

Aidan Finn

MASTERING

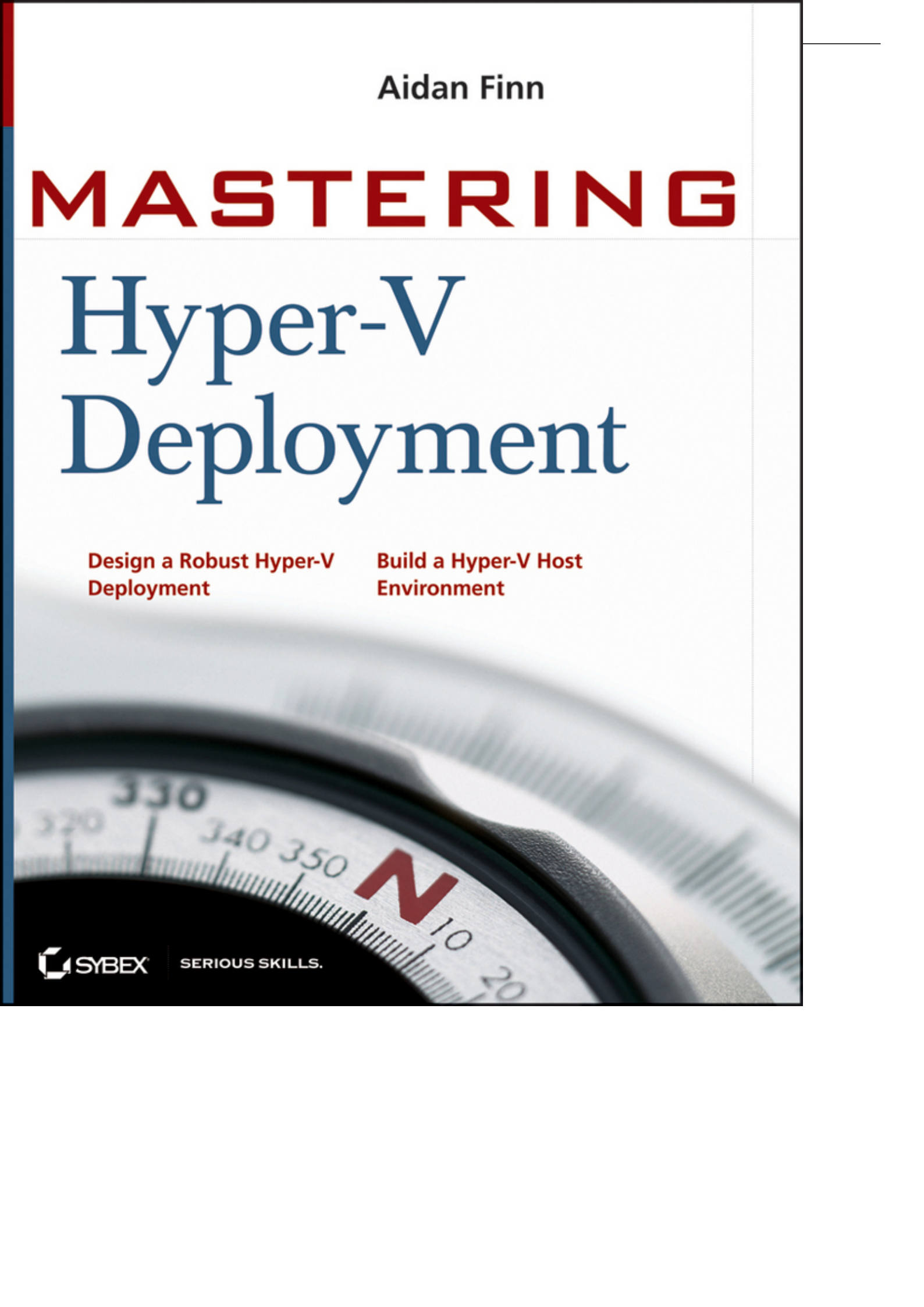
Hyper-V Deployment

**Design a Robust Hyper-V
Deployment**

**Build a Hyper-V Host
Environment**



SERIOUS SKILLS.





