



SGI NAS

VM Data Center User Guide

Release 3.1.x

VM Data Center User Guide

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Table of Contents

1 Overview.....	5
2 Terminology.....	7
3 Features.....	9
3.1 ZFS snapshot integration.....	9
3.2 Virtual Host consolidation.....	9
3.3 Virtual Machine cloning/templating.....	10
3.4 Creating Virtual Machine from scratch	10
3.5 NFS Data Storage.....	10
3.6 ISCSI Storage.....	10
3.7 Virtual Machine multi-cloning.....	10
3.8 VMware VMotion support.....	11
3.9 VM(s) relocation between SGI NAS systems.....	11
3.10 Fibre Channel support.....	11
3.11 Office-to-Office replication.....	11
4 VMDC capabilities vs. supported Hypervisors (VHosts).....	13
5 VMDC Installation.....	15
6 VMDC GUI Summary.....	19
7 Getting Started with VMDC.....	21
8 Connecting to VHost/VCluster.....	23
9 VHost Management.....	25
9.1 Create NAS Vstorage.....	27
9.2 Create SAN VStorage.....	28
9.3 Discover SAN disks.....	29
9.4 Register existing Virtual Machine.....	30
10 Virtual Machine Management.....	31
11 Cloning Virtual Machine.....	33
12 Creating auto services.....	35
13 Vmotion/Live migration	37

- 14 Relocating VMs.....39
- 15 Office-to-office replication.....41
- 16 Contact information.....43
 - 16.1 Support request43
 - 16.2 Other resources.....44

1 Overview

The Virtual Machine Data Center plugin (also called **VMDC**) provides an integration of the industry-leading infrastructure virtualization software with the SGI NAS appliance. Currently supported hypervisors are:

- VMware ESX
- Citrix Xen
- Microsoft Hyper-V

The pluggable module is designed from ground up to provide a single point of control to manage all storage related aspects of a virtualized infrastructure.

Currently, SGI NAS includes the 3rd generation of the VM DataCenter pluggable extension: VMDC 3.x.

2 Terminology

VMDC is designed to provide a unified interface to multiple virtualization platforms. To describe and document this common interface, we would need a set of common terms. The following table provides definitions for terms used in this document:

Term	Definition	Comments
VStorage	Virtualized Storage, VStorage, refers to the storage managed by SGI NAS.	VStorage is a virtual disk storage as seen from the perspective of VHost. VHost and its VMs see VDisks stored on VStorage. In ESX terminology VStorage is "datastore", in XEN it is "SR" (storage repository).
VBackstore	SGI NAS VM Datastore, VBackstore, is the storage allocated to a given VM.	VBackstore is actual SGI NAS-provided storage . Vbackstore may be: a shared Zvol or a Folder.
VHost	SGI NAS Virtual Factory, VHost, is a generic term for the virtualization platform (e.g. VMware, Citrix Xen, Microsoft Hyper-V).	VHost may be: ESX Cluster, Xen pool, or Hyper-V cluster.
Vmotion/	SGI NAS VM Motion is a generic term for migration of Virtual Machines, regardless of the virtualization environment.	Vmotion is a VMware term for Hyper-v/Xen Live Migration
VM Relocation	SGI NAS Virtual Storage Relocation, VM Relocation, is a generic term for relocation of the storage for VM (VBackstor), regardless of the virtualization environment.	
VCluster	SGI NAS VCluster is a generic term for VHosts combined in a cluster or pool.	

3 Features

Main VMDC features include:

- ZFS snapshot and auto-* services integration
- Virtual host consolidation
- Virtual machine cloning/templating
- Creating new virtual machine from scratch
- NFS data Storage
- iSCSI data Storage
- Virtual machine multi-cloning
- Support of native VMware VMotion/Hyper-V, XEN live migration capability
- VM(s) relocation between SGI NAS systems
- Fibre Channel support
- Office-to-office replication

3.1 ZFS snapshot integration

Administrator can create any number of auto-* services for vBackstore, a ZFS integrated storage for VM Datastore. Any ZFS snapshot taken over ZFS folder or Zvol containing vBackstore will automatically take corresponding virtual host level snapshot. The ZFS snapshot destroy operation will automatically destroy corresponding virtual host level snapshot.

3.2 Virtual Host consolidation

Single point of datastore management for multi-vendor virtual hosts. Currently supported: VMware ESX 3.5, VMware ESX 4.x and Xen Citrix 5.x, Hyper-V.

3.3 Virtual Machine cloning/templating

Virtual machines stored on local storage (i.e. SGI NAS backed) can be used as a template for creating virtual machine clones. For ESX and Hyper-V, an existing installed and runnable VM can be used to create its multiple clones. Xen templates have a special meaning and cannot be run by themselves – they can only be used to create Xen (non-template) VMs.

VMDC supports VM templating in a hypervisor-specific way.

Cloning of a virtual machine is tightly integrated with ZFS snapshot capabilities and ensures consistent states of a virtual machine itself.

3.4 Creating Virtual Machine from scratch

This functionality is under construction.

3.5 NFS Data Storage

VMDC provides capability to connect SGI NAS as NFS Storage to supported hypervisors.

3.6 iSCSI Storage

VMDC provides capability to connect SGI NAS as iSCSI Storage to supported hypervisors.

3.7 Virtual Machine multi-cloning

Multi-cloning allows administrator to replicate virtual machines as many times as needed. Major requirement: a Virtual Machine must be designed as one per VStorage.

3.8 VMware VMotion support

VMotion is native VMware capability available when you use vCenter as VCluster to migrate running virtual machines from one virtualization host to another. Requirement: both virtual hosts need to be registered with vCenter inventory and should have compatible CPU architectures.

3.9 VM(s) relocation between SGI NAS systems

Relocation procedure moves VM files from one Storage Appliance to another ssh-bound Storage Appliance.

Detailed description is in section: [VM DataCenter: Relocating Vms](#)

3.10 Fibre Channel support

VBackstore can be connected to VHost using Fibre Channel.

3.11 Office-to-Office replication

Starting with SGI NAS v3.0.4, VMDC supports VM replication from one VHost to another together with moving VM files from VStorage to another.

Read more in section [15.Office-to-office replication](#).

