vmware PRESS

Official Cert Guide

Learn, prepare, and practice for exam success

- Master the VCP5 exam with this official study guide
- Assess your knowledge with chapter-opening quizzes
- Review key concepts with Exam Preparation Tasks
- Practice with realistic exam questions on the DVD
- Reinforce learning with 3 hours of VCP5 video training from TrainSignal

The Official VCP5 Certification Guide

VMware® Certified Professional on vSphere® 5

BILL FERGUSON

PEARSON

The Official VCP5 Certification Guide

VMware Press is the official publisher of VMware books and training materials, which provide guidance on the critical topics facing today's technology professionals and students. Enterprises, as well as small- and medium-sized organizations, adopt virtualization as a more agile way of scaling IT to meet business needs. VMware Press provides proven, technically accurate information that will help them meet their goals for customizing, building, and maintaining their virtual environment.

With books, certification and study guides, video training, and learning tools produced by world-class architects and IT experts, VMware Press helps IT professionals master a diverse range of topics on virtualization and cloud computing and is the official source of reference materials for preparing for the VMware Certified Professional Examination.

VMware Press is also pleased to have localization partners that can publish its products into more than forty-two languages, including, but not limited to, Chinese (Simplified), Chinese (Traditional), French, German, Greek, Hindi, Japanese, Korean, Polish, Russian, and Spanish..

For more information about VMware Press, please visit
http://www.vmware.com/go/vmwarepress.

The Official VCP5 Certification Guide

Bill Ferguson

vmware® PRESS

Upper Saddle River, NJ • Boston • Indianapolis • San Francisco
New York • Toronto • Montreal • London • Munich • Paris • Madrid
Cape Town • Sydney • Tokyo • Singapore • Mexico City

The Official VCP5 Certification Guide

Copyright © 2013 VMware, Inc.

Published by Pearson plc

Publishing as VMware Press

The Library of Congress Cataloging-in-Publication data is on file.

All rights reserved. Printed in the United States of America. This publication is protected by copyright, and permission must be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise.

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. The publisher cannot attest to the accuracy of this information. Use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

VMware terms are trademarks or registered trademarks of VMware in the United States, other countries, or both.

Warning and Disclaimer

Every effort has been made to make this book as complete and as accurate as possible, but no warranty or fitness is implied. The information provided is on an "as is" basis. The authors, VMware Press, VMware, and the publisher shall have neither liability nor responsibility to any person or entity with respect to any loss or damages arising from the information contained in this book or from the use of the DVD or programs accompanying it.

The opinions expressed in this book belong to the author and are not necessarily those of VMware.

Corporate and Government Sales

VMware Press offers excellent discounts on this book when ordered in quantity for bulk purchases or special sales, which may include electronic versions and/or custom covers and content particular to your business, training goals, marketing focus, and branding interests. For more information, please contact U.S. Corporate and Government Sales, (800) 382-3419, corpsales@pearsontechgroup.com. For sales outside the United States, please contact International Sales, international@pearsoned.com.

ISBN-13: 978-0-7897-4931-4

ISBN-10: 0-7897-4931-9

Text printed in the United States at Courier in Westford, Massachusettes.

Second Printing, November 2012

VMware Press Program Manager
Erik Ullanderson

Associate Publisher
David Dusthimer

Acquisitions Editor
Joan Murray

Senior Development Editor
Christopher Cleveland

Managing Editor
Sandra Schroeder

Project Editor
Mandie Frank

Copy Editor
Keith Cline

Proofreader
Leslie Joseph

Book Designer
Gary Adair

Compositor
Mark Shirar

Editorial Assistant
Vanessa Evans

Cover Designer
Alan Clements

Contents at a Glance

About the Author xix

Dedication xx

Acknowlegments xxi

About the Reviewers xxii

Introduction xxiii

CHAPTER 1 Planning, Installing, Configuring, and Upgrading vCenter Server and VMware ESXi 3

CHAPTER 2 Planning and Configuring vSphere Networking 73

CHAPTER 3 Planning and Configuring vSphere Storage 159

CHAPTER 4 Deploying and Administering Virtual Machine and vApps 235

CHAPTER 5 Establishing and Maintaining Service Levels 323

CHAPTER 6 Performing Basic Troubleshooting 423

CHAPTER 7 Monitoring vSphere Implementation and Managing vCenter Alarms 471

CHAPTER 8 What Do I Do Now? 533

APPENDIX A Answers to the "Do I Know This Already?" Quizzes and Chapter Review Questions 539

Index 545

Table of Contents

About the Author xix
Dedication xx
Acknowlegments xxi
About the Reviewers xxii
Introduction xxiii

Chapter 1 Planning, Installing, Configuring, and Upgrading vCenter Server and VMware ESXi 3

"Do I Know This Already?" Quiz 3

Installing and Configuring vCenter Server 6

- Identifying Available vSphere and vCenter Server Editions 6
- Deploying the vCenter Appliance 9
- Installing vCenter Server into a Virtual Machine 14
- Sizing the vCenter Server Database 17
- Installing Additional vCenter Server Components 17

Installing/Removing vSphere Client Plug-Ins 18

- Enabling/Disabling vSphere Client Plug-Ins 19
- Licensing vCenter Server 19
- Determining Availability Requirements for vCenter Server in a Given vSphere Implementation 21
- Determining Use Cases for vSphere Client and Web Client 22

Installing and Configuring VMware ESXi 22

- Performing an Interactive Installation of ESXi 22
- Deploying an ESXi Host Using Auto Deploy 24
- Configuring NTP on an ESXi Host 26
- Configuring DNS and Routing on an ESXi Host 27
- Enabling/Configuring/Disabling Hyperthreading 27
- Enabling/Sizing/Disabling Memory Compression Cache 28
- Licensing an ESXi Host 30

Planning and Performing Upgrades of vCenter Server and VMware ESXi 31

- Identifying Upgrade Requirements for ESXi Hosts 31
- Identifying Steps Required to Upgrade a vSphere Implementation 32
- Upgrading a vSphere Distributed Switch 33
- Upgrading from VMFS3 to VMFS5 34

Upgrading VMware Tools 34

Upgrading Virtual Machine Hardware 37

Upgrading an ESXi Host Using vCenter Update Manager 39

Determining Whether an In-Place Upgrade Is Appropriate in a Given Upgrade Scenario 42

Securing vCenter Server and ESXi 43

Identifying Common vCenter Server Privileges and Roles 43

System Roles 44

Sample Roles 44

Custom Roles 45

Describing How Permissions Are Applied and Inherited in vCenter Server 45

Example 1: Permissions That Apply Directly to an Object Supersede Those That Are Inherited 46

Example 2: If a User Is a Member of More Multiple Groups, the User Is Assigned the Union of the Privileges for Each Group 46

Example 3: User/Role Pairings Applied Directly to an Object Supersede User/Role Pairings That Are Inherited 47

Example 4: Permissions That Are Applied Directly to a User Supersede Permissions That Are Inherited Through Group Membership 48

Configuring and Administering the ESXi Firewall 49

Enabling Lockdown Mode 50

Configuring Network Security Policies 51

Promiscuous Mode 52

MAC Address Changes 53

Forged Transmits 53

Viewing/Sorting/Exporting User and Group Lists 54

Adding/Modifying/Removing Permissions for Users and Groups on vCenter Inventory Objects 54

Creating/Cloning/Editing vCenter Server Roles 55

Creating Roles 55

Cloning Roles 56

Editing Roles 59

Adding an ESXi Host to a Directory Service 60

Applying Permissions to ESXi Hosts Using Host Profiles 62

Determining the Appropriate Set of Privileges for Common Tasks in vCenter Server 62

Identifying vSphere Architecture and Solutions 62
Identifying Available vSphere Editions and Features 63
Explaining ESXi and vCenter Server Architectures 63
Explaining Private/Public/Hybrid Cloud Concepts 64
Determining the Appropriate vSphere Edition Based on Customer Requirements 66
Summary 67
Chapter 2 Planning and Configuring vSphere Networking 73
"Do I Know This Already?" Quiz 73
Configuring vSphere Standard Switches 76
Identifying vSphere Standard Switch (vSS) Capabilities 76
Creating/Deleting a vSphere Standard Switch 77
Deleting a vSphere Standard Switch 81
Adding/Configuring/Removing vmnics on a vSphere Standard Switch 82
Configuring VMkernel Ports for Network Services 88
Adding/Editing/Removing Port Groups on a vSphere Standard Switch 90
Determining Use Cases for a vSphere Standard Switch 94
Configuring vSphere Distributed Switches 94
Identifying vSphere Distributed Switch Capabilities 95
Creating/Deleting a vSphere Distributed Switch 97
Deleting a vDS 100
Adding/Removing ESXi Hosts from a vSphere Distributed Switch 100
Adding/Configuring/Removing dvPort Groups 104
Adding/Removing Uplink Adapters to dvUplink Groups 108
Creating/Configuring/Removing Virtual Adapters 111
Migrating Virtual Adapters To/From a vSphere Standard Switch 117
Migrating Virtual Machines to/from a vSphere Distributed Switch 119
Determining Use Cases for a vSphere Distributed Switch 123
Configuring vSS and vDS Policies 124
Identifying Common vSS and vDS Policies 124
Configuring dvPort Group Blocking Policies 132
Configuring Load Balancing and Failover Policies 133
Load Balancing 134
Network Failover Detection 134
Notify Switches 135

Failback 135

Configuring VLAN Settings 137

Configuring VLAN Policy Settings on a VDS 139

Configuring VLAN Trunking Policies on a VDS 140

Configuring Private VLAN Policy Settings on a vDS 140

Configuring Traffic Shaping Policies 142

Traffic Shaping Policies for vSphere Standard Switches 143

Traffic Shaping Policies for vSphere Distributed Switches 144

Enabling TCP Segmentation Offload Support for a Virtual Machine 145

Enabling Jumbo Frames Support on Appropriate Components 147

Enabling Jumbo Frames for VMkernel Interface on a vSS 147

Enabling Jumbo Frames on a vDS 148

Enabling Jumbo Frame Support on Virtual Machines 149

Determining Appropriate VLAN Configuration for a vSphere Implementation 149

Summary 151

Chapter 3 Planning and Configuring vSphere Storage 159

"Do I Know This Already?" Quiz 159

Configuring Shared Storage for vSphere 162

Identifying Storage Adapters and Devices 162

Fibre Channel 163

FCOE 163

iSCSI 164

NAS 164

Identifying Storage Naming Conventions 164

Storage Naming Conventions for Local and SAN 165

Identifying Hardware/Dependent Hardware/Software iSCSI Initiator Requirements 166

Comparing and Contrasting Array Thin Provisioning and Virtual Disk Thin Provisioning 168

Array Thin Provisioning 168

Virtual Disk Thin Provisioning 169

Describing Zoning and LUN Masking Practices 170

Zoning 171

Masking 172

Scanning/Rescanning Storage 172
Identifying Use Cases for FCOE 173
Creating an NFS Share for Use with vSphere 174
Connecting to a NAS Device 175
Enabling/Configuring/Disabling vCenter Server Storage Filters 177
Configuring/Editing Hardware/Dependent Hardware Adapters 179
Enabling/Disabling Software iSCSI Initiator Settings 180
Configuring iSCSI Port Binding 181
Enabling/Configuring/Disabling iSCSI CHAP 183
Determining Use Cases for Hardware/Dependent Hardware/Software iSCSI Initiator 185
Determining Use Cases for and Configuring Array Thin Provisioning 186
Configuring the Storage Virtual Appliance for vSphere 186
Defining the VSA Architecture 187
Configuring ESXi Hosts as VSA Hosts 188
Configuring the Storage Network for the VSA 189
Deploying/Configuring the VSA Manager 189
Administering VSA Storage Resources 190
Administering VSA Clusters 191
Administering VSA Datastores 191
Administering VSA Cluster Membership 191
Determining Use Case for Deploying the VSA 192
Determining Appropriate ESXi Host Resources for the VSA 192
Creating and Configuring VMFS and NFS Datastores 193
Identifying VMFS and NFS Datastore Properties 193
Identifying VMFS-5 Capabilities 195
Creating/Renaming/Deleting/Unmounting a VMFS Datastore 195
Mounting/Unmounting an NFS Datastore 205
Extending/Expanding VMFS Datastores 209
Extending VMFS Datastores 209
Expanding VMFS Datastores 213
Upgrading a VMFS-3 Datastore to VMFS-5 218
Placing a VMFS Datastore in Maintenance Mode 220
Selecting the Preferred Path for a VMFS Datastore 221

Disabling a Path to a VMFS Datastore 223

Determining Use Cases for Multiple VMFS and NFS Datastores 224

Determining Appropriate Path Selection Policy for a VMFS Datastore 224

Summary 225

Chapter 4 Deploying and Administering Virtual Machine and vApps 235

"Do I Know This Already?" Quiz 235

Creating and Deploying Virtual Machines 238

Identifying Capabilities for VM Hardware Versions 238

Identifying VMware Tools Device Drivers 240

Identifying Methods to Access and Use Virtual Machine Console 240

Identifying Virtual Machine Storage Resources 242

Placing Virtual Machines in Selected ESXi Hosts/Clusters/Resource Pools 243

Configuring and Deploying a Guest OS Into a New Virtual Machine 243

Creating/Converting Thin/Thick Provisioned Virtual Disks 245

Configuring Disk Shares 246

Installing/Upgrading/Updating VMware Tools 249

Configuring Virtual Machine Time Synchronization 251

Converting a Physical Machine Using VMware Converter 252

Importing a Supported Virtual Machine Source Using VMware Converter 255

Modifying Virtual Hardware Settings Using VMware Standalone Converter 256

Configuring/Modifying Virtual CPU and Memory Resources According to OS and Application Requirements 256

Configuring and Modifying Virtual Machine CPU 257

Configuring and Modifying Virtual Machine Memory 258

Configuring/Modifying Virtual NIC Adapter and Connecting Virtual Machines to Appropriate Network Resources 260

Determining Appropriate Datastore Locations for Virtual Machines Based on Application Workloads 261

Creating and Deploying vApps 262

Identifying vApp Settings 262

Options 262

Start Order 266

vServices 267

Creating/Cloning/Exporting a vApp 267

Adding Objects to an Existing vApp 274

Editing vApp Settings 274

Configuring IP Pools 274

Suspending/Resuming a vApp 276

Determining When a Tiered Application Should Be Deployed as a vApp 276

Managing Virtual Machine Clones and Templates 277

Identifying the vCenter Server, Managed ESXi Hosts, and Virtual Machine Maximums 278

Identifying Cloning and Template Options 280

Cloning an Existing Virtual Machine 281

Creating a Template from an Existing Virtual Machine 282

Deploying a Virtual Machine from a Template 285

Updating Existing Virtual Machine Templates 287

Deploying Virtual Appliances and/or vApps from an OVF Template 290

Importing and/or Exporting an OVF Template 293

Determining the Appropriate Development Methodology for a Given Virtual Machine Application 295

Administering Virtual Machines and vApps 295

Identifying Files Used by Virtual Machines 295

Identifying Locations for Virtual Machine Configuration Files and Virtual Disks 297

Identifying Common Practices for Securing Virtual Machines 300

Hot Extending a Virtual Disk 301

Configuring Virtual Machine Options 303

General Options 304

vApp Options 304

VMware Tools 305

Power Management 306

Advanced 306

Configuring Virtual Machine Power Settings 307

Configuring Virtual Machine Boot Options 308

Configuring Virtual Machine Troubleshooting Options 309

Assigning a Storage Policy to a VM 310

Verifying Storage Policy Compliance for Virtual Machines 312

Determining When an Advanced Virtual Machine Parameter Is Required 312

Adjusting Virtual Machine Resources (Shares, Limits, and Reservations) Based on Virtual Machine Workloads 313

Summary 313

Chapter 5 Establishing and Maintaining Service Levels 323

"Do I Know This Already?" Quiz 323

Creating and Configuring VMware Clusters 326

Describing DRS Virtual Machine Entitlement 326

Creating/Deleting a DRS/HA Cluster 327

Adding/Removing ESXi Hosts from a DRS/HA Cluster 328

Adding or Removing Virtual Machines from a DRS/HA Cluster 334

Configuring Storage DRS 335

Configuring Enhanced vMotion Compatibility 340

Monitoring a DRS/HA Cluster 342

Configuring Migration Thresholds for DRS and Virtual Machines 342

Configuring Automation Levels for DRS and Virtual Machines 344

Creating VM-Host and VM-VM Affinity Rules 346

Enabling/Disabling Host Monitoring 350

Enabling/Configuring/Disabling Virtual Machine and Application Monitoring 351

Enabling/Configuring/Disabling Virtual Machine Monitoring 351

Enabling/Configuring/Disabling Application Monitoring 352

Configuring Admission Control for HA and Virtual Machines 353

Admission Control 354

Admission Control Policy 354

Determining Appropriate Failover Methodology and Required Resources for an HA Implementation 357

