

Dell FluidFS Multitenancy Solution Guide

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1 Dell FluidFS overview

Dell™ FluidFS is a fully distributed file system that provides the tools necessary to manage file data in an efficient and simple manner. The underlying software architecture leverages a symmetric clustering model with distributed metadata, native load balancing, advanced caching capabilities, and a rich set of features. FluidFS removes the scalability limitations such as limited volume size associated with traditional file systems, and supports high capacity, performance-intensive workloads by scaling up (adding capacity to the system) and by scaling out (adding nodes, or performance, to the system).

Powered by FluidFS, the Dell FS8600 scale-out NAS solution consists of one to four FS8600 appliances configured as a FluidFS cluster. Each NAS appliance is a rack-mounted 2U chassis that contains two hot-swappable NAS controllers in an active-active configuration. In a NAS appliance, the second NAS controller that has one paired NAS controller is called the peer controller. The solution supports expansion through the addition of NAS appliances to the cluster as needed to increase performance.

The FS8600 shares a back-end infrastructure with the Dell EMC SC Series SAN. The SAN network connects the FS8600 to the SC Series array and carries the block-level traffic. The FS8600 communicates with the SC Series array using either the iSCSI or Fibre Channel protocol, depending on the NAS appliance configuration.

2 FluidFS and multitenancy

FluidFS version 6 introduces the multitenancy feature which enables the option to create up to 100 instances of a FluidFS cluster in a single appliance. With the FluidFS multitenancy feature enabled, FluidFS provides a logical isolation of data, management access, and authentication per tenant.

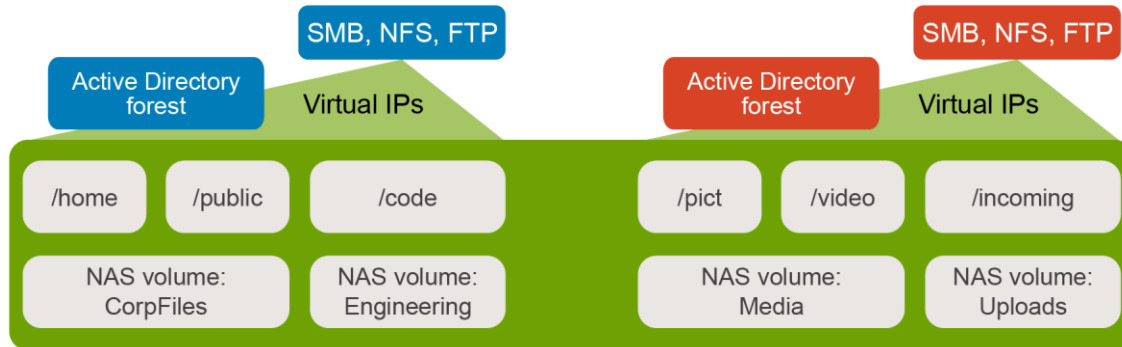


Figure 1 FluidFS and multitenancy overview

Note: By default, the multitenancy feature is disabled but the storage administrator can enable this feature.

2.1 FluidFS tenant scope

When the FluidFS cluster is first installed, a default tenant is created. When enabling multitenancy, each tenant has its own scope and also shares some resources from the default tenant.

The tenant scope includes the following:

- NAS volumes, export, and shares: Each tenant exclusively owns its volumes, shares, and exports.
- Networking: Each tenant can be configured with its own client networking and DNS IPs.
- Authentication: Each tenant independently defines its user repositories (AD, LDAP or NIS) including a separate local users repository.
- Protocol settings: Each tenant exclusively owns its access IP(s) and defines its own SMB, NFS, and FTP protocol settings, as well as interoperability parameters.
- Management: Each tenant can be optionally managed by dedicated administrator(s) or by a cluster administrator.

Shared cluster services include:

- Time: NTP configuration
- Third-party or external auditing
- Backup: NDMP
- Antivirus scanners
- Virtualization: VMware® servers list and VAAI support
- Management network
- Routing: static routes
- Physical controller IP address

3 Configuring FluidFS multitenancy

3.1 Enabling multitenancy on FluidFS

By default, FluidFS multitenancy is disabled but the administrator can enable this feature at any time using the Dell Storage Manager (DSM) or the FluidFS CLI.

To enable FluidFS multitenancy in DSM:

1. Log in to DSM and click the **Summary** tab.
2. Under the **FluidFS Cluster Status** menu, click **Edit FluidFS Cluster Settings**.
3. In the **Edit FluidFS Cluster Settings** window, click the checkbox, **Multitenancy Enabled**.

