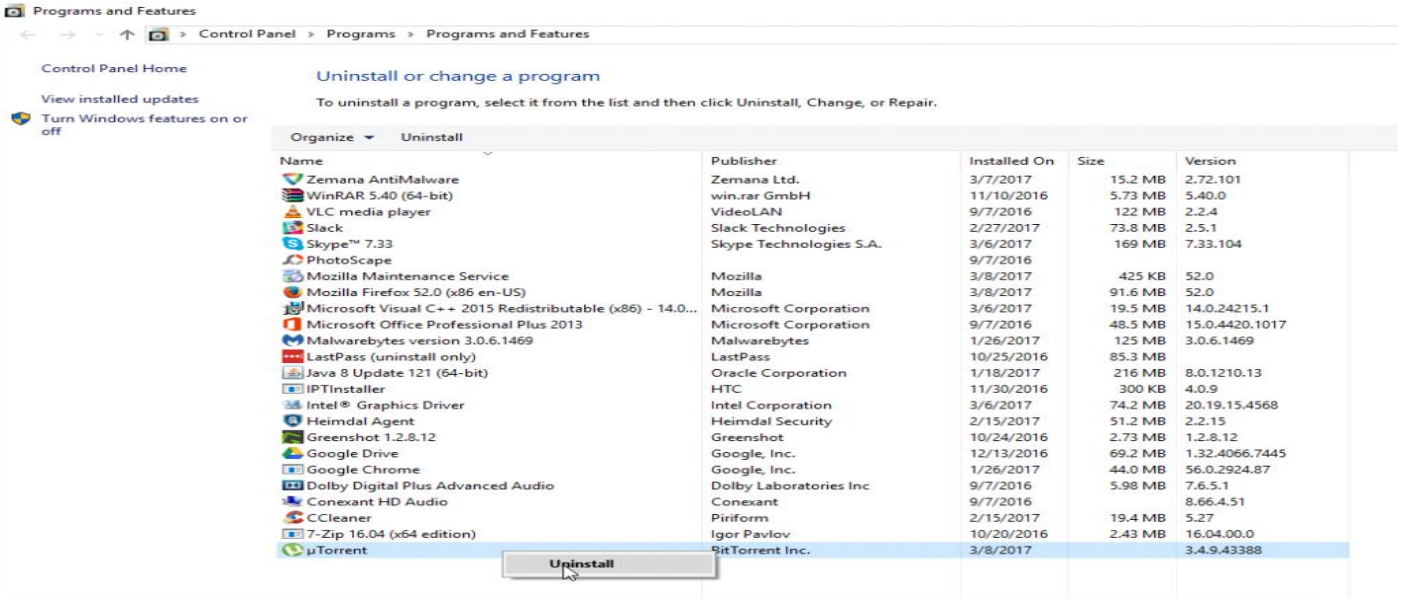

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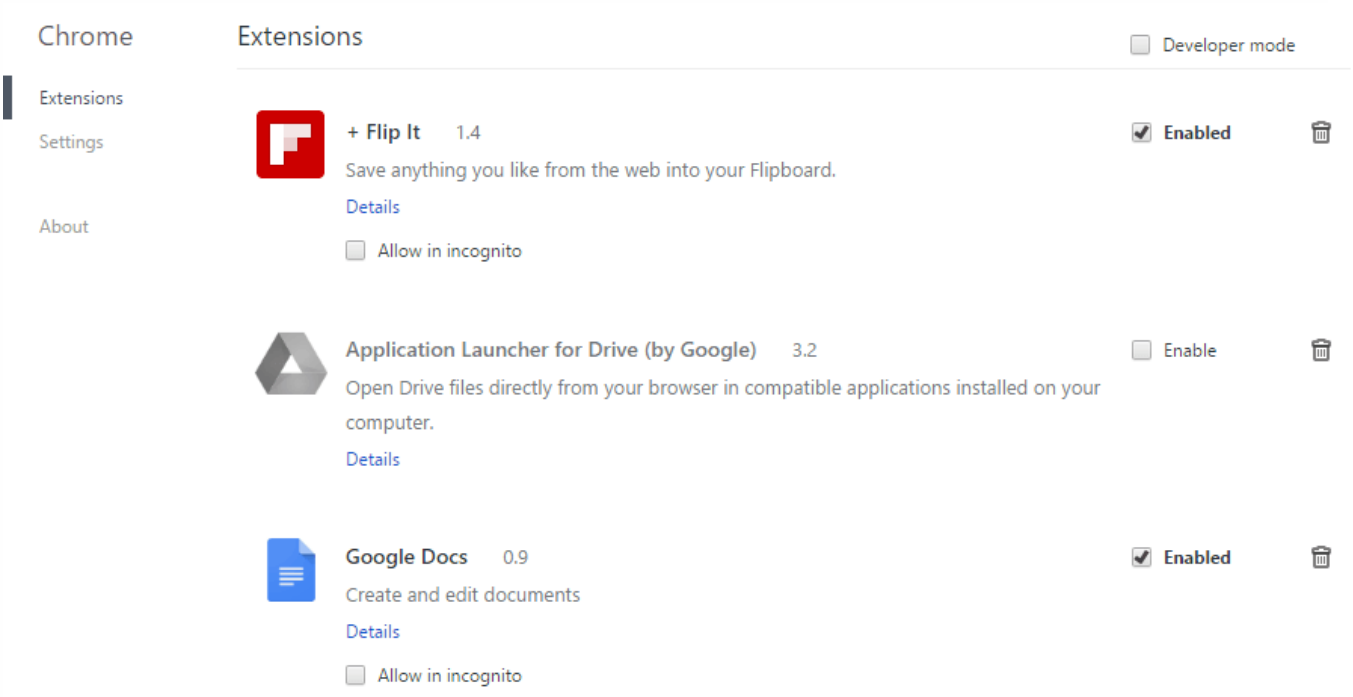

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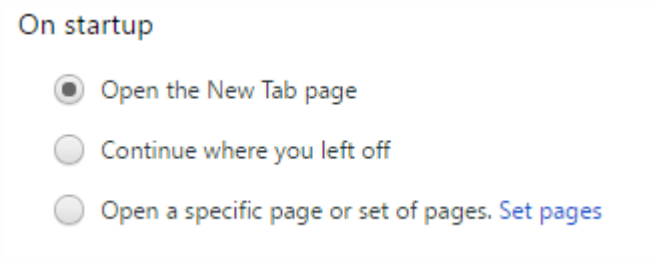
For Internet Explorer, go to **Tools -> Manage Add-ons -> All add-ons.** Uninstall the adware serving extension.

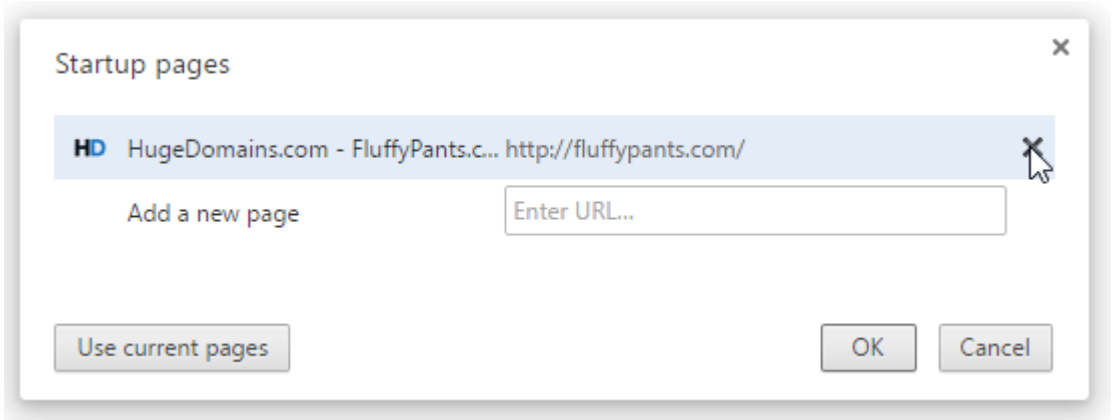
Reset any settings modified by an adware

Adware might modify your browser settings in order to change your homepage or redirect you to certain websites.

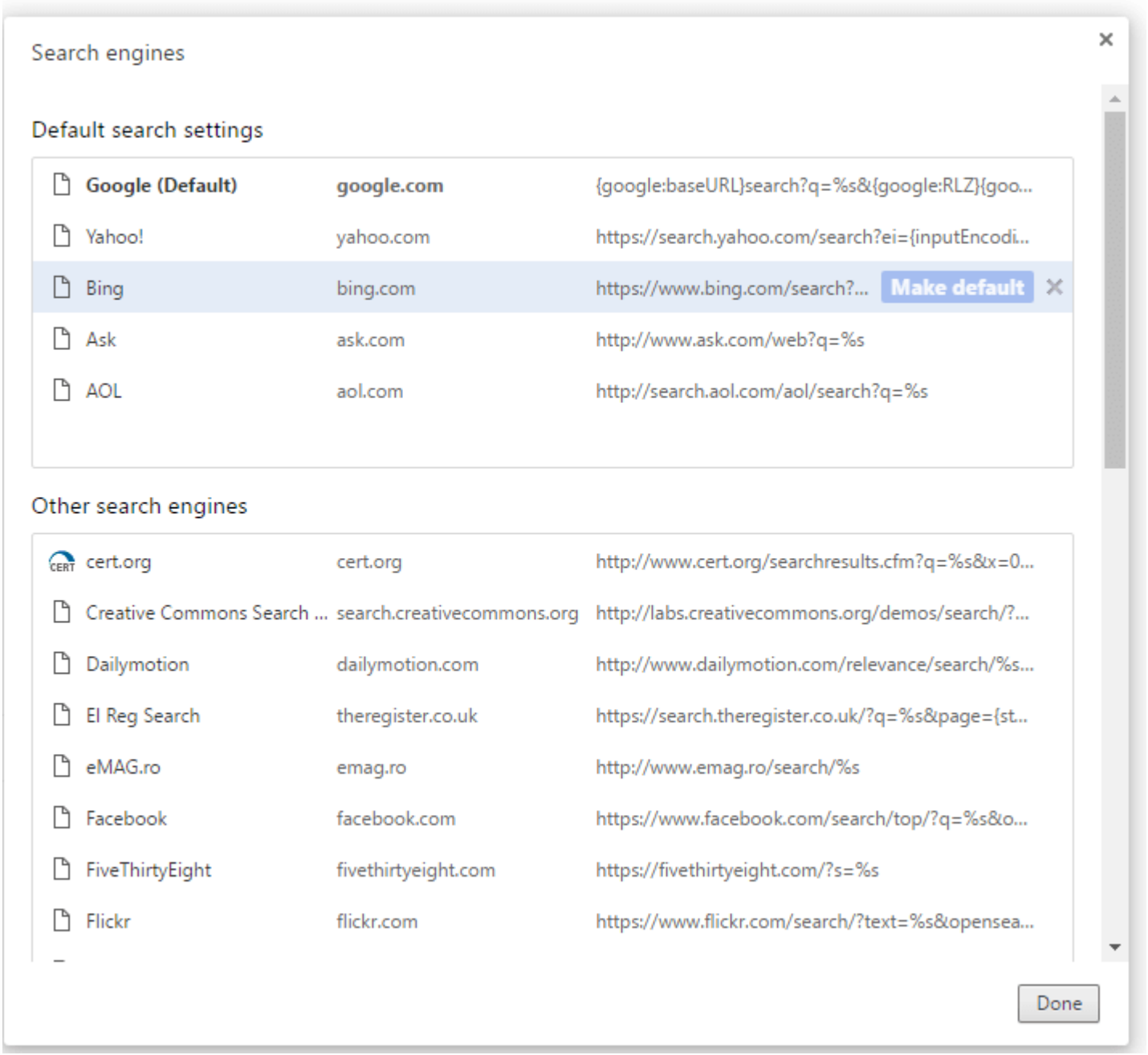
Google Chrome Settings

For Google Chrome, go to Settings -> Set pages in the "On startup" section. Whenever you start-up your browser, it automatically opens up the pages present in that section. To remove them, simply click the "X" button next to a page.



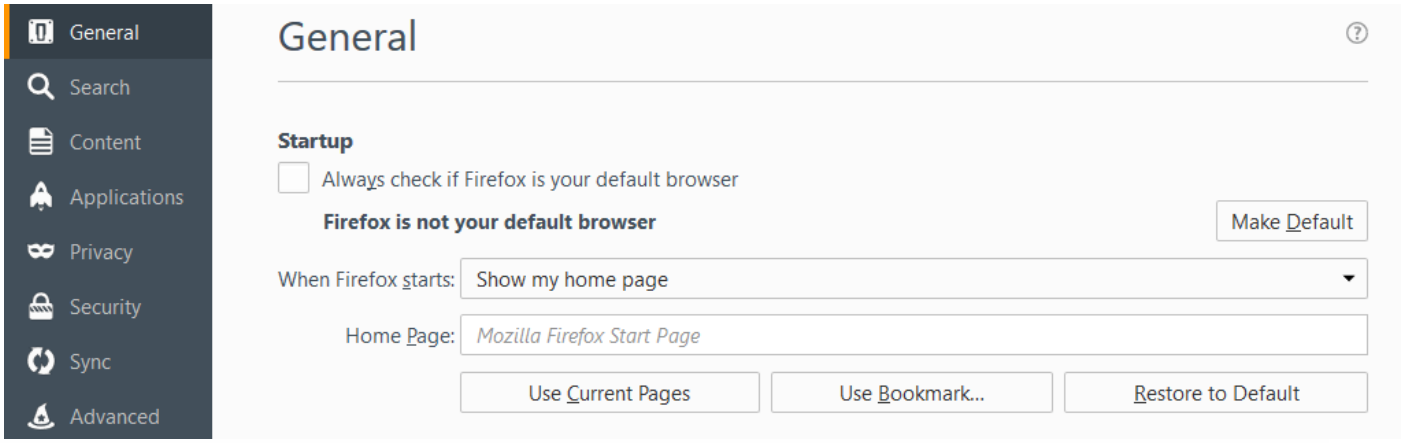


To modify your search settings, go to **Settings -> Manage Search Engines.** Here you can add and remove search engines and set up default ones. Make the default search engine is the one of your choosing, and not forced upon you by adware.

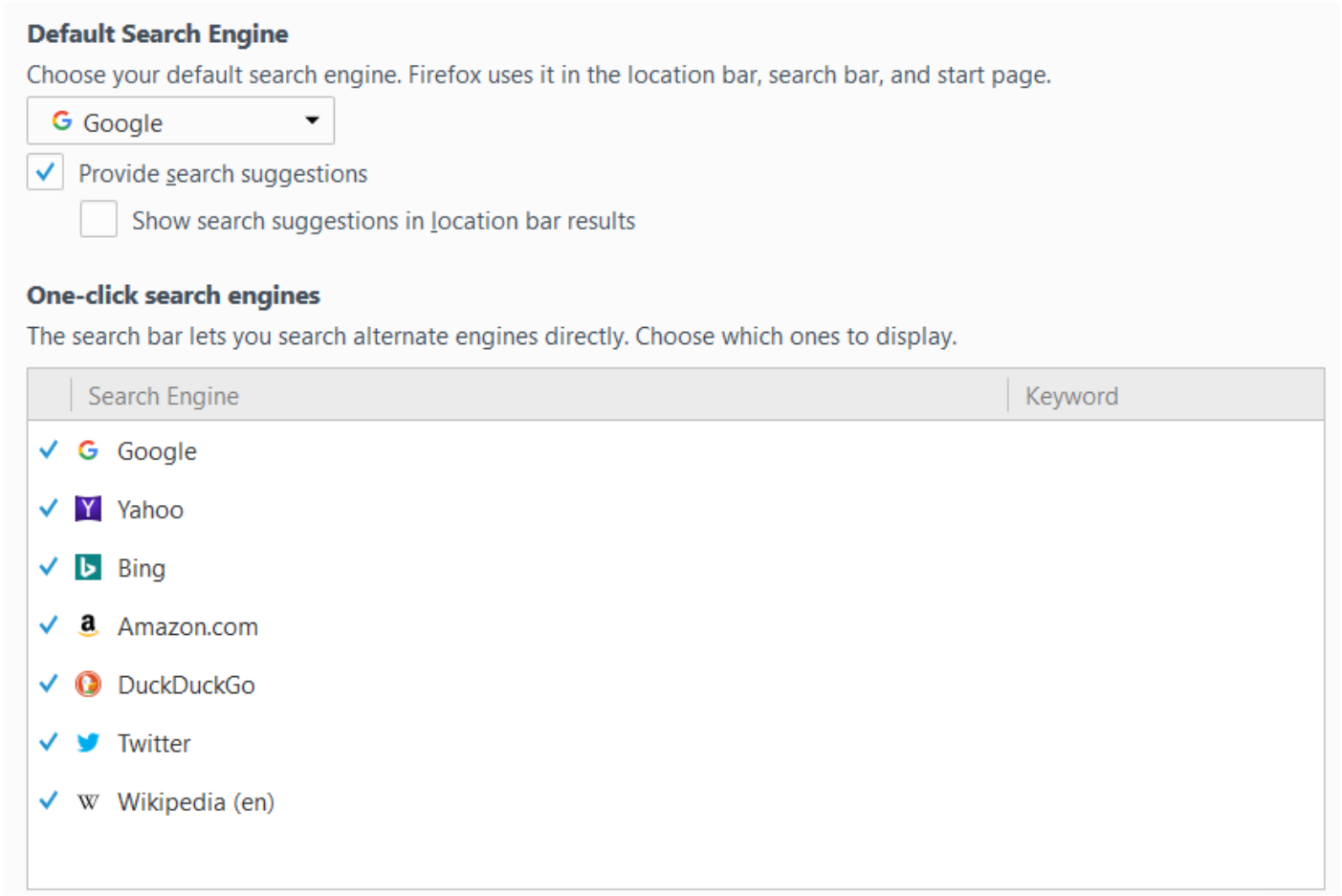


Mozzilla Firefox Settings

Press the **Open menu**, you'll be taken to the default **General** section. In the startup section, modify your homepage to the one you want, or simply press "Restore to Default" if you don't need a particular homepage.

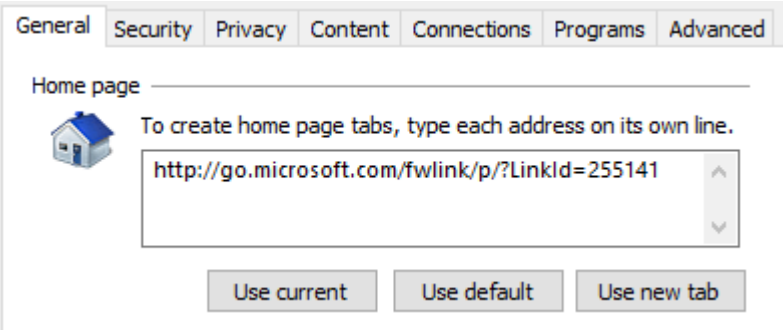


Next, press the **Search** tab on the left side of the menu (just below the **General** tab). In this section, you can set up your default search engine and add or remove the ones you don't need.



Internet Explorer Settings

Press the Tools option in the top right corner, then **Internet Options.** Modify the URL you see in the homepage section to prevent it from sending you there every time you open up the browser.



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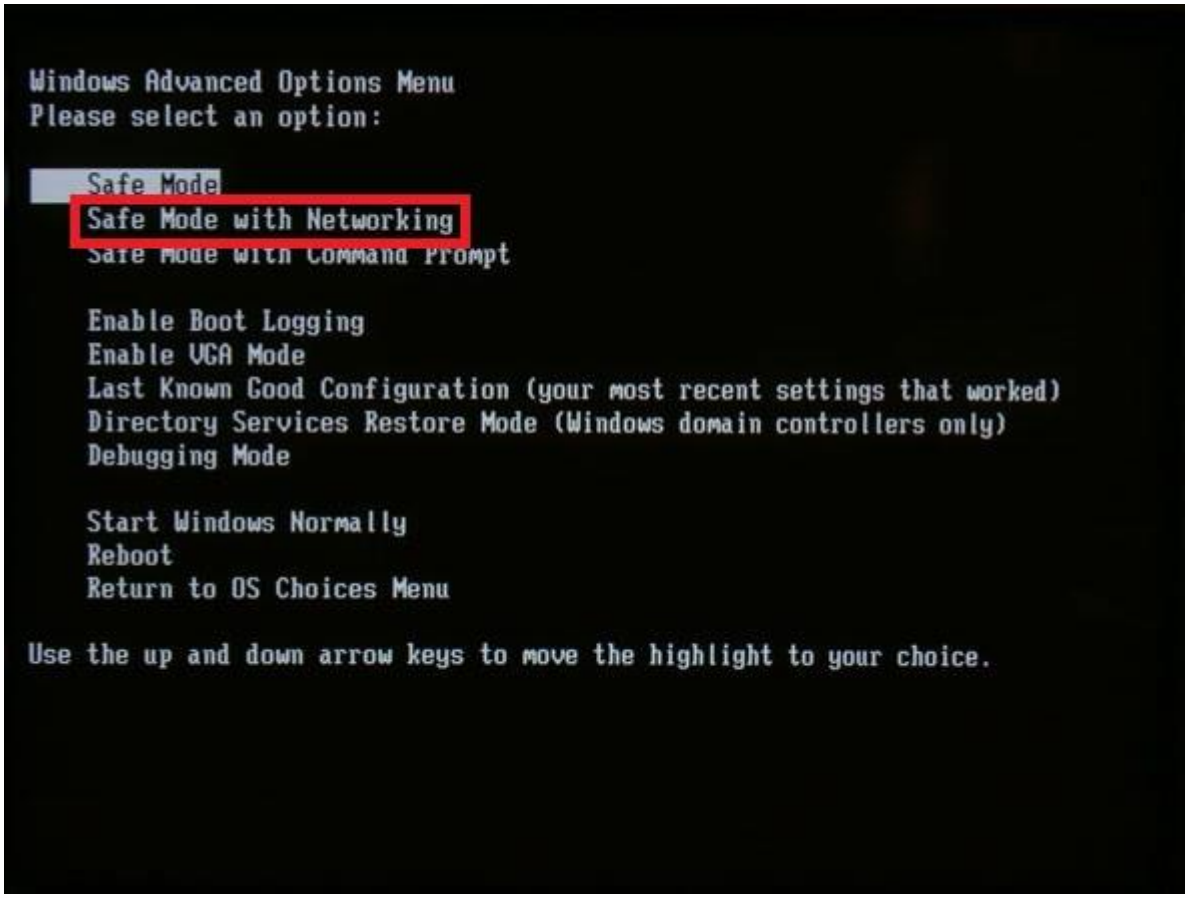

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If this doesn't work for you, then check out these links on how to access Safe mode for Windows 10/8 or Windows 7 and older.

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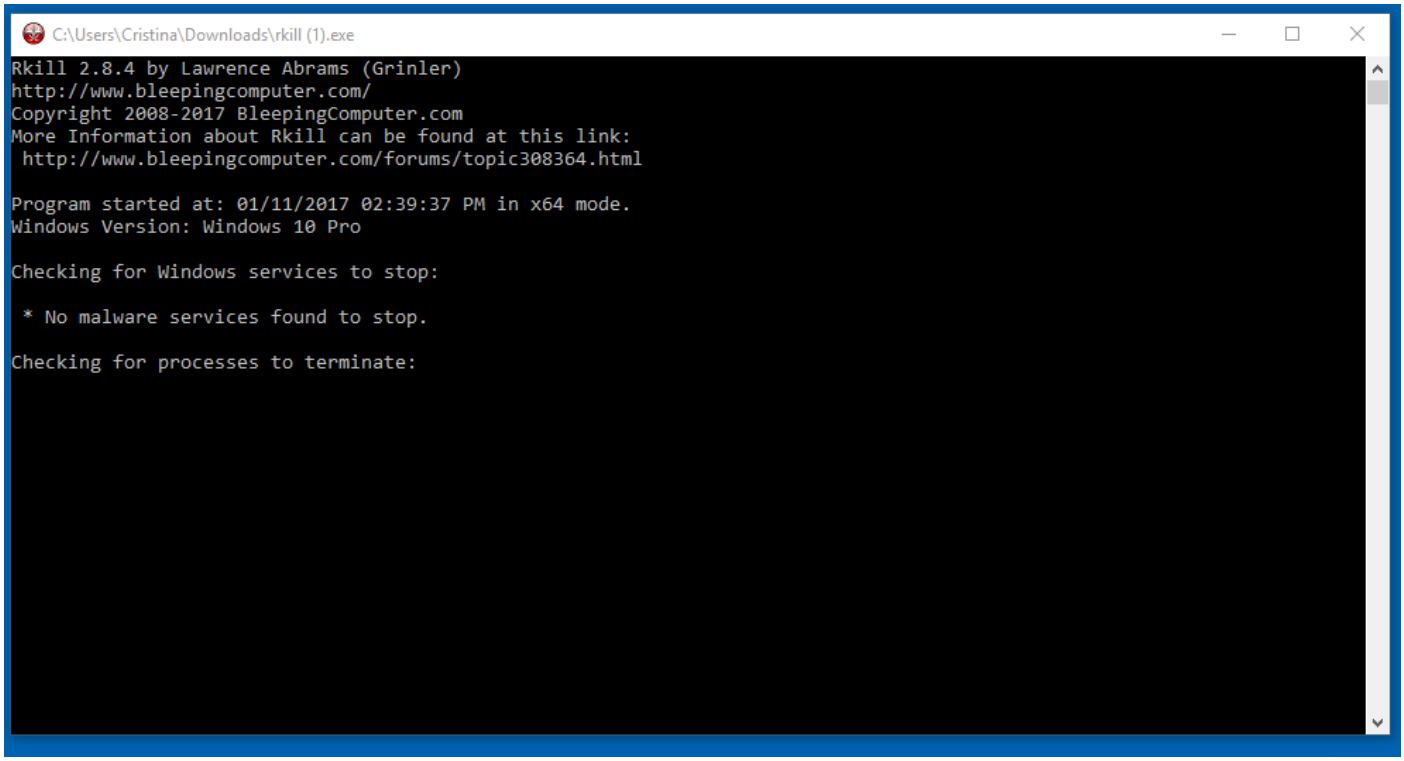

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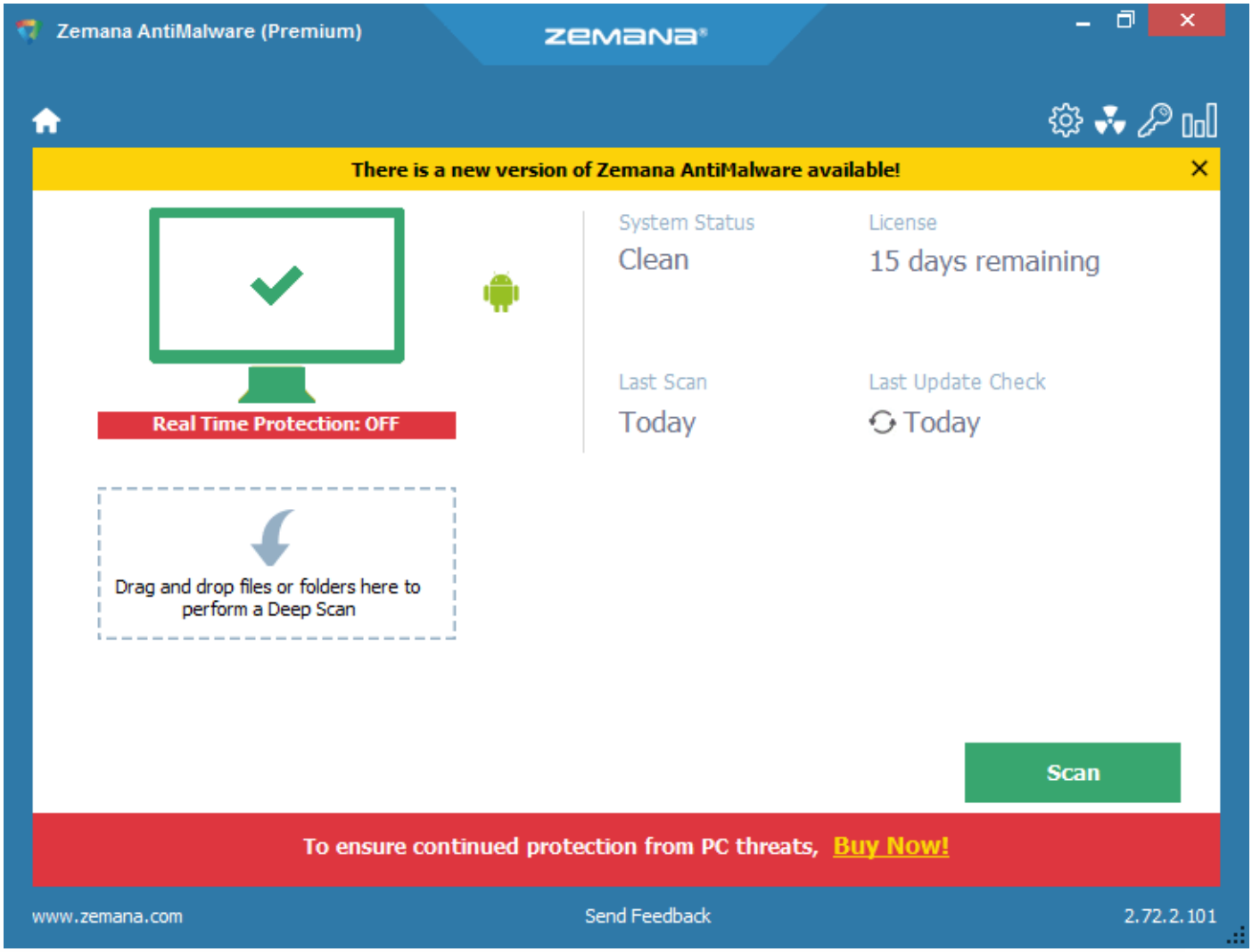
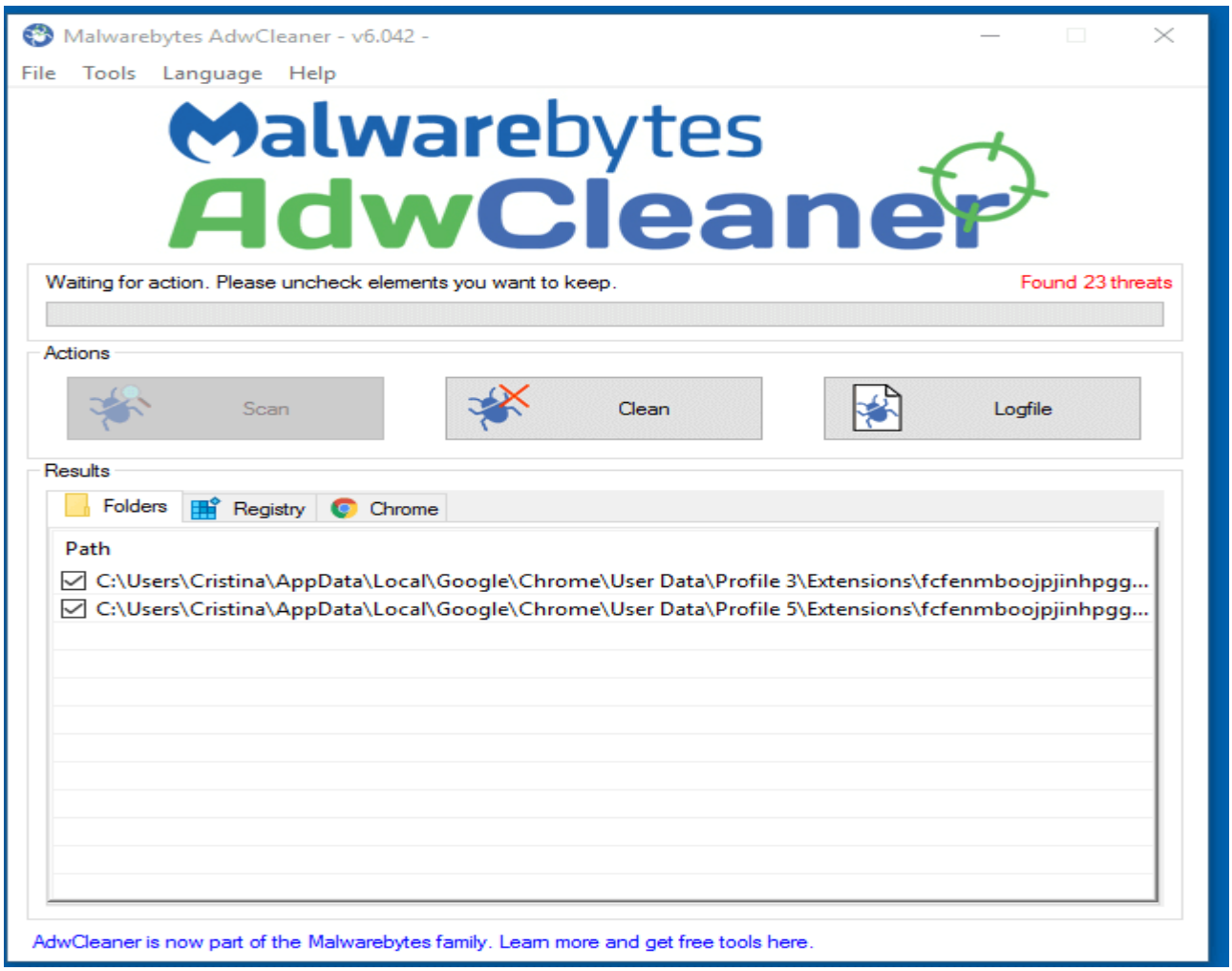


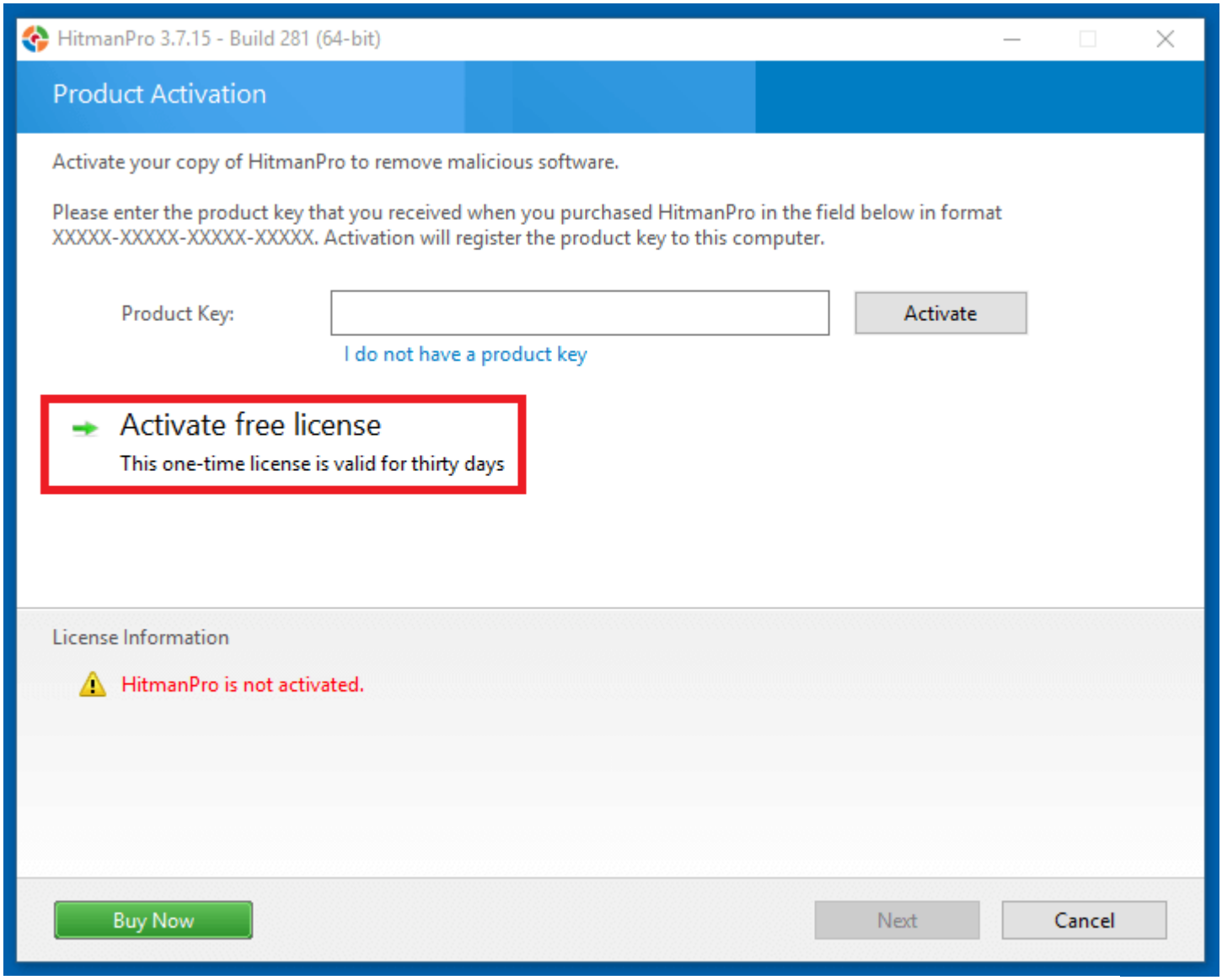
AdwCleaner is one of the best free adware remover

AdwCleaner was created to find and remove adware, so use it to scan and cleanup your system for any adware Zemana might have missed out.



Use HitmanPro as a second opinion scanner

HitmanPro excels at finding malware other security solutions somehow miss. It has an easy to user interface.



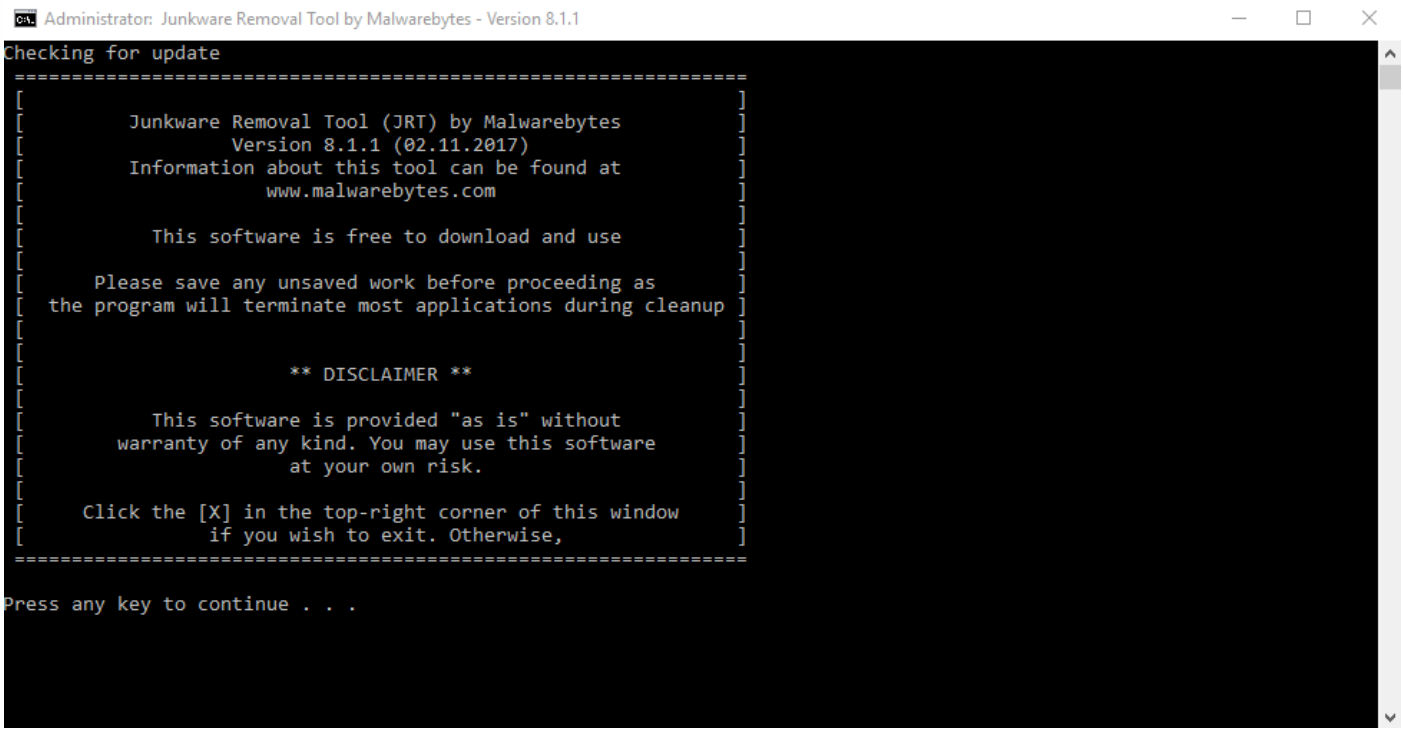
Junkware Removal Tool will clean up any malicious files left over

Adware might leave behind junk files on your PC. These slow down your system and take over your storage memory without having any useful function.

Junkware Removal Tool (JRT for short), will clean these up, as well as any other adware or malware installed on your PC.

JRT works in a similar way to Rkill, just open up the program, press a key and let it run.

If you followed all these steps, then chances are your PC is completely clean of adware. Some of your settings might have been modified however, so be sure to reset the browser settings like we've written above.

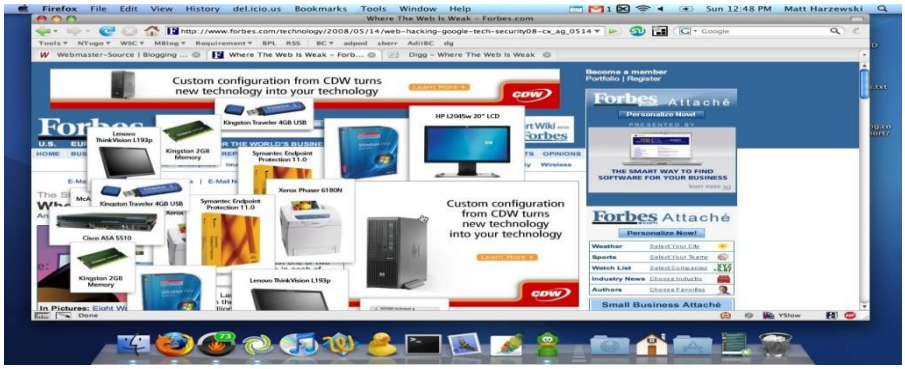


- **How to prevent an adware infection**

Adware are programs like any other types of software, so they only infect you after you've installed them.

Here are some practical tips on how to avoid an adware infection:

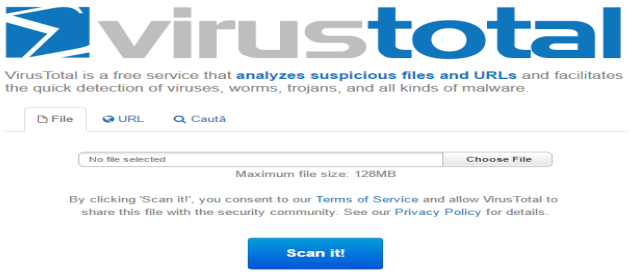
- Avoid suspicious and spammy websites.



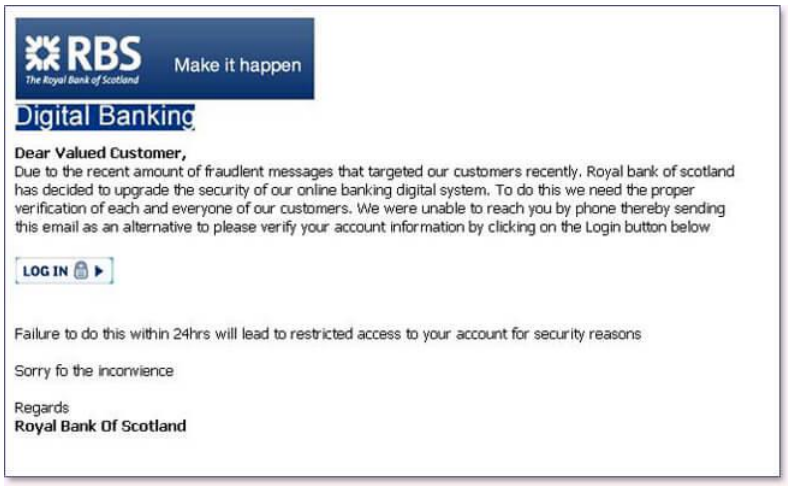
- **Source**

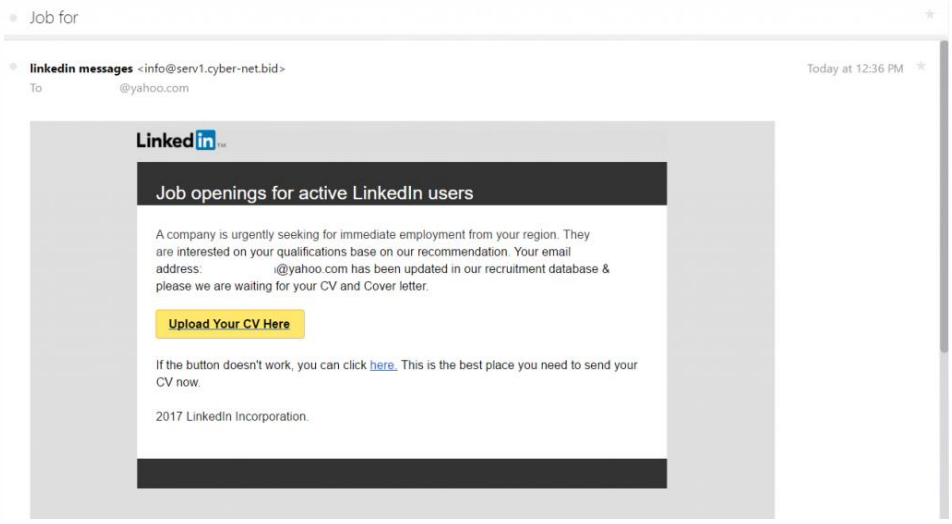
Don't believe any ads and pop-ups that claim to have found a malware infection on your PC. These are fake and are known as scareware.

- **Scan suspicious links or files in Virus Total.**



- **Don’t click any links or download attachments from phishing emails.**





As a rule of thumb, don't click on any online ads you might see. Even if the ad was originally legit, a malicious hacker might have infected it with malware.

Outdated software is another major reason for malware infections in general, since they come with numerous vulnerabilities that can malicious hackers can exploit. Keeping your software up-to-date is a critical step cybersecurity step, so a tool that automatically updates your programs without annoying you with pop-ups will go a long way into keeping you more secure. This advice carries even more weight, since an adware infection coupled with outdated software will greatly increase your risks of getting infected with more dangerous types of malware.

- **Content/Topic 2: Identification of equipment**

PPE, Personal Protective Equipment, are the tools that ensure the basic health protection and safety of users. PPE is any device or appliance designed to be worn by an individual when exposed to one or more health and safety hazards. PPE includes all clothing and other work accessories designed to create a barrier against workplace hazards, and using PPE requires hazard awareness and training on the part of the user.

Examples of PPE include respirators, gloves, aprons, fall protection, and full body suits, as well as head, eye and foot protection. Using PPE is only one element in a complete hazard control program that would use a variety of strategies to maintain a safe and healthy environment. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection.

When should PPE used?

PPE is used to reduce or minimize the exposure or contact to injurious physical, chemical, ergonomic, or biological agents. Remember, a hazard is not "gone" when PPE is used, but the risk of injury may be reduced. For example, wearing hearing protection reduces the likelihood of hearing damage when the ear plugs or muffs are appropriate for the kind of noise exposure and when the PPE is used properly. However, using hearing protection does not eliminate the noise.

PPE should only be used:

- as an interim (short term) measure before controls are implemented;
- where other controls are not available or adequate;
- during activities such as maintenance, clean up, and repair where pre-contact controls are not feasible or effective;
- during emergency situations.

Personal safety equipment

Head Protection

Protective hats for head protection against impact blows must be able to withstand penetration and absorb the shock of a blow. In some cases, hats should also protect against electric shock. Recognized standards for hats have been established by the American National Standards Institute (ANSI).

Foot and Leg Protection

For protection of feet and legs from falling or rolling objects, sharp objects, molten metal, hot surfaces, and wet slippery surfaces, workers should use appropriate footguards, safety shoes, or boots and leggings. Leggings protect the lower leg and feet from molten metal or welding sparks. Safety snaps permit their rapid removal.

Eye and Face Protection

Suitable eye protectors must be provided where there is a potential for injury to the eyes or face from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially injurious light radiation, or a combination of these.

Ear Protection

Exposure to high noise levels can cause hearing loss or impairment. It can create physical and psychological stress. There is no cure for noise-induced hearing loss, so the prevention of excessive noise exposure is the only way to avoid hearing damage. Specifically designed protection is required, depending on the type of noise encountered and the auditory condition of employee.

Arm and Hand Protection

Burns, cuts, electrical shock, amputation and absorption of chemicals are examples of hazards associated with arm and hand injuries. A wide assortment of gloves, hand pads, sleeves, and wristlets for protection from these hazards is available.

The devices should be selected to fit the specific task. Rubber is considered one of the best materials for insulating gloves and sleeves and must conform to ANSI standards (copies available from ANSI, 1430 Broadway, New York, NY 10018). Other glove and clothing materials such as latex, nitrile, butyl rubber, neoprene, etc.

Respiratory Protection

Information on the requirements for respirators to control the development of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, and vapors is available in the Respiratory Protection part.

LO1.2:Test tools, material and equipment.

- **Content/Topic 1:Testing of Software Maintenance tools**

. Testing of Software Maintenance tools

The following tools have to be tested before use.

1.Registry cleaner tool: is a class of third party software utility designed for the Microsoft Windows operating system, whose purpose is to remove redundant items from the Windows registry. You need to test this Registry cleaner tool before it's use.

Ex: Ccleanerwhich is one of the most popular free registry cleaners among users globally.

2. **File system cleaner**: is a Microsoft software utility first introduced with Windows 98 and included in all subsequent releases of Windows. It allows users to remove files that are no longer needed or that can be safely deleted.

3**. Cleaning tools**: Although computer cleaning products are available, you can also use household items to clean your computers and peripherals. Below is a listing of items you may need or want to use while cleaning your computer.

- Cloth - A cotton cloth is the best tool used when rubbing down computer components. Paper towels can be used with most hardware, but we always recommend using a cloth whenever possible. However, only use a cloth when cleaning components such as the case, a drive, mouse, and keyboard. You should not use a cloth to clean any circuitry such as the RAM or motherboard.
- Water or rubbing alcohol - When moistening a cloth, it is best to use water or rubbing alcohol. Other solvents may be bad for the plastics used with your computer.
- Portable Vacuum - Sucking the dust, dirt, hair, cigarette particles, and other particles out of a computer can be one of the best methods of cleaning a computer. However, do not use a vacuum that plugs into the wall since it creates lots of static electricity that can damage your computer.
- Cotton swabs - Cotton swaps moistened with rubbing alcohol or water are excellent tools for wiping hard to reach areas in your keyboard, mouse, and other locations.
- Foam swabs - Whenever possible, it is better to use lint-free swabs such as foam swabs.

4. **Removal tools software:** is a tool that removes some malware from Windows systems, particularly those systems without antivirus programs installed.

- **Testing of tools and equipment**

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. You need to test all these equipments' functionalities before their use.

LO 1.3: Arrange the workplace

- **Content/Topic 1: Arrangement of tools**

PC repair tools are software that aid in tuning your operating system by targeting specific issues it may encounter and neutralize these issues to restore or improve the PC's overall user experience.

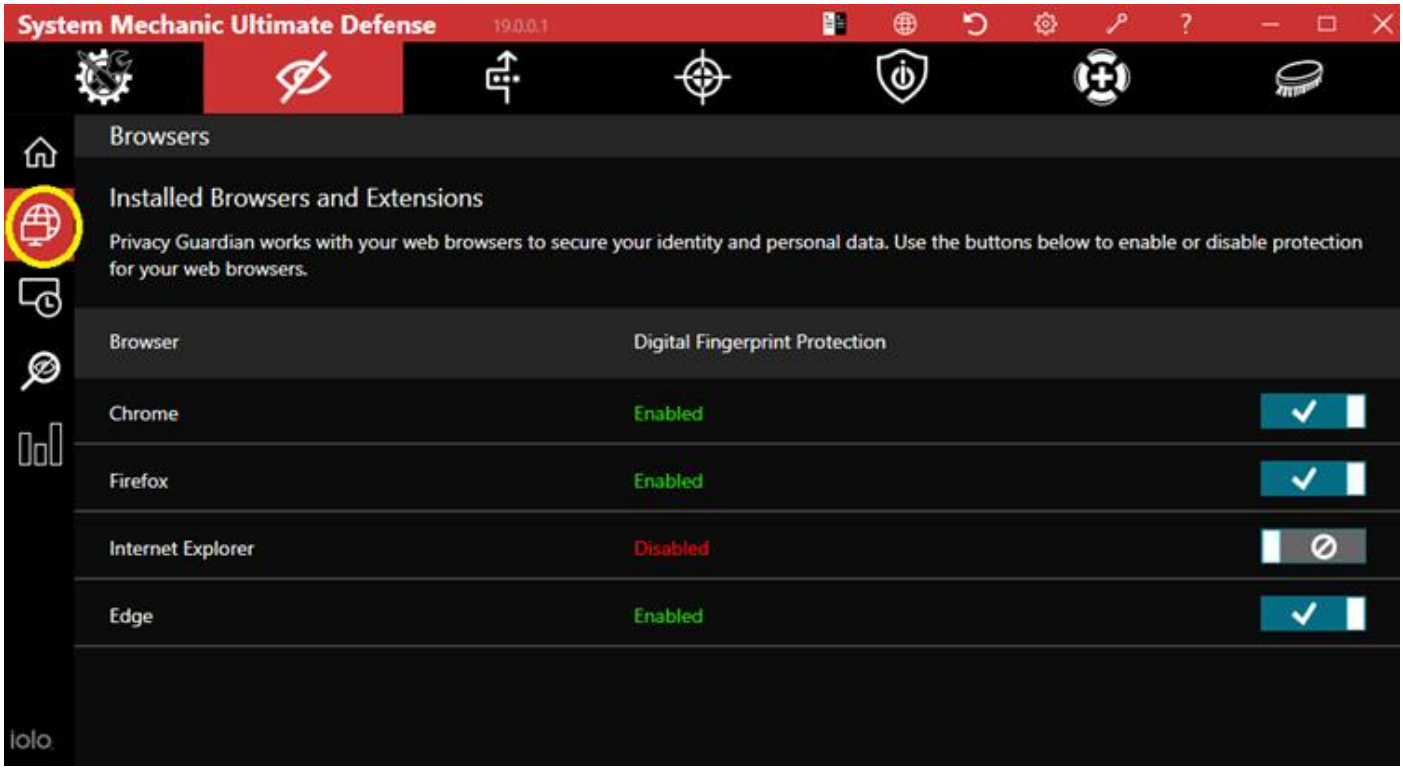
Although the built-in Windows 10 repair tool is great to resolve common PC issues, it still isn't potent enough to deal with a plethora of other issues that make your system sluggish. Independent PC repair tools are designed with many additional and practical features that unearth even the most complex issues and fix them with the utmost ease.

Here is a List of Top PC Repair Tools

- System Mechanic Ultimate Defense
- Windows Repair by Tweaking
- FixWin for Windows 10
- Snappy Driver Installer
- CCleaner Technician Edition
- CPU-Z
- Microsoft Fix it Tool
- IOBit Driver Booster
- AVG TuneUp
- Ashampoo Win Optimizer

System Mechanic Ultimate Defense is a comprehensive suite of security, privacy, and performance features, all in one interface. It will optimize PC performance and protect online privacy. It provides functionality to securely manage passwords.