Host Failures the Cluster Tolerates 357

Percentage of Cluster Resources as Failover Spare Capacity 358

Specify Failover Hosts 358

Planning and Implementing VMware Fault Tolerance 358
Identifying VMware Fault Tolerance Requirements 359
Configuring VMware Fault Tolerance Networking 360
Enabling/Disabling VMware Fault Tolerance on a Virtual Machine 361
Testing an FT Configuration 362
Determining Use Case for Enabling VMware Fault Tolerance on a Virtual Machine 362
Creating and Administering Resource Pools 363
Describing the Resource Pool Hierarchy 363
Defining the Expandable Reservation Parameter 364
Creating/Removing a Resource Pool 365
Configuring Resource Pool Attributes 367
Adding/Removing Virtual Machines from a Resource Pool 368
Determining Resource Pool Requirements for a Given vSphere Implementation 368
Evaluating Appropriate Shares, Reservations, and Limits for Resource Pool Based on Virtual Machine Workloads 368
Cloning a vApp 369
Migrating Virtual Machines 373
Identifying ESXi Host and Virtual Machine Requirements for vMotion and Storage vMotion 373
ESXi and VM Requirements for vMotion 373
ESXi and VM Requirements for Storage vMotion 375
Identifying Enhanced vMotion Compatibility CPU Requirements 376
Identifying Snapshot Requirements for vMotion/Storage vMotion Migration 377
Migrating Virtual Machines Using vMotion/Storage vMotion 378
Migrating a VM xix
Using vMotion 378
Migrating a VM's Files Using Storage vMotion 382
Configuring Virtual Machine Swap File Location 384
Migrating a Powered-Off or Suspended Virtual Machine 386
Utilizing Storage vMotion Techniques 387
Backing Up and Restoring Virtual Machines 388
Identifying Snapshot Requirements 389
Creating/Deleting/Consolidating Virtual Machine Snapshots 389

Installing and Configuring VMware Data Recovery 395

Creating a Backup Job with VMware Data Recovery 396

Performing a Test and Live Full/File-Level Restore with VMware Data Recovery 397

Determining Appropriate Backup Solution for a Given vSphere Implementation 397

Patching and Updating ESXi and Virtual Machines 398

Identifying Patching Requirements for ESXi Hosts and Virtual Machine Hardware/Tools 398

Creating/Editing/Removing a Host Profile from an ESXi Host 398

Attach/Apply a Host Profile to an ESXi Host or Cluster 402

Performing Compliance Scanning and Remediation of an ESXi Host Using Host Profiles 405

Installing and Configuring vCenter Update Manager 406

Configuring Patch Download Options 411

Creating/Editing/Deleting an Update Manager Baseline 412

Attaching an Update Manager Baseline to an ESXi Host or Cluster 415

Scanning and Remediating ESXi Hosts and Virtual Machine Hardware/Tools Using Update Manager 416

Summary 417

Chapter 6 Performing Basic Troubleshooting 423

"Do I Know This Already?" Quiz 423

Performing Basic Troubleshooting for ESXi Hosts 426

Identifying General ESXi Host Troubleshooting Guidelines 426

Learn How to Access Support Mode 426

Know How to Retrieve Logs 429

Troubleshooting Common Installation Issues 431

Troubleshooting Boot Order 432

Troubleshooting License Assignment 432

Troubleshooting Plug-Ins 433

Monitoring ESXi System Health 433

Exporting Diagnostic Information 435

Performing Basic vSphere Network Troubleshooting 439

Verifying Network Configuration 440

Verifying a Given Virtual Machine Is Configured with the Correct Network Resources 441

Troubleshooting Virtual Switch and Port Group Configuration Issues 442

Troubleshooting Physical Network Adapter Configuration Issues 443

Identifying the Root Cause of a Network Issue Based on Troubleshooting Information 444

Performing Basic vSphere Storage Troubleshooting 445

Verifying Storage Configuration 445

Troubleshooting Storage Contention Issues 448

Troubleshooting Storage Over-Commitment Issues 450

Excessive Reservations Cause Slow Host Performance 450

Path Thrashing Causes Slow Performance 450

Troubleshooting iSCSI Software Initiator Configuration Issues 451

Troubleshooting Storage Reports and Storage Maps 451

Storage Reports 451

Storage Maps 453

Identifying the Root Cause of a Storage Issue Based on Troubleshooting Information 454

Performing Basic Troubleshooting for HA/DRS Clusters and vMotion/Storage vMotion 455

Identifying HA/DRS and vMotion Requirements 455

Verifying vMotion/Storage vMotion Configuration 456

Verifying vMotion Configuration 456

Verifying HA Network Configuration 457

Verifying HA/DRS Cluster Configuration 458

Troubleshooting HA Capacity Issues 459

Troubleshooting HA Redundancy Issues 459

Interpreting the DRS Resource Distributing Graph and Target/Current Host Load Deviation 460

Troubleshooting DRS Load Imbalance Issues 462

Troubleshooting vMotion/Storage vMotion Migration Issues 462

Interpreting vMotion Resource Maps 463

Identifying the Root Cause for a DRS/HA Cluster or Migration Issue Based on Troubleshooting Information 463

Summary 465

Chapter 7 Monitoring vSphere Implementation and Managing vCenter Alarms 471

"Do I Know This Already?" Quiz 471

Monitoring ESXi, vCenter Server, and Virtual Machines 474

Describing How Tasks and Events are Viewed in vCenter Server 474

Viewing by Object Selected in Console Pane 475

Showing Only Object Entries 476

Filtering by Keyword 477

Identifying Critical Performance Metrics 477

Explaining Common Memory Metrics 478

Explaining Common CPU Metrics 484

Explaining Common Network Metrics 484

Explaining Common Storage Metrics 485

Comparing and Contrasting Overview and Advanced Charts 485

Configuring SNMP for vCenter Server 487

Configuring Active Directory and SMTP Settings for vCenter Server 488

Configuring Active Directory Settings for vCenter 488

Configuring SMTP Settings for a vCenter Server 489

Configuring vCenter Server Logging Options 491

Creating a Log Bundle 492

Creating/Editing/Deleting a Scheduled Task 495

Configuring/Viewing/Printing/Exporting Resource Maps 500

Starting/Stopping/Verifying vCenter Service Status 503

Starting/Stopping/Verifying ESXi Host Agent Status 505

Configuring vCenter Server Timeout Settings 506

Monitoring/Administering vCenter Server Connections 507

Creating an Advanced Chart 508

Determining Host Performance Using Resxtop and Guest Perfmon 510

Determining Host Performance Using Resxtop 510

Determining Host Performance Using Guest Perfmon 514

Given Performance Data, Identifying the Affected vSphere Resource 514

Creating and Administering vCenter Server Alarms 515

Listing vCenter Default Utilization Alarms 516

Listing vCenter Default Connectivity Alarms 516

Listing Possible Actions for Utilization and Connectivity Alarms 517

Creating a vCenter Utilization Alarm 518

Creating a vCenter Connectivity Alarm 521

Configuring Alarm Triggers 524

Configuring Alarm Actions 525

For a Given Alarm, Identifying the Affected Resource in a vSphere Implementation 525

Summary 526

Chapter 8 What Do I Do Now? 533

Scheduling the Test 533

Comparing Your Knowledge to the VCP510 Exam Blueprint Objectives 534

Studying the Questions at the End of Each Chapter and on the Bonus Material 535

Taking the Mock Exam on the VMware Website 536

The Day of the Test 536

Sending Me an Email When You Pass 537

Appendix A Answers to the "Do I Know This Already?" Quizzes and Chapter Review Questions 539

"Do I Know This Already?" Answers 539

Chapter Review Answers 540

Index 545

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

John A. Davidson, VCI, VCP 3 4 5, VCAP-DCA 4, MCT, MCSE, CCSI, CCNA, A+, Network+, has been in the computer industry for more than 20 years. With a career that has included roles in technical sales, sales management, system administration, and network engineering, John made his transition to being a Certified Technical Trainer in 1998, and has worked with many leading training organizations. Today, John serves as the VMware Course Director for Global Knowledge-USA for datacenter and desktop courses. As a lead instructor, John spends his time mentoring new instructors, students, and colleagues, and serves as subject matter expert to design, develop, and implement VMware solutions to support Global Knowledge-USA's training environment.

Gabrie van Zanten is a virtualization specialist working for Open Line in the Netherlands. As a consultant, he designs and implements virtual infrastructures for customers. Besides being a consultant, Gabrie runs one of the top-ten ranked blogs on VMware at http://www.GabesVirtualWorld.com. He writes about VMware and helps his readers get in-depth understanding on how VMware products work. His blogging activities, the presentations he gives, and the effort he puts in helping members of the VMware community have earned him the VMware vExpert award in 2009, 2010, and 2011.

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.

Email: VMwarePress@vmware.com

Mail: David Dusthimer
Associate Publisher
Pearson
800 East 96th Street
Indianapolis, IN 46240 USA

Reader Services

Visit our website and register this book at Pearsonitcertification.com/register for convenient access to any updates, downloads, or errata that might be available for this book.

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.

Note As I will state again in Chapter 8, I highly recommend that you schedule the test now and then study. Go to Pearson/Virtual University Enterprises (http://vue.com) on the web and find a testing center close to you. The cost of the exam at the time of this writing is $225. If you "put your money down" and "set the date," you will focus more and study better.

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

Exam Section/Objective	Chapter Where Covered
Section 1: Plan, Install, Configure, and Upgrade vCenter Server and VMware ESXi	
Objective 1.1 – Install and Configure vCenter Server	Chapter 1
Objective 1.2 – Install and Configure VMware ESXi	Chapter 1
Objective 1.3 – Plan and Perform Upgrades of vCenter Server and VMware ESXi	Chapter 1
Objective 1.4 – Secure vCenter Server and ESXi	Chapter 1
Objective 1.5 – Identify vSphere Architecture and Solutions	Chapter 1
Section 2 – Plan and Configure vSphere Networking	
Objective 2.1 – Configure vNetwork Standard Switches	Chapter 2
Objective 2.2 – Configure vNetwork Distributed Switches	Chapter 2
Objective 2.3 – Configure vSS and vDS Policies	Chapter 2
Section 3 – Plan and Configure vSphere Storage	
Objective 3.1 – Configure Shared Storage for vSphere	Chapter 3
Objective 3.2 – Configure the Storage Virtual Appliance for vSphere	Chapter 3
Objective 3.3 – Create and Configure VMFS and NFS Datastores	Chapter 3

Exam Section/Objective	Chapter Where Covered
Section 4 – Deploy and Administer Virtual Machines and vApps	
Objective 4.1 – Create and Deploy Virtual Machines	Chapter 4
Objective 4.2 – Create and Deploy vApps	Chapter 4
Objective 4.3 – Manage Virtual Machine Clones and Templates	Chapter 4
Objective 4.4 – Administer Virtual Machines and vApps	Chapter 4
Section 5 – Establish and Maintain Service Levels	
Objective 5.1 – Create and Configure VMware Clusters	Chapter 5
Objective 5.2 – Plan and Implement VMware Fault Tolerance	Chapter 5
Objective 5.3 – Create and Administer Resource Pools	Chapter 5
Objective 5.4 – Migrate Virtual Machines	Chapter 5
Objective 5.5 – Backup and Restore Virtual Machines	Chapter 5
Objective 5.6 – Patch and Update ESXi and Virtual Machines	Chapter 5
Section 6 – Perform Basic Troubleshooting	
Objective 6.1 – Perform Basic Troubleshooting for ESXi Hosts	Chapter 6
Objective 6.2 – Perform Basic vSphere Network Troubleshooting	Chapter 6
Objective 6.3 – Perform Basic vSphere Storage Troubleshooting	Chapter 6
Objective 6.4 – Perform Basic Troubleshooting for HA/DRS Clusters and vMotion/Storage vMotion	Chapter 6
Section 7 – Monitor a vSphere Implementation and Manage vCenter Server Alarms	
Objective 7.1 – Monitor ESXi, vCenter Server and Virtual Machines	Chapter 7
Objective 7.2 – Create and Administer vCenter Server Alarms	Chapter 7

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.

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.

To view the Premium Edition product page, go to http://www.pearsonitcertification.com/title/9780132965712.

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."

Table 2-1 "Do I Know This Already?" Section-to-Question Mapping

Foundations Topics Section	Questions Covered in This Section
Configuring vSphere Standard Switches	1–3
Configuring vSphere Distributed Switches	4–6
Configuring vSS and vDS Policies	7–10

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

Foundation Topics

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).

Key Topic

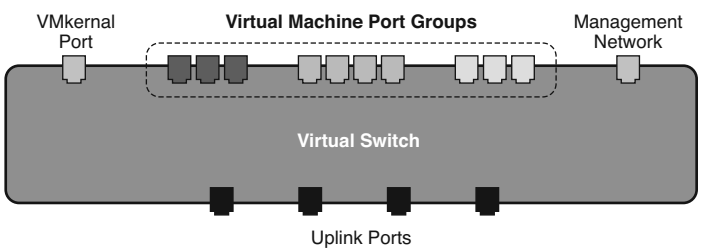

Figure 2-1 A Diagram of a vSphere Standard Switch

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 polices, 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.

Key Topic

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.

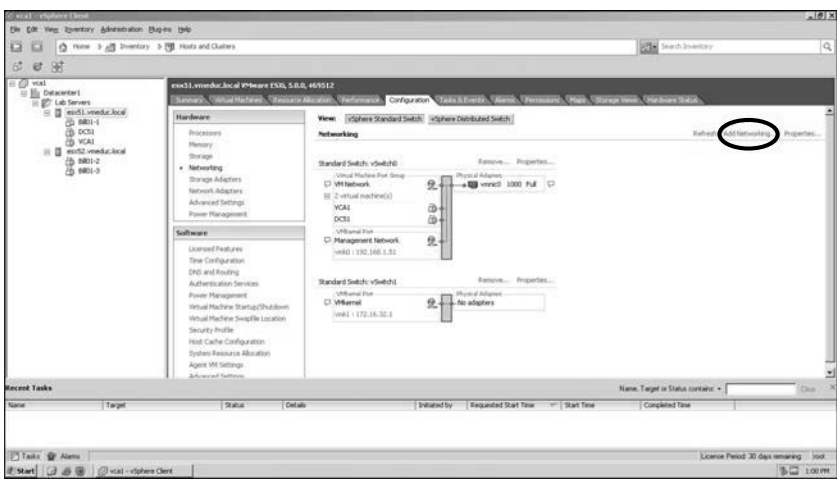

Figure 2-2 The Add Networking Link on a vSS

6. On the Connection Type of the Add Network Wizard, select **VMkernel** and click **Next**, as shown in Figure 2-3.

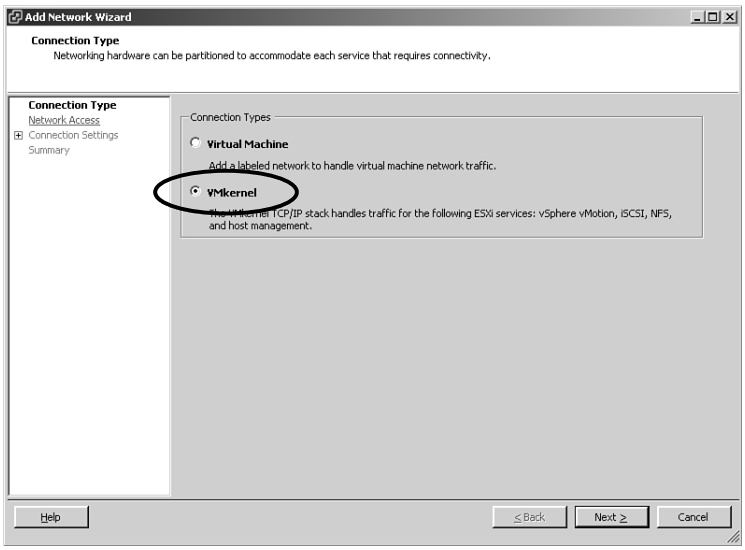

Figure 2-3 Selecting the VMkernel Connection Type

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.

