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vSphere 6 Foundations Exam

VMware Certified Professional 6 (Exam #2V0-620)

BILL FERGUSON

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vSphere 6 Foundations Exam Official Cert Guide (Exam #2V0-620)

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VMware® Certified Professional 6

Bill Ferguson

vmware® PRESS

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Contents at a Glance

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About the Author

Bill Ferguson, VCI 3, 4, 5, 6; VCP6-DCV, VCP6-NV; CCSI; and MCT Alumni has been in the computer industry for more than 20 years. Originally in technical sales and IT consulting with Sprint, he made his transition to Certified Technical Trainer in 1997 with ExecuTrain. He now runs his own company, Parallel Connections, as an independent contractor and consultant based in Birmingham, Alabama, working worldwide for most of the national training companies and some regional training companies. In addition, he has written and produced many technical training videos and books. Bill's aspiration is as follows: "My job is to understand the material so well that I can make it easier for others to learn than it was for me to learn. Toward that end, I strive to provide an effective learning environment whether in person, in print, or online."

Dedications

I am dedicating this book to my father, who told me when I was still in high school to learn as much about computers as I could. He convinced me to take a Lotus 1-2-3 class and later an A+ class! Thanks, Dad!

I am also dedicating this to my mother, who has always given me the encouragement and guidance to accomplish difficult tasks. She continues to be an inspiration to me, even at my age! Thanks, Mom!

Finally, I am dedicating this book to my wife, who supports me through the "busy writing weekends" and the late nights that come with taking on a project of this size! Thanks, Wilma, I love you!

Acknowledgments

First, I want to thank Mary Beth Ray for giving me the opportunity to write this important book. It's fun and rewarding to be able to continue the "legacy" that we started with the first two books: *The Official VCP5 Certification Guide*, which was the very first Pearson/VMware Press book, and the follow-up book, *Official Cert Guide for VCP5-DCV*, which provided updates for vSphere 5.5.

I also want to thank John Davidson and Dave Davis for their spot-on technical editing of the book. Because of them, I learned a few things myself while writing this book. In addition, the flow and consistency of the book are the result of efforts by Chris Cleveland, who kept me on target with his skilled developmental editing. I would also like to give another special thanks to Dave Davis at VMware, whose firsthand knowledge of the latest products and features in vSphere provided me with the most up-to-date information possible. His review of this book makes it a true VMware/Pearson collaboration. It takes a lot of people to create a book, and I am sure that I do not know all the names of the people who were involved in this one, but thank you.

Finally, I want to acknowledge the encouragement and prayers of my family and friends and the students in my technical classes and Sunday school classes. In Him, all things are possible!

We Want to Hear from You!

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

We welcome your comments. You can email or write us directly to let us know what you did or didn't like about this book—as well as what we can do to make our books better.

Please note that we cannot help you with technical problems related to the topic of this book.

When you write, please be sure to include this book's title and author as well as your name, email address, and phone number. We will carefully review your comments and share them with the author and editors who worked on the book.

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About This Book

Welcome to my *vSphere 6 Foundations Exam Official Cert Guide*. I'm excited about sharing this information with you to help you prepare to take and pass the vSphere 6 Foundations (2V0-620) exam. My original *VCP5-DCV Official Certification Guide*, for the VCP510 test, and the follow-up book, *Official Cert Guide for VCP5-DCV*, for the VCP550 test, have helped many people pass those tests. However, because there have been many changes to the vSphere product over the past four years, I decided to update the book to reflect the new information that you need to know for real life as well as for the new vSphere 6 Foundations test.

I've been a technical trainer/consultant for more than 20 years, and I've taught thousands of students. Because I teach many of my VMware classes online now, I sometimes tell people that "I teach people I can't see to use computers that don't exist in a physical sense." This book is just an extension of that theme.

Because the test blueprint on VMware's website, vmware.com/certification, is your best guide for success on the test, I decided, as before, to write this book as directly to the blueprint as possible. This means that we will jump into topics that might seem to be out of place if this is your first look at virtualization. This leads me to my first assumption, which is that this is not your first look at virtualization. The reason I assume this is that you are preparing to take a test that is of a highly technical nature, so it should seem reasonable to assume that you have had prior knowledge and experience with VMware products, either in the workplace or in technical classes like the ones that I teach. It is with this assumption that I can follow the blueprint as it is written, but I will take into account areas where I think there is a need to backfill information so that you can fully understand the topic that I am discussing.

My second assumption is that you have access to a vSphere 6.0 environment or can build yourself a system on which you can practice what we will discuss so that you will retain it better. We all learn in different ways, but I've found that many in the IT world learn by doing even more than by hearing. Because this is the case, and because it fits well with the blueprint, there will be many times throughout this book when I walk you through the steps. Therefore, it would be best for you to have a system with at least vCenter 6.0 and a couple of ESXi 6.0 hosts installed that you can use to follow along. You could even do this using Workstation 11 and all virtual machines.

As to what you need to learn and remember, my third assumption is that you don't want to know everything there is to know about "all things VMware"—just what is important in your situation and what might be on the test. Based on that

assumption, I will try my best not to throw in a lot of additional material that makes you wonder whether you need to know it as well. I will not repeat "this would be good to know for the test" throughout this book because that would get monotonous; however, if it is in this book, you can assume that it is fair game for the vSphere 6 Foundations test.

Finally, my last assumption is that you don't really care how much I know, but what you really care about is whether I can help you learn what you need to know. Toward that end, I will use examples, stories, and analogies to help you understand highly technical topics in a more comfortable manner than you might have experienced before in a technical book. The way I see it, my job is to know this material so well that I can make it easier for you to learn than it was for me to learn. So, if we are all in agreement, let's get started!

Who Should Read This Book

The VCP certification was recently listed on http://www.techrepublic.com/ as one of the top 10 certifications to hold. If you are currently working with VMware vSphere virtual data centers, it could be a valuable certification for you. If you are considering your options in the IT world, you will not go wrong if you learn about virtualization now. In either case, this book will help you obtain the knowledge and the skills toward becoming a VCP6-DCV, VCP6-NV, VCP6-DTM, or VCP6-CMA.

Goals and Methods

My number-one goal of this book is a simple one: to help you pass the vSphere 6 Foundations test as part of obtaining the status of VMware Certified Professional 6 for Data Center Virtualization, Network Virtualization, Cloud Management and Automation, or Desktop Mobility.

To aid you in gaining the knowledge and understanding of key vSphere topics, I use the following methods:

- **Opening topics list:** This list defines the topics to be covered in the chapter. Each chapter is a part of the exam blueprint, and the chapters and topics are written in blueprint order.
- **"Do I Know This Already?" quizzes:** At the beginning of each chapter is a quiz. The quizzes and answers/explanations (found in Appendix A) are meant to gauge your knowledge of the subjects. If the answers to the questions do not come readily to you, be sure to read the entire chapter.
- **Key topics:** The key topics indicate important figures, tables, and lists of information that you should know for the exam. They are interspersed throughout the chapter and are listed in table format at the end of the chapter.

- **Review questions:** All chapters conclude with a set of review questions to help you assess whether you have learned the key material in the chapter.
- **Exam-type questions:** Exam questions are included with the printed and digital editions of this book. They are written to be as close as possible to the types of questions that appear on the vSphere 6 Foundations exam.

How to Use This Book

Although you could read this book cover to cover, I designed it to be flexible enough to allow you to easily move between chapters and sections of chapters to work on the areas that you feel are the most important for you. If you intend to read all the chapters, the order in the book is an excellent sequence to follow.

The core chapters, Chapters 1 through 23, cover the following topics:

- **Chapter 1, "Identifying vSphere Architecture and Solutions":** This chapter focuses on various vSphere editions and the features they provide. I also discuss data center solutions that interact with vSphere, architectures for ESXi and vCenter, and new solutions for the vSphere 6.0 environment.
- **Chapter 2, "Installing and Configuring vCenter Server":** This chapter focuses on the requirements for the vCenter server and its accompanying database. I also discuss sizing the database, licensing the vCenter server, and creating database connections to the vCenter server database.
- **Chapter 3, "Installing and Configuring ESXi":** This chapter focuses on the requirements for installing ESXi and the methods that you can use. I also cover the configuration of NTP, and DNS. Then I cover licensing an ESXi host.
- **Chapter 4, "Configuring vSphere Standard Switches":** This chapter focuses on creating and deleting vSphere Standard Switches. I also cover adding, configuring, and removing vmnics and port groups. In addition, I cover configuring vmkernel ports. Finally, I discuss the use case for a vSphere Standard Switch.
- **Chapter 5, "Configuring vSphere Distributed Switches":** This chapter focuses on vSphere Distributed Switch capabilities and how to make the most of them. I cover creating and deleting a vSphere Distributed Switch, adding, configuring, and removing dvPort groups as well as dvUplink groups, configuring dvPort group settings, and configuring LACP. In addition, I cover migrating virtual adapters to and from a vSphere Standard Switch.

- **Chapter 6, "Configuring vSS and vDS Features":** This chapter focuses on features that are available on vSSs and those that are available on vDSs. I discuss policies such as dvPort blocking, load balancing, and failover. In addition, I discuss configuring VLAN and PVLAN settings and traffic shaping policies. Finally, I discuss enabling TCP Segmentation Offload, jumbo frames. You will be able to determine the appropriate VLAN configuration for a vSphere implementation.
- **Chapter 7, "Connecting Shared Storage Devices to vSphere":** This chapter focuses on the various types of storage from which you can choose for your vSphere and environment and on connecting it to your hosts and VMs. I cover storage adapters and devices, storage naming conventions, hardware and software initiators, zoning/masking LUNs, and configuring iSCSI Port Binding. You will be able to successfully choose and connect the appropriate storage options to your vSphere environment.
- **Chapter 8, "Configuring Software-Defined Storage":** This chapter focuses on the very latest techniques of configuring software-defined storage. I discuss your new options in regard to NFS, VSAN, and VVOLs. You learn about the latest methods of creating shared storage volumes for your vSphere environment.
- **Chapter 9, "Creating and Configuring VMFS and NFS Datastores":** This chapter focuses on the creation and configuration of VMFS and NFS datastores. I discuss supported NFS versions, storage multipathing, VMFS requirements, and configuring and managing VMFS extents. You learn the appropriate methods of creating and configuring datastores for your vSphere environment.
- **Chapter 10, "Creating and Deploying Virtual Machines":** This chapter focuses on creating and deploying virtual machines and the methods that you can use. I also discuss the capabilities of virtual machine hardware and DirectPath I/O Passthrough. In addition, I discuss deploying a Guest OS to a VM and configuring CPU and memory resources. You will be able to make informed decisions regarding the deployment of VMs in your environment.
- **Chapter 11, "Creating and Deploying vApps":** This chapter focuses on creating and deploying vApps. I discuss vApp requirements, cloning and exporting a vApp, and configuring vApp settings. You also learn how to use vApps in your environment.
- **Chapter 12, "Managing Virtual Machine Clones and Templates":** This chapter focuses on creating, configuring, and managing virtual machine clones and templates. I also discuss configuring virtual machine options and

configuring CPU and memory reservations and shares. You will know how to manage VMs, clones, and templates in your environment.

