

SGI NAS Namespace Cluster User Guide

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Table of Contents

1 Overview	5
1.1 Purpose	5
1.2 Audience	5
1.3 Document conventions	5
2 Introduction	7
2.1 Features	8
2.1.1 Ease of use	9
2.1.2 Quick start-up and namespace server autonomy	9
2.1.3 Single point of control	9
2.1.4 NFS v4.1 support	9
2.1.5 Live migration	10
2.1.6 Scalability and load balancing	10
2.1.7 Multi namespace links	10
2.1.8 Just-in-time graphics	10
2.1.9 Statistics: CPU, IOPS and bandwidth allocation, total and per folder	10
2.2 Terminology	11
2.3 How does Namespace link work?	11
3 Installation	15
3.1 Requirements	15
3.2 Installation	15
3.3 Icons legend	16
4 NMV management	17
4.1 Creating new Namespace Cluster	17
4.2 Adding a namespace server	18
4.3 Adding a logical group	20
4.4 Adding namespace link	20
4.5 Graphics	23
5 Migration	25

5.1 Overview	25
5.2 Live migration	26
5.3 Off-line migration	26
5.4 Migration management in NMV	27
5.5 Replication	
6 Mounting the share via NFSv3	31
7 Fault management	
7.1 Troubleshooting tips:	34
7.2 Known limitations	34
8 Contact information	35
9.1 Support request	35
9.2 Other resources	

1 Overview

1.1 Purpose

This guide presents SGI NAS Namespace Cluster plug-in, which main goal is to provide management of multiple NFS servers, as well as advanced graphics and statistics. Namespace Cluster allows you to extend existing infrastructure with new servers and spread the workload between few servers instead of centralizing it on a single server. On the other hand, Namespace Cluster lets you manage all the NFS servers from every node.

1.2 Audience

The guide's audience is the SGI NAS administrators, system administrators, users or any other involved parties.

1.3 Document conventions

• SGI NAS Management Console (NMC) commands:

nmc:/\$

- UNIX shell commands:
- #
- A note or another piece of important information:

2 Introduction

One of the main problems of modern network infrastructures is the limitations created by the initial architecture design. As far as the number of users and applications simultaneously accessing the data constantly increase, any given storage server potentially becomes a bottleneck, in terms of available I/O bandwidth, CPU, memory, network and disk I/O resources. The solution for all mentioned issues involve various techniques of spreading the I/O workload over multiple storage servers, which can be integrated to the existing network infrastructure.

Namespace Cluster (SGI NAS) plug-in is designed to solve two major problems:

- Simplify management of multiple NFS servers, by isolating clients from actual physical locations of the shared server-based filesystems
- Remove the 'single server' bottleneck resulting from any/all of the following:
 - filesystem growing over time to the size that is difficult to manage via a single server 'resource'
 - increasing number of NFS clients simultaneously accessing shared file data
 - increasingly powerful and demanding applications on the client side that access shared file data

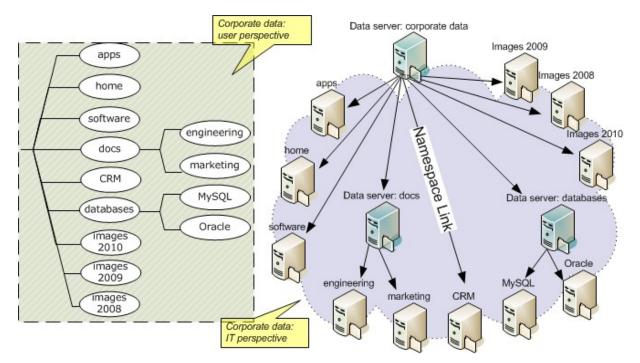
NAS clients have always been able to mount folders exported by multiple NAS servers wherever they desired in their local file system. However, maintaining a uniform naming scheme across multiple clients requires extra work from system administrators. The tools available to perform that work do not scale well.

Namespace cluster provides an easy and intuitive way to build a global namespace of any size, where directories and files are transparently distributed over any number of servers. The primary mechanism used to build a global namespace is called 'namespace link'. Namespace link has a name and two components: namespace server and a folder on this namespace server. For instance, if a link named 'corp/docs' has a value 'other-server:real-docs', clients accessing \corp/docs' would be automatically and transparently redirected to the corporate

documents residing on the 'other-server' in its 'real-docs' folder.

Storage administrator achieves various capabilities with Namespace Cluster. For end-users and client side applications, the names of the files and directories (that is, the 'name space') remains the same, independently of where data is physically stored. This allows administrators to manipulate the data according to system needs, without requiring users or applications to know the physical location of the different file systems and without incurring the overhead of updating user's machines. To users, all tiers of the namespace appear as a single large (possibly, extremely large) file system.

