



Inside **OUT**

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Windows 8.1

Sample Chapters

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What's new in Windows 8.1

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In the past few years, people have begun using computers in completely different ways. While many still use their computer at a desk with a keyboard and mouse, those same people step away from their desk and use mobile phones and tablets to keep in touch.

Microsoft designed Windows 8.1 to fit modern computing. The familiar Start menu is completely gone, replaced by a continuously updated Start screen. You even have the option of never touching another keyboard and mouse: Windows 8.1 is touch-friendly, allowing you to grab the latest tablet computers and navigate them with your fingers.

Windows 8.1 also integrates the cloud, allowing users to authenticate using a Microsoft account and to store and share files using SkyDrive. Social networking is deeply integrated into Windows, and Windows 8.1 connects to Twitter, Facebook, and other social networking sites just as easily as to local resources.

These changes will require those of us experienced with earlier versions of Windows to relearn some of the ways we interact with a computer. The new interface and apps are so intuitive that most people will comfortably navigate Windows 8.1 with just a few minutes of learning. The underpinnings, however, require deep examination to fully understand.

As with every version of Windows, Microsoft recognizes the importance of backward compatibility. Though Windows 8.1 is designed to be touch-friendly, it is equally usable with a keyboard and mouse. Though apps designed for Windows 8.1 provide the greatest performance, you can still run almost any app created for earlier versions of Windows, and your existing drivers will work without modification.

This first chapter gives you an overview of the most important new features of Windows 8.1. Some of these features were introduced in Windows 8 or have been updated since that release. Future chapters become increasingly more technical, providing greater detail about apps, the touch interface, documents, media, security, networking, troubleshooting, and much more.

NOTE

Because this book is focused on consumer and small business uses of Windows 8.1, it will not describe features that are exclusive to Windows 8.1 Enterprise.

Interacting with Windows 8.1

Whereas Windows 7 had a Start button that was always visible, and applications typically had menus and toolbars that remained visible, one of the design goals of Windows 8.1 is to completely immerse you in full-screen applications. Instead of wasting screen space on buttons, Windows 8.1 makes the corners and edges of the screens active, but it does not label them, so it is important for even the most experienced Windows users to learn the location of these new controls. While these new controls will not be immediately obvious to most Windows users, learning them takes just a few minutes.

Windows 8.1 is designed to be equally usable with a touch screen or a conventional mouse and keyboard. The sections that follow briefly describe the different ways you can control Windows 8.1.

Touch controls

Windows 8.1 and apps designed for Windows 8.1 are accessible using tablet computers without a mouse or keyboard. The touch controls are intuitive, especially if you have a smartphone. However, some of the controls will not be obvious the first time you use Windows 8.1. This section describes the basic touch controls.

Tap

Tapping, like clicking with a mouse, performs an action. For example, tap an app on the Start screen or a link in Internet Explorer to open it.

To select text within an app, tap it, and then use the circles to adjust the selection, as shown in Figure 1-1. Tap the selection to copy or paste it.

▼ Where is the Start button or Start menu?

The Start screen replaces the Start menu in Windows 8. You can pin apps, contacts, and websites to Start easily access what you use most. All of your apps—both apps you install from the Windows Store and desktop apps—are available from the Start screen. You can organize, group, and name categories of apps in whatever way makes sense to you. Tiles and notifications show what's new so you can get important info and updates at a glance.

Figure 1-1 Select text by tapping and then adjusting your selection.

Hold

Holding your finger on an object can do one of two things, depending on the app:

- Display information about the object, much like hovering over an object with the mouse.
- Display a context menu, much like right-clicking an object.

Swipe

The edges of the screen are really important in Windows 8.1. By swiping a finger in from the edges and corners of the screen, you can perform different actions regardless of the app you have open:

- Swipe from the right side of the screen to view the charms for searching, sharing, and printing.
- Swipe from the left side of the screen to bring up a list of previously used apps.
- Swipe from the top or bottom of the screen to view app-specific commands, which function like an app's menu.

Figure 1-2 illustrates swiping from the right side of the screen.

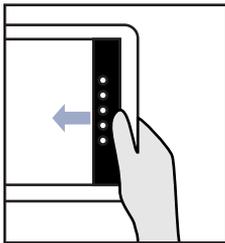


Figure 1-2 Swipe from the edges of the screen to view the charms or app commands.

Slide

Slide your finger across the screen to drag objects and scroll the screen, as shown in Figure 1-3. For example, to scroll left or right on the Start screen, just touch anywhere on the screen and slide to either side.

To view a list of recently used apps (equivalent to holding down the Alt key and repeatedly pressing Tab), tap the upper-left corner of the screen and then slide your finger down. You can

then slide an app to dock it to one side of the screen, or slide it to the bottom of the screen to close it.

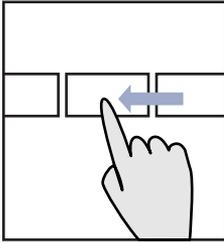


Figure 1-3 Slide your finger across the screen to scroll or drag objects.

Flick

Flick objects to select them. A flick is a short, quick, downward swipe. For example, you would tap a tile on the Start screen to open the app, but flick it to select the tile so you can change its settings.

Pinch and stretch

Some apps, including the Start screen, support pinching and stretching to zoom in and out, as illustrated by Figure 1-4. Zooming in allows you to see more detail, while zooming out shows you more context.

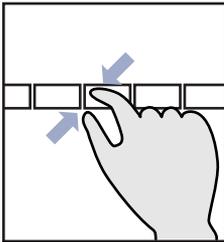


Figure 1-4 Pinch to zoom back and view more on the screen.

Rotate

In some apps, you can also use two fingers to rotate objects on the screen, as shown in Figure 1-5. For example, you might use this technique to rotate a picture from horizontal to vertical.

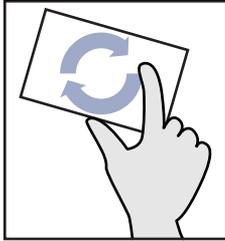


Figure 1-5 Rotate objects with two fingers.

▶ **Touch controls** Watch the video at <http://aka.ms/WinIO/touchcontrols>.

Mouse controls

Windows 8.1 also provides new mouse controls:

- Move your mouse to the upper-left corner to view the most recently used app. Click to open it or drag it to the side of the screen to snap it.
- Move your mouse to the lower-left corner and then click to open the Start screen.
- Move your mouse to the upper-left corner and then slide it down (without clicking) to view a list of recently used apps.
- When viewing the list of recently used apps, click an app to open it or drag it to the side of the screen to snap it.
- Move your mouse to the upper-right or lower-right corner to view the charms. Click a charm to use it.
- Right-click most apps to view the app commands. Some apps, such as Internet Explorer, provide traditional context menus when you right-click.
- Drag an app from the foreground to either side of the screen to snap it.
- Right-click the lower-left corner to open quick links.

▶ **Mouse controls** Watch the video at <http://aka.ms/WinIO/mousecontrols>.

Keyboard shortcuts

Windows 8.1 provides the keyboard shortcuts in Table 1-1 to access its features.

Table 1-1 Windows 8.1 keyboard shortcuts

Action	Key
Display the Start screen	Windows key
View charms	Windows+C
Search	Windows+Q
Search for files	Windows+F
Open Settings	Windows+I
View app commands	Windows+Z
Open quick links for power users (try it!)	Windows+X
Show the desktop	Windows+D
Lock the computer	Windows+L
Run an app	Windows+R
Snap an app to the right	Windows+Period
Snap an app to the left	Windows+Shift+Period
Switch applications	Windows+Tab

Windows 8.1 user interface

Windows 8.1 has a brand new user interface and app model. The new design theme focuses on simplicity, functionality, and touch. Gone are the beveled edges, drop shadows, and reflections that have become overused in the last decade. Instead, you interact with the simplest elements: immediately recognizable white icons and squares and rectangles designed to resemble subway tiles. Intuitive tapping and swiping controls work well with or without a mouse and keyboard.

When Windows 8.1 starts, it displays a lock screen with a picture and the time and date. Swipe up from the bottom of the screen to access the login screen. After login and every time you press the Windows key, Windows 8.1 displays the Start screen.

For more information about the apps included with Windows 8.1, read Chapter 2, "Using Windows 8.1 apps."

 **The Windows 8.1 user interface** Watch the video at <http://aka.ms/WinIO/UI>.

Inside OUT

Desktop apps and Windows Store apps

Windows 8 introduced a new type of full-screen, touch-friendly app. (You'll hear various names for these apps, including Windows Store apps.) Traditional apps created for earlier versions of Windows are now considered "desktop apps." These are the windowed apps with borders, menus, and toolbars. Windows 8.1, Windows 7, and earlier versions of Windows can all run desktop apps. Only Windows 8.1 can run Windows 8.1 apps. This book will refer to Windows 8.1 apps as simply "apps," and traditional apps as "desktop apps."

Lock screen

The first screen you see when you start Windows 8.1 is the lock screen, as shown in Figure 1-6. The lock screen shows a picture, the current date and time, battery life (for mobile devices), the network status, and notifications from up to seven different apps. To open the lock screen from your desk, click your mouse or press any key. To open the lock screen with touch, swipe up from the bottom.



Figure 1-6 The Windows 8.1 lock screen displays the time and date with a photo.

Inside OUT

Turning off the lock screen

While useful for preventing tablet users from accidentally entering input while carrying their PC, the lock screen isn't particularly useful for desktop or laptop users. Follow these steps to disable the lock screen:

1. Run **gpedit.msc** to open the Local Group Policy Editor.
2. Select **Computer Configuration\Administrative Templates\Control Panel\Personalization**.
3. Double-click **Do Not Display The Lock Screen**. Select **Enabled**, and then click **OK**.

The next time you start the computer, Windows will display the login screen when it starts, bypassing the lock screen.

Start screen

The Start screen, shown in Figure 1-7, is always the first page Windows 8.1 displays. Like most apps designed for Windows 8.1, the Start screen scrolls horizontally, rather than vertically. Instead of scrolling, you can zoom back to see the entire Start screen. To zoom with touch, pinch or stretch the Start screen. To zoom with a mouse and keyboard, hold down the Ctrl key and either scroll the mouse wheel or press the Plus Sign or Minus Sign.

The Start screen does not show every app. If you don't see the app you need, simply type its name from the Start screen. Windows 8.1 will search for the app and display any matching results.

After you open an app, you can open the Start screen in several different ways:

- Move your mouse to the lower-left corner of the screen.
- Press the Windows key on your keyboard.
- On touch-sensitive PCs, touch the lower-left corner. You can also swipe in from the right to view the charms and then touch the Start charm.

If you press the Windows key multiple times, Windows 8.1 will switch between the Start screen and your desktop. To run a command, simply type the command name and press Enter. Alternatively, you can open the Run dialog box from the desktop by pressing Windows+R. Press Windows+X to access the WinX menu, as shown in Figure 1-8, which contains links to commonly used tools.



Figure 1-7 The Start screen focuses on simplicity and functionality.

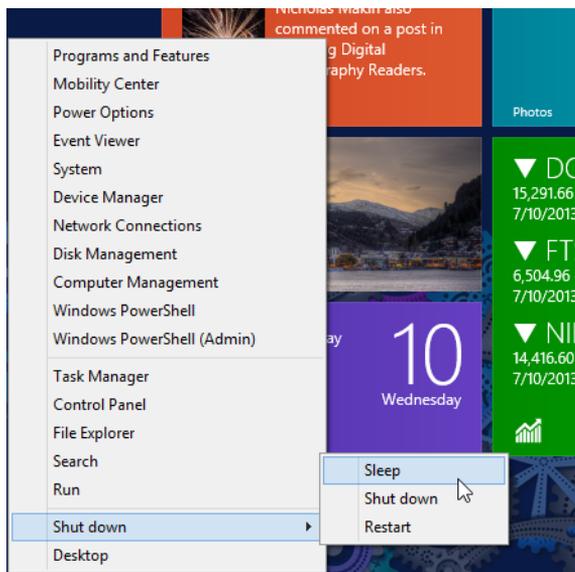


Figure 1-8 The WinX menu provides access to tools often used by power users.

Inside OUT

Getting a Windows 7–like Start menu

If you miss the Windows 7 Start menu, try giving the Windows 8.1 Start screen a few weeks. It really is better than the Windows 7 Start menu, even for traditional keyboard and mouse users. Sometimes, it's better to stick with what you know, however. While Windows 8.1 no longer has a Windows 7–like Start menu, you can download and install free alternatives. My favorite is ViStart (see Figure 1-9), available at <http://lee-soft.com/vistart/>. Another option is Start8, available at <http://www.stardock.com/products/start8/>.

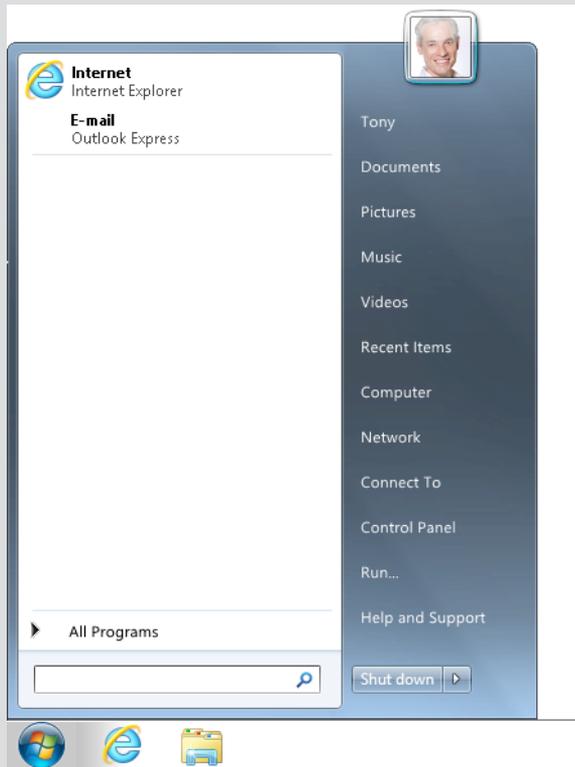


Figure 1-9 Install ViStart or Start8 if you prefer the Windows 7 Start menu.

Drag tiles to reorganize them on the Start screen. To change the size of tiles using touch, swipe up from the bottom, select a tile, and then touch an option. You can also flick tiles to select them and then open the app by swiping up from the bottom. With a mouse, right-click the tile you want to edit.

For information about live tiles and configuring apps on the Start screen, refer to Chapter 2.

Charms

Windows 8.1 introduces the idea of charms. You can use charms to perform common tasks in apps started from the Start screen, regardless of which app you're using. To view the charms with touch, swipe in from the right. To view the charms with a mouse, move your pointer to the upper-right or lower-right corner. To view charms with a keyboard, press Windows+C.

The five standard charms are:

- **Search** Opens the search bar to find apps, settings, and files. Some apps also use the Search charm to find content within the app. For example, to find a particular song, touch the Search charm, select the Music app, and type the name of your song. Press Windows+F to directly open the Search charm.
- **Share** Allows you to share content within apps that support sharing. For example, to email a link to a webpage that you have open in Internet Explorer, touch the Share charm, and then touch the Mail app. Windows 8.1 will open the Mail app with a link to the current webpage in the body of the message. Press Windows+H to directly open the Share charm.
- **Start** Opens the Start screen. You can also open the Start screen by pressing the Windows key.
- **Devices** Allows you to print from the current app or send data to another device, if you have any supported devices installed. Press Windows+K to directly open the Devices charm.
- **Settings** Lets you change options for the current app. Press Windows+I to directly open the Settings charm.

Charms, as shown in Figure 1-10, replace toolbar buttons and menu items that each app used to have for searching, sharing, printing, and setting options. Apps can still have unique commands for other features.



Figure 1-10 Use charms to access settings and functions you might have used menus to access in earlier versions of Windows.

PC Settings

To access PC Settings, touch the Settings charm or press Windows+I, and then select Change PC Settings in the lower-right corner. Figure 1-11 shows the new PC Settings tool that provides a touch interface to some of the Control Panel functionality you might be familiar with from Windows 7. You must still configure some settings from the Control Panel desktop app. To find a specific setting, press Windows+W, and then type words related to the setting.

