

chapter 3

The Visible Computer

“People who think they know everything really annoy those of us who know we don’t.”

—BJARNE STROUSTRUP, CREATOR OF THE C++ PROGRAMMING LANGUAGE



In this chapter, you will learn how to

- Describe how computing devices work
- Identify common connectors and devices on a typical computer system
- Discuss features common to operating system software

Charles Babbage didn’t set out to change the world. He just wanted to do math without worrying about human error, something all too common in his day. Babbage was a mathematician in the nineteenth century, a time well before anyone thought to create electronic calculators or computers (see Figure 3.1). When he worked on complex math, the best “computers” were people who computed by hand. They solved equations using pen and paper.

Babbage thought of making machines that would do calculations mechanically, so the numbers would always be right. Although his ideas were ahead of his time, inventors in the mid-twentieth century picked up the concepts and created huge calculating machines that they called *computers*.

This chapter explores how computing devices work. We’ll look first at the computing process, then turn to hardware components common to all devices. The chapter finishes with a discussion about software, exploring commonality among all operating systems and specific functions of application programming. And, there are lots of pictures.

Historical/Conceptual

■ The Computing Process

In modern terms, a **computer** is an electronic device that can perform calculations. The most common types use special programming languages that people, known as *computer programmers*, have written and compiled to accomplish specific tasks.

When most people hear the word “computer,” they picture *general* computing devices, machines that can do all sorts of things. The typical **personal computer (PC)** runs the operating system Microsoft Windows and is used for various tasks (see Figure 3.2). You can use it to manage your money and play games, for example, without doing anything special to it, such as adding new hardware.

Here are some other general-purpose computing devices:

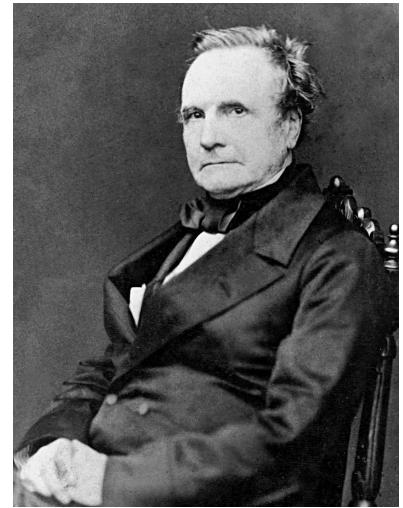
- Apple Mac
- Apple iPad
- Smartphone
- Portable computer (see Figure 3.3)

Plenty of other devices do *specific* computing jobs, focusing on a single task or set of similar tasks. You probably encounter them all the time. Here’s a list of common specific-purpose computers:

- Apple iPod
- Pocket calculator
- Digital watch
- Digital clock
- Wi-Fi picture frame
- Basic mobile phone
- Xbox One
- PlayStation 4
- GPS (Global Positioning System, the device that helps drivers figure out how to get where they need to go)
- TiVo
- Point of sale (POS) system (see Figure 3.4)
- Digital camera
- Camcorder

This list isn’t even close to complete! Plus, there are computers *inside* a zillion other devices. Here are some:

- Modern refrigerators
- Every automobile built since 1995



• **Figure 3.1** Charles Babbage, father of the computer



• **Figure 3.2** A typical PC



• **Figure 3.3** A portable computer



• **Figure 3.4** A point of sale computer in a gasoline pump



I picked 1995 as an arbitrary date for when every new car built had a computer. Computers have been used with cars for a long time. Simple computers helped make car factories work better starting in the 1970s, for example. The earliest mass-production car I found that had a central processor chip for added performance was the BMW 3 Series. The 1985-86 BMW 325, for example, can gain a few extra horsepower just from a ~\$200 chip upgrade.

- Airplanes
- Boats
- Mall lighting systems
- Zambonis
- Home security alarms

You get the idea. Computers help the modern world function.

Modern computer techs need to know how different types of computing devices work so they can support the many devices used by their clients. This diversity is also reflected in the CompTIA A+ exams.

If the list of devices to support seems overwhelming, relax. The secret savior for modern techs is that computing devices function similarly to each other. Once you

know what a particular device should enable a user to do, you'll be able to configure and troubleshoot successfully.

The Computing Parts

A modern computer consists of three major components:

- Hardware
- Operating system
- Applications

The **hardware** is the physical stuff that you can touch or hold in your hand. With a smartphone, for example, you hold the phone. On a typical personal computer, you touch the keyboard or view images on the monitor (see Figure 3.5).

The **operating system (OS)** controls the hardware and enables you to tell the computer what to do. The operating system often appears as a collection of windows and little icons you can click or touch (see Figure 3.6). Collectively these are called the **user interface (UI)**, which means the software parts with which you can interact. The UI that offers images or icons to select (as opposed to making you type commands) is called a **graphical user interface (GUI)**.

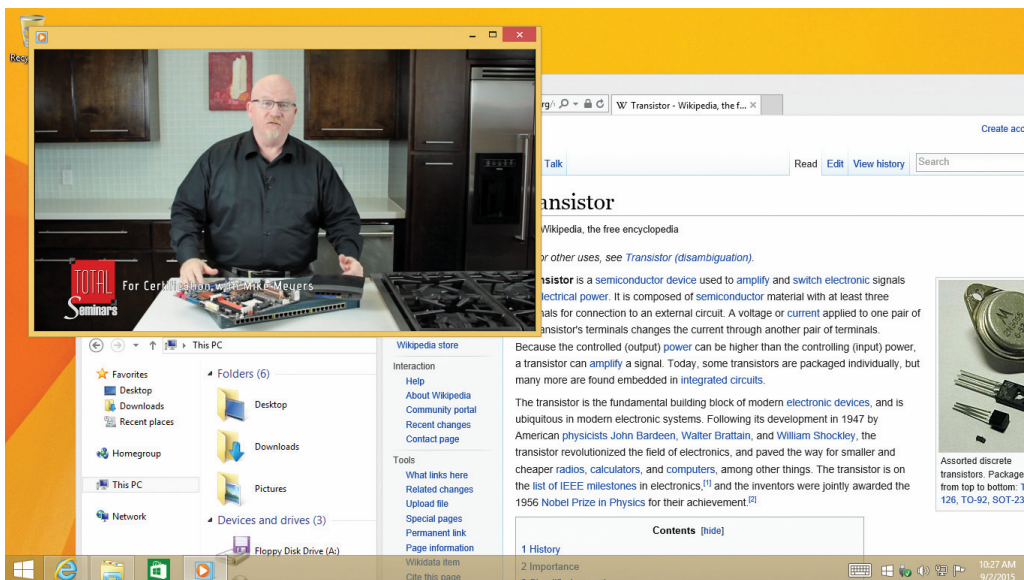
Applications (or programs) enable you to do specialized tasks on a computer, such as

- Type a letter
- Send a message from your computer in Houston to your friend's computer in Paris
- Wander through imaginary worlds with people all over Earth



• **Figure 3.5** A typical computer

Very simple computing devices might have an operating system with only a few features that give you choices. A digital camera, for example, has a menu system that enables you to control things like the quality of the picture taken (see Figure 3.7).



• **Figure 3.6** The Microsoft Windows 8.1 operating system



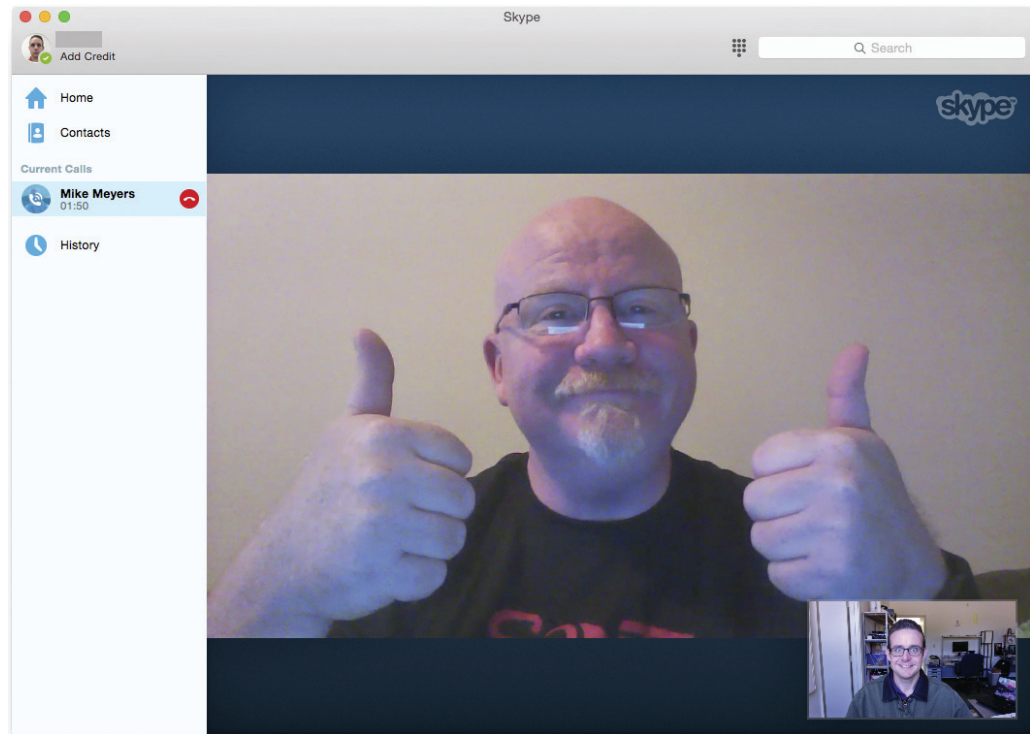
• **Figure 3.7** Changing settings on a digital camera

More complicated devices offer more choices. An Apple iPhone, for example, can do some cool things right out of the box, including make a phone call. But you can visit the Apple online store—the App Store—for programs and download applications (known as apps) to do all sorts of things that Apple didn't include (see Figure 3.8).

Finally, multipurpose computers like the typical Windows PC or Mac OS X computer offer applications to help you do everything from write a book on CompTIA A+ certification to talk with someone on the other side of the world, with full audio and video (see Figure 3.9).



• **Figure 3.8** Talking Carl + talks back to you—perhaps not the most *useful* app on the planet, but amusing



• **Figure 3.9** Skype communication

Stages

At the most basic level, computers work through three stages, what's called the **computing process**:

- Input
- Processing
- Output

You start the action by doing something—clicking the mouse, typing on the keyboard, or touching the touch screen. This is **input**. The parts inside the device or case take over at that point as the operating system tells the hardware to do what you've requested. This is **processing**.

In fact, at the heart of every computing device is a *central processing unit (CPU)*, usually a single, thin wafer of silicon and tiny transistors (see Figure 3.10). The CPU handles the majority of the processing tasks and is, in a way, the “brain” of the computer.

Once the computer has processed your request, it shows you the result by changing what you see on the display or playing a sound through the speakers. This is **output**. A computer wouldn't be worth much if it couldn't demonstrate that it fulfilled your commands! Figure 3.11 shows the computing process.

Modern computing devices almost always have two other stages:

- Data storage
- Network connection

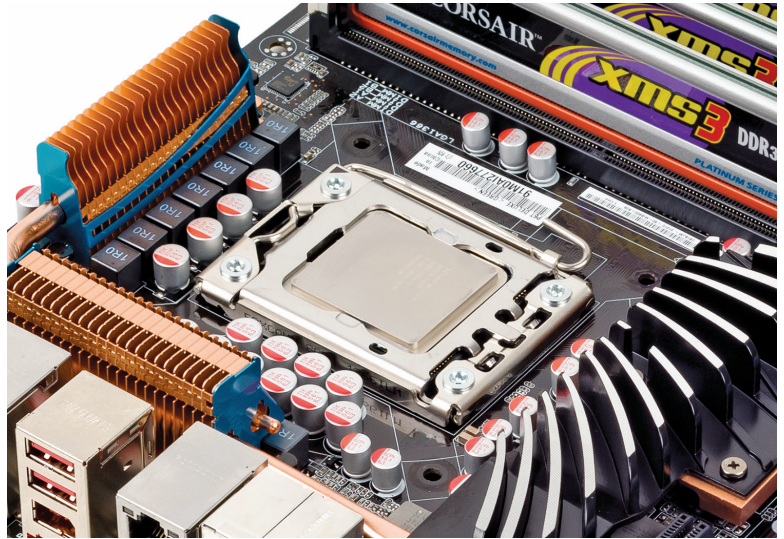


Chapter 4, “Microprocessors,” gives a lot more information on CPUs and other processing components.

Data storage means saving a permanent copy of your work so that you can come back to it later. It works like this. First, you tell the computer to save something. Second, the CPU processes that command and stores the data. Third, the computer shows you something, such as a message saying that the data is stored. Any work that you *don't* save is lost when you turn the computer off or exit the application.

Most computing devices connect to other devices to access other resources. A **network connection** often describes how one computer connects to one or more other computers. And it doesn't just apply to a couple of office computers. Every smartphone, for example, can connect to the Internet and play a video from YouTube (assuming you have a signal from a cell tower and a data plan). A network connection can also mean running a cable between two devices, like connecting an iPad or iPhone to a Windows desktop machine using a Lightning-to-USB cable.

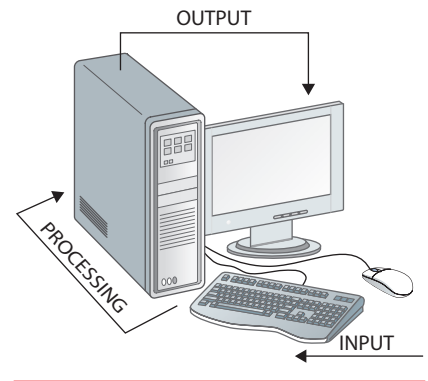
At this point, students often ask me a fundamental question: "Why should I care about the computing process?" The answer to this question defines what makes a good computer technician. Here's my response.



• **Figure 3.10** An Intel Core i7 CPU on a motherboard

Why the Process Matters to Techs

Because the computing process applies to every computing device, it provides the basis for how every tech builds, upgrades, and repairs such devices. By understanding both the components involved and how they talk to each other, you can work with *any* computing device. It might take a couple minutes to figure out how to communicate with the device via input, for example, but you'll quickly master it because you know how all computing devices work.



• **Figure 3.11** The computing process

Breaking It Down

The whole computer process from start to finish has a lot of steps and pieces that interact. The more you understand about this interaction and these pieces, the better you can troubleshoot when something goes wrong. *This is the core rule to being a great tech.*

Here are nine steps that apply to most computers and computing devices when you want to get something done:

1. Power up. Computers run on electricity.
2. Processing parts prepare for action.
3. You provide input.
4. Processing parts process your command.
5. Processing parts send output information to your output devices.

6. Output devices show you the results.
7. Repeat Steps 3–6 until you're satisfied with the outcome.
8. Save your work.
9. Power down the computer.

We'll come back to these processing steps as we tackle troubleshooting scenarios throughout the book. Keep these steps in mind to answer the essential question a tech should ask when facing a problem: What can it be? Or, in slightly longer fashion: What could cause the problem that stopped this device from functioning properly?

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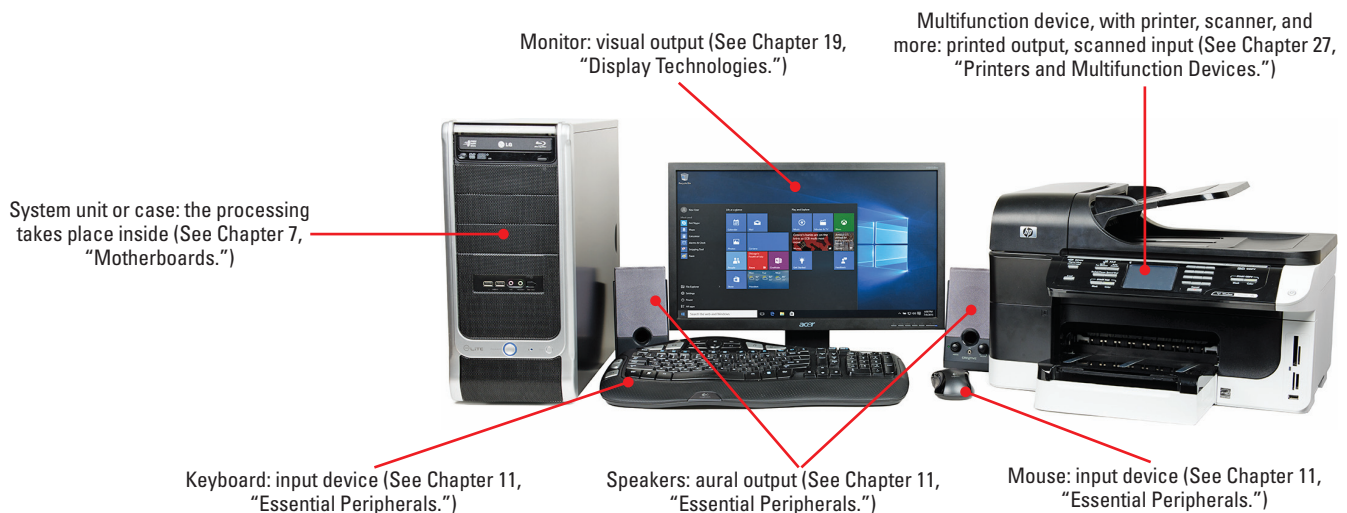
Memorize the names of the components, connectors, and terms discussed and displayed in this section. You'll see them in future chapters, in the real world, and on the CompTIA A+ 901 exam.

