DATACORE | vFilO

Configuration Guide

Version 4.2

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About This Guide

This guide will assist in adding storage into an installed DataCore vFilO server. If you have not yet installed DataCore vFilO, please see the Installation Guide.

Adding Storage to DataCore vFilO

DataCore vFilO supports storage from Network Attached Storage (NAS) systems, Block Storage such as Direct Attached Storage (DAS) and Storage Area Networking (SAN), and Object Storage.

> **Note:** SAN storage is currently supported as technology preview and is not supported for production workloads.

Prior to adding storage resources to DataCore vFilO, storage volumes must be created on those storage systems using the vendor's administrative tools. Once new storage resources have been added to the DataCore vFilO, DataCore vFilO can place data on them as part of the global namespace.

NAS storage systems can be added to DataCore vFilO either as platform integrated storage systems or generic storage systems. Block storage is added by installing DataCore vFilO Data Services (DSX) in a virtual machine or bare-metal server, acting as the underlying file server.

In DataCore vFilO, storage is called a **storage volume**, which is created and hosted by a storage system. DataCore vFilO identifies each **storage system** by a unique hostname and IP address. For platform integrated storage, this identifier is typically the storage system's management interface. For generic storage systems, this identifier is typically the storage system's IP address.

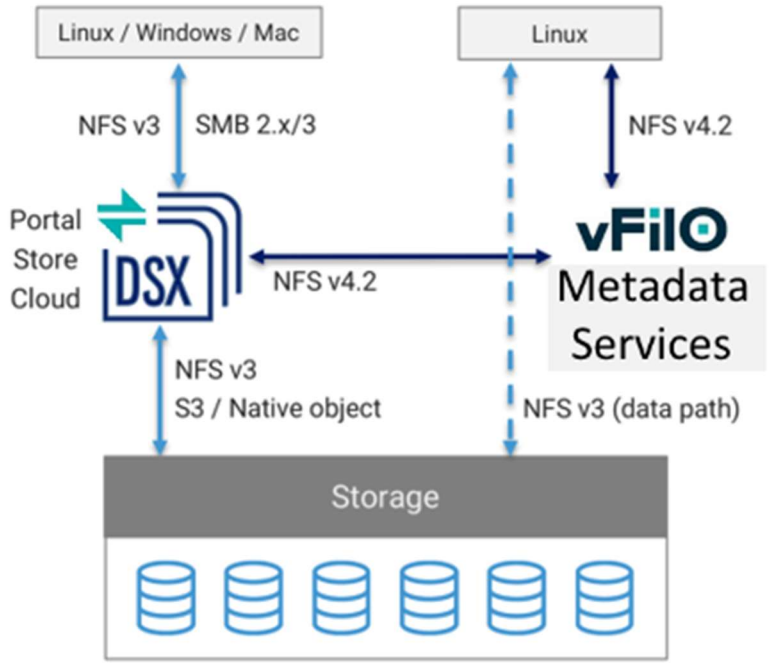


Figure 1 Client protocol access diagram

Adding Storage to DataCore vFilO

The high-level flow for adding storage is to first add the storage system(s) and then add volumes. This guide is developed using the graphical user interface but notations have been made for the relevant command line reference.

1. Select **Infrastructure & Data** from the left panel, select **Storage Systems** tab and then click **Add Storage System**

2. Enter a name, select the **Type**.

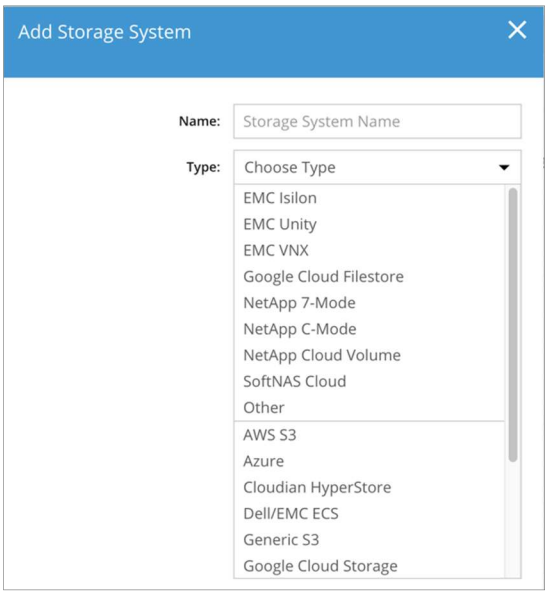


Figure 1 Storage Systems list

3. Enter the required information and press **Add Storage System**. Next section describes this in detail for each vendor.

Command Line Reference > node-add

4. **Add Volume** is the final step before storage can be used within the DataCore vFilO namespace

Command Line Reference > volume-add

NFS Storage

NETAPP

For NetApp (both 7-mode and Cluster mode), use the NetApp Management IP address. DataCore vFilO requires Read-only, Administrator credentials.

DataCore vFilO use native OnTAP APIs and the provided credentials to automatically discover the exported volumes to present to the user during Add Storage workflow. DataCore vFilO does **NOT** make any changes to the NetApp configuration settings.

In Appendix A there is a section for how to create a NetApp Read-Only management user in case of security concerns.

Vservers and qtrees are supported.

Volume settings

- Volumes only needs to be exported over NFS v3 only (even if client access is over SMB or NFS v4)
- Security style set to UNIX for R/W usage (incl. R/W assimilation)
- Security style set to Mixed or NTFS are supported using RO assimilation. For RO assimilation, no RW flags are required
- Volumes must be exported with root=<ANVIL IP>,<DSX IP> to ensure proper access for R/W usage

Volume export settings:

sec=sys,rw,anon=0,nosuid

- Volumes must be exported with those settings to all NAS client IPs that will use the storage, including Anvil and DSX nodes.

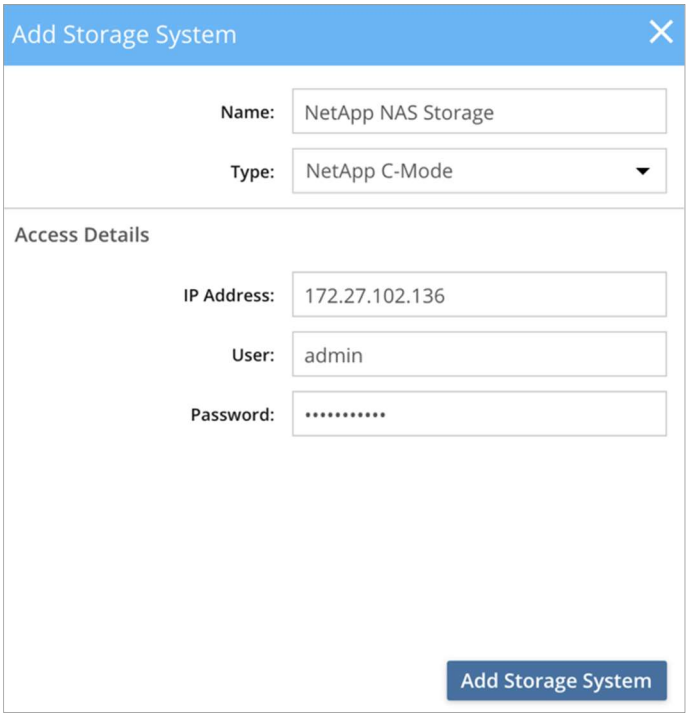


Figure 2 Adding NetApp Storage System

ONTAP Cluster Mode requirements
Ensure that ontapi is enabled, enter vserver services web show in the ONTAP command line.

> vserver services web show

Vserver	Type	Service Name	Description	Enabled
NAS_1	data	ontapi	Remote Administrative API Support	true

If it is disabled, enter the following to enable it:
> vserver services web modify –enabled true –vserver <vserver-name> -name ontapi

Change <vserver-name> to match your ONTAP cluster admin vserver.

ONTAP 7-mode requirements
These settings are required to be enabled

Ensure that httpd.admin.enable, httpd.admin.ssl.enable and tls.enable are set to on.

To set these values please enter the following on the ONTAP command line:
> options httpd.admin.enable on
> options httpd.admin.ssl enable on
> options tls.enable on

Recommendation
If volume snapshots are turned for the volume under DataCore vFilO management, it is highly recommended that they are turned off. Share-level snapshots are available as part of the DataCore vFilO namespace.

Adding NetApp Storage Volumes

Step 1 – Select volumes

Select the volumes to add from the added NetApp storage system. Note that for C-Mode configurations the root volume (sometimes exported as /) is not supported as a valid volume as it is most commonly used to store internal files for ONTAP.

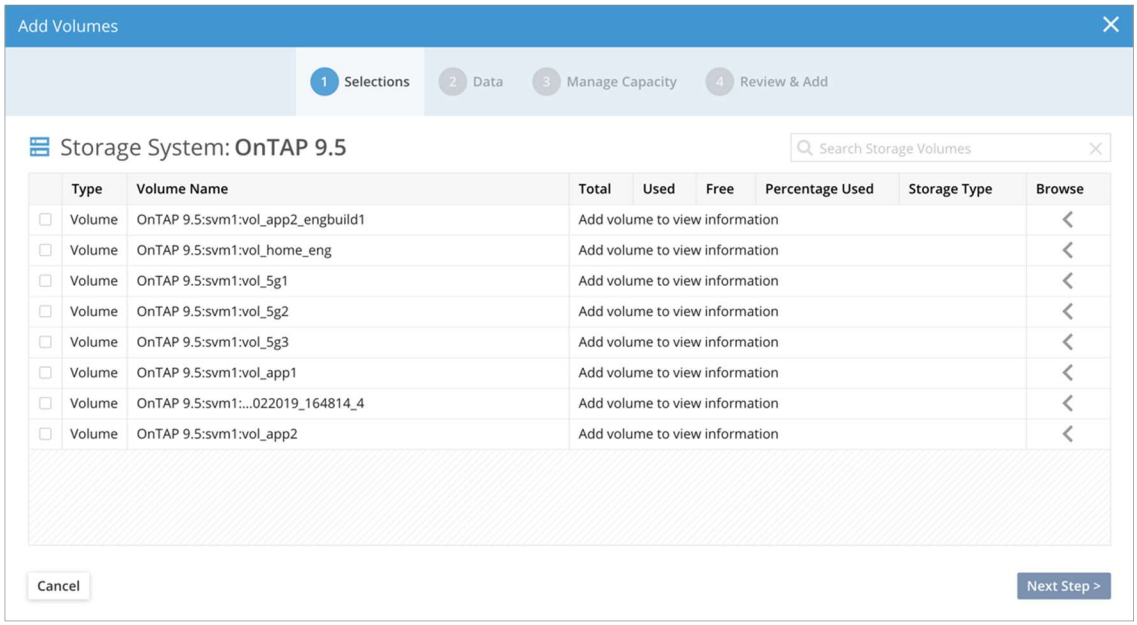


Figure 3 Adding NetApp storage volumes - Step 1

Command Line Reference
> volume-add

Step 2 – Assimilation of existing data

The second step will detect existing data on the volume and prompt the user to go through the assimilation process. For more details on assimilation, see the chapter on assimilation.