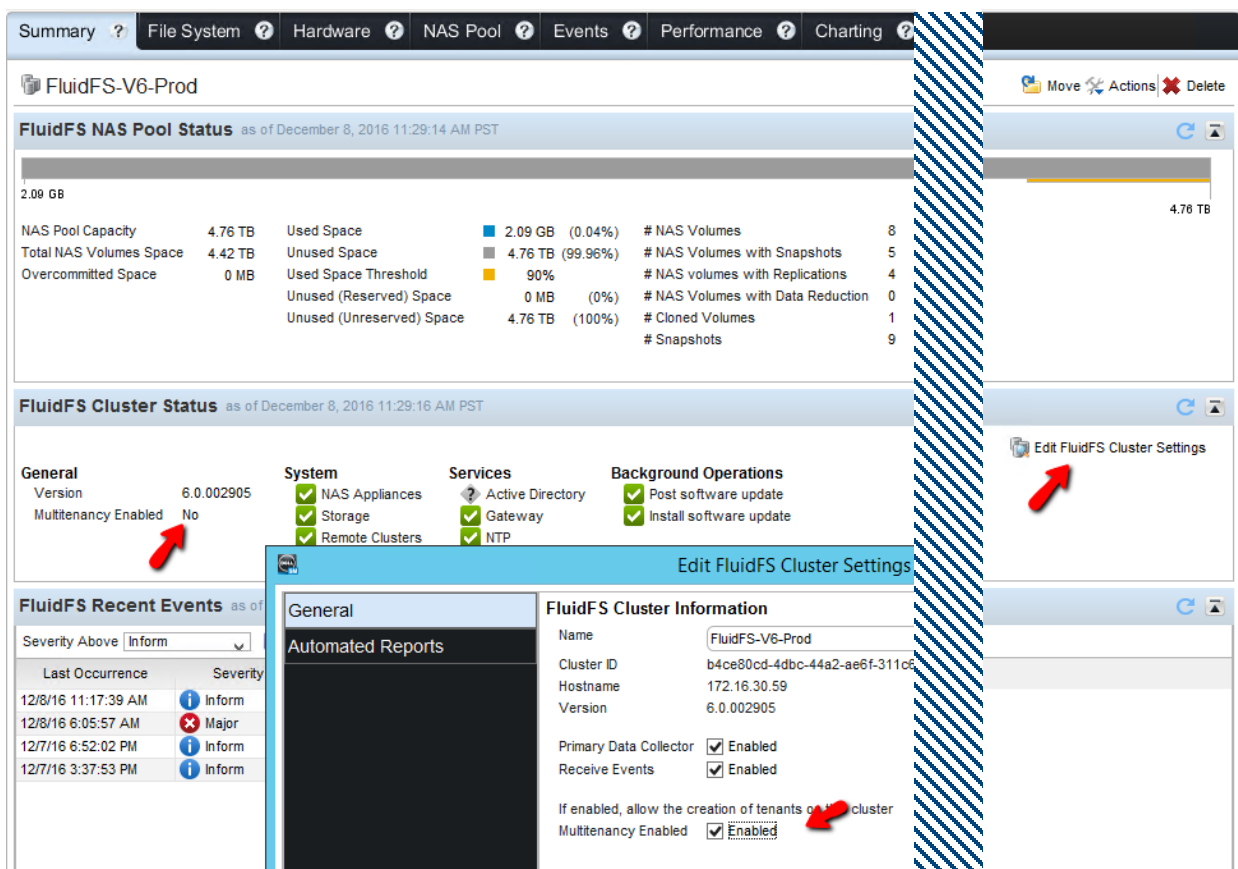


Figure 2 Enabling multitenancy on a FluidFS cluster

Once multitenancy feature is enabled, the **File system** tab shows tenants under the cluster name and makes the default tenant visible.

