

MIRRORING HARD DRIVES IN REAL TIME WITH NO-COST SOFTWARE

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Web location for this
presentation:

<http://aztcs.org>

Click on

“Meeting Notes”

SUMMARY

You can mirror two or more hard drives in real time using no-cost software to avoid data loss due to inevitable hard drive failures.

TOPICS

- Basic Concept of Real-Time Drive Mirroring With Software
- Demonstration
- Disadvantages of Periodic Backups
- Disadvantages of Drive Mirroring
- Multiple Techniques for Maximum Redundancy

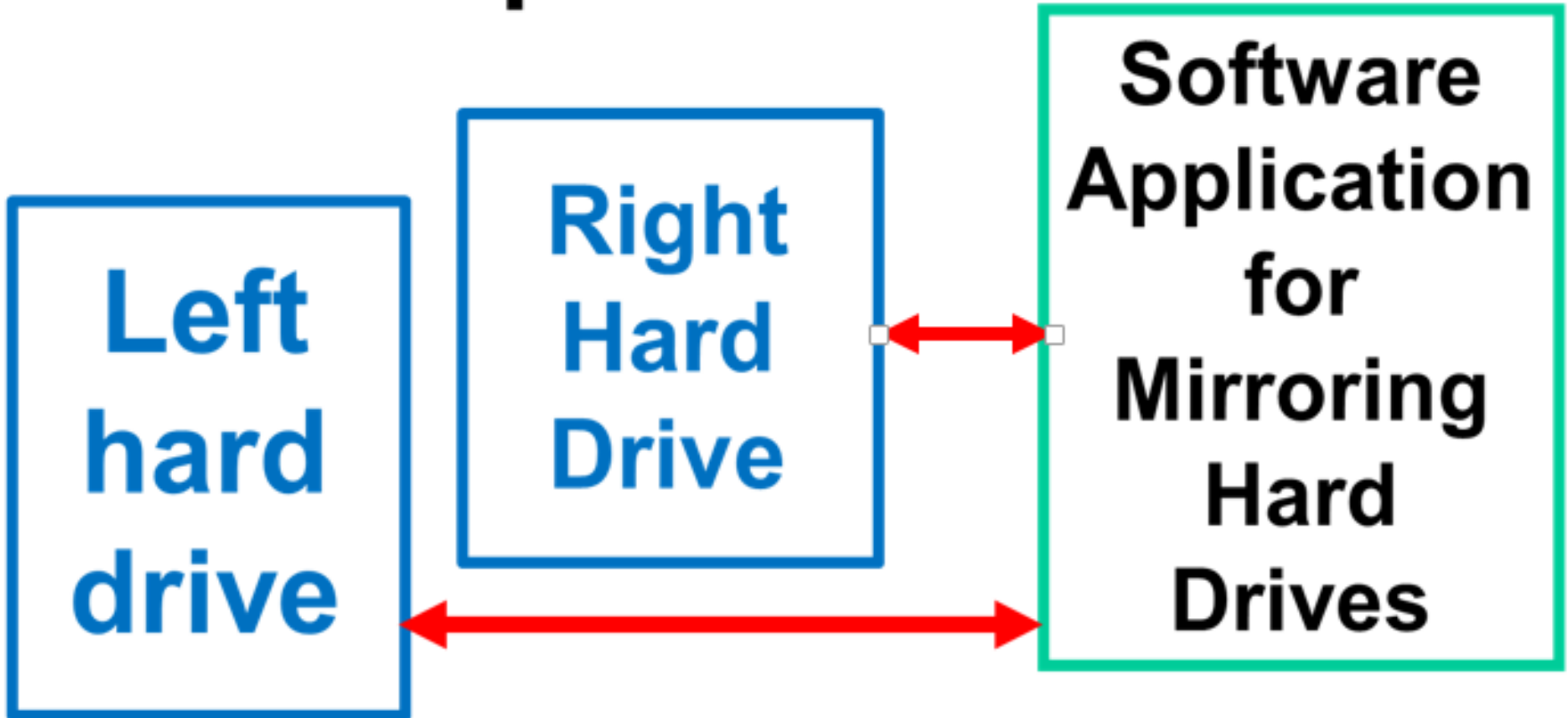
TOPICS (continued)

- Drive Mirroring Details
- Two No-Cost Software Programs:
 - Details of Windows 8's bundled "Storage Spaces" Applet
 - Details of Drive Mirroring with Dynamic Disks in "Windows 7" or "Windows 8"

Basic Concept of Real-Time Hard Drive Mirroring with Software

- From inside an application program or from inside "Windows Explorer"/"File Explorer, you create or modify a data file or folder in a virtual hard drive and your drive mirroring software transparently and automatically copies the data file or folder to two physical hard disk drives immediately. 6

Your Computer



A DEMONSTRATION OF
THE TWO NO-COST
PROGRAMS FOR HARD
DRIVE MIRRORING IN
REAL TIME

Start

testuser 

 Mail	 Desktop	 DOW 15,115.57 ▼ -1.36% (-208.96) 5/31/2013 4:37 PM EDT	 Maps	 SkyDrive
 People	 Calendar	 54° London Fair 64°/38° Weather	 FOX Sports - Police: Blaylock facing two charges	
 Messaging	 Photos	 Internet Explorer	 Store 15	 Storm chasers killed by Oklahoma tornado

Windows key + e
brings up "File Explorer"
in both the new "Start"
screen and the legacy
"Desktop"