The following diagram represents the principal of work of Namespace Cluster from two different points of view: user and IT infrastructure:



Namespace cluster is a 'forest' of servers containing multiple namespace servers. SGI NAS must be used as a namespace server. More than a single location of any given user folder WILL be supported as well.

2.1 Features

Ease of use

- Quick start-up and namespace server autonomy
- Single point of control
- NFS v4/NFS v4.1 support
- Live migration
- Scalability and load balancing
- Real-time performance statistics (graphics)
- Statistics: CPU, IOPS and bandwith allocation, total and per shared folder

2.1.1 Ease of use

Namespace Cluster provides user-friendly interface that makes it easy and intuitive to configure (or reconfigure) the cluster of appliances of any size, and monitor its health and performance.

2.1.2 Quick start-up and namespace server autonomy

Each node in a cluster is equal to others and **autonomous**. You can access and perform operations from any cluster node.

2.1.3 Single point of control

All the namespace servers can be managed from one point. All the changes performed on one namespace server will be automatically implemented on the others.

2.1.4 NFS v4.1 support

Namespace Cluster supports both a uniform name space implemented by multiple file servers (also called in this document 'namespace servers'), and enables migration of files and directories from one server to another. The current implementation relies on NFSv4.1; future releases will include support for Microsoft's Distributed File System (DFS).

2.1.5 Live migration

Possibility to transfer the data to new location incrementally, without unmounting shared folder.

2.1.6 Scalability and load balancing

The plugin allows (and makes it easy) to distribute NFS workload between namespace servers. After redirecting the client to the referred data folder, namespace server "removes" itself from the data path, and all the subsequent communications are happening directly between the client and the corresponding namespace server.

2.1.7 Multi namespace links

Namespace Cluster provides possibility to indicate more than one location of the required file system. It can be used in emergency scenario, when one of the locations is unreachable. This 'multi-location' functionality is not yet supported, and is currently being considered for future releases.

2.1.8 Just-in-time graphics

Namespace Cluster provides advanced monitoring system for NFS folders and namespace servers activity. See section <u>3.4 Graphics</u> for more information.

2.1.9 Statistics: CPU, IOPS and bandwidth allocation, total and per folder

Namespace Cluster collects statistic information about folders and namespace servers activity which is shown on the graphics.

Generally, Namespace Cluster dashboard provides all tools to build and monitor a unified multi-server namespace:

- multi-view (User, Admin) control panel at the left;
- migration/replication monitor;

- list, status, and capability to add/delete namespace servers;
- NFS (un)sharing;
- basic capacity management;
- integrated real-time graphics.

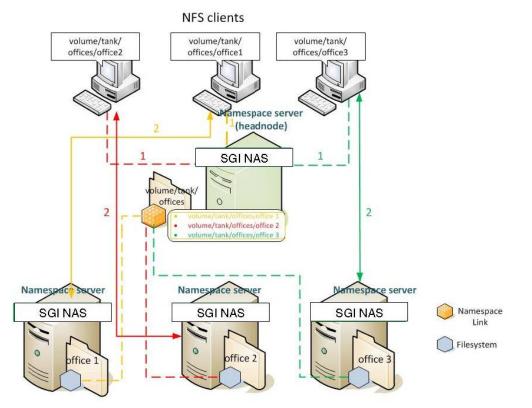
2.2 Terminology

Term	Definition	
	Namespace server is any appliance that is installed with the	
Namespace	namespace cluster plugin and that is intended to be used as	
	a node in the namespace cluster. Namespace server may	
server	provide NFS shares containing user data and referenced (via	
	Namespace links) by other namespace servers.	
	Namespace linking allows to build a global namespace of	
	any size, where directories and files are transparently	
	distributed over any number of servers. Namespace link has	
Namespace	a name and two components: namespace server and a	
-	folder on this namespace server. For instance, if a link	
link	named 'corp/docs' has a value 'other-server:real-docs',	
	clients accessing 'corp/docs' would be automatically and	
	transparently redirected to the corporate documents	
	residing on the 'other-server' in its 'real-docs' folder.	
Logical	Logical group - provides for logical grouping of servers	
	based on any criteria, e.g. same office, same subnet, same	
group	type of user or application data.	

2.3 How does Namespace link work?

Following diagram illustrates the operational principle of Namespace link:

- 1. NFSv4 client traverses NFS share on a namespace server
- 2. NFSv4 client encounters namespace link
- **3.** NFS client parses namespace link for NFS-accessible locations and mounts the first accessible.