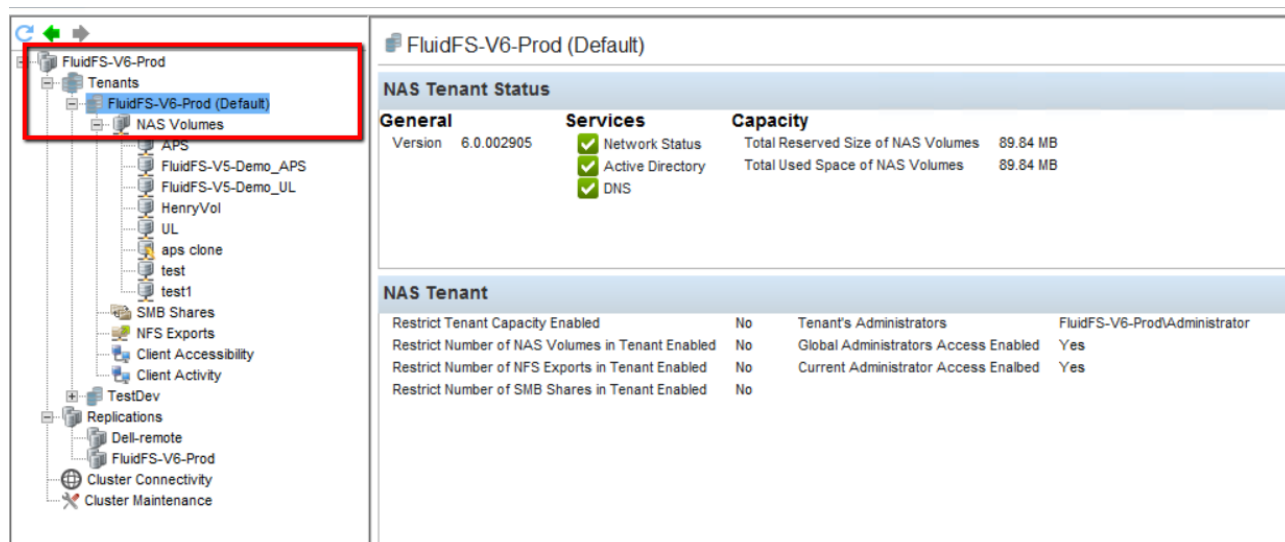


Figure 3 FluidFS file system tab after enabling multitenancy

3.2 Disabling multitenancy on FluidFS

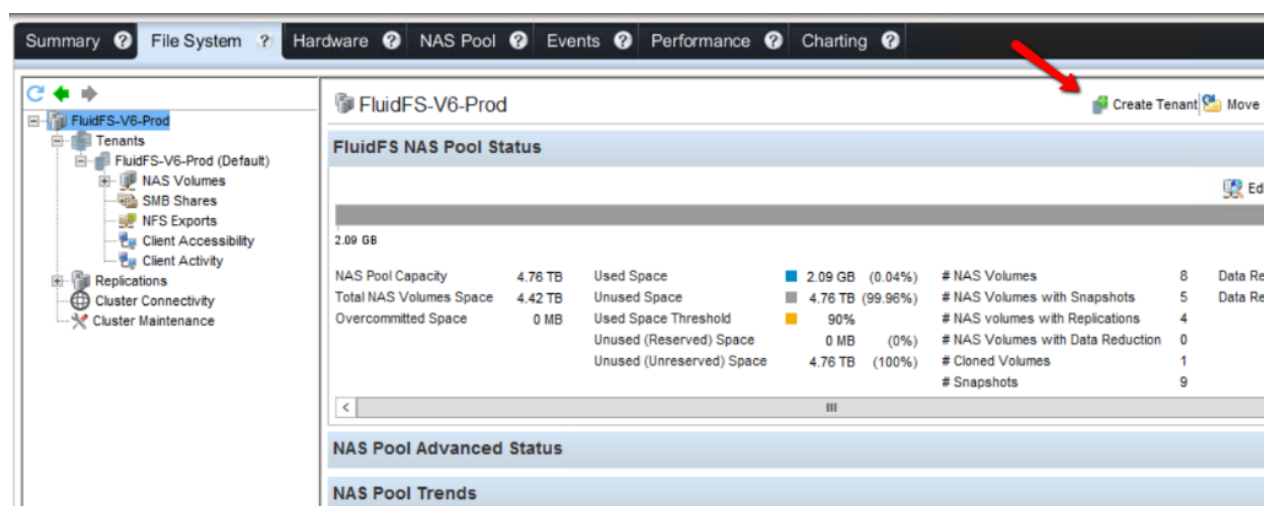
Storage administrators can disable FluidFS multitenancy with the following restrictions:

- Only the default tenant must exist; all other tenants must be deleted.
- When deleting a tenant, all NAS volumes, shares, and exports must be deleted first (delete the share and the export of a NAS volume before deleting the NAS volume).

3.3 Creating and configuring a new tenant

To create a new tenant, run the Create Tenant wizard and provide the requested information.

1. To start the wizard, from the **File System** tab, click **Create Tenant**.



2. Provide the information for the new tenant:
 - a. Tenant name: This may contain letters, numbers, underscores, and hyphens.

The screenshot shows the 'Create Tenant' form with the 'Create Tenant' tab selected in the left sidebar. The 'Tenant' field contains the text 'TestDev'.

- b. Pubic IP: Specify one or more virtual IPs for file access.

The screenshot shows the 'Create Tenant' form with the 'Public IPs' tab selected. A text box explains: 'Specify one or more Virtual IP addresses for file access. For effective load balancing, it is recommended that the total number of virtual IP addresses be equal or larger than the total number of frontend interfaces in the FluidFS cluster.' Below this, a list of VIPs is shown: 172.16.30.87, 172.16.30.88, 172.16.30.89, and 172.16.30.90. The last IP is highlighted. At the bottom, there is an input field and '+ Add - Remove' buttons.

- c. DNS: Specify the DNS server IPs and suffixes.

The screenshot shows the 'Create Tenant' form with the 'DNS' tab selected. It has two sections: 'DNS Servers IP Addresses' and 'DNS Suffixes'. The 'DNS Servers IP Addresses' section contains a list with '172.16.30.1' and '+ Up - Down' controls. The 'DNS Suffixes' section contains a list with 'fluidfs.lab.com' and '+ Up - Down' controls. Both sections have an input field and '+ Add - Remove' buttons at the bottom.

- d. Limits: Limit the tenant capabilities (optional).

In this example, the tenant is limited to 100 GB of capacity, and the maximum number of NAS volumes, NFS exports, and SMB shares is set to 10.

The screenshot shows the 'Create Tenant' form with the 'Limits' tab selected in the left sidebar. The sidebar also shows 'Create Tenant', 'Public IPs', 'DNS', 'Limits', 'Active Directory', and 'NFS User Repository'. The main content area has a title bar 'Create Tenant' and the following settings:

- Restrict Tenant Capacity:** ☒ Enabled. Tenant Capacity Limit: 100 GB.
- Restrict Number of NAS Volumes in Tenant:** ☒ Enabled. Max Number of NAS Volumes in Tenant: 10.
- Restrict Number of NFS Exports in Tenant:** ☒ Enabled. Max Number of NFS Exports in Tenant: 10.
- Restrict Number of SMB Shares in Tenant:** ☒ Enabled. Max Number of SMB Shares in Tenant: 10.

- e. Active Directory: Provide information to integrate with the Active Directory servers (optional).

The screenshot shows the 'Create Tenant' form with the 'Active Directory' tab selected in the left sidebar. The sidebar also shows 'Create Tenant', 'Public IPs', 'DNS', 'Limits', 'Active Directory', and 'NFS User Repository'. The main content area has a title bar 'Create Tenant' and the following settings:

- Join Active Directory Domain:** Specify the Active Directory fully qualified domain name to be used for authentication of SMB and NFS users.
 - Domain: fluidfs.lab.com
 - Optionally, specify the organizational unit in the AD domain where the computer account for this tenant should be created.
 - Organizational Unit:
- Provide credentials to perform this operation:**
 - Username: Administrator
 - Password:

- f. NFS User Repository: Provide information to integrate with the NIS/LDAP servers (optional).

The screenshot shows the 'Create Tenant' form with the 'NFS User Repository' tab selected in the left sidebar. The sidebar also shows 'Create Tenant', 'Public IPs', 'DNS', 'Limits', 'Active Directory', and 'NFS User Repository'. The main content area has a title bar 'Create Tenant' and the following settings:

- Specify the type of NFS user repository to use for searching UID and GID:**
 - ☒ None
 - ☐ NIS
 - ☐ LDAP

After the wizard has completed, a new tenant is created under **Tenants** in the FluidFS cluster. Click the tenant to view the tenant status and information.

