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Chapter 1

Introducing Windows 11

We all started as newbies who did not know much about technology. If you've never used an earlier version of Windows, you're in luck because you won't have to force your brain to forget so much of what you've learned! Windows 11 is a mix of Windows 10 and macOS, tossed into a blender, speed turned up to full, and poured out on your screen.

Although Windows 10 was a major improvement over Windows 8 and 8.1, some people still had problems understanding and using features such as tiles, Microsoft Store apps, Cortana, or the Settings app. Windows 11 makes the experience a bit gentler for everyone. It also further optimizes the touchscreen approach so that it works well with a mouse, too. The user interface is more consistent — it doesn't look like the old desktop — and the new touchscreen approach is designed a lot better than in older versions of Windows.

Some of you are reading this book because you chose to run Windows 11. Others are here because Windows 11 came preinstalled on a new computer or because your company forced you to upgrade to Windows 11. Whatever the reason, you've ended up with a solid operating system that should serve you well, as long as you understand and respect its limitations. However, you should know that other choices are

available, and I present them in this chapter. Who knows, maybe you're considering returning your new Windows 11 PC already.

Before I get technical, I want you to take a quick look at Windows 11. Then, I explain some important technical terminology and give an overview of what you need to keep in mind when buying your first Windows 11 PC, laptop, or tablet. And for those considering upgrading an old PC to Windows 11, I share how to check for compatibility. Lastly, I describe what you might not like about Windows 11. It's better to know all that sooner rather than later. Right?

Taking Your First Look at Windows 11

First things first. Position yourself in front of your computer and press the power button to turn it on. This thing called Windows 11 will load and then be staring at you, as shown in Figure 1-1. Microsoft named this the lock screen, and it doesn't say *Windows*, much less *Windows 11*. The lock screen displays a picture (Microsoft sets one for you automatically, but you can change it, as described in Book 2 Chapter 2), the current date and time, with a tiny icon or two to indicate whether your Wi-Fi or wired connection is working and how much battery you have left. At the bottom of the lock screen, you may also see widgets displaying things like weather forecasts, sports, or stock market data.



FIGURE 1-1:
The Windows 11
lock screen.

You may be tempted to sit and admire the gorgeous picture, whatever it may be, but if you swipe up from the bottom, click or tap anywhere on the picture, or press any key on your keyboard, you see the sign-in screen, resembling the one in Figure 1-2.

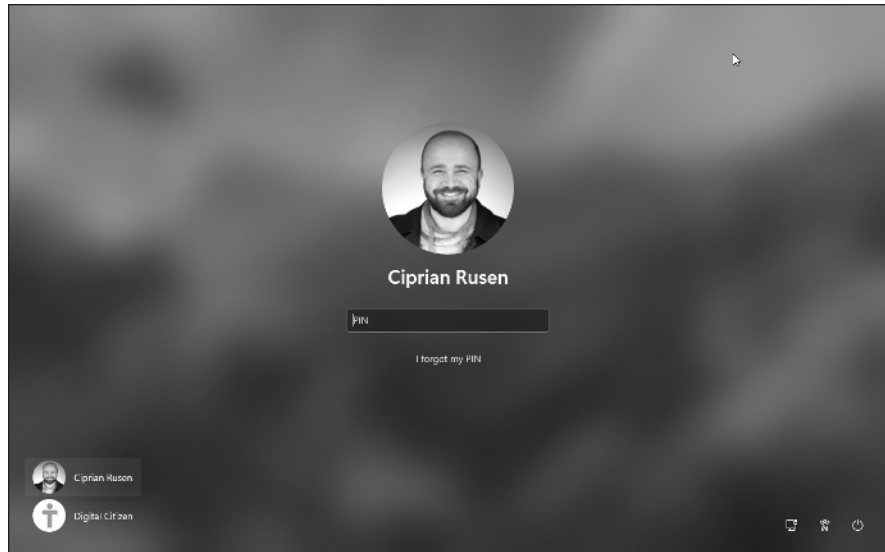


FIGURE 1-2:
The Windows 11
sign-in screen.

The sign-in screen doesn't say *Login*, *Welcome to Windows 11*, or *Howdy*. If more than one person is set up to use your computer, you'll see more than one name listed in the bottom-left corner. In the bottom-right corner, additional icons show up for enabling accessibility tools (like the onscreen keyboard, narrator, magnifier, and voice access) and opening the power menu.

Hardware versus Software

At the most fundamental level, computers are about two things: hardware and software. *Hardware* is anything you can touch — a computer screen, a mouse, a hard drive, a keyboard, a USB flash drive, and so on. *Software* is everything else: your Microsoft Edge browser, the movies you stream on Netflix, the digital pictures of your last vacation, and programs such as Office or Teams. If you shoot a bunch of pictures, the pictures themselves are just bits — software. But they're probably sitting on a memory card inside your smartphone or digital camera. That memory card is hardware. Get the difference?

Windows 11 is software. You can't touch it in a physical sense, even if you interact with it using the keyboard and a mouse or a touchscreen. Your PC, on the other hand, is hardware. Kick the computer screen, and your toe hurts. Drop the big box on the floor, and it smashes into pieces. That's hardware.

Chances are that one of the major PC manufacturers — such as Lenovo, HP, Dell, Acer, or ASUS — Microsoft, with its Surface line, or even Apple made your hardware. However, Microsoft, and Microsoft alone, makes Windows 11.

When you bought your computer, you paid for a license to use one copy of Windows on that PC. Its manufacturer paid Microsoft a royalty to sell Windows and the PC to you. (That royalty may have been close to zero dollars, but it's a royalty nonetheless.) You may think that you got Windows from, say, Lenovo — indeed, you may have to contact Lenovo for technical support on Windows questions — but Windows came from Microsoft.

If you upgraded from Windows 10 to Windows 11, you might have received a free upgrade license — but it's still a license, whether you paid for it or not. You can't give it away to someone else.



REMEMBER

Most software, including Windows 11, requires you to agree to an End User License Agreement (EULA). When you first set up your PC, Windows asks you to click or tap the Accept button to accept a licensing agreement that's long enough to reach the top of the Empire State Building. If you're curious about what agreement you accepted, take a look at the official EULA repository at www.microsoft.com/en-us/Useterms/Retail/Windows/11/UseTerms_Retail_Windows_11_English.htm.

Must You Run Windows?

Are you wondering if you must run Windows? The short answer is that you don't have to run Windows on your PC.

The PC you have is a dumb box. (You needed me to tell you that, eh?) To get that box to do anything worthwhile, you need a computer program that takes control of the PC and makes it do things, such as show apps on the screen, respond to mouse clicks, and print resumes. An *operating system* controls the dumb box and makes it do worthwhile things in ways people can understand.

Without an operating system, the computer can sit in a corner and display profound messages on the screen, such as *Operating System not found* or *BootDevice Not Found*. You need an operating system if you want your computer to do more than that.



REMEMBER

Windows is not the only operating system in town. The other big contenders in the PC-like operating system market are the following:

- » **Chrome OS:** Created by Google, Chrome OS is the operating system used on Chromebooks. Affordable Chromebooks have long dominated the best-seller lists at many computer retailers —for good reason. If you want to surf the web, work on email, compose simple documents, or do anything in a browser — which covers a lot of ground these days — a Chromebook and Chrome OS are all you need. Chromebooks can't run Windows programs such as Office or Photoshop (although they *can* run web-based versions of them, such as Office Web Apps or Photoshop on the Web). Despite this limitation, they don't get infected by traditional viruses and have few maintenance problems. You can't say the same about Windows: That's why you need a large book to keep it going. Yes, it would be best to have a reliable internet connection to get the most out of Chrome OS. However, some parts of Chrome OS and Google's apps, including Gmail, can work even if you don't have an active internet connection.

Chrome OS is built on Linux and looks and feels much like the Google Chrome web browser. There are a few minor differences, but generally, you feel like you're working in the Chrome browser.

- » **ChromeOS Flex:** This different flavor of Chrome OS is designed to run on older PCs that can't run Windows 11. Google makes it easy to create a bootable USB drive with the ChromeOS Flex setup and get your PC up and running with this operating system in about 5 minutes. This operating system is also designed to work on devices without a Trusted Platform Module (TPM) chip, which is required for Windows 11 to encrypt your data and keep it safe from hackers. Another significant difference between Chrome OS and ChromeOS Flex is that the latter can't run Android apps. Visit <https://chromeos.google/products/chromeos-flex/> for more details about this operating system.
- » **macOS:** If you don't know how to use Windows or own a Windows computer, consider buying a MacBook Air or a MacBook Pro. The latest models powered by Apple's M3 chips deliver excellent performance and energy efficiency, as well as support for workloads related to artificial intelligence (AI). However, they can natively run only macOS, not Windows. If you want Windows on the latest MacBooks, you must purchase Parallels Desktop for Mac from www.parallels.com. And, if you're a PC fan, you'll be happy to know that you can build a custom computer and run macOS on it. Check out www.hackintosh.com. But, no, it isn't legal — the macOS End User License Agreement explicitly forbids installation on a non-Apple-branded computer. Also, installing it is certainly not for the faint of heart.

