

Rapid Cloning Utility 2.0

Installation and Administration Guide

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Part number 215-04513_A0
March 2009

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Preface

About this guide

This document describes how to install and run the NetApp® Rapid Cloning Utility.

Audience

This document is for VMware® system administrators who manage large numbers of desktop environments or servers.

Terminology

To understand the concepts in this document, you might need to know the terms defined here.

- ◆ *Controller* or *storage controller* refers to the component of a storage system that runs the Data ONTAP® operating system and controls its disk subsystem. Controllers or storage controllers are also sometimes called *storage appliances*, *appliances*, *storage engines*, *heads*, *CPU modules*, or *controller modules*.

Command, keyboard, and typographic conventions

This document uses command, keyboard, and typographic conventions that help you enter commands.

Keyboard conventions: The following list describes keyboard conventions used in this document:

- ◆ When describing key combinations, this document uses the hyphen (-) to separate individual keys. For example, “Ctrl-D” means pressing the “Control” and “D” keys simultaneously.
- ◆ This document uses the term “Enter” to refer to the key that generates the digital equivalent of a carriage return, although the key is named “Return” on some keyboards.

Typographic conventions: The following table describes typographic conventions used in this document.

Convention	Type of information
<i>Italic font</i>	Words or characters that require special attention. Placeholders for information you must supply. For example, if the guide says to enter the arp -d hostname command, you enter the characters “arp -d” followed by the actual name of the host. Book titles in cross-references.
Monospaced font	Command names, option names, keywords, and daemon names. Information displayed on the system console or other computer monitors. The contents of files.
Bold monospaced font	Words or characters you type. What you type is always shown in lowercase letters, unless you must type it in uppercase letters.

Special messages

This document might contain the following types of messages to alert you to conditions you need to be aware of.

Note

A note contains important information that helps you install or operate the system efficiently.

Attention

An attention notice contains instructions that you must follow to avoid a system crash, loss of data, or damage to the equipment.

Topics in this chapter

This chapter includes the following topics.

- ◆ [“Overview”](#) on page 2
- ◆ [“Prerequisites”](#) on page 3
- ◆ [“Installing the Rapid Cloning Utility”](#) on page 4

Overview

About the Rapid Cloning Utility

Using FlexClone® technology, the NetApp® Rapid Cloning Utility (RCU) allows users to quickly create and deploy VMware® virtual machines (VMs) across new or existing NetApp NFS-based datastores. You can quickly and efficiently create virtual machine clones in VMware Virtual Center, power up virtual machines, and apply customized specifications to the guest operating system. The utility can deploy virtual machines for both server and desktop use.

The Rapid Cloning Utility can theoretically create up to 8,000 virtual machine clones and 32 datastores in a single execution. In practice, however, multiple executions of smaller requests is recommended. The exact size of these requests will depend on the size of the Virtual Infrastructure 3 deployment and the hardware configuration of the vCenter Server managing the ESX hosts.

Prerequisites

This section describes the host system requirements for running the RCU.

Note

For the most up-to-date version information, please see the *Rapid Cloning Utility Release Notes* at <http://now.netapp.com>.

Host system requirements

Host system requirements	
VMware	◆ VMware ESX 3.5 ◆ VMware vCenter Server 2.5 Update 3 or 4 (formerly VMware Virtual Center)
Memory	At least 256 MB free
Data ONTAP® Licenses	◆ FlexClone ◆ NFS
Data ONTAP	7.3.1P2 minimum
Virtual Machine cloning requirements	◆ Source VM must be powered off ◆ Source VM must not have a Raw Device Map (RDM) present

Network requirements

Network requirements	
Network configuration	Minimum of one VMkernel IP address and one NetApp storage system IP address in the same network

Installing the Rapid Cloning Utility

Follow these steps to install the Rapid Cloning Utility:

1. Make sure all prerequisites for the host system are met, as described in “[Prerequisites](#)” on page 3.
2. Download the RCU setup executable `RCU_Setup_2_0_win32.exe` from <http://now.netapp.com>.
3. Save the file to your local file system.
4. Navigate to the folder containing the executable.
5. Double-click the executable and follow the on-screen directions.

Topics in this chapter

This chapter includes the following topics.

- ◆ [“Launching the Rapid Cloning Utility”](#) on page 6
- ◆ [“Cloning Virtual Machines”](#) on page 11
- ◆ [“Importing Virtual Machines in View Server”](#) on page 18
- ◆ [“Destroying Virtual Machines”](#) on page 19
- ◆ [“Troubleshooting”](#) on page 22

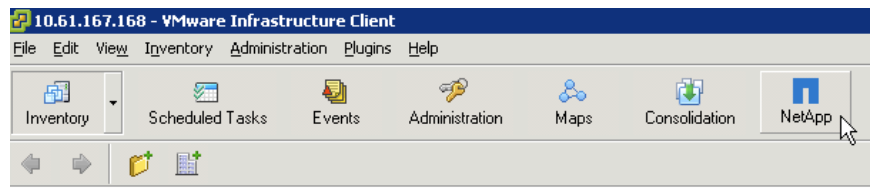
Launching the Rapid Cloning Utility

When you launch the RCU, you must import certificates and identify the NetApp controllers that will be used for cloning tasks.