■ Computing Hardware

A lot of this book takes you into depth on specific computing hardware, such as CPUs and mass storage devices. CompTIA expects competent techs to know what to call every connector, socket, and slot in a variety of computing devices. Rather than describe all of those briefly here, I decided to create a photo walkthrough naming points of interest and the chapters that discuss them.

This section serves as a visual introduction to the components and connections. Plus, it should work great as a set of study sheets for memorizing names just before taking the 901 exam. The images that follow indicate the chapters where you'll find information about a component or connection standard.

Figure 3.12 shows a typical PC. The input and output devices should be familiar to most.

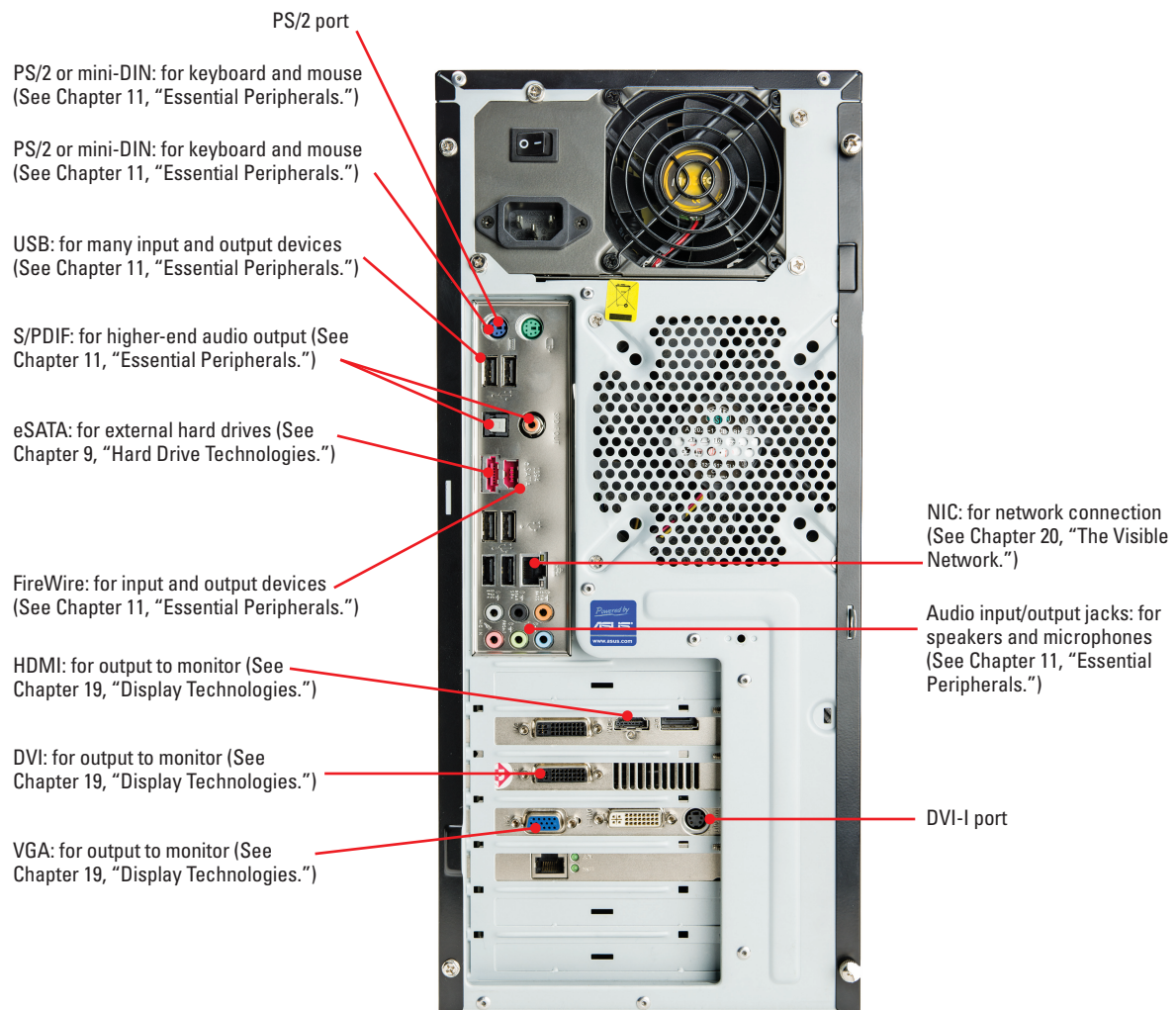


• **Figure 3.12** PC with common peripherals

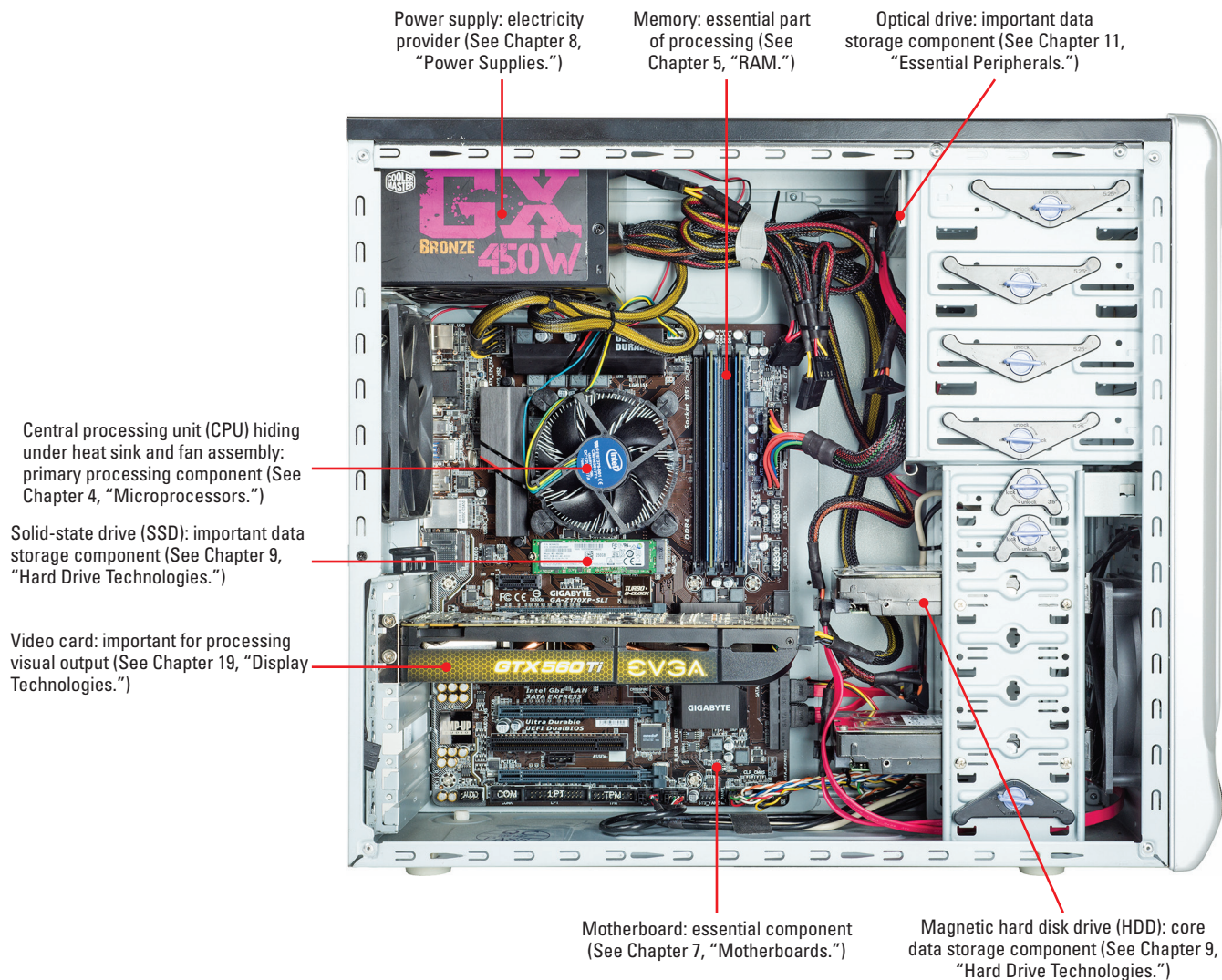
Figure 3.13 shows the back of a PC's system unit, where you'll find the many connection points called ports. Some ports connect to output devices; a couple are exclusively used for input devices. Most (such as the universal serial bus, or USB) handle either type of device.

Figure 3.14 reveals the inside of a PC case, where you'll find the processing and storage devices. Hiding under everything is the motherboard, the component into which everything directly or indirectly connects.

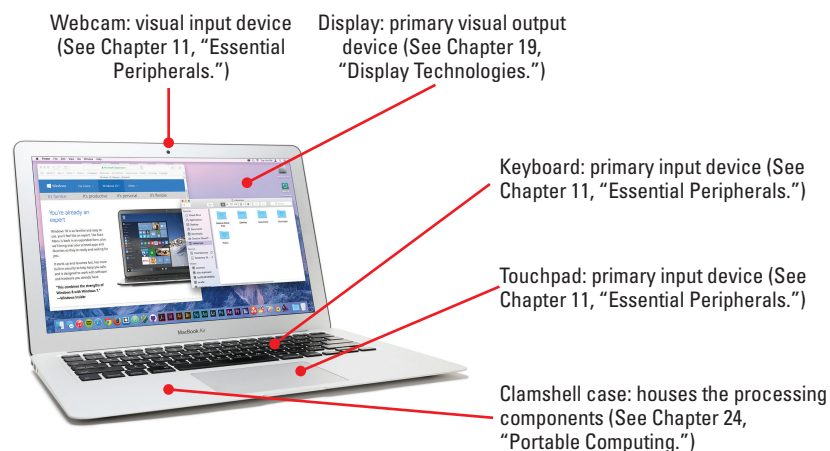
Figure 3.15 shows a clamshell-style portable computer, in this case an Apple MacBook Air. The portable nature of the device calls for input and output devices built into the case—some variation from the typical PC displayed earlier, therefore, but all the standard computing component functions apply.



• **Figure 3.13** The business end of a PC



• **Figure 3.14** Inside the system unit



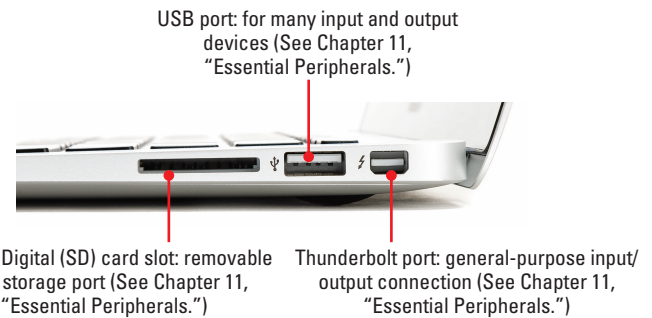
• **Figure 3.15** Portable computer (a MacBook Air)

Chapter 24, “Portable Computing,” goes into a lot of detail about each component displayed here.

Figure 3.16 shows the side of a portable computer with three different connection types.

Figure 3.17 shows a tablet computer, an Apple iPad. Note that the screen has a touch interface, which makes it both an input and output device.

We could continue with any number of computing devices in the same picture show, but at this point the uniformity of computing component functions should be pretty clear. They all work similarly, and, as a competent tech, you should be able to support just about any customer device. Let’s turn now to a visual feast of software.



• **Figure 3.16** Ports on a portable computer



• **Figure 3.17** Tablet computer



Check out the excellent Chapter 3 Challenge! sim on motherboard matching at <http://totalsem.com/90x>. It’s a cool sim that helps names stick in your head.

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■ Computing Software

The CompTIA A+ 902 exam covers a lot of software, though mostly operating system tools rather than specific applications. Five Microsoft operating systems make up the bulk of the coverage: Windows Vista, Windows 7, Windows 8, Windows 8.1, and Windows Phone/Mobile. Windows 10 didn’t make it into the objectives, but I’ve added it to the book because you need to know it for real-life support. Apple gets coverage of two OSs: OS X and iOS. Linux gets a generic nod (more on that in a moment), and Google Android gets some discussion.



Tech Tip

The Missing Links

Along with the unfortunately missing Windows 10, the CompTIA A+ objectives have a few notably absent operating systems. Microsoft released Windows 10 well after CompTIA finalized the exam objectives, so it gets no coverage. Perhaps more puzzling, though, is the lack of specific Linux versions, called **distributions** or **distros**. There’s a big difference in look and feel, for example, between Ubuntu and SUSE Linux. Focus here on what you can do with every OS and you’ll be able to handle any distro easily. Finally, Google Chrome OS, used on Google’s line of portable computers (Chromebooks), gets nary a nod.

Common Operating System Functions

All OSs are not created equal, but every OS provides certain functions. Here's a list:

- The OS communicates, or provides a method for other programs to communicate, with the hardware of the PC or device. Operating systems run on specific hardware. For example, if you have a 32-bit computer, you need to install a 32-bit version of an operating system. With a 64-bit computer, you need a 64-bit OS.
- The OS creates a *user interface (UI)*—a visual representation of the computer on the monitor that makes sense to the people using the computer.
- The OS enables users to determine the available installed programs and run, use, and shut down the programs of their choice.
- The OS enables users to add, move, and delete the installed programs and data.
- The OS provides a method to secure a system from all sorts of threats, such as data loss or improper access.

Almost every chapter in this book explores the interaction of OS and hardware. Chapter 12, “Building a PC,” examines adding and removing programs. Many security features show up in multiple chapters, such as Chapter 14, “User and Groups,” and Chapter 27, “Securing Computers.” The rest of this chapter, therefore, focuses on the user interface and the file structures.



Be sure you are very familiar with the operating system feature names, tools, and terms discussed and displayed in this section. Not only will you see them in future chapters, you will also encounter them in the field as well as in the CompTIA A+ 902 exam.

User Interfaces

This section tours the various operating system user interfaces. Like the hardware tours earlier, this section serves a double purpose. First, you need to know the proper names for the various UI features and have an understanding of their functions. Second, it serves as a handy quick review section before you take the 902 exam.

Windows Vista/7

Figure 3.18 shows the standard interface for Windows 7, a traditional multifunction computer. Windows uses a graphical user interface primarily, so you engage with the mouse or other pointing device and click on elements. The background is called the **Desktop**. The open applications are Internet Explorer—Windows' default Web browser—and a Windows Explorer window showing the Windows 7 default Libraries.

Other visible items are as follows:

- The open applications demonstrate *transparency*, where the edges of the applications show blurred background images. This feature is called **Aero**, or *Aero Glass*.
- Click on the **Start button** to get access to applications, tools, files, and folders.
- The *pinned programs* enable you to launch a program with a single left-click.



Chapter 25, “Mobile Devices,” details the three operating systems for mobile devices—iOS, Android, and Windows Phone/Mobile.

- The **taskbar** shows running programs.
- The **notification area** shows programs running in the background. Many techs also call it the **system tray**.

Interacting with the classic Windows interface for the most part involves using a mouse or touchpad to move the cursor and either left-clicking or right-clicking on the icons. Left-clicking selects an item; double-left-clicking opens an item. Right-clicking opens a **context menu** from which you can select various options (see Figure 3.19).

Windows 7's predecessor, Windows Vista, has a similar look and feel. The most visible difference is the Vista feature called the Sidebar. Enabled by default, the **Sidebar** houses one or more **Gadgets**, such as the Clock, Calendar, and speeds you can see in Figure 3.20. Windows 7 supports Gadgets too, but doesn't have a Sidebar.