» **Linux:** The big up-and-coming operating system, which has been up-and-coming for a couple of decades now, is Linux (pronounced “LIN-uchs”). If you are not an IT professional and use your PC only to get on the internet — to surf the web and send emails — Linux can handle that, with few of the headaches that remain as the hallmark of Windows. By using free programs such as LibreOffice (www.libreoffice.org) and online services such as Google Workspace and Google Drive (www.drive.google.com), you can even cover the basics in word processing, spreadsheets, presentations, contact managers, calendars, and more. Even though Linux doesn’t support Windows’s vast array of consumer hardware, it’s popular with many software developers and power users.

In the tablet sphere, iPadOS and Android rule. Windows 11 doesn’t compete with any of them, even though it works on Qualcomm chips designed for mobile devices and is available on tablets and convertible devices such as the Surface line.



WARNING

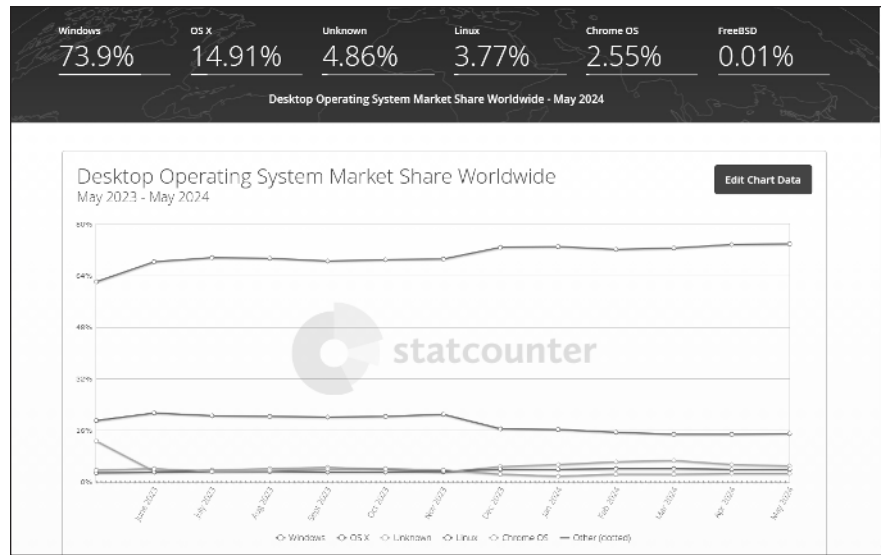
Windows 11 in S mode is a confusing development with an unclear future. Designed to compete with Chrome OS, *S mode* refers to a set of restrictions on “real” Windows. Supposedly in an attempt to improve battery life, reduce the chance of the PC getting infected, and simplify your life, the S mode in Windows 11 doesn’t run most regular Windows programs. S mode limits users only to apps found in the Microsoft Store. You get Spotify and Apple Music as well as Firefox, Opera, and Microsoft Edge but not Google Chrome. Fortunately, you can go to the Microsoft Store and buy an upgrade for getting out of S mode.

What do other people choose? Measuring the percentage of PCs running Windows versus Mac versus Linux is hard. StatCounter (www.statcounter.com) specializes in analyzing the traffic of millions of sites globally and provides useful statistics based on the data they collect. One stat tallies how many Windows computers hit those sites compared to macOS and Linux. While their data may not be 100 percent representative of real-world market share, it does an excellent job of giving us an idea of operating system penetration. If you look at only desktop operating systems — Windows (on desktops, laptops, 2-in-1s) and macOS — the numbers in May 2024 (according to StatCounter) tell the story from Figure 1-3.

In May 2024, Windows had a market share of 73.9 percent of all desktop operating systems, and macOS had 14.91 percent. Linux’s share is around 3.77 percent, while ChromeOS’s is just 2.55 percent.

Windows 10 is king in Microsoft’s world, with a 68 percent market share. Windows 11 is a distant second, with 27.64 percent, a value growing much slower than Microsoft would like. Windows 7 is still used in 2.87 percent of computers, even though it reached its end of life on January 14, 2020, and Microsoft no longer offers updates for it.

FIGURE 1-3:
Worldwide
market share
of desktop
operating
systems from
May 2023 to
May 2024.



REMEMBER

The numbers change dramatically if you look at the bigger picture, including tablets and smartphones. As of May 2024, StatCounter says that 43.86 percent of all devices on the internet use Android, while just 27.97 percent use Windows, and 17.8 percent use iOS (read iPhone). Mobile operating systems are swallowing the world — and the trend has been in favor of mobile, not Windows, for many years. The number of smartphones sold every year exceeds the number of PCs sold. And according to Statista, in the last quarter of 2023, 58.67 percent of all internet traffic was from mobile devices. Things are pretty clear, aren't they?

Which Windows Version Is Best?

As you have seen, Windows 10 commands the biggest market share in the PC world. However, this doesn't mean that it's a better operating system. And after October 14, 2025, Windows 10 won't be the better operating system for one simple yet important reason: Microsoft will end its support for it. After that date, you'll have to pay Microsoft for security updates, which will be available until 2028. However, this option is only for business customers, who will pay around \$61 for one PC during the first year, double for the second year, and double again for year three. The only institutions that will get an affordable fee are those that use the Windows 10 Education edition. They'll pay \$1 per PC for the first year, \$2 for the second year, and \$4 for the third and final year.

After October 14, 2025, non-business users will be exposed to an increasing number of security problems that will make their Windows 10 computer an easy target for malware creators, hackers, and other malicious entities lurking on the internet. Another problem is that Microsoft is no longer actively developing new features for Windows 10. Version 22H2, released on October 18, 2022, is the last version of Windows 10.

Therefore, the best version of Windows today is Windows 11 for the following reasons:

- » Microsoft actively maintains it, and it receives security updates and new features regularly.
- » Each year, we get a major update for Windows 11, which introduces new features to the operating system and increases its support window by another two years.

Microsoft has not said when it intends to end its support for Windows 11. However, I expect that their approach to be similar to the one for Windows 10: They will retire Windows 11 a few years after they launch Windows 12 but continue developing both operating systems in parallel for another year. Then, they will slowly phase out Windows 11 in favor of Windows 12.

Understanding Important Terminology

Some terms pop up so frequently that you'll find it worthwhile to memorize them or at least understand where they come from. That way, you won't be caught off-guard when your first grader comes home and asks to install TikTok on your computer.



TIP

If you want to drive your technical friends nuts the next time you have a problem with your Windows 11 computer, tell them that the hassles occur when you're "running Microsoft." They won't know whether you mean Windows, Word, Outlook, OneNote, or any dozen other programs. Also, they won't know if you're talking about a Microsoft program on Windows, the Mac, iPad, iPhone, Android, or even Linux.

Windows 11, the *operating system*, is a sophisticated computer program. So are computer games, Office, Microsoft Word (the word processor part of Office), Google Chrome (the web browser made by Google), those nasty viruses you've heard about, and the Instagram app on your teenager's smartphone.

An *app*, *program*, or *desktop app* is software that works on a computer (see the earlier “Hardware versus Software” section in this chapter). An app is modern and cool, while a program is old and boring. A *desktop app* or *application* manages to hit both gongs, but they all mean the same thing.

A *Windows app* is a program that runs on any edition of Windows 11. By design, *apps* should run on Windows 11 and Windows 10 on a desktop, a laptop, and a tablet— and even on an Xbox game console, a giant wall-mounted Surface Hub, a HoloLens augmented reality headset, and possibly Internet of Things tiny computers. They also run on Windows 11 in S mode (read Chapter 3 in this minibook).



WARNING

Although they might look the same, apps and desktop apps or programs have some significant differences. Initially, Windows apps were distributed only through the Microsoft Store. Nowadays, some desktop apps or programs, such as Mozilla Firefox and Adobe Photoshop, are also distributed through the Microsoft Store. Desktop apps can also be distributed separately from the Microsoft Store. However, if you don’t download them from the Microsoft Store, they aren’t updated automatically — you’ll need to handle this process on your own. Another difference is that apps can run on Windows 11 in S mode, while desktop apps that aren’t delivered through the Microsoft Store can’t.



REMEMBER

A special kind of program called a *driver* makes specific pieces of hardware work with the operating system. The driver acts like a translator that enables Windows to ask your hardware to do what the operating system wants. Imagine that you have a document that you want to print. You edit the document in Word, click or tap the Print button, and wait for the document to be printed. Word is an application that asks the operating system to print the document. The operating system takes the document and asks the printer driver to print the document. The driver takes the document and translates it into a language that the printer understands. Finally, the printer prints the document and delivers it to you. Everything inside your computer and all that is connected to it has a driver: The hard disk inside the PC has a driver, the printer has a driver, your mouse has a driver, and Tiger Woods has a driver (several, actually, and he makes a living with them). I wish that everyone was so talented.

