



Nick Marshall
with Grant Orchard
Josh Atwell

Foreword by Scott Lowe

Mastering VMware vSphere® 6

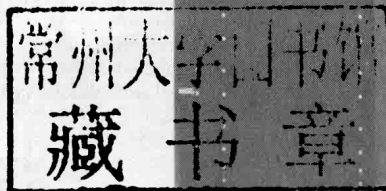
 **SYBEX**
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Published simultaneously in Canada

ISBN: 978-1-118-92515-7
ISBN: 978-1-118-92517-1 (ebk)
ISBN: 978-1-118-92516-4 (ebk)

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Library of Congress Control Number: 2015930535

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A black and white photograph of a server room. In the foreground, a person wearing a white shirt and dark pants is walking from left to right, slightly out of focus. The room is filled with rows of server racks. The floor is tiled. The lighting is bright, coming from overhead fixtures. The overall atmosphere is professional and technical.

Mastering VMware vSphere® 6

I dedicate this book to my wife Natalie. You are the most precious and loving wife I could ever ask for. This year has been made easier thanks to your kind and patient heart. I also dedicate this book to my son Ethan, and my soon-to-arrive daughter. Thank you for giving up some daddy time; now let's go and play.

—Nick Marshall



Acknowledgments

As I write this, I realize it has been over two years since I started writing in earnest for the 5.5 revision of the Mastering vSphere series. In late 2012, Scott Lowe graciously handed me the mantle of keeping this tome up to date. In some ways it feels like it was yesterday, but in others it feels like an eternity. I was a few months into my new role as a consultant at VMware in Sydney, my son was only nine months old, and I had landed this huge writing opportunity. Since that time, I've updated this book twice, VMware relocated my family and me to Palo Alto, and I now have a lively three-year-old and a baby girl on the way!

Throughout all of this craziness, my wife has been my rock. Always there when I need assistance (and coffee) after a long night of writing, always sympathetic when my lab or Word crashed for the umpteenth time and always, *always* patient and understanding when I couldn't spend time with her due to juggling work and writing. Nat, you're an amazing woman without whom I simply could not manage life. You are my everything; this project would not have happened without you (again).

Thanks to my contributing authors and good friends, Grant Orchard and Josh Atwell. Grant, thank you for taking on a large chunk of the work—there is no way I could have managed it all myself. Josh, thank you for your support again. Both of you are experts in your fields and I thank you for sharing that knowledge with the readers; they are better equipped because of your generosity. I would also like to thank Elizabeth Watson and Stephanie Atwell. I'm not sure if it's a coincidence or not, but all three of our families were pregnant, moved house, and changed jobs in the process of writing this book. On behalf of Grant and Josh, we thank you for all that you do in our lives and plan to spend some more quality time with you going forward!

While not contributing to this revision directly, Scott Lowe's work is still very much evident in this series. He gave me a very solid foundation from which to build. Thank you again, Scott, for your previous work, your continued support, and for writing the foreword. I look forward to working together more directly at some time in the future.

I'd also like to thank my technical editor, Jason Boche. Jason, your insight (and witty editing comments) never cease to amaze and bring a smile to my face. I'm glad you were on board with me for this journey.

Once again the team at Wiley/Sybex have been so supportive. Mariann Barsolo, thank you for your guidance and support; Stephanie Barton and Dassi Zeidel and the rest of the editing team, thank you for all that you did to ensure the quality of this work. Your attention to detail is second to none.

Internal to VMware, I was helped by so many people. I'd like to thank Manish Patel for his internal review. Thanks also to William Lam and Alan Renouf—your lunchtime banter always keeps me sane. Cormac Hogan, Rawlinson Rivera, Doug Baer, Ryan Johnson, and Tim Gleed, thanks for answering my spontaneous questions without context. And to those I haven't named, the hallway conversations, the quick emails to verify settings and the IMs late at night. Thank you to all, your assistance made a real difference.

There is also a list of vExperts who reviewed some late drafts of this work that I very much appreciated. Although I couldn't incorporate *all* of their feedback, having a fresh set of eyes look over things certainly helped. Thank you to the following vExperts:

Derek Seaman—www.derekseaman.com

Ather Beg—atherbeg.com

Christopher Kusek—pkguild.com

Keiran Shelden—www.readysetvirtual.com

Kyle Ruddy—www.thatcouldbeaproblem.com

Steve Flanders—sflanders.net

Paul Braren—www.tinkertry.com

David Hanacek—transformation.emc2.at

Abdullah Abdullah—notes.doodzzz.net

Finally, I'd like to thank the VMware community as a whole. To all the bloggers, speakers, tweeters, and podcasters: without you all, I would never have started down this road.

