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The Official VCP5 Certification Guide

Bill Ferguson
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About the Author

Bill Ferguson, VCI5, VCP5, CCSI, and MCT 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.”
Dedication

To my wife, who didn’t want me to take on this challenge at first because of the tremendous amount of time that it takes to complete a book of this type; yet she still became my prime source of encouragement and support when I decided to do it anyway. I love you, Wilma, and I couldn’t have done this without you. Thanks!
Acknowledgments

First, I want to thank Joan Murray for giving me the opportunity to write this important book. I am very glad that our paths crossed at vmWorld. I also want to thank John Davidson and Gabrie van Zenten 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 is due to Chris Cleveland, who kept me on target with his skilled developmental editing. I would also like to give a special thanks to Joshua Andrews at VMware, whose first-hand 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 collaboration of VMware and Pearson/VMware Press. 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!
About the Reviewers

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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.

As an associate publisher for Pearson, I welcome your comments. You can email or write me directly to let me 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 I cannot help you with technical problems related to the topic of this book. We do have a User Services group, however, where I will forward specific technical questions related to the 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. I will carefully review your comments and share them with the author and editors who worked on the book.

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Introduction

Welcome to my VCP5 study guide. I’m excited about sharing this information with you to help you prepare to take and pass the VCP510 test. I’ve been a technical trainer/consultant for more than 15 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, http://vmware.com/certification, is your best guide for success on the test, I decided 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 that 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 feel 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 5 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.” Since this is the case, and since 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 5.0 and a couple of vSphere 5.0 hosts installed that you can use to follow along. You could even do this using Workstation 8 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 VCP510 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 may 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 VCP5 certification was listed on http://www.techrepublic.com/ as one of the top-ten certifications to have in 2012. If you are currently working with VMware vSphere virtual datacenters, 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 VCP5.

Goals and Methods

My number-one goal of this book is a simple one: to help you pass the VCP510 Certification test and obtain the status of VMware Certified Professional for vSphere 5 (VCP5).

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 to the type of questions that appear on the VCP510 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 7, cover the following topics:

- **Chapter 1, “Planning, Installing, Configuring, and Upgrading vCenter Server and VMware ESXi”**: This chapter focuses on installing, upgrading, and securing all of the key components in your vSphere. I discuss ESXi hosts, vCenter, datastores, and network components.

- **Chapter 2, “Planning and Configuring vSphere Networking”**: This chapter focuses completely on networking components in vSphere. I cover both vSphere standard switch and vSphere distributed switch concepts.

- **Chapter 3, “Planning and Configuring vSphere Storage”**: This chapter focuses on storage of virtual datacenters and virtual machines. I discuss configuring and managing all forms of storage, including Fibre Channel, iSCSI, and network-attached storage.

- **Chapter 4, “Deploying and Administering Virtual Machine and vApps”**: This chapter focuses on creating, configuring, and managing virtual machines and vApps. I cover many other topics, including cloning, troubleshooting, and exporting virtual machines and vApps.

- **Chapter 5, “Establishing and Maintaining Service Levels”**: This chapter focuses on keeping your vSphere running smoothly and recovering quickly from any failure. I cover many topics, including services that improve overall utilization and recoverability.

- **Chapter 6, “Performing Basic Troubleshooting”**: This chapter focuses on understanding the key components of your vSphere and how they work together. You learn how to spot a problem and make the necessary corrections. I cover troubleshooting your ESXi hosts, network, storage, and key services.

- **Chapter 7, “Monitoring vSphere Implementation and Managing vCenter Alarms”**: This chapter focuses on the “core four” resources in any computer system: CPU, memory, disk, and network. I cover guidelines for monitoring each of the core four. By knowing how to monitor your resources and knowing what you should expect to see, you will be able to spot any metrics that seem to “out of place” and take the necessary action.