Windows includes many drivers, some created by Microsoft and others created by third parties. The hardware manufacturer is responsible for making its hardware work with your Windows PC, and that includes building and fixing the drivers. However, if Microsoft makes your computer, Microsoft is responsible for the drivers too. Sometimes, you can get a driver from the manufacturer that works better than the one that ships with Windows.

When you stick an app or a program or a driver on your computer — and set it up so that you can use it — you can say that you *installed* the app or program or driver.

When you crank up a program — that is, get it going on your computer — you can say you *started* it, *launched* it, *ran* it, or *executed* it. They all mean the same thing.

If the program quits the way it's supposed to, you can say it *stopped*, *finished*, *ended*, *exited*, or *terminated*. Again, all these terms mean the same thing. If the app stops with some weird error message, you can say it *crashed*, *died*, *cratered*, *went belly up*, *jumped in the bit bucket*, or *GPFed* (techspeak for “generated a General Protection Fault” — don't ask), or employ any of a dozen colorful but unprintable epithets. If the app just sits there and you can't get it to do anything, no matter how you click your mouse or poke the touchscreen, you can say that it *froze*, *hung*, or *stopped responding*.

A *bug* is something that doesn't work right. A bug is not a virus! If you ask me, viruses work as intended far too often. Speaking of bugs, did you know that the term *bug* comes from a real-life insect? US Navy Rear Admiral Grace Hopper — the intellectual guiding force behind the COBOL programming language and one of the pioneers in the history of computing — is credited with popularizing the term. It turns out that she found a moth inside the relay of an ancient Mark II Aiken Relay Calculator. The moth was taped into the technician's logbook on September 9, 1947. (See Figure 1-4.)

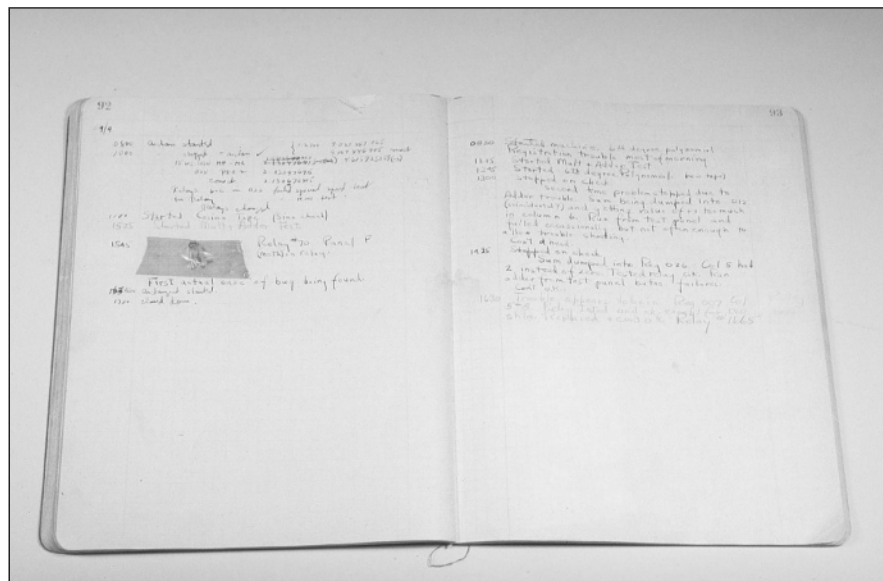


FIGURE 1-4:
Admiral Grace Hopper's log of the first actual case of a bug being found.

Source: US Navy

The people who invented all this terminology think of the internet as being some great blob in the sky — it's *up*, as in “up in the sky.” So, if you send something

from your computer to the internet, you're *uploading*. If you take something off the internet and put it on your computer, you're *downloading*.

The *cloud* is just a marketing term for the internet. Saying that you put your data "in the cloud" sounds so much cooler than saying you copied it to storage on the internet. Programs can run in the cloud — which is to say that they run on the internet. Just about everything that has anything to do with computers can be done in the cloud.



REMEMBER

If you use *cloud storage*, you're just sticking your data on some company's computers. Put a file in Microsoft OneDrive, and it goes onto one of Microsoft's computers. Put it in Google Drive, and it goes to Google's storage in the sky. Move it to Dropbox, and it's sitting on a Dropbox server.

When you connect computers and devices to each other, you *network* them. The network can be wired, using cables; wireless, often called *Wi-Fi*, the name for the main body of wireless networking standards; or a combination of wired and wireless. At the heart of a network sits a box, called a *router* or an *access point*, that computers and devices connect to via cables or Wi-Fi. If the router has "rabbit ears" on top, for wireless connections, it's usually called a *Wi-Fi router*. Do keep in mind that some Wi-Fi routers have antennae hidden inside their box.

You can hook up to the internet in two basic ways: wired and wireless. *Wired* is easy: You plug one end of a network cable into a router or some other box that connects to the internet and the other end into your computer. *Wireless* networks fall into two categories: Wi-Fi connections, as you'll find in many homes, coffee shops, airports, and all kinds of public places, and cellular (mobile phone-style) wireless connections. Cellular wireless internet connections are identified with one of the G levels: 3G, 4G, or 5G. Each G level is faster than its predecessor.

This part gets a little tricky. If your smartphone can connect to a 4G or 5G network, you can set it up to behave like a Wi-Fi router: Your laptop talks to the smartphone, and the smartphone talks to the internet over its 4G (or 5G) connection. That's called *tethering* — your laptop is tethered to your smartphone. Not all smartphones can tether, and not all manufacturers and mobile carriers allow it.

Special boxes called *mobile hotspot* units work much the same way: The mobile hotspot connects to the 4G or 5G connection, and your laptop gets tethered to the mobile hotspot box. Most smartphones these days can be configured as mobile hotspots.

If you plug your internet connection into the wall, you have *broadband*, which may run via *fiber* (a cable that uses light waves), *DSL* or *ADSL* (which uses regular old phone lines), *cable* (as in cable TV), or *satellite*. The fiber, DSL, cable, or satellite

box is often called a *modem*, although it's really a *router*. Although fiber-optic lines are inherently much faster than DSL or cable, individual results can vary. Ask your neighbors what they're using, and then pick the best. If you don't like your current service, vote with your wallet.



TECHNICAL
STUFF

Turning to the dark side of the force, the distinctions among *viruses*, *worms*, and *trojans* grow blurrier every day. That's why most journalists and tech specialists use the generic term *malware* to describe anything that can harm a computer, smartphone, or any other gadget. In general, they're programs that replicate and can be harmful, and the worst ones blend different approaches. *Spyware* gathers information about you and then phones home with all the juicy details. *Adware* gets in your face with dodgy ads, all too frequently installing itself on your computer without your knowledge or consent. *Ransomware* scrambles (or threatens to scramble) your data and demands a payment to unscramble it.

If a bad guy manages to take over your computer without your knowledge, turning it into a zombie that spews spam by remote control, you're in a *botnet*. (And yes, the term *spam* comes from the immortal *Monty Python* routine that's set in a cafe serving Hormel's Spam luncheon meat, the chorus bellowing "lovely Spam, wonderful Spam.") Check out Book 9 for details about preventing malware from messing with your Windows computer.

The most successful botnets employ *rootkits* — programs that run underneath Windows, evading detection because regular antivirus programs can't see them. Even though rootkits are less of a threat than they used to be, they can still inflict severe damage, especially when used to infiltrate business networks or government infrastructure.



TIP

This section covers about 80 percent of the buzzwords you hear in common tech talk. If you get stuck at a party where people are simply too geeky for your own sensibilities, do not hesitate to invent your own words. Nobody will ever know the difference.

Buying a Windows 11 Computer

Here is how it usually goes: You decide that you need to buy a new PC, and then spend a couple weeks brushing up on the details — price, storage, size, processor, memory — and doing some comparison shopping. You then end up at your local Best Buy shop, and the guy behind the counter convinces you that the best bargain you'll ever see is sitting right here, right now, and you better take it quick before somebody else nabs it.

YOU MAY NOT NEED TO PAY MORE TO GET A CLEAN PC

I don't like it when the computer I want comes loaded with all that "free" bloatware. I would seriously consider paying more to get a clean computer. You do not need an anti-virus and internet security program preinstalled on your new PC. It's going to open and beg for money next month. Windows 11 comes with Windows Security (formerly known as Windows Defender), and it works great — for free.

Trialware? Whether it's Quicken, Adobe Photoshop Elements, or any of a dozen other programs, if you must pay for a preinstalled app in one month or three months, you don't want it.

Unfortunately, it's difficult to find a new computer without all the unwanted extras. All companies are trying to increase their profit margins by bundling bloatware on our PCs. The only vendor that sells computers with less bloatware is Microsoft: Its Surface tablets and laptops are elegant and slim with preinstalled software. However, they're quite costly too. On the upside, the online Microsoft Store sells new, clean(er) computers from major manufacturers. Before you spend money on a computer, check to see whether it's available at the Microsoft Store. Go to www.microsoft.com/en-us/store/b/sale and choose any PC. The ones on offer usually ship without much junk preinstalled on them.