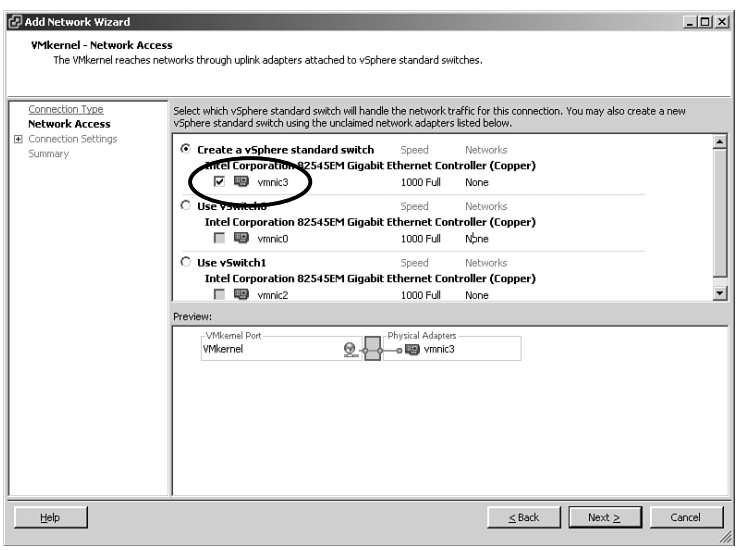

Figure 2-4 Selecting a vmnic

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**.

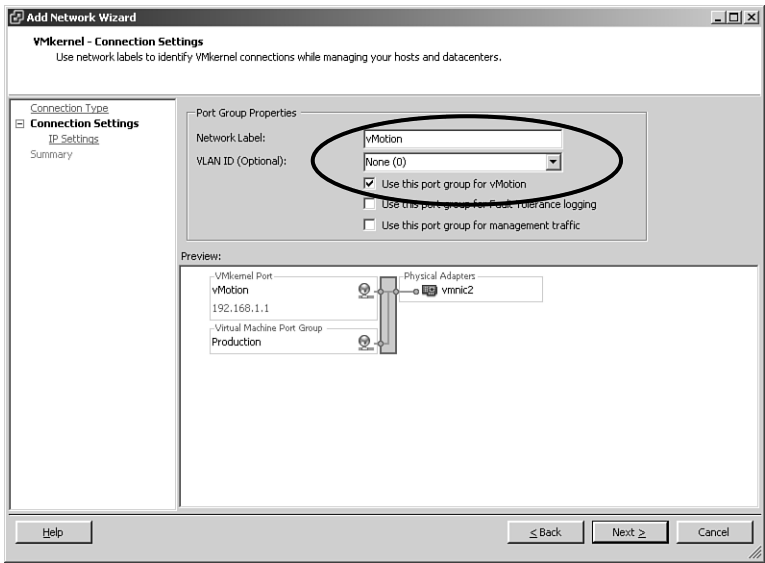

Figure 2-5 Selecting the VMkernel Connection Type

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.")

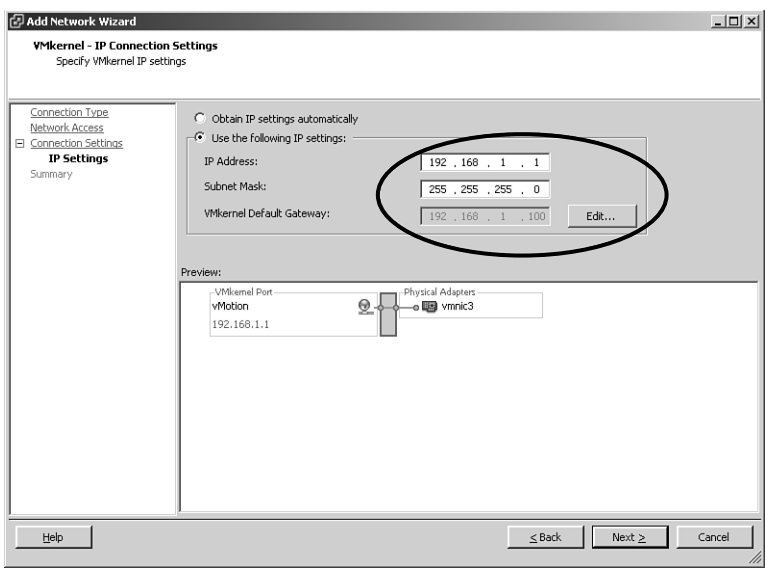

Figure 2-6 Entering IP Information

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

Key Topic

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.)

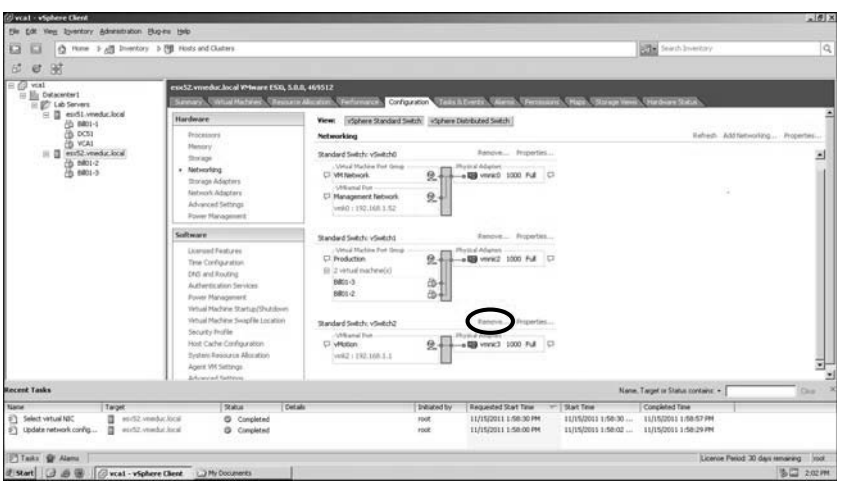

Figure 2-7 Deleting a vSphere Standard Switch

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:

Key Topic

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.

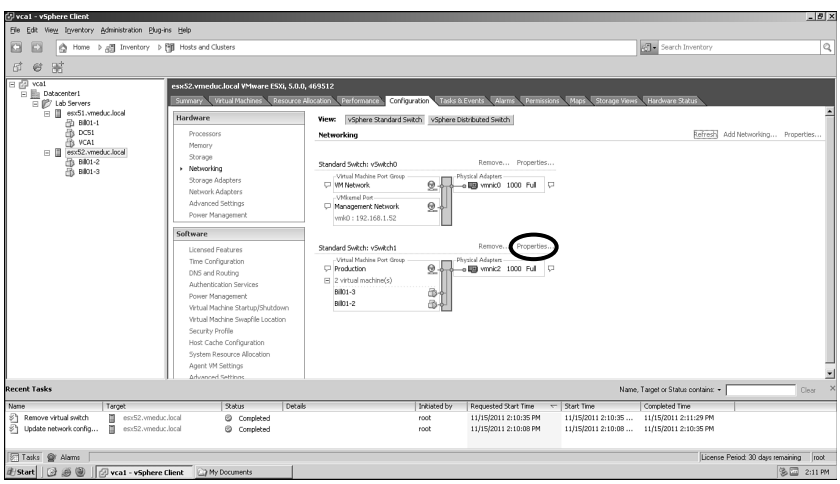

Figure 2-8 The Properties Link on a vSS

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

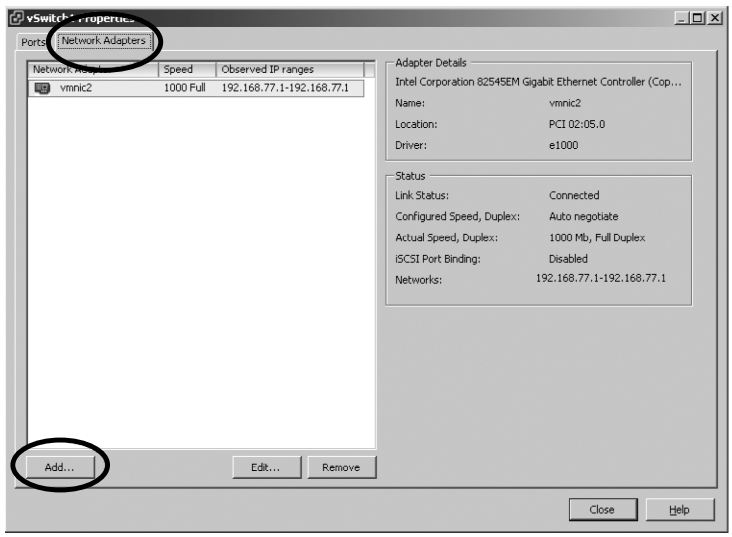

Figure 2-9 Adding a vmnic to a Switch

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.

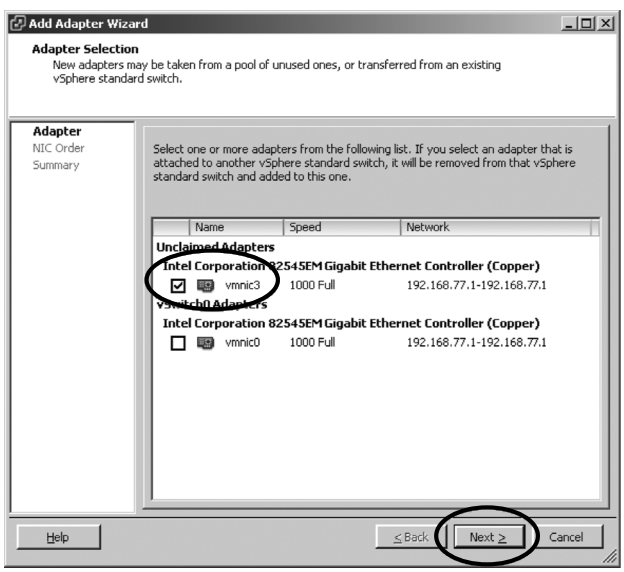

Figure 2-10 Selecting the new vmnic

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

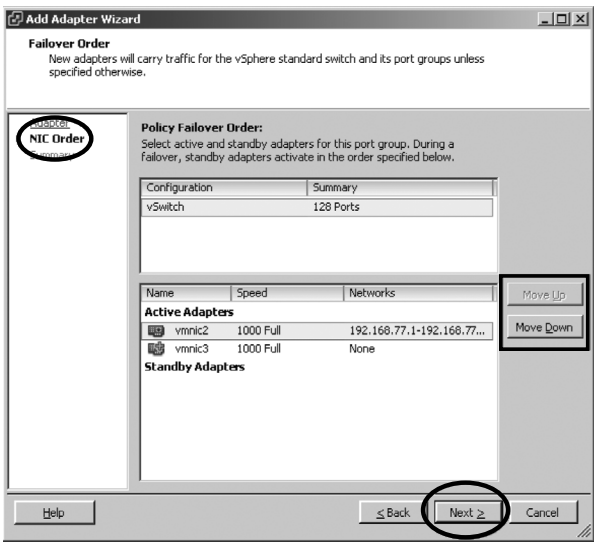

Figure 2-11 Choosing vmnic order and use

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.

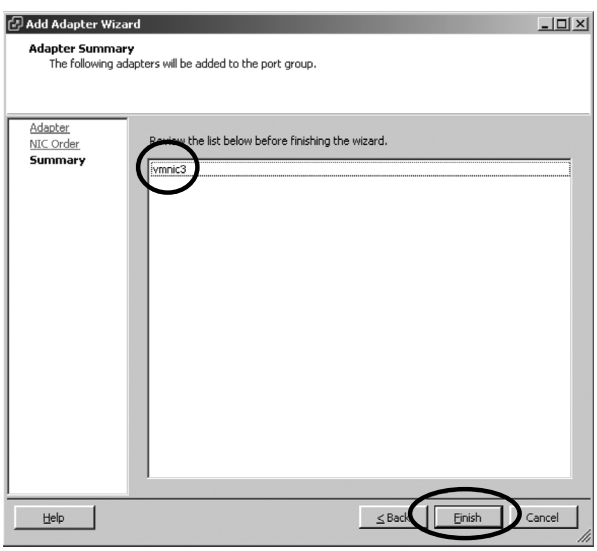

Figure 2-12 Adapter Summary page

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.

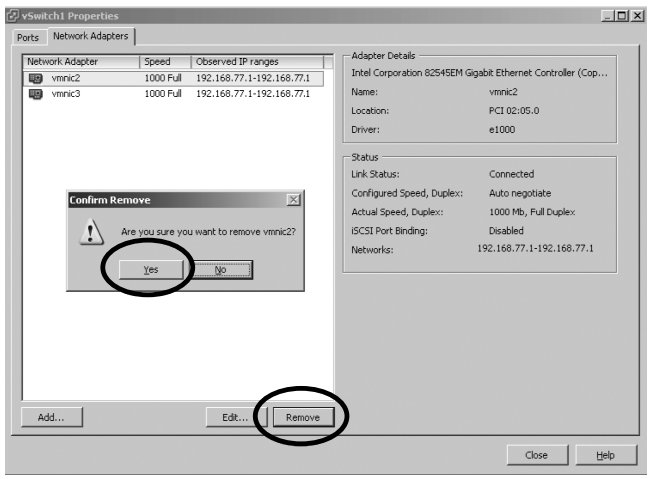

Figure 2-13 Removing a vmnic

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

Key Topic

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.

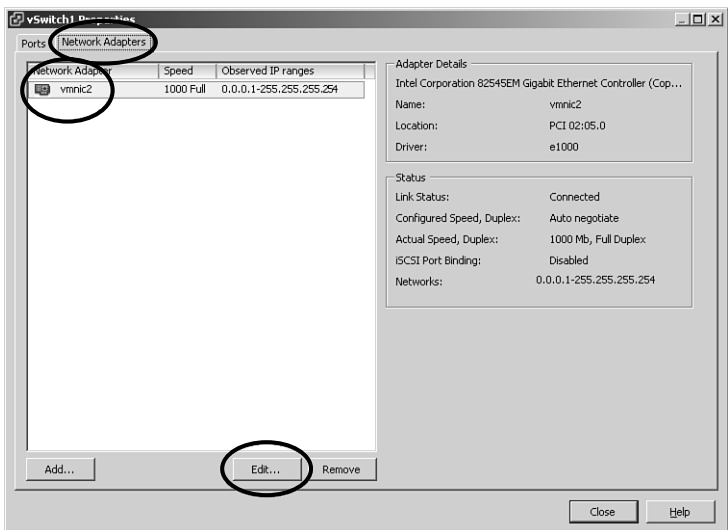

Figure 2-14 The Network Adapters Tab

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**.

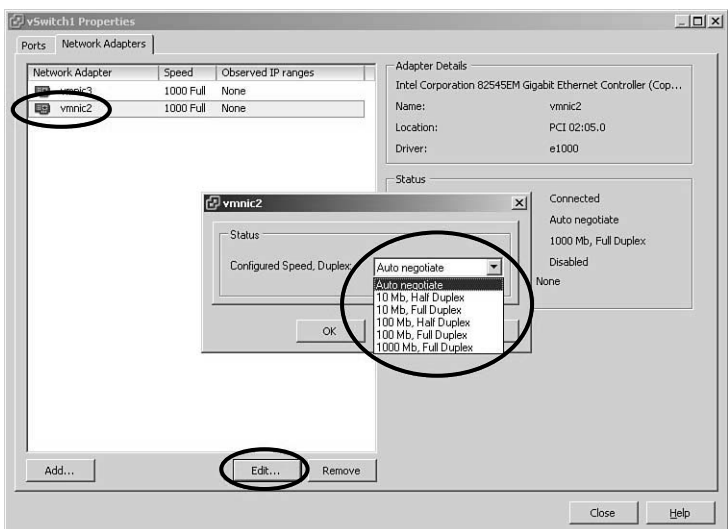

Figure 2-15 Configuring Physical Aspects of a vmnic

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

Key Topic

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.

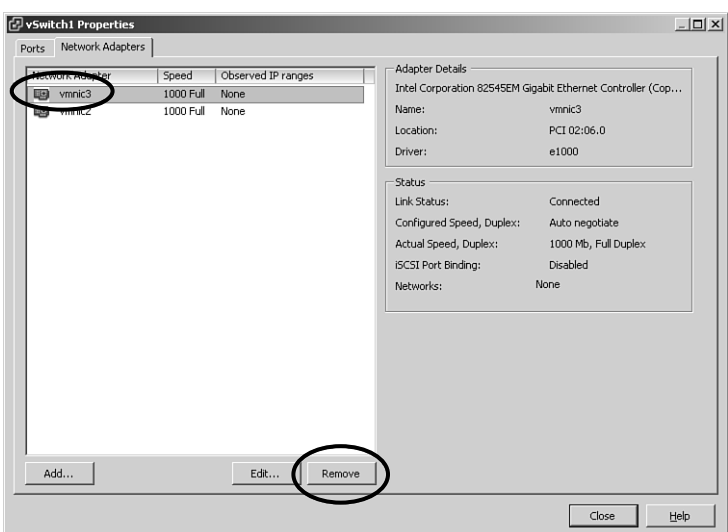

Figure 2-16 Removing a vmnic

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 is it 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.