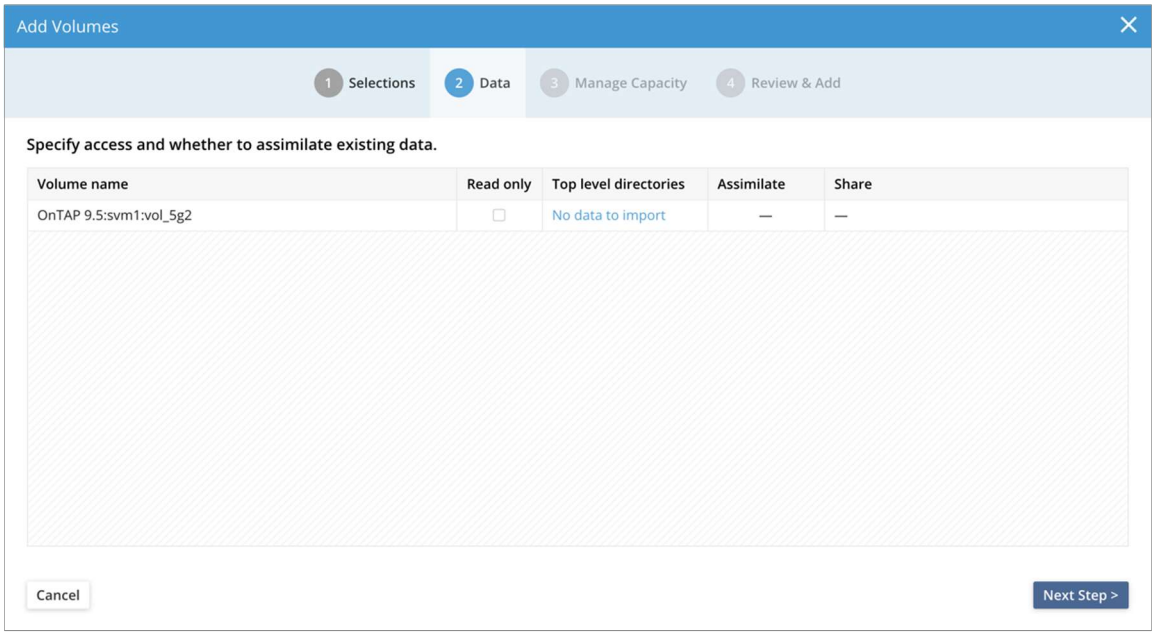


Figure 4 Adding NetApp storage volumes - Step 2

Step 3 – Setting the storage volume manage-to capacity

The DataCore vFilO namespace enables live data mobility for all data stored on DataCore vFilO volumes. With this core functionality, it is now possible to have the system automatically load-balance across storage volumes without any disruption for data access.

The manage-to capacity for volumes allows administrators to set the desired “max” fill level of a volume before the system will no longer place new data on this volume unless it determines that all other volumes are full and that there is no object storage volume available. The data placement logic is driven by a machine learning engine that automatically takes capacity, placement and user-driven needs into account for placing data.

The manage-to percentage value can be changed on the volume settings screen after the volume has been added.

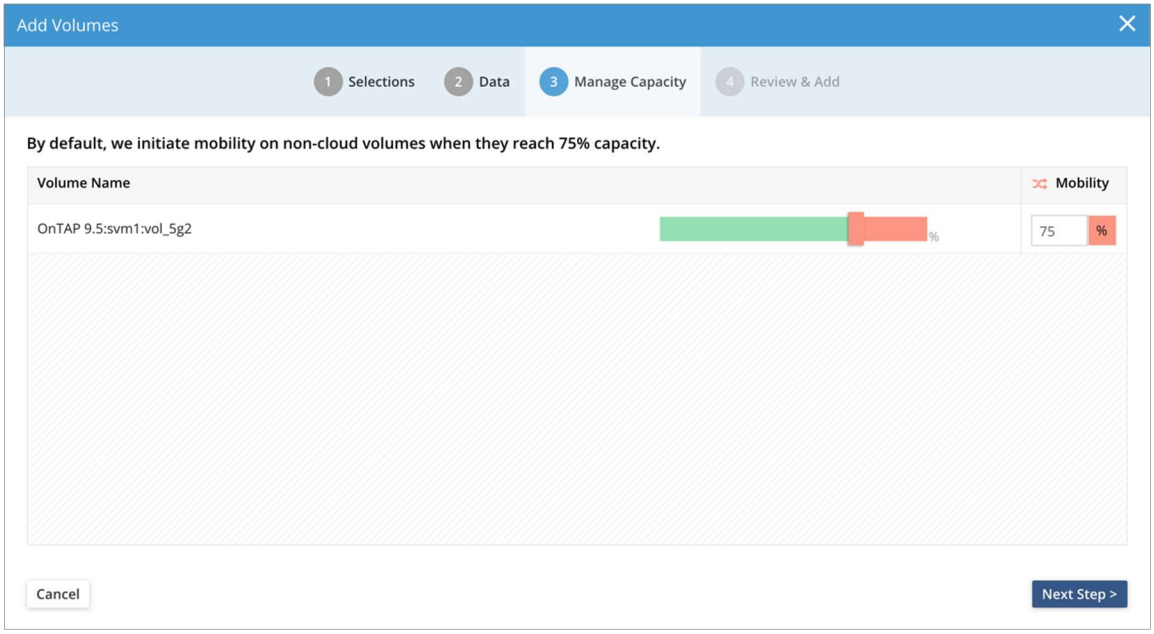


Figure 5 Adding NetApp storage volumes - Step 3

Step 4 – Summary screen

This final screen in the volume add step gives a summary of what will be done when clicking on Add Volumes.

Volume add is a background process and may take a few minutes to complete per Volume. Progress of volume add can be viewed in the task window or on the CLI.

Command Line Reference > task-list

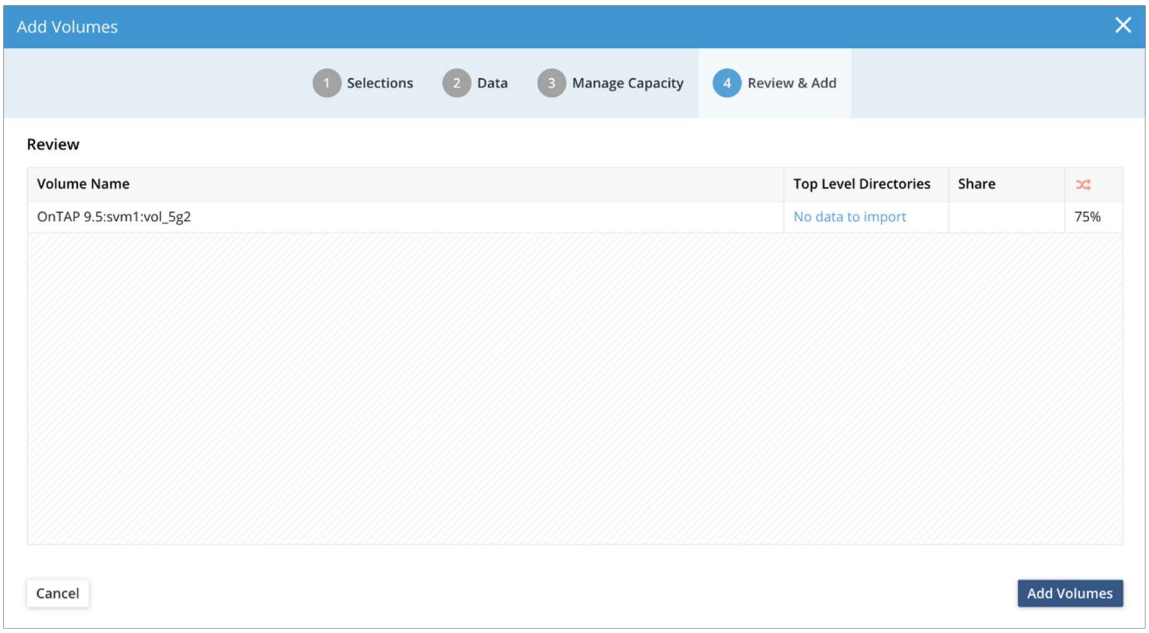


Figure 6 Adding NetApp storage volumes – Step 4

DELL-EMC ISILON

For Isilon, the Management IP address is the Isilon cluster management IP. DataCore vFilO will use the credentials provided and discover the exported volumes to present to the user during Add Storage workflow.

DataCore vFilO does **NOT** make any changes to the Isilon configuration settings.

Export settings:

- Exports only needs to be exported over NFS v3 (even if client access is over SMB or NFS v4)
- Enable SNMP v1/v2c, Allow SNMP v2 access and set the Community Name Read-only string
- Exports must be exported with the option **Root Clients** set to the Anvil and DSX IP addresses
- Exports must be exported read/write to all NFS clients that will using the shares

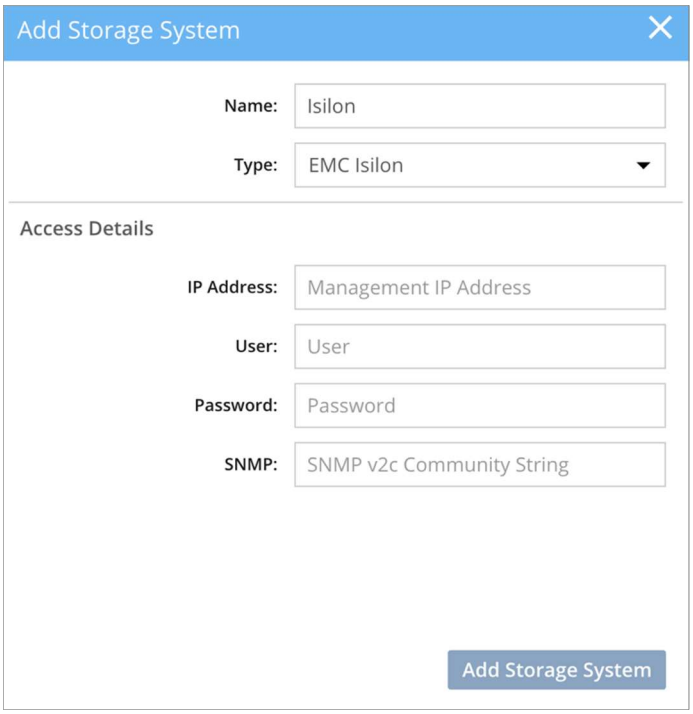


Figure 7 Adding Isilon Storage System

Isilon ACL requirements

Make sure the following settings:
Protocols->ACLs->ACL Policies->Environment “Balanced” is configured (default setting).