- **Chapter 13, "Administering Virtual Machines and vApps":** This chapter focuses on administering VMs and vApps. I discuss the files used by VMs and the location options of configuration files and virtual disks. In addition, I cover common practices for securing VMs, configuring IP pools, and managing a content library.
- **Chapter 14, "Creating and Configuring VMware Clusters":** This chapter focuses on creating and configuring VMware clusters. I discuss issues that relate to DRS and HA. In addition, I discuss adding and removing hosts and VMs on a cluster. You will be able to determine the appropriate failover methodology for your clusters and the required resources for your hosts.
- **Chapter 15, "Planning and Implementing VMware Fault Tolerance":** This chapter focuses on the configuration of fault tolerance for your VMs. I discuss fault tolerance requirements, new capabilities, and network configuration as it relates to fault tolerance.
- **Chapter 16, "Creating and Administering Resource Pools":** This chapter focuses on creating and administering resource pools. I discuss the configuration of resource pool attributes, including vFlash architecture. You also learn how to determine resource pool requirements.
- **Chapter 17, "Migrating Virtual Machines":** This chapter focuses on migrating virtual machines. I discuss the requirements for vMotion and Storage vMotion in regard to your hosts and VMs. In addition, I discuss the very latest options in regard to vMotion, including Enhanced vMotion and Long Distance vMotion. I also discuss snapshots in regard to vMotion and Storage vMotion. You learn best practices in regard to configuring and performing virtual machine migrations.
- **Chapter 18, "Backing Up and Restoring Virtual Machines":** This chapter focuses on backing up and restoring virtual machines. I discuss VMware Data Protection and the latest changes to it. I also discuss creating, deleting, and consolidating virtual machine snapshots. In addition, I discuss vSphere replication. You also learn methods of keeping your VMs and their data safe.
- **Chapter 19, "Updating ESXi and Virtual Machines":** This chapter focuses on updating and patching virtual machines. I also discuss managing host profiles. In addition, you learn how to keep your hosts up to date.
- **Chapter 20, "Performing Basic Troubleshooting of ESXi and vCenter Server":** This chapter focuses on troubleshooting ESXi and vCenter. I discuss troubleshooting guidelines and how to monitor ESXi system health.

- **Chapter 21, "Performing Basic Troubleshooting of ESXi and vCenter Server Operations":** This chapter focuses on troubleshooting ESXi and vCenter Server Operations. I discuss how to verify the network configuration and resources and troubleshoot common storage and VM issues. In addition, I discuss troubleshooting physical network adapter configuration issues, including checking the knowledge base on the Web.
- **Chapter 22, "Performing Basic Troubleshooting of Virtual Machine Operations":** This chapter focuses on troubleshooting options caused by improper VM configuration. I discuss resource contention issues, VMware tools issues, and storage issues. You also learn how to identify the root cause of a problem.
- **Chapter 23, "Monitoring ESXi, vCenter Server, and Virtual Machines":** This chapter focuses on monitoring your hosts, vCenter server, and VMs. I discuss the most common metrics in regard to performance, memory, CPU, networking, and storage. I also discuss monitoring overview and advanced charts. In addition, I cover creating, editing, and deleting a scheduled task.
- **Chapter 24, "Creating and Administering vCenter Server Alarms":** This chapter focuses on creating and administering vCenter Server alarms. I discuss utilizations alarms as well as connectivity alarms. In addition, you learn about configuring alarm triggers and actions.
- **Chapter 25, "Installing and Administering vRealize Operations Manager":** This chapter focuses on installing and managing vRealize Operations Manager. I discuss major and minor badges, architecture, and deploying the appliance. You also learn how to determine the effective resource for a given issue.
- **Chapter 26, "Final Preparation":** This chapter identifies tools for final exam preparation and helps you develop an effective study plan. It contains tips on how to best use the web-based material to study.

Certification Exam and This Preparation Guide

I wrote this book directly to the vSphere 6 Foundations Exam Blueprint. Each chapter of this book is a section of the blueprint, with all its objectives in the same order as the blueprint. This way, you can easily identify your strengths and work on your weaknesses. Table I-1 lists the vSphere 6 Foundations Exam Blueprint objectives and the chapter of this book that covers them.

Table I-1 vSphere 6 Foundations Exam Topics and Chapter References

Exam Section/Objective	Chapter Where Covered
Section 1—Install and Configure vCenter Server and ESXi	
Objective 1.1—Identify vSphere Architecture and Solutions for a given use case.	Chapter 1
Objective 1.2—Install and Configure vCenter Server	Chapter 2
Objective 1.3—Install and configure ESXi	Chapter 3
Section 2: Configure vSphere Networking	
Objective 2.1—Configure vSphere Standard Switches (vSS)	Chapter 4
Objective 2.2—Configure vSphere Distributed Switches (vDS)	Chapter 5
Objective 2.3—Configure vSS and vDS Policies	Chapter 6
Section 3—Configure vSphere Storage	
Objective 3.1—Connect Shared Storage Devices to vSphere	Chapter 7
Objective 3.2—Configure Software Defined Storage	Chapter 8
Objective 3.3—Create and Configure VMFS and NFS Datastores	Chapter 9
Section 4—Deploy and Administer Virtual Machines and vApps	
Objective 4.1—Create and Deploy Virtual Machines	Chapter 10
Objective 4.2—Create and Deploy vApps	Chapter 11
Objective 4.3—Manage Virtual Machine Clones and Templates	Chapter 12
Objective 4.4—Administer Virtual Machines and vApps	Chapter 13
Section 5—Establish and Maintain Availability and Resource Management	
Objective 5.1—Create and Configure VMware Clusters	Chapter 14
Objective 5.2—Plan and Implement VMware Fault Tolerance	Chapter 15
Objective 5.3—Create and Administer Resource Pools	Chapter 16
Objective 5.4—Migrate Virtual Machines	Chapter 17
Objective 5.5—Backup and Restore Virtual Machines	Chapter 18
Objective 5.6—Update ESXi and Virtual Machines	Chapter 19
Section 6—Perform Basic Troubleshooting	
Objective 6.1—Perform Basic Troubleshooting of ESXi and vCenter Server	Chapter 20
Objective 6.2—Perform Basic Troubleshooting of ESXi and vCenter Operations	Chapter 21
Objective 6.3—Perform Basic Troubleshooting of Virtual Machine Operations	Chapter 22
Objective 6.4—Identify and Troubleshoot Basic Misconfigurations	Chapter 22

Exam Section/Objective	Chapter Where Covered
Section 7—Monitor a vSphere Implementation	
Objective 7.1—Monitor ESXi, vCenter Server and Virtual Machines	Chapter 23
Objective 7.2—Create and Administer vCenter Server Alarms	Chapter 24
Objective 7.3—Install, Configure and Administer vRealize Operations Manager	Chapter 25

Book Content Updates

Because VMware occasionally updates exam topics without notice, VMware Press might post additional preparatory content on the web page associated with this book at http://www.pearsonitcertification.com/title/9780789756497. It is a good idea to check the website a couple of weeks before taking your exam, to review any updated content that might be posted online. We also recommend that you periodically check back to this page on the Pearson IT Certification website to view any errata or supporting book files that may be available.

Companion Website

Register this book to get access to the Pearson IT Certification test engine and other study materials plus additional bonus content. Check this site regularly for new and updated postings written by the author that provide further insight into the more troublesome topics on the exam. Be sure to check the box that you would like to hear from us to receive updates and exclusive discounts on future editions of this product or related products.

To access this companion website, follow these steps:

1. Go to www.pearsonITcertification.com/register and log in or create a new account.
2. Enter the ISBN: 9780789756497.
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Please note that many of our companion content files can be very large, especially image and video files.

If you are unable to locate the files for this title by following the preceding steps, please visit www.pearsonITcertification.com/contact and select the Site Problems/ Comments option. Our customer service representatives will assist you.

Pearson IT Certification Practice Test Engine and Questions

The companion website includes the Pearson IT Certification Practice Test engine—software that displays and grades a set of exam-realistic multiple-choice questions. Using the Pearson IT Certification Practice Test engine, you can either study by going through the questions in Study Mode or take a simulated exam that mimics real exam conditions. You can also serve up questions in a Flash Card Mode, which displays only the question and no answers, challenging you to state the answer in your own words before checking the actual answers to verify your work.

The installation process requires two major steps: installing the software and then activating the exam. The website has a recent copy of the Pearson IT Certification Practice Test engine. The practice exam (the database of exam questions) is not on this site.

NOTE The cardboard sleeve in the back of this book includes a piece of paper. The paper lists the activation code for the practice exam associated with this book. Do not lose the activation code. On the opposite side of the paper from the activation code is a unique, one-time-use coupon code for the purchase of the Premium Edition eBook and Practice Test.

Install the Software

The Pearson IT Certification Practice Test is a Windows-only desktop application. You can run it on a Mac using a Windows virtual machine, but it was built specifically for the PC platform. The minimum system requirements are as follows:

- Windows 10, Windows 8.1, or Windows 7
- Microsoft .NET Framework 4.5 client
- Pentium-class 1 GHz processor (or equivalent)
- 512 MB RAM
- 650 MB disk space plus 50 MB for each downloaded practice exam
- Access to the Internet to register and download exam databases

The software installation process is routine compared with other software installation processes. If you have already installed the Pearson IT Certification Practice Test software from another Pearson product, there is no need for you to reinstall the software. Simply launch the software on your desktop and proceed to activate the practice exam from this book by using the activation code included in the access code card sleeve in the back of the book.

The following steps outline the installation process:

1. Download the exam practice test engine from the companion site.
2. Respond to windows prompts as with any typical software installation process.

The installation process gives you the option to activate your exam with the activation code supplied on the paper in the cardboard sleeve. This process requires you to establish a Pearson website login. You need this login to activate the exam, so do register when prompted. If you already have a Pearson website login, there is no need to register again. Just use your existing login.

Activate and Download the Practice Exam

After the exam engine is installed, you should activate the exam associated with this book (if you did not do so during the installation process) as follows:

1. Start the Pearson IT Certification Practice Test software from the Windows Start menu or from your desktop shortcut icon.
2. To activate and download the exam associated with this book, from the My Products or Tools tab, click the **Activate Exam** button.
3. At the next screen, enter the activation key from the paper inside the cardboard sleeve in the back of the book. Then click the **Activate** button.
4. The activation process will download the practice exam. Click **Next**, and then click **Finish**.

When the activation process completes, the My Products tab should list your new exam. If you do not see the exam, make sure that you have selected the **My Products** tab on the menu. At this point, the software and practice exam are ready to use. Simply select the exam and click the **Open Exam** button.

To update a particular exam you have already activated and downloaded, display the **Tools** tab and click the **Update Products** button. Updating your exams will ensure that you have the latest changes and updates to the exam data.

If you want to check for updates to the Pearson Cert Practice Test exam engine software, display the **Tools** tab and click the **Update Application** button. You can then ensure that you are running the latest version of the software engine.

