❖ 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 Alway
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

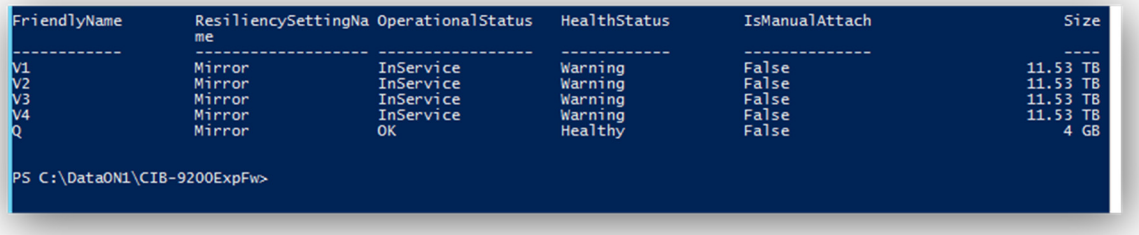
1. Configure storage pool and enable RetireMissingPhysicalDisks to Always.
2. Create 4 virtual disks and ensure OperationalStatus is "ok".

```
PS C:\DataON1\CIB-9200ExpFw> Get-VirtualDisk

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)

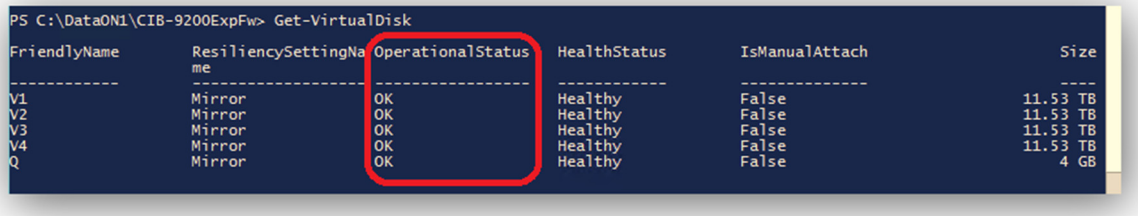
```
FriendlyName        ResiliencySettingName OperationalStatus HealthStatus       IsManualAttach      Size
------------        --------------------- ----------------- ------------       --------------      ----