Windows 8/8.1

Microsoft made significant changes to the Windows interface with the introduction of Windows 8. They borrowed from tablet operating systems, such as Windows Phone, to create a graphical set of **tiles** for full-screen programs, called **apps**. Note that the screen shows **pinned apps**—the default programs and programs selected by the user—and not all the applications installed on the computer.

The Windows 8 interface, code-named **Metro UI**, works great for touch-enabled devices. The PC becomes in essence a giant tablet. Touch an app to load, drag your finger across the screen to see other apps, and have fun. Figure 3.21 shows the default Windows 8 interface, called the **Start screen**, with various elements called out.



The context menu offers options specific to the icon you right-click. Right-clicking on a file, for example, gives you a context menu that differs greatly from when you right-click an application.



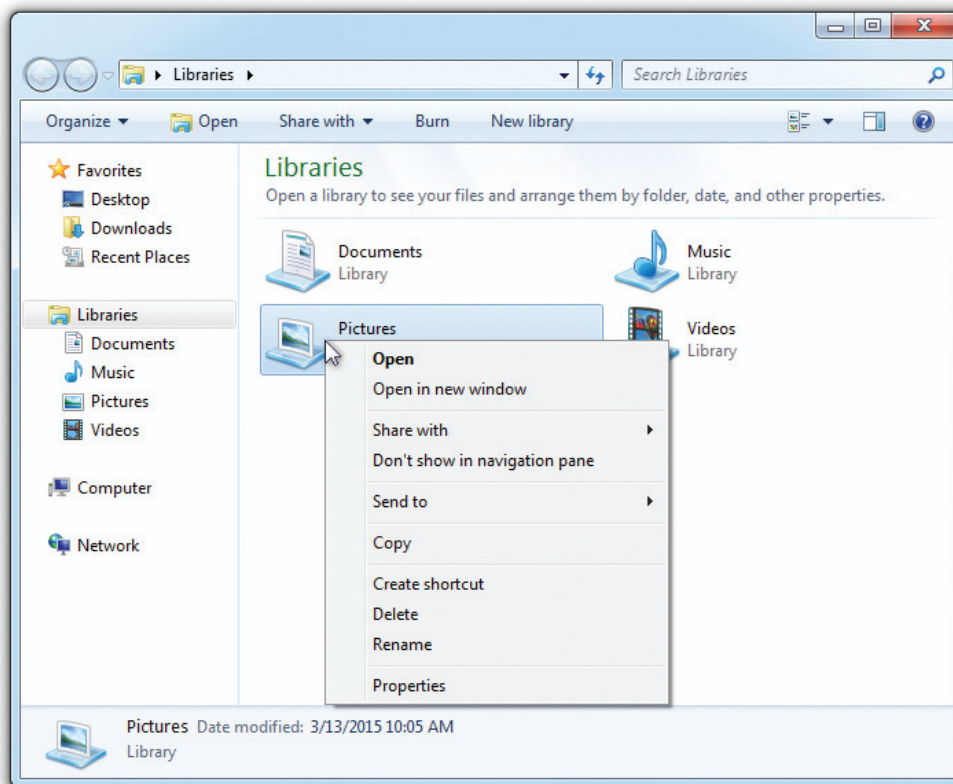
Because of the inherent security flaws with both Sidebars and Gadgets, Microsoft recommends disabling them on Windows Vista and Windows 7 systems. Later versions of the OS do not have either.



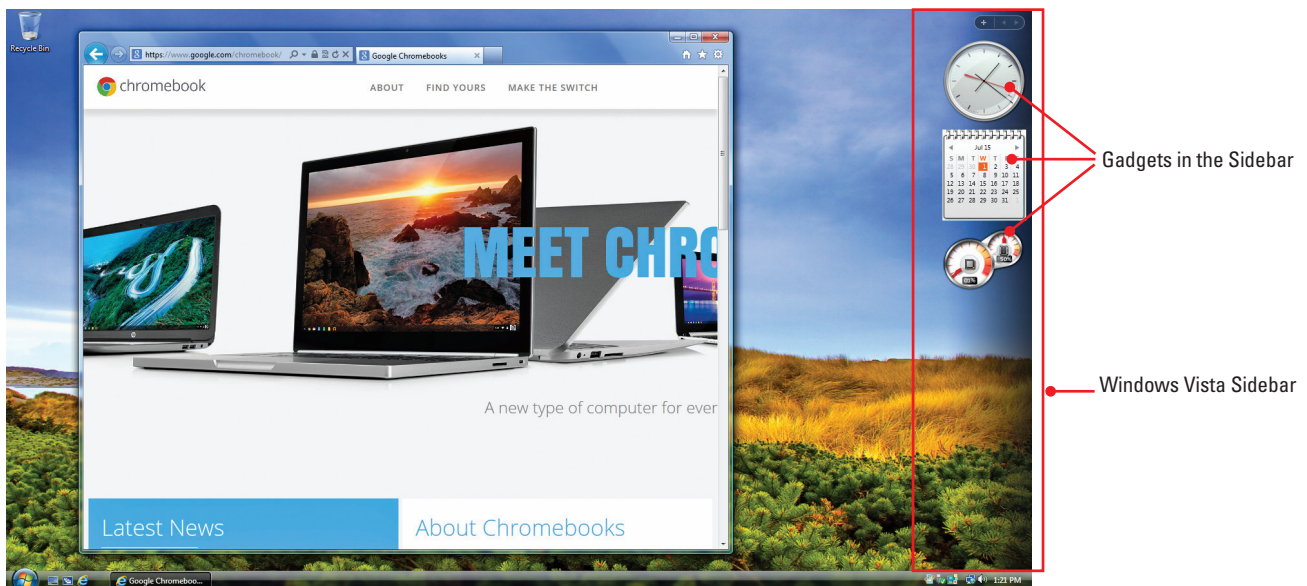
Microsoft dropped the "Metro UI" moniker just before releasing Windows 8 due to legal concerns, replacing it with "Modern UI." A lot of techs and IT industry pros continue to refer to the unique Windows 8/8.1 tiled interface as "Metro."



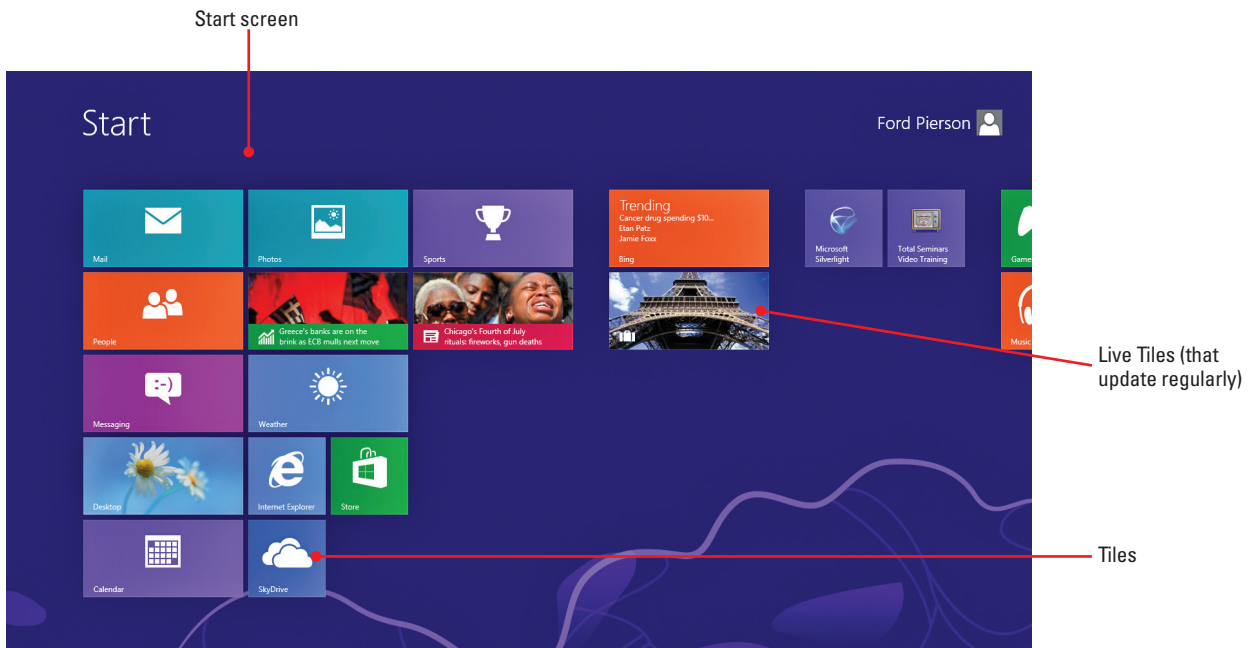
• **Figure 3.18** Windows 7 with applications open



• **Figure 3.19** Context menu



• **Figure 3.20** Windows Vista



• **Figure 3.21** Windows 8 Start screen

Windows 8 also features a more classic Desktop, but one with the noticeable absence of a visible Start button (see Figure 3.22). You access this screen by pressing the **Windows logo key** on a standard keyboard.

Using a keyboard and mouse with Windows 8 bothers a lot of users making the jump from Windows 7. Scrolling with the mouse wheel, for example, scrolls right to left rather than up and down (see Figure 3.23).

Windows 8 takes advantage of modern widescreen monitors with the **side-by-side apps** feature. Select an open application and press **WINDOWS LOGO KEY + LEFT ARROW** and the application will pin to the left half of the



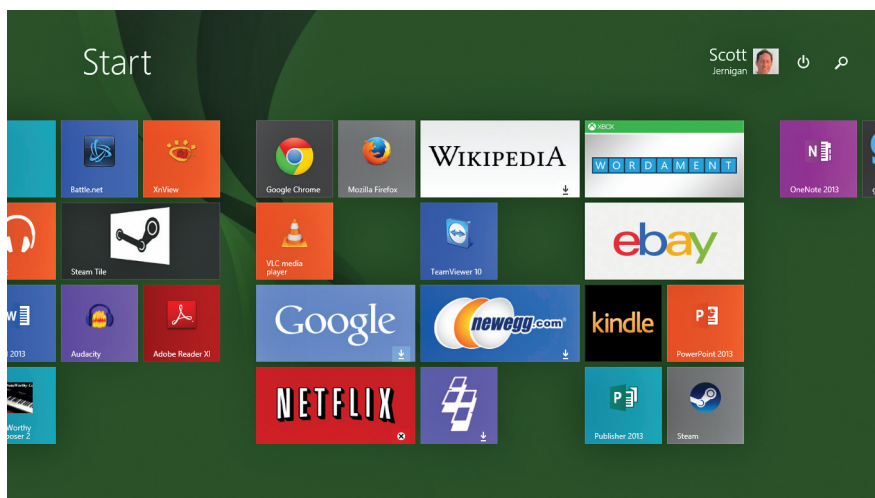
• **Figure 3.22** Windows 8 Desktop



Tech Tip

Windows Store

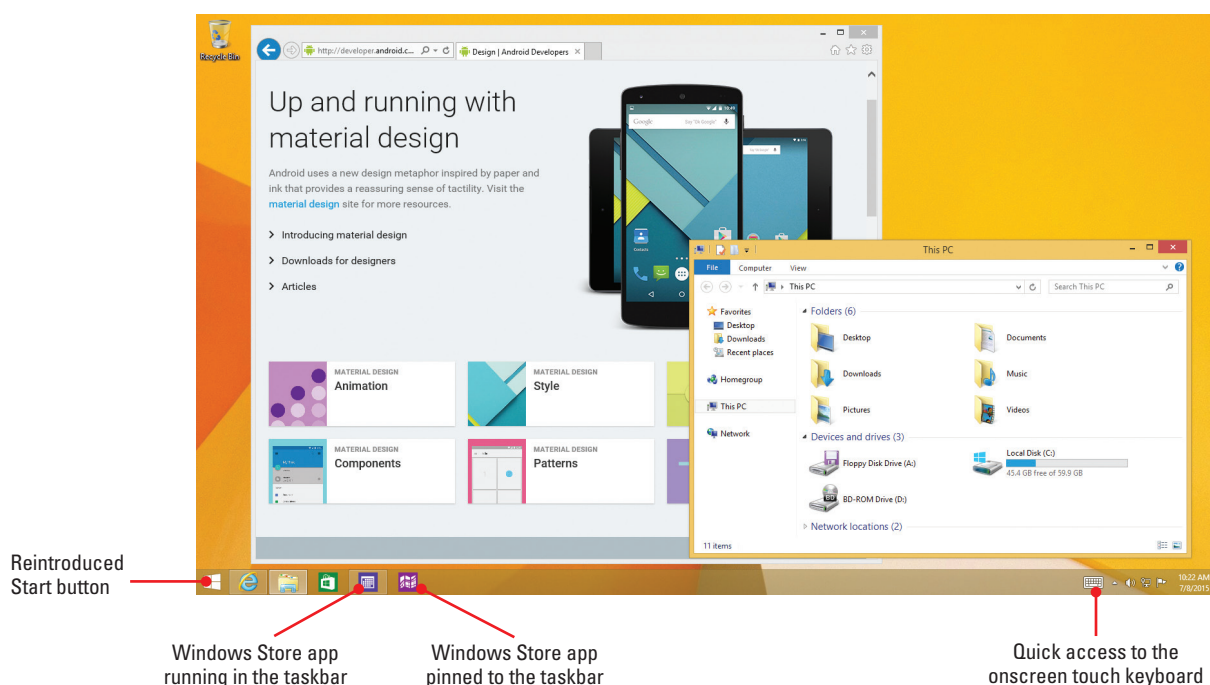
The Windows Store you can access through the task bar icons noted in Figure 3.25 enables you to purchase Windows apps directly from Microsoft. The app is called Store when you look at the Windows interface, as you can see in Figure 3.21, among others. Microsoft has updated the Windows Store several times, tying it together with their Xbox gaming system, for example. Finally, the Windows Store is the place to get touch-first apps, meaning programs designed specifically with touchscreen interfaces in mind.



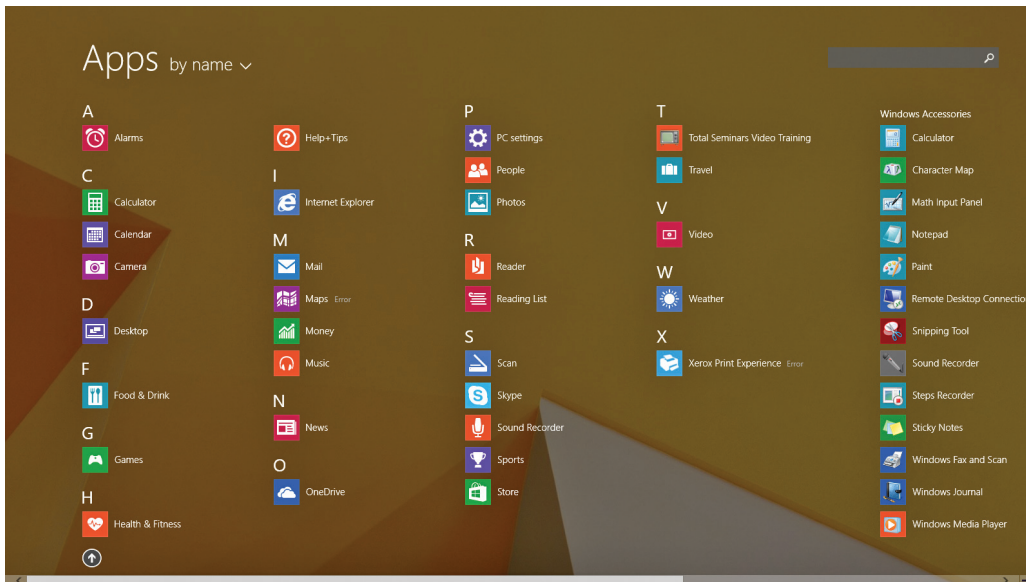
• **Figure 3.23** Windows 8 Start screen scrolled to the right

monitor. Do the reverse with another application, and it'll pin to the right half of the monitor. With apps like Microsoft Word, where each document opens in a unique window, side-by-side apps makes it easy to compare two documents.