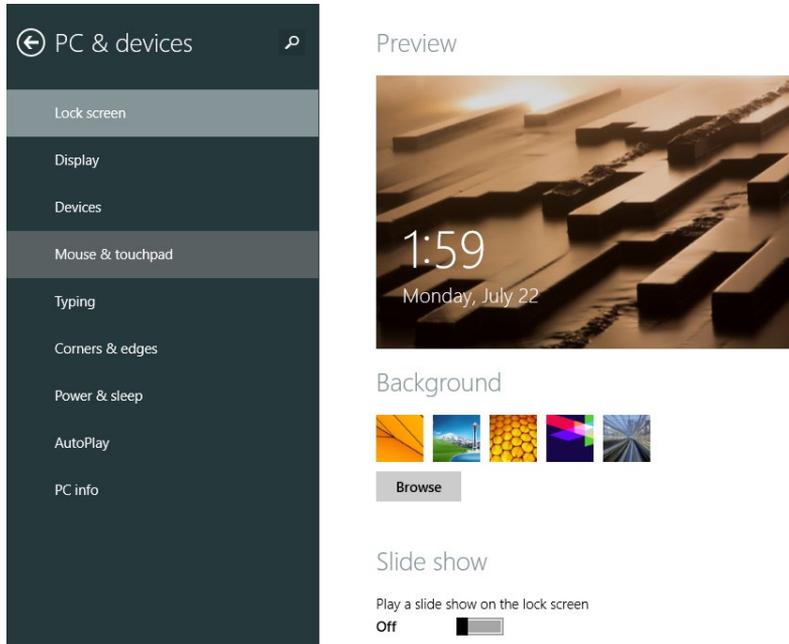


Figure 1-11 PC Settings replaces Control Panel.

Autocorrect and highlight misspelled words

Windows 8.1 can now highlight misspelled words and even autocorrect spelling errors and typos, as shown in Figure 1-12. Use the General screen within PC Settings to configure this feature.

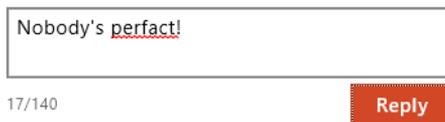


Figure 1-12 Windows 8.1 autocorrects common typing and spelling errors and highlights others.

Searching

Windows 8.1 includes more powerful and organized search capabilities. From the Start screen, simply type to search apps, settings, files, and even webpages. Windows displays matching results, with your most commonly used resources at the top of the list.

To search only files, press Windows+F and type your search. (See Figure 1-13.) Windows 8.1 displays suggested searches below the search box, including spelling corrections. Use the Down Arrow key to select a suggestion or simply click it.

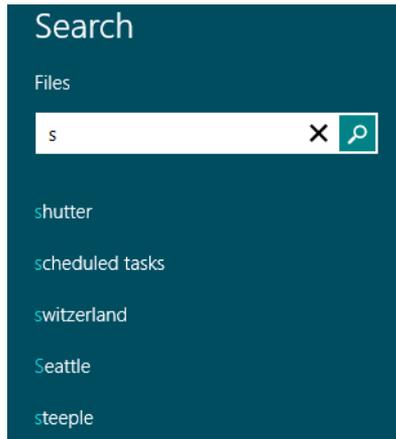


Figure 1-13 Windows 8.1 suggests searches as you type.

Results are organized based on the type of file: All (which includes every result), Documents, Pictures, Music, Videos, and Other. Hover your pointer over any result to see a larger thumbnail and more file details, as shown in Figure 1-14. You can use the Advanced Query Syntax (AQS) from Windows 7 to find files by attribute.

To search Settings, touch the Search charm and then touch Settings, or press Windows+W. Then, type words related to the setting you need to change. Windows 8.1 displays a list of settings you can modify.

Portrait and landscape modes

Windows 8.1 is designed to be used in either portrait or landscape mode, supporting the fact that users might prefer to hold tablet computers either vertically or horizontally. Most Windows 8.1 features are designed to work well no matter how the computer is held, and apps can support both horizontal and vertical displays, as well as a variety of different resolutions.

You can disable rotation, which is useful when you want to use a tablet computer lying flat or on its side.



Figure 1-14 Hover your pointer over a result to see more details.

Language packs

Windows 8.1 supports changing the default language. You no longer need to be concerned about the default language when you buy a computer; if you prefer to use a different language, you can change it at any time. This is particularly useful for environments where multiple users access a single computer and those users prefer different languages.

To add languages or to change the default language for your user account, use the Region & Language page in PC Settings, as shown in Figure 1-15.

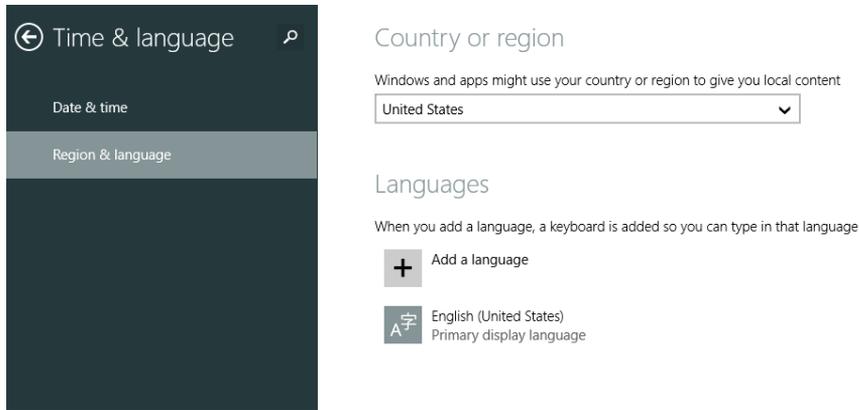


Figure 1-15 Windows 8.1 supports dozens of languages.

- For more information, refer to Chapter 5, “Personalizing Windows 8.1.”

Accessibility

Like previous versions of Windows, Windows 8.1 includes powerful accessibility features to make using a PC easier for users with different data input and visual needs. Windows 8.1 also makes several improvements:

- Narrator (the text-to-speech tool that audibly reads words from the screen) is now faster.
- Narrator supports more languages and voices.
- Narrator has new configuration settings that you can use to adjust the voice, speed, and other aspects of Narrator’s behavior.
- Windows works better with accessibility features, making it easier for users with different needs to install and configure their PC.
- When using a Windows 8.1 tablet PC, you can hold the Windows logo key and press Volume Up to launch Narrator.
- Internet Explorer 10 and Narrator can continuously read a webpage.

- For more information, refer to Chapter 7, “Using Windows 8.1 accessibility features.”

Boot changes

Windows 8.1 supports Unified Extensible Firmware Interface (UEFI) for BIOS, which allows for richer graphics using the Graphics Output Protocol (GOP) driver. UEFI also reduces the

number of BIOS-related screens, allowing Windows 8.1 to provide a single visual experience from startup, instead of the computer hardware displaying BIOS screens and then switching to Windows, which provides a graphical display.

These capabilities allow Windows 8.1, when running on hardware that supports UEFI, to never display the text-based consoles that computers have used to start since before Windows existed. You can use the touch interface to select different operating systems, as shown in Figure 1-16, which shows a custom boot item (Windows 8.1 Safe Mode) added by the user with the BCDEdit tool.

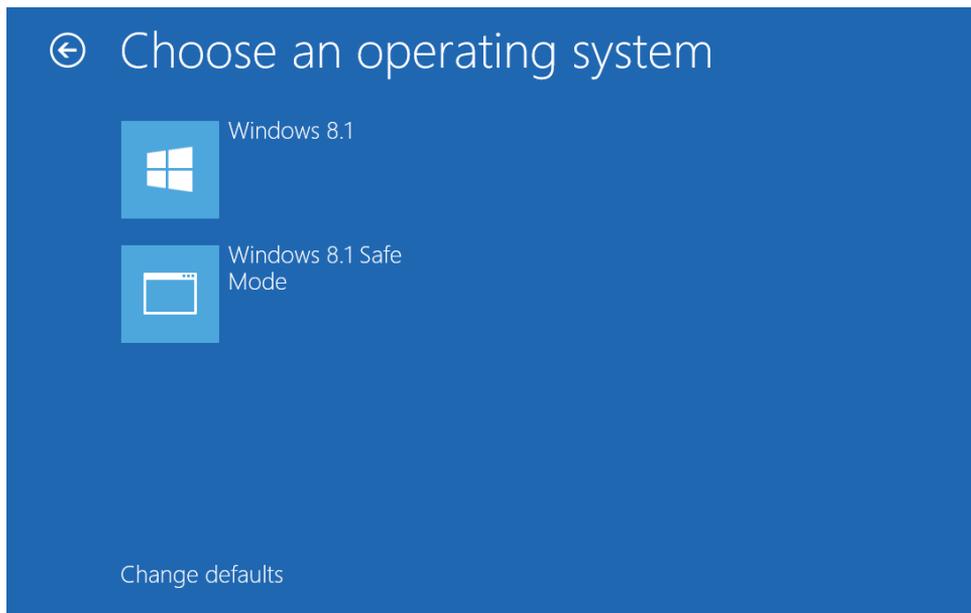


Figure 1-16 Windows 8.1 provides a graphical boot interface.

Inside OUT

Safe mode

Safe mode (also a part of earlier versions of Windows) is a special startup mode that minimizes the number of apps that run and hardware that Windows connects to. Sometimes when Windows won't start normally, you will still be able to start in safe mode. You can then use safe mode to run troubleshooting tools and recover your files. For detailed information, refer to *Troubleshoot and Optimize Windows 8 Inside Out* from Microsoft Press.

By clicking Change Defaults Or Choose Other Options, you can even change startup options before Windows starts, restore Windows, or run Windows Recovery Environment (WinRE), as shown in Figure 1-17. You never need a keyboard.

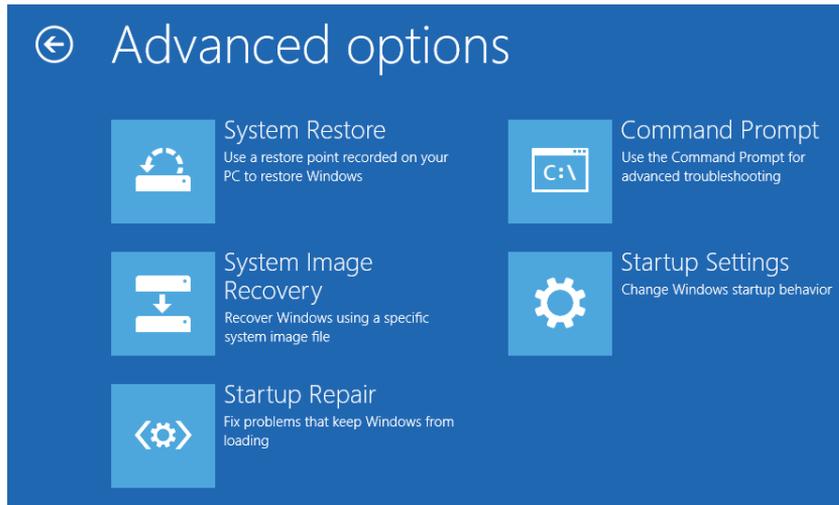


Figure 1-17 Windows 8.1 provides startup repair configuration and tools using a touch-friendly interface.

- For more information, read Chapter 27, “Troubleshooting startup problems, crashes, and corruption.”

Hardware

Windows 8.1 is designed to run on almost all existing computer hardware, including desktop PCs, mobile PCs, and tablets. Most computers running Windows Vista or Windows 7 can be upgraded to Windows 8.1 and provide an even better experience.

Apps in Windows 8.1 have higher minimum screen resolution requirements than in earlier versions of Windows, but most current computers meet or exceed the screen resolution requirements.

The sections that follow describe the Windows 8.1 hardware requirements in more detail.

Minimum hardware

Hardware requirements for Windows 8.1 have not changed from Windows 7, and Windows 8.1 will perform as fast, or faster, than earlier versions of Windows on almost any recent PC. The Windows 8.1 hardware requirements are:

- **32-bit versions of Windows 8.1** 1 GHz or faster processor, 1 GB of RAM, 16 GB of free hard disk space, and a graphics card that supports DirectX 9 with WDDM 1.0 or higher
- **64-bit versions of Windows 8.1** 1 GHz or faster processor, 2 GB of RAM, 20 GB of free hard disk space, and a graphics card that supports DirectX 9 with WDDM 1.0 or higher

Display resolution

Windows 8.1, the Start screen, the desktop, and desktop apps still work at 800x600. A resolution of 1024x768 is required for apps designed for Windows 8.1. Using multitasking with snap requires a minimum resolution of 1366x768 to dock apps to either side of the screen. Windows 8.1 scales well to higher resolutions and even multiple monitors.

- For more information about multitasking and snap, refer to Chapter 2.

Touch hardware

Windows 8.1 supports touch-capable PCs that were designed for Windows 7. Therefore, existing Windows 7 users with tablets can upgrade to Windows 8.1. However, touch-capable PCs designed for Windows 8.1 can provide an even better experience. Microsoft's hardware certification process for touch-capable computers requires higher levels of precision that improve the accuracy of common tasks, such as tapping, swiping, and sliding.

Sensor support

Windows 8.1 provides expanded support for sensors. While Windows 7 supported using ambient light sensors (ALS) to control display brightness, a feature known as adaptive brightness, Windows 8.1 includes support for several other types of sensors:

- 3-D accelerometers that measure how the computer is moving
- 3-D gyro sensors that measure how the device is rotating
- 3-D magnetometers that measure magnetic fields, such as that from the North Pole

Windows 8.1 uses this sensor data for adaptive brightness and automatic screen rotation. More importantly, Windows 8.1 processes the information using a feature known as sensor fusion

and makes it available to apps. By using the compass, incline, and device-orientation information provided by sensor fusion, apps can determine precisely how the computer is being held, where it is being pointed, and how it is being moved.

Improved power efficiency

When using apps, Windows 8.1 should offer increased battery life when compared to earlier versions of Windows. For more information, refer to Chapter 2.

USB 3.0 support

Windows 8.1 natively supports USB 3.0. This does not cause existing USB 2.0 ports to support USB 3.0; the computer must have USB 3.0 compatible hardware. Windows 7 required separate drivers to work with USB 3.0.

ARM support

Windows RT can run on computers that use ARM processors. ARM processors are often used in mobile devices such as smartphones, media players, and tablet computers. ARM support means you can use Windows 8.1 on some of the smallest and most efficient touch-screen-equipped devices, bringing the desktop experience anywhere you go.

Because ARM processors cannot run traditional Windows applications, Windows RT will run only apps designed for Windows 8.1. In other words, you cannot run apps designed for Windows 7 or earlier versions of Windows on Windows RT.

Security

Because security threats are constantly changing, Windows must continue to add new security features to help protect the user's privacy and the PC's integrity. Security features are valuable only if they do not significantly inconvenience the user, however. For example, a PC would be more secure if it required users to type a long, complex password each time they used it. However, the inconvenience would be so great that many users would find a way to bypass the password entry completely, nullifying the security benefits.

In Windows 8.1, Secured Boot and the improvements to Windows Defender and the SmartScreen filter help to improve your PC's security without further inconveniencing you. Picture passwords, PIN logins, Windows Live integration, and BitLocker performance directly improve Windows usability. However, by making security more convenient to users, these features can also improve security.

The sections that follow describe these features in more detail. For detailed information about security features, read Chapter 18, “Managing users and Family Safety,” and Chapter 19, “Windows, application, and network security.”

Picture password

Passwords are a convenient way to log in when using a keyboard, but typing is more difficult when you’re using a tablet computer. Picture passwords, a sign-in method that authenticates a user by checking gestures made on a picture, provide an easier way to log in using touch, with security that will be sufficient for many users.

To log in with a picture password, select a picture. Then, choose a sequence of three motions on the picture. Each motion can be a tap, a line, or a circle. Circles and lines can be any size or direction. Figure 1-18 shows one step of a sample picture password login: drawing a small counterclockwise circle around the nose of a fox.



Figure 1-18 Draw lines, dots, and circles (as shown around the fox’s nose) to log in using a picture password.

Using the example in Figure 1-18, a user could specify any of the following sequences to log in:

- Tap the right ear, tap the nose, and then tap the left eye.
- Draw a line from the nose to the tail, draw a small clockwise circle around the right ear, and then draw a small counterclockwise circle around the left ear.

- Draw a line from the right ear to the left ear, tap the nose, and then draw a big clockwise circle around the head.

Picture password is disabled by default. Enable it from the Account, Sign-In Options screen of PC Settings. The next time you sign in, you are automatically prompted to enter your picture password. For more information about picture passwords, refer to Chapter 18.

PIN login

You can also log in to Windows by using a four-digit numeric PIN. Pins are easy to type and remember, but they are not as secure as conventional or picture passwords. If you do decide to use a PIN, avoid common sequences such as 1111 or 1234 and important dates.

PIN login is disabled by default because it is significantly less secure than using a complex password. Enable PIN login from the Users screen of PC Settings. The next time you sign in, click Sign-In Options, and then click the keypad icon. For more information about using a PIN, refer to Chapter 18.

SmartScreen filter

Windows 8.1 integrates the SmartScreen filter from Internet Explorer into the operating system, helping to reduce the risk of users downloading and running known malware. If SmartScreen detects an application that is potentially malware or has not yet established a reputation, it warns the user as shown in Figure 1-19. The user has the option to continue on and run the application.