V1                  Mirror                Incomplete        Warning           False               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        ResiliencySettingNa OperationalStatus   HealthStatus        IsManualAttach              Size
                    me
------------        ------------------- -----------------   ------------        --------------              ----
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>
```

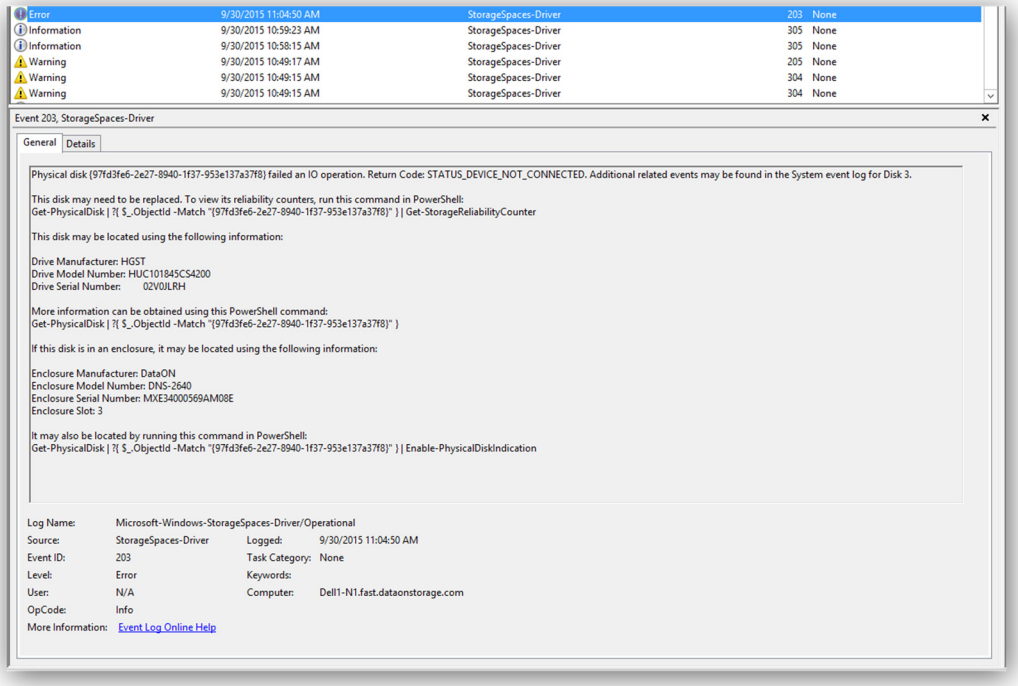
5. Once VDs fixed then OperationalStatus become “ok”.



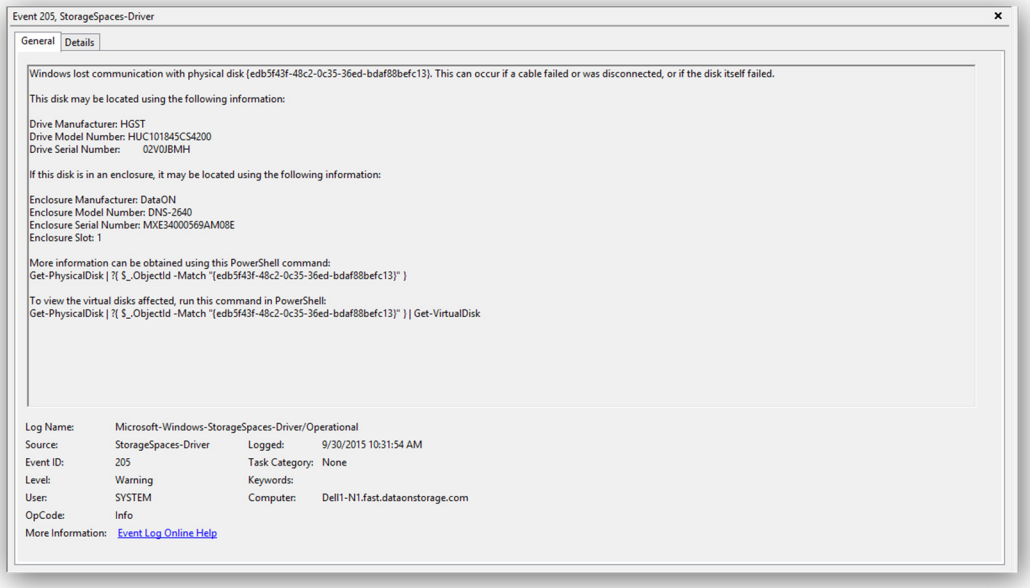
```
PS C:\DataON1\CIB-9200ExpFw> Get-VirtualDisk