With a series of updates culminating in Windows 8.1, Microsoft brought back features such as the Start button, easy access to a Close button for apps, and the ability to boot directly to the Desktop. Figure 3.24 shows the



• **Figure 3.24** Windows 8.1



• **Figure 3.25** Apps sorted by name

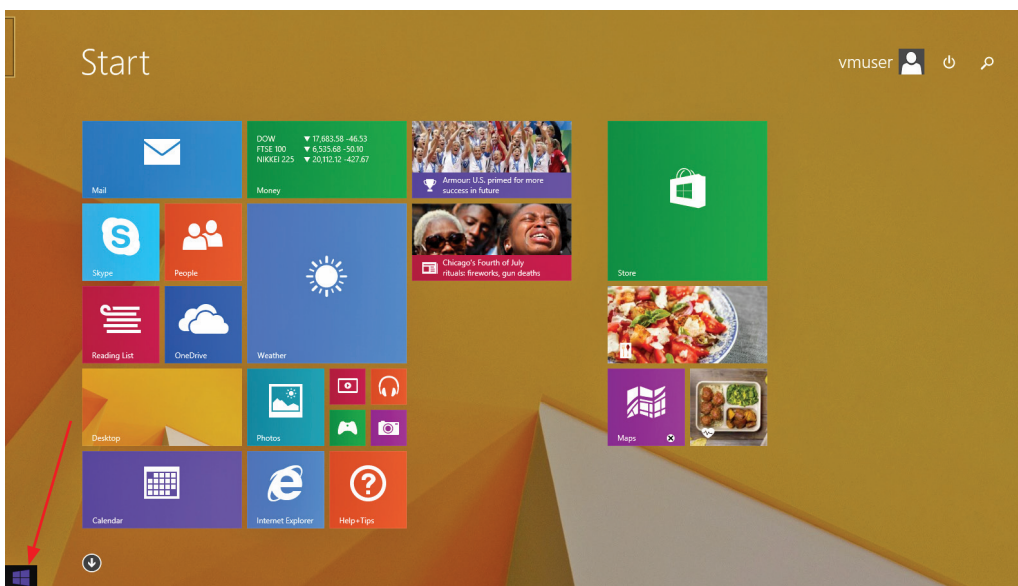
standard interface for Windows 8.1 with the various elements called out. Note that it's very similar to Windows 7.

Windows 8.1 makes it very easy to pin apps to the Start screen. Selecting the arrow at the bottom left brings up the Apps pane where you can sort and select apps and utilities (see Figure 3.25). Right-click on an icon to pin it to the Start screen.

Windows 8/8.1 offer lots of hidden interface components that activate when you place the cursor in certain places on the screen. Dropping the cursor to the bottom left corner, for example, activates the Start button (see Figure 3.26) when in the Start screen.



The first release of Windows 8 had no visible Start button on the Desktop (except in the Charms bar). Microsoft added it to the Desktop in later patches.



• **Figure 3.26** Start button magically appears



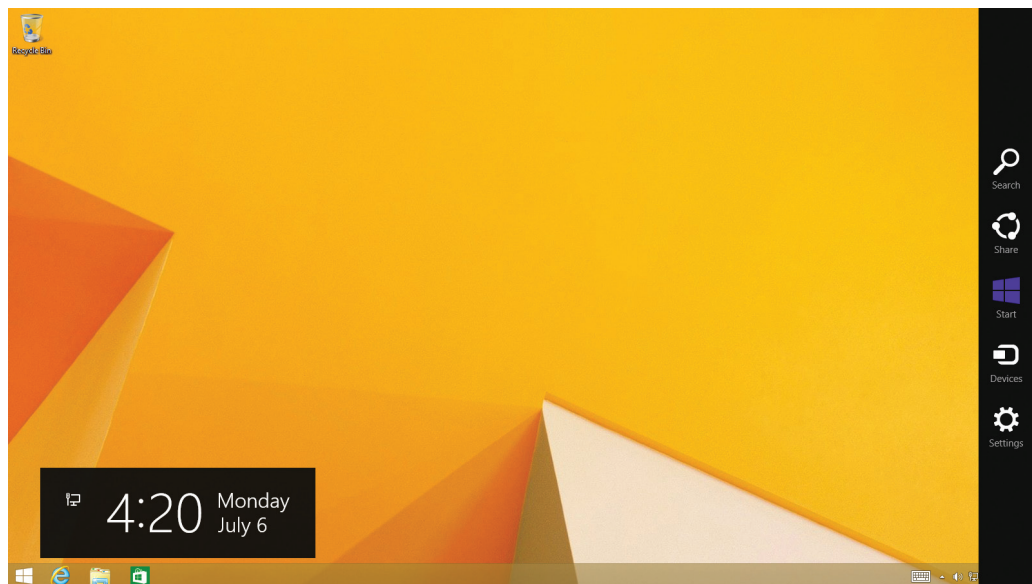
• **Figure 3.27** Charms accessed by cursor in upper- or lower-right corner



Windows 8 offers interesting options for the task bar when used with multiple monitors. The default option duplicates the running and pinned apps on both the main monitor and additional monitor(s). The multimonitor task bars can also show icons for apps running on a specific monitor too. Right-click the task bar and select Properties to change the task bar behavior.

Placing the cursor in the top- or bottom-right corner of the screen reveals the **Charms bar**, a location for tools called **charms**. See the right side of Figure 3.27. Charms include a robust Search tool that enables a search of the computer or even the Internet in one location. There's a Share charm for sharing photos, e-mail messages, and more. We'll revisit the charms later in this chapter when exploring how to access tech tools.

The final version of Windows 8.1 uses the Desktop rather than the Start screen as the default interface. The Start button is visible in the bottom left (see Figure 3.28). You can still access the charms using the cursor and the upper- and lower-right corners of the screen.



• **Figure 3.28** Windows 8.1 Desktop

Windows 10

With Windows 10, Microsoft created an OS that blends the traditional Windows 7–style Desktop experience with some of the more progressive features of the Windows 8.x Metro/Modern UI. In particular, Microsoft retained and refined the Start menu. They removed the much unloved Charms bar. Microsoft incorporated the essential tools—Search being my go-to feature—into the desktop in the lower-left corner of the taskbar. Figure 3.29 shows the Windows 10 interface with an active application in the foreground.

When you press the **WINDOWS LOGO KEY** on the keyboard, Windows 10 brings up the Start menu with useful tools and your most used apps on the left and pinned apps on the right (see Figure 3.30). Just like with Windows 8.1, you can click on the link helpfully named **All apps** (bottom left) to open a list of installed applications. Right-click to pin any app to the Start screen.

Click on the Windows 10 Task View button to create and manage **multiple Desktops** for grouping your open applications. Mac OS X and Linux each have their own take on this feature, as you'll see in the following sections.

Mac OS X

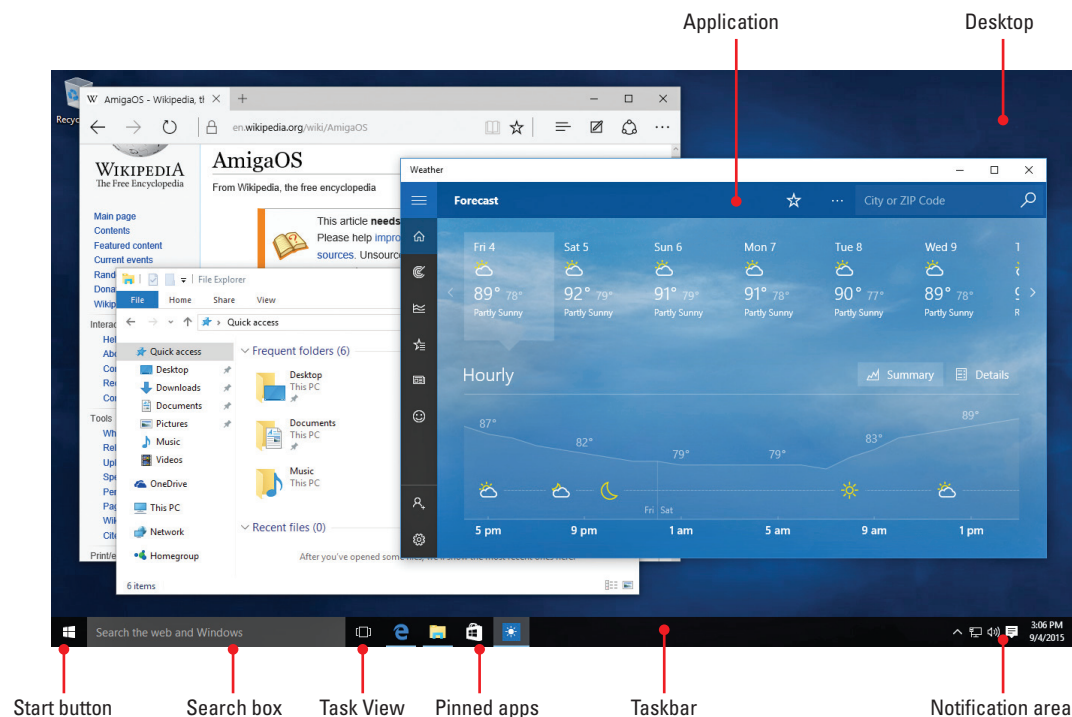
The Mac OS X operating system interface offers similar functions to those found on Windows. The background of the main screen is called the *Desktop*. You can access frequently used applications by clicking on their icons on the **Dock**. Just like with the taskbar pinned apps, you can add and remove



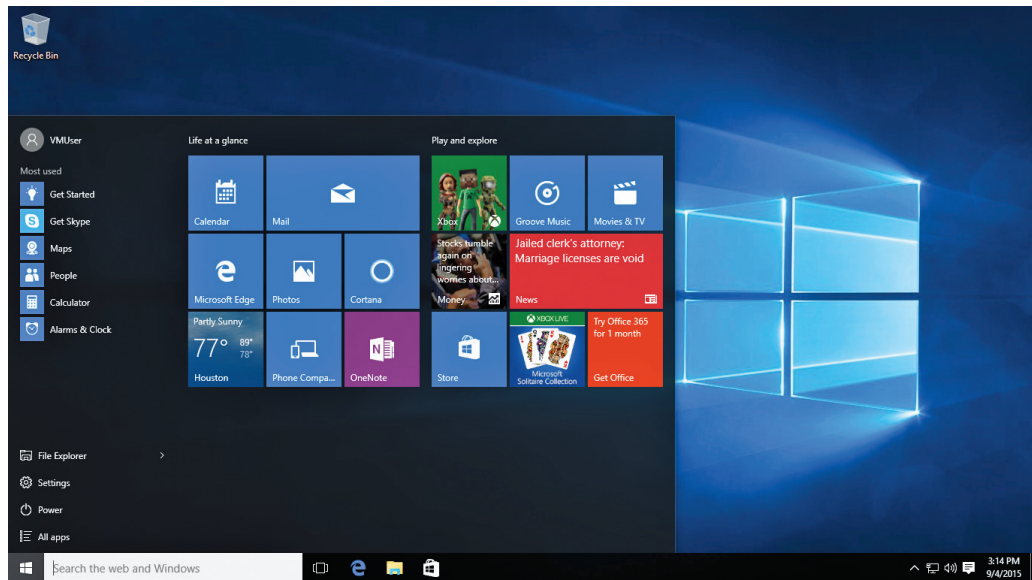
You don't need to memorize the Windows 10 information for the current CompTIA A+ exam. It's included here because you need to know it to be a successful tech today.



Microsoft altered the side-by-side apps feature in Windows 10 in one very cool way. Select the first application you want to pin and press the **WINDOWS LOGO KEY + LEFT ARROW OR RIGHT ARROW** and two things happen. The application pins to the left or right half of the monitor and thumbnails of every other open application pop up on the other side of the screen. Click the thumbnail of whichever application you want to work with and it'll open in that half of the screen.



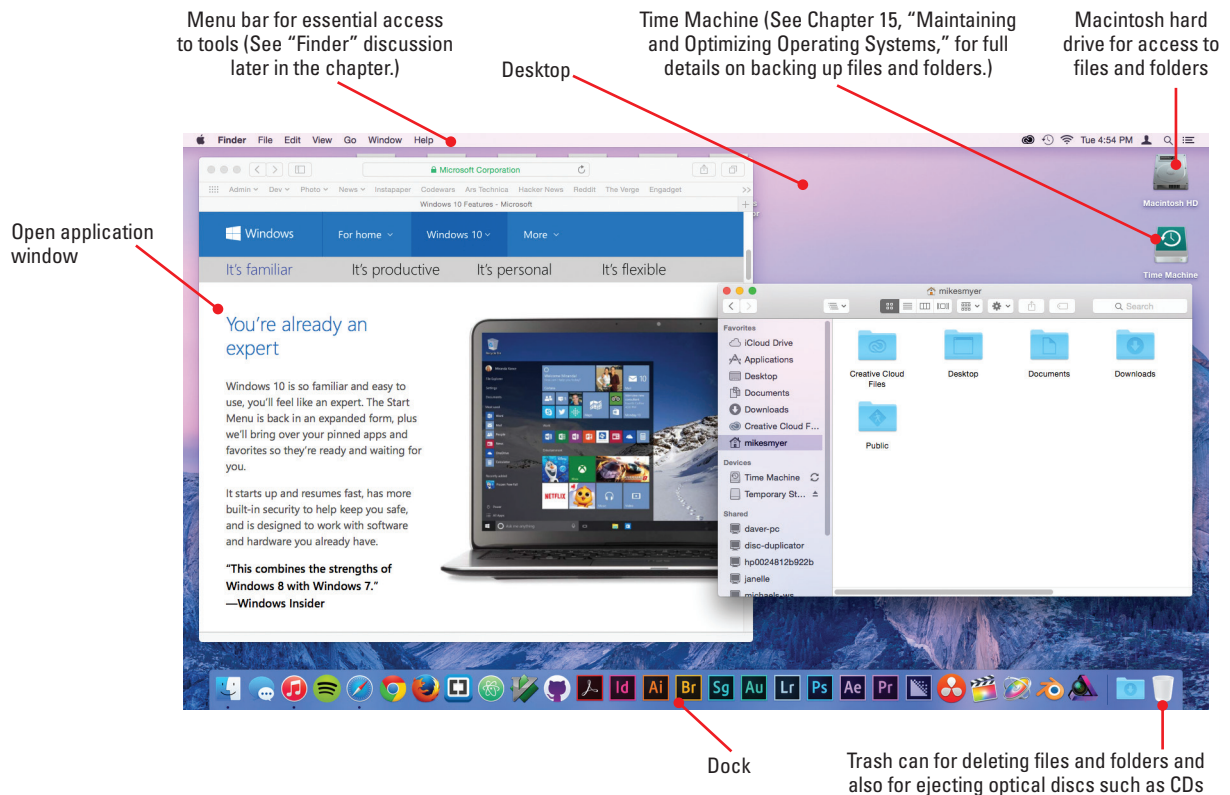
• **Figure 3.29** Windows 10 with a few applications open



• **Figure 3.30** Start menu in Windows 10

apps from the Dock with a right-click. The Dock is more than a set of apps, though. It also shows running applications (like the taskbar in Windows). Figure 3.31 shows a typical Mac OS X interface.

Pressing the Mission Control button on an Apple keyboard (see Figure 3.32) brings up a utility, called **Mission Control**, that enables you



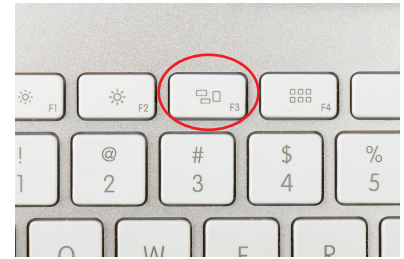
• **Figure 3.31** Mac OS X

to switch between open applications, windows, and more, as shown in Figure 3.33. You can also access Mission Control by pressing and holding the CONTROL/CTRL key and pressing the UP ARROW key.

Mac OS X supports **Spaces**—essentially multiple Desktops—that can have different backgrounds and programs, but keep the same Dock. You can optimize your workflow, for example, by putting your primary program full screen on Desktop 1 and putting your e-mail client on Desktop 2 (see Figure 3.34). New messages won't disturb you when working, but you can access the second Desktop easily when you want with Mission Control. On the latest versions of Mac OS X, press and hold the CONTROL key and press the RIGHT ARROW and LEFT ARROW keys to scroll through Spaces.

Linux

The many different distributions of Linux offer a variety of user interfaces, called **desktop environments (DEs)**, but they offer similar functions to those in Windows or Mac OS X. Figure 3.35 shows a popular Linux distro, Ubuntu Linux with the Unity DE, and notes the various features. Frequently used utilities and applications are locked on the Launcher on the left side of the screen. The top-left icon—the Ubuntu button—offers powerful system/network/Internet searching, while the next icon down enables you to access files and folders.