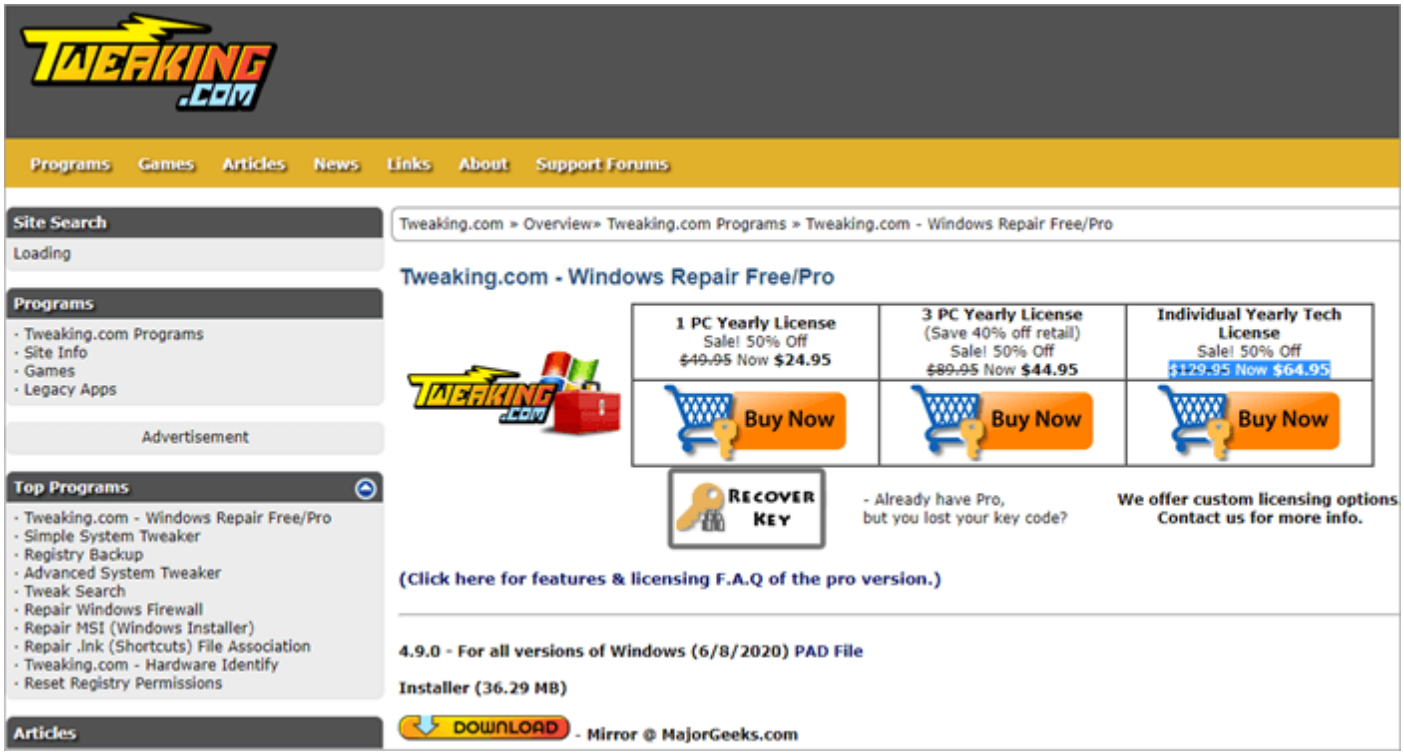
It can remove or block malware. It can recover the deleted files. It will prevent Windows Slowdown. System Mechanic Ultimate Defense can automatically boost speed, repair problems, clean out clutter, increase system stability, discover bloatware, and unleash internet speed.



This repair tool by Tweaking

This repair tool by Tweaking prides itself on being pretty extensive in its ability to fix issues and boost PC performance. The developers of this software have an accurate understanding of why your PC might pose problems and provides users with an exhaustive list of features to combat them effectively.

The problems that it helps resolve include fixing registry errors, untangling of file permissions, resolving issues with Windows updates, firewall, and Internet Explorer. The tool helps you identify the source of issues and rectify them by returning your Windows configuration to its original settings.



FixWin

FixWin can be used to fix an array of operating system issues in a heartbeat. The success of this program can be attributed to six different sections, each representing a particular issue your PC might face during its operations.

That's not all, for each of these 6 issues there are 10 separate solutions provided by the tool. Those problems can pertain to browsing issues or the sudden malfunctioning of important Windows functions. Some requiring as little as a simple reboot.

From fixing common problems like a corrupt recycle bin to resolve more advanced features like regaining access to the registry editor, FixWin is that one solution to almost all your Windows 10 problems.

Snappy Driver Installer

Usually, you can rest assured knowing that your Windows operating system will keep your drivers up-to-date along with other major components of your system. However, it happens more times than we can recall that the routine update misses out on this fundamental chore and leaves your drivers vulnerable to a score of problematic issues.

Snappy Driver Installer is that free and open-source software that makes sure your drivers are up-to-date and ready for function when it need be. What SDI does is fairly easy to understand. It will scan your entire system to suggest new driver installations that can improve the performance of your PC. It will offer a wide variety of new drivers for you to install.

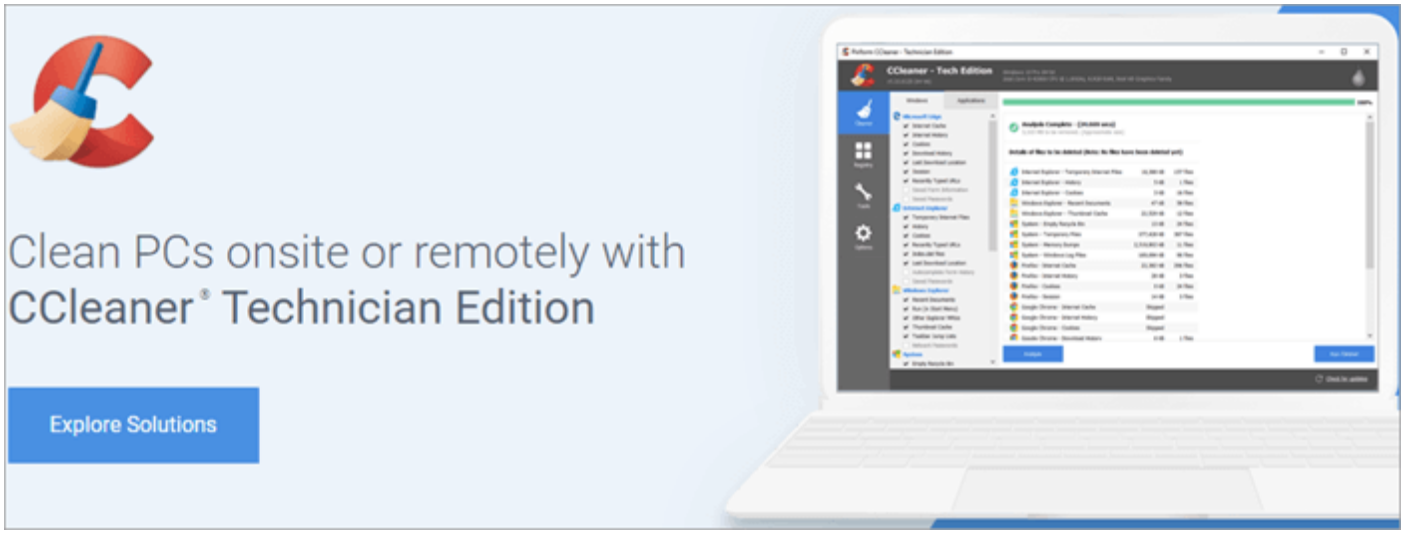
All you have to do is select the drivers you need to be installed from the list. When you do so, please make sure to select the 'create a new restore point' tab before you click 'install'. The time for driver's update will depend on how many drivers are there in your system that need updating.

CCleaner Technician Edition

One of the many reasons that could result in the depreciating nature of your system's performance is the abundance of unnecessary files invading much-needed space in it. CCleaner is a tool that takes care of this aspect of PC tuning. It scans your entire system for obsolete files, data, and settings and flushes them out of your system in record time.

This ultimately results in the PC relieving some hard-drive space and boosting the PC's overall speed.

It is a fantastic tool for technicians to have, helping them to be more productive and solve any issues their clients might have. Whatever function you need to perform to enhance a PC's overall performance, whether it is defragmenting or uninstalling unnecessary software to clear space, CCleaner can accomplish it without hassle.

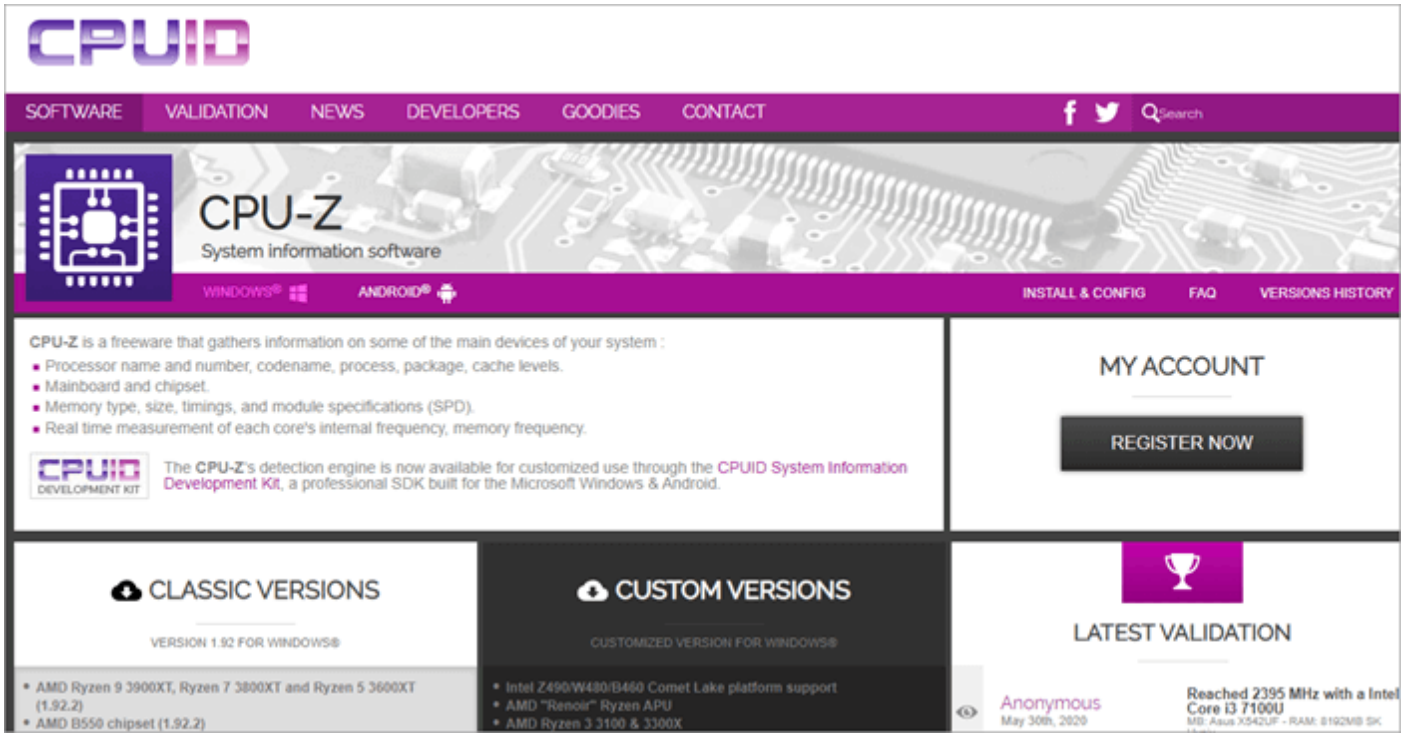


CPU-Z

CPU-Z is a freeware application that helps in monitoring and profiling all the major components in a system for both Android and Microsoft Windows. It can virtually detect components such as RAM, motherboard, CPU, etc. without having to open the hardware.

The application gives you a detailed description of the components installed on your system, the overall performance of the system, and alerts you of any problems whatsoever. In laymen's terms, the application provides users with all the information you need about your PC, without having to enter any commands.

It provides computer users with a set of raw data that is easy to read. Unfortunately, there is not much else to the tool apart from this salient feature.



Microsoft Fix-It Tool

When it comes to fixing issues it doesn't get any simpler than Microsoft's built-in fix-it tool that offers a quick fix to the issues you might face. Sometimes it may be wise to simply open your built-in troubleshooter to solve problems rather than opting for external software, and Microsoft Fix-it is fairly competitive in getting the job done.

To run the troubleshooter on your system, simply click 'start' on your desktop bar, go to settings, select Update and Security, and later Troubleshoot. Select the kind of troubleshooting you require then click 'Run the Troubleshooter'. Here the troubleshooter might ask you some questions, answer them appropriately, and let the tool do its job.

IOBit Driver Booster 7

IOBit Driver Booster 7 is by far the most advanced and ingenious driver booster in the market. Driver Booster 7 prides itself on providing driver updates to more than 3,000,000 components to boost PC performance.

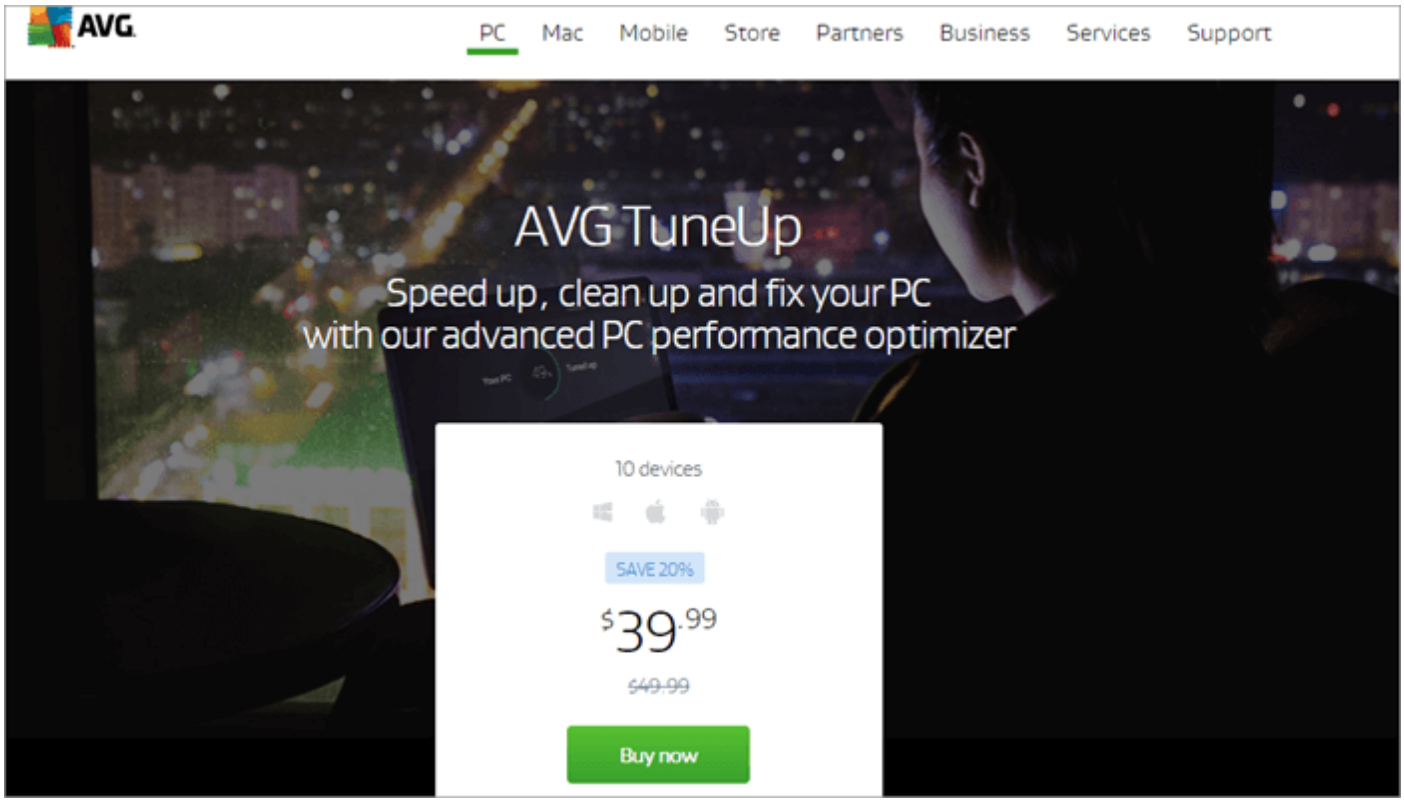
The updates that this software offers come from some of the most reputable manufacturers in the industry and pass both the WHQL Test and the IObit test, thus ensuring competent authority and security.

Apart from internal drivers, IOBit also provides updates to solve external driver issues you might face with your printer, mouse, or Bluetooth. It can solve the 'device not working' issue in a heartbeat. The driver updates are fast and can almost fix any issues facing your Windows operating system. This includes something as anxious and serious as the much dreaded blue death screen.

AVG TuneUp

You might have heard of this one, AVG TuneUp has been around for a while now but its new version gives us plenty of new reasons to boast about it and give it its rightful place on this list. Of course, it can perform all the optimization tasks one might need, which include browser cleanup, system cache, and logs cleanup, repairing broken shortcuts, restoring registries, etc.

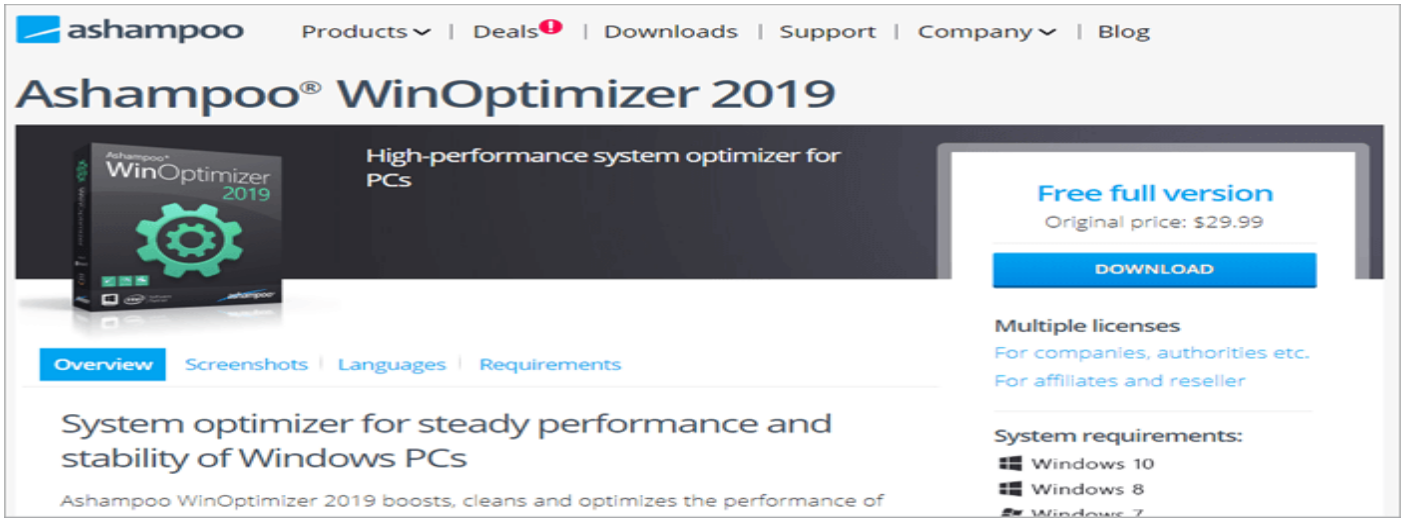
But it's the smart and advanced look that gives it an edge over its competition. It is a blast to use, although slow in its process. It will show you the progress of your scan, and present you with the depiction of the problem as well as the solution for it. It can also perform and deliver monthly optimization reports for your convenience.



- **Ashampoo Win Optimizer**

Ashampoo is compatible with Windows versions from 7 onwards and can perform all the basic optimization functions like registry restoration and browser clean up that you've come to expect from a PC repair tool. Apart from that, however, there are other practical features it offers that make the tool worth a try.

It gives you a privacy control module for Windows 10, offers a back-up system to protect important files should the process mess things up, an SSD wizard to enhance solid-state drives, and a very useful auto-clean option to make the clean-up process all the more convenient.



- **CD software:**

CD-ROM. Short for Compact Disc-Read Only Memory, a CD-ROM (shown right) is an optical disc which contains audio or software data whose memory is read only. And this CD software will keep useful software to be used during fieldwork.

_Arrangement Cleaning Tool

This refers to arranging all cleaning tools to be used during software maintenance at the fieldwork.

1. **Soft cloth**: is an excellent way to lift organic matter (bird droppings, bugs, pollen, dirt, etc.) and inorganic matter (road film, hard water spots, salt, etc.)

2. **Compressed air can**: is air kept under a pressure that is greater than atmospheric pressure. It serves many domestic and industrial purposes.

Arrangement Diagnostic tools

This refers to arranging all cleaning tools to be used during software maintenance at the fieldwork.

1. **Multimeter**: A Multimeter or a multitester, also known as a VOM (Volt-Ohm-Milliammeter), is an electronic measuring instrument that combines several measurement functions in one unit.

LO 2.1: Diagnose the computer Software and status

- **Content/Topic 1: Identification of the Diagnostic Tools**

If a computer serves for a long time, it may have various issues, which will slow down the computer or make it unbootable.

As we all know, all of the parts in a computer will affect its performance. However, what affects the computer performance most is the CPU, the hard drive, and the memory. CPU, memory, and I/O devices (including hard drives) are referred to as the three core components of the computer. If possible, you should run a hardware test toolto diagnose them regularly so that you can make sure they work well.

As for PC diagnostic tools, you can read on to get them. Some of them are PC diagnostic software. The rest of them are built-in Windows utilities.

Here is the list of 5 free and practical computer diagnostic tools

- Intel Processor Diagnostic Tool, used for checking CPU.
- CPU-Z, used for checking CPU.
- Windows Memory Diagnostic, used for checking RAM.
- MiniTool Partition Wizard, used for checking disk.

Windows Performance Monitor, used for checking system performance.

Checking the CPU

A CPU (Central Processing Unit) is the computing core and control unit of a computer. It mainly includes an Arithmetic Logic Unit, a Controller, a Cache, and a Bus. Its function is mainly to explain computer instructions and to process data in computer software. It is one of the core components of the computer.

Checking the CPU will help you analyze whether it works well on your computer and test its real performance in your computer. So, how can we check the CPU? You can use the following tools.

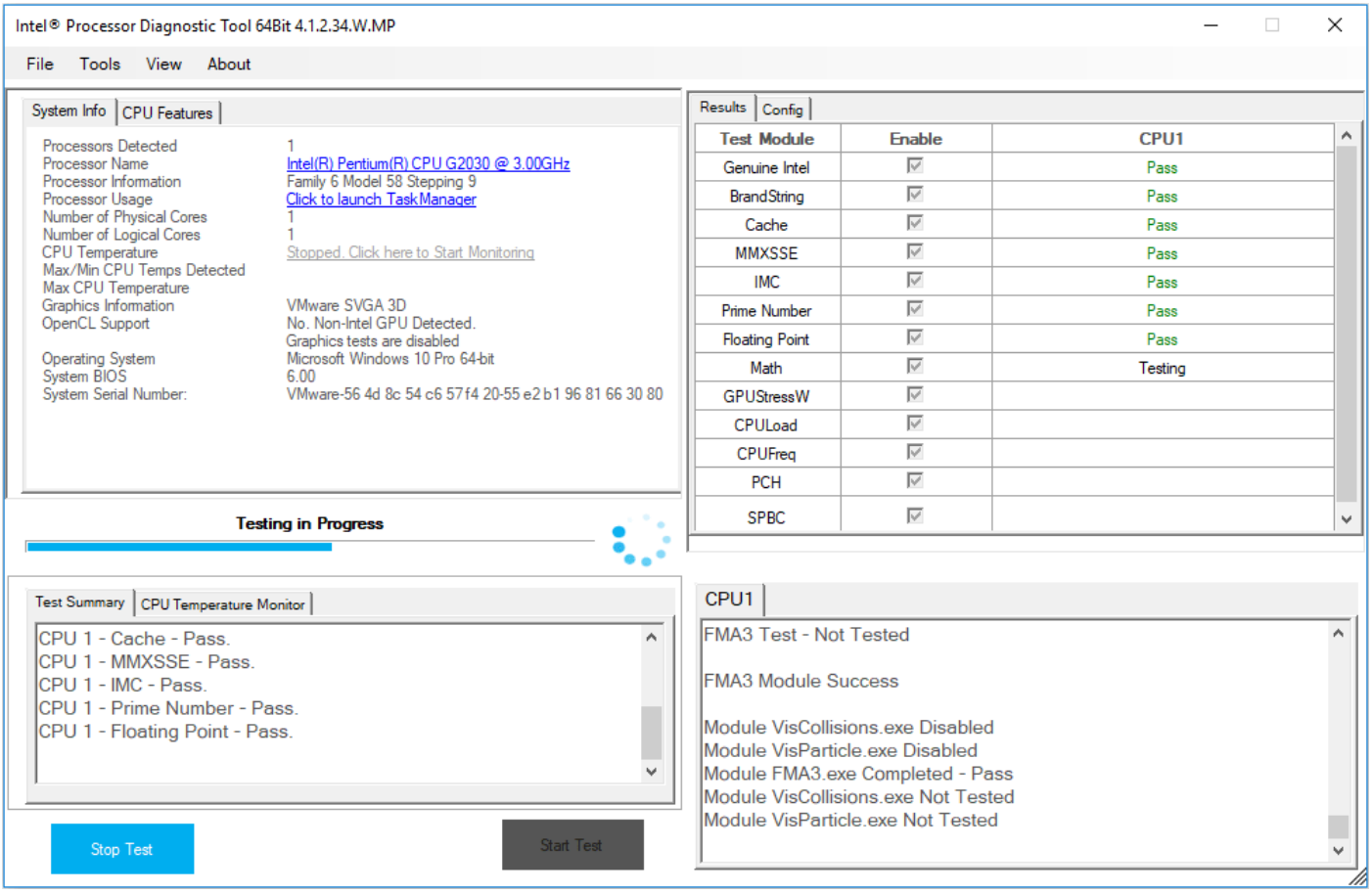
Intel Processor Diagnostic Tool

The Intel Processor Diagnostic Tool is mainly used to verify the functionality of an Intel microprocessor. It will check for brand identification, the processor's operating frequency, specific processor features, and perform a stress test on the processor.

Follow the tutorial below

Step 1: Set up the Intel Processor Diagnostic Tool.

Step 2: Click Start Test to run PC diagnostic tests.



Step 3: Navigate to File > View Results File to see detailed test results. If any test fails, you may need to replace the CPU sooner or later.

CPU-Z

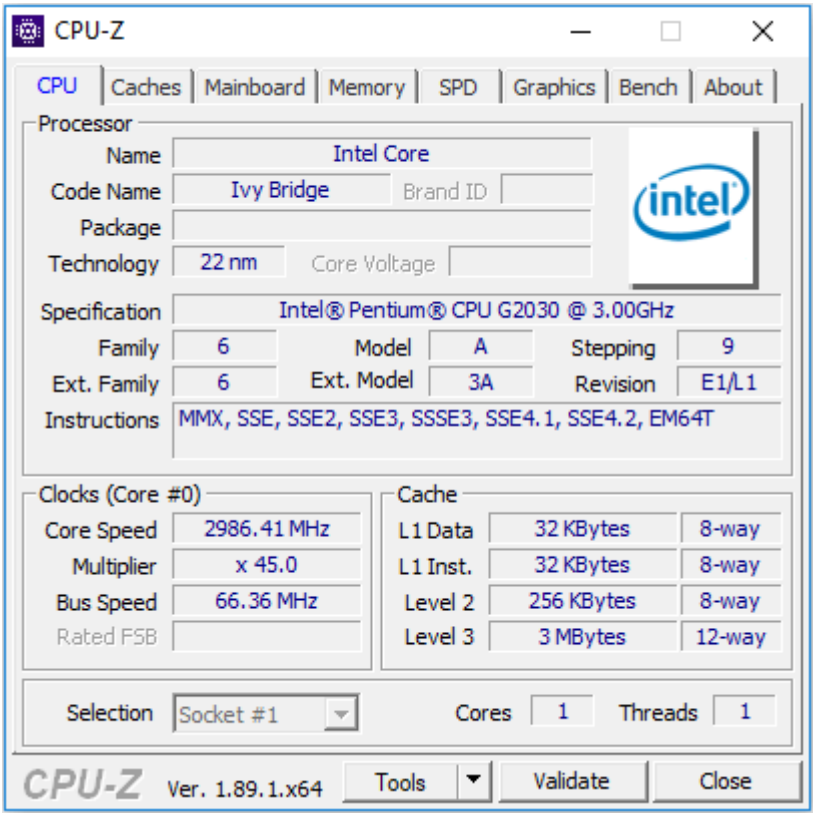
Apart from the above PC diagnostic software used for checking CPU health, there is also a PC hardware diagnostic tool used for checking CPU performance, which will tell you whether this CPU is suitable for your computer. That is CPU-Z, which supports both 32-bit and 64-bit operating systems.

CPU-Z is equipped with the following features:

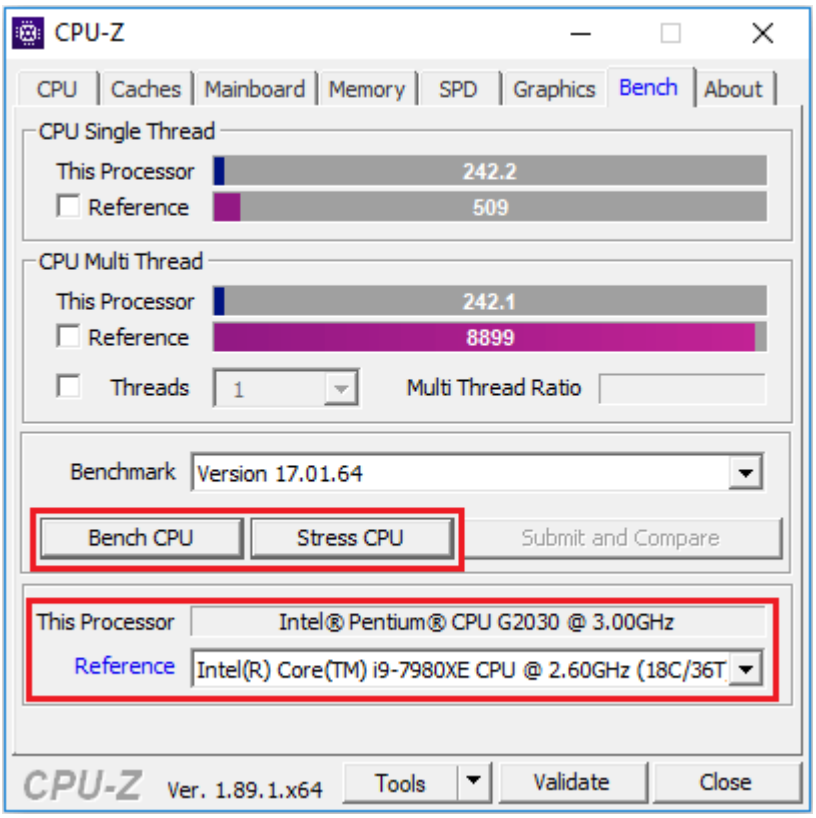
- Identifies the category and name of the processor.
- Detects the core frequency of the CPU and the multiplication index.
- Detects the core voltage of the processor.
- Over-Clocking probability detection.
- Detects the instruction set supported by the processor.
- Detects processor first and second level cache information, including cache location, size, speed, and so on.
- Detects part of the motherboard information, including BIOS type, chipset type, memory capacity, AGP interface information.

Follow this next tutorial to learn how to use it.

Tip: In CPU-Z, you should notice the following parameters: Core Speed, Level 3 Cache, Cores, and Threads. Core Speed is related to the CPU core operating frequency. Cache is related to the average time it takes for the processor to access memory. Cores and Threads are also related to the CPU performance



Step 2: Skip to the Bench tab. Then, choose your processor and click Bench CPU and Stress CPU to test its performance



Checking the Memory

Memory is used to store operational data of the CPU and data that the CPU exchanges with external memory such as a hard disk. The CPU will transfer the data that needs to be calculated into the memory for calculation and the CPU will transfer the result after the operation is completed. The operation of the memory also determines the stable operation of the computer.

Windows Memory Diagnostic

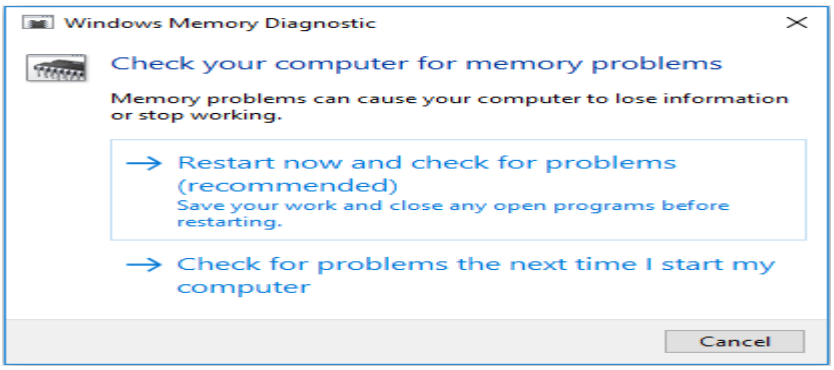
Windows Memory Diagnostic is a built-in Windows diagnostic tool, which is used for scanning your computer's physical memory to help identify any issues that may occur. This tool can help you check the stability of the memory bank.

How can the Windows Memory Diagnostic be run? Here is the tutorial.

Step 1: Type "memory diagnostic" in the Windows search box.

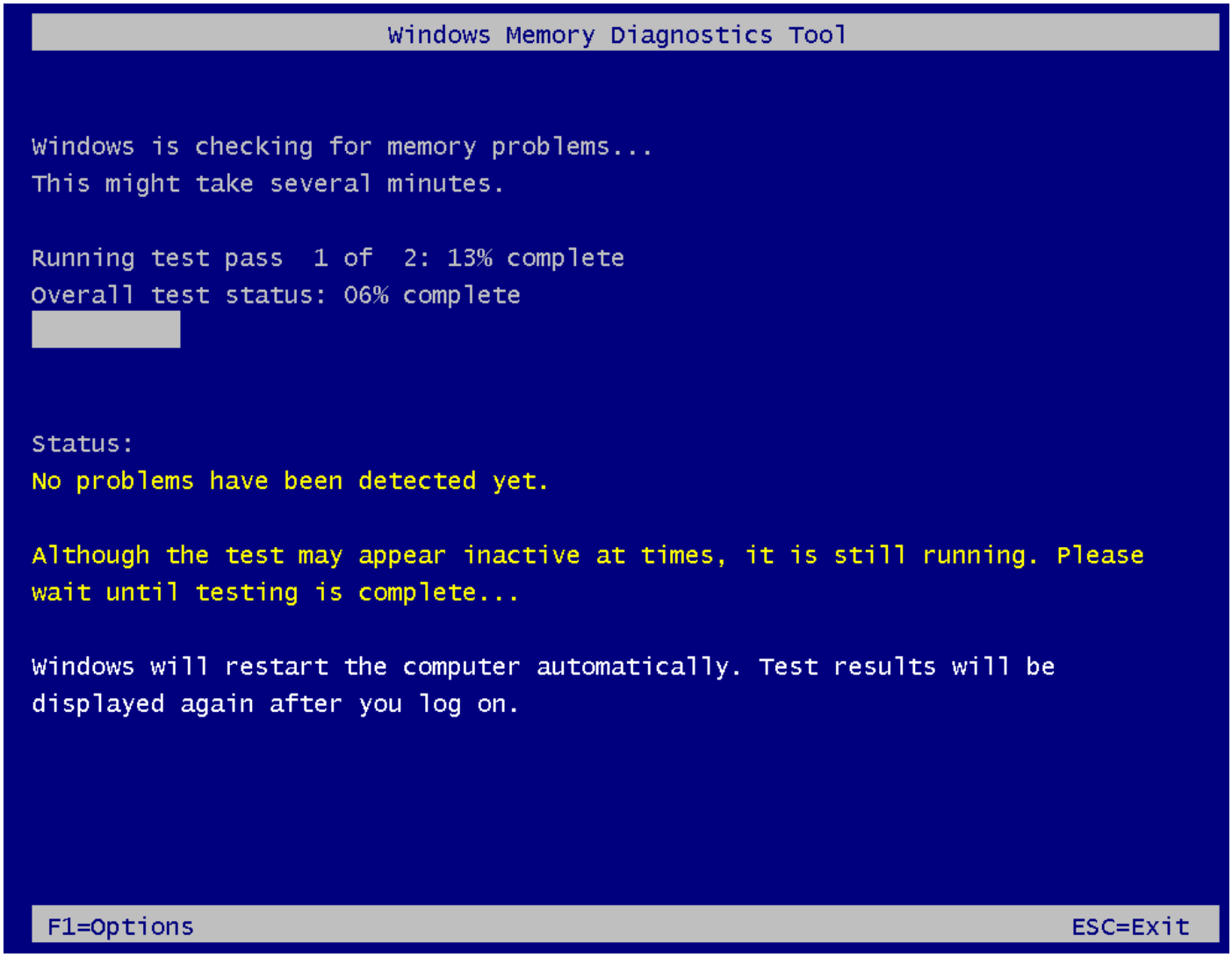
Step 2: Double-click the icon of Windows Memory Diagnostic.

Step 3: Choose Restart now and check for problems.



Step 4: Your computer will restart and diagnose the memory. If you press the F1 key, you can enter a new page to choose diagnosis mode: basic, standard, and extended.

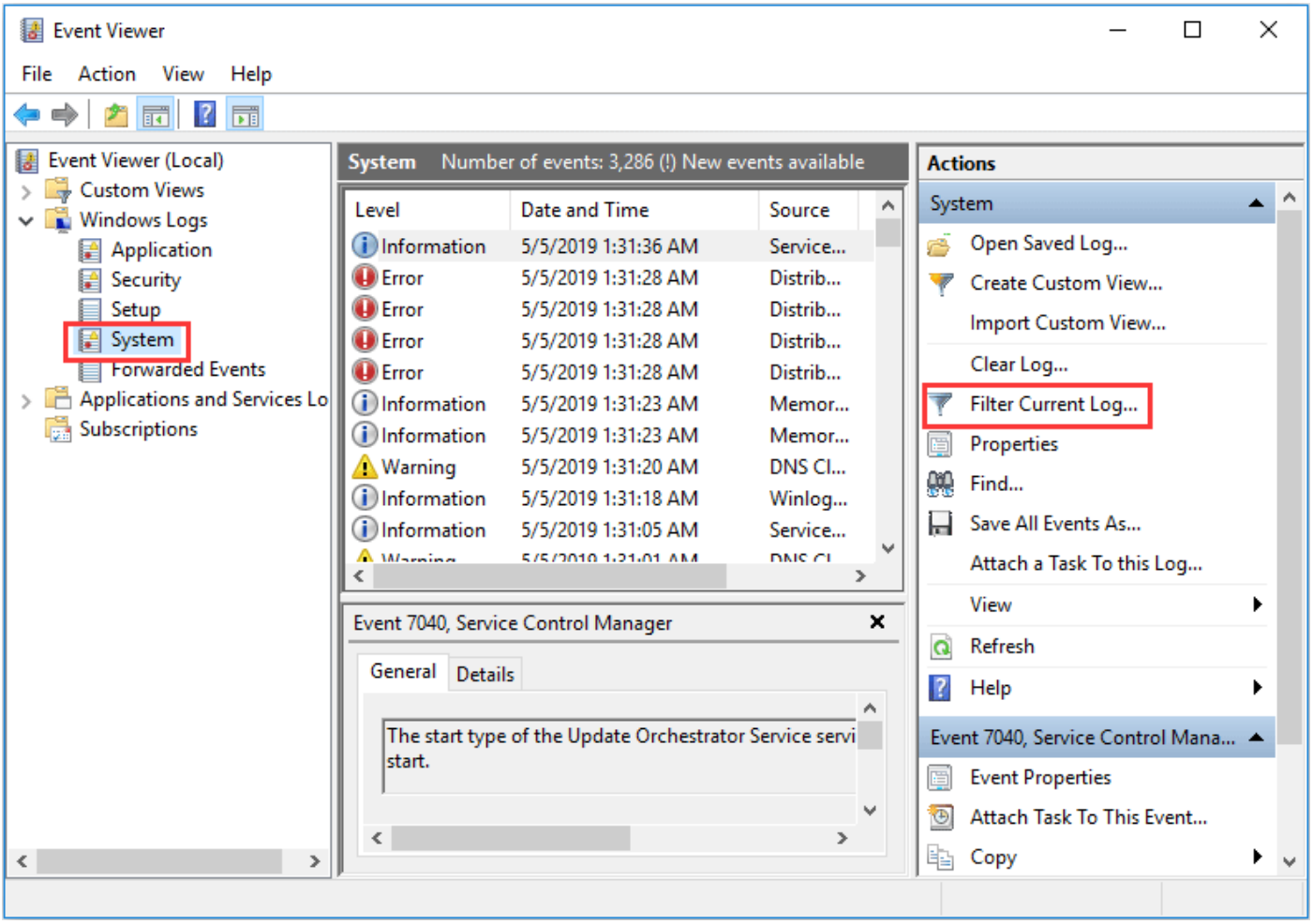
- Basic: The basic tests are MATS+, INVC, and SCHCKR (cache enabled).
- Standard: It includes the basic tests, LRAND, Stride6 (cache enabled), CHCKR3, WMATS+, and WINVC.
- Extended: It includes the standard tests, MATS+ (cache disabled), Stride38, WSCHCKR, WStride-6, CHCKR4, WCHCKR3, ERAND, Stride6 (cache disabled), and CHCKR8.



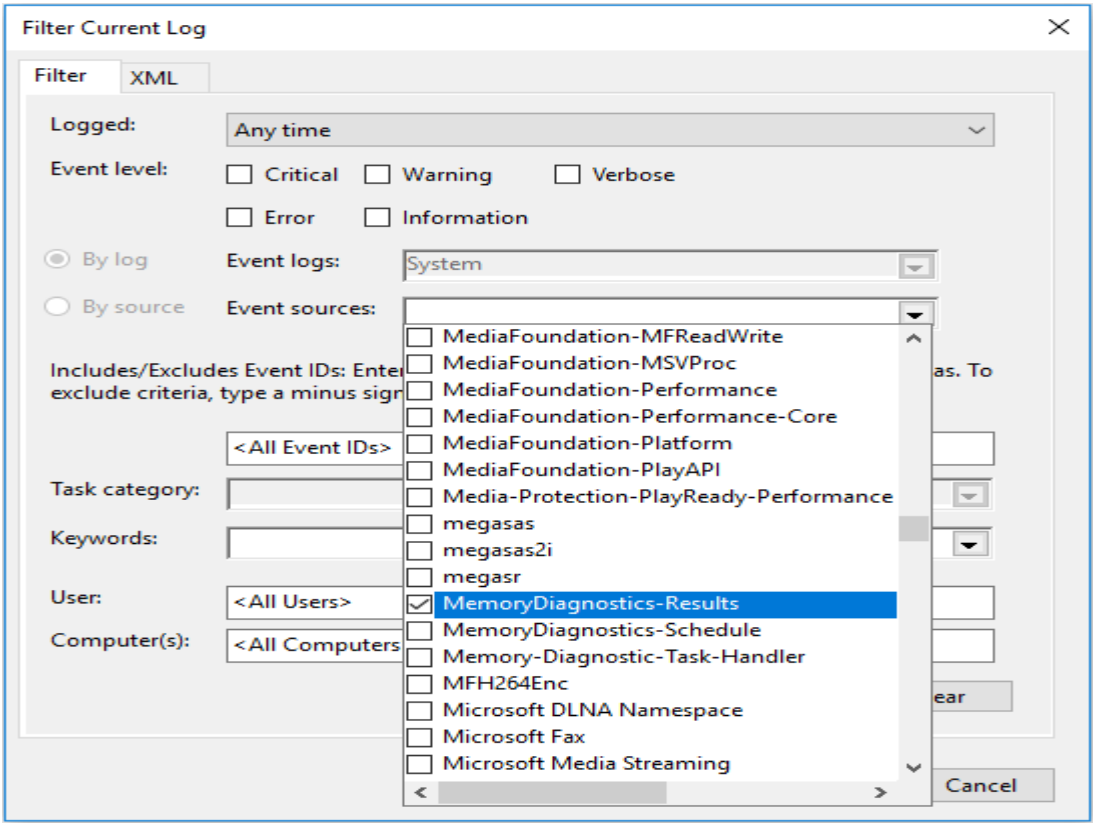
Step 5: After the diagnosis process is completed, the computer will boot up automatically. Then, you need to view the diagnosis report.

Step 6: Press "Windows + R" keys simultaneously to call out Run box. Type "eventvwr" in Run box and press the Enter key.

Step 7: Navigate to the Windows Logs > System. Then click "Filter Current Log" in the right box.



Step 8: Check "MemoryDiagnostics-Results" to display all result logs of the memory test.



Step 9: Double-click the result logs to see the detailed information. After reading them, you can adopt corresponding methods to fix memory problems

Checking the Disk

A storage device is a type of I/O device. In a computer, hard drives are important for users because they have a great influence on computer performance, user experience, and data existence. You should check the hard drive if the computer often freezes or crashes.

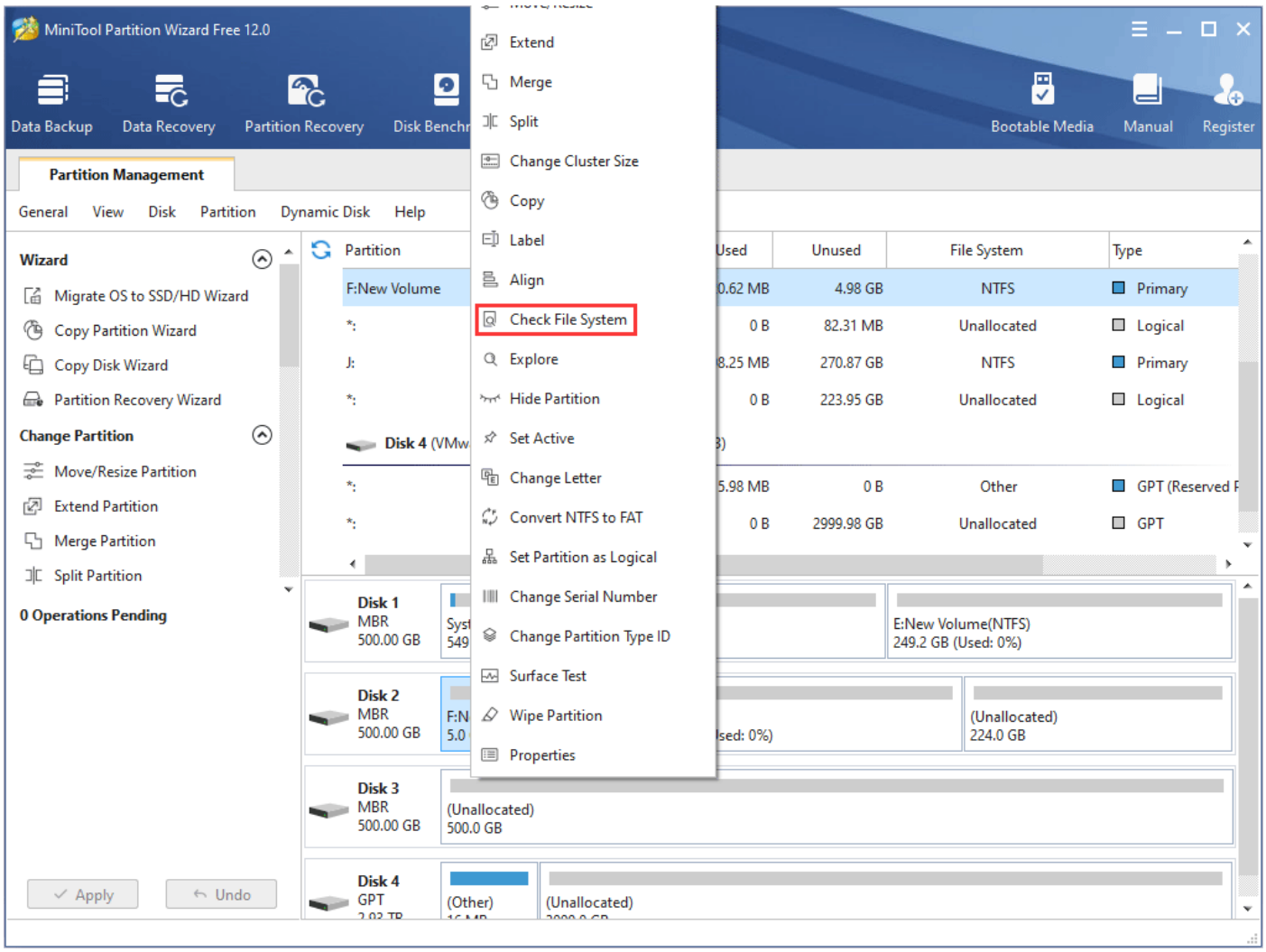
MiniTool Partition Wizard

MiniTool Partition Wizard is professional partition management software. However, it can also check disks for errors and test their performance. It can check file systems, scan for bad sectors, and test write and read speed.

Here is the tutorial on how to use MiniTool Partition Wizard.

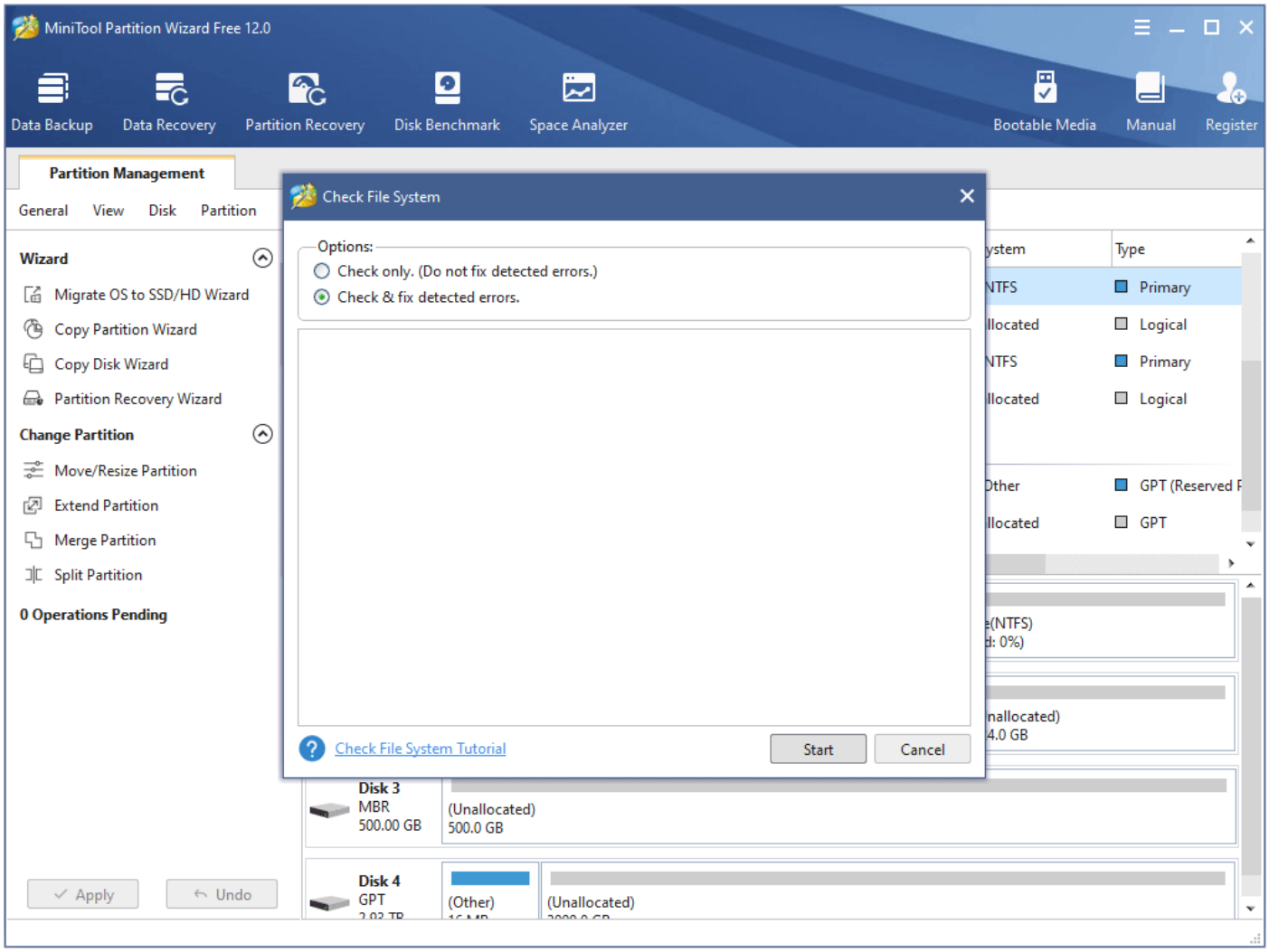
Step 1: Free download MiniTool Partition Wizard and launch it to get to its main interface. Right-click a partition on the hard drive and choose Check File System.

Tip: File system controls data access mode. If it has problems, your data will be lost. If the file system of the system partition is damaged or missing, your computer will crash.

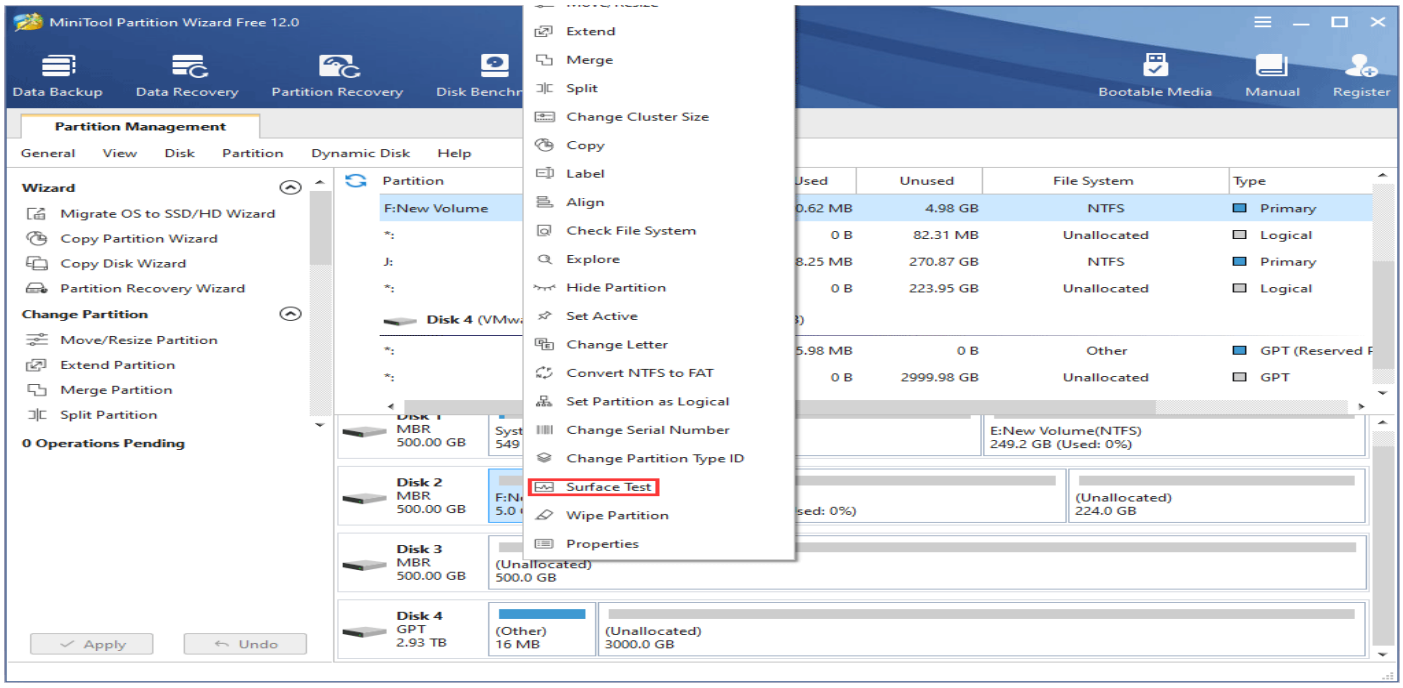


Step 2: Choose Check & fix detected errors and click the Start button. This feature will examine basic file system structures, file name linkages, and security descriptors.

Step 3: Click the Cancel button after the process is completed.