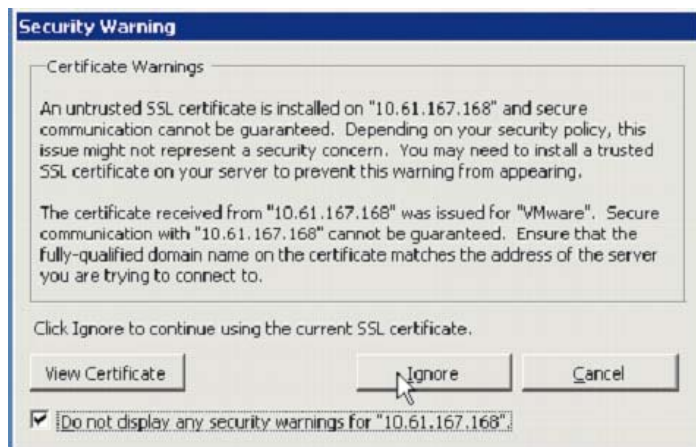
1. Click the NetApp button in the toolbar of VMware Infrastructure Client.

Note

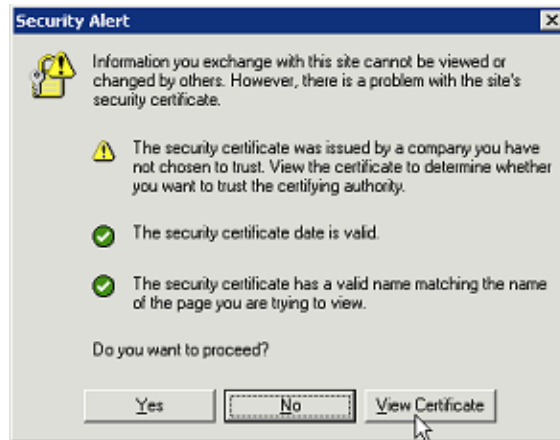
If the NetApp button is not visible, restart the VMware Infrastructure Client.



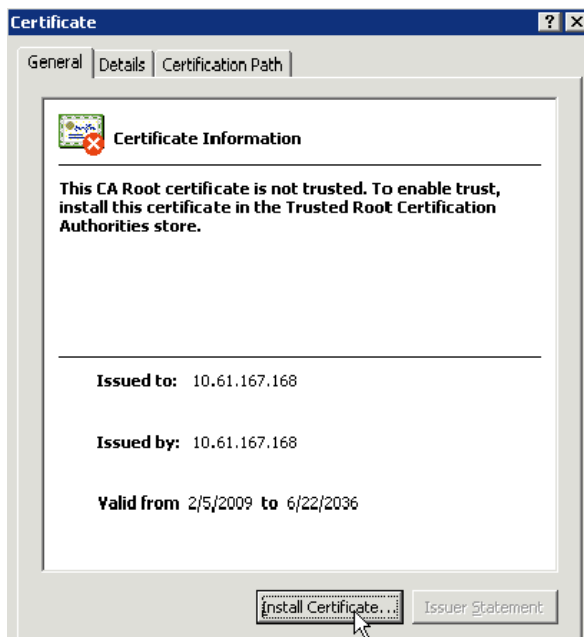
2. RCU uses SSL to encrypt communication to the vCenter Server and the Infrastructure Client. A "self signed" certificate is used in both cases. The first time the Infrastructure Client communicates with the RCU service, a certificate warning appears. To prevent this warning from appearing again, check **Do not display any security warnings...** and click **Ignore**.



3. The first time you click the NetApp button in the VMware Infrastructure Client toolbar, a similar warning displays. To prevent this warning from appearing each time, click **View Certificate**.