If this value is changed to other than Balanced, adding exported share to the DataCore vFilO could fail. Currently, “Balanced” is the only supported ACL Policies settings.

Adding Isilon Storage Volumes

Step 1 – Select volumes

Select the volumes to add from Isilon.

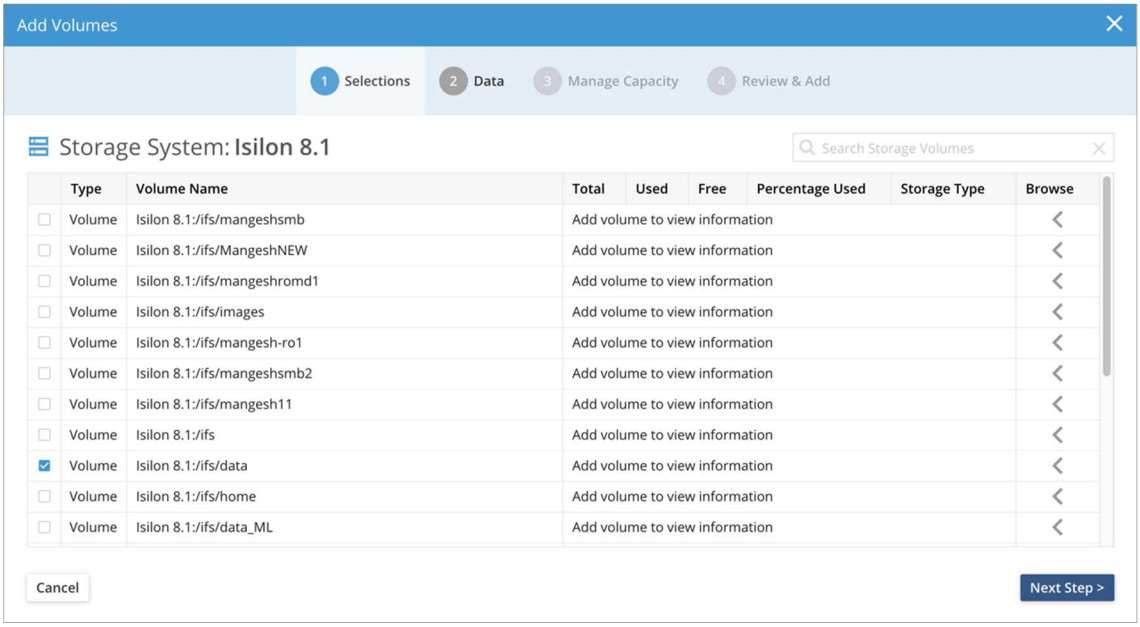


Figure 8 Adding Isilon storage volumes - Step 1

Command Line Reference
> volume-add

Step 2 – Assimilation of existing data

The second step will detect existing data on the volume and prompt the user to go through the assimilation process. For more details on assimilation, see the chapter on assimilation.

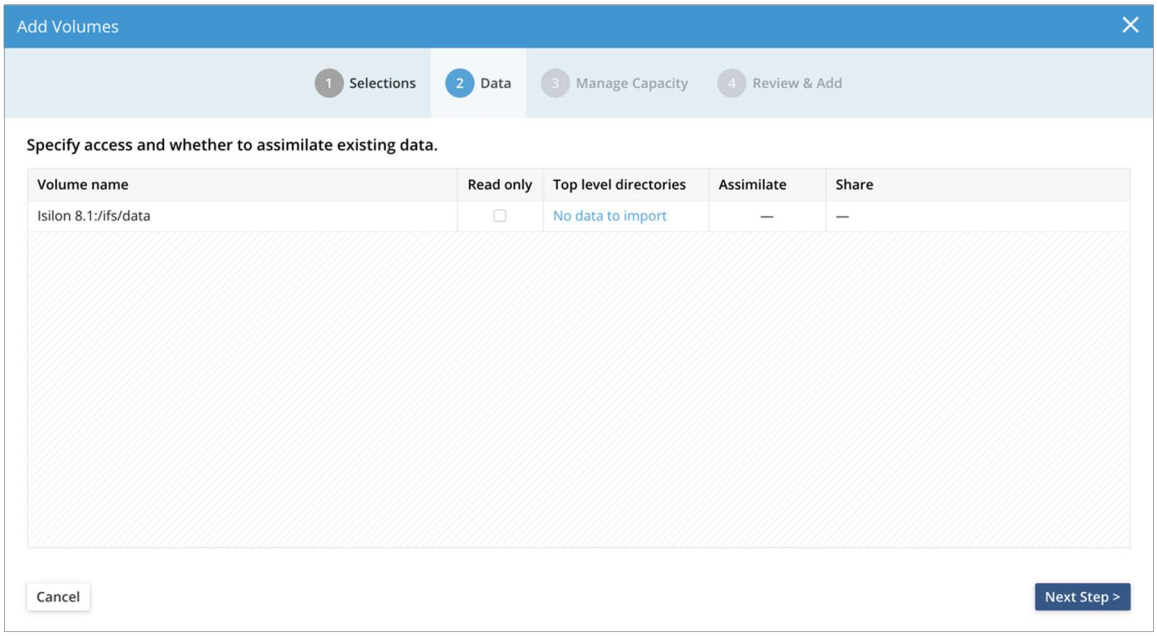


Figure 9 Adding Isilon storage volumes - Step 2

Step 3 – Setting the storage volume manage-to capacity

The DataCore vFilO namespace enables live data mobility for all data stored on managed volumes. With this core functionality, it is now possible to have the system automatically load-balance across storage volumes without any disruption for data access.

The manage-to capacity for volumes allows administrators to set the desired “max” fill level of a volume before the system will no longer place new data on this volume unless it determines that all other volumes are full and that there is no object storage volume available. The data placement logic is driven by a machine learning engine that automatically takes capacity, placement and user-driven needs into account for placing data.

The manage-to percentage value can also be changed on the volume settings screen after the volume has been added.

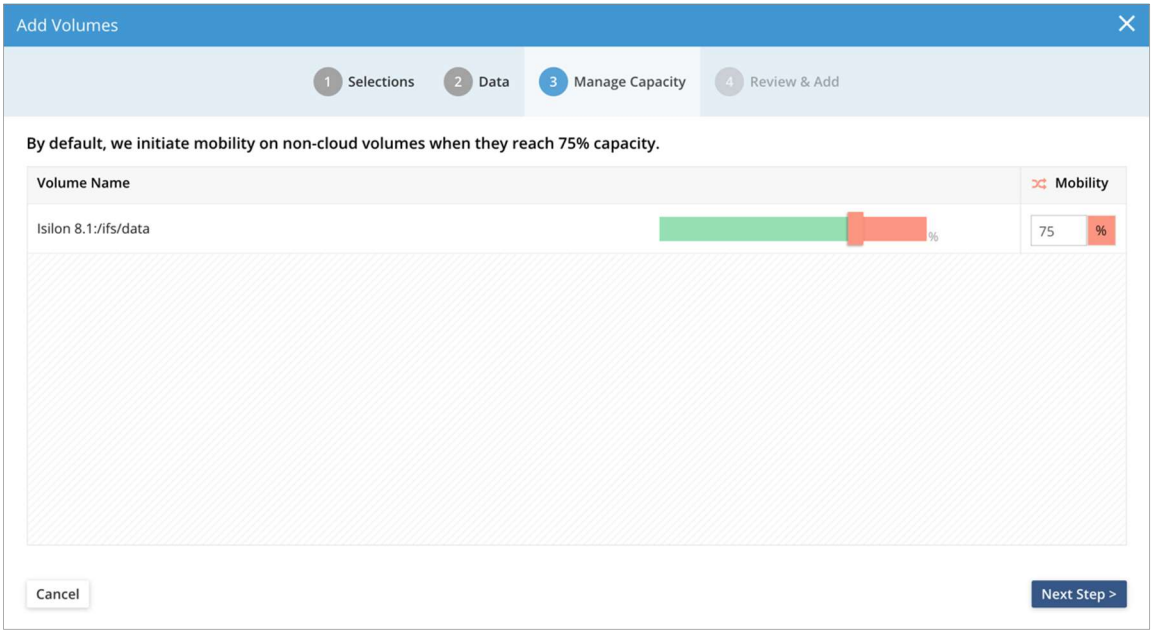


Figure 10 Adding Isilon storage volumes - Step 3

Step 4 – Summary screen

This final screen in the volume add step gives a summary of what will be done when clicking on Add Volumes.

Volume add is a background process and may take a few minutes to complete per Volume. Progress of volume add can be viewed in the task window or on the CLI.