• **Figure 3.32** Mission Control button on keyboard



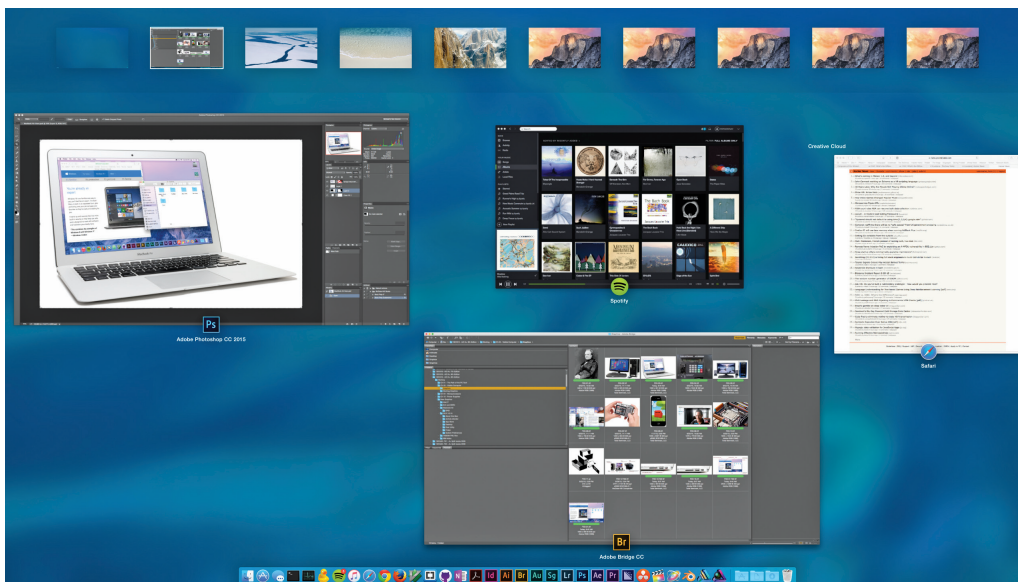
Windows 10 supports multiple Desktops with Task View, but you won't find support for that feature in earlier versions of Windows.



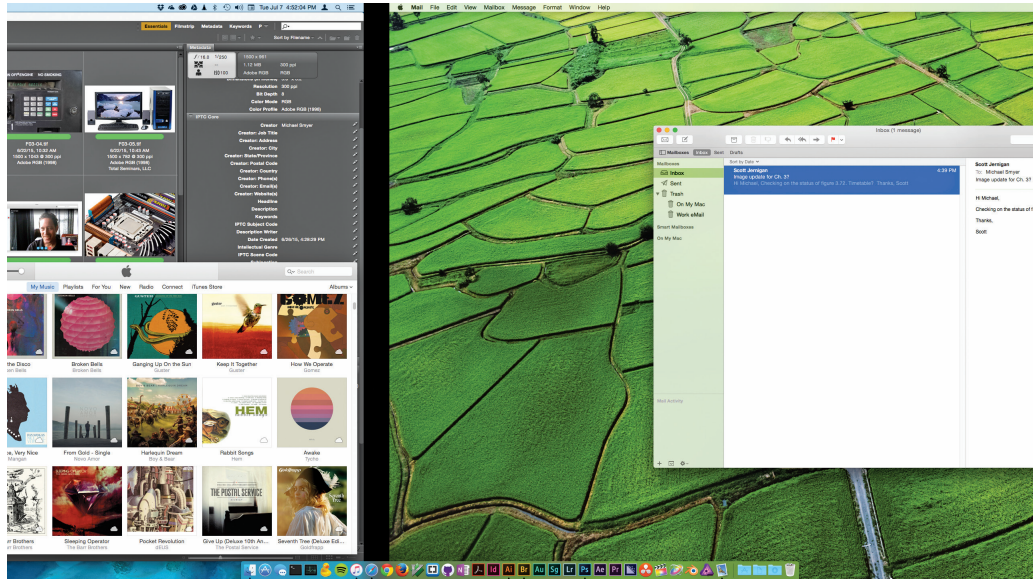
Try This!

Ubuntu Emulator Online

Ubuntu.com has a fairly robust emulator for Ubuntu Linux that enables you to poke around the desktop, check out settings and so forth. Try this! Open www.ubuntu.com, type **tour** in the Search option on the page, and press ENTER. In the search results, click on the first link to Take the tour. Have fun!



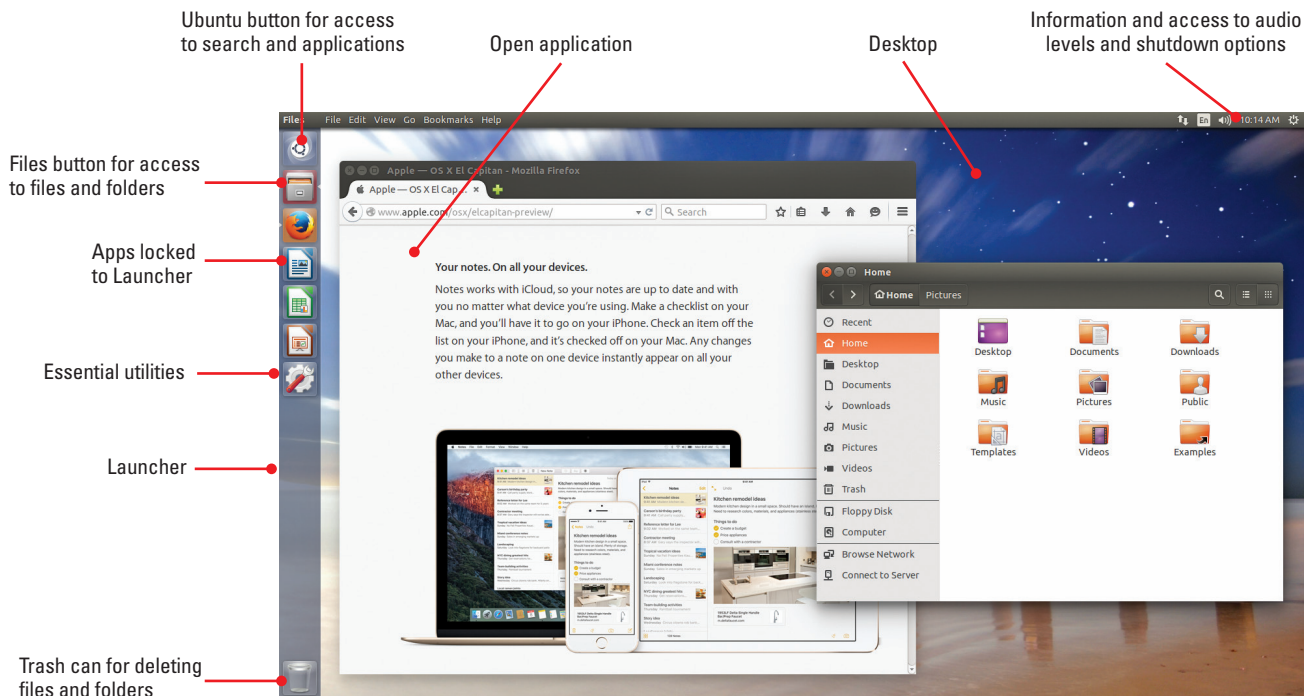
• **Figure 3.33** Mission Control showing four open apps and nine Desktops



• **Figure 3.34** Multiple Desktops

File Structures and Paths

Knowing where to find specific content—files and the folders in which they reside—helps techs help users do their day-to-day tasks more efficiently. Almost every operating system stores files in folders in a tree pattern. The root of the tree is the drive or disc, followed by a folder, subfolder,



• **Figure 3.35** Ubuntu Linux

sub-subfolder, and so on, until you get to the desired file. The drive or disc gets some designation, most usually a **drive letter** like C:. Chapter 10, “Implementing Hard Drives,” goes into gory detail on how modern operating systems implement systems for storing data. This section is more dictated by CompTIA’s obsession with requiring examinees to memorize paths.

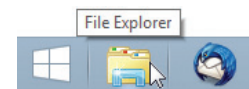
Windows

Windows has a number of important folders that help organize your programs and documents. They sit in the **root directory**—where the operating system is installed—and of course they have variations depending on the version of Windows. The following sections walk through the locations of important folders.

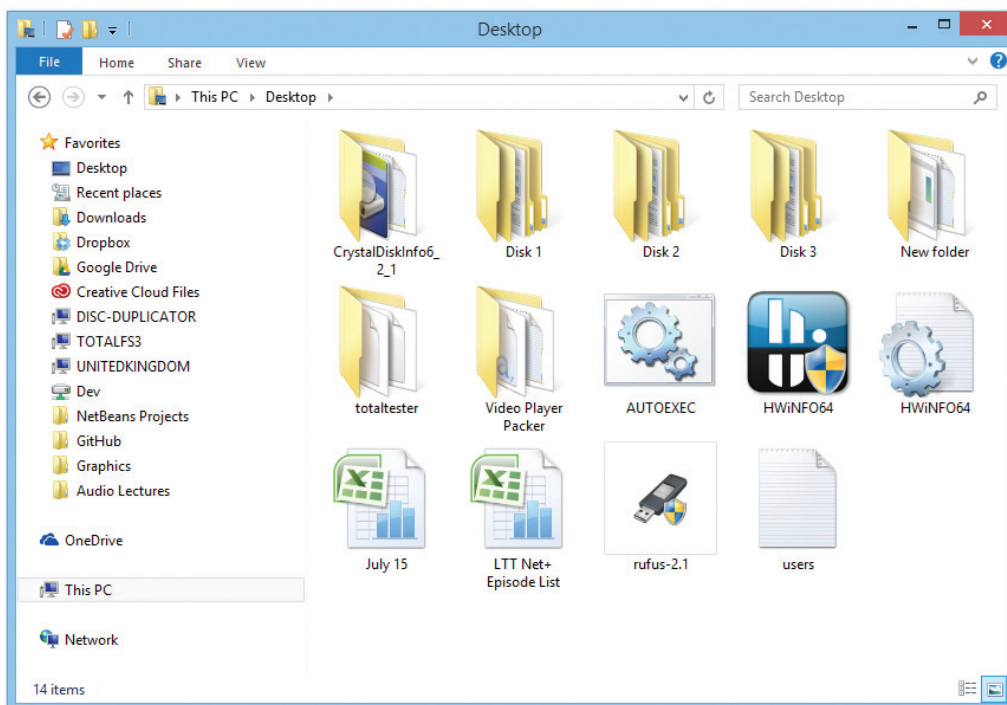
Most users and techs access folders and files in Windows with a tool called **Windows Explorer** in Windows Vista/7 and **File Explorer** in Windows 8/8.1/10—although you can only see that difference in name by right-clicking on the Start button or by moving your mouse over the folder icon in the taskbar (see Figure 3.36).

The name of the window that opens when you run Windows Explorer or File Explorer generally reflects the current focus of the exploration. Figure 3.37 shows File Explorer displaying the contents of the Desktop in Windows 10. Note the title on the Window is *Desktop*. The tool, regardless of the title, is File Explorer.

The default file and folder view in Windows has a couple of notable features that you can see in Figure 3.37. Note the “July 15” file? That X icon says Windows recognizes the file as a Microsoft Excel spreadsheet,



• **Figure 3.36** Mousing over the File Explorer icon



• **Figure 3.37** File Explorer



The CompTIA A+ 902 exam uses slightly older terms to describe the View options, such as *view hidden files* and *hide file extensions*. Microsoft changes the wording and placement of things in the View options from version to version. The functions stay the same: show or hide specific elements in a folder.

You can also right-click a file or folder, select Properties, and, on the General tab, change several aspects of the file or folder. You can make it hidden, for example, or read-only. Context menus unlock many options in Windows features.

which means almost certainly the actual filename is July 15.xlsx. The .xlsx is the **file extension**, hidden by default, that tells the OS which application to use with the file. This pairing of application with file extension is called **file association**.

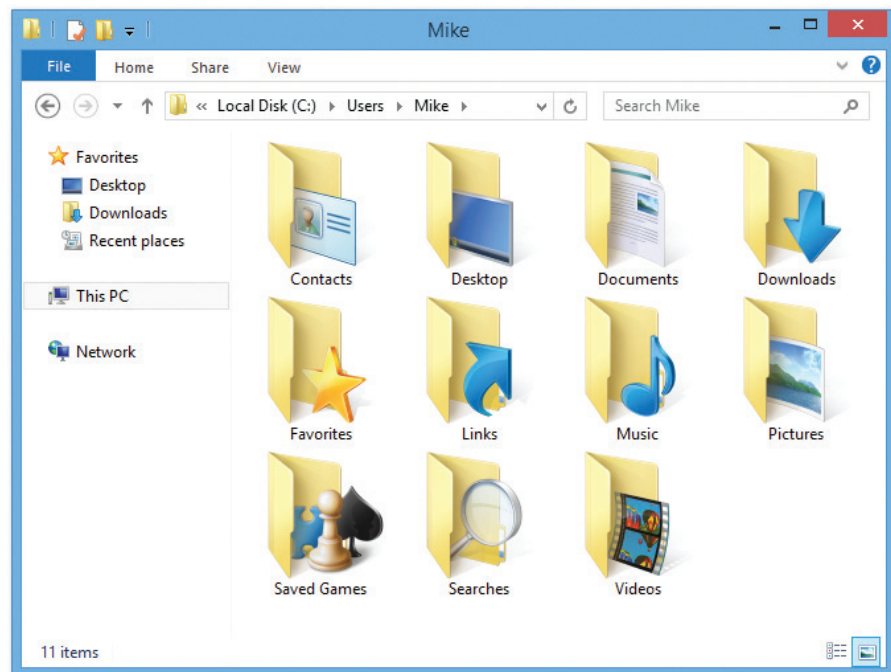
Note also that Figure 3.37 has the View options displayed—that's the ribbon at the top of the window. To change the default view, make changes here. Selecting the check box next to Hidden items, for example, enables you to view hidden files. That grayed-out desktop icon, for example, is a hidden file revealed by the View option selection.

The folder structures that follow here use the standard formatting for describing folder structures. This is what you'll see on the 902 exam and in almost any OS. Windows hides the “\” characters at the beginning to make it prettier. File Explorer might show something like “Local Disk (C:) > Users > Mike.” This translates in proper fashion as C:\Users\Mike.

C:\Program Files (All Versions) By default, most programs install some or all of their essential files into a subfolder of the Program Files folder. If you installed a program, it should have its own folder in here. Individual companies decide how to label their subfolders. Installing Photoshop made by Adobe, for example, creates the Adobe subfolder and then an Adobe Photoshop subfolder within it.

C:\Program Files (x86) The 64-bit editions of Windows create two directory structures for program files. The 64-bit applications go into the C:\Program Files folder, whereas the 32-bit applications go into the C:\Program Files (x86) folder. The separation makes it easy to find the proper version of whatever application you seek.