- **Chapter 8, “What Do I Do Now?”** is a small chapter that gives you some additional direction and encouragement to schedule, take, and pass the VCP510 test.
Certification Exam and This Preparation Guide

I wrote this book directly to the VCP510 Exam Blueprint. Each chapter of this book is a section of the blueprint, with all of 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 VCP510 Exam Blueprint objectives and the chapter of this book that covers them.

### Table I-1  VCP5 Exam Topics and Chapter References

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**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/9780789749314. 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.
Install the Software from the DVD

Pearson IT Certification Practice Test Engine and Questions on the DVD

The DVD in the back of this book 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.

The installation process requires two major steps: installing the software, and then activating the exam. The DVD in the back of this book has a recent copy of the Pearson IT Certification Practice Test engine. The practice exam—the database of exam questions—is not on the DVD.

Note The cardboard DVD case in the back of this book includes the DVD and 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 from the DVD

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 XP (SP3), Windows Vista (SP2), or Windows 7
- Microsoft .NET Framework 4.0 Client
- Microsoft SQL Server Compact 4.0
- Pentium class 1GHz processor (or equivalent)
- 512 MB RAM
- 650 MB disc space plus 50 MB for each downloaded practice exam

The software installation process is pretty routine as 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. Just launch the software on your desktop and proceed to
activate the practice exam from this book by using the activation code included in the DVD sleeve.

The following steps outline the installation process:

**Step 1.** Insert the DVD into your PC.

**Step 2.** The software that automatically runs is the Pearson software to access and use all DVD-based features, including the exam engine and the DVD-only appendixes. From the main menu, click the **Install the Exam Engine** option.

**Step 3.** Respond to window 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 DVD sleeve. This process requires that you establish a Pearson website login. You need this login to activate the exam, so please 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 installing the exam engine, you should then activate the exam associated with this book (if you did not do so during the installation process) as follows:

**Step 1.** Start the Pearson IT Certification Practice Test software from the Windows Start menu or from your desktop shortcut icon.

**Step 2.** To activate and download the exam associated with this book, from the My Products or Tools tab, click the **Activate** button.

**Step 3.** At the next screen, enter the activation key from paper inside the cardboard DVD holder in the back of the book. Once entered, click the **Activate** button.

**Step 4.** The activation process downloads 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 you have opened 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, open the Tools tab and click the **Update Products** button. Updating your exams will ensure 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, open the Tools tab and click the **Update Application** button. This will ensure you are running the latest version of the software engine.
Activating Other Exams

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

Premium Edition

In addition to the free practice exam provided on the DVD, you can purchase two additional exams with expanded functionality directly from Pearson IT Certification. The Premium Edition eBook and Practice Test for this title contains an additional full practice exam and an eBook (in both PDF and ePub format). In addition, the Premium Edition title also has remediation for each question to the specific part of the eBook that relates to that question.

If you have purchased the print version of this title, you can purchase the Premium Edition at a deep discount. A coupon code in the DVD sleeve contains a one-time-use code and instructions for where you can purchase the Premium Edition.

This chapter covers the following subjects:

- Configuring vSphere Standard Switches
- Configuring vSphere Distributed Switches
- Configuring vSS and vDS Policies
Planning and Configuring vSphere Networking

In our discussion on vSphere networking, I will address many topics, such as vSphere standard switches (vSS), vSphere distributed switches (vDS), port groups, and the properties for all of these. It’s easy to get overwhelmed in all the terminology, especially when most of the components are not something that you can see or hold in your hand. To keep from becoming overwhelmed with the technology, focus on two primary questions. The first question is, “What type of connections can I create and what do they do?” The second is, “Where does the ‘virtual world’ meet the ‘physical world,’ and how is that point of reference defined?” If you just focus on these two questions, I believe that the rest of the picture will come to your mind.

That said, this chapter covers configuring vSSs, configuring vDSs, and configuring vSS and vDS policies. In each section, I explain why these should be configured, and then I will discuss how you can configure them. In addition, I walk you through the steps to configure each of these settings.

“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 2-1 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.”