The screenshot displays the Dell FluidFS management interface. On the left, a tree view shows the hierarchy: Dell Storage > Storage Centers > SC 16 > FluidFS Clusters > Dell-remote > FluidFS-V6-Prod. The 'FluidFS-V6-Prod' cluster is selected, and its 'Tenants' sub-item is highlighted with a red arrow. The main panel shows the 'TestDev' tenant configuration. The 'NAS Tenant Status' section is highlighted with a red arrow, and the 'NAS Tenant' section is also highlighted with a red arrow.

TestDev

NAS Tenant Status

General		Services	Capacity
Version	6.0.002905	<input checked="" type="checkbox"/> Network Status	Total Reser
		<input checked="" type="checkbox"/> Active Directory	Total Used
		<input checked="" type="checkbox"/> DNS	

NAS Tenant

Restrict Tenant Capacity Enabled	Yes
Tenant Capacity Limit	100 GB
Restrict Number of NAS Volumes in Tenant Enabled	Yes
Max Number of NAS Volumes in Tenant	10
Restrict Number of NFS Exports in Tenant Enabled	Yes
Max Number of NFS Exports in Tenant	10
Restrict Number of SMB Shares in Tenant Enabled	Yes
Max Number of SMB Shares in Tenant	10

4 Tenant management

4.1 Tenant administrative access

In a multitenancy-enabled FluidFS cluster, storage administrators can delegate tenant management using the tenant administrator role.

Tenant administrators can perform the following tasks:

- View and modify assigned tenants
- View default tenant NAS volumes, NFS exports, and SMB shares

To create a new **tenant** administrator:

1. Log in to DSM as a cluster administrator.
2. Click the **File System** tab and click **Cluster Maintenance**.
3. From the **Cluster Maintenance** area, click **Mail & Administrators**.
4. Click **Grant Administrative Privilege**.
5. Uncheck **Global Administration Permission**.

Note: To create a FluidFS cluster administrator, leave **Global Administrative Permission** checked.

6. If adding a non-local user, choose the default tenant.
7. Search for the user and click **OK**.

Note: To use the tenant local user, use the tenant name instead of the default tenant. For non-default tenants, only local users can be granted administrative access to the system if the storage administrator chooses to use AD/LDAP/NIS users for administrative purposes. Those user repositories must be accessible from the default tenant.

Now that the tenant administrator has been created, the storage administrator can assign single or multiple tenants for the tenant administrator to manage. To assign a tenant administrator to manage a tenant:

1. Right-click the tenant and click **Edit Settings**.
2. Click the **Administrators** tab.
3. In the **All Administrators** pane, add the user to the **Tenant Administrators** area.

Note: To make sure the cluster administrator also can manage the tenant, leave **System Administrators Access** enabled. This enables the cluster administrator to have modify and view permissions for that specific tenant. If unchecked, the cluster administrator can ONLY view this tenant and will not be able to create volumes, shares, and exports BUT will have access to the tenant settings and will be able to modify this option.