File

Computer

View

Properties Open Rename

Location

Access media Map network drive Add a network location

Network

Open Control Panel Uninstall or change a program System properties Manage

System

Computer Search Computer

- ★ Favorites
 - Desktop
 - Downloads
 - Recent places

- Libraries
 - Documents
 - Music
 - Pictures
 - Videos

Homegroup

- Computer
 - Local Disk (C:)
 - D_DynMirror (D:)
 - S_StorageSpace (S:)

5 items

- Hard Disk Drives (3)
 - Local Disk (C:)
865 GB free of 979 GB
 - D_DynMirror (D:)
59.7 GB free of 59.8 GB
 - S_StorageSpace (S:)
59.0 GB free of 59.1 GB
- Devices with Removable Storage (2)
 - Floppy Disk Drive (A:)
 - DVD Drive (K:)



In "File Explorer" in "Windows 8", the two mirrored dynamic hard disk drives appear as a single "D:" hard drive.

File

Computer

View

Properties Open Rename

Location

Access media Map network drive Add a network location

Network

Open Control Panel

System

- Uninstall or change a program
- System properties
- Manage

Computer Search Computer

- ★ Favorites
 - Desktop
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Hard Disk Drives (3)

- Local Disk (C:)
865 GB free of 979 GB
- D_DynMirror (D:)
59.7 GB free of 59.8 GB
- S_StorageSpace (S:)
59.0 GB free of 59.1 GB

Devices with Removable Storage (2)

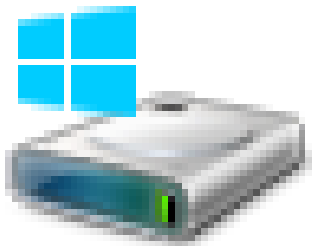
- Floppy Disk Drive (A:)
- DVD Drive (K:)

5 items

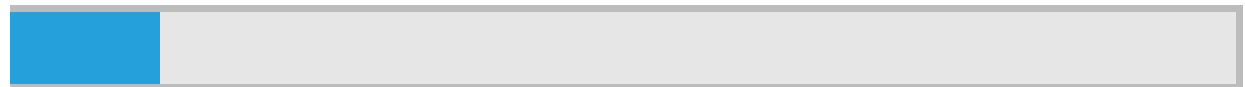


In "File Explorer" in "Windows 8", the two mirrored "Storage Spaces" hard disk drives appear as a single "S:" hard drive.

Hard Disk Drives (3)



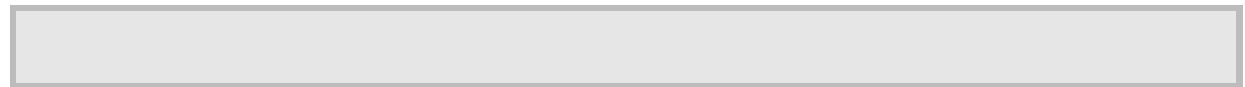
Local Disk (C:)



865 GB free of 979 GB



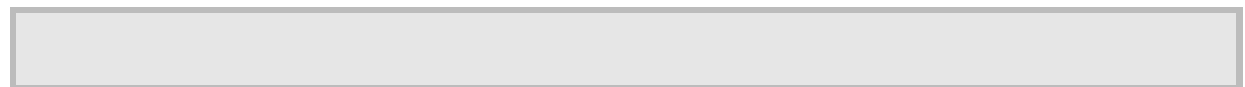
D_DynMirror (D:)



