

❖ What is Parallel Rebuild / Fast Rebuild?

Windows Server 2012 R2 Storage Spaces includes the ability to automatically rebuild storage spaces using free space in a storage pool instead of using hot spares. If a physical disk fails, Storage Spaces will regenerate the data that belongs to the failed physical disk in parallel. During parallel regeneration, a single disk in the pool either serves as a source of data or the target of data; during regeneration, Storage Spaces maximizes peak sequential throughput to complete the regeneration quickly no user action is necessary, as a newly created storage space will use the new policy.

The parallel rebuild process is designed to return the system to a resilient state as quickly as possible. To do so, it uses all the drives in the pool, which has the consequence of increasing the I/O load on the system in order to return the system to resilient state. However, for certain workloads, this may not be a desirable tradeoff. Certain deployments may choose to prioritize servicing production I/O over returning the system to a resilient state.

❖ How to enable?

To set repair policy to Parallel
`Set-StoragePool pool1 -RepairPolicy Parallel`

To check repair policy
`Get-StoragePool pool1 | ft RepairPolicy`

Repair Policy:

Specifies how the operating system proceeds with repairing virtual disks in the specified storage pool. The acceptable values for this parameter are:

- **Sequential** Repair processes one allocation slab at a time. Specifying this value results in longer repair times, but smaller impact on I/O load.
- **Parallel** Repair processes as many allocation slabs as it can in parallel. Specifying this value results in the shortest repair time, but significantly impacts I/O load.

To set RetireMissingPhysicalDisks to Always
`Set-StoragePool pool1 -RetireMissingPhysicalDisks Always`

To check RetireMissingPhysicalDisks
`Get-StoragePool pool1 | ft RetireMissingPhysicalDisks`

RetireMissingPhysicalDisks:

Specifies when Windows should set the Usage property of physical disks missing from a storage pool to Retired. The acceptable values for this parameter are:

- **Auto** This is the default setting for storage pools. When set to Auto, Windows retires missing disks, but doesn't automatically rebuild affected virtual disks unless there are physical disks whose Usage value is set to HotSpare, in which case Windows rebuilds the virtual disks five minutes after the failed write operation.
- **Always** This is the recommended setting when using free pool space to rebuild storage spaces instead of using hot-spare disks. When set to Always, Windows retires missing physical disks and automatically rebuilds affected virtual disks five minutes after the failed write operation.
- **Never** When set to Never, Windows never retires missing physical disks.

```
PS C:\Windows\system32> Get-Storagepool pool1 | ft FriendlyName,RepairPolicy,RetireMissingPhysicalDisks
FriendlyName                               RepairPolicy                           RetireMissingPhysicalDisks
-----                                     -----                                -----
Pool1                                     Parallel                            Always
```

❖ Parallel Rebuild Test and verified

1. Configure storage pool and enable RetireMissingPhysicalDisks to Always.
2. Create 4 virtual disks and ensure OperationalStatus is “ok”.

FriendlyName	ResiliencySettingName	OperationalStatus	HealthStatus	IsManualAttach	Size
V1	Mirror	OK	Healthy	False	11.53 TB
V2	Mirror	OK	Healthy	False	11.53 TB
V3	Mirror	OK	Healthy	False	11.53 TB
V4	Mirror	OK	Healthy	False	11.53 TB
Q	Mirror	OK	Healthy	False	4 GB

3. Pull out a physical disk as failed disk or missing disk then OperationalStatus will become “Incomplete”. (Event ID 203, 205)

FriendlyName	ResiliencySettingName	OperationalStatus	HealthStatus	IsManualAttach	Size
V1	Mirror	Incomplete	Warning	False	11.53 TB
V2	Mirror	Incomplete	Warning	False	11.53 TB
V3	Mirror	Incomplete	Warning	False	11.53 TB
V4	Mirror	Incomplete	Warning	False	11.53 TB
Q	Mirror	OK	Healthy	False	4 GB

4. Once any IO through the VDs, the VD stats will become degraded. Once Windows detected any VD “degraded”, Windows will active auto parallel rebuild. OperationalStatus become “in service”. (Event ID 304)

