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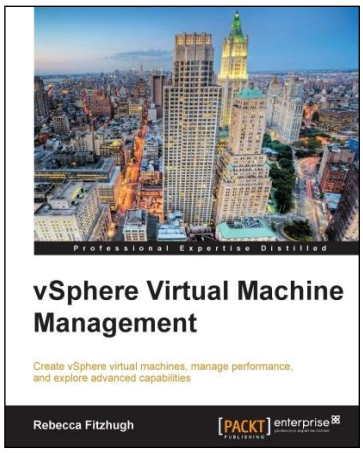
vSphere Virtual Machine Management

Rebecca Fitzhugh



Chapter No. 5

"Managing Multitiered Applications with vApps"

In this package, you will find:

A Biography of the author of the book

A preview chapter from the book, Chapter NO.5 "Managing Multitiered Applications with vApps"

A synopsis of the book's content

Information on where to buy this book

About the Author

Rebecca Fitzhugh is an independent VMware Consultant and VMware Certified Instructor (VCI). Her focus is on designing and delivering solutions as an infrastructure architect as well as delivering various authorized VMware courses. Prior to becoming a consultant and instructor, she served for five years in the United States Marine Corps, where she assisted in the buildout and administration of multiple enterprise networks residing on virtual infrastructure.

Rebecca currently holds multiple IT industry certifications, including VMware Certified Advanced Professional (VCAP) in Data Center Design (DCD), Data Center Administration (DCA), and Cloud Infrastructure Administration (CIA). You can follow her on Twitter (`@RebeccaFitzhugh`) or contact her using LinkedIn (`www.linkedin.com/in/rmfitzhugh/`).

First and foremost, I would like to thank my sister, Robyn, and my brother, Joe. There are not enough words in this world to express how deeply grateful I am for you. I also want to thank my hilarious and brilliant niece and nephew, Katalyna and Kellan, for inspiring me each and every day. To all my friends around the world who have supported me and encouraged me: I'm so glad that there are people like you in my life with whom I can share my adventures.

A big thanks to the editors, technical editors, and reviewers who went through my writing. This book was written across three continents, much of it while sitting in the planes and airports. Jet lag is not conducive to writing coherent sentences; so, I truly appreciate your patience as I worked on trying to get my thoughts written down.

vSphere Virtual Machine Management

Ever since VMware was founded in 1998, it has been creating stable x86 virtualization platforms that allow multiple guest operating systems and applications to run on a single physical server. VMware has truly revolutionized how a datacenter is managed. By consolidating and running more workloads on fewer servers, the datacenter requirements are reduced including space, power, cooling, and cabling. Using virtualization also transforms the way servers are provisioned; virtual machines are deployed within a few minutes rather than the much longer process of deploying physical servers. There's hardly any need to mention that there are many advanced features that improve the availability and continuity of virtual machines.

This book aims at assisting vSphere administrators, new and experienced, to improve their knowledge of virtual machine configuration and administration. This is not meant to replace any vSphere administration or installation guides but merely to supplement them.

What This Book Covers

Chapter 1, *Virtual Machine Concepts*, covers the fundamental ideas of virtual machines as well as understanding the components that VMs are comprised of.

Chapter 2, *Creating a Virtual Machine Using the Wizard*, explains the step-by-step process of how to create a virtual machine using the wizard in the vSphere Client and vSphere Web Client.

Chapter 3, *Other Ways to Provision a Virtual Machine*, covers how to build a template and provision VMs from template, by cloning, or from physical machines using VMware vCenter Converter. Also, guest OS customizations are covered so that potential IP conflicts, hostname conflicts, and duplicate SIDs are avoided.

Chapter 4, *Advanced Virtual Machine Settings*, discusses a few advanced settings, how to make the configurations, and how these configurations will affect the virtual machine's functionality and performance.

Chapter 5, *Managing Multitiered Applications with vApps*, discovers why a vApp is the perfect container for a multitiered application. Also, included herein are instructions on how to create, configure, and manage VMware vSphere vApps.

Chapter 6, *Virtual Machine Performance and Resource Allocation*, explores different settings that may improve a virtual machine's performance, if needed. Also, discussed in the chapter are resource allocation settings that affect the amount of resources given to a virtual machine and how virtual machines compete in contention.

Chapter 7, *Monitoring Virtual Machines*, discusses how an administrator can monitor a virtual machine using esxtop and performance graphs.

Chapter 8, *Migrating Virtual Machines*, explains how to migrate a virtual machine using vMotion and Storage vMotion, if the need arises, as well as how to configure these features.

Chapter 9, *Balancing Resource Utilization and Availability*, gives a general understanding of how to configure and use vSphere Distributed Resource Scheduler (DRS), Storage DRS, and High Availability.

Chapter 10, *Virtual Machine Design*, focuses on how the administrator should move forward in the creation and deployment of virtual machines taking everything discussed into consideration.

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Managing Multitiered Applications with vApps

This chapter discovers the power of vSphere vApps. vApps offer amazing functionality and portability that will be desired within your VMware infrastructure. vApps are containers used for holding one or more virtual machines and can be configured as resource pools. Shares, limits, and reservations can be set at the vApp level to dictate how the virtual machines will receive CPU and memory resources. vApps can not only be used as resource pools, but can also be used to share some functionalities with virtual machines. These functionalities include the ability to clone as well as start up and shut down the virtual machines in a specific order. You previously learned how to import an OVF template; this chapter will show you how to export a vApp into an OVF template for distribution.

In this chapter, you will learn:

- How to create a vApp
- vApp options
- Populating a vApp
- Configuring startup and shutdown options

What is a vApp?

A vApp is a container, similar to a resource pool, but with some virtual machine-like functionalities. vSphere is used as a platform for running applications and virtual machines. vApps can be used to package and manage these applications so that they are able to run directly on top of vSphere. Many vendors use vApps as a way to package their applications for quick deployment. For example, VMware has made vCenter Operations Manager available in a vApp format. If you use or administer VMware vCloud Director, then you may be familiar with vApps. Keep in mind that vSphere vApps are slightly different from those available in vCloud.

Since a vApp is a resource pool with extra functionality, it's recommended that resource pools and virtual machines not be made sibling objects within a hierarchy because, by default, resource pools are assigned shares that may not appropriately compare to those assigned to a virtual machine, which can potentially cause performance issues.

vApps offer a multitude of benefits, including:

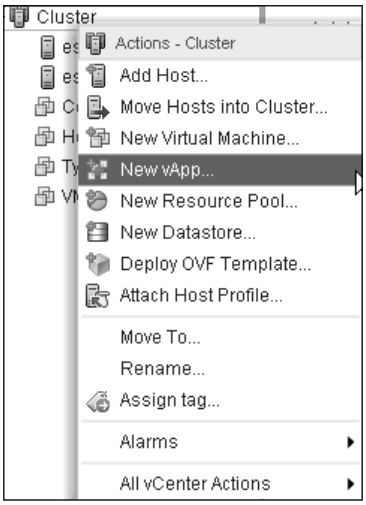
- Container for one or more virtual machines
- Resource controls (shares, limits, and reservations) for the VMs within the container
- Portability; everything is encapsulated and can be moved to a different virtual infrastructure
- Network information
- Can be started, stopped, or suspended
- Virtual machine startup and shutdown order

Be aware that the vApp metadata is located in the vCenter Server's database so that the virtual machine in a vApp can be distributed across multiple ESXi hosts. This metadata information could be lost if the vCenter Server database is ever cleared or if the vApp is residing on a standalone ESXi host that is removed from the vCenter Server inventory. Back up the vApps to an OVF package to avoid losing any metadata.