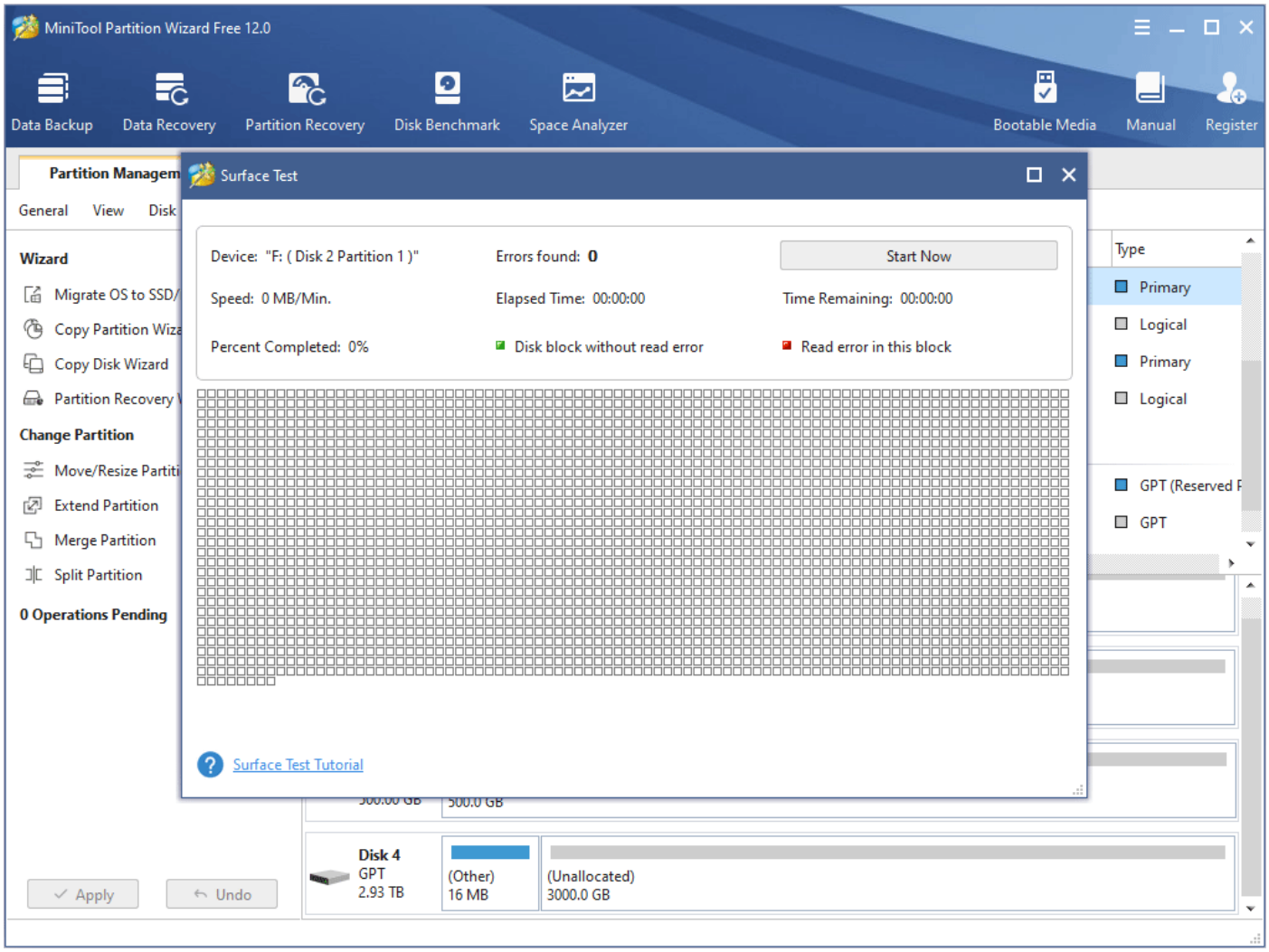


Step 4: Right-click a disk and choose Surface Test.

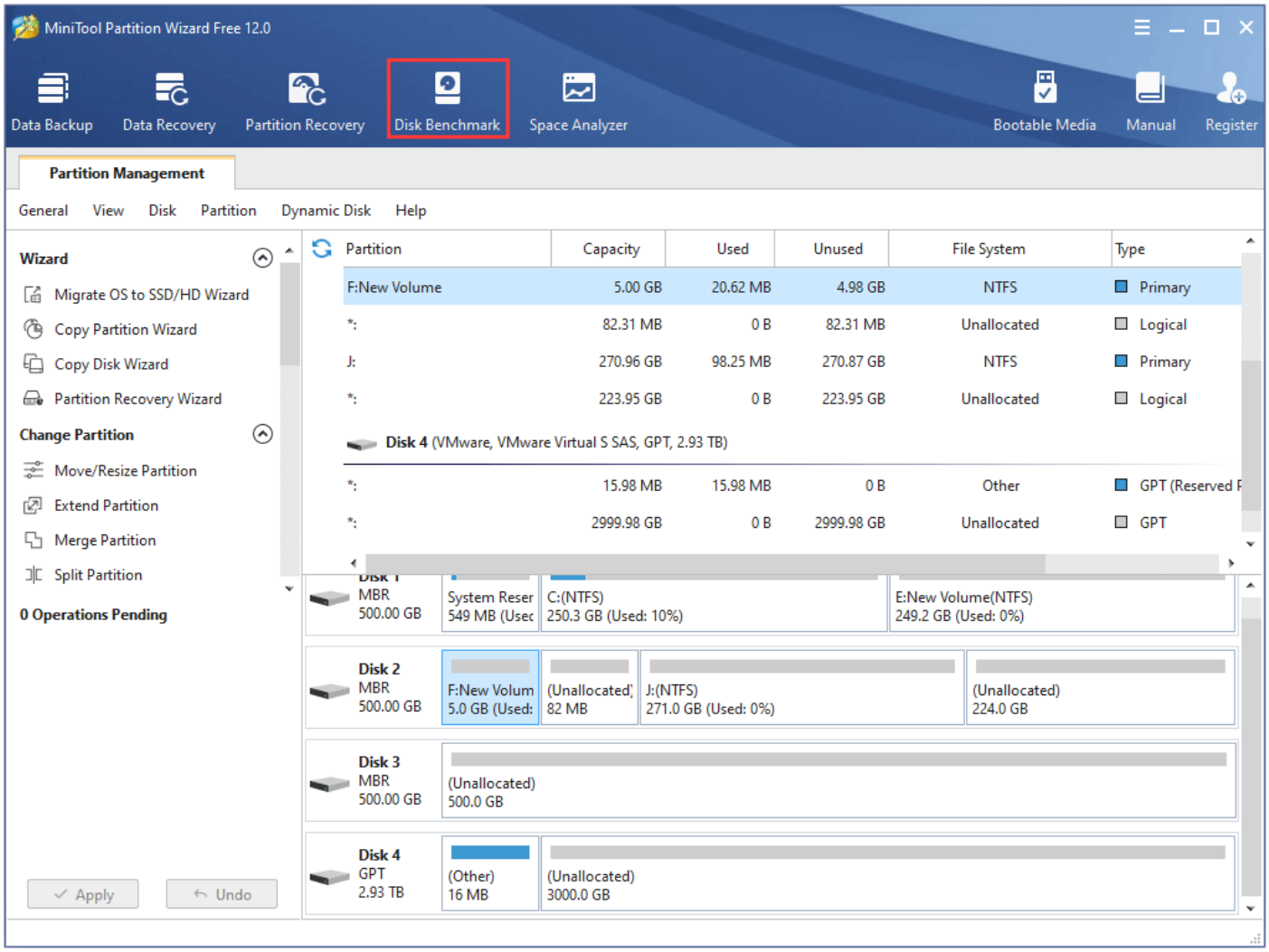


Step 5: Click Start Now to scan for bad sectors. Bad sectors will be marked with red blocks and good ones will be marked with green blocks.

Tip: Bad sectors are places on a hard disk where data cannot be written. If there are many physical bad sectors, you should consider replacing it. Logical bad sectors can be repaired by error checking and full formatting.

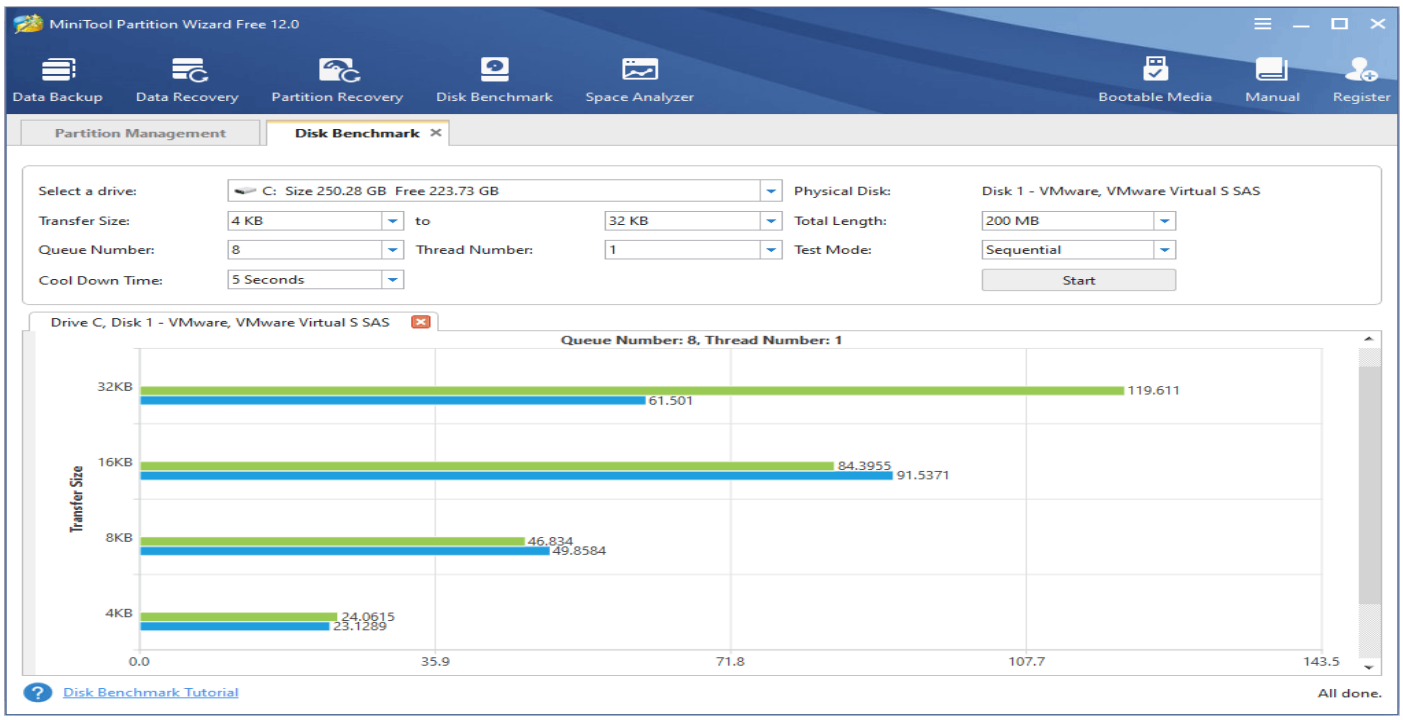


Step 6: Click Disk Benchmark on the tool bar. This feature will test disk performance.



Step 7: Select a partition and set parameters. Then, click the Start button.

Step 8: After the procedure is completed, you can see the result report. Please click Disk Performance Test Guide to get the detailed result explanation.



Checking the System Performance

Apart from the above tools, Performance Monitor should also be introduced. You can use this tool to monitor system performance and diagnose hardware.

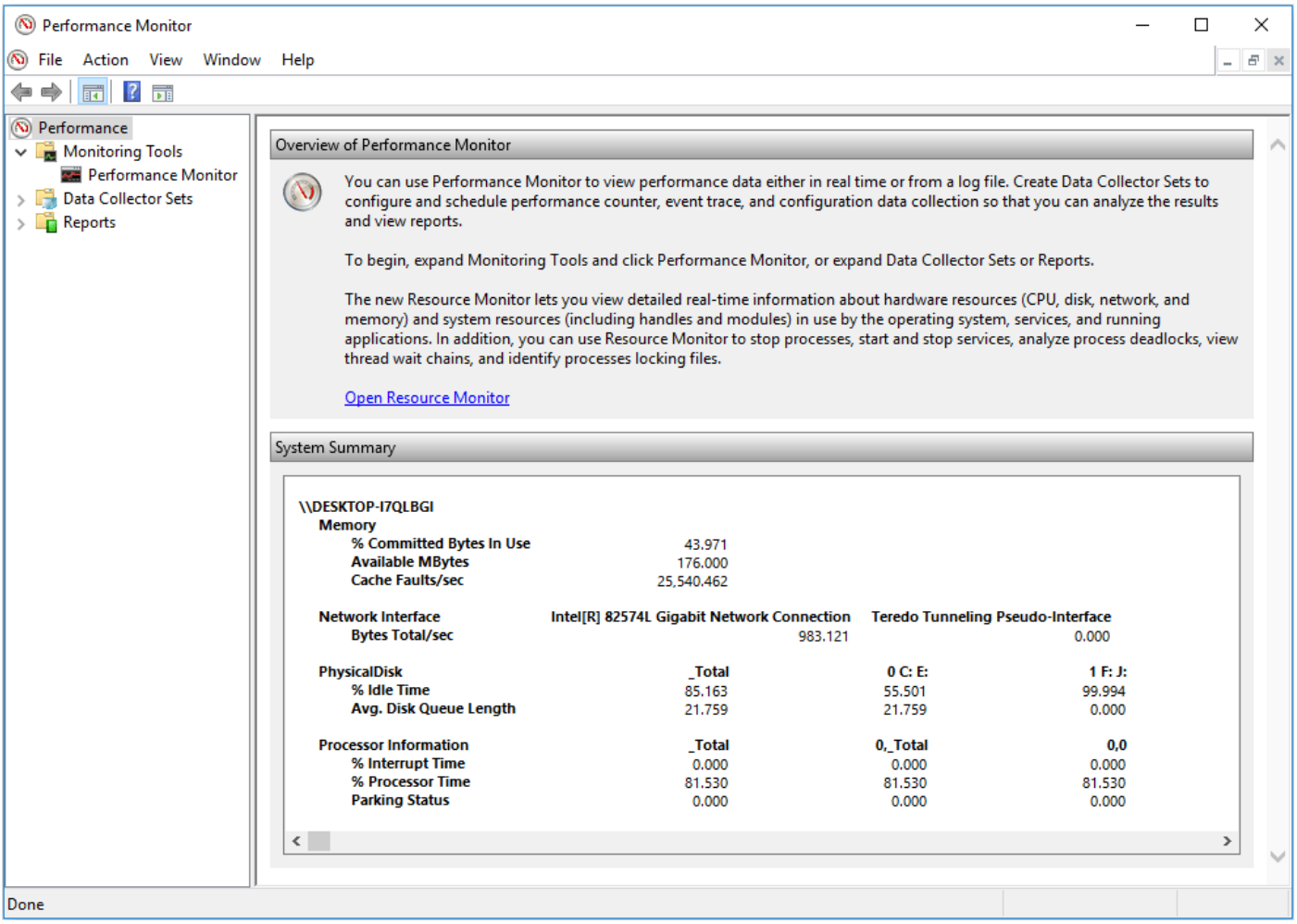
Performance Monitor

Performance Monitor is a built-in Windows performance monitor tool used for monitoring application and hardware performance in real time. It can monitor CPU, memory, network, hard disk, process, etc. You can use it to make a full computer diagnostic test.

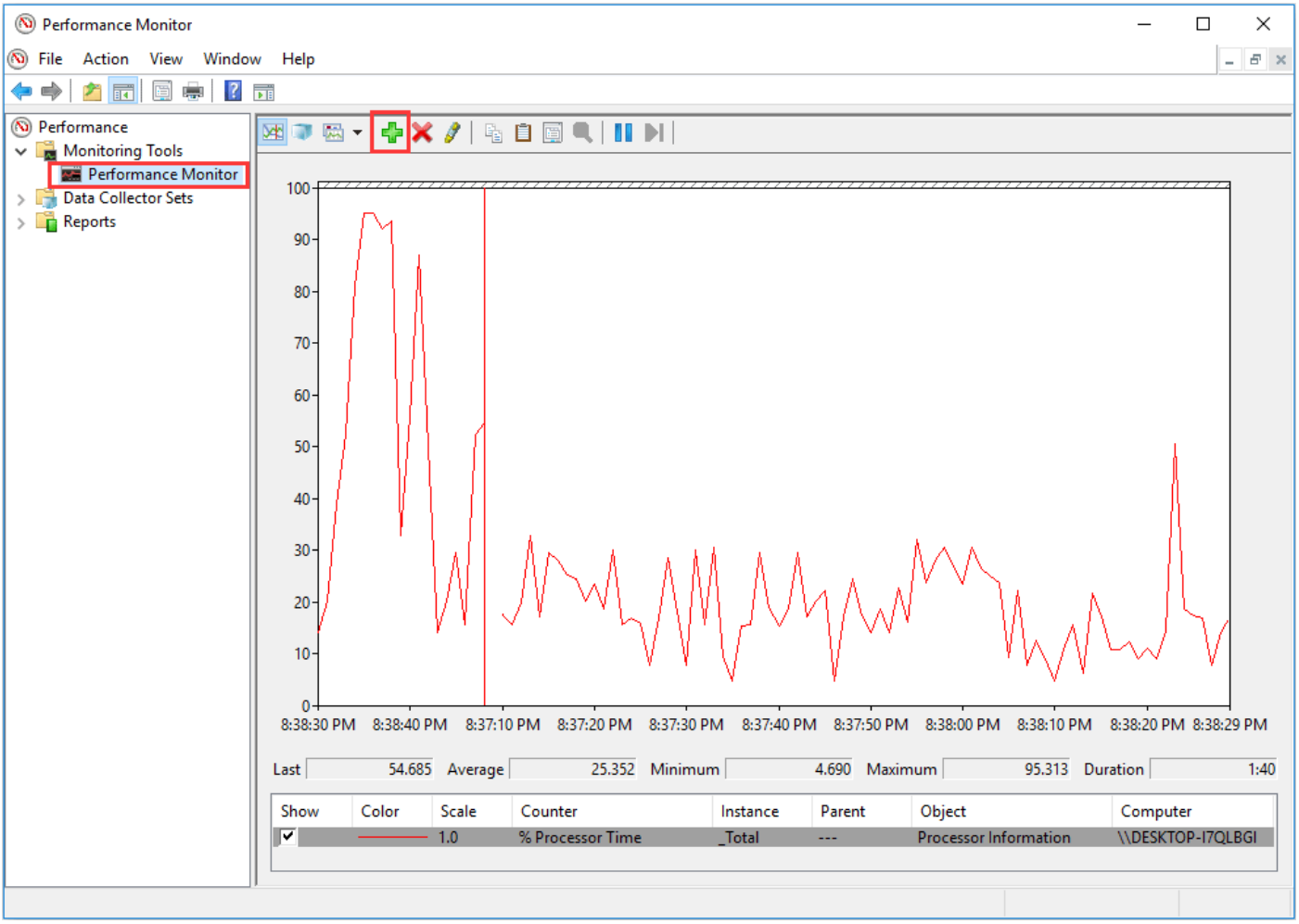
How can we use it? Here is the tutorial.

Step 1: Type "performance monitor" in Windows search box.

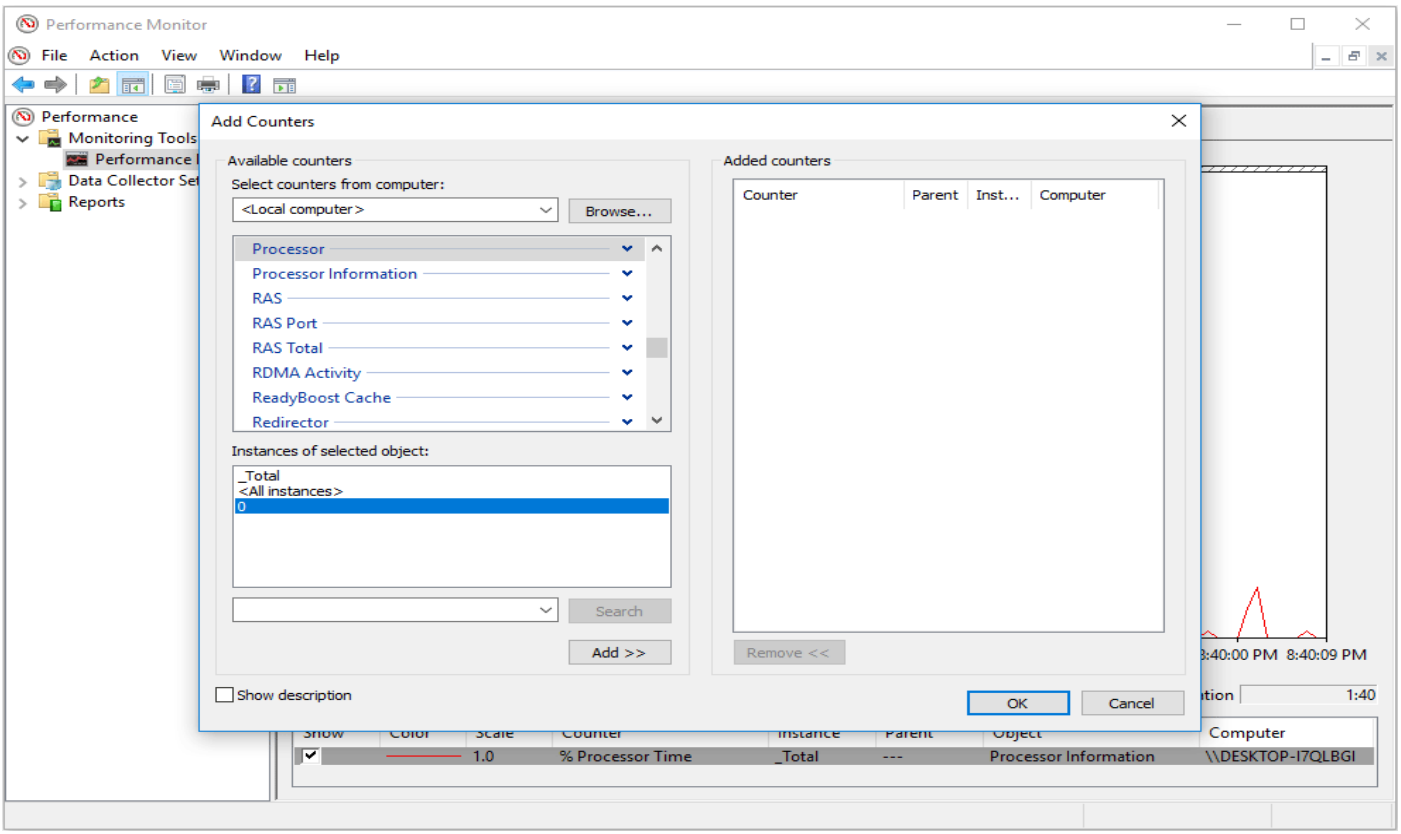
Step 2: Click Performance Monitor to run it. Then, you can get a system summary. If you want to monitor single hardware such as CPU, hard drive, and memory, please read on.



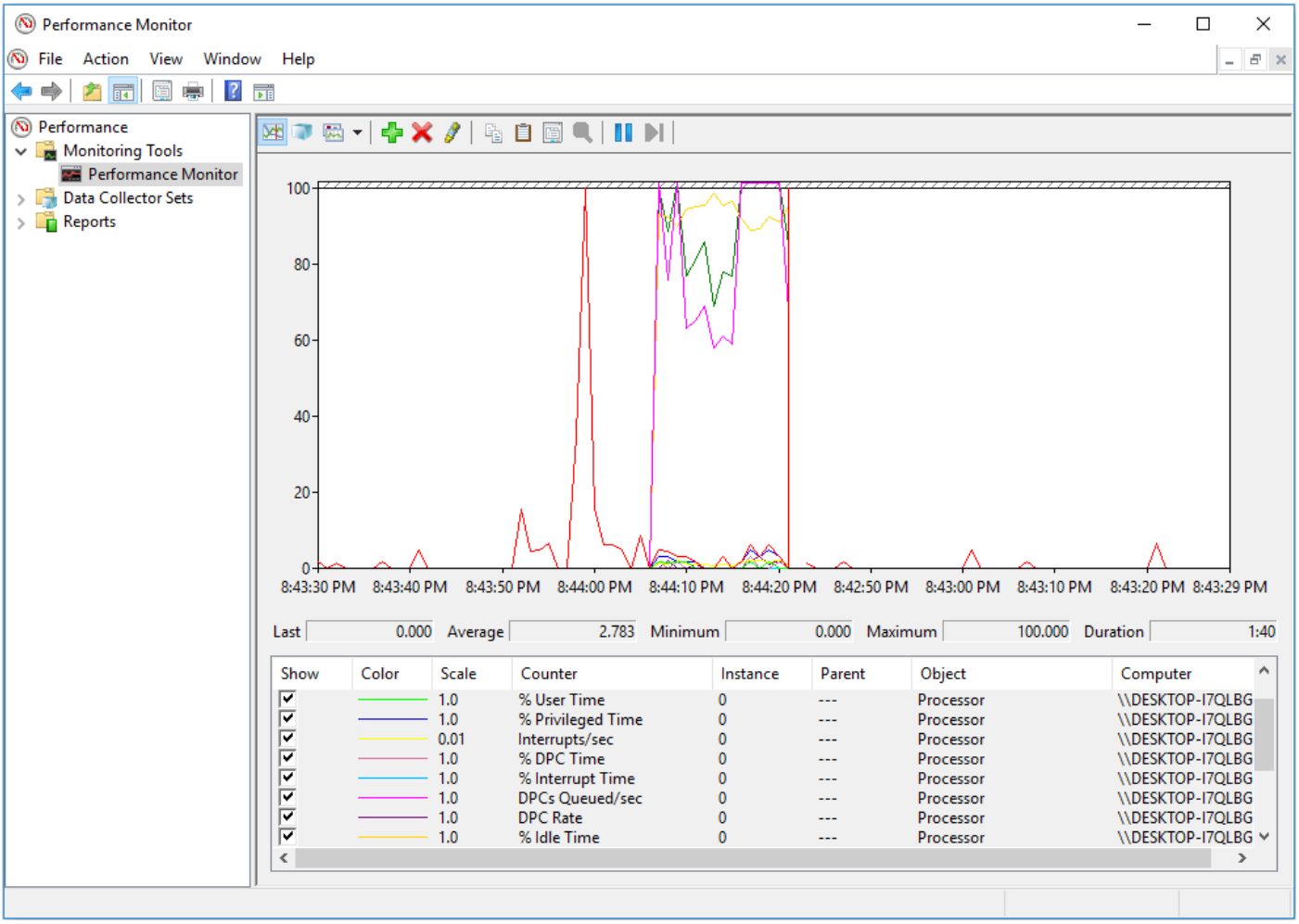
Step 3: Highlight Performance Monitor and click the "add" icon.



Step 4: Choose a monitor object and click the Add button and OK button.



Step 5: Finally, you can monitor the object and get the detailed information.



When you run a hardware test on a CPU, a memory, and a hard drive, you should pay attention to the following parameters.

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CPU

% Processor Time: It represents the percentage of time the processor spends in executing a non-idle thread. Its normal numerical value will fluctuate within the range of 80% ± 5%. A too low value means that the CPU utilization is not high enough. On the other hand, a too high value indicates that the CPU may become the processing bottleneck of the system.

Interrupts/sec: It represents the number of times when the device interrupts the processor every second. It's the lower value, the better; and it's best not more than 1,000.

If this value increases significantly while the system activity doesn't increase accordingly, it means that there is a hardware problem and you need to check the network adapter, disk, or other hardware that is causing the interrupts.

Memory

Pages/sec: Its normal value will fluctuate within the range of 0-20. This value will always be high if the server does not have enough memory to handle its workload. If it is greater than 80, it indicates a problem.

Page Reads/sec: It represents the number of times when reading from the hard disk in order to solve the hardware error. If its value keeps at 5, it means there may be insufficient memory.

Disk

% Disk Time: It represents the percentage of time the disk spends in serving read requests or write requests. The normal value is less than 10. If the value is too large, you should consider adding memory or replacing the disk with a faster one. If the value keeps exceeding 80 while the processor and network connection are not saturated at this time, a memory leak may occur.

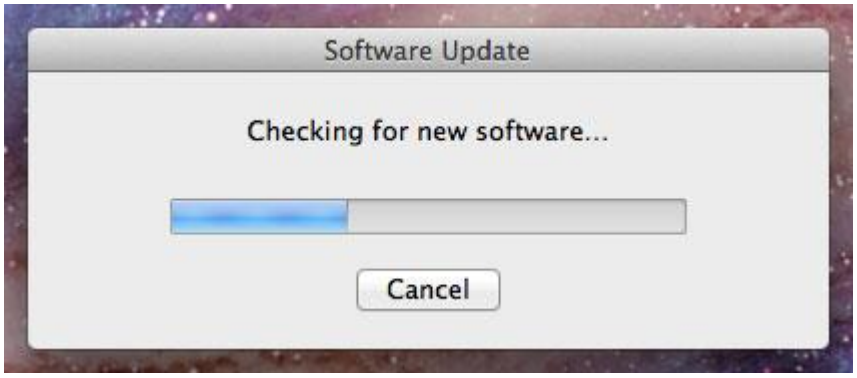
Avg. Disk Queue Length: It refers to the average number of reading and writing requests queued during the sample interval. Its normal value is less than 0.5. A too large value indicates that the disk inputs and outputs too slowly and you need to replace the disk with a faster one.

- **Content/Topic 2: Identification of common software problem/fault and error**

Most problems are software problems. Some are definitely hardware problems. And some can be caused by one or the other. This chart lists 16 of the most common problems. Knowing where to start troubleshooting can save you lots of time. And if you need to call in the cavalry, you'll know which customer service department to call.

Problem: An application is running slowly

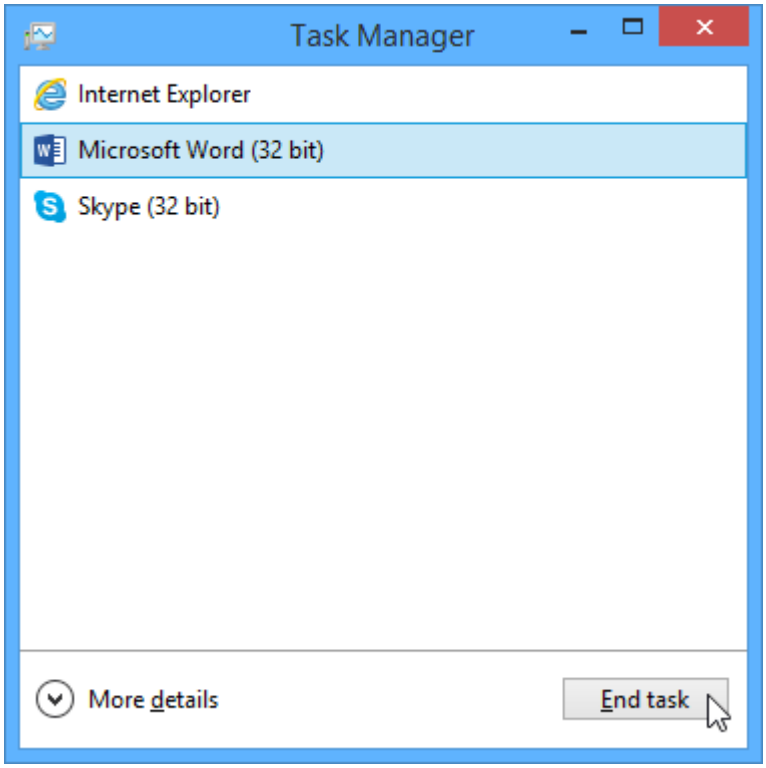
- **Solution 1**: Close and reopen the application.
- **Solution 2**: Update the application. To do this, click the **Help** menu and look for an option to check for **Updates**. If you don't find this option, another idea is to run an online search for application updates.



Problem: An application is frozen

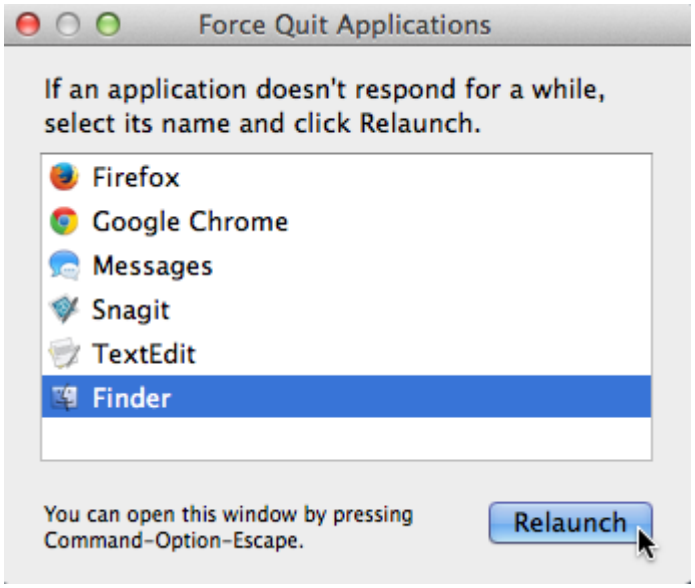
Sometimes an application may become stuck, or frozen. When this happens, you won't be able to close the window or click any buttons within the application.

Solution 1: Force quit the application. On a PC, you can press (and hold) Ctrl+Alt+Delete (the Control, Alt, and Delete keys) on your keyboard to open the Task Manager. On a Mac, press and hold Command+Option+Esc. You can then select the unresponsive application and click End task (or Force Quit on a Mac) to close it.



Solution 2: Restart the computer. If you are unable to force quit an application, restarting your computer will close all open apps.

Solution 2 (Mac only): Restart Finder. To do this, press and hold Command+Option+Esc on your keyboard to open the Force Quit Applications dialog box. Next, locate and select Finder, then click Relaunch.



Solution 3: Press and hold the Power button. The Power button is usually located on the front or side of the computer, typically indicated by the power symbol. Press and hold the Power button for 5 to 10 seconds to force the computer to shut down.

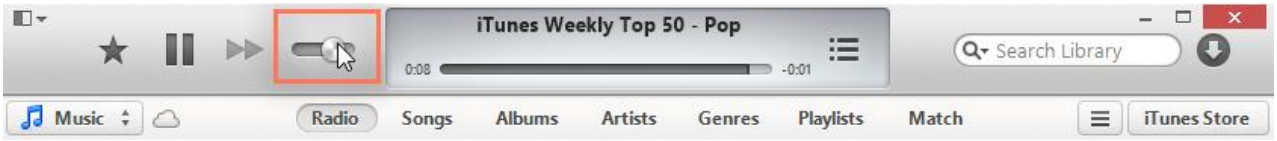
Solution 4: If the computer still won't shut down, you can unplug the power cable from the electrical outlet. If you're using a laptop, you may be able to remove the battery to force the computer to turn off.

Note: This solution should be your last resort after trying the other suggestions above.

Problem: The sound isn't working

Solution 1: Check the volume level. Click the audio button in the top-right or bottom-right corner of the screen to make sure the sound is turned on and that the volume is up.

Solution 2: Check the audio player controls. Many audio and video players will have their own separate audio controls. Make sure the sound is turned on and that the volume is turned up in the player.



Solution 3: Check the cables. Make sure external speakers are plugged in, turned on, and connected to the correct audio port or a USB port. If your computer has color-coded ports, the audio output port will usually be green.

Solution 4: Connect headphones to the computer to find out if you can hear sound through the headphones.

Problem: The screen is blank

Solution 1: The computer may be in Sleep mode. Click the mouse or press any key on the keyboard to wake it.

Solution 2: Make sure the monitor is plugged in and turned on.

Solution 3: Make sure the computer is plugged in and turned on.

Solution 4: If you're using a desktop, make sure the monitor cable is properly connected to the computer tower and the monitor.

Solving more difficult problems

If you still haven't found a solution to your problem, you may need to ask someone else for help. As an easy starting point, we'd recommend searching the Web. It's possible that other users have had similar problems, and solutions to these problems are often posted online. Also, if you have a friend or family member who knows a lot about computers, they may be able to help you.

google screenshot

Keep in mind that most computer problems have simple solutions, although it may take some time to find them. For difficult problems, a more drastic solution may be required, like reformatting your hard drive or reinstalling your operating system. If you think you might need a solution like this, we recommend consulting a professional first. If you're not a computer expert, it's possible that attempting these solutions could make the situation worse.

- **Content /Topic3: Description of Software diagnostic process steps**

Software diagnostic process steps:

- Gathering information from the customer.
- Verifying the obvious issues.
- Error/fault identification
- Error/fault analysis

- Error/fault Assessment

The following are tips you should follow when gathering information from customers:

1. Start with open questions such as “What is the issue?” Open questions generally start with words like how, why, when, who, what, and where. They cannot be answered with “yes” or “no.”
2. Let customers explain in their own words what they have experienced. Do not interrupt the customer—interrupting generally prompts someone to start over.
3. As you begin to understand the basics of the issue, start using closed questions that require more limited, specific answers. “What operating system are you using?” is an example of a closed question. The customer will either tell you what the Mac OS version is or tell you that he or she does not know. Closed questions often can be answered with “yes” or “no.”
4. Verify your understanding of what the customer has told you. Restate what you have been told and get the customer's agreement that you understand the issue. An example of restatement would be, “Okay, so what's happening is that when you try X, Y happens. Is that correct?”
5. If the customer agrees that you understand, continue to gather information. If the customer does not agree that you understand, clarify what you misstated and again verify your understanding. Do not continue until the customer agrees that you understand the issue.

Verify the Issue

Verifying the issue is extremely important in successful troubleshooting. It gives you a chance to objectively confirm the extent and the nature of the situation. In the long run, it saves time since you do not waste time working on the wrong issue.

Eliminate Third-Party Products

Third-party product incompatibilities can be the source of the issue. Before starting to isolate the suspected issue with Apple equipment or software, eliminate third-party products from the system. To the extent that you are able, make the system “all Apple” by:

- Disabling third-party software extensions in the System Folder if the computer has Mac OS 9 (choose the Mac OS Base set in the Extensions Manager control panel)
- Disconnecting third-party *SCSI*, *USB*, or FireWire peripherals
- Disconnecting third-party keyboards, mice, and other input devices
- Removing third-party *PCI*, *AGP*, or NuBus interface cards
- Removing third-party *RAM* (if possible)
- Disconnecting any other third-party hardware

If the issue does not occur with your “all Apple” system, the issue is most likely with the third-party products you removed. You can proceed with troubleshooting, but be aware that additional technical assistance may have to come from the third-party manufacturer.

LO 2.2:Fix any fault identified during Identification phase

- ✓ Selection of tools to be used.
- ✓ Steps of fixing the software error/fault
- ✓ Trying quick solutions first.
- ✓ Evaluation of the problem and implementation of the solution

- **Content/Topic 1: Selection of tools to be used in software maintenance**

To troubleshoot and repair laptop systems properly, you need a few basic tools. If you intend to troubleshoot and repair systems professionally, you may want to purchase many more specialized tools as well. These advanced tools enable you to more accurately diagnose problems and make jobs easier and faster. Here are the basic tools that should be in every troubleshooter's toolbox:

- Simple hand tools for basic disassembly and reassembly procedures, including a selection of flat-blade and Phillips screwdrivers (both medium and small sizes), tweezers, an IC extraction tool, and a parts grabber or hemostat. Most of these items are included in $10–$20 starter toolkits found at most computer stores. Although most of the same toolkits sold for conventional desktop systems will have these tools, for portable systems you may also need sets of smaller-sized flat-blade and Phillips screwdrivers and a set of small Torx drivers or Torx bits as well. For laptops, you may encounter Torx screws as small as T5, so consider purchasing a set including bits down to that size.
- Diagnostics software and hardware for testing components in a system.
- A multimeter that provides accurate measurements of voltage and resistance, as well as a continuity checker for testing cables and switches.
- Chemicals (such as contact cleaners), component freeze sprays, and compressed air for cleaning the system.
- Foam swabs, or lint-free cotton swabs if foam isn't available.
- Small nylon wire ties for "dressing" or organizing wires or small cables (such as internal Wi-Fi/Bluetooth antennas).

- **Content/Topic 2: Description of Steps of fixing the software error/fault**

1. Free up RAM by closing other open programs.

Every piece of software uses Random Access Memory (RAM). The more software that's running on your computer, the more RAM it uses. This can be especially problematic if you're using older machines that don't have a lot of RAM. So if a software program refuses to load or is running slowly, the first thing to do is to close all other open applications.

If you want to find out which open applications might be hogging your RAM, both Windows and Macintosh operating systems (OS) have tools that display this information:

- In Windows, hit Ctrl+Alt+Delete, then choose the Start Task Manager option. From the window that appears, click the Processes tab, then click the Memory menu item. This sorts all open processes based on the amount of RAM they're using. You can shut down a runaway process by clicking the End Process button. Before you do that, you may want to do a bit of

research on the process to ensure that you don't accidentally stop a critical process or program.

- In Mac OS X, use the Activity Monitor (called the Process Viewer in older versions of OS X). Access the Activity Monitor by going to Applications > Utilities. Once you've called up the Activity Monitor, sort programs based on RAM usage by clicking the column labeled "Real Memory."

2. Restart the software.

Software problems can stem from a conflict with other programs or simply from difficulties the software encountered when starting up. Shutting the program down and restarting it can sometimes resolve these issues.

3. Shut down and restart your computer.

If restarting the problematic program doesn't resolve the issue, try rebooting your computer. Once the computer has fully restarted, re-launch the application in question and see if the problem has been resolved.

4. Use the Internet to find help.

No matter what software problems you encounter, chances are it's happened to someone else. So there's a good chance you can find help on the Internet. Here are a few places to get started:

- Search for answers: In your search engine query, include the software program name and version, the problem you encountered, and the circumstances under which the problem occurred. If you received a specific error message, enter the exact error message text, along with the name of the application.
- Check the vendor's website: Most software vendors provide some form of product help, such as answers to frequently asked questions, product documentation, or user discussion forums.
- Check other websites: TechSoup's article Learning About Technology Online lists a number of other websites that offer technology tutorials, articles, and discussion forums.

5. Undo any recent hardware or software changes.

Changes to software and hardware can sometimes cause software problems, such as:

- Conflicts with other software: Newly installed software may conflict with other software. For example, Symantec Norton Antivirus can conflict with competing antivirus products. So, if you recently installed another antivirus program and Norton Antivirus no longer works correctly, uninstalling the other antivirus product could solve your problem.
- Changes to computer settings: Undo any recent changes to your computer's settings, and try launching the software again. For example, the Windows Control Panel includes an option to "Set Program Access and Defaults," which allows you to disable access to certain applications. If you accidentally disable access to a program here, the program may not run.
- **Conflicts with new or improperly configured hardware,** such as scanners and printers. If you've recently connected new hardware to one of your computers, try disconnecting the hardware and see if that corrects the software issue.

6. Uninstall the software, then reinstall it.

Sometimes, software problems occur because critical application files have been removed, updated, or deleted. For example, many Windows applications use Dynamic Link Library (DLL) files to perform basic tasks. Often, several applications will use the same DLL file. If you've recently removed one program from your computer, it's possible you removed DLL files that another program relied on. Similarly, adding a program could add or update DLL files. Applications that were dependent on those DLL files may become unstable or stop working entirely.

To ensure that all the necessary files are intact, you can completely uninstall the problematic software, then reinstall it. Even if you remove a program using its built-in uninstall wizard (if it includes one), it's still a good idea to check your hard drive's Program Files folder — usually located on the C drive — for any remnants of the program, and delete any files or folders you find.

Before reinstalling, check to see if there's a new version of the program available. The vendor or developer might have introduced bug fixes that address the issue you're having.

7. Look for software patches.

Software vendors may also fix bugs by issuing patches — small software updates that address known problems. Even if you're using the most current version of the software, there may be a more recent patch available for that version.

8. Scan for viruses and malware.

Viruses, spyware, and other forms of malicious software (or "malware") can cause software to freeze, crash, or quit working entirely.

If tips 1 through 8 haven't helped solve your software problem, you may also want to scan the computer using both antivirus and anti-malware tools to find and remove viruses and malware. Use the most thorough scan mode available, and remember to restart your machine if the antivirus or anti-malware programs found any threats.

9. Check for a firewall conflict.

Some organizations may choose to install personal firewall software on each computer, rather than a centralized hardware or software-based firewall. Personal firewalls can be an important line of defense against hackers and other security threats, but they can also cause software conflicts.

Firewalls frequently display messages asking whether it should allow a program to run or block it. Therefore, it's possible to accidentally tell the personal firewall to block a program from running. Check the firewall's settings to see if the problematic software was added to the firewall's list of programs to block. If so, change the firewall's settings to allow the software to run, then check to see if you're still having issues with your software.

10. Boot up in Safe Mode.

Some software malfunctions can be caused by OS settings or other system problems. Windows and Mac operating systems both offer a troubleshooting environment known as Safe Mode. Safe Mode disables non-critical applications and processes, which theoretically makes it easier to isolate problems.

Most Windows computers allow you to enter Safe Mode by pressing the F8 key as your computer is booting up. On a Mac, enter Safe Mode by pressing the Shift key while your computer boots up (or immediately after it boots up).

Once your computer is in Safe Mode, launch the problematic software and try to replicate the problem you had while your computer was in normal mode. If you don't have the same problem in safe mode, there's a good chance that the issue was caused by your OS or another program, not by the application you are troubleshooting.

11. Defragment your hard drive.

As a final troubleshooting step, you might defragment your computer's hard drive. Defragmenting rearranges your hard drive's file structure so that the system runs more efficiently. Defragmenting will probably be most useful if you're experiencing overall sluggishness on your computer, because defragmenting is meant to make your entire system run faster. Note that defragmenting a hard drive applies primarily to Windows-based computers.

Most recent Windows editions — including XP, Vista, and Windows 7 — include a built-in disk-defragmentation tool. To launch it, go to Start > All Programs > Accessories > System Tools > Disk Defragmenter. Be aware that defragmenting a hard drive can be time-consuming, so make sure to perform this task when you will be away from your computer for a few hours.

Trying quick solutions first.

Notes/Explanation

After you have verified the obvious issues, try some quick solutions:

- Reboot the computer or network device.
- Check that the antivirus and spyware signature files are up-to-date.
- Scan the computer with protection software.
- Check the computer for the latest operating system patches and updates.
- Disconnect from the network.
- Change your password.

Evaluation of the problem and implementation of the solution

After you have determined the exact cause of the problem, establish a plan of action to resolve the problem and implement the solution. Sometimes quick procedures can determine the exact cause of the problem or even correct the problem. If a quick procedure does correct the problem, you can go to step 5 to verify the solution and full system functionality. If a quick procedure does not correct the problem, you might need to research the problem further to establish the exact cause.

Evaluate the problem and research possible solutions. Divide larger problems into smaller problems that can be analyzed and solved individually. Prioritize solutions starting with the easiest and fastest to implement. Create a list of possible solutions and implement them one at a time. If you implement a possible solution and it does not work, reverse the solution and try another.

LO 2.3: Test the computer Software

- **Content/Topic 1: Description of Software Testing Methods**

Software testing is as old as the hills in the history of digital computers. The testing of software is an important means of assessing the software to determine its quality. Since testing typically consumes 40~50% of development efforts, and consumes more effort for systems that require higher levels of reliability, it is a significant part of the software engineering. With the development of Fourth generation languages (4GL), which speeds up the implementation process, the proportion

of time devoted to testing increased. As the amount of maintenance and upgrade of existing systems grow, significant amount of testing will also be needed to verify systems after changes are made. Despite advances in formal methods and verification techniques, a system still needs to be tested before it is used. Testing remains the truly effective means to assure the quality of a software system of non-trivial complexity, as well as one of the most intricate and least understood areas in software engineering. Testing, an important research area within computer science is likely to become even more important in the future.

Black Box Testing Vs. White Box Testing: Key Differences

Black Box testing

In Black-box testing, a tester doesn't have any information about the internal working of the software system. Black box testing is a high level of testing that focuses on the behavior of the software. It involves testing from an external or end-user perspective. Black box testing can be applied to virtually every level of software testing: unit, integration, system, and acceptance.

White Box testing

White-box testing is a testing technique which checks the internal functioning of the system. In this method, testing is based on coverage of code statements, branches, paths or conditions. White-Box testing is considered as low-level testing. It is also called glass box, transparent box, clear box or code base testing. The white-box Testing method assumes that the path of the logic in a unit or program is known.

Parameter	Black Box testing	White Box testing
Definition	It is a testing approach which is used to test the software without the knowledge of the internal structure of program or application.	It is a testing approach in which internal structure is known to the tester.
Alias	It also knowns as data-driven, box testing, data-, and functional testing.	It is also called structural testing, clear box testing, code-based testing, or glass box testing.
Base of Testing	Testing is based on external expectations; internal behavior of the application is unknown.	Internal working is known, and the tester can test accordingly.
Usage	This type of testing is ideal for higher levels of testing like System Testing, Acceptance testing.	Testing is best suited for a lower level of testing like Unit Testing, Integration testing.
Programming knowledge	Programming knowledge is not needed to perform Black Box testing.	Programming knowledge is required to perform White Box testing.
Implementation knowledge	Implementation knowledge is not requiring doing Black Box testing.	Complete understanding needs to implement WhiteBox testing.

Parameter	Black Box testing	White Box testing
Automation	Test and programmer are dependent on each other, so it is tough to automate.	White Box testing is easy to automate.
Objective	The main objective of this testing is to check what functionality of the system under test.	The main objective of White Box testing is done to check the quality of the code.
Basis for test cases	Testing can start after preparing requirement specification document.	Testing can start after preparing for Detail design document.
Tested by	Performed by the end user, developer, and tester.	Usually done by tester and developers.
Granularity	Granularity is low.	Granularity is high.
Testing method	It is based on trial and error method.	Data domain and internal boundaries can be tested.
Time	It is less exhaustive and time-consuming.	Exhaustive and time-consuming method.
Algorithm test	Not the best method for algorithm testing.	Best suited for algorithm testing.
Code Access	Code access is not required for Black Box Testing.	White box testing requires code access. Thereby, the code could be stolen if testing is outsourced.
Benefit	Well suited and efficient for large code segments.	It allows removing the extra lines of code, which can bring in hidden defects.
Skill level	Low skilled testers can test the application with no knowledge of the implementation of programming language or operating system.	Need an expert tester with vast experience to perform white box testing.
Techniques	Equivalence partitioning is Black box testing technique is used for Blackbox testing. Equivalence partitioning divides input values into valid and invalid partitions and selecting corresponding values from each partition of the test data. Boundary value analysis	Statement Coverage, Branch coverage, and Path coverage are White Box testing technique. Statement Coverage validates whether every line of the code is executed at least once. Branch coverage validates whether each branch is executed at least once

Parameter	Black Box testing	White Box testing
	checks boundaries for input values.	Path coverage method tests all the paths of the program.
Drawbacks	Update to automation test script is essential if you to modify application frequently.	Automated test cases can become useless if the code base is rapidly changing.

Key Difference

In Black Box, testing is done without the knowledge of the internal structure of program or application whereas in White Box, testing is done with knowledge of the internal structure of program.

Black Box test doesn't require programming knowledge whereas the White Box test requires programming knowledge.

Black Box testing has the main goal to test the behavior of the software whereas White Box testing has the main goal to test the internal operation of the system.

Black Box testing is focused on external or end-user perspective whereas White Box testing is focused on code structure, conditions, paths and branches.

Black Box test provides low granularity reports whereas the White Box test provides high granularity reports.

Black Box testing is a not time-consuming process whereas White Box testing is a time-consuming process.

- **Software Testing Techniques**

Comparison testing, an oft-repeated phrase and a type of testing that evokes our attention. Let's get into the details of how the comparison test is performed and what it actually means in real time.

Comparison Testing

Comparison testing is all about assessing the strengths and weaknesses of a software product with respect to other software products existing in the market. The goal of comparison testing is to provide pivotal and critical information to the business to unravel the software product's competitive advantage in the market Vis-a-vis loopholes.

Phases

This testing can be performed in two distinct phases:

- ≈ Comparing software product against known standards or benchmarks
- ≈ Comparing software product with specific features of other existing software products

a) For Example, if a Siebel CRM application is being tested, we know that any CRM application has modules that broadly deal with capturing customer details, processing customer orders, managing customer requests and customer issues.

In the first phase of testing, we can test the functionality of the application against known standards and functionality as existing in the market at the time of testing.

We can ask questions like:

Does the application have all modules which a CRM application should have?

Do the modules perform basic functionality as expected?

We will evolve test scenarios in such a way that the test results validate the functionality of the application as against already known standards in the market.

b) In **the second phase of testing**, we can compare the features of an application as against the features of other software products in the market.

Model Based Testing

Model based testing is a software testing technique where run time behavior of software under test is checked against predictions made by a model. A model is a description of a system's behavior. Behavior can be described in terms of input sequences, actions, conditions, output and flow of data from input to output. It should be practically understandable and can be reusable; shareable must have a precise description of the system under test.

There are numerous models available and it describes different aspects of the system behavior. Examples of the model are:

- Data Flow
- Control Flow
- Dependency Graphs
- Decision Tables
- State transition machines

Model-Based Testing describes how a system behaves in response to an action (determined by a model). Supply action, and see, if the system responds as per the expectation.

- **Know factors impacting computer performance**

You may be wondering why your computer is slow at times and there are other times when it is fast in processing. This could be caused by a number of factors. They include: the speed of the CPU, the space on the hard disk, the size of the RAM, the type of the graphics card, the speed of the hard disk,, if the computer is multitasking, the defragmenting files.

1) The speed of the CPU

The speed of the CPU is also known as the clock speed of the CPU. The clock speed of the CPU is the frequency of which the processor executes instructions or the frequency by which data is processed by the CPU. It is measured in millions of cycles per second or megahertz (MHz). If the Clock speed of the CPU is fast then definitely the performance of the computer will be affected positively, in other words the computer will carry out processing functions at a faster pace.

2) The size of the RAM (Random Access Memory)

The RAM is referred to as the active part of the computer. This is because the RAM has the capability of storing data that the computer is currently using, because of the fact that it is fast to retrieve data stored in the RAM. With the definition above, a large RAM size will mean a faster computer performance and a smaller RAM size will result to slower computer performance.

3) The speed of the hard disk

The hard disk speed is defined as the rate at which material and content can be read and written on it. The hard disk speed of different hard disks is not consistent because they vary by manufacturer, drive type and the use of the hard disk. It therefore means that the higher the speed of the hard disk the faster the performance of the computer and vice versa.

4) Hard disk space

The bigger the space on the hard disk will result to faster performance of the computer. The smaller the space on the hard disk will result in a slower performance of the computer. The hard disk is filled with data this will use most of the memory leaving less memory for the operations of the processor.

5) Multiple applications running on the computer

Multi-tasking tends to slow down the performance of the computer because memory is used to support more than one applications compared to when one application has all the memory to itself. This means that the more applications that are running the slower the computer will perform. Likewise if less or one application is running the performance of the computer will be faster.

6) Type of graphic card

When it comes to quality of pictures and animations graphic cards are the main factors. So if a machine processes many graphics and it has a weak graphic card it will perform slower. This means that the more powerful the graphic card is the faster the performance of the computer.

7) Defragmenting files

Files that are broken or it takes long to read them will mean that the computer will have to defragment them first. This will slow down the performance of the computer.

- **Naming common software applications and uses**

Application software is a type of software that allows the user to perform a specific personal, educational, or business-related function. In short, application software refers to the computer programs that we use on a daily basis. Examples of these include the following:

- ✓ Word processing
- ✓ Spreadsheet
- ✓ Database
- ✓ Presentation
- ✓ Email
- ✓ Document management

- ✓ Web browsers

Word-processing software

Word-processing software is a type of program that allows the user to compose, edit, format, save and print typed documents. Let's take a look at some of the other features of word-processing software:

Graphics: Word processors contain a variety of different backgrounds, clipart and colours that can be used. It also allows you to add images, photos and videos obtained from an external source.

Templates: Word processors possess the ability to create templates that can be used to standardise documents. This is extremely useful if you have to write multiple documents that cover the same topics.

Spell checker: Word processors come equipped with a built-in spell checker that will check your spelling and grammar. You can update the spell-checker's database to include words that are not used very often, for example scientific names, such as Beauveria bassiana.

Thesaurus: Word processors come equipped with a built-in thesaurus that will suggest similar words to the word that you are currently using.

If you are writing a letter, doing an assignment, or making a few notes, there are a few word-processing software applications that you can use.

PAID	FREE	ONLINE	
Microsoft Word	LibreOffice	Google Docs	Office 365
			

Spreadsheet software

Spreadsheet software is a type of program that sorts, arranges and analyses data in a table format. The user enters data into the columns and then the software performs various calculations.

Let's take a look at some of the other features of spreadsheet software:

Forms: The user can create forms that can be used for a variety of applications, including time sheets, surveys and review forms.

Data analysis: The user can analyse the data that is entered into the workbook cells. This can be done using a variety of formulae available in the workbook, or through graphs (which can be created automatically with the Insert Graph function).

Conditional formatting: The user can customise the data based on the content of the cells in the workbook. This can be used to highlight errors, identify important patterns in data, or to keep track of activities (for example, to show which employees have not been signing in with their time sheets).

Sorting and filtering: Spreadsheets may contain a huge amount of data. To make it easier to find the data you need, spreadsheet software can sort and filter the data, based on your requirements.