For example, there is an NFS share on a Namespace server /volume/tank/offices, where namespace links to other physical servers are located. The servers represent the following directories: office1, office2 and office 3. When a client need to access /volume/tank/offices/office1, it addresses to namespace link in the share, which redirects it to the real dataset destination. This operation is transparent to users and appears as if all the required datasets are located on the same node.

Note that a namespace server takes part only in redirection procedure. After the redirection is done, the redirecting namespace server (sometimes called 'headnode') is not getting accessed anymore. Instead, the client accesses the referenced namespace server directly. It means that load is balanced between client and corresponding referenced namespace server and therefore namespace server is not overloaded.

Namespace server also takes part in relocation scenario. If primary location is down and there is more than one location defined for one share, namespace server redirects the client to another location^A.

A This functionality is not yet supported, and is currently being considered for future releases.

3 Installation

3.1 Requirements

- Namespace server: SGI NAS appliances with pre-installed '**ns-cluster**' plugin extension.
- Supported NFSv4.1 compliant client

3.2 Installation

'ns-cluster' plugin extension must be installed on all namespace servers in a cluster.

In NMV go to: Settings \rightarrow Appliance and choose 'ns-cluster' from the list of remotely-available plugins:

Sgi NAS				Welcome Administrator Logout
76 1 1 1 1 1 1 1 1 1 1	Status 🕤 Settings	Data Manageme	nt O Analytics	
🗞 Appliance 🛛 🙀 Network 🗳	(Misc. Services 🖉 Disks	Users 🕺 Prefer	ences	📕 Console 📄 View log 🧼 Jol
asic Settings 🛛 👻	MANAGE PLUGINS			
-	HANAGE PLOGINS			
<u>Summary</u> Basic Settings	Installed plugins			
lostname	Plugin	Version	Description	
et appliance host name	🐞 autosmart	1.0 (r48)	AutoSmart, monitoring for hard drives	
omainname	📩 🚵 autosync	3.1.2 (r363)	AutoSync, the replication extension	
et appliance domain name	🎭 rrdaemon	3.1.0 (r182)	Remote Replication Daemon	
imezone	🎭 scsitarget	3.0.9 (r578)	COMSTAR iSCSI Target extension	
et geographical time zone	🎭 scsitarget-f			
imeserver	🐞 sgi Do you n	eally want to install "ns-cli	uster" plugin? NMS will be restarted after installation.	
et default time server (NTP)	🐞 storagelink			
leyboard	Remotely available p			
Set default keyboard layout	remotely available p		OK Cancel	
lpgrade Checkpoints 🛛 🔻	searching for the	specified plugin in the i	remote repository	
View	 downloading it 			
/iew checkpoints		in and all its software o the appliance software		
Create			e end of the operation, NMS service is automatically restarted.	
Create a new checkpoint		intro oroatoù aria, at in		
dministration 🛛 🔻	Plugin	Version	Description	
	🀞 amanda-dient	1.1 (r8)	Amanda backup system - Client	
assword et appliance password	🚓 apiviewer	0.11 (r13)	SA-API viewer and browser for NMV	
	🐞 bonnie-benchmark	1.4 (r8)	bonnie++ benchmark extension for NMC	
tailer et SMTP mail server account	📩 📩 damav-antivirus	0.9 (r20)	ClamAV AntiVirus extension for NMS	
	🐞 iozone-benchmark	1.1 (r1)	iozone benchmark extension for NMC	
<u>lugins</u> tanage plugins	🌸 iperf-benchmark	1.2 (r8)	iperf benchmark extension for NMC	
lanage plagne	🐞 ns-cluster	1.4 (r695)	Namespace Cluster extension for NMS	
aintenance 🗸 🔻	🌲 ntop	1.1 (r6)	Collect and show network usage in Web GUI for NMS	
	toracle-backup	0.1 (r5)	Oracle DB backup extension for NMC	
teboot	🏚 ups	1.0 (r21)	UPS monitoring and easy management extension	
teboot appliance	the vmdc	3.2.2 (r677)	VM Datastore Center management extension	
PowerOff	a vtape	0.5 (r16)	Nexenta Virtual Tape plugin	
Power off appliance				
Vizards 🔻				
Wizard 1 Start Configuration Wizard 1				
Wizard 2 Start Configuration Wizard 2				

Installation requires NMS reboot.