FriendlyName        ResiliencySettingNa OperationalStatus   HealthStatus        IsManualAttach              Size
                    me
------------        ------------------- -----------------   ------------        --------------              ----
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

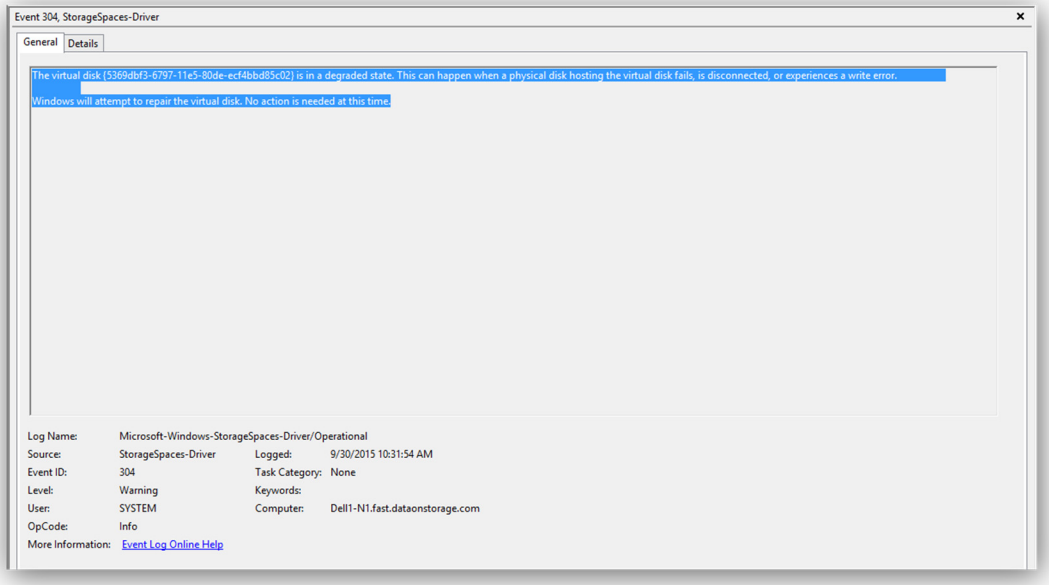


Event ID 203



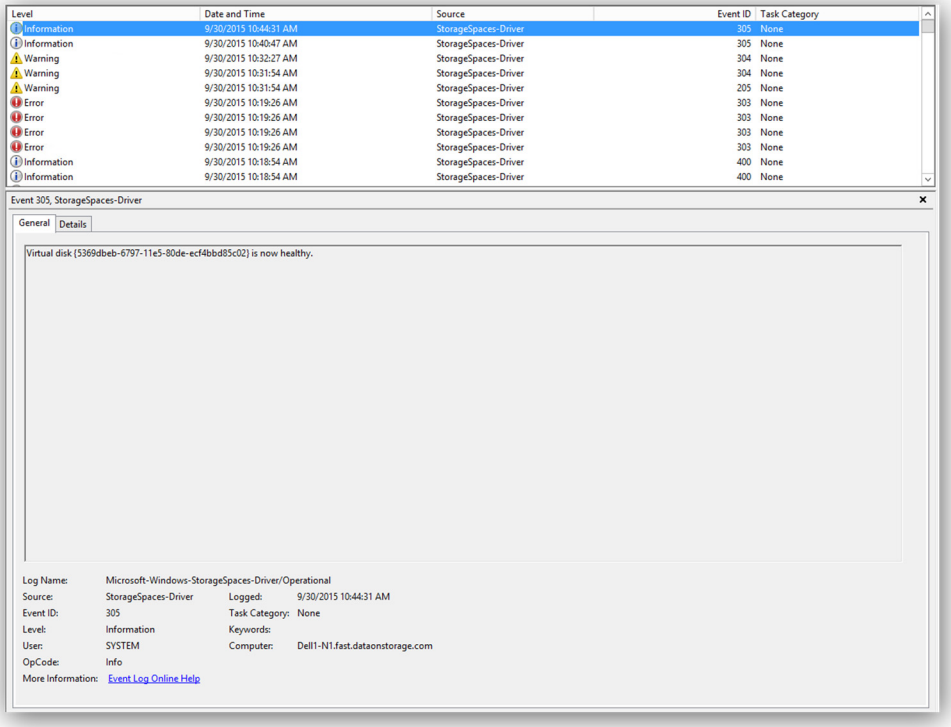
Event ID 205