PAID	FREE	ONLINE
Microsoft Excel 	LibreOffice 	Google Sheets 

Database software

Database software is designed to create and manage databases. A database is an organised collection of data, usually stored in the form of structured fields, tables and columns. With database software, the user can create, edit and maintain the database files, and sort, search for and retrieve information when needed.

Let's look at some of the other features of database software:

Security: One of the biggest concerns when working with data is how secure it is. With database software, a user can protect his or her data by giving only specific people access to the data.
Permanent storage: Database software makes it possible to create a database that can store data permanently. To help with this, the software is equipped with a file backup and recovery system.

PAID	FREE	ONLINE
Microsoft Access  Microsoft SQL Server 	MySQL 	Amazon SimpleDB 

Presentation software

Presentation software is specifically designed to help the user create and edit presentations in the form of a slide show. Presentations can include text, videos, or images.
Let's take a look at some of the features of presentation software:
Animation effects: Animation effects allow the user to add animations to the text and images on the slides. This helps to give the presentation a more interactive feel.

Slide notes: Slide notes allow the user to add notes and comments to each slide. This is especially useful to add a description for an image or video.

Transitions: Transitions allow the user to customize how the slides change when going from one slide to the next. This can help make the presentation “feel” like it is a video.

PAID	FREE	ONLINE
Microsoft PowerPoint	Apache OpenOffice Impress	Google Slides

Document management software

Document management software is a type of program that allows the user to store, manage, and track electronic documents and images. One of the ways in which this is done is by converting the document to a PDF format, as it prevents the user or recipients from mistakenly making any changes to the document.

Let’s take a look at some of the other features of document management software:

Password protection: This allows you to encrypt and protect your documents. Only people who have the correct password will be able to access and read the documents.

Restricted access: Restricting the access to your documents allows only certain people to view specific documents. As with password protection, this helps to protect your documents.

Version control: The software helps maintain version control by enabling you to see all the versions of a specific document, including its latest version.

Web browsers

A web browser is a software application that allows the user to access information on the internet. This is done by allowing the user to open and view web pages.

Examples of web browsers include the following:

- Microsoft Edge: This web browser comes pre-installed with any computer that runs on Windows 10.
- Google Chrome: This is a free web browser developed by Google.
- **Firefox:** This is a free open-source web browser developed by Mozilla.

- **Familiarizing with basic computer copyright laws and security issues**

Copyright refers to the rights of authors in works of authorship —as distinguished from patents (whose subject matter is inventions), trademarks (which concern symbols of an enterprise's reputation and goodwill) and trade secrets (information whose value derives from being kept secret). Copyright protects the expression in a work of authorship against copying. Copyright law does

Copyright Law

Copyright law promotes creativity in literature and the arts by affording authors and artists lengthy terms of protection (life of the author plus 70 years) against copying. Copyright law protects the expressive elements of a broad range of works—including books, graphical works, dramatic works, choreography, musical compositions, sound recordings, films, sculpture, architectural works, and computer programs—but does not extend to facts, ideas, or utilitarian aspects of such works. Copyright protection inheres upon the creation of original works of authorship fixed in a tangible medium of expression.

Learning Unit 3: Install OS, Application software

LO 3.1: Install the operating system

- **Content/Topic 1: Identification of software and hardware compatibility**

By now you know that all computers are made up of hardware and software. A computer will not function properly if it receives instructions from software that it cannot carry out. It is, therefore, very important that you get the correct software for your hardware.

Software compatibility

Software compatibility can refer to the compatibility that a particular software has running on a particular CPU architecture such as Intel or PowerPC. Software compatibility can also refer to ability for the software to run on a particular operating system. Very rarely is a compiled software compatible with multiple different CPU architectures. Normally, an application is compiled for different CPU architectures and operating systems to allow it to be compatible with the different system. Interpreted software, on the other hand, can normally run on many different CPU architectures and operating systems if the interpreter is available for the architecture or operating system. Software incompatibility occurs many times for new software released for a newer version of an operating system which is incompatible with the older version of the operating system because it may miss some of the features and functionality that the software depends on.

Hardware compatibility

Hardware compatibility can refer to the compatibility of computer hardware components with a particular CPU architecture, bus, motherboard or operating system. Hardware that is compatible may not always run at its highest stated performance, but it can nevertheless work with legacy components. An example is RAM chips, some of which can run at a lower (or sometimes higher) clock rate than rated. Hardware that was designed for one operating system may not work for another, if device or kernel drivers are unavailable. As an example, much of the hardware for macOS is proprietary hardware with drivers unavailable for use in operating systems such as Linux.

- **Content/Topic 2: Identification of software and hardware compatibility**

Operating systems are normally preloaded on the computer that you purchase. But it is possible to upgrade or install the operating system on your computer. There are three most common types of operating systems—Microsoft Windows, Mac OX, and Linux. For mobile devices, such as smartphones and tablet computers, the commonly used operating systems are Apple iOS and Google Android.

1. **Microsoft Windows**

It is a graphical user interface (GUI) based operating system. A typical desktop image of a computer system on which a Microsoft Window 10 is installed is shown in Figure In this GUI system, all the programs or commands of the operating system are available in the form of icons,

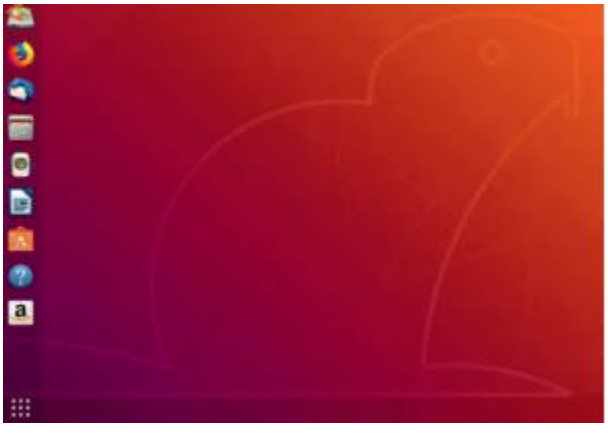
buttons, and menus. Everything within the operating system is clearly displayed on the screen by making a combination of graphics and text. Whenever we want to execute any command or program, then the corresponding icon needs to be clicked. There are various versions of Microsoft Windows OS available. Most recent version of Microsoft Windows OS is Windows 10, which was released in 2015. The earlier versions are Windows 8, released in 2010, and Windows 7, released in 2009. Microsoft Windows is one of the most popular operating

2. **Mac OS**

It is an operating system that is created by Apple. It is a preloaded OS on Macintosh computer or Macs. A typical image of a Mac desktop is shown in Figure 4.14. Observe that this operating system also has a graphical user interface (GUI). But the GUI of Mac OS is different from that of Microsoft Windows. All the commands and programs available in Mac OS are displayed in the form of icons or buttons. By clicking appropriate buttons, we can execute that program. There are various versions of Mac OS. Most recent version of Mac OS is OS X which is pronounced as OS 10. The latest version released on 24 September 2018 is Mac OS 10.14 and is named as Mojave (Liberty). The earlier versions of Mac OS are OS X 10.11: El Capitan (Gala) released on 30 September 2015, OS X 10.10: Yosemite (Syrah) released on 16 October 2014, OS X 10.9 Mavericks (Cabernet) released on 22 October 2013, OS X 10.8 Mountain Lion (Zinfandel) released on 25 July 2012, and OS X 10.7 Lion (Barolo) released on 20 July 2011.

3. **Linux**

It is a family of open source operating systems. It means that it can be modified and distributed by anyone around the world. Earlier OS that we have discussed such as Windows and Mac OS are proprietary software.



It means that they can be modified only by the company that owns it. Whenever you want to use proprietary software on your computer system, you need to purchase it by paying a cost so that you can get a user license. Linux is a freeware, meaning that you need not to pay any cost and you can use it on your computer system. A typical desktop image that runs Linux is shown in Figure 4.15. Observe that Linux is also available in the form of GUI. Every program in the Linux OS is displayed in the form of an icon, button, or graphics. By clicking on the icon or button, we can execute that program. There are many distributors of Linux, for example Ubuntu, Linux Mint, Fedora, Suse, Red Hat, and so on.

Identification of media storage

you can create several kinds of media that can be used to deploy operating systems. This includes capture media that is used to capture operating system images and stand-alone, pre-staged, and bootable media that is used to deploy an operating system. By using media, you can deploy operating systems on computers that do not have a network connection or that have a low bandwidth connection to your Configuration Manager site.

CD-ROM/DVD-ROM

Whenever you see “CD-ROM” in this manual, it applies to both CD-ROMs and DVD-ROMs, because both technologies are really the same from the operating system's point of view.

CD-ROM based installation is supported for most architectures.

On PCs SATA, IDE/ATAPI and SCSI CD-ROMs are supported.

USB CD-ROM drives are also supported, as are FireWire devices that are supported by the ohci1394 and sbp2 drivers.

USB Memory Stick

USB flash disks a.k.a. USB memory sticks have become a commonly used and cheap storage device. Most modern computer systems also allow booting the debian-installer from such a stick. Many modern computer systems, in particular netbooks and thin laptops, do not have a CD/DVD-ROM drive anymore at all and booting from USB media ist the standard way of installing a new operating system on them.

Network

The network can be used during the installation to retrieve files needed for the installation. Whether the network is used or not depends on the installation method you choose and your answers to certain questions that will be asked during the installation. The installation system supports most types of network connections (including PPPoE, but not ISDN or PPP), via either HTTP or FTP. After the installation is completed, you can also configure your system to use ISDN and PPP.

You can also boot the installation system over the network without needing any local media like CDs/DVDs or USB sticks. If you already have a netboot-infrastructure available (i.e. you are already running DHCP and TFTP services in your network), this allows an easy and fast deployment of a large number of machines. Setting up the necessary infrastructure requires a certain level of technical experience, so this is not recommended for novice users.

Diskless installation, using network booting from a local area network and NFS-mounting of all local filesystems, is another option.

Hard Disk

Booting the installation system directly from a hard disk is another option for many architectures. This will require some other operating system to load the installer onto the hard disk. This method is only recommended for special cases when no other installation method is available.

- **Content/Topic 3: Installation of Operating System(0S)**

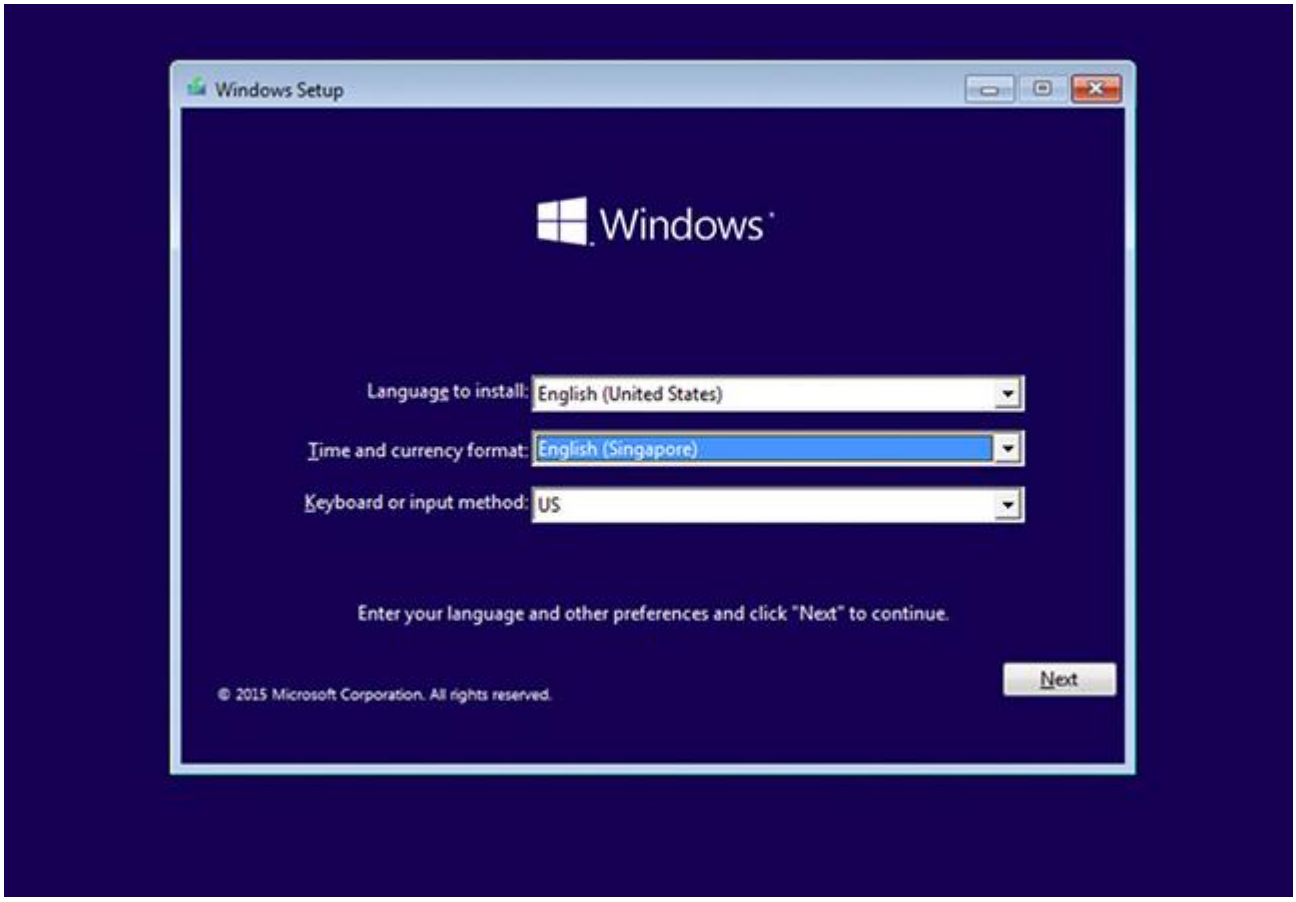
Introduction

Any computer system has an operating system. The user interacts with the machine via the operating system. An operating system (OS) is the software that provides an interface between the computer hardware and the application programs or users. An operating system is responsible for the management and coordination of activities and sharing of the resources in computer. The OS acts as a host for application programs that are run on the machine. As a host, one of the purposes of an OS is to handle the details of the operation of computer hardware. OS offers a number of services to application programs and users. Users may also interact with the OS by commands or using a graphical user interface (GUI). There are various types of operating systems, but all of them essentially perform the same functions. This Unit gives an overview of operating systems. Common OS include Microsoft Windows, Mac OS X, and Linux. The installation process of Microsoft Windows 10 and Ubuntu Linux operating system.

Lab: Steps to install Operating system

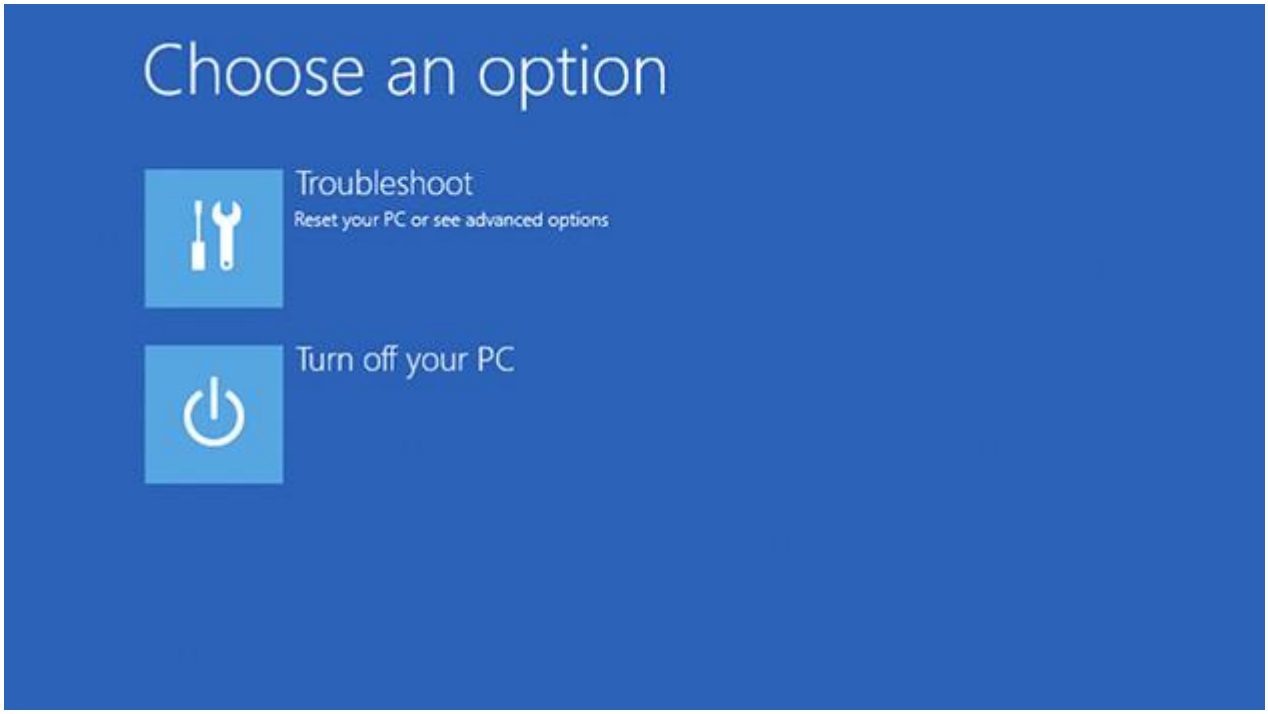
Windows 10 Installation

Step 1: This is the first screen you will see if you install Windows 10 using a bootable USB flash drive or DVD. Here's where you choose the OS' language, time and currency format, and input method.

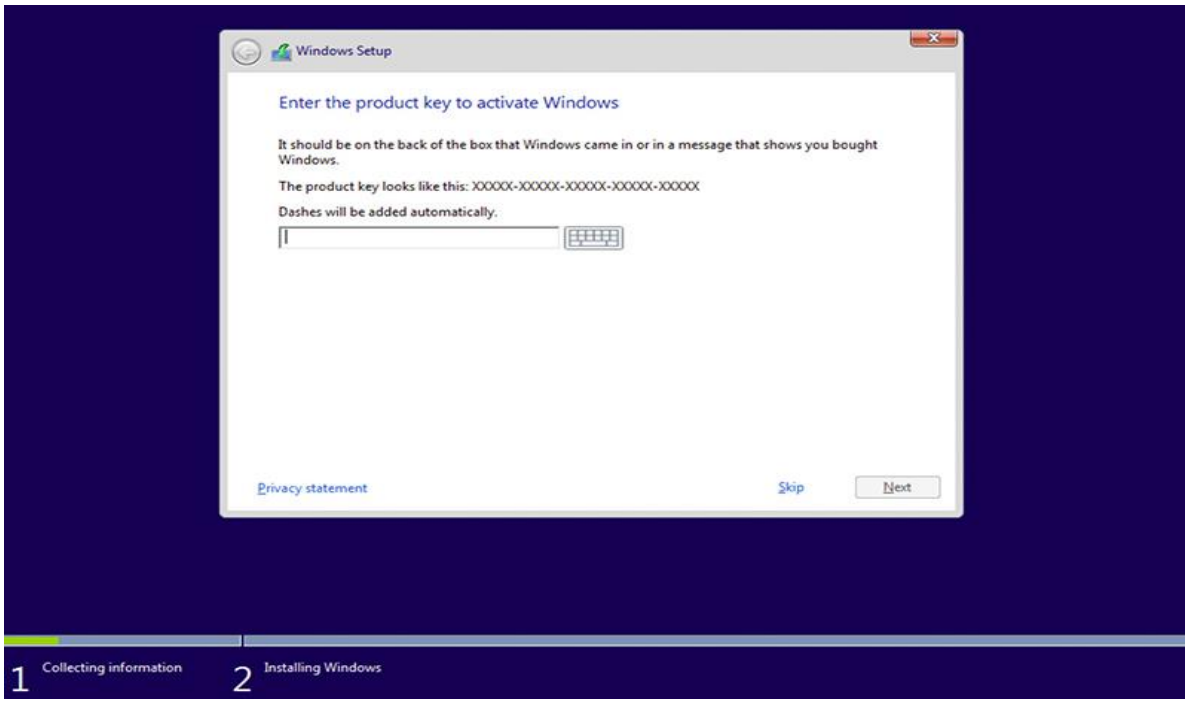


Step 2: It's pretty obvious what you need to click here. Like Windows 8.x, you can also choose to repair your computer.

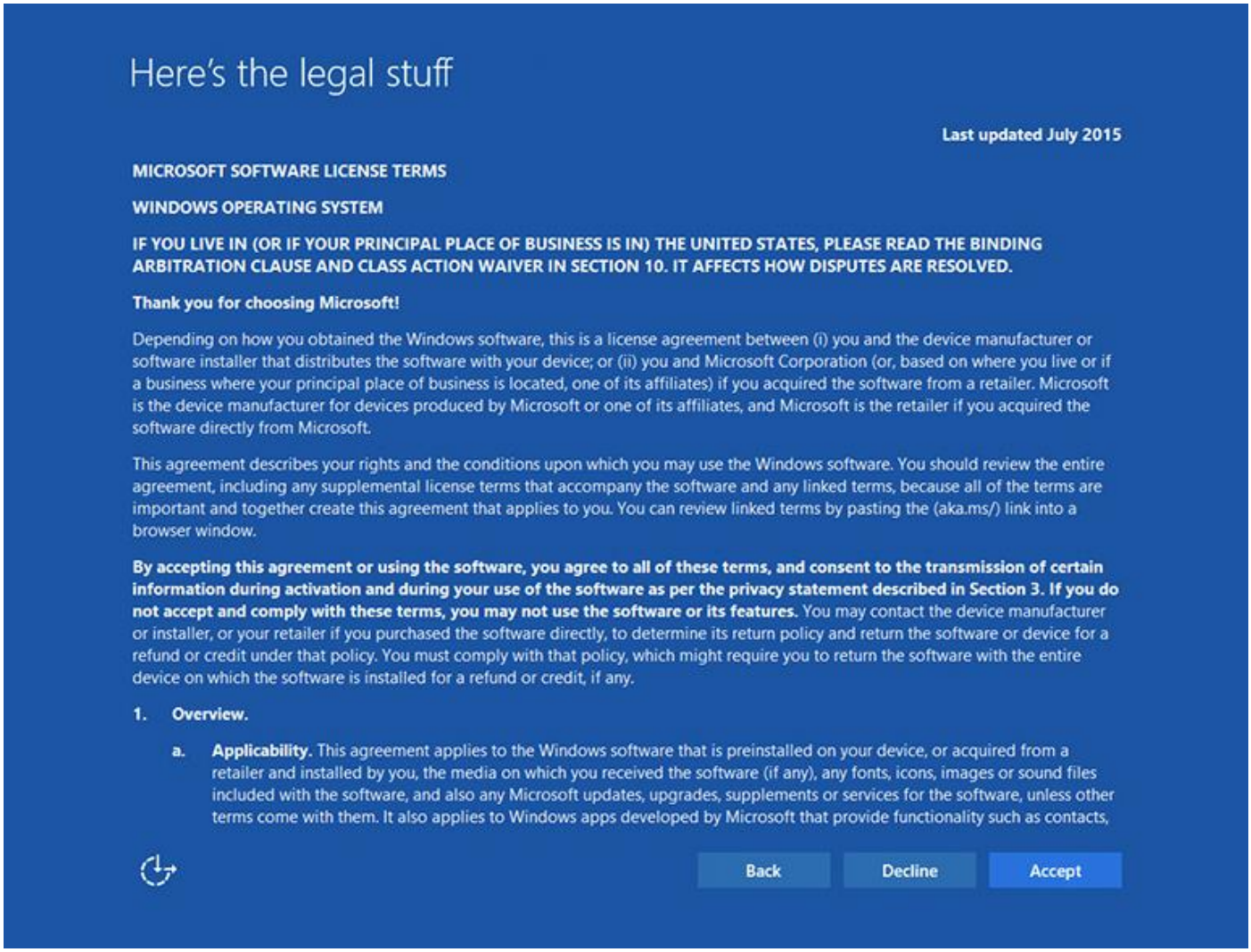
If you choose the repair option, you will end up at a Troubleshoot screen where you can choose to reset your PC and re-install windows (you can either keep or remove your files), or access more advanced troubleshooting options. For the latter, there are options for doing a system restore (if you've a restore point on your PC), image recovery, running commands in command prompt, and letting Windows fix any startup problems. You can also get to the advanced startup options after installation via the new Settings app in Windows 10.



Step 3: Traditionally, your Windows product key can be found on your online order info, in the confirmation email for your purchase, or on the DVD packaging. That said, this is more for a clean install. If your device has been successfully upgraded to Windows 10, and you choose to wipe your device and do a clean install later, the device will reactivate without the need of a Windows 8.x product key.

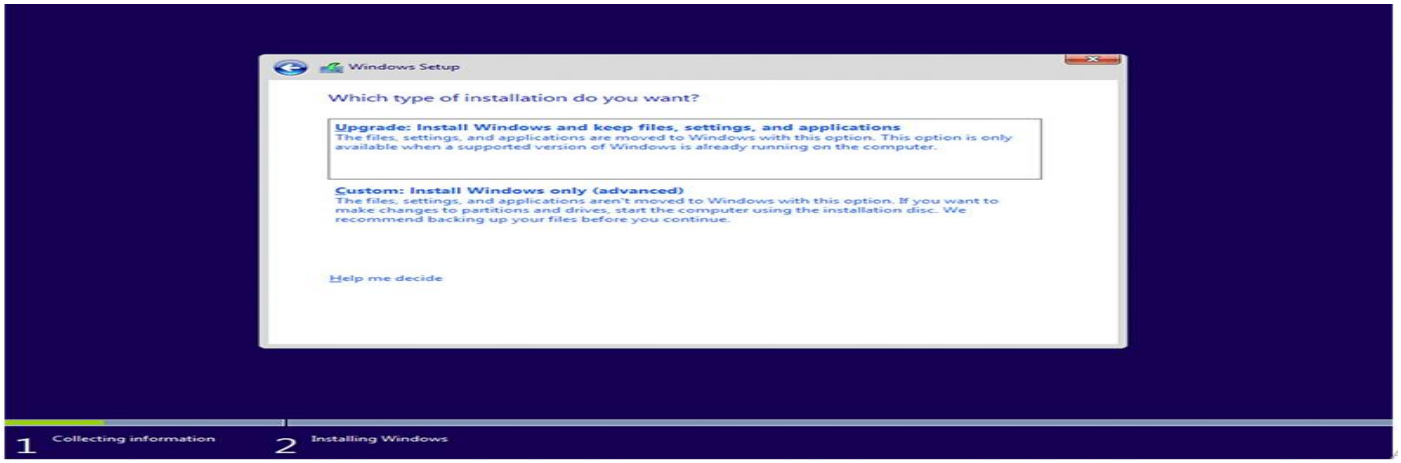


Step 4: Accept the license terms. After you read them, of course.

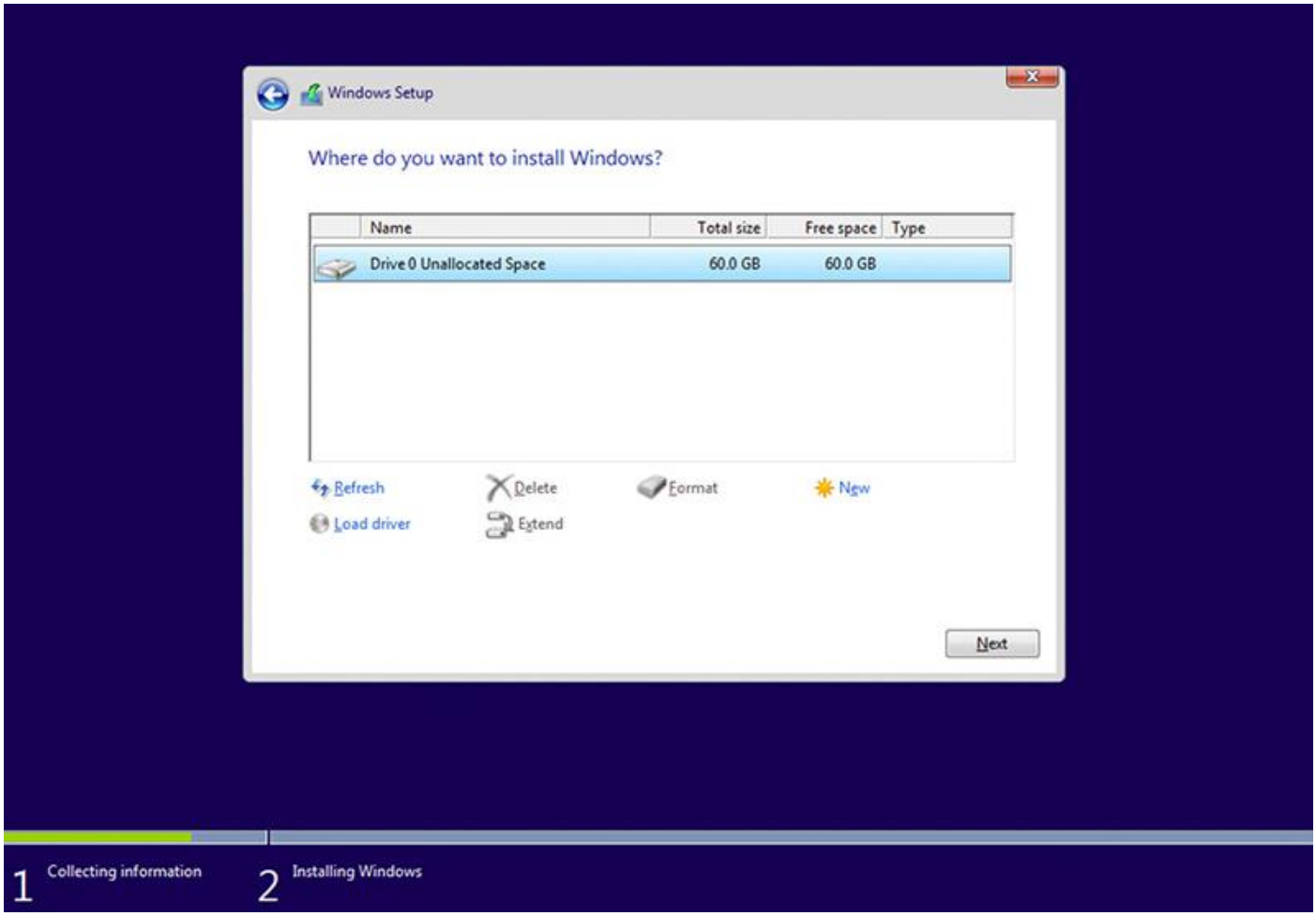


Step 5: Next, you'll be presented with this screen, where you can choose to do either an upgrade (files, settings, and apps are moved to Windows) or a custom install (files, settings, and apps aren't moved). The latter is the one to choose if you prefer a clean install, which was what we did.

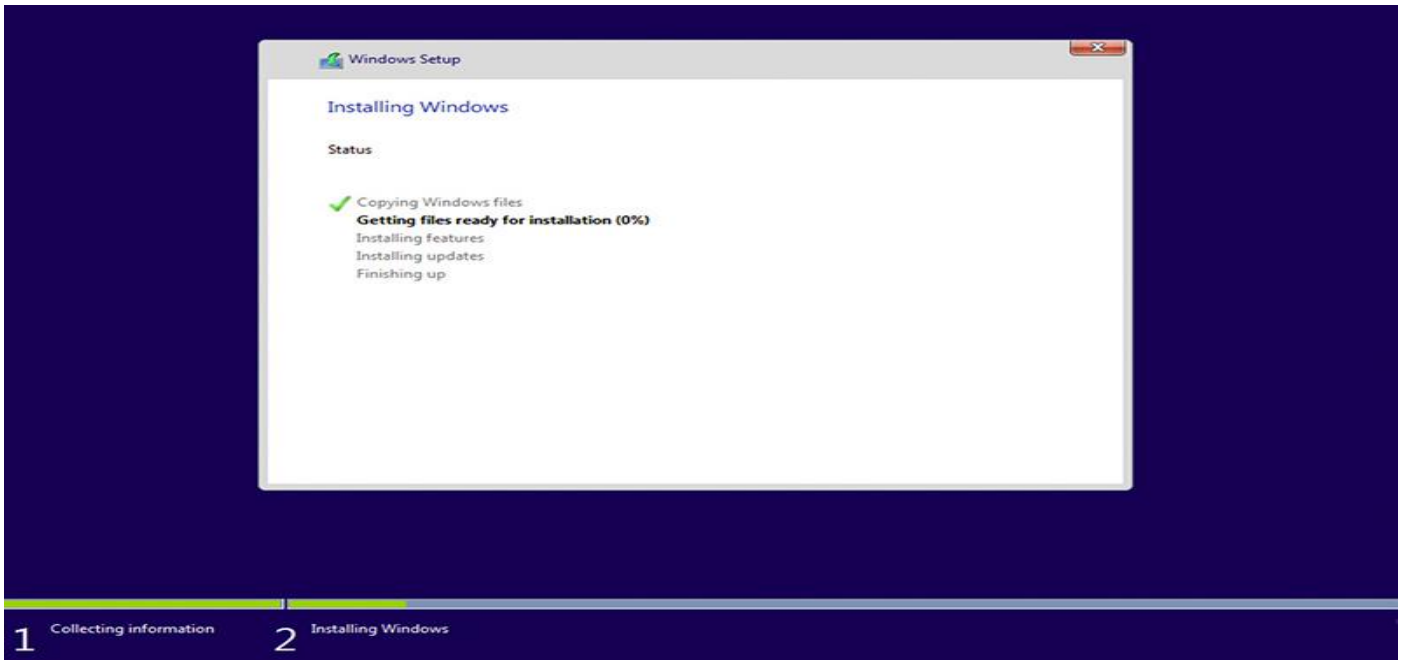
(Note: If you're doing an upgrade, and you're running Windows Media Center, Windows 10 will remove it.)



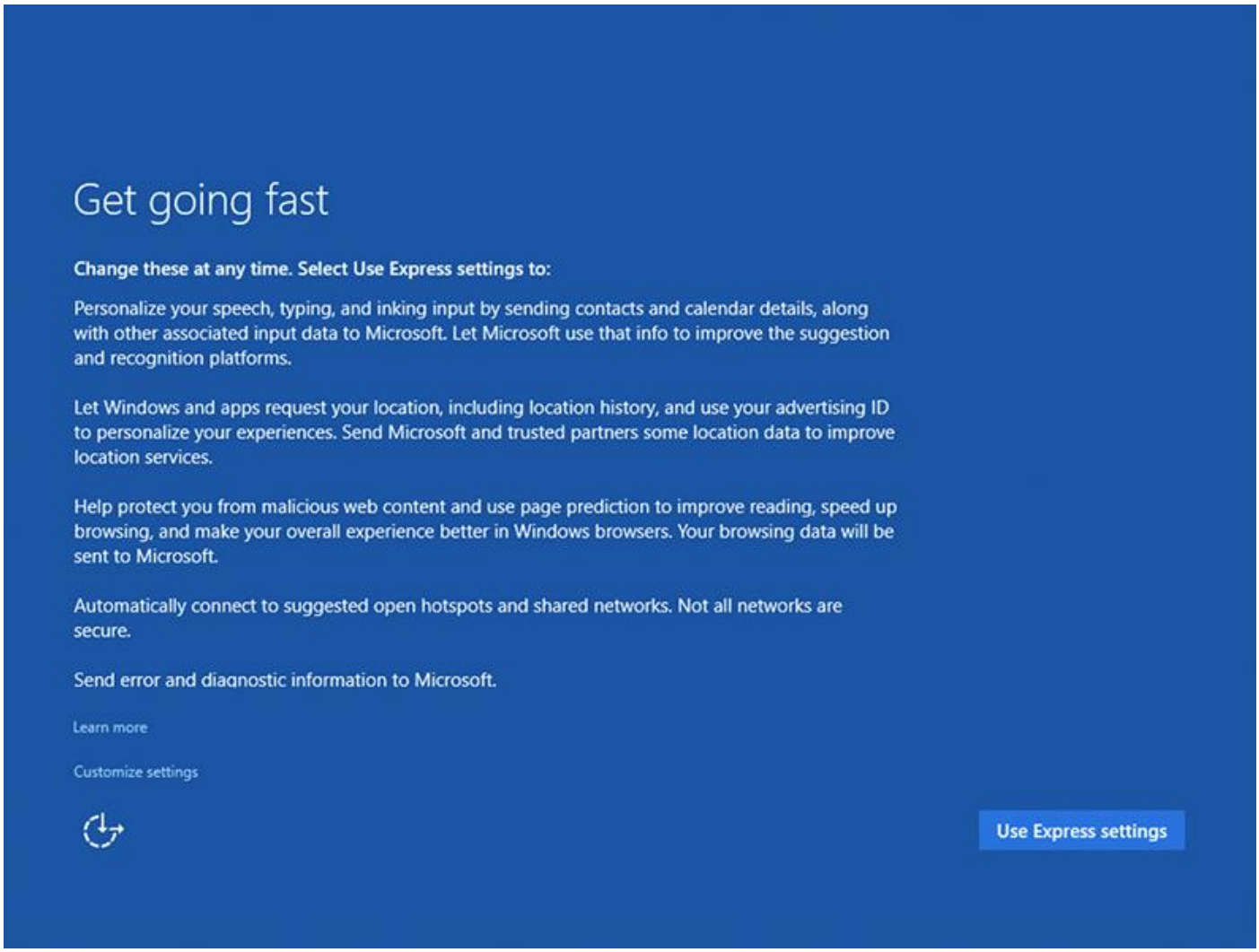
Step 6: Here's where you select the drive to install Windows 10 on. You can format a drive here as well.



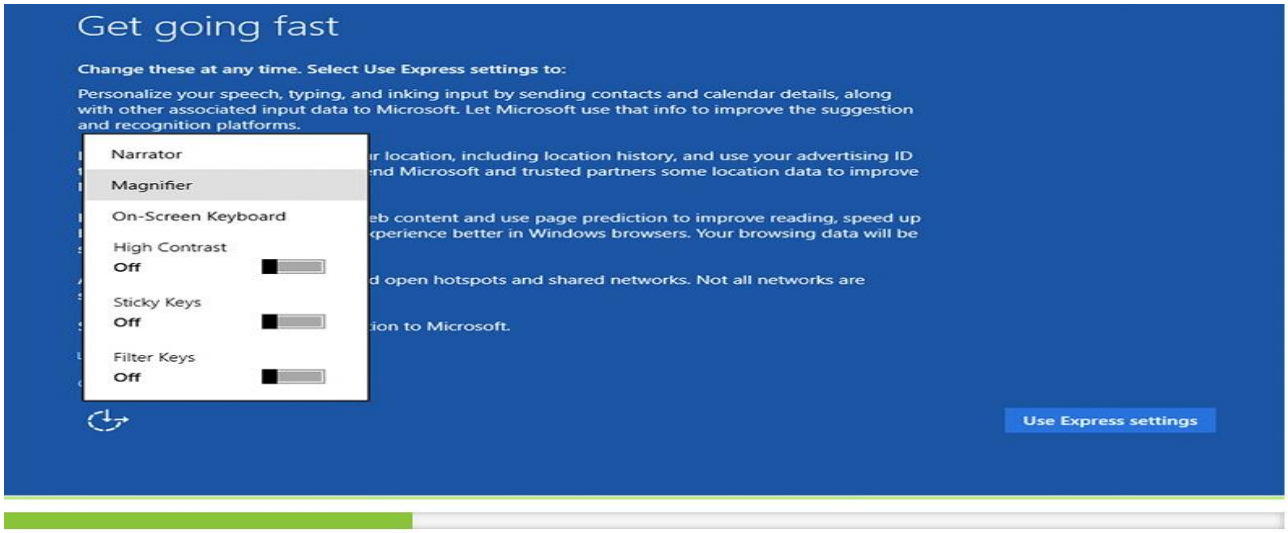
Step 7: Now, you wait.



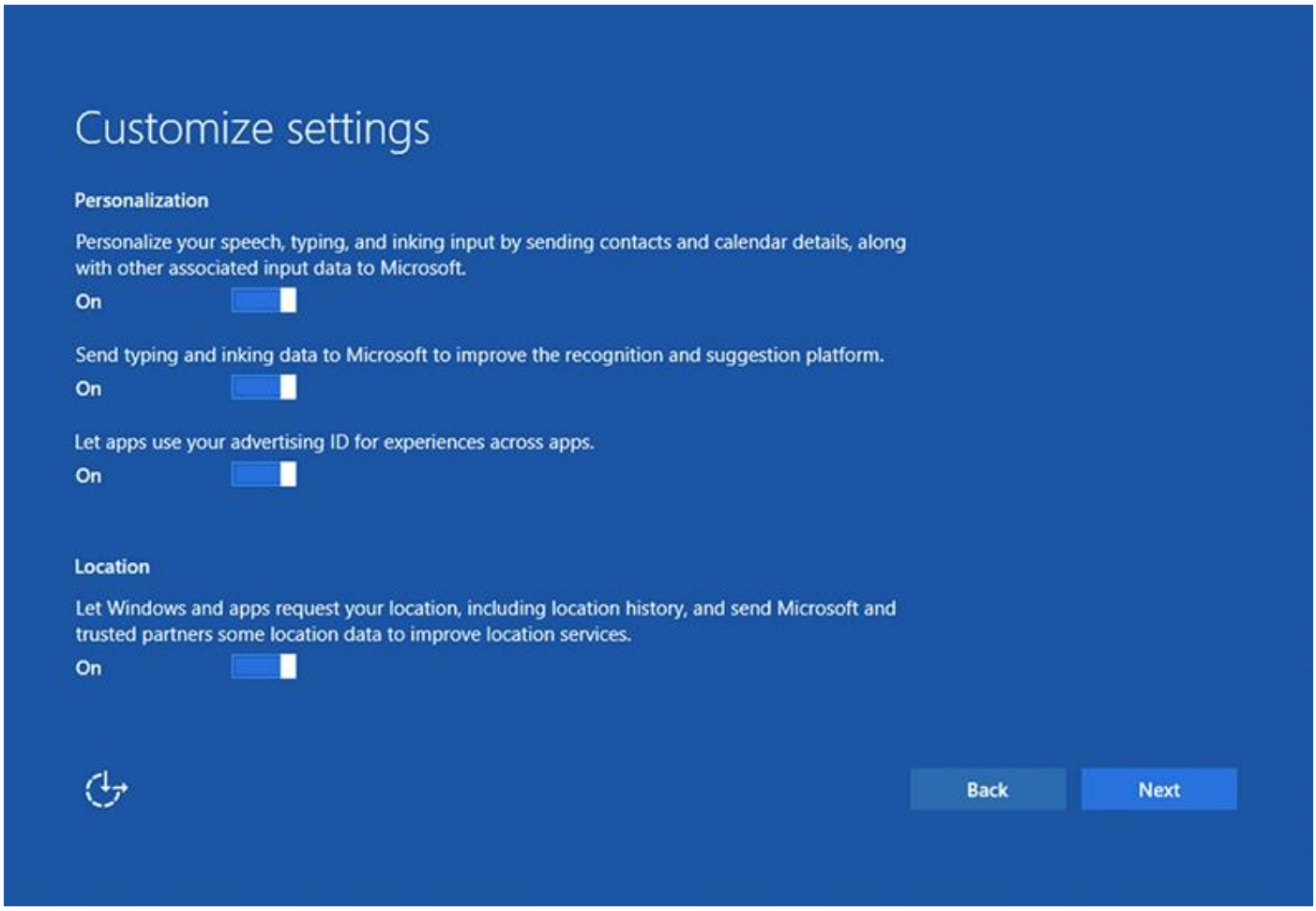
Step 8: Before you can start using Windows, there are some personalization, location, browser and protection, and connectivity and error reporting settings that you can adjust. You can zip through all these by using the Express settings, which basically turn everything on, or you can hit the small print that says 'Customize settings' to customize them. We went for the latter.



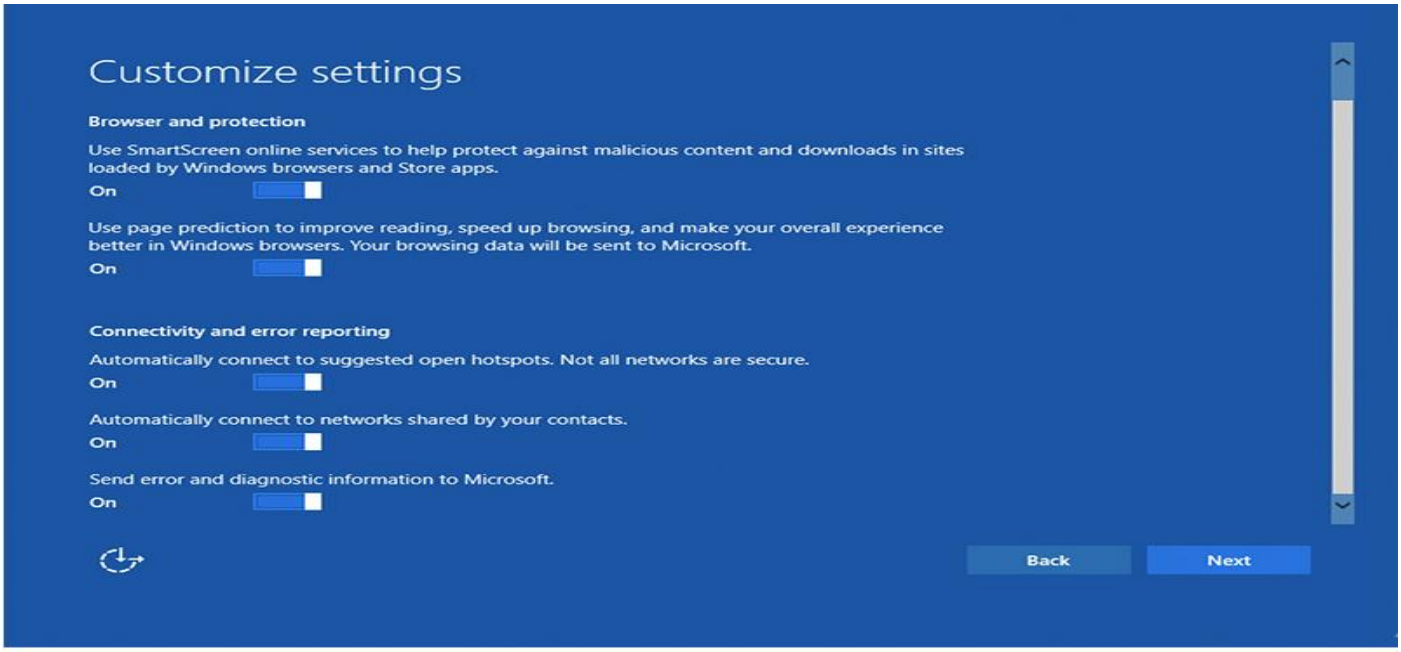
Oh, notice that little icon at the bottom left? Click on it to access an accessibility menu where you can turn on things like a narrator, magnifier, or increase the screen contrast.



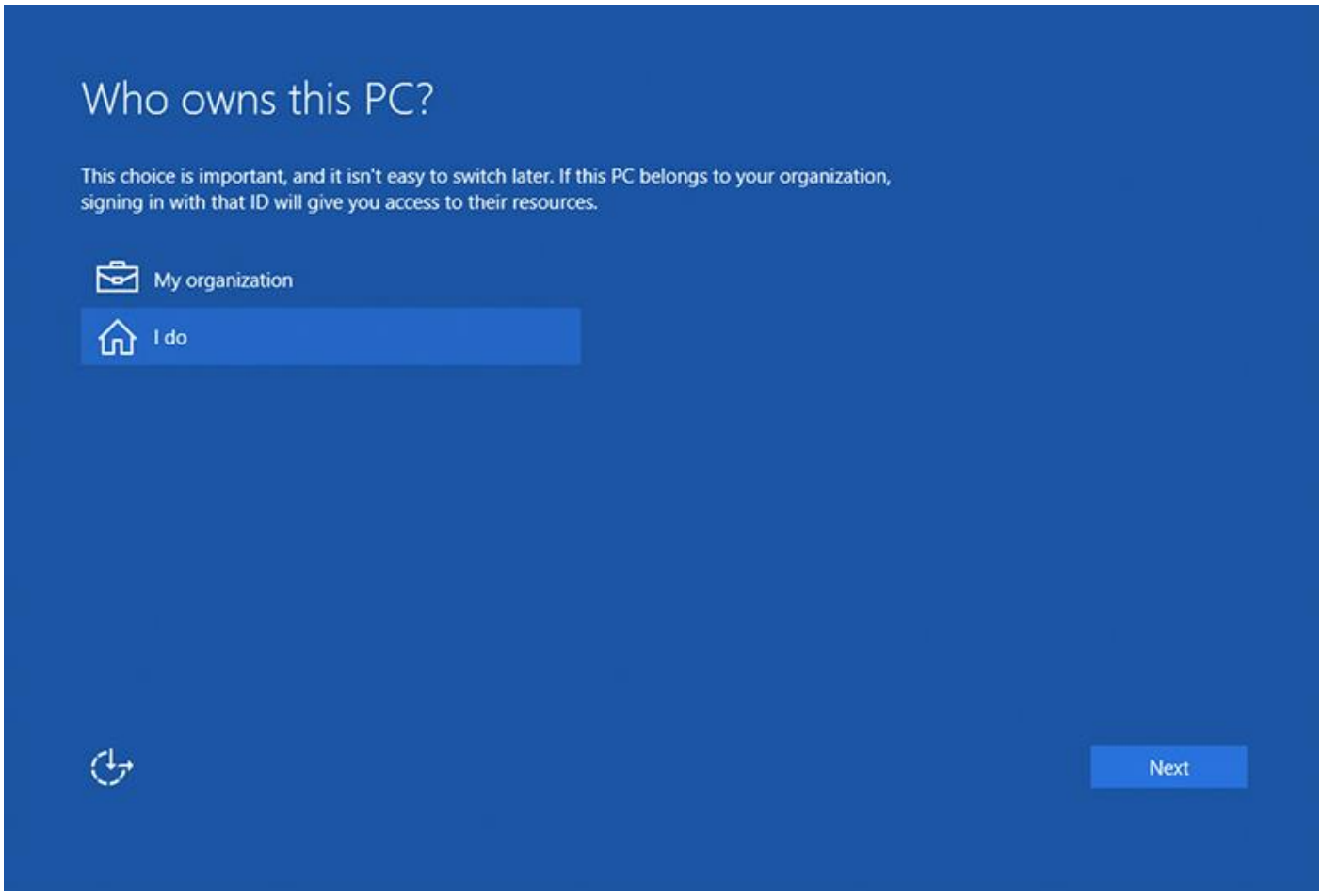
Step 9: If you choose to customize the settings, the first page deals with your contact, calendar, input, and location data. Read these carefully to decide if you want to turn the settings on or off.



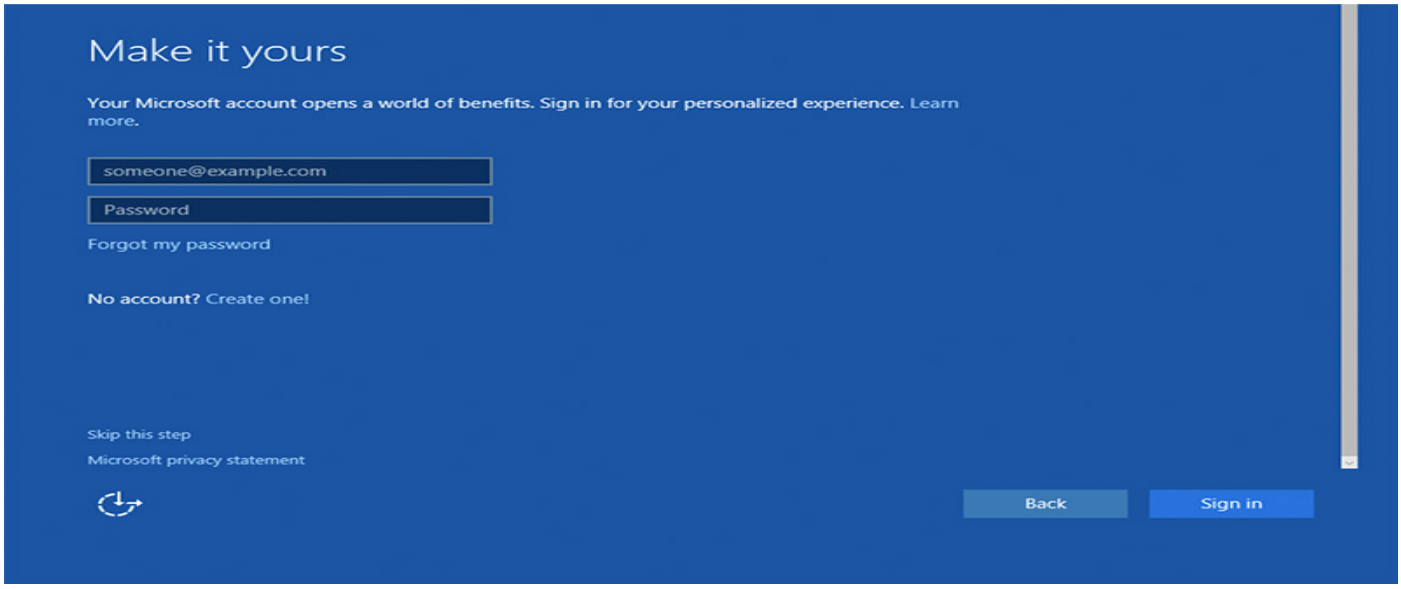
Step 10: The next page deals with browser data, connectivity, and error reporting. Again, read these carefully and toggle the switches accordingly.



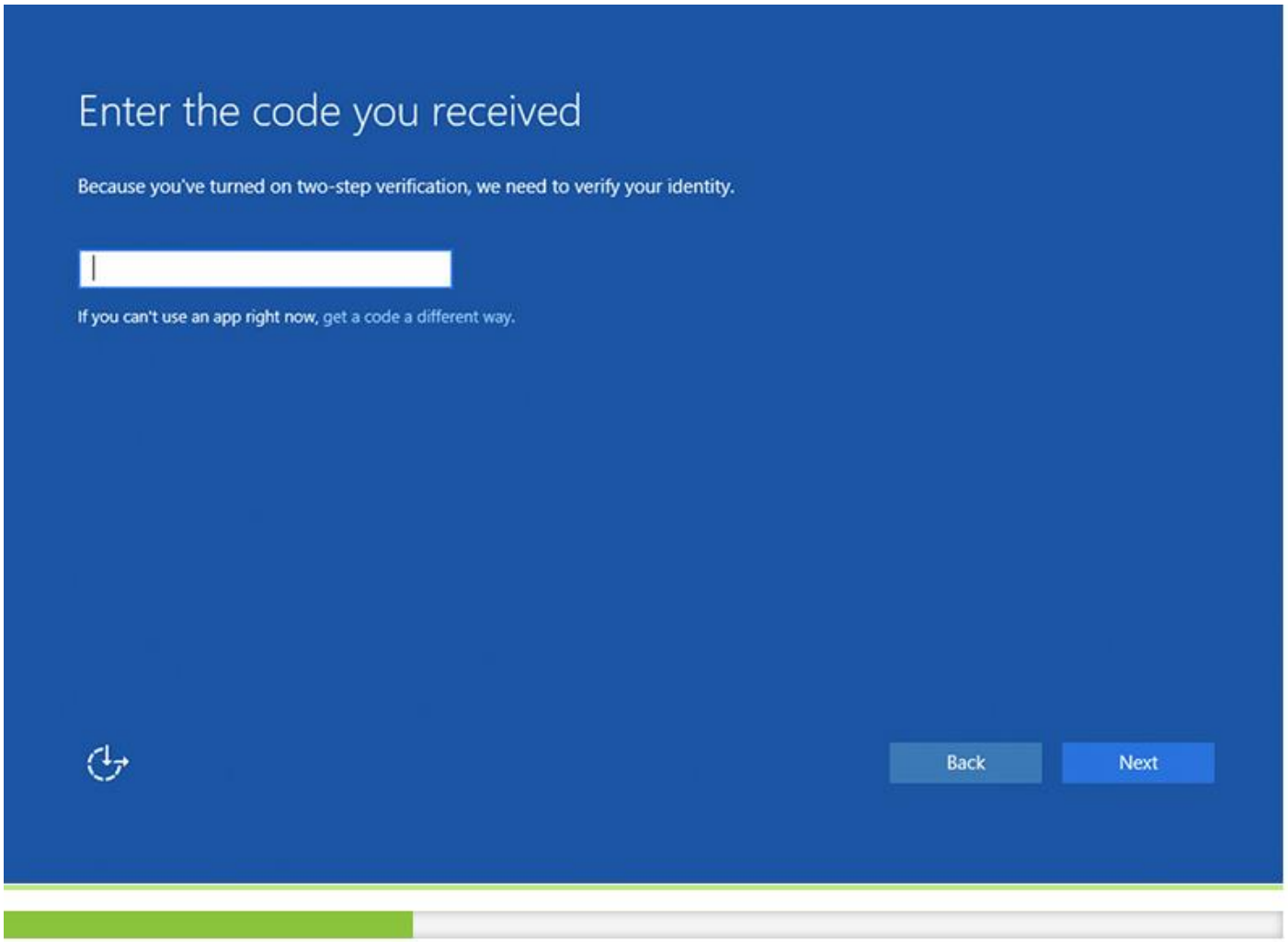
Step 11: Next, you need to specify who's the owner of the device. You can choose to sign in with your company ID, which will give you access to your company's resources.



