Storage Services

Server 2012R2

Introducing Storage Spaces

Storage Spaces is a new feature in Windows Server 2012 that provides for a single server the same storage flexibility provided by a storage area network (SAN) by using inexpensive locally attached disks. Storage Spaces enables you to create storage pools from which you can provision storage as needed.

Once you've created a storage pool by using Storage Spaces, you can provision storage from the pool by creating virtual disks, also called logical unit numbers (LUNs). A virtual disk behaves like a physical disk except that it can span multiple physical disks within the storage pool.

Storage Spaces has the following requirements:

- Windows Server 2012.
- One physical drive is required to create a storage pool; a minimum of two physical drives is required to create a resilient mirror storage space.
- A minimum of three physical drives is required to create a storage space with resiliency through parity or three-way mirroring.
- Drives must be unpartitioned and unformatted.
- Drives must have at least 10 GB capacity.
- Drives can be attached either internally or externally (individually or in a just-a-bunch-of-disks [JBOD] enclosure). The following bus technologies are supported:
  - SATA (not possible to use in a failover cluster)
  - SCSI (not supported in a failover cluster)

Installing Storage Spaces

To install Storage Spaces, use the Add Roles And Features Wizard to add the File Server role service. This role service is found under File and iSCSI Services in the File and Storage Services role. You can also install the File Server role service by using Windows PowerShell as follows:

```
Install-WindowsFeature -Name FS-FileServer
```

NOTE Storage Services, another role service of the File and Storage Services role, is always installed by default on Windows Server 2012 and provides general storage management functionality needed by other server roles.

To create a storage pool, Storage Spaces requires a server to have at least one attached physical disk of at least 10 GB without any partitions or volumes. Any physical disks that meet these two criteria are automatically added to what is called the server's primordial pool. The primordial pool is the complete set of locally available disks from which a storage pool can be created.

Servers
Volumes
Disks
Storage Pools
Shares
iSCSI

STORAGE POOLS

All storage pools | 1 total

TASKS

Filter

Name	Type	Managed by	Available to	Read-Write Server	Capacity	Free Space	Percent Allocated	St
Storage Spaces (1)								
Primordial	Available Disks	FILE	FILE	FILE				

New Storage Pool...
Refresh

Last refreshed on 5/30/2013 11:48:36 AM

VIRTUAL DISKS

No related data is available.

TASKS

No related virtual disks exist.

To create a virtual disk, start the New Virtual Disk Wizard.

PHYSICAL DISKS

Primordial on FILE

TASKS

Filter

Slot	Name	Status	Capacity	Bus	Usage	Ch
	PhysicalDisk3 (FILE)		25.0 GB	SATA	Automatic	
	PhysicalDisk4 (FILE)		25.0 GB	SATA	Automatic	
	PhysicalDisk2 (FILE)		25.0 GB	SATA	Automatic	
	PhysicalDisk1 (FILE)		25.0 GB	SATA	Automatic	

New Storage Pool Wizard

Before you begin

- Before You Begin
- Storage Pool Name
- Physical Disks
- Confirmation
- Results

This wizard helps you group physical disks into a storage pool, enabling you to make more efficient use of disk capacity. After creating a storage pool, you can use space in the pool to create volumes on virtual disks, which appear as normal disks to the operating system.

To create a storage pool, you must have at least one unused physical disk and a storage subsystem that can manage it, such as the included Storage Spaces subsystem or the subsystem included with a storage device.

To continue, click Next.

☐ Don't show this page again

< Previous | Next > | Create | Cancel

New Storage Pool Wizard

Specify a storage pool name and subsystem

- Before You Begin
- Storage Pool Name
- Physical Disks
- Confirmation
- Results

Name: Pool1

Description:

Select the group of available disks (also known as a primordial pool) that you want to use:

< Previous | Next > | Create | Cancel

New Storage Pool Wizard

Select physical disks for the storage pool

- Before You Begin
- Storage Pool Name
- Physical Disks
- Confirmation
- Results

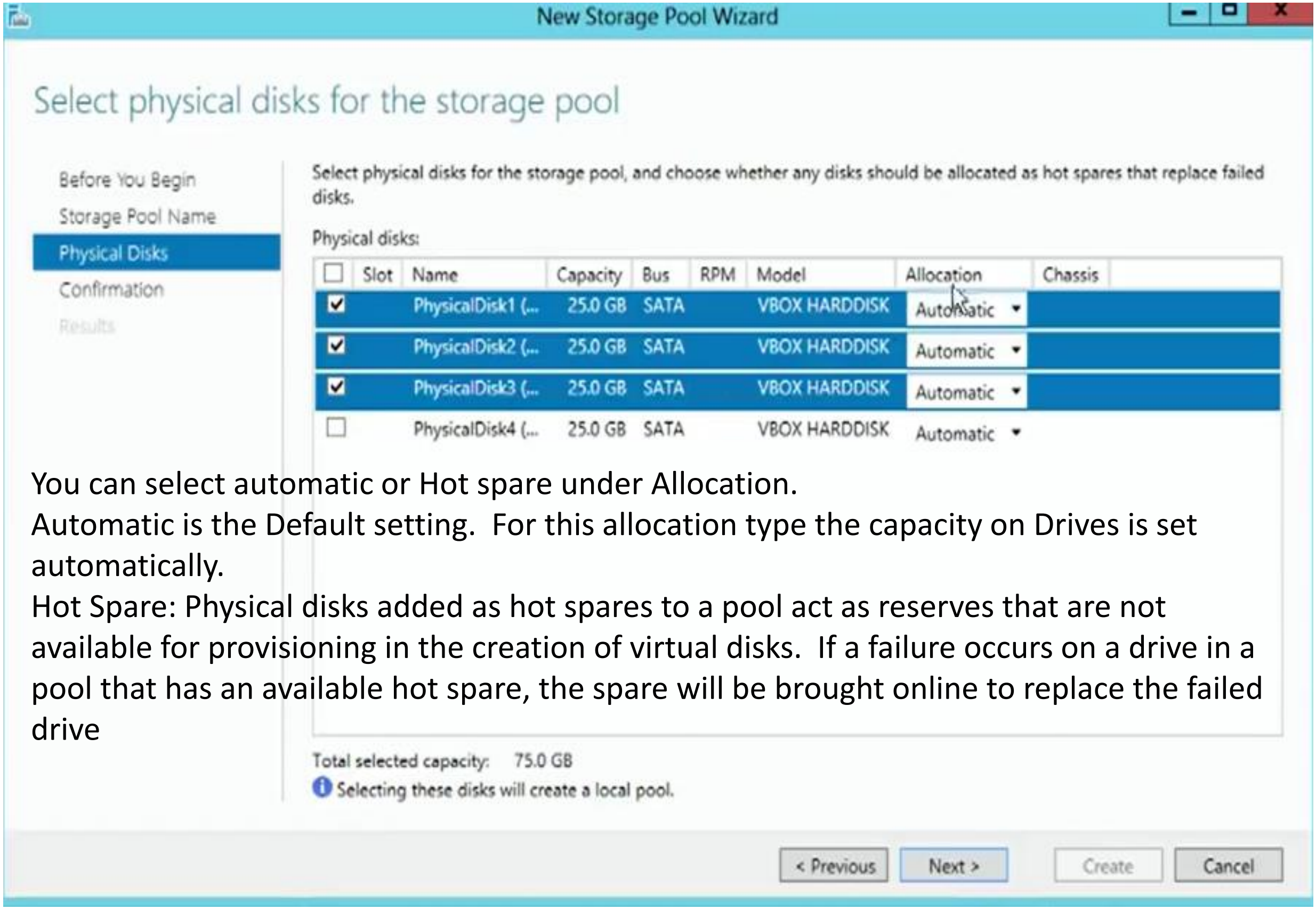
Select physical disks for the storage pool, and choose whether any disks should be allocated as hot spares that replace failed disks.

Physical disks:

	Slot	Name	Capacity	Bus	RPM	Model	Allocation	Chassis
☐		PhysicalDisk1 (...	25.0 GB	SATA		VBOX HARDDISK	Automatic	
☐		PhysicalDisk2 (...	25.0 GB	SATA		VBOX HARDDISK	Automatic	
☐		PhysicalDisk3 (...	25.0 GB	SATA		VBOX HARDDISK	Automatic	
☐		PhysicalDisk4 (...	25.0 GB	SATA		VBOX HARDDISK	Automatic	

Total selected capacity: 0.00 B

< Previous | Next > | Create | Cancel



You can select automatic or Hot spare under Allocation.