If you bought a new computer with bloatware on it, you can get rid of it by using some specialized tools. See Book 10, Chapter 4 for details.

Your eyes glaze over as you look at yet another spec sheet and try to figure out one last time whether DDR5 is better than DDR4 memory, whether a solid-state drive is worth the effort, and whether you need a SATA drive, or NVMe, or USB 3 or USB C. In the end, you figure that the person behind the counter must know more than you, so you plunk down your credit card and hope that you got a good deal.

The next Sunday morning, you look at the ads on Newegg (www.newegg.com) or Amazon (www.amazon.com) and discover that you could have bought the same PC for 20 percent less. The only thing you know for sure is that your PC is hopelessly becoming out of date, and the next time you'll be smarter about the entire process.

If that describes your experiences, relax. It happens to everybody. Take solace in the fact that technology evolves at an incredible pace, and many people can't keep

up with it. As always, I'm here to help and share everything you need to know about buying a Windows 11 PC:



TIP

- » **Decide if you're going to use a touchscreen.** Although a touch-sensitive screen is not a prerequisite for using apps on Windows 11, you'll probably find it easier to use apps with your fingers than with your mouse. Swiping with a finger is easy; swiping with a trackpad works well, depending on the trackpad; swiping with a mouse is a disaster. However, if you know that you won't be using Windows 11 apps optimized for touch from the Microsoft Store, a touchscreen won't hurt but probably is not worth the additional expense.

There is no substitute for physically trying the hardware on a touch-sensitive Windows 11 computer. Hands come in all shapes and sizes, and fingers, too. What works for size XXL hands with ten thumbs (present company included) may not cut the mustard for svelte hands and fingers experienced at taking cotton balls out of medicine bottles.

- » **Get a screen that's at least 1920 x 1080 pixels — the minimum resolution to play high-definition (1080p) movies.** You probably want to stream movies from Netflix and watch videos on YouTube. For a pleasant experience, don't get stingy when purchasing a monitor. Make sure that it's at least full HD — meaning that it has 1920 x 1080 pixels in resolution. Going higher makes for an even better experience. Therefore, if you have the cash, you won't be sorry if you buy a 1440p (2560 x 1440 pixels) or a 4K (3840 x 2160 pixels) display.

- » **Get a solid keyboard and a mouse that feels comfortable.** If you are upgrading your computer and love your keyboard and mouse, you may want to keep them. Corollary: Don't buy a computer online unless you know that your fingers are going to like the keyboard, your wrist will tolerate the mouse, and your eyes will fall in love with the monitor.

- » **Go overboard with hard drives.** In the best of all worlds, get a computer with a solid-state drive (SSD) for the system drive (the C: drive) plus a large hard drive for storage. For the low-down on SSDs, hard drives, backups, and putting them all together, see the upcoming section "Managing disks and drives."



TIP

How much hard drive space do you need? Unless you have an enormous collection of videos, or computer games, 1TB (1,024GB or 1,048,576MB) should suffice. That's big enough to handle about 500 hours of TV shows in standard definition. Interestingly, the Hubble Space Telescope produces approximately 10 TB of data per year. Imagine having a year's worth of cosmic images and discoveries on your computer's SSD drive?

If you're getting a laptop or an ultrabook with an SSD, consider buying an external 1TB or larger drive at the same time. You will use it. External hard drives are cheap and work with a simple plug-and-play.

Or you can just stick all that extra data in the cloud, with OneDrive, Dropbox, Google Drive, or some other competitor. For what it's worth, I used Dropbox in every phase of writing this book, as well as OneDrive to back up my home computers.



REMEMBER

If you want to spend more money, go for a faster internet connection, a better sit/stand desk and an ergonomic chair. You need these items much more than you need a marginally faster or bigger computer.

Looking inside your PC

It's time to share some information about the inner workings of a desktop or laptop PC. The big box that is your computer is named *PC* or *Personal Computer* (see Figure 1-5). The main computer chip inside is called *CPU*, or *central processing unit*. Less knowledgeable people often confuse the big box with the CPU because the computer is the one doing the calculations in their view.



FIGURE 1-5:
The enduring,
traditional
desktop PC.

Courtesy of Dell Inc.

However, the computer contains many parts and pieces (and no small amount of dust and dirt), but the crucial, central element inside every PC is the motherboard, not the CPU. (You can see a picture of a motherboard here: www.asus.com/motherboards-components/motherboards/csm/z790-ayw-wifi-w-csm/). That's because the motherboard is the component tying together all the others

and helping them communicate and work with one another. Inside each computer, many items are attached to the motherboard:

- » **The processor or CPU:** This gizmo does the main computing. It's probably from Intel or AMD. Different manufacturers rate their processors in different ways, and it's impossible to compare performance by just looking at the part number. Yes, Intel Core i9 CPUs usually run faster than Core i7s and Core i5s, while Core i3s are the slowest of the lineup. The same goes for AMD's Ryzen 9, Ryzen 7, Ryzen 5, and Ryzen 3 line-up of processors.

Unless you tackle intensive video games, create and edit audio or video files, or recalculate spreadsheets with the national debt, the processor doesn't count for much. You don't need a fancy processor if you're streaming audio and video (say, with YouTube or Netflix). If in doubt, check out the reviews at www.tomshardware.com and gamersnexus.net. Windows 11 requires an Intel Core processor from at least 2017, an AMD Ryzen processor from 2019 onward, or a processor from the Qualcomm Snapdragon lineup that was designed for this operating system.

- » **Memory chips and places to put them:** Memory is measured in megabytes (1MB = 1,024KB = 1,048,576 characters), gigabytes (1GB = 1,024MB), and terabytes (1TB = 1,024GB). Microsoft recommends a minimum of 4GB of RAM. Unless you have an exciting cornfield that you want to watch grow while using Windows 11, aim for 8GB or more. Most desktop computers allow you to add more memory, while many laptops don't.

Boosting your computer's memory to 8GB from 4GB makes the machine snappier, especially if you run memory hogs such as Microsoft Office, Photoshop, or Google Chrome. If you leave Outlook open and work with it all day and run almost any other major program at the same time, 16GB is a wise choice. If you're going to do some video editing, gaming, or software development, you probably need more. But for most people, 8GB or 16GB will run everything well.

- » **Video card:** Most motherboards include remarkably good built-in video. If you want more video oomph, you must buy a video card and put it in a card slot. Advanced motherboards have multiple PCI-Express card slots, to allow you to strap together two video cards and speed up video even more. If you're not a gamer, any graphics card released in the last four years will do just fine. If you are a gamer or are interested in using AI-based features and tools, you'll need a newer graphics card from NVIDIA's GeForce RTX40 series or AMD's Radeon RX 7000 series, or newer.
- » **SSD:** Solid-state drives, or SSDs, are fast and cheap storage. You don't have to buy an expensive drive to benefit from tangible speed improvements. If you don't want to wait a lot for your programs to load, and you don't want Windows 11 to take minutes to boot, buying an SSD is a must. In comparison,

hard disk drives (HDDs) are slow and dated. You should use an HDD for storing your personal files and backing up your data, not for running Windows 11, games, and apps. Remember, Windows 11 alone requires 64GB of storage, so don't be stingy with your SSD: Choose one with at least 256GB of storage space. 512 GB or 1 TB of storage is ideal for most people.

- » **Card slots (also known as expansion slots):** Laptops have limited (if any) expansion slots on the motherboard. Desktops contain several expansion slots. Modern slots come in two flavors: PCI and PCI-Express (also known as PCIe or PCI-E). Many expansion cards require PCIe slots: video cards, sound cards, network cards, and so on. PCI cards don't fit in PCIe slots and vice versa. To make things more confusing, PCIe slots come in four sizes — literally, the size of the bracket and the number of bumps on the bottom of the card is different. The PCIe 1x is smallest, the relatively uncommon PCIe 4x is considerably larger, and PCIe 8x is a bit bigger still. PCIe 16x is just a little bit bigger than an old-fashioned PCI slot. Most video cards these days require a PCIe 16x slot, sometimes two, depending on how big they are.

If you're buying a monitor separately from the rest of the system, make sure the monitor takes video input in a form that your PC can produce. See the upcoming section "Displays" for details.

- » **USB (Universal Serial Bus) connections:** The USB cable has a flat connector that plugs into your USB ports. Keep in mind that USB 3 is considerably faster than USB 2, and any kind of USB device can plug into a USB 3 slot, regardless of whether the device itself supports USB 3 level speeds.

USB Type-C (often called USB-C) is a different kind of cable that requires a different kind of slot. It has two big advantages: The plug is reversible, making it impossible to plug in upside down, and you can run a considerable amount of power through a USB-C, making it a good choice for power supplies. Many laptops these days get charged through a USB C connection.

Make sure you get plenty of USB slots — at least two and preferably four or more. Pay extra for a USB C slot or two. More details are in the section "Managing disks and drives," later in this chapter.