59.7 GB free of 59.8 GB

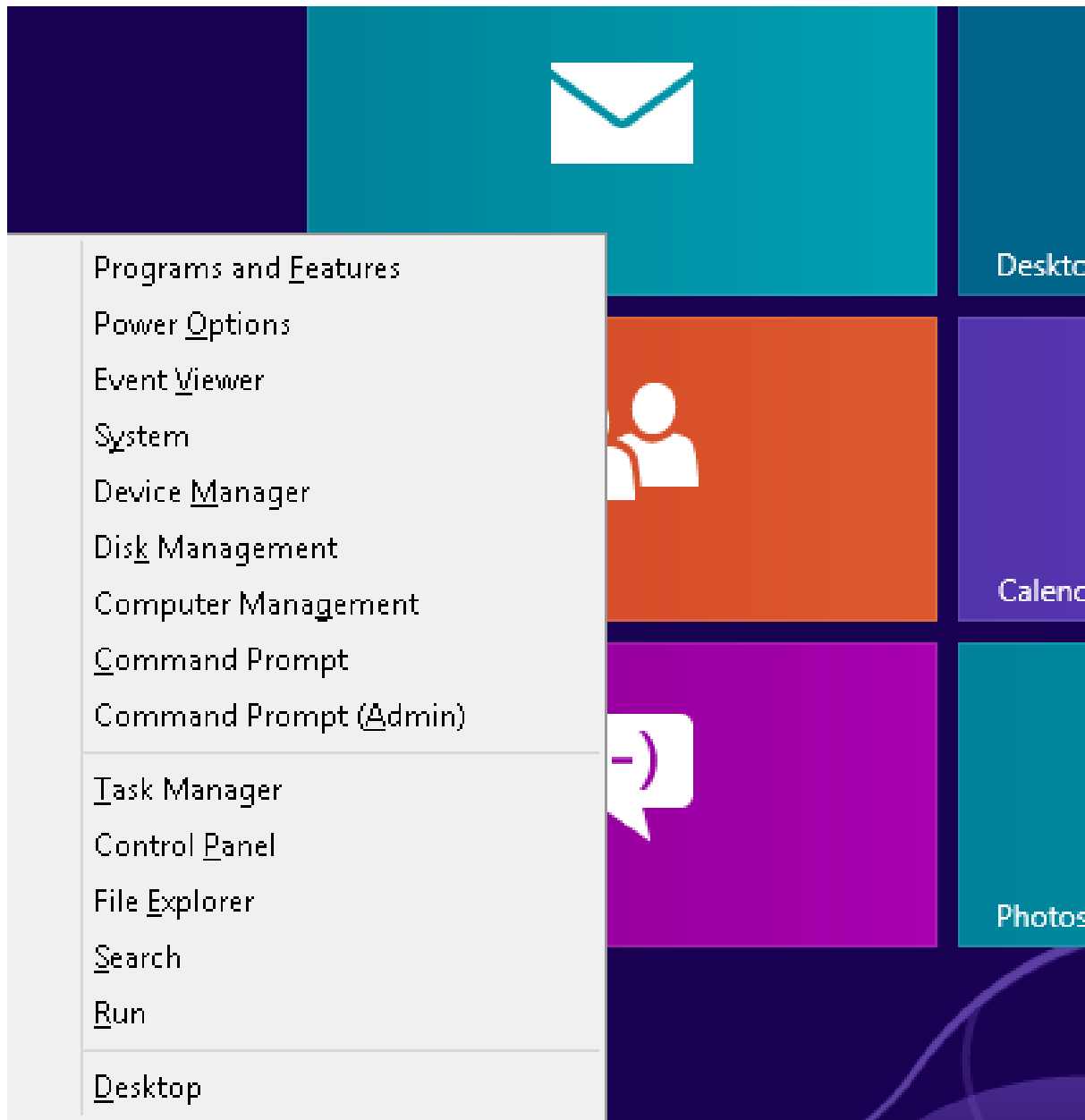


S_StorageSpace (S:)



59.0 GB free of 59.1 GB

Windows key + x
brings up the Power
User's menu in both the
new "Start" screen and
the legacy "Desktop"



Click on "Control Panel"



All Control Panel Items



Control Panel



All Control Panel Items



Search

Adjust your computer's settings

View by: [Small icon](#)

- Action Center
- BitLocker Drive Encryption
- Date and Time
- Devices and Printers
- Family Safety
- Folder Options
- Indexing Options
- Language
- Network and Sharing Center
- Performance Information and Tools
- Power Options
- Region
- Speech Recognition
- System
- Troubleshooting
- Windows Defender
- Windows Update
- Administrative Tools
- Color Management
- Default Programs
- Display
- File History
- Fonts
- Internet Options
- Location Settings
- Notification Area Icons
- Personalization
- Programs and Features
- RemoteApp and Desktop Connections
- Storage Spaces
- Tablet PC Settings
- User Accounts
- Windows Firewall
- AutoPlay
- Credential Manager
- Device Manager
- Ease of Access Center
- Flash Player (32-bit)
- HomeGroup
- Keyboard
- Mouse
- Pen and Touch
- Phone and Modem
- Recovery
- Sound
- Sync Center
- Taskbar
- Windows 7 File Recovery
- Windows To Go

**Double-click on
"Administrative Tools"**



Administrative Tools



... ..

Double-click on
"Computer Management"



Administrative Tools



File

Home

Share

View



Copy



Paste



W...

Clipboard



Organize

Organize

Organize



New folder

New



New



Properties

Open



Open

Open

Open



Select



<< All C...

> Admini...



Search Administr...



