

Introduction

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VMware vSphere®  
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design

2<sup>nd</sup> Edition

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# Introduction

This book has always stood out as a particularly interesting project for us. A multitude of vSphere textbooks are available, explaining every facet of configuring ESXi and vCenter. If you want to know how to do something in vSphere, you're literally spoiled for choice. However, in our minds, few resources properly encompass the design process. They exist for very specific features; but not many cover the entire design of a vSphere implementation in sufficient depth.

This revised, updated, and largely rewritten second edition of *VMware vSphere Design* has been thoroughly overhauled to encompass all the great new changes that have been introduced in vSphere up to and including version 5.1. We've been blown away by the sheer volume of improvements and additions to this product. Every area of vSphere design has been affected deeply, and the revamped book reflects this.

vSphere is the leading industry standard for hypervisors. It's simply the best enterprise solution available today. It has become this popular largely because of its wide range of features, efficiency, and flexibility. But for it to perform effectively in your datacenter, you must have a suitable architecture in place. This book is written to help you achieve that.

In addition to the changing landscape of vSphere in the datacenter, the book now incorporates another key tenet of VMware's datacenter portfolio: vCloud Director, its private/public cloud integration piece. This emerging technology is now deeply intertwined in the future of vSphere and becoming an essential skill for anyone currently involved or interested in vSphere design.

Above all, this is a technical book about a very complex subject. It's not concerned with the minutiae of every command-line tool, but rather with the underlying concepts. As vSphere has evolved from the early ESX days, it has grown in size to the point that every detail can't be covered in a single tome. But we sincerely believe this book fulfills its intended purpose better than anything else available. We'll dive into some areas not traditionally covered in such depth.

To that end, this book isn't a how-to manual with endless bullet-point instructions, but one that aims to make you think a little. It's for those of us who plan, design, implement, and optimize vSphere solutions. We hope it will challenge some of your preconceptions regarding the norm or what you consider best practice. Just because you designed a particular configuration one way in the past, doesn't mean it's a best fit for the next rollout. Here we try to question that prescriptive bias. Usually, that choice exists because different situations call for different answers. If there was one best solution for every case, then frankly no one would consider it a design choice at all.

This book isn't just for consultants who week by week deliver architectural solutions (although we hope you guys are here for the ride, too); it's for anyone who runs vSphere in their environment. It should make you question why things are set up the way they are, and encourage you to examine how to improve your environment even further.

There are constant advances in hardware, and vSphere is an ever-evolving tool, so it's always worth considering your existing deployments. Even if the hardware and software remain static in your environment, you can bet that new VMs will continue to appear. Nothing stands still for long, so your design should also be constantly growing to embrace those changes.

Each design decision has its own impact, and often these have a domino effect on many other elements. vSphere involves many disparate skills, such as guest OSes, server hardware, storage, and networking; and that's before you begin to consider the actual hypervisor. One of the hardest parts of creating a viable design is that normally, no individual choice can be made in isolation. Although this book is naturally split into chapters, sections, and subsections, it's only when the design is considered as a complete solution that it can truly succeed.

The book employs several techniques to understand how you can approach design: the critical requirements and constraints; the impacts, benefits, and drawbacks of each choice; the dependencies on and relationships between each decision; and ultimately how to decipher what is best for you.

## Who Should Read This Book

This book focuses on the design aspects of vSphere. It isn't primarily intended to teach you how to complete certain vSphere tasks, but rather to make you think about the *why* behind your different architectural decisions. We expect this book will be most useful for the following readers:

- ◆ Infrastructure architects designing new vSphere environments
- ◆ Engineers and architects charged with maintaining existing vSphere deployments, who wish to further optimize their setup
- ◆ Anyone who appreciates the basics of vSphere but wants to learn more by understanding in depth why things are the way they are
- ◆ Long-time experts who are always searching for that extra nugget of hidden information

## Ways to Read the Book

There are several ways to approach this book. Clearly, you can read it from cover to cover, and we certainly encourage anyone wanting the fullest understanding of vSphere design to do so. Alternatively, if you need to brush up your knowledge on one key area, you can read each chapter in isolation. Or, if you need a specific answer to a key design decision, you should be able to jump in and use this as a reference book. *VMware vSphere Design* has been written so each section stands on its own, if that is all you need from it, but it should also be a jolly good read if you want to sit down and immerse yourself.

## Other Resources Available

We're often asked for good sources of vSphere information, for those seeking *absolute knowledge*. Fortunately, there is a plethora of good places to look. The first stop for anyone (beyond this book, obviously) is VMware's own library of technical product documentation, which you can find at [www.vmware.com/support/pubs](http://www.vmware.com/support/pubs). Along with the standard PDFs, the site also offers a wide variety of whitepapers, best practices, case studies, and knowledge-based articles.