—*Nick Marshall*

About the Author

Nick Marshall is an integration architect with over 15 years' IT experience. He holds multiple advanced IT certifications, including VMware Certified Advanced Professional 5—Datacenter Administrator (VCAP5-DCA) and VMware Certified Advanced Professional 5—Datacenter Design (VCAP5-DCD). He is currently working for VMware in the SDDC Design and Test engineering group.

Previously, Nick has worked in a number of roles, ranging from computer assembler, to infrastructure architect, to product manager. Nick loves to solve business problems with technical solutions.

Outside of his day job, Nick continues to work on his passion for virtualization by helping run the most popular virtualization podcast, *vBrownBag*, writing on his personal blog, at www.nickmarshall.com.au, and writing how-to articles on www.labguides.com. You can also find him speaking at industry conferences such as VMUG (VMware User Group) and PEX (Partner Exchange). To recognize his contributions to the VMware community, Nick has been awarded the vExpert award for 2012, 2013, 2014, and 2015.

Nick lives with his wife Natalie and son Ethan in Palo Alto, California.

About the Contributors

The following individuals also contributed to this book.

Grant Orchard (Chapters 5, 7, 8, 11, and 12) is a systems engineer for VMware, focusing on their Cloud Automation portfolio. He is an active member of the Australian virtualization community and has been involved with the local chapters of the *VMUG* and *vBrownbag* community podcasts.

Grants holds the VMware Certified Advanced Professional 5 Design and Administration certifications for both Datacenter Virtualization (VCA-DCD, VCAP-DCA) and Cloud (VCAP-CIA, VCAP-CID).

He recently became a father for the second time and, despite the sleep deprivation, loves to get quality time with his wife Liz and two children, all of whom have been incredibly patient with the time he has spent working on this book. When he's not trying the latest fad diet, he blogs at grantorchard.com and engages with the virtualization community on Twitter (@grantorchard).

Josh Atwell (Chapter 14) is a Cloud Architect at SolidFire, focused on integration with automation platforms and management tools. He has worked hard for over a decade to allow little pieces of code to do his work for him. Now he focuses on building code and tools to help others. Josh has been highly active in the virtualization and datacenter communities, where he can be seen regularly on podcasts such as *Engineers Unplugged* and *vBrownBag*, and as a co-host of the *VUPaaS* podcast. He also still works actively with various technical user groups.

Never known for lacking an opinion, he blogs at vtesseract.com and talks shop on Twitter as @Josh_Atwell. When not working, he enjoys spending time with his three children and his supportive wife Stephanie.



Foreword

When I handed off the *Mastering VMware vSphere* series of books to Nick Marshall with *Mastering VMware vSphere 5.5*, Nick invited me to write the foreword for that version of the book. In that foreword, I shared the story of how *Mastering VMware vSphere 4* and *Mastering VMware vSphere 5* had come to be, and why I'd felt it necessary to "pay it forward" by giving someone else (Nick, in this case) the same opportunity I'd been given. Having me write the foreword made sense in a lot of ways; it was like passing the torch.

However, when Nick asked me to also write the foreword for the next edition—the book you now hold in your hands—I was truly honored. At the same time, though, I was also a bit stumped. What should I write? What should I say? What can be said that hasn't already been said?

Mastering VMware vSphere 6 is more than just a new version of a well-respected tome, because Nick has done more than just refresh the material found within these pages. Yes, you'll find in-depth coverage of new features in vSphere 6; that includes features like long-distance vMotion and cross-vCenter vMotion, a new version of VSAN, and the long-awaited SMP Fault Tolerance that will allow you to use VMware Fault Tolerance with up to four virtual CPUs. Yes, you'll find coverage of NFS 4.1 support, Virtual Volumes, and a new version of Network I/O Control. Of course, there is so much more in vSphere 6 than just what I've mentioned here, but you'll have to read the rest of the book to find out what else is included!

What you'll also find is a new contributing author (welcome, Grant!) that demonstrates Nick's commitment to also "pay it forward." You'll find evidence of broader community involvement, through Nick's inclusion of a variety of vExpert technical reviewers in addition to Jason Boche's always-exemplary technical editing. It's refreshing to see the community, to which authors like myself and Nick owe so much, being brought into this process. This is exactly what I'd hoped would happen, and I'm so thankful to see it come to pass.

As I said in the previous edition of this book, I'm confident you'll find this book to continue to be the "go-to" book for vSphere 6. I'm thrilled to see vSphere 6 get released, and I'm equally thrilled to see *Mastering VMware vSphere 6* hit the shelves. Readers, you are in for a treat.

Nick, congratulations! You've taken a solid foundation from previous editions of the book—which I, in turn, built on top of outstanding work done by Chris McCain with *Mastering VMware Infrastructure 3*—and you've made it your own. I look forward to seeing where you take it next.