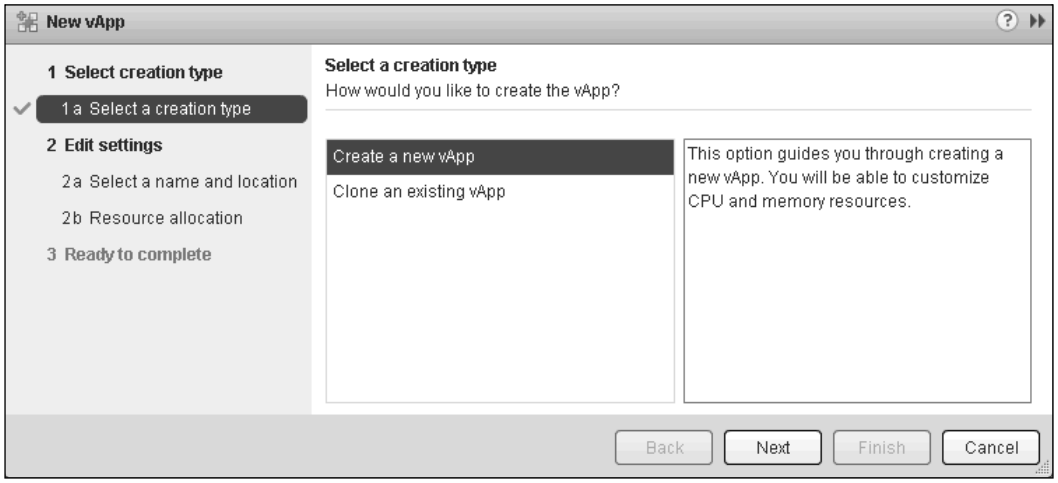
The distribution format for a vApp is **OVF** (**Open Virtualization Format**).

Creating a vApp

vApps can be created in folders, on standalone ESXi hosts, within resource pools, other vApps, or in DRS-enabled clusters. To create a vApp, navigate to one of these objects, right-click, and select **New vApp...**. This will launch the **New vApp** wizard.

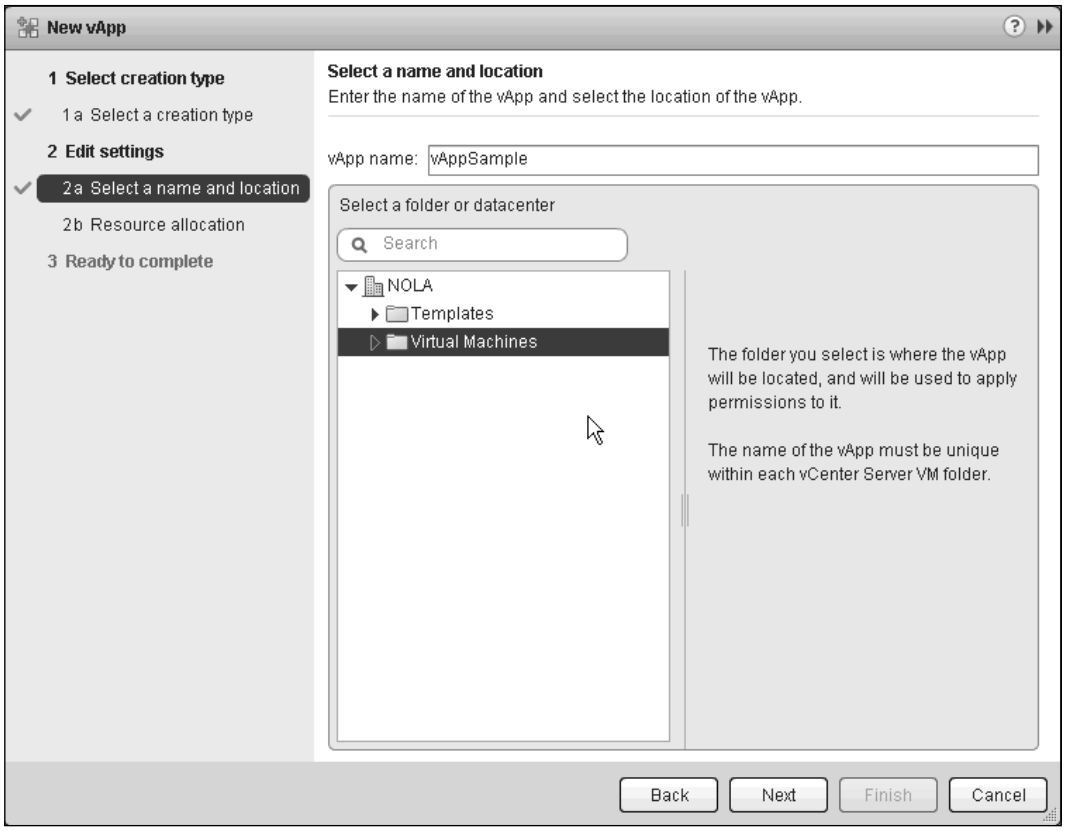


Once the **New vApp** wizard is launched, select **Create a new vApp** to begin the process of creating a vApp from scratch, as shown in the following screenshot:



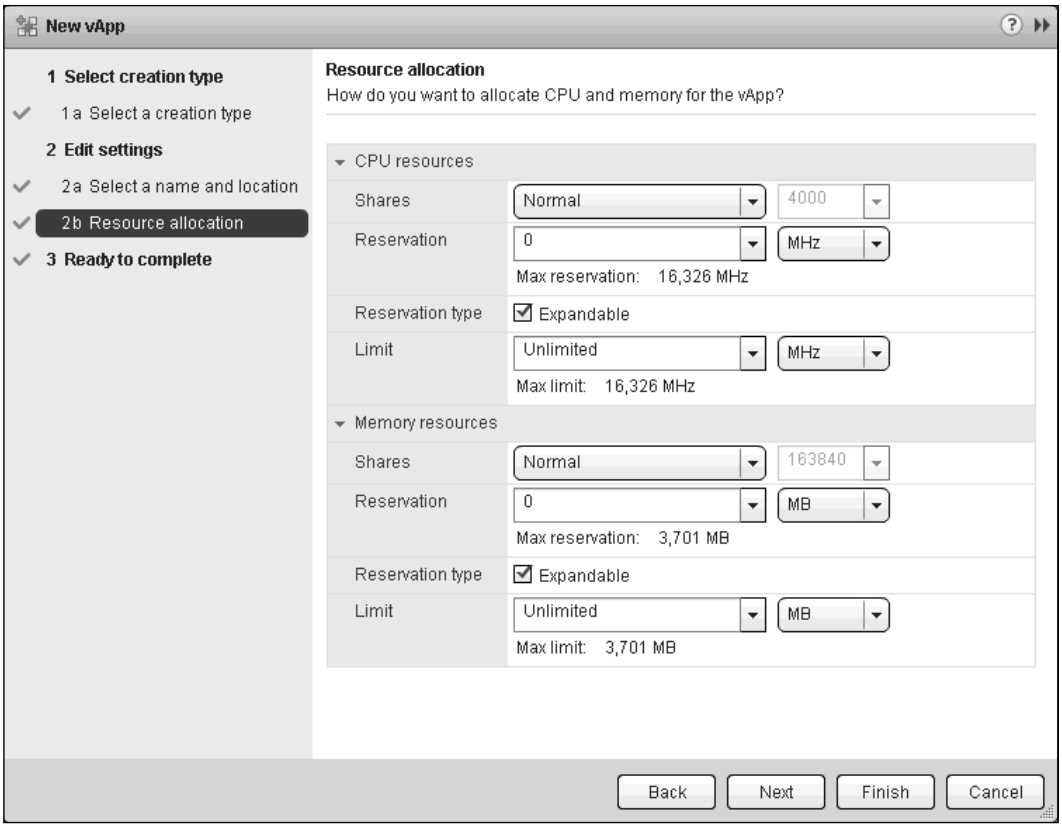
Click on **Next** after making the selection.