Activating Other Exams

The exam software installation process and the registration process have to happen only once. Then, for each new exam, only a few steps are required. For instance, if you buy another Pearson IT Certification Cert Guide, extract the activation code from the cardboard sleeve in the back of that book; you do not even need the exam engine at this point. From there, all you have to do is start the exam engine (if it's not still up and running) and perform Steps 2 through 4 from the previous list.

Assessing Exam Readiness

Exam candidates never really know whether they are adequately prepared for the exam until they have completed about 30 percent of the questions. At that point, if you are not prepared, it is too late. The best way to determine your readiness is to work through the "Do I Know This Already?" quizzes at the beginning of each chapter and review the foundation and key topics presented in each chapter. It is best to work your way through the entire book unless you can complete each subject without having to do any research or look up any answers.

Premium Edition eBook and Practice Tests

This book also includes an exclusive offer for 70% off the Premium Edition eBook and Practice Tests edition of this title. Please see the coupon code included with the cardboard sleeve for information on how to purchase the Premium Edition.

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This chapter covers the following subjects:

- Cloning and Template Options
- Configuring Virtual Machine Options
- Adding/Removing Virtual Machines
- Creating a Template from an Existing Virtual Machine
- Deploying a Virtual Machine from a Template
- Updating Existing Virtual Machine Templates
- Configuring CPU and Memory Reservations and Shares

If you have a VM that you like and you want another one identical to it, you can clone the VM. The catch is that a clone is an exact copy, and you might not want an exact copy. For example, it's unlikely that you want the same NetBIOS name, IP address, or SID, especially if you are planning to continue to use the VM that you cloned. In these cases (with VMs using a Microsoft guest OS), you can use Sysprep to provide customization while you are creating the clone.

Managing Virtual Machine Clones and Templates

Suppose that you don't want just one copy of a VM that you currently have running. Assume instead that you are in charge of standardizing the OS and applications that will be used for a certain type of VM. In that case, you might want to create a template that will thereafter be used by anyone who creates that type of VM. A template is a VM that cannot be powered on but that can be used as a master copy to create VMs that can be powered on. By enforcing the use of the template to create certain VMs, you will improve not only the speed at which VMs can be created but also the accuracy of their creation.

In this chapter, you learn about your options in regard to virtual machine clones and templates, and why you might choose one over the other. In addition, I discuss configuring the VMs that you have and adding more or removing those that you don't need. Finally, I discuss the process of deploying VMs from templates, updating existing templates, and configuring resources, such as CPU and memory reservations and shares.

"Do I Know This Already?" Quiz

The "Do I Know This Already?" quiz allows you to assess whether you should read this entire chapter or simply jump to the "Exam Preparation Tasks" section for review. If you are in doubt, read the entire chapter. Table 12-1 outlines the major headings in this chapter and the corresponding "Do I Know This Already?" quiz questions. You can find the answers in Appendix A, "Answers to the 'Do I Know This Already?' Quizzes and Chapter Review Questions."

Table 12-1 "Do I Know This Already?" Section-to-Question Mapping

Foundation Topics Section	Questions Covered in This Section
Cloning and Template Options	1, 2
Configuring Virtual Machine Options	3, 4
Adding/Removing Virtual Machines	5
Creating a Template from an Existing Virtual Machine	6, 7
Deploying a Virtual Machine from a Template	8
Updating Existing Virtual Machine Templates	9
Configuring CPU and Memory Reservations and Shares	10

1. Which of the following are true regarding the cloning of a VM? (Choose two.)
   a. You must power a VM off before cloning it.
   b. You can clone a VM that is powered on.
   c. You can clone a VM that is powered off.
   d. Cloning a VM that is powered off will likely take much longer than cloning one that is powered on.

2. Which of the following are true regarding a VM clone? (Choose two.)
   a. Without customization, a clone is an exact copy of a VM.
   b. You cannot customize a VM while you clone it.
   c. You can customize a VM while you clone it.
   d. Customizing Microsoft VMs is not possible.

3. Which tab under Edit Settings for a VM contains the categories of VMware Tools and Power Management?
   a. Virtual Hardware
   b. VMware Tools
   c. General Options
   d. VM Options

4. Which of the following are configurable under VMware Tools? (Choose two.)
   a. Power Operations
   b. VMware Tools Scripts
   c. Memory Management (vmmemctl)
   d. Swap file location

5. If you removed a VM by selecting **Delete from Disk**, how can you recover the VM?
   a. Restore the VM from the new datastore that was automatically created during the deletion of the VM from its original disk.
   b. Restore the files from the datastore in which the VM was originally created.
   c. Restore the VM from your latest backup.
   d. You cannot restore the VM because to save space, deleting the disk will also delete any backups of the VM.

6. Which of the following are true regarding converting a VM to a template? (Choose two.)
   a. The VM can be powered on or off.
   b. The VM must be powered off.
   c. The VM and the template will exist in the inventory afterward.
   d. Only the template will exist in the inventory afterward.

7. Which of the following are true regarding the cloning of VM to a template? (Choose two.)
   a. The VM may be powered off or powered on.
   b. A VM and a template will exist in the inventory afterward.
   c. The VM must be powered off.
   d. Only the cloned template will exist in the inventory afterward. The VM will be deleted.

8. Which of the following are true regarding deploying a VM from a template? (Choose two.)
   a. You can deploy the VM only on the host on which the template exists.
   b. You can deploy a VM anywhere in the vCenter from a template on any host connected to the vCenter.
   c. You must select the compute resource as you deploy the VM.
   d. You can delay selecting a compute resource until you first want to start the VM.

9. Which of the following are *true* regarding VM templates? (Choose two.)
   a. You can edit the settings of VM templates, just like VMs.
   b. You cannot edit the setting of templates.
   c. You cannot power on a template.
   d. You can power on a template as long as the VM to which it is connected is powered on.

10. Which of the following are true regarding CPU and memory reservations for VMs? (Choose two.)
    a. It is not possible to change the CPU and memory reservations and shares on individual VMs.
    b. It is not recommended to change the CPU and memory reservations and shares on individual VMs.
    c. Resource pools provide the best environment to control CPU and memory reservations, not VMs.
    d. VMs provide the best environment to control CPU and memory resources, not resource pools.

Foundation Topics

Cloning and Template Options

Suppose that you have a VM that you want to clone. Can you clone it with it powered on, or do you have to power it off first? The answer is "yes," you can clone it with it powered on, but you could also clone it with it powered off; it's your choice. The trade-off is that cloning with the VM powered on might be more convenient because the users can continue to use it, but cloning with it powered off will definitely be a bit faster. To clone an existing VM, follow the steps outlined in Activity 12-1.

Activity 12-1 Cloning an Existing Virtual Machine

Key Topic

1. Log on to your vSphere Web Client.
2. Select **Home** and then **VMs and Templates**.
3. Right-click the VM that you want to clone and click **Clone**, and then select **Clone to Virtual Machine**, as shown in Figure 12-1. (The VM can be powered off or on; in this case, the VM is powered on.)

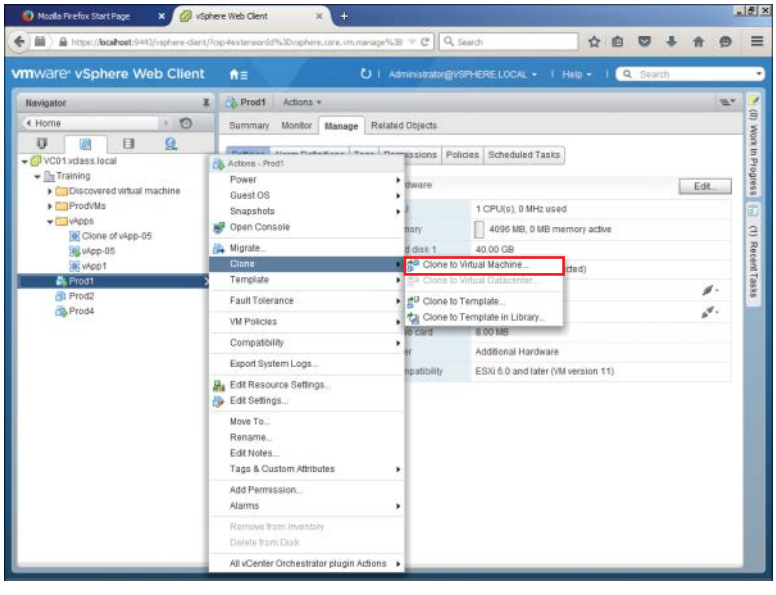


Figure 12-1 Cloning a VM

4. From Name and Location, give your new VM a name and select the inventory location, as shown in Figure 12-2, and then click **Next**.

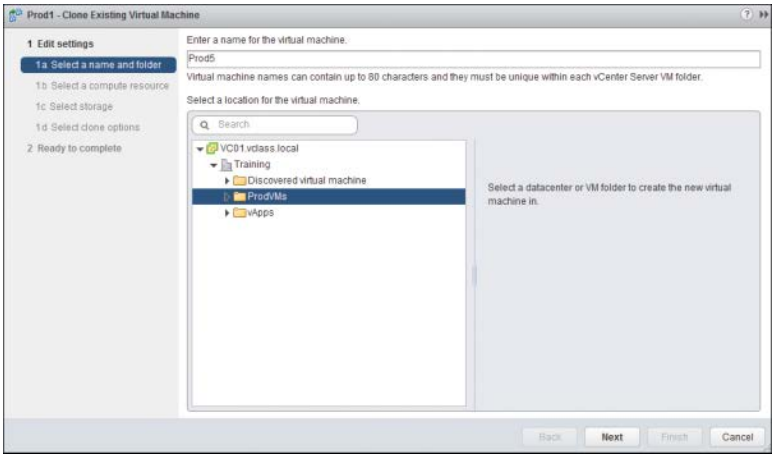


Figure 12-2 Entering the Name and Selecting the Folder

5. Select the host, vApp, or resource pool in which you want to run the cloned VM, and click **Next**, as shown in Figure 12-3.