Mastering

Hyper-V™ Deployment

Mastering Hyper-V™ Deployment

Aidan Finn

Patrick Lownds



WILEY

Wiley Publishing, Inc.

Acquisitions Editor: Agatha Kim
Development Editor: Sara Barry
Technical Editor: Hans Vredevoort
Production Editor: Rachel Gigliotti
Copy Editor: Kim Wimpsett
Editorial Manager: Pete Gaughan
Production Manager: Tim Tate
Vice President and Executive Group Publisher: Richard Swadley
Vice President and Publisher: Neil Edde
Book Designers: Maureen Forsys and Judy Fung
Proofreader: Nancy Bell
Indexer: Ted Laux
Project Coordinator, Cover: Lynsey Stanford
Cover Designer: Ryan Sneed
Cover Image: © Pete Gardner/DigitalVision/Getty Images

Copyright © 2011 by Wiley Publishing, Inc., Indianapolis, Indiana
Published simultaneously in Canada

ISBN: 978-0-470-87653-4

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise, except as permitted under Sections 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 646-8600. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permissions>.

Limit of Liability/Disclaimer of Warranty: The publisher and the author make no representations or warranties with respect to the accuracy or completeness of the contents of this work and specifically disclaim all warranties, including without limitation warranties of fitness for a particular purpose. No warranty may be created or extended by sales or promotional materials. The advice and strategies contained herein may not be suitable for every situation. This work is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional services. If professional assistance is required, the services of a competent professional person should be sought. Neither the publisher nor the author shall be liable for damages arising herefrom. The fact that an organization or Web site is referred to in this work as a citation and/or a potential source of further information does not mean that the author or the publisher endorses the information the organization or Web site may provide or recommendations it may make. Further, readers should be aware that Internet Web sites listed in this work may have changed or disappeared between when this work was written and when it is read.

For general information on our other products and services or to obtain technical support, please contact our Customer Care Department within the U.S. at (877) 762-2974, outside the U.S. at (317) 572-3993 or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Library of Congress Cataloging-in-Publication Data

Finn, Aidan, 1974-

Mastering Hyper-V deployment / Aidan Finn, Patrick Lownds.
p. cm.

ISBN 978-0-470-87653-4 (pbk.)

ISBN 978-1-118-00313-8 (ebk.)

ISBN 978-1-118-00315-2 (ebk.)

ISBN 978-1-118-00314-5 (ebk.)

1. Microsoft Windows server Hyper-V. 2. Virtual computer systems. I. Lownds, Patrick, 1970- II. Title.

QA76.9.V5F56 2011

005.4476—dc22

2010037960

TRADEMARKS: Wiley, the Wiley logo, and the Sybex logo are trademarks or registered trademarks of John Wiley & Sons, Inc. and/or its affiliates, in the United States and other countries, and may not be used without written permission. Microsoft and Hyper-V are trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries. All other trademarks are the property of their respective owners. Wiley Publishing, Inc., is not associated with any product or vendor mentioned in this book.

10987654321

Dear Reader,

Thank you for choosing *Mastering Hyper-V Deployment*. This book is part of a family of premium-quality Sybex books, all of which are written by outstanding authors who combine practical experience with a gift for teaching.

Sybex was founded in 1976. More than 30 years later, we're still committed to producing consistently exceptional books. With each of our titles, we're working hard to set a new standard for the industry. From the paper we print on to the authors we work with, our goal is to bring you the best books available.

I hope you see all that reflected in these pages. I'd be very interested to hear your comments and get your feedback on how we're doing. Feel free to let me know what you think about this or any other Sybex book by sending me an email at nedde@wiley.com. If you think you've found a technical error in this book, please visit <http://sybex.custhelp.com>. Customer feedback is critical to our efforts at Sybex.

