

Synchronizing Images and Files in Windows

Using Microsoft SyncToy

White Paper

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Introduction

There are new sources of files coming from every direction: digital cameras, e-mail, cell phones, portable media players, camcorders, PDAs, and laptops. Increasingly, computer users are using different folders, drives, and even different computers (such as a laptop and a desktop) to store and retrieve files. Yet managing hundreds or thousands of files is still largely a manual operation. In some cases it is necessary to get copies of files from one place; in other cases there is a need to keep two storage locations exactly in sync. Some users manage files manually, dragging and dropping from one place to another and keeping a mental card catalog in their heads. Others use one or more applications to provide this functionality for them.

Now there is an easier way. SyncToy is a free PowerToy for Microsoft Windows Vista

Fast, easy, and flexible!

"Many people at the company have asked for access to our photos from Africa for review, software testing, and amusement. I haven't had time to process all of the photos, or even double-check that all of the file names are correct and that no personal pictures made it into the "best of" list.

"I used SyncToy to create multiple folder pairs that each Echo the pictures from my computer to one of several network shares in the company. That way, when I delete, rename, or change files in my "best of" folder on my computer, I can use the SyncToy Run All option to Echo those deletions, renames, and changes to all of the shares that contain copies of my photos."

- Director of the SyncToy Team

and XP that provides is an easy to use, highly customizable program that helps users to do the heavy lifting involved with the copying, moving, and synchronization of different directories. Most common operations can be performed with just a few clicks of the mouse, and additional customization is available without added complexity. SyncToy can manage multiple sets of folders at the same time; it can combine files from two folders in one case, and mimic renames and deletes in another. Unlike other applications, SyncToy actually keeps track of renames to files and will make sure those changes get carried over to the synchronized folder.

This white paper provides an overview of SyncToy, and explains how it can be used to enhance your file management workflow.

Note: We've taken great care to ensure that this tool operates as it should, but it is not part of Windows and is not supported by Microsoft Technical Support. For this reason, Microsoft Technical Support is unable to answer questions about SyncToy. To speak to other users and contribute

feedback about your experiences with SyncToy, please use the forums accessible from the Professional Photography web site at <http://www.microsoft.com/prophoto>.

Overview of SyncToy

SyncToy can help you synchronize, copy, backup and maintain folders of files on your computers. SyncToy is a PowerToy, available as a free download, built by Microsoft Corporation that helps you get all your files exactly where you want them. SyncToy also helps you manage disk space by making sure that you do not end up with multiple copies of the same file with different names. SyncToy will help you back up your files more quickly by only backing up the files it needs to, to help you save time, instead of backing up every file in a folder whether it has been changed or not.

You may want your files organized and backed up in different places, and SyncToy enables you to select folder pairs, and set actions and options, for how to manage files between the two selected directories, or folders.

For instance, imagine you have pictures on one computer (perhaps your desktop computer), and pictures on another computer (perhaps your laptop). Quite a few of the pictures are already on both computers, but you do not remember exactly which ones are on both. You may want to get all the pictures on both computers. You could use Windows Explorer to copy all the pictures from one file to another, but simply copying all the pictures from one computer to the other has several shortcomings. One is that files that already exist on the other computer will be copied again, wasting time, disk space, and network bandwidth. Another issue is that you may have renamed some or all of your pictures from the names the camera generated to names based on the content, such as renaming HHOD4217.JPG to GrandCanyon.jpg. In that case, if the other computer already has HHOD4217.JPG, considerable time and disk space can be saved by recognizing that it is the same picture. SyncToy automatically renames the numbered file name to GrandCanyon.jpg on the other computer for you, and saves you the trouble of renaming the file manually.

What's So Special About SyncToy?

There are many ways to copy files in a Microsoft® Windows® environment. However, SyncToy is **faster, easier to configure, more transparent, and easier to repeat** than:

- Using Drag and Drop from Windows Explorer.
- Using Copy or XCopy from the command line.
- Building batch files and/or scripts to automate file copy operations.
- Using offline folders.
- Using Windows Briefcase.

Synchronize: New and updated files are copied both ways. Renames and deletes on either side are repeated on the other.

Echo: New and updated files are copied left to right. Renames and deletes on the left are repeated on the right.

Contribute: New and updated files are copied left to right. Renames on the left are repeated on the right. No deletions.