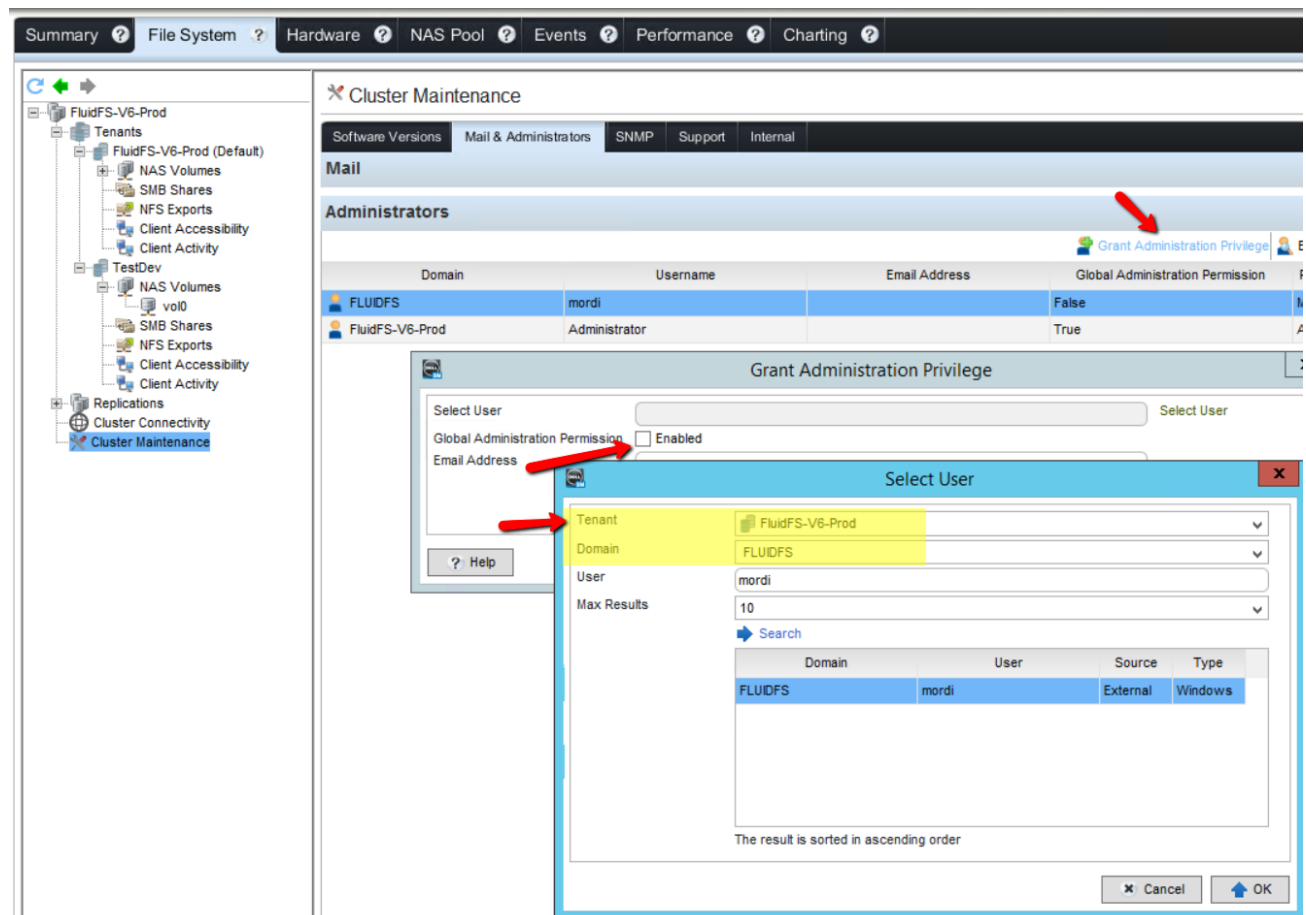


Figure 4 Creating a tenant administrator

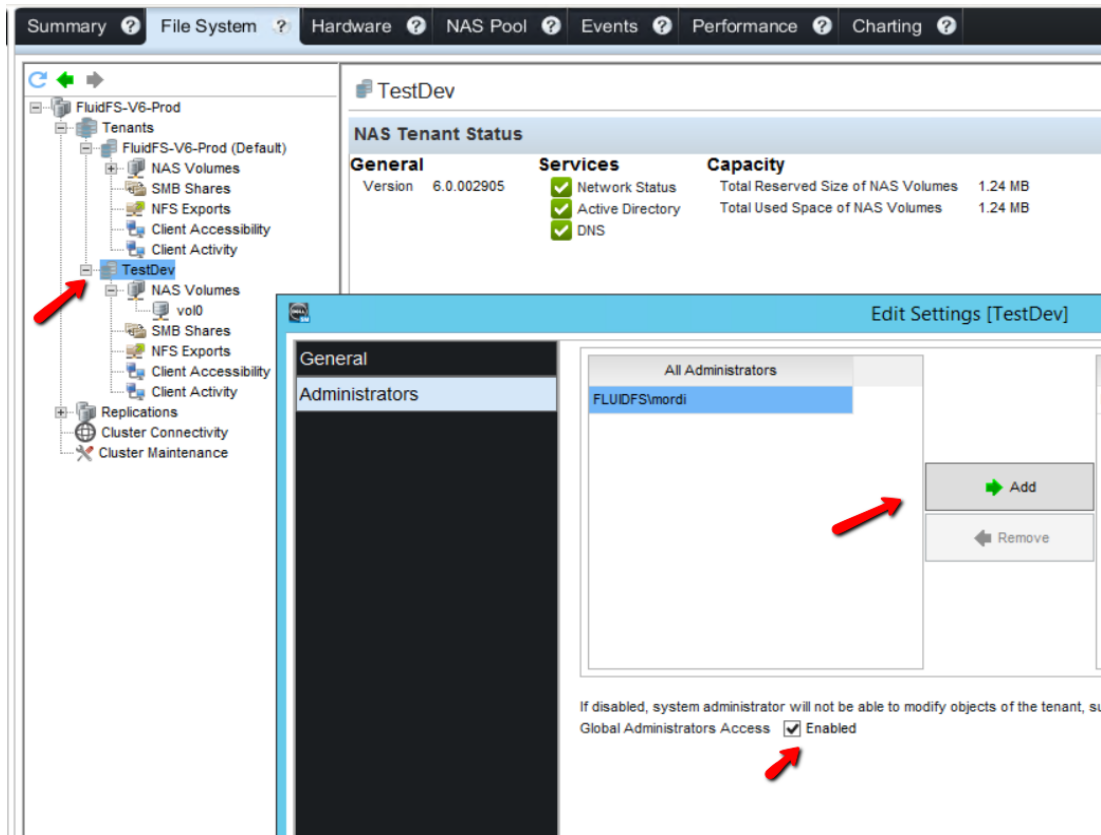


Figure 5 Assigning the tenant administrator role to a tenant

4.2 Accessing tenant data

When storage administrators create a tenant, virtual IPs are provided for the tenant. Accessing tenant data is no different from accessing any FluidFS cluster. To access the tenant data, use the tenant virtual IP or the DNS name and the specific share or export.

Note: The default tenant shares and exports will NOT be visible when accessing the tenant virtual IPs.

4.3 Moving volumes between tenants

Storage administrators can move volumes from one tenant to another if needed. Movement of volumes to a different tenant will not move actual data but FluidFS will modify the metadata to perform this task.

To move a volume from one tenant to another:

1. Right-click the volume to move.
2. Click **Move to Tenant**.
3. Choose the tenant name as the new location for the volume and click **OK**.

Note: Before moving volumes between tenants, make sure to delete any NFS exports, SMB shares, home shares, FTP/HDFS landing directories, or any subnet restrictions that are applied to this volume. If any exist, FluidFS will not perform this operation and it will result in error.