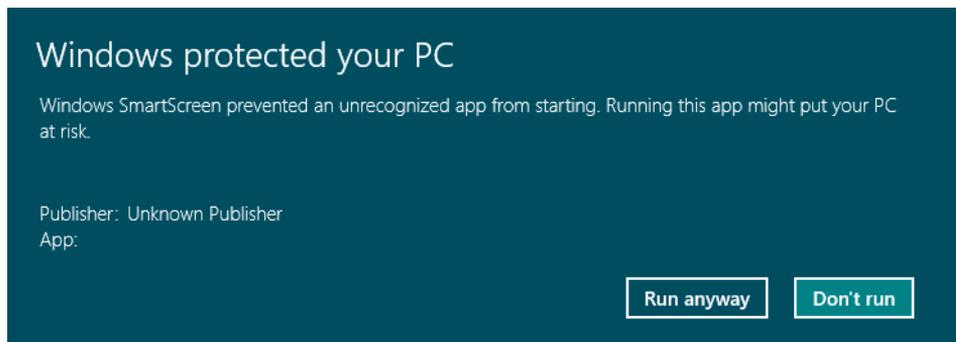


Figure 1-19 SmartScreen warns the user before running a potentially malicious application.

Windows Defender

As shown in Figure 1-20, Windows Defender in Windows 8.1 offers an important security improvement: improved protection from rootkits. Rootkits are a form of malware that runs below the level of the operating system and can be completely undetectable once Windows starts. On computers with UEFI-based secure boot, Windows Defender can detect potential malware attempting to load at boot and resume.

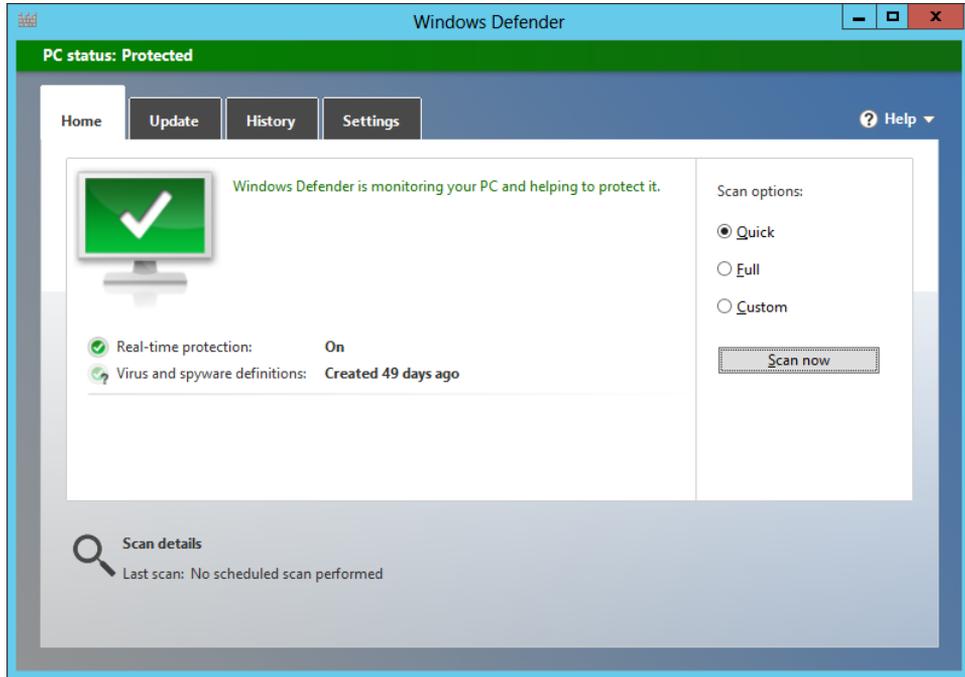


Figure 1-20 Windows Defender helps to protect your PC from malware.

When Windows Defender checks files as Windows accesses them to verify that they are not potentially malicious, Windows Defender adds some overhead, slowing your computer down just a small amount. In Windows 8.1, Windows Defender's performance is improved. Windows Defender adds only a 4-percent processing overhead to boot time. The performance improvements will also improve battery life.

Naturally, you can also choose to use third-party antimalware software or disable Windows Defender completely.

BitLocker

BitLocker is a disk encryption feature built into Windows Vista, Windows 7, and Windows 8.1. Windows 8.1 reduces the time required to initially encrypt your disk by encrypting only the portions of the disk that have data stored on them. Free space is not encrypted until the operating system writes to it.

Secured Boot

Windows 8.1 helps to reduce the risk of malware by more closely monitoring system integrity during the startup process. If Windows 8.1, working with a computer's onboard Trusted Platform Module (TPM) chip, detects any threats to system integrity, it automatically starts the Windows Recovery Environment (WinRE), which attempts to remove the malware by restoring system files and settings.

If your computer supports UEFI-based Secure Boot (as defined in the UEFI 2.3.1 specification), UEFI can help verify that all firmware and firmware updates are valid and that Windows system files are properly signed. This can make it much more difficult for a rootkit to install itself on a computer. For more information, read Chapter 27.

Microsoft accounts

Windows 8.1 supports logging in with local user accounts, just as Windows 7 and earlier versions of Windows did. For the first time, however, users have the option of logging in with a Microsoft account.

Windows and app settings work between different PCs. You can switch to a local account. Store your files in SkyDrive, and your entire Windows experience can be cloud-based. Log in to any computer, and have a familiar desktop environment and access to all your files.

This is very useful for users with multiple computers. If you use a desktop during the day, you can pick up your mobile computer, log in from a coffee shop, and continue exactly where you left off. For example, if you were in the middle of watching a video online, you can continue from that same point. If you were reading the news, Windows 8.1 will remember exactly where you were.

If you forget your password, you can use the Microsoft account website (shown in Figure 1-21) to reset your password from any device connected to the Internet. Microsoft accounts have sophisticated security features to minimize the security risks of password resets, including two-factor authentication, such as communicating with your mobile phone or a secondary email address.

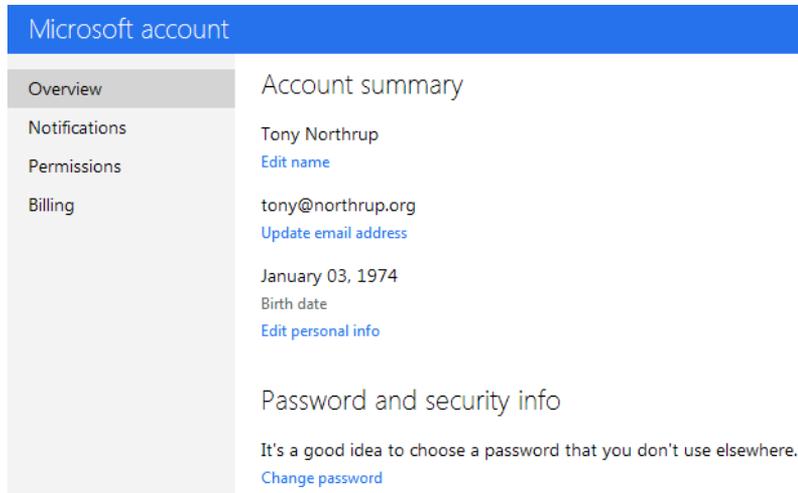


Figure 1-21 Use a Microsoft account to synchronize settings between computers and manage your account online.

If the computer can't connect to the Internet to authenticate you, or your Microsoft account credentials are compromised, Windows 8.1 can authenticate you using cached credentials. Basically, you can log in with the same user name and password you used in the past. For detailed information, read Chapter 18.

Networking

Connecting to the Internet is one of the most important uses for a PC, and users often use Wi-Fi and mobile broadband to connect to many different networks from a variety of locations. Windows 8.1 makes mobile networking easier and more efficient by giving you better control over mobile broadband charges and by more intelligently connecting to your preferred Wi-Fi networks.

Mobile broadband

Windows 8.1 treats mobile broadband connections as metered connections. This behavior causes Windows to minimize the network traffic sent across mobile broadband connections, potentially reducing data charges. To further minimize mobile broadband usage and improve battery life, Windows 8.1 will automatically turn off your mobile broadband when a Wi-Fi hotspot is available. Wi-Fi hotspots usually have faster bandwidth, higher data caps, and lower latency. If you move away from the Wi-Fi hotspot, Windows 8.1 can automatically use your mobile broadband to reconnect to the Internet.

These improvements keep you connected while reducing your costs, maximizing your network performance, and increasing your battery life.

Windows 8.1 includes a new user interface for turning wireless interfaces on and off, as shown in Figure 1-22. If your PC is equipped with mobile broadband, Windows will show a separate option on the same screen. You can use the new airplane mode to quickly turn all wireless signals off.

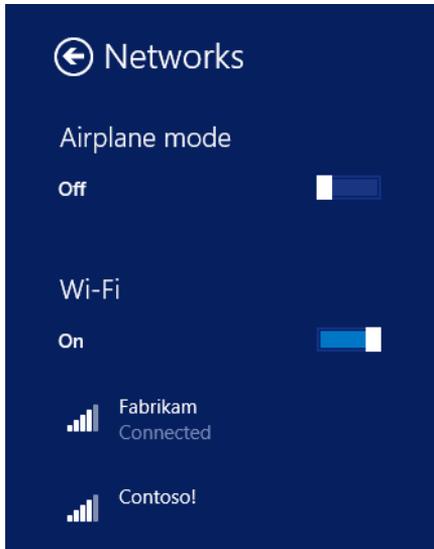


Figure 1-22 You can now easily control wireless network interfaces.

- For detailed information, read Chapter 22, “Setting up ad hoc, Bluetooth, and mobile networks.”

Wi-Fi

Windows 8.1 makes minor improvements to Wi-Fi behavior. If you manually disconnect from a Wi-Fi network, Windows 8.1 will stop automatically connecting to that network. If you disconnect from one Wi-Fi network and then connect to another, Windows 8.1 will configure the newly connected network at a higher priority so that Windows 8.1 automatically chooses that network in the future.

Windows 8.1 features connect more quickly to Wi-Fi networks when resuming from standby. Typically, Windows 8.1 can be connected to your preferred Wi-Fi network in about a second after resuming from standby. Windows 7 could often take more than 10 seconds.

- For detailed information, read Chapter 21, “Setting up a home or small office network.”

Storage

Windows 8.1 includes two major storage innovations: SkyDrive and Storage Spaces. SkyDrive provides cloud-based storage that can be accessed from any Internet-connected PC and many different mobile devices. Storage Spaces allows you to connect just about any type of disk to your computer (including disks you have left over from older computers) and combine them into organized volumes with varying levels of protection similar to RAID (redundant array of independent disks). The sections that follow describe these features in more detail.

SkyDrive

SkyDrive stores your documents on the Internet, so they can be accessed from any device with an Internet connection. You can access files stored in SkyDrive using the SkyDrive app, shown in Figure 1-23, as well as the standard open and save tools that Windows uses to access local files.

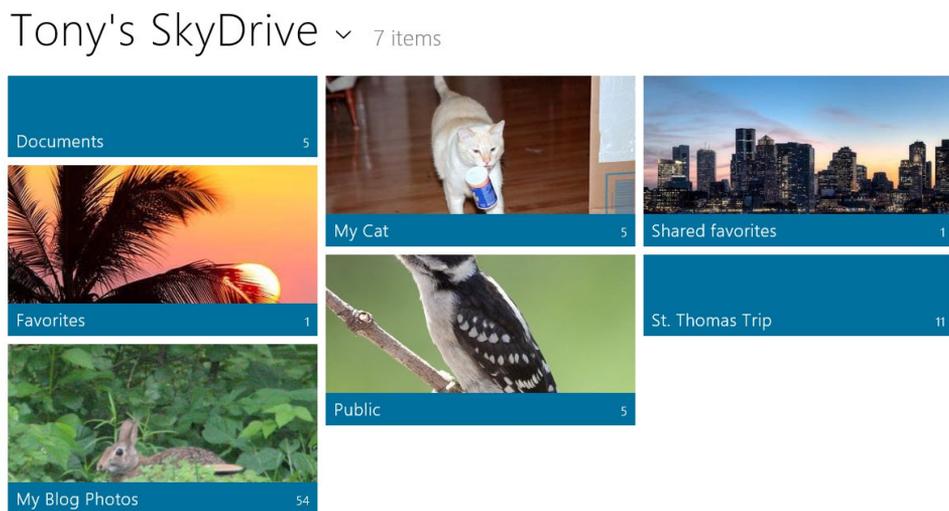


Figure 1-23 SkyDrive provides free cloud storage.

You can even choose to allow access to files stored on your local computer through SkyDrive.

Besides Windows 8.1, some of the devices you can use to access SkyDrive include:

- Any browser using the website <https://skydrive.live.com/>
- PCs running Windows Vista and Windows 7 using SkyDrive for Windows
- Macs using SkyDrive for Mac

- Windows Phone devices
- iPhones and iPads using the SkyDrive app
- Android phones using an app that connects to SkyDrive

To download the official SkyDrive apps, visit <https://apps.live.com/skydrive>. If you install the SkyDrive for Windows desktop app, you can choose to allow access to files stored only on your local computer (as shown in Figure 1-24). This can be useful if you need to access a file that you forgot to copy to SkyDrive and your computer is turned on and connected to the Internet. Access to your local files is optional and is always protected by two-factor authentication.

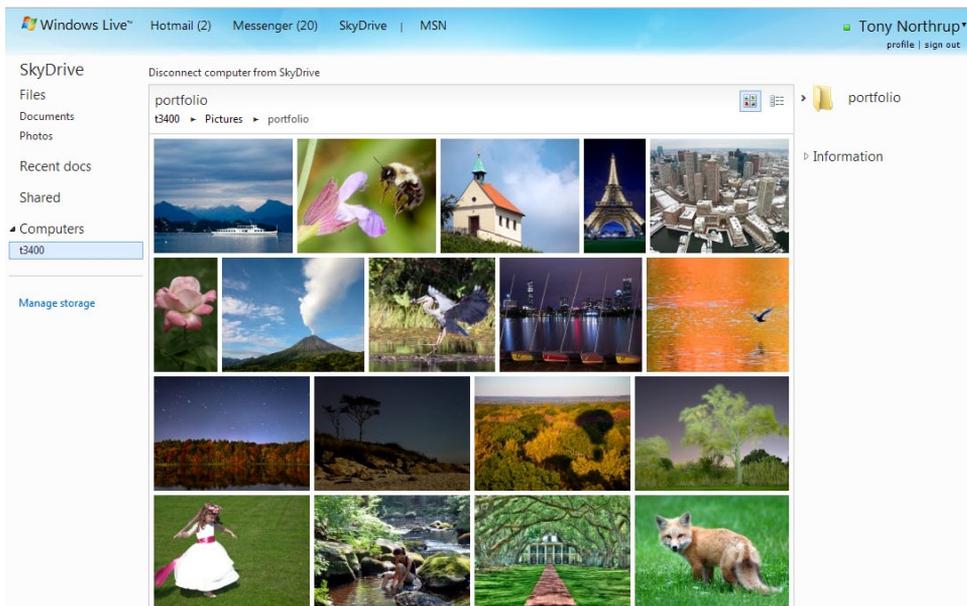


Figure 1-24 Use SkyDrive to access files stored locally on computers from across the Internet.

The SkyDrive website provides browser-based tools to access common files, including Microsoft Office documents. Depending on the file type, you might need to install apps on mobile devices to view or edit documents. SkyDrive requires logging in with your Microsoft account, which has the same credentials most users use to log in to Windows.

Many apps, including the Photos and Video apps, allow you to copy files to SkyDrive by using the Share charm, as shown in Figure 1-25.

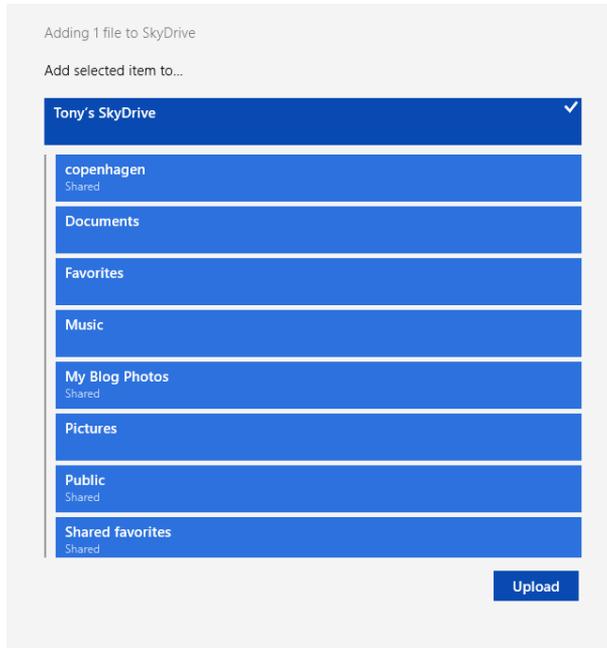


Figure 1-25 Use the Share charm to quickly copy files to SkyDrive.