Sybex has a number of excellent vSphere-focused books, such as *Mastering VMware vSphere 5*, a VCP5 Study Guide, a *vSphere PowerCLI* reference, and the *vSphere 5 Administration Instant Reference*, among others. A strong community of VMware users share knowledge through a number of different channels. The VMware forums at <http://communities.vmware.com/community/vmtn> are an excellent source of information and support for specific queries. There are a good number of vSphere-oriented blogs, the best of which tend to be aggregated on the popular Planet V12n site at [www.vmware.com/vmtn/planet/v12n](http://www.vmware.com/vmtn/planet/v12n). Finally, if you want something a little closer to home, user groups are available in many places (see <http://vmware.com/vmug>), where you have the chance to meet other VMware users face to face to discuss and learn more about vSphere.

## What You Need

To get started with *VMware vSphere Design*, you should have a basic understanding of virtualization, vSphere itself, and the associated VMware products. Both networking and storage concepts are discussed, because they're integral to any vSphere architecture, so a basic knowledge of them is assumed. The more hands-on experience you have with vSphere, the more you're likely to get out of this book. However, you don't need to be an expert beforehand.

No specific hardware or software is required while following this book, as long as you've seen the product before. But a lab is always useful to test some of many concepts we discuss. A simple nested VM lab run on a single platform should be sufficient to practice and explore most of the book's content.

## What's Inside

Here is a glance at each chapter:

**Chapter 1: An Introduction to Designing VMware Environments** We begin by introducing you to the design process for vSphere delivery. This chapter explains how to understand the basic requirements and how to assess and then design a successful, valid implementation.

**Chapter 2: The ESXi Hypervisor** This chapter explains the fundamental design choices around vSphere's ESXi hypervisor. The chapter looks into the architecture behind ESXi and examines the methods and considerations when deploying it across different organizations. We also provide design advice for its subsequent configuration and management.

**Chapter 3: The Management Layer** In this chapter, we look at many of the software management pieces and how best to use them in different design configurations.

**Chapter 4: Server Hardware** This chapter provides an in-depth examination of the components that make up a server and how each one affects the performance of vSphere. You need to consider many factors when selecting server hardware, and we look at them, including scaling-up versus scaling-out approaches. We also debate the merits of blade and rack servers.

**Chapter 5: Designing Your Network** This chapter covers the complex decisions you need to make to ensure that network traffic provides sufficient throughput, redundancy, and security. We look how different vSphere components can affect those designs, and we provide some example configurations.

**Chapter 6: Storage** In this chapter, we analyze the different factors that influence a complete virtualization storage strategy, comparing availability, performance, and capacity. We contrast different storage protocols and explain how to configure multipathing in different setups. Finally, we examine vSphere 5's new storage features and how they can enhance your design.

**Chapter 7: Virtual Machines** In this chapter, we describe each VM component in turn, to help you understand how VMs should be designed to make the most efficient solution for you. We look at how to optimize the OS and the applications within VMs and then explain different methods of efficiently replicating the VM design through the use of clones and templates. Additionally, we look at some techniques to protect those VMs with clustering solutions, and how Infrastructure Navigator can identify the interrelationships between VMs.

**Chapter 8: Datacenter Design** This chapter examines in detail each element of a vSphere inventory's hierarchy. It looks at the importance of clusters in the design and how to successfully implement the resource-management and redundancy features of a cluster. We discuss resource pools, DRS, DPM, the new version of HA, and FT, and what interdependencies exist when they're used in combination.

**Chapter 9: Designing with Security in Mind** Chapter 9 highlights some of the areas that security-conscious environments can use to ensure that vSphere is suitably strengthened. It explains the different security measures included in the hypervisor, examines the management tools, and discusses how best to tighten that security as required.

**Chapter 10: Monitoring and Capacity Planning** This chapter explains the concepts of monitoring and capacity planning. Monitoring relates to the present or recent past, whereas capacity planning looks to the future. The chapter also examines some of the common tools used for both and how to involve them in your design.

**Chapter 11: Bringing a vSphere Design Together** In this chapter, we return to the overall design strategy by looking at a specific example through a design for a fictitious company. We discuss several of the decisions made during the design, examine the justifications behind those decisions, and consider alternative choices that could have been made.

**Chapter 12: vCloud Design** This chapter highlights the topics involved in architecting a successful vCloud Director implementation. We examine the role vCloud Director plays in a cloud infrastructure and dive into designing individual vCloud Director components, such as Provider vDCs and Organization vDCs.

## How to Contact the Authors

We welcome feedback from you about this book or about books you'd like to see from us in the future. You can reach Forbes Guthrie by writing to [forbesguthrie@vReference.com](mailto:forbesguthrie@vReference.com), on Twitter at [@forbesguthrie](https://twitter.com/forbesguthrie), or by visiting his blog at [www.vReference.com](http://www.vReference.com). You can reach Scott Lowe at [scott.lowe@scottlowe.org](mailto:scott.lowe@scottlowe.org), on Twitter at [@Scott\\_Lowe](https://twitter.com/Scott_Lowe), or by visiting his blog at <http://blog.scottlowe.org>. You can reach Kendrick Coleman at [kendrickcoleman@gmail.com](mailto:kendrickcoleman@gmail.com), on Twitter at [@KendrickColeman](https://twitter.com/KendrickColeman), or by visiting his website, [www.kendrickcoleman.com](http://www.kendrickcoleman.com).

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