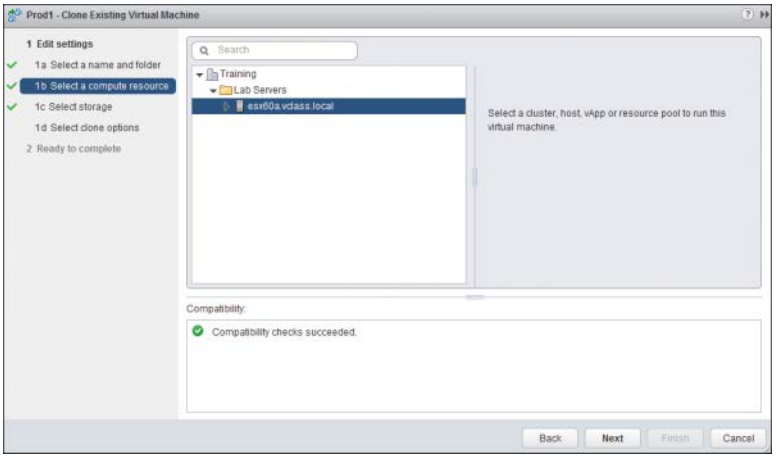


Figure 12-3 Selecting the Compute Resource

6. In Storage, select the datastore that you will use for the VM, and click **Next**, as shown in Figure 12-4.

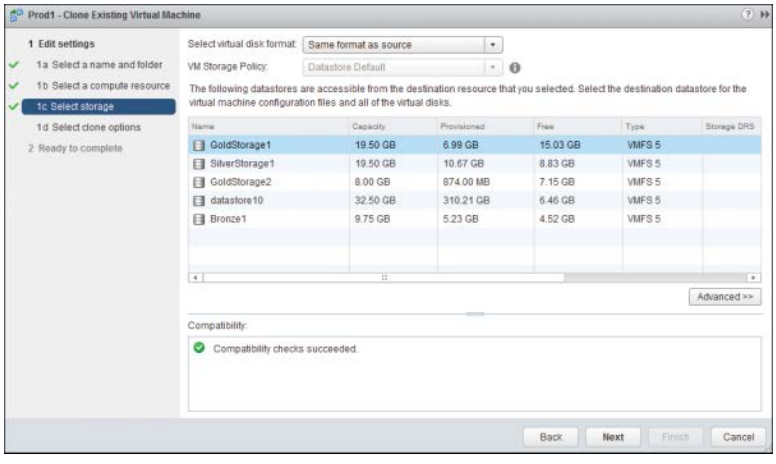


Figure 12-4 Selecting Storage Location

7. In clone options, you can choose to customize the operating system based on a standard that you have created, or choose not to customize (in this case, do not use customization) and click **Next**. (You can also choose to customize this VM's hardware or power on the VM after creation.) See Figure 12-5.

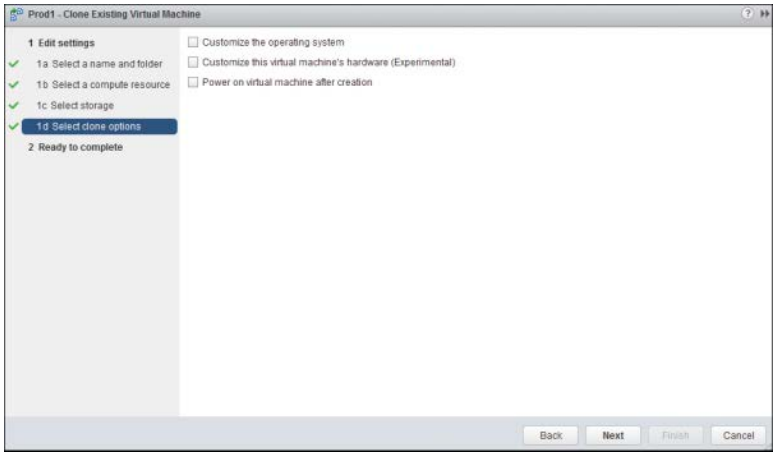


Figure 12-5 Selecting Clone Options

8. Review your settings and click **Finish**, as shown in Figure 12-6. Monitor the Recent Tasks pane and your inventory to see your new VM.

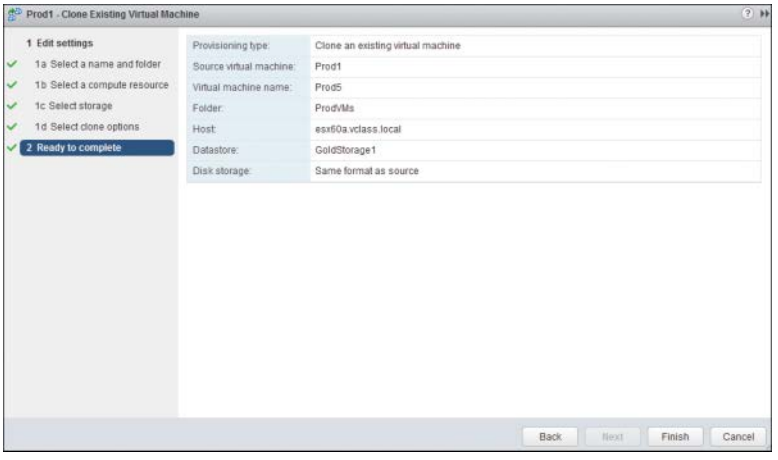


Figure 12-6 Reviewing Ready to Complete

Configuring Virtual Machine Options

Now you have another VM that is just like the one that you cloned. In this case, Prod5 is identical to Prod1. Chances are good that you don't need both to be absolutely identical, so you might want to change the options of the VM after you have cloned it from the other one. With a little knowledge, you can make the needed changes with minimal effort.

You might have noticed that when you right-click a VM and then click **Edit Settings**, there are multiple tabs, each with its own set of configuration settings, as shown in Figure 12-7.

One of these tabs is the **VM Options** tab, on which you can configure VM options. Also note that the version of the VM and its compatibility with regard to hosts is indicated in the bottom-left corner; in this case, we are viewing a Version 11 VM's settings. The options for a Version 11 VM are organized into the following categories:

Key Topic

- General
- VMware Remote Console
- VMware Tools
- Power Management

- Boot Options
- Advanced
- Fibre Channel NPIV

Key Topic

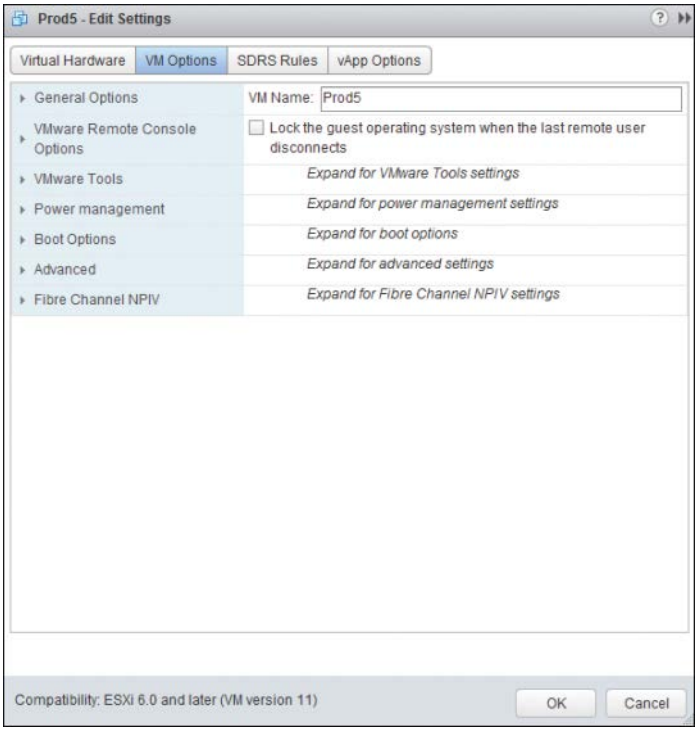


Figure 12-7 Edit Setting for VMs

This section briefly overviews the settings in each of the categories.

General Options

There are many settings and areas of information on the General Options page, as shown in Figure 12-8. On the first section at the top, the VM name is listed. This is the only parameter on this page that can be changed with the VM powered on. The VM name listed here is also referred to as the display name. It is the name that the VM will be represented by in your vCenter inventory. Still further down, the VM's configuration file and working location are listed. The names of these files will start with the display name. The last setting is that of the OS on the VM. Based on this setting, the system updates the VM with the latest drivers and VMware Tools. This setting should always match the actual OS that starts when you power on your VM.

Key Topic

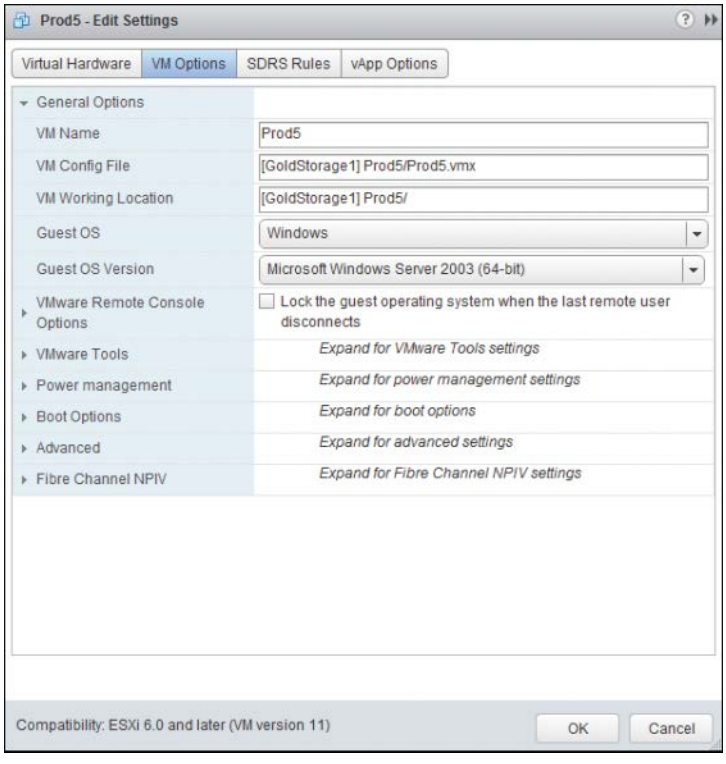
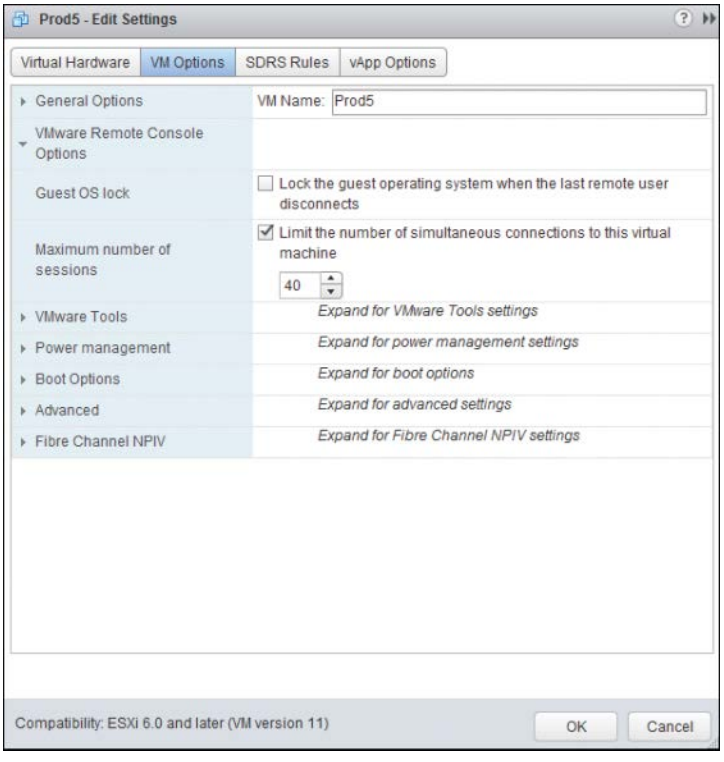


Figure 12-8 General Options

VMware Remote Console Options

This option controls the behavior of a remote connection or connections to the VM. Specifically, you can configure the VM to lock the guest OS when the last remote user disconnects (remember that this is a server), and you can limit the number of simultaneous connections to the VM, as shown in Figure 12-9.



