**What are the repercussions of a full aggregate?**

Sep 28, 2016•FAQ

ARTICLE NUMBER

‬ANSWER

What should I expect if the aggregate is showing 100% full?

In Data ONTAP 7G and Data ONTAP 8 7-Mode, df -A shows that an aggregate is 100% full. For example:

storage1> df -A Aggregate        kilobytes   used         available capacity aggr0            5238716824  5231747608    6969216    100% aggr0/.snapshot  275721936   60389932     215332004   22%

In Clustered Data ONTAP, storage aggregate show will display the space usage of the aggregates on the system.  For example:

cluster1::> storage aggregate show  Aggregate     Size Available Used% State    #Vols Nodes      RAID Status  --------- -------- --------- ----- ------- ------ ---------- ------------    aggr0       6.21TB    1.78TB   71% online      49 node0      raid\_dp     aggr1       6.65TB    6.42TB    3% online       4 node1      raid\_dp     aggr2       1.77TB    1.63TB    8% online       1 node2      raid\_dp    aggr3       1.77TB    1.73TB    2% online       2 node3      raid\_dp

4 entries were displayed.

An aggregate showing 100% used space in df -A might not actually be using 100% of the space.

If space reservations are used on the FlexVol volumes or LUNs, space will be marked reserved and thus be calculated as used space even though the blocks on disk are actually free space. An aggregate pools all the blocks that are not currently holding data (including free space in volume-guaranteed FlexVol volumes, unused Snapshot reserve space, and unused overwrite reserve space for LUNs) into an internal pool that it hands out to the FlexVol volumes on demand.

* If all the FlexVol volumes start to fill up at once, that might cause a problem depending on the workload.
* If they do not all fill up at once, this will not cause a problem. There is  nothing wrong with running a FlexVol volume at 100% full as long as there is still free space on the underlying aggregate.

In Data ONTAP 7G and Data ONTAP 8 7-Mode, Snapshot usage on aggregates is limited to 5%. In the example above:

* Snapshot usage is 22%, meaning 22% used out of the of the 5%.
* Snapshot space is 275721936, which is 5% of the total, and of that 60389932 (which is 22%) is used.
  + 5% is the default value, and it can be changed with snap reserve -A.

The actual space used by aggregate Snapshot copies and rate of change of a specific system can be monitored and used to determine the best reserve space based on the specific customer environment.  Also in the above example, snap sched -A is set to the default (0 1 4@9,14,19). The Snapshot usage of 22% is contributing to the fullness of the FlexVol volume.

In Clustered Data ONTAP, the Snapshot reserve on aggregates can be viewed using storage aggregate show -percent-snapshot-space .  The percent can be changed using storage aggregate modify -percent-snapshot-space *percent* .

If and when the Snapshot used space grows enough to fill the allotted space (5%), the Snapshot copies are deleted automatically to stop them from growing beyond the aggregate Snapshot reserve.  This aggregate-level behavior is different from the FlexVol volume-level Snapshot behavior. This happens automatically for aggregates only, not for traditional volumes or FlexVol volumes.

If an aggregate becomes full due to actual data consuming all available blocks, the FlexVol volumes hosted on the aggregate will also show as full.  For FlexVol volumes used by NAS protocols such as CIFS and NFS, the clients will receive a disk full error when attempting to write to the FlexVol.  For FlexVol volumes containing thin-provisioned LUNs and used by SAN protocols such as iSCSI and FCP, the LUN will be taken offline when it reaches full capacity.

Data ONTAP administrators have several options when managing available storage space:

* Depending on how future storage needs are projected, quotas may be setup within Data ONTAP for the users to manage unexpected storage usage.
* Snapshot space usage should be monitored to ensure it is not overrunning the Snapshot reserve as this would reduce the amount of writable space available to users in the FlexVol volume.
* Data ONTAP 7.1 or later contains FlexVol volume auto-grow and free space preservation features that allows the FlexVol volume to grow automatically based on storage needs and reduces the chance of the volume running out of space. When using this feature, the FlexVol volume storage usage should be monitored against the space available in the underlying aggregate.
  + For more information on space management features in Data ONTAP 7G and Data ONTAP 8 7-Mode, reference the [Data ONTAP 8.2 Storage Management Guide for 7-Mode](https://library.netapp.com/ecmdocs/ECMP1368859/html/GUID-10AA117D-A466-4B09-A012-10D3B46537F0.html).
  + For Clustered Data ONTAP, more information can be found in the [Clustered Data ONTAP 8.2 Logical Storage Management Guide](https://library.netapp.com/ecmdocs/ECMP1368017/html/GUID-10AA117D-A466-4B09-A012-10D3B46537F0.html).
* [Deduplication](https://library.netapp.com/ecmdocs/ECMP1114094/html/GUID-742D50E3-7AF1-4A2B-B702-3F27B417F926.html) may also be used to reduce the amount of space used in a FlexVol volume.  Deduplication works at the block level to eliminate duplicate data blocks.
  + The [Efficient IT Calculator](http://www.secalc.com/) can be used to estimate savings using deduplication.
  + More information on deduplication in Clustered Data ONTAP can be found in the [Clustered Data ONTAP 8.2 Logical Storage Management Guide](https://library.netapp.com/ecm/ecm_download_file/ECMP1368017).
  + For Data ONTAP 7G and Data ONTAP 8 7-Mode, reference the [Data ONTAP 8.2 Storage Efficiency Guide for 7-Mode](https://library.netapp.com/ecm/ecm_download_file/ECMP1368855).
* Data ONTAP 8.0.1 and later support [data compression](https://library.netapp.com/ecmdocs/ECMP1114094/html/GUID-37C6892A-AA01-4735-9CAF-AEB0DDFB7308.html) in a FlexVol volume as a way to increase storage efficiency by enabling more data to be stored using less space.  Compression can be configured as in-line or post-process.  In-line compression occurs as the data is being written.  Post-process compression runs as a low-priority background process on data already written to disk.
  + More information on data compression in Clustered Data ONTAP can be found in the [Clustered Data ONTAP 8.2 Logical Storage Management Guide](https://library.netapp.com/ecm/ecm_download_file/ECMP1368017).
  + For Data ONTAP 7G and Data ONTAP 8 7-Mode, reference the [Data ONTAP 8.2 Storage Efficiency Guide for 7-Mode](https://library.netapp.com/ecm/ecm_download_file/ECMP1368855).
* The LUN option space\_alloc can be used to control whether the LUN goes offline when it reaches 100% utilization.
  + More information on this LUN option can be found in the [Data ONTAP 8.2 SAN Administration Guide for 7-Mode](https://library.netapp.com/ecm/ecm_download_file/ECMP1368845) on page 18.