Command Line Reference
> task-list

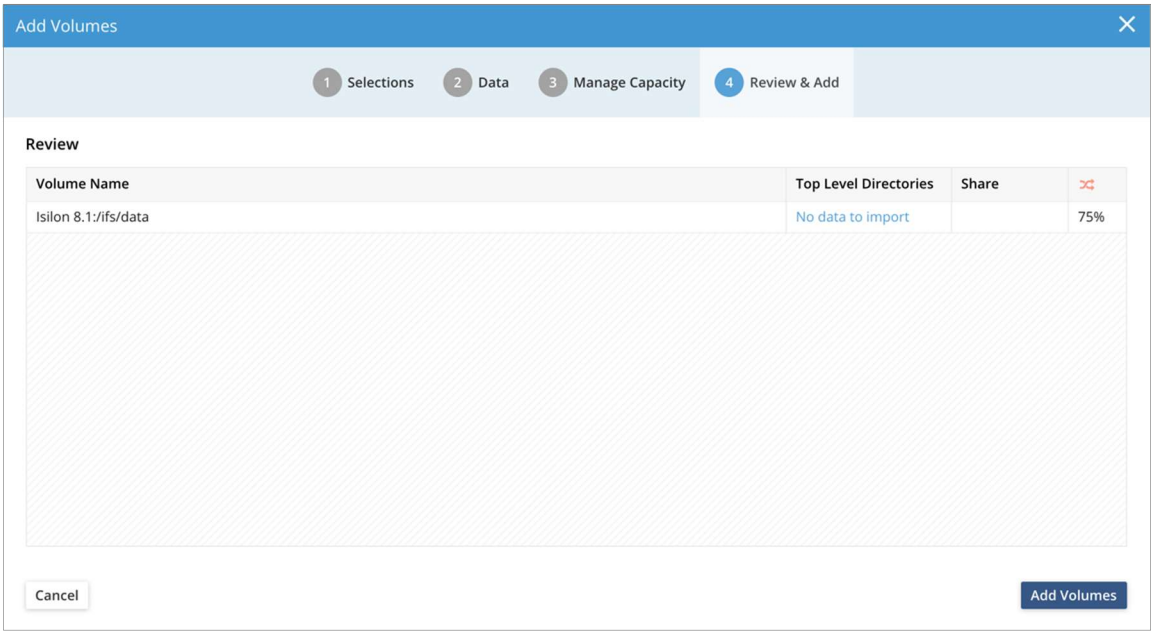


Figure 11 Adding Isilon storage volumes – Step 4

DSX (DATACORE VFILO DATA SERVICES)

Adding DSX Storage System

Adding a DataCore vFilO DSX Storage System is either fully automated or a single click operation. During the installation, the DSX is configured to only connect to one particular Anvil Cluster IP, if the Anvil admin credentials were also configured then the next step of manually adding the DSX has already been automatically done and you can skip to the Add Volume Step.

Manually adding a DSX node

In the Storage Systems tab, click on the + sign on the right hand side as illustrated in **Fehler! Verweisquelle konnte nicht gefunden werden.**.

The DSX needs to be added using this method even though it may not have any storage attached to it. If adding a DSX that is only functioning as a Portal, this is the only step that needs to be done.

Figure 1 Adding DSX

Adding DSX Storage Volumes

To complete the DSX Store configuration, click + Volume button from Storage Systems view or Add Volume from Volumes view.

Command Line Reference > volume-add

Note that the size of a volume is not reflected until the volume is added.

Step 1 – Select volumes

Select the volumes to add from DSX. Each configured block device will automatically be configured with a XFS file system as part of the installation process. See the admin guide for instructions on how to add new block storage after the DSX has been installed.

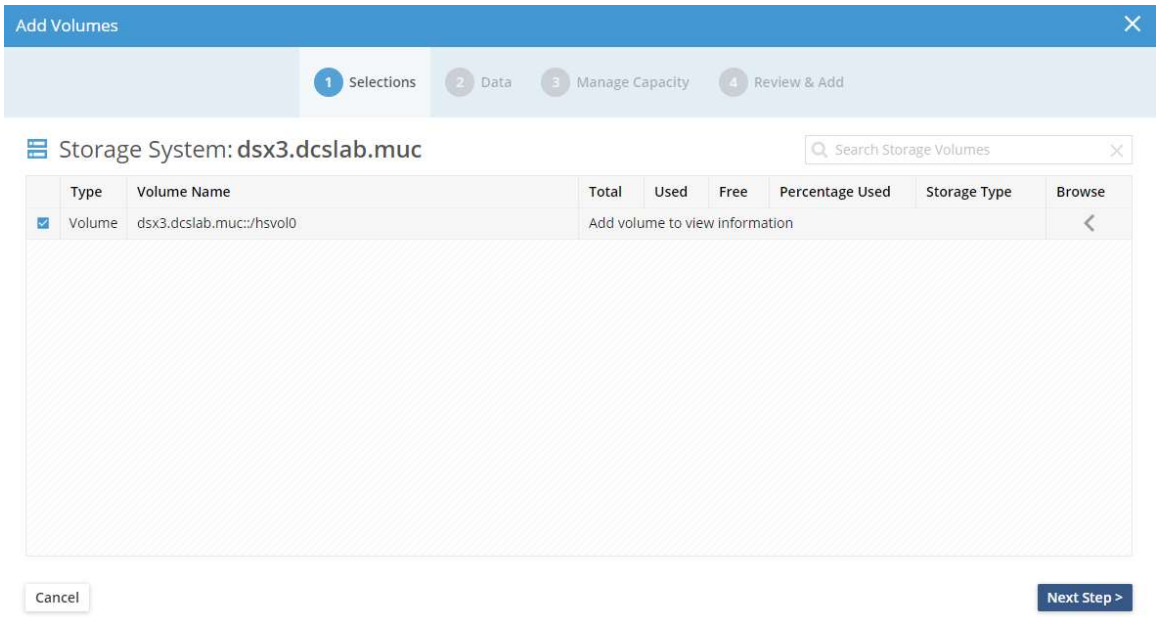


Figure 12 Adding DSX storage volume - Step 1

Step 2 – Assimilation of existing data

The second step will detect existing data on the volume and prompt the user to go through the assimilation process. For more details on assimilation, see the chapter on assimilation.

For a brand new DSX installation there will not be any existing data to be detected.

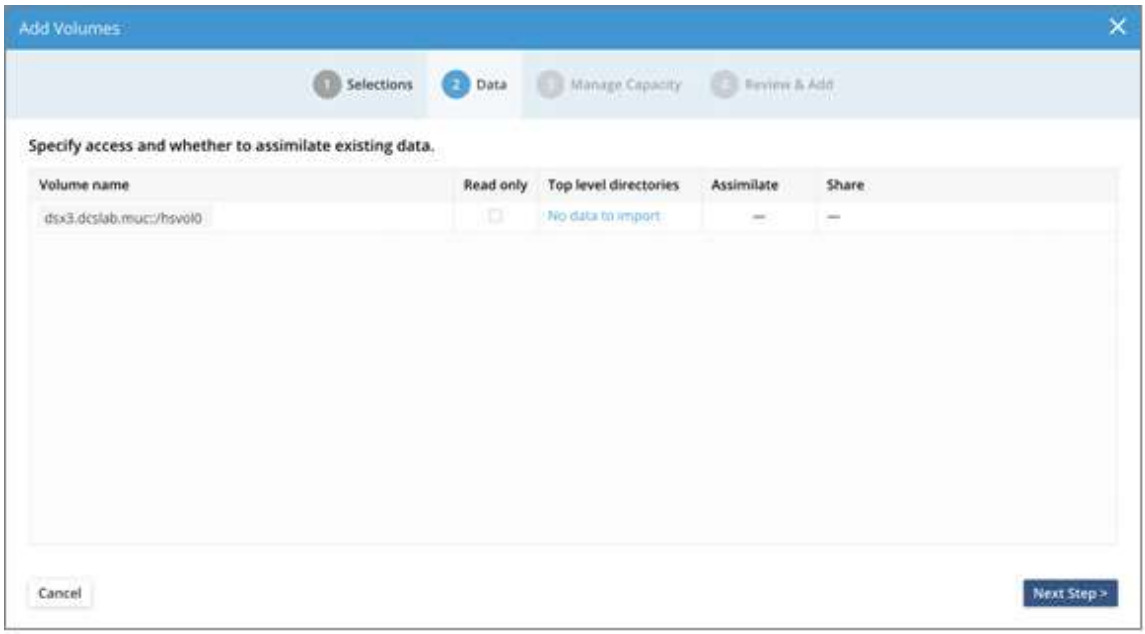


Figure 13 Adding DSX storage volume - Step 2

Step 3 – Setting the storage volume manage-to capacity

The DataCore vFilO namespace enables live data mobility for all data stored on managed volumes. With this core functionality, it is now possible to have the system automatically load-balance across storage volumes without any disruption for data access.

The manage-to capacity for volumes allows administrators to set the desired “max” fill level of a volume before the system will no longer place new data on this volume unless it determines that all other volumes are full and that there is no object storage volume available. The data placement logic is driven by a machine learning engine that automatically takes capacity, placement and user-driven needs into account for placing data.

The manage-to percentage value can be changed on the volume settings screen after the volume has been added.

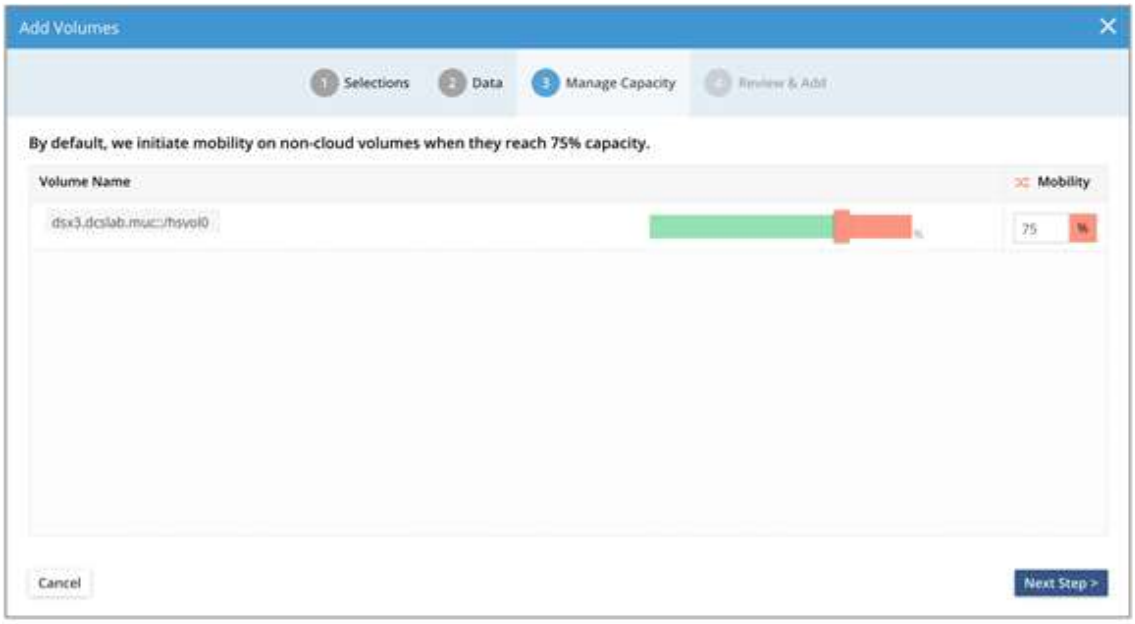


Figure 1 Adding DSX storage volume - Step 3

Step 4 – Summary screen

This final screen in the volume add step gives a summary of what will be done when clicking on Add Volumes.