Key Topic

Figure 12-9 VM Remote Console Options

VMware Tools

The VMware Tools options are organized into four categories, as shown in Figure 12-10:

- Power Operations
- Run VMware Tools Scripts
- Tools Upgrades
- Time

Key Topic

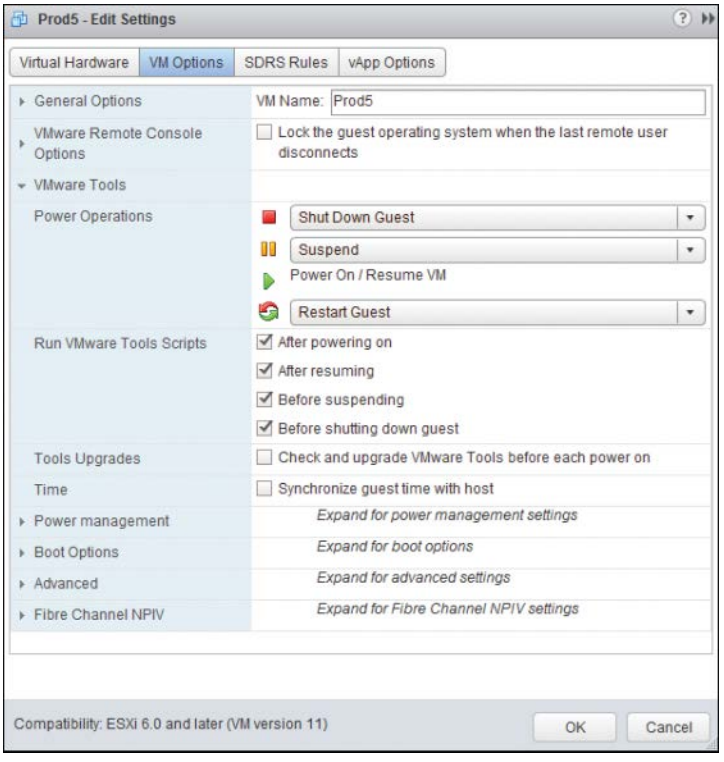


Figure 12-10 VMware Tools Options with VM Powered Off

The default setting of Power Operations provides for a graceful shutdown of the guest OS, suspend, and restart guest. These default settings should be fine for most VMs. Below that, the Run VMware Tools Scripts controls when the scripts are run. These are optional scripts installed in a VM along with VMware Tools that do things like answer the annoying Windows Server 2008 "Why are you shutting down?" question. If the tools have changed, running the scripts takes a short period of time, but the trade-off is that you have the latest options. You can decide whether you want that to happen when changing power states or before shutting down the guest OS. The VM represented in Figure 12-10 is powered off; therefore, all options are available. Changing most of these settings requires powering down the VM; otherwise, many of the settings would be grayed out (dimmed) and unavailable, as shown in Figure 12-11 with the same VM power on.

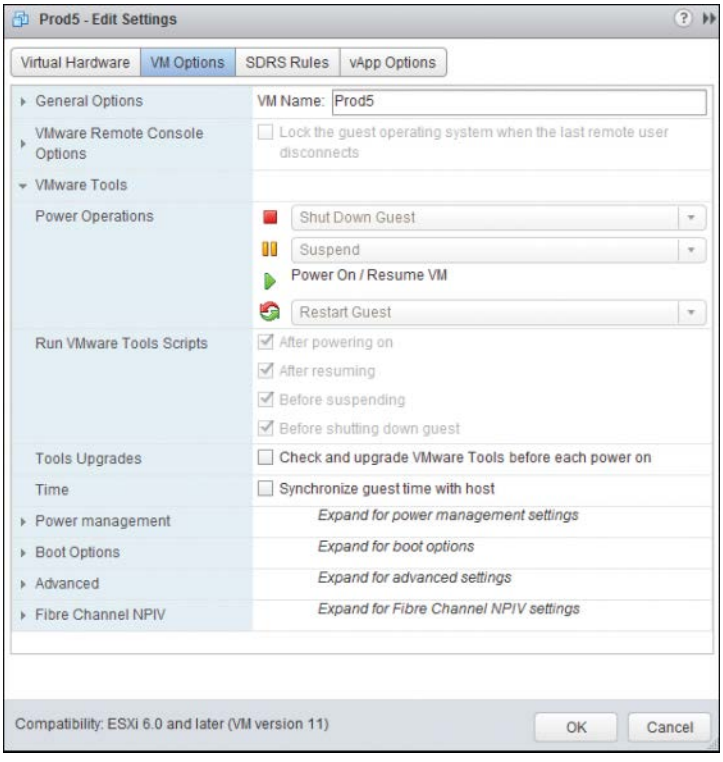


Figure 12-11 VMware Tools Options with VM Powered On

Power Management

The Power Management setting determines how the VM will respond when the guest OS is placed into standby mode. It is set by default to leave the VM powered on. The section "Configuring Virtual Machine Power Settings" discusses configuration options for this setting.

NOTE Don't worry, I'm not forgetting about Boot Options. I will cover those in a few sections within a section called "Configuring Virtual Machine Boot Options."

Advanced Options

As you can see from Figure 12-12, the options such as debugging settings, swap file location, and other configuration parameters that are included under the Advanced category can usually be left at their defaults. They are configurable for the unusual "one-off" situation when you might need to make a change.

Key Topic

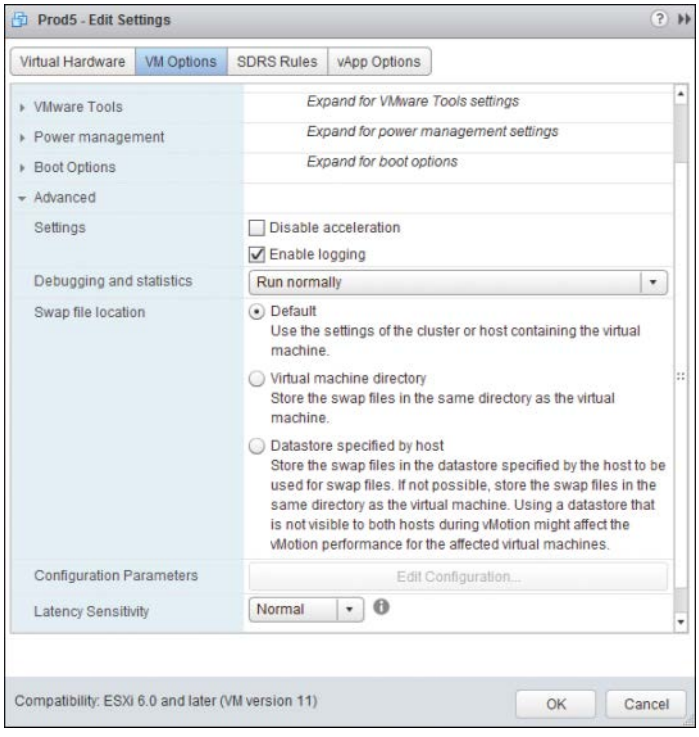


Figure 12-12 Advanced Options

Fibre Channel NPIV

This option enables you to examine worldwide names (WWNs) for individual VMs running on hosts that are using Fibre Channel hardware. These WWNs are normally assigned by the host of the vCenter for VMs that are enabled for NPIV. The details of this option are beyond the scope of this book.

Configuring Virtual Machine Power Settings

As mentioned previously, you can set the power management options for a VM on the VM Options tab. The default setting is that the VM will remain powered

on even when the OS is placed into standby mode. For servers, this is usually the appropriate setting.

If you elect to suspend the VM, the VM will have to be resumed to be used when the guest OS comes out of standby mode. Because standby mode was originally created to save energy and reduce the amount of heat that a computer puts into a room, and because this does not apply to a VM, it might be best to let the VM's guest OS go into standby mode but keep the VM powered on, as shown in Figure 12-13. Changing this setting requires first powering down the VM.

Key Topic

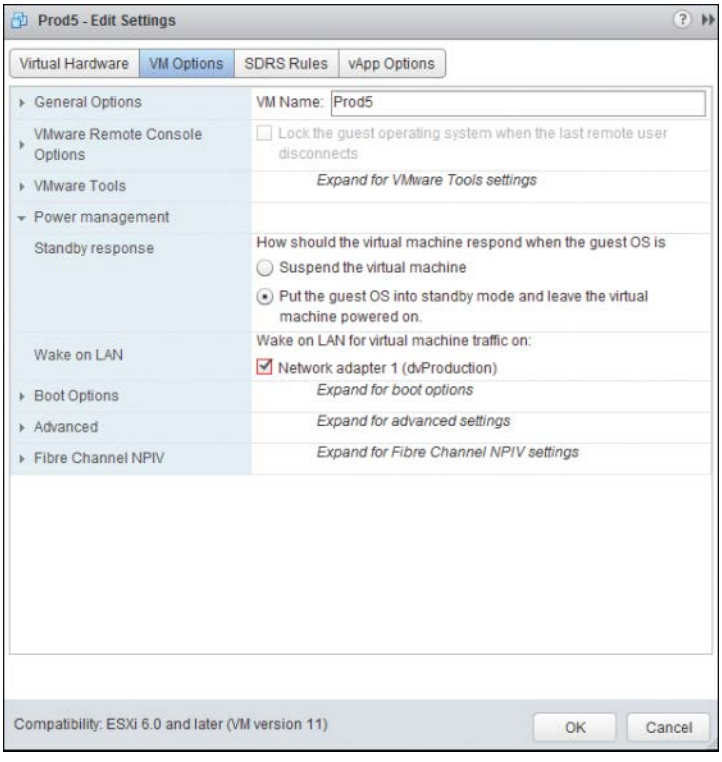


Figure 12-13 Power Management Settings

Configuring Virtual Machine Boot Options

You can configure VM boot options in four categories, as shown in Figure 12-14:

- **Firmware:** Allows you to specify the boot firmware for your VM, but changing to a setting that does not match your capabilities may render the VM unbootable. You should use this setting if your host supports EFI.

- **Boot Delay:** Allows you to specify a number of milliseconds between the time that POST is finished and the OS begins to load. This can give you time to press the appropriate key (such as F2) to enter setup. This might be useful, for example, to change the boot sequence to recognize a CD-ROM drive, but it will delay the start of the VM every time you power it on.
- **Force BIOS Setup:** This is a run-once type of setting that will clear itself automatically after you use it.
- **Failed Boot Recovery:** Used to configure the action of the VM if it should fail to find a boot device. This could be especially helpful if you are attempting to boot and install an operating system through a network, which can cause a delay in the VM's sensing the boot device.

