

Storage Spaces

If you have a few strands of nerd DNA in your body, this one's for you. It's a feature that lets you slice and dice various physical disks (hard drives and flash drives) into any number of virtual ones, for reasons of convenience or data safety.

For years now, the data centers of big corporations have used RAID systems (Redundant Array of Independent Disks). A RAID array is a bunch of drives installed inside a single metal box; clever software makes them look to a computer like one big drive. Or three smaller ones, or fifty little ones—however the highly trained system administrator decides to chop them up.

And why bother? Because the files on a RAID system can be recovered even if one of the hard drives dies, thanks to a fancy encoding scheme. (Thus, the “redundant” in the name.)

But RAID systems are complicated to set up, and incredibly inflexible; you generally have to install all drives of the same type and capacity simultaneously. And if you decide to expand your array, you have to erase all of the existing drives and reformat them.

Storage Spaces offers the same benefits as RAID systems—for example, data safety even if one of the drives croaks—without anywhere near the same complexity or

inflexibility. Your setup doesn't require matching drives, and you can fiddle with the capacity at any time without having to reformat anything.

Note: A Storage Space can't be a startup drive.

Here's how to set up Storage Spaces.

1. Round up your drives.

They can be internal or external; they can connect to the computer with any connector type; they can be spinning hard drives or solid-state drives.

This motley bunch of drives is what Microsoft calls a *pool*.

2. In the Control Panel, open Storage Spaces.

Click the System and Security heading to find it. The dialog box shown at top in Figure 1 appears.

3. Click "Create a new pool and storage space." Authenticate if you're asked. Confirm that yes, you want to do this.

Now you're shown a list of all drives attached to your computer that will work with Storage Spaces (Figure 1, middle). (For example, they have to be NTFS-formatted.) As Windows warns you, *they'll all be erased*. Might be a good idea to click "View files" next to each drive, to make sure you won't miss whatever files are on it now.

Windows is about to *combine* these drives' space into one gigantic pool, which you'll be able to chop up as you please in just a moment. (You won't be able to use these drives on their own anymore.)

Note: Nobody's found the upper limit to the number of actual drives that you can incorporate into a pool. Microsoft says that it's successfully tested this feature with "hundreds of drives." Can you imagine the size of their power strip?

4. Turn on the checkboxes of the drives you want pooled, and then click "Create pool."

The dialog box shown in Figure 1, bottom, appears now.

5. Type a name for your storage space.

A *space*, in Microsoft lingo, is "one of the virtual drives you'll carve out of the pool." It can be one big "drive," made up of all the component drives behind the scenes, or it can be five, or ten, or whatever. Each is called a storage space. Name it whatever you like.

6. Assign a drive letter to your new virtual disk.

The letter is up to you. You have a whole alphabet to choose from (except for letters already in use). You can change it later.

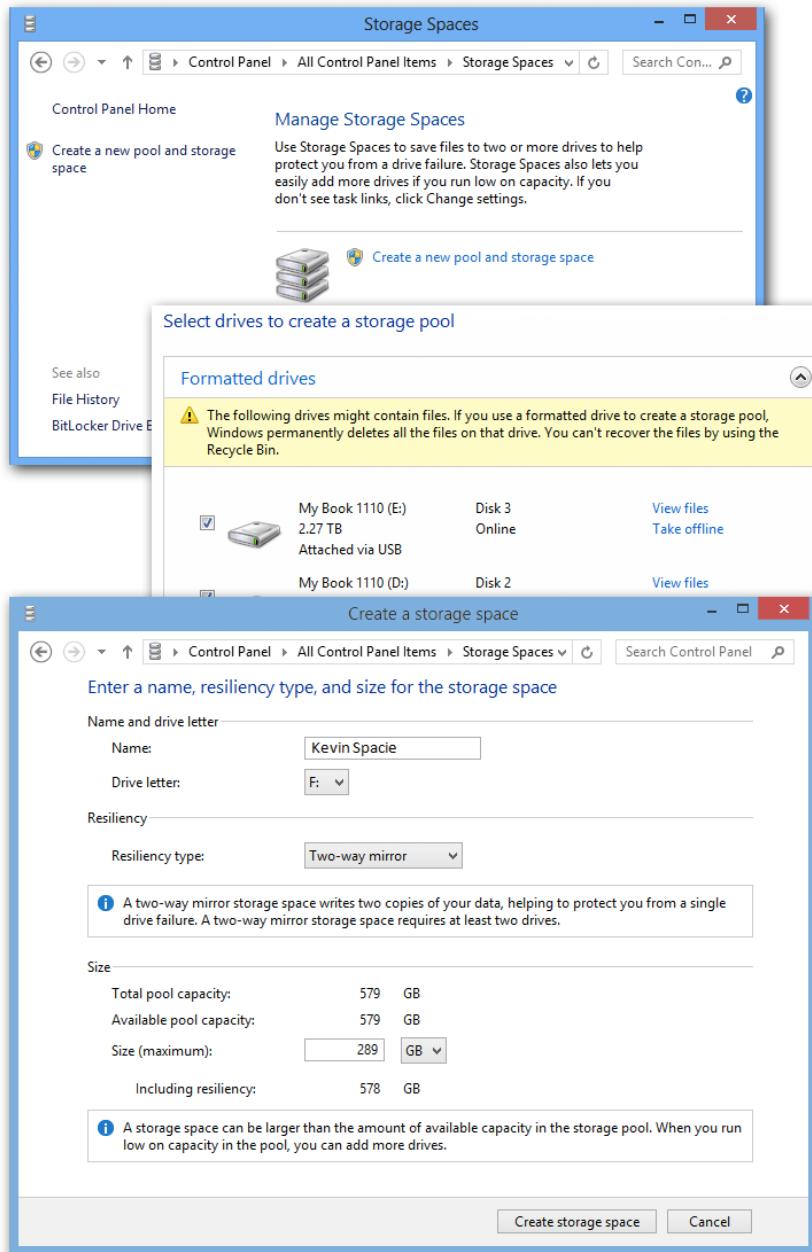
7. Choose the *resiliency* type you prefer.