The **Select a name and location** pane allows for the specification of the vApp's name. Make sure to name the vApp appropriately since this will be containing a specific multitiered application. Choose a folder to place the vApp in the **Virtual Machines** and **Templates** inventory views in vCenter.



After selecting the correct folder in the **Virtual Machines** and **Templates** views, click on **Next**.

On the **Resource allocation** pane, you are able to apportion memory and CPU resources to the new vApp by using reservations, shares, and limits.



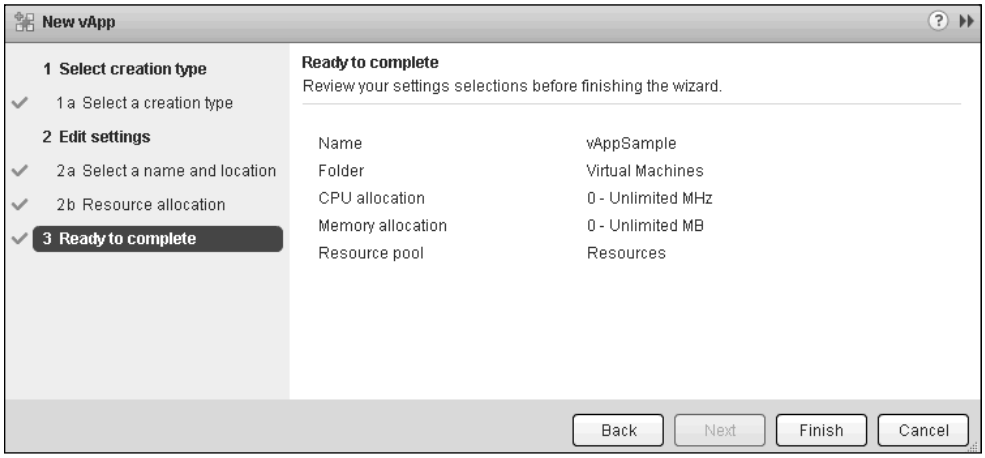
Consult the following table for assistance in making these selections. Click on **Next** after making the selections.

Option	Description
Shares	The value that specifies the relative priority or importance of this vApp's access to a given resource with respect to the parent's total resources. Sibling vApps share resources according to this value. Select **Low**, **Normal**, or **High**; this specifies share values in a 1:2:4 ratio, respectively. Select **Custom** to assign a vApp a specific proportional weight if the default ratio doesn't fit.
Reservation	Guaranteed amount of resource for this vApp. Must be available for the vApp to power on.
Reservation type	If the **Expandable** checkbox is selected, this will make the reservation expandable. This means that if the combined reservations of the virtual machines exceed the reservation of the vApp, the vApp can use resources from its parent resource pools to meet the demand.

Option	Description
Limit	Consumption of resources cannot exceed this value. Select **Unlimited** to specify no upper limit.

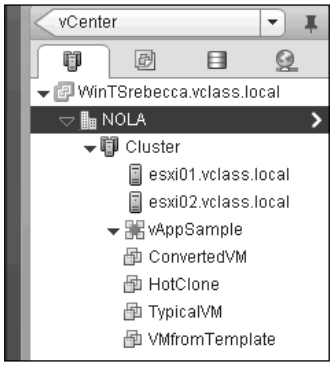
These concepts will be explored in more detail in *Chapter 6, Virtual Machine Performance and Resource Allocation*.

Check all the settings in the **Ready to complete** pane. Go back and change anything if needed.



Click on **Finish** when you are done with the vApp settings.

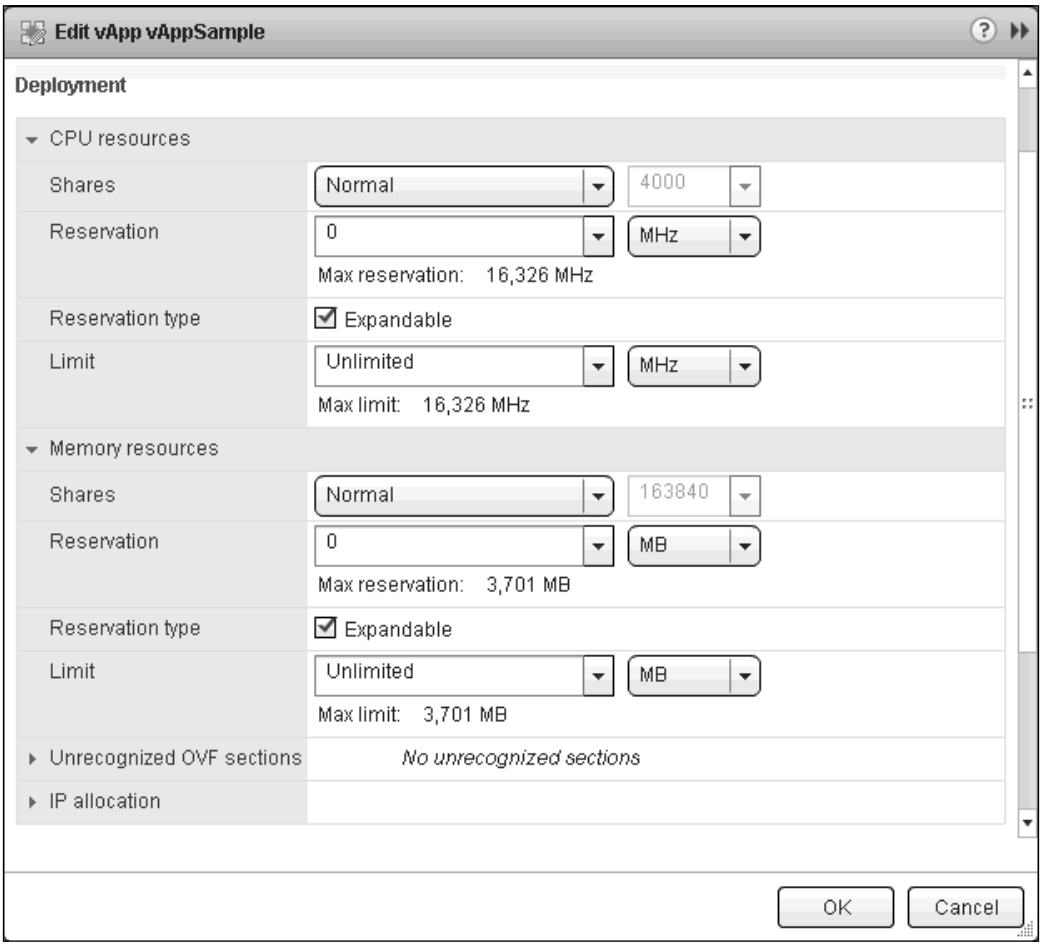
You will now see the vApp that you created in the vCenter Server inventory. To populate this vApp, select an existing virtual machine that isn't already contained in the vApp and drag the object to the target vApp.



