

Support for Windows 7 is coming to an end on January 14, 2020. This means that all of you who are still using Windows 7 will have to either decide to continue using Windows 7 unsupported, upgrade your existing PC's to a supported operating system (OS), or purchase another computer with a supported OS already installed. So let's look at each of these options.

## **Continuing to use Windows 7**

Ending support for Windows 7 means Microsoft stops issuing security updates. As you know, security updates are those patches and program updates that keep your PC safe while you're doing things like surfing the web and accessing your email. If you use Microsoft Defender, Microsoft's free anti-virus software, this will also stop receiving updates. Switching to another anti-virus solution will work for a while but once Microsoft suspends support for an operating system most software developers eventually follow suit and, before long, security updates for your other software entities, including your antivirus apps, will be unavailable as well. At that point, any online activity or any downloading of new material onto your PC will carry the risk of introducing malware or viruses that your PC will be unable to defend itself against. Continuing to use Windows 7 unsupported severely restricts what you'll be able to safely do with your PC and therefore is probably not a wise choice for most users.

## **Upgrading your OS to Windows 10**

This is a viable option for many of you as long as your current system is able to incorporate the upgrade and still have resources enough to function reasonably efficiently. The downside here is much of the hardware in older Windows 7 units is old enough that getting it to play well with Windows 10 may be difficult at best and impossible in some cases. Many times the outcome is a machine that is so slow and underpowered that computing on it is difficult. Furthermore, as Windows 10 continues to evolve, the computational resources needed to successfully run it will continue to increase. The tech committee can help you decide whether upgrading to Windows 10 from Windows 7 is a reasonable option for your system.

## **Purchasing a New or Refurbished Computer With a Supported Operating System Pre-installed**

For many of you this is probably the best option. You'll get an up-to-date computer with modern hardware capable of running Windows 10 with, hopefully, enough excess capability to be able to grow with Windows 10 as it evolves. This choice, while allowing you and your PC to adapt to this evolution, also carries with it the added work of deciding what type of PC would best serve your needs. This opens a myriad of choices:

- Desk top vs lap top
- PC vs Mac vs Chromebook
- Operating System
- CPU
- New vs Refurbished
- Screen Size
- All-in-one vs desktop vs laptop
- Expanded vs Basic Keyboard
- SSD vs HDD
- Size of hard drive
- Amount of RAM
- Touch Screen vs Mouse Controlled
- Ports & Drives

And the list goes on...

Before tackling this list you should keep one overriding question in mind, and that's, "How do I expect to use my new computer?" In other words are you a power user who will be doing desktop publishing, will you be editing photos or videos, doing computer assisted drafting or creating computer enhanced art and graphics or are you more of an occasional user who checks email, occasionally surfs the web, plays a game or two and then turns off their PC for the day. The expectations you have form your computer should figure significantly in the choices you'll make in purchasing your new computer.

So lets jump in...

## **Desktop vs Laptop vs All-in-one**

The advantages of a desktop are several. Generally speaking, the price point for a desktop computer is significantly less than a comparable laptop computer. Also, a desktop computer has a much larger variety of available components than a laptop computer. Changing and upgrading components is also much easier and cheaper than in a laptop. Processors in desktop computers are a bit larger than processors in laptop computers which means they also tend to be more powerful than lap top processors. Since desktop computers require a separate monitor, the monitor screen can be as large as you choose. Repairing and cleaning a desktop computer is much easier than repairing a laptop due to the ease of removing individual components in the desktop computer.

There are several disadvantages to desktop computers as well. Lack of portability can be a major annoyance for those who compute on the go. Since desktop computers don't normally come with on-board battery back-up, any interruption in power while computing can lead to loss of critical data and possible inability to easily re-boot the system. Initial hook-up of a desktop system can be difficult as every peripheral component must be plugged into an appropriate receptacle. This, however, has been made much easier since the advent of USB connections. Also, bringing your desktop in for repairs requires you to disconnect all the peripheral hardware attached to it.