Best regards,

A handwritten signature in black ink, appearing to read 'Neil Edde', written in a cursive style.

Neil Edde
Vice President and Publisher
Sybex, an Imprint of Wiley

To my family who made this possible.

Acknowledgments

So many people have helped with this book — many more people than I can thank here; after all, I have to think of the rain forests.

I knew that I would need help with writing this book. The deadlines would be tight, and the book needed to include some topics I haven't had much experience with. I asked fellow virtualization Microsoft Valuable Professional (MVP) Patrick Lownds to help with some of the chapters. Patrick is a detail-oriented person, and I knew he would provide you with complete knowledge in subjects that I have not dealt with. I could not have completed this book without his help. This book is a better product because of Patrick's knowledge and his willingness to share.

I was asked if I had a preference for the person who would be the technical reviewer for the book. This person had to ensure that everything we wrote was valid. I wanted someone with that expertise but also a person who would question me and raise alternative points of view. Hans Vredevoort was my first and ideal choice. Hans, a respected clustering MVP and virtualization expert, is a consultant in the Netherlands who works with all the technologies in this book. Hans didn't let me down; he corrected many mistakes and made me think, and I thank him for his efforts.

There are many people at Sybex who made this book possible. Rachel Gigliotti and Kim Wimpsett corrected my many grammatical mistakes, made it more understandable, and improved the quality of this book. Sara Barry managed the project and was always a joy to work with. Sara is the person who kept us on schedule and juggled all the pieces when the inevitable problems would occur. I also have to thank Agatha Kim. I approached Agatha with a very raw concept, and she helped me mold the idea into this book. I could not have done this without her faith in this project and the chance that she took with me, a first-time lead author.

Fellow MVPs, my friends on the Internet (especially those on the Minasi Forum), and colleagues I know in the Irish IT community have taught me so much and helped and encouraged me over the years. Ben Armstrong (aka the Virtual PC Guy) in Redmond and Dave Northey, Wilbour Craddock, and Enda Flynn in Microsoft Ireland have helped and given me opportunities that have changed my life.

Mark Minasi is a friend, mentor, and inspiration for me. Not only have I learned a considerable amount from Mark over the years, but he gave me my first opportunity as an author. I will be forever grateful for his belief in me and his endless encouragement. Mark is the rare person who enjoys helping and seeing others succeed.

Finally, I have to thank my family and friends. My mother and father brought me up to always seek further education, to investigate why things work, and to think independently. They, and my sister, have been supporters without whom I would never have reached this point.

—Aidan Finn

About the Author

Aidan Finn (B.Sc., MCSE, MVP) has been working in IT since 1996. He has worked as a consultant, contractor, and systems administrator for various companies in Ireland and with clients around Europe. In recent years, Aidan has worked with VMware ESX, Hyper-V, and Microsoft System Center. Currently, Aidan is working as a senior infrastructure consultant in Dublin, Ireland.

Aidan is the leader of the Windows User Group in Ireland. He regularly speaks at user group events and conferences about Windows Server, desktop management, virtualization, and System Center. Aidan was also a Microsoft Most Valuable Professional (MVP) on System Center Configuration Manager in 2008. He was awarded MVP status with virtual machine expertise in 2009. He is a member of the Microsoft Springboard STEP program and is one of the Microsoft System Center Influencers. Aidan has worked closely with Microsoft, including online interviews, launch events, and road shows, and has worked as a technical reviewer for the Microsoft Official Curriculum course on Windows Server 2008 R2 virtualization.

Aidan wrote four chapters of *Mastering Windows Server 2008 R2*.

About the Contributing Author

Patrick Lownds (MCSE, MCTS, and MVP) has been working in the IT industry since 1988. He has worked as a junior IT analyst, systems engineer, consultant, and solution architect for various companies within the United Kingdom, working across a number of industry verticals for clients in the United Kingdom and Europe. In recent years, Patrick has worked with Citrix XenServer, VMware ESX, Microsoft Hyper-V, and a number of Microsoft System Center products. Currently, Patrick is working as a solution architect with Hewlett Packard and is based in Wood Street, London.