Favorites



Desktop



Downloads



Recent places



Libraries



Documents



Music

21 items

Name



Component Services



Computer Management



Defragment and Optimize Drives



Disk Cleanup



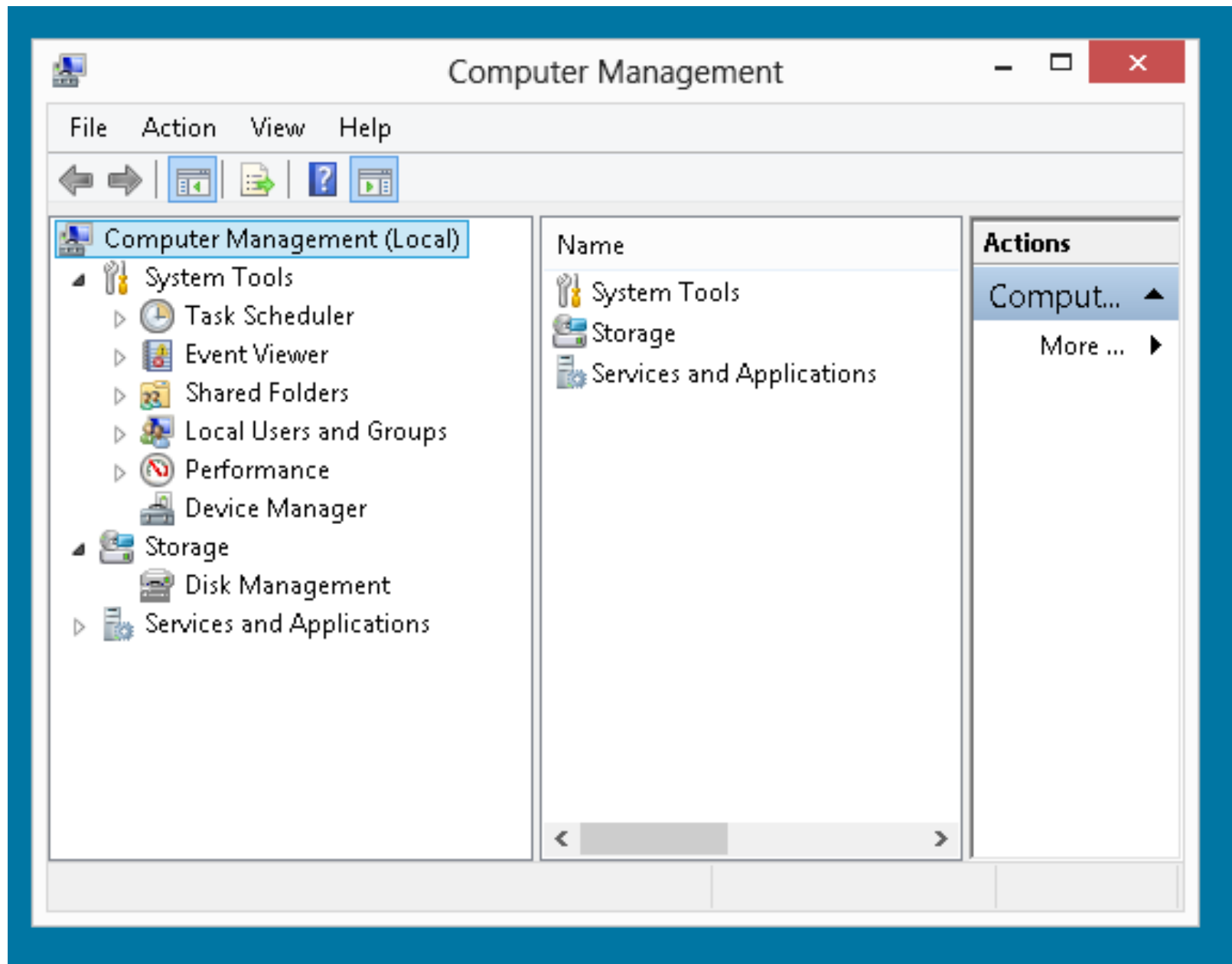
Event Viewer



iSCSI Initiator



Click on "Disk
Management"



Computer Management

File Action View Help





Computer Management (Local)

- System Tools
 - Task Scheduler
 - Event Viewer
 - Shared Folders
 - Local Users and Groups
 - Performance
 - Device Manager
- Storage
 - Disk Management
 - Services and Applications





Volume	Layout	Type	File System	Status	Capacity	Free Space	Actions
(C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Crash Dump, Primary Partition)	979.66 GB	865.53 GB	Disk Ma... More ...
D_DynMirror (D:)	Mirror	Dynamic	NTFS	Healthy	59.87 GB	59.77 GB	
S_StorageSpace (S:)	Simple	Basic	NTFS	Healthy (Primary Partition)	59.12 GB	59.03 GB	
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Primary Partition)	350 MB	109 MB	

Disk 0 Basic 980.00 GB Online	System Reserved 350 MB NTFS Healthy (System, Active, Primary)	(C:) 979.66 GB NTFS Healthy (Boot, Page File, Crash Dump, Primary Partition)
Disk 1 Dynamic 59.88 GB Online	D_DynMirror (D:) 59.87 GB NTFS Healthy	
Disk 3 Dynamic 59.88 GB Online	D_DynMirror (D:) 59.87 GB NTFS Healthy	
Disk 5 Basic 59.13 GB Online	S_StorageSpace (S:) 59.12 GB NTFS Healthy (Primary Partition)	
CD-ROM 0 DVD (K:)		

Unallocated
 Primary partition
 Mirrored volume

 Disk 1 Dynamic 59.88 GB Online	<div style="background-color: #800000; height: 15px; margin-bottom: 5px;"></div> D_DynMirror (D:) 59.87 GB NTFS Healthy
 Disk 3 Dynamic 59.88 GB Online	<div style="background-color: #800000; height: 15px; margin-bottom: 5px;"></div> D_DynMirror (D:) 59.87 GB NTFS Healthy
 Disk 5 Basic 59.13 GB Online	<div style="background-color: #000080; height: 15px; margin-bottom: 5px;"></div> S_StorageSpace (S:) 59.12 GB NTFS Healthy (Primary Partition)
	

In "Disk Management",
the two mirrored dynamic
hard drives are shown as
two "dynamic" hard drives
with the exact same label
and drive letter:

 Disk 1 Dynamic 59.88 GB Online	 D_DynMirror (D:) 59.87 GB NTFS Healthy
 Disk 3 Dynamic 59.88 GB Online	 D_DynMirror (D:) 59.87 GB NTFS Healthy

In "Disk Management",
the two mirrored "Storage
Spaces" hard drives are
shown as a single "basic"
hard drive:

 **Disk 5**

Basic
59.13 GB
Online

S_StorageSpace (S:)
59.12 GB NTFS
Healthy (Primary Partition)

 CD-ROM

All of the individual physical hard drives are shown separately in the "Disk drives" section of "Device Manager":

All Control Panel Items

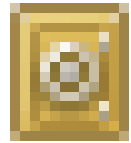
Control Panel > All Control Panel Items

Search Control P...

