



Increasing storage capacity

ONTAP Select

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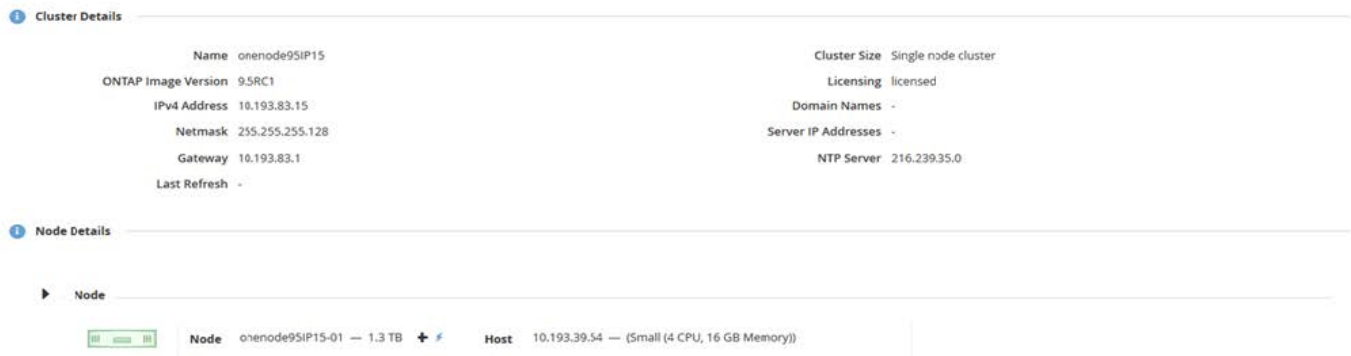
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Increasing storage capacity

ONTAP Deploy can be used to add and license additional storage for each node in an ONTAP Select cluster.

The storage-add functionality in ONTAP Deploy is the only way to increase the storage under management, and directly modifying the ONTAP Select VM is not supported. The following figure shows the “+” icon that initiates the storage-add wizard.



The following considerations are important for the success of the capacity-expansion operation. Adding capacity requires the existing license to cover the total amount of space (existing plus new). A storage-add operation that results in the node exceeding its licensed capacity fails. A new license with sufficient capacity should be installed first.

If the extra capacity is added to an existing ONTAP Select aggregate, then the new storage pool (datastore) should have a performance profile similar to that of the existing storage pool (datastore). Note that it is not possible to add non-SSD storage to an ONTAP Select node installed with an AFF-like personality (flash enabled). Mixing DAS and external storage is also not supported.

If locally attached storage is added to a system to provide for additional local (DAS) storage pools, you must build an additional RAID group and LUN (or LUNs). Just as with FAS systems, care should be taken to make sure that the new RAID group performance is similar to that of the original RAID group if you are adding new space to the same aggregate. If you are creating a new aggregate, the new RAID group layout could be different if the performance implications for the new aggregate are well understood.

The new space can be added to that same datastore as an extent if the total size of the datastore does not exceed the ESX-supported maximum datastore size. Adding a datastore extent to the datastore in which ONTAP Select is already installed can be done dynamically and does not affect the operations of the ONTAP Select node.

If the ONTAP Select node is part of an HA pair, some additional issues should be considered.

In an HA pair, each node contains a mirror copy of the data from its partner. Adding space to node 1

requires that an identical amount of space is added to its partner, node 2, so that all the data from node 1 is replicated to node 2. In other words, the space added to node 2 as part of the capacity-add operation for node 1 is not visible or accessible on node 2. The space is added to node 2 so that node 1 data is fully protected during an HA event.