Patrick is the co-founder and co-contributor of the Microsoft Virtualization User Group in the United Kingdom. He regularly speaks at user group events and conferences about Windows Server, virtualization and System Center and is a member of the Microsoft System Center Influencers program. Patrick is a Microsoft Most Valuable Professional (MVP) and was awarded MVP status with the virtual machine expertise in 2009.

Patrick has worked closely with Microsoft for a number of years, including technology adoption programs, events, and road shows, and was a technical reviewer for *Microsoft Hyper-V Security Guide*.

Contents at a Glance

<i>Foreword</i>	<i>xxi</i>
<i>Introduction</i>	<i>xxiii</i>
Part 1 • Overview	1
Chapter 1 • Proposing Virtualization	3
Chapter 2 • The Architecture of Hyper-V	11
Part 2 • Planning	67
Chapter 3 • The Project Plan	69
Chapter 4 • Assessing the Existing Infrastructure	85
Chapter 5 • Planning the Hardware Deployment	139
Part 3 • Deploying Core Virtualization Technologies	167
Chapter 6 • Deploying Hyper-V	169
Chapter 7 • Virtual Machine Manager 2008 R2	241
Chapter 8 • Virtualization Scenarios	325
Part 4 • Advanced Management	349
Chapter 9 • Operations Manager 2007	351
Chapter 10 • Data Protection and Recovery	397
Chapter 11 • The Small and Medium Business	449
Part 5 • Additional Operations	467
Chapter 12 • Security	469
Chapter 13 • Business Continuity	509

Appendix A • The Bottom Line..... 529

Appendix B • New and Upcoming Products for Hyper-V..... 545

Index..... 549

Contents

Foreword *xxi*

Introduction *xxiii*

Part 1 • Overview **1**

Chapter 1 • Proposing Virtualization **3**

The Business Case 3

 Line-of-Business Application Continuity 3

 Centralized Computing 4

 Lower Costs 5

 Green Computing 6

 Self-Provisioning 6

 Business Continuity Planning 7

The Technical Case 8

 Test and Development 8

 Standardization 9

 Rapid Deployment 9

 Greater Flexibility 9

 High Availability 10

 The Private Cloud 10

Chapter 2 • The Architecture of Hyper-V **11**

The Many Kinds of Virtualization 12

 Profile Virtualization 12

 Session Virtualization 13

 Application Virtualization 15

 Server Virtualization 15

 Desktop Virtualization 16

 Virtual Desktop Infrastructure 16

How Hyper-V Works 17

 The System Requirements 18

 The Architecture 19

 Integration Components 23

The Design of Hyper-V 24

 The Virtual Machine 24

 The Host 32

The Features of Hyper-V 44

 Fault Tolerance 44

 Second-Level Address Translation 52

 Virtual Machine Queue 53

Core Parking	55
Dynamic Memory	58
RemoteFX	62
Management Options	62
Virtualization Management	63
Monitoring	63
Backup and Recovery	64
Small and Medium Business Management	64
Other Microsoft Solutions	65
Non-Microsoft Solutions	65
The Bottom Line	65

Part 2 • Planning 67

Chapter 3 • The Project Plan 69

Why You Need a Project Plan	69
A Virtualization Project Plan	70
Gather Business Requirements	72
Assess Existing Infrastructure	74
Test and Development	76
Design Solution	76
Purchase Hardware	77
Deploy Production System	77
Deploying Virtual Machine Manager	78
Operations Manager	79
Data Protection Manager	79
Go into Production	80
Convert Physical and Virtual Machines	80
An Alternative Project Plan	81
The Project Plan and This Book	83
The Bottom Line	83

