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- **Author:** thibor (Robert Thibodeau)
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Understanding Disk Reconstruction

PURPOSE

Provide an understanding of the Data Domain Disk Reconstruction process

APPLIES TO

- All Data Domain systems
- All Software Releases

SOLUTION

Data Domain systems utilize RAID 6 protection in order to protect customer data. As disks fail, you may wish to review the status of disk reconstruction on a DDR. With RAID 6, multiple disks can fail and have data protected.

There are rules on how DDOS handles disk failures and reconstructions.

- A DDR may have 2 disk reconstructions on going at the same time.

- The exception to this rule is 2 disk failures in the same RAID group (dg). In this case, one disk reconstruction must complete in order for the next disk reconstruction to start.

- Data Domain systems use a system of global spares for all external enclosures. In the event that all the spares on one enclosure are used and not replaced, the system will pull the next spare from another external disk enclosure with the same size disks. This will result in a disk group spanning multiple enclosures. While It is desirable to keep RAID and spare disks on each enclosure, it is not required and will not affect system performance. To reconfigure a system after global sparing has occurred, contact support to verify the health of the system and to assist you in the reconfiguration of the disk enclosures.

- A head unit will NOT global spare. Failed disks in a Data Domain head should be replaced as soon as possible.

The commands to determine disk reconstruction progress will differ depending on DDOS version.

DDOS 4.9 and below:

Use the command disk show raid-info

sysadmin@dd860-rtp1# disk show raid-info

```
Disk Show Raid-Info
-------------------
Disk   State        Additional Status
----   -----------  --------------------------------------
1.1    in use (dg0)
1.2    in use (dg0)
1.3    in use (dg0)
1.4    spare
2.1    in use (dg1)
2.2    in use (dg1)
2.3    in use (dg1)
2.4    spare ( dg1)   reconstructing ( 50%, done in 250 mins. )
2.5    in use (dg1)
2.6    in use (dg1)
```

```
2.7    in use (dg1)
2.8    failed (dg1)
2.9    in use (dg1)
2.10   in use (dg1)
2.11   in use (dg1)
2.12   in use (dg1)
2.13   in use (dg1)
2.14   in use (dg1)
2.15   in use (dg1)
2.16   spare
3.1    in use (dg2)
3.2    in use (dg2)
3.3    in use (dg2)
3.4    failed
3.5    in use (dg2)
3.6    in use (dg2)
3.7    in use (dg2)
3.8    spare
3.9    in use (dg2)
3.10   in use (dg2)
3.11   in use (dg2)
3.12   in use (dg2)
3.13   in use (dg2)
3.14   in use (dg2)
3.15   in use (dg2)
3.16   spare ( dg2)   reconstructing ( 76%, done in 134 mins. )


---- ----------- ----------------------------------------
35 drives are operational
1 drive is undergoing reconstruction - 76% complete
1 drive is undergoing reconstruction - 50% complete
30 drives are "in use"
5 drives are "spare"
2 drives are "failed"
2 drives are non-operational
3 disk groups total
3 disk groups present
```

This shows the disks, the state of the disks, the disk reconstructing, the RAID group being reconstructed and the percent complete. In the event of a second failure in dg1 or dg2 the output will show a reconstruction pending for the disk group.

DDOS 5.0 and higher:

Use the command disk show state

```
sysadmin@dd890-rtp1# disk show state
Enclosure   Disk
           1  2  3  4  5  6  7  8  9  10 11 12 13 14 15
---------   --------------------------------------------
1          s  .  .  .
2          .  .  R  .  .  .  .  .  .  .  .  .  .  .  F
3          F  .  .  .  .  .  .  .  .  .  .  .  .  .  R
4          .  s  .  .  .  .  .  .  .  .  .  .  .  .
---------   --------------------------------------------


Legend  State                    Count
------   -------------------------  -----
.        In Use Disks               44
s        Spare Disks                2
R        Spare (reconstructing) Disks  2
F        Failed Disks               2
------   -------------------------  -----
Total 49 disks


Disk   Disks         Progress  Remaining
Group  Reconstructing (%)       (minutes)
-----  -------------  --------  ---------
dg1    2.3           0         238
dg2    3.15          99        10
-----  -------------  --------  ---------
```

or use the command storage show all

```
sysadmin@dd890-rtp1# storage show all
Active tier details:
```

Disk Group	Disks	Count	Disk Size	Additional Information
dg1	2.1-2.2, 2.4-2.14	13	931.5 GiB	1 disk degraded
dg2	3.2-3.15	13	931.5 GiB	1 disk degraded
dg3	4.1, 4.3-4.15	14	931.5 GiB	
(spare)	4.2	1	931.5 GiB	

Disk Group	Disks Reconstructing	Progress (%)	Remaining (minutes)
dg1	2.3	0	238
dg2	3.15	99	10

Current active tier size: 32.7 TiB
Active tier maximum capacity: 131.0 TiB

The output shows that there are two disk currently undergoing reconstruction (dg1) and (dg2). Because the failed disks are in different disk groups, both are allowed to reconstruct at the same time. In the event of another disk failure in dg1, dg2 or dg3, the reconstruction will be queued until disk reconstruction is complete in the disk group where the failure occurred. If the disk failed in a disk group where there are no current reconstructions ongoing, the reconstruction will start as soon as one disk reconstruction has completed. Until a failed disk is replaced, the spare disk 4.2 will be used to complete reconstruction of any new disk failures.

Disk reconstruction times vary due to many factors, such as size, failed disk conditions, system load, etc. Use the commandstorage show all to determine time remaining on reconstruction.

On average, disk reconstruction will take:

500Gb	2 Hours
1Tb	4 Hours
2Tb	8 Hours
3Tb	16 Hours

Your system may take more or less time based on the factios listed above.

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3.3    in use (dg2)
3.4    failed
3.5    in use (dg2)
3.6    in use (dg2)
3.7    in use (dg2)
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3.10   in use (dg2)
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---------   --------------------------------------------
1           s  .  .  .
2           .  .  R  .  .  .  .  .  .  .  .  .  .  .  F
3           F  .  .  .  .  .  .  .  .  .  .  .  .  .  R
4           .  s  .  .  .  .  .  .  .  .  .  .  .
---------   --------------------------------------------


Legend  State                        Count
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REFERENCE

Identifying disk state 4.9 and earlier from autosupport
Identifying disk state 4.9 and earlier from CLI
Identifying disk state 5.X from autosupport
Identifying disk state 5.X from CLI
Spare disks