Corresponding NMC command:

nmc:/\$ setup plugin install ns-cluster

After successful installation new 'Namespace Cluster' tab appears in NMV:



Click on NameSpace Cluster tab to enter Cluster menu:

About Support Add Capacity Register Help	Welcome Administrator Logout
	📕 Console 📄 View log 🔅 Jobs
Welcome	
Welcome to Namespace Cluster plugin	
Namespace cluster is not configured on this appliance. To create new Namespace Cluster, press "Create" button:	
© Create	
Found a bug? Feature request? Request Technical Support	

- 3.3 Icons legend
 - Image: Namespace server
 - NFS shared folder
 - 盲 folder
 - Namespace link
 - 🗟 Referenced data folder
 - +A Referenced data folder resides on a shared volume on HA-clustered appliances.

4 NMV management

4.1 Creating new Namespace Cluster.

To create new Namesapce Cluster click on 'Create' button as it is shown on a picture below:

Create new cluster	×
Namespace cluster is a "forest" of servers servers.	containing multiple headnodes and data
Cluster name:	
SGINASCluster1	
	Ok Cancel

After successful initialization a screen with cluster status appears:

Summary Version: 1.3 (r638) Servers: 1 HA clusters: 0 Faults: 0 Management tools: • Migration/replication monitor	Namespace cluster servers Image: Im
Servers: 1 HA clusters: 0 Faults: 0 Management tools:	Host Uptime Status
HA clusters: 0 Faults: 0 Management tools:	· · · · · · · · · · · · · · · · · · ·
Management tools:	10.3.52.152 / day(s), 01.24.27 success
Servers NFS statistics	
Resource KO per second	To start monitoring just-in-time statistics, press "Start monitori button (graph refreshes every 3 seconds).
	🕑 Start monitoring 🖄 🎆 Settings 🕶

4.2 Adding a namespace server

To add a new namespace server click on '**+Add**' and choose '**Add server**' from the drop-down list.

🗿 Add 🔻 💥 Remove	💪 🗉 🗄 🗛 🕹
🔁 Add group	
🔥 Add server	
😹 Add Namespace link	

In a pop-up window choose a namespace server from the drop down list of bound appliances and Click '**Ok**'.

Add Namespace server	×
Namespace server is any appliance that has Namespace Cluster plugin installed an is intended to be used as a node in the namespace cluster. Namespace server may provide NFS shares containing user data and referenced (via Namespace links) by other namespace servers.	
Parent:	
/SGINASCluster1	
Bound appliances:	
s2.sgi.com 🛛 🖌 🥹 Bind appliance via SSH	
Ok Cancel	

To add a new namespace server you need a remote appliance ssh-bound to current appliance.

If it wasn't bind previously, it can be bound by clicking on 'Bind new appliance'.

SSH-bind remote namespace server to the local namespace	server 🛛 🗙
Remote server:	
s2.sgi.com	0
User:	
root	0
User Password:	
*****	0
Add	Cancel

To complete the operation, you need to be logged as a user with 'can_admin_services' permission. Otherwise, you'll be asked to provide the required credentials:

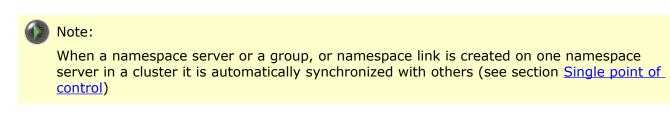
(· · · ·

	Login	×
	You need administrative privileges (can_admin_services) to run this action. Please u NexentaStor's credentials to login. Username: admin Password: ••••••	
bi a VYf [*] \$\$+!), *\$!\$\$I	establish SSH-binding' in h∖Y G; = " be specified in Settings→Users. R	
Guide		

If adding procedure was performed successfully, new namespace server appears in **'Namespace tree'** with all NFS shared folders:

Namespace Cluster	
📀 Add 👻 💥 Remove	olarin 🕒 🔄 🗛 🕹
🖻 🚠 SGINASCluster1	
😑 🚅 CorporateData	
🚊 📵 data.sgi.com	
🔤 pool/corp	

The namespace server that we just added contains one shared folder - 'data/corp'

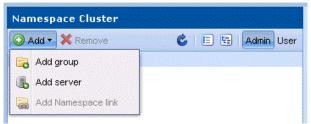


Click on a shared folder to see the statistics.

4.3 Adding a logical group

For ease of management namespace servers in a namespace tree can be unified in logical groups. You can specify any name for a logical group according to its assignment.

To create a new logical group, click on '+**Add**' and choose '**Add group**' from the the drop-down list:



In the pop-up window, specify '**Parent**', if there is any, or leave the line blank to place the group in the main tree. Click '**Add**':

A	dd group	×
	Logical group - provides for logical grouping of servers based on any criteria, e.g. same office, same subnet, same type of user or application data.	
	Parent: /SGINASCluster1 Name:	
	CorporateData	
	Add Cancel	

Newly created logical group should now appear in the 'Namespace tree':



4.4 Adding namespace link

As soon as namespace server is created, namespace link can be added on this server. To add a new namespace link lick on '**+Add**' and choose '**Add namespace link**' from the drop-down list.