Benefits for Digital Photographers

Some of the benefits of SyncToy are:

- **Save bandwidth, disk space, and time.** SyncToy has a sophisticated rename feature that matches files or images that are the same, but have different names. SyncToy will rename the older file with the new name, if that is what you want SyncToy to do. This means that if you have the same files on both your laptop and your desktop, then work on your laptop on the airplane to rename dozens of your photographs from the numerical file names to descriptive file names, you can run SyncToy between your laptop and desktop and SyncToy will match the files and rename the numerical files on your desktop to the descriptive names. This is much faster and easier than having to find and delete files, and it is a more efficient use of bandwidth and disk space than just keeping and backing up both copies of each image.

- **Simple and clean user interface.** SyncToy builds on the familiar Windows user experience and requires little learning. An extensive help file is included with SyncToy.
- **Preview.** SyncToy enables you to preview all the operations it will run for a specific action, and you can deselect operations you do not want to run in the preview screen. You can also sort operations to make sure that SyncToy is doing exactly what you want it to do.
- **Save and repeat.** SyncToy will save a folder pair and action that you set up, so you can repeat the same action on the same folders again later very easily by just selecting the pair and running it.

How Does SyncToy Deliver These Benefits?

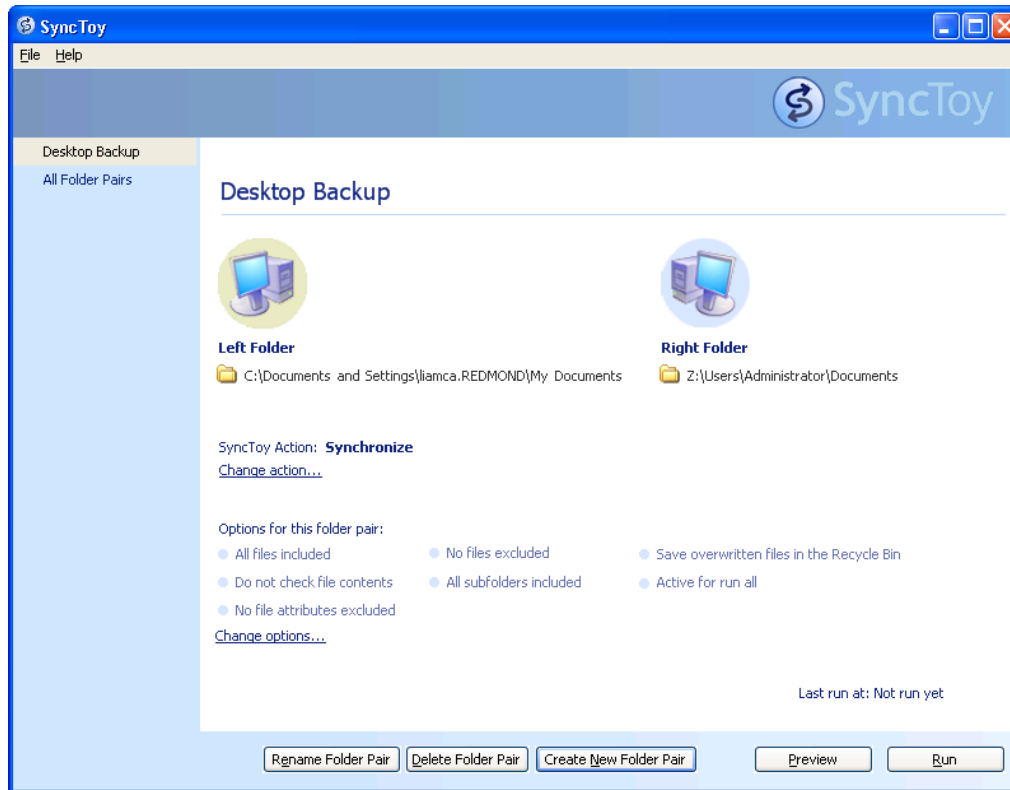
SyncToy saves time, minimizes network usage, and saves disk space by only copying when necessary. SyncToy has a simple, fast, and familiar Windows interface that lets you point and click to define your folders and the SyncToy actions you want performed on each folder pair. You choose the appropriate action when you create a folder pair, and the action determines how SyncToy handles file conflicts such as:

- Files that have been renamed in both folders
- Files deleted from one folder and renamed in the other
- Files renamed in one folder and modified in the other
- Many other file conflict situations

SyncToy remembers how you want your folder pairs synced so you can sync again and again with a single click of a button.

SyncToy lets you run a single pair of folders or all of your folder pairs with a single click. You can even set up SyncToy to run unattended.

SyncToy has a powerful preview feature that shows you exactly what is going to happen before any files are touched. Preview even gives you a chance to unselect any proposed actions before you start.



