

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

by Francis Chao  
fchao2@yahoo.com

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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/>

# USING "DYNAMIC VOLUMES" TO MIRROR THE C: DRIVE PARTITION IN THE BOOT DRIVE (continued)

- 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 <https://www.digitalcitizen.life/open-disk-management-windows>

# 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 to reside on a "GUID Partition Table" type of hard drive instead of a "Master Boot Record" type of hard drive

# DISK PARTITIONS THAT BELONG TO A "STORAGE POOL" (continued)

- According to [https://en.wikipedia.org/wiki/GUID\\_Partition\\_Table](https://en.wikipedia.org/wiki/GUID_Partition_Table)

Disk partitions that belong to a "Storage Pool" have their own "Globally Unique Identifier":

Windows	Microsoft Reserved Partition (MSR)	E3C9E316-0B5C-4DB8-817D-F92DF00215AE
	Basic data partition <sup>[9]</sup>	EBD0A0A2-B9E5-4433-87C0-68B6B72699C7
	Logical Disk Manager (LDM) metadata partition	5808C8AA-7E8F-42E0-85D2-E1E90434CFB3
	Logical Disk Manager data partition	AF9B60A0-1431-4F62-BC68-3311714A69AD
	Windows Recovery Environment	DE94BBA4-06D1-4D40-A16A-BFD50179D6AC
	IBM General Parallel File System (GPFS)	37AFFC90-EF7D-4E96-91C3-
	Storage Spaces partition	E75CAF8F-F680-4CEE-AFA3-B001E56EFC2D

# 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**

GParted Edit View Device Partition Help

/dev/sdb (50.00 GiB)

/dev/sdb2  
49.98 GiB

Device Information	Partition	Name	File System	Size	Used	Unus
<b>Model:</b> ATA VMware Virtual S	/dev/sdb1	Microsoft reserved partition	unknown	15.98 MiB	---	---
<b>Serial:</b> 0200000000000000000001	/dev/sdb2	Storage pool	unknown	49.98 GiB	---	---
<b>Size:</b> 50.00 GiB	unallocated		unallocated	1.00 MiB	---	---
<b>Path:</b> /dev/sdb						

**Partition table:** gpt  
**Heads:** 255  
**Sectors/track:** 63  
**Cylinders:** 6527  
**Total sectors:** 104857600  
**Sector size:** 512

0 operations pending

## /dev/sdb - GParted

Help

 /dev/sdb (500 GiB)

/dev/sdb2  
49.98 GiB

Partition	Name	File System	Size
/dev/sdb1	! Microsoft reserved partition	■ unknown	15.98 MiB
/dev/sdb2	! Storage pool	■ unknown	49.98 GiB
unallocated		■ unallocated	1.00 MiB

**/dev/sdc - GParted**

GParted Edit View Device Partition Help

/dev/sdc (50.00 GiB)

/dev/sdc2  
49.98 GiB

Device Information	Partition	Name	File System	Size	Used	Unus
<b>Model:</b> ATA VMware Virtual S	/dev/sdc1	Microsoft reserved partition	unknown	15.98 MiB	---	---
<b>Serial:</b> 0400000000000000000001	/dev/sdc2	Storage pool	unknown	49.98 GiB	---	---
<b>Size:</b> 50.00 GiB	unallocated		unallocated	1.00 MiB	---	---
<b>Path:</b> /dev/sdc						

**Partition table:** gpt  
**Heads:** 255  
**Sectors/track:** 63  
**Cylinders:** 6527  
**Total sectors:** 104857600  
**Sector size:** 512

0 operations pending

# /dev/sdc - GParted

Help

/dev/sdc (50.00 GiB)

/dev/sdc2  
49.98 GiB

Partition	Name	File System	Size	Used	U
/dev/sdc1	Microsoft reserved partition	unknown	15.98 MiB	---	
/dev/sdc2	Storage pool	unknown	49.98 GiB	---	
unallocated		unallocated	1.00 MiB	---	