Chapter 4 • Assessing the Existing Infrastructure 85

An Overview of Assessment	85
Why Do an Assessment?	85
How to Do an Assessment	88
Using MAP	88
Planning MAP	88
Using and Installing MAP	89
Pros and Cons of MAP	118
Using System Center for Assessment	119
Gathering Configuration Data	120
Reporting on Performance Metrics	127
Virtualization Candidate Report	133
Pros and Cons of System Center	135
Choosing an Assessment Option	136
The Bottom Line	136

Chapter 5 • Planning the Hardware Deployment	139
Understanding Hyper-V Hardware Requirements	139
The Business Requirements	140
The Hardware Requirements of Hyper-V	143
How Hyper-V Scales Out	144
Hardware Options	147
Converting an Assessment into a Hardware Specification	151
How Hyper-V Consumes Resources	151
Sizing a Solution	161
Licensing for Hyper-V	162
The Bad News: OEM Licensing	162
The Good News: Hyper-V Is Better Than Free	163
System Center and SQL	164
The Bottom Line	165
Part 3 • Deploying Core Virtualization Technologies	167
Chapter 6 • Deploying Hyper-V	169
Deploying Hyper-V Host Servers	169
Manually Installing Hyper-V	170
Using an Automated Process to Build a Hyper-V Host Server	174
Configuring Hyper-V	176
NIC Teaming	177
Failover Clustering	179
Constrained Delegation for ISO Sharing	188
Managing Hyper-V	190
Hyper-V Management	191
Hyper-V Settings	192
Virtual Network Manager	193
Virtual Machine Management	197
Advanced Networking	221
Performance Monitoring of Virtual Machines	226
Dynamic Memory	227
Linux Virtual Machines	235
The History of Linux on Hyper-V	235
Linux Integration Components 2.1	235
Installing the Integration Components	236
Using the Mouse Integration Component	239
Understanding Other Linux Distributions	239
The Bottom Line	240
Chapter 7 • Virtual Machine Manager 2008 R2	241
Introducing Virtual Machine Manager 2008 R2	242
The Components of VMM	243
Planning for VMM 2008 R2	245
Supported Host Servers	249