Namespace Cluster User Guide



In the pop-up window, specify:

- A 'Namespace server' where namespace link will be located
- In 'Parent folder' choose a folder shared by NFS from the drop-down list where namespace link will be located (if it wasn't previously shared, it can be shared by clicking 'Create an NFS shared folder').
- In 'Namespace link name' field type the name of the namespace link.
- In 'Referenced namespace server' choose a namespace server to which namespace link will be referenced
- In 'Referenced data folder' choose a folder to which namespace link will be referenced

After filling all the required fields, click 'Add'.

Namespace linking allows to build a global namespace of any size, and files are transparently distributed over any number of servers has a name and two components: namespace server and a folder	
namespace server. For instance, if a link named 'corp/docs' has a server:real-docs', clients accessing 'corp/docs' would be automatic transparently redirected to the corporate documents residing on t in its 'real-docs' folder.	value 'other- ally and
amespace server:	
GINASCluster1/CorporateData/s2.sgi.com	
arent folder:	
latapool0/fol_1 🛛 🛛 🕑 <u>Create NFS sha</u>	red folder
amespace link:	
rchive	0
eferenced namespace server:	
lata.sgi.com 🛛 🖌 🎯 Add Namespace	e server
eferenced data folder:	
ool/archive	red folder
iterface:	
· · · · · · · · · · · · · · · · · · ·	• 0
Add	Cancel

Several locations for one folder can be specified. In that case, if one of the locations is unreachable, it can be accessed via another. This functionality is not fully implemented yet. It will be scheduled for one of the future updating releases.

You can add new folder and share it via NFS automatically by clicking on 'Create an NFS

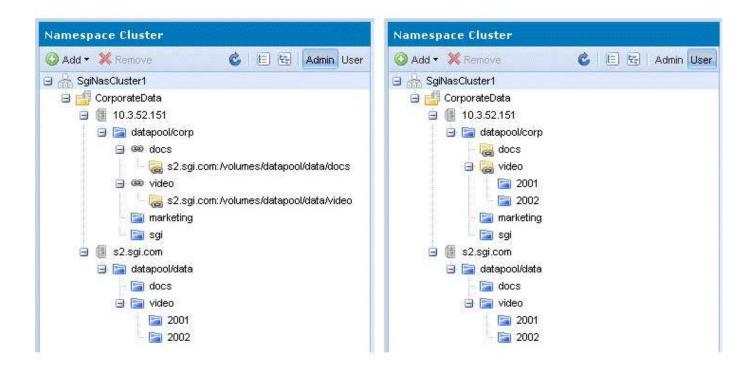
shared folder'.

If all the data is specified correctly, namespace link appears in the 'Namespace tree'.



To unshare or delete the folder, first remove all the namespace links it contains and then remove/unshare.

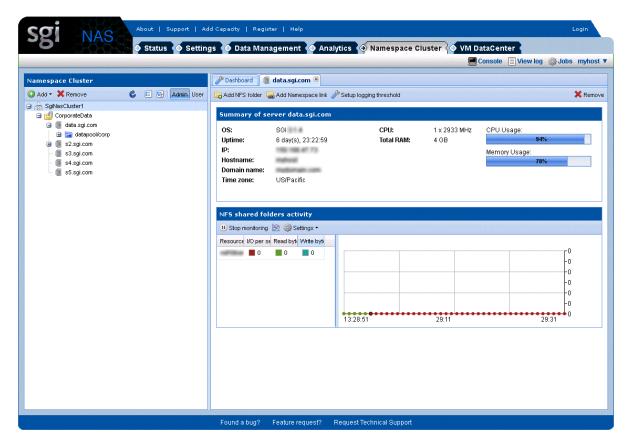
Keep adding required namespace links, groups and namespace servers to Namespace tree according to your configuration requires. On the following screen is the example of the tree structure. Note the difference in User and Admin view:



4.5 Graphics

Namespace cluster provides two types of graphics to monitor:

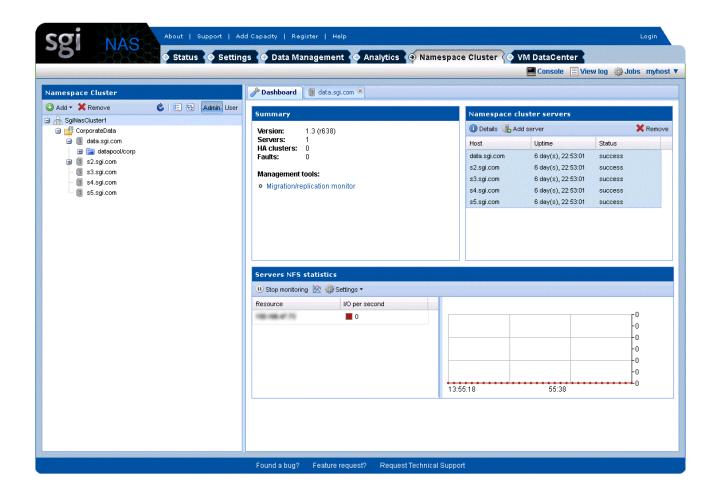
• NFS shares activity:



You can specify what parameters or resources to include to graph by clicking on 'Settings':



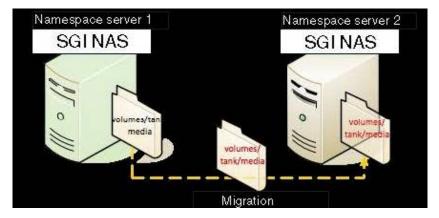
• Namespace servers activity can be seen on a dashboard:



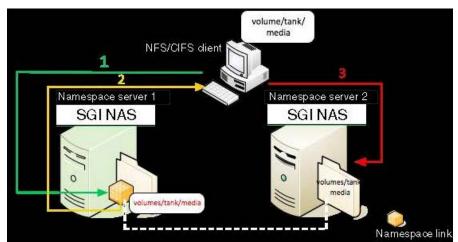
5 Migration

5.1 Overview

Namespace Cluster provides the possibility to perform data migration between namespace servers transparently to user. The operation performs the following: transfers the data from a namespace server to corresponding namespace server and then replaces the actual filesystem on the namespace server with namespace link. See the pictures below:



After creation of the namespace link the NFS clients is forwarded by the namespace link to the actual filesystem location. During migration between two namespace servers namespace link is created on source namespace server and NFS clients are redirected to the actual location. See the diagram below:



The whole procedure is absolutely transparent to the user, i.e. user obtains the access to **volume/tank/media** as if it was on the first Namespace Server.

Two types of migration can be associated with Namespace Cluster:

- Live migration
- Off-line migration

Note that migration is performed recursively: all the nested folders are moved to the destination.

5.2 Live migration

Live migration is a process of data relocation without switching off NFS share. It means that the data stays continuously accessible to users during migration. The mechanism of the operation is:

- 1. A snapshot of the folder is created and sent to corresponding namespace server.
- 2. After that the process of migration is started and continued by iterations. Every iteration the data is sent via Remote Replication transport protocol. All this time the share stays accessible to user and modifiable, so only the delta (the difference between the source and destination) is sent every iteration.
- 3. When delta is very small that it can be transferred for very short period of time (10 secs) Namespace Cluster unmounts the NFS share on the namespace server, substitutes it to namespace link and mounts the namespace link. Then the data becomes available again.

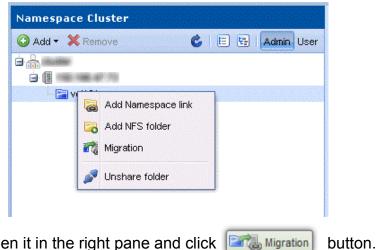
Live or incremental migration is used for big amount of data (for instance 10 TB), which migration process may take up to several hours or days.

5.3 Off-line migration

During off-line (non-incremental) migration, Namespace Cluster unmounts a share, transfers data to its new destination, substitutes the share with a namespace link to actual filesystem location and mounts a namespace link. This type of migration is useful in case of slow network connections between a source and a destination or to shares that don't require permanent availability.

Migration management in NMV 5.4

To migrate a share from one namespace server to another and substitute it with Namespace Link, right-click on the share and choose 'Migration' as it's shown in the image below:



or click on share to open it in the right pane and click Migration

The following screen appears:

Migration			×
another, possibly on a different n	amespa is are ne	shared folder from one location to te server. Migration is transparent from cessary on the client side to access the	
✓ Live migration: uninterrupt folder during the migration proc		ess: users may continue accessing th	e
Remove source: remove da	ata fror	n source after migration.	
Source:			
data.sgi.com:pool/corp			
Namespace server:	v	Add Namespace server	
s2.sgi.com		Muu Namespace server	
Data folder:			
datapool/data	*	Oreate NFS shared folder	
Interface:			
		▼ 0	
Advanced options			
TCP buffer size in KB:		PDU size in KB:	
128	0	512 😡	
Number of connections:		Max rate in KB/s:	
2	0	0	
		Session timeout value in minutes:	
		15	
		Migrate Cancel	