Automatic is the Default setting. For this allocation type the capacity on Drives is set automatically.

Hot Spare: Physical disks added as hot spares to a pool act as reserves that are not available for provisioning in the creation of virtual disks. If a failure occurs on a drive in a pool that has an available hot spare, the spare will be brought online to replace the failed drive

New Storage Pool Wizard

Confirm selections

- Before You Begin
- Storage Pool Name
- Physical Disks
- Confirmation
- Results

Confirm that the following are the correct settings, and then click Create.

STORAGE POOL LOCATION

Server:	FILE
Cluster role:	Not Clustered
Storage subsystem:	Storage Spaces

STORAGE POOL PROPERTIES

Name:	pool
Capacity:	75.0 GB

PHYSICAL DISKS

PhysicalDisk1 (FILE)	25.0 GB
PhysicalDisk2 (FILE)	25.0 GB
PhysicalDisk3 (FILE)	25.0 GB

The three Hard disks have now been turned into a Pool

< Previous | Next > | Create | Cancel

New Storage Pool Wizard

View results

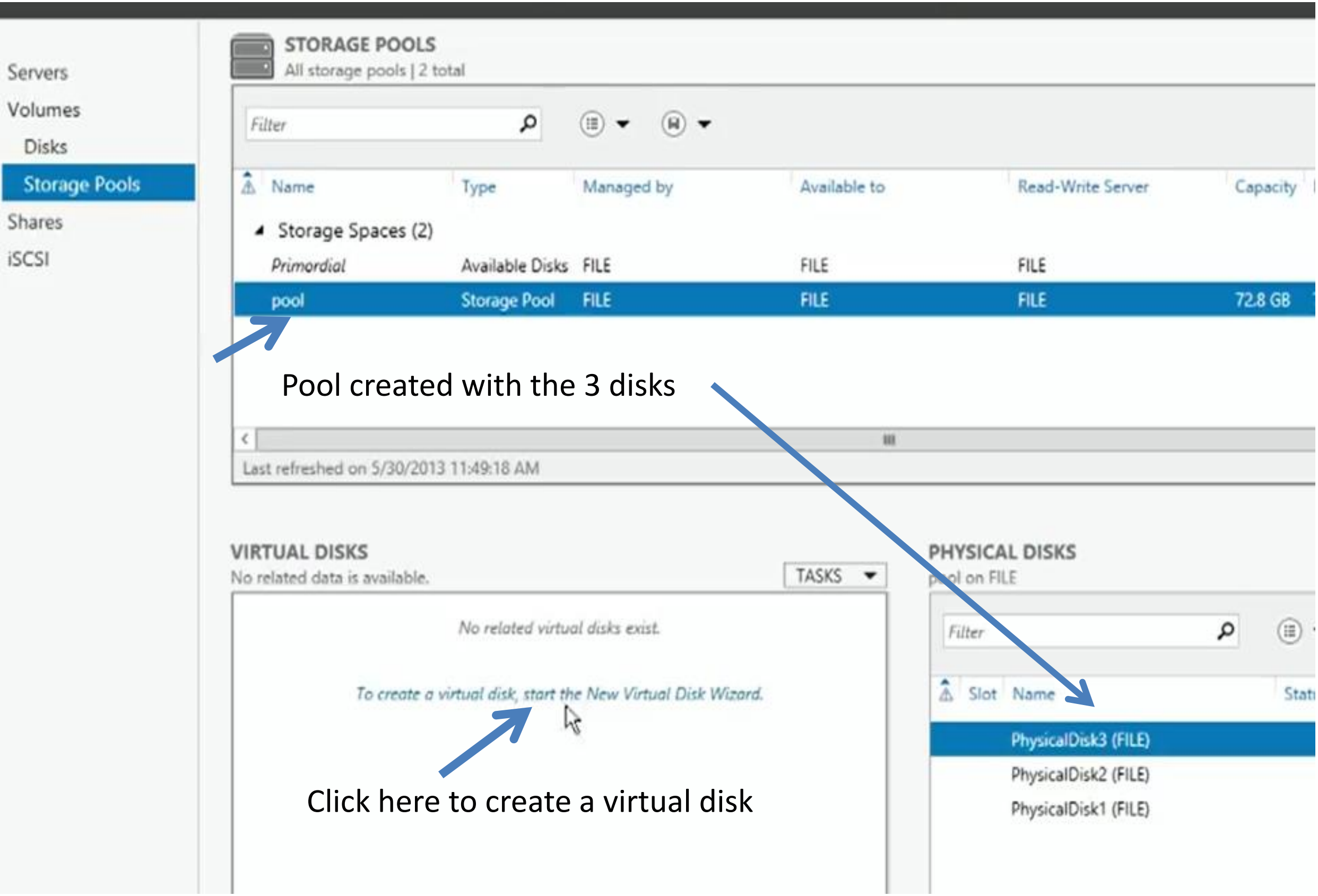
- Before You Begin
- Storage Pool Name
- Physical Disks
- Confirmation
- Results

You have successfully completed the New Storage Pool Wizard.

Task	Progress	Status
Gather information		Completed
Create storage pool		Completed
Update cache		Completed

☐ Create a virtual disk when this wizard closes

< Previous | Next > | Close | Cancel


Servers
Volumes
Disks
Storage Pools
Shares
iSCSI
STORAGE POOLS
All storage pools | 2 total
Filter
Name
Type
Managed by
Available to
Read-Write Server
Capacity
Storage Spaces (2)
Primordial
Available Disks
FILE
FILE
FILE
pool
Storage Pool
FILE
FILE
FILE
72.8 GB
Pool created with the 3 disks
Last refreshed on 5/30/2013 11:49:18 AM
VIRTUAL DISKS
No related data is available.
TASKS
No related virtual disks exist.
To create a virtual disk, start the New Virtual Disk Wizard.
Click here to create a virtual disk
PHYSICAL DISKS
pool on FILE
Filter
Slot
Name
PhysicalDisk3 (FILE)
PhysicalDisk2 (FILE)
PhysicalDisk1 (FILE)

New Virtual Disk Wizard

Before you begin

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- Size
- Confirmation
- Results

This wizard helps you create a virtual disk from a storage pool.

A virtual disk is a collection of one or more physical disks from a previously created storage pool. The layout of data across the physical disks can increase the reliability and performance of the virtual disk.

To continue, click Next.

Don't show this page again

< Previous | Next > | Create | Cancel

This wizard helps you create a virtual disk form a storage pool

A virtual disk is a collection of one or more physical disks from a previously created storage pool. The layout of data across the physical disks can increase the reliability and performance of the virtual disk.

New Virtual Disk Wizard

Select the storage pool

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- Size
- Confirmation
- Results

Storage pool:

Pool Name	Managed by	Available to	Capacity	Free Space	Subsystem
pool	FILE	FILE	72.8 GB	72.0 GB	Storage Spaces

Select the Pool you want to use then click next

< Previous | Next > | Create | Cancel

New Virtual Disk Wizard

Specify the virtual disk name

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- Size
- Confirmation
- Results

Name: VDISK1

Description:

< Previous | Next > | Create | Cancel

New Virtual Disk Wizard

Select the storage layout

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- Size
- Confirmation
- Results

Layout:

- Simple
- Mirror
- Parity

Description:

Data is striped across physical disks, maximizing capacity and increasing throughput, but decreasing reliability. This storage layout requires at least one disk and does not protect you from a disk failure.

< Previous | Next > | Create | Cancel

5. On the Select The Storage Layout page (Figure 1-21), specify one of the following three data redundancy types for the virtual disk:

   - **Simple** A simple virtual disk provides data striping across physical disks but does not provide redundancy. Administrators should not host irreplaceable user data on a simple space. A simple space maximizes capacity and throughput and therefore can be good for hosting temp files or easily re-created data at a reduced cost.

- **Parity** A parity virtual disk is similar to a hardware Redundant Array of Inexpensive Disks (RAID5). Data, along with parity information, is striped across multiple physical disks. Parity enables Storage Spaces to continue to service read and write requests even when a drive has failed. A minimum of three physical disks is required for a parity virtual disk. Note that a parity disk cannot be used in a failover cluster.
- **Mirror** A mirror virtual disk maintains either two or three copies of the data it hosts: two data copies for two-way mirror spaces and three data copies for three-way mirror spaces. All data writes are repeated on all physical disks to ensure that the copies are always current. Mirror spaces are attractive due to their greater data throughput and lower access latency compared to parity disks.