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1. Which of the following will result if you choose Add Networking, and then immediately choose Next on the Networking link of your ESXi host?
   a. You can add a new VMkernel port to an existing switch.
   b. You can add a new VM port to an existing switch.
   c. You will be creating a new vSS.
   d. You can add a new vmnic to an existing switch.

2. Which of the following is not a common use of a VMkernel port?
   a. IP storage
   b. Storage vMotion
   c. vMotion
   d. Management

3. Which of the following is true about switch and port group policies on a vSS?
   a. Switch settings override port group settings.
   b. You cannot configure port group settings different from switch settings.
   c. There are no switch settings on a vSS.
   d. Port group settings override switch settings for the VMs on the port group.

4. What is the maximum number of hosts that can be connected to a single vDS?
   a. 32
   b. 1000
   c. 350
   d. 100

5. Which of the following is the minimum license requirement to create a vDS?
   a. Enterprise Plus
   b. Enterprise
   c. Advanced
   d. Essentials
6. Which view should you be in to add a host to an existing vDS?
   a. Hosts and Clusters
   b. Networking
   c. vSphere
   d. VMs and Templates

7. Which of the following is not a common policy for vSS switch and port groups?
   a. Traffic shaping
   b. NIC teaming
   c. Permissions
   d. Security

8. Which of the following is true about vDS policies?
   a. Policies set at the port group level override those are the port level.
   b. Policies cannot be set at the port level.
   c. Policies are always set at the port level.
   d. Policies set at the port level override policies set at the port group level.

9. Which of the following is not a load-balancing option in vSphere?
   a. Route based on the originating virtual port ID
   b. Beacon probing
   c. Route based on source MAC hash
   d. Route based on IP hash

10. Which of the following is not a type of private VLAN?
    a. Isolated
    b. Trunking
    c. Promiscuous
    d. Community
Configuring vSphere Standard Switches

A vSphere standard switch (vSS) is a logical construct within one ESXi host that connects virtual machines (VMs) to other VMs on the same switch. In addition, using connections called uplinks, it can connect VMs to other virtual or physical machines on other ESX/ESXi hosts, other vSSs in the same host, or anywhere in the physical environment. In this section, I discuss vSS capabilities and how to create and delete them. In addition, I cover adding, configuring, and removing vmnics; configuring VMkernel ports and services; adding and removing port groups; and determining use cases for a vSS.

Identifying vSphere Standard Switch (vSS) Capabilities

A vSS models a simple Layer 2 switch that provides networking for the VMs connected to it. It can direct traffic between VMs on the switch as well as link them to external networks. Figure 2-1 shows a diagram of a vSS. (It only exists in a software state.) Note that there are actually two VMkernel ports on the vSS in this ESXi host. One is for management (management network), and the other is for other purposes that I will describe later in this section.

![Figure 2-1 A Diagram of a vSphere Standard Switch](image)

As mentioned earlier, a vSS models an Ethernet Layer 2 switch on which a virtual machine network interface card (vNIC) can connect to its port and thereby be connected to other machines on the same switch; or off of the switch by way of an uplink to the physical world. Each uplink adapter also uses a port on a vSS. As I said before, one of the main questions to ask yourself is, “What type of connections can I create?” So, now I will discuss connections on vSSs.
You can create two main types of connections on vSSs: VMkernel ports and VM ports. The difference between these two types of connections is dramatic. It is important to understand how each type of connection is used.

VMkernel ports are used to connect the VMkernel to services that it controls. There is only one VMkernel on an ESXi host (also called the hypervisor), but there can be many VMkernel ports. In fact, it is best practice to use a separate VMkernel port for each type of VMkernel service. There are four main types of VMkernel services that require the use of a VMkernel port, as follows:

- **IP storage**: iSCSI or networked-attached storage (NAS). (Chapter 3, “Planning and Configuring vSphere Storage,” covers these in more detail.)
- **vMotion**: A VMkernel port is required and a separate network is highly recommended. (Chapter 5, “Establishing and Maintaining Service Levels,” covers vMotion in more detail.)
- **Management**: Because ESXi does not have a service console, or service console ports, management is performed through a specially configured VMkernel port.
- **Fault-tolerant logging**: A feature in vSphere that allows a high degree of hardware fault tolerance for the VMs involved, but also requires a separate and distinct VMkernel port. (Chapter 5 covers fault-tolerant logging in greater detail.)