How the People that Built SyncToy Use SyncToy

The SyncToy software team is composed of avid digital photographers, ranging from hobbyist to professional. “Our customers, our executives, our partners, and our co-workers all wanted a better way to manage the thousands of picture and video files we generate weekly,” says Reynaa senior program manager at Microsoft. The team members have been using SyncToy for months prior to release, coming up with new features and making sure it works flawlessly on their own picture and music files at home and at work. Customer requests and the team members’ own passions for photography and music inspired and drove the design of SyncToy.

George, a Senior Director at Microsoft relied on SyncToy to help manage thousands of irreplaceable photographs during his family vacation to Africa:

At the end of May 2005, my family and I began a three week photo-safari and eco-tour of Kenya and Tanzania. This was our first trip to Africa, but not our first photo-vacation. So, I expected that we’d be taking two hundred to five hundred photos a day. Because my wife and I were using Nikon D1X and Nikon D2X cameras respectively and because we were capturing RAW images exclusively, I guessed that we’d be storing in excess of 60GB of photos in 6,000 files by the end of the trip.

I’ll share the details of the trip, the details of the camera equipment, and our lessons learned about digital photography in Africa in a separate article for www.microsoft.com/prophoto. For

now, I'll tell you that I only used two software products for the entire trip: NikonView and a pre-beta internal build of SyncToy. Yes, it occurred to me that we were betting a lot on pre-beta software, but the team was confident and so was I.

To try to insure that we never ran out of card space while shooting and never ran out of hard disk space when saving our pictures, we carried four 2GB Compact Flash cards, two 1GB Compact Flash cards, one notebook computer, and two 100GB USB hard drives. My goal was to have two copies of every viable picture at the end of every day. My fear was that I would have more than two copies of some files, less than one copy of others, and no way to manage that many files through that many working sessions in an uncertain environment.

Thanks to SyncToy, over nineteen days and thirty editing sessions, I copied more than 8,000 files, deleted more than 1,500 files, and renamed more than 6,000 files without losing a single file, without losing a single rename, and without losing a single edit. Just as importantly, when we were done, I had exactly one copy of each of 6,300 pictures consuming 65GB+ on each of two different hard drives, just as I hoped.

Before I dive into the detail of my particular workflow and how SyncToy helped, I'll share two observations. First, the preview feature in SyncToy is an amazing tool. I had been renting and using a D2X prior to the trip while my camera was on back order. I only received my own D2X four days before the trip and I forgot to set the continuous numbering option on the new D2X! As a result, on the second day of the trip, the D2X created pictures with the same names as pictures I had taken on the first day of the trip. Worse, I had two cards worth of duplicate file names!

In SyncToy, preview gave me a chance to see "overwrites" where I should have seen "new" actions. Unfortunately, it was late, I was tired, and I didn't notice this helpful hint until the second card! It was the second day, and already I had lost photos. I was sick but not without hope. I knew SyncToy had protection for such an occasion and I just hoped the feature was in place in my pre-beta version. When I looked in the recycle bin on the hard drive, there were yesterday's files! A little renaming, copying, and deep breathing and I was back on track.

My second observation will come as no surprise to digital photographers who are more experienced than me: I didn't finish my workflow every day. As a result, I occasionally started a day, or an afternoon game drive, not knowing with any certainty which CF cards could be erased. Once again SyncToy preview came to my rescue. In 20 seconds or so, SyncToy Preview could tell me if the files on the CF card had already been copied to the hard drive, even if I had renamed or deleted the files on the hard drive. If I didn't have time to unload the card, I could at least use other cards first.

My workflow changed over the three weeks, especially when my notebook hard drive nearly became full, but here is a good overview of the early days of the trip:

At mid-day and at the end of the day, I used SyncToy to "Contribute" files from each full or partially full Compact Flash card to a directory on my notebook's hard drive. I created separate folder pairs for each camera because they use different folder names to store their pictures, but I did not have to create different folder pairs for each CF card.

Copying files from the CF cards took between 10 and 30 minutes per card. With 5-6 cards to copy every day, I spent 1-2 hours copying.

Then, I'd use SyncToy to "Echo" files from my notebook hard drive to one of my external drives. This took about a quarter as long as copying from the CF cards.

Next, I'd use SyncToy to "Synchronize" the files between the two external hard drives.

With my three copies of my photos safely in place, I used the camera to format the Compact Flash cards. For the next 30-120 minutes I'd rename, delete, and edit the pictures on the notebook.