Ah, now this is where it gets good (and complicated). This option lets you set up that magical redundancy feature, in which Windows will duplicate your files across multiple physical drives. That way, if one drive dies, your files are still safe. Here are your choices.

Figure 1:
Top: Here's Microsoft, letting you know what you're in for.

Middle: Here's a list of all the drives Windows can find. If you turn on the checkbox of a drive, it will be completely erased!

Bottom: After you've chosen the drives you want to include in this virtual "space," you have to give the new pretend disk a name, drive letter, and mirroring scheme.



“Simple (no resiliency)” doesn’t create any duplicate copies. It just turns all your selected drives into one big virtual disk in your Explorer windows, or several, if you chop it up. (This is the only choice if you selected only one disk in step 4.)

Note: If you use this option, then when of these drives dies, you lose the contents of *all* of these drives. In other words, don’t use a “Simple (no resiliency)” storage space for anything important.

“Two-way mirror” requires two drives. (They don’t have to match.) Your files are stored in duplicate, one copy on each drive, for safety purposes. In Explorer, you’ll still see only one “disk,” with only half the capacity of the actual disks you’ve attached. That’s because Windows is maintaining a second copy of everything. (Actually, you’ll have less than half the space, because Storage Spaces requires some file storage of its own. And if the two real drives don’t match in size, you get only the available space of the smaller one.)

“Three-way mirror” means that every file is stored in *triplicate*, on three different actual drives, for incredible safety. Even if *two* of your drives die simultaneously—*wow*, are you having a rotten day—your data marches on, unaffected. (This option requires at least five actual drives.)

Suppose you have six drives, of capacities in 1, 1, 2, 2, 2, and 4 terabytes. That adds up to 12 terabytes of storage. With three-way mirroring, in Explorer, you’ll see only *one* drive on the screen, with only a 4-terabyte capacity. That’s because the rest of the storage is being used for your safety copies.

Finally, there’s “Parity.” This clever scheme, available if you have three or more real disks in the pool, duplicates your files for safety, just like mirroring. But somehow, using fancy coding, this arrangement uses *less* than twice the physical storage to do it. If you have 2 terabytes of files, for example the Parity setting will use only 3 terabytes for this duplication, not 4. The downside: saving files takes longer.

8. Choose the maximum size for this pool.

You can actually choose a size that’s greater than the total storage of your physical disks. If you ever run low on storage in your pool, you’ll be able to buy another drive and add it to the others without having to erase or reformat anything. (That’s a feature the geeks called *thin provisioning*. See if you can work that term into a conversation at your next party.)

9. Click “Create storage space.”

Windows creates your new storage space, summarizes it in a window, and proudly opens an Explorer window for the new virtual disk. You can use this disk just as you would any drive. You can share it on the network, encrypt it with BitLocker, and so on.

And if one of the component drives should stop working, guess what? You won't care. (At least not if you chose one of the "resiliency" options.)

Your taskbar sprouts a message that says, "Check Storage Spaces for problems," but you'll keep right on working. Not a single file is lost or damaged.

Of course, you're flying without a net now, so you should replace the broken drive as soon as you can, with one that's as big or bigger than the dead one. Open the Storage Spaces Control Panel again, where you'll see a yellow exclamation-point icon to indicate the dead drive. Connect a new drive to your PC, click "Add drives," introduce the new blank drive to the mix, and you're back in business. (Now you can click Remove next to the dead drive's icon and uninstall the thing.)

Important: Remove the dead drive only *after* connecting up the new drive. Otherwise, you'll lose all your files on all the drives.