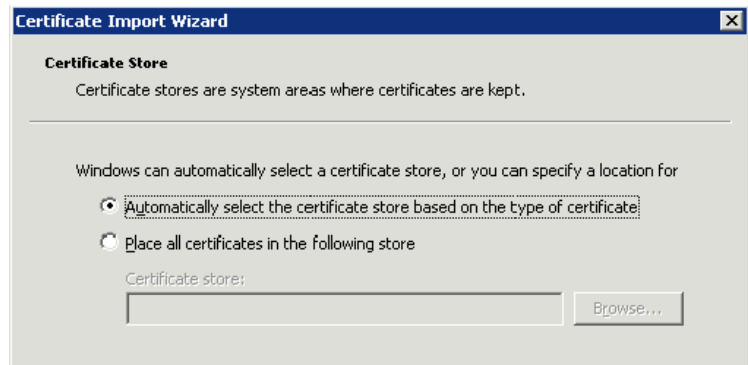


4. Click **Install Certificate...** to launch the Certificate Import Wizard.



5. When the Certificate Import Wizard opens, click **Next**.

6. Accept the default and click **Next**.



7. Click **Finish**.



8. Click **OK**.

9. Click **Install Certificate**.

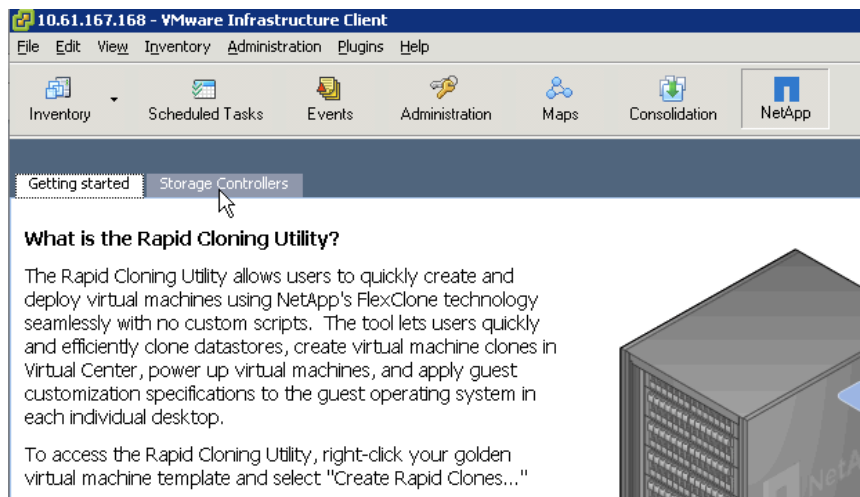


10. Click **Yes** in the Security Alert window.

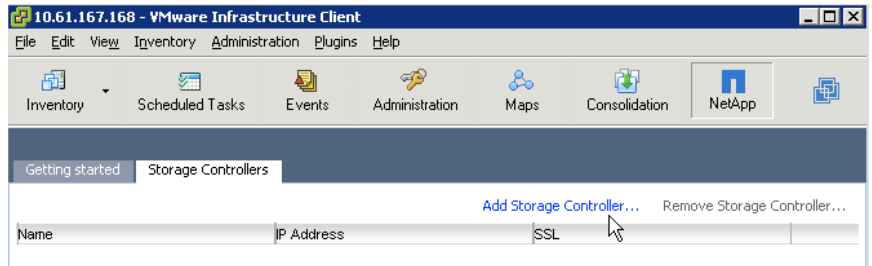
Adding a storage controller

Before creating clones, identify the storage controllers to use for cloning.

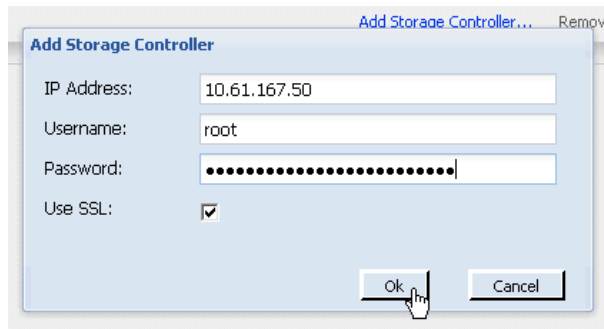
1. Click the **Storage Controllers** tab.



2. Click Add Storage Controller.



3. Enter the NetApp storage controller credentials and click **OK** to verify connectivity. Optionally deselect **Use SSL** if you do not want to encrypt communication between the RCU service and the storage controller.



Cloning Virtual Machines

1. Click the Infrastructure Client **Inventory** button. Right-click a powered-down VM or template to clone, and select **Create NetApp Rapid Clones...**
2. The Create Rapid Clones Wizard launches. Select the storage controller to use for the new clones. The storage controller credentials are provided.

To prevent clone failure due to a lost VI client session, open the Advanced options dialog and enter the password of the current Virtual Center user.

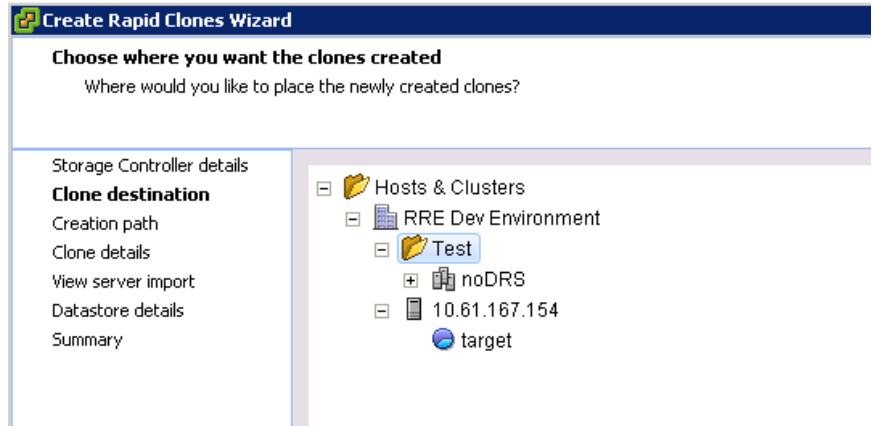
Click **Validate password**, and then click **Next**.