FriendlyName	ResiliencySettingName	OperationalStatus	HealthStatus	IsManualAttach	Size
V1	Mirror	InService	Warning	False	11.53 TB
V2	Mirror	InService	Warning	False	11.53 TB
V3	Mirror	InService	Warning	False	11.53 TB
V4	Mirror	InService	Warning	False	11.53 TB
Q	Mirror	OK	Healthy	False	4 GB

PS C:\DataON1\CIB-9200ExpFw>

5. Once VDs fixed then OperationalStatus become “ok”.

FriendlyName	ResiliencySettingName	OperationalStatus	HealthStatus	IsManualAttach	Size
V1	Mirror	OK	Healthy	False	11.53 TB
V2	Mirror	OK	Healthy	False	11.53 TB
V3	Mirror	OK	Healthy	False	11.53 TB
V4	Mirror	OK	Healthy	False	11.53 TB
Q	Mirror	OK	Healthy	False	4 GB

❖ What kinds of Event ID you may meet during Parallel Rebuild?

1. Event ID 203 / 205 -Failed disk or missing disk

Event 203, StorageSpaces-Driver

Level	Date	Source	Category	ID	Task Category
Error	9/30/2015 11:04:50 AM	StorageSpaces-Driver	None	203	None
Information	9/30/2015 10:59:23 AM	StorageSpaces-Driver	None	305	None
Information	9/30/2015 10:58:15 AM	StorageSpaces-Driver	None	305	None
Warning	9/30/2015 10:49:17 AM	StorageSpaces-Driver	None	205	None
Warning	9/30/2015 10:49:15 AM	StorageSpaces-Driver	None	304	None
Warning	9/30/2015 10:49:15 AM	StorageSpaces-Driver	None	304	None

Event 203, StorageSpaces-Driver

General Details

Physical disk (97fd3fe6-2e27-8940-1f37-953e137a37f8) failed an IO operation. Return Code: STATUS_DEVICE_NOT_CONNECTED. Additional related events may be found in the System event log for Disk 3.

```
Get-PhysicalDisk | ? $_.ObjectId -Match "97fd3fe6-2e27-8940-1f37-953e137a37f8" | Get-StorageReliabilityCounter
```

This disk may be located using the following information:

Drive Manufacturer: HGST
Drive Model Number: HUC101845CS4200
Drive Serial Number: 02V0LRH

More information can be obtained using this PowerShell command:

```
Get-PhysicalDisk | ? $_.ObjectId -Match "97fd3fe6-2e27-8940-1f37-953e137a37f8" | Get-StorageReliabilityCounter
```

If this disk is in an enclosure, it may be located using the following information:

Enclosure Manufacturer: DataON
Enclosure Model Number: DNS-2640
Enclosure Serial Number: MXE34000569AM08E
Enclosure Slot: 3

It may also be located by running this command in PowerShell:

```
Get-PhysicalDisk | ? $_.ObjectId -Match "97fd3fe6-2e27-8940-1f37-953e137a37f8" | Enable-PhysicalDiskIndication
```

Log Name: Microsoft-Windows-StorageSpaces-Driver/Operational
Source: StorageSpaces-Driver
Event ID: 203
Level: Error
User: N/A
OpCode: Info
Keywords:
Computer: Dell1-N1.fast.dataonstorage.com
Logged: 9/30/2015 11:04:50 AM
Task Category: None
More Information: [Event Log Online Help](#)

Event ID 203

Event 205, StorageSpaces-Driver

General Details

Windows lost communication with physical disk (edb5f43f-48c2-0c35-36ed-bdaf88befc13). This can occur if a cable failed or was disconnected, or if the disk itself failed.