VMM 2008 R2 Licensing 250

Using VMM 2008 R2 250

 Adding and Configuring Hosts 253

 Library Management 263

 Creating Virtual Machines 269

 Delegation of Administration 285

Converting Physical Servers 298

 P2V Techniques 298

 Supported Configurations for P2V 299

 Schedule Server Conversions 301

 Prepare Physical Servers for Conversion 302

 Convert the Physical Server 303

Manage Other Virtualization Solutions 309

 Virtual Server 2005 R2 SP1 310

 VMware Hosts 315

 What about Citrix XenServer Hosts? 321

New Features in VMM 2008 R2 321

 Maintenance Mode 321

 Quick Storage Migration 322

The Bottom Line 323

Chapter 8 • Virtualization Scenarios 325

Designing Virtual Machines 325

 Application Support 326

 Virtual Machine Configurations 327

 Virtual Machine Placement 332

Application Virtualization Guidance 336

 SQL Server 2005, 2008, and 2008 R2 337

 Exchange 2007 SP1 and 2010 339

 SharePoint 2007 and 2010 341

 System Center 342

 Domain Controllers 344

Fault Tolerance for Virtualized Applications 345

 Network Load Balancing 345

 Guest Failover Clustering 347

The Bottom Line 348

Part 4 • Advanced Management 349

Chapter 9 • Operations Manager 2007 351

Introducing Operations Manager 2007 351

 Traditional Monitoring Solutions 352

 Understanding Operations Manager 353

 Versions of Operations Manager 357

 Requirements and Architecture 359

 A Quick Tour of OpsMgr 359

Integration with Virtual Machine Manager 2008 R2	362
Prerequisites	363
Installing VMM 2008 R2 Integration	366
Non-RMS Management Servers	368
Configuring the VMM-OpsMgr Integration	368
Managing Hyper-V and VMM in OpsMgr	373
Monitoring VMM	373
Monitoring Hyper-V	376
OpsMgr Reporting	379
VMM Reporting	382
Performance and Resource Optimization	384
What Is PRO?	384
How PRO Works	386
Enabling and Configuring PRO	388
Extending PRO Functionality	389
Testing PRO	395
The Bottom Line	396
Chapter 10 • Data Protection and Recovery	397
An Overview of Hyper-V Backup	398
Protection and Recovery Concepts	398
Backup Terminology	399
Learning to Back Up on a Budget	401
Configuring Windows Server Backup for Hyper-V	401
Protecting Virtual Machines by Using Windows Server Backup	403
Recovering Virtual Machines by Using Windows Server Backup	406
Understanding VSS	408
Hyper-V Backup and Recovery Considerations	409
Using Data Protection Manager 2010	410
Planning for Data Protection Manager 2010	410
Installing Data Protection Manager 2010	413
Performing Basic Configuration Tasks	417
Recovering Hyper-V Virtual Machines	435
Understanding Data Protection and Recovery for Cluster Shared Volumes	439
Protecting System Center Virtual Machine Manager	443
Understanding SCVMM Roles	443
Backing Up SCVMM	444
Third-Party Solutions	446
Symantec Backup Exec 2010	446
Computer Associates ARCserve R15	446
The Bottom Line	447
Chapter 11 • The Small and Medium Business	449
The Small and Medium Business	450
Small Business Server 2008	451
Introducing SBS 2008	451

Using SBS on Hyper-V 453

System Center Essentials (SCE) 2010 458

 What Is SCE 2010? 459

 Installing SCE 2010 460

 Comparing Products 461

 The Bottom Line 464

Part 5 • Additional Operations 467

Chapter 12 • Security 469

The Importance of Security 469

Network Architecture 470

 Isolated Network with Workgroup Member Hosts 470

 Isolated Network with Domain Member Hosts 472

 Open Network 474

 A Hybrid Network Architecture 474

Physical Security 475

Active Directory 475

 Organizational Units 475

 Administrators 477

Antivirus 477

 The Argument over Antivirus 478

 Scanning Virtual Machines 479

 Configuring Antivirus Software 479

Patching Your Hyper-V Infrastructure 480

 Patching Strategy 480

 Installing Hyper-V Hotfixes 481

Distributing Security Updates 482

 How Security Updates Impact Hyper-V 483

 Virtual Machine Servicing Tool 3.0 484

The Bottom Line 507

Chapter 13 • Business Continuity 509

Understanding Business Continuity 510

 Know the Basics of Business Continuity 510

 Understand How Virtualization Benefits Disaster Recovery 512

Looking at Ways to Implement Hyper-V Business Continuity 513

 Using Offsite Backup 513

 Using Multi-site Clustering 516

 Using Host-Based Replication 519

 Using SAN Replication 522

Choosing a Disaster Recovery Design 525

The Bottom Line 527

Appendix A • The Bottom Line	529
Chapter 2: The Architecture of Hyper-V	529
Chapter 3: The Project Plan	530
Chapter 4: Assessing the Existing Infrastructure.	531
Chapter 5: Planning the Hardware Deployment	532
Chapter 6: Deploying Hyper-V	533
Chapter 7: Virtual Machine Manager 2008 R2	534
Chapter 8: Virtualization Scenarios	535
Chapter 9: Operations Manager 2007	537
Chapter 10: Data Protection and Recovery	538
Chapter 11: The Small and Medium Business	539
Chapter 12: Security.	540
Chapter 13: Business Continuity	542
Appendix B • New and Upcoming Products for Hyper-V	545
System Center Opalis	545
Microsoft Assessment and Planning (MAP) Toolkit 5.0	545
System Center Virtual Machine Manager Self-Service Portal (SCVMM SSP) 2.0	546
System Center Virtual Machine Manager (VMM) v.Next	546
Windows Azure Appliance	547
Azure Virtual Machine Hosting	547
<i>Index</i>	549

Foreword

After many years and many missteps, Microsoft has given us a top-quality server virtualization tool, Hyper-V Server. It's about time, then, for us Windows types to understand it. After all, if you already have Windows Server 2008 or 2008 R2, then Hyper-V is essentially free and in the box, so why not take it through its paces and see what it can do for you?