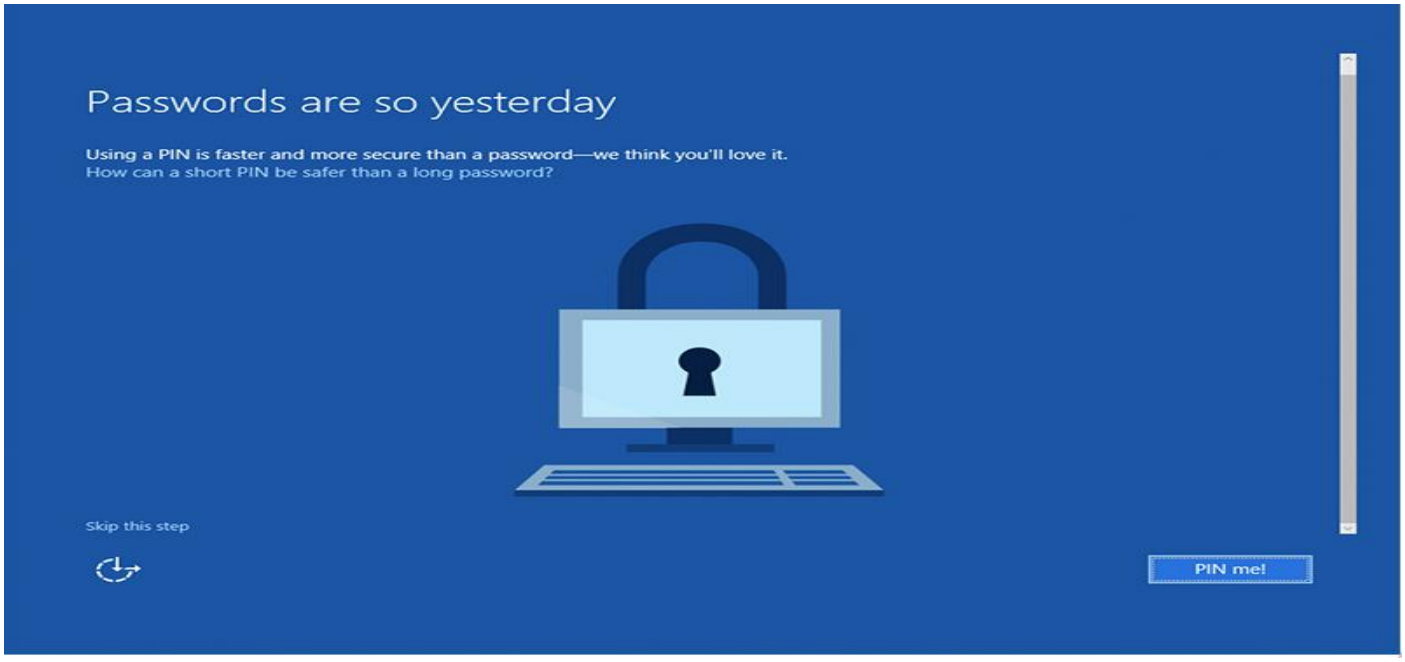
Step 12: Microsoft really wants you to sign in to Windows 10 with your Microsoft account. If you use Microsoft services like Office, Outlook.com, OneDrive, Skype, or Xbox, it makes sense to sign in with your Microsoft account as it ties them all up and makes your Windows experience more personal.



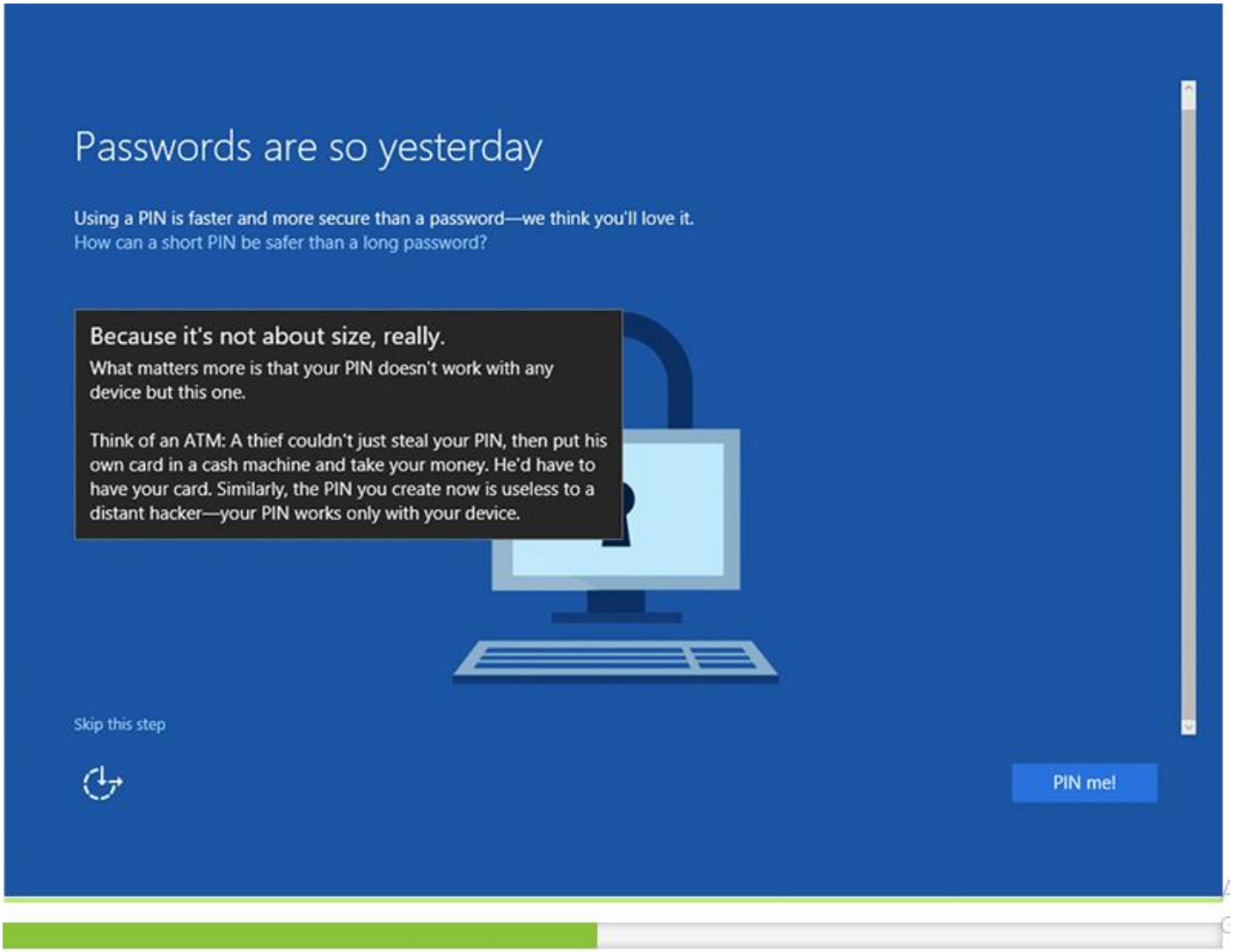
If you use two-factor authentication, you'll need to enter your code. If you don't have a Microsoft account, you can create one right away. Alternatively, you can sign in with a local account. Unlike Windows 8.x, apps like Mail will not force you to switch to a Microsoft account and stop you from using the app if you don't comply.



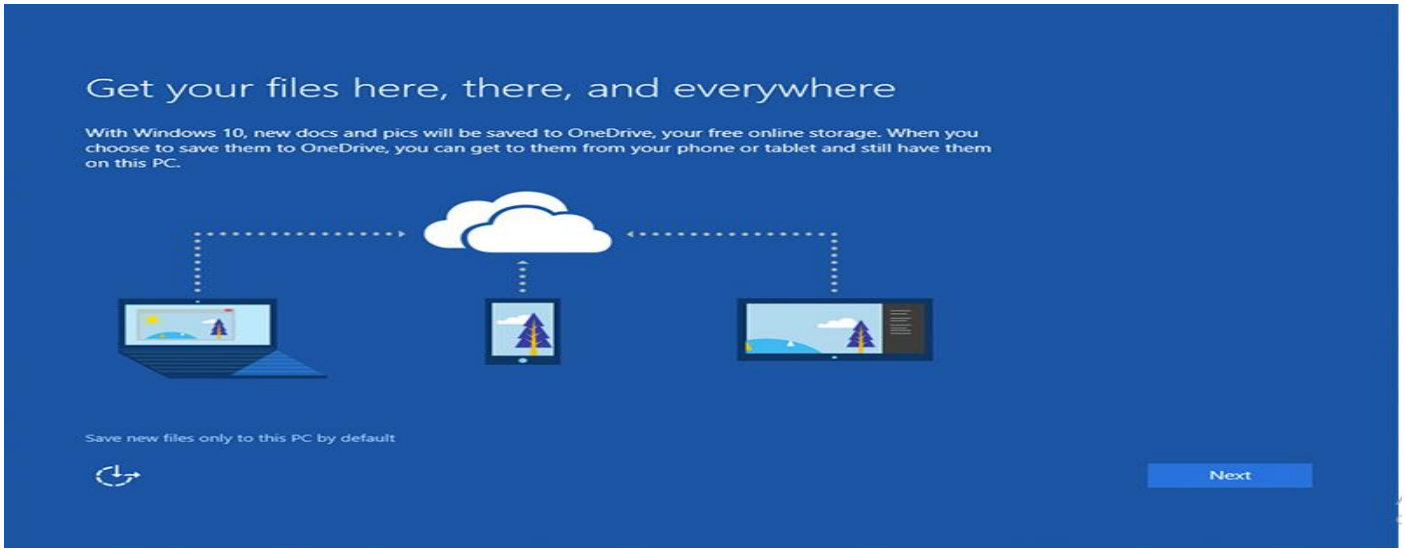
Step 13: Instead of signing in using your Microsoft account password, you've the option to create and use a short PIN instead.



In addition to easy typing, another benefit is that once created, this PIN only works on the device it's created on.



Step 14: Windows 10 will save new documents and pictures to OneDrive. If you're okay with that, just hit Next to continue. Else, you can click the small text that says 'Save new files only to this PC by default'.

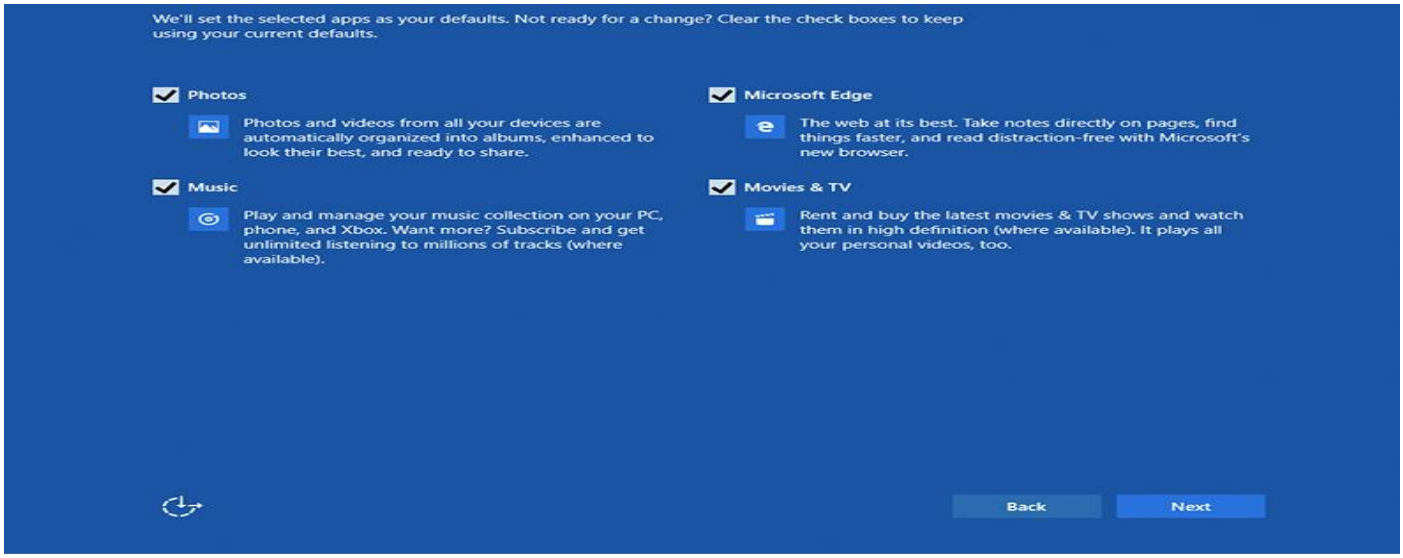


Step 15: You can also decide if you want to turn on the Cortana personal assistant feature. Some people may not want to use Cortana as this allows Microsoft to collect and use their location;

contacts; voice input; info from email and messages; browser history; search history; calendar details; and more. If you were to ask us, Cortana is one of the best features in Windows 10. And for it to be truly useful, it has to be granted access to such data. Here's a link to Microsoft's privacy statement.

(Note: Cortana is only available in select markets. Currently, Cortana on Windows 10 is only available for the U.S., U.K., China, France, Italy, Germany, and Spain.)

At some point, you'll also be asked if you want to set the built-in apps to be the default apps for certain tasks. Simply untick the checkboxes for those that you don't want the installer to change.

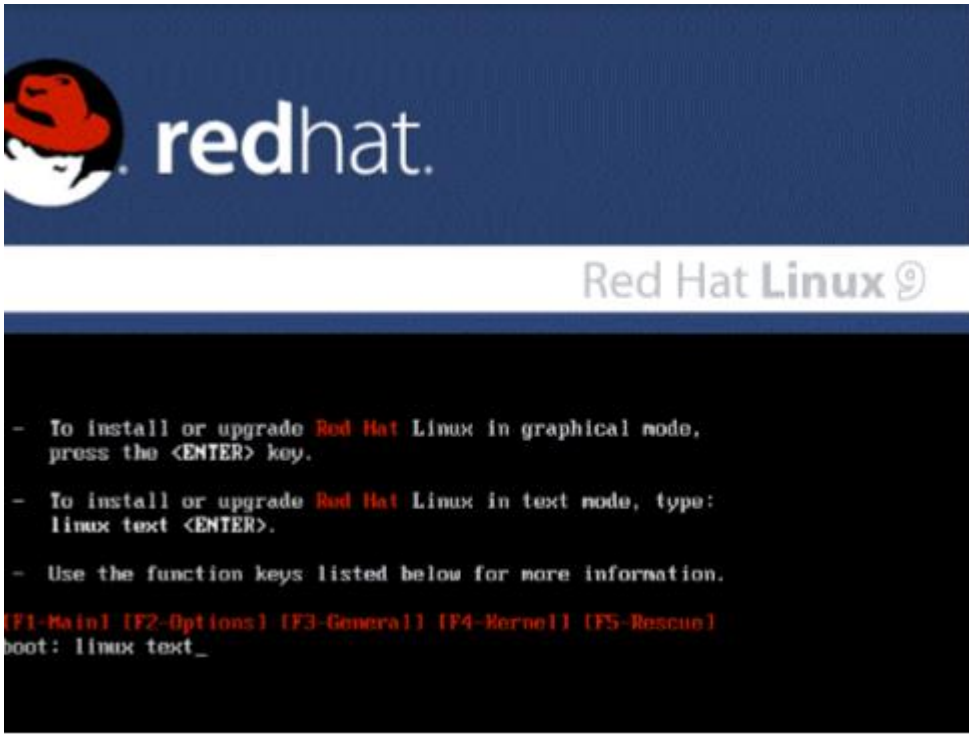


Step 16: There's no step 16. Welcome to Windows 10!

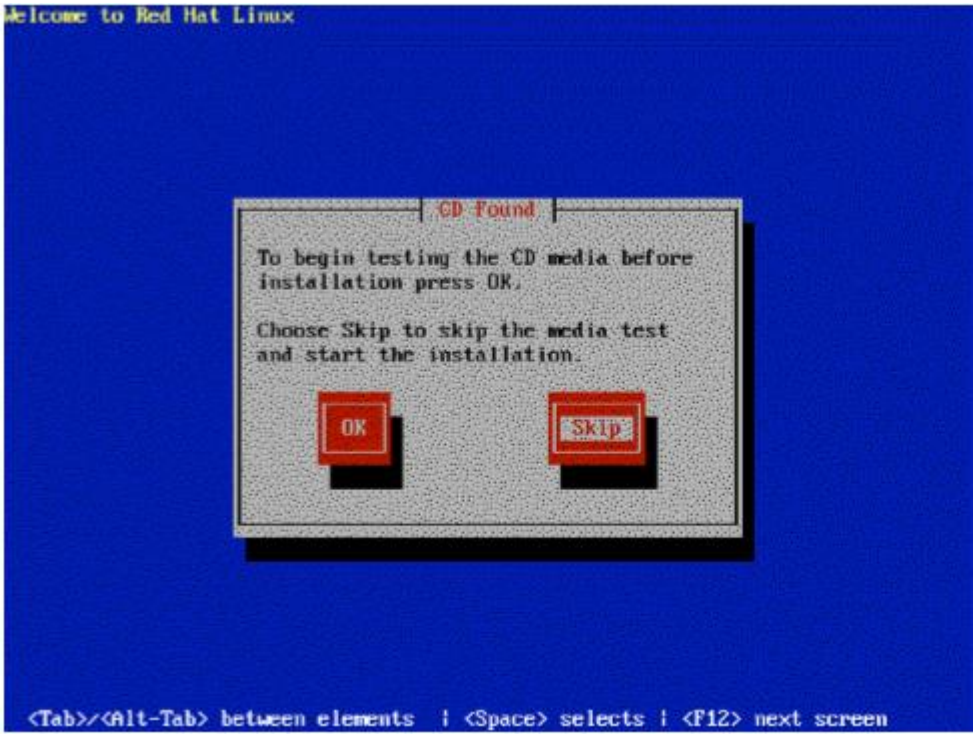
Linux Installation

Now you are going to install Red Hat 9.0. The first step is to insert the Red Hat 9.0 Disc 1 into your CD-ROM drive. Next, power on the system. The system boots off of the CDROM and begins the Red Hat installation program. Follow these steps to complete the installation of Red Hat:

When the Red Hat Installation screen appears (the first screen) type linux text at the boot: prompt and press Enter, as shown in the following screen.

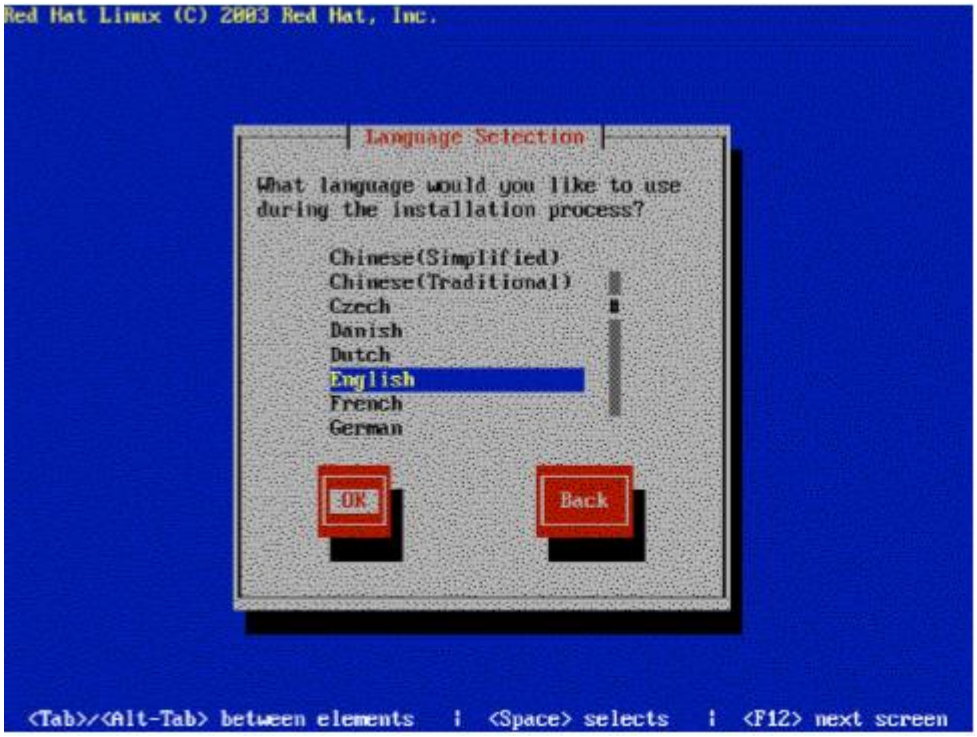


Press the Tab key until Skip is highlighted, and then press Enter.



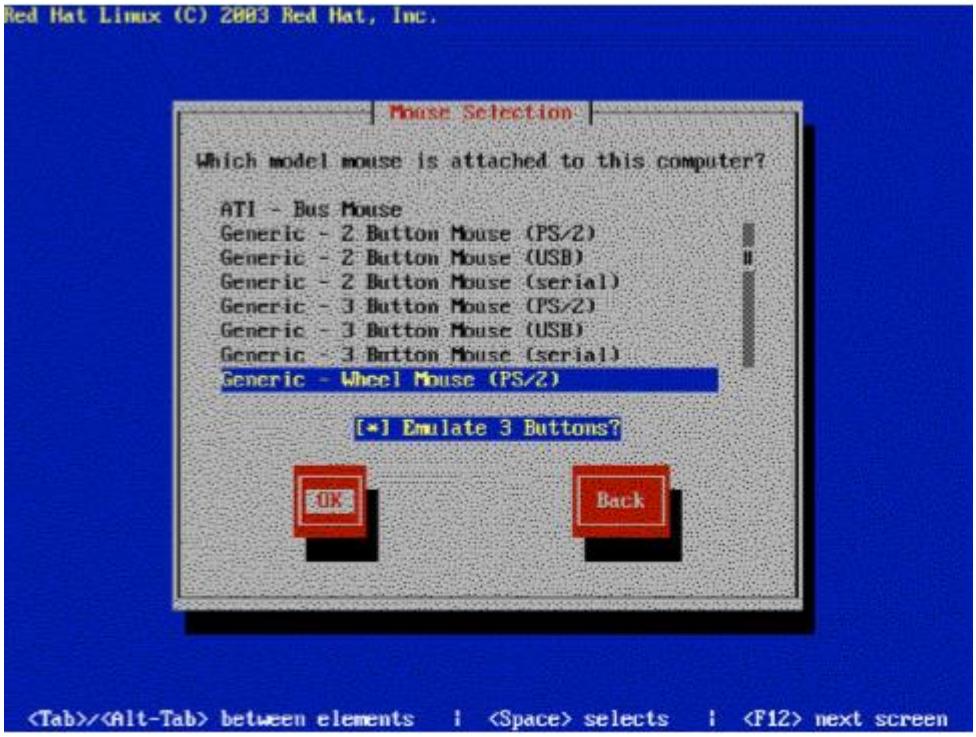
The “Welcome’ screen appears. Press Enter.

The ‘Language Selection’ screen appears. Ensure that the language is set to English. Press the Tab key until OK is highlighted, and then press Enter.

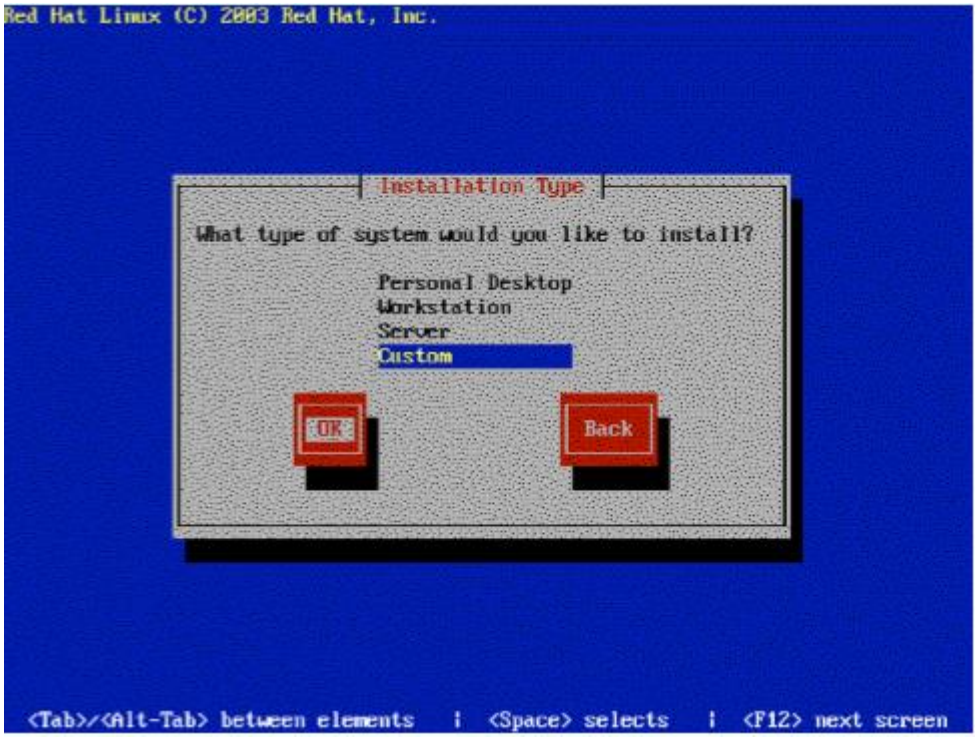


The 'Keyboard Selection' screen appears. Accept the default keyboard us. Press the Tab key until OK is highlighted and press Enter.

The 'Mouse Selection' screen appears. Press the Tab key until the box next to Emulate 3 Buttons is selected and press Space Bar to place an asterisk in the brackets [*]. Next, press the Tab key until OK is highlighted and then press Enter



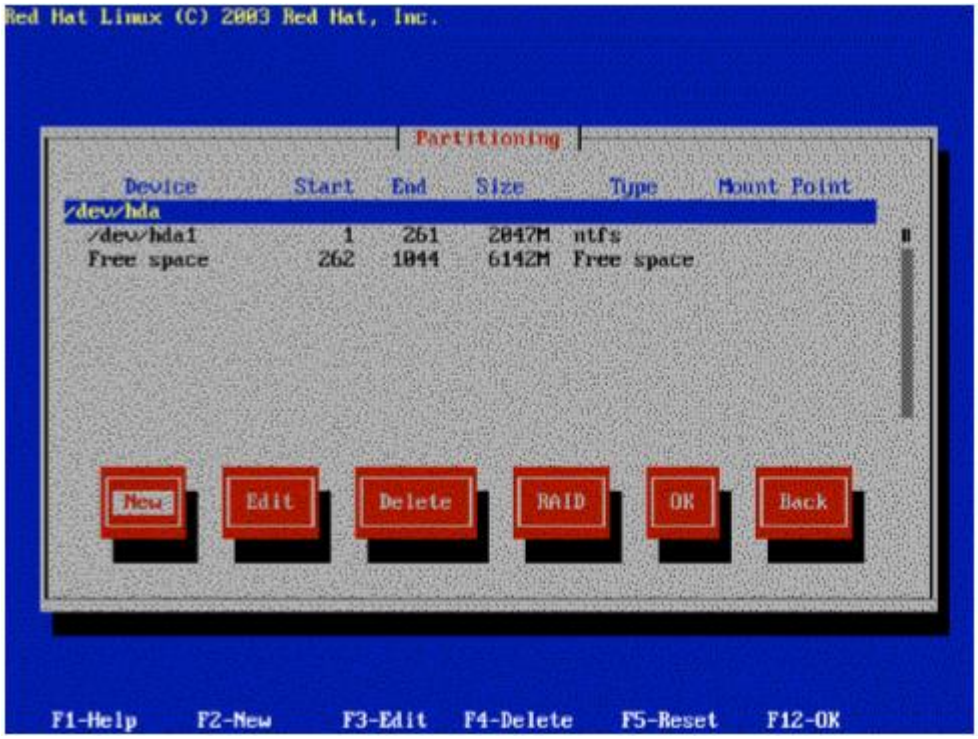
The 'Installation Type' screen appears. Use the arrow keys to highlight Custom. Press the Tab key until OK is highlighted and then press Enter.



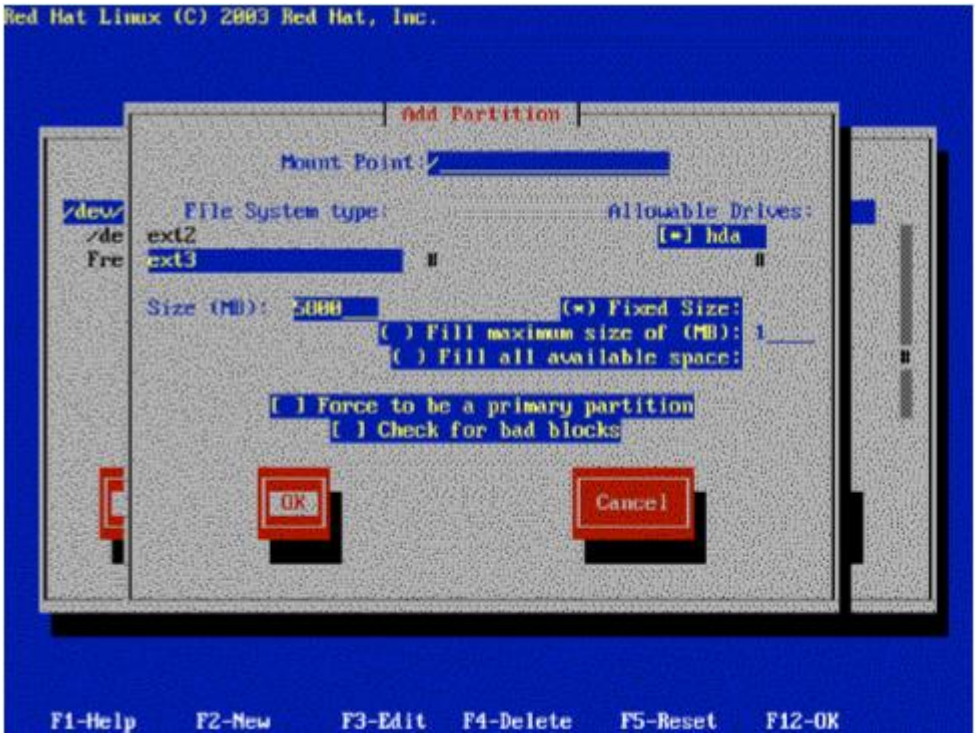
The 'Disk Partitioning Setup' screen appears. Press the Tab key until Disk Druid is highlighted, and then press Enter

Note that the values used to partition the hard drive may need to be altered based on the memory and hard drive size of the system that you are using.

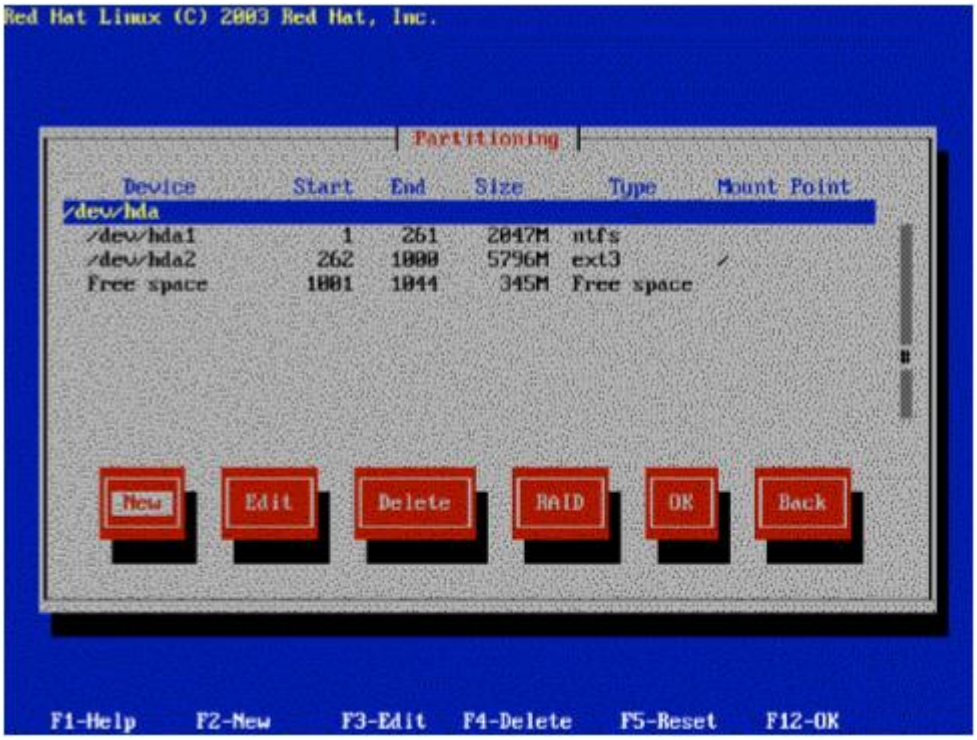
The 'Partitioning' screen appears. Press the Tab key until New is highlighted, and the press Enter.



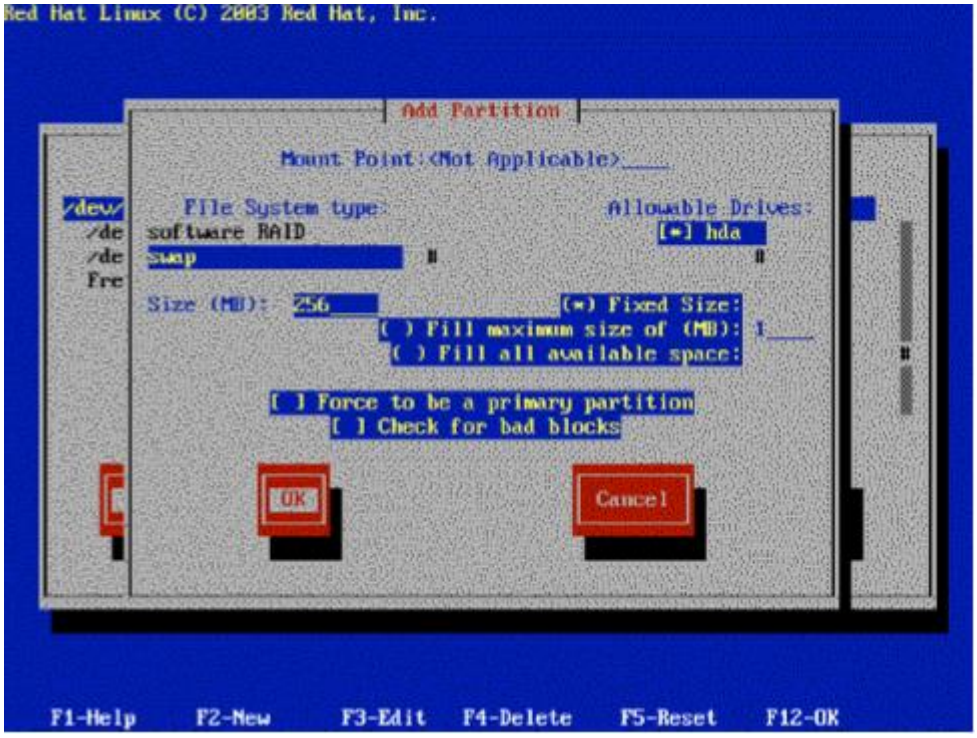
The 'Add Partition' screen appears. In Mount Point: type /. Press the Tab key until the cursor is in the Size (MB): field. Enter 5800. Press the Tab key until OK is highlighted, and then press Enter.



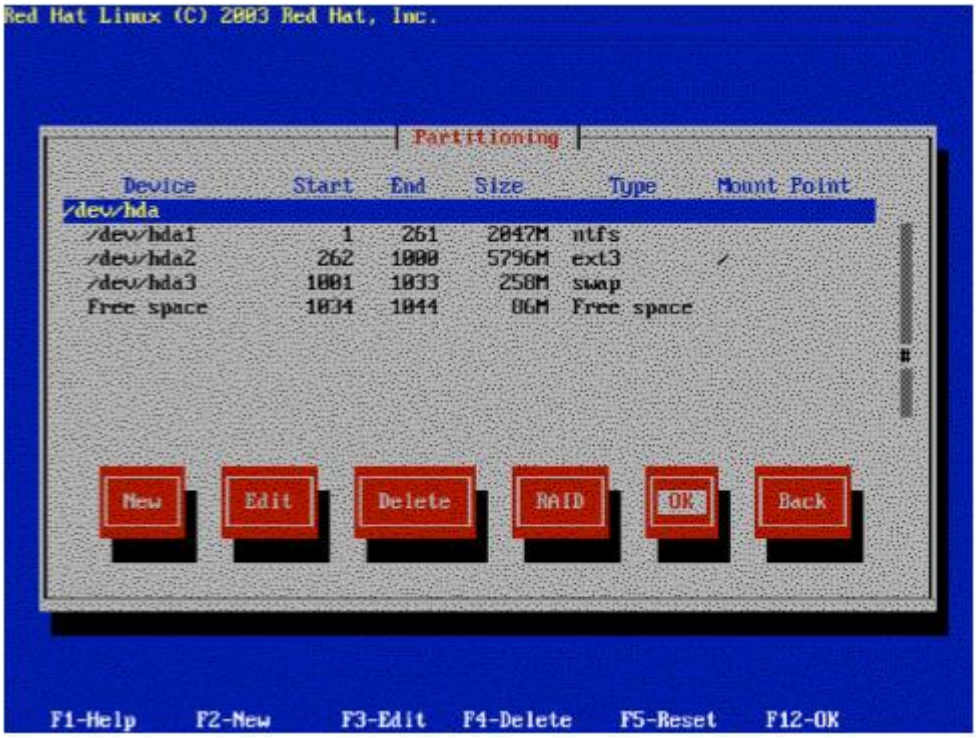
The ‘Partitioning’ screen reappears. With the arrow and Tab keys, highlight Free Space, as shown in the following screen. Afterwards, press the Tab key until New is highlighted, and then press Enter.



The ‘Add Partition’ screen appears. Press the Tab key once to select the File System type: field. Using the arrow keys, highlight swap. Press the Tab key until the Size (MB): field is selected. Enter 256. Press the Tab key until OK is highlighted, and then press Enter. These fields and selections are shown in the following screen.

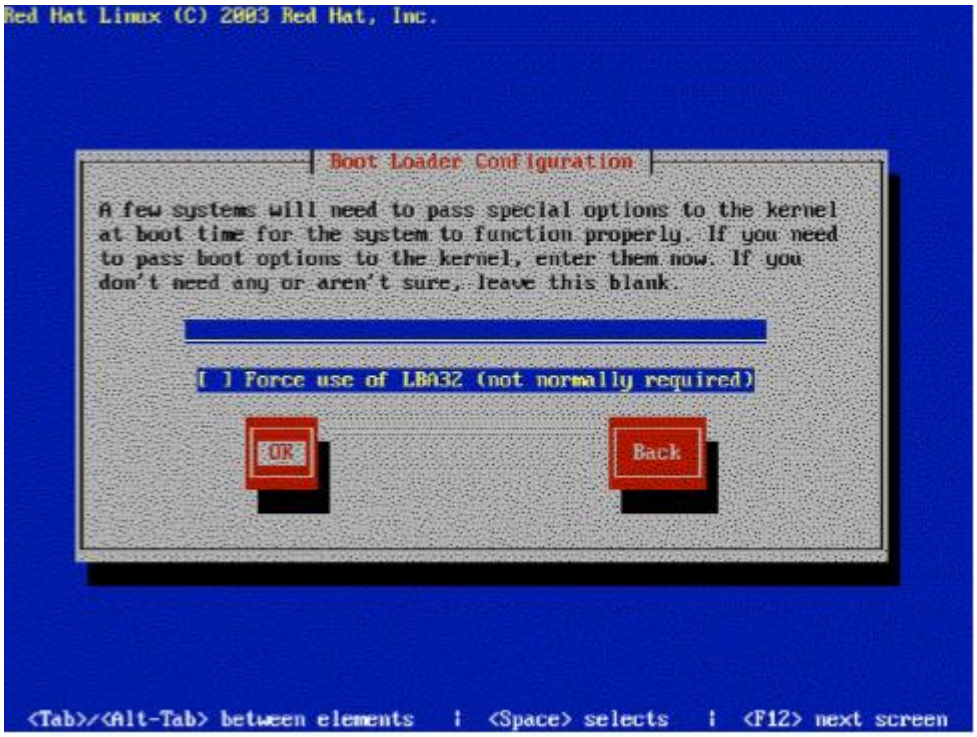


13. The 'Partitioning' screen reappears. Press the Tab key until OK is highlighted. Press Enter.



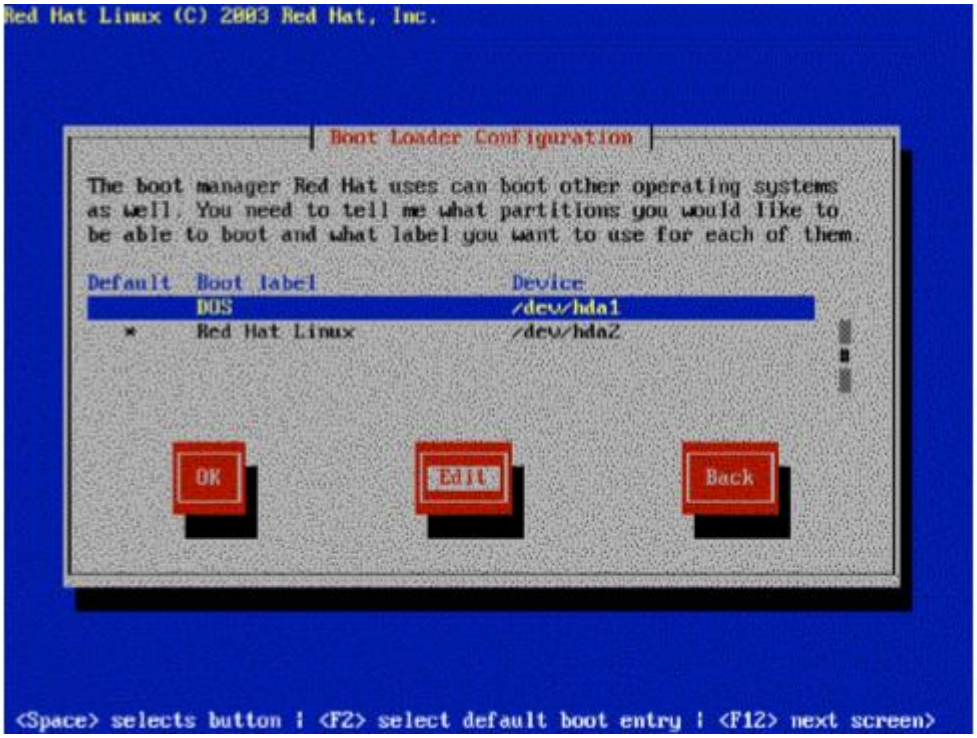
The 'Boot Loader Configuration' screen appears. Press the Tab key until OK is highlighted, and then press Enter.

The 'Boot Loader Configuration' screen appears. Press the Tab key until OK is highlighted, and then press Enter.

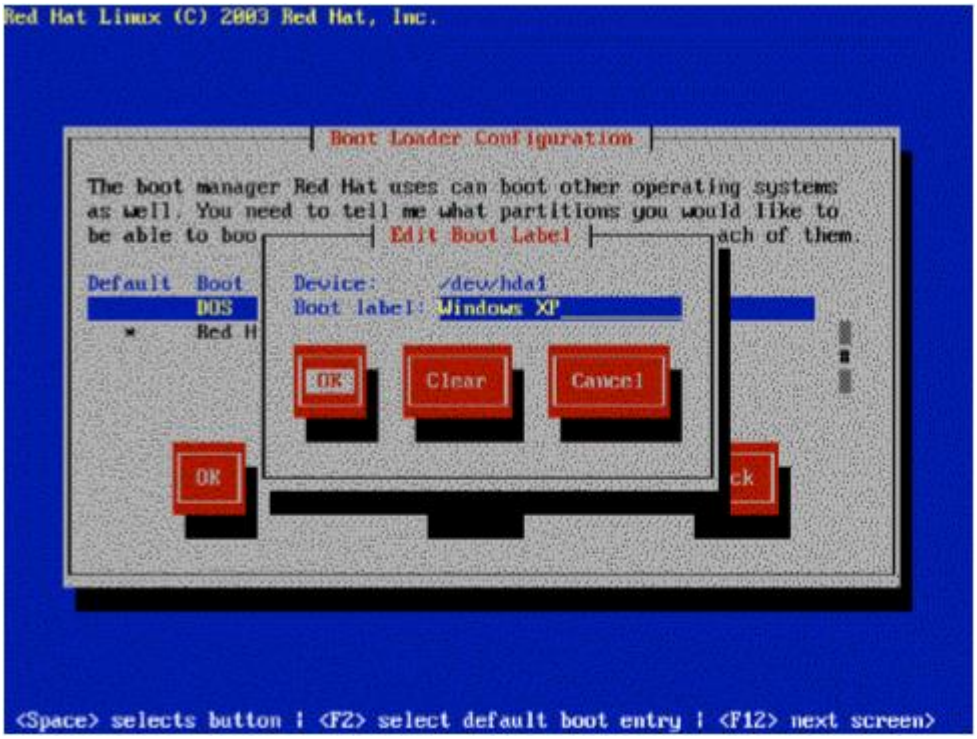


The 'Boot Loader Configuration' screen appears. Press the Tab key until OK is highlighted, and then press Enter.

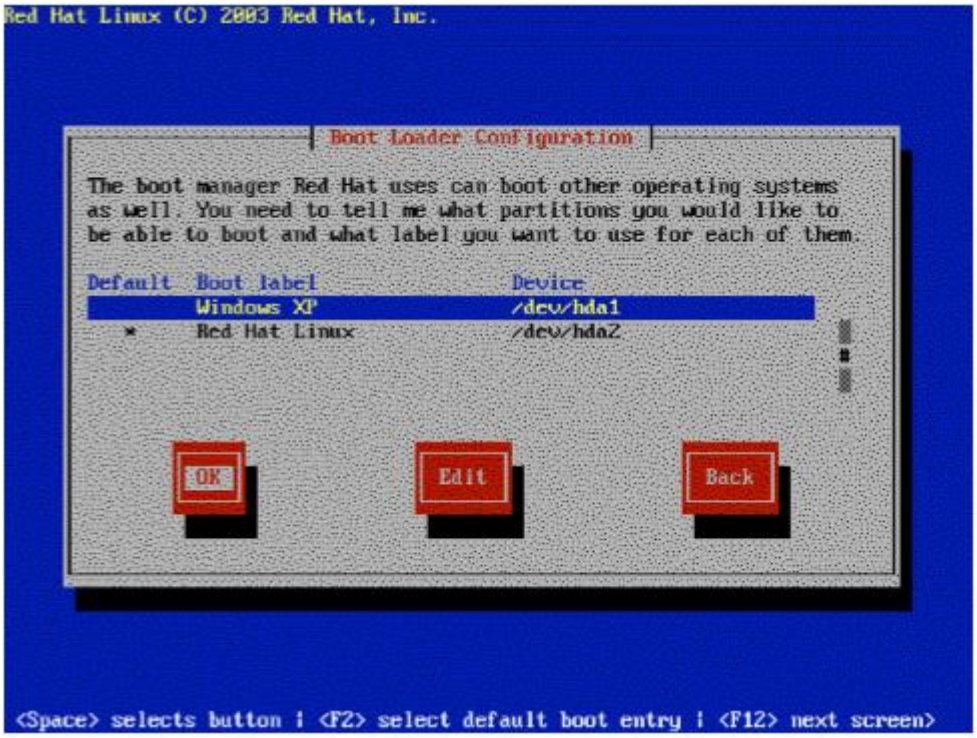
The 'Boot Loader Configuration' screen appears. Use the Tab and arrow keys to highlight DOS and then press the Tab key until Edit is highlighted, and then press Enter.



The 'Edit Boot Label' screen appears. Change the Boot Label field to Windows XP. Press the Tab key until OK is highlighted and press Enter.



The 'Boot Loader Configuration' screen appears. Press the Tab key until OK is highlighted and press Enter.



The 'Boot Loader Configuration' screen appears. Press the Tab key until OK is highlighted and press Enter.

The 'Network Configuration for eth0' screen appears. Press the Spacebar to remove the * (asterisk) in the following [ ] Use bootp/dhcp option. Press the Tab key to select the IP address field.

Enter the following parameters:

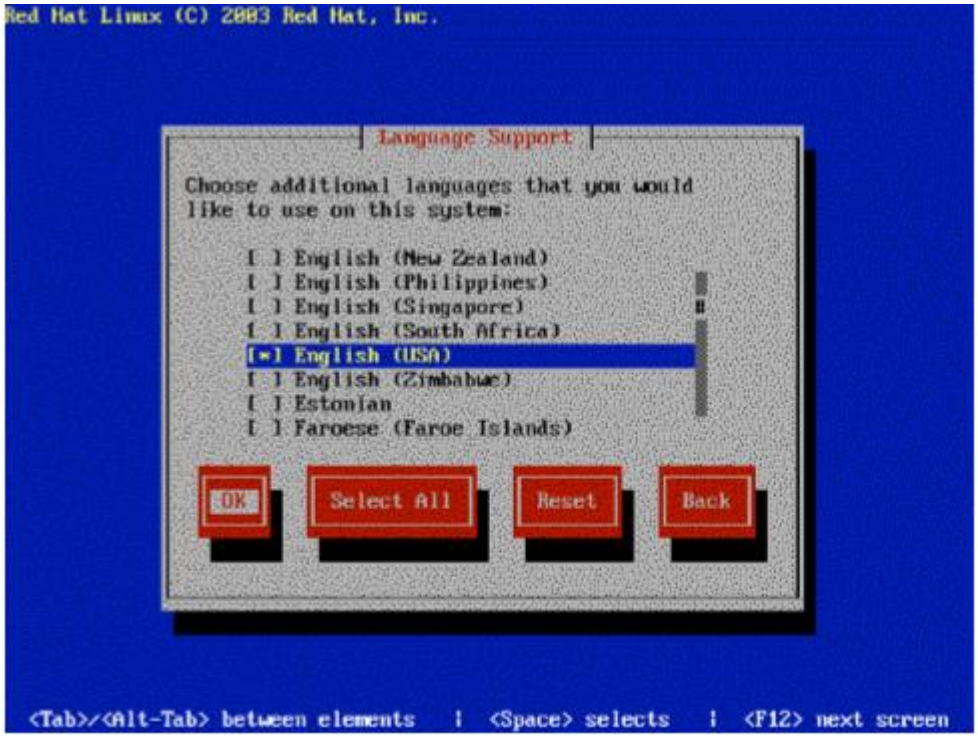
- IP address: 192.168.1.50
- Netmask: 255.255.255.0
- Default gateway (IP): 192.168.1.2
- Primary nameserver: 192.168.1.4

After you enter the parameters, press the Tab key until OK is highlighted, and then press Enter.

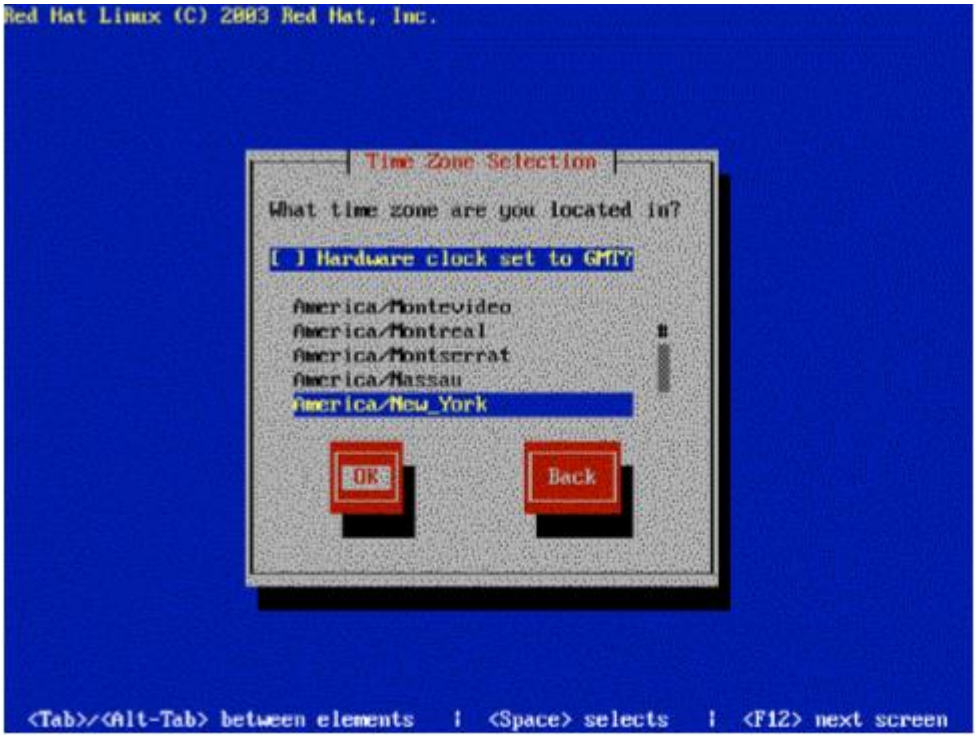
The ‘Hostname Configuration’ screen appears. Enter linux-lab in the Hostname field. Press the Tab key until OK is highlighted, and then press Enter.

The ‘Firewall Configuration’ screen appears. Press the Tab key until ( ) No Firewall is selected. Press the Spacebar to insert an asterisk (*), as shown in the screen. Then, press the Tab key until OK is highlighted and press Enter.

The ‘Language Support’ screen appears. Press the Tab key until OK is highlighted, and then press Enter.

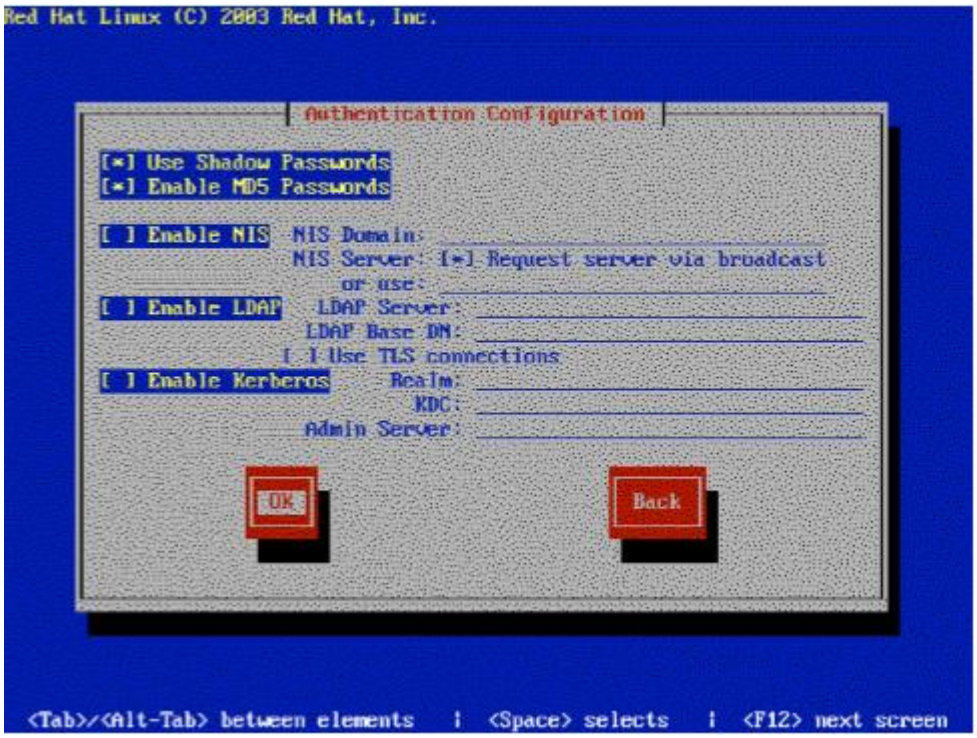


The 'Time Zone Selection' screen appears. Press the Tab key until OK is highlighted, and then press Enter. (If you are in a different time zone, use the Tab and arrow keys to select the appropriate time zone.)