The screenshot shows the 'Create Rapid Clones Wizard' window. The title bar reads 'Create Rapid Clones Wizard'. The main heading is 'Specify the storage controller' with the question 'What is the storage controller you would like to use for the rapid cloning process?'. On the left is a sidebar with 'Storage Controller details' selected, listing 'Clone destination', 'Creation path', 'Clone details', 'View server import', 'Datastore details', and 'Summary'. The main area contains a section for selecting the storage controller with fields for 'Storage Controller:' (a dropdown menu showing 'Imahara-1'), 'Username:' (a text box with 'root'), 'Password:' (an empty text box), and 'Use SSL:' (an unchecked checkbox). Below this is an 'Advanced options' section with a warning: 'If the VI client is closed, the clone operation will fail due to a lost session. To guarantee that the clone operation is successful, provide the Virtual Center password below.' It includes a 'Virtual Center password:' text box and a 'Validate password' button.

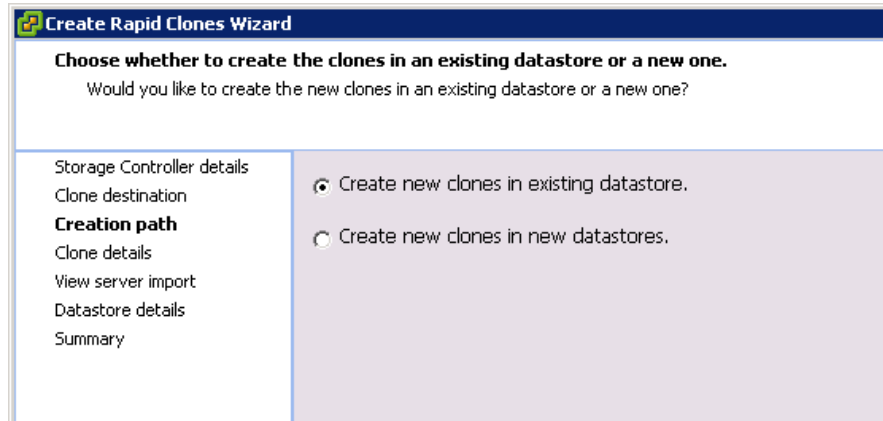
3. Select the destination for the new clones and click **Next**.

Note

When the destination is a datacenter and not a single server, the new clones are distributed across the available servers as quickly as possible. Therefore, new clones might be unevenly distributed, with more clones created on faster servers.



4. Indicate whether the new clones will be created in a new or existing datastore, then click **Next**.



5. Specify the following details for the clone operation, then click **Next**:
- ❖ **Number of clones (per datastore)**- For new datastores, maximum 250. If using existing datastores, maximum depends on available space.
 - ❖ **Datastore** (if using existing datastore) - select from drop-down list
 - ❖ **Number of datastores** (if creating new datastore) - maximum 31
 - ❖ **Clone name** - used as a prefix for each clone

Note

By default, the clone number is placed at the end of the clone name. To force the clone number to a different position in the name, use %CLONE_NUM% where you want the number to appear. For example, *new%CLONE_NUM%clone*.

- ❖ **Starting clone number** - maximum of eight digits
- ❖ **Apply customization specification?** - applies a pre-defined specification to the new VMs. Select from specifications used for the native cloning process.
- ❖ **Power on?** - powers up the clones after creation
- ❖ **Create View Server import file?** Select the checkbox to create an import file for VMware View Server.

The screenshot shows the 'Create Rapid Clones Wizard' window. The title bar reads 'Create Rapid Clones Wizard'. The main heading is 'Specify the details of the clone operation' with a sub-question 'How many clones would you like to create and what would you like to name them?'. On the left is a sidebar with navigation links: 'Storage Controller details', 'Clone destination', 'Creation path', 'Clone details' (which is highlighted), 'View server import', 'Datastore details', and 'Summary'. The main area contains several input fields and checkboxes. 'Clones per datastore' is set to 10, 'Number of datastores' is 1, and 'Total' is 10. 'Clone name' is 'newClone'. 'Starting clone number' is 1. 'Apply customization specification?' is unchecked, and 'Customization specification' is set to 'XP1'. 'Power on?' is unchecked. 'Create View Server import file?' is checked. On the right, 'Sample clone names' are listed in a scrollable box: 'newClone01' through 'newClone10'.