New Virtual Disk Wizard

Specify the provisioning type

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- **Provisioning**
- Size
- Confirmation
- Results

Provisioning type:

(•) Thin
The volume uses space from the storage pool as needed, up to the volume size.

( ) Fixed
The volume uses space from the storage pool equal to the volume size.

Thin Thin provisioning is a mechanism that enables storage capacity to remain unallocated until datasets require the storage. You specify a maximum size for the virtual disk, and the capacity of the virtual disk grows as needed. Thin provisioning optimizes utilization of available storage, but it adds a few extra I/Os that can cause an occasional latency increase.

Fixed A fixed provisioned space allocates storage capacity upfront, at the time the space is created.

< Previous | Next > | Create | Cancel

New Virtual Disk Wizard

Specify the size of the virtual disk

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- **Size**
- Confirmation
- Results

When using fixed provisioning and storage layouts other than simple stripe sets, the virtual disk consumes more free space than the size you specify. By default, Windows creates the virtual disk only if there is sufficient free space.
When using thin provisioning, you can create a virtual disk larger than the amount of free space in the storage pool.

Storage pool free space: 72.0 GB

(•) Specify size

Virtual disk size: 72 GB

[ ] Create the largest virtual disk possible, up to the specified size

( ) Maximum size

< Previous | Next > | Create | Cancel

New Virtual Disk Wizard

Confirm selections

- Before You Begin
- Storage Pool
- Virtual Disk Name
- Storage Layout
- Provisioning
- Size
- Confirmation
- Results

Confirm that the following are the correct settings, and then click Create.

VIRTUAL DISK LOCATION

Server:	FILE
Subsystem:	Storage Spaces
Storage pool name:	pool
Status:	OK
Free space:	72.0 GB

VIRTUAL DISK PROPERTIES

Name:	disk
Storage layout:	Mirror
Provisioning type:	Thin
Requested size:	72.0 GB

< Previous | Next > | Create | Cancel

The New Virtual Disk Wizard successfully completed.

Task	Progress
Gather information	
Create virtual disk	
Rescan disks	
Initialize disk	
Update cache	

Primordial	Available Disks	FILE	FILE	FILE	
pool	Storage Pool	FILE	FILE	FILE	72.8 GB

Last refreshed on 5/30/2013 11:50:35 AM

VIRTUAL DISKS

pool on FILE

TASKS

Filter

Name	Status	Layout	Provisioning	Capacity	Allocated	Volume	Clus
disk		Mirror	Thin	72.0 GB	512 MB		

PHYSICAL DISKS

pool on FILE

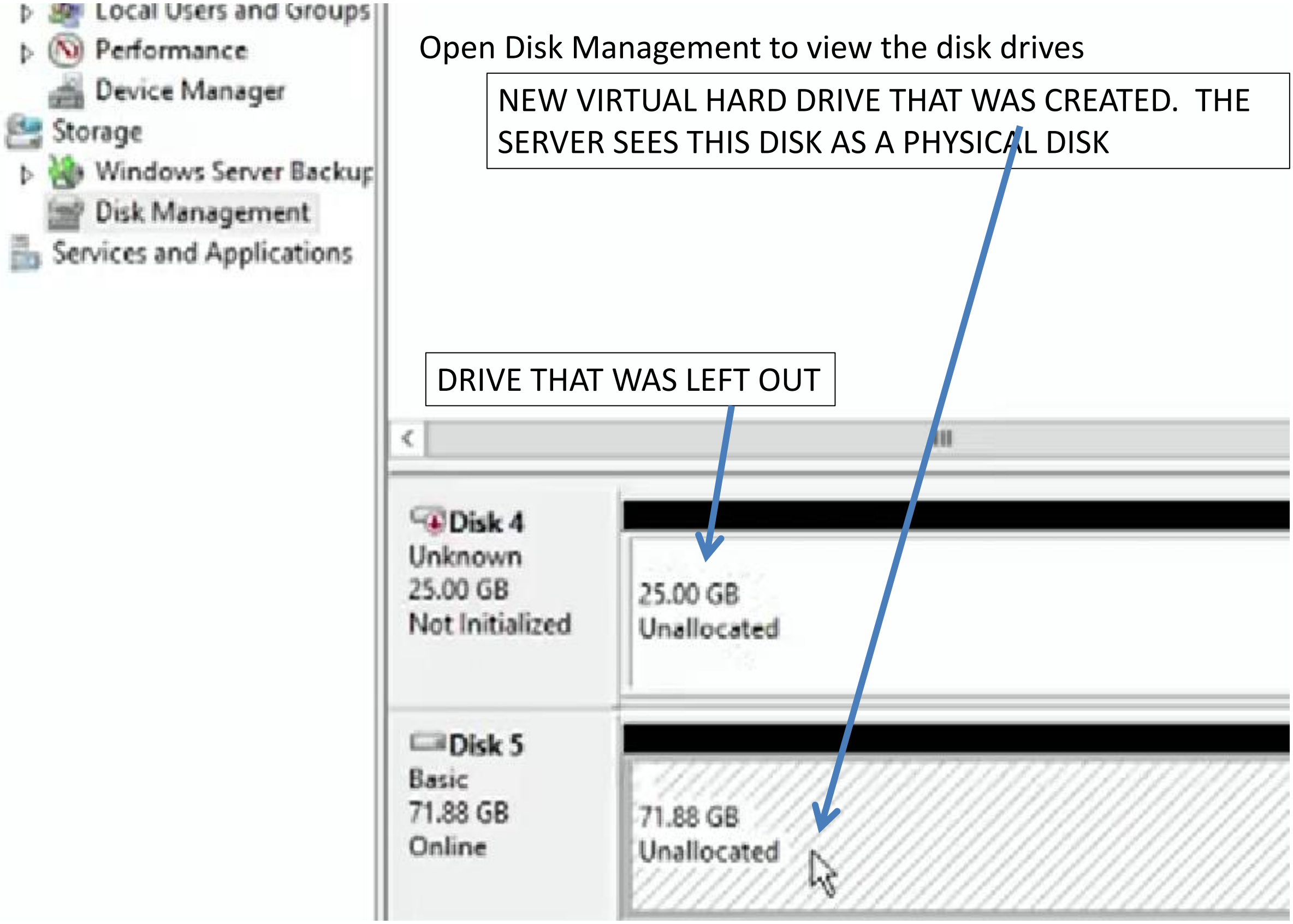
Filter

Slot	Name	St
	PhysicalDisk3 (FILE)	
	PhysicalDisk2 (FILE)	
	PhysicalDisk1 (FILE)	