VM port groups, however, are only used to connect VMs to the virtual switches. They are primarily a Layer 2 connection that does not require any configuration other than a label to identify a port group, such as Production. A VLAN can be configured for a port group, but that is optional. You can have multiple VM port groups on a single switch and use them to establish different policies, such as security, traffic shaping, and NIC teaming for various types of VMs. You will learn more about these in the section, “Configuring vSS and vDS Policies.”

**Creating/Deleting a vSphere Standard Switch**

The first question that you might want to ask yourself is, “Do I really need a new vSS?” The answer to this question might not be as straightforward as you think. You do not necessarily need a new vSS for every new port or group of ports, because you can also just add components to the vSS that you already have. In fact, you might make better use of your resources by adding to a vSS that you already have, instead of creating a new one. In the section, “Adding/Editing/Removing Port Groups on a vNetwork Standard Switch,” I will discuss the power of using port groups and policies. In this section, I will discuss how to create a new vSS and how to delete a vSS that you no longer require.
If you decide to create a new vSS, you should select **Add Networking** from the Networking link and follow the wizard from there. The main thing to remember is that, when you select Add Networking, and then immediately click **Next**, you are always creating a new vSS, not just adding networking components to an existing vSS. For example, if you want to create a new vSS for a VMkernel port used for vMotion, follow the steps outlined in Activity 2-1.

### Activity 2-1 Creating a New vSphere Standard Switch

1. Log on to your vSphere Client.
2. Select **Home** and then **Hosts and Clusters**.
3. Select the ESX host on which you want to create the new vSS, and then open the Configuration tab.
4. Click the **Networking** link under Hardware.
5. In the upper-right corner, click the **Add Networking** link, as shown in Figure 2-2.

![Figure 2-2 The Add Networking Link on a vSS](image)

6. On the Connection Type of the Add Network Wizard, select **VMkernel** and click **Next**, as shown in Figure 2-3.
7. In VMkernel - Network Access, select the vmnic that you will use for the VMkernel port and click Next, as shown in Figure 2-4.

8. In VMkernel - Connection Settings, enter the Network Label and optionally the VLAN, as shown in Figure 2-5. (The Network Label should generally indicate the purpose of the switch or port group. In this case, you might use vMotion, and then enable it for vMotion.) Click Next.
9. In VMkernel - IP Connection Settings, enter the IP address, subnet mask, and VMkernel Default Gateway to be used for the switch, as shown in Figure 2-6, and then click Next. (I will discuss these settings in detail later in the section, “Creating/Configuring/Removing Virtual Adapters.”)
10. In Ready to Complete, review your configuration settings and click Finish.

Deleting a vSphere Standard Switch

There might come a time when you no longer require a vSS that you have in your inventory. This might be because you have chosen to upgrade to a vSphere distributed switch (vDS) or because you are changing the networking on each of the hosts to provide consistency across the hosts, which is a very good idea. In this case, follow the steps outlined in Activity 2-2.

Activity 2-2 Deleting a vSphere Standard Switch

1. Log on to your vSphere Client.
2. Select Home and then Hosts and Clusters.
3. Select the ESX host on which you want to delete the vSS, and then open the Configuration tab.
4. Click the Networking link under Hardware.
5. Click the Remove link next to the switch that you want to remove, and then confirm your selection by clicking Yes, as shown in Figure 2-7. (There is a Remove link for each switch, so take care to select the right one.)