Field	Value
Clones per datastore:	10
Number of datastores:	1
Total:	10
Clone name:	newClone
Starting clone number:	1
Apply customization specification?	☐
Customization specification:	XP1
Power on?	☐
Create View Server import file?	☒

Sample clone names

- newClone01
- newClone02
- newClone03
- newClone04
- newClone05
- newClone06
- newClone07
- newClone08
- newClone09
- newClone10

6. Specify the details for the optional VMware View Server import file. Click **Validate credentials** and then click **Next**.

Note

See “[Importing Virtual Machines in View Server](#)” on page 18 for details on importing this file into VMware View Server.

- ❖ **Desktop type:** Choose **Individual desktops** to create new individual desktops. Select **Manual desktop pool** for a pool of virtual machines that are manually constructed by the View Manager administrator.
- ❖ **Access mode:** For manual desktop pools, **Persistent** access gives users connection to the same desktop for every session. **Non-persistent** access allocates desktops dynamically.

Note

For details on desktop types and access modes, refer to the *View Manager Administration Guide* at http://www.vmware.com/pdf/viewmanager3_admin_guide.pdf.

Create Rapid Clones Wizard

Select if you would like to create a View server import file
Would you like to create an import file for VMWare View Server?

Storage Controller details
Clone destination
Creation path
Clone details
View server import
Datastore details
Summary

View Server hostname or IP Address: view-server

Fully qualified domain name: rtp.testdomain.com

Domain username: administrator

Domain password:

Desktop type: ☒ Individual desktops ☐ Manual desktop pool

Access mode: ☒ Persistent ☐ Non-persistent

Desktop pool type: ☒ New pool ☐ Existing pool

Desktop pool name:

Validate credentials

7. If you requested a new datastore, enter specifications for the new datastore, then click **Next**.

The RCU balances new datastores across available IP addresses.

- ❖ **Size** - Maximum datastore size depends on the controller and space available. For details, see the *Data ONTAP Storage Management Guide* for your Data ONTAP release.
- ❖ **Thin provision** - Capacity is not reserved for an individual datastore. This treats the aggregate as a shared resource pool, where capacity is only consumed as each datastore requires it. By eliminating unused but provisioned areas of storage, more storage space is presented than is actually available. The expectation is that every datastore will not utilize all of its provisioned storage at the same time.

NOTE: Thin provisioning sets space reserve to none, and disables space checks. Therefore, cloning can fail if your size request uses too much of the aggregate.

The screenshot shows a window titled "Create Rapid Clones Wizard" with a dark blue header. Below the header, the main area is titled "Specify the details for the new datastores" with a subtitle "What is the size of the new datastores, the name, and the aggregate to create them in?". On the left, a vertical sidebar lists the steps: "Storage Controller details", "Clone destination", "Creation path", "Clone details", "View server import", "Datastore details" (which is highlighted in bold), and "Summary". The main content area is titled "Specify the size, name, and aggregate of the new datastore(s)." and contains four input fields: "Size (GB):" with the value "12.669", "Datastore name:" with the value "newDataStore", "Aggregate :" with a dropdown menu showing "aggr1", and "Thin provision:" with an unchecked checkbox.

Step	Size (GB)	Datastore name	Aggregate	Thin provision
Storage Controller details				
Clone destination				
Creation path				
Clone details				
View server import				
Datastore details	12.669	newDataStore	aggr1	☐
Summary				

8. Review the summary page and click **Apply** to proceed. To return to previous pages and modify settings, click **Back**.

Create Rapid Clones Wizard

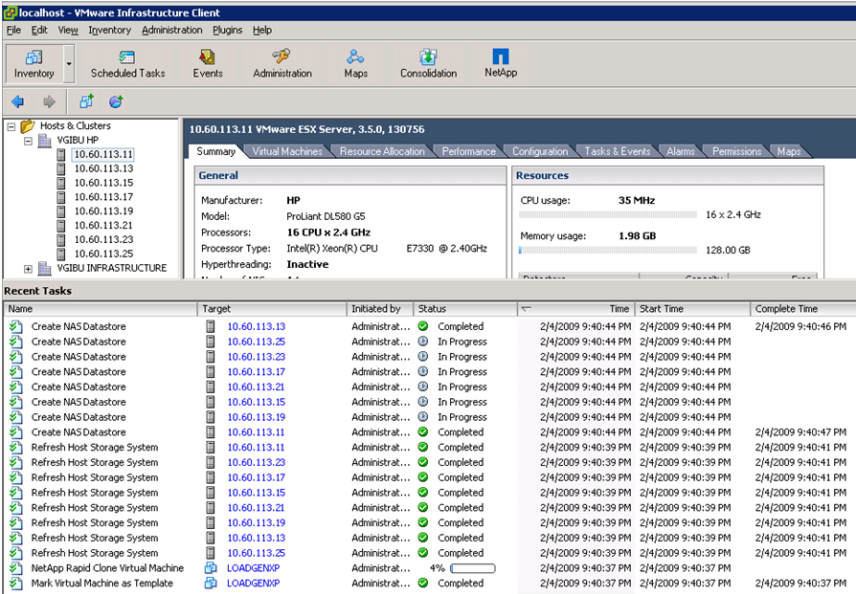
Ready to complete the rapid clone creation
Are these the settings you want to use?