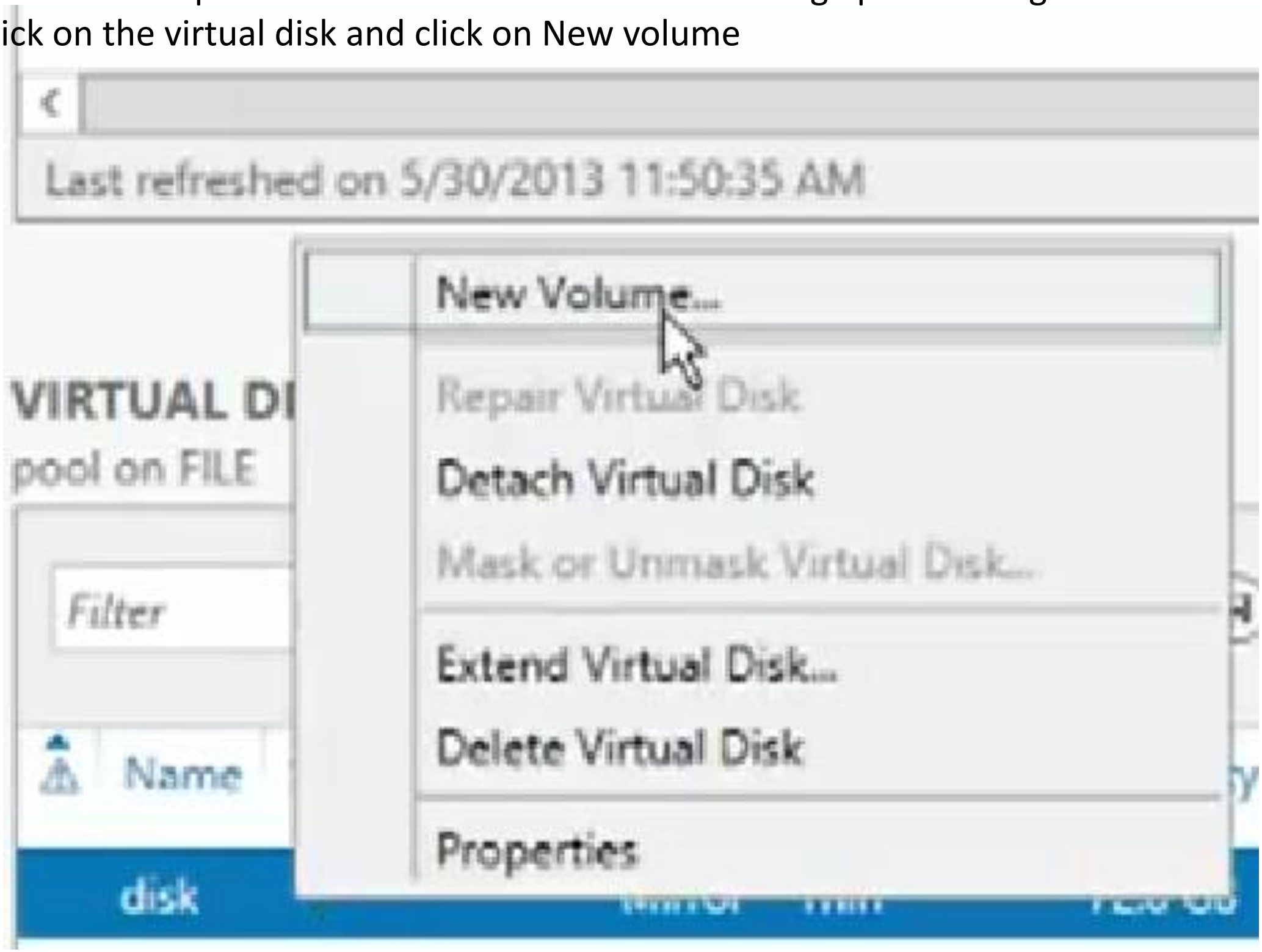
Open Disk Management to view the disk drives

NEW VIRTUAL HARD DRIVE THAT WAS CREATED. THE SERVER SEES THIS DISK AS A PHYSICAL DISK

DRIVE THAT WAS LEFT OUT



The disk in its present state in Unallocated so in storage pools dialog box we need to right Click on the virtual disk and click on New volume



New Volume Wizard

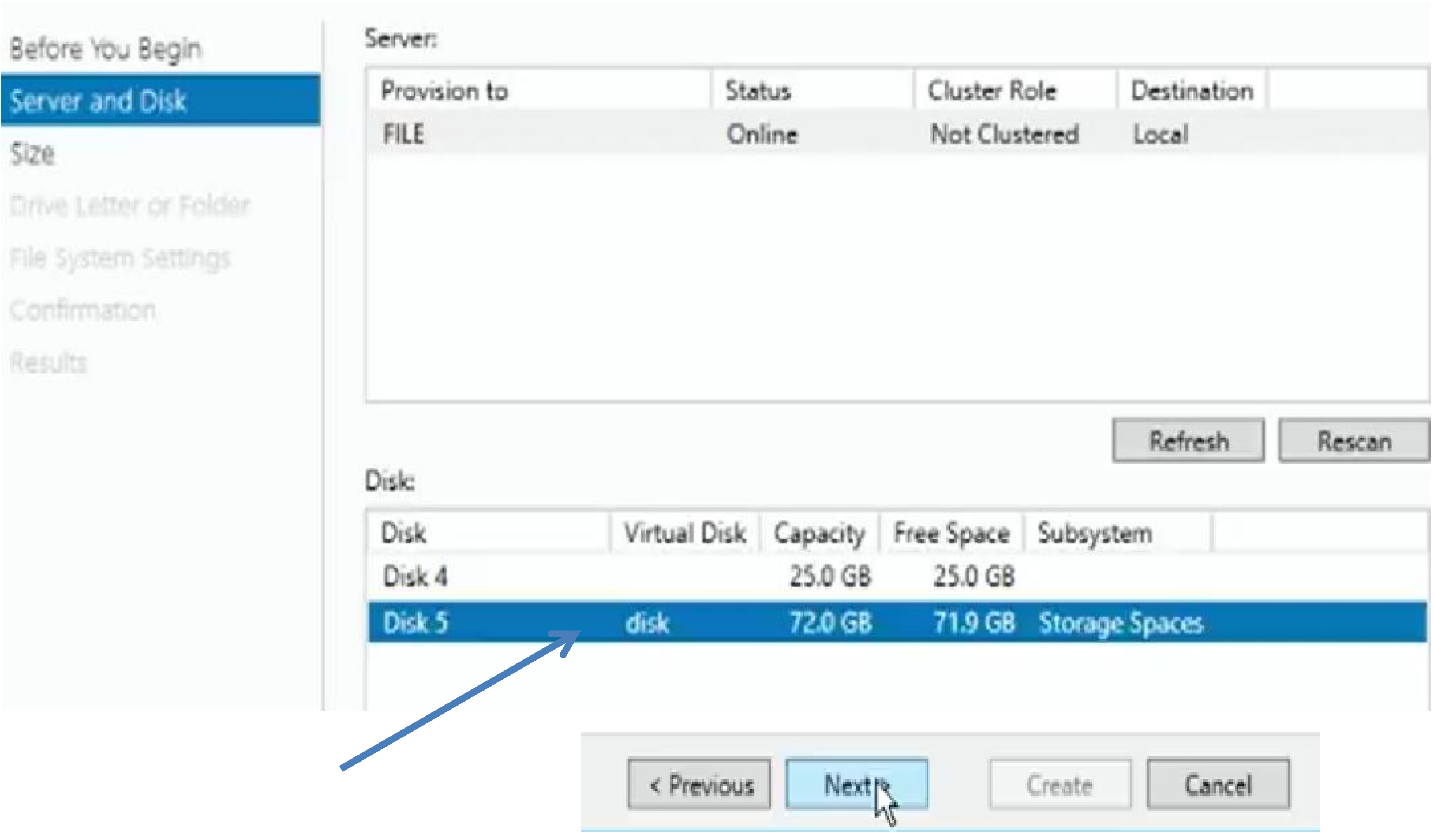
Before you begin

- Before You Begin
- Server and Disk
- Size
- Drive Letter or Folder
- File System Settings
- Confirmation
- Results

This wizard helps you create a volume, assign a drive letter or folder, and then formati it with a file system.

You can create a volume on a physical disk or a virtual disk. A virtual disk is a collection of one or more physical disks from a previously created storage pool. The layout of data across the physical disks can increase reliability and performance of the volume.

To continue click Next



Select the disk and then click Next

New Volume Wizard

Specify the size of the volume

- Before You Begin
- Server and Disk
- Size
- Drive Letter or Folder
- File System Settings
- Confirmation
- Results

Available Capacity: 71.9 GB

Minimum size: 8.00 MB

Volume size: 71.9 GB

< Previous | Next > | Create | Cancel

Assign to a drive letter or folder

- Before You Begin
- Server and Disk
- Size
- Drive Letter or Folder
- File System Settings
- Confirmation
- Results

Select whether to assign the volume to a drive letter or a folder. When you assign a volume to a folder, the volume appears as a folder within a drive, such as D:\UserData.

Assign to:

(•) Drive letter: E

( ) The following folder:

Browse...

( ) Don't assign to a drive letter or folder.

< Previous | Next > | Create | Cancel

Select file system settings

- Before You Begin
- Server and Disk
- Size
- Drive Letter or Folder
- File System Settings
- Confirmation
- Results

File system: NTFS

Allocation unit size: Default

Volume label: New Volume

☐ Generate short file names (not recommended)

Short file names (8 characters with 3-character extensions) are required for some 16-bit applications running on client computers, but make file operations slower.

< Previous | Next > | Create | Cancel

Confirm selections

- Before You Begin
- Server and Disk
- Size
- Drive Letter or Folder
- File System Settings
- Confirmation
- Results

Confirm that the following are the correct settings, and then click Create.

