USING
"STORAGE SPACES"
FOR BACKING UP AND
MOVING YOUR DATA FILES
IN "WINDOWS 8.."
Web location for this presentation:
http://aztcs.org
Click on “Meeting Notes”
"Storage Spaces" is a new feature in "Windows 8..". It provides for real-time mirroring of two hard drives or two hard drive partitions. In addition to not losing data when a single hard drive fails, you can use "Storage Spaces" to back up and move your data files.
TOPICS

• "Storage Spaces" Basics
• Creating A Two-Way-Mirrored "Storage Space"
• Replacing A Hard Drive In A Two-Way-Mirrored "Storage Space"
TOPICS (continued)

• Using "Storage Spaces" To Make A Full Backup Of Your Data Files.

• Using "Storage Spaces" To Move Your Data Files To Another "Windows 8" Computer
STORAGE SPACES BASICS
"STORAGE SPACES" BASICS

• "Storage Spaces" is a feature of "Windows 8" that is used to group physical hard drives into single logical "Storage Pool".

• A "Storage Pool" can then be used to create one or more "Storage Spaces" virtual hard drives.

• A "Windows 8" computer can have more than one "Storage Pool".
A "Storage Space" is a logical NTFS hard drive or a logical NTFS hard drive partition that is under the control of the "Storage Spaces" process.
"My Home Storage" Pool

Physical View

Logical View

"Documents" Space
Thinly Provisioned, Mirrored Resiliency

"Multimedia" Space
Thinly Provisioned, Parity Resiliency
Using the "Storage Spaces" applet in "Windows 8", you create logical "Storage Pools" which are then used to create "Storage Spaces" virtual hard drives.
"Storage Spaces" can be used to synchronize hard drives when you create a single virtual hard drive from a "Storage Pool" that consists of two physical hard drives:
When you create a logical "Storage Space", it gets a drive letter and it shows up in "Disk Management" in the "Control Panel" as a hard drive with a "GUID Partition Table" ("GPT"). It also shows up in "File Explorer". It does not show up in "Device Manager" nor does it show up in "Devices and Printers".
"STORAGE SPACES" BASICS (continued)

• The physical hard drives that are added to a "Storage Pool" disappear from "Disk Management" in the "Control Panel".

• Instead, you see a new local "Storage Pool" drive in "Disk Management": 
• You can create a logical "Storage Space" for any letter of the alphabet that is not already assigned.
"STORAGE SPACES" BASICS (continued)

• When a physical hard drive is added to a "Storage Pool":
  o The physical hard drive no longer has a drive letter
  o The physical hard drive no longer shows up in "File Explorer"
  o The physical hard drive no longer shows up in "Disk Management" in the "Control Panel".
"STORAGE SPACES" BASICS (continued)

- The main place where the physical hard drive shows up will be the "Storage Spaces" list of "Physical Drives".

- The physical hard drive still shows up in the "Device Manager".

- The physical hard drive still shows up in "Devices and Printers".
"STORAGE SPACES" BASICS (continued)

- The C: hard drive or hard drive partition where "Windows 8.." resides cannot be used for one of the physical hard drives in a "Storage Pool".
At some point in the future, "Storage Spaces" will be able to utilize both NTFS and ReFS (Resilient File System) hard drives: At the present time, the new ReFS file system is only available on "Windows 8 Server".
• After a hard drive is placed into "Storage Pool", you cannot use the "Safely Remove Hardware and Eject Media" icon in the "Notification Area" to eject the mirrored hard drives.
Problem Ejecting USB Mass Storage Device

This device is currently in use. Close any programs or windows that might be using the device, and then try again.
A healthy "Storage Pool" looks like this:
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 3.00 GB of 1.58 TB pool capacity

Storage Spaces

- StorageSpace07 (S):
  - OK
  - Two-way mirror
  - 814 GB logical size
  - Using 200 GB

Physical Drives

- ST310003 33AS USB Dev.:
  - OK
  - Attached via USB
  - 930 GB
  - 0.16 % used

- Seagate FreeAgent Pro U.:
  - OK
  - Attached via USB
  - 698 GB
  - 0.21 % used
"STORAGE SPACES" BASICS (continued)

• To make a change to a "Storage Pool", you first have to click on the "Change Settings" button:
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives to help protect you from a drive failure. Storage Spaces also lets you easily add more drives if you run low on capacity. If you don't see task links, click Change settings.