Adjust your computer's settings

View by: **Small icons**

- Action Center
- Administrative Tools
- AutoPlay
- BitLocker Drive Encryption
- Color Management
- Credential Manager
- Date and Time
- Default Programs
- Device Manager
- Devices and Printers
- Display
- Ease of Access Center
- Family Safety
- File History
- Flash Player (32-bit)
- Folder Options
- Fonts
- HomeGroup
- Indexing Options
- Internet Options
- Keyboard
- Language
- Location Settings
- Mouse
- Network and Sharing Center
- Notification Area Icons
- Pen and Touch
- Performance Information and Tools
- Personalization
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- Tablet PC Settings
- Taskbar
- Troubleshooting
- User Accounts
- Windows 7 File Recovery
- Windows Defender
- Windows Firewall
- Windows Update
- Windows To Go



Credential Manager



Device Manager



Ease of Access Center





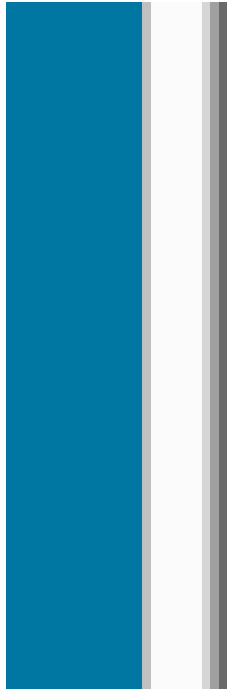
Device Manager



File Action View Help




- Wn8EnEv20130528
 - Audio inputs and outputs
 - Batteries
 - Computer
 - Disk drives
 - Display adapters
 - DVD/CD-ROM drives
 - Floppy disk drives
 - Floppy drive controllers
 - Human Interface Devices
 - IDE ATA/ATAPI controllers
 - Keyboards
 - Mice and other pointing devices
 - Monitors
 - Network adapters
 - Ports (COM & LPT)
 - Print queues
 - Processors
 - Software devices
 - Sound, video and game controllers
 - Storage controllers
 - System devices
 - Universal Serial Bus controllers



- ▶  Batteries
- ▶  Computer
- ▶  Disk drives
- ▶  Display adapters
- ▶  DVD/CD-ROM drives

Microsoft Storage Spaces

 Disk drives

 Microsoft Storage Space Device

 VMware, VMware Virtual S SCSI Disk Device

 VMware, VMware Virtual S SCSI Disk Device

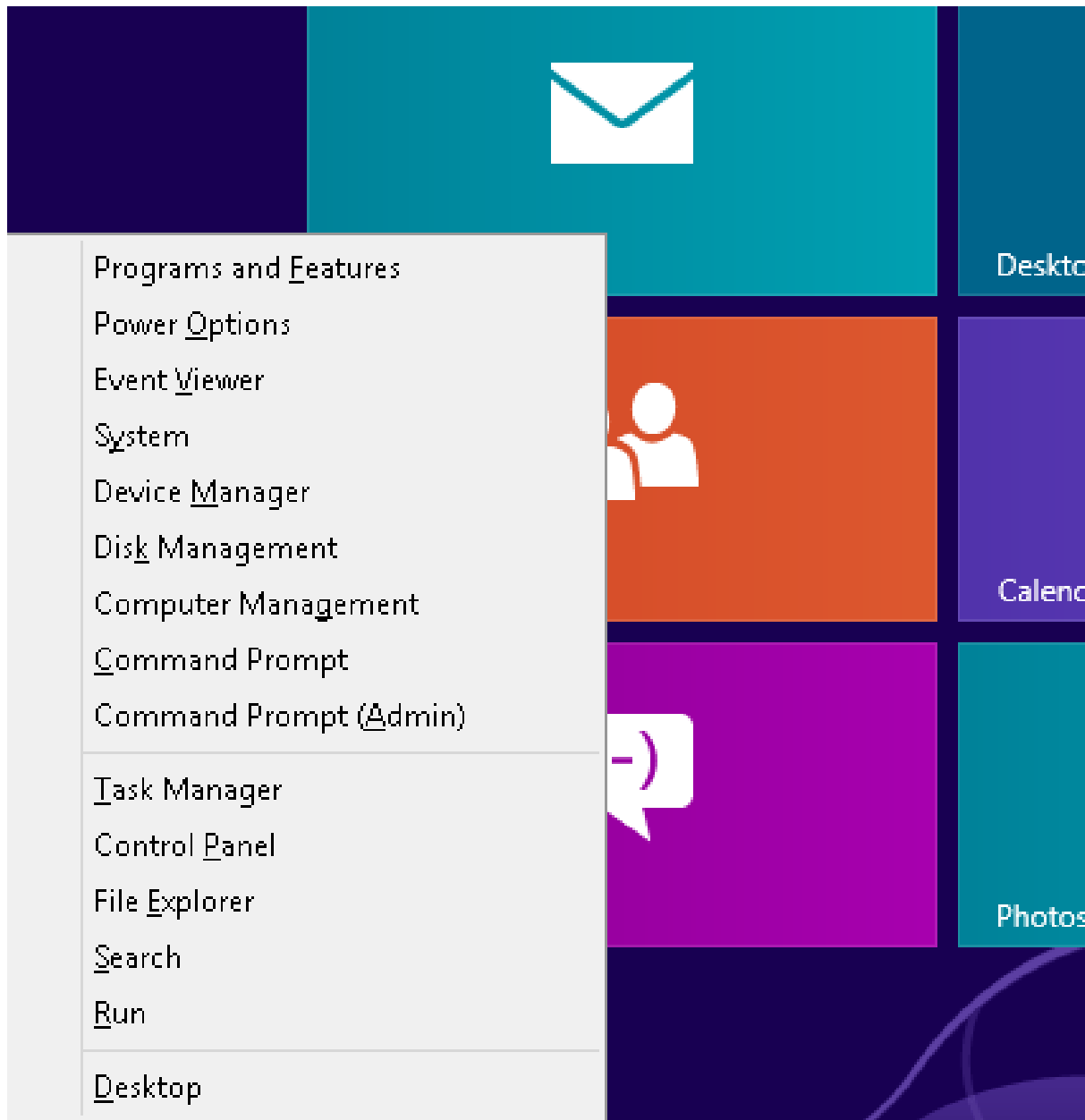
 VMware, VMware Virtual S SCSI Disk Device