As of September 2013, SkyDrive offers users 7 GB of free storage, with the option to buy additional storage. For more information about SkyDrive, read Chapter 13, “Using SkyDrive.”

Storage Spaces

With Storage Spaces (shown in Figure 1-26), you can access hard disk storage any way you want. For example, you can connect three different disks to your computer, combine them as a storage pool, and then access them as a virtual drive (such as D:\) to store your documents. Later, you could easily add more disks to increase the space. You can even configure redundancy, protecting your data in the event a disk fails.

Disks in a storage pool can be different sizes and connected through USB, SATA (Serial ATA), or SAS (Serial Attached SCSI). Storage Spaces provides two data-resiliency options to protect your data in the event a single hard disk fails:

- **Mirroring** Storage Spaces can keep an extra copy of all data on different hard disks. If a single disk fails, Windows 8.1 will transparently access the redundant copy of the data contained on your failed disk and will even make an extra copy on the remaining disks if space is available.

- Parity** Storage Spaces protects your data from the failure of a single disk by storing parity information. While mirroring requires twice the storage space, parity data requires much less space when used with three or more physical disks. Accessing and updating data protected with parity can be slower than with mirroring.

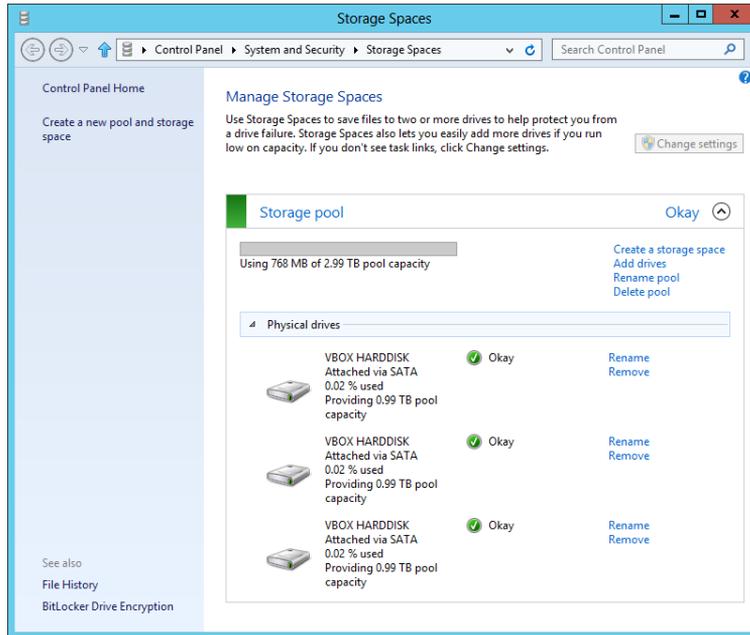


Figure 1-26 Use Storage Spaces to combine multiple drives and to provide data resiliency.

Unlike with traditional RAID mirroring and parity, you do not need to use identical partition sizes. You cannot boot from a Storage Space. Therefore, you always need a separate physical disk to use as your boot disk.

NOTE

If you have used Windows Home Server Drive Extender (a feature of Windows Home Server that is now deprecated), you might recognize some of these capabilities.

You can protect individual pools differently by using mirroring, parity, or no redundancy. For example, you could use mirroring to protect your Documents folder, parity to protect your Videos folder, and no redundancy to protect your Downloads folder.

Storage Spaces is not available with Windows RT. Chapter 12, “Managing storage,” discusses Storage Spaces in more detail.

Manageability, productivity, and troubleshooting

Windows 8.1 makes several improvements that power users especially will appreciate. While many Windows 8.1 improvements will most benefit casual users, Windows 8.1 also includes features that will make power users more productive.

Improved support for using multiple monitors makes managing the extra screen space much simpler. Task Manager has been completely reworked to provide a great deal of information instantly. If you have ever had to reinstall Windows to solve problems, you will appreciate how easy Windows 8.1 makes it to refresh or reset your PC. Finally, client Hyper-V is built into Windows 8.1 and provides the ability to run almost any operating system within a virtual machine.

The sections that follow describe these features in more detail.

Support for multiple monitors

For users with two or more monitors attached to their computer, Windows 8.1 offers two improvements:

- You can use different background images for each monitor or stretch a single image across both.
 - The taskbar can span both monitors, or you can have a separate taskbar for each monitor.
- For more information about configuring multiple monitors, refer to Chapter 5, “Personalizing Windows 8.1.”

Task Manager

Task Manager gives you detailed insight into the inner workings of your computer and the power to prioritize and stop processes. The redesigned Task Manager is both easier to use and more powerful.

When you open Task Manager by pressing Ctrl+Alt+Del on a keyboard or Windows+Power on a tablet and then clicking Task Manager, Windows 8.1 starts Task Manager with a simplified interface, shown in Figure 1-27, that simply displays a list of applications and the End Task button. This interface (which replaces the Applications tab in earlier versions of Windows) is ideal for casual users, but it does not allow a user to stop the Explorer task and lacks the level of detail power users might have become accustomed to in earlier versions of Windows.

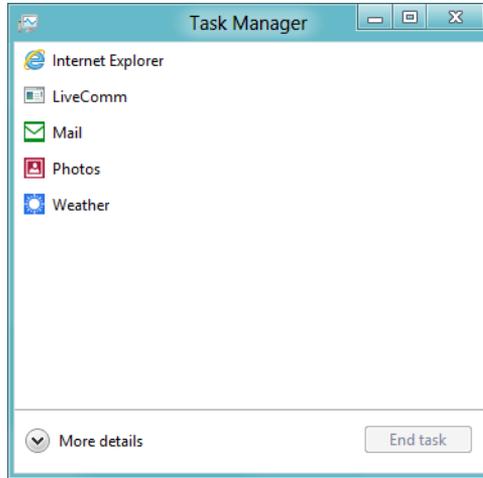


Figure 1-27 The simplified view of Task Manager lets you close running applications.

Click the More Details link to view expanded information about running applications and the operating system's state. This view of Task Manager displays seven tabs:

- **Processes** Helps you identify which process is slowing down a computer.
- **Performance** Displays an overview of the amount of CPU, memory, disk, and network resources Windows 8.1 and your applications are currently using.
- **App History** Shows you the CPU and network resources applications have used, even if the application has been closed.
- **Startup** Displays applications that start automatically.
- **Users** Displays running and suspended applications for each logged-in user.
- **Details** Displays in-depth information about every process running on the computer, similar to the information provided by the Processes tab in Windows 7 Task Manager.
- **Services** Displays all services installed in Windows, whether or not they are running.

Figure 1-28 shows the new Processes tab of Task Manager.

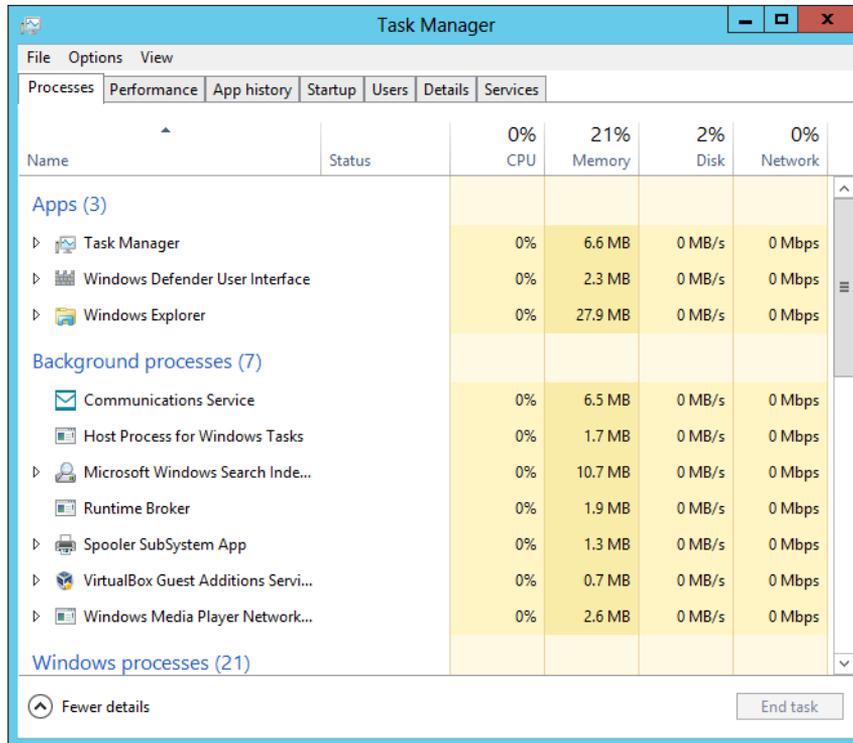


Figure 1-28 Task Manager has been completely redesigned.

- For detailed information about Task Manager, refer to Chapter 26, “Monitoring, measuring, and tuning performance.”

Refreshing and resetting your PC

At times, Windows might not perform as well as it did when new. Windows might seem slow, or you might experience seemingly unexplainable problems. The cause of these types of problems varies, but often they might be caused by unreliable drivers, corrupted system files, or malware. In the past, many users resorted to reinstalling Windows to solve these problems.

Windows 8.1 gives you two easier options on the General page of PC Settings:

- **Refresh Your PC** A useful tool for solving some Windows problems that traditional troubleshooting techniques might not have fixed, refreshing your PC automatically reinstalls Windows while maintaining your documents, some system settings, and apps. You will still need to reinstall desktop applications.

- **Reset Your PC** A useful tool for preparing your computer for a different owner, resetting your PC automatically reinstalls Windows and removes all your applications, files, and settings.

Both options reinstall Windows; however, the process happens automatically without prompting the user for the information usually gathered during setup, including choosing a preferred language and providing a product key. For more information, refer to Chapter 27.

Client Hyper-V

Windows 8.1 includes Hyper-V, which provides the ability to run virtual machines. A virtual machine is an isolated computer within your computer that can run a second copy of Windows or many other operating systems. Essentially, it's a separate computer running inside a window.

When working with virtual machines, the term *host* refers to the physical computer that is running Hyper-V. The term *guest* refers to the virtual machine that is running within Hyper-V.

Virtual machines create a simulated environment that behaves very similar to a physical computer. The guest operating system seems to have all the physical resources any operating system might have: one or more processors, memory, disks, network adapters, monitors, and a keyboard and mouse. However, all these resources are virtual, giving you complete control over the guest operating system.

While most users will never need to create a virtual machine, they can be very useful to advanced users. You can use virtual machines to:

- Try new software without impacting the settings on your computer, which is particularly useful if an app might be malware.
- Run an operating system other than Windows 8.1, which might be required if an app does not run properly in Windows 8.1.
- Test a variety of different configuration settings without impacting your computer.
- Undo any number of changes to a computer, instantly returning it to an earlier state.

Each running virtual machine requires dedicated memory. For example, if you want to run Windows 8.1 within a virtual machine, you need to allocate at least 2 GB of RAM to the guest operating system. This would reduce the amount of RAM available to apps running on your host. Each virtual machine also needs to store its own system files on a virtual disk. Therefore, if you plan to use virtual machines, you should consider adding extra RAM and hard disk space to your computer.

Using Hyper-V requires the 64-bit version of Windows 8.1 Pro and a computer with second level address translation (SLAT) capabilities (found in some Intel Core i7, Core i5, and Core i3 processors and in AMD processors that support Rapid Virtualization Indexing). You might need to enable SLAT by configuring your computer's BIOS settings. Hyper-V also requires an additional 2 GB of RAM, for a total of at least 4 GB of RAM.

Inside OUT

Free Hyper-V alternative

If your computer does not meet the Hyper-V requirements, consider using VirtualBox. VirtualBox, available from www.virtualbox.org, is free, runs on both 32-bit and 64-bit versions of Windows (including earlier versions of Windows), and requires only 512 MB of RAM.

Hyper-V is not enabled by default. To enable it, select the Hyper-V option from Turn Windows Features On Or Off in Control Panel. Then, restart your computer. You can then launch the Hyper-V Manager desktop app to configure Hyper-V.

- For detailed information, read Chapter 20, "Using Hyper-V"

What's new in the Windows 8.1 update

In October 2013, Microsoft released Windows 8.1, a free update to Windows 8. Similar to a service pack, Windows 8.1 fixes bugs, adds new features, has been more thoroughly tested than a typical update, and can be directly installed on new computers.

The sections that follow discuss the most important features added in the Windows 8.1 update.

 **What's new in the Windows 8.1 update** Watch the video at <http://aka.ms/WinIO/new>.

Improved multitasking

One of the biggest innovations in Windows 1 (released in 1985) was the ability to run multiple apps side by side in separate windows. That innovation was so important that an entire operating system was named after the feature.

Windows 8.1 still supports traditional windows on the desktop. However, the Windows 8.1 touch interface runs most apps full-screen.

In Windows 8, you could run two apps side by side. However, one app always ran at a resolution of 320 pixels, while the other app took up the remaining space. That worked well on most tablets, but it looked rather silly on my 30-inch monitor because the second app took up a narrow strip of only 12 percent of my screen.

The Windows 8.1 update removes the 320-pixel limitation, allowing you to resize side-by-side apps to any width. For example, you can have two apps running side by side, evenly sharing the display, or you can resize the apps, as long as each is wider than 320 pixels.

If you have a 1080p resolution screen (1920x1080 or higher), you can run three or more apps side by side in Windows 8.1. Figure 1-29 shows four apps running on a 2560x1600 pixel monitor: Photos, Weather, the desktop, and SkyDrive. If the maximum number of apps are running side by side and you launch a new app, Windows 8.1 prompts you to choose which app you want to replace.

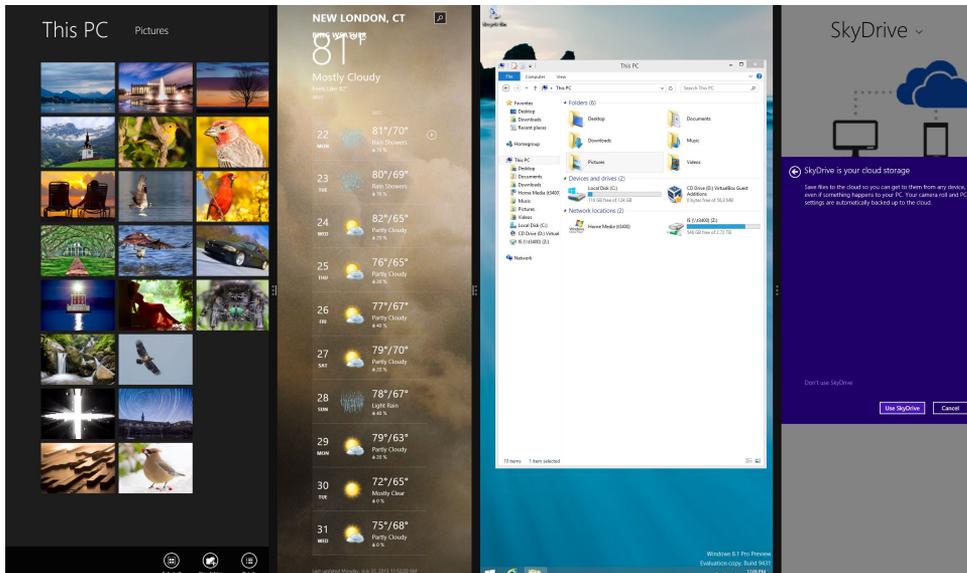


Figure 1-29 Windows 8.1 provides more flexible multitasking.

Boot to desktop and other navigation properties

Windows 8 always showed you the Start screen after booting. Some users prefer to work on the desktop, however, or they need to automatically start a desktop app, such as Home Theater PC (HTPC) software. With the Windows 8.1 update, you can start the desktop automatically after logging in.

To go directly to the desktop when you log in, search from the Start screen for **navigation properties** and select it. Then select **Go To The Desktop Instead Of Start When I Sign In**, as shown in Figure 1-30.

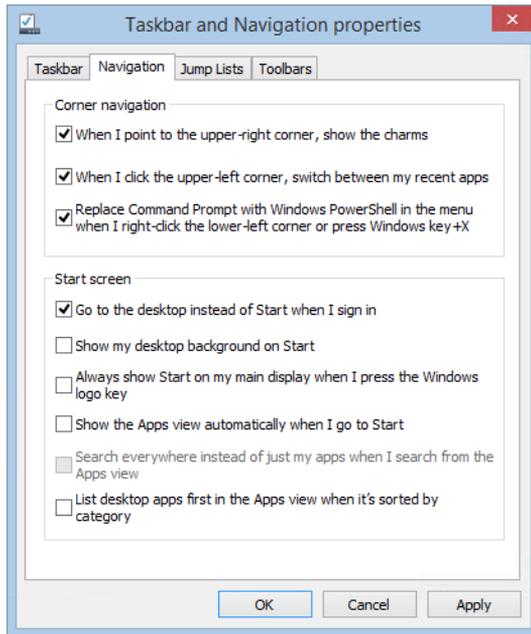


Figure 1-30 Windows 8.1 lets you boot to the desktop. Finally!