Storage pool

Using 4.36 TB of 5.45 TB pool capacity

Storage spaces

L Storage space (L:\r
Two-way mirror
2.71 TB
Using 4.36 TB pool capacity

Warning

Low capacity; add 2 drives

Storage pool

Warning

Create a storage space
Add drives
Rename pool

Physical drives

See also
File History
BitLocker Drive Encryption
"STORAGE SPACES" BASICS (continued)

• When a physical hard drive in a "Storage Pool" fails or when you physically disconnect the physical hard drive:
Physical Drives

ST310003 33AS USB Dev...
Attached via an unrecog...
930 GB
0.26 % used

Warning
Selected for data reallocation

Rename
Remove
If a hard drive belongs to a "Storage Space", and you physically remove the hard drive from your computer, you cannot logically remove the hard drive from the "Storage Pool" unless you first add in another hard drive to the "Storage Pool":
### Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

### Storage Pool

- **Using 5.00 GB of 1.58 TB pool capacity**
  - Unhealthy drives; check drive health
  - Unhealthy drives; check drive health

### Storage Spaces

- **StorageSpace07 (S:)** Two-way mirror
  - Using 4.00 GB
  - 814 GB logical size
  - Unhealthy drives; check drive health

- **Physical Drives**
  - ST3100033AS USB Device
    - Attached via an unrecognized controller
    - 930 GB
    - 0.26% used
    - Warning: Selected for data reallocation
  - Seagate FreeAgent Pro USB Device
    - Attached via USB
    - 698 GB
    - 0.35% used
    - OK

See also:
- File History
- BitLocker Drive Encryption
Remove a Drive

Drive could not be removed because some data remains to be reallocated. Please add an additional disk to this pool and reattempt this operation.

Close
Once a "Storage Space" is created, you cannot change its "synchronization" option. Instead, you have to delete the "Storage Space" and use the freed up hard drives to make a new "Storage Space".
The physical hard drives that are part of a "Storage Pool" are formatted in a proprietary format that only "Windows 8.." computers can access:
"STORAGE SPACES" BASICS (continued)

- If you attach a "Storage Spaces" hard drive to a "Windows XP", "Windows Vista", or "Windows 7" computer, it will show up in "Disk Management" but you will be unable to access the hard drive with "Windows Explorer":
<table>
<thead>
<tr>
<th>Volume</th>
<th>Layout</th>
<th>Type</th>
<th>File System</th>
<th>Status</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Simple</td>
<td>Basic</td>
<td>NTFS</td>
<td>Healthy (Primary Partition)</td>
<td>59.87 GB</td>
</tr>
<tr>
<td>(C:)</td>
<td>Simple</td>
<td>Basic</td>
<td>NTFS</td>
<td>Healthy (Boot, Page File, Crash Dump, Primary Partition)</td>
<td>959.90 GB</td>
</tr>
<tr>
<td>System</td>
<td>Simple</td>
<td>Basic</td>
<td>NTFS</td>
<td>Healthy (System, Active, Primary Partition)</td>
<td>100 MB</td>
</tr>
</tbody>
</table>

**Disk 0**
- Basic
- 960.00 GB
- Online
- System Reserved
  - 100 MB
  - NTFS
  - Healthy (System, Active, Primary Partition)
- (C:)
  - 959.90 GB
  - NTFS
  - Healthy (Boot, Page File, Crash Dump, Primary Partition)

**Disk 1**
- Basic
- 59.88 GB
- Online
- Unallocated
- Primary partition

**CD-ROM 0**
- DVD (D:)
- No Media
Hard Disk Drives (1)

Local Disk (C:)
437 GB free of 959 GB

Devices with Removable Storage (2)

Floppy Disk Drive (A:)
DVD RW Drive (D:)

WIN7ENTRI201304 Workgroup: WORKGROUP Memory: 4.93 GB
Processor: Intel(R) Core(TM) i7-377...
"STORAGE SPACES" BASICS (continued)

• If any single drive fails in a "Storage Pool" that has "redundancy", the "Storage Pool" logical drive will not disappear from "File Explorer".

• If all drives fail, the "Storage Pool" logical drive will disappear from "File Explorer".
If all drives fail, the "Storage Pool" logical drive will disappear from "File Explorer". If any single drive is restored, then the "Storage Pool" drive will be restored to "File Explorer".
"STORAGE SPACES" BASICS (continued)

• You cannot add a hard drive that already contains data files to a new or existing "Storage Space". If you do so, all data files on the hard drive will be deleted.
CREATING A TWO-WAY-MIRRORED "STORAGE SPACE"
Creating a Two-Way-Mirrored "Storage Space" (continued)

- A Two-Way-Mirrored "Storage Space" has two hard drives that are synchronized in real time: When you create or modify a file or folder for the virtual "Storage Space" hard drive, the change is immediately made on both hard drives.
Creating a Two-Way-Mirrored "Storage Space" (continued)