Conversely, laptops are smaller, lighter, easier to transport and have their monitor, keyboard and touch pad all in the same unit. This makes for easy on-the-go computing dependent only on the availability of an internet connection if you require internet connectivity to accomplish your task. Although laptop units do have a somewhat smaller and less powerful processor than desktop units you can easily find a processor that is more than adequate for your particular needs. More on this in the CPU section. Due to their compact size laptops are also more difficult to repair.

Historically, all-in-one computers were designed with the monitor and computer in one package. This gave computer manufacturers the ability to build high end computers with components not usually available to laptop units due to size and power restrictions and to build them with a small enough footprint to conserve on desk space compared to the more bulky desktop computers. Since the first all-in-one computers, laptops have advanced to the point where their performance is essentially on a par with modern all-in-one computers. Now the only real advantage of an all-in-one compared to a laptop is increased screen size. The disadvantage, obviously, is portability. When comparing an all-in-one to a desktop the advantage of conservation of desk space still holds.

## **PC vs Mac vs Chromebook**

The difference between PC and Mac is a bit less straight forward. All components of a Mac are made by apple whereas the components for a PC are made by a multitude of different companies. Apple feels this makes the Mac more stable and allows the individual components of a Mac to play well with one another other. This is reflected in the price of Mac's, which are generally more expensive than comparable PC's. Mac's are thought to be the better platform for design and artistic creativity due to the strength of the applications available in these areas. This, however, seems to be changing as many of the applications in these areas are now available for use on PC's as well. If you have little or no need to edit videos or do high end work in graphic design then you probably don't need to spend the extra money for a Mac. Ultimately, though, the choice between PC and Mac boils down to individual preference.

Chromebooks are an entirely different animal. Chromebooks run Chrome OS as their operating system and are essentially a chrome web browser vehicle. Chromebooks are designed primarily to be used while being connected to the Internet, with most applications and documents being stored in the cloud. More and more, apps are being made available for offline use however. Also, Android Apps are becoming more and more available via the Google Playstore. Still, Chromebooks are primarily optimized for Google apps such as Gmail, Google Calendar, and Google Doc's, etc. Since many popular software apps are currently not available through the Store, you may very well be forced to learn how to use new, supported, apps to replace those that aren't. Also, although Microsoft Office Online is designed to work with Chrome OS, by and large Windows apps are not compatible with Chromebooks so if there are Windows apps you just can't live without then a Chromebook isn't for you. This being said, there are apps available to do the vast majority of what you currently do on your Windows laptop. As far as cost is concerned, Chromebooks tend to be significantly less expensive than both PC's and Mac's. Finally, before settling on a Chromebook investigate the pros and cons. There's a wealth of information on the internet to help you decide if a Chromebook is right for you.

## Operating System

Mac- OS X

Chrome-book - Chrome OS

PC - Windows 10 (and earlier versions of Windows)

Other - Linux

Operating systems (OS) are specific to computer types, i.e. if you use an Apple computer your OS will

be OS X, an operating system developed by Apple Inc. for their Mac computers. Similarly, if you prefer a PC your OS will be some iteration of Windows. Chrome-books use Chrome OS. Linux, developed by Linus Torvalds in 1991, can be used on both Macs and PCs instead of their respective native OS's. Linux will soon be available for use on Chrome-books as well.

## CPU

The CPU or Central Processing Unit is the brain of your computer. It runs the programs on your computer and is partially responsible for the speed of your system. Lets look at a typical CPU processor number. What do these numbers mean?

### Intel Core i5 7500

i5 - the 5 following the i is the overall performance of that chip compared to other chips in the "core" series. The higher the i number the faster and more powerful the chip.

7500 - the 7 stands for the generation of that chip within the i5 series. The higher the generation number the faster and more powerful the chip compared to other chips in the i5 series

7500 - the 500 stands for the chips performance rating within that particular i5 generation. Again, the higher the number the better the performance of that chip compared to other chips in that generation.