4 VMDC capabilities vs. supported Hypervisors (VHosts)

VMDC FEATURES	VMware ESX	Citrix XEN	Microsoft Hyper-V
Virtual machine cloning/templating	Included	Included	Included
Virtual machine multi-cloning	Included	Included	Included
Native VMotion capability (moving a live VM from hypervisor to another hypervisor)	Included	Included	Included
Creating new Virtual Machine from scratch	N/A	N/A	N/A
NFS data storage	Included	Included	N/A
ISCSI data storage	Included	Included	Included
Integration with SGI NAS auto-services: auto-snap, auto-tier and auto-sync	Included	Included	Included
VM(s) relocation between SGI NAS systems	Included	N/A	Included
Fibre Channel support	Included	N/A	Included
Office to Office replication	Included	Included	Included

5 VMDC Installation

You can use management console 'setup' and 'show' commands to administer plugins, view already installed plugins and plugins that can be installed:

```
nmc:/$ show plugin
```

To install plugins using management console run:

```
nmc:/$ setup plugin
```

Alternatively, you can view, install and uninstall the SGI NAS extension modules using appliance's web GUI, as shown below:

Confirming the installation:

The screenshot shows the SGI NAS web GUI interface. The main content area is titled 'MANAGE PLUGINS' and contains two tables. The first table, 'Installed plugins', lists the following:

Plugin	Version	Description
autosmart	1.0 (r48)	AutoSmart, monitoring for hard drives
autosync	3.1.2 (r363)	AutoSync, the replication extension
ns-cluster	1.4 (r700)	Namespace Cluster extension for NMS
rrdaemon	3.1.0 (r182)	Remote Replication Daemon
scsitarget		
scsitarget-fc		
sgi		
storagelink		

The second table, 'Remotely available plugins', lists the following:

Plugin	Version	Description
amanda-client	1.1 (r8)	Amanda backup system - Client
apiviewer	0.11 (r13)	SA-API viewer and browser for NMV
bonnie-benchmark	1.4 (r8)	bonnie++ benchmark extension for NMC
clamav-antivirus	0.9 (r20)	ClamAV AntiVirus extension for NMS
iozone-benchmark	1.1 (r1)	iozone benchmark extension for NMC
iperf-benchmark	1.2 (r8)	iperf benchmark extension for NMC
ntop	1.1 (r6)	Collect and show network usage in Web GUI for NMS
oracle-backup	0.1 (r5)	Oracle DB backup extension for NMC
rsf-cluster	2.5.0-8171 (r479)	RSF-1 Cluster management extension
ups	1.0 (r21)	UPS monitoring and easy management extension
vmdc	3.2.2 (r677)	VM Datastore Center management extension
vtape	0.5 (r16)	Nexenta Virtual Tape plugin

A modal dialog box is overlaid on the 'vmdc' plugin row, containing the text: 'Do you really want to install "vmdc" plugin? NMS will be restarted after installation.' with 'OK' and 'Cancel' buttons.

Installation in progress:

The screenshot shows the SGI NAS web interface. The main content area is titled 'MANAGE PLUGINS'. It contains two tables: 'Installed plugins' and 'Remotely available plugins'. A red box highlights a warning message about the transactional nature of plugin installation.

Installed plugins

Plugin	Version	Description
autosmart	1.0 (r48)	AutoSmart, monitoring for hard drives
autosync	3.1.2 (r363)	AutoSync, the replication extension
ns-cluster	1.4 (r700)	Namespace Cluster extension for NMS
rrdaemon	3.1.0 (r182)	Remote Replication Daemon
scsitaraget	3.0.9 (r578)	COMSTAR iSCSI Target extension
scsitaraget-fc	3.0.6 (r435)	COMSTAR FC Target extension
sgi	1.2 (r176)	SGI extension
storagelink	1.0 (r10)	Nexenta Storagelink support module

Remotely available plugins

Installation of a pluggable module (plugin) is a transactional operation, which includes:

- searching for the specified plugin in the remote repository
- downloading it
- installing the plugin and all its software dependencies
- registering it with the appliance software

A new system checkpoint is created and, at the end of the installation, the appliance is automatically restarted.

Remotely available plugins

Plugin	Version	Description
amanda-client	1.1 (r8)	Amanda backup system - Client
apiviewer	0.11 (r13)	SA-API viewer and browser for NMV
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rsf-cluster	2.5.0-8171 (r479)	RSF-1 Cluster management extension
ups	1.0 (r21)	UPS monitoring and easy management extension
vmdc	3.2.2 (r677)	VM Datastore Center management extension
vtape	0.5 (r16)	Nexenta Virtual Tape plugin

VM DataCenter 3.0 successfully installed:

VM Data Center User Guide

The screenshot shows the SGI NAS web interface. The top navigation bar includes links for 'About', 'Support', 'Add Capacity', 'Register', and 'Help'. The user is logged in as 'Administrator'. The main navigation tabs are 'Status', 'Settings', 'Data Management', 'Analytics', 'Namespace Cluster', and 'VM DataCenter'. The left sidebar has sections for 'Basic Settings', 'Upgrade Checkpoints', 'Administration', 'Maintenance', and 'Wizards'. The main content area is titled 'MANAGE PLUGINS' and contains two tables: 'Installed plugins' and 'Remotely available plugins'. A warning message is displayed above the second table, stating that plugin installation is a transactional operation.

Installed plugins

Plugin	Version	Description
autosmart	1.0 (r48)	AutoSmart, monitoring for hard drives
autosync	3.1.2 (r363)	AutoSync, the replication extension
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scsitarget-fc	3.0.6 (r435)	COMSTAR FC Target extension
sgi	1.2 (r176)	SGI extension
storagelink	1.0 (r10)	Nexenta Storagelink support module
vmdc	3.2.2 (r677)	VM Datastore Center management extension

Remotely available plugins

Installation of a pluggable module (plugin) is a transactional operation, which includes:

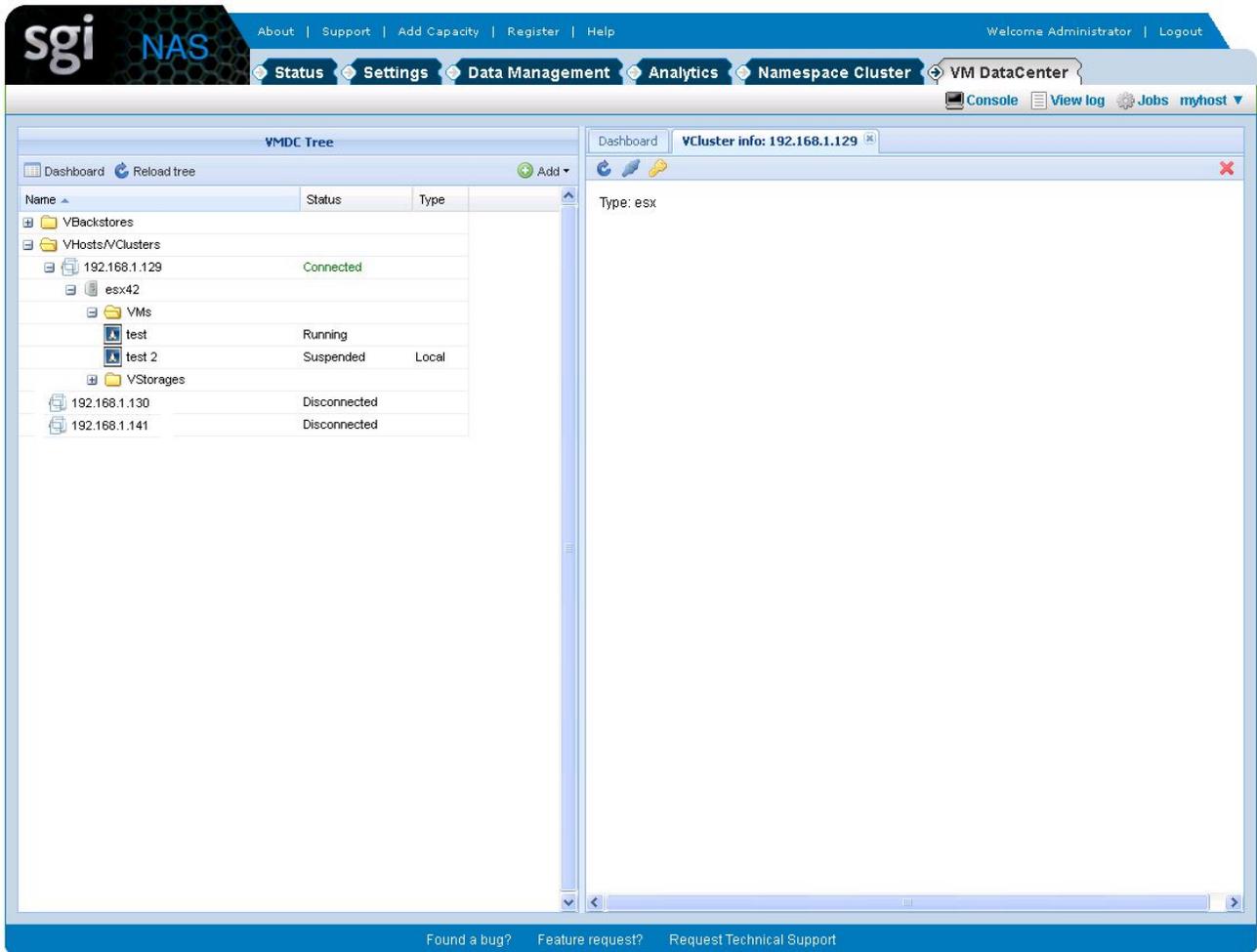
- searching for the specified plugin in the remote repository
- downloading it
- installing the plugin and all its software dependencies
- registering it with the appliance software

A new system checkpoint is created and, at the end of the operation, NMS service is automatically restarted.

Plugin	Version	Description
amanda-client	1.1 (r8)	Amanda backup system - Client
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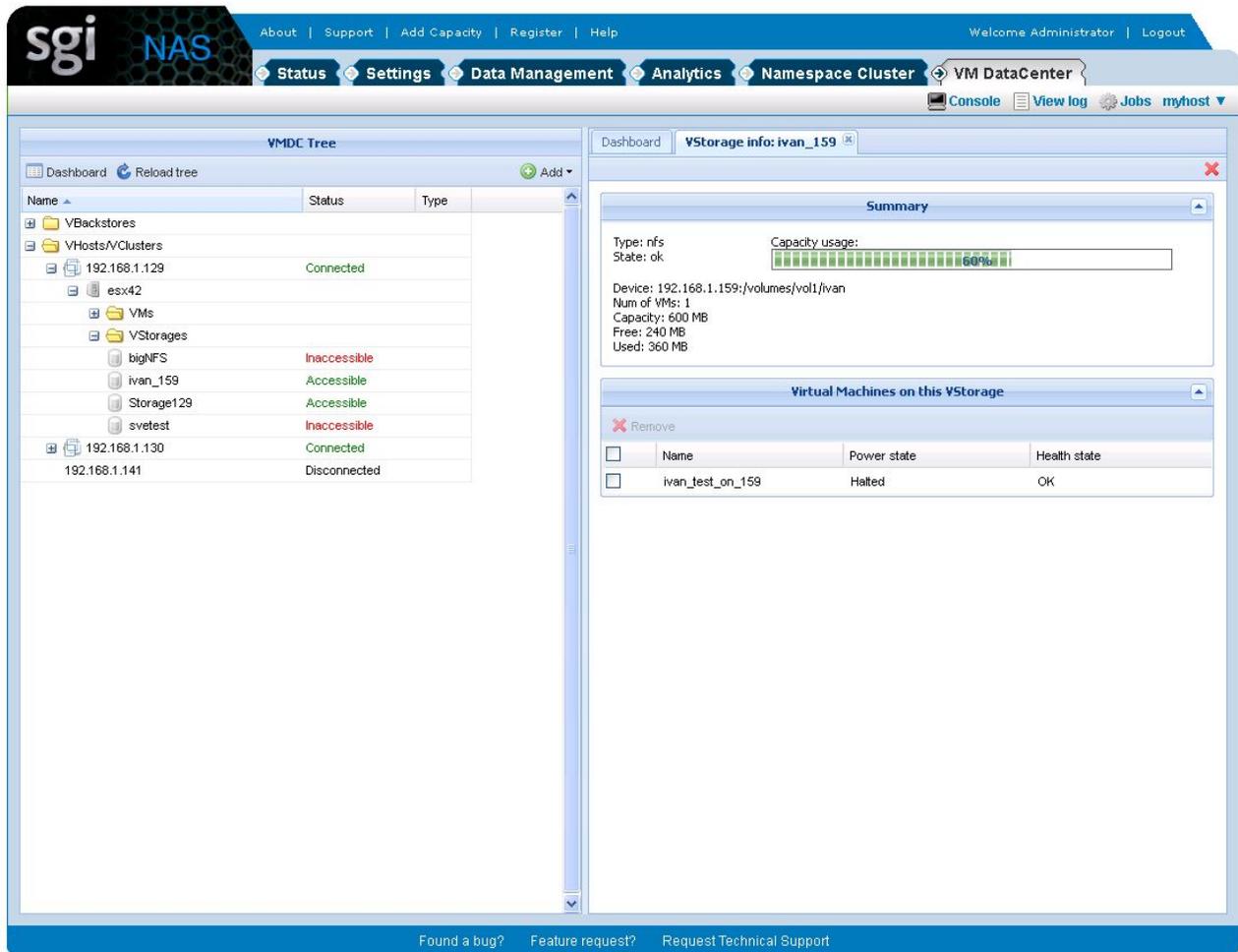
6 VMDC GUI Summary

Once installed, the plugin shows up in NMV as an additional **VM DataCenter** tab, with a tree menus of all objects on the left and a dash board on the right.