- All software and hardware inside your "Windows 8" computer treat the "Storage Space" as if it were a single hard drive:
  You have a single drive letter but you actually have two physical hard drives that contain the same exact data files and folders at the same time:
Real Physical “Windows 8” Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space

Hard Drive 3 = Bottom Right hard drive of L: Storage Space
Creating a Two-Way Mirrored "Storage Space" (continued)

• Here are the steps for creating a two-way-mirrored "Storage Space":


Creating a Two-Way Mirrored "Storage Space" (continued)

Step 1: Attach two USB, SATA, or eSATA hard drives to your existing "Windows 8" computer:
Real Physical “Windows 8” Computer

existing
C: Drive

add
Hard
Drive 2

add
Hard
Drive 3
Creating a Two-Way Mirrored "Storage Space" (continued)

Step 2: Press "Windows" key + x

Step 3: Click on "Control Panel".

Step 4: Locate the "Storage Spaces" applet and double-click on it.
Adjust your computer's settings

- Recovery
- Region
- RemoteApp and Desktop Connections
- Sound
- Speech Recognition
- Storage Spaces
- Sync Center
- System
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 5: Double-click on "Create a new pool and storage space".
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Create a new pool and storage space

See also

File History
BitLocker Drive Encryption
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 6: All data hard drives will be shown with the unformatted drives in the top section if there are any AND formatted drives in the bottom section:
Create a Storage Pool

Unformatted drives

Seagate FreeAgent Pro Ultra Portable 750 698 GB
Attached via USB

Formatted drives

⚠️ The following drives might contain files. If you use a formatted drive to create a storage pool, Windows permanently deletes all the files on that drive. You can't recover the files by using the Recycle Bin.

- WDC WD30EZRS-00J99B0 2.72 TB
  Attached via RAID
  Online
  View files
  Take offline

- ST310003 33AS USB Device 931 GB
  Attached via USB
  Online
  View files
  Take offline

Create pool  Cancel
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 7: Use the check boxes to select drives for the mirrored hard drive set that you are about to create:
Create a Storage Pool

Unformatted drives

Seagate FreeAgent Pro U... Disk 8
Attached via USB
698 GB

Formatted drives

⚠️ The following drives might contain files. If you use a formatted drive to create a storage pool, Windows permanently deletes all the files on that drive. You can’t recover the files by using the Recycle Bin.

WDC WD30EZRS-00J99B... Disk 0
Attached via RAID
Online
2.72 TB

ST310003 33AS USB Dev... Disk 7
Attached via USB
Online
931 GB

Create pool  Cancel
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 8: Click on the "Create pool" button:
The following drives might contain files. If you use a formatted drive to create a storage pool, Windows permanently deletes all the files on that drive. You can’t recover the files by using the Recycle Bin.
Step 9: Change the name of the new "Storage Space" from "unnamed" to your desired name:
Select a name, resiliency type, and size for the storage space

Name and drive letter

Name: Unnamed

Drive letter: D:

Resiliency

Resiliency type: Two-way mirror

Size

Storage pool capacity: 1.82 TB

Available capacity: 1.82 TB

Logical size: 934 GB

(1.82 TB maximum pool capacity usage)

- The two-way mirror layout stores two copies of your data, protecting you from a single drive failure. This resiliency type requires at least two drives.

- You can create a storage space larger than the amount of available capacity in the storage pool. When you run low on capacity in the pool, you can add more drives.
Select a name, resiliency type, and size for the storage space

Name and drive letter

Name: $5_StorageSpace20120415
Drive letter: D:

Resiliency

Resiliency type: Two-way mirror

Size

Storage pool capacity: 1.82 TB
Available capacity: 1.82 TB
Logical size: 934 GB (1.82 TB maximum pool capacity usage)

The two-way mirror layout stores two copies of your data, protecting you from a single drive failure. This resiliency type requires at least two drives.

You can create a storage space larger than the amount of available capacity in the storage pool. When you run low on capacity in the pool, you can add more drives.
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 10: Select a drive letter for the new "Storage Space": 

63
Select a name, resiliency type, and size for the storage space

<table>
<thead>
<tr>
<th>Name and drive letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name: S_StorageSpace20120415</td>
</tr>
<tr>
<td>Drive letter: D:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resiliency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resiliency type: Two-way mirror</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage pool capacity: 1.82 TB</td>
</tr>
<tr>
<td>Available capacity: 1.82 TB</td>
</tr>
<tr>
<td>Logical size: 934 GB (1.82 TB maximum pool capacity usage)</td>
</tr>
</tbody>
</table>

The two-way mirror layout stores two copies of your data, protecting you from a single drive failure. This resiliency type requires at least two drives.