You'll find a few other useful options on the Navigation tab:

- **Show My Desktop Background On Start** As the name indicates, you can now select your own picture as the Start screen background.
- **Always Show Start On My Main Display When I Press The Windows Logo Key** By default, Windows shows the Start screen on whichever display you're currently using. If you'd rather have it appear always on the main display, select this check box.
- **Show The Apps View Automatically When I Go To Start** By default, the Start screen displays the tiles that you've organized. If you'd rather see a list of all the apps, select this check box.
- **Search Everywhere Instead Of Just My Apps When I Search From The Apps View** By default, Windows searches only your apps when searching from the Apps view; it doesn't search your files, settings, or the web. If you'd like it to search for all these, select this check box.

- **List Desktop Apps First In The Apps View When It's Sorted By Category** If you spend most of your time on your desktop and don't use many apps designed for Windows 8.1, selecting this check box helps you find your apps faster.

Start button on the desktop

In Windows 8, users had to open the Start screen by pressing the Windows logo key on the keyboard or a tablet, or by clicking in the lower-left corner of the desktop. As shown in Figure 1-31, Windows 8.1 has added a Start button to the desktop, in the same place earlier versions of Windows had it.



Figure 1-31 The Windows 8.1 desktop has a Start button.

The desktop Start button doesn't open a Windows 7–style Start menu like you might expect; it displays the Start screen. If you've already learned how to open the Start screen without using the Start button, you can turn it off by installing the free StartKiller app from <http://www.tordex.com/startkiller/>.

If you miss your Windows 7 Start menu, get it back by installing Start8 from <http://www.stardock.com/products/start8/>.

Improved WinX menu

The WinX menu has always been my favorite power user's tool—open it by pressing Windows+X or right-clicking the lower-left corner of the screen. The WinX menu now gives you more options, including the options to sleep, restart, or shut down your PC.

Lock screen slide show

Your lock screen can now display a photo slide show. That's nice if you have a tablet displayed in a common area of your house, such as a tablet propped up in your kitchen. To set up a slide show, follow these steps:

1. From PC Settings, select PC & Devices.
2. Select Lock Screen.
3. Select Play A Slide Show On The Lock Screen.
4. Optionally, configure your slide show, as shown in Figure 1-32:
 - Select Play A Slide Show When Using Battery Power if you plan to keep your device unplugged but aren't worried about it running out of battery power.
 - Under Use Pictures From, configure the folders that have your pictures. If you keep your pictures in your Pictures folder, you don't have to configure this.
 - Select Let Windows Choose Pictures For My Slide Show to let Windows intelligently choose which pictures to show. For example, it tends to show more recent pictures from the same season, rather than embarrassing pictures of you from high school. Okay, I admit it; I have no idea how the algorithm works.
 - Configure when the slide show starts and stops by setting Show The Lock Screen After My PC Has Been Inactive For and Turn Off Screen After Slide Show Has Played For.

APP TIP

If you hate your own photos, get the free **Amazing Lock Screen** app from the Windows Store. It automatically displays Bing's photos on your lock screen.

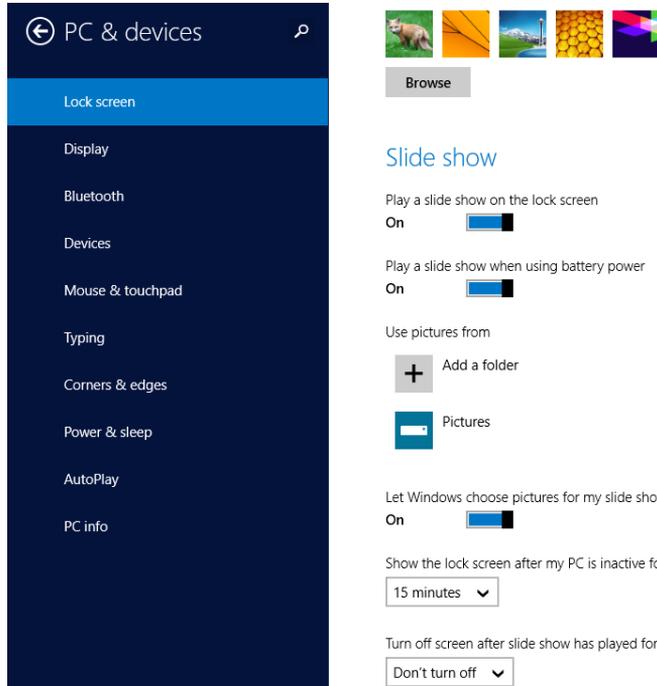


Figure 1-32 Use PC Settings to configure a slide show on the lock screen.

Camera access from the lock screen

On touch PCs, you can allow users to take pictures without unlocking the PC, similar to what you can do with most smartphones. Simply swipe down from the lock screen to open the camera without logging in. Some of the features will be limited until you log in and authenticate yourself.

Windows 8.1 enables this feature by default. To turn it off, access the lock screen settings from the PC & Devices page of PC settings, and then select Use Camera From The Lock Screen at the bottom of the page.

New tile sizes on the Start screen

You can now select larger or smaller sizes for tiles on your Start screen. The larger tile sizes allow you to get more information from live tiles without opening the associated app. The smaller tile sizes allow you to fit four times more apps on the Start screen without scrolling.

Figure 1-33 shows each of the different tile sizes: wide, large, small, and medium. To change the size of a tile, select it by flicking or by right-clicking it, and then click Resize.

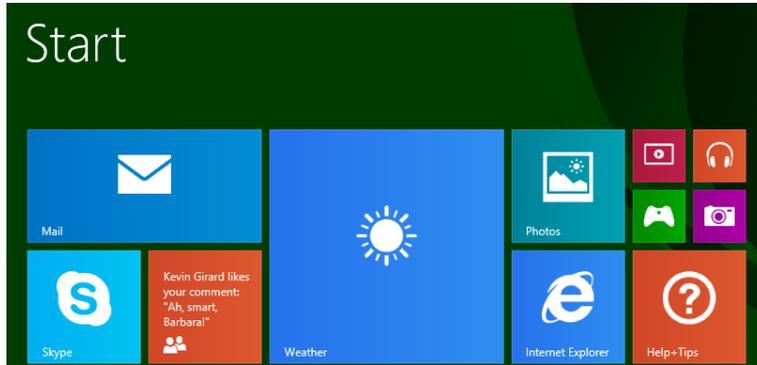


Figure 1-33 On the new Start screen, you can choose large and small tile sizes.

Improved Apps view

Just swipe up from the bottom of the screen (on touch-screen PCs) or click the down arrow in the lower-left corner of the Start screen to view all your apps, including those that don't have a tile on the Start screen. As shown in Figure 1-34, click the list at the top of the All Apps screen to change how the apps are sorted.



Figure 1-34 The All Apps screen makes it easier to find the app you need.

More personalization options

You're no longer limited to the handful of colors Windows 8 supported for the Start screen. As shown in Figure 1-35, you can select almost any color you want by opening the Settings charm and then selecting Personalize. You can also select your own desktop wallpaper, though you can't select a different image as your wallpaper.

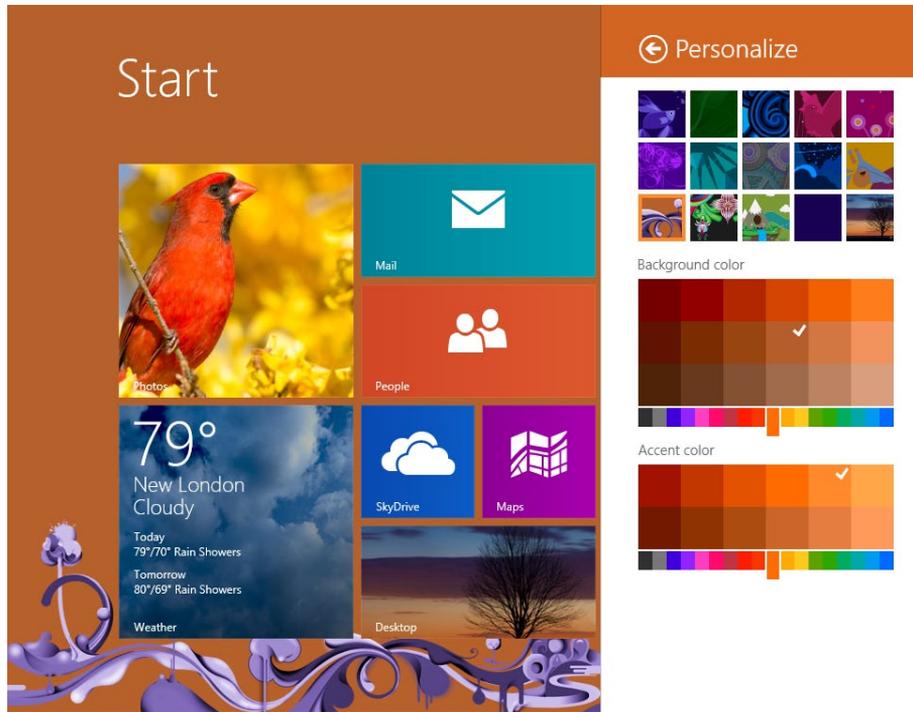


Figure 1-35 You can now select custom colors for the Start screen.

Windows 8.1 also makes your Start screen more dynamic by using motion accents. Basically, graphics move with your Start screen, providing an interesting, almost three-dimensional effect. Watch the video at the link provided at the beginning of this section to see motion accents in action.

Drastically improved searching

Perhaps my favorite improvement in Windows 8.1 is search. Now, you can simply type from the Start screen and Windows will find what you're looking for, whether it's an app, setting, document, picture, news, or webpage. As shown in Figure 1-36, Windows 8.1 displays the results using a full-screen interface that's much nicer to browse than any web search engine.

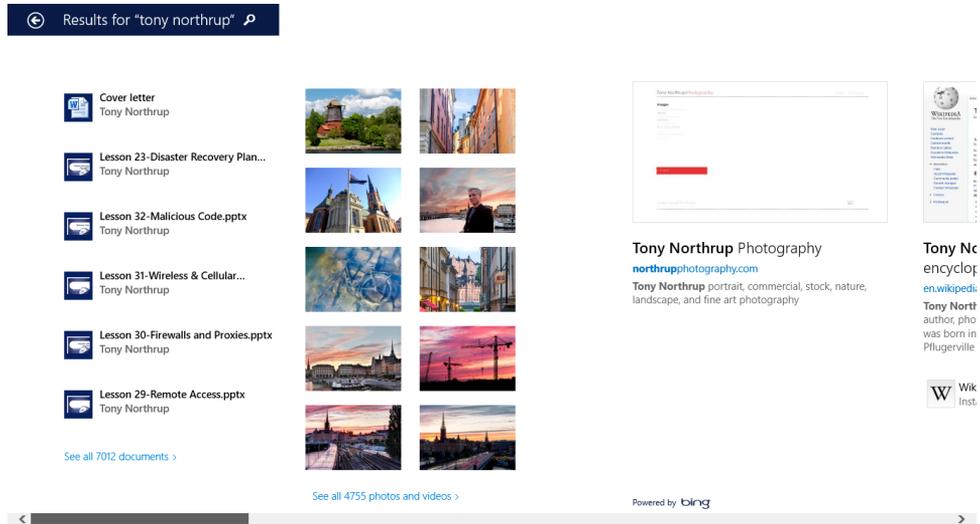


Figure 1-36 Windows 8.1 makes it easier to find anything.

More settings available with the touch interface

Windows 8 featured a handful of settings accessible from the touch interface (available from the Settings charm by selecting Change PC Settings). However, to change most settings, you still had to open Control Panel on the desktop, exactly as in Windows 7. That worked well with a keyboard and mouse, but it could be difficult to use with touch.

Windows 8.1 moves more settings from Control Panel to the touch interface. Now, all the settings most users might need to change are accessible through touch. Some settings accessed less frequently, such as configuring BitLocker or Windows Firewall, still require you to use Control Panel from the desktop.

Internet Explorer 11

In Windows 8, you could access Adobe Flash-based websites only from the desktop. The Windows 8.1 update includes Internet Explorer 11, which supports Adobe Flash, whether you're using the touch-screen interface or the desktop. Additionally, Microsoft will now distribute updates to Adobe Flash using Windows Update, which allows Adobe to more quickly fix newly discovered vulnerabilities.

Internet Explorer 11 also supports Enhanced Protected Mode (EPM) on the desktop, and EPM is enabled by default. EPM runs webpages in a sandbox, preventing them from accessing important system resources and your personal files. EPM also provides 64-bit tabs, which are less vulnerable to attacks such as buffer overflows than are 32-bit tabs.

Together, these security improvements reduce the risk of getting a malware infection from a website.

Improved security

Windows 8.1 includes several improvements to security:

- **Windows Defender network support** Windows Defender can now monitor your network communications for suspicious activity, allowing it to detect malware that would otherwise remain hidden.
- **Biometrics** If your PC has a fingerprint scanner (or if you've installed a USB fingerprint scanner), you can now use it to log on and to authenticate in other areas of Windows 8.1, such as User Account Control prompts. Naturally, you can still revert to a traditional password. However, fingerprint scanning can be a convenient way to log on, especially when using a touch-screen device.
- **Encryption** All editions of Windows 8.1 support device encryption. In Windows 8, only the RT, Pro, and Enterprise editions supported BitLocker Drive Encryption. Those editions of Windows 8.1 still provide more full-featured encryption management tools than the standard edition of Windows 8.1, but standard users can now encrypt drives for better security.
- **Assigned access** You can limit specific accounts to running only a single app. When the user logs on, that app will automatically open, and the user won't be able to switch to other apps. Assigned access is useful for kiosk environments, where a PC serves a very specific, single function.
- **Remote data removal** With increased mobility comes the increased risk of physical loss of your PCs. Windows 8.1 provides remote data removal, which allows businesses to configure types of data to always be encrypted. If the PC is lost, the business can remotely wipe the data (provided the PC connects to the Internet).

3-D printer support

Windows 8.1 supports printing directly to 3-D printers, so you can print 3-D objects using plastic. You can do this with earlier versions of Windows, but doing so required additional software. For more information about 3-D printing in Windows, including apps to help you get started, visit <http://channel9.msdn.com/Events/Build/2013/3-9027>.

Tethering

Windows 8.1 supports tethering. With tethering, you can use Wi-Fi to share an Internet connection. For example, if your Windows 8.1 PC has a mobile broadband connection, you can enable tethering and then connect other wireless devices to a mobile Wi-Fi hotspot. Any device that connects to the hotspot will be able to use the mobile broadband connection to access the Internet. Tethering is particularly useful when you are traveling because you can share a single Internet connection between all your wireless devices.

In Windows 8, you had to follow a complex series of steps to enable tethering or use a third-party app.

New business features

This book focuses on using Windows 8.1 in the home environment. However, I do want to mention the features that Windows 8.1 adds that are primarily intended for business environments:

- **NFC tap-to-print** When administrators allow it and your printers and Windows 8.1 devices support it, you can now connect to a printer using near field communications (NFC). Just tap your device against a printer, and you'll be able to print your document.
- **Better Bring Your Own Device (BYOD) support** Administrators can configure business networks to allow users to connect their home devices, including Windows 8.1 RT tablets, to the corporate network while minimizing security risks. For more information, visit <http://www.microsoft.com/en-us/windows/windowsintune/pc-management.aspx>.
- **Work folders** If your system administrator allows it, you can now synchronize your work files with your different devices, even if you bought them yourself.

What's missing

Windows 8.1 is missing a couple of features that were part of Windows 7:

- **DVD playback** Windows 7 had DVD playback capabilities built in. You could insert a DVD movie and play it without any additional software. This is not a feature in Windows 8.1. Because of licensing fees, including DVD playback capabilities increases the cost of every computer that includes Windows. However, many new netbooks, ultrabooks, and tablets do not even include DVD hardware, so including the feature would increase costs without offering the user any benefit.

- **Media Center** With Media Center, you can use a remote control to play music, videos, and DVDs, as well as to record and play TV. Media Center has been a popular way to create a Home Theater PC (HTPC). Some editions of earlier versions of Windows included Media Center, but Media Center is available only as an add-on for Windows 8.1 (for an additional charge). As with DVD playback, supporting the ability to record broadcast TV added costs to computers for features that many people would never use. To purchase Media Center, use the Add Features To Windows 8.1 tool in Control Panel, as shown in Figure 1-37.