Then I'd use SyncToy to "Echo" the renames, deletes, and changes from the notebook to one of the external hard drives. This took less than five minutes!

Then I'd use SyncToy to "Synchronize" the two external hard drives. This also took less than five minutes, even when the external drives contained more than 6000 files consuming more than 65GB!

As the trip continued, and the internal hard drive of my notebook came perilously close to being full, I realized that I could skip the step of copying files to my notebook's drive. Instead, I used SyncToy to "Contribute" files directly from the CF card to one of the external drives. As a bonus, the CF-to-external hard drive copy was even faster than the CF-to-notebook hard drive. From there I only had to "Synchronize" files between the two external hard drives.

While working with SyncToy in Africa, I stumbled upon a feature I've come to depend on quite a bit. One night, I started a sync that would take about 30 minutes to complete. The trouble was, I was using my camera to sync with my notebook, and I needed to interrupt the sync to take pictures of vervet monkeys outside our room. I used the SyncToy cancel button, disconnected the camera, and took my shots. When I reconnected the camera to the laptop, I started the sync again. Because SyncToy first checks to see if files already exist before copying, my sync in essence picked up where I left off, and added my new shots as well! Since then, I've used SyncToy's ability to interrupt a sync and restart it later many times.

Every photo we took on this trip was handled five or more times by SyncToy and SyncToy did the right thing every single time. As a result, we have two copies of 6,300 memories from Africa that we can share for a lifetime. I hope you find SyncToy as useful as we did.

Jim, a group manager at Microsoft shared this story about how he uses SyncToy to track and store music in his home:

We listen to music in our house all of the time: doing laundry, cooking, working outside, having dinner. Regularly our CDs would get lost or separated from their cases and have to be replaced, only to be found in some other case or stacked in an obscure closet months later. At some point, I got tired of this game, and I started looking for a more convenient way to keep track of all of my music.

I ended up recording all of our CDs onto our office computer. It was the perfect solution; it had copious amounts of storage and connected to our wireless network. Initially I used it as my media server; storing everything from images to music on this computer, where they were accessible via the wireless network all over our house. I have a number of devices in house that can then access my music: laptops, media players, desktops, and more.

While this setup is great and allows me to no longer have to have racks of CDs stacked up

somewhere, now I have the problem that my desktop PC has to be online while any other device in the house wants access to my music. For example, rebooting my office computer meant that the music I was listening to down the hall would stop until the computer was running again. I also couldn't turn it off for the evening without losing access to music.

Enter SyncToy. I purchased a stand-alone hard drive that connects directly to my wireless network in my house. This device has a lot of space and sits in an out-of-the-way closet. I configured SyncToy on my desktop computer to "Contribute" music from my local hard drive to a share called MUSIC on the network drive. Now when others in the house want to listen to music, their devices look at that device, rather than my office PC.

This worked so well, I've started to copy other shared files with SyncToy out to that drive. Photos, music, and video clips are all now kept in a dedicated place that is available around the clock. Additionally, I have the benefit of having a backup already on my desktop computer so if there's ever a problem; I have a solution ready to go.

How Does SyncToy Work?

SyncToy allows you to select an action to perform. The available actions are Synchronize, Echo and Contribute. Then SyncToy examines the files in the two selected folders, and decides which operations it should take to complete the selected action. The operations available to SyncToy are to copy a file, rename a file, or delete a file. One advantage of selecting all the operations first, and then performing them, is that SyncToy can show you a preview of what operations will be taken before any files are modified. You can even unselect individual operations, which will tell SyncToy to not perform them, before telling SyncToy to run the remaining selected operations.

Once you tell SyncToy to perform the copy, rename, and delete operations, SyncToy performs them just like Windows Explorer would. It should be noted that delete operations work just like in the Explorer, so files are moved to the recycle bin where they can be recovered if needed. When the synchronization is complete, SyncToy stores a list of the files in the folders for use during the next run.

How SyncToy Gets Better

It is quite common to synchronize the same folders repeatedly. You may periodically back up your music to an external hard drive, or perhaps you wish to get all the pictures from a desktop PC onto a laptop every time you travel. One benefit SyncToy offers in this case is that your preferences are saved from previous uses, so you can get files synced just the way you like them in only a few mouse clicks. An even bigger benefit comes from SyncToy remembering what the folders contained after the previous sync, and using that information to select sync operations more intelligently.