Figure 2-7 Deleting a vSphere Standard Switch
Adding/Configuring/Removing vmnics on a vSphere Standard Switch

As I mentioned earlier, you may not want to create a new vSwitch every time you need a new connection. In fact, you will make better use of your resources by adding to a current switch and thereby leveraging port groups and NIC teaming. In this section, I will discuss how to add new vmnics to a switch that you already have. I will also discuss how to remove a vmnic from a switch if you no longer require it.

To add a new vmnic to an existing switch, you should not click on Add Networking! So if you don’t click on Add Networking, then what do you do? Well, if you think about it, what you really want to do is edit the configuration of a switch. For example, if you wanted to add a new vmnic to your existing vSwitch named vSwitch1, then you should do the following:

Activity 2-3 Adding a vmnic to a Switch

1. Log on to your vSphere Client.
2. Select Home and then Hosts and Clusters.
3. Select the ESX host on which you would like to edit the vSS.
4. Click the Networking link under Hardware.
5. Click the Properties link next to the switch that you want to edit, as shown in Figure 2-8.

Figure 2-8 The Properties Link on a vSS
6. On the Properties dialog box for the switch, click on the Network Adapters tab and click Add, as shown in Figure 2-9.

![Figure 2-9 Adding a vmnic to a Switch](image)

7. On the Adapter Selection dialog box, choose the vmnic (or vmnics) that you want to add and click Next, as shown in Figure 2.10. Note that the adapters are categorized as unclaimed or as already connected to a vSwitch.

![Figure 2-10 Selecting the new vmnic](image)
8. Set the desired failover order and whether you want your new adapter to be active or just standby; then select Next; as shown in Figure 2.11

![Figure 2-11](image)

**Figure 2-11** Choosing vmnic order and use

9. On the Adapter Summary page, review the list of adapters that you are adding, and select Finish. In this case, we are only adding vmnic3.

![Figure 2-12](image)

**Figure 2-12** Adapter Summary page
10. To remove a vmnic when you no longer need it, simply select the vmnic in the Network Adapters list, select **Remove**, and confirm your selection; as shown in Figure 2.13.

![Figure 2-13 Removing a vmnic](image)

There will be cases when you need to change the settings of a vmnic that you have already configured for a vSS. For example, you might want to edit the physical configuration such as the speed and duplex settings to match those of a physical switch to which your ESXi host is connected. To edit the physical configuration of the vmnic, follow the steps outlined in Activity 2-4.

**Activity 2-4 Configuring the Physical Aspects of a vmnic**

1. Log on to your vSphere Client.
2. Select **Home** and then **Hosts and Clusters**.
3. Select the ESXi host on which you want to edit the vSS.
4. Click the **Networking** link under **Hardware**.
5. Click the **Properties** link next to the switch that you want to edit.
6. On the Properties dialog box for the switch, open the Network Adapters tab and select the vmnic that you want to configure, as shown in Figure 2-14.

![Figure 2-14 The Network Adapters Tab](image)

7. Click Edit, and then select the speed and duplex that matches the physical switch to which the ESXi host is connected, as shown in Figure 2-15, and click OK.

![Figure 2-15 Configuring Physical Aspects of a vmnic](image)

8. Click Close to exit the Properties dialog box.
NOTE  Auto Negotiate is the default, but is not always considered a best practice when more than one vendor is involved. This is because the result will often be less than the desired setting (such as 100 Mb Half Duplex). If you use Auto Negotiate, verify that the resulting setting is what you expected.

There might come a time when you need to remove a vmnic from a switch. This might happen if you are changing network settings to provide consistency or if you intend to use the vmnic on a new switch. If you need to remove a vmnic from a vSS, follow the steps outlined in Activity 2-5.

**Activity 2-5 Removing a vmnic from a vSphere Standard Switch**

1. Log on to your vSphere Client.
2. Select **Home** and then **Hosts and Clusters**.
3. Select the ESX host on which you want to remove the vmnic.
4. Click the **Networking** link under Hardware.
5. Click the **Properties** link next to the switch that contains the vmnic that you want to remove.
6. On the Properties dialog box for the switch, open the Network Adapters tab, select the vmnic that you want to remove, select **Remove**, and confirm your selection by clicking **Yes**, as shown in Figure 2-16.