New virtual machines and child vApps may also be created under a vApp.

vApp options

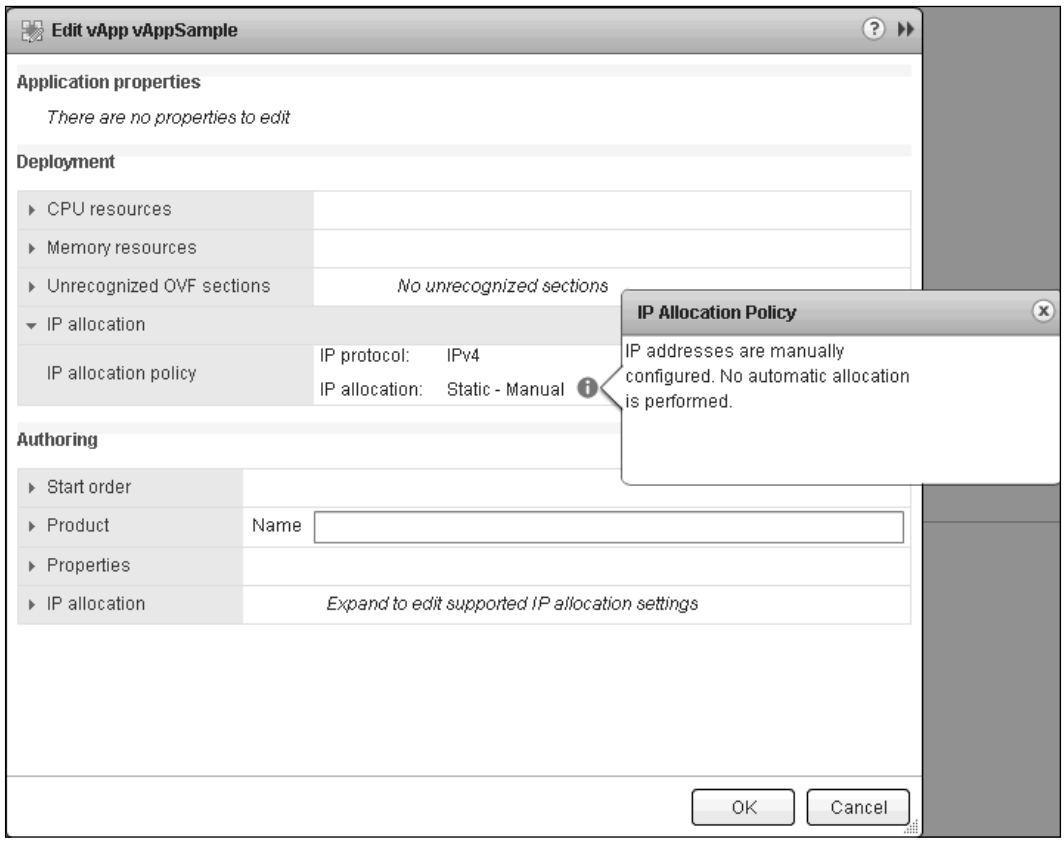
Once the vApp has been created, there are many settings than can be edited as required. To edit the vApp's configuration, right-click on the vApp in the vCenter Server inventory and select **Edit settings**. The **CPU resources** and **Memory resources** sections originally allocated can be adjusted as needed, as shown in the following screenshot:



The CPU- and memory-related options can be adjusted at any time after creation. The resource options displayed in the preceding screenshot are the same options that are available when using a resource pool. A vApp is a resource pool with additional features.

IP addressing policies

A setting that everyone should be familiar with is the **IP allocation policy** option. This modifies how IP addresses can be allocated to the virtual machines for the vApp if IP pools are in use. The following screenshot displays that the vApp is using the **Static - Manual** option; there are however multiple options to choose from.



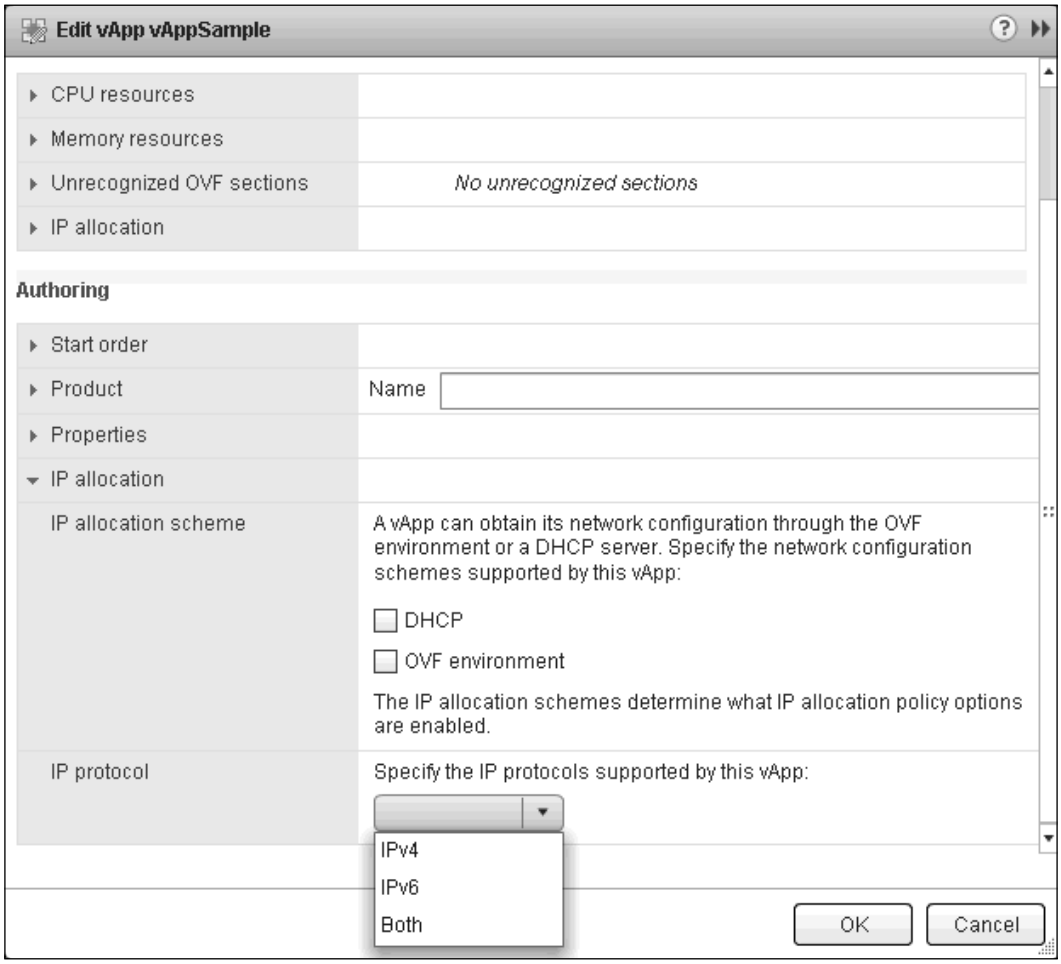
The following options are available for the **IP allocation policy** for a vApp:

- **Static - Manual**: In this option, no automatic allocation is performed; the IP addresses are manually configured.
- **Static - IP Pool**: In this option, the IP addresses are allocated automatically at power-on from a vCenter Server managed IP network range. These IP addresses will remain assigned even at power-off.
- **Transient**: In this option, the IP addresses are allocated automatically from a vCenter Server managed IP network range at power-on. These IP addresses are released when the virtual machines are powered off.
- **DHCP**: In this option, the IP addresses are allocated by using a DHCP server. The leases must be periodically renewed.

If you plan on using the vApp's **IP allocation policy** options, keep in mind that there are a few more steps for this to function properly. An IP Pool must be created at the datacenter level for use by the **Static-IP Pool**, **Transient**, and **DHCP** options. Check the *Add a Network Protocol Profile* section under VMware's *vSphere Virtual Machine Administration* guide for more information on how to create this pool. The documentation can be found at `https://www.vmware.com/support/pubs/vsphere-esxi-vcenter-server-pubs.html`. The virtual machines within the vApp must also be configured to accept IP addresses; check `http://kb.vmware.com/kb/1031476` for more information.

