ORGANIZING HARD DRIVES IN A "WINDOWS 10" OR "WINDOWS 8.1" COMPUTER

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WINdows usERS

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SUMMARY

You can use the bundled "Storage Spaces" applet inside a "Windows 10.." or "Windows 8.1.." computer to organize your hard drives in order to make your computer easier to use and to reduce the probability of data loss.
TOPICS

- "Dynamic Disks" and "Dynamic Volumes" are Deprecated
- "Storage Spaces" in "Windows 10"
- "Simple" "Storage Spaces" for Greater (Virtual) Disk Size
- "Mirroring" For Redundancy
- Types of Hard Drive Failures
TOPICS (continued)

- "Mirroring" Combined With Manual Copying for Better Protection from Data Loss
"DYNAMIC DISKS" AND "DYNAMIC DISKS" ARE DEPRECATED

- According to Microsoft, "Dynamic Disks" and "Dynamic Disks" are now deprecated, as explained at https://msdn.microsoft.com/en-us/windows/compatibility/vds-is-transitioning-to-windows-storage-management-api
For all usages except mirror boot volumes (using a mirror volume to host the operating system), dynamic disks are deprecated. For data that requires resiliency against drive failure, use Storage Spaces, a resilient storage virtualization solution. For more info, see Storage Spaces Technical Preview.
"MIRRORED" "DYNAMIC VOLUMES" FOR "WINDOWS 10.."

If you absolutely have to use "Dynamic Volumes" to mirror two drives in a "Windows 10.." computer:

- "Mirrored" "Dynamic Volumes" are only available for the ..Pro, ..Enterprise, and ..Education editions of "Windows 10.."
- "Mirrored" "Dynamic Volumes" are not permitted in the default "Windows 10 Home" edition of "Windows 10.."
- Spoiler alert: You can use "Storage Spaces" to mirror two hard drives in "Windows 10.."
USING "DYNAMIC VOLUMES" TO MIRROR THE C: DRIVE PARTITION IN THE BOOT DRIVE
• Microsoft still has not devised another way for Windows.. computers to mirror the C: drive partition so they still allow the use of "Dynamic Disks" with "Dynamic Volumes" for doing so (but this is mainly for Windows Server.. computers:
• To use dynamic volumes to mirror the boot drive (where the C: disk partition resides) in Windows 7, 8.1, and 10, see https://www.wintips.org/how-to-mirror-boot-hard-drive-on-windows-10-legacy-or-uefi/
If you perform the previously-mentioned procedure to convert the boot drive to a "Dynamic Disk", you will be subsequently unable to run "Storage Spaces" until you reload the "Windows.." operating system.
WAYS TO START "DISK MANAGEMENT" IN "WINDOWS."

- See
REQUIREMENTS FOR REAL HARD DRIVES THAT ARE USED FOR "STORAGE SPACES"

- Each real hard drive that you add to a "Storage Pool" must be at least 5 Gigabytes in size
DISK PARTITIONS THAT BELONG TO A "STORAGE POOL"

- Disk partitions that belong to a "Storage Pool" have their own unique ID to reside on a "GUID Partition Table" type of hard drive instead of a "Master Boot Record" type of hard drive.
According to https://en.wikipedia.org/wiki/GUID_Partition_Table
Disk partitions that belong to a "Storage Pool" have their own "Globally Unique Identifier":
<table>
<thead>
<tr>
<th>Windows</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microsoft Reserved Partition (MSR)</strong></td>
<td>E3C9E316-0B5C-4DB8-817D-F92DF00215AE</td>
</tr>
<tr>
<td><strong>Basic data partition</strong>[^g]</td>
<td>EBD0A0A2-B9E5-4433-87C0-68B6B72699C7</td>
</tr>
<tr>
<td><strong>Logical Disk Manager (LDM) metadata partition</strong></td>
<td>5808C8AA-7E8F-42E0-85D2-E1E90434CFB3</td>
</tr>
<tr>
<td><strong>Logical Disk Manager data partition</strong></td>
<td>AF9B60A0-1431-4F62-BC68-3311714A69AD</td>
</tr>
<tr>
<td><strong>Windows Recovery Environment</strong></td>
<td>DE94BBA4-06D1-4D40-A16A-BFD50179D6AC</td>
</tr>
<tr>
<td><strong>IBM General Parallel File System (GPFS)</strong></td>
<td>37AFFC90-EF7D-4E96-91C3-</td>
</tr>
<tr>
<td><strong>Storage Spaces partition</strong></td>
<td>E75CAF8F-F680-4CEE-AFA3-B001E56EFC2D</td>
</tr>
</tbody>
</table>
DISK PARTITIONS THAT BELONG TO A "STORAGE POOL" (continued)