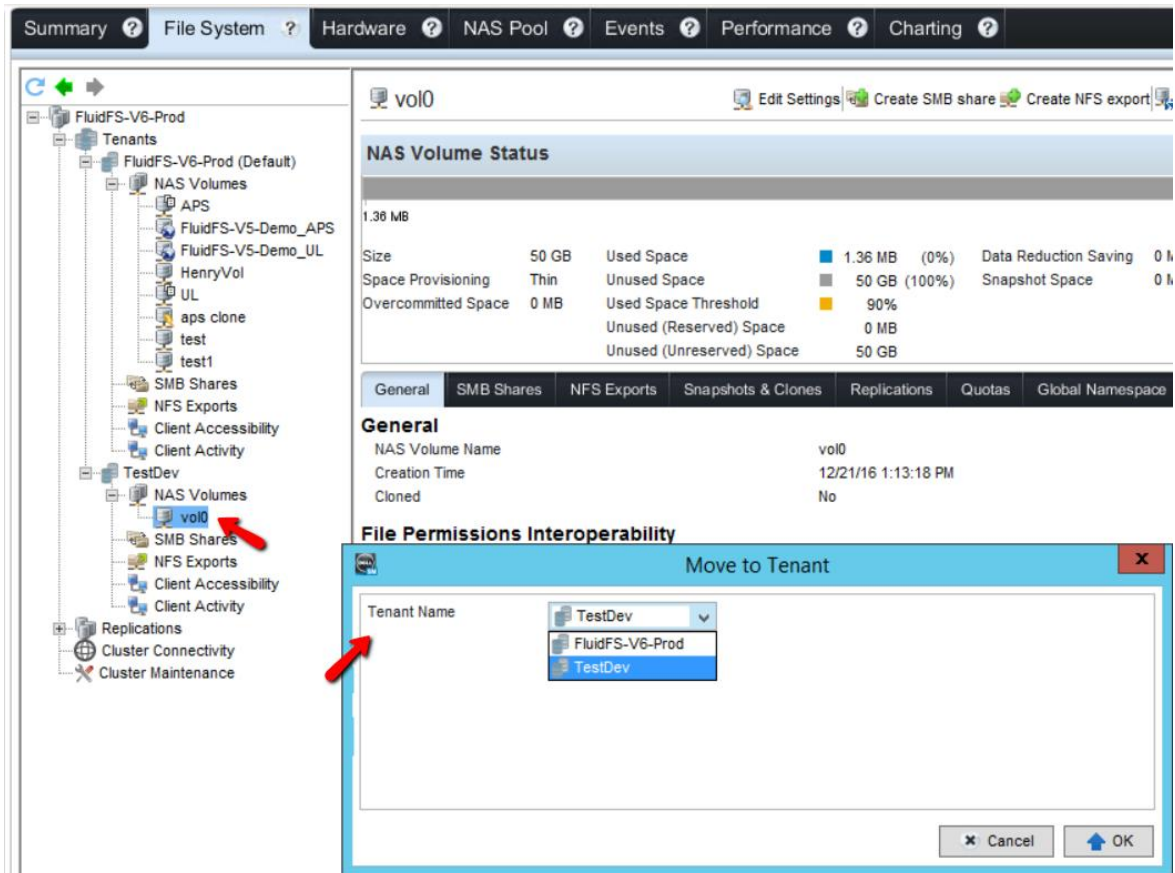


Figure 6 Moving volumes to a new tenant

4.4 Replicating between tenants

In addition to replicating between two or more FluidFS clusters storage administrators can also use replication between tenants on a local cluster or remote cluster.

To configure tenant to tenant replication:

1. From the **File System** tab, click the **replication** icon.
2. Highlight the cluster to add the replication tenants to, and click **Edit Settings**.
3. Click **Add** and choose the tenant in the local and the remote clusters.