You can create a storage space larger than the amount of available capacity in the storage pool. When you run low on capacity in the pool, you can add more drives.
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 11: Click on the drop down list button at the right end of the "Resiliency type" field:
Select a name, resiliency type, and size for the storage space

Name and drive letter

Name: S_StorageSpace20120415

Drive letter: S:

Resiliency

Resiliency type: Two-way mirror

Size

Storage pool capacity:
- Three-way mirror
- Parity
- 1.82 TB

Available capacity: 1.82 TB

Logical size: 934 GB (1.82 TB maximum pool capacity usage)

The two-way mirror layout stores two copies of your data, protecting you from a single drive failure. This resiliency type requires at least two drives.

You can create a storage space larger than the amount of available capacity in the storage pool. When you run low on capacity in the pool, you can add more drives.
Creating a Two-Way-Mirrored "Storage Space" (continued)

• If you select "Two-way mirror", the "Storage Pool" has to have at least two physical drives. (Otherwise, the "Create storage space" button will be grayed out.)

• If you select "Three-way mirror", the "Storage Pool" has to have at least five physical drives. (Otherwise, the "Create storage space" button will be grayed out.)
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 12: Change the "Resiliency type" to "Two-way mirror":

Create a Storage Space

Select a name, resiliency type, and size for the storage space

Name and drive letter
Name: S_StorageSpace20120415
Drive letter: S:

Resiliency
Resiliency type:
- Two-way mirror
- None

Size
- Storage pool capacity: 1.82 TB
- Available capacity: 1.82 TB
- Logical size: 934 GB

The two-way mirror layout stores two copies of your data, protecting you from a single drive failure. This resiliency type requires at least two drives.

You can create a storage space larger than the amount of available capacity in the storage pool. When you run low on capacity in the pool, you can add more drives.

Create storage space | Cancel
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 13: Click on the "Create storage space" button:
This text box is not visible, but it appears to be a form or interface for creating storage space. The text inside the text box discusses the importance of creating two copies of your data to protect against a single drive failure and explains that the storage space should be at least as large as the amount of available capacity in the storage pool. It also mentions that you can add more drives when necessary.
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 14: Your new "Storage Space" will be displayed. In our example, our "Storage Space" is a virtual S: drive:
Creating a Two-Way-Mirrored "Storage Space" (continued)

Step 15: To see the individual hard drives of the "Storage Space", click on the downward pointing triangle that is to the left of "Physical Drives":

Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 3.00 GB of 1.58 TB pool capacity

Storage Spaces

StorageSpace07 (S:) Two-way mirror
814 GB logical size
Using 200 GB

Storage Spaces

ST310003 33AS USB Dev... Attached via USB
930 GB
0.16 % used

Seagate FreeAgent Pro U... Attached via USB
698 GB
0.21 % used
Real Physical “Windows 8” Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space

Hard Drive 3 = Bottom Right hard drive of L: Storage Space
REPLACING A PHYSICAL HARD DRIVE IN A TWO-WAY-MIRRORED "STORAGE SPACE"
You cannot logically remove a physical hard drive from a mirrored "Storage Space" unless you first add in another hard drive to the "Storage Pool".

Replacing A Physical Hard Drive In A.."Storage Space" (continued)
Step 0: Physically remove one of the hard drives from a two-way-mirrored "Storage Space". (If the activity light of the hard drive is blinking, wait for it to stop blinking.)
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 1: Attach a USB 2, USB 3, eSATA, or SATA hard drive to your computer.

Step 2: Press Windows + x.

Step 3: Click on "Control Panel" in the pop-up "Power Users Menu".
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 4: Locate and double-click on the "Storage Spaces" applet.
Step 5: A "Storage Spaces" window will be displayed.
Step 6: Click on "Add drives".
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

<table>
<thead>
<tr>
<th>Storage Pool</th>
<th>Warning</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using 5.00 GB of 1.58 TB pool capacity</td>
<td>Unhealthy drives; check drive health</td>
<td>Create a storage space, Add drives, Rename pool</td>
</tr>
</tbody>
</table>

Storage Spaces

<table>
<thead>
<tr>
<th>Storage Space07 (S:)</th>
<th>Two-way mirror</th>
<th>Using 4.00 GB</th>
</tr>
</thead>
<tbody>
<tr>
<td>814 GB logical size</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Physical Drives

<table>
<thead>
<tr>
<th>Drive</th>
<th>Attached via</th>
<th>Status</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST310003 33AS USB Dev</td>
<td>Attached via an unrecognized port</td>
<td>Warning</td>
<td>930 GB, 0.26% used</td>
</tr>
<tr>
<td>Seagate FreeAgent Pro USB Drive</td>
<td>Attached via USB</td>
<td>OK</td>
<td>698 GB, 0.35% used</td>
</tr>
</tbody>
</table>
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 7: A "Select drives to add to the storage pool" window will be displayed:
Add Drives

Select drives to add to the storage pool

Formatted drives

⚠️ The following drives might contain files. If you use a formatted drive to create a storage pool, Windows permanently deletes all the files on that drive. You can't recover the files by using the Recycle Bin.