Volume add is a background process and may take a few minutes to complete per Volume. Progress of volume add can be viewed in the task window or on the CLI.

Command Line Reference
> task-list

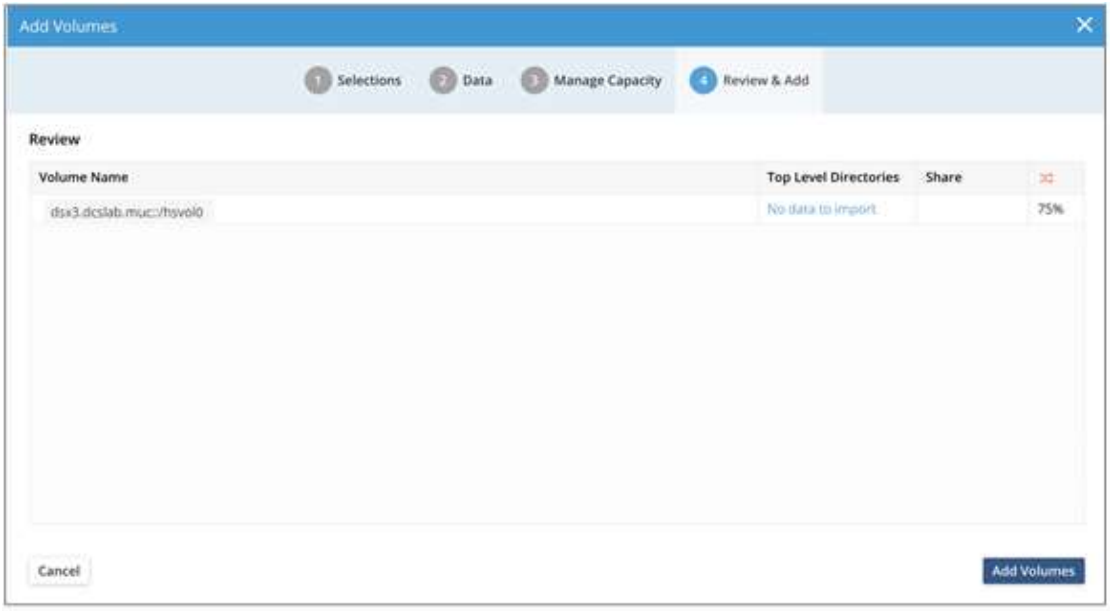


Figure 1 Adding DSX storage volume – Step 4

NFS OTHER

For NAS storage systems other than NetApp, Isilon and DSX, the NFS Other type can be used to add the shares into the DataCore vFilO namespace.

The Management IP address is the actual NFS export IP address.

Required export settings:

- Exports needs to be exported over NFS v3 (even if client access is over SMB or NFS v4)
- Exports must be exported read/write to all client IPs that will use the storage, including Anvil and DSX nodes
- The root user will be mounting the share for read/write access and needs full access (the equivalent of root user mapping or no_root_squash export setting)

Example settings from a generic Linux server:
/srv/app *(rw,sec=sys,no_root_squash)

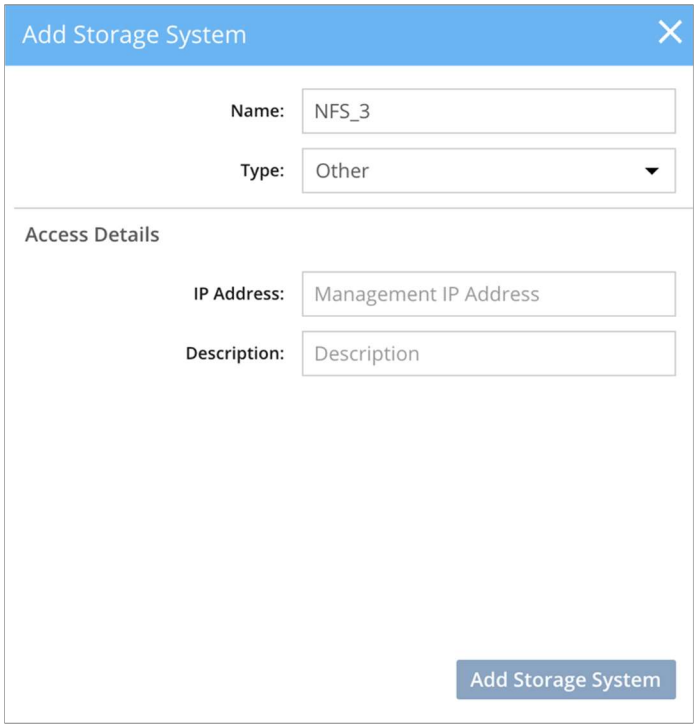


Figure 14 Adding NFS Other Storage System

Adding NFS Other Storage Volumes

Step 1 – Select volumes

Select the volumes to add from NFS Other. These volumes are discovered using the API equivalent of the showmount command. If a volume is missing from the list, please ensure that it is properly exported over NFS v3 from the NFS server.

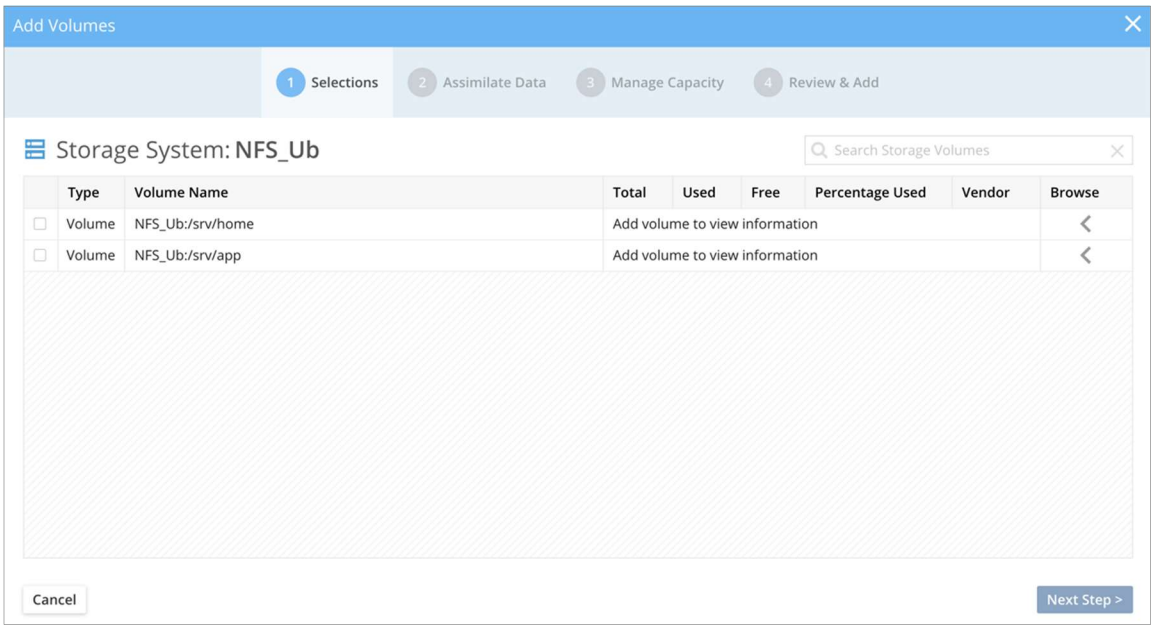


Figure 15 Adding NFS Other storage volume - Step 1

Step 2 – Assimilation of existing data

The second step will detect existing data on the volume and prompt the user to go through the assimilation process. For more details on assimilation, see the chapter on assimilation.

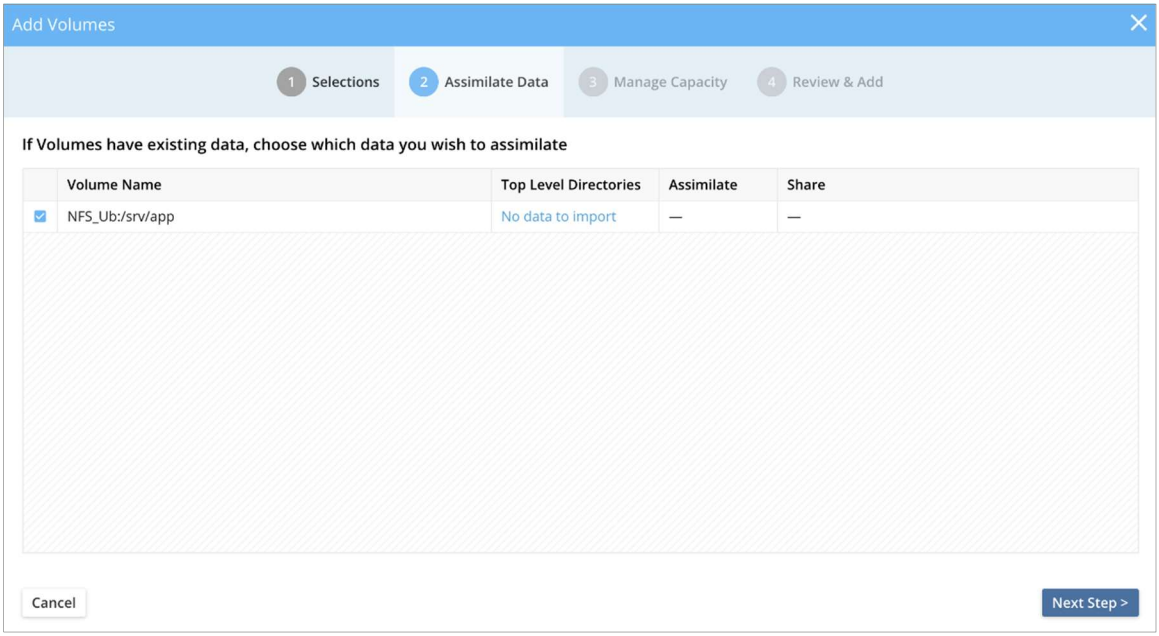


Figure 16 Adding NFS Other storage volume - Step 2

Step 3 – Setting the storage volume manage-to capacity

The DataCore vFilO namespace enables live data mobility for all data stored on managed volumes. With this core functionality, it is now possible to have the system automatically load-balance across storage volumes without any disruption for data access.