After SyncToy completes a successful synchronization, it saves a file called a "snapshot" for each folder. The snapshot is a list of all the files, and certain information about them, such as the size, date/time, and optionally the SHA1 hash of the file's contents. On a later run, these snapshots help SyncToy determine the file actions more precisely. For example, if the file exists on the left,

but not the right and if it exists in the saved snapshot on the right folder, that means that the file must have been deleted on the right. For folder pairs with Synchronize action, the delete should be propagated to the left. Without snapshots, it would be impossible for SyncToy to know whether the file does not exist on the right because it was newly created on the left, or because it has been deleted from the right. The snapshot provides enough historical information to make it easy to tell what changes have been made.

Keith, an architect and lead developer at Microsoft relies on SyncToy to assist him during his two hobbies: race cars and photography.

The racing series where I used to be a mechanic and engineer made its closest visit of the year last weekend. The ALMS came to Portland, and I was able to finagle media credentials. I had hoped to sleep in a bit, now that I wouldn't have to open the tent and warm up the cars before the first practice session. Sadly there was a 7:30am photographers' meeting each morning, so I was at the track bright and early, listening to fascinating safety tips like, "Don't stand in the path of a car moving at 170 mph." In addition to the free physics lesson, this meeting was where we got the fashionable blue vests that would serve as our passes into the special media areas right next to the track. How close to the track? So close in one spot that a 28mm lens wasn't wide enough to get a whole car in the frame, although admittedly this was on a body with a 1.3x focal length multiplier.

Speaking of equipment, I had just one body with me, a Canon 1D MkII, and just three lenses: a 28-70 f2.8, 70-200 f2.8, and my latest toy, a 300 f2.8 IS. I also had a 1.4x and 2x teleconverter with me, and I used each of them frequently on the 300. The 28-70 was either too wide or not wide enough for trackside work, and even shooting people fixing cars in the paddock would probably be better served by something wider like the 16-35. The 70-200 was great for getting multi-car shots, such as when everyone is bunched up at the start of a race. After a lap or two, I'd switch back to the 300 to capture one or two cars at a time. I know quite a few of the drivers and teams involved, and they all wanted me to get pictures of their cars in action.

I only had 4gb of flash with me, a 2gb and a pair of 1gb cards. Since I was shooting raw + large jpeg, this limited me to about 250 shots between downloads. Why waste card space on jpegs? Because they're still the most convenient way to share pictures with all the teams and drivers. Until there's a good workflow tool to help me convert my raws to jpegs in bulk after the fact, I'll stick with this system. Friday was a semi-short day, so I didn't need to download until I got back to my hotel. On Saturday I did a lunch time download to my laptop in the media trailer using a PC card CF reader. I was able to eat a (free) sandwich and a cookie, drink many cups of water, and hear several folks talk about how wonderful their Macs are, all in the time it took to download just the 2gb card to my laptop.

Friday night, after downloading my pictures, I yearned for a way to sort them. Looking at the pictures in the order I'd shot them, there were a few pictures of the 31 car, then a few of the 74, then a few more of the 31 making its next lap, some shots of the 55, etc. I wanted to categorize them into a directory for each car and driver, but I found this really inconvenient. First, the thumbnails in Explorer are sometimes too small to see which car(s) is in a given shot. Then there's the hassle of selecting both the raw and jpeg file before moving to the appropriate directory. If not for the late hour, I might have prototyped a sorting tool right there in my hotel. I have since whipped up something crude that not yet ready to share with the public.

On Saturday I spent some time with a real professional photographer, the gentleman who had gotten me my photo pass for the weekend. Richard does motorsports photography for a living, supplementing that income with a little ordinary corporate photography. He's written two books about Corvettes, and GM is among his clients on race weekends. He shoots about 1 to 1.5 terabytes of pictures per year. He has several external hard drives, and he backs up his pictures onto DVDs. Why not back up to another external hard drive? He's heard conflicting opinions

from "experts" about whether drives are archival -- if you leave a drive on the shelf for a year, will it really work when you plug it back in? I pointed out that the jury is still out on the longevity of home burnt DVDs, too. The labor of making the DVDs isn't so bad for him, as he has an assistant (his sister) whose time isn't as expensive as his own.

Richard had an external drive fail last year, and he paid a data recovery service \$3,000 to get back almost all the data on it. What I found most interesting was that he still had the raw files for all those images, but he was willing to pay the recovery fee to avoid losing all the work he had done processing, correcting, cropping, and retouching the pictures. I hinted around at rights management, and he says he usually charges his clients one flat fee for use of his pictures regardless of how they're used, so he isn't very worried about what happens to his images after he's given them to a client.