<table>
<thead>
<tr>
<th>Drive Name</th>
<th>Status</th>
<th>Online Status</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST310005 28AS USB Dev...</td>
<td>Disk 8</td>
<td>Online</td>
<td>View files, Take offline</td>
</tr>
<tr>
<td>931 GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WDC WD30EZRS-00J99B...</td>
<td>Disk 0</td>
<td>Online</td>
<td>View files, Take offline</td>
</tr>
<tr>
<td>Attached via RAID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.72 TB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 8: Place a checkmark for the hard disk drive that you wish to add to the storage pool:
Select drives to add to the storage pool

Formatted drives

⚠️ The following drives might contain files. If you use a formatted drive to create a storage pool, Windows permanently deletes all the files on that drive. You can’t recover the files by using the Recycle Bin.

- ST31000528AS USB Device
  - Attached via USB
  - Online
  - 931 GB
  - View files
  - Take offline

- WDC WD30EZRS-00J99T0
  - Attached via RAID
  - Online
  - 2.72 TB
  - View files
  - Take offline

Add drives  Cancel
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 9: Click on the "Add drives" button:
Select drives to add to the storage pool

<table>
<thead>
<tr>
<th>Formatted drives</th>
<th>View files</th>
<th>Take offline</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST310005 28AS USB Dev...</td>
<td>Disk 8</td>
<td>Online</td>
</tr>
<tr>
<td>Attached via USB 931 GB</td>
<td>View files</td>
<td>Take offline</td>
</tr>
<tr>
<td>WDC WD30EZR-00J99B...</td>
<td>Disk 0</td>
<td>View files</td>
</tr>
</tbody>
</table>
Replacing A Physical Hard Drive In A.."Storage Space" (continued)
Step 10: "Storage Spaces" will start "Repairing.." the newly-added hard drive by copying data files and folders from the existing hard drive to the newly-added hard drive.
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 5.25 GB of 2.49 TB pool capacity

Unhealthy drives; check drive health

Create a storage space
Add drives
Rename pool

Storage Spaces

StorageSpace07 (S:)
Two-way mirror
814 GB logical size
Using 4.00 GB

Warning
Repairing (12%)

Warning

View files
Rename
Delete

Physical Drives

-
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 11: Click on "Remove" for the hard drive that you wish to logically remove from the "Storage Space".
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 12: Click on the "Remove" button:
Confirm removal of the drive

Drive to remove:

ST3100033AS USB Device
Attached via an unrecognized path
930 GB
0.02 % used

Warning: Selected for data reallocation

Remove drive
Cancel
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 13: Click on the downward pointing caret to the left of "Physical Drives":

Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 5.00 GB of 1.58 TB pool capacity

Create a storage space
Add drives
Rename pool

Storage Spaces

StorageSpace07 (S:)
Two-way mirror
814 GB logical size
Using 4.00 GB

Physical Drives
Replacing A Physical Hard Drive In A.."Storage Space" (continued)

Step 14: Note that the hard drive that you wanted logically-removed from the "Storage Space" is no longer displayed:
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 5.00 GB of 1.58 TB pool capacity

Create a storage space
Add drives
Rename pool

Storage Spaces

StorageSpace07 (S:)
Two-way mirror
814 GB logical size
Using 4.00 GB

View files
Rename
Delete

Physical Drives

ST310005 2BAS USB Dev...
Attached via USB
930 GB
0.26 % used

Rename

Seagate FreeAgent Pro U...
Attached via USB
698 GB
0.35 % used

Rename

See also
File History
BitLocker Drive Encryption
USING "STORAGE SPACES" TO CREATE A FULL BACKUP OF A HARD DRIVE
• You can use "Storage Spaces" to create a full backup by physically removing any hard drive that is part of a two-way-mirrored "Storage Space".
USING "STORAGE SPACES" TO CREATE A FULL BACKUP OF A HARD DRIVE (continued)