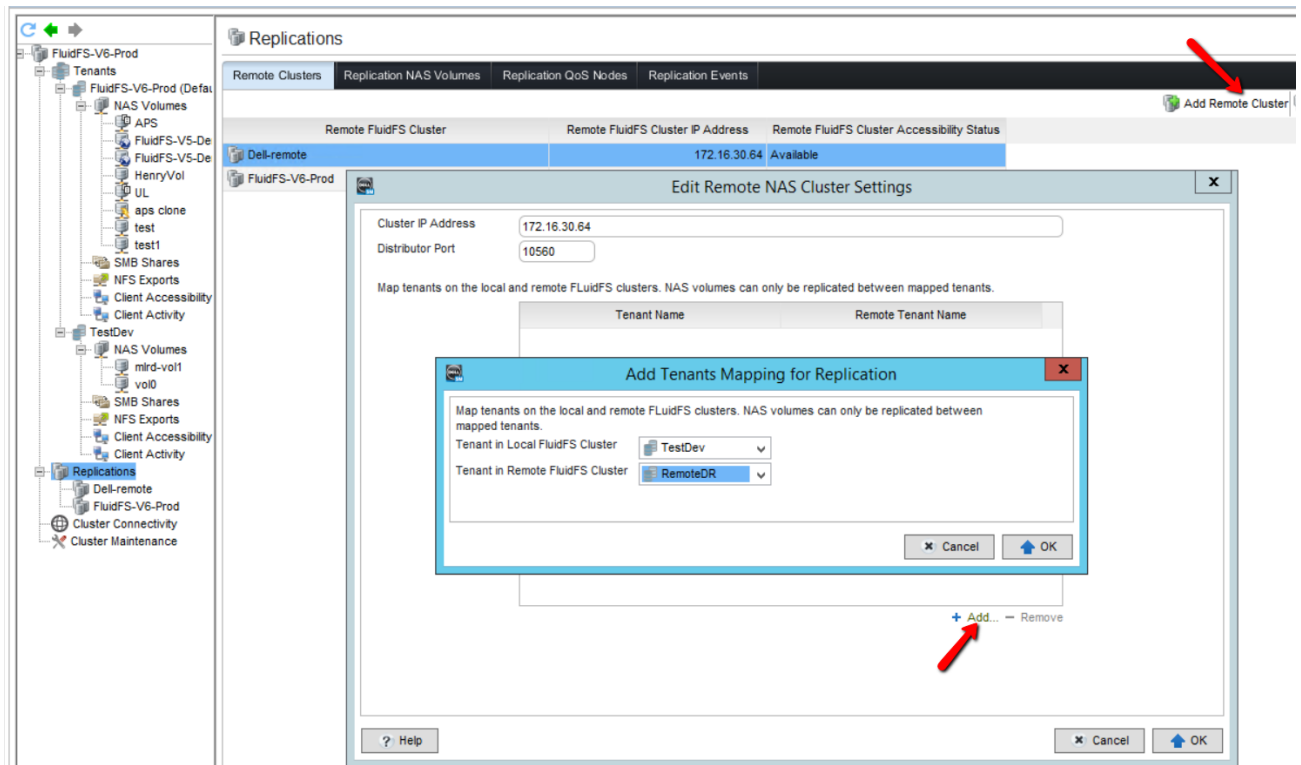


Figure 7 Configuring tenant replication

Note: The default tenant on both the source and remote clusters are configured as partners by default.

5 Tenant monitoring

FluidFS provides storage administrators the option to monitor tenant information such as client activities and tenant usage.

5.1 Tenant client activities

FluidFS provides the following options to monitor client activities:

- **Sessions:** FluidFS displays the current active sessions to the tenant and the information regarding the session such as the client IP, protocol in use, connection time, and more.

Note: SMB Multichannel is supported only for SMB3 clients connected to shares on the DEFAULT tenant.

- **Open files:** FluidFS displays current open files, provides the ability to search for a specific open file, and provides the ability to close the file.
- **Virtual machines and appliances:** FluidFS displays virtual machines and appliances connected to the tenant.
- **SACL auditing events:** FluidFS displays SACL auditing events and provides the ability to search for events.

To monitor client activities per tenant, click the **File System** tab and click **Client Activity** under the desired tenant.

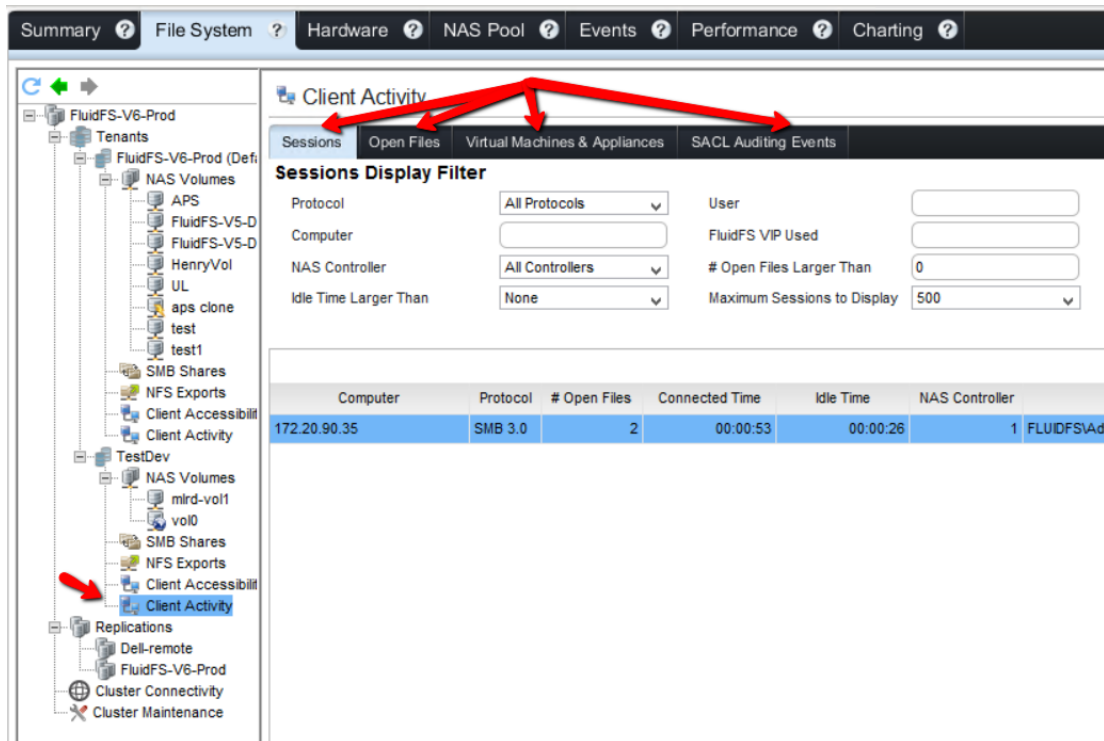
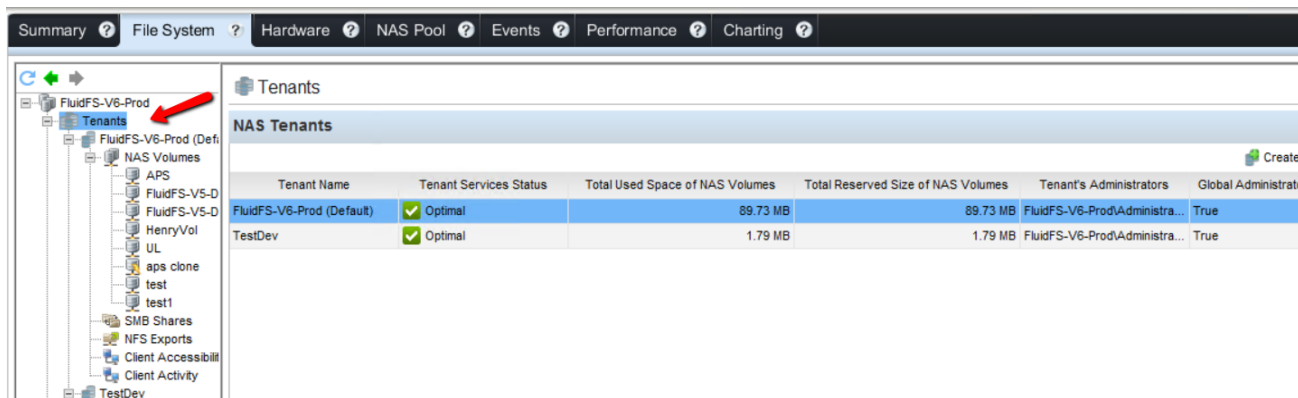


Figure 8 Monitoring tenant client activities

5.2 Tenant status and capacity usage

FluidFS provides cluster administrator privileges to monitor tenant status and capacity usage information. In addition to displaying the tenant information, the administrator can modify tenant settings or delete tenants. To view a list of tenants and their capacity information, from the **File System** tab, click **Tenants**.