Personal Documents Modern versions of Windows use subfolders of the C:\Users folder to organize files for each user on a PC. Figure 3.38 shows



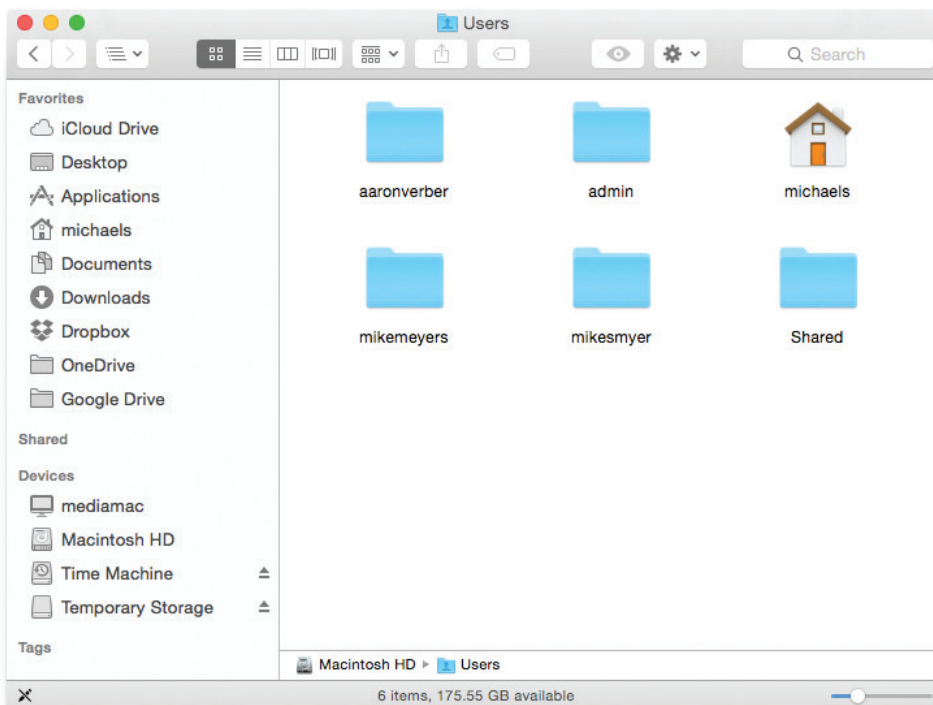
• **Figure 3.38** File Explorer viewing Mike's folders

the default folders for a user named Mike. Let's quickly survey the ones you need to know for the CompTIA A+ exams:

- **C:\Users\Mike\Desktop** This folder stores the files on the user's Desktop. If you delete this folder, you delete all the files placed on the Desktop.
- **C:\Users\Mike\Documents** This is the Documents or My Documents folder for that user. (Only Windows 7 uses My Documents. The others use Documents.)
- **C:\Users\Mike\Downloads** Microsoft's preferred download folder for applications to use. Most applications use this folder, but some do not.
- **C:\Users\Mike\Music** This is the default location for music you download. My guess is that more people have music in iTunes, but that's just me.
- **C:\Users\Mike\Pictures** Pictures is the default location for images imported into the PC, although the Pictures library can (and does) draw from many folder locations.
- **C:\Users\Mike\Videos** Videos is the default location for movies and homebrewed videos imported into a PC.

Mac OS X

Finder holds the keys to files and folders in Mac OS X. Figure 3.39 shows Finder open to display Mike's Users folder. Note that, although its style differs from the Windows screen shown in Figure 3.38, it has functionally



• **Figure 3.39** Finder

similar folders. These are the default locations for files on the Desktop, in Documents, Downloads, Music, Pictures, and so on. Each user account on the Mac will have a unique Users folder that is inaccessible by other users on that computer.

Linux

Ready to be shocked? Not surprisingly, Linux uses pretty much the same structure for user organization (see Figure 3.40). I guess once something seems logical to enough people, there's no reason to add confusion by changing the structure. The only major difference is the name: Linux uses the Home folder, rather than the Users folder.

The Tech Launch Points

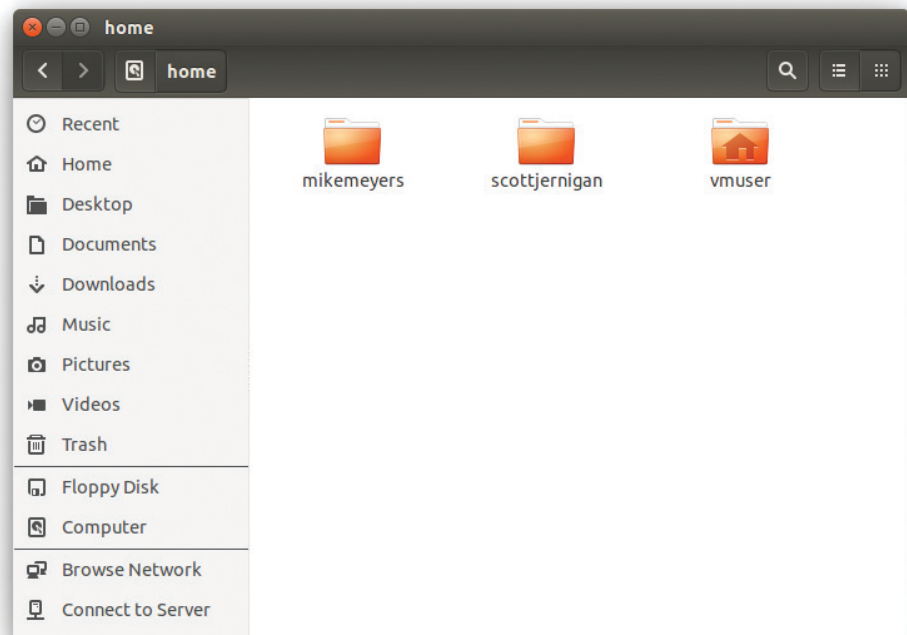
Every OS has two or three areas for tech-specific utilities. This section shows you how to access those areas, primarily so that we don't have to repeat the steps to get to them when accessing them many times throughout the book. Just refer back to this section if you have difficulty remembering how to arrive at a place later on. Also, CompTIA will test your knowledge on how to access these tool locations, with specific steps. Use this section for the last-minute cram before taking the exams.

Windows Vista/7

Windows Vista/7 have three tech launch points: the Control Panel, System Tools, and the command-line interface. You can get to each launch point in multiple ways.



The 902 exam will test you on specific paths to specific tools. Be prepared for several multiple-choice and scenario-based questions on the topic.



• **Figure 3.40** Home folder

Control Panel The **Control Panel** handles most of the maintenance, upgrade, and configuration aspects of Windows. As such, the Control Panel is the first set of tools for every tech to explore. You can find the Control Panel by clicking on the Start button and choosing Control Panel from the Start menu.

The Control Panel opens in the Control Panel's Category view by default, which displays the icons in groups like Hardware and Sound. See Figure 3.41. This view requires an additional click (and sometimes a guess about which category includes the applet you need), so many techs use Classic view.

The CompTIA A+ 902 exam specifically assumes Classic view with large icons, so you should do what every tech does: switch from Category view to Classic view. In Windows Vista, choose Classic View. In Windows 7, select either Large icons or Small icons from the View by drop-down list for a similar effect. Figure 3.42 shows the Windows Vista Control Panel in Classic view.

A large number of programs, called **applets**, populate the Control Panel. The names and selection of applets vary depending on the version of Windows and whether any installed programs have added applets. But all versions of Windows have applets that enable you to control specific aspects of Windows, such as the appearance, installed applications, and system settings. You will get details on each applet as we put them into use over the course of this book.

System Tools The Start menu offers a variety of tech utilities collected in one place: System Tools. In the **System Tools** menu, you'll find commonly accessed tools such as System Information and Disk Defragmenter (see Figure 3.43).

Many techs overlook memorizing how to find the appropriate Windows tool to diagnose problems, but nothing hurts your credibility with a client



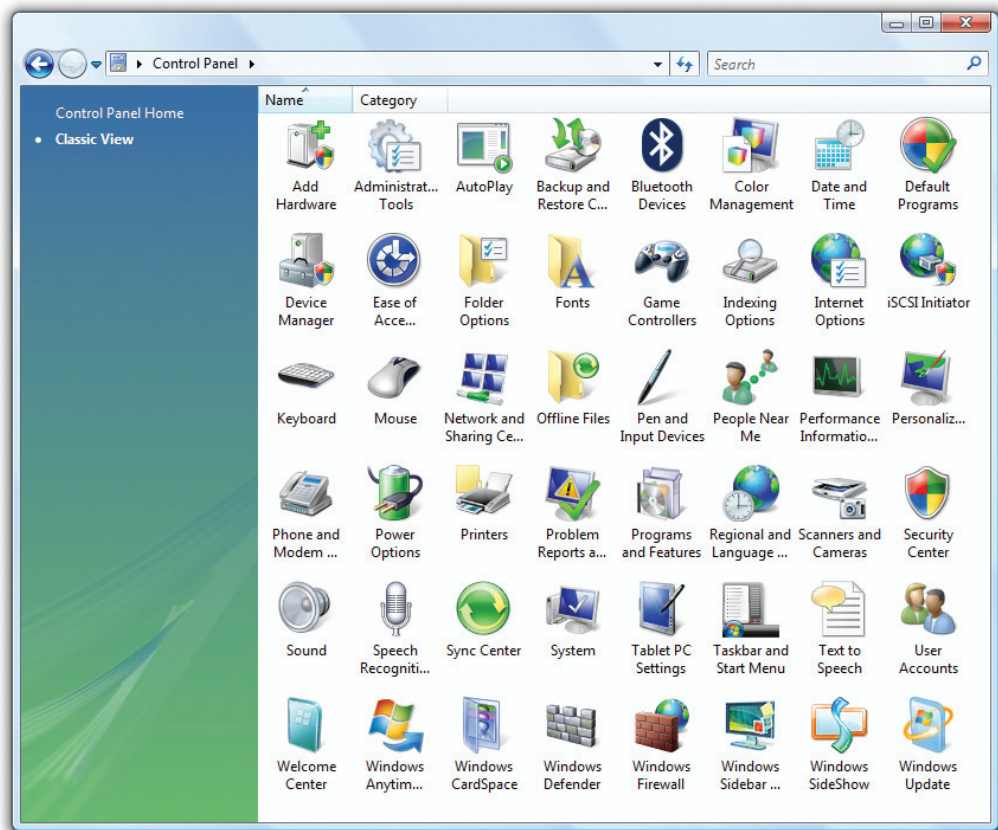
Tech Tip

Device Manager

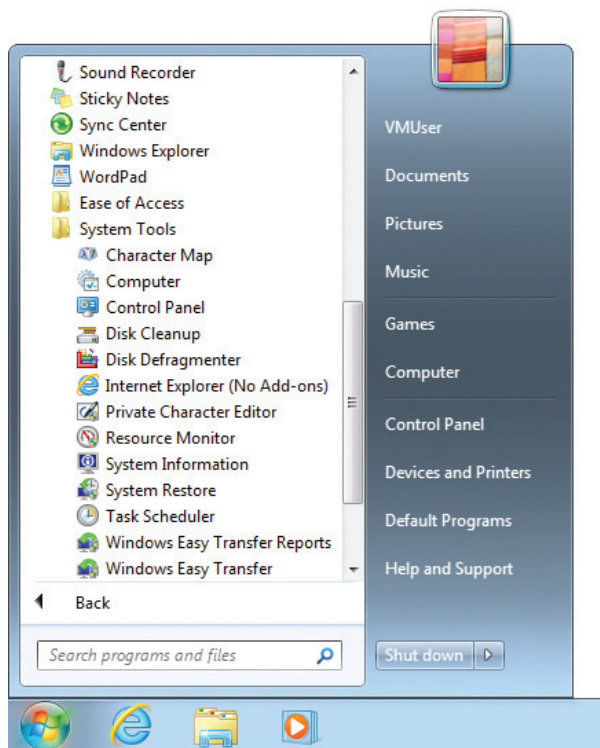
*The Control Panel enables you to access **Device Manager**, a critically important tool for techs and troubleshooting every device on a PC. With Device Manager, you can examine all of the hardware and drivers in a Windows computer. As you might suspect from that description, every tech spends a lot of time with this tool. You'll work with Device Manager many more times during the course of this book and your career as a PC tech.*



• **Figure 3.41** Windows 7 Control Panel Category view



• **Figure 3.42** Windows Vista Control Panel Classic view



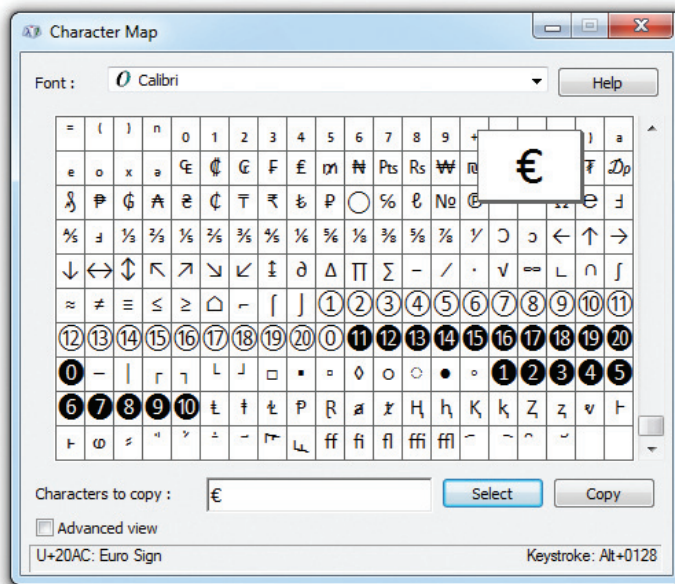
• **Figure 3.43** System Tools menu options

like fumbling around, clicking a variety of menus and applets, while mumbling, “I know it’s around here somewhere.” The CompTIA A+ certification 902 exam therefore tests you on a variety of paths to appropriate tools.

To access System Tools in Windows Vista /7, go to Start | All Programs | Accessories | System Tools. Each version of Windows shares many of the same tools, but each includes its own utilities as well. Rather than go through every tool here, I’ll discuss each in detail during the appropriate scenarios in the book. Here’s one example that won’t appear again, Character Map.

Ever been using a program only to discover you need to enter a strange character such as the euro character (€) but your word processor doesn’t support it? That’s when you need the Character Map. It enables you to copy any Unicode character into the Clipboard (see Figure 3.44) and paste into your document. Unicode has all the special symbols and alphabet characters used in languages throughout the world.

Command Line The Windows **command-line interface** is a throwback to how Microsoft operating systems worked a long, long time ago when text commands were entered



• **Figure 3.44** Character Map

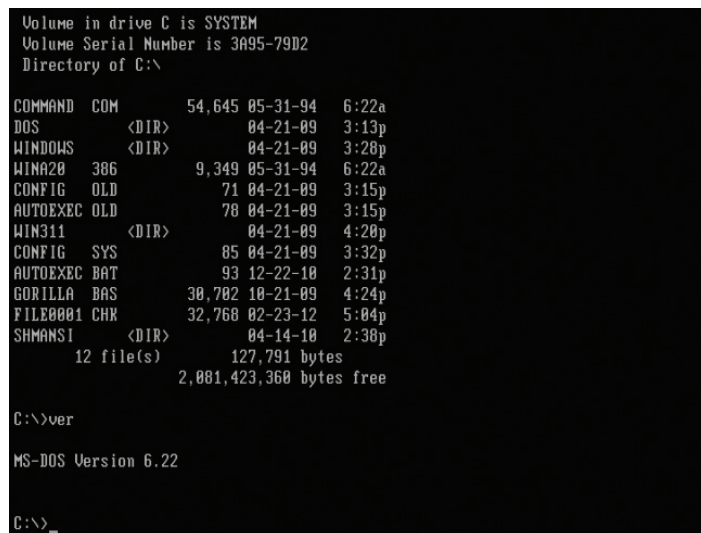
at a command prompt. Figure 3.45 shows the command prompt from DOS, the first operating system commonly used in PCs.

DOS is dead, but the command-line interface is alive and well in every version of Windows. Every good tech knows how to access and use the command-line interface. It is a lifesaver when the graphical part of Windows doesn't work, and it is often faster than using a mouse if you're skilled at using it. An entire chapter (Chapter 16, "Working with the Command-Line Interface") is devoted to the command line, but let's look at one example of what the command line can do. First, you need to get there. Click on the Start button, type **cmd** in the Search text box, and press the ENTER key. Figure 3.46 shows a command prompt in Windows Vista.

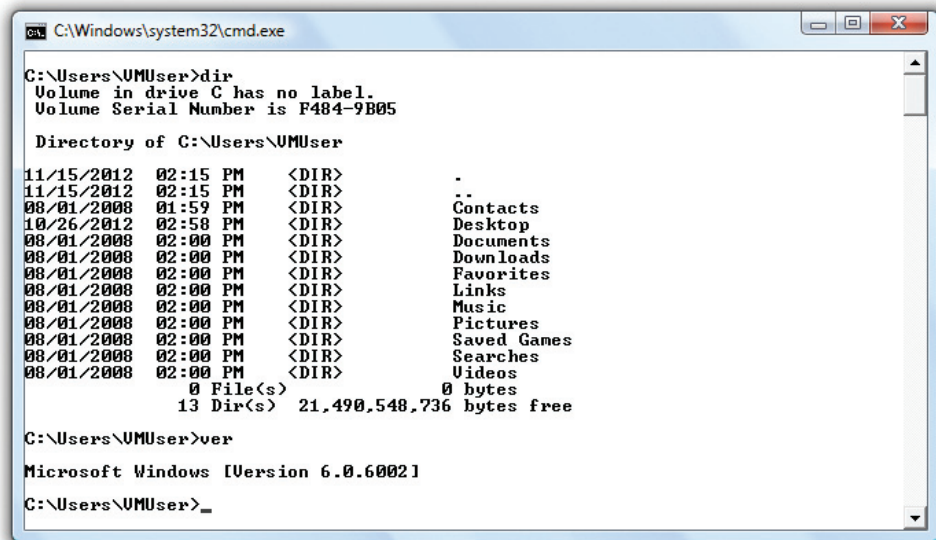
Once at a command prompt, type **dir** and press ENTER. This command displays all the files and folders in a specific directory—probably your user folder for this exercise—and gives dates, times, folder names, and other information. The **dir** command is just one of many useful command-line tools you'll learn about in this book.