This disk may be located using the following information:

Drive Manufacturer: HGST
Drive Model Number: HUC101845CS4200
Drive Serial Number: 02V0BMH

If this disk is in an enclosure, it may be located using the following information:

Enclosure Manufacturer: DataON
Enclosure Model Number: DNS-2640
Enclosure Serial Number: MXE34000569AM08E
Enclosure Slot: 1

More information can be obtained using this PowerShell command:

```
Get-PhysicalDisk | ? $_.ObjectId -Match "edb5f43f-48c2-0c35-36ed-bdaf88befc13" | Get-VirtualDisk
```

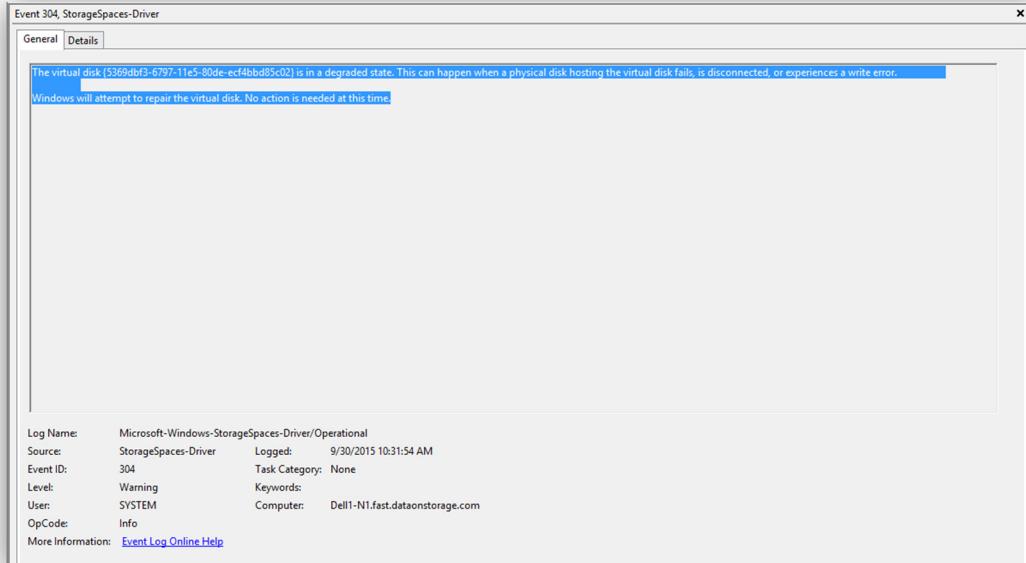
To view the virtual disks affected, run this command in PowerShell:

```
Get-PhysicalDisk | ? $_.ObjectId -Match "edb5f43f-48c2-0c35-36ed-bdaf88befc13" | Get-VirtualDisk
```

Log Name: Microsoft-Windows-StorageSpaces-Driver/Operational
Source: StorageSpaces-Driver
Event ID: 205
Level: Warning
User: SYSTEM
OpCode: Info
Keywords:
Computer: Dell1-N1.fast.dataonstorage.com
Logged: 9/30/2015 10:31:54 AM
Task Category: None
More Information: [Event Log Online Help](#)

Event ID 205

2. Event ID 304 – Windows attempt to repair VDs



Event ID 304

3. Event ID 305 – VD is now healthy

Level	Date and Time	Source	Event ID	Task Category
Information	9/30/2015 10:44:31 AM	StorageSpaces-Driver	305	None
Information	9/30/2015 10:40:47 AM	StorageSpaces-Driver	305	None
Warning	9/30/2015 10:32:27 AM	StorageSpaces-Driver	304	None
Warning	9/30/2015 10:31:54 AM	StorageSpaces-Driver	304	None
Warning	9/30/2015 10:31:54 AM	StorageSpaces-Driver	205	None
Error	9/30/2015 10:19:26 AM	StorageSpaces-Driver	303	None
Error	9/30/2015 10:19:26 AM	StorageSpaces-Driver	303	None
Error	9/30/2015 10:19:26 AM	StorageSpaces-Driver	303	None
Information	9/30/2015 10:18:54 AM	StorageSpaces-Driver	400	None
Information	9/30/2015 10:18:54 AM	StorageSpaces-Driver	400	None