- Disk partitions that belong to a "Storage Pool" are ignored by the "Disk Management" applet in Windows.. but they can be seen in the free "GPartED" hard drive utility in Linux where they are identified as "Storage pool" partitions:
### /dev/sdb - GParted

#### Device Information
- **Model:** ATA VMware Virtual S
- **Serial:** 02000000000000000000001
- **Size:** 50.00 GiB
- **Path:** /dev/sdb

#### Partition Table
- **Partition**
  - /dev/sdb1 (Microsoft reserved partition)
  - /dev/sdb2 (Storage pool)
  - unallocated

#### Partition Details
- **File System:** Unknown
- **Size:** 15.98 MiB
- **Used:** ---
- **Unallocated Size:** 1.00 MiB
- **Path:** /dev/sdb2
- **Size:** 49.98 GiB

#### Drive Specifications
- **Partition table:** gpt
- **Heads:** 255
- **Sectors/track:** 63
- **Cylinders:** 6527
- **Total sectors:** 104857600
- **Sector size:** 512
- **0 operations pending**
### GParted - /dev/sdb

#### /dev/sdb2
**Size:** 49.98 GiB

<table>
<thead>
<tr>
<th>Partition</th>
<th>Name</th>
<th>File System</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sdb1</td>
<td>Microsoft reserved partition</td>
<td>unknown</td>
<td>15.98 MiB</td>
</tr>
<tr>
<td>/dev/sdb2</td>
<td>Storage pool</td>
<td>unknown</td>
<td>49.98 GiB</td>
</tr>
<tr>
<td>unallocated</td>
<td></td>
<td>unallocated</td>
<td>1.00 MiB</td>
</tr>
</tbody>
</table>
### /dev/sdc - GParted

#### /dev/sdc2
49.98 GiB

<table>
<thead>
<tr>
<th>Partition</th>
<th>Name</th>
<th>File System</th>
<th>Size</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sdc1</td>
<td>Microsoft reserved partition</td>
<td>unknown</td>
<td>15.98 MiB</td>
<td>---</td>
</tr>
<tr>
<td>/dev/sdc2</td>
<td>Storage pool</td>
<td>unknown</td>
<td>49.98 GiB</td>
<td>---</td>
</tr>
<tr>
<td>unallocated</td>
<td>unallocated</td>
<td>unallocated</td>
<td>1.00 MiB</td>
<td>---</td>
</tr>
</tbody>
</table>
"STORAGE SPACES" IS AT A HIGHER LEVEL OF ABSTRACTION THAT "DISK MANAGEMENT" CANNOT "SEE"

- Each real hard drive that you add to a "Pool" in "Storage Spaces" disappears in "Disk Management"

- Each real hard drive that belongs to a "Pool" in "Storage Spaces" returns to "Disk Management" when you delete the "Pool"
"STORAGE SPACES" IS AT A HIGHER LEVEL OF ABSTRACTION THAT "DISK MANAGEMENT" CANNOT "SEE" (continued)

- Each virtual hard drive that you create from a "pool" in "Storage Spaces" is immediately displayed as a hard drive inside "Disk Management"

- Each virtual hard drive that you create from a "pool" in "Storage Spaces" is immediately displayed as a hard drive inside "Device Manager"
STRIPED "DYNAMIC VOLUMES" FASTER THAN ANY THAT "STORAGE SPACES" CONFIGURATION OF DRIVES

- See
  and
  https://imgur.com/a/IReS0
WHEN A HARD DISK JOINS A "POOL" IN "STORAGE SPACES", IT IS ORGANIZED INTO "SLABS"

- "Slabs" are 256 Megabytes in size
- The first two "Slabs" in a hard disk are reserved for use by the "Storage Spaces System"
WHEN A HARD DISK JOINS A "POOL" IN "STORAGE SPACES", IT IS ORGANIZED INTO "SLABS"