The 'Root Password' screen appears. In the Password: field, type a strong password to use for the root account. Confirm the password by typing it in the Password (confirm): field. Press Tab until OK is highlighted and press Enter.

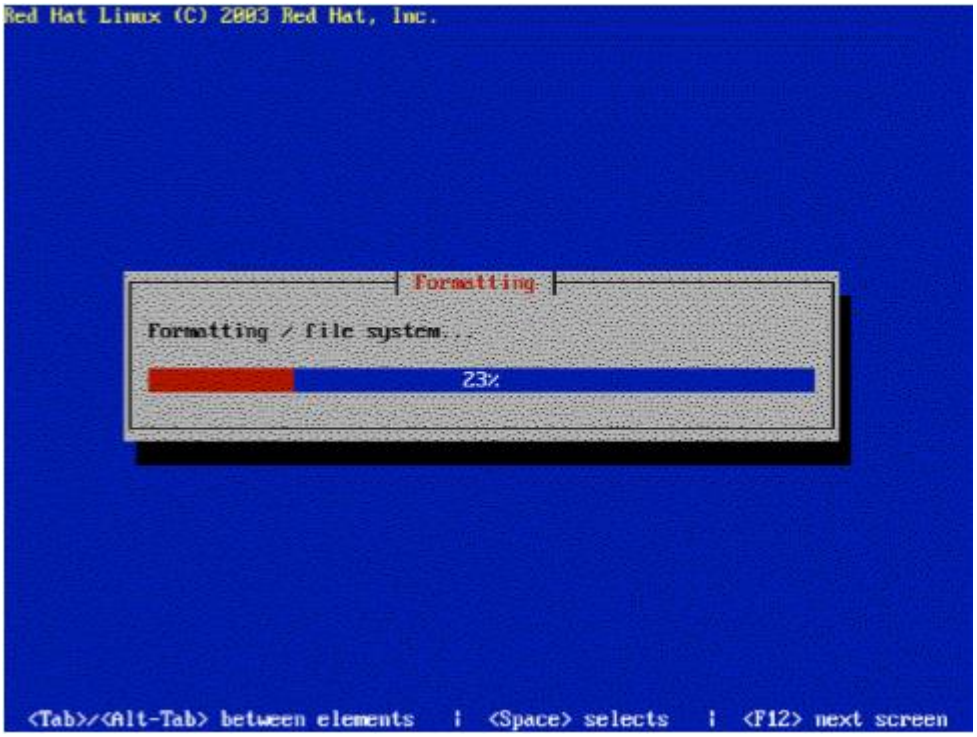
The 'Authentication Configuration' screen appears. Press the Tab key until OK is highlighted, and then press Enter.



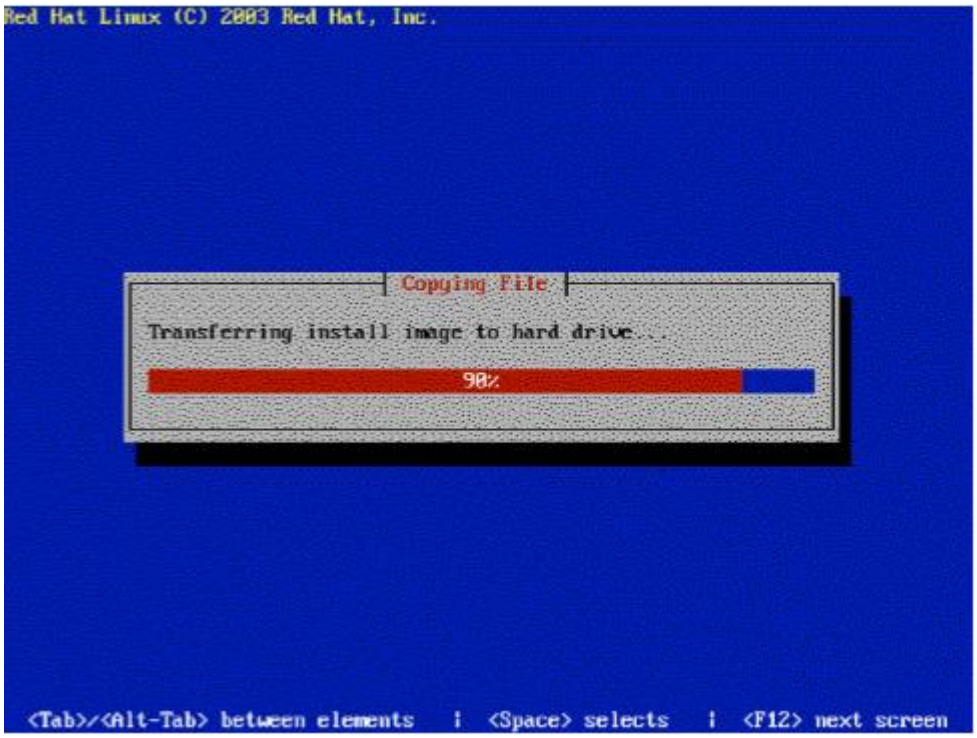
The 'Package Group Selection' screen appears. Press End to highlight Everything and then press Space Bar to select it. (an asterisk identifies the option as selected) Press the Tab key until OK is highlighted and press Enter.

The 'Installation to begin' screen appears. Press Enter.

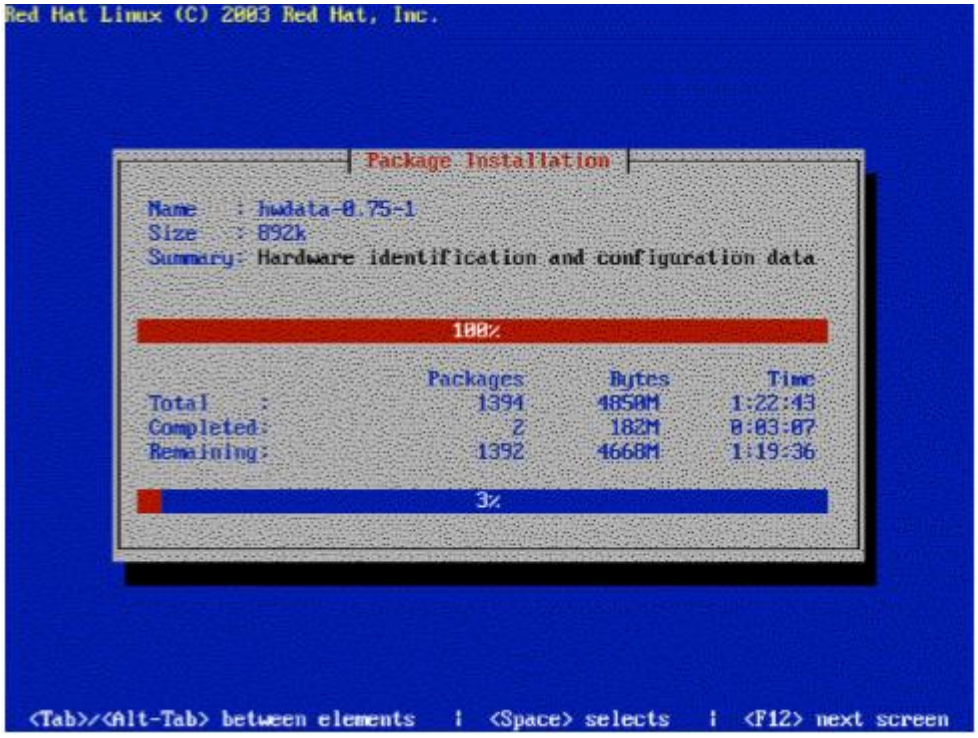
The 'Formatting' screen appears. The Formatting / file system… message appears. Proceed to the next step.



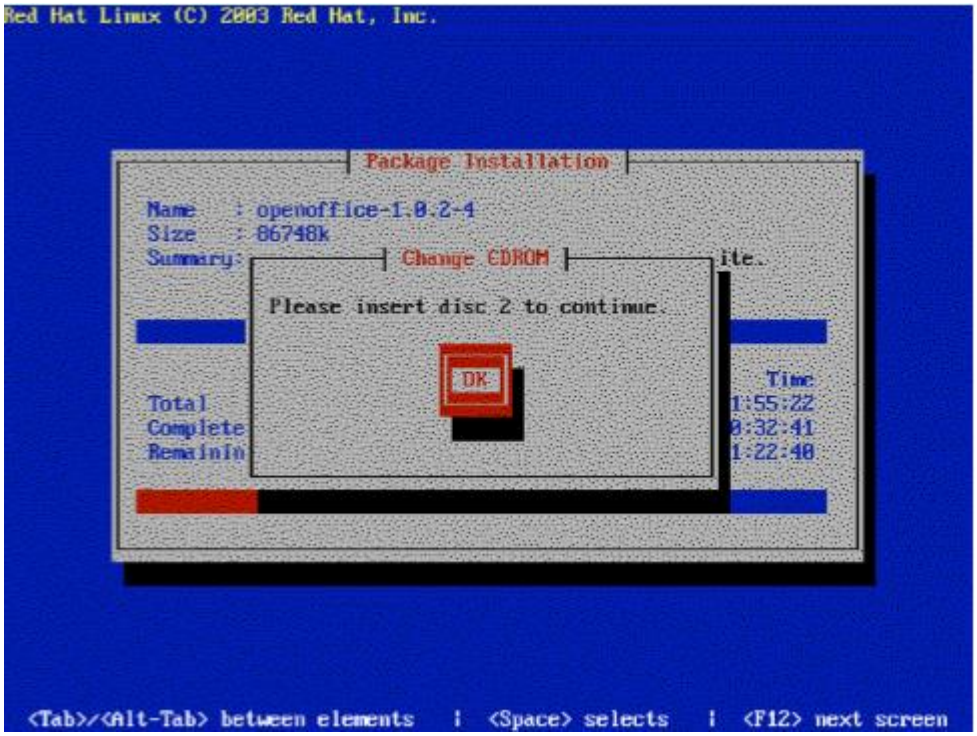
The ‘Copying File’ screen appears. The Transferring install image to hard drive… message appears. Proceed to the next step.



The ‘Package Installation’ screen appears. Red Hat now starts installing the packages. Proceed to the next step.

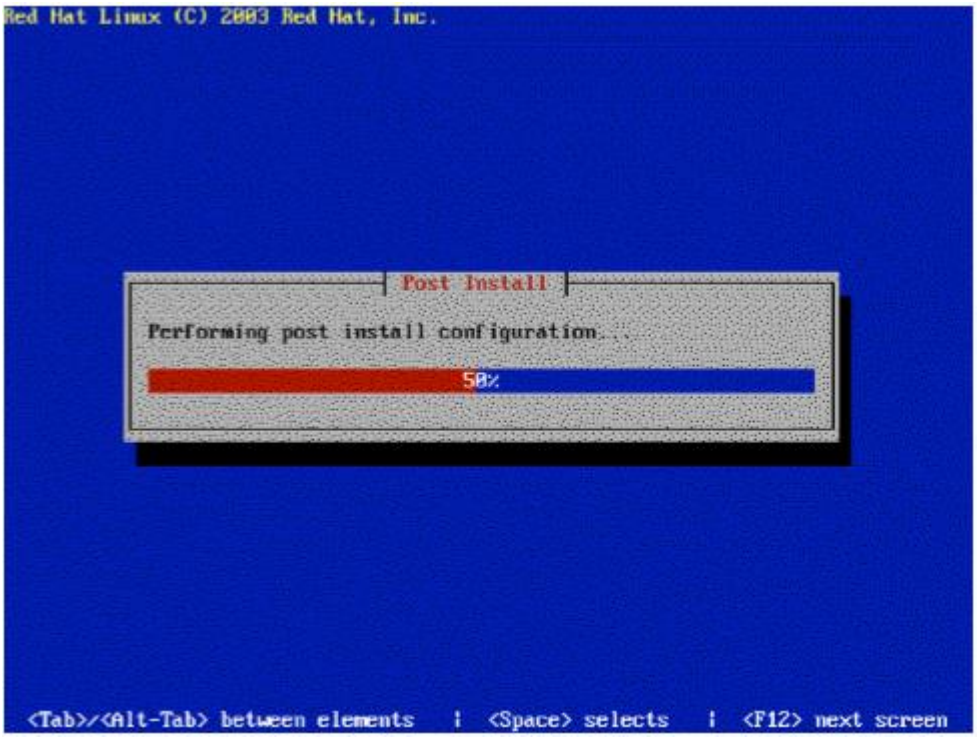


The 'Change CDROM' screen appears. When prompted, insert the Red Hat Disc 2 and press Enter.

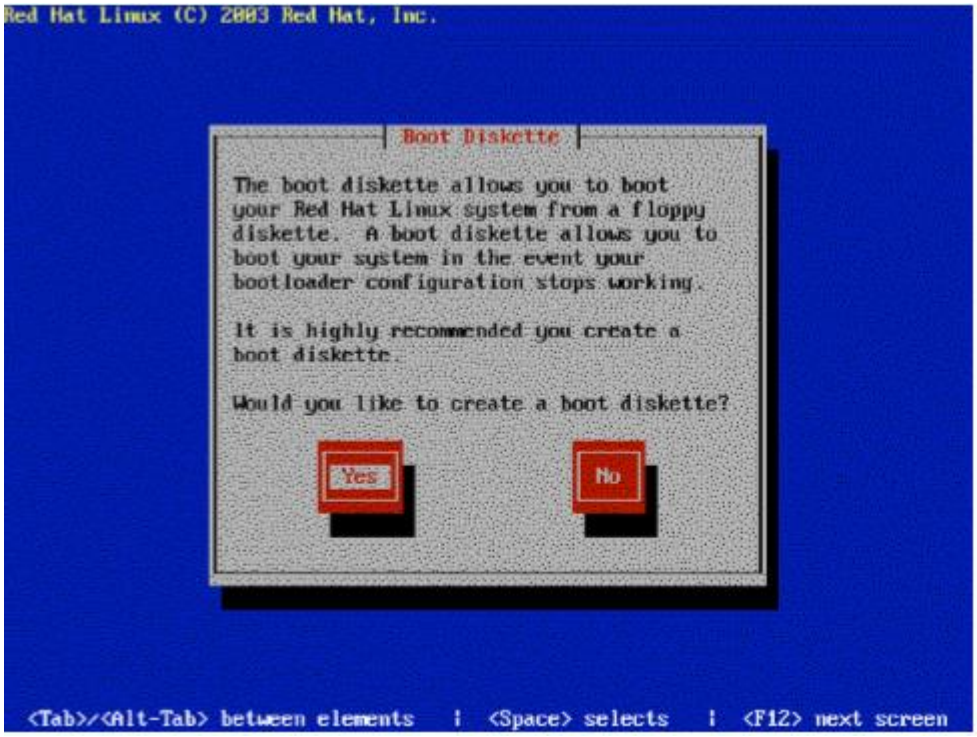


The 'Change CDROM' screen appears again. When prompted, insert Red Hat Disc 3 and press Enter.

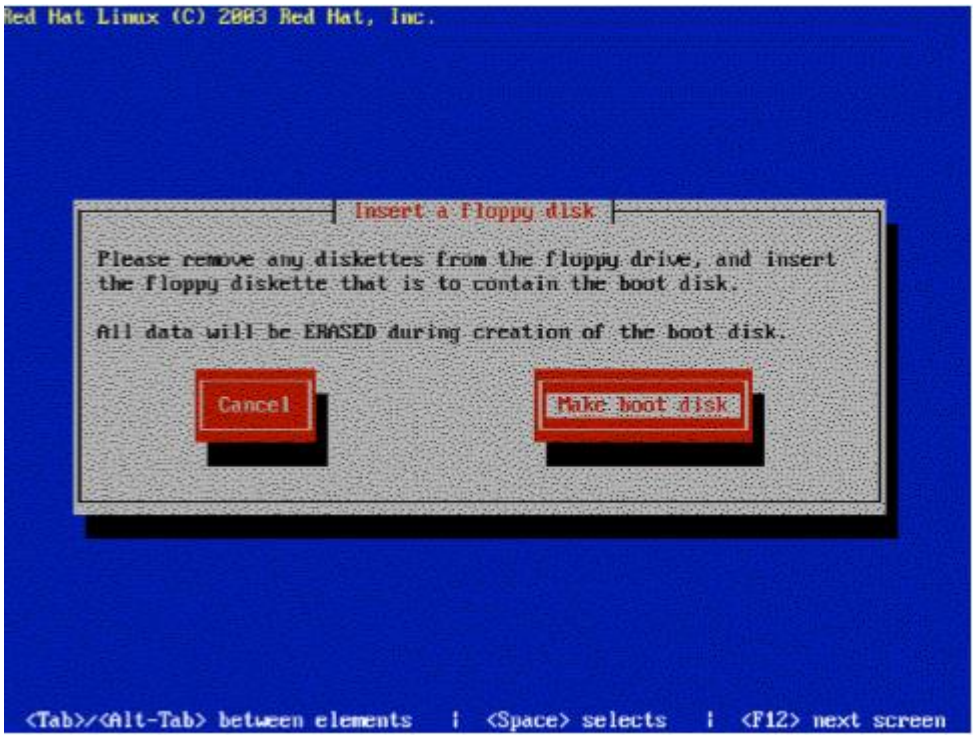
The ‘Post Install’ screen appears. After all of packages have been installed, Red Hat performs the post-install configuration, as shown in the following screen. Proceed to the next step.



The ‘Boot Diskette’ screen appears. Press Enter to create a boot disk.

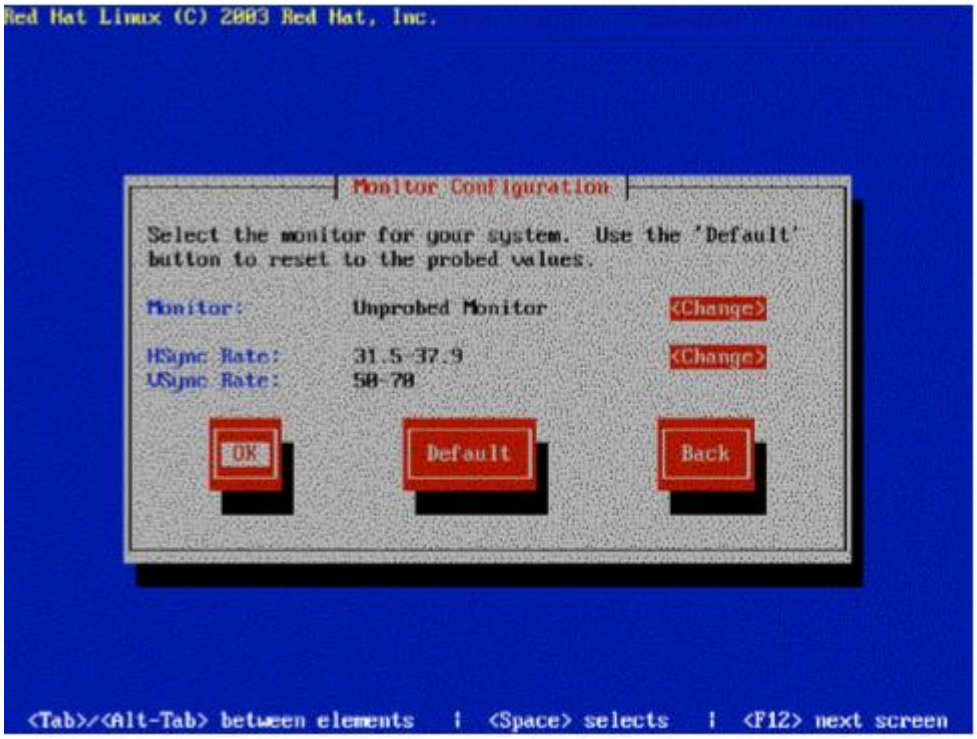


The 'Insert a floppy disk' screen appears. Insert a blank diskette into your floppy drive. Press TAB to highlight Make boot disk and press Enter.



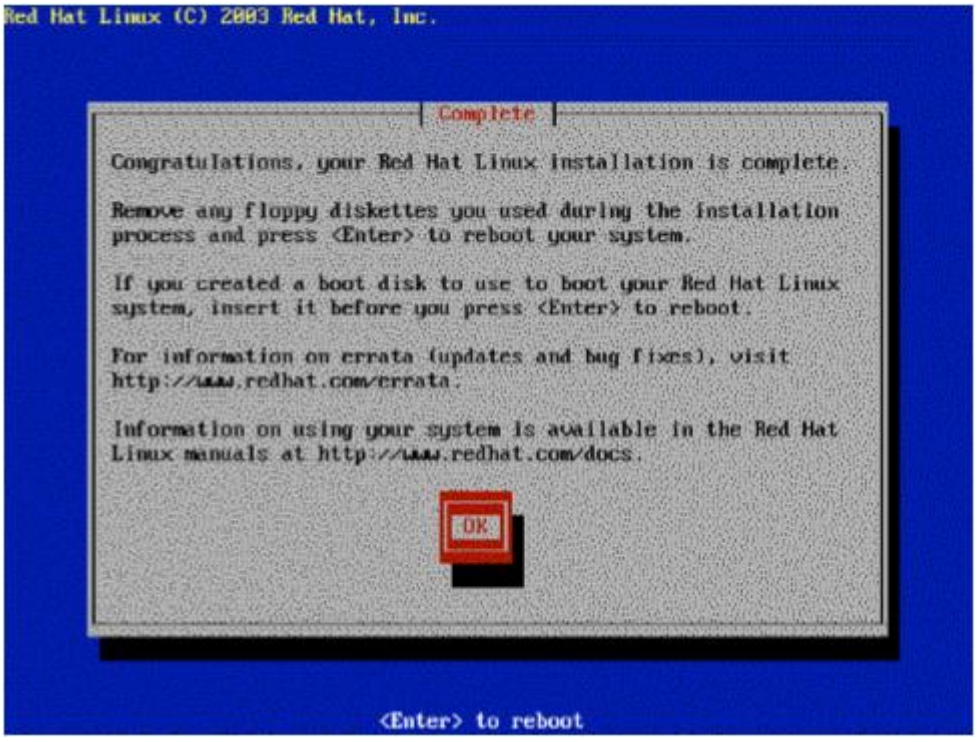
The 'Video Card Configuration' screen appears. Use the Tab key and Enter key to select the appropriate video card settings for your system. Press the Tab key until OK is highlighted, and then press Enter.

The 'Monitor Configuration' screen appears. Again, use the Tab and Enter keys to select the appropriate monitor settings for your system. Press the Tab key until OK is highlighted, and then press Enter.



The 'X Customization' screen appears. Press the Tab key until ( ) Text is selected, and then press the Spacebar. Press the Tab key until OK is highlighted, and then press Enter.

The 'Complete' screen appears. Congratulations, you have just installed Red Hat Linux. After removing the boot disk created earlier in the installation, press Enter to reboot the system. The CD-ROM will eject during the reboot process.



As the system is rebooting you will be presented with the choice of booting into Red Hat or Windows XP. Use the arrow keys to select the OS that you want to boot into and press Enter to boot the choice. Note that the GRUB boot loader is only presented for a few seconds before the default OS is booted so you have to be paying attention.

- Content/Topic 5: Testing the OS

Whether you're installing a workstation or a server, the Windows operating system is designed to get you up and running as quickly as possible. Built-in drivers, ready-for-use applications, and a standardized Start Menu mean less devils in the details.

However, there are a few things for you to make sure to check off when you set up a new Windows environment.

Obviously tasks like setting up the initial account, joining the domain and getting online are a no-brainer so I'll skip past these and assume the hypothetical system in question has just booted up and been logged in. I'll also skip steps like manipulating the page file, defragmenting the operating system or installing a registry health check/cleaner since these are largely things of the past thanks to improvements in Windows.

1. Document the administrator password

It's a small step, but you can't stress the importance of this enough. you use different administrator passwords on different systems (after all, like dominoes falling, if one administrator password is compromised all systems become accessible). They're all stored in a shared password safe called KeePass which your fellow admins and I rely on.

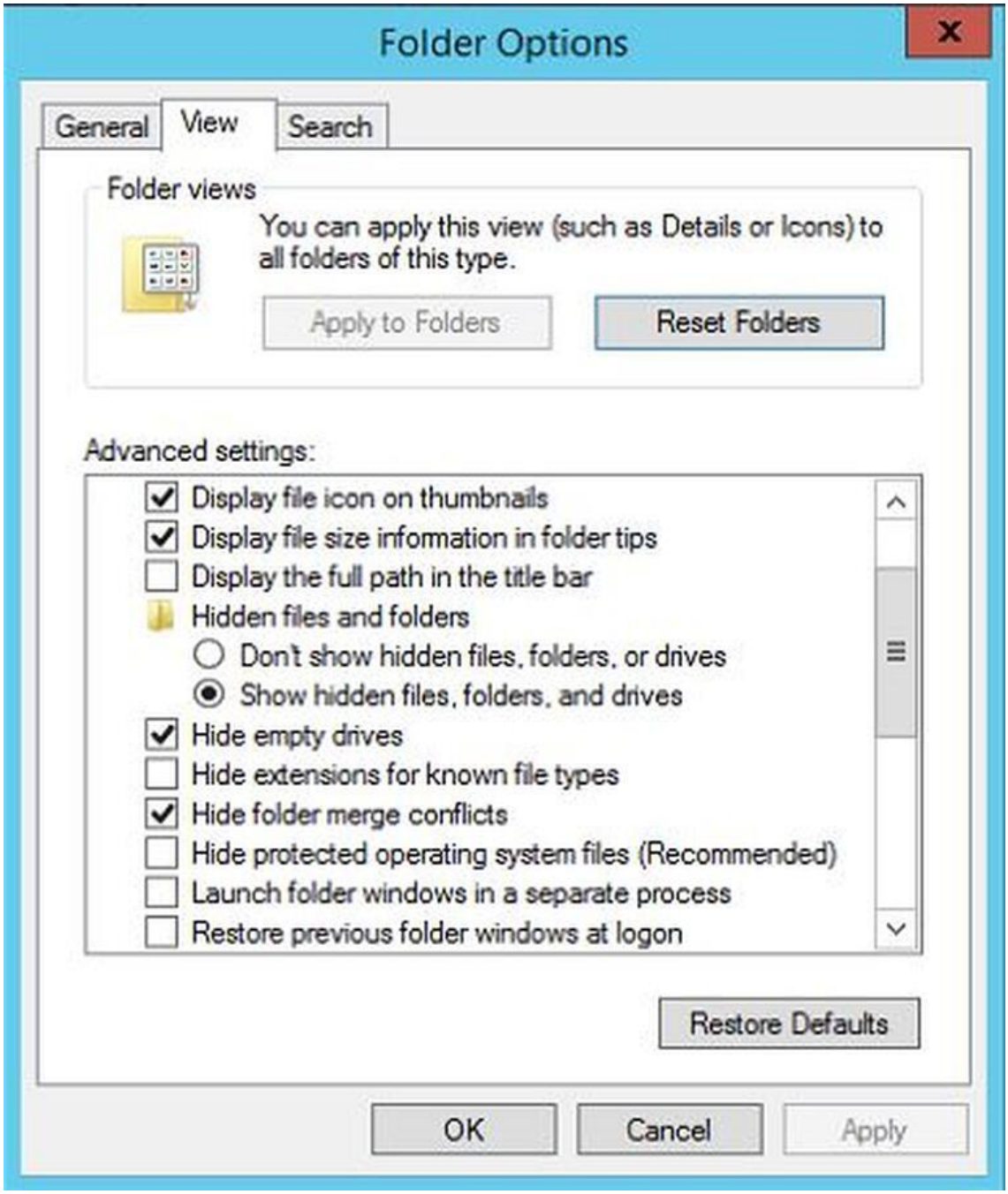
2. Reveal what is hidden

By default, Windows hides certain files such as system files, subdirectories in user profile folders and other elements which would wreak havoc if accidentally deleted. Since the purpose of being a system

administrator often involves working with these hidden files to resolve problems, it's essential to be able to find them (it's also frustrating to have to set them to be displayed when you're trying to solve an urgent problem).

You can turn off the options to hide these files or extensions via these steps:

Open Windows Explorer, click View, go to Options then click the View tab.



Select "Show hidden files, folders and drives."

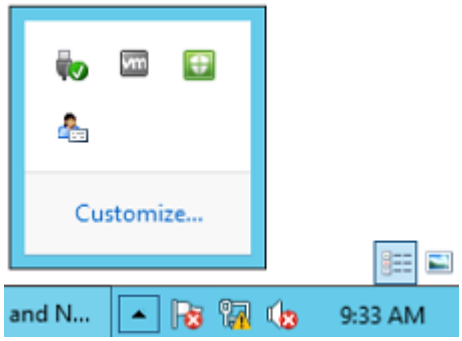
Uncheck "Hide extensions for known file types" and "Hide protected operating system files (Recommended)."

3. Tweak the taskbar/system tray settings

Microsoft is big on pinning things to the Task Bar. This process groups multiple running programs together via large icons and can result in a task bar which looks like this:

The notification area, which consists of icons in the lower right which can help you identify what's running, whether there are problems with the system, or other interesting operational elements, is also collapsed by default so not all icons are visible:

I can reveal all of the icons by hovering the mouse over that little black up arrow:

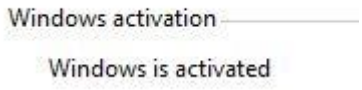


4. Drivers and patches

The next task is to install the latest drivers and Windows Updates for this system. Microsoft does provide certain drivers via Windows Update, but you have to go straight to the source since those are likely the newest and most appropriate drivers.

5. Activate Windows

This is one of the best messages to come across on a Windows system:



Like a cat at dinnertime, Windows is very good about notifying you when it needs to be activated. In fact, you might say it can nag you quite a bit, especially as the 30-day deadline approaches.

To activate, go to Control Panel, System and click "Activate Windows Now." If the internet connection works this should happen automatically, but if there is a problem or the system has no internet access then activation by phone is necessary.

Microsoft offers a great service called "Key Management Service" (or KMS) which can handle automatic activation of systems in your domain. Basically, you set up the service on a centralized system and new systems activate Windows through this all on their own thanks to specific DNS records. The only catch is the system must connect to the server every 180 days to confirm its activation status, so if a machine leaves the domain or ends up as personal property Windows will eventually request activation again.

Installing Programs

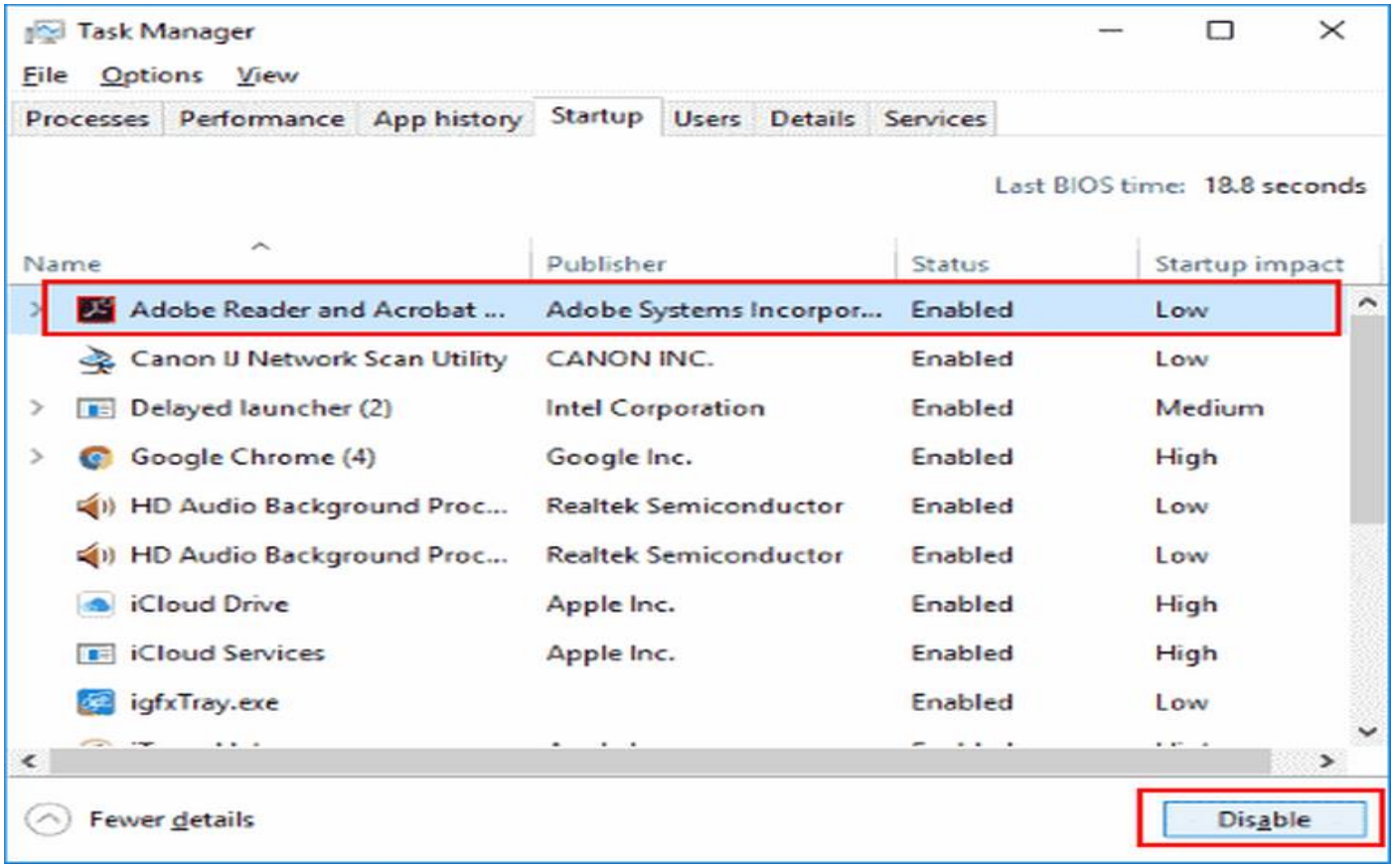
The programs you install on a workstation or a server will vary depending on your needs and tastes. Obviously certain programs such as anti-malware, productivity tools, document readers and foundational elements like Java should be part of the process. For workstations I intend to utilize, Dropbox comes in handy since it contains all installation of programs so once can install this then they eventually appear on the hard drive ready to run. Reduce the number of programs you use on servers, however, to cut down on patch work and exploitable vulnerabilities (do you really need Microsoft Office running on a Windows server?)

7. Control startup items

This tip applies mainly to workstations but can have some merit with servers as well.

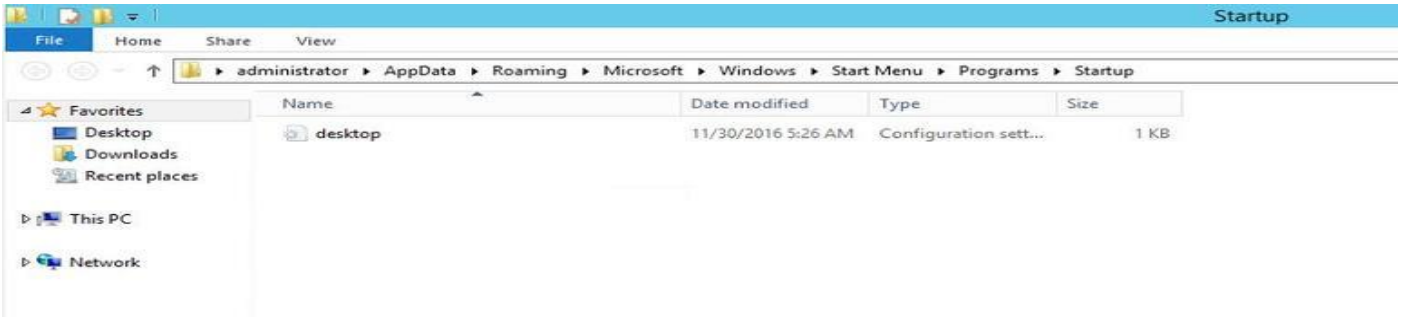
Many operating systems and programs set unnecessary elements to start up automatically, such as the Adobe Acrobat Update Service. Many of these can slow down the boot process and add delays, can interfere with other programs and cause issues, or just plain aren't necessary. You can view and control which items are set to start automatically.

For Windows 10, hit Ctrl-Alt-Del, select Task Manager and then review the Startup tab.



You can review items and stop them from starting up automatically by right-clicking them and choosing "Disable." The right-click menu also gives you the option to open the file location, search online about it or examine properties.

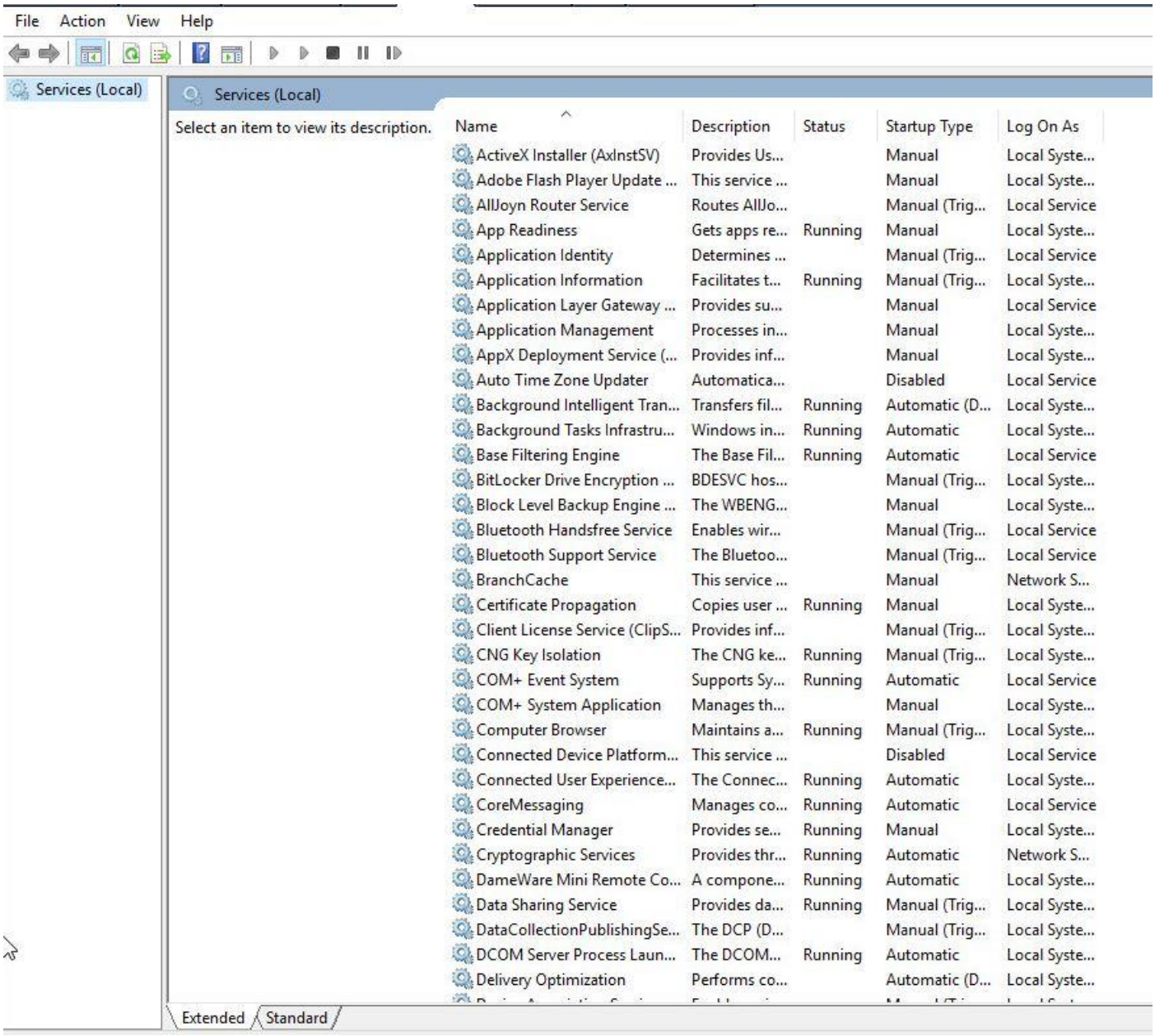
This just opens the AppData\Roaming\Microsoft\Windows\Start Menu\Programs\Startup under the local profile, and in this case we can see there are no startup items configured.



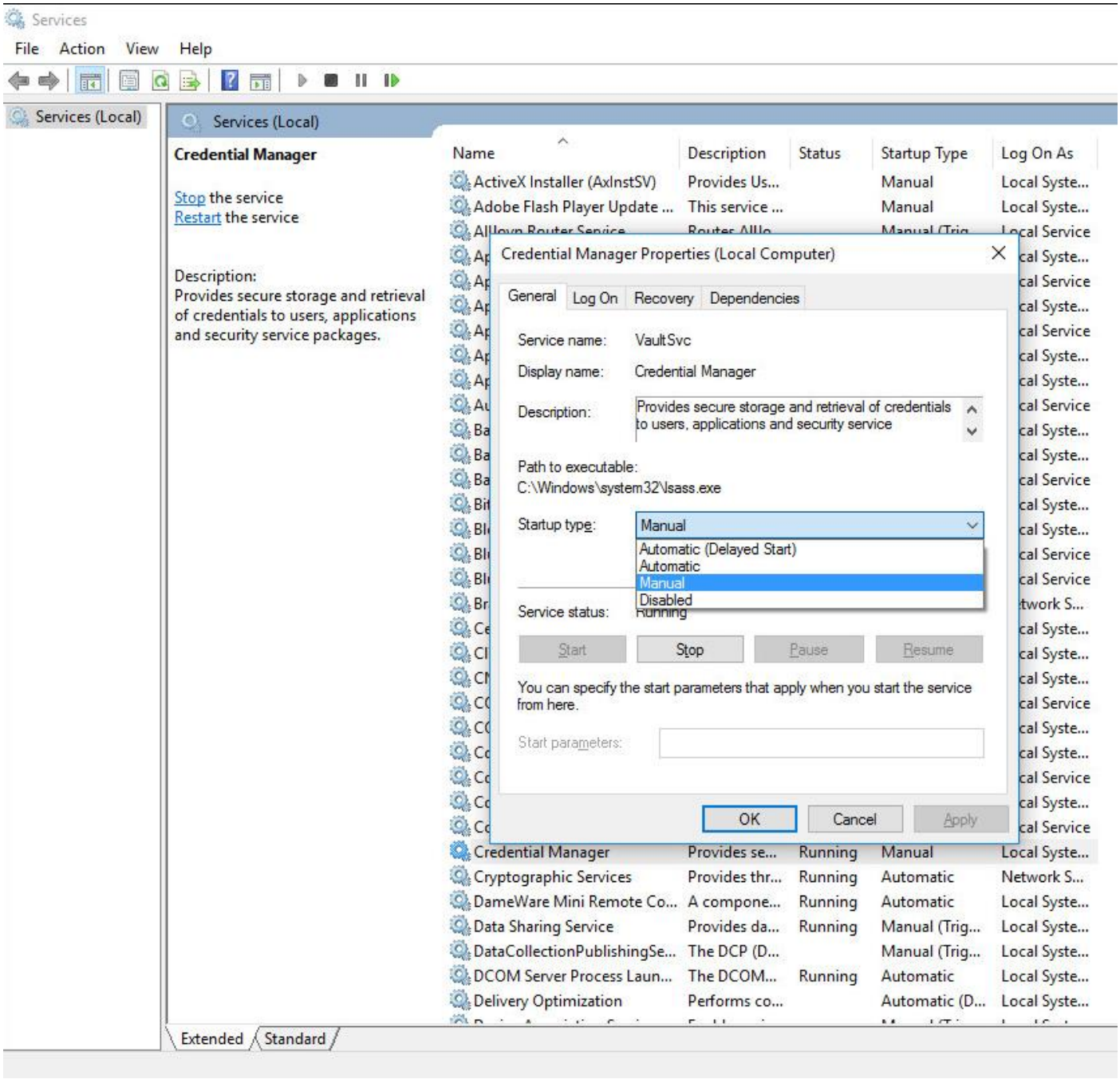
You can do the same for Services, which are system-based programs. Run the command:

services.msc

This will open the Services window:



As with startup items, you can right-click any given service and stop or start is as desired. You can also specify what the service should do the next time it boots; to disable it right-click it, choose Properties:



Choose "Automatic (Delayed Start)," "Automatic," "Manual" or "Disabled."

Make sure you know what you're doing here and that the service in question can be disabled if you decide to go this route. Disabling the wrong service might adversely impact your system.

8. Arrange data backups

Whether a workstation or server, the system will quite likely contain some sort of data which needs to be backed up. Arrange to do so either via the official company backup software or arrange synchronization of data elsewhere (such as between servers).

Cloud storage is also an option (if not the official backup product); Dropbox works fine for me in backing up all my data, but it's also important to be aware of security policies and regulations which may prohibit the transfer of data off-site or to a third party.

9. Create an image or take a snapshot

Just as data should be backed up, you might need to arrange for the backup of the applications or operating system. If you can create a system image this can save you the headache of a full reinstallation down the road since you can roll Windows back to this image if needed. Microsoft provides built-in mechanisms to do this, such as for Windows 10. It's also possible to use SCCM for operating system deployments or rely on third party products such as Quest's KACE System Imaging and Deployment.

If the system is a virtual machine, the process can be even easier. Just take a snapshot of it and you can revert to this snapshot later if trouble arises. Just be aware that in some environments snapshots can inadvertently cause issues. For instance, if using the vSphere console with a VMWare virtual environment you might find you can't expand a virtual volume because a snapshot exists of the system.

10. Document/set up alerts

This one often falls by the wayside after setting up a system. Document all necessary details including name, IP address, function, programs, support information and the like. Add asset tags (if applicable) and list the system in any financial-related documents or programs so it can be tracked and end of life (EOL) plans made for retirement.

If this is a server and it runs a critical function, make sure it is added to your monitoring and alerting environment (which of course should exist in any serious business) and that responsible staff are notified of any issues which may arise. Track resource consumption, service status, hardware components and any other elements which may impact operations if adversely affected.

LO 3.2: Install the application software

- Content/Topic 1 Identification of hardware compatibility

A family of computer models is said to be compatible if certain software that runs on one of the models can also be run on all other models of the family. The computer models may differ in performance, reliability or some other characteristic. These differences may affect the outcome of the running of the software.

System requirements are the required specifications a device must have in order to use certain hardware or software. For example, a computer may require a specific I/O port to work with a peripheral device. A smartphone may need a specific operating system to run a particular app.

Before purchasing a software program or hardware device, you can check the system requirements to make sure the product is compatible with your system. Typical system requirements for a software program include:

- ✓ Operating system
- ✓ Minimum CPU or processor speed
- ✓ Minimum GPU or video memory
- ✓ Minimum system memory (RAM)
- ✓ Minimum free storage space
- ✓ Audio hardware (sound card, speakers, etc)

System requirements listed for a hardware device may include:

- ✓ Operating system
- ✓ Available ports (USB, Ethernet, etc)
- ✓ Wireless connectivity
- ✓ Minimum GPU (for displays and graphics hardware)

Minimum vs Recommended Requirements

Some products include both minimum and recommended system requirements. A video game, for instance, may function with the minimum required CPU and GPU, but it will perform better with the recommended hardware. A more powerful processor and graphics card may produce improved graphics and faster frame rates (FPS).
Some system requirements are not flexible, such as the operating system(s) and disk space required for software installation. Others, such as CPU, GPU, and RAM requirements may vary significantly between the minimum and recommended requirements. When buying or upgrading a software program, it is often wise to make sure your system has close to the recommended requirements to ensure a good user experience.

Below is an example of minimum versus recommended system requirements for a Windows application.

1. OS: Windows 7 with SP1; Recommended: Windows 10
2. CPU: Intel or AMD processor with 64-bit support; Recommended: 2.8 GHz or faster processor
3. GPU: nVidia GeForce GTX 1050 or equivalent; Recommended: nVidia GeForce GTX 1660 or Quadro T1000
4. Disk Storage: 4 GB of free disk space
5. Monitor Resolution: 1280x800; Recommended: 1920x1080
6. Internet: Internet connection required for software activation

Identification and Selection of storage media to be used

- DVD/CD
- Floppy disk
- Flash disk
- External hard disk
- Network

Identification and selection of application software to be used

application software Allows end users to accomplish one or more specific (non-computer related) tasks.

Examples of Computer Application Software to be used after installing Operating system

- ✓ Graphic design software
- ✓ Spread sheet software

- ✓ Audio editing software
- ✓ Video editing software
- ✓ Web design software
- ✓ Text editing software

- **Content/Topic 2: Installing application software**

  You will usually start by either clicking on the downloaded file or inserting the disk and then letting the program setup file run (usually called *Setup.exe* or *Install.exe*).

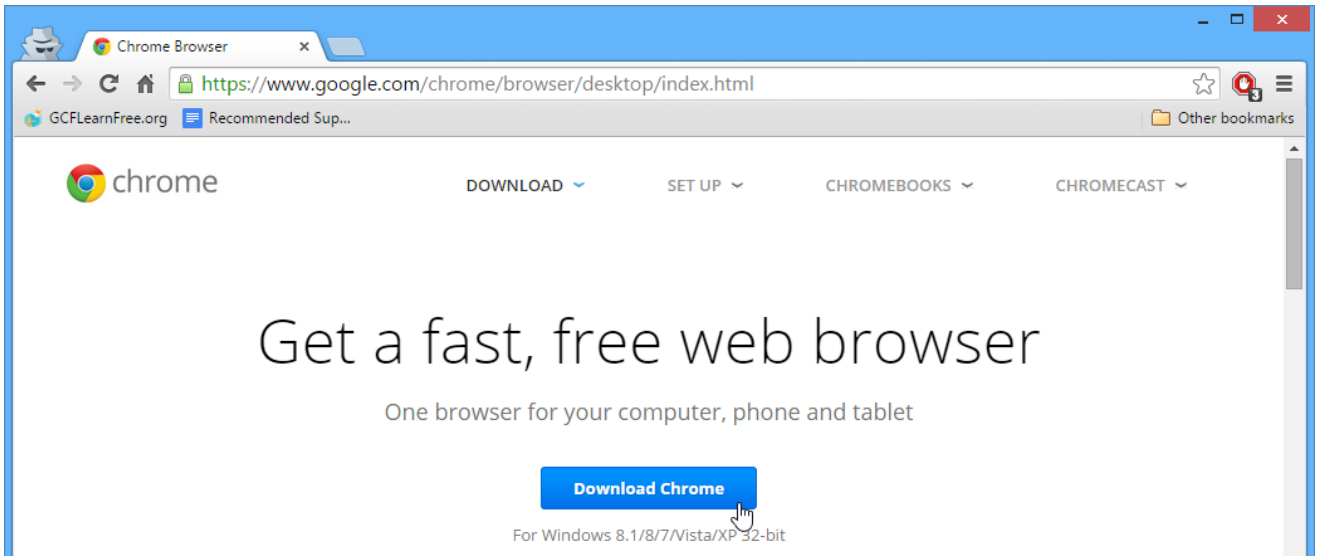
STEP	DESCRIPTION
Accept the license agreement	Most software cannot complete the installation if you do not agree to the manufacturer's terms of use. This license agreement is a legally binding contract between you and the manufacturer and outlines what you can and cannot do with the software.
Enter the product key/activation code/registration number	The product key is the way that the manufacturer links the software to you, stops the software from being installed on more devices than the licensing terms agree to and prevents piracy. It also links you to any online support available.
Choose the installation location	The installer will suggest a default folder. It is usually best to stick to this suggestion. For example, if your installer suggests installing all your software on the C:/ drive, you will know where to look for a program.
Choose the type of installation you want	You can usually choose between the following types of installation: • Typical installation, which installs the components that are used most often. • Custom installation, where you can choose which components to install. • Full installation, which installs all the components of the software. This is not always an option in an installation.
Install extras	Some software comes with extra software bundled in (such as McAfee antivirus with some Microsoft products). In this step you can choose which extra software to install. Often these extras are ticked by default and you will have to untick them to not install them. You should always check which extras are installing to your computer and untick the ones you do not want.
Check for updates	Once a program has installed, the installer may ask if you want to check for the latest version. This is usually done with software that is installed from a disk. Downloaded software is often more up to date.
Register your product	Some programs require that you register on their online portal so that the company can contact you with news and notifications of updates. You should be allowed to skip this step if you do not want to be contacted by the manufacturer.
Add shortcuts	The last step in the installation process is to add a shortcut. Most software will ask you if you want a shortcut to the program on your desktop. If you do not, deselect this option.
Take a tour	Some software offers a tutorial the first time you open the program. These tutorials will usually highlight important features and how to use them. If it is the first time you are using a specific program, you should work through the tutorial before getting started.

Installing software from the Web

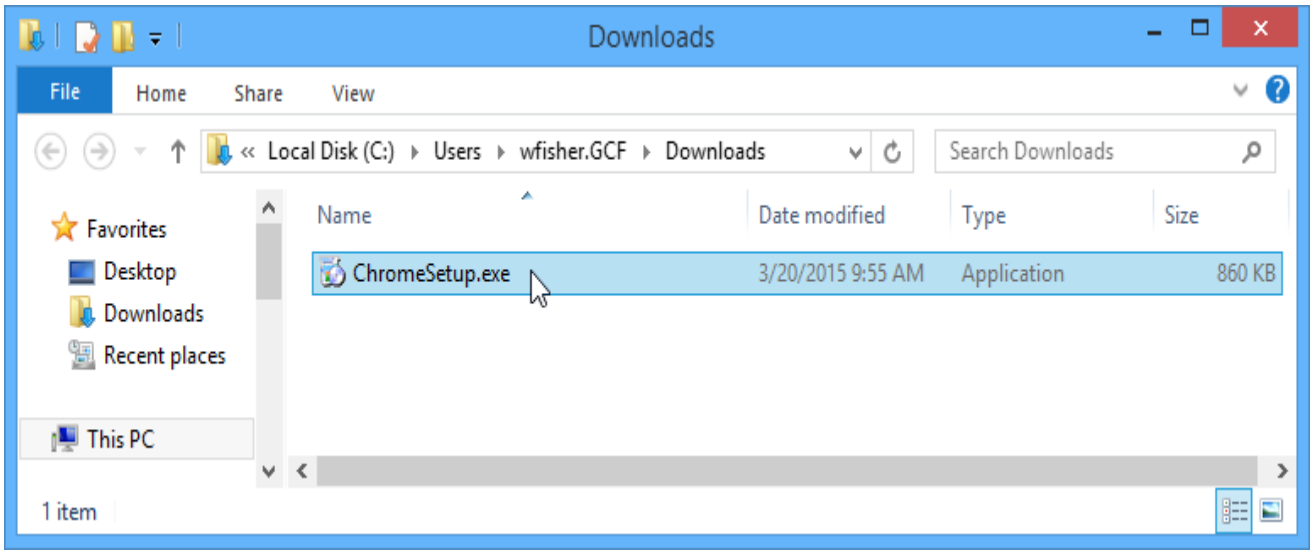
Today, the most common way to get new software is to download it from the Internet. Applications like Microsoft Office and Adobe Photoshop can now be purchased and downloaded right to your computer.You can also install free software this way. For example, if you wanted to install the Google Chrome web browser, you can visit this page and click the Download button.

The installation file will be saved to your computer in .exe format. Pronounced dot e-x-e, this is the standard extension for installation files on Windows computers. You can follow the steps below to install an application from an .exe file.