Windows 8/8.1

Windows 8/8.1 have three tech tool starting points, but they differ a little from the big three in Windows Vista/7. The newer versions feature the Control Panel, Administrative Tools, and the command-line interface.



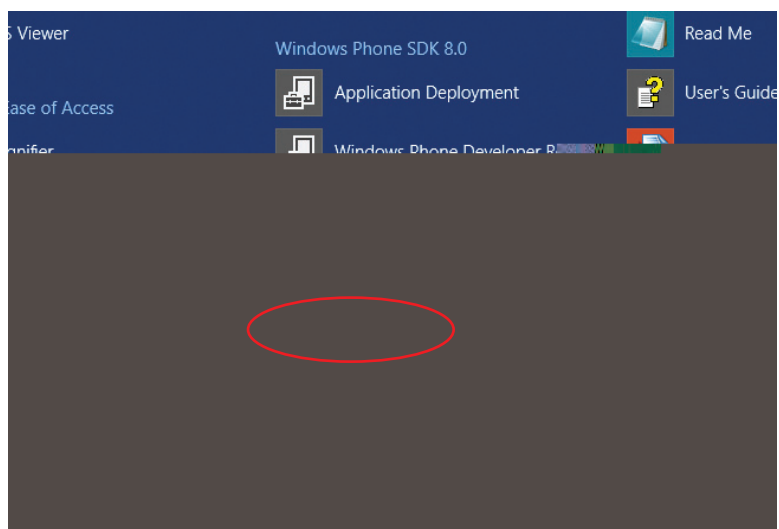
• **Figure 3.45** DOS command prompt



• **Figure 3.46** Command prompt in Windows Vista

Control Panel The Control Panel in Windows 8/8.1 serves the same function as in previous versions of Windows—the go-to source for tech tools. You can access the Control Panel in several ways:

- Tap the down arrow on the lower right of the Start screen and scroll all the way to the right in the list of Apps. In the Windows System category, click on Control Panel (see Figure 3.47). That’s the slow way, but you should know it for the exams. You can also start typing **control panel** in the Search field in the Apps list. Control Panel will quickly appear as the best option to select.



• **Figure 3.47** Selecting Control Panel from the list of Apps

- Right-click on the Start button and select Control Panel from the menu (see Figure 3.48). You can bring up the same menu by pressing **WINDOWS LOGO KEY + X**. I call this menu *Tech Essentials* because it gives you very quick access not only to the Control Panel and its collection of tools but also to specific tools that every tech relies on heavily, like the Task Manager (for forcing frozen programs to close, among other things).
- In the Start screen, start typing **control panel**; the Control Panel will show up as the top option in the Search charm (see Figure 3.49). Select it to open.

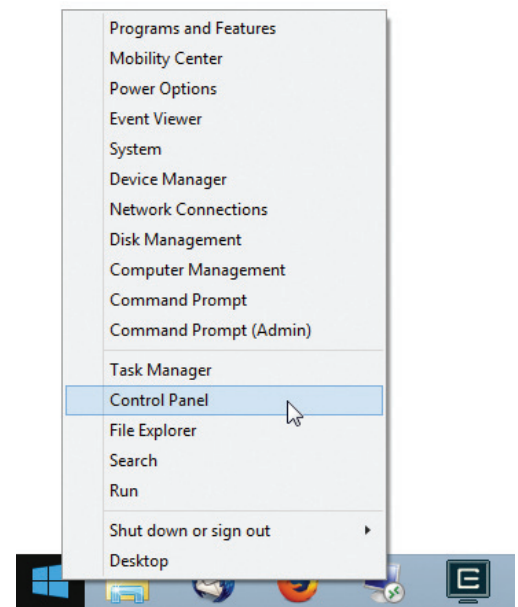
Administrative Tools Microsoft beefed up Administrative Tools starting in Windows 8, adding some of the tools found in the System Tools menu in previous versions of Windows. **Administrative Tools** enables you to set up hard drives, manage devices, test system performance, and much more. This is a go-to set of tools for every tech, and one that we will access many times for scenarios in this book.

As with Control Panel, you have several options for accessing Administrative Tools:

- In the Start screen, click on the down arrow to open the Apps list. Scroll a little to the right and you'll see the list of Administrative Tools (see Figure 3.50). Select the specific tool you want to open.
- Begin typing **administrative tools** in the Start screen and Administrative Tools will quickly appear as an option in the Search charm (see Figure 3.51). Select it to open.
- Right-click on the Start button (or press **WINDOWS LOGO KEY + X**) and select Control Panel from the context menu. In the Control Panel, select Administrative Tools to open.

Command Line The command-line interface retains its place as a go-to tool for techs. Windows 8/8.1 offers several ways to access it:

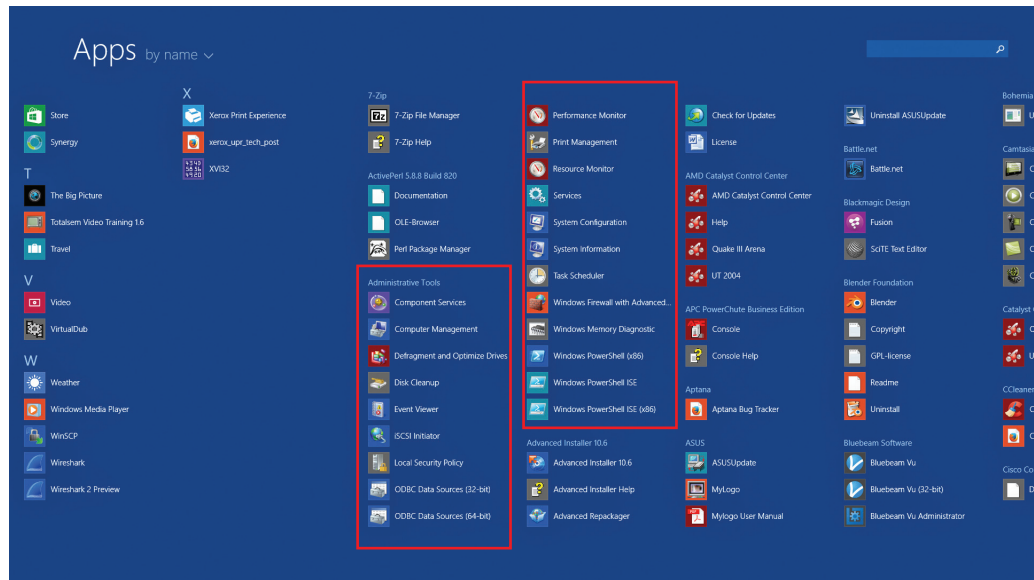
- Tap the down arrow on the lower right of the Start screen and scroll all the way to the right in the list of Apps. In the Windows System category, click on Command Prompt to open the utility. You can also start typing **command prompt** in the Search field in the Apps list. Command Prompt will quickly appear as the best option to select.
- Right-click on the Start button (or press **WINDOWS LOGO KEY + X**) and select Command Prompt from the context menu to open the command-line interface.
- In the Start screen, start typing **cmd** or **command prompt** and Command Prompt will appear in the Search charm. Click on it to open it.



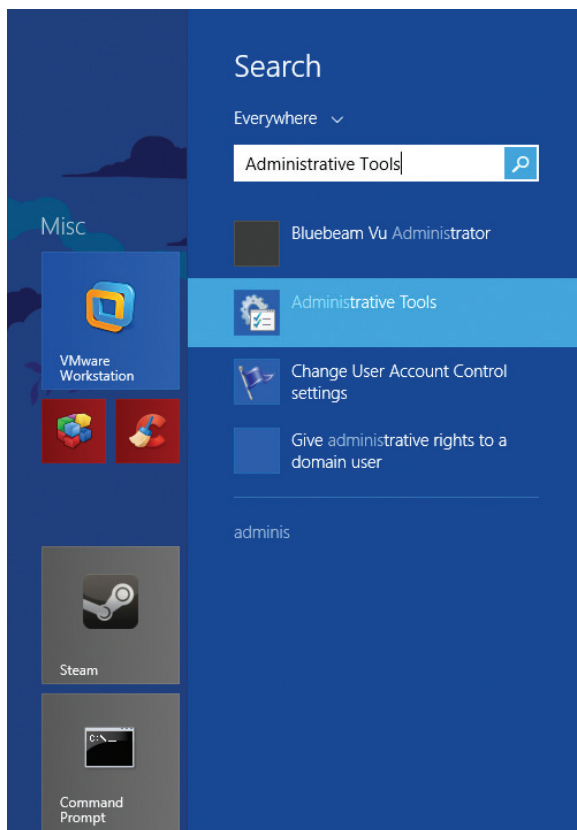
• **Figure 3.48** Right-clicking on the Start button



• **Figure 3.49** Search charm with Control Panel as top option



• **Figure 3.50** Administrative Tools in the Apps list



• **Figure 3.51** Administrative Tools option in the Search charm

Windows 10

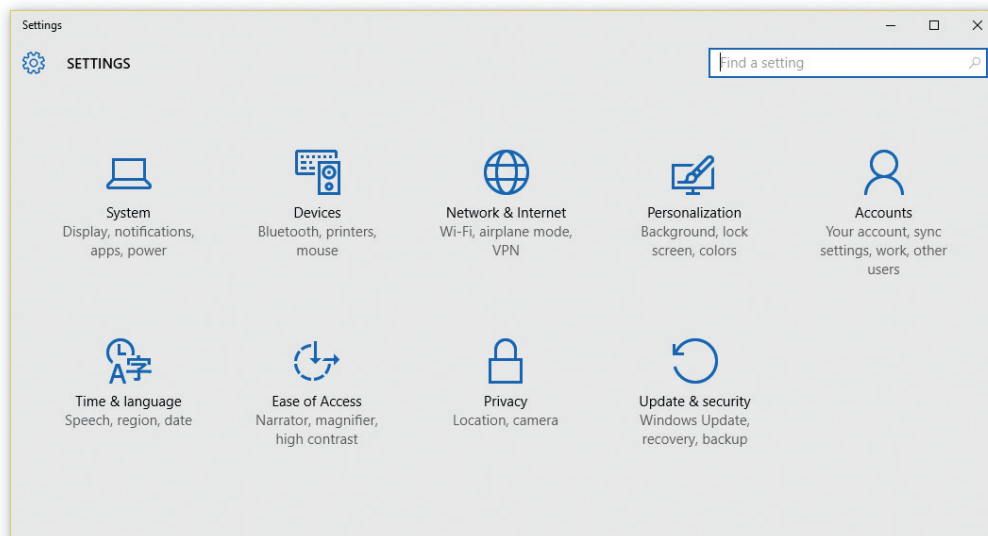
Windows 10 keeps the Control Panel and command-line interfaces we see in earlier versions of Windows, but focuses on an expanded Settings app for day-to-day administration.

Control Panel Windows 10 offers two standard ways to get to the Control Panel. Right-click on the Start button to open the Tech Essentials menu and select Control Panel. Alternatively, you can click on the Start button to open the Metro/Modern UI interface, start typing **control panel**, and select Control Panel from the Search results.

Administrative Tools is still an important part of Windows 10, a set of utilities piled together as a single Control Panel applet. You have the same options for accessing Administrative Tools in Windows 10 as listed in the prior section for Windows 8/8.1.

Settings App The Windows 10 **Settings app** combines a huge number of otherwise disparate utilities, apps, and tools traditionally spread out all over your computer into one fairly unified, handy Windows app (see Figure 3.52). Since the Settings app was introduced in Windows 8, it has taken over more and more tasks from the Control Panel. Expect it to grow as Windows 10 matures.

To access the Setting app, press the **WINDOWS LOGO KEY** to access the Start menu. Select Settings from the lower left to open the tool (see Figure 3.53).



• **Figure 3.52** Windows Settings app

Mac OS X

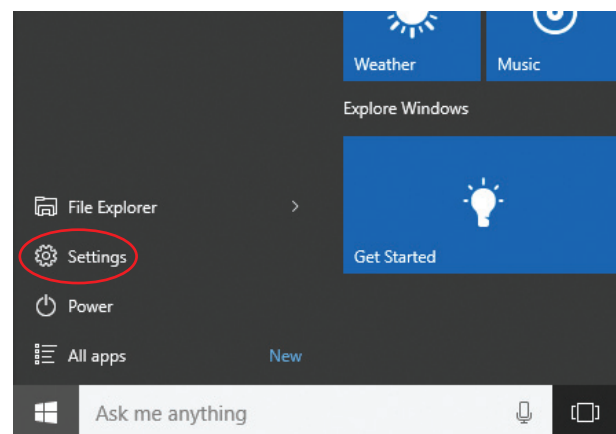
Mac OS X has two key launch points for techs: the System Preferences app and the Utilities folder. You can access both quickly.

System Preferences To access **System Preferences**, click on the Apple (top-left corner of screen). Select System Preferences from the permanent Apple menu to open the app (see Figure 3.54). From System Preferences you have access to almost all settings you will need to administer a Mac OS X system.

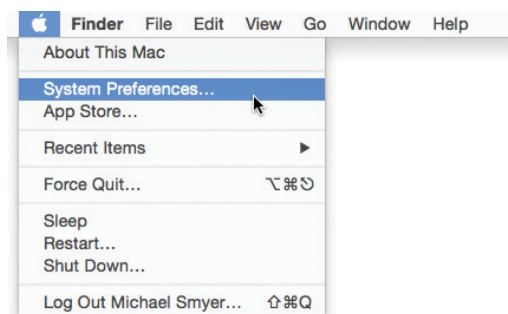
Utilities Folder The second launch point is the **Utilities** folder, located neatly in the Applications folder. Because of its importance, Apple provides a quick shortcut to access it. With the Finder in focus, click on Go on the menu bar and select Utilities (see Figure 3.55). Alternatively, use the hot-key combination: COMMAND-SHIFT-U. This gives you access to the tools you need to perform services on a Mac beyond what's included in System Preferences, including Activity Monitor and Terminal. The latter is the command-line interface for Mac OS X, a very powerful tool for techs that we explore in detail in Chapter 16.

Linux

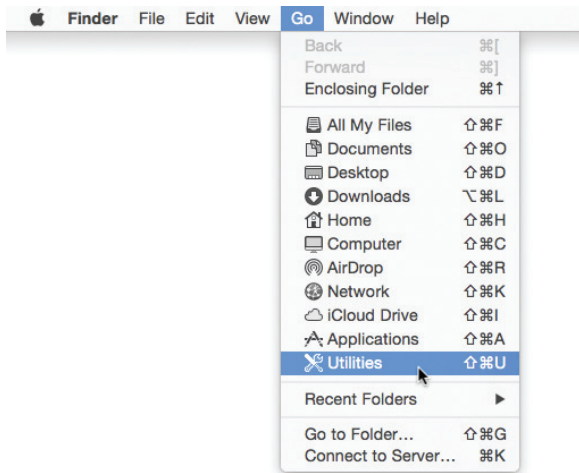
An essential tool in Linux for techs is the command line, called Terminal. You can get there in most distros by pressing CTRL-ALT-T. (See Chapter 16, "The Command-Line Interface," for a lot of details about essential Linux commands.)



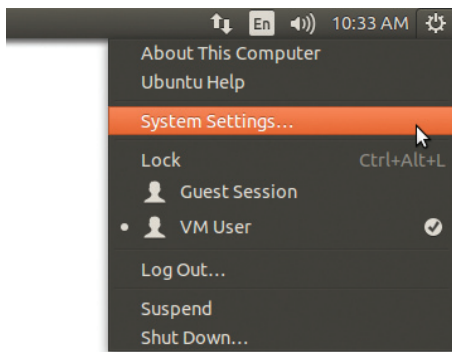
• **Figure 3.53** Accessing Settings in Windows 10



• **Figure 3.54** Accessing System Preferences



• **Figure 3.55** Accessing the Utilities folder



• **Figure 3.56** Accessing System Settings

Other launch points vary from distro to distro. Here are the locations of the launch points for the three most common desktop environments.

Unity (Default for Ubuntu Desktop) Similar to Mac OS X, Unity has a central application for managing common settings called *System Settings*. To access System Settings, click on the gear icon on the far right of the menu bar and select System Settings (see Figure 3.56).