Here are a few upgrade dos and don'ts:

- » **Do not** let a salesperson talk you into eviscerating your PC and upgrading the CPU: Intel Core i7 isn't that much faster than Intel Core i5; a 3.0-GHz PC doesn't run a whole lot faster than a 2.8-GHz PC. The same is true for AMD's Ryzen 7 versus Ryzen 5. If you're not doing high-performance computing, you won't need an Intel Core i9 or AMD Ryzen 9 processor. Those processors cost a lot more, require more electrical energy to work, and won't deliver a tangible enough performance improvement to be worth the cost.

- » **Do not** expect big performance improvements by adding more memory when you hit 16GB of RAM, unless you're running Google Chrome all day with 42 open tabs or editing videos.
- » **Do** consider upgrading to a faster video card or one with more memory if you have an older one installed. Windows 11 will take good advantage of an upgraded video card.
- » **Do** wait until you can afford a new PC, and then give away your old one, rather than nickel-and-dime yourself to death on little upgrades.
- » **Do** buy a new SSD if you can't afford to buy a new PC and you want more performance. Install Windows 11 and all your apps and games on the SSD. No other hardware component delivers bigger performance improvements than the switch from HDD to SSD.



TIP

If you decide to add memory, have the company that sells you the memory install it. The process is simple, quick, and easy — if you know what you're doing. However, having the dealer install the memory also puts the monkey on the dealer's back if a memory chip doesn't work or is not compatible with your computer's motherboard or CPU.

Secure boot, TPM, and Windows 11

Windows 11 is a big deal when it comes to the security requirements it has for running on PCs and devices. Microsoft wants it to be the most secure Windows version ever and decided to enforce some stringent restrictions. As a result, for Windows 11 to work, your PC must have a processor with an embedded Trusted Platform Module (TPM) 2.0 and Secure Boot support. The TPM 2.0 chip has been a requirement for Windows devices since 2016, and Secure Boot has been around since the days of Windows 8. Because of that, you may think that these security features aren't a big deal and that most computers should be able to handle Windows 11. However, many computers with a TPM 2.0 chip don't have it enabled by default, and you have to fiddle with your computer's UEFI (read Book 8, Chapter 3 for more details) to enable it — a task many users have no idea how to perform. To cope with this issue, motherboard manufacturers like ASUS have released new BIOS updates that enable this chip for you. However, if your PC runs Windows 10, and you want to upgrade to Windows 11, you can't do that without enabling TPM and Secure Boot first.



TECHNICAL
STUFF

What is a TPM chip, you ask? It's a device used to generate and store secure and unique cryptographic keys. The cryptographic keys are encrypted and can be decrypted only by the TPM chip that created and encrypted them. Encryption software such as BitLocker (read Book 9, Chapter 3) in Windows 11 uses the TPM chip to protect the keys used to encrypt your files. Since the key stored in each

TPM chip is unique to that device, encryption software can quickly verify that the system seeking access to the encrypted data is the expected system and not a different one.

Secure Boot, on the other hand, detects tampering attempts that may compromise your PC's boot process (which spans when you press the power button on your PC to when Windows starts) and key files of the operating system. When Secure Boot detects something fishy, it rejects the code and makes sure only good code is executed. Both security features are a big deal when it comes to protecting your data and your computer from all kinds of nasty cyberthreats.

These requirements significantly reduce the list of processors that work with Windows 11. To run this operating system, PCs and devices must have an Intel Core processor from at least 2017 or an AMD Ryzen processor from 2019 onward. They also need at least 4GB of RAM and 64GB of storage on their hard drives. Although Windows 11 places high demands on the computers on which it can be used, remember that this operating system has been around for some years now, and new computers sold today in computer shops worldwide are capable of running Windows 11, unless they come with another operating system preinstalled, such as Linux.

Tablets and 2-in-1s

Although tablets have been on the market for decades, they didn't really take off until Apple introduced the iPad in 2010. The old Windows 7 tablets required a *stylus* (a special kind of pen) and had truly little software that took advantage of touch input. Since the iPad took off, every Windows hardware manufacturer has been clamoring to join the game. Even Microsoft has entered the computer-manufacturing fray with its line of innovative tablets known as Surface.

The result is a confusing mix of Windows tablets, many kinds of 2-in-1s (some of which have a removable keyboard, as shown in Figure 1-6, and thus transform to a genuine tablet), and laptops and ultrabooks with all sorts of weird hinges, including some that flip around like an orangutan on a swing.

The choice has never been broader. All major PC manufacturers offer traditional laptops as well as some variant on the 2-in-1, many still have desktops, and more than a few even make Chromebooks!

I did most of the touch-sensitive work in this book on an ASUS Zenbook S 16 laptop (see Figure 1-7). It's a new Copilot+ PC device, with a cutting-edge AMD Ryzen AI 9 365 processor and a dedicated neural processor for running artificial intelligence tasks. It's a good-looking, capable, and versatile laptop.

FIGURE 1-6:
Surface Pro
tablets have
attachable/
removable
keyboards.



Courtesy of Microsoft

FIGURE 1-7:
The ASUS
Zenbook S 16
laptop that I used
for writing parts
of the book.



Courtesy of ASUS

It has fast Wi-Fi 7 connectivity, two USB 4.0 Gen 3 type-C ports with support for power delivery, one USB 3.2 type-A port, an HDMI output for high-definition monitors (or TVs!), and a microSD card reader. Another cool feature is the webcam with facial-recognition support, which makes it easy to sign into Windows 11 using your face instead of your password. Don't worry, your photo isn't sent to Microsoft; it's stored locally, on your PC.

Of course, this oomph came at a price, around \$1,699. However, you don't need to spend as much. If you just want a laptop, you can find respectable, traditional Windows 11 laptops, with or without touchscreens, for a few hundred dollars.

Microsoft's Surface Pro (refer to Figure 1-6) starts at \$999. A more affordable option is the Surface Laptop Go, which starts at \$699. The Surface Laptop Studio, which is both a laptop and a tablet, starts at \$1,852.

If you're thinking about buying a Windows 11 tablet or 2-in-1, keep these points in mind:



REMEMBER

- » **Focus on weight, heat, and battery life.** Touch-sensitive tablets or 2-in-1s are meant to be carried, not lugged around like a suitcase. The last thing you need is a box so hot that it burns a hole in your pants, or a fan so noisy you can't carry on a conversation during an online meeting.
- » **Make sure you get multi-touch.** Some manufacturers like to skimp and make tablets or touchscreens that respond only to one or two touch points. You need at least four just to run Windows 11, and ten wouldn't be overkill.
- » **The screen should have 1920 x 1080 or more pixels.** Anything with a lower resolution will have you squinting to look at the desktop.
- » **Get a solid-state drive.** In addition to making the machine much, much faster, a solid-state drive (SSD) also saves on weight, heat, and battery life. Don't be overly concerned about the amount of storage on a tablet. Many people with Windows 11 tablets end up putting all their data in the cloud using OneDrive, Google Drive, Dropbox, or Box. (For more info on cloud storage solutions, see Book 10, Chapter 4.)
- » **Try before you buy.** The screen must be sensitive to your big fingers and look good, too. Not an easy combination. You might have specific issues; for example, I dislike keyboards with a very low-profile design because they don't provide tactile feedback. Better to know the limitations before you fork over the cash.
- » **Make sure you can return it.** If you try the device and it doesn't provide the productivity benefits you were expecting or if you don't like using the touch-screen, it's best if you can return the product, get your money back, and invest in a traditional laptop instead.

Laptops, Ultrabooks, Gaming laptops

Netbooks, a popular concept in the days of Windows 7, were small laptops designed to provide the basics people needed from a laptop at an affordable price. Think of them as the precursor to today's Chromebooks.

Then along came the iPad, and at least 80 percent of the reason for using a netbook disappeared. Sales of netbooks have not fared well and this entire segment died. Tablets blew the doors off netbooks, and 2-in-1s mopped up the remains.

Ultrabooks are a slightly different story. Intel coined (and trademarked) the term *Ultrabook* and set the specs. For a manufacturer to call its piece of iron an Ultrabook, it must be less than 21mm thick, run for 5 hours on a battery charge, and resume from hibernation in 7 seconds or less. In other words, it must work a lot like an iPad, even though it is a laptop.

Intel invested a \$300 million marketing budget on Ultrabooks, but they fizzled. Now the specs seem positively ancient, and the term *Ultrabook* doesn't have the wow factor it once enjoyed. However, Ultrabooks remain the best choice for most people, even though they're more expensive than a traditional laptop. Therefore, if you're on a modest budget, buy a cheap laptop instead of an Ultrabook.