The manage-to capacity for volumes allows administrators to set the desired “max” fill level of a volume before the system will no longer place new data on this volume unless it determines that all other volumes are full and that there is no object storage volume available. The data placement logic is driven by a machine learning engine that automatically takes capacity, placement and user-driven needs into account for placing data.

The manage-to percentage value can be changed on the volume settings screen after the volume has been added.

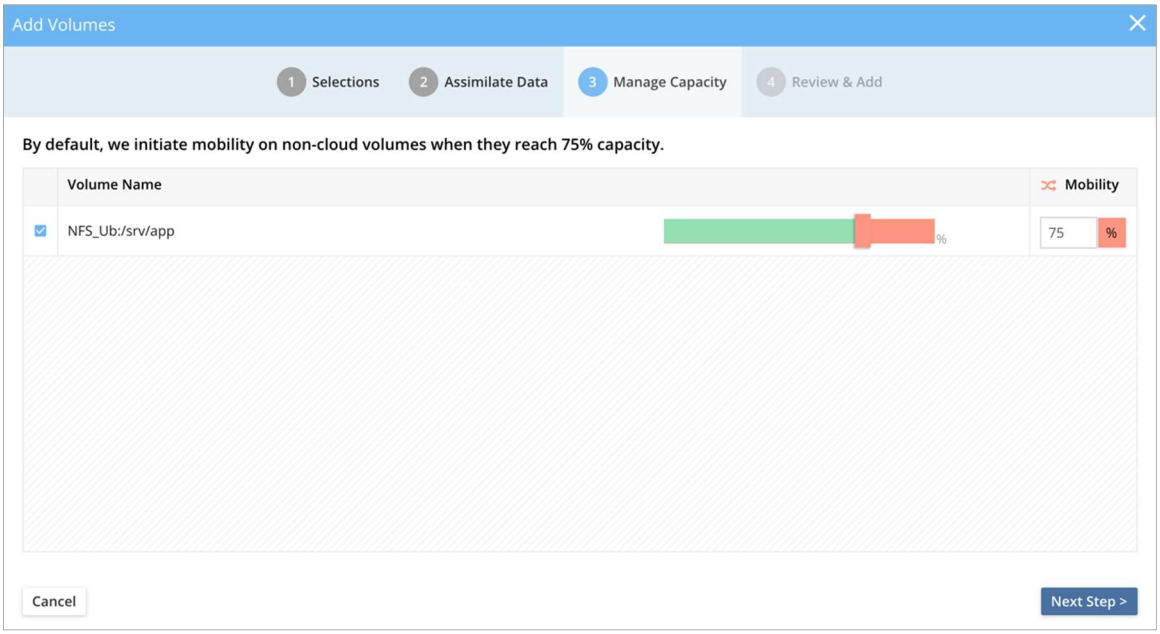


Figure 17 Adding NFS Other storage volume - Step 3

Step 4 – Summary screen

This final screen in the volume add step gives a summary of what will be done when clicking on Add Volumes.

Volume add is a background process and may take a few minutes to complete per Volume. Progress of volume add can be viewed in the task window or on the CLI.

Command Line Reference > task-list

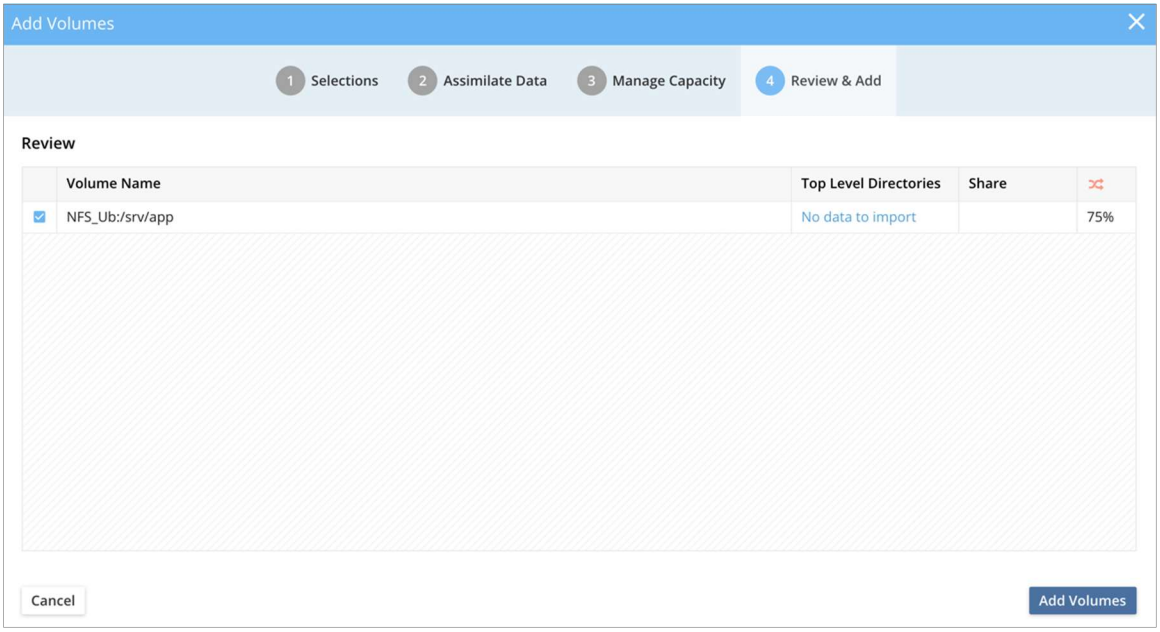


Figure 18 Adding NFS Other storage volume – Step 4

Adding Cloud/Object Storage

Object storage can be added to DataCore vFilO. The following steps show how to add Object endpoints and buckets. Amazon S3 is used as an example.

1. Select **Infrastructure & Data** from the left panel, then Storage Systems and click Add Storage System
2. Select AWS S3 as the Type, provide an access key and secret key
    - Selecting an end-point is optional for Amazon AWS, Microsoft Azure and Google Cloud, the end-point selection is automatic.
3. If you need to access Cloud storage via a Proxy please enter the Proxy Host and Port details

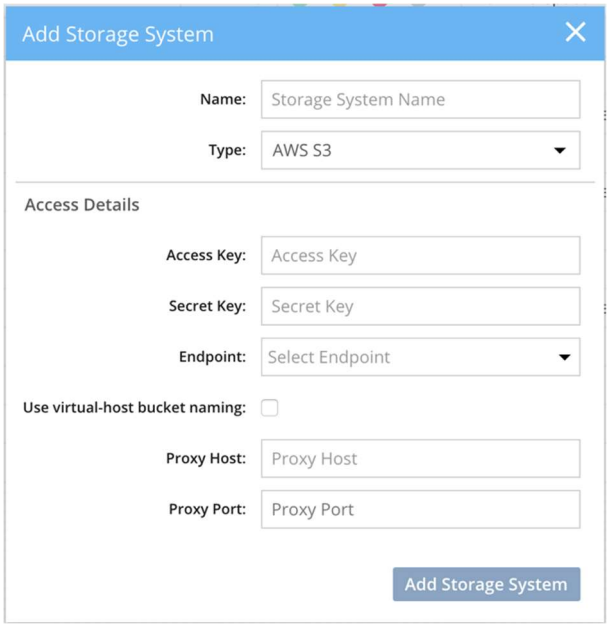


Figure 19 Add an object storage system

4. Review your settings and click Add Storage System
5. When the S3 Object storage is added it will be listed under Storage Systems
6. To add an Object Volume (Bucket), select **Infrastructure & Data** from the left panel, then select Volumes and click Add Volume
7. Tick the box on the left-hand side to select all volumes in an object storage system or the arrow on the right-hand side to expand and select individual volumes.
8. Click Next Step and then click Add Volumes
9. The object volume(s) will be added to DataCore vFilO

Assimilation of existing data

DataCore vFilO includes the ability of using existing storage and leaving the data in place. This means that DataCore vFilO can be pointed to an existing share or directory, and can simply assimilate the metadata while leaving the data in-place.

The assimilation is an on-demand and background operation, enabling the administrator to assimilate any amount of data and files in literally a few minutes, minimizing downtime for users drastically.

Assimilation can be used to take many different sources (exports, volumes, different vendors) and combine them into a new namespace. The namespace is not stitched or symlinked together but rather represented as a new share using DataCore vFilO. Traditional data services such as snapshots, clones, tiering, archiving and data replication are now managed through DataCore vFilO and in most cases able to use vendor specific optimizations.

Share-granular assimilation using the GUI

Share granular assimilation is triggered when the volume add process detects existing data on the volume being added.

In the example below, two shares are assimilated into a single new share. This example only assimilates the metadata over NFS. To assimilate SMB-specific metadata like ACLs, the command line has to be used: volume-assimilate

Step 1 – Select the volumes for assimilation

Multiple volumes from the same storage system can be selected. It is expected at this point in the assimilation workflow that there are no clients accessing these volumes.

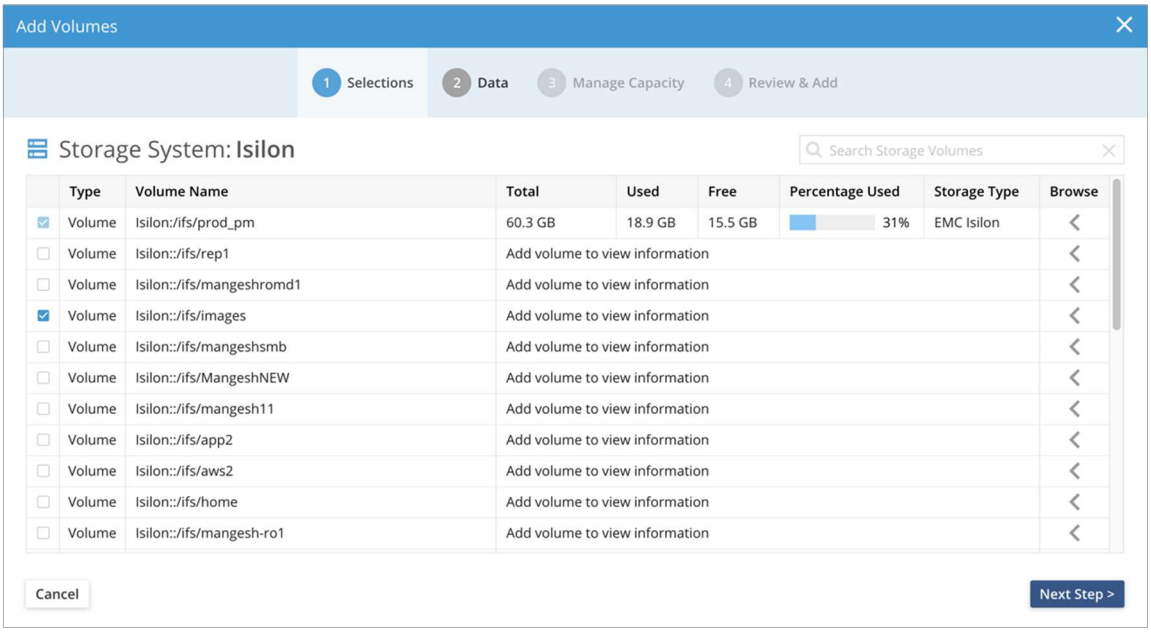


Figure 20 Assimilation example - select volumes

Step 2 Confirm assimilation

Select the sources for assimilation. If No is selected, the existing data on that volume will not be affected and will be left alone.