Key Topic

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.

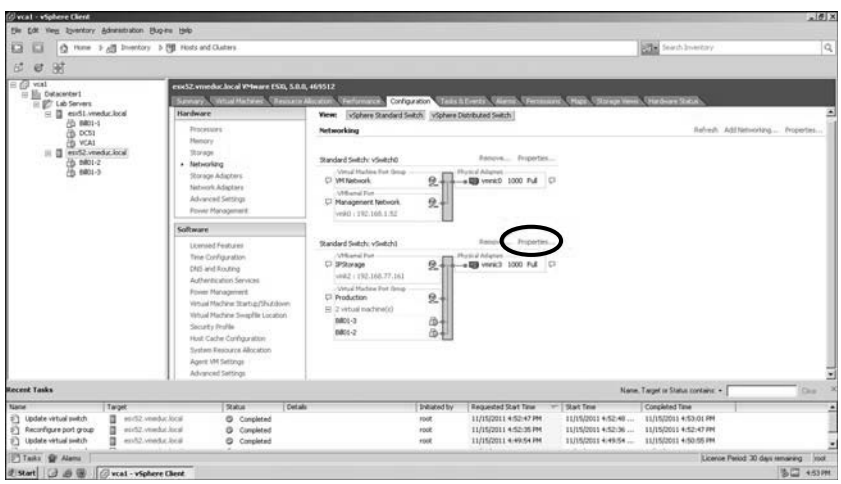

Figure 2-17 Properties Link for vSS

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.

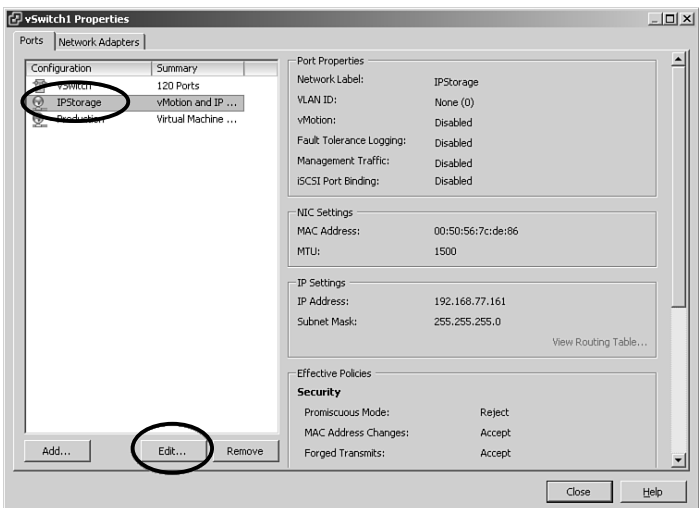

Figure 2-18 Editing a Port Group

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

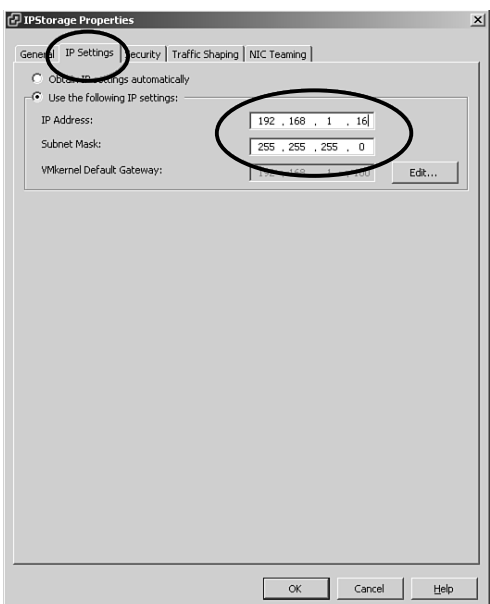

Figure 2-19 Editing IP Information

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**.

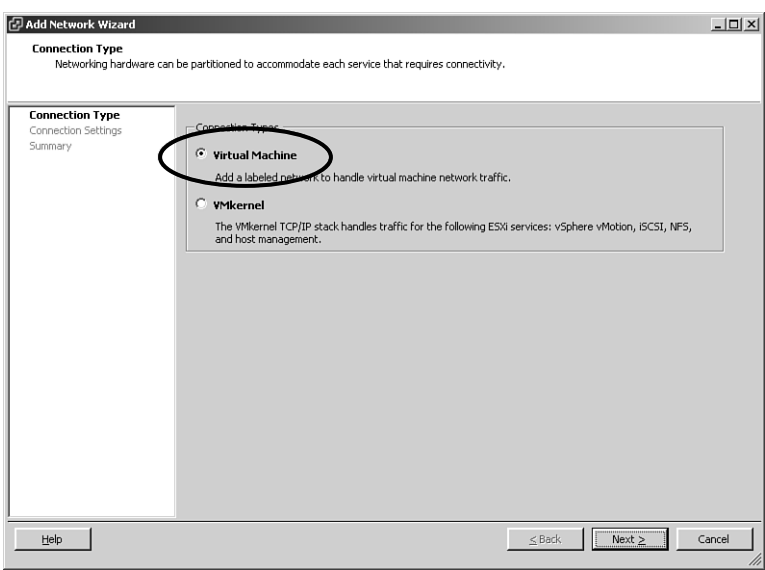

Figure 2-20 Adding a Virtual Machine Port Group

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**.

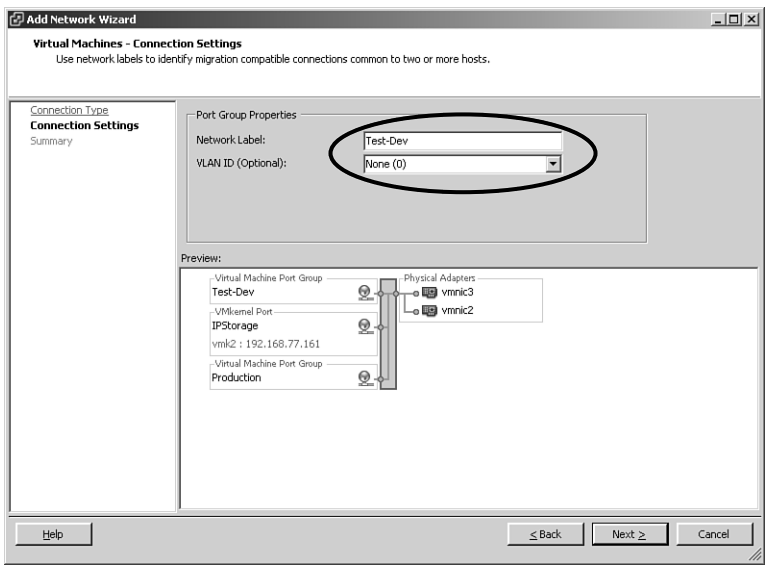

Figure 2-21 Entering and Network Label

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."

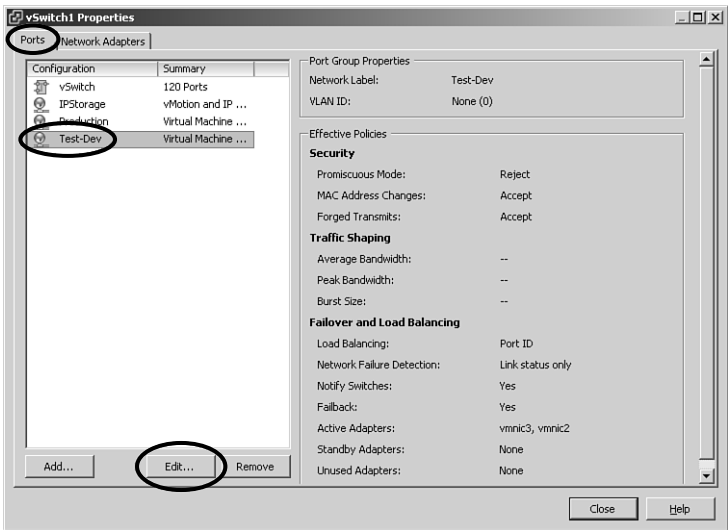

Figure 2-22 Port Group Configuration

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.

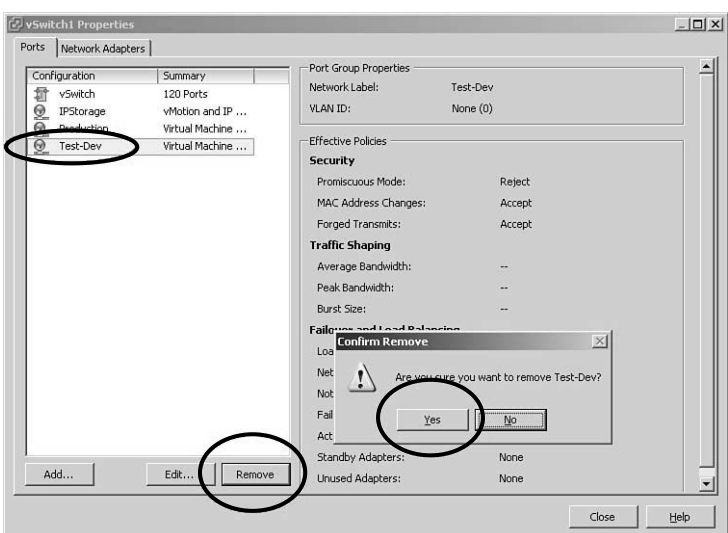

Figure 2-23 Removing a Port Group

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,

This page intentionally left blank

Index

A

absolute time, 13
accessing
DAC, 44
datastore properties, 214
Lockdown Mode, 330
logs, troubleshooting, 429-430
LUNs, 171
NFS datastores, 206
RBAC, 44
resource pools, 364
Storage View tabs, 165
templates, 291
TSM, 426-429
vApp settings, 262
vCenter Server, 13
VM consoles, 240-241
vServices (vApps), 267
Windows, 504
account privileges, 329
actions, alarms, 517-518, 521, 525
Active Directory. *See* **AD**
active memory, 483
Active NICs, 135
AD (Active Directory), 9
configuring, 488
permissions, 44
adapters. *See also* **devices**
CNAs, 164, 174
dependent hardware, configuring, 179
HBAs, 171, 450
iSCSI, configuring, 184
networks, troubleshooting, 443-444
SCSI, VMs, 239
settings, viewing, 115
storage, 162
adding, 180
selecting, 182
uplinks
adding, 108-111
deleting, 110
virtual, formatting, 111-117
adding
alarms to clusters, 518
CPUs, 8
dvPort Groups, 104-107
dvUplink groups, 108-111
ESXi (VMware) hosts to DRS/HA clusters, 328-334
groups to ports, 90-93
hosts, 348
service directories, 61
vDSs, 100
inventory objects, 327
IP pools, 275

license keys to hosts, 30
memory, 8
Memory Hot Add, 259
NAS devices, 176
objects, vApps, 274
permissions, 55-56
resource pools, VMs, 368
rules,
software iSCSIs, 180
storage, adapters, 180
vCPUs, 257
VFMS datastores, 196
vmnic, 82-85
VMs, 347
vSS, 82-87

Add Network Wizard, 78

Add or Remove Programs (Control Panel), 18

Add Permissions dialog box, 488

addresses
64-bit, 171
IP, 174
iSCSI targets, 181
MAC, 52, 135
NAT, 260
NFS datastores, 207

Add Send Target Server dialog box, 181

Add Storage Adapter dialog box, 180

administration
connections, 496-507
ESXi (VMware) firewalls, 48-49
Groups Manager (DRS), 346
host profiles, 402
Resource Pools, 363-388
Snapshot Manager, 391
vApps, 295-313
vCenter Server alarms, 515-525
vMA, 510
VMs, 295-313
VUM, 398

Administrator role, 44

Admin View link (Update Manager), 40

Admission Control, configuring, 353-356

Adobe Flex, 22

Advanced options, VMs, 307

Advanced performance charts, 444, 485-487, 508

Advanced settings, vApps, 264

affinity rules, configuring, 346-349

agents, 487, 505-506

alarms
clusters, adding, 518
triggers, configuring, 520, 524
vCenter Server, 471, 515-525

Alarms tab, 515

alerts, No Management Network Redundancy warning, 460

allocation
IP Allocation Policy setting, vApp, 264
memory, 326, 355
virtual disks, 169

All (4095) setting, 139

answer files, 25

anti-affinity rules, 346. *See also* **affinity rules**

antivirus software, 300

APIs (application programming interfaces)
array integration, 8
storage, 8
Storage APIs- Array Integration, 186
switches, vSphere, 96

appliances, vCenter. *See* **vCenter Servers**
application programming interfaces. *See* **APIs (application programming interfaces)**
applications
antivirus software, 300
monitoring, 352
plug-ins, troubleshooting, 433
third-party backup, 8
vApps, configuring, 262-277
VMs, developing, 295
workloads, selecting datastore destinations, 261
applying
Converters (VMware), 252-255
EVC, legacy hosts, 342
host profiles, 399, 402
licenses to vCenter, 19
permissions, 46-48
Promiscuous mode, 52
resxtop, 510-514
Storage vMotion, 387-388
swap files, VMs, 326
Update Manager, 39-43
architecture
Auto Deploy, 24
vCenter Server, 64
vDSs, 108
VSAs, 187-188
vSphere, 64-68
arrays
integration, 8
thin provisioning, 168, 186
assigning
licenses
troubleshooting, 432
VMware ESXi, 30
MAC addresses, 52
storage policies to VMs, 309
vmnics, 90, 133
Assign Licenses dialog box, 20
asynchronous communication, 175
attaching
baselines, 415-416
hosts
compliance, 405
profiles, 402-404
attacks, 43. *See also* **security**
hopping attacks, VLANs, 149
attributes, configuring resource pools, 367
audio, VMs, 239
authentication, 44, 183. *See also* **security**
Centralized Authentication, 61
Auto Deploy, 9
ESXi (VMware), 24-26
automation
configuring, 344-345
Database Clusters, 336
restarts, 8
SDRS, 337
upgrades, VMware tools, 250
VMs, 353-356
Auto Negotiate, 87
autonegotiate setting, 444
autorun.exe files, 15
availability
HA, 8, 14, 21, 158, 440
clusters, 189, 326
configuring, 457
failover resources, 357
monitoring, 342
monitoring VMs, 351

storage, *192*
troubleshooting, *455-460*
VM Heartbeat, *240*
vCenter Server requirements, 21
Average Bandwidth setting, 144

B

back-end traffic, 189
backups
disk-based, 8
solutions, selecting, 397
third-party backup software, 8
VDR, 396-397
VMs, 388-398
vServices (vApps), 267
balloon drivers, 240, 481
baselines
attaching, 415-416
CPUs, configuring EVC, 341
Update Manager, formatting, 412-415
batteries
CMOS, 39
vDSs, 140
Beacon Probing, 135
bidirectional authentication, 183
bindings, ports, 180-183
BIOS
chips, 39, 127
Force BIOS Setup setting, 308
hyperthreading, configuring, 28
updating, 450
vDSs, 140
blocking policies, dvPort Groups, 132-133
booting
ESXi (VMware), troubleshooting, 432
PXE, 24
VMs, configuring options, 308
bottlenecks, troubleshooting, 444
Browse Datastore, 242
bundles
diagnostics, exporting, 435-439
logging, 492-495
Burst Size setting, 144
buttons, Manage Paths, 448