 VMware, VMware Virtual S SCSI Disk Device

 VMware, VMware Virtual S SCSI Disk Device

 Network

Windows key + x
brings up the Power
User's menu in both the
new "Start" screen and
the legacy "Desktop"



Click on "Control Panel"



All Control Panel Items



Control Panel



All Control Panel Items



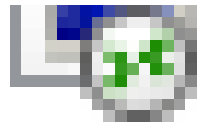
Search

Adjust your computer's settings

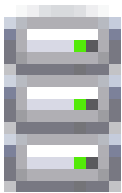
View by: [Small icon](#)

- Action Center
- BitLocker Drive Encryption
- Date and Time
- Devices and Printers
- Family Safety
- Folder Options
- Indexing Options
- Language
- Network and Sharing Center
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- HomeGroup
- Keyboard
- Mouse
- Pen and Touch
- Phone and Modem
- Recovery
- Sound
- Sync Center
- Taskbar
- Windows 7 File Recovery
- Windows To Go

Double-click on "Storage
Spaces"



RemoteApp and Veski



Storage Spaces



T... ..

Storage Spaces

Control Panel Home

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.


Change settings

Storage pool

Using 3.00 GB of 118 GB pool capacity

Create a storage space
Add drives
Rename pool

Storage spaces

S_StorageSpace (S:)  Okay [View files](#)
Two-way mirror [Change](#)
59.2 GB [Delete](#)
Using 2.00 GB pool capacity

Physical drives

See also
File History
BitLocker Drive Encryption

Expand the "Physical drives" section to see the status of the individual hard drives that are being mirrored:

Storage pool

Okay 




Using 3.00 GB of 118 GB pool capacity

- Create a storage space
- Add drives
- Rename pool

Storage spaces



S_StorageSpace (S:)  Okay
Two-way mirror
59.2 GB
Using 2.00 GB pool capacity

- [View files](#)
- [Change](#)
- [Delete](#)

Physical drives


Storage Spaces

Control Panel > All Control Panel Items > Storage Spaces

Search Control P...


Control Panel Home

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.

 Change settings

 Create a new pool and storage space



Storage pool

Okay 

Using 3.00 GB of 118 GB pool capacity

Create a storage space
Add drives
Rename pool

Storage spaces

	S_StorageSpace (S:) Two-way mirror 59.2 GB Using 2.00 GB pool capacity	 Okay	View files Change Delete
---	---	--	--

Physical drives

	SS-Right-VMware, VMwar... Attached via SAS 2.53 % used Providing 59.2 GB pool capacity	 Okay	Rename
	SS-Left-VMware, VMware ... Attached via SAS 2.53 % used Providing 59.2 GB pool capacity	 Okay	Rename

See also

[File History](#)

[BitLocker Drive Encryption](#)

Physical drives



SS-Right-VMware, VMwar...



Okay

Attached via SAS

2.53 % used

Providing 59.2 GB pool
capacity



SS-Left-VMware, VMware ...



Okay

Attached via SAS

2.53 % used

Providing 59.2 GB pool
capacity

Disadvantage of Periodic Backups

- If your hard drive where you store your in-use data files and folders fails after a periodic backup, you will probably lose the data files that you created or modified after the date and time of the periodic backup.

Disadvantage of Periodic Backups (continued)

- The data files that are not on the last periodic backup MIGHT be recovered by a professional computer technician OR by a cleanup drive recovery operation such as "Drive Savers", a cleanroom service for recovering data from failed hard drives.

Disadvantage of Periodic Backups (continued)

- Our Harry Elver can provide you with the "Drivesavers" services at a discount, but it will still cost you between \$1500 and \$3500 for their services.

See

<http://www.repairtucsoncomputer.com/data-recovery-tucson/data-recovery-tucson.html>

Disadvantage of Drive Mirroring

- Both hard drives catch the same malware at the same time
- Operator error occurs on both hard drives at the same time

Multiple Techniques for Maximum Redundancy

- For maximum reliability, you can combine drive mirroring, periodic backups (such as Macrium, Clonezilla or Acronis), and manual copying of data files and folders to mitigate against the disadvantages of the various redundancy techniques.

Drive Mirroring Details

- "Drive mirroring" means that two or more hard drives are kept matched up with the exact same set of data files and folders.
- "Real time" means that changes to data files and folders on one hard drive are almost simultaneous with your pressing on the Enter key or clicking on "Save".