VOLUME LOCATION

Server:	FILE
Subsystem:	Storage Spaces
Virtual disk:	disk
Disk:	Disk 5
Free space:	71.9 GB

VOLUME PROPERTIES

Volume size:	71.9 GB
Drive letter or folder:	E:\
Volume label:	New Volume

FILE SYSTEM SETTINGS

File system:	NTFS
Short file name creation:	Disabled
Allocation unit size:	Default

< Previous | Next > | Create | Cancel

Completion

Before You Begin
Server and Disk
Size
Drive Letter or Folder
File System Settings
Confirmation
Results

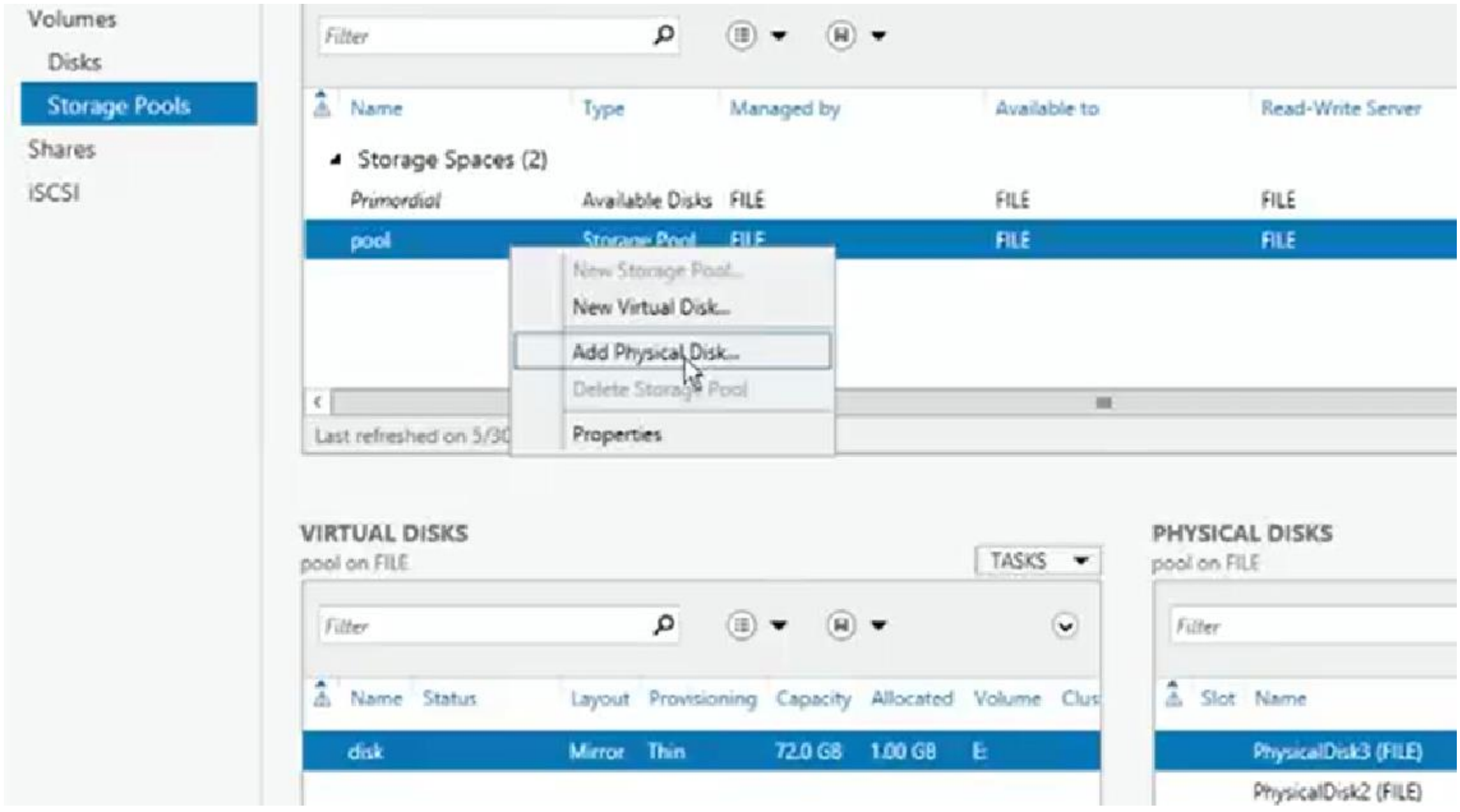
You have successfully completed the New Volume Wizard.

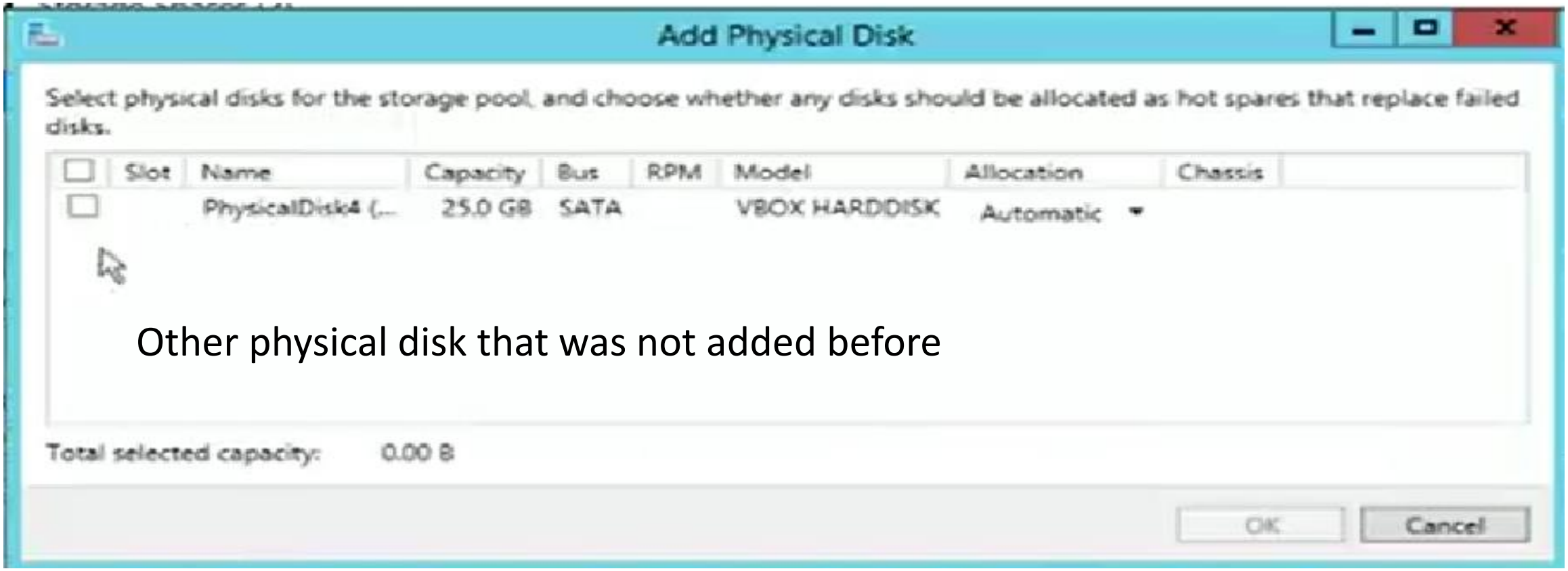
Task	Progress	Status
Gather information		Completed
Create new partition		Completed
Format volume		Completed
Add access path		Completed
Update cache		Completed