C

cables, Fibre Channels, 163
caches
memory, 28, 480
sizing, 22
calculating
database sizes, 17
tolerance, host failures, 357
canonical names, 165
capabilities
EVC, 341
vDS, identifying,
VFMS-5, identifying, 195
VMs, hardware, 238-239
vSS, identifying, 76-77
capacity
datastores
configuring, *212*
NAS, *169*
VMFS, *199*
failovers, 358
HA, troubleshooting, 458
upgrading, 169
used storage, 169
CDP (Cisco Discovery Protocol), 97

central processing units. *See* **CPUs**
Centralized Authentication, 61
CHAP (Challenge Handshake Authentication Protocol), 168, 180, 183-185
CHAP Credentials dialog box, 185
charts
Advanced performance, 444, 508
performance, 485-487
Resource Distribution Charts, 460
views, modifying, 487
checking
hosts for profile compliance, 405
versions, 251
child pools, 363
chips, BIOS, 39, 127, 140. *See also* **BIOS**
CIFS (Common Internet File Systems), 164
CIM (Common Information Model), 488
Cisco Discovery Protocol. *See* **CDP**
CLI (command-line interface), 487
Client (vSphere), 242
hosts, accessing logs, 430
monitoring hardware, 433-434
clients (vSphere), 10, 18-22. *See also* **vSphere**
clocks, hardware, 23
cloning
options, 280
roles, 56-59
vApps, 267-273, 369-372
VMs, 277-295
clouds, types of, 66
clusters
alarms, adding, 518
configuring, 326-417
Database Clusters, formatting, 336
DRS, HA, 327-340
editing, 346
ESXi (VMware), 243
EVC, 377
HA, 189
hierarchies, resource pools, 363-364
hosts, attaching profiles, 402-404
monitoring, 342
overcommitting, 445
performance, troubleshooting, 463-464
resources as failover spare capacity, 358
vApps, selecting, 371
views, 500
VMs, DRS entitlements, 326
VSAs, 187-188
VUM, 398
CMOS batteries, 39, 127, 140
CNAs (converged network adapters), 164, 174
cold migration, VM hosts/datastores, 386
columns, viewing, 453
command-line interface. *See* **CLI**
commands
iSCSI, 164
latency, VMkernel, 485
Common Information Model. *See* **CIM**
Common Internet File Systems. *See* **CIFS**
common vDS/vSS policies, identifying, 124-132
communication, types of, 189
Community mode, 142

compatibility
EVC, 340-342
RDMs, 195
requirements, 377
vCenters, 6
compliance
host profiles, 405
objects, scanning, 416
VM storage policies, 312
components
Auto Deploy, 25
vCenter Server, installing, 17-18
compression, memory, 480
concentrators, virtual serial ports, 8
config log, viewing, 430
configuration files, VM destinations, 296
configuring, 3
AD, 488
Admission Control, 353-356
affinity rules, 346-349
alarm triggers, 520, 524
automation, 344-345
bandwidth, 144
blocking policies, 132-133
Centralized Authentication, 61
CHAP, 180, 183-185
charts, 486
clusters, 326-417
DRS/HA, 327-340
DRS VM entitlements, 326
editing, 346
Converters (VMware), 252-255
Database Clusters, 336
datastore capacities, 212
default utilization alarms, 516
dependent hardware adapters, 179
DHCP settings (vApps), 265
disks
resources, 247
shares, 246-249
DNS, 22
DRS
groups, 348
SDRS, 335-340
dvPort Groups, 106
dvUplink groups, 108-111
dynamic discovery, 180
ESXi (VMware), 22-30
EVC, 340-342
failover resources, 357
firewalls, 48-49
Forged Transmits, 54
guest operating systems, 243-244
HA, 457
host profiles, 398-401
hyperthreading, 27-28
IP pools, 274-276
iSCSI
initiators, 180
port bindings, 180-183
load balancing, 133-134
locations, 298
logging, 491-492
bundles, 492-495
levels, 301
memory, 28-30, 480
migration thresholds, 342-344
Mutual CHAP, 185
networks, 73
storage, 189
verifying, 440
vSS, 76

NFS
datastores, 193-225
shares, 174-175
NTP, 26-27
patching options, 411-412
port groups, 92
Promiscuous mode, 52
resource maps, 500-502
Resource Pools, 363-388
security
policies, 52
zones, 8
SMTP, 488-491
snapshots, VMs, 389
SNMP, 487-488
softly enforced VM-VM-host rules, 346
SSH, 429
storage, 445
Read Only role, 175
vCenter Server filters, 177-179
verifying, 445-447
swap files, 298
task scheduling, 495-500
templates, existing VMs, 282-285
thin provisioning, 186
timeout, 495
time synchronization, 95
traffic shaping policies, 142-145
vApps, 262-277, 304
vCenter Server, 6-8
VDR, 388-398
vDS, 94-95, 124-150
VFMS datastores, 193-225
virtual adapters, 116
VLANs, 105, 137-142, 149-150
VMkernel, 88-90
VMs
booting options, 308
CPUs, 257-258
hardware, 239
identifying vCenter Server maximums, 278-280
memory, 258-260
monitoring, 351-352
options, 303
swap files, 384
troubleshooting, 310
verifying, 442
VMware ESXi hosts, 27
vnics, 260
VSA Manager, 189-190
VSAs, 186-193
vSphere storage, 159
vSS, 85-86, 124-150
VUM, 406-410
zoning, 171
Confirm Changes dialog box, 30
connecting
alarms, 517
databases, 408
Fibre Channels, 163
monitoring, 496-507
NAS devices, 175-176
SSH, 426
storage processors, 171
TCP, 167
virtual adapters, 114
VMkernel, 78
vmnics, 74
VMs, 76
consoles
DCUI. *See* DCUI
objects, viewing, 475

vCenter, 12
VMs, accessing, 240-241
consolidating snapshots, VMs, 389
consumed memory, 483
contention, troubleshooting storage, 448
control
DAC, 44
I/O (input/output)
networks, 8
storage, 8
RBAC, 44
Control Panel, Add or Remove Programs, 18
conventions, naming, 164-166
converged network adapters. *See* **CNAs**
conversion
templates to VMs, 288
virtual disks, 245-246
Conversion Wizard, starting, 254
Converters (VMware), 54, 252-255
coordinated universal time. *See* **UTC**
copper cables, Fibre Channels, 163
copying power settings, VMs, 306
costs, VCenter Servers, 10
CPU Ready Time alarms, VMs, 519
CPU Ready value, 484, 508
CPUIDs (CPU IDs), 341
CPUs (central processing units), 6
adding, 8
affinity rules, configuring, 346-349
EVC
baselines, 341
requirements, 376-377
metrics, 478, 484
physical CPU usage, viewing, 511
SDRS, configuring, 335
statistics, 510-514
vCenter Servers, 14
VMs, 238, 257-258
Create Profile Wizard, 400
creating. *See* **configuring; formatting**
credentials, adding hosts, 329
critical performance metrics, identifying, 477-478
customer requirements, vSphere editions based on, 68
custom values, configuring disk shares, 246
customizing
applications, developing, 295
Guest Customization option, 287
load balancing, 134
memory, VMs, 259
resource maps, 501
Storage links, 445-447
vApp options, 304
views, 512

D

DAC (discretionary access control), 44
Database Clusters, formatting, 336
databases
connecting, 408
vCenter Server, sizing, 17
datacenters
datacenter-level management, 95-96
SDRS, 335
data recovery, 8
Datastore Clusters view, 336
datastores, 455
Browse Datastore, 242
capacity, configuring, 212

clusters, 335
Database Clusters, 336
destinations, selecting, 261
NAS, 158, 169
NFS, 187, 193-225
properties
accessing, 214
identifying, 193-195
vApps, selecting, 371
VFMS, 193-225
expanding, 209, 213-218
extending, 209-213
Maintenance Mode, 220
Path Selection Policies, 224-225
selecting paths, 224
upgrading, 218-219
use cases, 224
Datastores view, 193
day of tests, preparing, 536-537
DCUI (Direct Console User Interface), 51, 426-429, 430, 505
de-duplication, 8, 479
defaults
charts, 487
folders, 409
installation download patches, 407
ports, 408
reporting options, verifying, 520
utilization alarms, 516
defining VSA architecture, 187
delegation, resource pools, 364
deleting
baselines (Update Manager), 412-415
clusters, DRS/HA, 327
dvPort Groups, 107
ESXi (VMware) hosts
DRS/HA clusters, 328-334
vDS, 103-104
host profiles, 398-401
port groups, 93
resource pools, 365, 368
snapshots, 389
tasks, scheduling, 500
uplinks, 110
vDS, 100
VFMS datastores, 195-205
virtual adapters, 116
vSS, 81, 87
demilitarized zones. *See* **DMZs**
dependent hardware
adapters, configuring, 179
iSCSI initiators, 167, 185-186
deploying
Auto Deploy, 9
Auto Deploy, ESXi (VMware), 24-26
guest operating systems, 243-244
vApps, 262-277
vCenter Server, 9-13
virtual appliances, 290-293
VMs, 238-261, 285-287
VSA Manager, 189-190
destinations
datastores, selecting, 261
log bundles, 494
selecting, 122, 254
vApps, cloning, 370
VM configuration files, 296
details, specifying tasks, 498
detecting network failovers, 134
developing applications, VMs, 295

devices
drivers, tools, 240
extents, selecting, 211
NAS, connecting, 175-176
storage, 162
DHCP (Dynamic Host Configuration Protocol), 50, 264, 277
diagnostics
ESXi (VMware), exporting, 435-439
log bundles, creating, 492-495
diagrams, vSS (vSphere standard switches), 76
dialog boxes
Add Permissions, 488
Add Send Target Server, 181
Add Storage Adapter, 180
CHAP Credentials, 185
Confirm Changes, 30
iSCSI Initiator Properties, 184
Properties, 86
Schedule Task, 497
Direct Console User Interface. *See* **DCUI**
directories
AD, configuring, 488
services, adding ESXi hosts, 61
disabling
applications, monitoring, 352
hosts, monitoring, 350
hyperthreading, 27-28
iSCSI initiators, 180
Lockdown mode, 51
logging, 491
memory, compression caches, 28
paths, 223
storage filters, vCenter Server, 177-179
VMs, monitoring, 351-352
vSphere client plug-ins, 19
discovery, 167, 180
discretionary access control. *See* **DAC**
disk-based backups, 8
disks
formatting, 372
layouts, 198, 210
resources, configuring, 247
shares, configuring, 246-249
thick provisioning, 245-246
thin provisioning, 168-170, 245-246
VMs, 238
Disk setting, 373
disk storage, upgrading vCenter Servers, 31
displays, SVGA, 240
Distributed Power Management. *See* **DPM**
Distributed Resource Scheduler. *See* **DRS**
distributed switches, 9, 33
distribution, Resource Distribution Charts, 460
DMZs (demilitarized zones), 260
DNS (Domain Name System), 22, 27, 50
documentation
ESXi (VMware) hosts, troubleshooting, 426-429
vendors, 147
Domain Name System. *See* **DNS**
domains
AD, 9
FQDN, 329

downloading
default installation download patches, 407
vCenter, 10
vSphere client plug-ins, 18
downtime
hardware, 8
servers, 8
DPM (Distributed Power Management), 8, 158
drivers
balloon, 240, 481
devices, tools, 240
dropped receive (droppedRx) packets, 444
dropped transmit (droppedTx) packets, 444
DRS (Distributed Resource Scheduler), 8, 21, 39
affinity rules, configuring, 346-349
automation, configuring, 344-345
clusters, 326
groups
creating, 348
viewing rules, 349
Groups Manager, 346
HA, 327-340
hierarchies, resource pools, 363-364
load balancing, troubleshooting, 462
migration thresholds, configuring, 342-344
monitoring, 342
performance, troubleshooting, 463-464
SDRS, configuring, 335-340
storage, 9, 192
troubleshooting, 455-456
VMs, entitlement, 326
dvPort Groups
adding, 104-107
blocking policies, 132-133
Uplink Teaming, 136
dvUplink groups, configuring, 108-111
dynamic baseline criteria, 414
dynamic discovery, configuring, 180
Dynamic Discovery tab, 181
Dynamic Host Configuration Protocol. *See* **DHCP**

E

Eager Zeroed (think provision), 246
editing
baselines (Update Manager), 412-415
clusters, 346
dependent hardware adapters, 179
host profiles, 398-401
override settings, 130
port groups, 6, 127
roles, 56, 59-61
settings
ports, 130
VMs, 243
task scheduling, 495-500
vApp settings, 274
VM settings, 248, 442
vnics, 260
vSS policies, 125
editions
vCenter Server, 6-9
vSphere, 64
Edit Settings setting, 373
efficiency, configuring SDRS, 335

email
alarms, sending, 521
scheduled tasks, 498
SMTP, configuring, 488-491
Enable Query limits, 488
enabling
applications, monitoring, 352
DRS/HA clusters, 327
fault tolerance, 361
Forged Transmits, 54
hosts, monitoring, 350
hyperthreading, 27-28
iSCSI
CHAP, 183
initiators, 180
jumbo frames, 147-149
Lockdown Mode, 51-52, 330
memory, compression caches, 28
Promiscuous mode, 52
SDRS, 337
storage filters, vCenter Server, 177-179
TSM, 426-429
TSO, 145-146
validation, 488
VMs, monitoring, 351-352
vSphere client plug-ins, 19
encapsulation, Fibre Channel, 174
end-user license agreements. *See* **EULAs**
engines rules, Auto Deploy, 25
Enhanced vMotion Compatibility. *See* **EVC**
entering
labels, networks, 84, 92
SDRS Maintenance Mode, 221
Snapshot Manager, 391
Enterprise Linux, 6
Enterprise Plus licenses, 98
entitlement, DRS, 326
entries in objects
modifying, 476
viewing, 475
errors
logging, 491
network flapping, 135
ESXi (VMware), 3
architecture, 64
Auto Deploy, 24-26
baselines, attaching, 415-416
booting, troubleshooting, 432
configuring, 22-30
diagnostics, exporting, 435-439
firewalls, 48-49
hosts
agent status, 505-506
attaching profiles, 402-404
configuring, 27
DRS/HA clusters, 328-334
guidelines, 426
rescanning storage, 172
scanning profiles, 405-406
vDS, 100-103
VSAs, 192-193
installing, 431
iSCSI CHAP, configuring, 183-185
licenses, 30
monitoring, 433-434
patching, requirements, 398
troubleshooting, 426-439
assigning licenses, 432
plug-ins, 433
Update Manager, applying, 39-43
updating, 398-416

uplinks, 162
vCenter Server
security, 43-63
upgrading, 31-43
vMotion, 373
VMs, 243, 278-280
VSAs, configuring, 188-189
esxstop, 444
Ethernet vCenter Servers, upgrading, 31
EULAs (end-user license agreements), 13
evaluating resource pools, 368-369
Evaluation Mode, 330
EVC (Enhanced vMotion Compatibility), 340-342, 373
CPU requirements, 376-377
events
keywords, filtering, 477
viewing, 474-475
exams
day of, preparing, 536-537
grade notification, 537
mock, 536
questions, bonus material, 535
scheduling, 532
VCP510 Exam Blueprint, 534
exception policies, dvPort Groups, 133
executing PXE, 24
existing clusters, adding hosts, 328
existing VMs
cloning, 281-282
templates
creating from, 282-285
updating, 287-290
expandable reservation parameters, 364
expanding
extents, 215
VFMS datastores, 209, 213-218
explicit failover orders, 134
exporting
ESXi (VMware) diagnostics, 435-439
group lists, 54
logs, selecting, 435
resource maps, 500-502
templates, OVF, 293-295
vApps, 267-273
extending VFMS datastores, 209-213
extensions, hosts, 412
extents
datastores, viewing, 210
devices, selecting, 211
expanding, 215

F

failback, 135-137
failovers
explicit orders, 134
hosts, specifying, 358
networks, detecting, 134
resources, implementing HA, 357
spare capacity, 358
failures
fault tolerance, 8, 362
hosts, 8
intervals, configuring VM Monitoring, 352
tolerance, calculating, 357
fault tolerance, 8, 440
logging, 77
security, 301
VMware, implementing, 358-363

FCoE (Fibre Channel over Ethernet), 158, 162-163
storage metrics, 485
use cases, 173-174
VMs, 242
features
clusters, 328
security, 43-63
vSphere, 64
Fibre Channel over Ethernet. *See* **FCoE**
Fibre Channels, 158, 162
encapsulation, 174
fiber-optic cables, 163
HBAs, 171
storage metrics, 485
VMs, 242
File Level Restore. *See* **FLR**
file systems, selecting versions, 197
files
answer, 25
autorun.exe, 15
ISO, 249
OVF, 10
swap, 298, 482-483
troubleshooting, 455
VMs, 326
templates, accessing, 291
.vmdk, 10
VMs
identifying, 295
migrating, 201
VSWP, 296
filtering
keywords, 477
MIB, 488
output, 488
performance charts, 485
storage, vCenter Servers, 177-179
firewalls
ESXi (VMware), 48-49
VMware ESXi, 44
firmware, VMs, 308
Fixed policy, 224
flags, hiding NX/XD, 376
floppy drives, VMs, 239
FLR (File Level Restore), 389
folders
defaults, 409
hierarchies, 174
Force BIOS Setup setting, 308
Forged Transmits, 54
formatting
Admission Control, 353-356
Advanced performance charts, 508
alarm triggers, 520, 524
automation, 344-345
baselines (Update Manager), 412-415
clusters, 326-417
DRS/HA, 327-340
DRS VM entitlement, 326
editing, 346
Database Clusters, 336
disks, 372
DRS
groups, 348
SDRS, 335-340
EVC, 340-342
Forged Transmits, 54
HA failover resources, 357
host profiles, 398-401
logging bundles, 492-495
log objects, 437