Another family of portable devices that you might consider is gaming laptops. They started becoming popular in the 2010s due to their sheer power, and their capability to replace desktop computers in terms of performance. However, for many years, they were heavy, clunky devices, difficult to carry, and with unsatisfactory battery life. In recent years, manufacturers have brought several innovative approaches to cooling gaming laptops, improving their charging speeds and battery life. As a result, you can now buy gaming laptops that are not only powerful enough to run the latest games and serve professionals for video editing, graphic design, and game development, but are also slim and easy to carry. If you're on the lookout for a slim gaming laptop, consider the ASUS Zephyrus G14, Dell XPS 17, or Lenovo Legion 5 Slim 14. They're good and beautiful but also expensive.

OLED VERSUS LED

OLED (organic light-emitting diode) screens are found on TVs, computer monitors, laptop screens, tablets, and even smartphones. Their prices have lowered over the years. Can or should they supplant LED screens, which have led the computer charge since the turn of the century? That's a tough question with no easy answer.

First, understand that an LED screen is an LCD (liquid crystal display) screen — an older technology — augmented by backlighting or edge lighting, typically from LEDs or fluorescent lamps. A wide variety of LED screens are available, but most of the screens you see nowadays incorporate IPS (in-plane switching) technology, which boosts color fidelity and viewing angles.

OLED is a horse of a different color. IPS LED pixels rely on the backlight or sidelight to push the color to your eyes. OLED (pronounced "oh-led") pixels make their own light. If you take an LED screen into a dark room and bring up a black screen, you can see

variations in the screen brightness because the backlight intensity changes, if only a little bit. OLED blacks, by contrast, are uniform and thus deeper.

All sorts of new techniques are being tried with LED, and LED screens are getting better and better. HDR (high dynamic range) improvements, for example, make LED pictures stand out in ways they never could before. Quantum dots improve lighting and color. Many people feel that OLEDs have blacker blacks, but the best LEDs produce better bright colors.

The huge difference is in price: OLED screens are still more expensive than LED, although the price of OLED has dropped in recent years. In addition, OLEDs don't last as long as LEDs — say, a decade with normal use. There is also some concern that OLEDs draw more power and will burn through a laptop battery faster than LCDs, but some contest that statement. Much depends on the particular LED and OLED you compare.

Displays

The computer monitor or screen — and LED, LCD, OLED, and plasma TVs — use technology that's quite different from old-fashioned television circuitry of your parents' childhood. A traditional TV scans lines across the screen from left to right, with hundreds of lines stacked on top of each other. Colors on each individual line vary. The almost infinitely variable color on an old-fashioned TV combined with a comparatively small number of lines makes for pleasant but fuzzy pictures.

By contrast (pun intended, of course), computer monitors, touch-sensitive tablet screens, and plasma, LED, OLED, and LCD TVs work with dots of light called *pixels*. Each pixel can have a different color, created by tiny, colored gizmos sitting next to each other.



REMEMBER

The more pixels you can cram on a screen — that is, the higher the screen resolution — the more information you can pack on the screen. That's important if you tend to have more than one word-processing document open at a time, for example. At a resolution of 1024 x 768, two open Word documents placed side by side look big and fuzzy, like caterpillars viewed through a dirty magnifying glass. At 1280 x 1024, those same two documents look sharp, but the text may be so small that you must squint to read it. If you move up to wide-screen territory — 1920 x 1080 (full HD), or even 2560 x 1440 (also called 1440p) — with a good monitor, two documents side-by-side look stunning. Run up to 4K technology, at 3840 x 2160 or better — the resolution available on many premium Ultrabooks — and you need a magnifying glass (preferably a clean one this time) to see the pixels.

A special-purpose computer called a *graphics processing unit (GPU)*, stuck on your video card or integrated into the CPU, creates everything displayed on your computer's screen. The GPU has to juggle all the pixels and all the colors, so if you're a gaming fan, the speed of the video card (and to a lesser extent, the speed of the monitor) can make the difference between a zapped alien and a lost energy shield. If you want to experience Windows 11 in all its glory, play the latest games in maxed-out graphical detail, or do video editing, 3D modeling, virtual reality, and the like, you need a fast GPU with at least 8 GB (preferably 12 GB or more) of its own memory.

Computer monitors and tablets are sold by size, measured diagonally (glass only, not the bezel or frame), like TV sets. And just like with TV sets, the only way to pick a good computer screen over a run-of-the-mill one is to compare them side-by-side or to follow the recommendation of someone who has the knowledge to test them in detail and make a thorough review. Luckily, plenty of hardware review websites and YouTube channels do a fantastic job testing all the latest computer hardware.

Managing disks and drives

Your PC's memory chips hold information only temporarily: Turn off the electricity, and the content of RAM disappears. If you want to re-use your work, keeping it around after the plug has been pulled, you must save it, typically on a hard drive or possibly in the *cloud* (which means you copy it to a location on the internet).

The following list describes the most common types of disks and drives:

» **Hard drive:** Traditional hard disk drives (HDDs) have been replaced by *solid-state drives* (SSDs), which have no moving parts and, to a lesser extent, *hybrid drives*, which bolt together a rotating drive with an SSD. Each technology has benefits and drawbacks. Yes, you can run a regular HDD drive as your C: drive, and it will work fine. But tablets, laptops, or desktops with SSD drives run like lightning. The SSD wins as speed king. After you use an SSD as your main system (C:) drive, you'll never go back to a spinning platter, I guarantee.

SSDs feature low power consumption and give off less heat than HDDs. SSDs have no moving parts, so they don't wear out like hard drives. And, if you drop a hard drive and a solid-state drive off the Leaning Tower of Pisa, one of them may survive. Or maybe not.

SSDs are great for the main drive, but they may be too expensive for storing pictures, movies, and photos. Price and technical considerations (see the sidebar "Solid-state drives have problems, too") assure that hard drives will still be around.



Hybrid drives combine the benefits and problems of both HDDs and SSDs. Although HDDs have long had *caches* — chunks of memory that hold data before being written to the drive and after it's read from the drive — hybrid drives have an entire SSD to act as a buffer.

If your budget stretches that far, start with an SSD for the system drive and a big hard drive (one that attaches with a USB cable) for storing photos, movies, and music, and then get another drive (which can be inside your PC, outside attached with a USB cable, or even on a different PC on your network) to run File History (see Book 8, Chapter 1).

If you want full on-the-fly protection against dying hard drives, get three hard drives — one SSD and two hard drives, either inside the PC or outside attached with USB or eSATA cables — and run Storage Spaces (see Book 7, Chapter 5).

Many people opt for a fast SSD for files needed immediately, coupled with cloud storage for the big stuff. If you opt for a Microsoft 365 subscription, which gives you 1 TB of cloud storage space, your need for hard drives will be reduced considerably.

A three-tier system, with SSDs storing data you need all the time, intermediate backup in the cloud, and multi-terabyte data repositories hanging off your PC, is the way to go for enthusiasts. Privacy concerns (and the intervention of various governments) have people worried about cloud storage, and rightfully so.

- » **SD card memory:** Many Windows laptops, mini PCs, and some tablets have built-in SD card readers. You probably know Secure Digital (SD) cards best as the kind of memory used in digital cameras and smartphones (see Figure 1-8). A microSD card can be plugged into an SD card adapter to have it function like an SD card.



Many desktop computer cases have drive bays. Why not use one of them for a multifunction card reader? That way, you can slip a memory card from your digital camera and transfer files at will. A multifunction reader costs a pittance and can read them all: SD card, microSD card, CompactFlash, memory stick, whatever you have.

- » **CD, DVD, or Blu-ray drive:** Of course, these types of drives work with CDs, DVDs, and Sony Blu-ray discs, respectively, which can be filled with data or contain music or movies. CDs hold about 700MB of data; DVDs hold 4GB, or six times as much as CDs. Dual-layer DVDs (which use two separate layers on top of the disc) hold about 8GB, and Blu-ray discs hold 50GB, or six times as much as a dual-layer DVD.

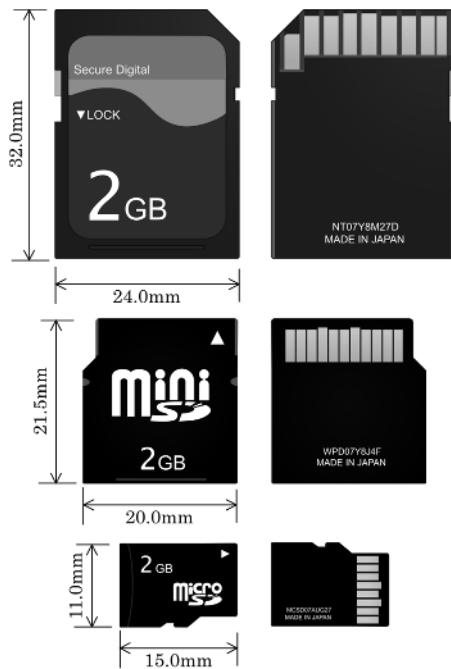


FIGURE 1-8:
Comparative
sizes of an SD,
a miniSD, and a
microSD card.

Source: tweezers / Wikimedia Commons / CC BY-SA 3.0.

Fewer and fewer machines these days come with built-in DVD drives: If you want to move data from one place to another, a USB drive works fine — and going through the cloud is even easier. For most storage requirements, big, cheap USB drives are hard to beat.