The new NAS (NFS) and SAN (iSCSI or Fibre Channel) storage for Virtual Machines and their own virtual disks can be easily provisioned and deployed for new VMs. The picture above shows Vhost's VMs and VStorages in VMDC Tree.

VStorage info panel screenshot below contains information about attached virtual machines. It also shows summary information about VStorage.



If VHost VStorage has local backstore, it is possible to get detailed information about attached VHost and virtual machines with stored Vdisks and snapshots list.

The rest of this section introduces VMDc terminology and provides a detailed and illustrated description of VMDc operations, along with usage guidelines and examples.

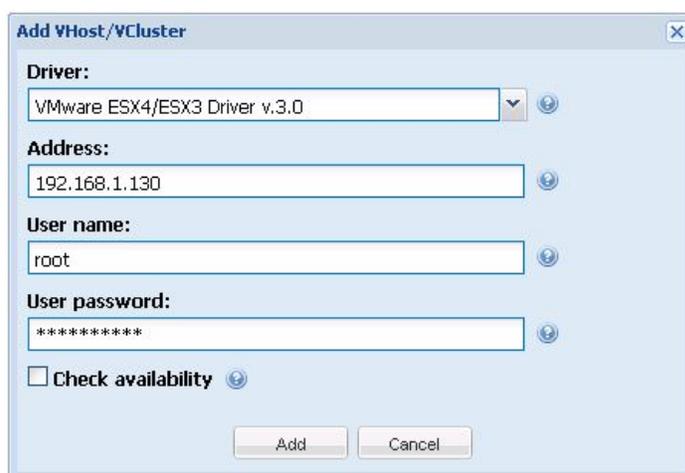
7 Getting Started with VMDC

Before you start using VMDC, as a very first step you have to register at least one managed virtualization host or virtualization cluster (also called **VHosts/VClusters**).

1. Click on [VM DataCenter](#) tab.
2. On [VMDC Tree](#) panel click on [Add](#) and choose [Add VHost/VCluster](#).
3. In the drop-down menu choose [Add VHost/VCluster](#).



4. Enter required parameters:
 - **Driver:** desired type of virtualization platform;
 - **Address:** hostname or IP address;
 - **Username/Password:** In order to check if credentials are valid and host is accessible, toggle “Add VHost/VCluster only if connection was successful” check box.



5. Click on [Add](#).

If entered parameters are valid, VHost or VCluster will be added.



Note: If you see a dialog window "You need administrator privileges to run this action" you need to log in as a user who has this privileges.

SGI NAS default is:

USER NAME: admin

PASSWORD: nasnas

Register additional VHost/VCluster as needed.

8 Connecting to VHost/VCluster

Once you have registered VHost it will appear in VMDC tree:



Now you can manage this VHost, its VStorages and Virtual Machines. In order to do that you have to create a connection. There are two ways to do that:

1. When you select VHost in VMDC tree, a dialog window will appear:



2. Click on [Yes](#).

After successful connection VMDC tree will show all VHost's objects: Vstorages and VMs. If VHost you have chosen is Vcluster, all VHosts that belong to this Vcluster will also be shown in VMDC tree.

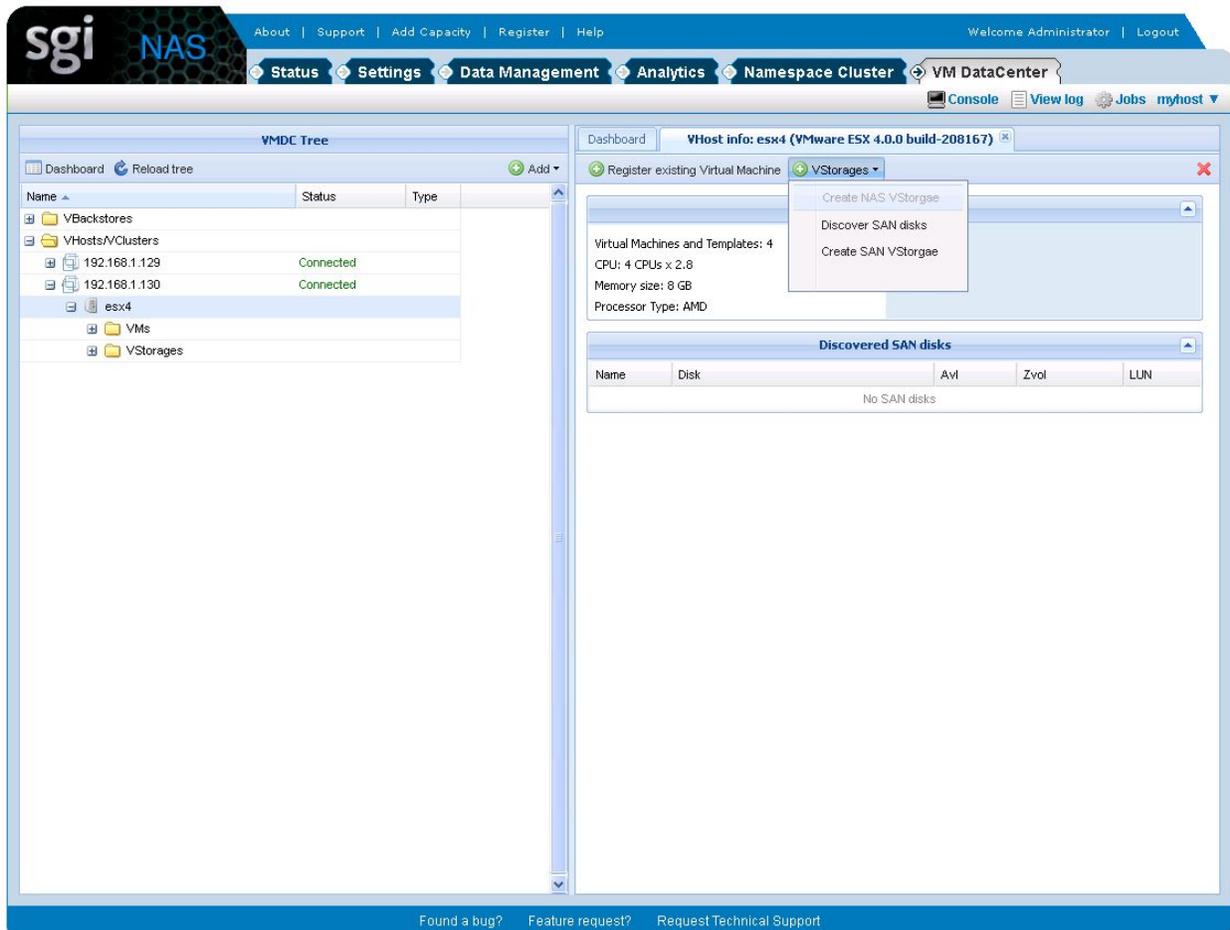


Note: non-VMDC modification to VHost may cause VHost de-synchronization. Recommended action is to **re-connect** Vhost/VCluster.