LUNs, 450
MAC addresses, 52
migration thresholds, 342-344
NFS, sharing, 174-175
OVF, 262-264
PVLANs, 141
resource maps, 500-502
roles, servers, 56
snapshots, VMs, 389
softly enforced VM-VM-host rules, 346
task scheduling, 495-500
templates, existing VMs, 282-285
vDS, 97-100
VFMS datastores, 195-205
virtual adapters, 111-117
virtual disks, 245-246
VMs, 238-261
vSS, 77-81
FQDN (fully qualified domain name), 329
frames, jumbo, 147-149
front-end traffic, 189
Fully Automated DRS, 334, 345
fully qualified domain name. *See* **FQDN**
functionality, vCenter Servers, 31

G

General Options page, VMs, 304
General Properties, vDS, 99
GET requests, 487
grades, notification, 537
grafting, Resource Pools, 331
graphical user interfaces. *See* **GUIs**
groups
DRS
creating, 348
viewing rules, 349
dvPort Groups
adding, 104-107
blocking policies, 132-133
dvUplink groups, configuring, 108-111
lists, viewing, 54
multiple, 47
permissions, 48, 55
ports
adding, 90-93
configuring, 92
deleting, 93
editing, 6, 127
migrating, 102
troubleshooting, 441
vDS, 129
VLAN configuration on, 138
vSS, 126
Groups Manager (DRS), 346
Guest Customization option, 287
guest operating systems
deploying, 243-244
EVC, 341
NX/XD flags, hiding, 376
restrictions, 300
guidelines, ESXi (VMware) hosts, 426. *See also* **documentation**
GUIs (graphical user interfaces), 18. *See also* **interfaces**

H

HA (high availability), 8, 14, 21, 158, 440
Admission Control, configuring, 353-356
clusters, 189, 326
configuring, 457
DRS, 327-340
failover resources, 357
monitoring, 342
performance, 463-464
storage, 192
troubleshooting, 455-460
VM options, 355
VMs
Heartbeat, 240
monitoring, 351
hardware
baselines, attaching, 415-416
Client (vSphere), monitoring, 433-434
clocks, 23
dependent. *See* dependent hardware
downtime, 8
iSCSI initiator requirements, 166-168
requirements, VMware ESXi, 39
SMASH, 433
virtual hardware settings, 256, 342
VMs
capabilities of, 238-239
upgrading, 37-39
Hardware Status tab, opening, 434
HBAs (host bus adapters), 171, 450
hiding NX/XD flags, 376
hierarchies
clusters, 328
folders, 174
resource pools, 363-364
high availability. *See* **HA**
high values, configuring disk shares, 246
hopping attacks, VLANs, 149
host bus adapters. *See* **HBAs**
Host Failures the Cluster Tolerates policy, 355
Host Isolation Response option, 356
hostnames, 174
hosts, 6
adding, 348
agents, 505
baselines, attaching, 415-416
ESXi (VMware)
agent status, 505-506
DRS/HA clusters, 328-334
exporting diagnostic bundles, 435-439
identifying vCenter Server maximums, 278-280
rescanning storage, 172
vDS, 100-103
VMs, 243
VSAs, 188-189, 192-193
EVCs, configuring, 341
extensions, 412
failovers, specifying, 358
failures, 8
health monitoring tools, 433-434
hyperthreading, enabling, 27-28
ISV licenses, 346
licenses, adding, 30
logs, viewing, 430
memory, 483
migration, 8
monitoring, 350
objects, moving, 332
patching, 398, 412

performance
Perfmon, *514*
resxtop, *510-514*
profiles, 9
applying permissions to, *63*
attaching, *402-404*
Auto Deploy, *25*
formatting, *398-401*
scanning, *405-406*
references, selecting, 400
rescan filters, 177
reservations, troubleshooting, 450
resource maps, creating, 500
security zones, 8
service directories, adding, 61
softly enforced VM-VM-host rules, 346
templates, selecting, 284
tolerance, calculating, 357
upgrading, 412
vDSs, adding, 100
vMotion, configuring, 374
VMs, selecting, 289
VMware ESXi
configuring, *26-27*
NTP, *26-27*
upgrading, *31*
hot adds, 8, 239
hot extending virtual disks, 301-303
Hot Plug CPUs, 257
hybrid clouds, 68
hyperthreading, 22, 27-28

I

identifiers, SCSI, 165
identifying
critical performance metrics, 477-478
datastore properties, 193-195
vCenter Server
editions, *6-9*
privileges, *44*
roles, *44*
VFMS-5 capabilities, 195
VMs
files, *295*
maximums, *278-280*
storage resources, *242*
IDEs (integrated development environments), 239
IDSs (intrusion detection systems), 52, 97
IEEE 802.1Q, 95, 138
images
loading, 39
naming, 39
profiles, Auto Deploy, 25
verifying, 42
implementing
HA, failover resources, 357
VMware fault tolerance, 358-363
vSphere, monitoring, 471
importing templates, OVF, 293-295
inbound traffic shaping, 95-96
independent software vendors. *See* **ISVs**
indicators, CIM, 488
Information logging, 491. ***See also*** **logging**
infrastructure, PXE, 24
inheritance
permissions, applying, 46-48
roles, 44

initiators, iSCSI
enabling, 180
hardware requirements, 166-168
troubleshooting, 451
use cases, 185-186
in-place upgrades, 43. *See also* **upgrading**
Installation Manager (vSphere), 15, 17, 22. *See also* **vSphere**
Installer (vSphere), 406
installing, 3
default installation download patches, 407
ESXi (VMware), 22-30, 431
folders, defaults, 409
plug-ins, clients (vSphere), 18-22
tools, 249-251
vCenter Converters, 253
vCenter Server, 6-78
components, 17-18
operating systems, 17
sizing databases, 17
VMs, 14-15
VDR, 389, 395
VUM, 406-410
Windows Installer, 244
integrated development environments. *See* **IDEs**
integrating arrays, 8
Intelligent Platform Management Interface. *See* **IPMI**
interfaces
CLI, 487
DCUI, 51, 426-429, 505
IPMI, 487
iSCSI, 158, 164, 440
SCSI, 450
Start Order screen, vApps, 266
TSM, 426-429
UIs, 180
vCenter Server, 9
vnic, 240, 260
Internet Protocol. *See* **IP**
Internet Small Computer System Interface. *See* **iSCSI**
intervals
failures, configuring VM Monitoring, 352
timeout, AD, 488
intrusion detection systems. *See* **IDSs**
intrusion prevention systems. *See* **IPSs**
inventory objects, adding, 327
I/O (input/output)
control
networks, 8
storage, 8
performance, 335
quiescing, 240
vDSs, 108
IOPS (I/O operations per second), 246
IP (Internet Protocol), 77
addresses, 174
editing, 89
entering, 84
iSCSI, 164
pools, configuring, 274-276
vApps, 266
virtual adapters, 114
VMkernel ports, configuring, 88
IP Allocation Policy setting, vApps, 264
IPMI (Intelligent Platform Management Interface), 487
IPSs (intrusion prevention systems), 97

iSCSI (Internet Small Computer System Interface), 77, 158, 162-164, 440
CHAP, configuring, 183-185
Initiator Properties dialog box, 184
initiators
enabling, 180
hardware requirements, 166-168
troubleshooting, 451
use cases, 185-186
port bindings, configuring, 180-183
storage metrics, 485
VMs, 242
ISO files, 249
isolation
Isolated mode, 142
of resources, 364
ISVs (independent software vendors), 346

J

jumbo frames, enabling, 147-149

K

keyboards, VMs, 239
keywords, filtering, 477

L

labels, entering networks, 84, 92
LANs (local-area networks), 164
latency
failovers, 135
troubleshooting, 444
VMkernel command, 485
Layer 2 switches, 95
layouts, disks, 198, 210
Lazy Zeroed (thick provision), 246
legacy hosts, 342. See also hosts
levels
automation, configuring, 344-345
FLR, 389
logging, configuring, 301
port override settings, 137
licenses
assigning, troubleshooting, 432
Enterprise Plus, 98
ESXi (VMware), 30
EULAs, 13
hosts in clusters, 330
ISVs, 346
Processor entitlement, 6
vCenter Server, 19-21
limitations
Enable Query limits, 488
resource pools, 368-369
swap files, 482
Link Layer Discovery Protocol. *See* **LLDP**
links
Manage Virtual Adapters, 112
Rescan All, 172
status, 134
Storage, customizing, 445-447
Linux
SUSE Linux Enterprise Server for VMware, 6
VMware tools, upgrading, 251
lists, viewing groups, 54
LLDP (Link Layer Discovery Protocol), 95-97

load balancing
configuring, 133-134
DRS, troubleshooting, 462
NLB, 54
SDRS, configuring, 335
troubleshooting, 444
VMs, 9
load-based teaming, 95-96
loading images, 39
local-area networks. *See* **LANs**
local disks, naming conventions, 165-166
locations
configuration file destinations, 296
swap files, 298, 384
Lockdown Mode, 44, 330
enabling, 51-52
logging
accessing, troubleshooting, 429-430
bundles, creating, 492-495
configuring, 491-492
fault tolerance, 77, 301
hosts, viewing, 430
levels, configuring, 301
objects, creating, 437
selecting, exporting, 435
services, 267
VMkernel, viewing, 431
logical unit numbers. *See* **LUNs**
logons, vCenter Servers, 13
loss of vCenter, 21
low values, configuring disk shares, 246
LUNs (logical unit numbers), 171
formatting, 450
masking, 172
NAS devices, connecting, 175
reservations, 450
SDRS, 335
selecting, 197
storage metrics, 478, 485
VMFSs, 177
VMs, 242

M

MAC addresses, 52, 135
machines, selecting sources, 254
maintenance
host health monitoring tools, 433-434
security zones, 8
Maintenance Mode
clusters, deleting, 332-334
VFMS datastores, 220
Management Agent log, viewing, 430
Management Information Base. *See* **MIB**
Manage Paths button, 448
Manage Virtual Adapters link, 112
managing
connections, 496-507
DPM, 158
ESXi (VMware) firewalls, 48-49
Groups Manager (DRS), 346
hosts, 110, 402
Installation Manager (vSphere), 17. *See also* vSphere
memory, balloon drivers, 240
Plug-In Manager, 18
Power Management setting, 307
Resource Pools, 363-388
SMASH, 433
Snapshot Manager, 391
subnets, 138

Update Manager, 8, 35, 39-43
vApps, 295-313
vCenter Server alarms, 515-525
virtual serial port concentrators, 8
vMA, 510
VMkernel ports, 440
VMs, 277, 295, 313
VMware tools, 305
VSAs
resources, 190-191
VSA Manager, 189-190
vSS, 76
VUM, 31-32, 398
Manual mode, configuring automation, 344
mapping
RDMs, 177, 195, 445
resources, 463, 500-502
storage, troubleshooting, 451
masking LUNs, 172
Maximum Per-VM setting, configuring VM Monitoring, 352
Maximum Resets Time Window setting, configuring, 352
maximum transmission units. *See* **MTUs**
maximums, identifying VMs, 278-280
membership groups, 48. *See also* **groups**
memory
adding, 8
balloon drivers, 240
caches, 480
enabling, 28
sizing, 22
compression, 480
hosts, 483
metrics, 478-483
overhead, 355
RAM, 326
resources, modifying, 256
SDRS, configuring, 335
vCenter Servers, upgrading, 31
viewing, 512
VMs, 238, 258-260
MemoryDisk (vCenter Servers), 14
Memory Hot Add, 259
Memory setting, 373
metrics
CPUs, 484
networks, 484
performance, identifying, 477-478
storage, 485
MIB (Management Information Base), 487
Microsoft SQL, 17
Migrate Virtual Machine Networking tool, 122
Migrate VM Wizard, 495
migration, 8
clusters, 332
files, VMs, 201
performance, troubleshooting, 463-464
port groups, 102
thresholds, configuring, 342-344
vMotion, 135, 462-463
VMs, 117-119, 373-388
Migration Threshold slider, 343-344
Minimum Uptime setting, configuring, 352
mirroring ports, 95-97
mock exams, 536
models
CIM, 488
vSS, 76. *See also* vSS

modes
Community, 142
Evaluation Mode, 330
Isolated, 142
Lockdown Mode, 44, 51-52, 330
Maintenance Mode
deleting clusters, 332
VFMS datastores, 220
Manual, configuring automation, 344
Partially Automated, 344
Promiscuous, 52, 142
TSM, 426-429
modifying
Datastores view, 194
disks shares, VMs, 247
MAC addresses, 52
memory resources, 256
objects, 476
permissions, 55-56
storage views, 166
views, charts, 487
virtual CPUs, 256
virtual hardware settings, 256
VMs, CPUs, 257-258
Monitor Recent Tasks pane, 199
monitoring
applications, 352
connections, 496-507
DRS/HA clusters, 342
ESXi (VMware), 433-434
hosts, 350
Perfmon, 510
port state, 95-97
snapshots, 391
swap files, 482
vCenter Server, 474-475
VMs, 240, 351-352
vSphere, 471
most recently used. *See* **MRU**
Most Recently Used policy, 224
motherboards, 127
CMOS batteries, 39
vDSs, 140
mounting
NFS datastores, 205-208
VFMS datastores, 195-205
mouse
support, 240
VMs, 239
moving
host objects, 332
vApps, 267-273
MRU (most recently used), 478
MTUs (maximum transmission units), 90, 145
multipathing, 448, 478
multiple groups, 47
multiple hosts
profiles, 9
vDS policies, 128
multitier services, resource pools, 364
mutual authentication, 183
Mutual CHAP, 185. *See also* **CHAP**

N

NAA (Network Address Authority), 165, 214
naming
baselines, 413
clusters, 327
dvPort Groups, 105
FQDN, 329
hostnames, 174

images, 39
performance charts, 508
profiles, 401
resource pools, 366
snapshots, 390
storage, 164-166
tasks, 498
templates, 284
vApps, 268, 371
VFMS datastores, 195-205
NAS (network-attached storage), 77, 158, 162-164
connecting, 175-176
datastores, 158
storage metrics, 485
NAT (Network Address Translation), 260
navigating
resource pools, 363-364
Start Order screen, vApps, 266
NetFlow, 95
Network Adapters tab, 86
Network Address Authority (NAA), 165
Network Address Translation. *See* **NAT**
network-attached storage. *See* **NAS**
Network Configuration tab, 182
Network File Systems. *See* **NFS**
Network Information Services. *See* **NIS**
Network Load Balancing, 135*See* **NLB**
Network Mapping page, 292
Network Time Protocol. *See* **NTP**
networks
adapters, troubleshooting, 443-444
CNAs, 164
configuring, 73, 440
failovers, detecting, 134
flapping errors, 135
I/O control, 8
labels, 84, 92
LANs, 164
metrics, 478, 484
NAS, 158
performance, troubleshooting, 444-445
planning, 73
policies
configuring security, 52
security, 44
resources, verifying VMs, 442
SANs, 158, 163
statistics, viewing, 513
storage, configuring, 189
vCenter Servers, 14
viewing, verifying configurations, 440
VMkernel, configuring, 88-90
vMotion, 95-96
VMs, 238
VSAs, 188
vSS, 76
WANs, 164
new storage devices, scanning, 173
New vApp Wizard, 268
NFS (Network File Systems), 164, 440
datastores, 187, 193-225
servers, connecting NAS devices, 175
shares, creating, 174-175
volume replication, 189
NICs (network interface cards)
failback, 135
requirements, 455
selecting, 109
teaming, 95, 124, 133

NIS (Network Information Services), 9
NLB (Network Load Balancing), 54
No Access role, 44
No Management Network Redundancy warning, 460
Normal Logging, 491, 492. *See also* **logging**
normal values, configuring disk shares, 246
no root_squash, 175
notification
email, 488
grades, 537
scheduled tasks, 498
switches, 135
NTP (Network Time Protocol), 22, 26-27, 252
NX/XD flags, hiding, 376