Note 'Remove Source' checkbox. If you leave this checkbox unchecked, then a copy of original

dataset will remain on source. In our example it will be stored on source as 'pool/.corp'

If you don't have any NFS shares, click 'Create an NFS shared folder' button to create new NFS share. The following screen will appear:

Create a folder and share it via NFS.	
datawal	
datapool	 v 🕑
Folder name:	
data	
Description:	
	0
Record Size:	
128K	▼ 00
Log Bias:	
latency	▼ 00
Deduplication:	
off	▼ 0
Compression:	
on	× 0
Number of copies:	
1	▼ Ø
Case Sensitivity:	
mixed	▼ 00
Unicode Only:	
off	▼ 00
Sync:	
standard	▼ 0

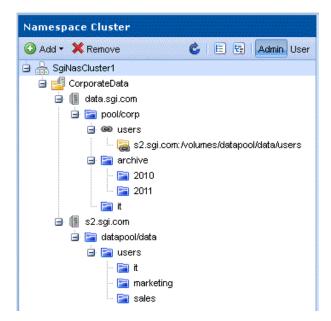
Fill the corresponding fields and click 'Add':



During the process of migration the share remains accessible for all the users.

After migration process is finished migrated share is located on the destination node. On the

place of share's original location appears Namespace Link. In our example it's NFS shared folder pool/corp/users:



After migration is finished, you can go to **Data Management** \rightarrow **Data Sets** \rightarrow **Folder** \rightarrow **Show** and delete folder pool/data/.users and all its subfolders to free space. This copy of shared folder is kept for safety reasons. In case migration procedure is not successful the data is safe. After successful migration procedure the copy of data can be left or removed according to administration needs. On the picture below the deletion of folder /pool/corp/.users is shown:

눩 Data Sets 🛛 👔 Shares 🛛 💥 SO	:SI Target Plus 🛛 🍓 Auto Services 🛛 🖏 Ru	nners						Console	View log	Jobs	myhost
olders	SUMMARY INFORMATION : FOLDERS										
Show	Folder	Refer	Used	Avail	CIFS	NES	FTP	RSYNC	WebDAV	Index	Delet
Summary Information	pool/corp	44.00 KB	44.00 KB	976.00 MB		Edit					×
Create Create New Folder	pool/corp/.users	44.00 KB	44.00 KB	976.00 MB					100 C		×
	pool/corp/.users/it	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
IFS Server disabled 🔻	pool/corp/.users/marketing	44.00 KB	44.00 KB	976.00 MB						V	×
onfigure	pool/corp/.users/sales	44.00 KB	44.00 KB	976.00 MB						V	×
lasic CIFS configuration	pool/corp/archive	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
lentity Mapping	pool/corp/archive/2010	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
Configure Windows to UNIX identity napping	pool/corp/archive/2011	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
oin AD/DNS Server	pool/corp/vms	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
lecome a member of Windows D/DNS Server	pool/corp/vms/developers	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
	pool/corp/vms/qa	44.00 KB	44.00 KB	976.00 MB		🗹 Edit				V	×
oin Workgroup ecome a member of Windows	🗖 pool/data	44.00 KB	44.00 KB	976.00 MB						V	×
Vorkgroup	Filter De	elete selected								Results	(a
<mark>fiew Log</mark> fiew Service Logs											
i <mark>tatus</mark> 'iew CIFS status											
FS Server online 🔻											
onfigure											
Basic NFS configuration											

5.5 Replication

Replication procedure is a simple copying of data from one namespace server to another. No Namespace Link is created during this procedure.

Choose NFS shared folder and click *Replication* button. Fill all the required fields on the replication screen and click 'Replicate'.

Replication	×
Replication - the process of copying user data and filesystem metadata to a specified location within the namespace cluster.	
Source:	
data.sgi.com:pool/corp/vms	
Destination	
Namespace server:	
s2.sgi.com 🖌 🎯 <u>Add Namespace server</u>	
Data folder:	
datapool/new	
Interface:	
▼ 9	
Advanced options	
Cancel	

After successful replication the data appears on source and on destination:

Namespace Cluster
🗿 Add 🕶 💥 Remove 🏾 🍪 🗉 🖼 🛛 Admin User
😑 🚠 SgiNasCluster1
🖨 🚰 CorporateData
🚊 📳 data.sgi.com
🖨 🔚 pool/corp
🗃 🔚 archive
🖨 🚰 users
🔚 sales
🖨 🚰 vms
- 📄 developers
📄 📄 qa
🖨 📳 s2.sgi.com
- 📄 datapool/data
- 📄 users
- 📄 sales
- 📄 datapool/new
- 📄 vms
- 📄 developers
🔤 🔁 qa

6 Mounting the share via NFSv3.

The NFSv4.1 protocol provides a NFS referral mechanism that allows server to redirect the client to another server.