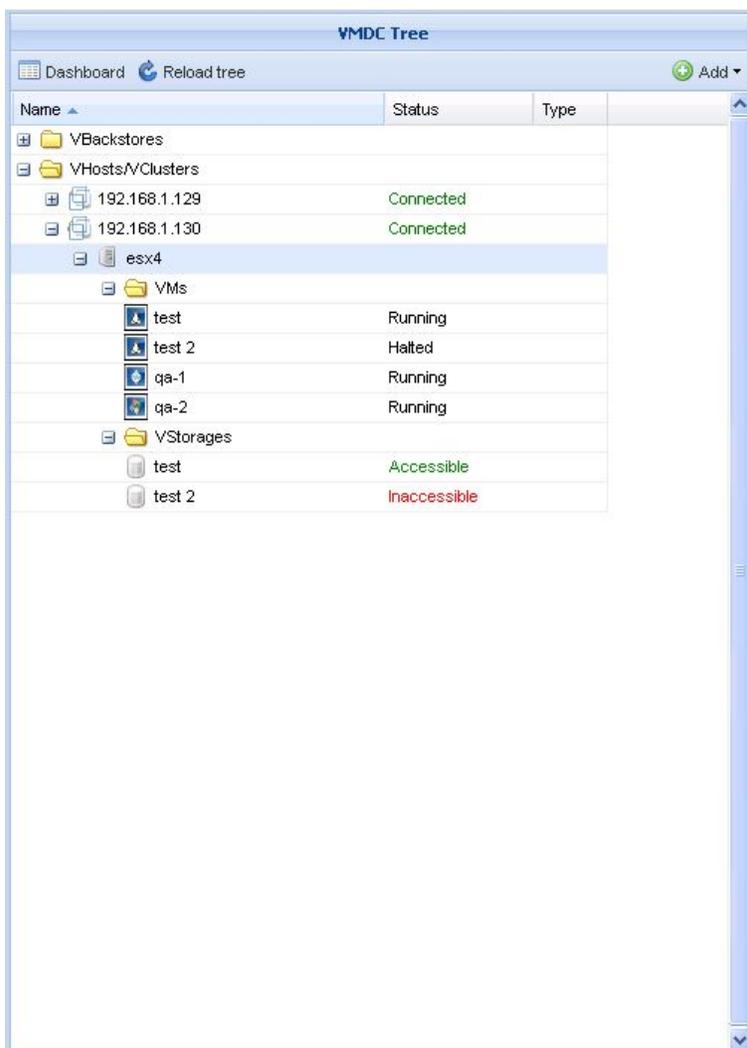
9 VHost Management

On the VHost info page (see screenshot below), you can see VHost information. There are four functions available on VHost toolbar:

- Create NFS Vstorage
- Create SAN Vstorage
- Discover SAN disks
- Register existing Virtual Machine



You can manage VHost storages (also called “**VStorages**”) and virtual machines (**VMs**). On the picture below you can see VMs and VStorages in VMDC tree.



The screenshot shows the 'VMDC Tree' interface. At the top, there is a 'Dashboard' button, a 'Reload tree' button, and an 'Add' button. Below this is a table with columns for 'Name', 'Status', and 'Type'. The tree structure is as follows:

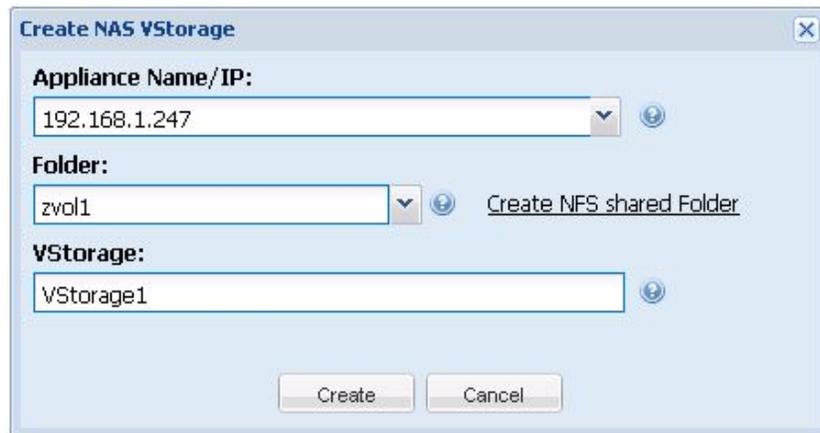
- VBackstores
 - VHosts/VClusters
 - 192.168.1.129 (Connected)
 - 192.168.1.130 (Connected)
 - esx4
 - VMs
 - test (Running)
 - test 2 (Halted)
 - qa-1 (Running)
 - qa-2 (Running)
 - VStorages
 - test (Accessible)
 - test 2 (Inaccessible)

 To enable some of the advanced VMDC capabilities such as VM Multicloning, we recommend to use one-to-one relationship between a virtual machine and a Vstorage. (i.e. one VM per VStorage) This allows to utilize ZFS clone capability in the most efficient way.

9.1 Create NAS Vstorage

To create a new NFS based Vstorage:

1. Select VStorages menu in VHost toolbar.
2. Click on [Create NAS Vstorage](#). You will see the following:



The screenshot shows a dialog box titled "Create NAS VStorage". It contains the following fields and options:

- Appliance Name/IP:** A text box containing "192.168.1.247" with a dropdown arrow and a help icon.
- Folder:** A dropdown menu showing "zvol1" with a help icon and a link labeled "Create NFS shared Folder".
- VStorage:** A text box containing "VStorage1" with a help icon.
- At the bottom, there are "Create" and "Cancel" buttons.

3. Enter all parameters. If you need to create NFS folder, click on [Create new NFS folder](#).
4. Click on [Register](#).
5. Check on hypervisor client site, that Vstorage is automatically added.

Note, that remote management must be enabled and firewall must be properly configured to let VMDC manage Hypervisor.