O

objects
compliance, scanning, 416
consoles, viewing, 475
hosts, moving, 332
inheritance, 46
inventory, adding, 327
logs
bundles, 492-495
creating, 437
modifying, 476
selecting, 497
vApps, adding, 274
open virtualization format. *See* **OVF**
opening
Hardware Status tab, 434
VM consoles, 241
operating systems
EVC, 341
troubleshooting, 240
TSO capabilities, 145
vCenter Server, 17
options
Advanced, VMs, 307
cloning, 280
clusters, configuring, 327
General Options page, VMs, 304
Guest Customization, 287
Host Isolation Response, 356
load balancing, 134
logging, configuring, 491-492
patching, configuring, 411-412
reporting, verifying defaults, 520
resource maps, 500-502
Show All Entries, 476
templates, 280
vApps, 304
Virtual Machine Options setting, 345
VMs
configuring, 303
HA, 355
Restart Priority, 356
troubleshooting, 310
Options tab (vApps), 262-266
Oracle databases, 4
OS (operating systems), 243-244
outbound traffic shaping, 95
output, filtering, 488
overallocating storage, 169
overcommitting
clusters, 326, 445
storage, troubleshooting, 450
overhead, memory, 355, 483

override settings
editing, 130
Uplink Teaming, 137
vDS, 441
oversubscriptions, storage, 169
Overview performance charts, 485-487
OVF (open virtualization format), 10, 262-264
templates, importing, 293-295
virtual appliances, deploying, 290-293

P

pairings
roles, 48, 55
users, 55
parallel ports, VMs, 239
parameters, expandable reservations, 364
parent pools, 363
Partially Automated mode, 344
passwords (vCenter Server), 13
patching
default installation download, 407
ESXi (VMware), 398-416
hosts, 412
options, configuring, 411-412
requirements, 398
VMs, 398-416
Path Selection Policy. *See* **PSP**
paths
disabling, 223
multipathing, 448, 478
thrashing, 450
VFMS datastores, selecting, 224
Peak Bandwidth setting, 144
Percentage of Cluster Rescues Reserved policy, 355
Perfmon, 510
host performance, 514
performance
Advanced performance charts, formatting, 508
balloon drivers, 481
charts, 485-487
fault tolerance, 362
hosts
Perfmon, 514
resxtop, 510-514
I/O, 335
logging, configuring, 491
loss of vCenter, 21
metrics, identifying, 477-478
migration, troubleshooting, 463-464
networks, troubleshooting, 444-445
SDRS, configuring, 335
software iSCSI initiators, 168
storage, troubleshooting, 454
storage APIs, 8
thin provisioning, 6
VMs, applying swap files, 326
periods, validating, 488
permissions
AD, 44
adding, 55-56
applying, 46-48
read-write, 175
per-port policy settings, 95-96
physical adapters
adding, 110
troubleshooting, 443-444
physical CPU usage, viewing, 511

physical machines, Converters (VMware), 252-255
physical memory. *See* **RAM**
physical resources, IOPS, 246
planning, 3
mock exams, 536
networks, 73
VMware, fault tolerance, 358-363
vSphere, storage, 159
Plug-In Manager, 18
plug-ins
clients (vSphere), 18-22
ESXi (VMware), troubleshooting, 433
VDR, 409
policies
Admission Control, 354-356
assigning, storage to VMs, 309
dvPort Groups
blocking, 132-133
exceptions, 133
IP Allocation Policy setting, vApp, 264
networks
configuring security, 52
security, 44
PSP, 224-225, 451
traffic shaping, configuring, 142-145
vDS, configuring, 124-150
vSS, configuring, 124-150
pools
child, 363
IP, configuring, 274-276
parent, 363
Resource Pools, 363-388
resources
vApps, 286
VMs, 243
servers, 192
populating ADs, 488
portability, vApps, 277
ports
bindings, iSCSI, 180-183
defaults, 408
dvPort Groups, adding, 104-107
groups
adding, 90-93
configuring, 92
deleting, 93
editing, 6, 127
migrating, 102
troubleshooting, 441
vDS, 129
VLAN configuration on, 138
vSS, 126
levels, override settings, 137
mirroring, 95-97
settings, editing, 130
state, monitoring, 95-97
virtual serial port concentrators, 8
VMkernel, 77, 88-90
binding, 183
managing, 440
VMs, 239
power
powered-off VMs, migrating, 386
settings, 306
templates, 287
VMs, 244
Power Management setting, 307
Power On Boot Delay setting, 308
pre-boot execution infrastructure. *See* **PXE**
preparing
day of tests, 536-537
mock exams, 536

prepopulating ADs, 488
printing resource maps, 500-502
private clouds, 65
private memory, 483
private virtual local-area networks. *See* **PVLANs**
privileges, 44. *See also* **security**
accounts, 329
roles, editing, 59-61
vCenter Server, identifying, 44
Processor entitlement, 6
processors
hyperthreading. *See* hyperthreading
storage, connecting, 171
vCenter Servers, 14, 31
Profile Wizard, 404
profiles
hosts, 9
applying permissions to, 63
attaching, 402-404
Auto Deploy, 25
formatting, 398-401
scanning, 405-406
images (Auto Deploy), 25
naming, 401
security, ESXi (VMware) hosts, 429
SMASH, 433
Promiscuous mode, 52, 142
properties
datastores
accessing, 214
identifying, 193-195
Volume Properties page, 213
Properties dialog box, 86
Properties link, vSS, 82, 125
Properties settings, vApps, 263
protection, data, 8
protocols
CHAP, 168, 180, 183-185
DHCP, 50, 264, 277
Fibre Channel, 174.
IP
configuring VMkernel ports, 88
editing, 89
entering, 84
storage, 77
virtual adapters, 114
LLDP, 95-97
NTP, 22, 26-27, 252
SMTP, 488-491
SNMP, 50, 487-488
STP, 135
provisioning
thick, 245-246
thin, 6, 168-170
support, 192
uses cases, 186
virtual disks, 245-246
PSP (Path Selection Policy), 451
VFMS datastores, 224-225
public clouds, 65
publishing SLAs, 21
PVLANs (private virtual local-area networks), 96
policy settings, configuring on vDSs, 140
PXE (pre-boot execution infrastructure), 24

Q

QoS (quality of service), user-defined network I/O control, 97
queries, Enable Query limits, 488
questions, studying bonus material, 535
quiescing I/O, 240

R

RAID (redundant array of inexpensive disks), 188, 192
RAM (random access memory)
clusters, 326
TPS, 479
random access memory. *See* **RAM**
raw device mappings. *See* **RDMs**
RBAC (role-based access control), 44
RDMs (raw device mappings), 177, 195, 445
filters, 177
Read Only role, 44
storage, configuring, 175
read-write permissions, 175
Ready to Complete page, 199, 212
clusters, 331
host profiles, 401
log bundles, 472
SDRS, 340
vApps, 270, 372
Recent Tasks pane, 287
recovery
data, 8
VDR, 389
redundancy
HA, troubleshooting, 458
IP addresses, 174
vCenter, 21
redundant array of inexpensive disks. *See* **RAID**
references, selecting hosts, 400
registration, vApps, 266
remediation
ESXi hosts, 416
host profiles, 405-406
remote connections, SSH, 426
removing. *See also* **deleting**
permissions, 55-56
plug-ins, clients (vSphere), 18-22
renaming VFMS datastores, 195-205
replication, 189
reports
options, verifying defaults, 520
storage, troubleshooting, 451
requests, GET, 487
requirements
customers, vSphere editions based on, 68
DRS, 455
EVC
compatibility, 377
CPUs, 376-377
HA, 455
hardware, VMware ESXi, 39
initiators, iSCSI hardware, 166-168
patching, 398
resource pools, 368
snapshots, 377, 389
vCenter Server
availability, 21
installation, 14
vMotion, 374, 455

Rescan All link, 172
rescanning, 172-173. *See also* **scanning**
reservations
expandable parameters, 364
hosts, troubleshooting, 450
memory, 355
resource pools, 368-369
Resource Allocation page
swap files, 482
vApps, 269
VMs, 248
Resource Distribution Chart, 460
Resource Pools, 328
configuring, 363-388
grafting, 331
Resource settings, vApps, 262
resources
clusters as failover spare capacity, 358
disks, configuring, 247
DRS, troubleshooting, 455-456
ESXi hosts, VSAs, 192-193
failovers, implementing HA, 357
IOPS, 246
mapping, 463, 500-502
memory, modifying, 256
networks, verifying VMs, 442
pools
vApps, 286
VMs, 243
SDRS, configuring, 335
VMs
storage, 242
viewing, 462
VSA management, 190-191
vSphere, troubleshooting, 514
restarts, 8, 21, 240, 351
automation, 353-356
Restart Priority option, 356
restoring
FLR, 389
VMs, 388-398
restrictions, guest operating systems, 300
resumé-generating event. *See* **RGE**
resuming vApps, 276
Resxtop, 444, 510-514
reviewing OVF details, 292
RGE (resumé-generating event), 171
role-based access control. *See* **RBAC**
roles, 44. *See also* **security**
cloning, 56-59
editing, 59-61
servers, creating, 56
system, 44
vCenter Server, identifying, 44
RolesSample roles, 44
Rollback Options page, 38
root accounts, 329
root cause of network issues, troubleshooting, 444-445
root passwords, 23. *See also* **passwords**
Round Robin policy, 225
routers, NAT, 260
routes, load balancing, 134
routing, DNS, 22
rules
adding,
affinity, configuring, 346-349
Database Clusters, 336
engines, Auto Deploy, 25
permissions, 46-48

runtime, SDRS, 338
softly enforced VM-VM-host, 346
viewing, 349
running tasks, 500. *See also* **tasks**
runtime
Database Clusters, 336
names, 165
SDRS, 338

S

Same Host and Transport Filters, 177
SANs (storage-area networks), 158, 163, 440
naming conventions, 165-166
SAS (Serial Attached SCSI), 188
SATA (Serial Advanced Technology Attachment), 188
saving performance charts, 508
scalability, storage APIs, 8
scanning
hosts, profiles, 405-406
objects, compliance, 416
storage, 172-173
VMs, 37
Schedule Task dialog box, 497
Scheduled Task Wizard, 495
scheduling
tasks, 495-500
tests, 532
screens, Start Order screen (vApps), 266
SCSI (Small Computer System Interface)
adapters, VMs, 239
identifiers, 165
reservations, 450
SDKs (software development kits), 352
SDRS (Storage DRS)
DRS, configuring, 335-340
Maintenance Mode, entering, 221
Secure Shell. *See* **SSH**
security
CHAP, configuring, 183-185
IDSs, 52
no root_squash, 175
policies
configuring, 52
vDS/vSS, 124
profiles, ESXi (VMware) hosts, 429
vCenter Server, 13, 43-63
VMs, 300-301
vShield zones, 8
segmentation, VLANs, 95
selecting
backup solutions, 397
clusters, SDRS, 339
destinations, 254, 261
extent devices, 211
file system versions, 197
hosts
SDRS, 339
templates, 284
VMs, 289
logs, exporting, 435
LUNs, 197
NICs, 109
objects, 497
options, naming snapshots, 390
OVF types, 294
paths, VFMS datastores, 224
PSP, 224-225, 451
references, hosts, 400

scheduled tasks, 497
SDRS automation levels, 337
sources, 122, 254
storage adapters, 182
Upgrade VMware Tools, 35
virtual adapters, 113
vmnic, 79
sending email, alarms, 521
Serial Advanced Technology Attachment. *See* **SATA**
Serial Attached SCSI. *See* **SAS**
serial ports
virtual concentrators, 8
VMs, 239
series of snapshots, 393
servers
Auto Deploy, 25
connections, monitoring, 496-507
DHCP, 264, 277
downtime, 8
NFS
connecting NAS devices, 175
creating, 174
pools, 192
roles, creating, 56
SMASH, 433
SMTP, configuring, 488-491
SUSE Linux Enterprise Server for VMware, 6
Tomcat, plug-ins, 433
vCenter Server, 3, 6 *See also* vCenter Servers
alarms, 471, 515-525
architecture, 64
deploying, 9-13
licenses, 19-21
operating systems, 17
permissions, 55-5
security, 43-63
status, 503-504
storage filters, 177-179
upgrading, 31-43
service level agreements. *See* **SLAs**
services
directories, adding ESXi hosts, 61
multitier, resource pools, 364
SSH, configuring, 429
VMkernel, 77, 88-90
VMware, 16
vServices (vApps), 267
Windows, accessing, 504
sessions, vCenter Sessions tool, 507. *See also* **connecting**
settings
adapters, viewing, 115
Admission Control, 353-356
Advanced, vApps, 264
alarm triggers, 520, 524
autonegotiate, 444
Average Bandwidth, 144
bandwidth, 144
Burst Size, 144
charts, 486
clusters, editing, 346
default utilization alarms, 516
Disk, 373
Edit Settings, 373
Force BIOS Setup, 308
Forged Transmits, 54
host profiles, 398-401
IP Allocation Policy, vApp, 264
Memory, 373
memory, 326, 480
Migration Threshold slider, 343-344

multipathing, 448
network security, 44
override
editing, 130
vDS, 441
Peak Bandwidth, 144
ports, editing, 130
power, copying VMs, 306
Power On Boot Delay, 308
Properties, vApps, 263
Resource, vApps, 262
SMTP, 488-491
SNMP, 487-488
timeout, 495
vApp, 262, 274
virtual hardware, 256, 342
Virtual Machine Options, 345
VLANs, configuring, 137-142
VMs, editing, 243, 248, 442
vnics, editing, 260
sharing
disks, configuring, 246-249
memory, 483
NFS, 174-175
resource pools, 368-369
storage, vSphere, 162-186
TPS, 479
Show All Entries option, 476
shutting down VMs, 240
Simple Network Management Protocol. *See* **SNMP**
sizing
caches, 22
compression caches, 28
databases, vCenter Server, 17
memory, 480
swap files, 482
SLAs (service level agreements), 21
sliders, Migration Threshold, 343-344
SMASH (Systems Management Architecture for Server Hardware), 433
SMP (symmetric multiprocessing), 6
SMTP (Simple Mail Transfer Protocol)
AD, configuring, 488
configuring, 488-491
vCenter Servers, configuring, 488-491
Snapshot Manager, 391
snapshots
requirements, 377, 389
VMs, 389, 450
SNMP (Simple Network Management Protocol), 50
configuring, 487-488
softly enforced VM-VM-host rules, creating, 346
software
antivirus, 300
iSCSI initiators, 168
third-party backup, 8
software development kits. *See* **SDKs**
solid state drives. *See* **SSDs**
solutions
backups, selecting, 397
vSphere, 64-68
sorting groups, lists, 54
sources
machines, 254
selecting, 122
Spanning Tree Protocol. *See* **STP**
specifications, SMASH, 433
Specify Failover Hosts policy, 355

specifying failovers, hosts, 358
spreadsheets, 17. *See also* **databases**
SQL (Microsoft), 17
SQL Express, 408
SSDs (solid state drives), 296
troubleshooting, 455
SSH (Secure Shell), 50, 426
standards, SMASH, 433
Standby NICs, 135
starting
agent status, 505-506
Conversion Wizard, 254
vCenter Server status, 503-504
Start Order screen, vApps, 266
state
exporting, 294
ports, monitoring, 95-97
statistics
CPUs, 510-514
networks, viewing, 513
performance, 21
status
agents, 505-506
Hardware Status tab, opening, 434
links, 134
NICs, viewing, 110
vCenter Server, 503-504
stopping
agent status, 505-506
vCenter Server status, 503-504
storage
adapters, 162
adding, 180
selecting, 182
APIs, 8
array integration, 8
configuring, verifying, 445-447
contention, troubleshooting, 448
DRS, 9
Fibre Channel, 163
filters, vCenter Server, 177-179
I/O control, 8
IP, 77
maps, troubleshooting, 451
MemoryDisk, vCenter Servers, 14
metrics, 478, 485
naming, 164-166
NAS, 162, 164. *See also* NAS
networks, configuring, 189
overallocation, 169
overcommitting, troubleshooting, 450
oversubscriptions, 169
performance, troubleshooting, 454
processors, connecting, 171
Read Only role, configuring, 175
reports, troubleshooting, 451
scanning, 172-173
thin provisioning, 6, 168-170
vCenter Servers, upgrading, 31
views, modifying, 166
vMotion, 8
VMs
assigning policies to, 309
resources, 242
VSAs, 187. *See also* VSAs
vSphere, 159
sharing, 162-186
troubleshooting, 445-454
zoning, 170-171
Storage APIs- Array Integration, 186
storage area networks. *See* **SANs**
Storage DRS. *See* **SDRS**