Key Topic

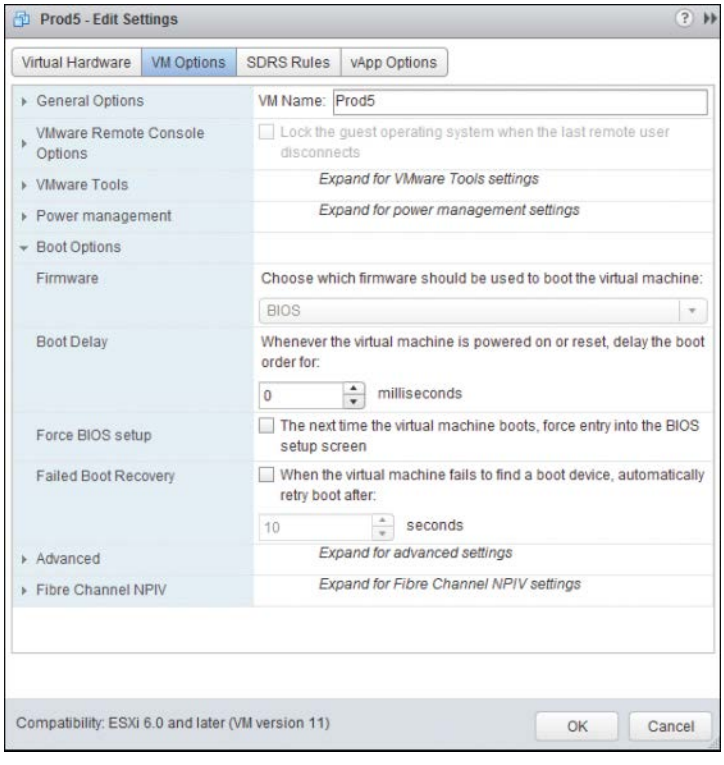


Figure 12-14 Advanced Boot Options

Configuring Virtual Machine Troubleshooting Options

Troubleshooting is a process of isolating an issue. To isolate an issue, what you need more than anything is information (in other words, *logs*). Normal logging of events and tasks associated with a VM is enabled by default. You can see this by logging on to your vSphere Client, choosing a VM, and examining the advanced options, as shown in Figure 12-15. You can disable logging on this setting, but that is not a recommended practice. In addition, if you are troubleshooting a VM and you want verbose debugging information or statistics, you can change this setting to force the system to record the information that you want. The information that is collected might also be useful to VMware technical support.

Key Topic

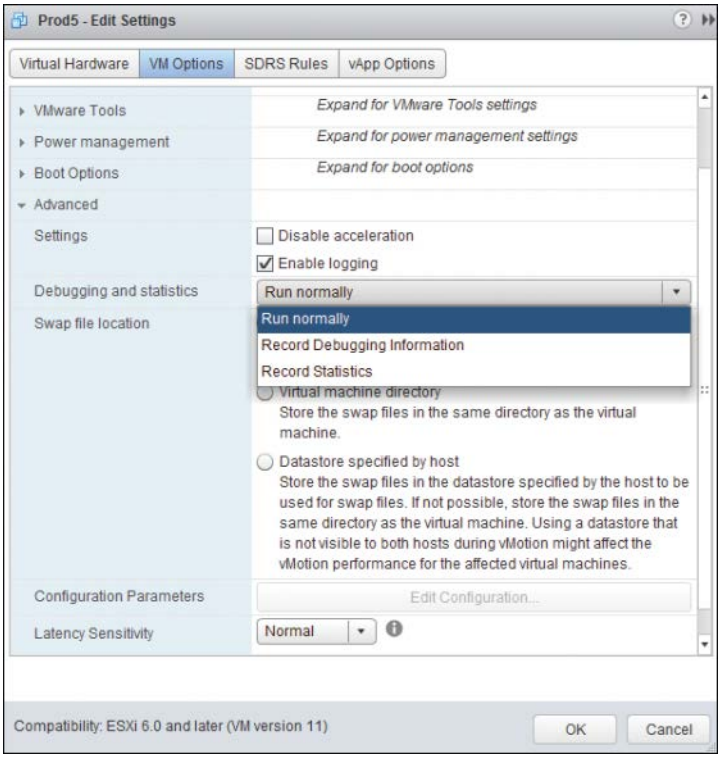


Figure 12-15 Advanced Troubleshooting Options

Adding/Removing Virtual Machines

There are many ways to add a virtual machine (VM) to your host and your vCenter inventory. In fact, we have already discussed many of them. You can add the VM by building it "from scratch," cloning, deploying from a template, or just acquiring a virtual appliance and installing it. Regardless of how you have added the VM, you can manage it with all the same tools as you manage the others. Many of these tools are covered in the coming chapters of this book.

In contrast, there are only two ways to remove a VM from your vCenter inventory. You can remove it from the inventory but leave the files on the datastore, so you can add it back later as needed, as shown in Figure 12-16. As an alternative, you can completely delete the VM from the datastore at the same time that you remove it from your vCenter inventory, as shown in Figure 12-17. If you choose this option, the VM is said to be "permanently" deleted, but if you change your mind, you could still restore it with your latest backup. You did make a backup, didn't you?

Key Topic

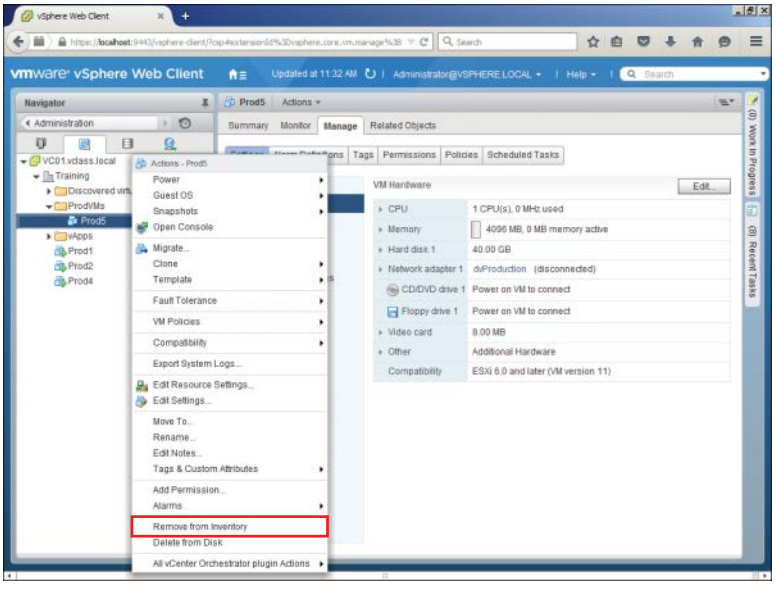


Figure 12-16 Removing a VM from Inventory

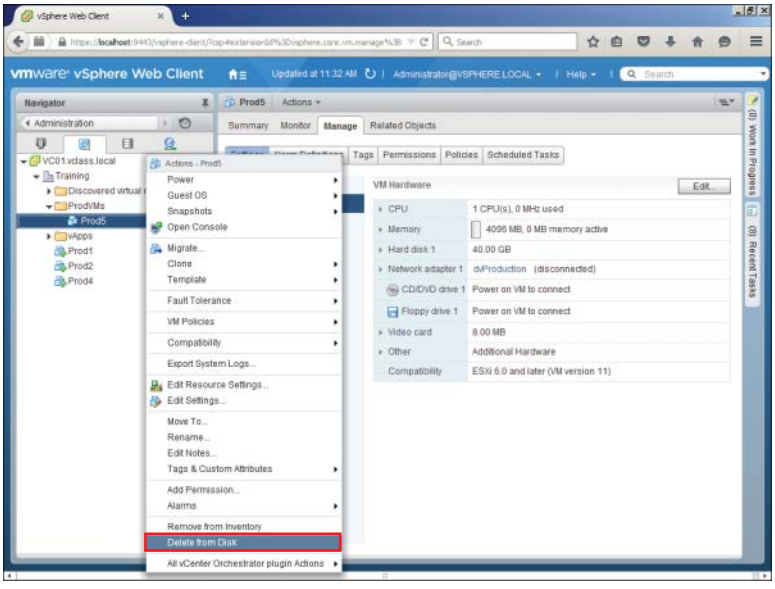


Figure 12-17 "Permanently" Deleting a VM

Creating a Template from an Existing Virtual Machine

As mentioned earlier, you might use a template to create a new standard that you want everyone to use in the future. In that case, the VM that you are using for the template might not even be in your production environment. In that situation, the easiest and fastest way to create a template from the VM would be to convert the VM into the template. Of course, then you wouldn't have your VM anymore until you created a new VM from the template or converted it back. The upside of this method is that it happens almost instantaneously.

Another method of creating the template would be to clone the template from the running VM. As you can imagine, this takes longer to do; however, it allows the users to continue to use the VM while the template is being created, possibly with minor loss in performance. Either way, you end up with a template. However, cloning the template from the running VM results in your ending up with a template and still retaining the VM from which you created the template.

To create a template from an existing VM, follow the steps outlined in Activity 12-2.

Key Topic

Activity 12-2 Creating a Template from an Existing VM

1. Log on to your vSphere Web Client.
2. Select **Home** and then **VMs and Templates**.
3. Right-click the VM from which you want to create the template and select **Clone**. Then choose **Clone to Template**, as shown in Figure 12-18. The VM can be powered off or on if you are cloning. If you are converting, the VM must be powered off. In this case, I am cloning the template with the VM powered off.

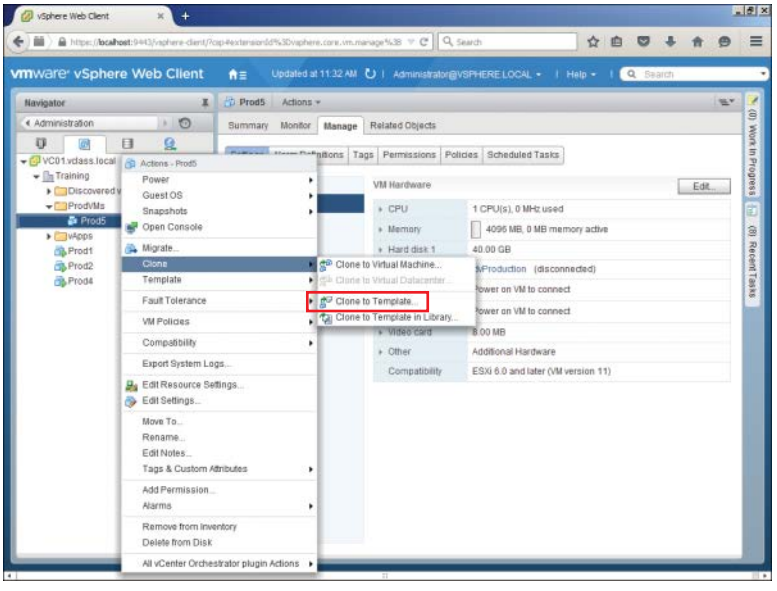


Figure 12-18 Creating a Template

4. Give your new VM a name and select the inventory location, as shown in Figure 12-19, and then click **Next**.

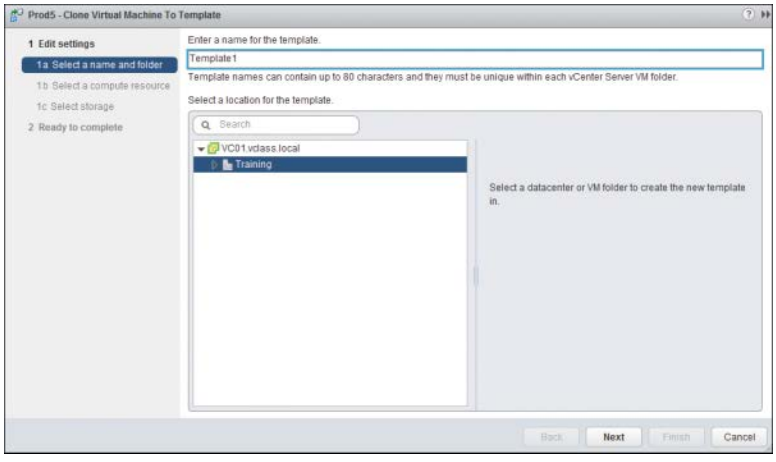


Figure 12-19 Naming a Template

5. Select a host for the new VM, as shown in Figure 12-20, and click **Next**. The system performs a compatibility check.