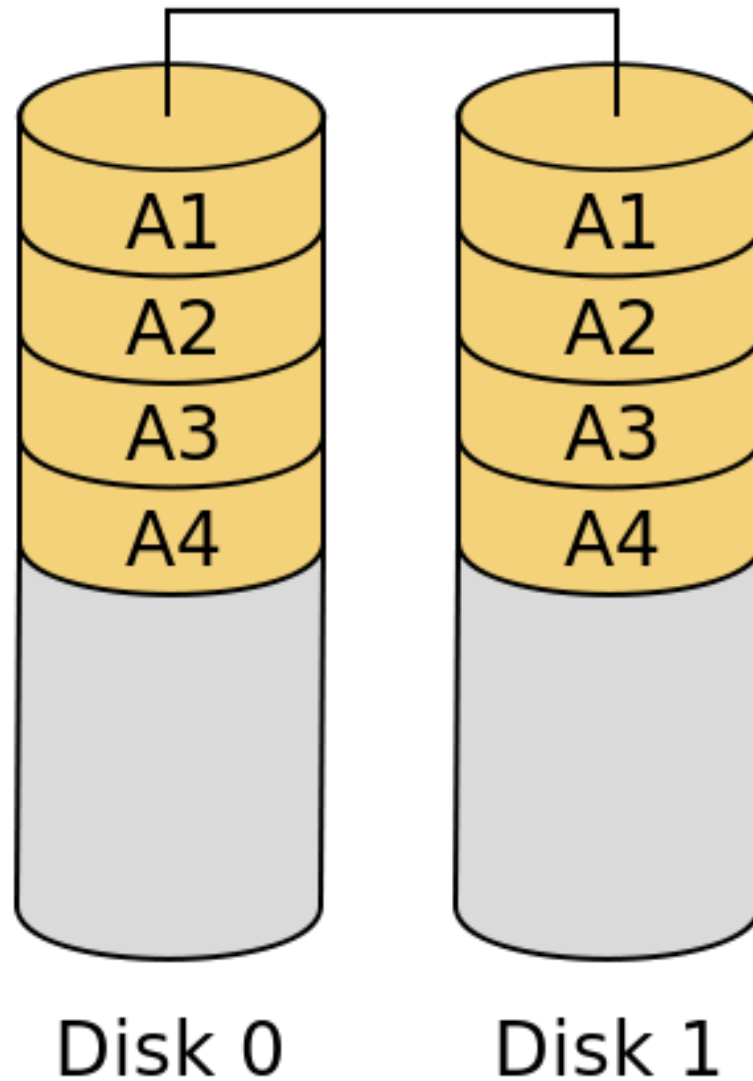
Drive Mirroring Details (continued)

- When drive mirroring is not "real time" and there is a time lag between the two or more mirrored hard drives, a drive failure in the first updated hard drive will probably result in the permanent loss of data that was not written to the second+ hard drive.

Drive Mirroring Details (continued)

- **Hard drive mirroring is also known as "RAID 1":**

RAID 1



Drive Mirroring Details (continued)

- According to Wikipedia: ..in some environments, it is possible to "split the mirror",..., then a new disk can be substituted so that the inactive disk can be kept in much the same way as traditional backup.

Two No-Cost Software Programs for Mirroring Hard Drives in Real Time

- "Storage Spaces" Applet in "Windows 8"
- "Mirroring of Dynamic Hard Drives" in "Windows 7" and "Windows 8"

"Storage Spaces" Applet in "Windows 8"

- No cost: Bundled with all editions of "Windows 8" except for "Windows RT"
- GUI applet is easy to use
- Mirrored drives are formatted in a proprietary format that is difficult to recover data from
- Mirrored drives cannot be accessed with prior versions of "Windows"

"Storage Spaces" Applet in "Windows 8" (continued)

- External mirrored drives can be connected with eSATA, USB 2, USB 3, or SCSI.
- Storage spaces cannot be used with "dynamic" hard drives or "dynamic" hard drive partitions. ("Dynamic" hard drives or "dynamic" hard drive partitions are proprietary to "Windows")

Mirroring of Dynamic Hard Drives

- No cost: Bundled in with some versions and editions of "Windows.."
- "Disk Management" applet or "diskpart" in a command prompt window is hard to use
- Mirrored drives are formatted in a format that is easy to recover data from
- Mirrored drives can be accessed with many versions and editions of "Windows"
- External mirrored drives can be connected with SATA, eSATA, or SCSI.
- External mirrored drives cannot be connected with USB 1 or USB 2⁶² or USB 3.

Mirroring of Dynamic Hard Drives (continued)

- "Windows.." cannot mirror "simple" hard drives or "simple" hard drive partitions: You have to convert "simple" hard drives or "simple" hard drive partitions to "Windows"-proprietary "dynamic" hard drives or "dynamic" hard drive partitions before you can mirror them

Details of Drive Mirroring With "Storage Spaces" of "Windows 8"

- See http://aztcs.org/meeting_notes/winhardsig/win8/StorageSpaces-howto.pdf

Details of Drive Mirroring with Dynamic Disks

- See http://aztcs.org/meeting_notes/DriveMirroring/dynamicdisks.pdf
- <http://www.howtogeek.com/howto/17926/use-drive-mirroring-for-instant-backup-in-windows-7/>
- <http://technet.microsoft.com/en-us/library/cc938519.aspx>

Details of Drive Mirroring with Dynamic Disks (continued)

- [http://technet.microsoft.com/en-us/library/cc758037\(v=ws.10\).aspx](http://technet.microsoft.com/en-us/library/cc758037(v=ws.10).aspx)
- <http://technet.microsoft.com/en-us/magazine/ff601861.aspx>
- <http://buildeggs.com/bewp/?p=44>

Disk Management

File Action View Help

Volume	Layout	Type	File System	Status	Capacity	Free Space	% Free
L Storage space (L:)	Simple	Basic	NTFS	Healthy (Primary Partition)	2785.37 GB	847.54 GB	30 %
MMirroredDy (M:)	Mirror	Dynamic	NTFS	Healthy	2794.39 GB	1214.44 GB	43 %
SWSBeast-1VMw (C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cr...	2047.90 GB	1280.55 GB	63 %
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Pri...	100 MB	67 MB	67 %