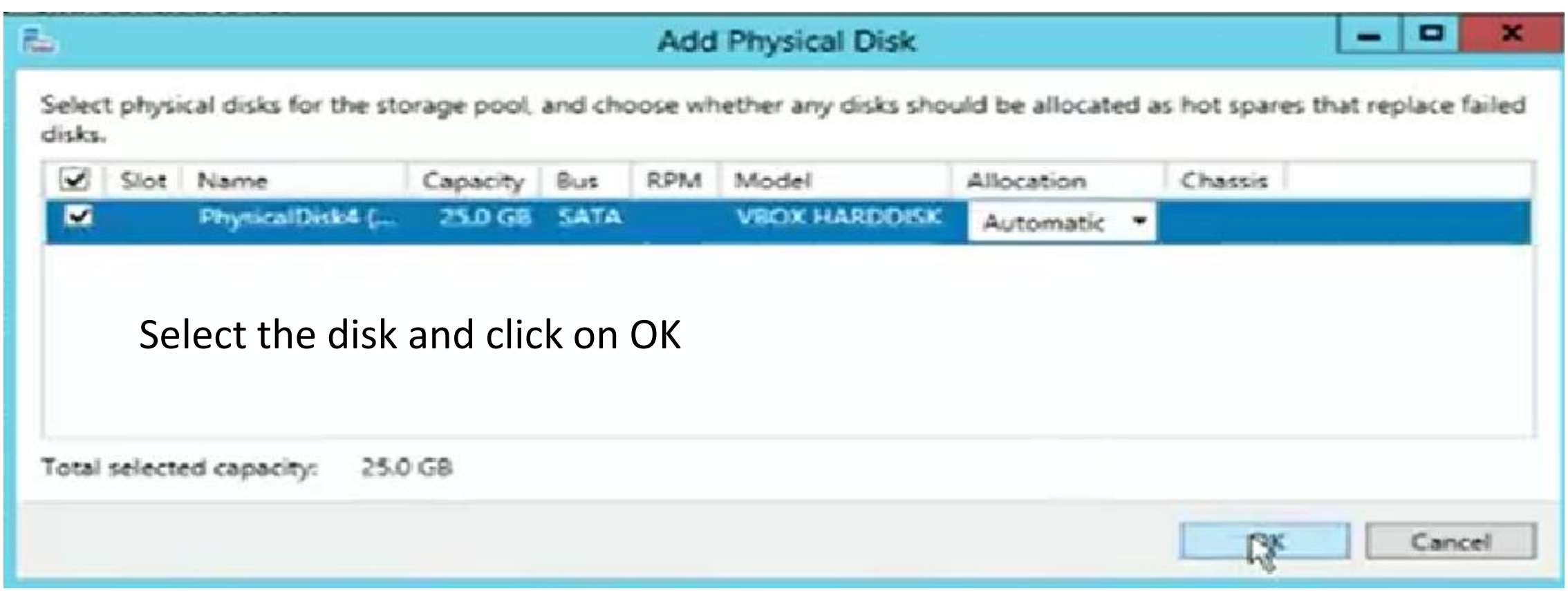
< Previous | Next > | Close | Cancel

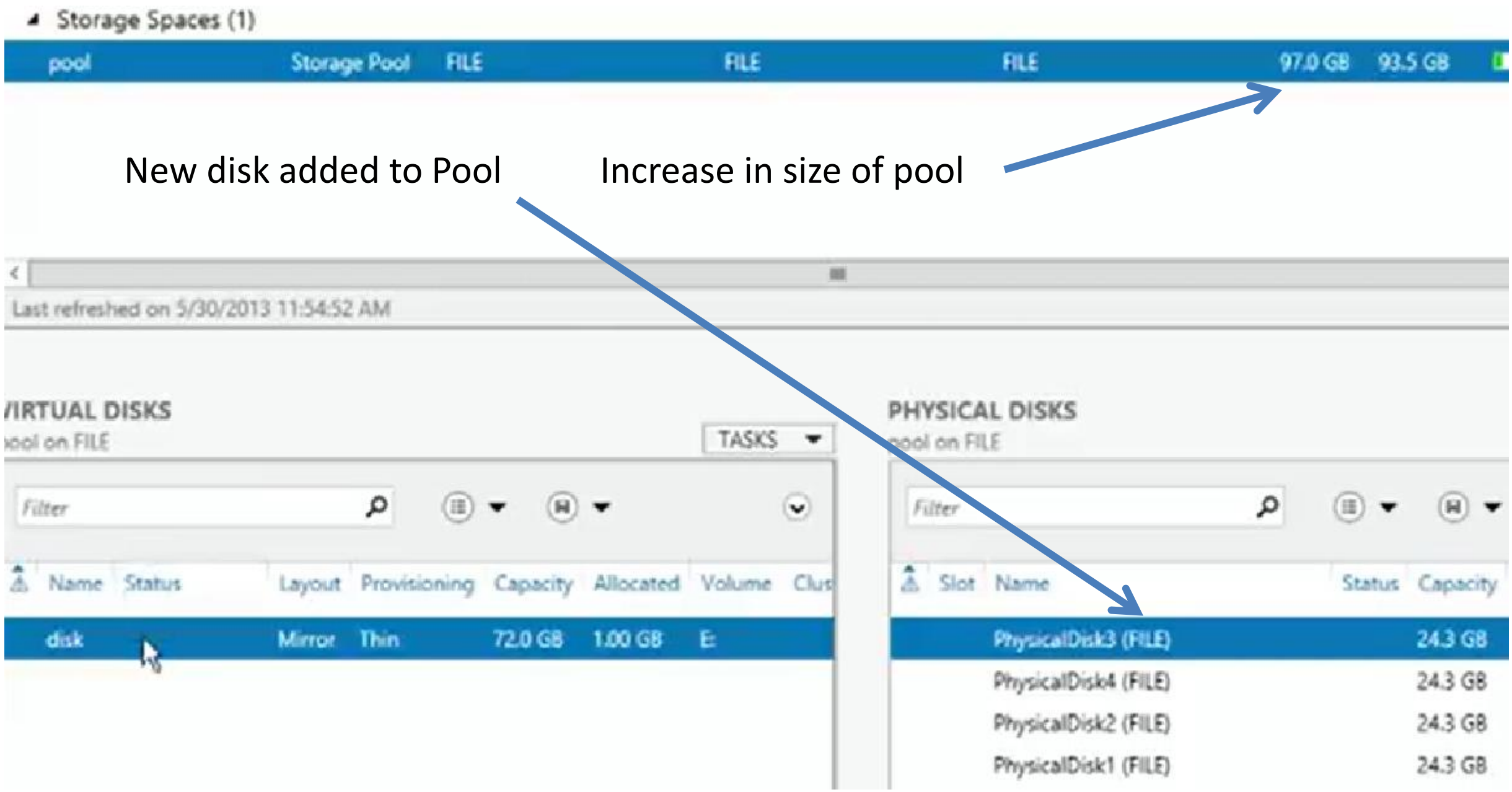
To increase the size of the pool you can add additional hard disks. We will Add the Hard disk that was left out.

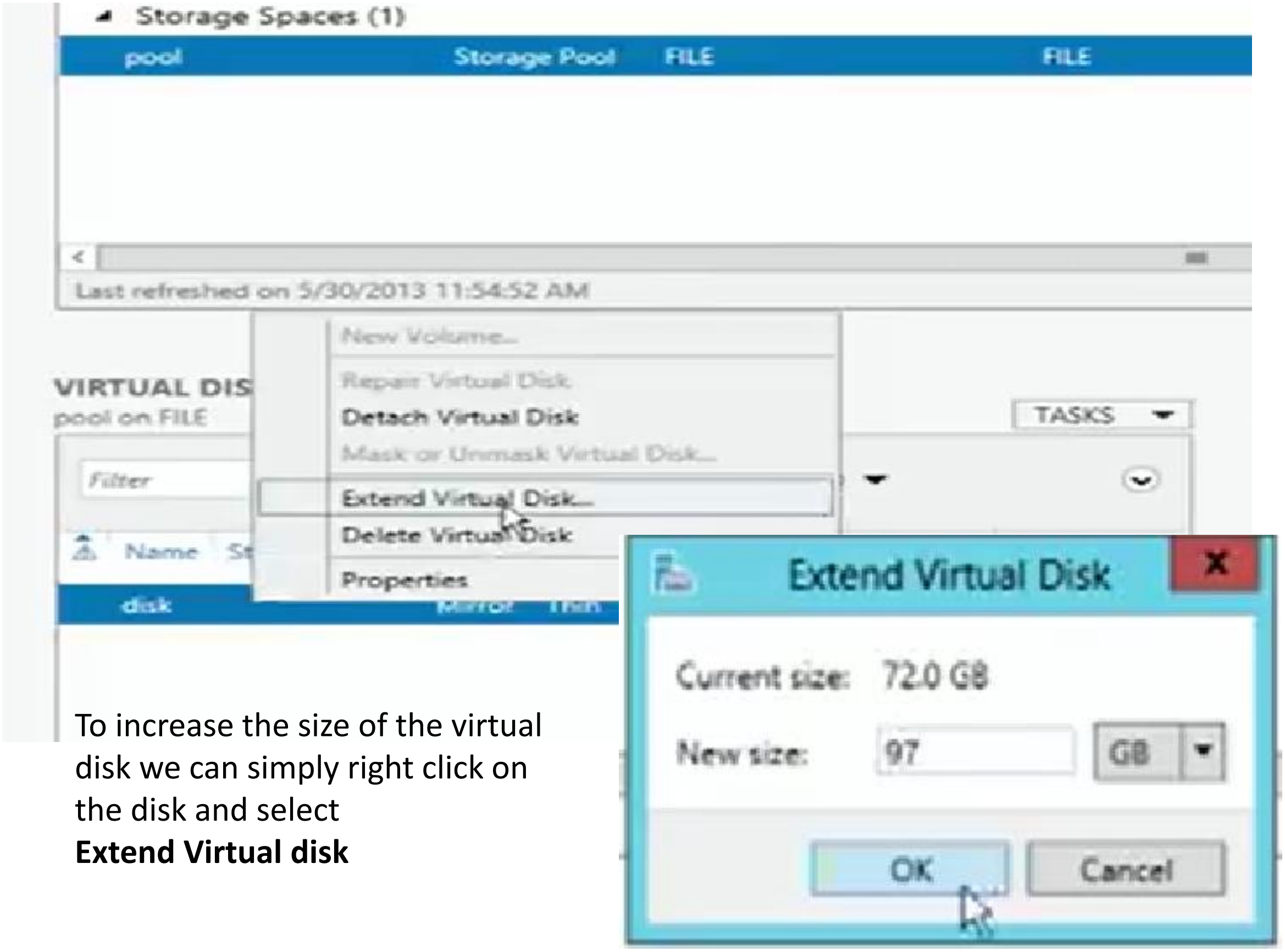
Right click on the pool and select Add Physical disk