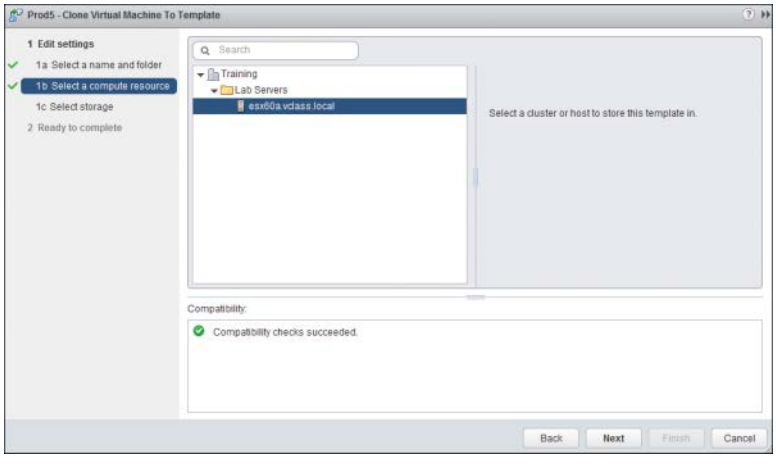


Figure 12-20 Selecting a Host for a Template

6. From Datastore, select the datastore that you will use for the VM and the VM disk format, and click **Next**.
7. Review your settings and click **Finish**. Monitor the Recent Tasks pane and your inventory to see your new template.

Deploying a Virtual Machine from a Template

Of course, the reason that you made the template is not just to have a template, but to be able to deploy VMs more quickly and accurately by using the template. After you have created the template, you can deploy VMs from it and create them anywhere in your vCenter. To deploy a VM from your template, follow the steps outlined in Activity 12-3.

Key Topic

Activity 12-3 Deploying a VM from a Template

1. Log on to your vSphere Web Client.
2. Select **Home** and then **VMs and Templates**.
3. Right-click the template from which you want to deploy the VM and select **Deploy VM from this Template**, as shown in Figure 12-21.

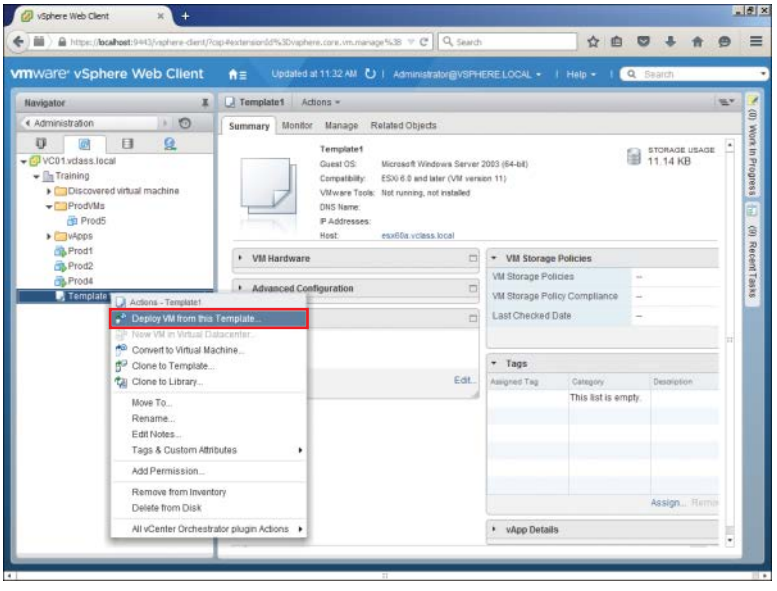


Figure 12-21 Deploying a VM from a Template

4. From Name and Location, give your new VM a name and select the inventory location, as shown in Figure 12-22, and then click **Next**. The location can even be a different data center in the same vCenter.

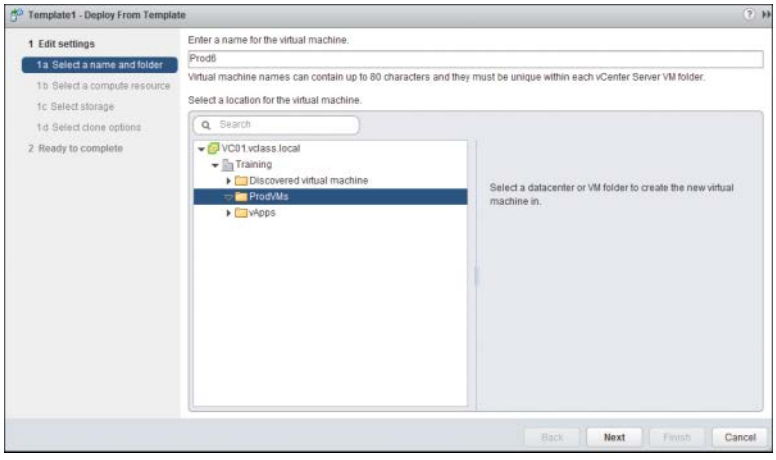


Figure 12-22 Naming the New VM

5. From Host/Cluster, select the host for the new VM.
6. Select the host, vApp, or resource pool to which you want to deploy the new VM, as shown in Figure 12-23, and then click **Next**.

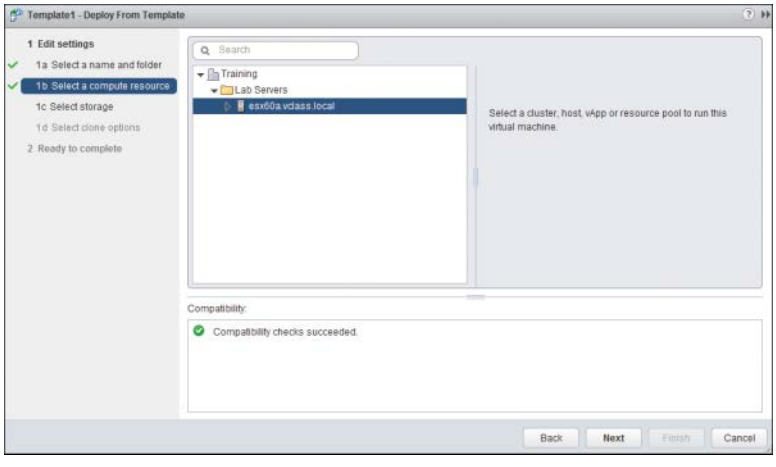


Figure 12-23 Selecting a Host, Resource Pool, or vApp

7. From Datastore, select the datastore that you will use for the VM and the VM disk format, and click **Next**.

8. From **Select Clone Options**, select whether you want to use a custom group of settings that you have previously created (in this case, do not use customization), as shown in Figure 12-24, and then click **Next**.

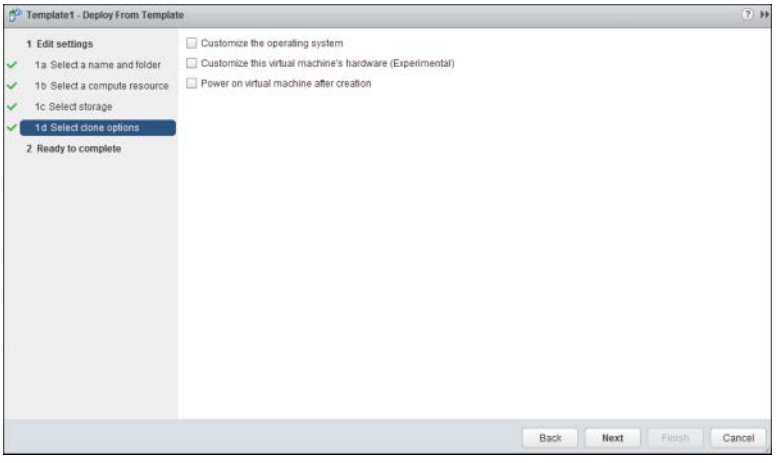


Figure 12-24 The Select Clone Options Section

9. Review your settings and click **Finish**. Monitor the Recent Tasks pane and your inventory to see your new template.

Updating Existing Virtual Machine Templates

Not only is a template a VM that can't be powered on, but it's a VM on which you can't change settings, at least not as long as it's a template. If you right-click a template, you will see that the options to edit its settings and to power it on are not available, as shown in Figure 12-25. This is actually good, because it makes it unlikely that someone could change your template by accident.

However, what if you need to update the software or the virtual hardware settings on the template? In the case of virtual hardware settings, it would seem that you don't have the option. In the case of the software, you certainly can't update software on a VM that you can't power on, so what is the solution to this problem?

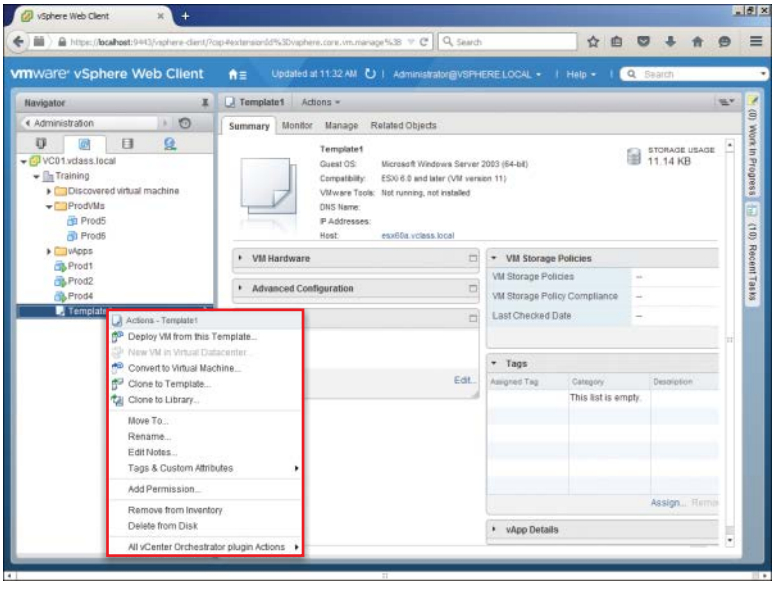


Figure 12-25 Templates Cannot Be Powered On

If you look again at Figure 12-25, you will see that you can convert the template back to a VM. After you have converted the template to a VM, you can apply the updates and convert the VM back to a template to use the updates for future VMs created with the template. To convert a template into a VM, follow the steps outlined in Activity 12-4.

Activity 12-4 Converting a Template to a VM

Key Topic

1. Log on to your vSphere Client.
2. Select **Home** and then **VMs and Templates**, right-click the template that you want to convert to a VM, and select **Convert to Virtual Machine**, as shown in Figure 12-26.