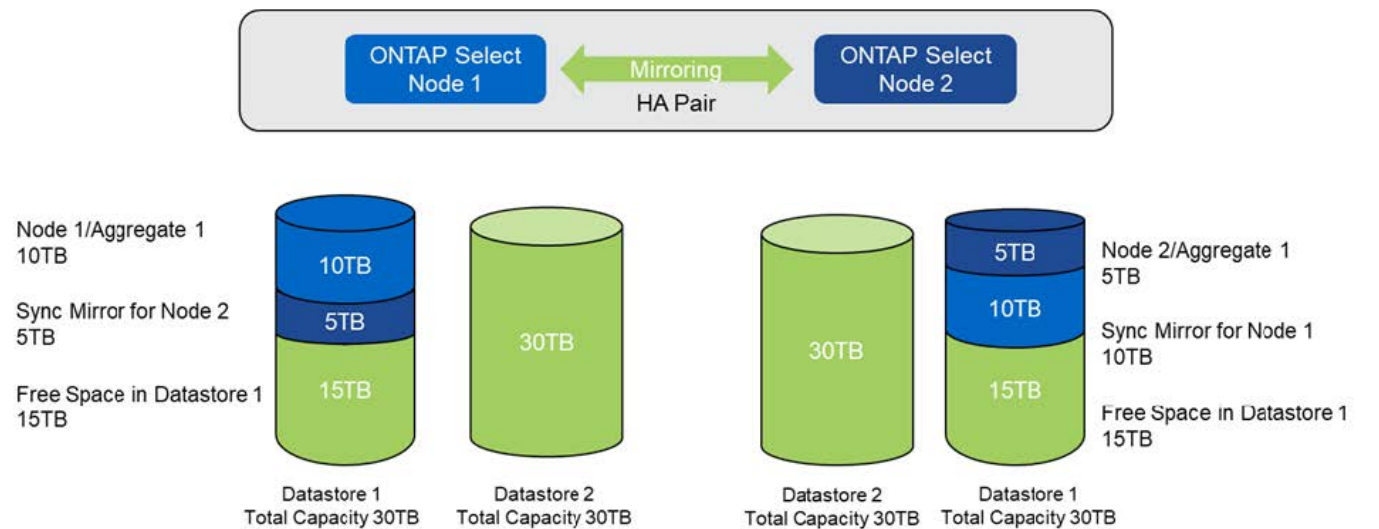
There is an additional consideration with regard to performance. The data on node 1 is synchronously replicated to node 2. Therefore, the performance of the new space (datastore) on node 1 must match the performance of the new space (datastore) on node 2. In other words, adding space on both nodes, but using different drive technologies or different RAID group sizes, can lead to performance issues. This is due to the RAID SyncMirror operation used to maintain a copy of the data on the partner node.

To increase user-accessible capacity on both nodes in an HA pair, two storage-add operations must be performed, one for each node. Each storage-add operation requires additional space on both nodes. The total space required on each node is equal to the space required on node 1 plus the space required on node 2.

Initial setup is with two nodes, each node having two datastores with 30TB of space in each datastore. ONTAP Deploy creates a two-node cluster, with each node consuming 10TB of space from datastore 1. ONTAP Deploy configures each node with 5TB of active space per node.

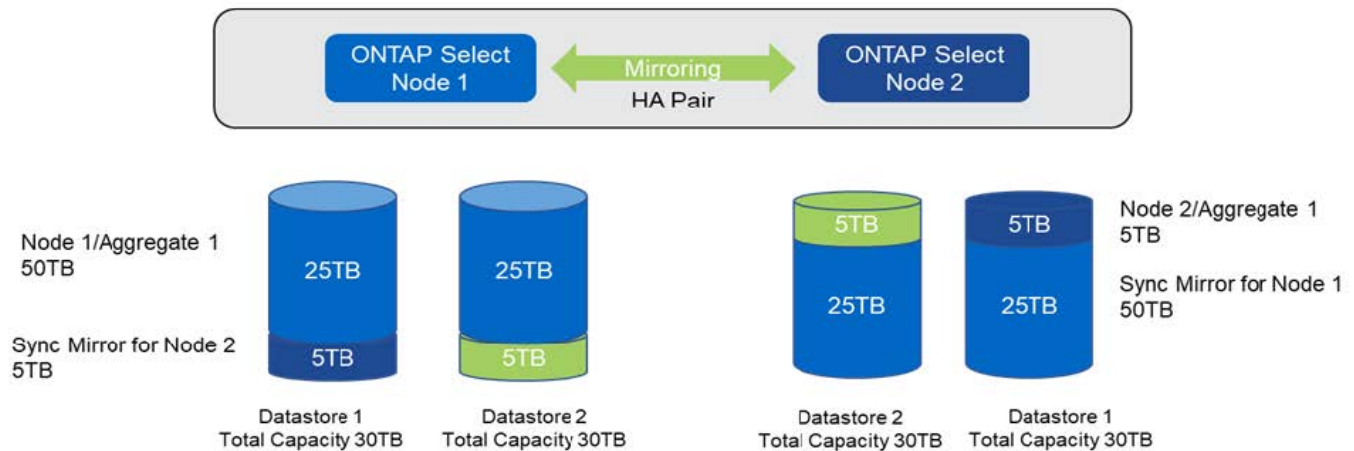
The following figure shows the results of a single storage-add operation for node 1. ONTAP Select still uses an equal amount of storage (15TB) on each node. However, node 1 has more active storage (10TB) than node 2 (5TB). Both nodes are fully protected as each node hosts a copy of the other node's data. There is additional free space left in datastore 1, and datastore 2 is still completely free.