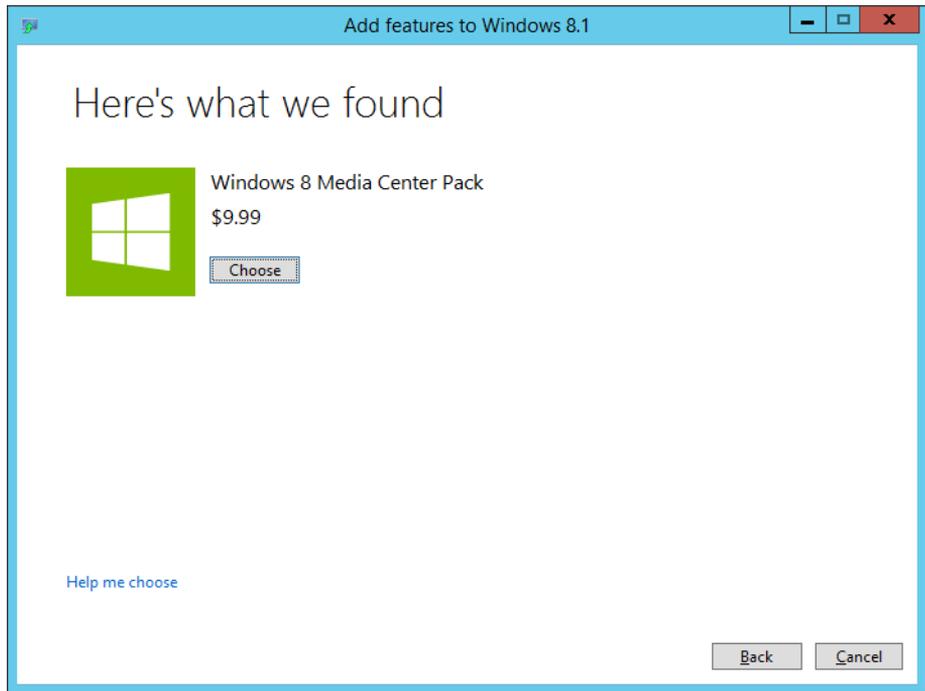


Figure 1-37 Use Add Features To Windows 8.1 to purchase and install Media Center.

For more information about watching videos, refer to Chapter 14, "Music and videos." For more information about Media Center, refer to Chapter 17, "Creating a Home Theater PC."

While Windows 8.1 does not natively support playing back DVDs, computer manufacturers are likely to include their own software for DVD playback on computers with the necessary hardware, so the user experience is not likely to change.

Inside OUT

Free Media Center alternative

I've used HTPCs for all my TV and movies since about the year 2000. In that time, I've tried many different applications. Media Center remains my favorite, but there's also a free alternative: XMBC, available at <http://xbmc.org/>. XMBC doesn't have Media Center's refinement, but for power users, it's a great choice because it has dozens of different skins and anyone can create new features for it. It has some features built in that Media Center lacks, such as automatically downloading cover art and summaries for movies and TV shows.



Creating a Home Theater PC

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Chapter 14, “Music and videos,” and Chapter 16, “Sharing and streaming digital media,” each discussed different techniques for playing music and videos on your home TV and stereo. Those approaches, such as using an Xbox or a digital media receiver (DMR), are far less complex than connecting a Home Theater PC (HTPC). Additionally, your cable TV company will probably rent you a digital video recorder (DVR) with the most important HTPC features.

So why dedicate an entire chapter to the HTPC?

- **The apps** You can run dozens of different apps to play your music and videos, and they can be infinitely customized. I’m not using hyperbole; people write custom scripts to accomplish anything they want to do with their HTPC.
- **The codecs** DMRs can play music and videos using only a limited number of codecs. Because an HTPC is a full Windows PC, and Windows always has the latest codecs available, you’ll never find a file you can’t play back on your HTPC.
- **The capacity** Large-capacity hard drives are relatively inexpensive, allowing you to store thousands of songs, movies, and TV shows for just a few hundred dollars. Most DMRs are not very easy to extend.
- **The online connection** HTPCs can connect directly to online sources for streaming music and video, giving you entertainment options not available through your cable company.
- **The games** Though PC games aren’t typically designed to be played from your couch, many can be played with a wireless controller. MAME (Multiple Arcade Machine Emulator) is particularly popular, because it allows you to play retro games. To download MAME and some free games, visit <http://mamedev.org/roms/>.
- **The cost** While many people build high-end HTPCs that cost thousands of dollars, you can also create an HTPC from a very inexpensive computer—even a 10-year-old computer is capable of being a useful HTPC. So, you can create an HTPC from a computer that you would otherwise throw away, and you can probably find a capable computer

on eBay for less than US\$100 (just make sure it can run Windows 8.1). Computers with slower processors might struggle with some HD codecs, but I personally use an old laptop with an Intel Core2 processor at a meager 2 GHz. Compared to renting a DVR from your cable company, an HTPC can even save you money.

Still, an HTPC is not for everyone. Fortunately, you don't have to go all out. Start by running free HTPC software on your computer and see if you like it. If you do, spend a few minutes connecting your PC to your TV so you can experience it the way it should be. Once you get a taste for the power of HTPC, you may never want to go back to a conventional DVR.

HTPC software

HTPC software manages your music, TV, and movies and lets you access everything from your couch with a remote control. Different apps have different features, but most HTPC software provides these basic capabilities:

- **Remote control** Whereas most apps are designed to be controlled by a mouse, keyboard, or touch, HTPC apps are primarily controlled using an infrared remote control, just like your TV and stereo.
- **10-foot user interface** Whereas tablet computers are accessed from a foot or two away, and desktop and laptops are usually within two or three feet, most people watch TV from across the room. The so-called 10-foot user interface (UI) is similar to a touch interface, with large text and icons.
- **Digital video recorder (DVR)** Many HTPC apps can play and record live TV. This is known as time-shifting, and it requires specialized hardware known as a tuner card (discussed later in this chapter). DVR capabilities usually allow you to skip past commercials in recorded TV.
- **Converting recorded TV for mobile devices** HTPC software, or add-ons such as MCEBuddy (discussed later in this chapter), can convert TV into formats you can play on your smartphone or media player, allowing you to take your shows with you.
- **Skipping commercials** HTPC software makes it easy to skip through the commercials. Typically, you can simply fast-forward 30 seconds at a time until the commercials have passed. Some HTPC software even supports add-ons that can automatically remove commercials from recorded TV shows. This makes the shows more enjoyable and reduces their storage requirements by making the video files shorter and the file sizes smaller.

- **Photo slide shows** HTPC software can show off your photos on the big screen, giving a much nicer presentation than a computer monitor.
- **Access to online streaming services** HTPC software can allow you to connect to online streaming services such as Zune HD (previously known as Zune Internet TV, available to download from within Media Center), Hulu, Netflix, and YouTube without leaving the HTPC user interface. Basically, you can stream TV from these services by using your remote control.
- **Streaming to digital media receivers (DMRs)** HTPC software often allows you to stream to other rooms in your house using a DMR. For example, Windows Media Center can stream content to an Xbox 360. For more information about streaming, refer to Chapter 16.
- **The ability to use your smartphone as a remote control** Popular HTPC software has spawned mobile apps that allow you to use your phone as a remote control or even stream music and video directly to your phone. While non-techies will still prefer a traditional remote control, smartphones allow you to view detailed information about shows, see album art, and select the next show without interrupting playback on the TV.

Some of the more popular HTPC apps include:

- **Media Center** Microsoft's official HTPC software, it's also the easiest to set up and has some of the best third-party add-ons available for it. Provides CableCARD support, allowing you to record TV shows from digital cable without using a cable box. Media Center is not as customizable as some of the other HTPC apps, however.
- **XBMC** Free HTPC software with some amazing capabilities. It provides a richer user interface than Media Center by displaying artwork, cast information, and reviews for TV shows and movies. Setup is more challenging than for Media Center, however.
- **Boxee** Based on XBMC, Boxee makes it very simple to install add-ons that give you access to many interesting Internet entertainment sources.
- **SageTV** Not free, but extremely customizable HTPC software for the enthusiast.

If you're new to HTPCs, Media Center is a great place to start. If you learn to love your Media Center HTPC but wish the software was more customizable, you should explore XMBC, Boxee, and SageTV.

Media Center

Windows Media Center, as shown in Figure 17-1, is Microsoft's own HTPC software. Technically, it's a desktop app. However, once you maximize the window, it very much feels like a native Windows 8.1 app, and works perfectly with touch.



Figure 17-1 Media Center is the official Microsoft HTPC app.

Some editions of Windows XP, Windows Vista, and Windows 7 included Media Center. With Windows 8.1, Media Center is an add-on. If you buy a new computer, you'll have to buy Media Center. If you upgrade from Windows 7, Media Center might be available as a free add-on by using the Add Features tool, which you can access by searching Settings for **add features** and then selecting Add Features To Windows 8.1.

▶ **Windows Media Center overview** Watch the video at <http://aka.ms/WinIO/mediacenter>.

Media Center settings

When using Media Center for a dedicated HTPC, there are some settings you should change. Adjust settings by selecting Settings from Tasks, as shown in Figure 17-2.

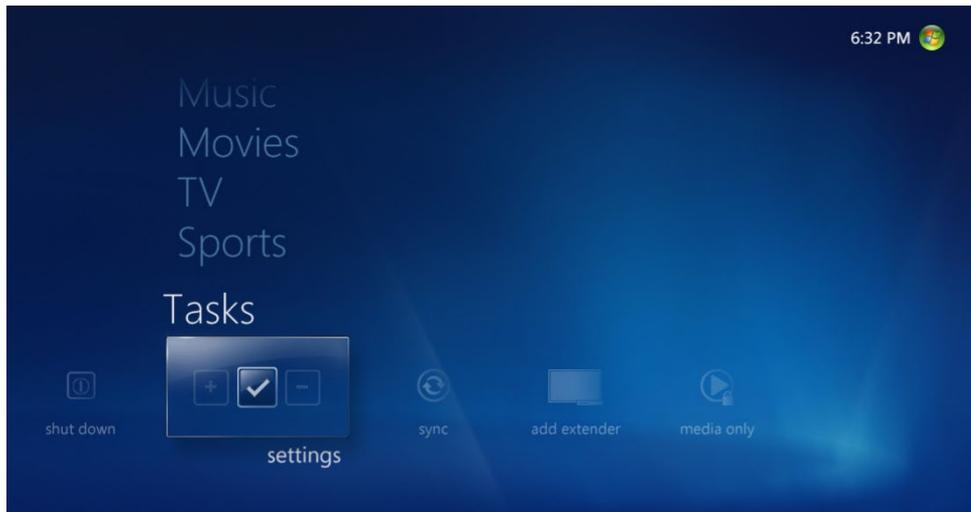


Figure 17-2 Adjust Media Center settings from the Tasks menu.

I won't bother describing all the settings, but there are some that you might want to adjust. First click Settings, then click through the menus as indicated to adjust the settings:

- **General, Startup And Window Behavior** Clear the Show Taskbar Notifications setting to prevent annoying messages from appearing while you watch videos.
- **General, Windows Media Center Setup, Set Up TV Signal** Use this wizard to configure Media Center with the information it needs to determine your TV schedule so that it can record TV shows for you. The section "Recording TV" later in this chapter describes the hardware requirements.
- **General, Windows Media Center Setup, Set Up Your Speakers** Use this wizard to configure and optimize the sound through your speakers. You can select from common speaker setups including two speakers, 5.1 surround speakers, and 7.1 surround speakers. The wizard lets you test your speakers to make sure they are all working correctly and to verify that you haven't plugged any of the wires into the wrong connectors.

Inside OUT

Understanding surround sound

With speakers, more is always better. 5.1 surround-sound setups have five speakers and one subwoofer. The first speaker is a center speaker directly under or over the TV, and it is primarily used for voices of people speaking. The second and third speakers are the left and right speakers, located near the TV. They provide stereo effects to make sound seem to come from different parts of the TV.

The fourth and fifth speakers are located behind the audience, to the left and right, and they typically provide ambient noise. The subwoofer provides all low sounds that the direction speakers are incapable of providing. You don't need subwoofers spread throughout your room to feel like the bass sounds are coming from all around; your ears simply can't tell the direction of lower sounds, but your brain kindly fills in the direction.

7.1 surround sound simply adds two speakers to the 5.1 speaker arrangement, placed directly to the left and right of the audience.

- **General, Windows Media Center Setup, Configure Your TV Or Monitor** Use this wizard to configure display settings, such as whether you have a 4:3 (standard) or 16:9 (widescreen) TV, which of your multiple displays you should use, and the type of cable you use to connect to your TV. Figure 17-3 shows the wizard selecting a flat panel TV.



Figure 17-3 Use the Display wizard to optimize your video for your TV.

- **General, Windows Media Center Setup, Install PlayReady** Installing the PlayReady component allows you to play some content encrypted using Digital Rights Management (DRM) and to copy content to portable devices.
- **General, Parental Controls** Allows you to configure the TV and movie ratings so that you can block shows that might be inappropriate for your family. The first time you open these settings, you will be prompted to configure a four-digit PIN. This PIN is required to bypass the parental controls and to change the parental control settings. Navigate to General\Parental Controls\TV Ratings and then click Advanced to fine-tune the TV content that is allowed based on violence, dialogue, and other criteria, as shown in Figure 17-4.



Figure 17-4 Use Advanced TV Ratings to fine-tune what your family is allowed to watch.

- **General, Optimization** Select the Perform Optimization check box and choose a time when your HTPC will be turned on but you aren't likely to be using it.
- **TV, Closed Captioning** Media Center records closed captioning when you record TV, and many videos and movies that you download include closed captioning information. By default, closed captioning is turned on only when you mute the sound.
- **Pictures** Use these settings to turn on the slide show screen saver, which starts a slide show of your favorite photos when you're not using Media Center. Use the other settings within this section to choose exactly which pictures from your Pictures library Media Center shows as part of the default slide show. You can also specify a different folder, which is a good way to force Media Center to show specific pictures.

- **Music** Use these settings to choose the types of songs Media Center displays in your favorite music playlist. You can also start visualizations automatically and select which visualizations Media Center shows while music is playing.
- **Extenders** Choose this option to configure an Xbox 360 to work with Media Center.
- **Media Libraries** Choose this option to add Music, Pictures, Videos, Recorded TV, and Movies folders to your Media Center library. There's an easier way to do this, however: follow the instructions in Chapter 9, "Organizing and protecting files," to add the folder to the appropriate Windows 8.1 library using File Explorer. Then, Media Center will find the folder automatically, and you'll also be able to access the folder from the Music or Video app. The one exception to this is the Recorded TV library, which does not have an equivalent in Windows 8.1. If you have multiple PCs running Media Center, share the folder from each PC that records TV, and add it to every other Media Center PC so that you can watch recorded TV from any of your PCs.

Converting recorded shows

One of the great things about using an HTPC is that you can take your recorded shows with you by copying them to a mobile computer, your smartphone, or a media player. Media Center records TV in a very high-quality format that uses a great deal of disk space. Most smartphones and media players won't be able to play the format, and if they could, the large size of the files would quickly fill up their storage.

To solve these problems, convert your recorded shows into a different video format. My favorite tool for this is MCEBuddy, available at <http://mcebuddy2x.codeplex.com/>. When you install MCEBuddy, it will prompt you to install other required tools.

Once installed, MCEBuddy has a straightforward user interface, which is primarily used to monitor the conversion process. Change the Priority in the lower-right corner to Low (shown in Figure 17-5) to reduce the performance impact that converting videos has on other running apps.

MCEBuddy is designed to automatically find and convert new recordings. By default, it monitors your C:\Users\Public\Recorded TV\ folder, which is the folder Media Center uses to store new recordings, and stores converted files in your C:\Users\Videos folder. You can change these settings by launching the app and clicking Settings to open the MCEBuddy Settings dialog box, as shown in Figure 17-6.

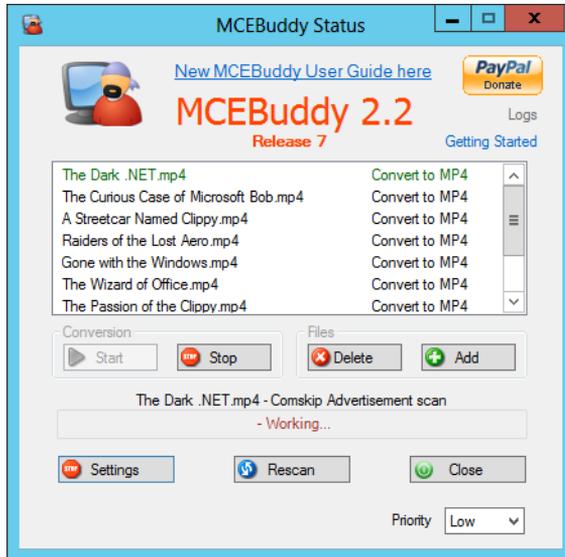


Figure 17-5 MCEBuddy works automatically in the background but allows you to monitor progress.