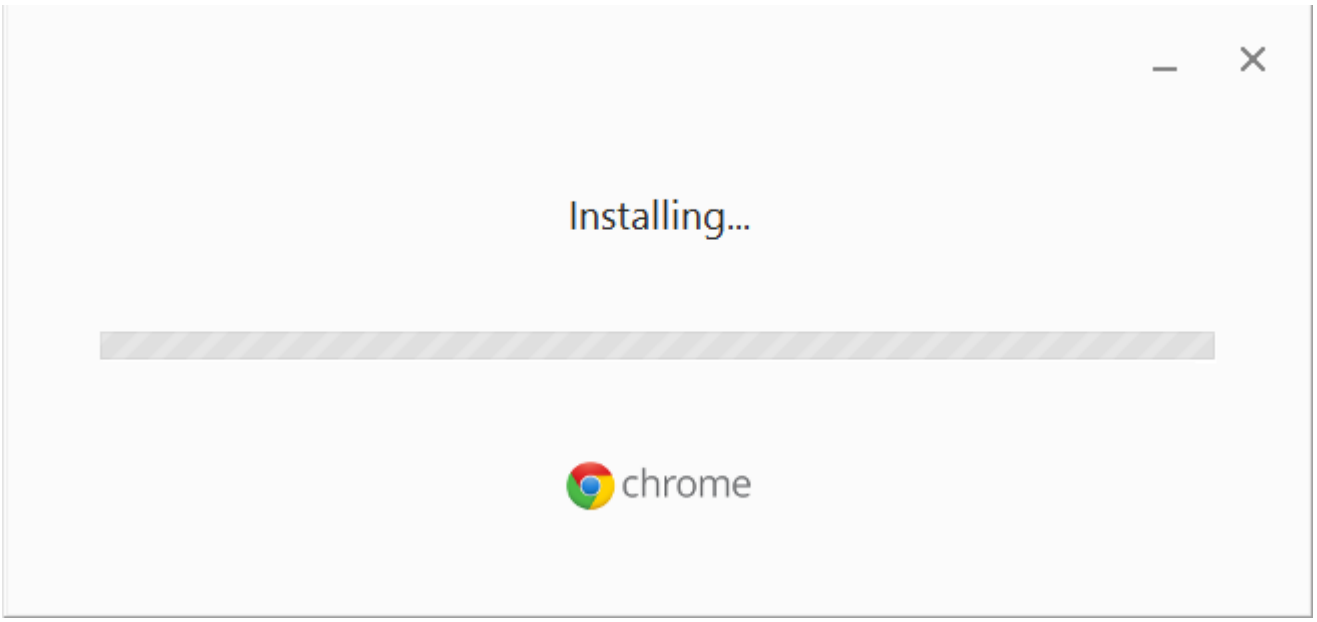
1. **Locate and download an .exe file.**



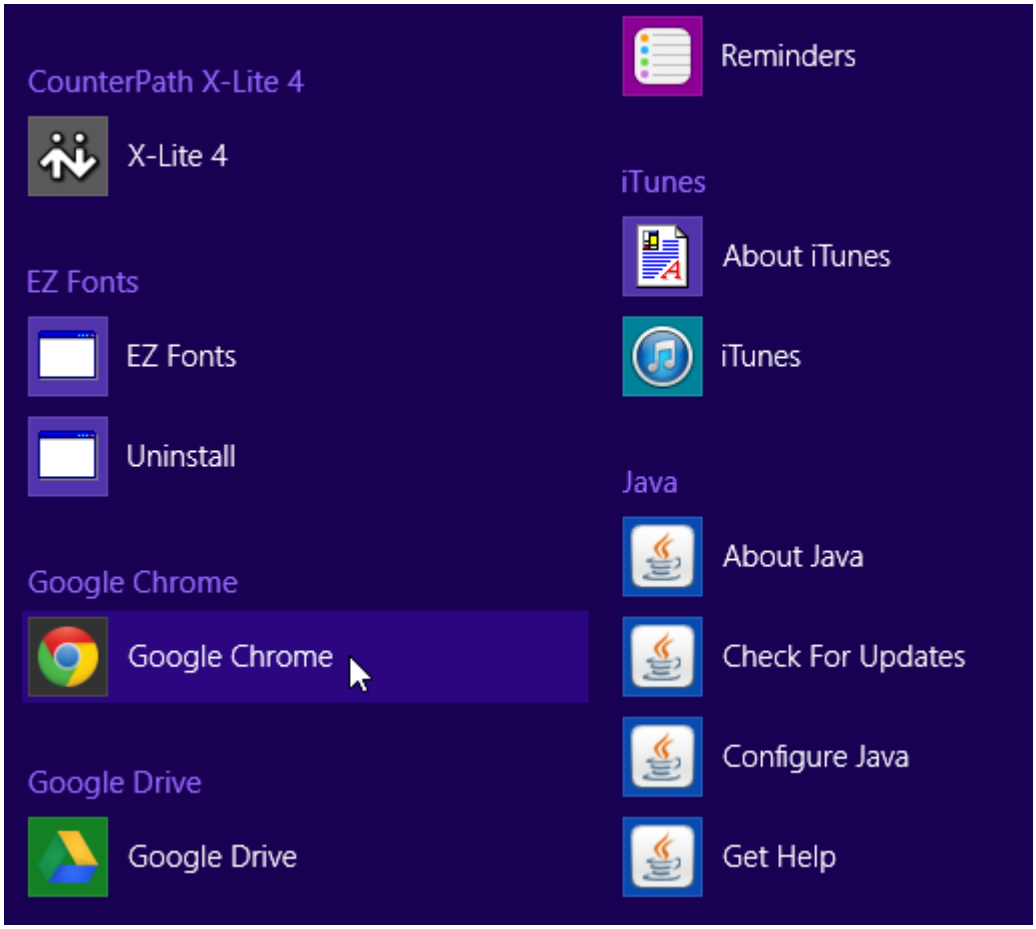
2. Locate and **double-click** the .exe file. (It will usually be in your **Downloads** folder.)



3. A dialog box will appear. Follow the instructions to install the software.



- The software will be installed. You can now open the application from the **Start menu** (Windows 7) or the **Start Screen** (Windows 8).



Testing the application software

Installation Testing (Implementation Testing) is quite an interesting part of the Software Testing Life Cycle.

Installation Testing is like introducing a guest in your home. The new guest should be properly introduced to all the family members in order to feel comfortable. Installation of new software is also quite like the above example.

If your installation is successful on the new system, then a customer will be definitely happy but what if things are completely opposite**.** If an installation fails, then our program will not work on that system not only this but can leave a user's system badly damaged. A user might require reinstalling the full operating system.

LO 3.3: Reinstall the computer application software

- **Content/Topic 1: Identification of software and hardware compatibility**

A family of computer models is said to be compatible if certain software that runs on one of the models can also be run on all other models of the family. The computer models may differ in performance, reliability or some other characteristic. These differences may affect the outcome of the running of the software.

Software compatibility

Software compatibility can refer to the compatibility that a particular software has running on a particular CPU architecture such as Intel or PowerPC. Software compatibility can also refer to ability for the software to run on a particular operating system. Very rarely is a compiled software compatible with multiple different CPU architectures. Normally, an application is compiled for different CPU architectures and operating systems to allow it to be compatible with the different system. Interpreted software, on the other hand, can normally run on many different CPU architectures and operating systems if the interpreter is available for the architecture or operating system. Software incompatibility occurs many times for new software released for a newer version of an operating system which is incompatible with the older version of the operating system because it may miss some of the features and functionality that the software depends on.

Hardware compatibility

Hardware compatibility can refer to the compatibility of computer hardware components with a particular CPU architecture, bus, motherboard or operating system. Hardware that is compatible may not always run at its highest stated performance, but it can nevertheless work with legacy components. An example is RAM chips, some of which can run at a lower (or sometimes higher) clock rate than rated. Hardware that was designed for one operating system may not work for another, if device or kernel drivers are unavailable. As an example, much of the hardware for macOS is proprietary hardware with drivers unavailable for use in operating systems such as Linux.

Identification and Selection of storage media to be used

An application can be installed using different methods, which are as follows:

CD/DVD: The application's installation files are provided on the CD/DVD. Before this method, floppy disks used to be the most popular method. The CD/DVD method is being phased out because most application development organizations provide a direct download from their Websites. Small organizations, even though, still use the CD/DVD method. The CD/DVD contains the installation files that a user can use to install the application.

Network: The installation files are copied to a shared folder on a server. When a user needs to install an application, the access is granted to the user.

Internet: this is the most preferred method. After purchasing the application, the user is given access to the application installer and installation key. The user needs to download the installer and then install on his or her system. Users typically download pirated, shareware, open-source, and freeware from the Internet.

Solid-State Drives

A relatively new component becoming more common in some personal computers is the solid-state drive (SSD). The SSD performs the same function as a hard disk: long-term storage. Instead of spinning disks, the SSD uses flash memory, which is much faster.

Solid-state drives are currently quite a bit more expensive than hard disks. However, the use of flash memory instead of disks makes them much lighter and faster than hard disks. SSDs are primarily utilized in portable computers, making them lighter and more efficient. Some computers combine the two storage technologies, using the SSD for the most accessed data (such as the operating system) while using the hard disk for data that is accessed less frequently. As with any technology, Moore's Law is driving up capacity and speed and lowering prices of solid-state drives, which will allow them to proliferate in the years to come.

Here are examples of removable media storage to be used to store different applications to be used while installing operating system,

1. DVD/CD
2. Floppy disk
3. Flash disk
4. External hard disk
5. Network

Identification and Selection of application software to be reinstalled

- Graphic design software
- Spread sheet software
- Audio editing software
- Video editing software

- Web design software
- Text editing software

Application software re-installation Process

Installing software on your Windows PC

Your computer allows you to do some really amazing things. Digital photo editing, sophisticated computer gaming, video streaming—all of these things are possible because of different types of software. Developers are always creating new software applications, which allow you to do even more with your computer.

Installing from a CD-ROM

From the mid-1990s through the late 2000s, the most common way to get new software was to purchase a CD-ROM. You could then insert the disc, and the computer would walk you through through the installation.

Now, almost all software has moved away from this model. Many new computers no longer include a CD-ROM for this reason. However, if you do need to install software from a CD-ROM, simply insert the disc into your computer, then follow the instructions.

Installing software from the Web

Today, the most common way to get new software is to download it from the Internet. Applications like Microsoft Office and Adobe Photoshop can now be purchased and downloaded right to your computer. You can also install free software this way. For example, if you wanted to install the Google Chrome web browser, you can visit this page and click the Download button.

The installation file will be saved to your computer in .exe format. Pronounced dot e-x-e, this is the standard extension for installation files on Windows computers. You can follow the steps below to install an application from an .exe file.

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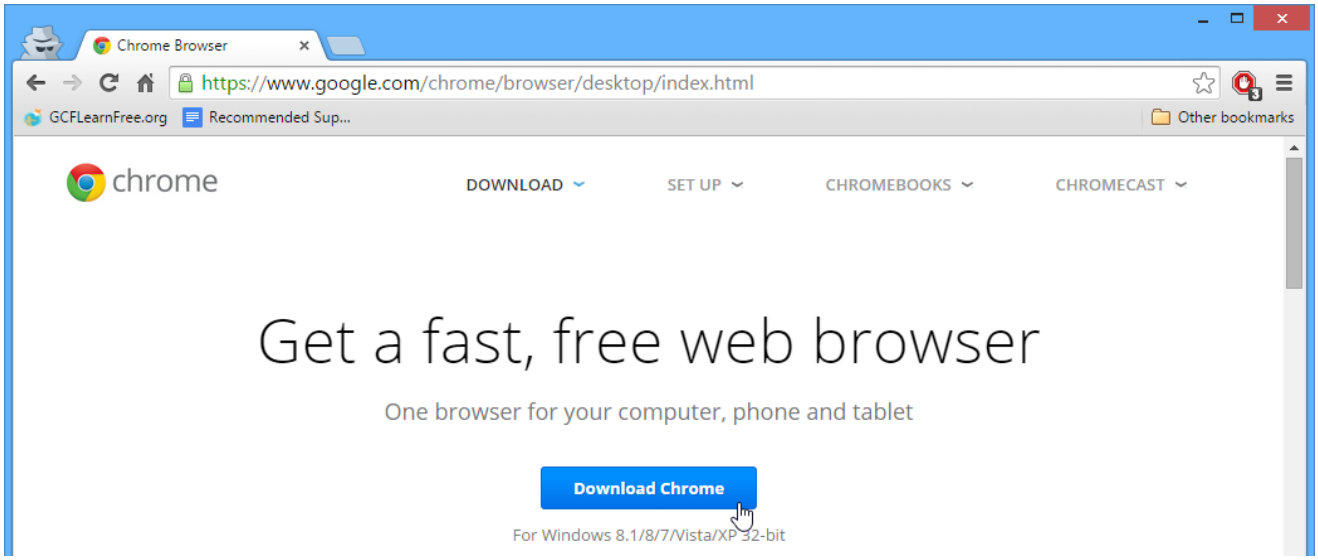
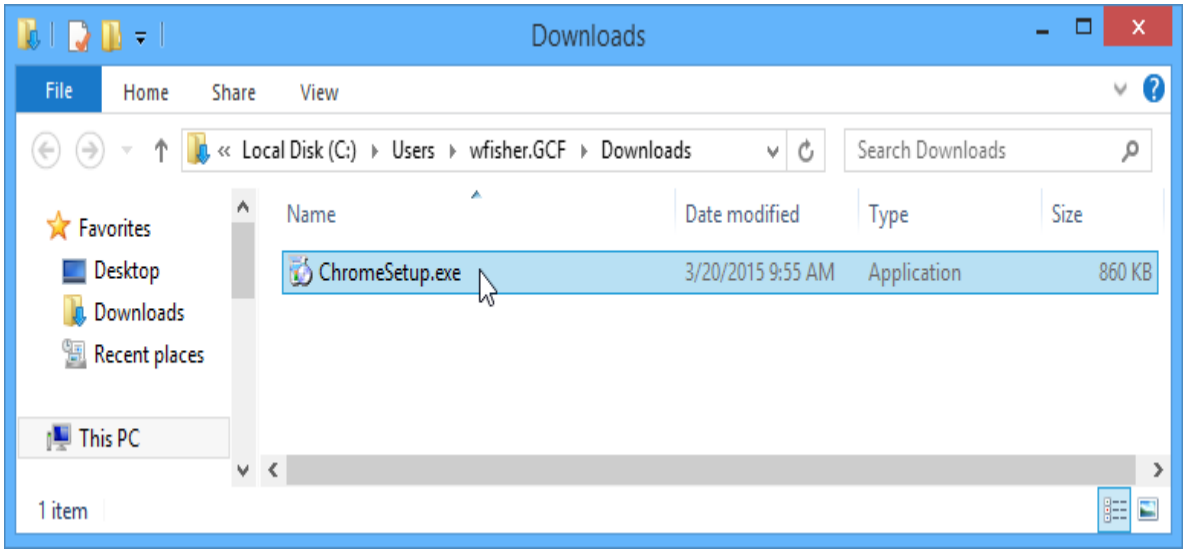
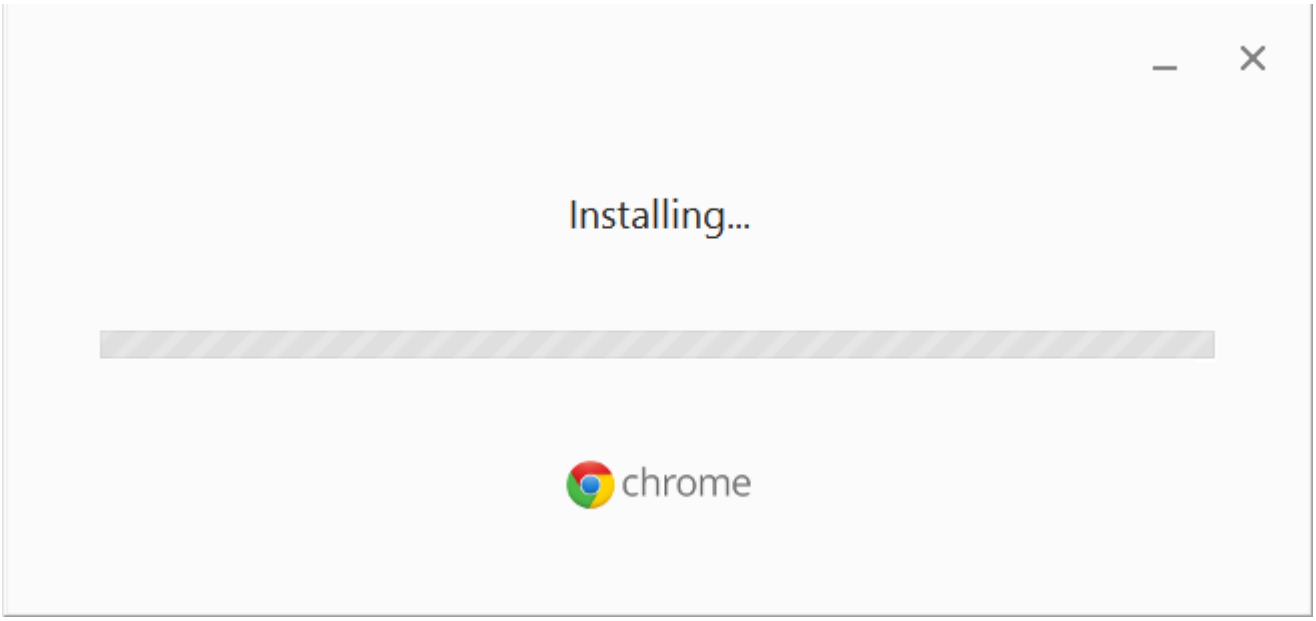


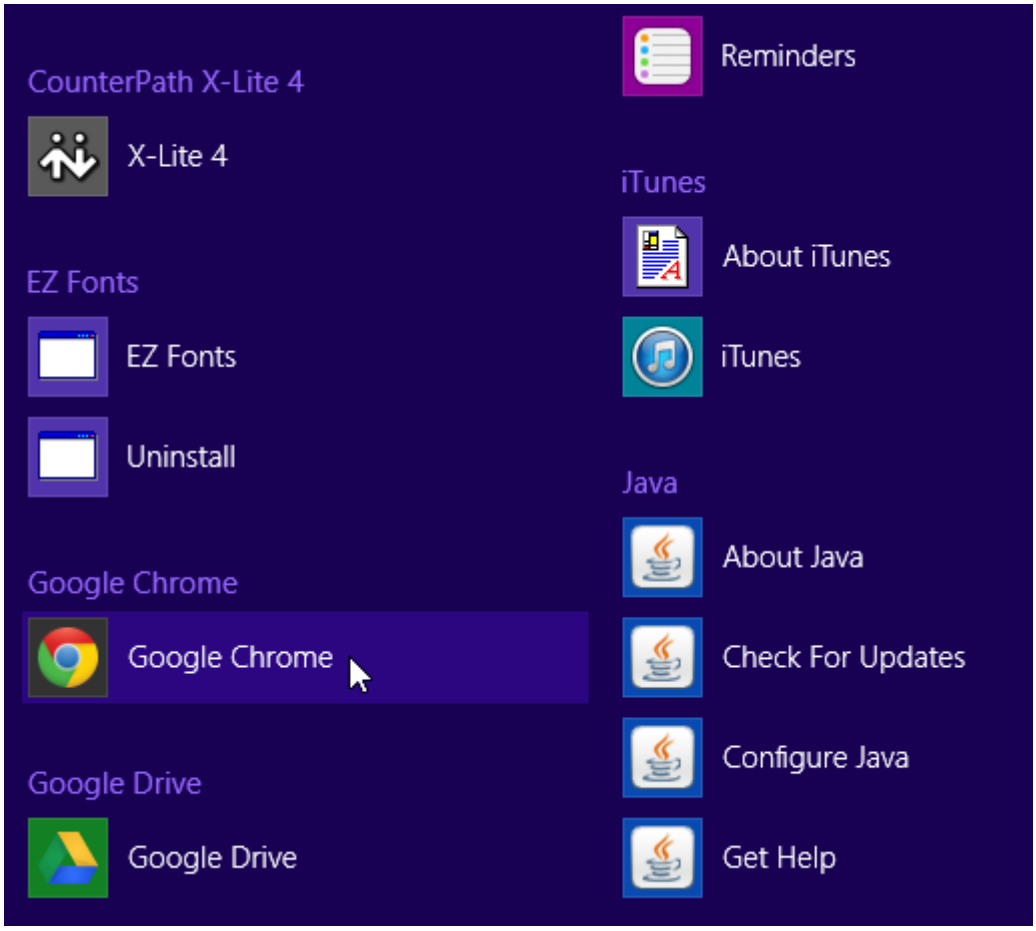
2. Locate and double-click the .exe file. (It will usually be in your Downloads folder.)



3. A dialog box will appear. Follow the instructions to install the software.



4. The software will be installed. You can now open the application from the Start menu (Windows 7) or the Start Screen (Windows 8).



Testing the application software

- Running the re- installed application
- Testing of the application performance
- Checking application features

Learning Unit 4: Update upgrade and reinstall computer software

LO 4.1: Update the computer operating system and applications software

- **Content /Topic1: Updating Different types of operating system**

As flaws are found in your computer's operating system and other software, they are patched through software updates. All operating systems and software require updates to repair security flaws that are found after the software was originally released.

Microsoft Windows Operating System

Manual Windows Update

Follow the instructions below to manually check for updates. You need to be connected to the Internet. Windows update will take a few moments to analyze your system. You will then be prompted with a listing of Service Packs or Hotfixes available for your system.

From the **Start** menu, choose **Windows Update.**
If you do not have the Windows Update item in your **Start** menu, you can get to it using **Internet Explorer** and going to http://windowsupdate.microsoft.com/ (Note, only Internet Explorer will work.)

Carefully follow the instructions on the **Windows Update** Website to install all **critical** updates.

Automatic Windows Update

How to configure and use Automatic Updates in Windows

Apple Mac Operating System

Manual Mac Update

From the Apple menu, choose App Store.

Click on Updates at the top of the App Store screen.

Install all security updates that it says are available.

After the update is complete, restart your computer if required. You will be prompted if it is required.

Repeat these steps to see if more updates are available. Some updates are prerequisites for others. You may need to repeat these steps several times until no more updates are available.

Linux Ubuntu and Fedora Operating System Upgrade

There is one thing to understand about updating Linux: Not every distribution handles this process in the same fashion. In fact, some distributions are distinctly different down to the type of file types they use for package management.

- Ubuntu and Debian use .deb
- Fedora, SuSE, and Mandriva use .rpm

- Slackware uses .tgz archives which contain pre-built binaries
- And of course there is also installing from source or pre-compiled .bin or .package files.¬†

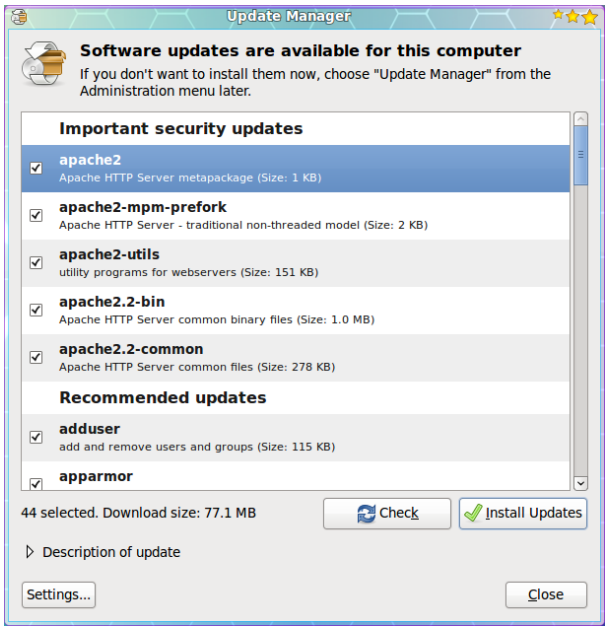
As you can see there are number of possible systems (and the above list is not even close to being all-inclusive). So to make the task of covering this topic less epic, I will cover the Ubuntu and Fedora systems. I will touch on both the GUI as well as the command line tools for handling system updates.

Ubuntu Linux

Ubuntu Linux has become one of the most popular of all the Linux distributions. And through the process of updating a system, you should be able to tell exactly why this is the case. Ubuntu is very user friendly. Ubuntu uses two different tools for system update:

- apt-get: Command line tool.
- Update Manager: GUI tool.

The Update Manger is a nearly 100% automatic tool. With this tool you will not have to routinely check to see if there are updates available. Instead you will know updates are available because the Update Manager will open on your desktop (see Figure 1) as soon as the updates depending upon their type:



- Security updates: Daily
- Non-security updates: Weekly

If you want to manually check for updates, you can do this by clicking the Administration sub-menu of the System menu and then selecting the Update Manager entry. When the Update Manager opens click the Check button to see if there are updates available.

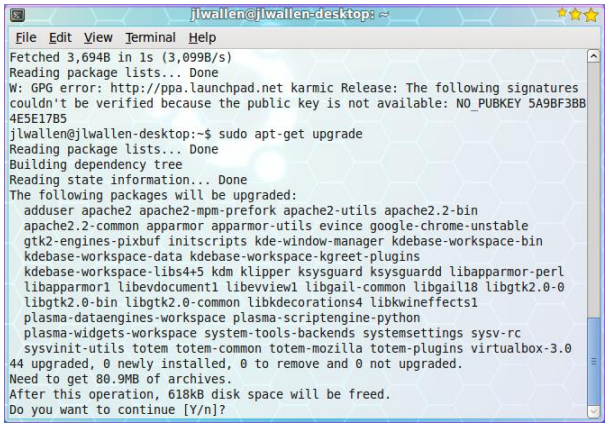
Figure 1 shows a listing of updates for a Ubuntu 9.10 installation. As you can see there are both *Important Security Updates* as well as *Recommended Update*. If you want to get information about a particular update you can select the update and then click on the *Description of update* dropdown.

In order to update the packages follow these steps:

1. Check the updates you want to install. By default, all updates are selected.
2. Click the Install Updates button.
3. Enter your user (sudo) password.
4. Click OK.

The updates will proceed and you can continue on with¬† your work. Now some updates may require either you to log out of your desktop and log back in, or to reboot the machine. There are is a new tool in development (Ksplice)¬† that allow even the update of a kernel to not require a reboot. Once all of the updates are complete the Update Manage main window will return reporting that *Your system is up to date*.

Now let's take a look at the command line tools for updating your system. The Ubuntu package management system is called *apt*. Apt is a very powerful tool that can completely manage your systems packages via command line. Using the command line tool has one drawback – in order to check to see if you have updates, you have to run it manually. Let's take a look at how to update your system with the help of Apt. Follow these steps:



1. Open up a terminal window.
2. Issue the command *sudo apt-get upgrade*.
3. Enter your user's password.
4. Look over the list of available updates (see Figure 2) and decide if you want to go through with the entire upgrade.
5. To accept all updates, click the 'y' key (no quotes) and hit Enter.
6. Watch as the update happens.

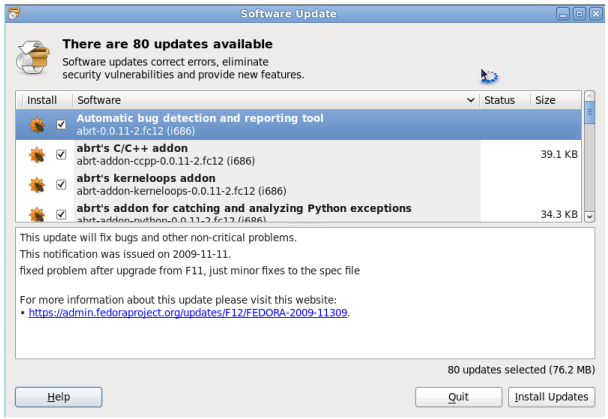
That's it. Your system is now up to date. Let's take a look at how the same process happens on Fedora (Fedora 12 to be exact).

Fedora Linux

Fedora is a direct descendant of Red Hat Linux, so it is the beneficiary of the Red Hat Package Management system (rpm). Like Ubuntu, Fedora can be upgraded by:

- yum: Command line tool.
- GNOME (or KDE) PackageKit: GUI tool.

Depending upon your desktop, you will either use the GNOME or the KDE front-end for PackageKit. In order to open up this tool you simply go to the Administration sub-menu of the System menu and select the Software Update entry. When the tool opens (see Figure 3) you will see the list of updates. To get information about a particular update all you need to do is to select a specific package and the information will be displayed in the bottom pane.

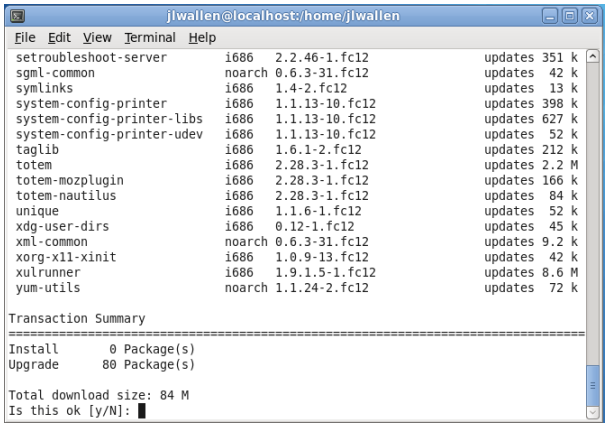


To go ahead with the update, click the Install Updates button. As the process happens a progress bar will indicate where GNOME (or KDE) PackageKit is in the steps. The steps are:

1. Resolving dependencies.
2. Downloading packages.
3. Testing changes.
4. Installing updates.

When the process is complete, GNOME (or KDE) PackageKit will report that your system is update. Click the OK button when prompted.

Now let's take a look at upgrading Fedora via the command line. As stated earlier, this is done with the help of the *yum* command. In order to take care of this, follow these steps:



1. Open up a terminal window (Do this by going to the System Tools sub-menu of the Applications menu and select Terminal).
2. Enter the *su* command to change to the super user.
3. Type your super user password and hit Enter.
4. Issue the command *yum update* and yum will check to see what packages are available for update.
5. Look through the listing of updates.
6. If you want to go through with the update enter 'y' (no quotes) and hit Enter.
7. Sit back and watch the updates happen.
8. Exit out of the root user command prompt by typing "exit" (no quotes) and hitting Enter.
9. Close the terminal when complete.

Your Fedora system is now up to date.

System Software Updates

First, let's look at updating system software. You always want to keep your system updated as much as possible as updates most often focus on bug fixes, so your system will run better, and additional security, so your computer doesn't end up with a virus or something like that.

To update system software on a Mac, just follow these steps:

Click the Apple menu (up in the top left corner of your screen) and choose "Software Update."

Software Update will load and check for updates. When it finishes, it'll let you know if there are any updates to install. Click "Show Details" to see any updates Software Update wants to install, or just click the "Install" button to install them.

The process is similar on Windows computers. To update your system software on Windows, just follow these steps:

1. Click the Windows icon in your task bar to open up the Start menu. (If you don't already know, this icon is in the bottom left corner of your screen.)
2. Click "All Programs."

3. Click, "Windows Update."
4. After Windows Update opens, click "Check for Updates" on the top left side of the window.
5. Once Windows finishes checking for updates, click the "Install" button.
6. When the updates have finished installing, restart your computer (if prompted).

Software Update (Mac) and Windows Update (Windows) will periodically run all by themselves and ask you to update. Nonetheless, you may not notice this or ignore it from time to time, so it's good to check yourself once in a while.

Note: If you're worried about messing up your computer, don't. It's very hard to make a mistake when updating your software nowadays, and Windows Update even creates a restore point for you in case an update goes south. If you're on a Mac and already backing up with Time Machine, you'll be able to restore as well. The chances of something going wrong are pretty slim, however, so as long as you don't turn off your machine during an update you have nothing to worry about.

Third-Party Software Updates

Third-party software describes any software created by a third party and did not come with your computer's operating system. This primarily includes any software you, yourself, have installed on your machine. Because third-party software is created by different people, the way you update it varies.

Web browsers, such as Firefox and Google Chrome, update themselves. You don't have to do anything at all. Other software may also update itself, or notify you of an update so you can choose whether to install it or not. Most software will allow you to check for updates manually. The location varies, but you'll almost always find a "Check for Updates" option in one of the program's menus. Some software will not notify you of updates and you'll have to visit the software's web site in order to find out if a new version is available. If it is, just download the available update or the most recent version and install it like it's a new program. If it asks you to replace the previous version, it's okay to allow that. Finally, if you downloaded an application from the Mac App Store, simply open the Mac App Store, click the "Updates" tab, and install any available updates.

Those are the basics of updating software. It's a good idea to set a day and time each week to check for new updates to make sure you don't forget. It only takes a few minutes and your computer will be better off for it.

- **Checking of Hardware specifications**

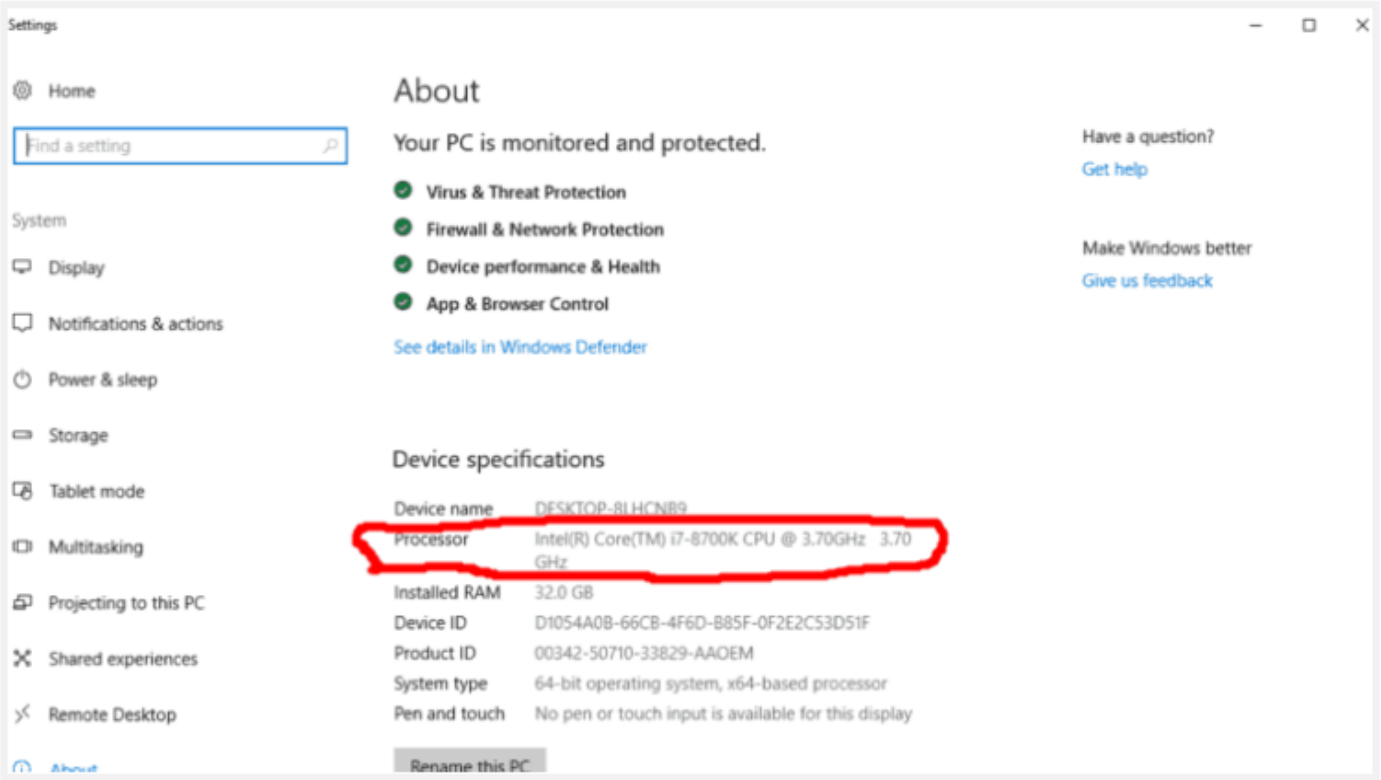
In this easy-to-follow guide, we'll walk you step-by-step through how to quickly check your computer's specs so that you can get the information you need.

How to Check What Processor (CPU) You Have

If you're wondering what kind of processor you have, you can easily find out that information on a Windows 10 computer in two clicks.

To find out what CPU you have, simply do the following:

1. Right-click on the Windows start menu icon on the bottom left-hand side of your screen.
2. Click on 'System' in the menu that pops up.
3. Next to 'Processor' it will list what kind of CPU you have in your computer.

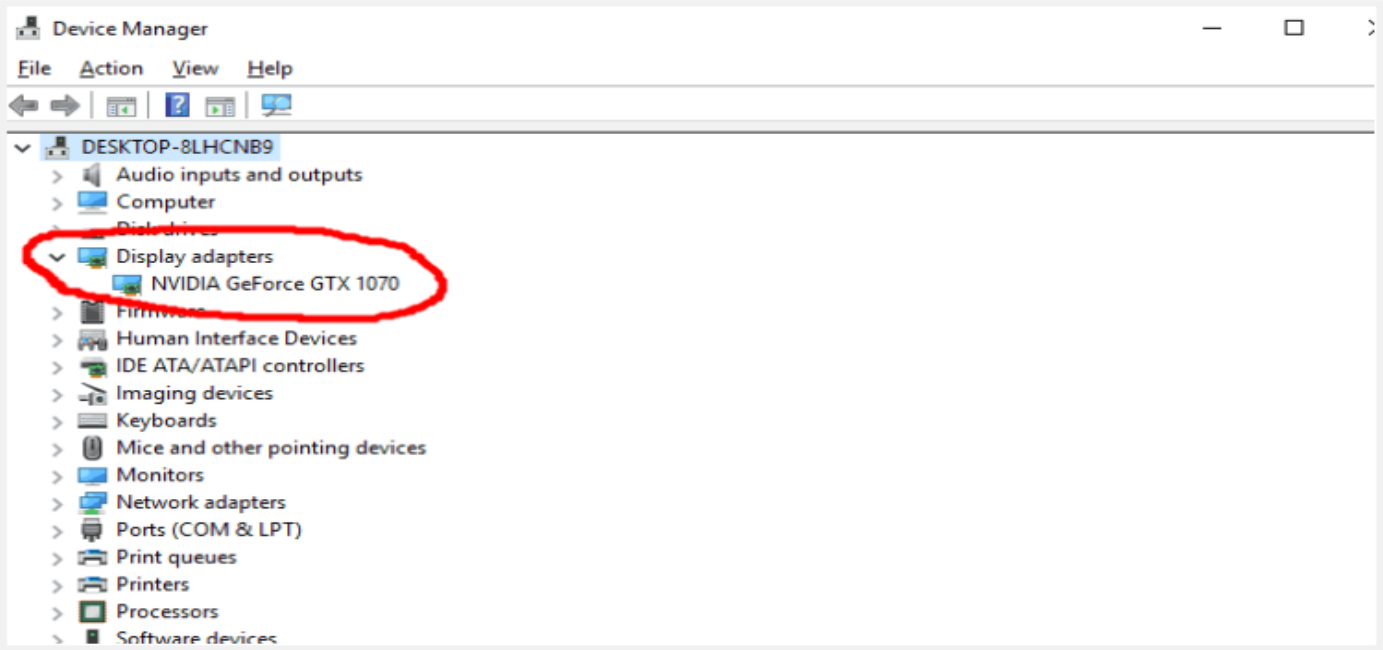


How to Check What Graphics Card (GPU) You Have

If you want to find out what kind of graphics card you have, the process is similar to finding out what CPU you have, but checking to see what GPU is in your system is 50% more work than checking to see what your CPU is. (Beause you have to click 3 times, instead of 2.)

To find out what GPU you have, simply do the following:

1. Again, right-click on the Windows start menu icon.
2. Click on 'Device Manager' in the menu that pops up.
3. In 'Device Manager' click on the arrow next to 'Display Adapters'
4. Your GPU will be listed there.



It should be noted, though, that it might show two options under the 'Display Adapters' tab. If it shows two, that means it is showing both the integrated graphics on your processor and the dedicated graphics card on your laptop.

The one that you are looking for is the dedicated graphics card, as it is the more powerful (and the one your system uses) of the two.

And, your dedicated graphics card will typically be the second option listed. If you have an Intel processor, the integrated graphics will be named something like 'Intel HD Graphics 4000.' In that case, the other option will be the one you want to.

And, it will likely either be something like NVIDIA GeForce GTX 700M or AMD Radeon (or HD) R9 M470. Just note, though, that if you have an AMD processor in your system, the integrated graphics will also likely be 'AMD Radeon…" But in that case, just go with the 2nd option, as that is likely your dedicated graphics.

How to Check What Motherboard You Have

To find out what type of motherboard you have (and, really, who manufactures your motherboard and what socket and chipset it is), the process is a bit different than above.

You could of course open up your desktop (if you have a desktop and not a laptop) and check and see who manufactures your motherboard and what the model name is on the board.

However, motherboards are typically named something like ASUS Z370-A, or MSI B350M, or Gigabyte GA-AX370-Gaming5, where ASUS, MSI, and Gigabyte are motherboard manufactures, and Z370, B350, and X370 are the motherboard chipsets (which can also lead you to the socket type of the motherboard as well.)

For some users, you can try the following:

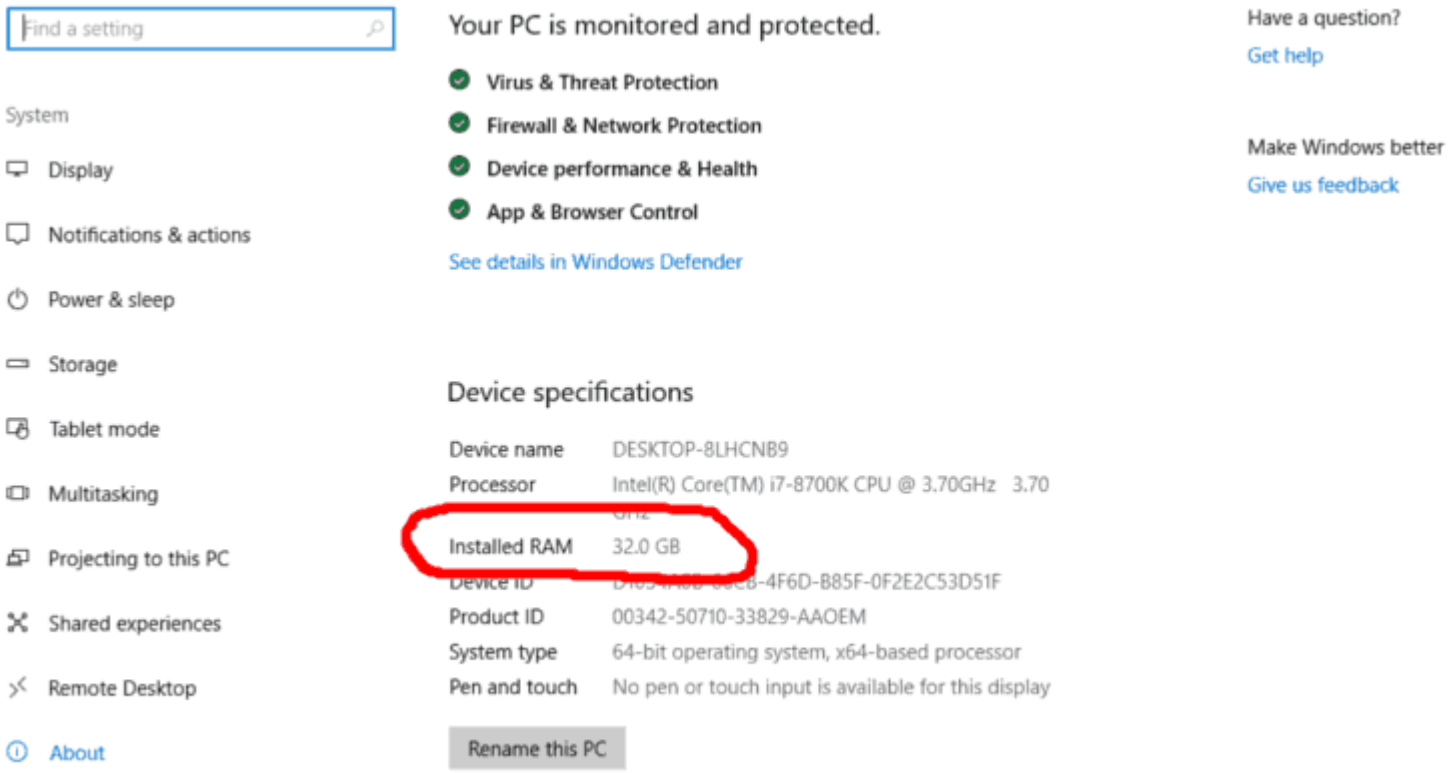
1. In the Windows search bar, type in 'System Information'
2. Scroll down on the System Summary tab (opens on the left side of the window) until you find 'Motherboard Manufacturer', or 'BaseBoard Manufacturer'.
3. The information next to 'Motherboard/BaseBoard Manufacturer', 'Motherboard/BaseBoard Model', and 'Motherboard/BaseBoard Name', should give you the information you are looking for.

System Model	System Product Name
System Type	x64-based PC
System SKU	SKU
Processor	Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz, 3701 Mhz, 6 Core(s), 12 Logical P...
BIOS Version/Date	American Megatrends Inc. 0408, 8/31/2017
SMBIOS Version	3.0
Embedded Controller Version	255.255
BIOS Mode	UEFI
BaseBoard Manufacturer	ASUSTeK COMPUTER INC.
BaseBoard Model	Not Available
BaseBoard Name	Base Board
Platform Role	Desktop
Secure Boot State	Off
PCR7 Configuration	Binding Not Possible
Windows Directory	C:\Windows
System Directory	C:\Windows\system32
Boot Device	\Device\HarddiskVolume2
Locale	United States
Hardware Abstraction Layer	Version = "10.0.16299.192"
User Name	DESKTOP-8LHCNB9\brent

How to Check How Much Memory (RAM) You Have

Checking how much RAM you have in your computer is another very easy task. In fact, you can find how much memory you have on the same screen that lists what CPU you have.

1. Right-click the Windows start menu icon.
2. Select 'System'
3. Scroll down and it should list how much memory you have.



You can also find out how much RAM you have by looking in 'System Information' on Windows 10 as outlined in the section above on how to find out what type of motherboard you have.

Third Party Tools

While the methods above will easily all you to check your computer's specifications, you can also use third-party hardware monitoring tools to help you find necessary info about your system.

We recommend the following tools to help you monitor your computer's performance, as well as give you information (like what CPU and GPU you have, as well as how much RAM you have):

- CPU-Z
- Speccy
- Core Temp (CPU only)
- HWInfo

Now that you know what specs your computer has you can make a better decision on whether or not your current system is worth upgrading or not. However, it should be noted that if you are looking to upgrade your components, it isn't as simple as just picking out a new and better component and putting it into your system.

Your current components will dictate what new components you can buy. For instance, if you have an older motherboard, you can't simply go out and upgrade to the newest processor, because your motherboard and the newest processor probably won't be compatible.

Checking of Software specifications

Knowing your current PC's system specs is imperative when you're buying a new PC, upgrading your current hardware or software, and while you're comparing the performance of two different computers.

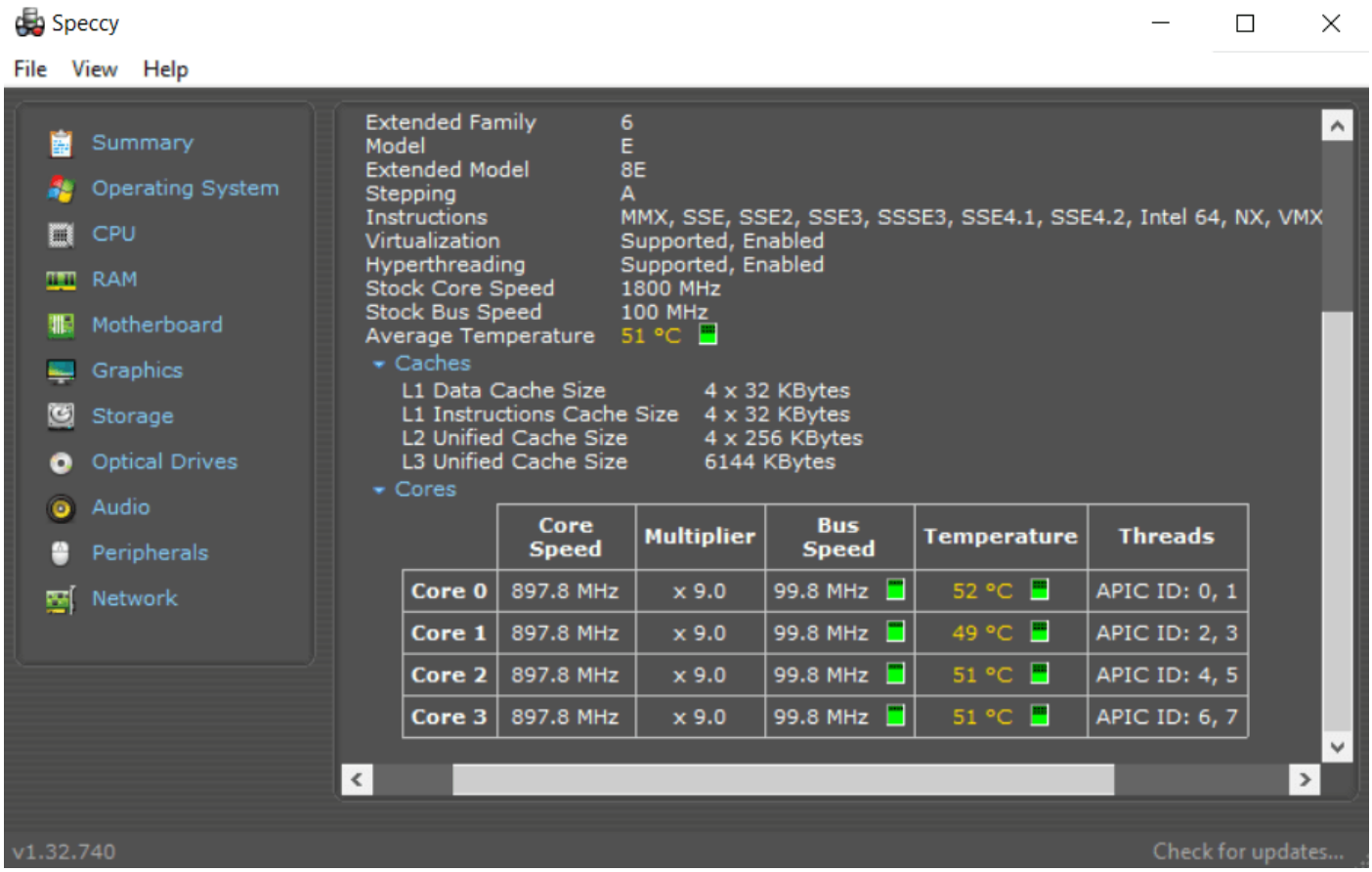
What Is A System Information Software?

A system information software or PC information software is a tool that tells you the detailed specifications of your computer. A good system information tool tells you everything from RAM usage and CPU usage to what type of graphics memory you have and so on.

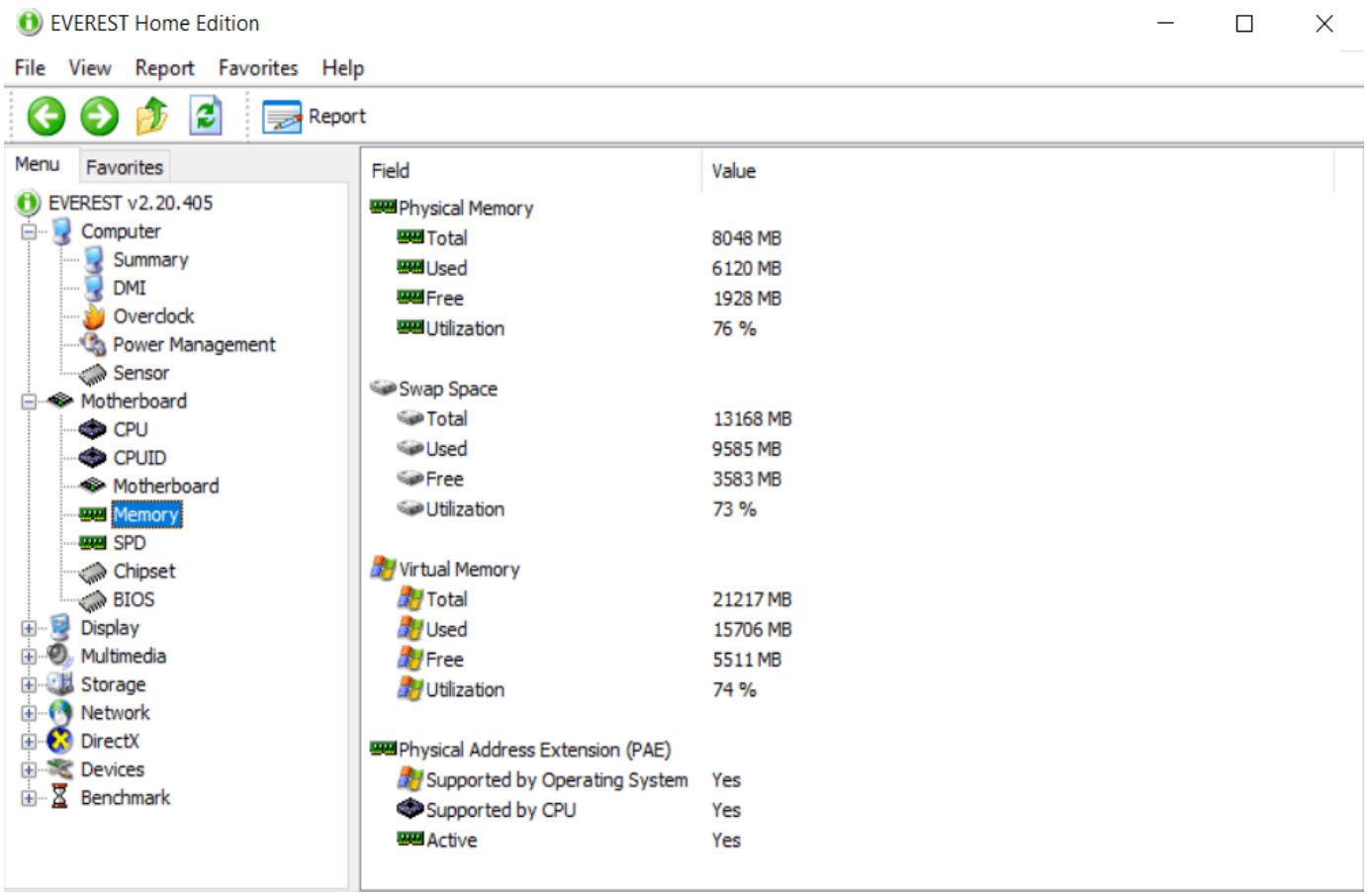
Moreover, such tools can also be used to measure CPU load while running a certain application, comparing the workload of two different applications, and a lot of other stuff as well.

Some Best System Information Software

- ✓ Speccy
- ✓ Everest Home Edition
- ✓ Wise System Monitor
- ✓ HWiNFO
- ✓ CPUz And GPUz
- ✓ HWMonitor
- ✓ Belarc Advisor
- ✓ Astra32
- ✓ Sandra Lite
- ✓ Agaue Eye



2. Everest Home Edition



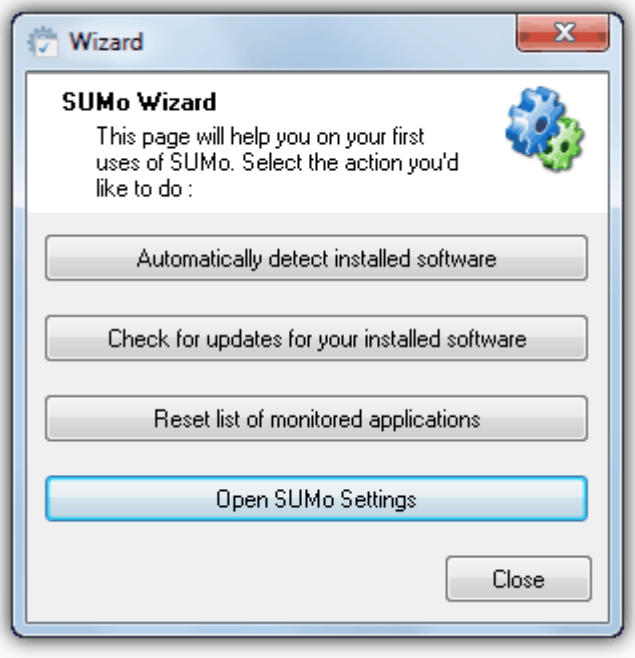
- **Checking of Software new features**

Software Update Check App will help you to check for all pending updates, downloaded apps, system apps at regular bases.

Tools to Check Installed Software for Updates

Whether it's freeware, commercial software, shareware or Windows itself, keeping your installed software up to date is a good idea. New versions often bring security updates, bug fixes, enhancements and new features. Checking for updated software yourself is not very appealing especially if you have a lot of programs installed. Some might have an automatic update function somewhere inside the settings, but many do not.
Using a program to check as many of these software titles as possible for you, and telling you if updates are available or not, could be a potential time saver. Here are 4 different tools that can help tell you if your current software is out of date.