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

# STRIPED "DYNAMIC VOLUMES" FASTER THAN ANY THAT "STORAGE SPACES" CONFIGURATION OF DRIVES

- See <https://superuser.com/questions/1141357/best-performance-windows-10-software-striping-vs-storage-spaces-simple>  
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"

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- 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> :

Hard drive			
Slab 0	Storage Spaces metadata		
Slab 1	Filesystem metadata		
Slab 2	File 1 File 2		
Slab 3	File 3, part 1 File 3, part 2	<b>Accessible in Storage Spaces</b>	
Slab 4	File 3, part 3 File 4		
Slab 5	File 5		
Slab 6			<b>Not visible in Storage Spaces, pool of available slabs</b>
Slab N			

Original Windows Storage Space layout

Hard drive		
Slab 0	Storage Spaces metadata	
Slab 1	Blank filesystem metadata	<b>Accessible in Storage Spaces</b>
Slab 2	File 1 File 2	<b>Not visible in Storage Spaces</b>
Slab 3	File 3, part 1 File 3, part 2	
Slab 4	File 3, part 3 File 4	
Slab 5	File 5	
Slab 6		
Slab N		

**pool of available slabs**

Storage Space After Formatting

**/dev/sdb - GParted**

GParted Edit View Device Partition Help

/dev/sdb (50.00 GiB)

/dev/sdb2  
49.98 GiB

Partition	Name	File System	Size	Used	Unused	Flags
/dev/sdb1	Microsoft reserved partition	unknown	15.98 MiB	---	---	msftres
/dev/sdb2	Storage pool	unknown	49.98 GiB	---	---	
unallocated		unallocated	1.00 MiB	---	---	

0 operations pending

**/dev/sdd - GParted**

GParted Edit View Device Partition Help

/dev/sdd (50.00 GiB)

/dev/sdd2  
49.98 GiB

Partition	Name	File System	Size	Used	Unused	Flags
/dev/sdd1	Microsoft reserved partition	unknown	15.98 MiB	---	---	msftres
/dev/sdd2	Storage pool	unknown	49.98 GiB	---	---	
unallocated		unallocated	1.00 MiB	---	---	

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\UsbTreeVi  
ew.exe
```

```
control /name Microsoft.Storage32Spaces
```



# 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](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](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 without 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

Hard drive		Hard drive		
Slab 0	Storage Spaces metadata	Slab 0	Storage Spaces metadata	
Slab 1	Blank filesystem metadata	Slab 1	Blank filesystem metadata	<b>Accessible in Storage Spaces</b>
Slab 2	File 1 File 2	Slab 2	File 1 File 2	<b>Not visible in Storage Spaces</b>
Slab 3	File 3, part 1 File 3, part 2	Slab 3	File 3, part 1 File 3, part 2	
Slab 4	File 3, part 3 File 4	Slab 4	File 3, part 3 File 4	
Slab 5	File 5	Slab 5	File 5	
Slab 6		Slab 6		
Slab N		Slab N		<b>pool of available slabs</b>

Storage Space After Formatting

Storage Space After Formatting

# "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>

Hard drive		
Slab 0	Storage Spaces metadata	
Slab 1	Blank filesystem metadata	<b>Accessible in Storage Spaces</b>
Slab 2	File 1 File 2	
Slab 3	File 3, part 1 File 3, part 2	Not visible in Storage Spaces
Slab 4	File 3, part 3 File 4	
Slab 5	File 5	
Slab 6		pool of available slabs

Hard drive		
Slab 0	Storage Spaces metadata	
Slab 1	Blank filesystem metadata	<b>Accessible in Storage Spaces</b>
Slab 7	File 1 File 2	
Slab 8	File 3, part 1 File 3, part 2	Not visible in Storage Spaces
Slab 9	File 3, part 3 File 4	
Slab 10	File 5	
Slab 11		pool of available slabs
Slab 12		

# 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.