Event 305, StorageSpaces-Driver

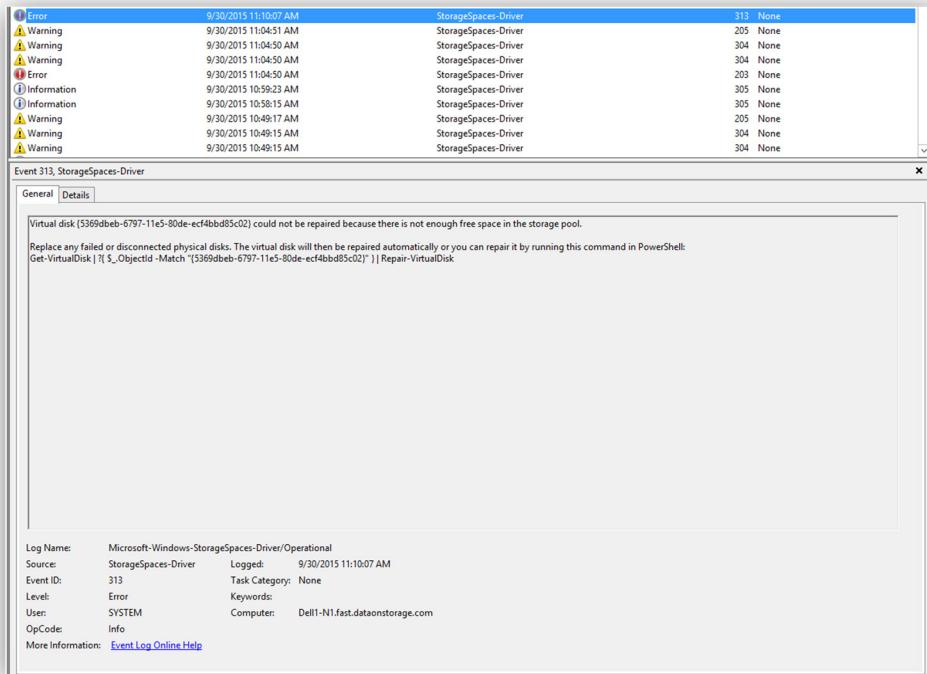
The virtual disk (5369dbf3-6797-11e5-80de-ecf4bbd85c02) is now healthy.

Log Name: Microsoft-Windows-StorageSpaces-Driver/Operational
 Source: StorageSpaces-Driver
 Event ID: 305
 Level: Information
 User: SYSTEM
 OpCode: Info

More Information: [Event Log Online Help](#)

Event ID 305

4. Event ID 313 – VD not enough free space to fix



Event ID 313

- ❖ **Rebuild Time** – here are different capacity of disks we tested in our lab ,and the Parallel Rebuild time for reference

Manufacture	Model	Type	Capacity	Rebuild time
HGST	0B29917	HDD	450GB	12 m
HGST	0B31066	SSD	400GB	6 m
HGST	0B23651	HDD	8TB	8-12 h

❖ Troubleshooting

Once all the VDs have been repaired, you may see the failed disk still not been remove from storage pool as image below. It will cause your storage pool status warning.

The screenshot displays three main windows:

- STORAGE POOLS**: Shows two pools: Pool2 (Storage Spaces) and Pool1 (Storage Pool). Pool1 has a yellow warning icon and a status bar indicating 7.36 TB total capacity, 3.44 TB free space, and 50% allocated.
- VIRTUAL DISKS**: Shows two volumes: V2 (Mirrored, 1,000 GB) and V1 (Mirrored, 1,000 GB).
- PHYSICAL DISKS**: Shows 16 physical disks in Dell1-N1. Disk 1 (PhysicalDisk1 (Dell1-N1)) is highlighted with a red box around its context menu options: "Remove Disk", "Toggle Drive Light", "Reset Disk", and "Properties".

You may manual remove the failed disk then your storage pool status will become healthy!

Ref: [https://technet.microsoft.com/en-us/library/hh848672\(v=wps.630\).aspx](https://technet.microsoft.com/en-us/library/hh848672(v=wps.630).aspx)
 Ref: http://www.dell.com/learn/us/en/04/shared-content~datasheets~en/documents~deploying_storage_spaces_on_powervault_md12xx-v1.pdf