- **Software Updates Monitor (SUMO)**

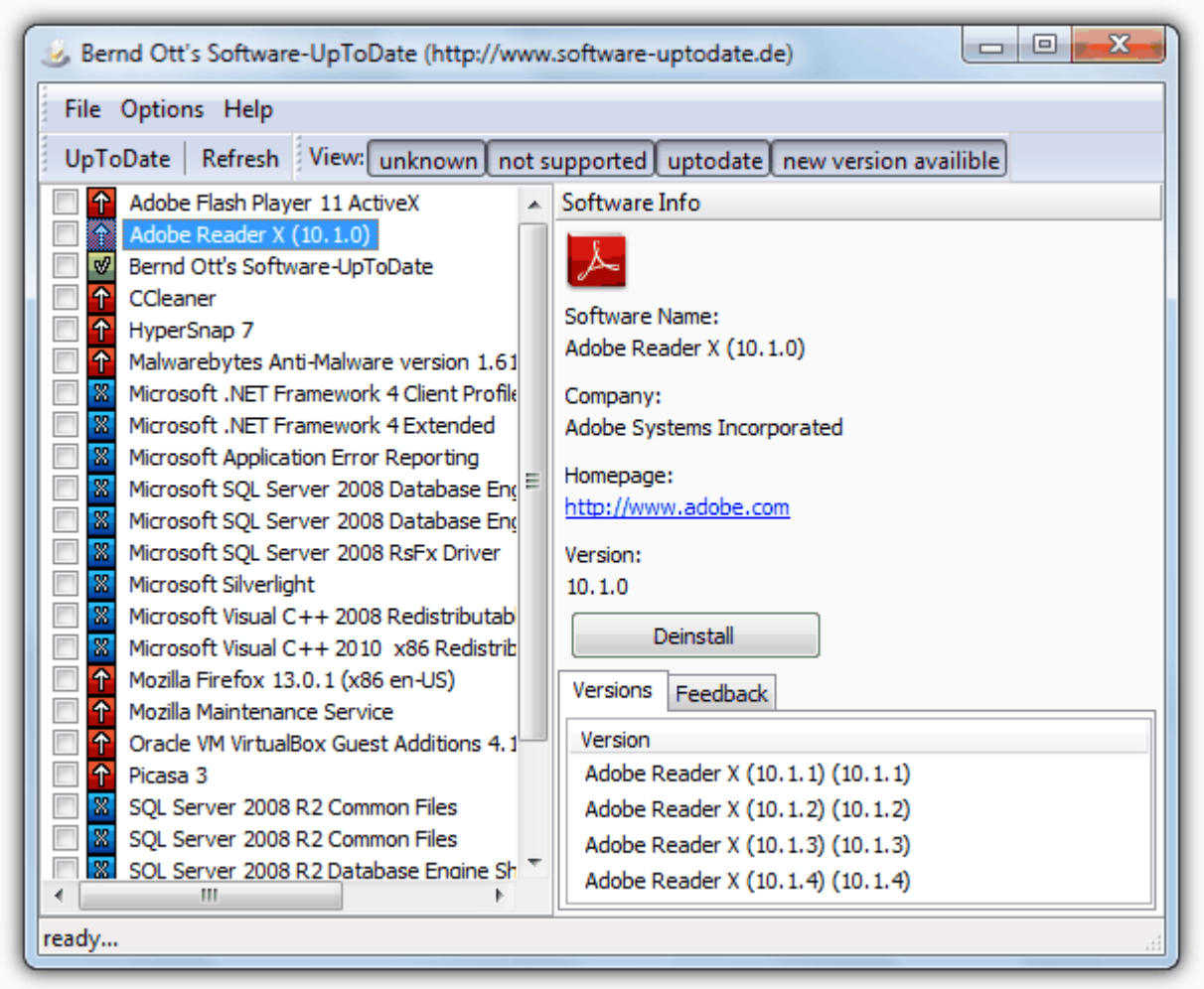


SUMO is a program which shows a lot of promise because it can detect a vast array of software titles and also gives options of including specific executable files or folders in non-standard locations. Multiple locations are scanned to detect any software such as the Program Files folder, Windows folder and the registry.

When you run the program it will pop up a small wizard window where you need to click to detect your installed software, and then check it for updates. After that the wizard can be closed and you will see all the detected applications and the icons to show whether each one has major, minor or no update available. Entries can be excluded from scans or removed altogether, or new ones added via the File menu.

- **Software-UpToDate**

Software-UpToDate by Bernd Ott is a simple update checking program that does what it claims to do and nothing more. The database of recognized software is large and kept updated and appears to be quite accurate, matching SUMO pretty much in all the software it tried to detect.



After installation all you have to do is select if you want the program to check for beta versions, a scheduled check and whether to use SSL for the connection. Then when the main window has loaded click the UpToDate button and your software will be checked for any updated versions. The red arrowed icons are the programs that have an updated version available and the right side will give details about the current version, with a list of all the known versions that are newer than the one you have installed.

LO 4.2: Upgrade the computer operating system and applications software

- **Content /Topic1: Upgrading different types of operating system**

In the rapidly changing world of both computer technology and consumer expectations, operating systems evolve rapidly. When a new version of the operating system for your computer becomes available there are lines waiting to get it and install it on their machines. This deals with upgrading a Windows operating system and some of the pitfalls that can exist or arise in this process.

Updates vs. Upgrades
An update is when patches of code are released in order to fix minor stability or security issues. An upgrade is when the old operating system is replaced with the newest and supported version.

Why upgrade?

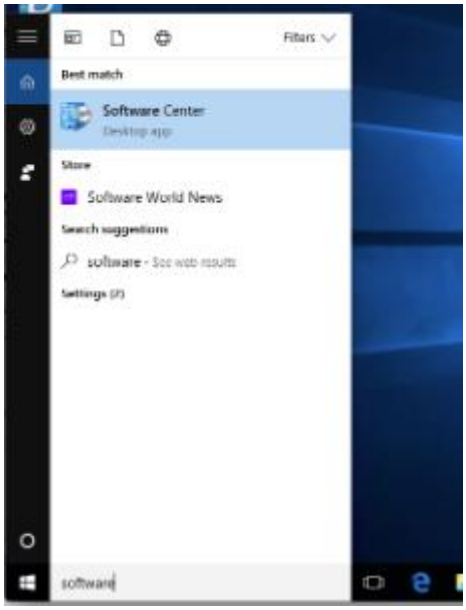
- ✓ Security upgrades - The most important reason to upgrade systems is to patch the vulnerabilities that exist in older operating systems. Both Apple and Microsoft have changed

the way they handle their older operating systems and CIT has to keep up by enforcing a new upgrade process.

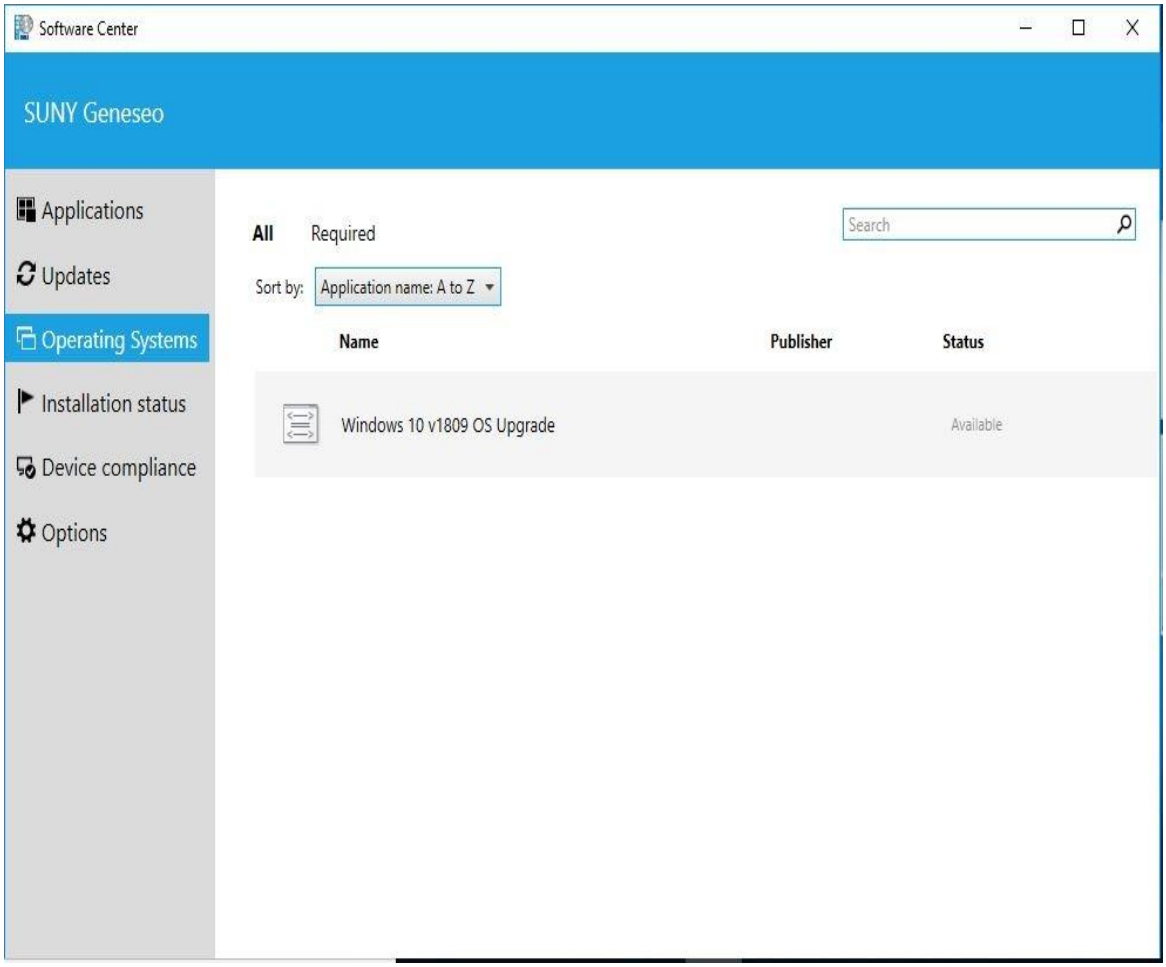
- ✓ Efficiency - Both Apple and Microsoft have made the code running their operating systems smaller and more efficient. In recent years, it's become more common to have upgrades improve a computer's performance.
- ✓ New features - New operating systems come with new features which empower clients with the ability to do more with existing hardware.

Upgrade Windows 10

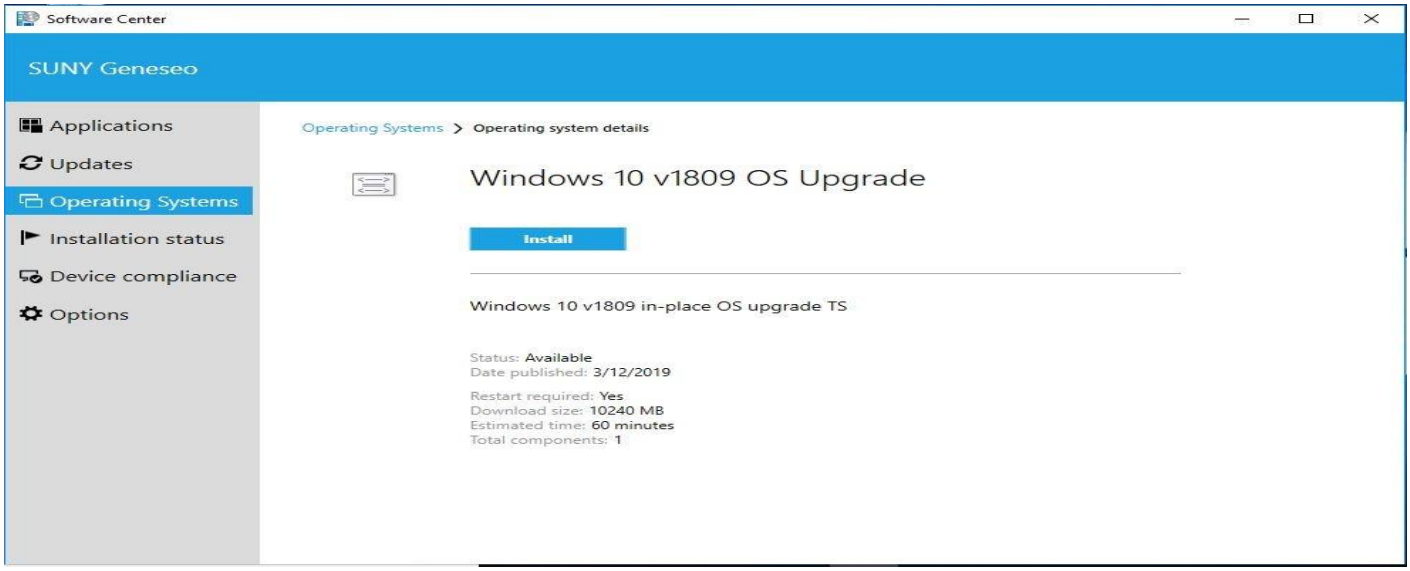
pen **Software Center** (click on the search icon in the lower left hand corner of the screen and type *Software Center*).



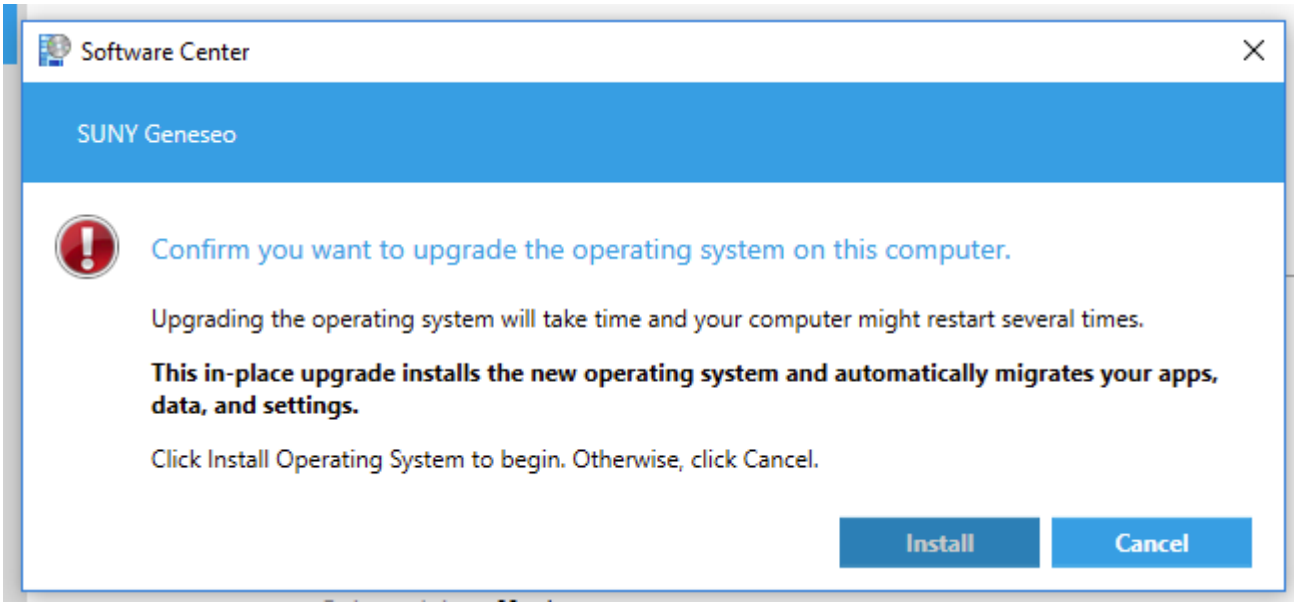
2. Select **Operating Systems** from the left hand column.



3. Click Windows 10 v1809 OS Upgrade
4. Click the Install button.



5. A window will pop up to confirm you are ready to upgrade. To proceed, click the **Install** button.



6. After a minute you will see a progress bar as the machine updates.

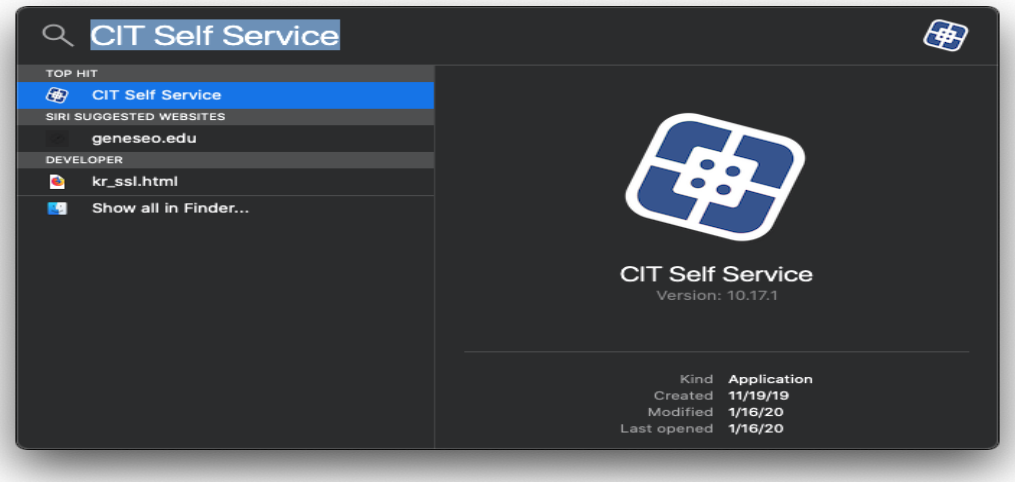
a) The upgrade process may take an hour or more.

b) Your device may restart more than once during this process. This is normal.

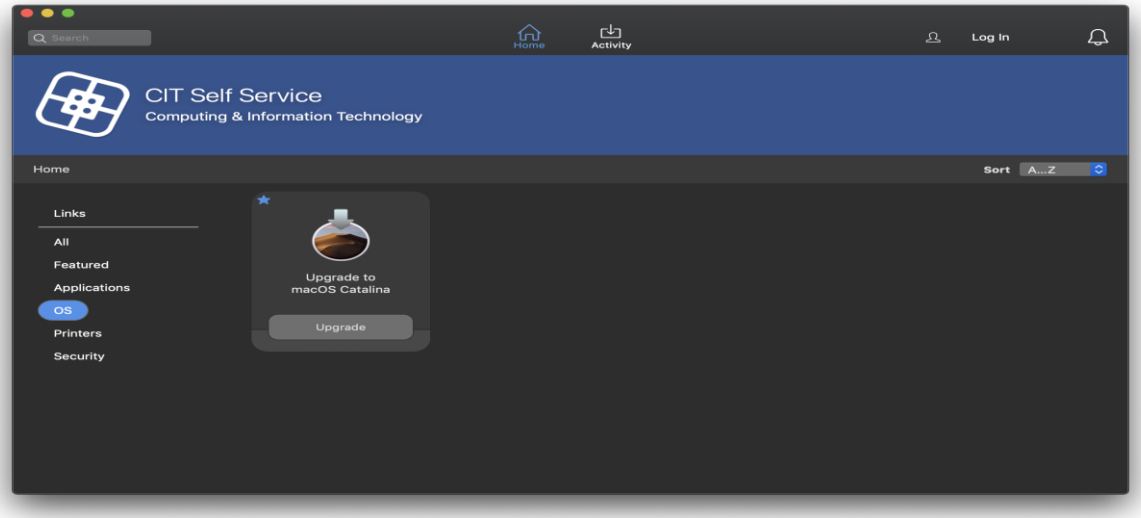
c) Once the upgrade has completed, log in to your computer and follow any onscreen prompts.

Upgrade macOS

1. Open CIT Self Service (click the magnifying glass icon in the top right-hand corner of the screen and type in CIT Self Service)



2. The update may appear on Featured tab or you can click the OS tab.
3. Click on the Update button for Install macOS Catalina.



4. Click the Upgrade button.

a) Your device may restart more than once during this process; this is normal.

b) Once the upgrade has completed, log in to your computer and follow any onscreen prompts

- **Content /Topic2: Description of Different types of Application software**

A software upgrade is a new version of the software that offers a significant change or major improvement over your current version. In many cases, a software upgrade requires the purchase of the new version of the software, sometimes at a discounted price if you own an older version of the software.

If you bought your software recently and an upgrade is released soon after that, some software companies offer the upgrade to the latest version for free. Be sure to register the software when you install it so you know if you qualify for these types of deals.

An important thing to note: upgrading software is different from *updating* software.

A software update (sometimes called a 'patch') is a download that contains 'fixes' for features that aren't working properly, security patches and sometimes minor feature enhancements.

A software upgrade, on the other hand, involves moving to a new version of your software. Moving from Windows 7 to Windows 10, for example, is a software upgrade. Unlike software updates, which are usually free, software upgrades often incur a cost.

If you're upgrading your software and IT applications, you'll either be moving to new *versions* of your current software or moving to other products completely. Whichever option you choose should depend on your **business requirements** - more on this below.

Before you embark on your upgrade odyssey it's important that you think about **why** your business needs to upgrade its software. Here are some questions to help you isolate the motivation to upgrade:

- ✓ Do our current applications expose us to **security** threats, like malware?

- ✓ Are we running into **performance** or **reliability** issues?
- ✓ How old is our **hardware**?
- ✓ Are our **operating systems** more than one version old?
- ✓ Are we running the latest **versions** of our applications?

You need to gather information from across your business and build a picture of how your current applications are performing, and what exactly the issues are. Upgrading your software is no mean feat, so you shouldn't approach it without a **clearly-articulated motivation** and a **set of requirements** for the new versions or applications.

Here are various types of application software:

Word Processors: These applications for documentation. Along with that it also helps I storing, formatting and printing of these documents. Some examples of word processors are:

- ✓ Abiword
- ✓ Apple iWork- Pages
- ✓ Corel WordPerfect
- ✓ Google Docs
- ✓ MS Word

Database Software: This software is used to create and manage a database. It is also known as the Database Management System or DBMS. They help with the organization of data. Some examples of DBMS are:

- ✓ Clipper
- ✓ dBase
- ✓ FileMaker
- ✓ FoxPro
- ✓ MS Access
- ✓ MySQL

Multimedia Software: It is the software that is able to play, create or record images, audio or video files. They are used for video editing, animation, graphics, and image editing, some examples of Multimedia Software are:

- ✓ Adobe Photoshop
- ✓ Inkscape
- ✓ Media Monkey
- ✓ Picasa
- ✓ VLC Media Player
- ✓ Windows Media Player
- ✓ Windows Movie Maker

Education and Reference Software: These types of software are specifically designed to facilitate learning on a particular subject. There are various kinds of tutorial software that fall under this category. They are also termed as academic software. Some examples are:

- ✓ Delta Drawing
- ✓ GCompris
- ✓ Jumpstart titles

- ✓ KidPix
- ✓ MindPlay
- ✓ Tux Paint

Graphics Software: As the name suggests, Graphics Software has been devised to work with graphics as it helps the user to edit or make changes in visual data or images. It comprises of picture editors and illustration software. Some examples are:

- ✓ Adobe Photoshop
- ✓ Autodesk Maya
- ✓ Blender
- ✓ Carrara
- ✓ CorelDRAW
- ✓ GIMP
- ✓ Modo
- ✓ PaintShop Pro

Web Browsers: These applications are used to browse the internet. They help the user in locating and retrieving data across the web. Some examples of web browsers are:

- ✓ Google Chrome
- ✓ Internet Explorer
- ✓ Microsoft Edge
- ✓ Mozilla Firefox
- ✓ Opera
- ✓ Safari
- ✓ UC Browser

Types of Windows Updates

You might have encountered the following types of Windows Updates when working on Windows devices.

Critical Update: It is a worldwide release update for any specific issue that is not related to the security that the operating system offers; such updates are released to address a critical but non-security issues

Definition Update: Definition update is a Windows update that adds or modifies the definition database of Windows operating system; A definition database is a database that is built into the operating system to help it identify malicious code, phishing sites, and junk mail

Update: An update addresses a noncritical, non-security-related bug.

Driver Updates: are the ones that affect the working of one or more device drivers

Security Updates: Updates that address security-related issues in an operating system are called security updates; These Windows Updates are generally issued after some security organization finds a fault in any operating system and notifies Microsoft; Microsoft creates a patch (update), asap or within a fixed period, to fix those issues; The update is then released worldwide; often users are also notified via email to download these security updates

Feature Pack Updates: Are updates that makes changes to specific features of the operating system; such updates are released as and when available to a selected set of users; if that set of users provide good feedback about the changes in operating system features, Microsoft includes the changes into the next big release of Windows Operating Software; Currently, you get two feature updates every year if you are using Windows 10

Monthly Rollup: Among the different types of Windows updates, you also get monthly rollup as an update on every second Tuesday normally; this update includes all the updates rolled out previous month plus additional definitions of malware

Service Pack: It is a cumulative set of all hotfixes, security updates, critical updates, fixes, and updates. It is a set of Windows Updates that were released between two successive versions of Windows operating system. The age of Service Packs is over now.

Tool updates: These are updates to the built-in utilities and tools.

Update rollup: A cumulative set of hotfixes, security updates, critical updates, and updates that are packaged together for easy deployment

Full updates: They have all the necessary components and files that have changed since the last feature update.

Express updates: They generate differential downloads for every component in the full update based on several historical bases.

Delta updates: They include only the components that changed in the most recent quality update, and will only install if a device already has the previous month's update installed.

Security Quality Update: It contains all the previous updates.

Security Monthly Quality Rollup: It contains only the current month's updates.

Preview of Monthly Quality Rollup: It is a preview of the Quality updates that will be released next month.

Service Stack Updates: They are kept separate from the regular cumulative updates because these Cumulative Updates add new and more optimized files to the operating system.

Steps for upgrading the OS and applications version

Upgrade steps

1) Run the Upgrade Tool from the Windows download page (online).

2) Select [Upgrade this PC now]

3) Select Language and Preferences

Click [Next] to continue.

4) Accept the End-User Licensing Agreement (EULA)

Click [Accept] to accept the EULA and continue with the upgrade.

Clicking [Decline] will exit the upgrade.

5) Start the Upgrade

Once download is completed, it will run through pre-install checks. If any warning message appears, please follow the instructions on the screen to resolve the issue.

After passing the pre-install checks, click [Start the upgrade now] to upgrade immediately.

6) Upgrade Installation

System restarts and the upgrade installs.

7) Completing Installation

Once the installation is completed:

a) Restart occurs and system starts first boot experience.

b) Sign-in screen displays, depending on the type of account.

c) Click [Use express settings] to continue, or click [Customize settings] to personalize settings.

d) Click [Next] to use the Windows 10 default apps, or click [Let me choose my default apps] to change defaults.

e) Logon to Windows.

8) Continuing Setup

If you entered the password incorrectly previously, a screen will be shown prior to the color screen below prompting you to re-enter it.

9) Process Completed

- For Local Accounts (with no password), Microsoft Account, Domain and Azure Active Directory (AAD) accounts, the logon screen will be displayed.
- For Local Accounts that had already provided passwords, you will see the Desktop.

Clean install steps

1) Create Installation Media

You can create your own installation media using either a USB flash drive or a DVD. However, DVD installation is highly recommended.

2) Boot up the System with the Windows 10 Installation Disc

3) Select Language and Preferences

Click [Next] to continue.

4) Click [Install now]

5) Enter the Product Key

Type the product key into the text box, and then click [Next].

** NOTE: Skip this step if you have successfully upgraded to Windows 10 with the upgrade offer

previously.

6) Read and Accept the Microsoft Software License Terms

Click [I accept the license terms] (required to use Windows), then click [Next].

7) Select Custom Install

Click [Custom: Install Windows only (advanced)] to proceed with clean install.

Note: All user data will be deleted. Please ensure that you have the corresponding backups.

8) Delete All Partitions

Select each partition and click [Delete] to remove all partitions on your hard disk. Then select the freed up unallocated space and click [Next] to continue.

9) Installing Windows

Windows 10 clean installation begins.

10) Get Connected

If you use a wireless network, connect to your access point.

11) Configure Windows Settings

Click [Use express settings] to automatically configure your Windows 10 settings.

Note: This step is optional. If you prefer your own settings, click [Customize settings] instead.

12) Select the Owner of the PC

Select [My organization] or [I own it], and follow the instructions.

[9]

13) Setup Account

If you have a Microsoft account, enter your account name and password, then click [Sign in].

If you want to use a new Microsoft account, click [Create one!].

Otherwise, click [Skip this step] to create a Local account.

14) Setup a PIN

If you wish to use a PIN, click [PIN me!] and follow the instructions.

Please click [Skip this step] if it is unnecessary.

15) OneDrive Opt-in

Click [Next] to opt-in to OneDrive. Otherwise click [Save new files only to this PC by default].

16) Cortana Opt-in

Click [Next] to opt-in to Cortana. Otherwise click [Not now].

17) Installing Apps

18) Setup Completed

Please wait a while before Windows starts up.

Checking of Hardware specifications

Notes/Explanation

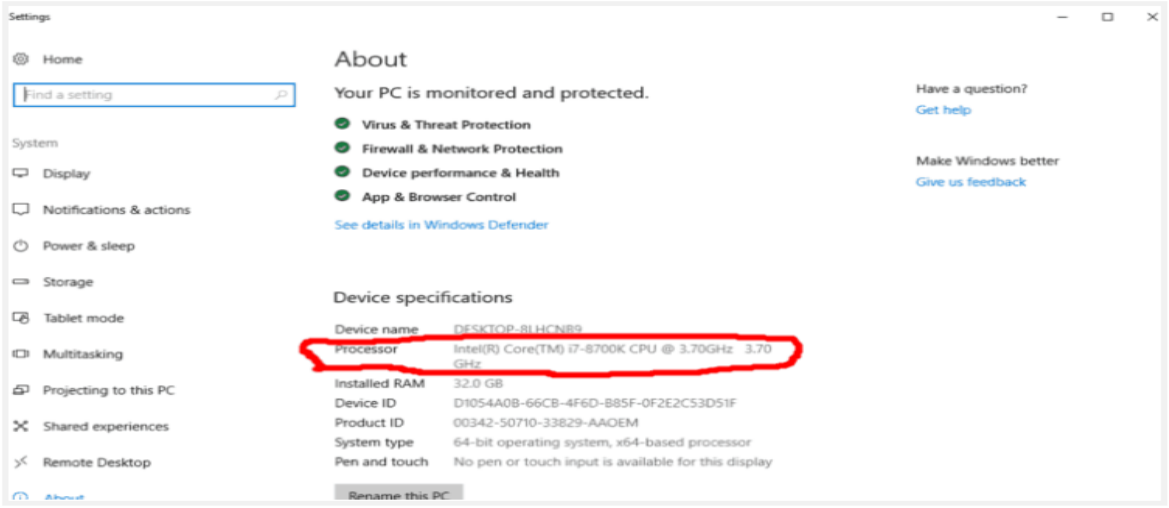
In this easy-to-follow guide, we'll walk you step-by-step through how to quickly check your computer's specs so that you can get the information you need.

How to Check What Processor (CPU) You Have

If you're wondering what kind of processor you have, you can easily find out that information on a Windows 10 computer in two clicks.

To find out what CPU you have, simply do the following:

1. Right-click on the Windows start menu icon on the bottom left-hand side of your screen.
2. Click on 'System' in the menu that pops up.
3. Next to 'Processor' it will list what kind of CPU you have in your computer.

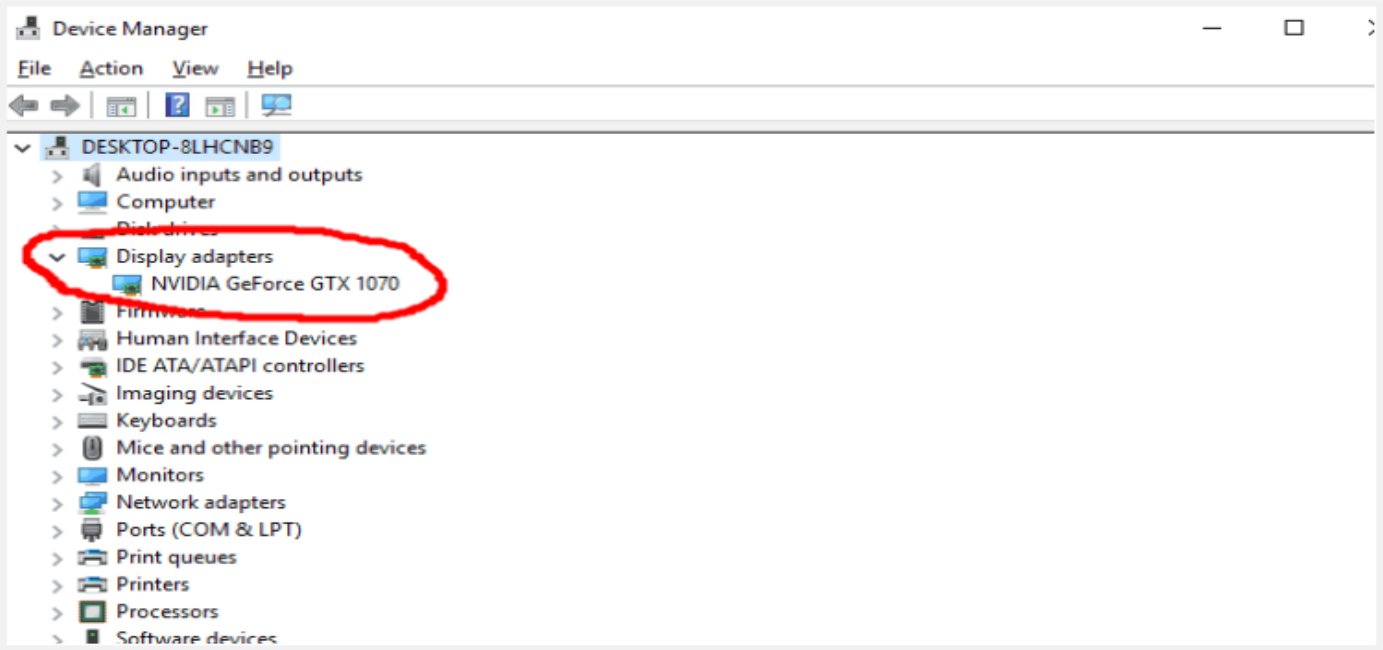


How to Check What Graphics Card (GPU) You Have

If you want to find out what kind of graphics card you have, the process is similar to finding out what CPU you have, but checking to see what GPU is in your system is 50% more work than checking to see what your CPU is. (Beause you have to click 3 times, instead of 2.)

To find out what GPU you have, simply do the following:

1. Again, right-click on the Windows start menu icon.
2. Click on 'Device Manager' in the menu that pops up.
3. In 'Device Manager' click on the arrow next to 'Display Adapters'
4. Your GPU will be listed there.



It should be noted, though, that it might show two options under the 'Display Adapters' tab. If it shows two, that means it is showing both the integrated graphics on your processor and the dedicated graphics card on your laptop.

The one that you are looking for is the dedicated graphics card, as it is the more powerful (and the one your system uses) of the two.

And, your dedicated graphics card will typically be the second option listed. If you have an Intel processor, the integrated graphics will be named something like 'Intel HD Graphics 4000.' In that case, the other option will be the one you want to.

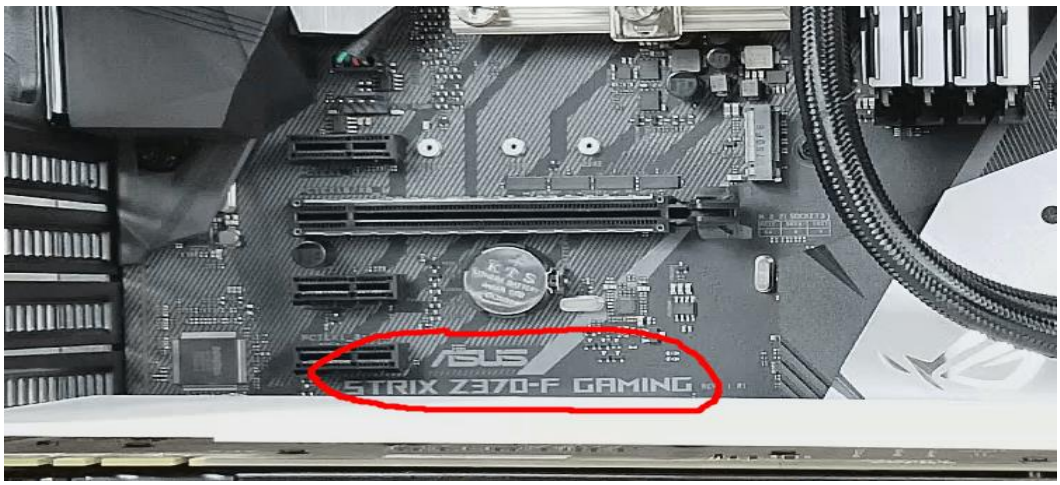
And, it will likely either be something like NVIDIA GeForce GTX 700M or AMD Radeon (or HD) R9 M470. Just note, though, that if you have an AMD processor in your system, the integrated graphics will also likely be 'AMD Radeon…" But in that case, just go with the 2nd option, as that is likely your dedicated graphics.

How to Check What Motherboard You Have

To find out what type of motherboard you have (and, really, who manufactures your motherboard and what socket and chipset it is), the process is a bit different than above.

You could of course open up your desktop (if you have a desktop and not a laptop) and check and see who manufactures your motherboard and what the model name is on the board.

However, motherboard's are typically named something like ASUS Z370-A, or MSI B350M, or Gigabyte GA-AX370-Gaming5, where ASUS, MSI, and Gigabyte are motherboard manufactures, and Z370, B350, and X370 are the motherboard chipsets (which can also lead you to the socket type of the motherboard as well.)



For some users, you can try the following:

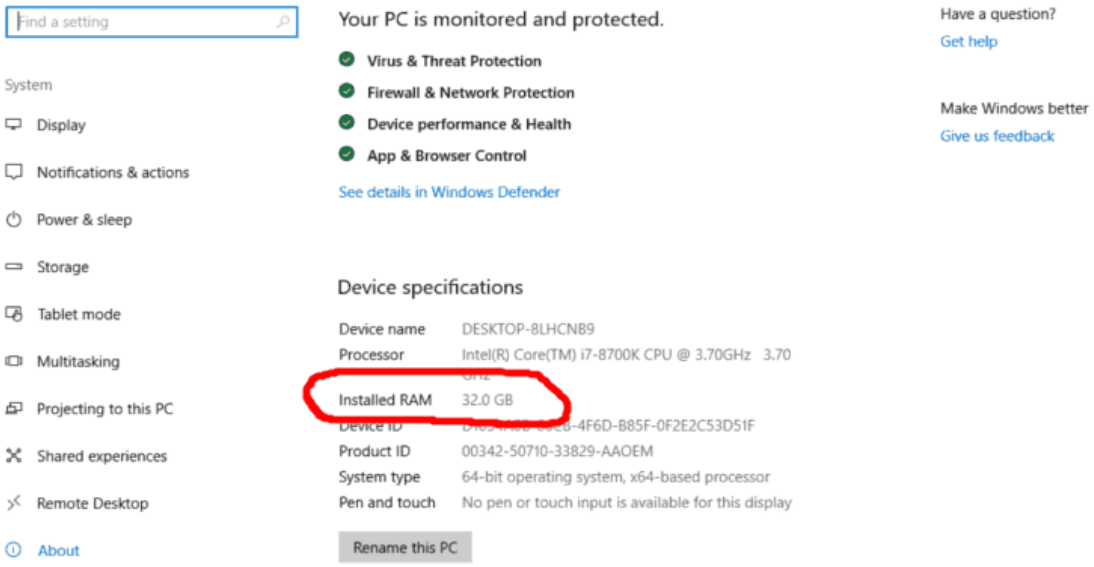
1. In the Windows search bar, type in 'System Information'
2. Scroll down on the System Summary tab (opens on the left side of the window) until you find 'Motherboard Manufacturer', or 'BaseBoard Manufacturer'.
3. The information next to 'Motherboard/BaseBoard Manufacturer', 'Motherboard/BaseBoard Model', and 'Motherboard/BaseBoard Name', should give you the information you are looking for.

System Model	System Product Name
System Type	x64-based PC
System SKU	SKU
Processor	Intel(R) Core(TM) i7-8700K CPU @ 3.70GHz, 3701 Mhz, 6 Core(s), 12 Logical P...
BIOS Version/Date	American Megatrends Inc. 0408, 8/31/2017
SMBIOS Version	3.0
Embedded Controller Version	255.255
BIOS Mode	UEFI
BaseBoard Manufacturer	ASUSTeK COMPUTER INC.
BaseBoard Model	Not Available
BaseBoard Name	Base Board
Platform Role	Desktop
Secure Boot State	Off
PCR7 Configuration	Binding Not Possible
Windows Directory	C:\Windows
System Directory	C:\Windows\system32
Boot Device	\Device\HarddiskVolume2
Locale	United States
Hardware Abstraction Layer	Version = "10.0.16299.192"
User Name	DESKTOP-8LHCNB9\brent

How to Check How Much Memory (RAM) You Have

Checking how much RAM you have in your computer is another very easy task. In fact, you can find how much memory you have on the same screen that lists what CPU you have.

1. Right-click the Windows start menu icon.
2. Select 'System'
3. Scroll down and it should list how much memory you have.



You can also find out how much RAM you have by looking in 'System Information' on Windows 10 as outlined in the section above on how to find out what type of motherboard you have.

Third Party Tools

While the methods above will easily all you to check your computer's specifications, you can also use third-party hardware monitoring tools to help you find necessary info about your system.

We recommend the following tools to help you monitor your computer's performance, as well as give you information (like what CPU and GPU you have, as well as how much RAM you have):

- CPU-Z
- Speccy
- Core Temp (CPU only)
- HWInfo

Now that you know what specs your computer has you can make a better decision on whether or not your current system is worth upgrading or not. However, it should be noted that if you are looking to upgrade your components, it isn't as simple as just picking out a new and better component and putting it into your system.

Your current components will dictate what new components you can buy. For instance, if you have an older motherboard, you can't simply go out and upgrade to the newest processor, because your motherboard and the newest processor probably won't be compatible.

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Some Best System Information Software

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- Wise System Monitor
- HWiNFO
- CPUz And GPUz
- HWMonitor
- Belarc Advisor
- Astra32
- Sandra Lite
- Agaue Eye

LO 4.3: Test the computer Software application

- **Content/Topic1: Identification and testing of installed application software**
  Steps:
  - ✓ Click on start button
  - ✓ Click on control panel
  - ✓ Click on programs
  - ✓ Click on program and features
  - ✓ The list of installed programs on your computer will be displayed in the new window opened.

Testing the application software

Testing the application software refers to:

- ✓ Running the installed application
- ✓ Testing of the application performance
- ✓ Checking application features

Learning Unit 5 – Document the work done

LO 5.1 –Testing the application software

- **Content/Topic 1: Description of computer software before**

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software:

- ✓ System Software
- ✓ Application Software

System Software

The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.

Here is a list of some of the most prominent features of a system software −

- ✓ Close to the system
- ✓ Fast in speed
- ✓ Difficult to design
- ✓ Difficult to understand
- ✓ Less interactive
- ✓ Smaller in size
- ✓ Difficult to manipulate
- ✓ Generally written in low-level language

Application Software

Application software products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are the following −

- ✓ Payroll Software
- ✓ Student Record Software
- ✓ Inventory Management Software

- ✓ Income Tax Software
- ✓ Railways Reservation Software
- ✓ Microsoft Office Suite Software
- ✓ Microsoft Word
- ✓ Microsoft Excel
- ✓ Microsoft PowerPoint

Features of application software are as follows:

- ✓ Close to the user
- ✓ Easy to design
- ✓ More interactive
- ✓ Slow in speed
- ✓ Generally written in high-level language
- ✓ Easy to understand
- ✓ Easy to manipulate and use
- ✓ Bigger in size and requires large storage space

- **Review of user manual and previous report**

Technical documentation refers to the documentation that describes how a product or service operates. For example, software code documentation, technical specifications and API documentation.

User documentation refers to the documentation for a product or service provided to the end users. The user documentation is designed to assist end users to use the product or service. This is often referred to as user assistance. The user documentation is a part of the overall product delivered to the customer.

Traditionally user documentation was provided as a user guide, instruction manual or online help. However, user documentation is increasingly being delivered online today. This has enabled technical writers to be more imaginative in how they assist users.

User documentation is important because it provides a avenue for users to learn:

- ✓ how to use your software?
- ✓ features of your software
- ✓ tips and tricks of your software
- ✓ how to resolve common problems with your software

Without user documentation, a user may not know how to do the above things.

Users expect the user documentation to include:

- ✓ FAQs
- ✓ Video tutorials
- ✓ Embedded assistance (for example, tool tips and dynamic page content)
- ✓ Support Portals

- **Suggestion of solutions on problems found**

Common computer problems arise due to some small malfunctioning either in the software or hardware. Their solutions are often easy to apply.

Admit it, we all face them in our day to day lives when using a PC. So, following are common PC problems and their possible solutions:

1. Computer won't turn on

This is probably the no.1 problem faced by many of us. To understand this problem, you can compare it to our human body.

When we are sick, we often get a fever. It's the body mechanism to fight infection. In the same way, when the computer faces any problem, it usually won't turn on until you fix that.

There are hundreds of reasons why a PC won't boot up. The issues can range from power supply failure to virus infection. Normally, by following the steps given below, your computer should be able to start.

Solutions:

1. Check the power supply

If it's a laptop, a loss of power could result from a battery that has completely run out of charge. So, the first thing to do is to plug it in and leave it to charge for a few hours. If that doesn't work, it could mean the charger is faulty, so, if you can try a different charger. If the charger has a power indicator, check whether it lights up when you plug it in.

If your PC is a desktop computer and doesn't start, check that it's not the plug socket at fault by plugging it into a different socket. If that doesn't work, it could be that the power supply in your PC has failed.

2. Make sure the monitor or display is functional

If you can see that your PC has power, because the fans start-up or the power lights come on, but nothing else happens, there are a couple of possible faults.

If you have a desktop PC connected to an external monitor, it could be the display that's faulty. Check the power connection to the monitor and that it's properly connected to your PC. Try disconnecting it and reconnecting it. If that doesn't work, try connecting a different monitor, if possible. That way you'll be able to either determine it's the monitor's fault or rule it out.

If you have a laptop, or if you've ruled out the external display, it could be that your PC is in sleep mode and is having trouble waking. To check that, shut it down completely and restart from cold. To do that, hold down the power button for 5 seconds and then press it again to start your PC.

3. Eliminate external hardware

If none of the steps above work, the peripherals could be the culprit. This could either happen because of electrical issues or external hardware failures.

After doing this, try restarting the system again to see if it works or not. If it doesn't, move on the next final step.

4. Reinstall system

If none of the steps work, the last thing you would want to do is to reinstall your Windows. Because till this point, you can be sure that it's the software and not a hardware issue.

Since you can't turn your computer on, there's no way to get access to your file. However, there are methods to backup your files from the hard drive. A clean installation will help to reset everything back to normal, should your system is infected or corrupted.

2. Slow Internet

Nothing can be more frustrated than a slow internet connection. I know, you can't enjoy that famous Netflix show or stay connected on Facebook.

But this problem is usually pretty easy to deal with. The problem lies in 2 areas, i.e. internal issue (issues related to your internet appliance) and external (related to your Internet Service Provider)

Solutions:

1. Restart the modem

This solution is just like how you would resolve any gadgets. Sometimes a power fluctuation or overused of the internet modem can overload it.

In order to reset everything back to normal, simply switch off the modem, wait for few minutes and turn it back on. You should be good to go in most cases.

2. Fix your wifi signal

Speaking of wifi, you might find that your router and internet are fine, but your wireless signal is weak. This can cause a slowdown—or, at minimum, a latency-filled browsing experience. In that case, you may need to reposition, tweak, and boost your router with a few tricks.

Check out this link here to find out how to fix your wifi signal with some good tips.

3. Kill any unwanted background software

Sometimes, background processes like software updates or any other programs that require internet maybe pulling your data, hence slow down your internet speed.

By simply check your task manager, you can see the list of this software and are able to kill them off. Turn off any automatic updates in the setting and this should help.

4. Contact your ISP

If none of the above works, your problem is maybe an external issue, i.e. from your internet service provider.

This could be something like a network upgrade, bad weather, wires fixing, etc. Definitely, they will assess your internet signal and inform you of the necessary action to take.

3. PC Becoming Slow

I know that kind of feeling you feel when it takes like 5 minutes to open just an app. Well, this is another common computer problems people face in their daily lives.

The root cause is usually due to the duration of how long you have been operating the PC. A computer that is older than 2 years will experience this, regardless of their specifications.

Solutions:

1. Find resource-hungry program

With your system full of programs, there will definitely be one or two programs that use lots of your resources, for instance, a ram.

To find out, open the Task Manager. You can right-click your taskbar and select the “Task Manager” option or press Ctrl+Shift+Escape to open it. On Windows 8, 8.1, and 10.

Click the “CPU,” “Memory,” and “Disk” headers to sort the list by the applications using the most resources. If any application is using too many resources, you might want to close it normally — if you can’t, select it here and click “End Task” to force it to close.

2. Disable startup program

Autostart programs during system startup can be the major reason why your PC is slowing down.

On Windows 8, 8.1, and 10, there’s now a startup manager in the Task Manager you can use to manage your startup programs.

Right-click the taskbar and select “Task Manager” or press Ctrl+Shift+Escape to launch it. Click over to the Startup tab and disable startup applications you don’t need.

Windows will helpfully tell you which applications slow down your startup process the most.

3. Scan for malware and adware

Day-to-day usage of computers can make you accidentally catch malware and adware.

These are usually small malicious programs, caught from the internet when we browse or download something.

These programs are designed to steal your information and to that, they have to transfer information over the internet, which can potentially slow down your system.

To remove them, simply use your built-in anti-virus software to scan and detect. For more information on how to remove spyware and adware, check out my article here.

4. Windows Update Problem

Windows update errors can occur due to a bunch of reasons. Causes include Windows piracy, core files missing, license issues, etc.

The problem is, however, not that serious. But if you still want to have the latest software and security installed, you have to fix it.

Solutions:

The solution is quite straight forward. With an in-built error detection and troubleshooting, Windows has its own mechanism to fix this.

But if you still cannot fix it, I recommend going through the official Microsft Windows update errors fixing walkthrough here.

5. Noisy Hard Drive

Hard drives are usually nearly silent but some do make a muted clicking sound when they're being accessed or turned off — this is completely normal.

On the other hand, if you start hearing noises only occasionally or noises that you've never heard before — like clicking, grinding, vibrations, or squealing — your hard drive may be failing.

Solutions:

1. Make sure the sound comes from the hard drive

Usually, when we hear the sound from our computers, it's a hard drive sound. So when the sound suddenly gets louder, we assume that it's from the hard drive.

To check this, you can simply unplug the power and data cables from the hard drive and reboot the system. If you still hear the sound, the issue is not with the hard drive.

2. Run a diagnostic software

If you're certain that the sound comes from the hard drive itself, you can run a free hardware diagnostic software which is already available on many computers or available on the internet.

3. Replace the hard drive

If the diagnostic software fails, it simply means there is an issue related to the hardware of the drive. If in that case, there is nothing you can do except to replace it.

Remember to make a back up of your files before replacing it.

6. PC Fan Not Working

Another common computer hardware problem here. However, people usually get panic when the fan stops working.

In reality, that it is normal behavior for the CPU fan to stop spinning when the CPU temperatures are low or you are not running any power-hungry applications.

In most cases, it's happening due to the motherboard, and not the fan itself.

Solution:

1. Determine the root cause

As mentioned, the motherboard is usually the main reason why the fan stops spinning. This could happen because the fan isn't installed well on the board or there's a problem on the board wires.

To check this, simply connect the fan to the external power source and see if it's still working. If not, then the problem is with the fan itself.

2. Assess the fan

Three common issues related to the fan are:

CPU Fan Save Dusts

The Bearing of the CPU Fan is Stuck

CPU Fan is Broken

For the first case, you can simply clean it with a cloth. For the second and third cases, which are the more serious case here, you need to hire professional computer repair service to replace the part.

8. Blue Screen of Death (BSOD)

A Blue Screen of Death (BSoD) — also referred to as “blue screen,” “stop error,” or just “system crash” — will happen after a critical error that the system is unable to process and repair automatically.

Usually, you may see a blue screen while upgrading to a new version of Windows, during startup, or suddenly while actively using the computer, and the most frustrating thing is that it’s just a screen with a blue background and a sad character face without enough information to figure out the problem.

Solutions:

1. Check that there is enough space for updates

BSOD is usually a problem occurring due to corrupted files, file system failures and system spaces.

Sometimes, your system space may get filled during the update, causing some of the files to be missing, hence resulted in a corrupted file.

2. Scan your system for viruses

Some viruses can cause a Blue Screen of Death, especially ones that infect the master boot record (MBR) or boot sector.

3. Update your hardware drivers

Most Blue Screens of Death are hardware or driver related, so updated drivers could fix the cause of the STOP error.

4. Return BIOS settings to their default levels.

An overclocked or misconfigured BIOS can cause all sorts of random issues, including BSODs.

5. Perform diagnostic tests on all hardware you’re able to test

It’s highly likely that the root cause of any given Blue Screen of Death is a failing piece of hardware

9. Computer Freezes

A slow or aged computer can freeze from time to time. The main reason behind this is due to lack of enough resources.

Before regularly encounter this problem, your Windows should start becoming slow first. To fix that, you can read the above point.

10. System Automatically Restart

Last but not least for common computer problems here, and quite the most frustrated one too!

There are many reasons for this problem. It can be a result of various issues, including corrupted drivers, faulty hardware, and malware infection, among others.

It can be difficult to pinpoint exactly what keeps your computer in a reboot loop. In most cases, it usually happens after the Windows update.

Solutions:

1. Deleting bad registry files

Before you do this, you have to be completely confident that you can complete the process without making any mistake.

Keep in mind that the Windows Registry is a sensitive database. Even misplacing a comma can cause damages to your computer! As such, I suggest you opt for a one-click solution like Auslogics Registry Cleaner.

This freeware automatically searches for duplicate or corrupted registry files.

2. Updating drivers

When your drivers are outdated, it is possible for your computer to get stuck in a reboot loop. This is because your devices are not able to properly communicate with your system.As such, it is important to check if your drivers are up to date

3. Checking hardware issues

In some cases, a computer may keep on restarting because of faulty hardware. The three main hardware to check on are:

1. RAM
2. CPU
3. External Devices

4. Scanning for viruses or malware

It is possible that your computer has been infected by a virus or malware – that is why it keeps on restarting. You can run a complete virus scan by using Windows Defender.

Description of solution implementation

Implementation is the culmination of all your work in solving a problem and requires careful attention to detail. There are three basic stages involved:

- ✓ planning and preparing to implement the solution
- ✓ implementing and monitoring the action
- ✓ reviewing and analyzing the success of the action.

Planning and preparation

Planning and preparation is the key to successful implementation. The more important the problem, or the more complex the actions required to solve it, the more thorough your planning and preparation needs to be to ensure success.

Description of procedures of the task accomplished: In its simplest form a procedure is a way in which one works to accomplish a task. It can therefore be a sequence of steps that include preparation, conduct and completion of a task. Each step can be a sequence of activities and each

activity a sequence of actions. The sequence of steps is critical to whether a statement or document is a procedure or something else. Specifications, contracts and records are not procedures as they do not tell us how to do anything. These describe the outputs resulting from carrying out procedures or tasks, leaving us to decide any further actions necessary to use these outputs. The output will more than likely be used as inputs to other procedures.

Tools equipment and materials used

For each action the resources required have to be precisely defined along a number of parameters, including the type, amount and when they are required. Each resource is considered individually:

Materials may fall into a number of categories, including consumables, raw materials, and equipment (for temporary or permanent use).

Technical journal and recommendation report

A technical report (also scientific report) is a document that describes the process, progress, or results of technical or scientific research or the state of a technical or scientific research problem. It might also include recommendations and conclusions of the research. Unlike other scientific literature, such as scientific journals and the proceedings of some academic conferences, technical reports rarely undergo comprehensive independent peer review before publication. They may be considered as grey literature. Where there is a review process, it is often limited to within the originating organization. Similarly, there are no formal publishing procedures for such reports, except where established locally.

LO 5.2 – Report the procedures of the task accomplished are in place and used

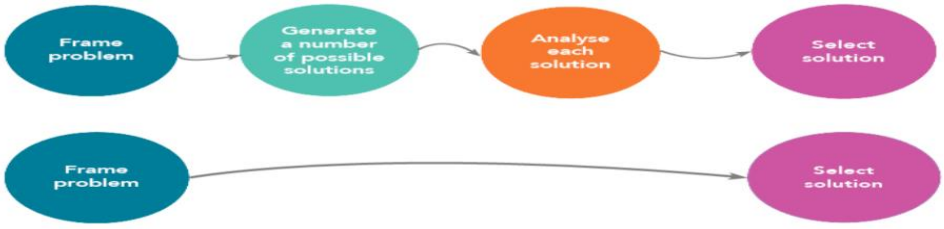
- **Description of computer software before**
  - ✓ Status of computer software
  - ✓ Describe problems found
- **Description of solution implementation**

Deciding which solution best addresses your problem involves a number of steps. In this article Nick Patterson describes the process of identifying, selecting and implementing solutions to problems.

In the previous steps we have framed our problem, analyzed it and identified the root cause. Now we are going to consider the final steps in solving a problem.

To do this, let's break this process down into three steps:

- ✓ Identifying potential solutions
- ✓ Selecting the right solution
- ✓ Implementing the solution.



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