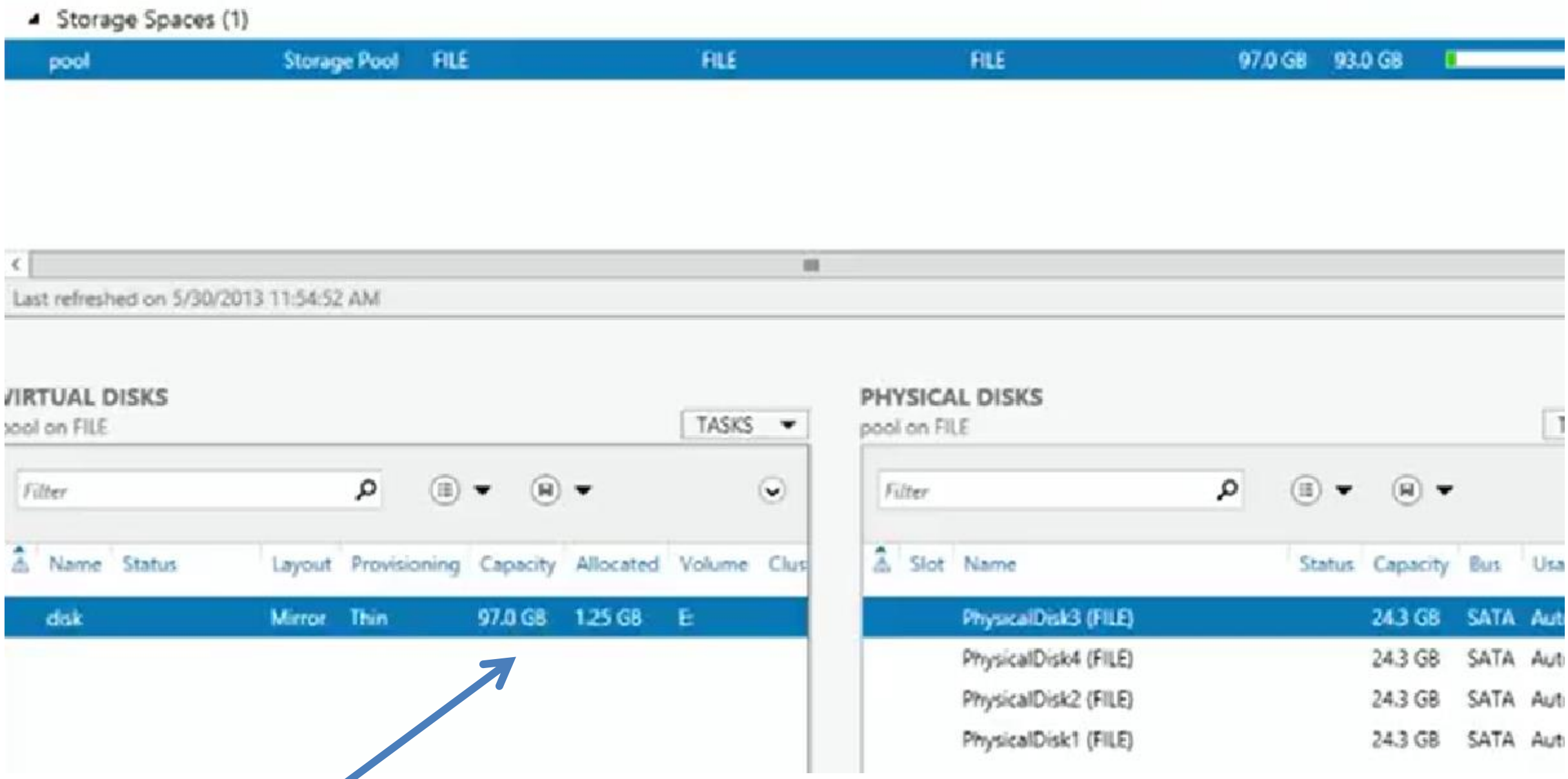

Add Physical Disk
Select physical disks for the storage pool, and choose whether any disks should be allocated as hot spares that replace failed disks.
Slot
Name
Capacity
Bus
RPM
Model
Allocation
Chassis
PhysicalDisk4 (...
25.0 GB
SATA
VBOX HARDDISK
Automatic
Other physical disk that was not added before
Total selected capacity:
0.00 B
OK
Cancel


Add Physical Disk
Select physical disks for the storage pool, and choose whether any disks should be allocated as hot spares that replace failed disks.
Slot
Name
Capacity
Bus
RPM
Model
Allocation
Chassis
PhysicalDisk4 (...
25.0 GB
SATA
VBOX HARDDISK
Automatic
Select the disk and click on OK
Total selected capacity:
25.0 GB
OK
Cancel

