

"The perfect way to understand both the technology and benefits of virtualization" Simon Crosby, CTO, XenSource

Virtualization

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Bernard Golden, MBA

CEO of Navica, Inc. & expert blogger
for CIO.com

**Boost server
utilization to
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Virtualization For Dummies

by Bernard Golden



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When Bernard invited me to write an introduction to this book, I found myself reminded of a frequently repeated conversation with my father, who is a retired engineer. Typically, it goes like this: “Simon, what does virtualization do?” -- followed by a lengthy reply from me and then a long pause from my father -- “And why is that useful?” Now, I certainly don’t think that my father really has much use for server virtualization, but a lot more people do need it -- and need to understand it -- than currently use it.

Although virtualization is all the rage in the tech industry press, and savvy market watchers have observed the exciting IPO of VMware, and Citrix’s acquisition of my own company, XenSource, the market for virtualization software is largely unaddressed. Depending on whose research you read, only 7 percent or so of x86 servers are virtualized, and only a tiny fraction of desktop or mobile PCs are virtualized. But the virtualization market is white hot, and every day new announcements in storage, server, and network virtualization make the picture more complex and harder to understand.

Virtualization For Dummies is the perfect way to develop a complete understanding of both the technology and the benefits of virtualization. Arguably, virtualization is simply a consequence of Moore’s Law -- the guideline developed by Intel founder Gordon Moore that predicts a doubling in the number of transistors per unit area on a CPU every couple of years. With PCs and servers becoming so incredibly powerful, the typical software suites that most users would install on a single physical server a few years ago now consume only a few percent of the resources of a modern machine. Virtualization is

simply a consequence of the obvious waste of resources -- allowing a machine to run multiple virtualized servers or client operating systems simultaneously. But if that were all that were needed, there wouldn't be such a fuss about virtualization. Instead, virtualization is having a profound impact on data center architectures and growth, on software lifecycle management, on security and manageability of software, and the agility of IT departments to meet with new challenges. And it is these opportunities and challenges that urgently need to be articulated to technologists and business leaders alike in an accessible and understandable way.

Having spent many enjoyable hours with Bernard Golden, a recognized open source guru, President and CEO of Navica, and self-taught virtualization expert, I cannot think of a better-qualified author for a book whose objective is to cut through the hype and clearly and succinctly deal with virtualization and its effects on IT and users alike. I always look forward to reading Bernard's frequently published commentaries on Xen, VMware, and Linux, which combine his hands-on experience with those products and a rare depth of insight into industry dynamics. I know firsthand that Bernard is a master of the subject of virtualization because he is one of the most persistent and demanding beta testers of XenEnterprise, XenSource's server virtualization product, where his feedback has provided us with terrific guidance on how to improve the product overall. This, together with Bernard's incisive, clear, and articulate style, makes this book a pleasure to read and a terrific contribution to the virtualization industry -- a concise categorization of virtualization that will further the understanding of the technology and its benefits, driving uptake of virtualization generally. It is with great

pleasure that I strongly recommend that you read this book.

Simon Crosby

CTO, XenSource, Inc.

About the Author

Bernard Golden has been called “a renowned open source expert” (IT Business Edge) and “an open source guru” (SearchCRM.com) and is regularly featured in magazines like *Computerworld*, *InformationWeek*, and *Inc.* His blog “The Open Source” is one of the most popular features of CIO Magazine’s Web site. Bernard is a frequent speaker at industry conferences like LinuxWorld, the Open Source Business Conference, and the Red Hat Summit. He is the author of *Succeeding with Open Source*, (Addison-Wesley, 2005, published in four languages), which is used in over a dozen university open source programs throughout the world. Bernard is the CEO of Navica, a Silicon Valley IT management consulting firm.

Dedication

To Sebastian and Oliver, the bright stars Kocab and Pherkad, Guardians of the Pole of the Golden family constellation. May your lives be blessed in the ways you’ve blessed mine.

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Introduction

If you work in tech, there's no way you haven't heard the term *virtualization*. Even if you don't work in tech, you might have been exposed to virtualization. In August 2007, virtualization's leading company, VMware, went public with the year's most highly anticipated IPO. Even people who confuse virtualization with visualization sit up and pay attention when a blockbuster IPO comes to market. To show how hot the sector is, VMware was bought by the storage company EMC for \$625 million in 2004, but it has, as of this writing, a market capitalization of \$25.6 *billion*.