![Figure 2-16 Removing a vmnic](image)
Configuring VMkernel Ports for Network Services

As mentioned earlier, there are only four reasons that you would create a VMkernel port: management, IP storage, fault-tolerant logging, and vMotion. I will discuss each of these in greater detail in later chapters, but for now, you should understand that they all share the same configuration requirements for network services (namely, an IP address and subnet mask). In addition, you should know that all VMkernel ports will share the same default gateway. You might also want to configure a VLAN, and you will want to enable the port with the services for which it was created (such as vMotion, management, or fault-tolerant logging).

To configure a VMkernel port with network service configuration, you should configure the IP settings of the port group to which it is assigned. I discuss port group configuration in greater detail later in this chapter. For now, if you want to configure the IP settings of a VMkernel port, follow the steps outlined in Activity 2-6.

**Activity 2-6 Configuring a VMkernel Port for Network Services**

1. Log on to your vSphere Client.
2. Select Home and then Hosts and Clusters.
3. Select the ESX host on which you want to configure the VMkernel port.
4. Click the Networking link under Hardware.
5. Click the Properties link next to the switch that contains the port, as shown in Figure 2-17.

![Figure 2-17 Properties Link for vSS](image-url)
6. On the Properties dialog box for the switch, on the Ports tab, select the port group to which the VMkernel port is assigned and click Edit, as shown in Figure 2-18.

![Figure 2-18 Editing a Port Group](image)

7. Open the IP Settings tab, and enter the IP information for your network, as shown in Figure 2-19, and click OK.

![Figure 2-19 Editing IP Information](image)
8. If you want to configure a VLAN for the port group, open the General tab and enter the VLAN information directly under the Network Label.

9. On the General tab, you can also enable the vmnic for the specific services for which it was created, such as vMotion, FT Logging, or Management. If the port was only created for IP storage, you do not need to check any of the Enabled boxes.

10. Finally, if appropriate, you can change the maximum transmission unit (MTU) for the vmnic (for example, if you are using jumbo frames for iSCSI storage). (Chapter 3 covers storage options in greater detail.) Click OK to close the Properties dialog box and save your settings.

Adding/Editing/Removing Port Groups on a vSphere Standard Switch

The main reason to use port groups is to get more than one function out of each switch. This is possible because port group configuration supersedes switch configuration. Because of this, you can have policies for security, traffic shaping, NIC teaming, and so on that apply to the switch but also have a separate policy for each that applies to any port group on which the settings differ from those of the switch. This tremendously improves your flexibility and gives you options such as those security options discussed in Chapter 1, “Planning, Installing, Configuring, and Upgrading vCenter Server and VMware ESXi.” In this section, I will discuss adding, editing, and removing port groups on a vSS.

Suppose you decide to add a new group of VMs on which you will test software and monitor performance. Furthermore, suppose you decide that you will not create a new switch, but that you will instead add the VMs to a switch that you already have in your inventory. However, suppose the VMs that are already on the switch are not for testing and development, but are actually in production. Chances are good that you do not want to “mix them in” with the new testing VMs, but how can you keep them separate without creating a new vSS?

Well, if you create a new port group and assign a different vmnic to it, you can manage the new testing VMs completely separate from the production VMs, even though they are both on the same vSS. In this case, you might want to label your existing port group Production and label your new port group Test-Dev. It does not matter what label you use, but it is a best practice to relate it to the function of the port group, which is generally related to the function of the VMs that will be on it. Also, you should strive for consistency across all of your ESXi hosts in a small organization or at least across all of the hosts in the same cluster in a medium-sized or large organization. (Chapter 5 covers clusters in greater detail.)
So, what was the purpose of all of that labeling? Well, after you have done that, you will have a set of five tabs on the Properties link of the port group that only apply to that port group. You can make important changes to port group policies, such as security, traffic shaping, and NIC teaming, that will override any settings on the vSS properties tabs. I will discuss the details of these port group policies later in this section, “Configuring vSS and vDS Policies.” For now, if you want to add a new VM port group to an existing vSS, follow the steps outlined in Activity 2-7.