Storage link, customizing, 445-447
Storage View tabs, 445
accessing, 165
Storage vMotion
applying, 387-388
snapshot requirements, 377
VMs
migration, 378, 382-384
requirements, 373
STP (Spanning Tree Protocol), 135
strategies, study, 535
studying. *See also* **exams; testing**
mock exams, 536
questions, bonus material, 535
subnets, managing, 138
Summary tab (VM), 242
super video graphics array. *See* **SVGA**
support
CPUs, EVC, 341
jumbo frames, enabling, 147
mouse, 240
thin provisioning, 192
tools, 18
TSM, 426-429
vnic, 240
SUSE Linux Enterprise Server for VMware, 6
VSA architecture, 187
suspending
vApps, 276
VMs, migrating, 386
SVGA (super video graphics array) display, 240
swap files, 298, 482-483
troubleshooting, 455
VMs, 326, 384
switches
distributed, 9
Fibre Channel, 171
Layer 2, 95
notifying, 135
upgrading, 33
vDS, 81, 94-95. *See also* vDS
virtual, troubleshooting, 441
vmnics, adding, 82-85
vSphere, APIs, 96
vSS. *See also* vSS
configuring, 76, 85-86
deleting, 81, 87
formatting, 77-81
policies, 126
symmetric multiprocessing. *See* **SMP**
sync drives, 240
synchronization
communication, 175
time, 240
VMs, 251
syslog, 430
systems
logs
exporting, 437
viewing, 430
roles, 44
Systems Management Architecture for Server Hardware. *See* **SMASH**

T

tables, MAC addresses, 135
tabs
Alarms, 515
Dynamic Discovery, 181
Hardware Status, opening, 434

Network Adapters, 86
Network Configuration, 182
Options (vApps), 262-266
Storage View, 165, 445
Summary (VM), 242
VM consoles, 241
tags, IEEE 802.1Q, 95, 138
tasks
keywords, filtering, 477
scheduling, 495-500
viewing, 474-475
Tasks and Events tool, 474-475
TCO (total cost of ownership), 192
TCP (Transmission Control Protocol) offload, 167
TCP Offload Engine. *See* **TOE**
TCP Segmentation Offload. *See* **TSO**
Tech Support Mode. *See* **TSM**
templates
existing VMs
creating from, 282-285
updating, 287-290
files, accessing, 291
options, 280
OVF
importing, 293-295
vCenter, 10-13
virtual appliances, 290-293
VMs
deploying from, 285-287
management, 277-295
terminating connections, 496-507
testing
day of, preparing, 536-537
fault tolerance, 362
grade notification, 537
mock exams, 536
questions, bonus material, 535
scheduling, 532
vCenter, 13
VCP510 Exam Blueprint, 534
thick provisioning, 245-246
thin provisioning, 6, 168-170
support, 192
uses cases, 186
virtual disks, 245-246
third-party backup software, 8
thrashing paths, 450
thresholds, configuring migration, 342-344
tiered applications, deploying vApps as, 193
time
NTP, 22, 26-27
synchronization, 240, 251
zones, 13, 26
timeout
configuring, 495
intervals, AD, 488
TOE (TCP Offload Engine), 167
tolerance
fault. *See* fault tolerance
host failures, calculating, 357
Tomcat servers, plug-ins, 433
tools
device drivers, 240
DRS/HA, monitoring, 342
host health monitoring, 433-434
installing, 249-251
management, 7
Migrate Virtual Machine Networking, 122
Perfmon, 510

performance charts, 485-487
resxtop, 510-514
SMASH, 433
Tasks and Events, 474-475
vCenter Sessions, 507
VMware
managing, *305*
upgrading, *34-37*, *398*
Toolstools (VMware), 249
total cost of ownership. *See* **TCO**
TPS (transparent page sharing), 479
traffic
back-end, 189
fault tolerance, security, 301
front-end, 189
vMotion, 189
traffic shaping policies
configuring, 142-145
vDS/vSS, 124
transparent page sharing. *See* **TPS**
triggers, configuring alarms, 520, 524
trivia logging, 492. *See also* **logging**
troubleshooting, 423
autonegotiate settings, 444
DCUIs, 505
DRS, 342, 455-456
ESXi (VMware), 426-439
assigning licenses, *432*
booting, *432*
installing, *431*
monitoring, *433-434*
plug-ins, *433*
ESXi (VMware) host guidelines, 426
fault tolerance, 362
HA, 342, 455-460
hosts
Perfmon, *514*
reservations, *450*
iSCSI initiators, 451
load balancing, DRS, 462
logs, accessing, 429-430
loss of vCenter, 21
migration performance, 463-464
networks
adapters, *443-444*
performance, *444-445*
operating systems, 240
storage
contention, *448*
maps, *451*
overcommitting, *450*
performance, *454*
reports, *451*
virtual switches, 441
VM options, 310
vMotion, 455-456, 455-457
maps, *463*
migration, *462-463*
vSphere, 439-445
client plug-ins, *19*
resources, *514*
storage, *445-454*
trunking, VLAN, 139. *See also* **VLANs**
vDS, 140
TSM (Tech Support Mode), 426-429
TSO (TCP Segmentation Offload), enabling, 145-146
types
of baselines, 414
of clouds, 66
of communication, 189

of OVF, selecting, 294
of permissions, 46-48
of roles, 44
of storage adapters, 162
of virtual adapters, 113
of VMkernel services, 77
of vSS connections, 77

U

UIs (user interfaces), 180
unaccessed memory, 483
unions, privileges, 47
universal serial bus. *See* **USB**
unmounting
NFS datastores, 205-208
VFMS datastores, 195-205
Unused NICs, 135
Update Manager, 8, 35
applying, 39-43
baselines, formatting, 412-415
updating
BIOS, 450
ESXi (VMware), 398-416
existing VM templates, 287-290
tools, 249-251
VMs, 398-416
VUM, 398
upgrading, 3
capacity, 169
distributed switches, 33
hosts, 412
tools, 249-251
Tools (VMware), 398
VA, 412
vCenter Server, 31-43
vDS, 81
VFMS, 195, 218-219
VMs, 33, 37-39
VMware tools, 34-37
vSphere, 32
VUM, 32
uplinks, 162
deleting, 110
dvUplink groups, configuring, 108-111
troubleshooting, 443
Uplink Teaming, 136
USB (universal serial bus), VMs, 239
use cases
FCoE, 173-174
iSCSI initiators, 185-186
vDS, 123-124
VFMS datastores, 224
VSAs, 192
vSphere, 22
vSS, 94
used storage capacity, 169
user-defined network I/O control, 95-97
user interfaces. *See* **UIs**
users
lists, viewing, 54
permissions, 55
uses cases
fault tolerance, 362-363
thin provisioning, 186
UTC (coordinated universal time), 26
utilization alarms, 516. *See also* **alarms**

V

validation
enabling, 488
periods, 488
values
CPU Ready, 484, 508
disk shares, configuring, 246
vApps, 235
administration, 295-313
cloning, 369-372
creating, 262-277
exporting, 293
objects, adding, 274
options, 304
settings, editing, 274
VAs (virtual appliances), 96
vCenter Heartbeat, 21
vCenter Servers, 3, 6
AD, configuring, 488
alarms, 471, 515-525
architecture, 64
availability requirements, 21
components, installing, 17-18
configuring, 6-9
connections, monitoring, 496-507
Converters, installing, 253
databases, sizing, 17
deploying, 9-13
licenses, 19-21
logging, configuring, 491-492
monitoring, 474-475
operating systems, 17
permissions, 46-48, 55
plug-ins, 433
security, 43-63
SMTP, configuring, 488-491
SNMP, configuring, 487-488
status, 503-504
storage filters, 177-179
Storage link, customizing, 445-447
system logs, exporting, 437
timeout settings, configuring, 495
upgrading, 31-43
VMs
identifying maximums, 278-280
installing, 14-15
VMware ESXi, 26-27. *See also* VMware ESXi
vCenter Sessions tool, 507
VCP510 Exam Blueprint, 534
vCPUs (virtual CPUs)
entitlement, 6
modifying, 256
VDR (VMware Data Recovery), 389, 409
backups, 396-397
configuring, 395
vDS (vSphere distributed switch), 81
capabilities, identifying,
configuring, 94-95
deleting, 100
dvUplink groups, configuring, 108-111
ESXi hosts
adding, 100-103
deleting, 103-104
formatting, 97-100
jumbo frames, 148
override settings, 441
policies, configuring, 124-150
port groups
adding, 104-107
override settings, 131

traffic shaping policies, 144-145
troubleshooting, 440
use cases, 123-124
virtual adapters, formatting, 111-117
VLAN policies, configuring, 139-142
VMs, migrating, 117-119
vendor documentation, 147
verbose logging, 492. *See also* **logging**
verifying
agent status, 505-506
default reporting options, 520
fault tolerance, 362
HA, 457
images, 42
networks, configuring, 440
storage configurations, 445-447
vCenter Server status, 503-504
vMotion configurations, 456-457
VMs, configuring, 442
Version 7 hardware, 239
versions
checking, 251
file systems, selecting, 197
VMs, hardware capabilities, 238-239
VFMS (Virtual Machine File System), 158, 445, 450
expanding, 209, 213-218
extending, 209-213
filters, 177
LUNs, 177
Maintenance Mode, 220
Path Selection Policies, 224-225
selecting paths, 224
upgrading, 218-219
use cases, 224
VFMS-5 capabilities, identifying, 195
VIBs (VMware Infrastructure Bundles), 25
video, VMs, 239
viewing
adapter settings, 115
columns, 453
datastores, 210
disk layouts, 210
DRS groups rules, 349
events/tasks, 474-475
group lists, 54
hardware status, 434
health status of hosts, 433
logs
hosts, 430
VMkernel, 431
memory, 512
multipathing, 448
naming conventions, 165
networks
statistics, 513
verifying configurations, 440
NICs, 110
objects, consoles, 475
physical CPU usage, 511
Resource Distribution Charts, 460
resource maps, 463, 500-502
rules, 349
scheduled tasks, 499
storage
maps, 453
reports, 451
system logs, 430
VMs
network configurations, 442
resources, 462

views
charts, modifying, 487
clusters, 500
customizing, 512
Datastore Clusters, 336
Datastores, 193
storage, modifying, 166
virtual adapters
deleting, 116
formatting, 111-117
virtual appliances, 290-293. *See* **VAs**
Virtualcenter Agent (vpxa) log, 430
virtual CPUs. *See* **vCPUs**
virtual disks
configuration file destinations, 296
hot extending, 301-303
thick provisioning, 245-246
thin provisioning, 169-170, 245-246
virtual hardware settings, 256, 342
virtual local-area networks. *See* **VLANs**
Virtual Machine File System. *See* **VFMS**
Virtual Machine Options setting, 345
virtual machines. *See* **VMs**
virtual network interface card. *See* **vnic**
virtual serial port concentrators, 8
virtual switches, troubleshooting, 441
VLANs (virtual LANs)
configuring, 105, 149-150
segmentation, 95
settings, configuring, 137-142
VSAs, 189
vMA (vSphere Management Assistant), 510
.vmdk files, 10
VM Heartbeat, 240
VMFS3, upgrading to VMFS5, 34
VMkernel
CNAs, 174
command latency, 485
configuring, 88-90
connections, 78
jumbo frames, enabling, 147
logs, viewing, 431
memory compression caches, 28-30
ports, 77
binding, 183
managing, 440
swap files, 483
system logs, viewing, 430
vDS, migrating to, 102
vmmemctl (memory management), 240
vmnics, 440
adding, 82-85
assigning, 90, 133
configuring, 85-86
deleting, 87
failback, 135
selecting, 79
troubleshooting, 443
vDSs, connecting, 74
virtual adapters, deleting, 116
vMotion, 8, 39, 77
EVC, 340-342
migration, 135, 462-463
networks, 95-96
replication, 189
requirements, 374
resource maps, viewing, 463
snapshot requirements, 377
storage, 8, 192
troubleshooting, 455-457

VMs
migration, 378
requirements, 373
VM Restart Priority option, 356
VMs (virtual machines), 6, 235
adding, 347
administration, 295-313
Admission Control, configuring, 353-356
affinity rules, configuring, 346-349
applications, developing, 295
automation, configuring, 344-345
backups, 388-398
baselines, attaching, 415-416
booting, configuring options, 308
cloning, 277-295
configuring, verifying, 442
connecting, 76
consoles, accessing, 240-241
CPUs
configuring, 257-258
Ready Time alarms, 519
creating, 238-261
destinations, configuration files, 296
DRS entitlement, 326
editing, settings, 442
exporting, 293
files
identifying, 295
migrating, 201
guest operating systems, 341
HA options, 355
hardware
capabilities of, 238-239
upgrading, 37-39
hierarchies, resource pools, 363-364
hosts, selecting, 289
importing, 255
jumbo frames, 149
load balancing, 9
MAC addresses, 52
maximums, identifying, 278-280
memory, configuring, 258-260
migration, 117-119, 342-344, 373-388
monitoring, 351-352
networks, port blocks, 95-96
options, configuring, 303
performance, 478
port groups, adding, 91
power settings, copying, 306
resources
pools, adding, 368
viewing, 462
restarts, automation, 353-356
scanning, 37
security, 300-301
settings, editing, 248
snapshots, 389, 450
softly enforced VM-VM-host rules, 346
storage
assigning policies to, 309
resources, 242
swap files, 298, 384, 483
time synchronization, 251
traffic shaping policies, configuring, 142-145
troubleshooting, 310
TSO, enabling, 145-146
updating, 398-416
upgrading, 33
vCenter Servers, installing, 14-15

VMware
clusters. *See* clusters
Converters, 54, 252-255
Data Recovery. *See* VDR
device driver tools, 240
ESXi, 3. *See also* ESXi (VMware)
applying Update Manager, *39-43*
architecture, *64*
Auto Deploy, *24-26*
configuring, *22-30*
firewalls, *48-49*
installing, *431*
iSCSI CHAP, *183-185*
licenses, *30*
Observation Log (vobd), *430*
rescanning storage hosts, *172*
security, *43-63*
updating, *398-416*
upgrading vCenter Server, *31-43*
uplinks, *162*
VMs, *243*
VSAs, *188-189*, *192-193*
fault tolerance, implementing, 358-363
Infrastructure Bundles. *See* VIBs
services, 16
tools
managing, *305*
upgrading, *34-37*, *398*
Toolstools, 249
Update Manager. *See* VUM
vmxnet - vmxnet3 vnic drivers, 240
vnic (virtual network interface card), 240
configuring, 260
Volume Properties page, 213
volumes
replication, 189
scanning, 173
vRAM, entitlement, 6
VSAs (vSphere Storage Appliances), 158
configuring, 186-193
ESXi (VMware)
configuring, *188-189*
hosts, *192-193*
resource management, 190-191
use cases, 192
VSA Manager, configuring, 189-190
vServices (vApps), 267
vShield zones, 8
vSphere
architecture, 64-68
clients, 242
accessing host logs, *430*
monitoring hardware, *433-434*
plug-ins, *18-22*
distributed switch. *See* vDS
editions, 7
Installation Manager, 15-17, 22
Installer, 406
Management Assistant. *See* vMA
memory, 478-483
monitoring, 471
resources, troubleshooting, 514
standard switches. *See* vSS
storage, 159
sharing, *162-186*
troubleshooting, *445-454*
Storage Appliance. *See* VSAs
switches, APIs, 96
troubleshooting, 439-445
upgrading, 32

use cases, 22
VSAs, configuring, 186-193
vSS (vSphere standard switches)
adding, 82-87
capabilities, identifying, 76-77
configuring, 76, 85-86
deleting, 81, 87
formatting, 77-81
jumbo frames, 147
policies, configuring, 124-150
port groups
adding, 90-93
VLAN configuration on, 138
traffic shaping policies, 143-144
troubleshooting, 440
use cases, 94
VLANs, configuring, 149-150
VMkernel, configuring, 88-90
VMs, migrating, 117-119
VSWP files, 296
VUM (VMware Update Manager), 31, 398
baselines, creating, 412
configuring, 406-410
upgrading, 32

W-Z

WANs (wide-area networks), 164
warnings, logging, 491
wide-area networks. *See* **WANs**
Windows
accessing, 504
Installer, 244
VMware tools, upgrading, 251
wizards
Add Network Wizard, 78
Conversion Wizard, starting, 254
Create Profile Wizard, 400
Migrate VM Wizard, 495
New vApp Wizard, 268
Profile Wizard, 404
Scheduled Task Wizard, 495
workloads
applications, selecting datastore destinations, 261
resource pools, 368-369
WWNs (World Wide Names), 171

zones, 170-171
time, 13, 26
vShield, 8