- This removed physical hard drive can be attached to and then browsed by any "Windows 8" computer.
• By storing a hard drive that "half" of a two-way-mirrored "Storage Space", you can create at regular time intervals, a series of archived full backups of your data to avoid data loss due to hard drive crashes, software failure, human error.
Real Physical “Windows 8” Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space

Hard Drive 3 = Bottom Right hard drive of L: Storage Space
REMOVE AND STORE "HARD DRIVE 3":

Real Physical "Windows 8" Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space

Hard Drive 3 = Bottom Right hard drive of L: Storage Space
was Hard Drive 3
Labelled as
"Bottom Right hard drive of L:
Storage Space on 2013-06-13"
Real Physical “Windows 8” Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space
USING "STORAGE SPACES" TO CREATE A FULL BACKUP OF A HARD DRIVE (continued)

• The "Action Center" of "Windows 8" will now be complaining about the "failed" hard drive in your "Storage Space":

108
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 5.00 GB of 1.58 TB pool capacity

Unhealthy drives; check drive health

Create a storage space
Add drives
Rename pool

Storage Spaces

StorageSpace07 (S:)
Two-way mirror
814 GB logical size
Using 4.00 GB

Warning
Reduced resiliency; check drive health

View files
Rename
Delete

Storage Spaces

ST3100033AS USB Dev.
Attached via an unrecognized path
930 GB
0.26 % used

Warning
Selected for data reallocation

Rename
Remove

Seagate FreeAgent Pro USB
Attached via USB
698 GB
0.35 % used

OK

Rename
USING "STORAGE SPACES" TO CREATE A FULL BACKUP OF A HARD DRIVE (continued)

• To restore the "Storage Space" back to a redundant configuration, you will then have to follow our step-by-step procedure for "Replacing A Physical Hard Drive In A.."Storage Space".
Real Physical "Windows 8" Computer

Drive Pool

Storage Space L:

C: Drive

Hard Drive 2 = Top Left hard drive of L: Storage Space

Hard Drive 4 = Bottom Right hard drive of L: Storage Space
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives so that your files remain safe, even when a drive fails. Storage Spaces also enables you to easily add more drives if you run low on capacity.

Storage Pool

Using 5.00 GB of 1.58 TB pool capacity

Storage Spaces

- StorageSpace07 (S:)
  - Two-way mirror
  - 814 GB logical size
  - Using 4.00 GB

Physical Drives

- ST310005 28AS USB Dev...
  - Attached via USB
  - 930 GB
  - 0.26 % used

- Seagate FreeAgent Pro U...
  - Attached via USB
  - 698 GB
  - 0.35 % used
USING "STORAGE SPACES" TO MOVE DATA FILES TO ANOTHER "WINDOWS 8" COMPUTER
USING "STORAGE SPACES" TO MOVE DATA FILES TO ANOTHER "WINDOWS 8" COMPUTER

- You can move one or both of the real hard drives in a two-way mirrored "Storage Pool" to another "Windows 8" computer. The second "Windows 8" computer will show the Storage Pool's logical drive(s) in its "File Explorer" and its "Storage Spaces" applet.
• If you only move one of the hard drives in the two-way-mirrored "Storage Space", the second "Windows 8" computer will expect you to eventually move the other hard drive(s) in the "Storage Pool" to it or add a new hard drive to the "Storage Pool".
Manage Storage Spaces

Use Storage Spaces to save files to two or more drives to help protect you from a drive failure. Storage Spaces also lets you easily add more drives if you run low on capacity. If you don’t see task links, click Change settings.

### Storage pool

<table>
<thead>
<tr>
<th>Using 3.00 GB of 118 GB pool capacity</th>
<th>Warning</th>
<th>Create a storage space Add drives Rename pool</th>
</tr>
</thead>
</table>

#### Storage spaces

- **Storage space (Z:)**
  - Two-way mirror
  - 59.2 GB
  - Using 2.00 GB pool capacity

#### Physical drives

- **VMware, VMware Virtual S...**
  - 2.53 % used
  - Providing 59.2 GB pool capacity

- **VMware, VMware Virtual S...**
  - Attached via SAS
  - 2.53 % used
  - Providing 59.2 GB pool capacity

---

See also
- File History
- BitLocker Drive Encryption
• The physical hard drives that are part of a "Storage Pool" are formatted in a format that only "Windows 8.." computers can access: Do not attempt to use computers running earlier versions of "Windows.." to access a "Storage Space" drive.
• For example, if you attempt to access a "Storage Spaces" hard drive with "Windows 7..":