**Activity 2-7 Adding a Port Group to a vSphere Standard Switch**

1. Log on to your vSphere Client.
2. Select **Home** and then **Hosts and Clusters**.
3. Select the ESX host on which you want to add the port group.
4. Click the **Networking** link under Hardware.
5. Click the **Properties** link next to the switch on which you want to add the port group.
6. On the Ports tab, click **Add**, and then choose **Virtual Machine**, as shown in Figure 2-20. Click **Next**.

![Figure 2-20 Adding a Virtual Machine Port Group](image-url)
7. From **Virtual Machines > Connection Settings**, enter the label that you want to use (such as Test-Dev) and the VLAN if you are using a VLAN, as shown in Figure 2-21. Click **Next**.

![Figure 2-21 Entering and Network Label](image)

8. On Ready to Complete, review your configuration settings and click **Finish**.

Your new port group should now appear in the Properties dialog box under Configuration. This new port group is now completely configurable and will have its own set of five tabs for you to configure. Just click the port group under Configuration and select **Edit**, as shown in Figure 2-22. I will discuss the configuration of port group policies in detail later in the section, “Configuring vSS and vDS Policies.”
Finally, you might want to remove a port group that you no longer need. This might happen because you are reorganizing your network or because you are no longer using the VMs to which the port group was associated. To remove the port group, click the port group, select **Remove**, and confirm your selection by clicking **Yes**, as shown in Figure 2-23.
Determining Use Cases for a vSphere Standard Switch

Now that I have discussed how you would create and manage a vSS, let’s talk about why you would want one in the first place. In other words, what would cause you to use a vSS instead of a vDS? One practical reason might be that you do not have the appropriate license to use a vDS. As discussed in Chapter 1, in the section, “Installing and Configuring vCenter Server,” creating a vDS requires an Enterprise Plus license. Another reason might be that you have a small to medium-size organization and therefore the settings on a vSS are sufficient for your needs. Your organization can have many hosts and those hosts can communicate to each other using vSSs.

The main point to consider is how you can keep the networking that is inside of each ESXi host consistent with the networking that is inside the other hosts, or at least all the hosts in the same cluster. If possible, you should have the same number of vSSs in each of your hosts and the same port groups on each of them (at least the ones that are in the same clusters). In fact, the consistent spelling of the port group names is even important. In addition, to leverage the power of port groups, you should have as few vSSs on each host as possible while still maintaining consistency across the hosts. If you balance these two factors in your organization as much as possible, you will be on the right track.

Configuring vSphere Distributed Switches

Now that you understand what a virtual switch does and understand that consistency of configuration is a key component, what if I were to tell you that there is a way to guarantee consistency by associating a virtual switch to more than one host at the same time? Well, that’s what a vDS does.

A vDS is the same as a vSS in many ways except that it can be connected to more than one host at the same time, which makes a radical difference. I know what you’re thinking, “Is it similar to a vSS or radically different?” Well, in a word, “Yes.” It’s similar in that it uses the same types of connections (namely, VMkernel and VMs). It’s also similar in that the point at which the virtual world meets the physical world is an important thing to know and understand. However, it’s radically different because it is managed centrally in the vCenter and can be connected to multiple hosts at the same time. In fact, a single vDS can be connected to as many as 350 hosts. Because of this difference, vDSs come with a whole new set of terms to understand.

In this section, I will discuss the capabilities of a vDS versus those of a vSS. I will also discuss creating and deleting a vDS and adding and removing ESXi hosts. In addition, I will cover adding, configuring, and removing dvPort groups and dvUplinks (new terms in vDSs). A vDS also has virtual adapters just like a vSS,
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