Select the desired IP allocation policy that best fits the needs of your virtual machines residing in the vApp.

Using the **IP allocation scheme** will determine which IP allocation policy options are enabled. If the **OVF environment** option is selected, then this will allow the IP allocation policy to be determined by the OVF environment. The IP addresses are allocated using DHCP when the virtual machines are powered on if the **DHCP** option is selected.



Choose the appropriate vApp-supported IP protocol, either **IPv4**, **IPv6**, or **Both**.

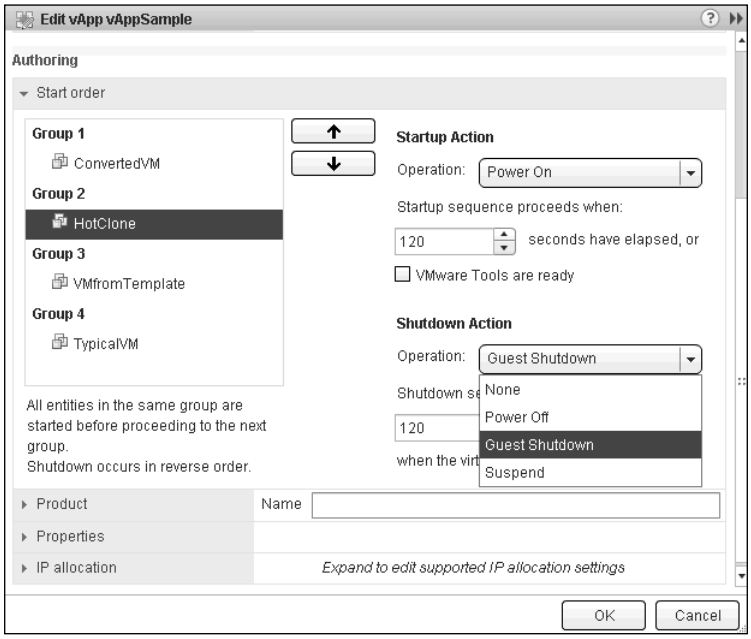
Virtual machine startup/shutdown order

One great feature of vApps is that you can specifically set the order in which virtual machines (and nested vApps) within a vApp start up and shut down. Choose which order to power on by assigning the virtual machines to groups. You can also specify that a virtual machine should wait a specific amount of seconds before powering on or powering off the next virtual machine in the vApp. A different time interval can be placed between each group. Another option is to select **VMware Tools are ready**; choosing this will allow for the virtual machines to wait until the VMware Tools have started and ready on one virtual machine before powering on the next. This way, if you have set the interval to 600 seconds, if the virtual machine is powered on, and if the VMware Tools initialize in 75 seconds, then the next virtual machine will go ahead and power on, and not wait until the entire interval has elapsed.

The **Shutdown Action** operation works similarly, except that you can modify the operation to either conduct **Guest Shutdown**, **Power Off**, or **Suspend** on the virtual machines.

All of these **Start order** settings are contained inside the vApp and are portable when the vApp is transferred.

Though these settings are contained within the vApp and are portable, keep in mind that High Availability does not follow the startup order configured in the vApp in case of an HA event.



Once the virtual machine's start order has been configured, press **OK**.

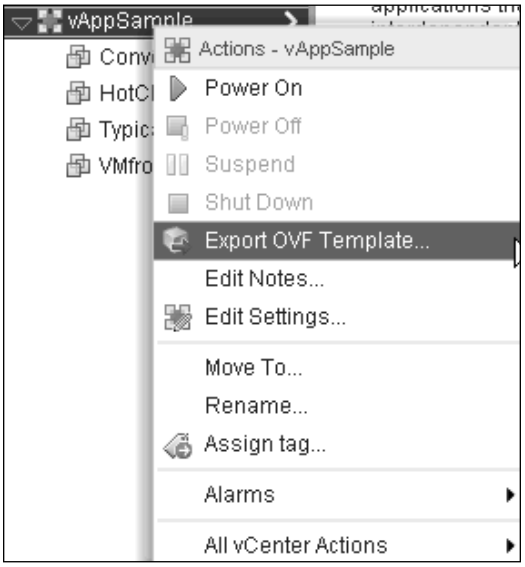
For more information regarding startup and shutdown actions, check `http://kb.vmware.com/kb/2012036`.

Also, you can find out more information regarding vApp properties by checking the *vSphere Virtual Machine Administration* guide documentation.

Exporting a vApp

Once this vApp has been deployed, the virtual machines are placed within, and the vApp policies are configured, you can export this vApp as an OVF template. It is greatly beneficial if this multitiered application is to be deployed multiple times or deployed between virtual infrastructures. Create and configure this as a template for all deployments of this application.

To export this vApp, right-click on the desired vApp and select the **Export OVF Template...** option, as shown in the following screenshot:

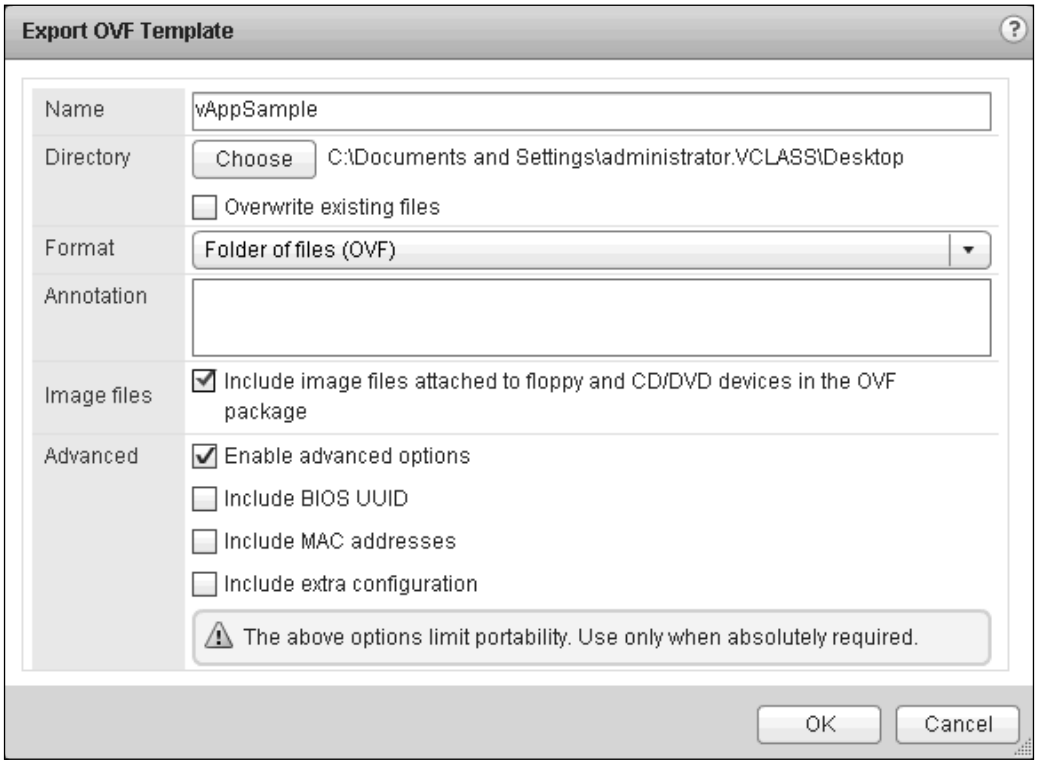


Selecting this option will bring up a menu to complete the export operation.

Enter a value for the **Name** field of the OVF template, and click on the **Choose** button to select the directory that the vApp should be exported to. You can choose whether this should be exported as an OVF or OVA file. The **Annotation** box provides a place to enter any notes as needed.