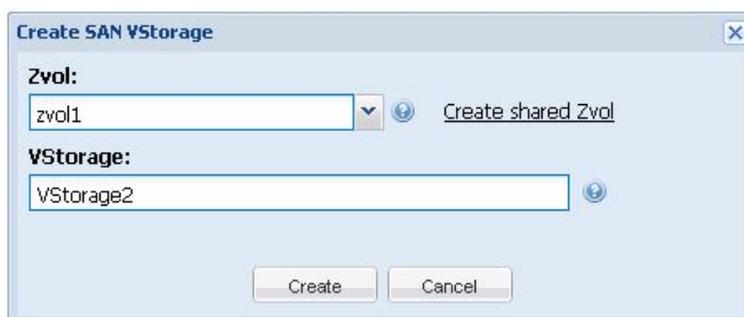


If SCSI Target plugin is installed, you can prepare LUN mapping using Data Management → SCSI Target page.

9.2 Create SAN VStorage

To create a new SAN VStorage create a new zvol or use existing one. You also have to make sure that SAN target is configured and LU mapping exists (if COMSTAR Target plugin is installed). To create a new SAN Vstorage:

1. Select VStorages menu in VHost toolbar.
2. Click on [Create SAN Vstorage](#). You will see the following:



3. Enter all parameters. If no expected Zvols appear in the drop-down box try to discover SAN targets see [Discover SAN disks](#).
4. Click on Add. Vstorage should appear in VMDC tray.
5. Check on hypervisor client side, that SAN VStorage automatically appeared as Storage.

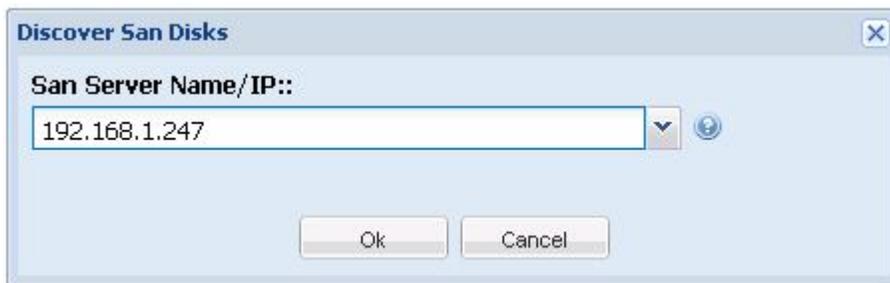
Note, that zvol 'zvol1' (or 'vol1/zvol1') chosen for SAN VStorage 'VStorage2' appears in the list of Vbackstores. The same is for NAS VStorage.



9.3 Discover SAN disks

To discover SAN Disks:

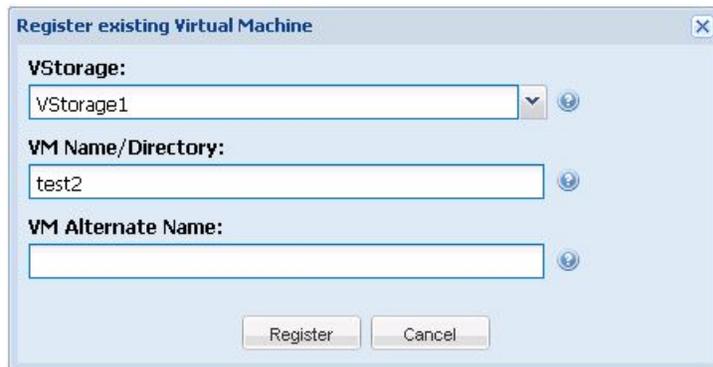
1. Click on **Discover SAN Disks** on VHost toolbar.



2. Select hostname or network interface IP address to be used for SAN targets discovering, then click **Discover** button. If you still do not see Zvols, verify entered information and networking cabling/switching.

9.4 Register existing Virtual Machine

If you need to register an existing VM you can use this function:



The screenshot shows a dialog box titled "Register existing Virtual Machine". It contains three input fields: "VStorage:" with a dropdown menu showing "VStorage1", "VM Name/Directory:" with the text "test2", and "VM Alternate Name:" which is empty. Each field has a help icon to its right. At the bottom are "Register" and "Cancel" buttons.

1. Select Vstorage from drop-down menu.
2. Enter VM directory/name.
3. Enter VM Alternate (new) name.
4. Click on Register.

10 Virtual Machine Management

All VHost's VMs will be displayed in VMDC tree. The Virtual Machine management is limited to: Start, Stop, Resume. You can take a Quick VM Snapshot and Rollback to it later if a virtual machine is stored on the VBackstore. It is also possible to clone a virtual machine using pre-existing VM snapshot. To create new VM please use existing management tools such as VMware vSphere client. The VM information panel is shown below:

The screenshot displays the SGI NAS VM Data Center interface. The left pane shows the VMDC Tree with a table of VMs:

Name	Status	Type
192.168.1.129	Connected	
esx42		
test	Running	
test 2	Suspended	Local
192.168.1.130	Disconnected	
192.168.1.141	Disconnected	

The right pane shows the details for 'Virtual Machine: test 2':

- Summary:** State: Suspended, Guest OS: Sun Solaris 10 (64-bit), Memory size: 1 GB
- VDisks:**

Name	VStorage
2000	svetest1
config	svetest1
- VStorages:**

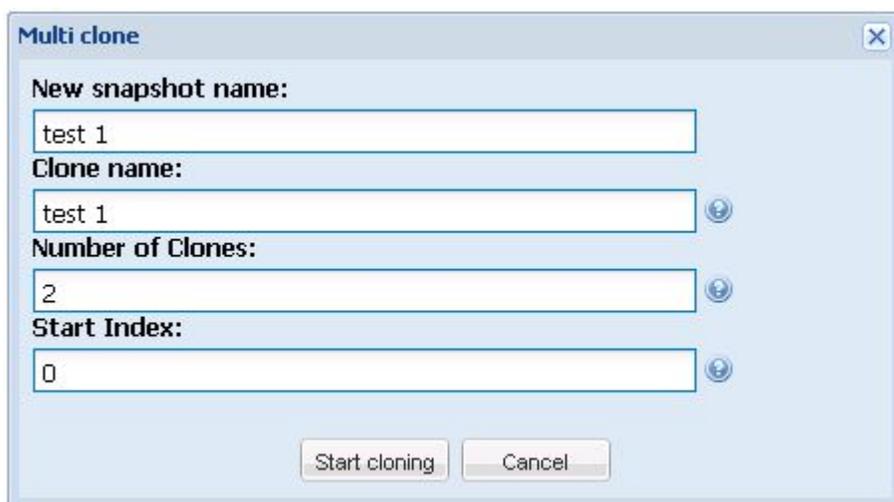
Name	Type	VBackstore	Capacity	Free space
svetest1	nfs	vol1.nfs1	48.97 GB	47.73 GB
- VM Snapshots:**

Name	Num VMs	Used	Refer	Created at
No snapshots				

11 Cloning Virtual Machine

If a virtual machine is stored on a local backstore (VBackstore) it can be cloned multiple times to create new virtual machines. You can clone VM either by cloning from an existing VM snapshot or by creating a new snapshot while cloning.