For Windows and Mac machines an Intel i5 or an AMD Ryzen 5 CPU should do well for the average user. If your use pattern is more like the power user outlined above consider an Intel i7 or AMD Ryzen 7 CPU. If you're considering a Chromebook an Intel i3 or i5 CPU would be ideal but an ARM processor would be just fine for the average user.

AMD has a similar naming convention with the AMD Ryzen 3 being less powerful and slower than the AMD Ryzen 5 which I turn is less powerful and slower than the AMD Ryzen 7 and so on.

## **New vs Refurbished**

The advantages of a new computer are several. New computers come with a warranty that allows you to return the unit for repair or replacement should anything go wrong during the warranty period. Many refurbished units also come with a warranty but often these are both shorter and less inclusive than new computer warranties. Although refurbished computers are significantly less costly than new units, the quality of a refurbished unit is strongly dependent on the quality of the workmanship that went into refurbishing it. For this reason it's important to vet your computer shop prior to purchasing a refurbished unit. Refurbished units also "come as they are" i.e. the internal components have been chosen by the previous owner, therefore you take what you get. Obviously, you can choose to upgrade and/or replace components but this often increases the price to the point where purchasing the refurbished unit has little advantage over purchasing a new one. If, however, you can find a refurbished unit with the internal components and options you want you can save considerable expense by buying the refurbished unit.

## **Screen Size**

When buying a desktop computer your options for screen size are almost unlimited. Screen size plays a much larger roll in purchasing a laptop computer. Current common laptop screen sizes range from 11 inches to 18 inches. Often screen sizes and laptop weight coincide, for instance the thinnest and lightest systems weigh from 2.5-3.5 lbs. and usually have 11-12 inch screens. Conversely, units with 18 inch screens often weigh in excess of 8 lbs. When considering screen size and weight think about what size screen you can easily see while computing. There's nothing worse than having to squint at an overly small screen every time you use your PC. Also consider how often you'll be carrying your unit from place to place and how heavy a unit you're willing to carry around. Another thing to remember is whether you want a full sized keyboard with a separate number pad. The minimum screen size for a number pad keyboard appears to be 15 inch. More on this in the keyboard section.

## **Expanded vs Basic Keyboard**

Computers come with two standard keyboard sizes, basic and extended. The difference lies primarily in the inclusion of a separate number pad to the right of the standard keyboard. This number pad makes dealing with numbers easier than using the number keys along the top of the basic keyboard. If you commonly do a lot of work with numbers it may be worth considering a computer with an extended keyboard. The minimal screen size that will allow for an extended keyboard is 15 inches.

## **SSD vs HDD**

SSD - in its simplest form an SSD or Solid State Drive is flash storage and has no moving parts whatsoever. Because of this an SSD is smaller and considerably faster than an HDD.

HDD - an HDD or Hard Disk Drive is made up of a variable number of stacked metallic disks that spin and have data written to them by use of a movable stylus called a HAS or head stack assembly.

Which is best for you depends on a number of things, so lets compare.

**Price:** This section gets a bit technical and most of the information presented here is presented in an easier to digest table at the back of this article. For those of you who enjoy the technical aspect, buckle-up 'cause here we go. SSD's are more expensive per gigabyte than HDD's. It's worth noting that some SSD's are also more expensive than others. SSD's connect to your PC in a number of ways and the mode of connection has much to do with the price of the drive. The older SSD's connect with a SATA III connection, the same connection that most HDD's use. This makes the SSD very easy to connect to your computer if your upgrading from a HDD. The down side is the SATA III connection limits the data throughput to the SSD to 600 MB/s. Since SSD's are capable of dealing with much faster throughputs the SATA III connection actually degrades the SSD's potential performance. Newer SSD's have a PCIe connection that can plug directly into the PCIe lane of the motherboard enabling much faster speeds. This presupposes you have a motherboard that has an empty PCIe connection available. Modern SSD's may also connect to the motherboard directly using an M.2 slot which also allows for much faster speeds. These newer connectivity options also increase the cost of the SSD. The point of all this technical stuff is to point out that if you're buying a new or refurbished PC with an SSD installed it's worth asking whether the SSD connects with a SATA III connection or one of the two faster connections. But remember, even with a SATA III connection your SSD will be significantly faster than a traditional HDD. More on this in the speed section below.