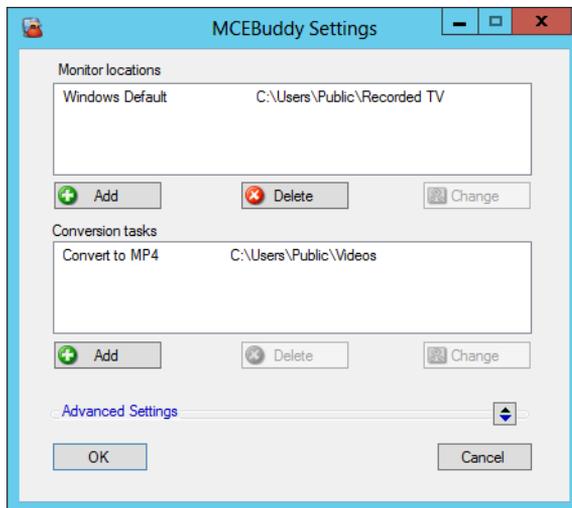


Figure 17-6 Change the settings for MCEBuddy to monitor different folders.

When you specify a new folder to monitor, you can specify a search pattern that will convert only files that match the pattern you specify. For example, if you don't want to convert every TV show you record, you can specify the names of the shows you want to convert as part of the search pattern. First, examine your Recorded TV folder to see how Media Center names

the shows you want to convert. Then, specify a pattern that matches those names, using an asterisk for a wildcard and separating different names with a semicolon. For example, entering `*HisShow*;*HerShow*` will convert all files that have either HisShow or HerShow in the file name. For more information about creating search patterns, hover your pointer over the phrase “Search pattern” in the Monitor Location dialog box.

Converting videos will consume every bit of your computer’s processor time. This has the potential to slow down other apps and might heat up your HTPC so much that the fan starts to make noise, disturbing your audio experience. Expand the Advanced Settings area at the bottom of the MCEBuddy Settings dialog box, as shown in Figure 17-7, to fine-tune the conversion schedule. For example, you could use these settings to perform all conversions when your family is asleep.

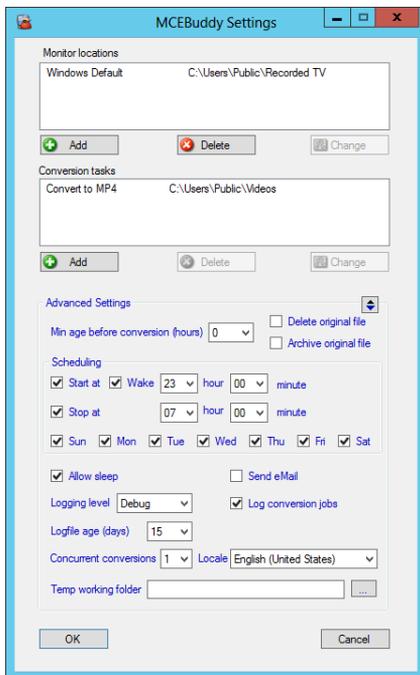


Figure 17-7 Use MCEBuddy Advanced Settings to schedule conversions for times when you are not using your HTPC.

MCEBuddy allows you to convert to several different formats. Naturally, you should choose the newest video format supported by the devices you plan to play the video on. When in doubt, choose the MP4 format, which is the default for MCEBuddy. MP4 provides great compression and quality and is supported by most video players, including iOS, Android, and Windows Phone devices.

As an added bonus, MCEBuddy can automatically remove commercials from recorded TV shows. Not only does this make the show more enjoyable to watch, but it reduces the file size, allowing you to fit more shows onto your media players.

Configuring HTPC software to start automatically

There are several settings you'll want to change to configure your PC as a dedicated HTPC.

First, configure your PC to log on automatically after you restart your computer. This saves you from having to type a password every time the computer restarts, which can happen when Windows automatically installs updates. This is only a good choice if you're not at all concerned about security.

To configure your PC to log on automatically, follow these steps:

1. At the Start screen, type **netplwiz** and then press Enter.
2. In the User Accounts dialog box, clear the Users Must Enter A User Name And Password To Use This Computer check box, as shown in Figure 17-8.

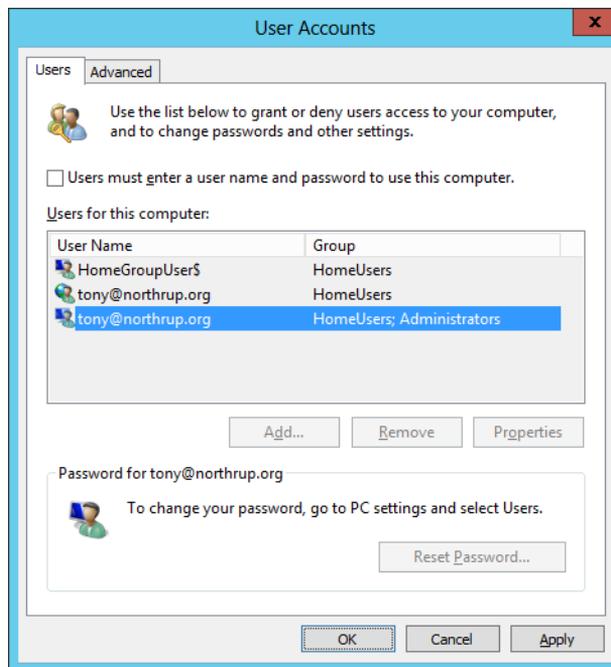


Figure 17-8 Clear the check box at the top of this dialog box to configure your PC to log on automatically.

3. Click OK and type your password twice when prompted.

The next time you restart your PC, Windows will automatically log on with your account.

In previous versions of Windows, Media Center provided a simple check box to configure it to start automatically when you log on. Media Center in Windows 8.1 lacks that option, but you can still configure Media Center (or other HTPC software) to start automatically when you log on. Follow these steps:

1. Open the desktop by clicking the Desktop app from the Start screen or by pressing Windows+D.
2. Open File Explorer. Type the following path in the address bar and then press Enter: **%AppData%\Microsoft\Windows\Start Menu\Programs\Startup**.
3. Right-click in the Startup folder, click New, and then click Shortcut. The Create Shortcut wizard appears.
4. On the What Item Would You Like To Create A Shortcut For page, type **%WinDir%\ehome\ehshell.exe**, as shown in Figure 17-9. Ehshell.exe is Media Center's executable file. If you use other HTPC software, select the app's executable file, which is probably located under C:\Program Files\. Click Next.

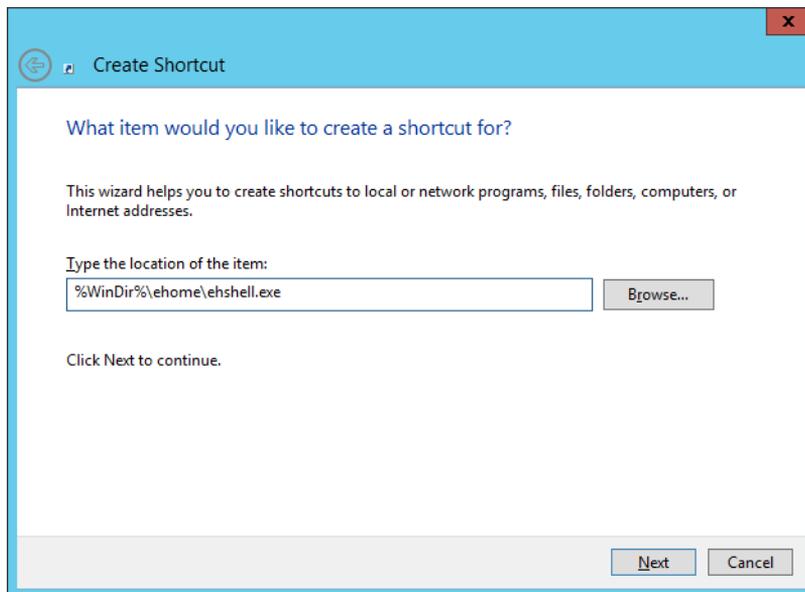


Figure 17-9 Create a shortcut for Media Center in the Startup folder to configure it to start automatically.

5. On the What Would You Like To Name The Shortcut page, type **Media Center** (or the name of your HTPC software), and then click Finish.
6. Right-click in the Startup folder, click New, and then click Shortcut.
The Create Shortcut wizard appears.
7. On the What Item Would You Like To Create A Shortcut For page, type **explorer.exe shell:::{3080F90D-D7AD-11D9-BD95-0000947B0257}**. Running this command opens the Windows desktop, and creating a shortcut for it allows you to run the command automatically when Windows starts. If you were to automatically run Media Center or another desktop app at startup, it would start, but it would be hidden behind the Start screen. Opening the Windows desktop brings any running desktop app to the foreground. Click Next.
8. On the What Would You Like To Name The Shortcut page, type **Show Desktop**, and then click Finish.

The next time you log on, Media Center (or the HTPC software you selected) will start automatically a short time after the Start screen appears. If you also configure Windows to log you on automatically, then Media Center will appear each time your computer starts, making it always available to everyone in your family.

One last setting to verify: disable backups for your Recorded TV folder. Recorded TV takes up a great deal of drive space, and if you do lose your hard drive, it's probably easier for you to wait for your episode to air again. For more information, refer to Chapter 10, "Backing up and restoring files."

Choosing the hardware

You can turn almost any computer into an HTPC. This section describes the benefits of different types of hardware if you plan to buy a new PC or upgrade an existing PC, and gives you information about getting the best out of the hardware you already have.

For information about selecting a tuner card to record TV, refer to section "Recording TV" later in this chapter.

 **Home Theater PC hardware** Watch the video at <http://aka.ms/WinIO/hardware>.

Case

A computer's case determines its form factor. Large desktop computers offer plenty of room for internal adapters and drives, but they also take up more space in your entertainment center. Small form-factor cases are the most popular for HTPCs, but if you have room in

your entertainment center, a full desktop case offers lower cost, easier upgrades, and more flexibility.

My favorite way to store an HTPC is to keep it with the audio/video (A/V) equipment in a closet or the basement and just run cables through the wall to the TV and speakers. I recommend that approach if it's an option because you can pick any size case, you won't have to see it from your living room, and fan noise will never be an issue.

If you do plan to keep your HTPC near your TV, choose an attractive case that fits in with your A/V equipment. Several vendors sell PC cases specifically for this purpose, or you can simply look for a case with a black front.

Fan

Here's an audiophile's nightmare: you spend thousands on a top-of-the-line digital amplifier and connect it to an amazing subwoofer and surround-sound speakers. You position your couch for absolutely perfect acoustics. Then, you play your first movie on your HTPC, and the fan buzzes the entire time, ruining the sound for you.

PC processors, power supplies, and memory get hot when you use them. Almost all PCs are air cooled; they have a couple of fans inside them that blow whenever the thermostat inside the computer determines that it's getting too hot. Unfortunately, those fans can be very noisy.

As I recommended in the previous section, one of the simplest solutions is to put your HTPC in a closet or another room. Then, the fan can buzz all it wants and you won't be bothered by it. If that's not an option, find a quiet PC. Many PCs are designed to stay as cool as possible and have particularly quiet fans, and some are so efficient they don't need a fan at all. They'll cost more than a more conventional PC, but the extra cost might be worth it if you get the most out of your sound system.

Other than specially designed quiet PCs, mobile computers tend to be quieter. They're designed to minimize power usage, which in turn minimizes heat and how fast the fan needs to run.

Many entertainment centers have doors that close. That door can minimize the sound that comes from your computer. It can also trap the heat in, causing your computer to overheat and run the fan even more. The point is: consider cooling when choosing an entertainment center for your HTPC.

Video card

Here's some great news: you don't need an expensive video card for playing music and videos. You only need an expensive video card if you plan to play 3-D games.

You do, however, need to make sure you can easily connect your video card to your TV and stereo. Most newer TVs support High-Definition Multimedia Interface (HDMI), so choose a video card that outputs both audio and video through HDMI. Figure 17-10 shows an HDMI connector.



Figure 17-10 HDMI provides perfect quality and simple wiring.

Typically, you can run an inexpensive HDMI cable from your HTPC to your stereo, and then run a second HDMI cable from your stereo to your TV. The stereo will play the audio and pass the video on to your TV. This makes for a very simple connection because you don't need to run a second cable for audio.

If you plan to use your TV's speakers, simply run an HDMI cable from your HTPC to your TV. Verify that your video card, your HDMI cable, and your TV all support both audio and video over HDMI. Figure 17-11 shows a video card with DVI, HDMI, and VGA outputs.



Figure 17-11 To simplify wiring, choose a video card that supports HDMI output.

If your TV doesn't support HDMI, check to see whether it supports VGA or DVI (Digital Visual Interface). Most new video cards support one or the other, and you can use an inexpensive adapter to convert between the formats. Figure 17-12 shows a VGA cable with an inexpensive DVI adapter connected to it.



Figure 17-12 Convert between VGA and DVI using an adapter.

If your TV doesn't support HDMI, VGA, or DVI, then choose a video card that supports TV out in the format your TV requires. For example, some early HDTVs require component input, while others support composite input. Video cards are available with both types of connections. Figure 17-13 shows a video card designed for connecting to analog TVs. From left-to-right, the video card has three outputs: composite, S-Video, and VGA.



Figure 17-13 To connect to an analog TV, buy a video card with analog outputs.

If you already have a video card you want to use and it isn't compatible with your TV, you can purchase an adapter. For example, you can buy an adapter that connects HD video to HDMI, as shown in Figure 17-14, allowing you to connect otherwise incompatible HD systems. These adapters tend to be more expensive than basic video cards, however.



Figure 17-14 Use an HDMI converter for devices that lack HDMI output.

Most new mobile computers include an HDMI, mini-HDMI, or micro-HDMI port. Use an HDMI cable with the appropriate connector type to connect directly to a TV. If you are using a mobile computer and your TV requires analog composite or S-Video connectors, purchase an adapter such as the one shown in Figure 17-15, along with the appropriate cables to connect to your TV.



Figure 17-15 Use adapters to convert HDMI output to connect to analog TVs.

When I travel, I bring a PC running Windows 8.1 with Media Center installed, an HDMI cable, the adapter shown in Figure 17-15, a composite cable with audio support, and an S-Video cable (they don't take up as much room as you might think). Depending on the type of TV the hotel room has, I connect my mobile PC with either the HDMI cable or the adapter and watch TV shows and movies using Media Center. While I could watch them on the PC's screen, I much prefer watching them on the TV. This is particularly important when traveling to foreign countries/regions where I don't know the local language.

Inside OUT

HD video resolutions

Higher resolutions offer sharper images if your monitor or TV can display them in full resolution. For example, 1080p video looks fantastic on a 1080p display. However, many mobile PCs, especially tablets, have a display that is 768 pixels tall, which means they can't display the extra resolution. Rather than playing 1080p video, you should use 720p video, which almost perfectly suits a 768 pixel display.

If you record broadcast HDTV, it will almost always be 720p. Currently, 1080p HDTV is only available online or on Blu-ray DVDs.

Don't be too bummed out. In most households, people don't sit close enough to TVs to see the difference between 720p and 1080p, and 720p video files take up much less storage space, which means you have room to keep far more videos at your fingertips.

Processor

Playing videos doesn't require a particularly cutting-edge processor, but there's no specific formula I can give you; the processing requirements vary depending on the resolution of your video and the codec being used. For example, 1080p HD video requires much more processing capacity to play smoothly than does 480p video. With that said, modern, low-end mobile processors are very capable of playing 1080p video.

As an added benefit, lower-power processors use less power and generate less heat. Not only will that help keep your electricity bill down, but it will allow the HTPC's fan to run at lower speeds, keeping the HTPC quieter.

Encoding or transcoding video can be a different story. If you have remote DMRs connecting to your HTPC across the network and you run transcoding software (as described in Chapter 16), you should choose the fastest processor you can afford. Transcoding video in real time, especially HD video, can max out even higher-end systems.

Memory

Memory is another area where you can skimp with an HTPC. Even 1 gigabyte (GB) of RAM is sufficient for playing any video, including HD video. As with the processor, if you plan to transcode video, more memory can help. Additionally, other apps you run on your HTPC might require more memory, so refer to those apps' recommendations.

Storage

Even the slowest modern hard drives can play back 1080p video with no problem. Therefore, choose a low-RPM, low-power hard drive for your HTPC, as shown in Figure 17-16.