Disk 0 Dynamic 2794.39 GB Online	MMirroredDy (M:) 2794.39 GB NTFS Healthy	
Disk 1 Basic 2794.52 GB Online	System Reserved 100 MB NTFS Healthy (System,)	SWSBeast-1VMw (C:) 2047.90 GB NTFS Healthy (Boot, Page File, Crash Dump, Primary Partition)
Disk 2 Dynamic 2794.39 GB Online	MMirroredDy (M:) 2794.39 GB NTFS Healthy	

Unallocated
 Primary partition
 Mirrored volume

Computer

Drive Tools

File Computer View Manage

Properties Open Rename Access media Map network drive Add a network location Open Control Panel Uninstall or change a program System properties Manage

Location Network System

Computer

Music Pictures Videos

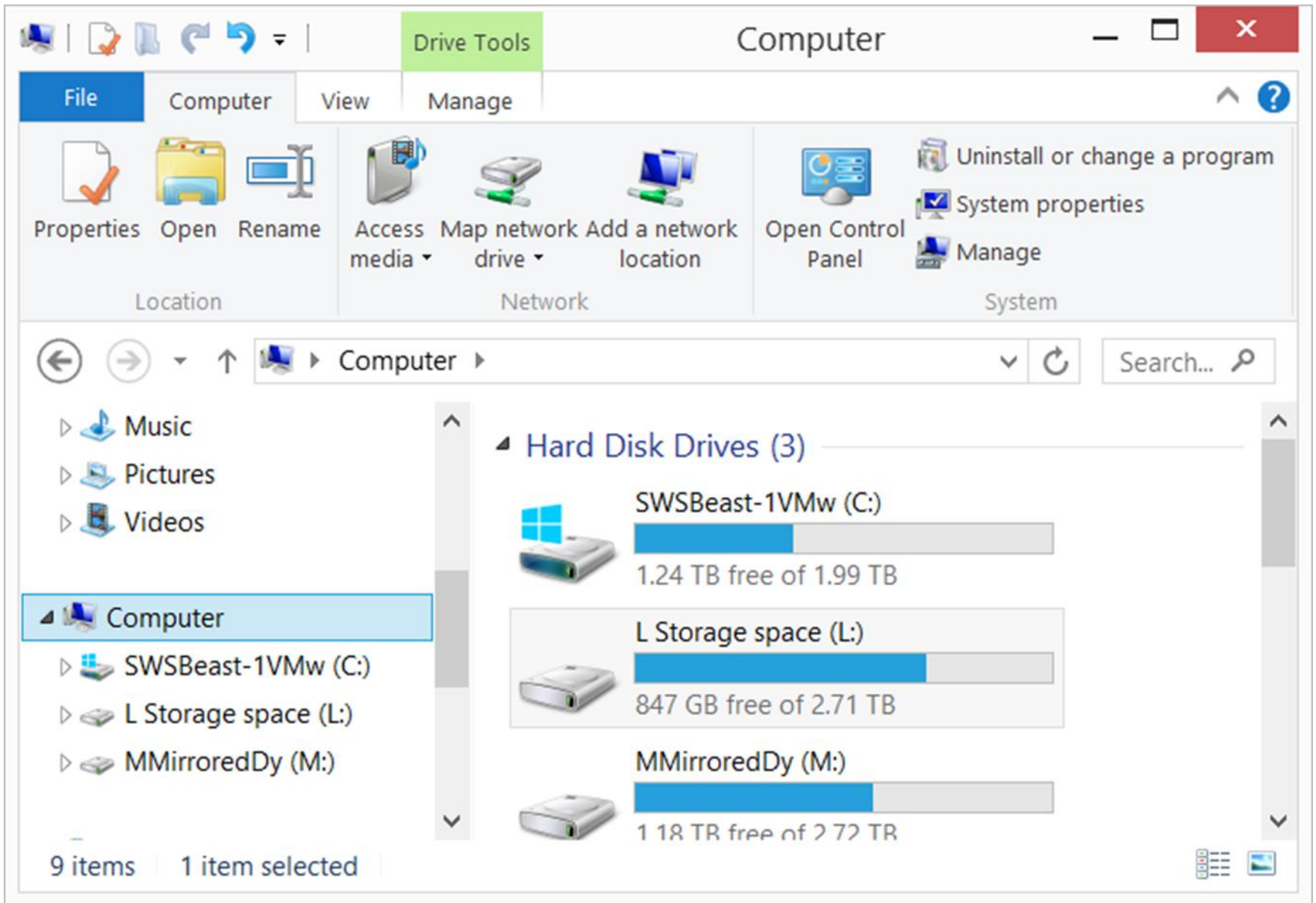
Computer

- SWSBeast-1VMw (C:)
- L Storage space (L:)
- MMirroredDy (M:)

9 items | 1 item selected

Hard Disk Drives (3)

- SWSBeast-1VMw (C:)
1.24 TB free of 1.99 TB
- L Storage space (L:)
847 GB free of 2.71 TB
- MMirroredDy (M:)
1.18 TB free of 2.72 TB



Details of Drive Mirroring with Dynamic Disks (continued)

- External mirrored drives can be connected with SATA, eSATA, or SCSI.

Details of Drive Mirroring with Dynamic Disks (continued)

- External mirrored drives cannot be connected with USB 1 or USB 2 or USB 3:

Virtual Disk Manager



The operation is not supported by the object.

OK

Details of Drive Mirroring with Dynamic Disks (continued)

- When one of the mirrored drives is physically removed/disconnected (by you), the "virtual disk service" breaks the mirror and when you reconnect the drive, you do not see the mirror in "Disk Management" anymore.