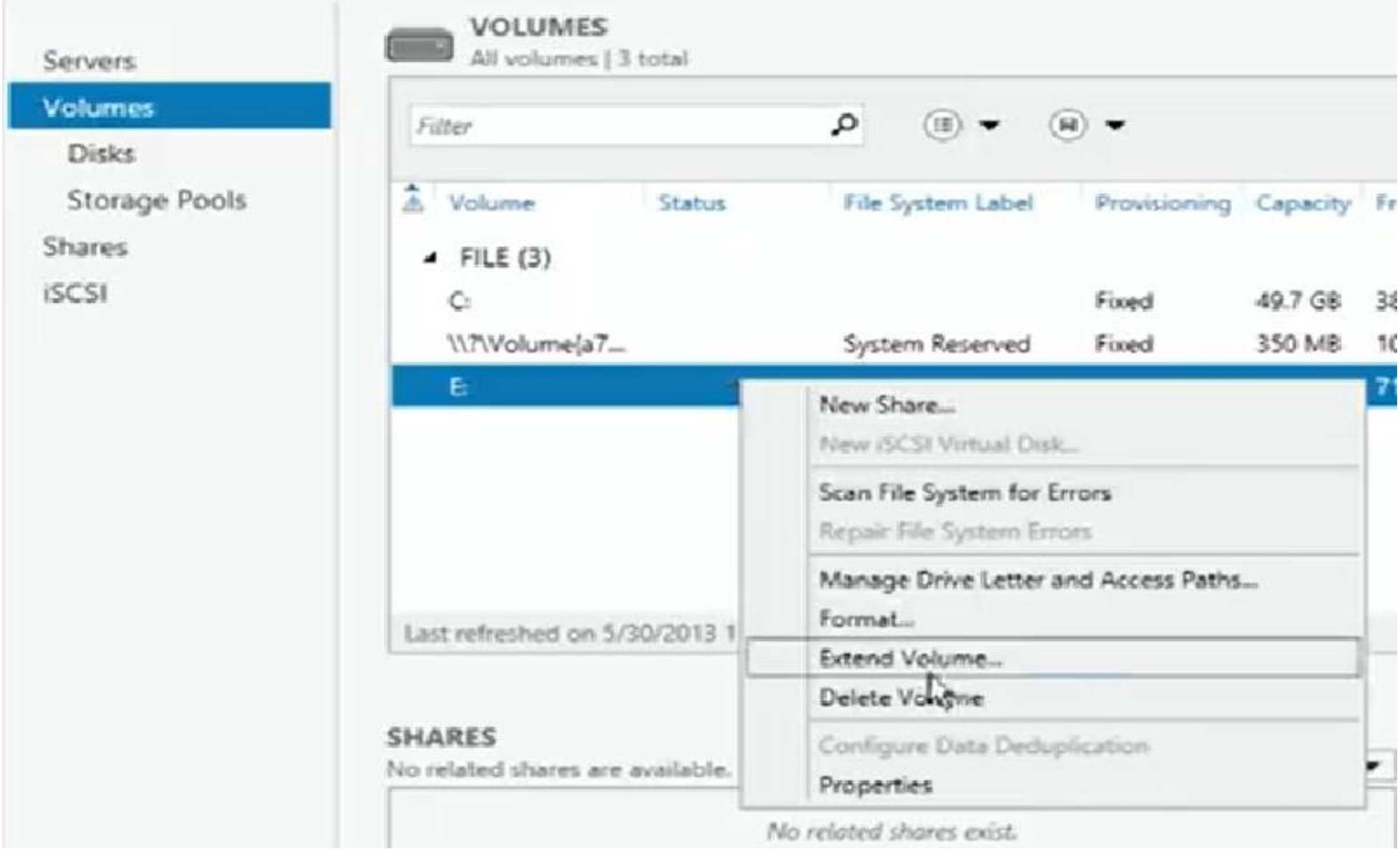

Storage Spaces (1)
pool
Storage Pool
FILE
FILE
FILE
97.0 GB
93.5 GB
New disk added to Pool
Increase in size of pool
Last refreshed on 5/30/2013 11:54:52 AM
VIRTUAL DISKS
ool on FILE
TASKS
Filter
Name
Status
Layout
Provisioning
Capacity
Allocated
Volume
disk
Mirror
Thin
72.0 GB
1.00 GB
E:
PHYSICAL DISKS
ool on FILE
Filter
Slot
Name
Status
Capacity
PhysicalDisk3 (FILE)
24.3 GB
PhysicalDisk4 (FILE)
24.3 GB
PhysicalDisk2 (FILE)
24.3 GB
PhysicalDisk1 (FILE)
24.3 GB



To increase the size of the virtual disk we can simply right click on the disk and select
Extend Virtual disk



Now the capacity of the drive is 97 GB



We can now go to the volume that was 71 GB, right click on it and select Extend Volume

Disks

Storage Pools

Shares

iSCSI

Filter

Volume	Status	File System Label	Provisioning	Capacity	Free Space	Deduplication Rate	Deduplication Savings	Percen
FILE (3)								
C:			Fixed	49.7 GB	38.8 GB			
\\?\Volume{a7...		System R						
E:		New Volu						

Last refreshed on 5/30/2013 11:58:14 AM

Extend Volume

Current size: 71.9 GB

Maximum size: 96.9 GB

New size: 96 GB

OK Cancel

SHARES

No related shares are available.

TASKS

No related shares exist.

DISK

E:\ on FILE

Microsoft Storage Space Device

Capacity: 97.0 GB

74.2% Allocated

72.0 GB Allocated

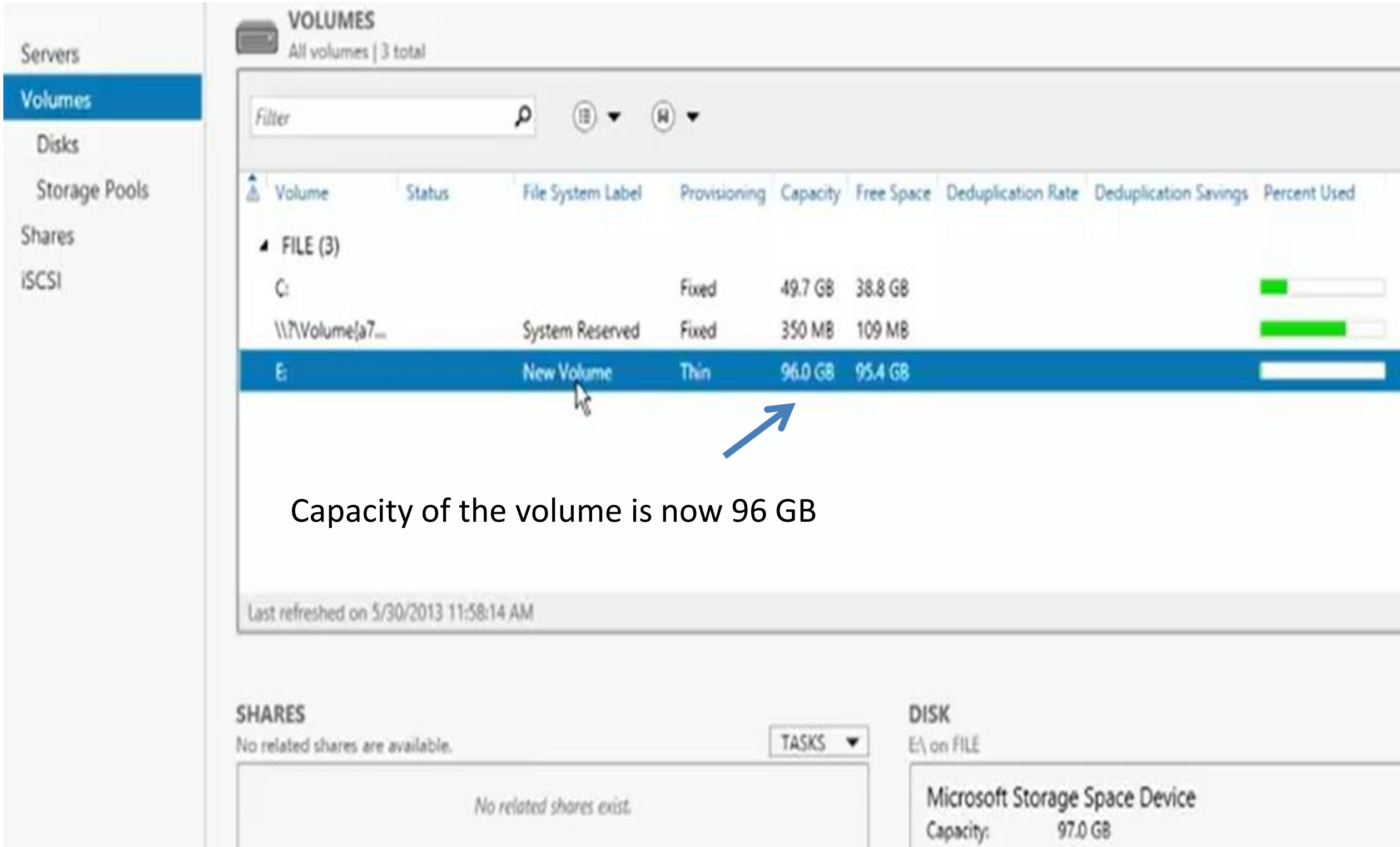
25.0 GB Unallocated

Status: Online

Bus Type: Storage Spaces

Subsystem: Storage Spaces

Virtual Disk: disk


Servers
Volumes
Disks
Storage Pools
Shares
iSCSI
VOLUMES
All volumes | 3 total
Filter
Volume
Status
File System Label
Provisioning
Capacity
Free Space
Deduplication Rate
Deduplication Savings
Percent Used
FILE (3)
C:
Fixed
49.7 GB
38.8 GB
\\?\Volume{a7...
System Reserved
Fixed
350 MB
109 MB
E:
New Volume
Thin
96.0 GB
95.4 GB
Capacity of the volume is now 96 GB
Last refreshed on 5/30/2013 11:58:14 AM
SHARES
No related shares are available.
TASKS
No related shares exist.
DISK
E:\ on FILE
Microsoft Storage Space Device
Capacity:
97.0 GB