If you plan to stream video across the network, you need only enough storage for Windows 8.1 and any apps that you plan to run. Even the smallest modern hard drives will be more than sufficient.

If you plan to store movies and TV shows, you might need a very large hard drive, and you might even need to combine multiple drives. Table 17-1 lists typical file sizes for different media types, though file size can vary widely depending on the video quality and the compression algorithm being used. Multiply these sizes by the number you plan to store on your HTPC simultaneously to determine your storage requirements.



Figure 17-16 Use high-capacity, inexpensive, low-power hard drives in HTPCs.

Table 17-1 Approximate storage required for different file types

File type	Approximate size
Medium-quality MP3 or WMA song	3 megabytes (MB)
High-quality MP3 or WMA song	5 MB
Lossless song	25 MB
480p, 30-minute TV show without commercials	200 MB
720p, 30-minute TV show without commercials	750 MB
1080p, 30-minute TV show without commercials	2 GB
480p, one-hour TV show without commercials	400 MB
720p, one-hour TV show without commercials	1.5 GB
1080p, one-hour TV show without commercials	4 GB
480p movie	700 MB
720p movie	2.5 GB
1080p movie	8 GB

If you need more capacity than a single drive can provide, combine your drives into a Storage Space so that you can access them as a single volume. For detailed information, refer to Chapter 12, “Managing storage.”

Sound card

The type of sound card you need is determined by how you connect your HTPC to your stereo and TV:

- **HDMI or other digital connection (recommended)** If you use HDMI for both audio and video, you don't need a sound card at all. Your computer will simply pass the digital audio signals directly across the HDMI cable with no additional processing. Your receiver or TV will be responsible for decoding the stereo and surround-sound signals.
- **Analog** When you use an analog connection, your computer must perform the decoding of stereo and surround-sound signals. This isn't an extremely processor-intensive task, and many inexpensive sound cards (including sound cards built into most motherboards) are quite capable of this task. However, the quality of analog sound can vary widely because analog sounds are subject to interference from both other components within your computer and other wiring that the cables are near outside your computer. For best results, use an external USB sound card (which eliminates interference from internal components) and use shielded cabling that only crosses other wires perpendicularly.

Digital is always superior. If you're not sure whether your receiver or TV supports digital audio, just look at the connectors on the back of the receiver and choose a sound card with similar connectors. The most common digital connection types are HDMI, Toslink/SPDIF, and digital coaxial.

As a last resort, you can connect your amplifier or speakers to the headphone jack on your computer. While many stereos have a 3.5mm auxiliary port, many others require red and white RCA connectors. Figure 17-17 shows a specialized cable designed to connect any device with a headphone jack to a stereo that uses RCA connectors.



Figure 17-17 As a last resort, connect your headphone jack to your stereo.

If you connect your computer's headphone jack to a stereo, turn the volume on the computer all the way up, and then adjust the volume using your amplifier. Sound quality might be noticeably bad, especially when playing back quiet recordings. If you hear crackling during the louder parts of the sound track, turn the volume on the computer down until the crackling disappears.

Network

If you plan to record all your TV and movies using a tuner card, your HTPC's network connection isn't terribly important. You'll still need some network connection so that the HTPC software can download show schedules and information, but any wired or wireless connection will be sufficient.

Similarly, streaming music across the network doesn't require much bandwidth. As long as your network connection is stable, you shouldn't have any problem streaming music.

If you plan to stream video, however, your bandwidth becomes very important. If you plan to stream HD video, especially 1080p video, getting sufficient bandwidth could be the most challenging aspect of setting up your HTPC.

If you plan to stream standard-definition video from the Internet, just about any broadband connection should be sufficient. On your local network, make sure that you consistently maintain at least 10 Mbps available bandwidth. The latest wireless networks are capable of that; in particular, look for equipment that supports 802.11n, and try to keep your HTPC as close to your wireless access point (WAP) as possible.

If you plan to stream HD video from the Internet, make sure your LAN speeds are at least as fast as your Internet connection. For example, if you have a 20 Mbps Internet connection, configure your LAN so that it has at least 20 Mbps throughput. Remember that wireless bandwidth estimates are wild exaggerations, and even the latest 802.11n networks can reach 20 Mbps only when the wireless access point is very close to the PC.

If you plan to stream 1080p HD video across your LAN, you're going to need as much bandwidth as possible. The precise amount of bandwidth varies depending on the compression level used in the video, but 100 Mbps throughput is a good value to strive for. Wireless networks will simply be inefficient. Instead, run wired Ethernet cables between the PC storing your videos and the HTPC or DMR playing the videos. If you can't run wired Ethernet, use the latest powerline networking adapters rated at 200 Mbps or 500 Mbps, as shown in Figure 17-18. In my experience, the 200 Mbps and 500 Mbps adapters have similar performance, so paying more for 500 Mbps might not be worth it.



Figure 17-18 Powerline networking can provide the consistent bandwidth you need for streaming HDTV.

Cables

When choosing connection types and cables, choose digital over analog whenever possible. You have several choices for digital connections, and the quality will be similar regardless of which you choose. However, for simplicity, you should choose HDMI for both audio and video when your equipment supports it.

Don't buy expensive digital cables. Digital signals don't degrade from interference like analog signals do; digital signals either work or they don't. Don't trust anyone who tells you that a more expensive digital cable will improve your sound or image quality. Really, you only need to spend a few dollars on cables.

TROUBLESHOOTING

How can I improve my sound quality?

If you have poor sound or video quality with an analog connection, it could be caused by several sources: interference at the cable, poor connections, poor-quality audio/video equipment, or poor-quality speakers. To troubleshoot the problem, use a different cable, preferably a short cable, even if you need to move your speaker or monitor closer to your HTPC.

If the problem goes away, it's the cable. If not, it's an internal component.

If your cable is to blame, try moving the cable away from any other cables. If the problem persists or you can't move the cable away from other cables (for example, if they are bundled together), replace the cable with a thicker cable featuring better shielding.

If you regularly remove and reconnect a cable, you should pay particular attention to how the connector is attached to the cable because that area tends to wear out quickly. However, if you simply plan to connect a cable once and leave it connected for years, even the most flimsy cable should work fine.

Speaker cables (the two-wire cables that connect your amplifier to your speakers) are analog. Therefore, proper shielding really can make a difference. Still, as long as you're not running them through the wall or alongside power cables (always cross power cables perpendicularly to minimize interference), you shouldn't notice a difference.

If you do run cables through the wall, be sure to get cables that meet your local building codes. Typically, this requires plenum cables that minimize the risk that fire will travel up a cable, thus reducing the risk that the cable will help spread a fire throughout your house.

Recording TV

If you want to use your computer to record TV, you'll need a tuner card. You can use a tuner card to connect your computer to your cable or satellite TV or to record broadcast transmissions. The four ways of connecting, in rough order of preference, are:

- Digital, by connecting your cable service directly to a tuner card and using a CableCARD with Media Center
- Digital, by connecting your cable service to a cable box, and then connecting the cable box to a tuner card

- Analog, by connecting your cable service directly to a tuner card
- Analog, by connecting an antenna directly to your tuner card

The sections that follow describe these four ways in more detail. Except for the discussion of CableCARD, references to cable TV also apply to satellite TV.

Inside OUT

Choosing a tuner card

Because some people still watch live TV, TV networks tend to air the best TV shows at the same time, but on different channels. Look for tuner cards that allow you to record two shows airing on different channels simultaneously. Look for a card with dual tuners that has a single incoming connection with an internal splitter, because it will minimize the number of cables that you need to run.

Encrypted digital cable with a CableCARD

The best way to record premium and encrypted digital channels is by using a CableCARD. If you had a laptop 15 years ago, you might remember Personal Computer Memory Card International Association (PCMCIA) cards, which were later known as PC cards. CableCARDS are PCMCIA cards that contain the technology to allow your computer to decrypt the digital cable signals that most consumers use a cable box to decrypt.

When you use a CableCARD, you do not have to use an infrared (IR) blaster (described later in the chapter), so you never have to worry about missed channels. Additionally, you can save some money by not having to rent a cable box from your cable provider. Modern CableCARDS allow your HTPC to record multiple channels simultaneously, so you typically need only a single CableCARD and a single connection to your HTPC.

CableCARDS came about as part of the Telecommunications Act of 1996. Among other purposes, CableCARDS free consumers from needing to use their cable company's cable box. By connecting a CableCARD to a DVR or an HTPC, your HTPC can receive all the basic and premium digital cable channels you receive with a cable box.

Your cable company should be able to provide a CableCARD at your request. Many people complain that their cable companies make this process as difficult as possible. This makes sense because the alternative to using a CableCARD in an HTPC is to rent a costly DVR from the cable company.

You'll also need a tuner card that supports the CableCARD standard. A single tuner card, CableCARD, and coaxial connection will allow you to record multiple channels simultaneously. At the time of this writing, some of the popular cards include:

- **The Ceton InfiniTV 4 card** An internal card that can record four channels. Costs about US\$200.
- **The SiliconDust HDHR3-CC HDHomeRun PRIME** An external USB device that can record three channels. Costs about US\$150.
- **The Hauppauge WinTV-DCR-2650** An external USB device that can record two channels. Costs about US\$110.

Finally, you'll need HTPC software that is compatible with the CableCARD standard. The cable companies define copy protection for shows recorded with a CableCARD, and software must be certified for use with the CableCARD; otherwise, it would be too easy to circumvent copy protection. Right now, only Media Center is certified for use with a CableCARD. For detailed information about CableCARD copy protection, read "Cable Provider Copy Protection, Switched Digital Video and Self-Install Status Master List" at <http://www.missingremote.com/forums/cable-provider-copy-protection-switched-digital-video-and-self-install-status-master-list>.

Unfortunately, pay-per-view and on-demand services are not available when using a CableCARD. Therefore, you might need a separate cable box connected directly to your TV for those services.

Using a cable box or other device that connects to a TV

If your cable company won't provide a CableCARD, you can still record TV output from a cable box. For example, the Hauppauge Colossus PCI Express Internal HD-PVR has HDMI and component video (YCrCb) HD inputs, allowing it to record 1080i video from any device that would normally connect to an HDTV. This allows you to record from almost any source. To allow your HTPC to change the channel on your cable box, you need an IR blaster, which is included with most tuner cards.

If you want to record multiple channels simultaneously, you need multiple cable boxes, each separately connected to a video recording card in your HTPC. Naturally, you'll need to pay a rental fee to your cable company, making this a much more expensive option than using a tuner card that supports a CableCARD.

Higher-end tuner cards include a hardware encoder, whereas lower-end tuner cards require the processor in your HTPC to do the encoding. Choosing a tuner card with a hardware encoder will reduce your processor usage, but it might not be necessary if your computer has

a powerful processor. If you have a low-end processor and you plan to record HDTV, choosing a tuner card with a hardware encoder can ensure trouble-free operation.

Analog and unencrypted digital cable

You can watch and record analog and unencrypted digital cable by connecting the coaxial cable directly to your tuner card (shown in Figure 17-19) and recording analog TV. Inexpensive TV tuners, such as those made by Hauppauge, can be used to record analog or unencrypted digital cable TV using quadrature amplitude modulation (QAM). QAM basically broadcasts over-the-air channels, including local HDTV, across cable TV unencrypted and for free.



Figure 17-19 Use a tuner card to record TV from analog cable.

Internal tuners tend to work better than USB tuners. However, if you are using a mobile computer, a USB tuner is your only option.

Typically, only basic cable channels are provided as analog and unencrypted digital cable. Premium channels such as HBO and Showtime are not available using this recording technique. This type of recording is the simplest because your computer can control the channel without communicating with any external device.

Some tuner cards can also receive FM radio when connected to an antenna. Most popular radio stations stream across the Internet, and that's how I prefer to listen to them on my HTPC. However, if you listen to FM radio and your favorite station doesn't stream, look for a card with an FM tuner.

Over-the-air broadcasts

Though most tech-savvy people seem to use cable or satellite TV, there are some distinct advantages to recording over-the-air broadcasts:

- There are no monthly fees.
- You can receive high-quality HDTV.
- You can receive local news, which is often not available through a cable provider.
- Your HTPC can act as the tuner, so you do not need a separate cable box or IR blaster (discussed later in this chapter).

Most tuner cards that record directly from a coaxial cable can also record over-the-air broadcasts. Of course, most cable channels do not broadcast over the air, but you can receive your local TV for free by connecting a TV antenna to your tuner card. A significant advantage of recording over-the-air broadcasts is that you can record digital, HDTV without using a cable box.

To record over-the-air broadcasts, you need an HDTV antenna, which typically costs between US\$35 and US\$80.

Using IR blasters

HTPCs can use a device, known as an IR blaster, that transmits infrared (IR) signals to control other components of your entertainment system. These devices send the same IR signals you send with a remote control.

Most commonly, IR blasters are used to change the channel on the cable box, just like you do when you watch TV. In other words, if you use a cable box and you want to watch live TV on channel 36 on your HTPC, you'll use your HTPC's remote control to change the channel. The HTPC will then change the channel on your cable box and begin recording and playing back the video signal.

Some people also use IR blasters and HTPC software to turn their TV and receiver on or off and to make sure they are configured for the right input.

You should stick your IR blaster directly on the IR receiver of the device to be controlled. They tend to have an adhesive surface that allows you to fasten them semi-permanently to the device. If they fail to stick properly, you might need to tape them down.

Unfortunately, IR blasters can be unreliable, and they tend to be the weak link in an HTPC setup. For example, if your computer needs to tune your cable box to channel 36, the cable box might not receive the 6 and will tune to channel 3, causing your HTPC to record the

wrong channel. How reliable your signals are depends on both your IR blaster and the cable box that you're controlling. While many people experience problems, others report never having a missed channel.

All IR signals are unreliable, but when you're changing the channel manually, you notice when a signal isn't received and push the button again. Your computer simply isn't that smart. As a result, if you must use IR blasters to control your cable box, be prepared for missed recordings at times.

Choosing a remote control

Most people want to be able to control their HTPC with an infrared remote control. An inexpensive USB IR receiver, as shown in Figure 17-20, provides that capability.



Figure 17-20 Use a USB IR receiver to control your computer with a remote control.

You'll probably need two remote controls for your HTPC: a full-featured wireless keyboard and mouse and a more conventional remote that your family can use.

While Media Center and other HTPC software is designed to be used with a traditional remote (that is, only requiring you to type numbers and use a direction pad), a keyboard/mouse is useful for installing updates, configuring Windows, and browsing the web. You might not think that's important, but when you have a few friends over and one of them says, "Hey! Did you see that video where the cat that looks like a dog eats bacon and then looks suspicious?" you'll be able to quickly pull it up on the big screen so everyone can watch it comfortably, instead of having people crowd around a tiny smartphone.

Those times are frequent enough that you'll want to manage them when you're comfortable, not while you're sitting cross-legged on the floor with the wired mouse and keyboard you've

kept stored in the basement from a long-dead computer. The example shown in Figure 17-21 is an infrared keyboard with a pointing device in the upper-right corner that functions like a mouse.



Figure 17-21 Use a wireless keyboard with a built-in mouse when you need to set up your HTPC.

Bluetooth keyboards with a built-in trackball or trackpad work well for this purpose. Bluetooth's range of 30 feet is usually good enough, though it can be unreliable at a distance, and enclosing the HTPC in an entertainment center can substantially reduce that range.

You can download apps for your smartphone that control your HTPC across your wireless network, providing both a touchpad and a small keyboard. HippoRemote LITE for the iPhone or Valence for Android do this very well. Some remote-control apps even support Wake-on-LAN to wake your computer up across the network, which can save you the trouble of walking to your HTPC and pushing the power button.

Only use an IR keyboard or mouse if you use an IR relay system to send signals to your audio/video equipment in an enclosed room. While it's fairly easy to point a traditional remote at your computer, you typically use a keyboard while it's on your lap, and your attention is focused on typing rather than on keeping the keyboard pointed directly at the computer. IR keyboards tend to miss keystrokes, and using them can be a very laborious process.

For all scenarios that don't involve an IR relay system, choose an RF (radio frequency) keyboard and mouse combination. RF devices communicate more reliably and don't need to be pointed directly at a receiver.

Most of the time, you'll want a remote just to turn your gear on and off and select music, TV shows, and movies. Your TV and stereo probably require IR anyway, and if you don't want to teach everyone in your family to juggle three remotes, you're going to want to be able to control your HTPC with a universal IR remote. You'll still want an RF keyboard and mouse combo when you need the extra power.

Your family remote should be small and simple, because while you're clearly good with technology (you're reading this book, after all), you probably live with someone who simply wants to watch their show without dealing with an 80-button keyboard. The simplest way to control Media Center is to use a remote designed for Media Center, such as the remote shown in Figure 17-22.



Figure 17-22 Use a smaller remote for day-to-day tasks.