The excitement and big dollars illustrate a fundamental reality about virtualization: It's transforming the way computing works. Virtualization is going to fundamentally change the way you implement and manage data centers, the way you obtain and install software, and the way you think about the speed with which you can respond to changing business conditions. The changes that virtualization will cause in your work environment will be so profound that, in ten years time, you'll look back on the traditional ways of managing hardware and software the way your grandparents looked back on operator-assisted telephone dialing after the introduction of direct dialing.

I wrote this book because I'm convinced that the world is on the cusp of an enormous change in the use of

information technology, also known as IT. In the past, IT was expensive, so it was limited to must-have applications such as accounting and order tracking. In the past, IT was complex, so it had to be managed by a group of wizards with their own special language and incantations. That's all changing.

In the future, IT will be cheap, so applications will be ubiquitous, and low-priority applications will finally get their day in the sun. In the future, implementing IT will be simple, so groups outside of IT will shun the wizards' robes and arcane language and implement their own applications, which will, of course, make central IT's role even more important because it will have to create a robust yet malleable infrastructure.

Instead of IT being this special thing that supports only certain aspects of a business, it will become pervasive, suffusing throughout every business operation and every business interaction. It's an incredibly exciting time for IT; I compare it to the rise of mass production made possible by Henry Ford. Because of Henry Ford, automobiles went from playthings for the wealthy to everyday belongings of the masses, and society was transformed by mobility and speed. Virtualization is the mass production of IT.

Just as the automobile industry underwent rapid transformation after Ford invented mass production in 1913, the virtualization marketplace is transforming the IT industry today. One of the biggest challenges for this

book is to present a coherent and unified view of the topic even though virtualization is evolving at an incredible pace. At times, I felt that writing this book was like trying to nail Jell-O to the wall. During just one week of the writing of this book, the IPO of VMware went from an event no one had even considered to the technology financial event of the year; in the same week, XenSource, the commercial sponsor of the open source Xen virtualization project, was purchased by Citrix for \$500 million. Furthermore, myriads of virtualization technology and product announcements occurred, making me, at times, wish I could push a Pause button on the market so that I could have a hope of completing an up-to-date book. Alas, virtualization's fevered evolution shows no sign of diminishing — good for the virtualization user, challenging for the virtualization writer.

Why Buy This Book?

Even though virtualization is changing the face of technology, it is, unfortunately, still riddled with the complexities and — especially — the arcane language of tech. Two seconds into a conversation about virtualization, you'll start hearing terms like *hypervisor* and *bare metal*, which sound, respectively, like something from *Star Wars* and an auto shop class.

It's unfortunate that virtualization can be difficult to approach because of this specialized terminology. It's

especially unfortunate because understanding and applying virtualization will be, in the near future, a fundamental skill for everyone in IT — and for many people working in other disciplines like marketing and finance. Consequently, having a strong grounding in virtualization is critical for people wanting to participate in the IT world of the future.

This book is designed to provide a thorough introduction to the subject. It assumes that you have no knowledge of virtualization and will leave you (I hope) with a good grasp of the topic. My objective is for you to be completely comfortable with virtualization and its many elements and to be able to participate and contribute to your organization's virtualization initiatives. The book also serves as a jumping-off point for deeper research and work in virtualization.

Foolish Assumptions

This book doesn't assume you know much about virtualization beyond having heard the term. You don't have to know any of the technical details of the topic, and you certainly don't need to have done hands-on work with virtualization. (The book provides the opportunity to do hands-on work with virtualization, with three chapters devoted to installing and implementing different virtualization products.)

I define every virtualization term you encounter. I also make it a point to thoroughly explain complex topics so that you can understand the connections between different virtualization elements.

The book *does* assume that you have a basic understanding of computers, operating systems, and applications and how they work together to enable computers to do useful work. Because virtualization shuffles the placement and interaction of existing system software and hardware layers, it's important to have a grasp of how things are traditionally done. However, if you've worked with computers, used an operating system, and installed applications, you should have the knowledge base to make use of the book's content.

How This Book Is Organized

As is the case with other *For Dummies* books, this book doesn't assume that you'll begin on page one and read straight through to the end. Each chapter is written to stand alone, with enough contextual information provided so that you can understand the chapter's content. Cross-references are provided to other chapters that go into more detail about topics lightly touched on in a given chapter.