2. Event ID 304 – Windows attempt to repair VDs



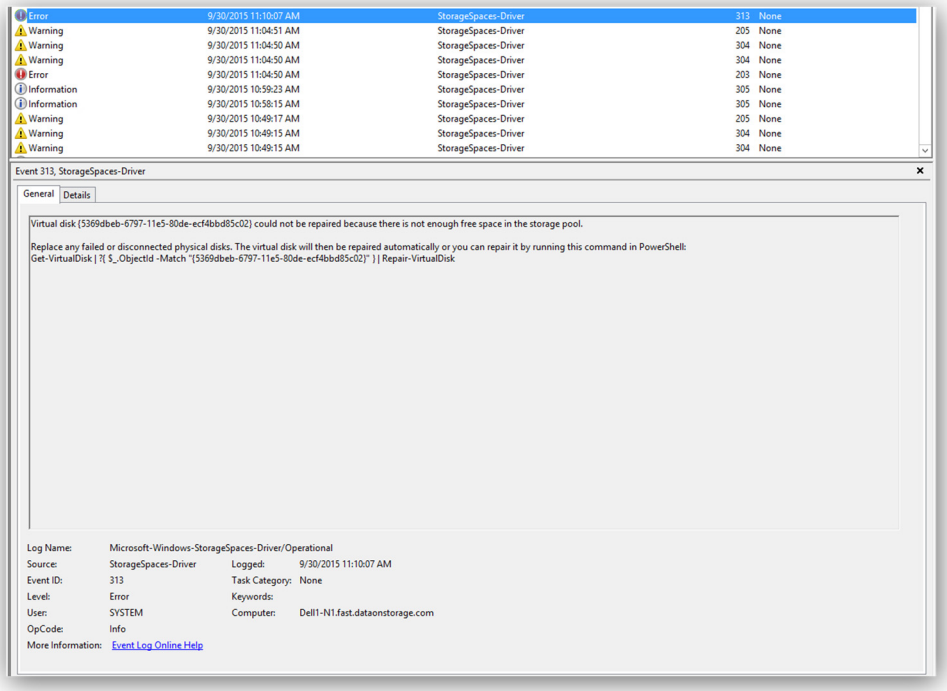
Event ID 304

3. Event ID 305 – VD is now healthy



Event ID 305

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



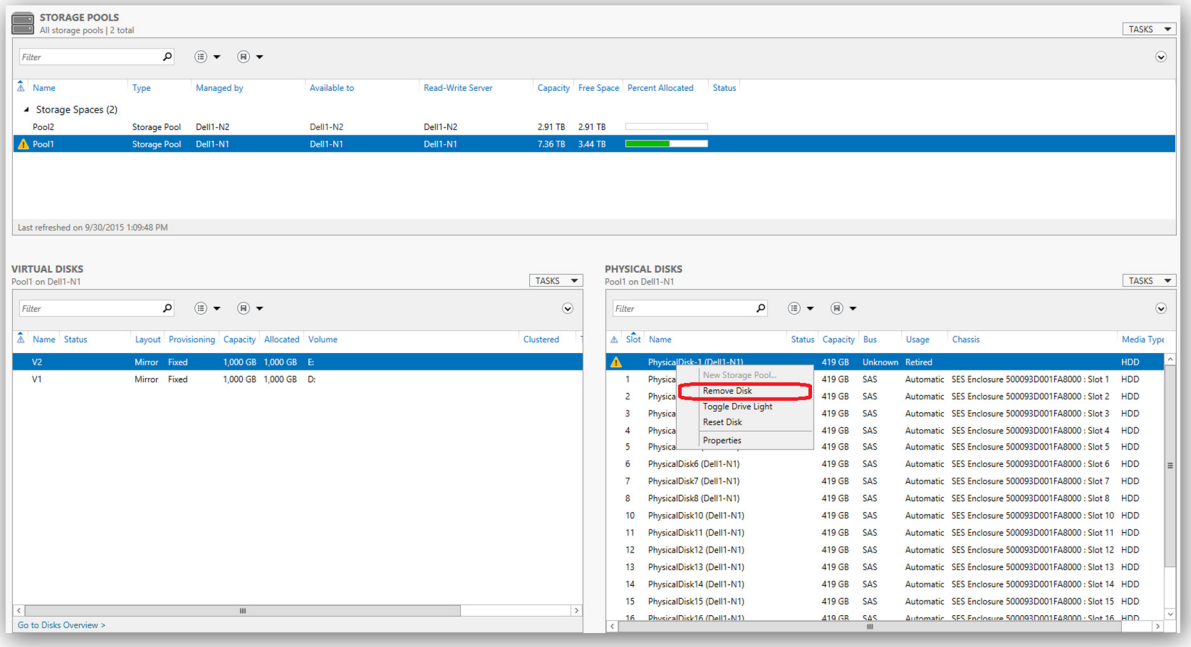
Event ID 313

- **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.



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

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