» **USB drive or key drive:** It's half the size of a pack of gum and can hold an entire PowerPoint presentation or two or six, plus a few full-length movies. Flash memory (also known as a jump drive, thumb drive, or memory stick) should be your first choice for external storage space or for copying files between computers. (See Figure 1-9.) You can even use USB drives on many DVD players and TV set-top boxes.

Pop one of these guys in a USB slot, and suddenly Windows knows it has another drive — except that this one's fast, portable, and incredibly easy to use. It's okay to go for the cheapest flash drive you can find as long as it belongs to a recognized manufacturer.



TIP

What about USB 3? If you have a hard drive that sits outside your computer — an *external drive* — or a USB drive, it'll run faster if it's designed for USB 3 and attached to a USB 3 connector. Expect performance with USB 3 that's three to five times as fast as USB 2. For most other outside devices, USB 3 is overkill, and USB 2 works just as well.

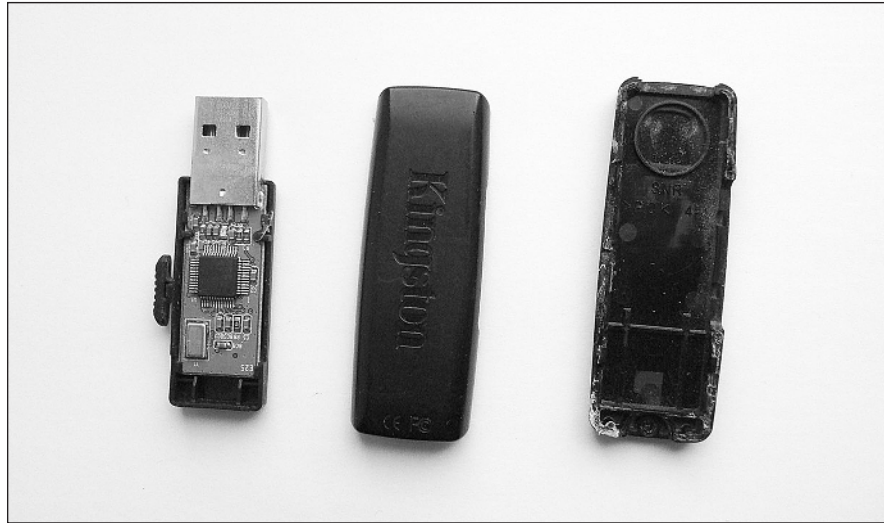


FIGURE 1-9:
The inside of a
USB drive.

Source: Ravenperch / Wikimedia Commons / CC BY-SA 3.0.

This list is by no means definitive: New storage options come out every year.

SOLID-STATE DRIVES HAVE PROBLEMS, TOO

Although I love my SSD system drives and would never go back to rotating hard disk drives (HDDs), SSDs aren't perfect. First, they don't have any moving parts, and it looks like they're more reliable than HDDs. But when an HDD starts to go belly up, you can usually tell because of its unusual slowness, the sounds it makes (usually a repetitive clicking sound), and the errors you start encountering. Expiring SSDs don't give off advanced warning signals or sounds. When trying to open a file, you may encounter a sudden system freeze, followed by tons of read and write errors. When an HDD dies, you can frequently get the data back, although it can be expensive and time-consuming. When an SSD goes, you rarely get a second chance.

SSDs must take care of lots of internal bookkeeping for trimming unused space and load balancing to guarantee uniform wear patterns. *Trimming* is the process in which the operating system tells the SSD which data blocks are no longer needed and can be deleted or are marked as free for rewriting. SSDs slow down after you've used them for a few years. The speed decrease is usually associated with the bookkeeping programs kicking in over time.

Connecting your PC to other devices

Your PC connects to the outside world by using a bewildering variety of cables and connectors. I describe the most common in this list:



TECHNICAL
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- » **USB (Universal Serial Bus) cable:** This cable has a flat connector (known as *USB A*) that plugs into your PC, as shown in Figure 1-10. The other end is sometimes shaped like a D (called *USB B*), but smaller devices have tiny terminators (usually called *USB mini* and *USB micro*, each of which can have two different shapes).

USB 2 connectors work with any device, but hardware — such as a hard drive — that uses USB 3 will be much faster if you use a USB 3 cable and plug it into the back of your computer in a USB 3 port. USB 2 works with USB 3 devices, but you won't get the additional speed. Note that not all PCs, especially older PCs, have USB 3 ports.

USB-C is a special kind of USB connector that supports amazingly fast data transmission and high power levels depending on which USB standard you're using. You know when you have USB-C because it's impossible to insert the plug upside down — both sides work equally well. It's becoming the go-to choice for connecting peripherals and, in some cases, power supplies.



TECHNICAL
STUFF

USB is the connector of choice for just about any hardware — printer, scanner, smartphone, digital camera, portable hard drive, and even the mouse. After many years of using a proprietary Lighting port, Apple's new iPhones and iPads finally use USB-C, just like the rest of the technology world. If you run out of USB connections on the back of your PC, get a USB hub with a separate power supply and plug away.



TECHNICAL
STUFF

- » **LAN cable:** Also known as a CAT-5e, CAT-6, or Ethernet cable, a LAN cable is a common type of network connector. Each end of the cable has an RJ-45 connector, which resembles an overweight telephone plug (see Figure 1-11). One end plugs in to your PC, typically into a *network interface card* (or *NIC*, pronounced “nick”) or a network connector on the motherboard. The other end plugs in to your wireless router (see Figure 1-12) or switch or into a cable modem, DSL box, router, or other internet connection-sharing device.
- » **Keyboard and mouse cable:** Most mice and keyboards (even wireless mice and keyboards) come with USB connectors.
- » **Bluetooth** is a short-distance wireless connection. Once upon a time, Bluetooth was finicky and hard to set up. In recent years, it has become quite useful and is now used to connect all kinds of accessories: speakers, headsets, mice, and keyboards.

» **DisplayPort and HDMI connectors:** Modern computer monitors and smart TVs use HDMI (see Figure 1-13), mini HDMI, or micro HDMI, DisplayPort (see Figure 1-14), or mini DisplayPort connectors, which transmit both audio and video over one cable.

USB Connection Type Reference Chart

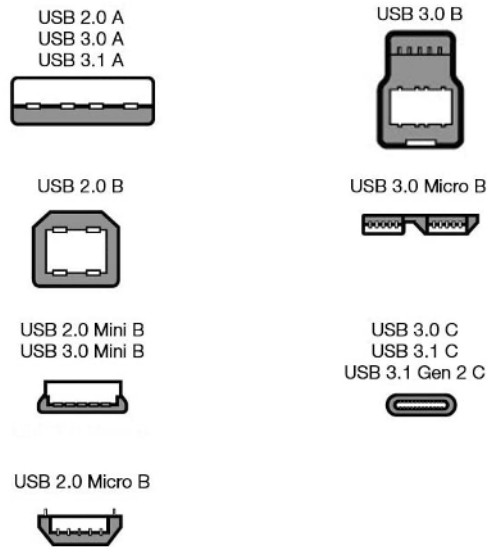


FIGURE 1-10:
The most common USB A, B, C, Mini, and Micro USB connectors.

Source: Wikimedia

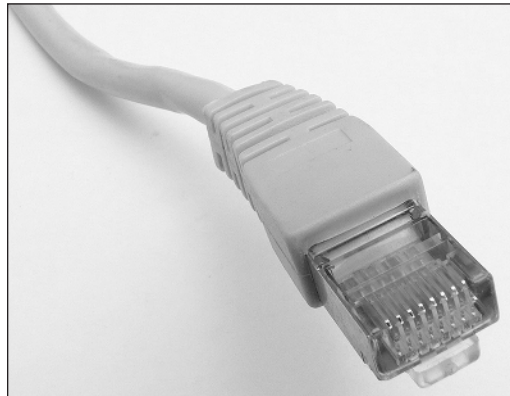


FIGURE 1-11:
An Ethernet cable with an RJ-45 connector.

Source: David Monniaux / Wikimedia Commons / CC BY-SA 3.0.

FIGURE 1-12:
The back of a wireless router.

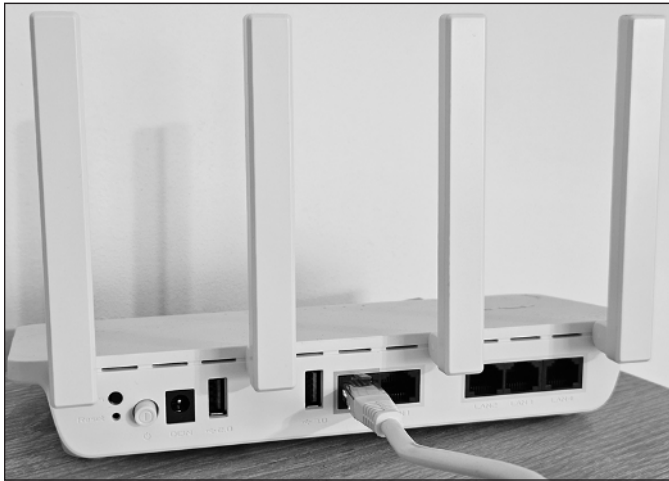


FIGURE 1-13:
HDMI replaced
the old VGA
and DVI-D video
adapters.