Storage Controller details
Clone destination
Creation path
Clone details
View server import
Datastore details
Summary

Review the summary below. Click 'Apply' to apply the configuration changes.

Template name:	localTemplate
Number of clones:	10
Clone name:	newClone
Starting clone number:	1
Customization specification:	XP1
Power on:	Yes
Clone destination :	10.61.167.136
Storage Controller:	Imahara-1
Number of datastores:	1
Datastore name:	newDataStore
Size (GB):	12,669
Aggregate :	aggr1
Thin provision:	No
Create import file:	No

9. The **Recent Tasks** pane of VMware Infrastructure Client is populated as clone creation proceeds.



Log of new VMs

A list of new VMs is written to a csv file in the `<install directory>\exports` directory. The filename is in the following format:

◆ `import_generic_date_time.csv`

Importing Virtual Machines in View Server

To create a View Server import file, select the **Create View Server import file** checkbox in the Clone Details page of the Create Rapid Clones Wizard.

When you create a View Server import file, an ldf file is written to the directory `<install directory>\exports`.

To import the file into View Server, perform the following from the View Server system:

1. Open the ADAM Tools command prompt, using Start > Programs > ADAM.
2. Run the following command from the ADAM Tools command prompt:

```
ldifde -i -f <import file name> -s 127.0.0.1 -z
```

Note

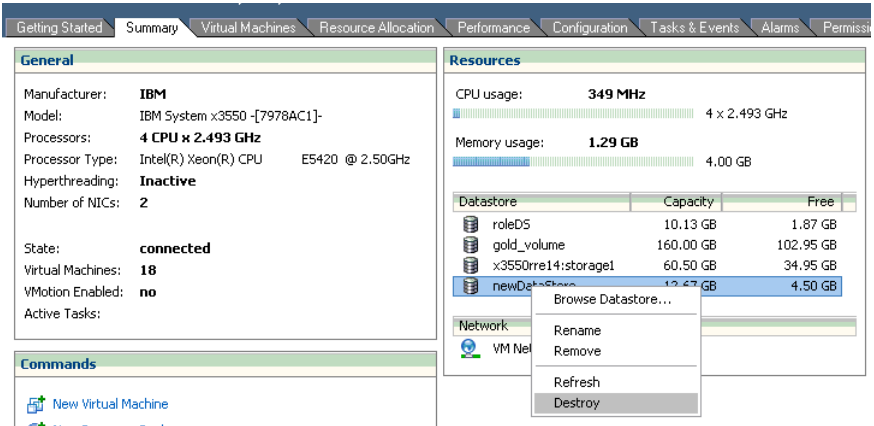
For details on imports and exports, refer to *VMware Virtual Desktop Manager Configuration Data Export and Import* at http://www.vmware.com/pdf/vdm_config_data_export_import.pdf.

Destroying Virtual Machines

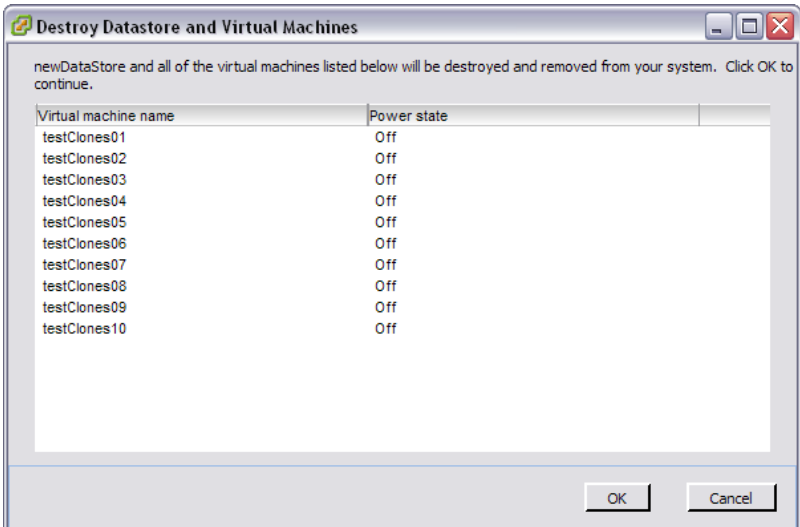
The RCU can quickly destroy all virtual machines in a datastore, detach the datastore from the VMware Infrastructure Client environment, and free the space on the storage controller. These actions permanently destroy all VMs, datastores, snapshots and FlexVolumes.