One thing Richard also brought up was his yearning for a tool to quickly sort raw files into a folder per client and delete the bad ones. He wants to do it with one keystroke per image. He uses Breeze Browser, which makes it convenient to either delete the junkers or categorize the keepers (I failed to take enough notes on our conversation), but it's not good at both, so he uses another tool to do what Breeze Browser doesn't. He wishes he had one tool that could do it all. In other words, he was asking for the thing I'd nearly prototyped the night before.

I took about 850 pictures in two days, several of which I'm pretty darn proud of. Maybe at the end of George's safari slide show I'll exhibit my top ten, or I might just rotate some prints into my "Le Mans at Night" collection that's on display in the office hall now.

About Deleting Images or Files

Photographers can use SyncToy to delete unwanted files. Once an action is set up that will delete files, the Preview will indicate which files will be deleted when the action is run.

Once files are "deleted" by SyncToy, if they need to be recovered, they can be found in the Recycle Bin.

Limitations When Using SyncToy

While SyncToy has been designed to address requirements of photographers working with images, and can be used by anyone who needs to manage files between folders, it does have a few limitations. The primary limitations are:

- This release does not support moving files from one share to another; SyncToy will not delete all the files in the originating folder although several of the available actions will copy files from left to right.
- It is not recommended to use SyncToy to back up entire drives. There are other tools better matched for ongoing large scale back up needs.

Installing the Software

Microsoft suggests that customers install all critical and recommended Windows Updates prior to installing SyncToy. Windows Updates can be found at <http://windowsupdate.microsoft.com/>.

Minimum requirements for installing SyncToy are:

- Microsoft Windows XP SP2 or Vista
- Microsoft .NET Frameworks V2.0
- 1GHz Intel P3 processor or equivalent
- 256MB RAM, 512MB RAM recommended
- 20MB free disk space

Hardware and Software Requirements

The following hardware and software requirements are necessary to use this software:

Operating System. Windows Vista, XP Home or Professional (including Tablet PC and Media Center Editions) with Service Pack 2 or later installed. This program has not been tested on any other version of Windows.

Hardware. A system with at least 256 Mb of RAM and a Pentium III or better CPU is required. For best performance, 512 Mb of RAM and a Pentium 4 or better CPU is recommended. 20 MB of free disk space is recommended.

Microsoft .NET Framework. Version 2.0 of the Microsoft .NET Framework is required. Other versions of the .NET Framework may be safely installed on your system without affecting the use of SyncToy.

What Has Changed in v2.0

The SyncToy v2.0 release has several improvements, most notably:

- **Dynamic Drive Letter Assignment:** Drive letter reassignment will now be detected and updated in the folder pair definition.
- **True Folder Sync:** Folder creates, renames and deletes are now synchronized for all SyncToy actions.
- **Exclusion Filtering Based on Name:** File exclusion based on name with exact or fuzzy matching.
- **Filtering Based on File Attributes:** The ability to exclude files based on one or more file attributes (Read-Only, System, Hidden).
- **Unattended Folder Pair Execution:** Addressed issues related to running scheduled folder pairs while logged off.
- **Folder Pairs With Shared Endpoints:** Ability for folder pairs associated with the same or different instances of SyncToy to share end-points.
- **Command line enhancements:** Added the ability to manage folder pairs via the command line interface.
- **Re-Architect Sync Engine:**

- The SyncToy engine has been rearchitected to provide scalability and the ability to add significant enhancements in future releases.
- Sync engine is also more robust inasmuch that many single, file level errors are skipped without affecting the entire sync operation.
- **Sync Encrypted Files:** Sync of Encrypted files works when local folder and files are encrypted, which addresses the common scenario involving sync between local, encrypted laptop PC folder and remote, unencrypted desktop PC folder.
- **64-Bit Support:** SyncToy now has a native 64-bit build (x64 only) for 64-bit versions of Windows.
- **Folder pair rename**
- **Sub-folder Exclusion Enhancements:** Descendents created under excluded sub-folders are automatically excluded. Usability improvements for the sub-folder exclusion dialog.
- **Folder Pair Metadata Moved:** Folder pair metadata removed from MyDocuments to resolve any issues with server-based folder pair re-direction setup.
- **Setup Improvements:** Integrated setup with single self-extracting archive file and no extra downloads if you already have .NET Framework 2.0 installed. Enabled silent install for the SyncToy Installer file (see readme.txt file for more information).
- Removed combine and subscribe actions.

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