1. On a virtual machine multicloning page select VM snapshot name (existing or to be created – depends on selected parameters).
2. Enter number of clones.
3. Enter newly created virtual machine's base name and initial cloning index number (offset). A cloned virtual machine's new name will consist of a base clone name concatenated with a clone index. A clone index number will be incremented upon successful VM clone creation.
4. Click on “Start Cloning” button and cloning process will begin. If everything is OK, newly created virtual machines will be automatically added to the VMDC tree on the left side.



The screenshot shows a 'Multi clone' dialog box with the following fields and values:

- New snapshot name:** test 1
- Clone name:** test 1 (with a dropdown arrow)
- Number of Clones:** 2 (with a dropdown arrow)
- Start Index:** 0 (with a dropdown arrow)

Buttons at the bottom: Start cloning, Cancel



Due to ESX NFS server limitations, ensure that configuration option **NFS.MaxVolumes** is set to maximum allowed value 64. You cannot create more than **MaxVolumes.NFS** VStorages.

12 Creating auto services

It is possible to create a new auto service for selected VBackstore. The following auto services are available:

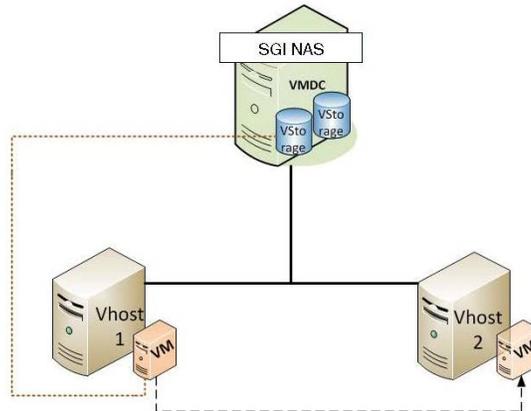
- **Auto-Snap** - VM Snapshots will be periodically taken on SGI NAS and corresponding VHost side using ZFS snapshot capabilities integrated with virtualization platform
- **Auto-Tier** – a file-level tiering mechanism. Useful to setup local to remote or remote to local networking protocol tiering. Examples of tiering protocol: RSYNC, RSYNC over SSH, etc
- **Auto-Sync** – a ZFS-level syncing mechanism. Useful to have periodic syncing from local to remote site. This service will also transfer all the VM snapshots, i.e. it will create exact copy of syncing source

Auto-services can be created at VBackstore edit page related to a selected virtual machine. You can find VBackstore edit link on VM summary page or directly on Inventory/Backstores page.

13 Vmotion/Live migration

Starting with SGI NAS v3.0.3, VM DataCenter can move VMs between VHosts for all supported drivers: ESX, Citrix Xen and Hyper-V. This function is only available in Vcluster.

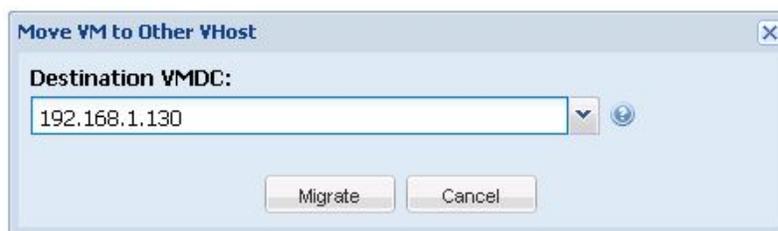
The following diagram illustrates Vmotion/Live migration principle:



1. Click on [Move VM to Other VHost](#) in VM toolbar.



2. Select destination Vhost and click on [Migrate](#)

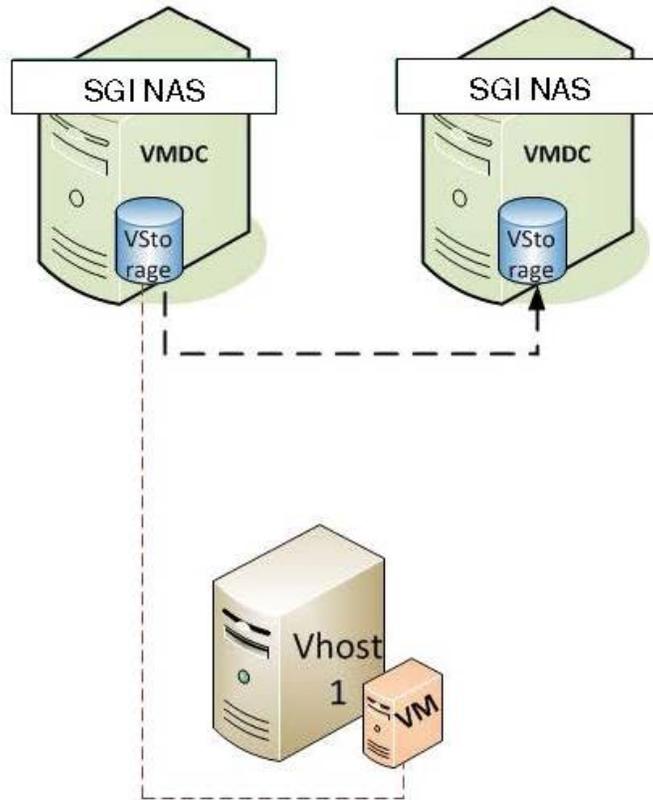


 Note, that there are some limitations for different types of visualization platforms, which may prevent Vmotion/Migration operation to be performed:

- If your virtualization platform is Hyper-V, two hypervisors must be in a cluster.
- If your virtualization platform is Citrix Xen Server, two hypervisors must be in one pool.
- There are no limitations for VMware ESX.

14 Relocating VMs

This section illustrates VM relocation to another appliance. The destination appliance must be ssh-bound. The following diagram represents relocation working principle:



Internally, VMDC uses appliance's auto-sync service to replicate a given VM and subsequently register a copy with the same hypervisor VHost. This is illustrated on the screenshot below:



When VM relocation uses an existing auto-sync service, you can simply disable the latter, if you want it to run only once. All auto-services are periodic. You can create auto-sync from

inside VMDC, just for the purposes of one-time relocation in which case VMDC controls it, or you can reuse an existing one.