In my life as a technologist, I've been lucky enough to have seen great changes in the computer business. The 1970s brought us personal computers, and the 1980s brought us operating systems and useful applications for those computers. The 1990s brought an explosion of networking and *internetworking*, which led to another explosion: a massive increase in the number of computers needed to *run* that Internet. Fortunately, the 21st century's first decade brought virtualization, the technology that's gone furthest in reducing the number of computers needed to run the world. Virtualization is a technology that can save money, make IT greener, and ease the task of keeping our computers running reliably. Virtualization can do those things, however, only if we take the time to truly understand virtualization technology or, alternatively, if we're smart enough to find someone with the knowledge, tenacity, and hard-earned battle scars to handle that virtualization stuff for us, and to do it well.

In my life as an employer, a colleague, or a friend to techies of all stripes, I've been lucky to have worked with many folks in the IT community. Rarely, however, do I meet someone who doesn't just learn the minimum necessary to get by in some IT-related task. Of course, we *all* want to understand things "down to the bare metal," but as a rule, time pressures on and off the job often conspire to keep that from happening. My friend Aidan Finn is an exception to that rule, though. Once he gets interested in a subject, he refuses to leave it alone until he has mastered it as fully as is possible—and that quality is why I'm pleased that this book has found its way out of his cranium and onto the printed page.

Server virtualization can deliver much, but it's not all wine and roses, and newcomers to Microsoft Hyper-V shouldn't expect that a few wizards will be sufficient to get them up and running. Which servers are appropriate to virtualize, and which are not? How can you back up and, more important, *restore* virtual machines? Can you uproot and transplant an existing physical server into a virtual machine, and how best might you do that? Is it dangerous to run domain controllers as virtual machines? Will you find securing a virtual system harder than securing a physical one? Those are questions that I hear on my online forum—a forum that Aidan has been an active member for years—nearly every day. And nearly every day, Aidan is the guy (or *one* of the guys—it's a smart and feisty lot) with the answer, so if you're looking for Hyper-V help, you've come to the right place.

With that said, I think it's time for me to grab a seat, dig into a bucket of popcorn, and let Aidan take the stage. Come join me; there's an empty chair over here! The show is about to begin, and you don't want to miss any of it!

—Mark Minasi

Author of *Mastering Microsoft Windows Server* series

- [read The Verso Book of Dissent: From Spartacus to the Shoe-Thrower of Baghdad](#)
- [download Access to Justice as a Human Right \(Collected Courses of the Academy of European Law\) pdf, azw \(kindle\)](#)
- [download online Carnival of Fear pdf, azw \(kindle\), epub, doc, mobi](#)
- [read online A Path Toward Love: A Novel](#)
- [read online Bamboo and Blood \(Inspector O, Book 3\)](#)
- [read **52 Loaves: One Man's Relentless Pursuit of Truth, Meaning, and a Perfect Crust here**](#)

- <http://www.freightunlocked.co.uk/lib/The-Verso-Book-of-Dissent--From-Spartacus-to-the-Shoe-Thrower-of-Baghdad.pdf>
- <http://www.satilik-kopek.com/library/Digital-Image-Compositing-Fundamentals.pdf>
- <http://unpluggedtv.com/lib/Wildlife-Photography--On-Safari-with-your-DSLR--Equipment--Techniques--Workflow.pdf>
- <http://honareavalmusic.com/?books/A-Path-Toward-Love--A-Novel.pdf>
- <http://aircon.servicessingaporecompany.com/?lib/China-s-Cosmological-Prehistory--The-Sophisticated-Science-Encoded-in-Civilization-s-Earliest-Symbols.pdf>
- <http://honareavalmusic.com/?books/CRM-Fundamentals.pdf>