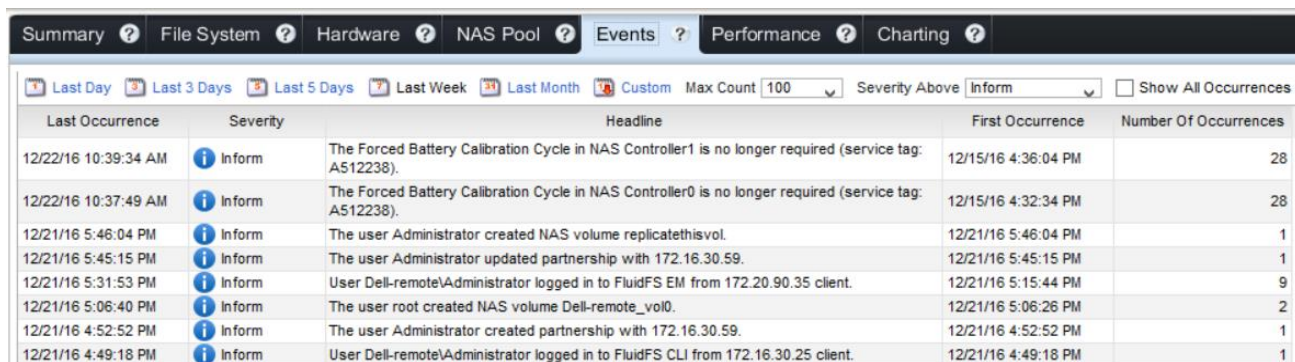
Tenant Name	Tenant Services Status	Total Used Space of NAS Volumes	Total Reserved Size of NAS Volumes	Tenant's Administrators	Global Administrator
FluidFS-V6-Prod (Default)	Optimal	89.73 MB	89.73 MB	FluidFS-V6-Prod\Administra...	True
TestDev	Optimal	1.79 MB	1.79 MB	FluidFS-V6-Prod\Administra...	True

Figure 9 Monitoring tenant status and capacity

5.3 Tenant events

FluidFS provides the option to monitor tenant events. Administrators with tenant administration privileges will be able to see the following events:

- Partial global cluster events such as hardware failure
- Service-related events
- Volume-related events



Last Occurrence	Severity	Headline	First Occurrence	Number Of Occurrences
12/22/16 10:39:34 AM	Inform	The Forced Battery Calibration Cycle in NAS Controller1 is no longer required (service tag: A512238).	12/15/16 4:36:04 PM	28
12/22/16 10:37:49 AM	Inform	The Forced Battery Calibration Cycle in NAS Controller0 is no longer required (service tag: A512238).	12/15/16 4:32:34 PM	28
12/21/16 5:46:04 PM	Inform	The user Administrator created NAS volume replicatethisvol.	12/21/16 5:46:04 PM	1
12/21/16 5:45:15 PM	Inform	The user Administrator updated partnership with 172.16.30.59.	12/21/16 5:45:15 PM	1
12/21/16 5:31:53 PM	Inform	User Dell-remote\Administrator logged in to FluidFS EM from 172.20.90.35 client.	12/21/16 5:15:44 PM	9
12/21/16 5:06:40 PM	Inform	The user root created NAS volume Dell-remote_vol0.	12/21/16 5:06:26 PM	2
12/21/16 4:52:52 PM	Inform	The user Administrator created partnership with 172.16.30.59.	12/21/16 4:52:52 PM	1
12/21/16 4:49:18 PM	Inform	User Dell-remote\Administrator logged in to FluidFS CLI from 172.16.30.25 client.	12/21/16 4:49:18 PM	1

Figure 10 Monitoring tenant events

6 Multitenancy and cluster shared services

6.1 Tenants and NDMP

FluidFS provides the option to use the Network Data Management Protocol (NDMP) for backup purposes.

FluidFS NDMP support is a cluster shared service. With all tenants, the storage administrator can configure the NDMP backup user, port information, and DMA servers at the cluster level and all tenant data will be available for the NDMP backup application in use.

6.2 Tenants and antivirus protection

FluidFS provides the option to use a third-party antivirus application to protect data from viruses.

FluidFS antivirus support is a cluster shared service. With all tenants, the storage administrator can configure the antivirus servers and port information at the cluster level. Configuration of SMB share protection is done on each individual share.

6.3 Tenants and third-party auditing services

FluidFS provides the option to use third-party auditing services and also native SACL auditing.

Unlike native SACL auditing support, third-party auditing services are cluster shared services with **only one** tenant due to tenant isolation.

A Technical support and resources

[Dell.com/support](https://dell.com/support) is focused on meeting customer needs with proven services and support.

[Dell TechCenter](#) is an online technical community where IT professionals have access to numerous resources for Dell EMC software, hardware and services.

[Storage Solutions Technical Documents](#) on Dell TechCenter provide expertise that helps to ensure customer success on Dell EMC Storage platforms.