Relocation is supported for main virtualization platforms: VMware ESX version 3.5, 4, 4.1, Microsoft Hyper-V R2 and Citrix XenServer version 5.0, 5.5, 5.6.



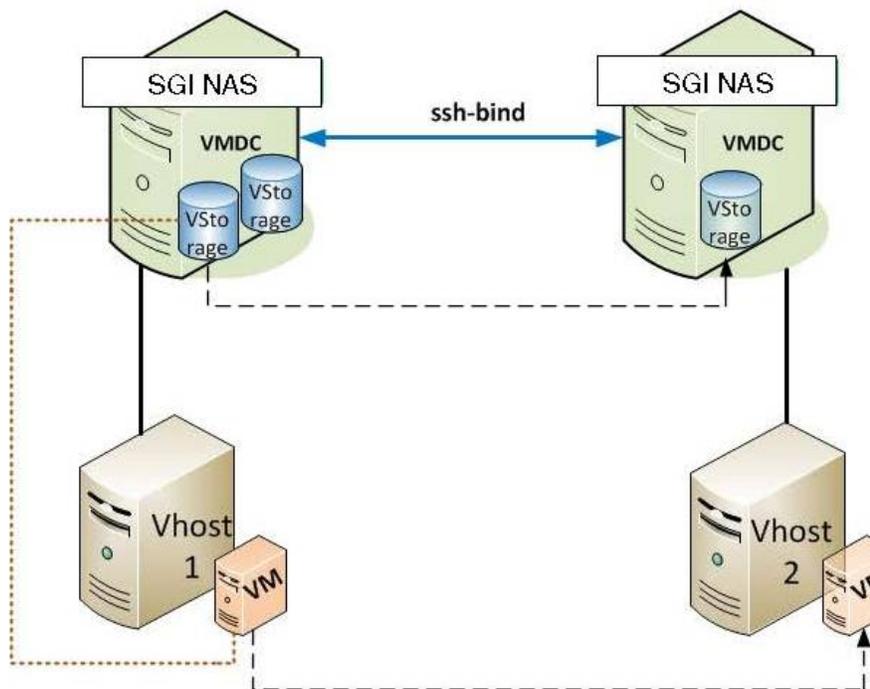
Note!

Relocation can't be performed for VM's running as a Hyper-V cluster service. This limitation is planned to be removed in future releases.

15 Office-to-office replication

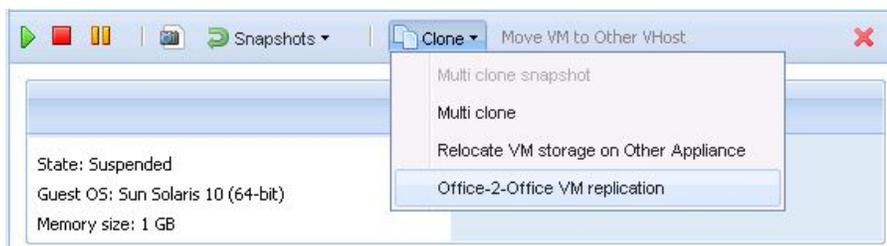
Office-to-office (O2O) replication is an operation, that moves VM from one VHost and VStorage to another VHost and VStorage. VM need to be halted before start of the replication. Office-to-office operation is supported for main virtualization platforms: VMware ESX version 3.5, 4, 4.1, Microsoft Hyper-V R2 and Citrix XenServer version 5.0, 5.5, 5.6.

The following diagram shows principle of the operation:

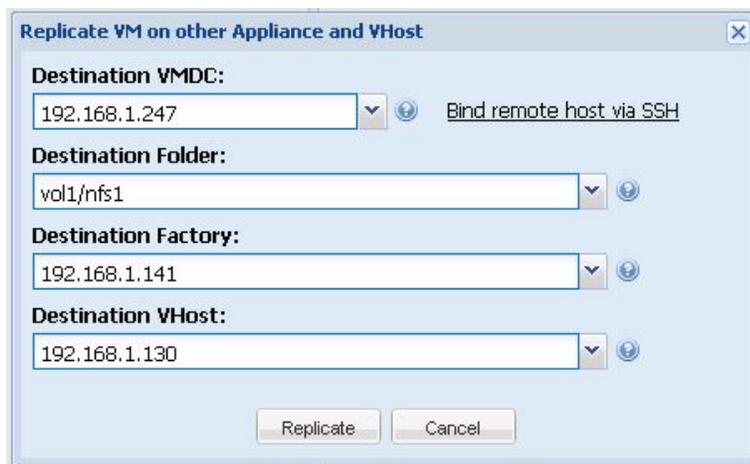


Virtual Machine, that runs on Vhost 1 is moved to Vhost 2 along with VStorage it's stored on is moved to another SGI NAS appliance.

To start O2O replication in NMV click on 'VM Data Center' tab and chose VM, that you want to replicate from the VMDC tree. In the right pane click on 'Clone' and choose 'Office-2-office VM replication'.



In the pop-up window destination ssh-bound SGI NAS appliance, folder, VHost/VCluster address and VHost name are need to be specified.



Note, that for successful office-to-office replication single VM must be stored on the local VStorage (otherwise, the button 'Move VM to other Vhost' is inaccessible):



If there is more than one VM located on VStorage, you receive a warning.

As was already mentioned in this document, it is strongly recommended to store only one VM on one VStorage.

16 Contact information

16.1 Support request

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

The screenshot shows the SGI NAS web interface. The top navigation bar includes links for 'About', 'Support', 'Add Capacity', 'Register', and 'Help'. The main menu has tabs for 'Status', 'Settings', 'Data Management', 'Analytics', 'Namespace Cluster', and 'VM DataCenter'. The 'VM DataCenter' tab is active, showing a 'Console', 'View log', 'Jobs', and 'myhost' dropdown. The main content area is titled 'Send Request' and contains a 'REQUEST FOR TECHNICAL SUPPORT' form. The form includes the following fields and options:

- Company:** Text input field.
- Contact E-Mail:** Text input field with the value 'root@localhost'.
- Category:** Dropdown menu with 'Other' selected. Below it, the text 'General NexentaStor issue -> Other' is visible.
- Subject:** Text input field.
- Verbosity:** Dropdown menu with 'Verbose' selected. Below it, the text 'Includes extended logging and diagnostics.' is visible.
- Comment:** Large text area for entering the support request details.

A 'Send Request' button is located at the bottom of the form. At the bottom of the page, there are links for 'Found a bug?', 'Feature request?', and 'Request Technical Support'.

or type the following NMC command:

```
nmc:/$ support
```

which will then prompt for a subject and message.

16.2 Other resources

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