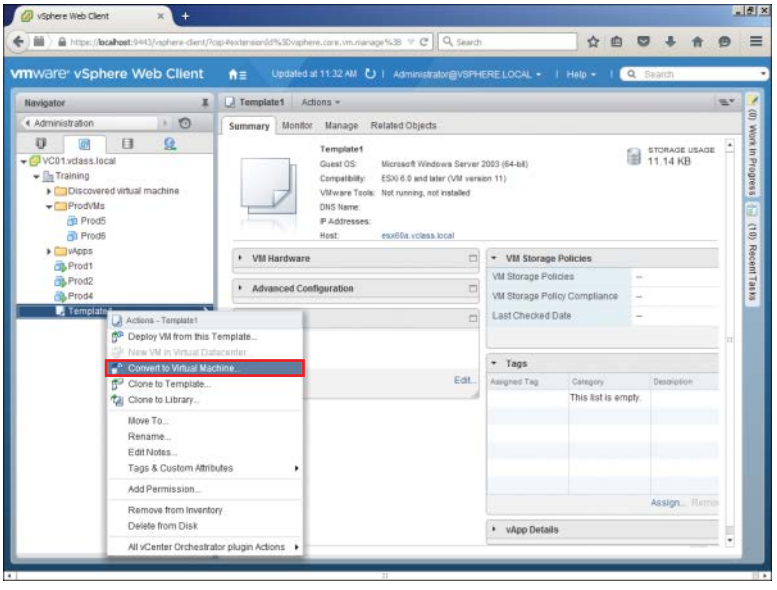


Figure 12-26 Converting a Template to a VM

3. Select the host, vApp, or resource pool for the new VM, as shown in Figure 12-27, and click **Next**.

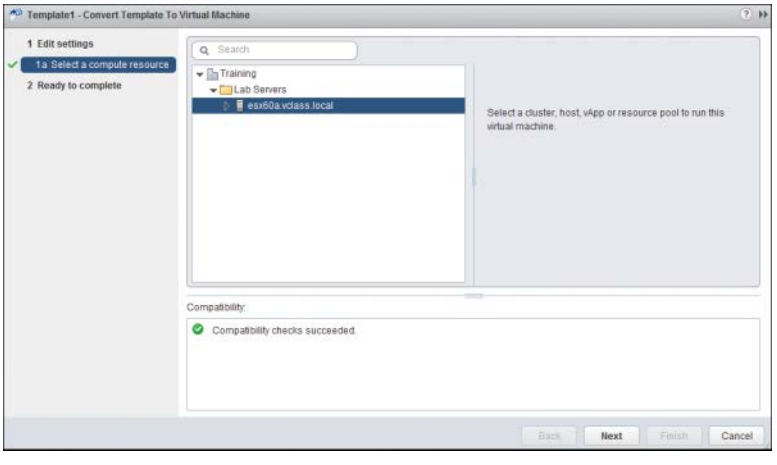


Figure 12-27 Selecting the Compute Resource for the New VM

4. From Ready to Complete, review your settings and click **Finish**, as shown in Figure 12-28. Monitor the Recent Tasks pane and your inventory for your converted VM.

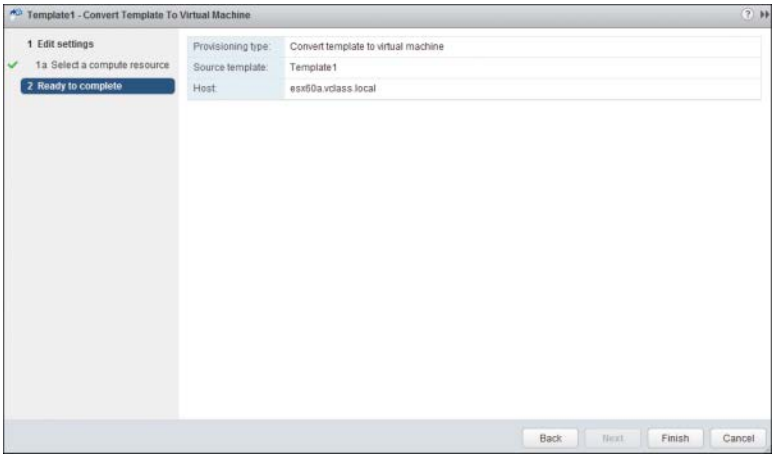


Figure 12-28 Confirming Your Selections to Convert a Template to a VM

NOTE You can also use software, such as VMware Update Manager, to automate much of this process. You learn about Update Manager in Chapter 19, "Updating ESXi and Virtual Machines."

Configuring CPU and Memory Reservations and Shares

Strictly speaking, it's not usually a best practice to configure CPU and memory reservations for individual VMs. This is because a reservation that is configured arbitrarily too high can prevent a VM from starting up. However, if you really need to configure these on a VM, you can find them on the Virtual Hardware tab of the VM's settings, as shown in Figure 12-29.

So, you might be wondering where you should configure these settings instead of on the VM itself. The best place to use CPU reservations and shares is in conjunction with resource pools for VMs. Chapter 16, "Creating and Administering Resource Pools," covers the best practices related to CPU and memory reservations and shares.

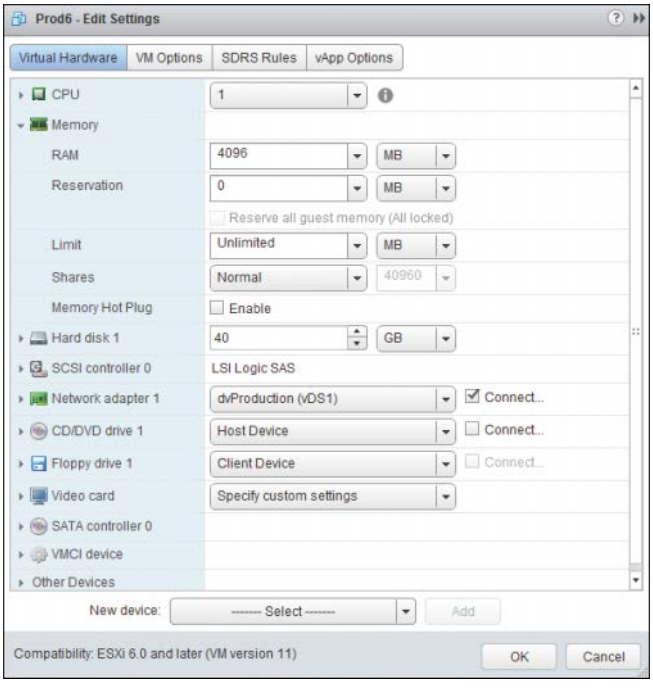


Figure 12-29 Configuring CPU and Memory Settings for a VM

Summary

This chapter covers the following main topics:

- The options for configuring virtual machines, clones, and templates.
- Adding and removing virtual machines in your inventory.
- Creating templates, deploying VMs from templates, and updating VM templates.
- You learned that it's not a best practice to configure individual CPU and memory reservations on VMs and that you should use resource pools instead.

Exam Preparation Tasks

Review All the Key Topics

Review the most important topics from inside the chapter, noted with the Key Topic icon in the outer margin of the page. Table 12-2 lists these key topics and the page numbers where each is found.

Table 12-2 Key Topics for Chapter 12

Key Topic

Key Topic Element	Description	Page Number
Activity 12-1	Cloning an Existing Virtual Machine	283
Bullet List	Options for Version 11 VMs	286
Figure 12-7	Edit Setting for VMs	287
Figure 12-8	General Options	288
Figure 12-9	VM Remote Console Options	289
Figure 12-10	VMware Tools Options with VM Powered Off	290
Figure 12-11	VMware Tools Options with VM Powered On	291
Figure 12-12	Advanced Options	292
Figure 12-13	Power Management Settings	293
Figure 12-14	Advanced Boot Options	294
Figure 12-15	Advanced Troubleshooting Options	295
Figure 12-16	Removing a VM from Inventory	296
Figure 12-17	"Permanently" Deleting a VM	297
Activity 12-2	Creating a Template from an Existing VM	298
Activity 12-3	Deploying a VM from a Template	300
Activity 12-4	Converting a Template to a VM	303

Review Questions

The answers to these review questions are in Appendix A.

1. Which of the following are *not* true regarding the cloning of a VM? (Choose two.)
   a. You must power a VM off before cloning it.
   b. You can clone a VM that is powered on.
   c. You can clone a VM that is powered off.
   d. Cloning a VM that is powered off will likely take much longer than cloning one that is powered on.

2. Which of the following are *not* true regarding a VM clone? (Choose two.)
   a. Without customization, a clone is an exact copy of a VM.
   b. You cannot customize a VM while you clone it.
   c. You can customize a VM while you clone it.
   d. Customizing Microsoft VMs is not possible.

3. Which tab under Edit Settings for a VM contains the categories of VMware Remote Console and Fibre Channel NPIV?
   a. Virtual Hardware
   b. VMware Tools
   c. Boot Options
   d. VM Options

4. Which of the following are configurable under VMware Tools? (Choose two.)
   a. Tools Upgrades
   b. Time Synchronization
   c. Memory Management (vmmemctl)
   d. Swap file location

5. If you removed a VM by selecting **Remove from Inventory**, how can you recover the VM?
   a. Restore the VM from the new datastore that was automatically created during the deletion of the VM from its original disk.
   b. Restore the files from the datastore in which the VM was located.
   c. Restore the VM from your latest backup.
   d. You cannot restore the VM, because deleting the disk will also delete any backups of the VM, to save space.

6. Which of the following are *not* true regarding converting a VM to a template? (Choose two.)
   a. The VM can be powered on or off.
   b. The VM must be powered off.
   c. The VM and the template will exist in the inventory afterward.
   d. Only the template will exist in the inventory afterward.

7. Which of the following are *not* true regarding the cloning of VM to a template? (Choose two.)
   a. The VM may be powered off or powered on.
   b. A VM and a template will exist in the inventory afterward.
   c. The VM must be powered off.
   d. Only the cloned template will exist in the inventory afterward. The VM will be deleted.

8. Which of the following are *not* true regarding deploying a VM from a template? (Choose two.)
   a. You can only deploy the VM on the host on which the template exists.
   b. You can deploy a VM anywhere in the vCenter from a template on any host connected to the vCenter.
   c. You must select the compute resource as you deploy the VM.
   d. You can delay selecting a compute resource until you first want to start the VM.

9. Which of the following are *not* true regarding VM templates? (Choose two.)
   a. You can edit the settings of VM templates, just like VMs.
   b. You cannot edit the setting of templates.
   c. You cannot power on a template.
   d. You can power on a template as long as the VM that it's connected to is powered on.

10. Which of the following are *not* true regarding CPU and memory reservations for VMs? (Choose two.)
    a. It is not possible to change the CPU and memory reservations and shares on individual VMs.
    b. It is not recommended to change the CPU and memory reservations and shares on individual VMs.
    c. Resource Pools provide the best environment to control CPU and memory reservations, not VMs.
    d. VMs provide the best environment to control CPU and memory resources, not resource pools.

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