To destroy a group of VMs:

- 1. Right-click the datastore and select **Destroy**.



- 2. Click **OK** to confirm the action.



Multiple datastore note

When a request is made to create more than one new datastore, the RCU first creates a *golden volume* on the controller. The datastores that are then attached to vCenter Server will be FlexClones of the golden volume. Because the FlexClones share the storage with the golden volume, this space is not wasted. When the last datastore (FlexClone) of a golden volume is destroyed as described above, the golden volume is destroyed as well. This gives you complete control over each individual datastore.

NFS exports on new volumes

The RCU discovers all VMkernel IP addresses and cross-references them with the available IP addresses on the NetApp controller. The export for each new volume is limited to the IP address of the VMkernels that are in the same network.

The following options are set on the new volumes:

- ◆ `sis enable`
- ◆ `no_snap` is set to on
- ◆ `no_atime_update` is set to on
- ◆ `minra` is set to on
- ◆ `snapreserve` is set to 0 (zero)
- ◆ `qtree security` is set to unix

Troubleshooting

This section describes the logs and files created by the Rapid Cloning Utility, and also provides troubleshooting information.

Logs

The RCU creates logs in the following location.

- ◆ `<install_directory>/logs/rcu.log`
- ◆ `<install_directory>/logs/rcuSupport.xml`

The log files include RCU version, build number, and build date. Each log file is rotated at a size of 8192KB. Up to nine log files are retained.

List of VMs created

The RCU creates a time-stamped csv file with information about the new VMs. The file is written to the following location in the following filename format:

- ◆ `<install_directory>/exports/import_generic_date_time.csv`

For example: `import_generic_2009_03_06_11_04.csv`

The file includes the following information for each VM:

- ◆ VM Name
- ◆ UUID, VMX Path
- ◆ Number of CPUs
- ◆ Memory in MB
- ◆ Guest Full Name
- ◆ Guest Alternate Name
- ◆ Datastore Name

The file also includes the following information for up to ten NICs:

- ◆ NIC x
- ◆ NIC x Network Label
- ◆ NIC x Address Type
- ◆ Manual - Statically assigned MAC address.
- ◆ Generated - Automatically generated MAC address.
- ◆ Assigned - MAC address assigned by VirtualCenter.
- ◆ NIC x WOL Enabled
- ◆ Wake-on-LAN enabled or disabled on this virtual network adapter
- ◆ NIC x MAC Address

NetApp button not visible in VMware Infrastructure Client

Problem: After installing the RCU, the NetApp button is not visible in VMware Infrastructure Client toolbar.

What to do: Restart VMware Infrastructure Client. If this does not resolve the problem, the RCU service may not be running. Go to the list of services on the system and restart the RCU service if it is not running.

VMs are not created

Problem: During storage system takeover or giveback, virtual machine clone creation fails because the RCU cannot communicate with the NetApp storage controller.

What to do: Restart the RCU when the takeover or giveback process is complete.

Utility does not recognize some datastores

Problem: The RCU does not seem to recognize some datastores even though they are on the controller.

What to do: The use of `-actual` is not supported in exports. The following example will not be seen as a valid NetApp-based datastore:

```
/vmware_infrastructure      -actual=/vol/sata_vmware_infrastructure,  
sec=sys,rw,root=192.168.235:10.192.168.235.9
```

VMs remain after destroying them via the datastore Destroy option

Problem: After running Destroy on a datastore, some of the VMs still appear in the inventory tree. Attempting to remove them results in the following error message:

The request refers to an object that no longer exists or has never existed.

What to do: Restart the VI Client.

Warning: aggr does not have sufficient space for the operation

Problem: This warning can appear when specifying the size of a new datastore.

What to do: Cancel the RCU. Increase the space in the aggregate to accommodate the cloning operation, then rerun the RCU.

**Unable to continue.
No IP address
found...**

Problem: RCU task may end in error, accompanied by the following log entry:

Unable to continue. No ip addresses found when cross-referencing
kernel ip addresses and addresses on the controller.

Unable to find a matching network to NFS mount volume to these
hosts.

What to do: Make sure that at least one VMkernel IP address and one NetApp
storage system IP address are in the same network.

**error: The selected
virtual machine is
powered on**

Problem: This message appears after selecting “Create NetApp Rapid Clone”
for a Virtual Machine that is powered on. VMs must be powered off during
cloning.

What to do: Cancel the RCU, power off the VM, and restart the RCU.

**RCU uses multiple
IPs on storage
system**

Problem: Any matching network between the storage system and the ESX
VMKernel will be used to mount datastores.