You'll soon notice, though, that individual chapters are grouped together in a somewhat-less-than-random order. The organizing principle here is the *part*, and this book has five of them.

Part I: Getting Started with a Virtualization Project

Getting a good grounding in a subject is critical to understanding it and, more important, to recognizing how you can best take advantage of it. Part I provides a whirlwind tour of the world of virtualization — from where it is today to beyond where it will be tomorrow.

Chapter 1 is where you get an overview of virtualization, including an introduction to why it's such a hot topic. Chapter 1 also discusses the basic philosophy of virtualization — the abstraction of computer functionality from physical resources. Chapter 2 describes the business reasons that are driving virtualization's explosive growth, and it discusses how you can make a business case for your virtualization project. If you want a deeper understanding of the different technologies that make up virtualization as well as the different ways virtualization is applied in everyday use, Chapter 3 is for you. Finally, if you want to get a sense of where virtualization is heading, Chapter 4 provides a glimpse of the exciting initiatives that are being made possible by virtualization.

Part II: Server Virtualization

Server virtualization is where the hottest action is in today's virtualization world. The most obvious use cases and the most immediate payoffs are available with server virtualization, and this part covers it all.

Chapter 5 gives you information for a litmus test to inform you whether server virtualization makes sense for you. The chapter lets you do a bit of self-testing to see whether your organization is ready to implement virtualization. Just as important, the chapter gives you the tools you'll need to find out whether it doesn't make sense for you to implement virtualization. Chapter 6 provides in-depth information on how to make a financial assessment of your virtualization project, including how to create a spreadsheet to calculate all the costs and benefits of a potential virtualization project. Chapter 7 discusses the all-important topic of how to manage a virtualization project; there's far more involved here than just installing a virtualization hypervisor. Finally, Chapter 8 discusses a very important topic — the hardware you'll use to run your virtualization software. There are many exciting developments in hardware with significant influence on the operational and financial benefits of virtualization.

Part III: Server Virtualization Software Options

Sometimes I see a movie with a happy ending and wonder “Yeah, but how did the rest of their lives turn out?” Virtualization can be something like that. If you listen to vendors, you just install their software and — presto! — instant virtualized infrastructure. Just like real life isn’t like the movies, real infrastructure isn’t like that, either, and Part III helps you have a true happy ending.

Chapter 9 deals with the critical issue of how to migrate an existing physical infrastructure to a virtualized one. (

Hint: It’s more complex than the vendors claim.)

Chapter 10 addresses managing a virtualized infrastructure; there are a plethora of options, and this chapter provides help in deciding which option is a good choice for you. Chapter 11 addresses a topic that’s often an afterthought in virtualization: storage. For many organizations, virtualization provides the impetus to move to shared (also known as *virtualized*) storage. It’s important to know what your storage options are and how to select one.

Part IV: Implementing Virtualization

If you're like me, theoretical understanding goes just so far. Then I want to roll up my sleeves and get my hands dirty. If you're like that as well, rejoice! Part IV can feed your hands-on hunger. In this part, I present three different examples of how to install and use virtualization. Best of all, each of the products used for the examples is available at no cost, making it possible for you to work along with them with no financial commitment.

Chapter 12 illustrates how to implement VMware Server as well as how to install a guest virtual machine. Chapter 13 works through Xen virtualization via the open source Linux distribution Fedora. Chapter 14 also illustrates a Xen-based virtualization, but the chapter uses the free XenExpress product from XenSource to share a different way of applying Xen virtualization.

Part V: The Part of Tens

Every *For Dummies* book concludes with a few chapters that provide a final burst of valuable information delivered in a sleek, stripped-down format — the time-honored ten-point list.

In Chapter 15, you get a list of the ten must-do steps for your first virtualization project. Chapter 16 shares ten no-no's to avoid in a virtualization project. And Chapter 17 gives you ten great virtualization resources for you to use after you finish this book.

Icons Used in This Book



This icon flags useful, helpful tips, or shortcuts.



This icon marks something that might be good to store away for future reference.



Pay attention. The bother you save might be your own.



This icon highlights tidbits for the more technically inclined that I hope augment their understanding — but I won't be offended if less-technically inclined readers hurry through with eyes averted.

Where to Go from Here