Selecting **Folder of files (OVF)** will store the OVF template (`.ovf`, `.vmdk`, and so on) as a set of files. It is optimal if it is planned whether this OVF will be published on an image library or on a web server.

Selecting **Single file (OVA)** will package the OVF template into a single `.ova` file, which is convenient if planning to move around using a USB device.

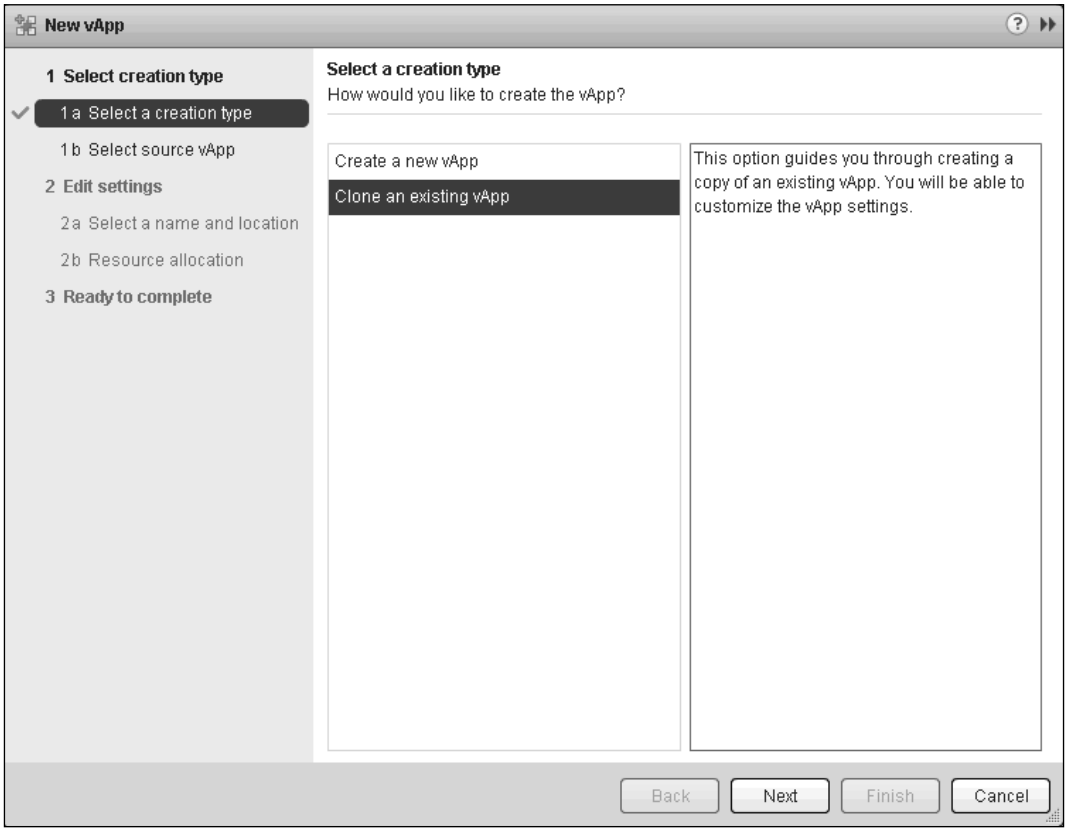


Select the **Enable advanced options** checkbox if it is desired to include other information, such as BIOS UUID, MAC addresses, and any extra configuration, in the exported template. By default, the **Enable advanced options** checkbox is not selected in order to make the vApp more portable by not including information specific to the included virtual machines. If you want to export an exact copy of this vApp to include things like the MAC addresses, select the appropriate options. Be aware that importing this vApp into the same environment that it was exported from can result in issues of duplicate UUIDs and MAC addresses.

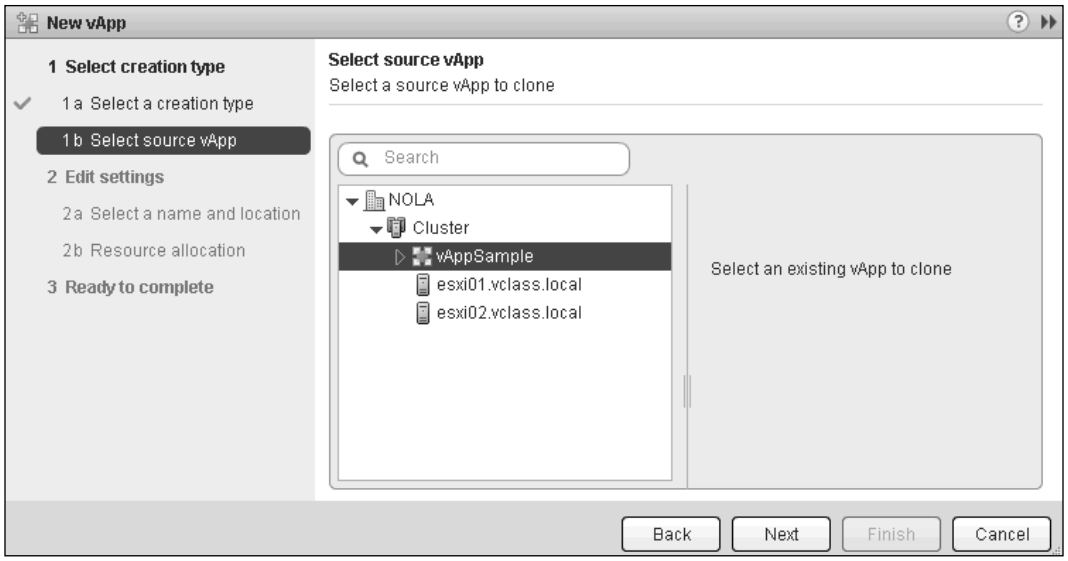
Cloning a vApp

Another benefit of the vApp's virtual machine-like functionality is being able to clone a vApp. This is advantageous when you want to duplicate the vApp setup in a test or development environment in order to do something like test or update a new patch. But be aware that you cannot use guest customization specifications, so duplicate names, SIDS, and IP addresses can occur.

To clone a vApp, right-click on an inventory object that can contain a vApp and select **New vApp...**. Once the **New vApp** wizard is launched, select the **Clone an existing vApp** option, as shown in the following screenshot:

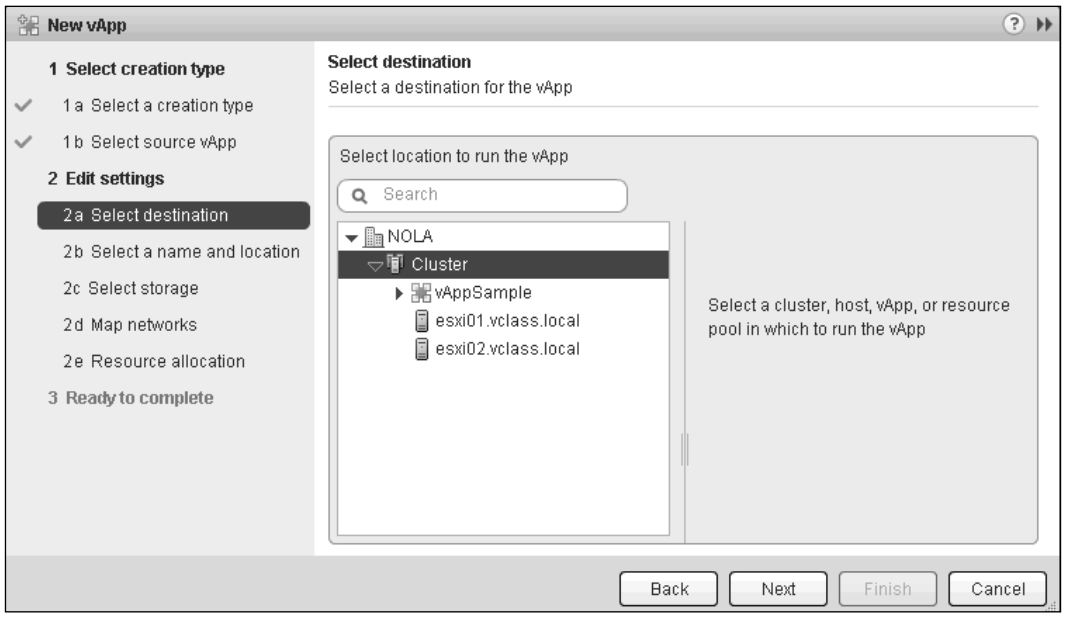


On the next pane, select the source vApp that you would like to clone:



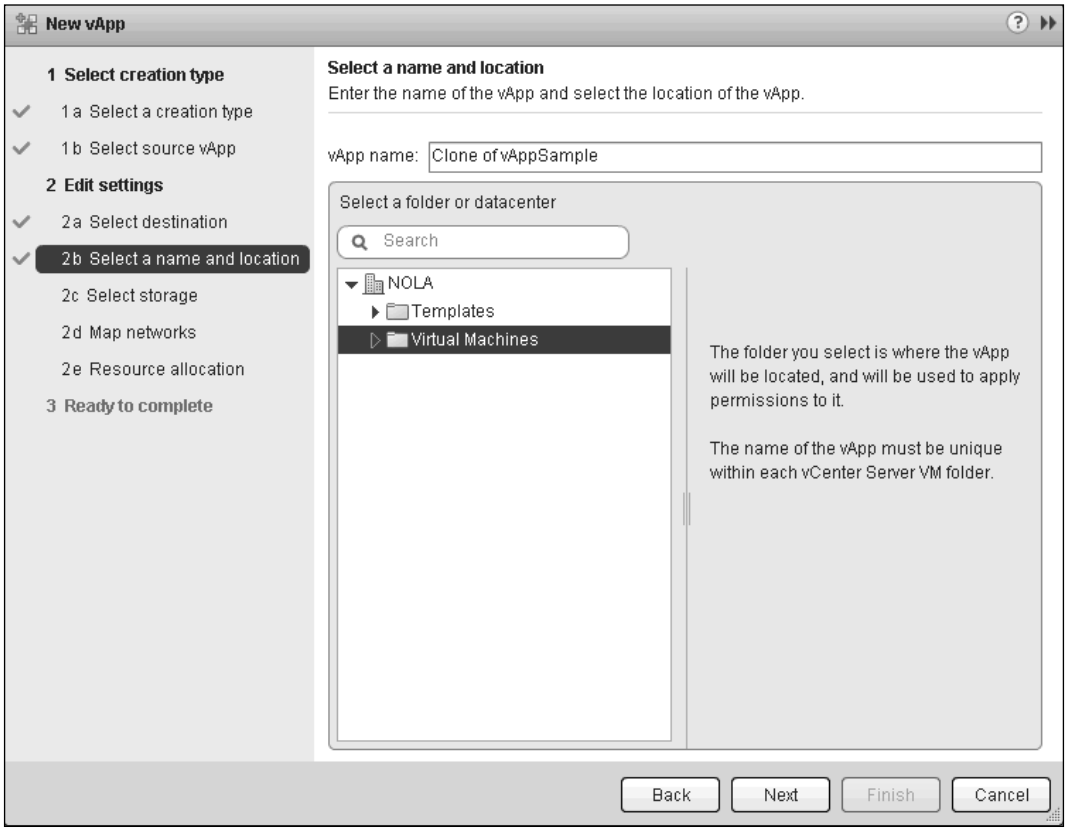
Once the vApp has been selected, click on **Next**.

The **Select destination** pane allows the choice of which object the cloned vApp should be placed under in the Hosts and Clusters inventory view in vCenter.



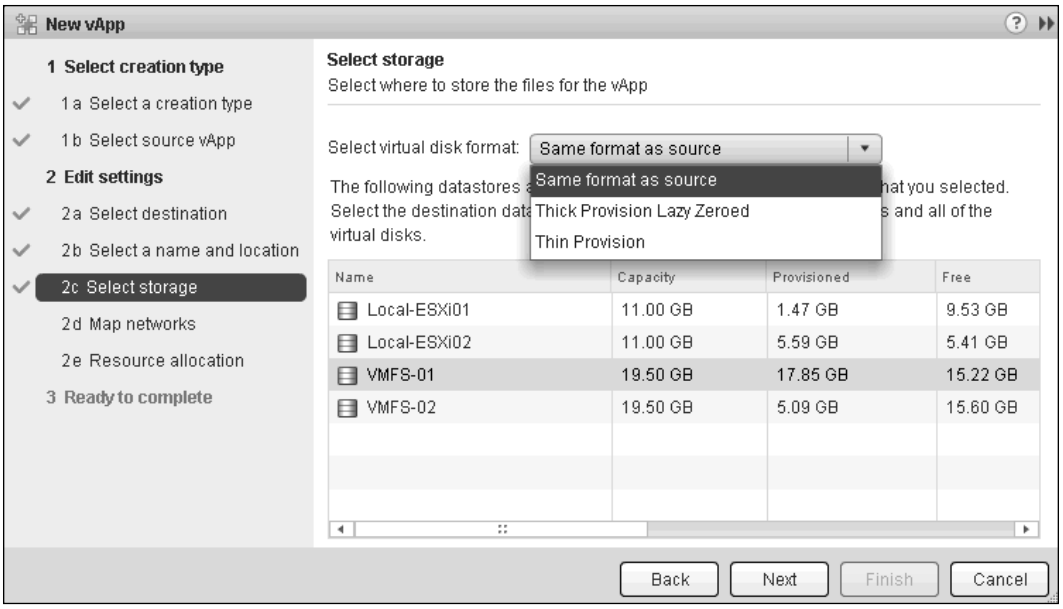
Click on **Next** after making this selection.

Next is the **Select a name and location** pane, which allows for the new vApp to be named. Choose which folder in the VM and Template inventory view the vApp should be placed under.



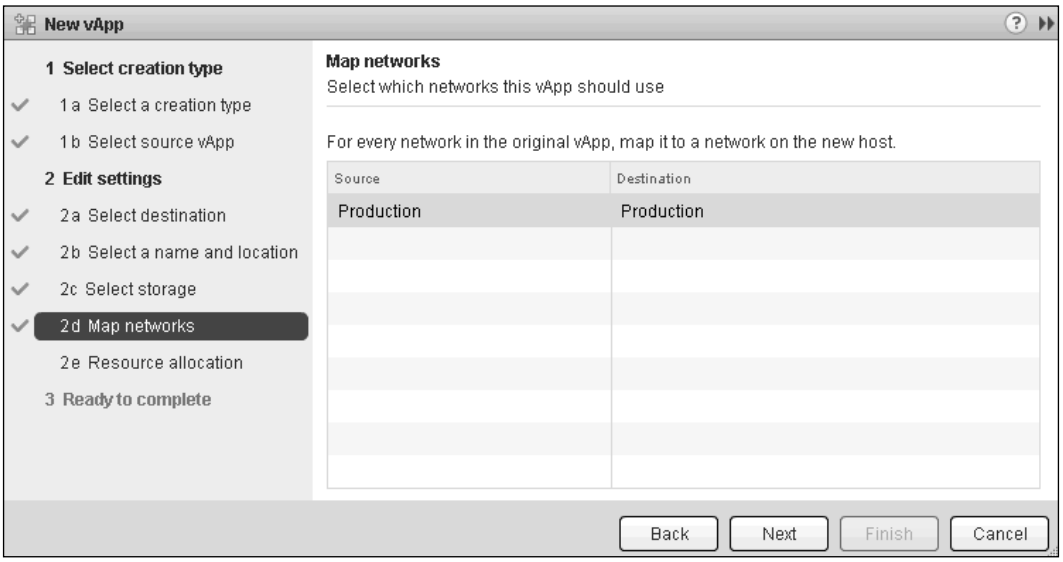
Click on **Next** after making selections.