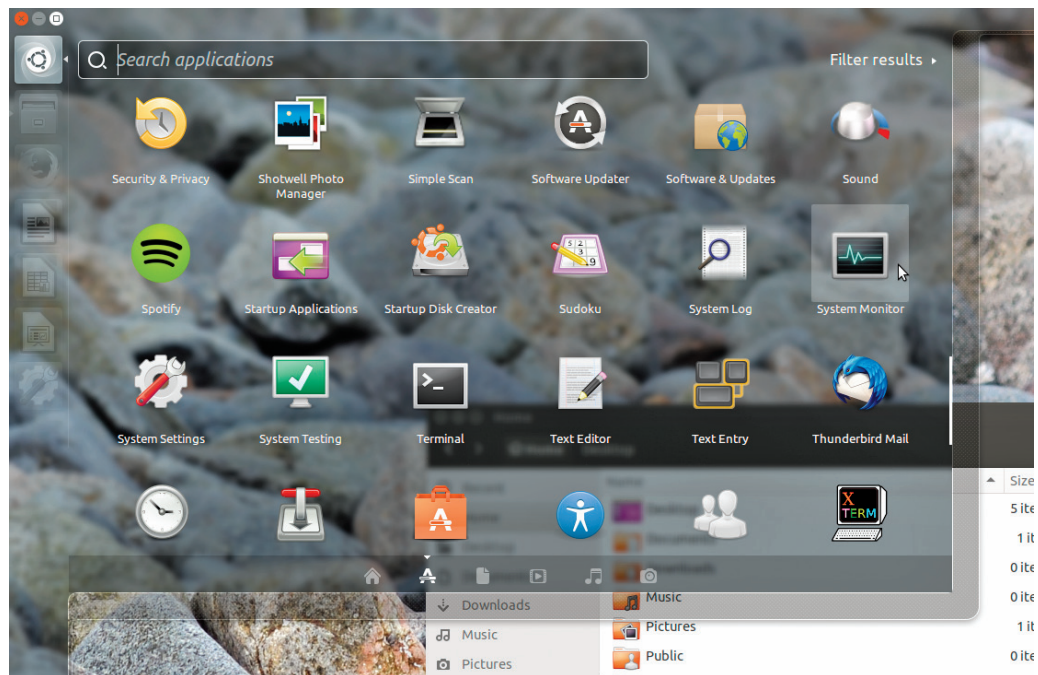
You can find settings and utilities not in the System Settings application with the rest of the applications in the Dash. Click on the Ubuntu button at the top of the Launcher (see Figure 3.57). From here you can search or browse for handy applications such as the System Monitor or the always critical Terminal.

GNOME 3 (Default for Fedora Workstation, Red Hat Enterprise Linux)

If you have any experience with Ubuntu's Unity, working with GNOME 3 should feel somewhat familiar because Unity is based on GNOME. Because of this connection, the same applications are used to administer GNOME 3-based desktops, although some of the names are different.

The first launch point is the All Settings application, which is practically the same as System Settings in Unity. To access All Settings, click on the down arrow icon on the far right of the menu bar and select the wrench and screwdriver icon (see Figure 3.58).

For other system utilities such as System Monitor or Terminal, click on the Activities button on the far left of the menu bar. From here you can search for the utility from the box at the top, or select the Show Applications

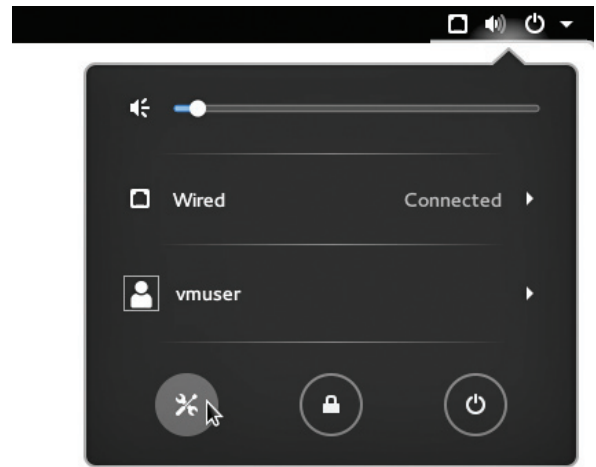


• **Figure 3.57** Browsing through Dash applications

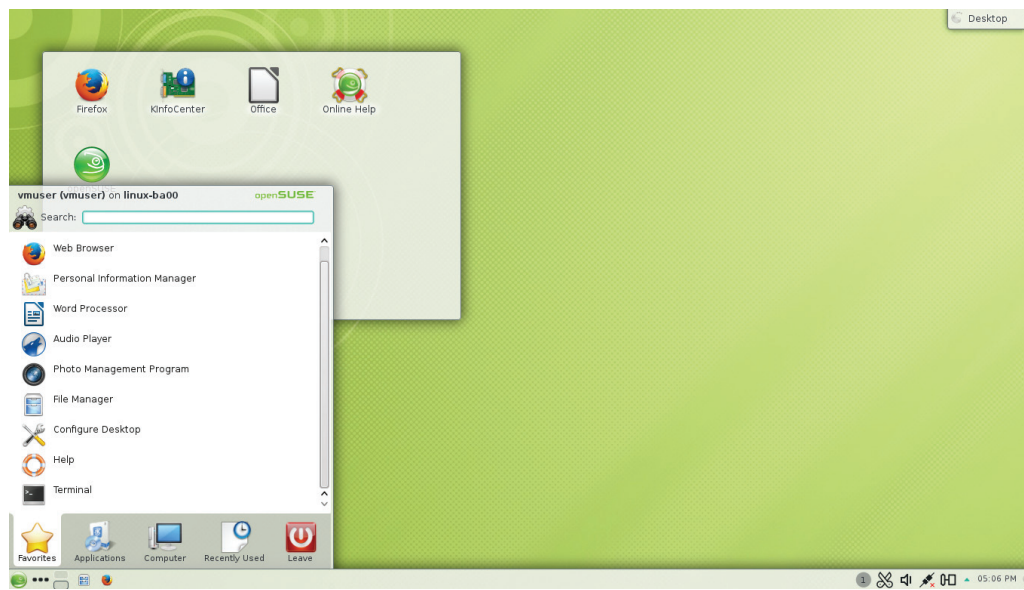
grid icon from the bottom of the Dash on the left side of the screen. This will open a menu showing all installed applications, and within this list is a folder for Utilities.

KDE Plasma Desktop (Default for OpenSUSE, Kubuntu) “Choice!” could be the unofficial motto of Linux, and when you are working on a KDE-based distro, you are certainly spoiled for choices. The downside to this abundance is that the configuration utilities can vary among the different KDE-based distros.

The one thing that is the same in all the KDE-based distros is that everything you need to work on the system is accessible from the *Kickoff* menu on the far left of the Panel (see Figure 3.59). The Kickoff menu looks and works a lot like the Start menu in Windows 7, so it should be relatively easy to navigate. Once in the Kickoff menu, you can search for a needed utility or select the Applications tab at the bottom. From here, most distros have a Utilities or System menu that holds all the key system configuration and maintenance applications.



• **Figure 3.58** Accessing All Settings



• **Figure 3.59** KDE Kickoff menu

Chapter 3 Review

■ Chapter Summary

After reading this chapter and completing the exercises, you should understand the following about working as a tech.

Describe how computing devices work

- Computing devices come in all shapes and sizes today. General computing devices dot desktops and café tables around the world. Smartphones grace many pockets and purses. Specific computing devices strap on joggers' armbands, occupy math students' desks, and register the amount and cost of the gas at the pump. Regardless of the scope of the devices, they have the same components.
- A modern computer consists of hardware, an operating system, and applications. Hardware is the stuff you can touch or hold in your hand. The operating system controls the hardware and enables you to tell the computer what to do. Applications (or programs) enable you to do specialized tasks on a computer.
- Computers work through several stages, such as input, processing, and output. Input is what you do. Processing is how the computer responds. Output is what you see on the computer display or hear through the speakers. Other stages include data storage (saving your work) and network connection (connecting a computer to one or more other computers).

Identify common connectors and devices on a typical computer system

- Computing devices have many peripherals for input and output, such as keyboards and mice, monitors, speakers, headphones, and so on. These devices connect to a variety of ports, such as USB, DVI, HDMI, and more.
- A glance inside a general-purpose computer, such as a desktop PC, shows many of the processing components, such as the motherboard, CPU, RAM, hard drive, and video card.

Discuss features common to operating system software

- The OS communicates with the hardware of the computer and provides a user interface. The OS enables users to determine the available installed

programs. The OS enables users to add, move, and delete the installed programs and data. The OS provides a method to secure a system.

- The user interface for every operating system enables a user to interact with the OS. Left-clicking selects an object, for example, whereas right-clicking reveals a context menu. Windows Vista/7 employ an interface that focuses on the Desktop and supports transparency with Aero Glass. Windows 8/8.1 offer the Metro/Modern UI tiled interface, with pinned apps and the Charms bar.
- Windows 10 ditches charms and returns Windows to the more traditional Desktop environment. The Start screen/menu is more compact and not full screen.
- The Mac OS X interface relies on the Desktop experience, with a complex Dock that has pinned apps, running programs, and utilities. A press of the Mission Control key brings up Mission Control, enabling you to switch readily between apps, windows, and spaces.
- Most Linux distros feature a desktop interface with a Launcher on the left that holds locked applications and file management tools.
- Most users and techs access folders and files in Windows with a tool called Windows Explorer in Windows Vista/7 and File Explorer in Windows 8/8.1/10. This tool give you access to essential locations such as C:\Program Files and C:\Program Files (x86) where all the 64-bit and 32-bit programs install, respectively. Personal documents can be found in the C:\Users\<user name> subfolders.
- Mac OS X and Linux distros follow a similar pattern. Mac OS X has User folders for individual user accounts. Linux uses the term "Home" rather than "Users." Functionally, it's the same.
- Every OS has two or three areas for tech-specific utilities. Windows Vista/7 have the Control Panel, System Tools, and the command-line interface. You can access all from the Start menu. Memorize the paths! Windows 8/8.1 remove System Tools but add a lot of those tools into Administrative Tools. Windows 10 relegates Administrative Tools, but introduces a robust, all-but-the-kitchen-sink tool in the Settings app.

- Mac OS X has two go-to places for system setup and configuration: System Preferences and Utilities. Access the former through the permanent Apple menu; access the latter through Finder.
- The many distros of Linux vary in what tools they use and the path to those tools. One essential

tool is Terminal, the command-line interface. The most common distro, Ubuntu Linux, has a System Settings application, accessible from the Launcher, that is very similar to System Preferences in Mac OS X.

■ Key Terms

Administrative Tools (71)

Aero (52)
 applet (67)
 application (44)
 app (53)
 charm (58)
 Charms bar (58)
 command-line interface (68)
 computer (43)
 computing process (46)
 context menu (53)
 Control Panel (67)
 data storage (47)
 Desktop (52)
 desktop environment (DE) (61)
 Device Manager (67)
 distribution (distro) (51)
 Dock (59)
 drive letter (63)
 file association (64)
 File Explorer (63)
 file extension (64)
 Finder (65)
 Gadget (53)
 graphical user interface (GUI) (44)
 hardware (44)
 input (46)

Metro UI (53)

Mission Control (60)
 multiple Desktops (59)
 network connection (47)
 notification area (53)
 operating system (OS) (44)
 output (46)
 personal computer (PC) (43)
 pinned app (53)
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 system tray (53)
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 user interface (UI) (44)
 Utilities (73)
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 Windows logo key (55)

■ Key Term Quiz

Use the Key Terms list to complete the sentences that follow. Not all terms will be used.

1. The term _____ refers to the software parts of the operating system with which you can interact.
2. Computers work through three basic stages, what's called the _____.
3. You can access frequently used applications in Mac OS X by clicking their icons on the _____.
4. Windows 8's tile-based interface is called the Metro/Modern UI or _____.
5. Move the cursor to the top or bottom right corner of the screen in Windows 8 to access one of the tools called a(n) _____.

6. The _____ utility in Mac OS X enables you to switch easily among applications, windows, and Spaces.
7. You can use _____ in Windows 8.1 to access files and folders.
8. The _____ enables a tech to perform most of the maintenance, upgrade, and configuration aspects of Windows.
9. _____ enables you to set up hard drives, manage devices, test system performance, and much more.
10. You can access the _____ tool from the permanent Apple menu to administer a Mac.

■ Multiple-Choice Quiz

1. What is the standard main screen/user interface used in all versions of Windows?
 - A. Control Panel
 - B. Dock
 - C. Taskbar
 - D. Desktop
2. How do you open an application in Windows?
 - A. Left-click its icon.
 - B. Right-click its icon.
 - C. Left double-click its icon.
 - D. Right double-click its icon.
3. Which of the following operating systems has a Sidebar?
 - A. Windows Vista
 - B. Windows 7
 - C. Windows 8.1
 - D. Mac OS X
4. Which version of Windows introduced the Metro UI?
 - A. Windows 7
 - B. Windows 8
 - C. Windows 8.1
 - D. Windows 10
5. Which Windows 8 feature did Microsoft not include in Windows 10?
 - A. Metro/Modern UI
 - B. Start button
 - C. Control Panel
 - D. Charms bar
6. Which Windows 7 feature—that's not in Windows 8—did Microsoft bring back in Windows 10?
 - A. Sidebar
 - B. Charms bar
 - C. Start menu
 - D. Start button
7. What Mac OS X feature is essentially multiple desktops?
 - A. Charms
 - B. Desktop
 - C. Mission Control
 - D. Spaces
8. Which of the following is a well-known Linux distribution?
 - A. Ubuntu
 - B. Brownstone
 - C. Trinidad
 - D. Haswell
9. What is the default Ubuntu Desktop Environment?
 - A. Metro UI
 - B. Unity
 - C. KDE
 - D. GNOME 3
10. The user, Mike, has downloaded files with his Web browser. Where will they be stored by default?
 - A. C:\Downloads
 - B. C:\Mike\Desktop\Downloads
 - C. C:\Users\Mike\Downloads
 - D. C:\Users\Mike\Desktop\Downloads

11. 32-bit programs are installed into which folder by default in a 64-bit edition of Windows?
 - A. C:\Program Files
 - B. C:\Program Files (x32)
 - C. C:\Program Files\Wins\Old
 - D. C:\Program Files (x86)
12. Which Mac OS X feature is functionally equivalent to Windows File Explorer?
 - A. Finder
 - B. Dock
 - C. Quartz
 - D. File Manager
13. Which of the following paths would open Administrative Tools in Windows 8.1?
 - A. Right-click on the taskbar and select Administrative Tools from the context menu.
 - B. Right-click on the Start button and select Administrative Tools from the context menu.
 - C. Right-click anywhere on the desktop and select Administrative Tools from the context menu.
 - D. Press the WINDOWS LOGO KEY + L combination to open Administrative Tools.
14. What feature of Mac OS X is the equivalent of the command-line interface in Windows?
 - A. Dock
 - B. Spaces
 - C. Terminal
 - D. Unity
15. What Windows app in Windows 10 combines many utilities into a unified tool?
 - A. Settings
 - B. Control
 - C. Command Center
 - D. Control Center

■ Essay Quiz

1. After exploring methods to access the Control Panel and Administrative Tools in Windows 8.1, write a short essay describing your go-to methods for accessing each one. Why did you choose the path you chose?
2. A local donut shop has decided to license franchises and therefore needs a central office with computers for all the users. In such a scenario, recommend the best operating system and write a short essay defending your choice.
3. In a short essay, identify a single feature you think is common among all three operating system families (Windows, Mac OS X, and Linux). Describe a single user interface that combines what you consider the best of all features.

Lab Projects

• Lab Project 3.1

Feeling brave? Linux distributions are free to download and install. Ubuntu is extremely user friendly. When you download Ubuntu Linux and burn it to a DVD, you can boot to the disc and (without installing) run the OS right from the disc. Try before you take the plunge. If you're new to computers, do not do this Lab Project without consulting a very experienced tech. Here are the steps:

1. Go to www.ubuntu.com.

2. Download the latest copy of Ubuntu Linux. You will download a file in .iso format—that just means it's a precise copy of a disc as a single file.
3. Burn the .iso file to a DVD using the built-in Windows or Mac OS X tools.
4. Reboot the system, selecting to boot to the optical disc.
5. When prompted, select Live Preview rather than Install to Hard Drive.