USING "STORAGE SPACES" TO MOVE DATA FILES TO ANOTHER "WINDOWS 8" COMPUTER (continued)
USING "STORAGE SPACES" TO MOVE DATA FILES TO ANOTHER "WINDOWS 8" COMPUTER (continued)

• "Storage Spaces" virtual hard drive(s) shows up in "Disk Management" of a "Windows 7" computer as a "healthy" partition of unknown format that you cannot assign a drive letter to:
"STORAGE SPACES" AUTOMATED BACKUP (continued)

- "Storage Spaces" virtual hard drive(s) do not show up in "Windows Explorer" of a "Windows 7" computer:
"STORAGE SPACES" AUTOMATED BACKUP (continued)

- See
  http://blogs.msdn.com/b/b8/archive/2012/01/05/virtualizing-storage-for-scale-resiliency-and-efficiency.aspx
  and
  http://helgeklein.com/blog/2012/03/windows-8-storage-spaces-bugs-and-design-flaws/
• If a hard drive that is part of a "Storage Space" fails, you usually have to use "diskpart" from an elevated command prompt in "Windows 8" in order to repair the hard drive.
SOME PROBLEMS WITH "STORAGE SPACES" (continued)

• "Windows 8.." does not notify you when there is a temporary failure of one of the USB 2 or USB 3 ports that connect an external hard drive to a "Storage Space".
Misconception:
When a "Storage Spaces" pool of hard drives fails, it cannot be repaired because no software utility programs are available.
Misconception: When a "Storage Spaces" pool of hard drives fails, it cannot be repaired because no software utility programs are available.

See
http://www.storage-spaces-recovery.com/
and
http://www.prweb.com/releases/2013/2/prweb10436480.htm
What you get

Each license key of ReclaiMe Storage Spaces Recovery can be used to recover all the pools and spaces from one set of physical drives and/or disk image files.

Once you purchase ReclaiMe Storage Spaces Recovery, you will get a license key. The key allows you to use capabilities of ReclaiMe Storage Spaces Recovery software to recover the configuration of all the pools and spaces belonging to a particular set of physical drives. The key allows you to save contents of spaces as VHD, VHDX, and raw image files. Each new set of physical drives requires a new license key.

Additionally, you will get a discount coupon to purchase ReclaiMe File Recovery Standard for a nominal fee. ReclaiMe File Recovery allows you to recover data from the spaces on a file-by-file basis.

Refund policy

The refunds are provided only if the problem cannot be resolved by our technical support team.

Payment options

You can purchase ReclaiMe Storage Spaces Recovery using a credit card, PayPal, or iDEAL payments. You can place the order in almost any currency.

Purchase a license

ReclaiMe Storage Spaces Recovery, one case for one disk set
- Reconstructs failed Storage Spaces pools.
- Saves space contents as VHD, VHDX, or raw image files.
- Saves Storage Spaces configuration in an XML file.

$299.95
Instant purchase

Discount for second and subsequent recoveries

Along with the license key you get a discount coupon for subsequent orders of ReclaiMe Storage Spaces Recovery. If you are a data recovery specialist, you will definitely need it.

ReclaiMe Storage Spaces Recovery license agreement.
Misconception: When a "Storage Spaces" pool of hard drives fails, it cannot be repaired because no software utility programs are available (continued)

The "ReclaiMe Storage Spaces Recovery" program costs ~$300 for each computer that you use it on.
Purchase a license

ReclaiMe Storage Spaces Recovery, one case for one disk set

- Reconstructs failed Storage Spaces pools.
- Saves space contents as VHD, VHDX, or raw image files.
- Saves Storage Spaces configuration in an XML file.

$299.95
Instant purchase

Discount for second and subsequent recoveries

Along with the license key you get a discount coupon for subsequent orders of ReclaiMe Storage Spaces Recovery. If you are a data recovery specialist, you will definitely need it.
Brief history and photo gallery

**Elena Y. Pakhomova**, Development and Marketing

One of the founders of ReclaiMe software development team, she started working in data recovery field even before completing her master degree. Elena is a certified translator and she sometimes contributes to various online technology outlets in addition to her professional life.

She enjoys skiing, skating, music and movies, and spending time with her family.

**Julia Y. Pakhomova**, Chief Developer

Our products

- **Free RAID Recovery**, a freeware to recover RAID configuration parameters. As of 2012, it covers the widest possible range of RAID levels, compared to other similar software. You can check out [this comparison](#) if you want an example. ReclaiMe Free RAID Recovery is the first ever automatic tool to support delayed parity in RAID 5 arrays.

- **ReclaiMe** multipurpose data recovery software. Built with simplicity in mind, ReclaiMe recovers data from most filesystems one can encounter in day-to-day use.