Client mounts a filesystem on server via NFS version 4.1. The server administrator can decide to move this exported filesystem to another server. The server must inform each client mounting filesystem on it that the data has moved.

The method used to communicate the migration event between client and server is the following: once the servers participating in the migration have completed the move of the filesystem, the error will be returned for subsequent requests received by the original server. Upon receiving the error, the client obtains the value of the specific attribute. The client then uses the contents of the attribute to redirect its requests to the specified server. This specific attribute is called NFS referral^A.

NFSv3 doesn't provide referral mechanism, but you can still mount the share and use the workaround below.

If your operating system doesn't support NFSv4.1 referrals, but has NFSv3 support and allows usage of 'amd' (automounter daemon), you can mount the share using NFSv3 protocol.

In this case SGI NAS will automatically transform referrals to symlinks to **/net/** directory, suitable for use by **'amd'**.

Centos 5.x:

Install am-utils using:

```
# yum install am-utils
```

No further configuration needed.

Debian 5.x/Ubuntu:

install am-utils using the following command

A http://nfsv4.bullopensource.org/doc/migration-and-replication-0.2.pdf

```
# apt-get install am-utils
```

No further configuration needed.

FreeBSD 8.x:

amd is shipped with the OS, to enable it add amd_enable='YES' to /etc/rc.conf and run

```
# /etc/rc.d/amd start
```

No further configuration needed.

Note, that all NFSv4.1 based clients are supported by Namespace Cluster out of the box (Linux kernel 2.6, VMware vSphere 5, etc.).

7 Fault management

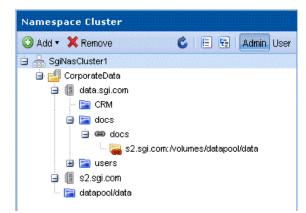
Namespace Cluster provides functionality to monitor namespace servers, and state of the shared filesystems (referenced data folder). The corresponding fault management is executed in a way consistent with the general appliance's fault management capability.

If a namespace server, referenced data folder or data server is faulted or unavailable, it appears in a namespace tree with a red alarm number, which specifies how many objects can be reached:



Expand the tree to see the details:

Observe how unavailable destination folder looks like :



Next screen shows unavailable server:



There are several node statuses:

success – a normal healthy state of a node.

warning – draws your attention to an event that may cause a failure or requires administration actions.



failure – namespace server is unreachable.

These statuses are the same for namespace links and folders.

7.1 Troubleshooting tips:

1. Namespace server is unreachable.

Ping the namespace server.

If it's not available:

- Check all the physical connections.
- Check if SGI NAS is up and running.
- 2. Referenced data folder or namespace link is unreachable.
- Check that corresponding disk is available.
- Check that corresponding NFS share wasn't forcefully unshared.

7.2 Known limitations

1. Namespace Cluster can't use CIFS protocol yet.

8 Contact information

8.1 Support request

To contact support at SGI, click on 'Support' in NMV screen shown below:

Status Settings Data Management Analytics Namespace Cluster VM DataCenter Console View log 3 do not intervent Console View log 3 do not intervent to support technicians via configured SMTP mail server. This E-Mail Will include a snapshot of your system settings and configured SMTP mail server. Collected information will reduce the time spent on tech support. Company Contact E-Mail Contact E-Mail Cottegory Other Subject Verbose Verbose Includes extended logging and diagnostics.	Console View log I I I I I I I I I I I I I I I I I I I	EQUEST FOR TECHNICAL SUPPORT From this page a simple E-Mail can be sent to su This E-Mail will include a snapshot of your syste Collected information will reduce the time spent of Company Contact E-Mail root@localhost Category Other Other Other Subject	pport technicians via configured <u>SMTP ma</u> m settings and configuration. on tech support.	📕 Console 📃 View log 🔅
		From this page a simple E-Mail can be sent to su This E-Mail will include a snapshot of your syste Collected information will reduce the time spent of Company Contact E-Mail root@localhost Category Other General NexentaStor issue -> Other Subject	m settings and configuration. on tech support.	<u>ail server</u> .
		This E-Mail will include a snapshot of your syste Collected information will reduce the time spent Company Contact E-Mail root@localhost Category Other Other Subject	m settings and configuration. on tech support.	ail server.
Includes extended logging and diagnostics.	Includes extended logging and diagnostics.			
		Includes extended logging and diag	nostics.	
			Comment	Comment

or type the following NMC command:

nmc:/\$ support

which will then prompt for a subject and message.

8.2 Other resources

For licensing questions, please contact your SGI sales or support representative.