What to do: To prevent a network from being used to mount datastores, use the
setting `default.restrict.mount.networks` in the preferences file. This file is
stored in the following location:

```
<install directory>/rcuPreferences.xml
```

The example below tells the RCU to ignore the 192.168.2.0 and 10.1.0.0
networks when determining the storage system IP address to be used for the next
datastore.

```
<entry key="default.restrict.mount.networks"  
value="192.168.2.0;10.1.0.0"/>
```

**Connectivity to
storage controller is
lost**

Problem: If the connection is broken, the current task (destroy or clone) will
fail.

What to do: Resolve the communication issue. No additional steps need to be
taken in the application. RCU creates new a connection for each new task.

This Appendix presents the storage system permissions required by the Rapid Cloning Utility.

A role and group must be created or modified as described below. Then a user must be created or modified to include this group. Finally, when the storage system is added to the Rapid Cloning Utility, the user just created or modified should be used.

Clone vmdk files

The following permissions are required to use File Level FlexClone (flfc) to clone vmdk files in the same datastore while creating VMs.

```
api-system-get-version,login-http-admin,api-system-get-  
info,api-system-cli,  
api-license-list-info,cli-ifconfig,api-aggr-list-  
info,api-volume-list-info,  
api-ems-autosupport-log,api-file-get-file-info,api-file-  
create-directory,  
api-file-read-file,api-clone-start,api-clone-list-  
status,api-file-delete-file,  
api-file-write-file,cli-mv,api-file-delete-  
directory,cli-ndmpd,cli-ndmpcopy
```

Example configuration:

```
useradmin role add rcuRole1a -a api-system-get-version,login-  
http-admin,api-system-get-info,api-system-cli,api-license-list-  
info,cli-ifconfig,api-aggr-list-info,api-volume-list-info,api-  
ems-autosupport-log,api-file-get-file-info  
useradmin role add rcuRole1b -a api-file-create-directory,api-  
file-read-file,api-clone-start,api-clone-list-status,api-file-  
delete-file,api-file-write-file,cli-mv,api-file-delete-  
directory,cli-ndmpd,cli-ndmpcopy  
useradmin group add rcuUseCase1_group -r rcuRole1a,rcuRole1b  
useradmin user add rcuUseCase1 -g rcuUseCase1_group
```

Create volume and mount datastore

The following access is required to create volumes and mount a datastore while creating VMs (includes previous rights).

```
api-system-get-version,login-http-admin,api-system-get-  
info,api-system-cli,  
api-license-list-info,cli-ifconfig,api-aggr-list-info,api-  
volume-list-info,  
api-ems-autosupport-log,api-file-get-file-info,api-file-create-  
directory,  
api-file-read-file,api-clone-start,api-clone-list-status,api-  
file-delete-file,  
api-file-write-file,cli-mv,api-file-delete-directory,cli-  
ndmpd,cli-ndmpcopy,  
api-volume-create,api-volume-set-option,api-sis-enable,api-sis-  
start,  
api-snapshot-set-reserve,api-nfs-exportfs-list-rules-2,  
api-nfs-exportfs-modify-rule-2,api-nfs-exportfs-load-  
exports,cli-qtree
```

Example configuration (builds on previous case):

```
useradmin role add rcuRole2 -a api-volume-create,api-volume-  
set-option,api-sis-enable,api-sis-start,api-snapshot-set-  
reserve,api-nfs-exportfs-list-rules-2,api-nfs-exportfs-modify-  
rule-2,api-nfs-exportfs-load-exports,cli-qtree  
useradmin group add rcuUseCase2_group -r  
rcuRole1a,rcuRole1b,rcuRole2  
useradmin user add rcuUseCase2 -g rcuUseCase2_group
```

Destroy datastore

The following access is required to destroy a datastore (volume/flexclone) (includes previous rights).

```
api-system-get-version,login-http-admin,api-system-get-  
info,api-system-cli,  
api-license-list-info,cli-ifconfig,api-aggr-list-info,api-  
volume-list-info,  
api-ems-autosupport-log,api-file-get-file-info,api-file-create-  
directory,  
api-file-read-file,api-clone-start,api-clone-list-status,api-  
file-delete-file,  
api-file-write-file,cli-mv,api-file-delete-directory,cli-  
ndmpd,cli-ndmpcopy,
```

```
api-volume-create,api-volume-set-option,api-sis-enable,api-sis-  
start,  
api-snapshot-set-reserve,api-nfs-exportfs-list-rules-2,  
api-nfs-exportfs-modify-rule-2,api-nfs-exportfs-load-  
exports,cli-qtree,  
api-volume-offline,api-volume-destroy
```

Example configuration (builds on previous case):

```
useradmin role add rcuRoleD -a api-volume-offline,api-volume-  
destroy  
useradmin group add rcuUseCase4_group -r  
rcuRole1a,rcuRole1b,rcuRole2,rcuRoleD  
useradmin user add rcuUseCase4 -g rcuUseCase4_group
```