FIGURE 1-14:
DisplayPort is
the modern
alternative
to HDMI.



Source: Belkin / Wikimedia Commons / CC BY-SA 3.0.

Video, sound, and multimedia

When it comes to connecting your speakers to a desktop PC or a microphone to your laptop, you must be concerned about the five specific sound jacks, as each one serves a different function. Here's how the five key jacks are usually marked, although sometimes you must read the documentation of your PC or laptop to find the details (see Figure 1-15):

- » **Line In:** This stereo input jack is usually blue. It feeds a stereo audio signal — generally from an amplified source — into the PC. Use this jack to receive audio output into your computer from your iPad, cable box, TV set, radio, electric guitar, or other audio-generating box.



FIGURE 1-15:
The audio jacks
on the back
of a desktop
computer.

- » **Mic In:** This jack is usually pink. It's for unamplified sources, like most microphones or some electric guitars. If you use a cheap microphone for Skype, Teams, or another VoIP service that lets you talk long distances for free, and the mic doesn't have a USB connector, plug in the microphone here. In a pinch, you can plug any of the Line In devices into the Mic In jack — but you may hear only mono sound, not stereo, and you may have to turn the volume way down to avoid some ugly distortion when the amplifier inside your PC increases the strength of an already amplified signal.
- » **Line Out:** This stereo output jack is usually lime green. In many cases, it can be used for headphones or patched into powered speakers. Line Out is the source for the highest-quality sound your computer can produce. If you go for a multi-speaker setup, Line Out is for the front speaker.

- » **SPDIF Out:** SPDIF stands for Sony/Philips Digital Interface, from the names of the companies which developed this interface. You can plug an optical audio cable into this jack, which allows the transfer of digital audio signals. This interface was popular for transferring digital audio from CD and DVD players to amplifiers, TVs, or computers. It's rarely used these days.
- » **Rear Surround Out:** Usually black, this jack isn't used often. It's intended to be used if you have independent powered rear speakers. Most people with rear speakers use the Line Out connector and plug it into their home theater system, which then drives the rear speakers, or they use the HDMI cable (see the preceding section) to hook up to their TVs. If your computer can produce full surround sound output, and you have the amplifier to handle it, you'll get much better results using the black audio jack.

Many desktop computers have two more jacks: The orange one is a direct feed for your subwoofer, and the gray (or brown) one is for your side speakers. Again, it would be best to put an amplifier between the jacks and your speakers.

Laptops typically have just two jacks, pink for Mic In and lime for Line Out. If your headphones have a microphone, that's the right combination. It's also common to plug powered external speakers into the lime jack.

Some tablets and smartphones have a headphone jack, which works just like a lime green Line Out jack on your desktop PC.

High-end audio systems may support optical connections. Check the alignment of both the computer end of the connection and the speaker/receiver end.



TIP

PC manufacturers love to extol the virtues of their advanced sound systems, but the simple fact is that you can hook up a plain-vanilla PC to a home stereo and get good enough sound. Just connect the Line Out jack on the back of your PC to the Aux In jack on your home stereo or entertainment center. *Voilà!*

Is your old PC or laptop compatible with Windows 11?

Before upgrading a Windows 10 laptop or PC to Windows 11, it's a good idea to download and install the PC Health Check app from Microsoft. The app is free and does all the background checks for you, sharing a simple message on whether your computer can run Windows 11. Most importantly, if it can't run Windows 11, the app will tell you why. Sometimes, the problem is easy to fix, such as insufficient free storage space on your SSD or the TPM chip being available but not enabled.

Here's how to use the PC Health Check on your Windows 10 PC:

1. **Open your favorite web browser in Windows 10 and navigate to this address:** `https://aka.ms/GetPCHealthCheckApp`.
A file named `WindowsPCHealthCheckSetup` gets downloaded onto your computer.
2. **Double-click or tap `WindowsPCHealthCheckSetup` to install the app.**
You are first shown the license agreement.
3. **Select the `I Accept the Terms in the License Agreement` box and press `Install`.**
The app gets installed in a couple of seconds.
4. **Click or tap `Finish`.**
The PC Health Check app opens, as shown in Figure 1-16.

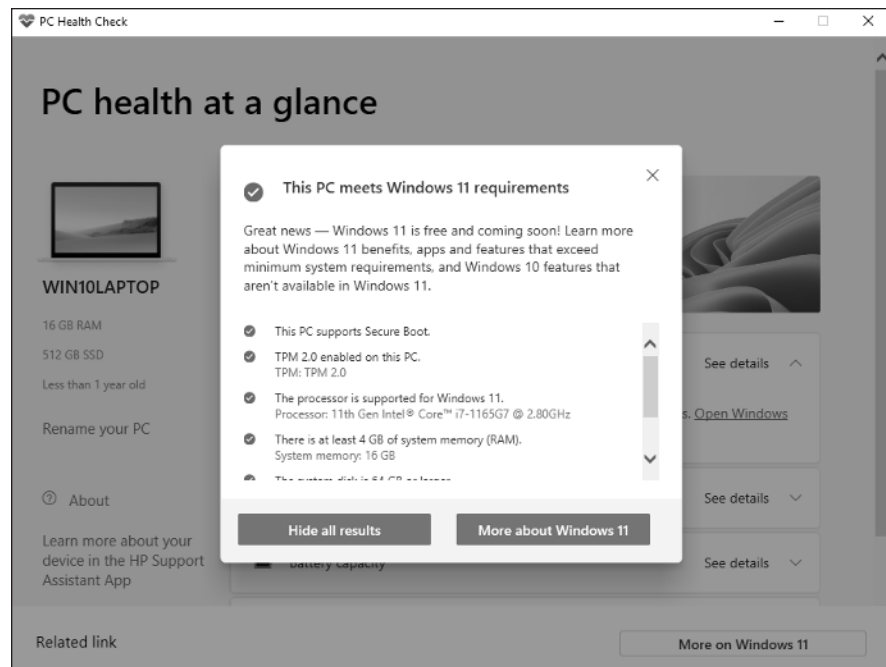


FIGURE 1-16:
The PC Health
Check app tells
you whether you
can upgrade to
Windows 11.

5. Click or tap Check Now.

The app summarizes its findings and tells whether your PC meets the Windows 11 system requirements.

6. To see more information, click or tap See All Results.

You see the technical aspects that the PC Health Check app checks and its findings.

7. When you're finished using the app, close it.

What You Might Not Like about Windows 11

Windows 11 is not all greatness. There are frustrating bits, as in any operating system. Here are the negative aspects that I think every Windows 11 customer should know before using it:

- » **Forced updates:** Windows 11 users do not have any choice about updates. When Microsoft releases a patch, it gets applied. Considering the troublesome update history of Windows 10, this is not a great policy on Microsoft's part. Unfortunately, you can only pause Windows 11 updates for up to five weeks. How annoying is that? Well, you'll soon find out.
- » **Inflexible hardware requirements:** As mentioned earlier in this chapter, you must have an Intel Core processor from at least 2017 or an AMD Ryzen processor from 2019 onward. As a result, only people with a new PC can run Windows 11, and they must also enable security features like the TPM chip and Secure Boot. These restrictions lowered the adoption rate for Windows 11 to a level below Microsoft's expectations. While Windows 11 is better than Windows 10 in some ways, that doesn't justify the cost of replacing a not-so-old computer with a new one.
- » **Privacy concerns:** Microsoft follows the same path blazed by Google, Facebook, and many other tech companies. They're all scraping information about you, snooping on your actions to sell you things. I don't think Microsoft is worse than the others, and Windows 11 has lots of privacy controls built in. However, things could be better in this regard. In Book 2, Chapter 7, I talk about reducing the amount of data that Microsoft collects about you.

- » **Enforced Microsoft account:** Another annoyance is that Microsoft doesn't allow Windows 11 users to install the operating system using a local account. You have to jump through many complicated technical hoops to do that. The company insists that you sign up with a Microsoft account, which allows it to track you and badger you to buy a Microsoft 365 subscription, a Copilot subscription, an Xbox Game Pass, and other services on top of Windows 11.
- » **Lots of preinstalled apps:** Many people rely on apps to get their work done. The problem is that most Windows 11 PCs come with lots of preinstalled bloatware: free apps and games you don't need, trialware antivirus software that eventually asks you for money, and so on.

I've learned how to block or at least postpone some of Microsoft's forced updates and have come to peace with the knowledge that Windows 11 is snooping on me. Hey, I've used Google's Chrome browser and Android operating system for years, and both have been harvesting data the entire time. Windows 11 may or may not give you more headaches than the alternatives, but it also gives you more opportunities.

Welcome to Windows 11!