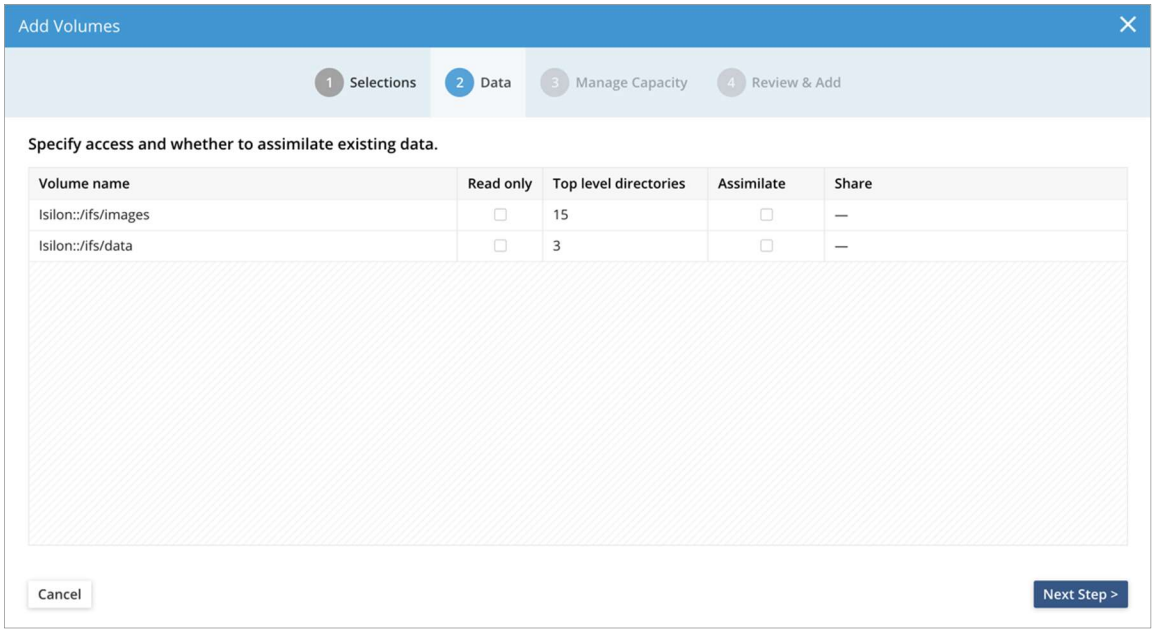


Figure 21 Assimilation example - confirm selection

Step 3 – Placement selection

Select where in the namespace from where the assimilated data will be accessible. It can be the root of a new share or a sub-directory of an existing share. The example below assimilates into a new sub-directory, in an existing share.

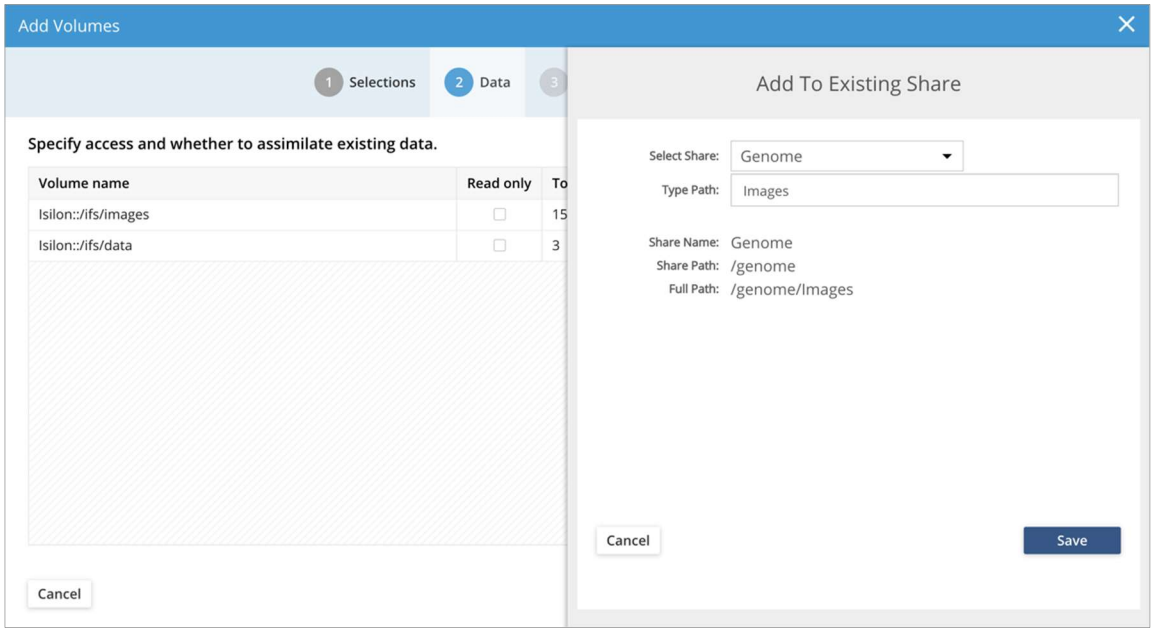


Figure 22 Assimilation example - Placement selection

Step 4 – Confirm placement

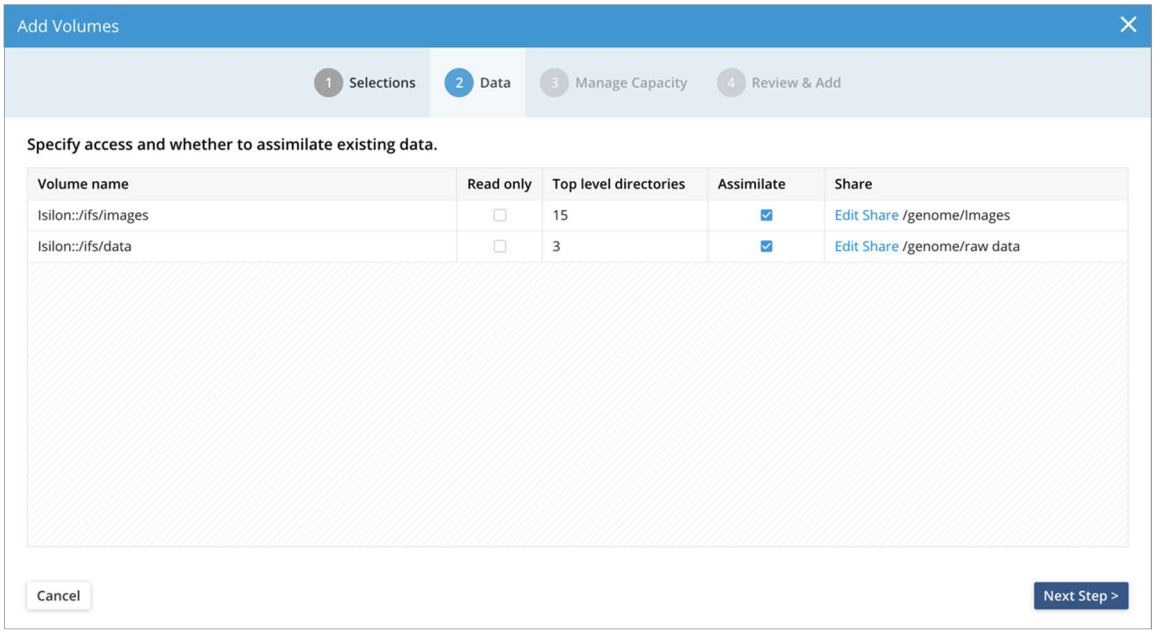


Figure 23 Assimilation example - Confirm placement

Step 5 – Setting the manage-to capacity for the underlying storage volumes.

If the volume being assimilated has data higher than the manage-to percentage, then DataCore vFilO will automatically move files from the assimilated volume until the manage-to capacity is met.

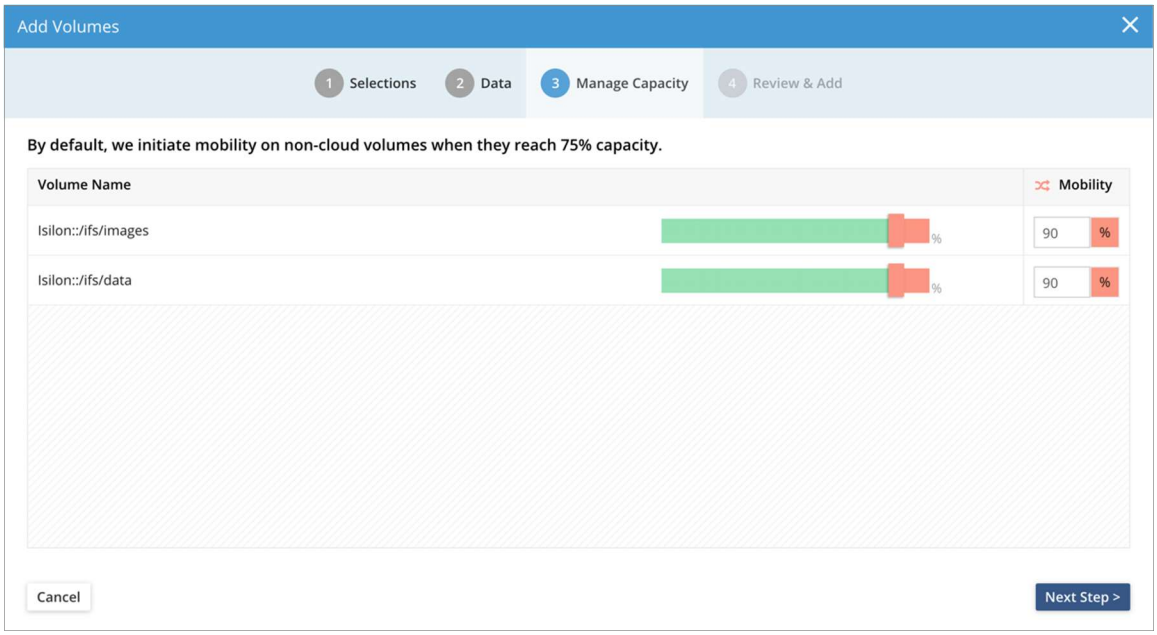


Figure 24 Assimilation example - Setting the manage-to capacity

Step 6 – Assimilation example – Step 7

Review the settings and press Add Volumes to submit the assimilation job.