- "Slabs" are 256 Megabytes in size
- The first two "Slabs" in a hard disk are reserved for use by the "Storage Spaces" system
WHEN A HARD DISK JOINS A "POOL" IN "STORAGE SPACES", IT IS ORGANIZED INTO "SLABS" (continued)

- The following two diagrams are from https://www.smallnetbuilder.com/nas/nas-features/32057-data-recovery-tales-why-you-cant-recover-a-windows-8-drive:
Original Windows Storage Space layout
<table>
<thead>
<tr>
<th>Slab 0</th>
<th>Storage Spaces metadata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slab 1</td>
<td>Blank filesystem metadata</td>
</tr>
<tr>
<td>Slab 2</td>
<td>File 1</td>
</tr>
<tr>
<td>Slab 3</td>
<td>File 3, part 1</td>
</tr>
<tr>
<td>Slab 4</td>
<td>File 3, part 3</td>
</tr>
<tr>
<td>Slab 5</td>
<td>File 5</td>
</tr>
<tr>
<td>Slab 6</td>
<td></td>
</tr>
<tr>
<td>Slab N</td>
<td></td>
</tr>
</tbody>
</table>

Storage Space After Formatting
<table>
<thead>
<tr>
<th>Partition</th>
<th>Name</th>
<th>File System</th>
<th>Size</th>
<th>Used</th>
<th>Unused</th>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sdb1</td>
<td>Microsoft reserved partition</td>
<td>unknown</td>
<td>15.98 MiB</td>
<td>---</td>
<td>---</td>
<td>msftres</td>
</tr>
<tr>
<td>/dev/sdb2</td>
<td>Storage pool</td>
<td>unknown</td>
<td>49.98 GiB</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>unallocated</td>
<td></td>
<td>unallocated</td>
<td>1.00 MiB</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

0 operations pending
DETECTING ERRORS IN HARD DRIVES

- Intermittent errors in a SATA or eSATA hard drive will cause blinks in "Device Manager" but not in "USBTreeView".
- Intermittent errors in a USB hard drive will cause blinks in both "Device Manager" and "USBTreeView".
- Intermittent errors in any hard drive that is part of a mirrored pair of drives will cause both drives to fail.
BATCH FILE FOR DETECTING PROBLEMS IN "STORAGE SPACES"

Contents of diagnostics.bat:

start mmc devmgmt.msc

start ""
C:Apps.par\UsbTreeView\x64\UsbTreeView.exe

c control /name Microsoft.StorageSpaces
A SOFTWARE UTILITY THAT CAN RECOVER DATA FROM "STORAGE SPACES" DRIVES

- At the present time, the only software utility that we know of that can recover information from failed "Storage Spaces" is the "ReclaiMe Pro" utility program. See http://www.reclaime-pro.com/
USING "STORAGE SPACES" AND "DYNAMIC DISKS"

- See
  https://hetmanrecovery.com/recovery-news/how-to-create-a-storage-space-or-mirrored-volume-in-windows-7-8-or-10.htm
"STORAGE SPACE" WITH "MIRRORED" CONFIGURATION

- See https://hetmanrecovery.com/recovery-news/how-to-create-a-storage-space-or-mirrored-volume-in-windows-7-8-or-10.htm
"STORAGE SPACE" WITH "MIRRORED" CONFIGURATION (continued)

- Cannot add a mirror drive to an existing data with destroying the data that is already on the hard drive volume
- Must create the mirrored drive pair and then copy the existing data files and folders to the newly-created mirrored drive pair
"STORAGE SPACE" WITH "SIMPLE" CONFIGURATION

- "Spanned"
- Sometimes called "JBOD" meaning "Just a Bunch of Disks"
- See https://www.techradar.com/how-to/how-to-combine-multiple-hard-drives-in-raid-0-using-windows-10s-storage-spaces-feature
TYPES OF HARD DRIVE FAILURES

- Type 1: Quick catastrophic failure
- Type 2: Massive slowdown without data loss
- Type 3: Intermittent errors generated over a long slow death
"STORAGE SPACE" PORTABILITY

- A "Storage Space" hard drive (or half of a "Storage Space" mirrored drive pair) can be moved to another Windows 10 or 8.1 computer as long as the target Windows 10 or 8.1 computer is running a version of "Storage Spaces" that is not earlier than the version of "Storage Spaces" the "Storage Space" hard drive was originally running inside of.