The next pane will allow you to specify which datastore the new virtual machine files should be placed on. Using the **Select virtual disk format** option will allow the destination vApp's virtual machine to be provisioned differently from the source vApp.



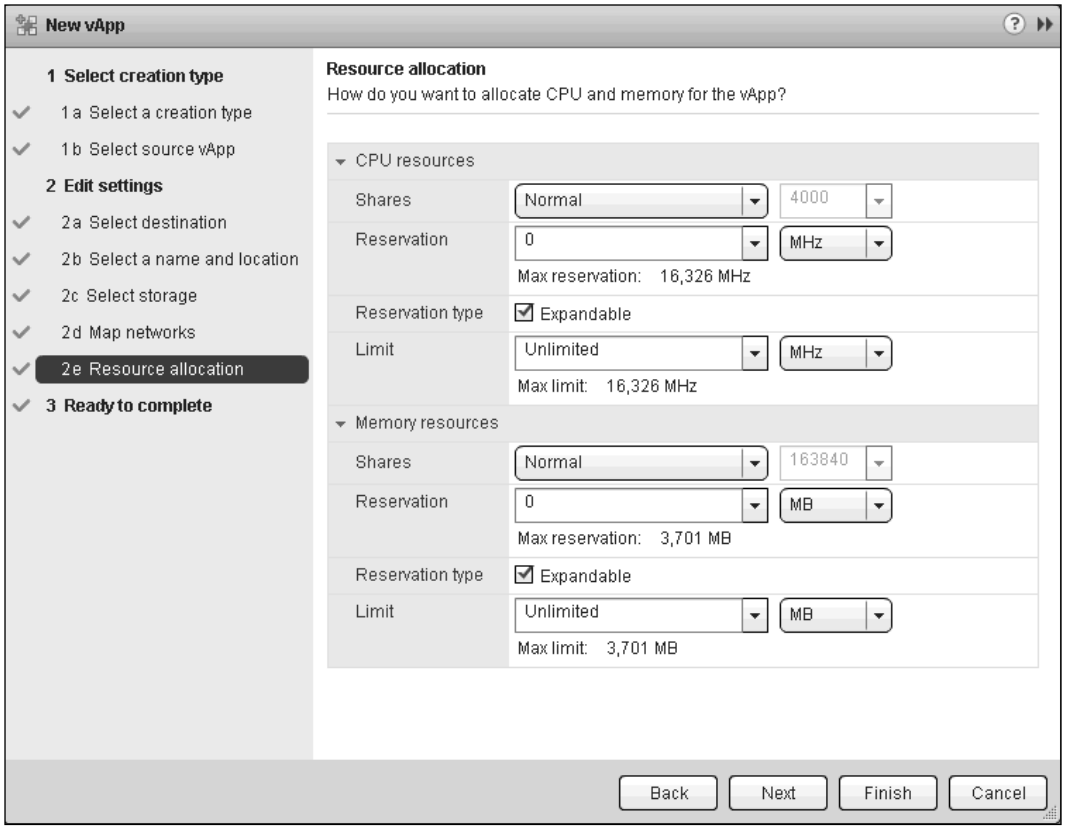
Click on **Next**.

The **Map networks** pane allows for the selection of which network the virtual machines in the cloned vApp should be connected to.



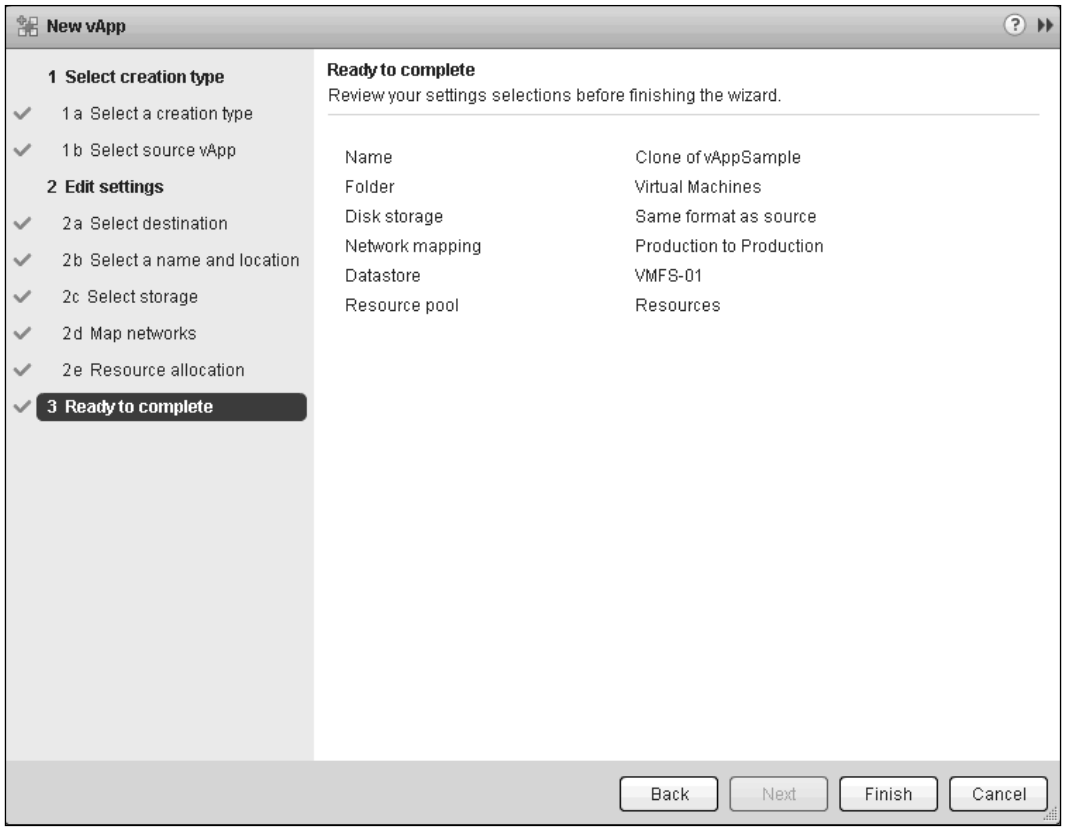
After selecting the vApp network, click on **Next**.

The final pane before review allows for the reconfiguration of resource allocations. Adjust the **Shares**, **Reservation**, and **Limit** fields as needed so that the destination vApp is configured according to desired expectations.



Click on **Next** after adjusting resource allocations.

Review all vApp settings to ensure that the destination vApp will be deployed as desired. Go back and change any setting if needed.



Click on **Finish** upon reviewing the settings.

Summary

A vApp is a container, acting like a resource pool, but with some extra virtual machine-like functionality. The resource pool functionality includes resource allocation settings, such as shares, reservations, and limits, which can be configured for a vApp and a resource pool. Another great benefit of using vApps is that a specific virtual machine startup and shutdown order can be defined. The vApps can be cloned and exported for portability. vApps can be used to package and manage these multitiered applications so that they are able to run directly on top of vSphere. Many vendors are using vApps to allow for applications to be deployed more easily.

The next chapter will discuss virtual machine performance and resource allocation.

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