Capacity distribution: allocation and free space after a single storage-add operation



Two additional storage-add operations on node 1 consume the rest of datastore 1 and a part of datastore 2 (using the capacity cap). The first storage-add operation consumes the 15TB of free space left in datastore 1. The following figure shows the result of the second storage-add operation. At this point, node 1 has 50TB of active data under management, while node 2 has the original 5TB.

Capacity distribution: allocation and free space after two additional storage-add operation for node 1



The maximum VMDK size used during capacity add operations is 16TB. The maximum VMDK size used during cluster create operations continues to be 8TB. ONTAP Deploy creates correctly sized VMDKs depending on your configuration (a single-node or multinode cluster) and the amount of capacity being added. However, the maximum size of each VMDK should not exceed 8TB during the cluster create operations and 16TB during the storage-add operations.

Increasing capacity for ONTAP Select with Software RAID

The storage-add wizard can similarly be used to increase capacity under management for ONTAP Select nodes using software RAID. The wizard only presents those DAS SDD drives that are available and can be mapped as RDMs to the ONTAP Select VM.

Though it is possible to increase the capacity license by a single TB, when working with software RAID, it is not possible to physically increase the capacity by a single TB. Similar to adding disks to a FAS or AFF array, certain factors dictate the minimum amount of storage that can be added in a single operation.

Note that in an HA pair, adding storage to node 1 requires that an identical number of drives is also available on the node's HA pair (node 2). Both the local drives and the remote disks are used by one storage-add operation on node 1. That is to say, the remote drives are used to make sure that the new storage on node 1 is replicated and protected on node 2. In order to add locally usable storage on node 2, a separate storage-add operation and a separate and equal number of drives must be available on both nodes.

ONTAP Select partitions any new drives into the same root, data, and data partitions as the existing drives. The partitioning operation takes place during the creation of a new aggregate or during the expansion on an existing aggregate. The size of the root partition stripe on each disk is set to match the existing root partition size on the existing disks. Therefore, each one of the two equal data partition

sizes can be calculated as the disk total capacity minus the root partition size divided by two. The root partition stripe size is variable, and it is computed during the initial cluster setup as follows. Total root space required (68GB for a single-node cluster and 136GB for HA pairs) is divided across the initial number of disks minus any spare and parity drives. The root partition stripe size is maintained to be constant on all the drives being added to the system.

If you are creating a new aggregate, the minimum number of drives required varies depending on the RAID type and whether the ONTAP Select node is part of an HA pair.

If adding storage to an existing aggregate, some additional considerations are necessary. It is possible to add drives to an existing RAID group, assuming that the RAID group is not at the maximum limit already. Traditional FAS and AFF best practices for adding spindles to existing RAID groups also apply here, and creating a hot spot on the new spindle is a potential concern. In addition, only drives of equal or larger data partition sizes can be added to an existing RAID group. As explained above, the data partition size is not the same as drive raw size. If the data partitions being added are larger than the existing partitions, the new drives is right-sized. In other words, a portion of capacity of each new drive remains unutilized.

It is also possible to use the new drives to create a new RAID group as part of an existing aggregate. In this case, the RAID group size should match the existing RAID group size.

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