**Capacity:** Dollar for dollar, if you're looking for a lot of storage space a HDD is the way to go. Although the newer SSD's are getting large enough now that you can easily find sizes upwards of 1 terabyte, the cost for these larger drives is significantly higher than for a comparable HDD.

**Speed:** As stated in the price section above, the SATA III connection allows throughputs of 600 MB/s. Since SSD's are capable of much faster throughputs they are able to utilize all 600 MB/s. HDD speeds are largely dependent on the speed of spin of the HDD storage disks. Many budget HDD's spin at 5,400 RPM which allows for a throughput of about 100 MB/s. Most mid range HDD's spin at 7,200 RPM allowing for a throughput of roughly 150 MB/s. Some top-of-the-line HDD's can achieve spin rates approaching 10,000 RPM but these are rare and quite expensive. As you can see, even with a SATA III connection an SSD will perform considerably faster than the normal mid-range HDD. With direct connection to the motherboard through either a PCIe or M.2 connection SSD's are even faster.

**Other Considerations:** Since SSD's have no moving parts they tend to be more durable and use less power than HDD's. Using less power translates to more battery life per charge. No moving parts means they are also far more resistant to drops and jars. SSD's don't require defragmentation like HDD's do. In fact, it's recommended that SSD's NOT be defragmented. SSD's have a life cycle determined by write/erase cycles. Due to the chemical construction of the flash memory cells, the cells that actually store information on an SSD, each write/erase cycle decreases the life of the cell by a minute amount. To further complicate the issue, the number of available write/erase cycles is limited by the number of layers in the storage cell. For example, the average expected life of a SSD using single layer cells ranges from 50,000 to 100,000 write/erase cycles. As the number of layers of the storage cells increases the storage capacity also increases but the number of available write/erase cycles decreases markedly.

**One Last Thing to Consider:** Rather than deciding SSD vs HDD consider SSD AND HDD. A PC with a small, 250 GB, SSD on which the operating system and a few key apps are stored allowing for rapid retrieval and a larger HDD on which most of the raw data is stored can give you the best of both worlds.

## Size of Hard Drive

Not much to say here. The key is to have a good idea of how much data; including personal files, apps, photos, videos, spread sheets, etc. you plan to store and then buy a hard drive that gives you significantly more space than you think you'll need. Hard drive memory, especially HDD memory, is so cheap it makes little sense to scrimp on size to save a few dollars.

## Amount of RAM

RAM or Random Access Memory is the place your OS loads to when you turn on your computer. It's also the place your browser, email client and other apps load to when you open them. In other words, the more RAM you have available, the more "things" you'll be able to have open and ready to use on your computer. With this in mind let's look at how much ram you may need.

The magic number for minimal RAM is 4GB. With 4GB you should have enough RAM to open the current iteration of Windows 10 and still have enough left over to open a modest number of browser tabs and access your email or use some productivity apps like Microsoft Word. If you like to have multiple productivity apps all open at the same time along with multiple browser tabs, a few games, and other apps than you'll chew through 4GB of RAM fairly quickly. If this is you, then 8GB or even 16GB of RAM would be a better choice. The above comment about memory being cheap also applies to RAM. Another thing to check when buying a computer is whether the RAM can be increased. Some laptop units are sealed and cannot have additional RAM easily added. For these reasons overbuying rather than underbuying RAM is probably the wisest choice. Current recommendations are a minimum of 8GB RAM unless you're considering a Chromebook, in which case you should consider 4GB RAM as a minimum.

## Touch Screen vs Mouse Controlled

Touch screen monitors are a fairly recent development in computer technology. When considering your next computer purchase knowing the pros and cons of touch screen monitors will help you decide which is right for you. There are a number of things to consider.