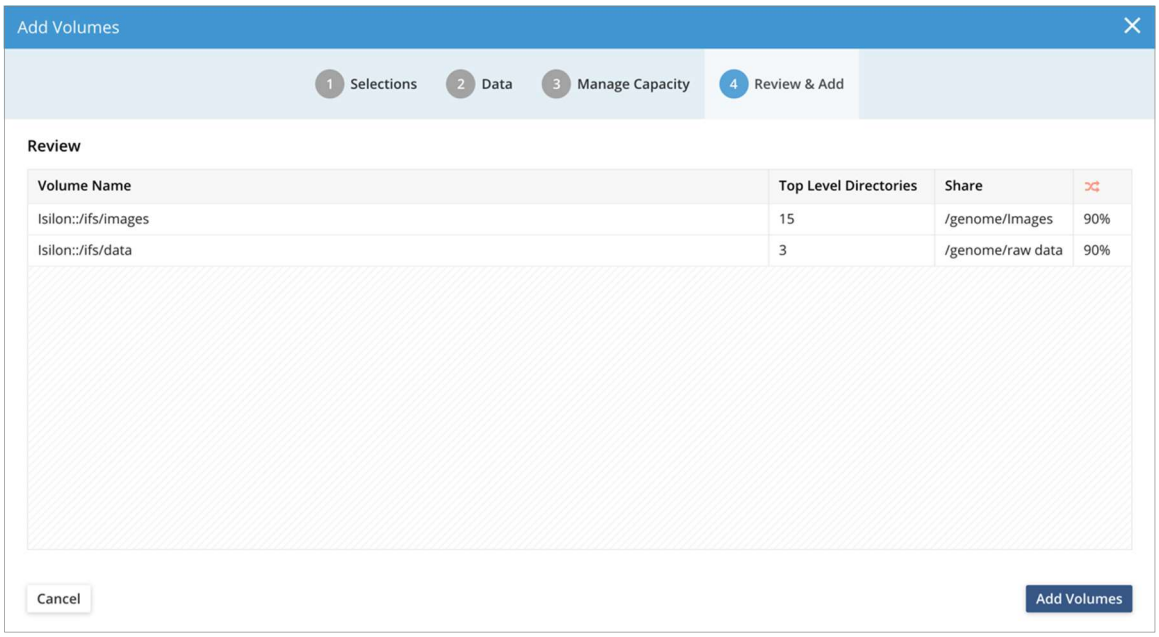


Figure 25 Assimilation example - Confirm settings

Directory-granular assimilation using the CLI

DataCore vFilO is also capable of assimilating data from individual directories on storage volumes. This is achieved using the command line when adding a volume or from a volume that has already been added.

In the following example we will assimilate data as we add a new volume from directory /projects to a new directory /import on a share called share1. We will assimilate an additional directory /engineering to a different share and path.

1. When adding a new volume with the volume-add command we can choose a directory to assimilate and select the share and path within the share to assimilate the data to.

   ```
   # volume-add --node-name C-Mode-132 --logical-volume-name vs1:vol1 --name CM132-vol1
   --assimilation --source-path /projects --share-name share1 --destination-path /import
   ```

2. If additional directories need to be assimilated, use the volume-assimilation command and choose the directories to assimilate and select which share and path within the share to assimilate the data to. The example below assimilates /engineering into the root (/) of share2. It is important to note that --destination-path option starts at the root of the share, not at the root of the global namespace.

   ```
   # volume-assimilation --name CM132-vol1 --source-path  /engineering --share-name share2 -
   -destination-path /
   ```

3. The data will be immediately available to clients when they mount the DataCore vFilO shares, there is no reason to wait until the background assimilation process finish.

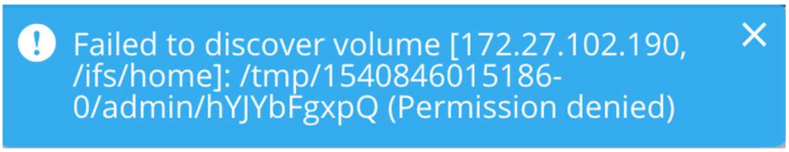
   ```
   # df -Th /mnt/test[1-2]
   Filesystem            Type  Size  Used Avail Use% Mounted on
   172.27.102.123:/share1      nfs4  1.1T   25G  1.1T   3%    /mnt/test1
   172.27.102.123:/share2      nfs4  1.1T   25G  1.1T   3%    /mnt/test2

   # ls /mnt/test[1-2]
   /mnt/test1:
   import

   /mnt/test2:
   engineering
   ```

Troubleshooting

This section contains troubleshooting help for adding and configuring Storage.

Adding storage volumes from an Isilon storage system gives Permission denied error message in the wizard or on the CLI

If the UID mapping is set incorrectly or overlooked as part of configuring the Isilon export for use with DataCore vFilO, then the following error will show in the UI:



On the CLI, the following error is shown:

volume-add: Failed to discover volume [172.27.102.190, /ifs/home]: /tmp/1541116442901-0/admin/fYzUcgadEI (Permission denied)

Solution

Go into the Isilon Administration Tool and correctly set the root UID mapping to admin. It is available under NFS exports settings.

Adding Isilon in the GUI silently fails

When trying to add Isilon, a progress bar is briefly shown in the UI that completes however nothing is added to the Storage Systems list. In the Tasks window, under progress, I see “Failed”

Solution

Either the wrong admin credentials or the incorrect SNMP value has been used. Additional details are available on the CLI. Login as the admin user and run

Example: Incorrect SNMP value

> task-list
ID: fd3b3636-a8c6-4129-a38b-9c1a94f23e37
Name: node-add
Params: name: Isilon8.1; force: false; created-by: Uoid [uuid=6b439e52-3361-4db8-81e8-02cd898be011, objectType=USER]
Status: FAILED

Created: 2018-11-01 23:35:25 UTC
Started: 2018-11-01 23:35:26 UTC
Ended: 2018-11-01 23:35:38 UTC
Exit Value: Failed to get SNMP interfaces

Example: Incorrect login credentials

> task-list
ID: fb8d5dd3-2c9b-4107-9d57-3c245bc534ae
Name: node-add
Params: name: Isilon; force: false; created-by: Uoid [uuid=6b439e52-3361-4db8-81e8-02cd898be011, objectType=USER]
Status: FAILED
Created: 2018-11-01 22:36:53 UTC
Started: 2018-11-01 22:36:53 UTC
Ended: 2018-11-01 22:36:56 UTC
Exit Value: failed to identify node. please check the the node is available, and that the node's credentials/type are correct

Example: Wrong IP/hostname

ID: af69b73a-6ce9-48ec-b8b9-1e4889287862
Name: node-add
Params: name: Isilon8.1; force: false; created-by: Uoid [uuid=6b439e52-3361-4db8-81e8-02cd898be011, objectType=USER]
Status: FAILED
Created: 2018-11-01 23:41:28 UTC
Started: 2018-11-01 23:41:28 UTC
Ended: 2018-11-01 23:41:33 UTC
Exit Value: failed to identify node. please check the the node is available, and that the node's credentials/type are correct

---

I added a Storage System but I can't see my volume

Verify from the vendor management tools or a regular Linux client that the storage system is exporting the volumes.

I added a share/export to my Storage System after I added it into DataCore vFilO, how do I re-scan it?

A manual rescan is required for DataCore vFilO to detect new exports, shares, volumes or buckets in storage systems. Login into DataCore vFilO using the CLI and execute the following command:

> node-refresh <-id | -name>

The output of the command will list all the volumes discovered on the storage system.

Appendix A

Creating a restricted Administrator for ONTAP cluster mode

When adding ONTAP cluster mode, an admin role is required so DataCore vFilO has access to the required ONTAP APIs. The default cluster mode admin role can be used, however in some situations this may present a security concern.

The following steps will create an ONTAP cluster admin role that provides read-only access to only the APIs DataCore vFilO needs.

1. Log in to your ONTAP cluster as a cluster admin user
2. Run the following commands from the ONTAP command line (copy/paste friendly):

```
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access none -cmddirname DEFAULT
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "vserver show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "cluster show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "volume show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "cluster identity show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "network interface show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "system license show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "storage aggregate show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "version"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "system node show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "volume qtree show"
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "system node autosupport show”
security login role create -role DataCore vFilO -vserver C-Mode-PM1 -access readonly -cmddirname "security login role show-ontapi"
```

Note: These commands will create warning messages that they are automatically setting up additional permissions, this is expected.

3. To verify the role is created correctly run:

```
security login role show -role DataCore vFilO -vserver C-Mode-PM1
      cluster identity modify                          readonly
      cluster identity show                      readonly
      cluster modify                           readonly
      cluster show                             readonly
      network interface create                       readonly
      network interface delete                       readonly
      network interface modify                       readonly
      network interface show                         readonly
      security login role show-ontapi                readonly
      storage aggregate create                       readonly
      storage aggregate modify                       readonly
      storage aggregate show                         readonly
      system license delete                        readonly
            system license show                      readonly
            system node autosupport modify                     readonly
      system node autosupport show                 readonly
system node modify                                 readonly
system node show                                   readonly
version                                  readonly
volume create                            readonly
volume modify                            readonly
volume qtree create                                readonly
volume qtree show                                  readonly
volume show                              readonly
vserver create                           readonly
vserver modify                           readonly
vserver show                             readonly
28 entries were displayed.
```

4. Create a new user with the DataCore vFilO role:

```
security login create -user-or-group-name DataCore vFilO_admin -application ontapi -authentication-
method password -role DataCore vFilO
```

   Enter a password when prompted

5. You can now add the ONTAP cluster as a storage node to DataCore vFilO using the restricted cluster admin user credentials.