- **BenchMe**, a free tool to benchmark various data storage devices. With BenchMe, you can get an overview of most significant performance characteristics of a storage system at a glance. Benchme produces conveniently arranged read speed chart, access time chart, and IOPS values.

- **Lowvel**, a freeware to erase data irreversibly from a storage device. One's ultimate zero filling software. Just point to a drive, click, and all the data goes *poof*, not recoverable even by our own data recovery software.
ReclaiMe Storage Spaces Recovery - Word's First Software to Recover Failed Windows 8 Storage Spaces

Storage Spaces is becoming more and more popular among users in the world. ReclaiMe's newly released Storage Spaces Recovery deals with failures of Storage Spaces of all kinds, extracting data in a variety of output formats.

Volgograd, Russia (PRWEB) February 17, 2013

The ReclaiMe data recovery company released a brand new ReclaiMe Storage Spaces Recovery software - at this moment the only tool that can recover a failed Storage Spaces configuration.

"A few months ago we started to develop algorithms to recover a failed Storage Spaces configuration since we predicted that this capability will become very popular among users," said Elena Pakhomova, senior developer of ReclaiMe. "Storage Spaces is an absolutely new, well-designed capability that is available in Windows 8 and Windows 2012 Servers. With Storage Spaces, you can manage disk space effectively. However, Storage Spaces fails like all other things. Quite a few clients contact us asking for a solution to Storage Spaces recovery. And now we got it."

When developing ReclaiMe Storage Spaces Recovery, designers encountered quite a number of difficulties. One of them is the computational complexity of the recovery process, manifesting itself in some severe system requirements.

"Storage Spaces fails like all other things. Quite a few clients contact us asking for a solution to Storage Spaces recovery."
Mystery: The hardware configuration of your USB 3 ports greatly affects the reliability of Storage Spaces composed of "Drive Pools" consisting entirely of external hard drives.
An "All PCI-e USB 3 Configuration" That Causes "Storage Spaces" To Fail

• When you create a "Drive Pool" from two external USB 3 hard drives that are both connected to one or more PCI-e "USB 3" adapters, any two-way mirrored "Storage Space" that you create from this drive pool will fail when the "Storage Space" reaches between 40 percent and 60 percent of fill.
An "All PCI-e USB 3 Configuration" That Causes "Storage Spaces" To Fail (continued)

- This configuration occasionally overwhelms the USB controller chip set and causes other devices that are connected to the same USB controller chip set to occasionally fail.
"All PCIe USB 3 Configuration"

Computer with "Windows 8" operating system

**Motherboard**

PCIe USB 3 Adapter

PCIe USB 3 Adapter

USB Cable

USB Cable

Drive Pool

USB 3 External Hard Drive A

USB 3 External Hard Drive B

Two-Way Mirror "Storage Spaces" fail at 40 to 60 percent of fill
An "All Motherboard USB 3 Configuration" That Causes "Storage Spaces" to Fail

- When you create a "Drive Pool" from two external USB 3 hard drives that are both connected to motherboard-based "USB 3" adapters, any two-way mirrored "Storage Space" that you create from this drive pool will fail when the "Storage Space" reaches between 40 percent and 60 percent of fail.
An "All Motherboard USB 3 Configuration" That Causes "Storage Spaces" to Fail (continued)

- This configuration occasionally overwhelms the USB controller chip set and causes other devices that are connected to the same USB controller chip set to occasionally fail.
"All Motherboard USB 3 Configuration"

Computer with "Windows 8" operating system

Motherboard

- Motherboard-based USB 3 Adapter
- Motherboard-based USB 3 Adapter

USB Cable

USB 3 External Hard Drive A

USB 3 External Hard Drive B

Drive Pool

Two-Way Mirror "Storage Spaces" fail at 40 to 60 percent of fill
A "Hybrid Motherboard/PCIe USB 3 Configuration" That Works Reliably With "Storage Spaces"

• When you create a "Drive Pool" from two external USB 3 hard drives with one hard drive connected to a motherboard-based USB port and the other hard drive connected to a PCI-e USB 3 adapter, any two-way mirrored "Storage Space" that you create from this "Drive Pool" will work reliably without problems.
Computer with "Windows 8" operating system

Motherboard
- Motherboard-based USB 3 Adapter
- PCIe USB 3 Adapter

USB Cable

USB 3 External Hard Drive A

USB 3 External Hard Drive B

Drive Pool

Two-Way Mirror "Storage Spaces" work reliably without problems
REFERENCES

REFERENCES (continued)

- http://www.pcpro.co.uk/features/379408/windows-8-storage-spaces-a-how-to-guide/4