**Proximity** - Interacting with a touch screen display requires you to be close enough to touch the screen. This could be a drawback if your computer is located on a large desk, particularly if you also prefer using an unattached keyboard. Conversely, a monitor without touch screen allows you to work with your monitor at a distance which accommodates a keyboard and a mouse. Having a touch screen monitor does not preclude the use of a mouse, however, as most touch screen capable laptops can also be used with a Mouse and detached keyboard.

**Precision** - Since it's difficult touching small areas on a touch screen monitor with accurately, using a touch screen capable laptop is less precise than using a monitor with a mouse and pointer. This shortcoming can be avoided by using a stylus, but having to reach for and use a stylus multiple times during a project is inconvenient and time consuming.

**Speed** - Touch screen clicking is faster using either a finger or a stylus than using a mouse controlled pointer.

**Simplicity** - There is no need for prior training and practice using and controlling a mouse when using a touch screen monitor. There are no left and right buttons and scroll wheels and no need to remember whether to single click or double click with a touch screen. Also zooming and scrolling, both horizontally and vertically, is much easier with a touch screen than with a mouse controlled screen.

**Cost** - Touch screen monitors tend to be more expensive than comparable mouse controlled systems.

**Other Considerations** - Touch screen monitors drain battery power faster than mouse controlled systems. They are also heavier and thicker than non-touch screen units and it's often harder to see the screen in direct light. Also, touch screen viewing angles are often narrower than traditional monitor screens.

## Ports & Drives

The number of available ports is a matter of personal preference. Make sure you know how you intend to use your computer then insure you have the right number of USB, HDMI and other more specialized ports to do the job. One thing to consider is having at least one USB-C port. In many cases an inexpensive USB-C hub can eliminate the need for extra built-in ports.

Although many of the apps you'll want will be download from the internet there may still be a need to download from a CD or DVD. Also, if you're a movie buff, being able to play your favorite movie on your computer is pretty handy. This begs the question of whether or not you want a DVD drive in your computer. DVD vs no DVD is, again, purely a personal preference. Choosing a computer with no DVD drive doesn't mean you'll have to do without since you can always purchase an external DVD player if you change your mind.

So there you have it. Hopefully this information will help you decide whether or not you need a new computer and, if so, what computer options may be the best for you.

## SSD vs HDD Pro's and Con's

	SSD (solid State Drive)	HDD (Hard Disk Drive)
<b>Price</b>	More expensive per Gbyte. Price dependent on method of connection: SATA III least expensive PCIe and M.2 more expensive	Less expensive per GByte
<b>Speed</b>	Speed determined by type of connection. SATA III connection slower than PCIe or M.2 but still significantly faster than HDD	Speed determined by RPM rating of internal storage disks. Fastest HDD's still slower than SSD
<b>Life Cycle</b>	Life cycle determined by write/erase cycles. Also determined by number of storage cell layers present. Single layer- rated for 50K to 100K write/erase cycles. As # of layers increases, write/erase cycle rating drops markedly. However, it's estimated that under normal use an SSD will still outlive a HDD.	Generally considered to have an infinite number of write/erase cycles available. Failure usually due to mechanical issues.
<b>Reliability</b>	Since SSD's and HDD's work differently and also fail differently, it's difficult to compare reliability of one against the other. SSD's have limited, although huge, write/erase cycle limits whereas HDD's have essentially unlimited write/erase cycles. HDD's have moving parts that can wear and fail and are more susceptible to dropping or jarring. All in all, reliability seems to be similar although tending to favor SSD's.	
<b>Data Recovery</b>	More difficult and more expensive to recover data if drive fails.	Less expensive and easier than for SSD but still very costly.
<b>Other Considerations</b>	No moving parts. Less power consumption. Defragmentation not recommended.	Many moving parts. More susceptible to damage due to dropping or jarring. Consume more power. Need to be periodically defragmented for optimal Performance.

Table 1