—Scott Lowe
VCDX, vExpert



Introduction

Back in 2005 I was trying to convince my boss that we should use GSX Server on our shiny new DL385. To him, it was a hard sell. He didn't understand why on earth we should install two operating systems onto a server—"It'll just slow it down!" he exclaimed in his Aussie accent. So I went ahead and started experimenting with VMware software on my desktop computer. Luckily at the time I had a workstation capable of running such things.

The times have changed quite a bit since then, and now virtualization—especially server virtualization—is readily embraced in corporate datacenters worldwide. VMware has gone from a relatively small vendor to one of the industry heavyweights, garnering a commanding share of the server virtualization market with its top-notch virtualization products. Even now, while other companies such as Microsoft, Red Hat, and Citrix have jumped into the server virtualization space, it's still VMware that's almost synonymous with virtualization. For all intents and purposes, VMware invented the market.

If you're reading this, though, there's a chance you're just now starting to learn about virtualization. What is virtualization, and why is it important to you?

I define *virtualization* as the abstraction of one computing resource from another computing resource. Consider storage virtualization; in this case, you are abstracting servers (one computing resource) from the storage to which they are connected (another computing resource). This holds true for other forms of virtualization, too, like application virtualization (abstracting applications from the operating system). When most information technology professionals think of virtualization, they think of hardware (or server) virtualization: abstracting the operating system from the underlying hardware on which it runs and thus enabling multiple operating systems to run simultaneously on the same physical server. That is the technology on which VMware has built its market share.

Almost single-handedly, VMware's enterprise-grade virtualization solution has revolutionized how organizations manage their datacenters. Before VMware introduced its powerful virtualization solution, organizations bought a new server every time a new application needed to be provisioned. Over time, datacenters became filled with servers that were all using only a fraction of their overall capacity. Even though these servers were underutilized, organizations still had to pay to power them and to dissipate the heat they generated.

Now, using VMware's server virtualization products, organizations can run multiple operating systems and applications on their existing hardware, and new hardware is purchased only when capacity needs dictate. No longer must organizations purchase a new physical server whenever a new application needs to be deployed. By stacking workloads together using virtualization, organizations derive greater value from their hardware investments. They also reduce operational costs by reducing the number of physical servers and associated hardware in the datacenter, in turn

decreasing power usage and cooling needs in the datacenter. In some cases these operational cost savings can be quite significant.

But consolidation is only one benefit of virtualization; companies also realize greater workload mobility, increased uptime, streamlined disaster-recovery options, and a bevy of other benefits from adopting virtualization. And virtualization, specifically server virtualization, has created the foundation for a new way of approaching the computing model: cloud computing.

Cloud computing is built on the tenets of broad network access, resource pooling, rapid elasticity, on-demand self-service, and measured service. Virtualization, such as that provided by VMware's products, enables the IT industry to embrace this new operational model of more efficiently providing services to their customers, whether those customers are internal (their employees) or external (partners, end users, or consumers). That ability to efficiently provide services is the reason virtualization is important to you.

This book provides all the information you, as an information technology professional, need to design, deploy, configure, manage, and monitor a dynamic virtualized environment built on VMware's enterprise-class server virtualization product, vSphere 6.0.

What Is Covered in This Book

This book is written with a start-to-finish approach to installing, configuring, managing, and monitoring a virtual environment using the VMware vSphere 6.0 product suite. The book begins by introducing the vSphere product suite and all of its great features. After introducing all of the bells and whistles, the book details an installation of the product and then moves into configuration. This includes configuring vSphere's extensive networking and storage functionality. We wrap up the configuration discussion with chapters on high availability, redundancy, and resource utilization. After completing the installation and configuration, we move into virtual machine creation and management and then into monitoring and troubleshooting. You can read this book from cover to cover to gain an understanding of the vSphere product suite in preparation for a new virtual environment, or you can use it as a reference if you are an IT professional who has begun your virtualization and wants to complement your skills with real-world tips, tricks, and best practices as found in each chapter.

This book, geared toward the aspiring as well as the practicing virtualization professional, provides information to help implement, manage, maintain, and troubleshoot an enterprise virtualization scenario.

Here is a glance at what's in each chapter:

Chapter 1: Introducing VMware vSphere 6.0 I begin with a general overview of all the products that make up the vSphere 6.0 product suite. This chapter also covers vSphere licensing and provides some examples of benefits that an organization might see from adopting vSphere as its virtualization solution.

Chapter 2: Planning and Installing VMware ESXi This chapter looks at selecting the physical hardware, choosing your version of VMware ESXi, planning your installation, and installing VMware ESXi, both manually and in an unattended fashion.

Chapter 3: Installing and Configuring vCenter Server In this chapter, I dive deep into planning your vCenter Server environment. vCenter Server is a critical management component of vSphere, and so this chapter discusses the proper design, planning, installation, and configuration for vCenter Server.