

Learn HYPER-V IN A MONTH OF LUNCHES

COVERS WINDOWS SERVER 2016



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MEAP Edition
Manning Early Access Program
Learn Hyper-V in A Month of Lunches
Covers Windows Server 2016
Version 3

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welcome

Thank you for purchasing the MEAP for *Learning Hyper-V in a Month of Lunches : Covers Windows Server 2016*. Virtualization is the keystone of the modern data center. Hyper-V is Microsoft's virtualization platform that is designed to work with both Windows and Unix/Linux virtual machines.

The chapters in this book are written to be digested in a roughly lunch time sized chunks. Building on your existing knowledge of Windows Server management, Active Directory, networking and storage we'll start by taking you through the background to why we virtualize computing workloads. This is followed by chapters on managing Hyper-V hosts and creating and managing virtual machines. Networking and storage are important factors in any computing environment and we'll also teach you the details of managing these areas of your Hyper-V environment.

Businesses are increasingly dependent on their IT systems. High availability at both the Hyper-V host and guest virtual machine level will show you how to provide that additional level of protection to your organization's applications.

Migrating virtual machines between Hyper-V hosts, as well as migrating workloads to Hyper-V are covered as an important part of your Hyper-V management role. Once you've populated your Hyper-V environment you need to be able to monitor the environment to prevent issues becoming problems.

Disaster recovery is a must for any business and Hyper-V environments have their own needs and way to deal with the problem.

Microsoft has introduced the concept of containers to the Windows environment. Containers may be run directly on Hyper-V or in a virtual machine. Both options and how to deal with the issues containers bring to your environment are covered in the book.

Our aim is to provide you with the information you need to be immediately effective in administering Hyper-V environments. In these days of IT pros being asked to manage environments that are constantly growing in size and complexity you need access to the information necessary to do your job in a format that is both comprehensive and easy to digest. By breaking down the information into a series of easy to digest lessons and showing you how to perform Hyper-V management tasks using both GUI and PowerShell based tools we achieve both goals.

Becoming immediately effective as soon as you've read the first few chapters repays your investment in buying the book and boosts your employability. The later chapters will extend your skills and knowledge around managing Hyper-V and by extension data center management.

We hope you'll get as much from reading the book as we did from writing it. Please be sure to post any questions, comments, or suggestions you have about the book in the Author Online forum. Your feedback is essential in developing the best book possible.

—Andy Syrewicze

—Richard Siddaway

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Before You Begin

Do you remember the days of physical servers? Generally, the rule of thumb was one major role or application per server because many applications and services just did not play well together. They had to be separated so that they couldn't fight amongst themselves and cause problems for everyone else. The unfortunate side effect of this practice was that all of these physical servers were, on average, utilizing 20% of their resources. Meaning 80% of those resources were being wasted. We don't pour a glass of water to only drink 20% of it and waste the rest do we? We don't live in only 20% of our homes do we? Clearly, resource utilization in IT needed a makeover. This is where virtualization technology comes in.

Virtualization has solved our resource utilization woes by enabling us to make more effective use of the hardware available meaning we can now host more workloads using less space inside of our datacenters. We can dynamically move workloads from one piece of physical hardware to another without any interruption to the running workload. We can even provide high availability functionality to workloads using these virtualization technologies.

It's not difficult to see how virtualization is changing the IT management landscape. System administrators now have to add this knowledge to their toolbox to manage ever increasing IT complexity as virtualization becomes a staple of IT departments everywhere.

While there are many different virtualization technologies on the market today, this book will focus on Microsoft's Hyper-V with a primary focus on Windows Server 2012 R2. The changes introduced by Windows Server 2016 will be highlighted. Let's dig in.

1.1 What is Hyper-V?

Simply put, Hyper-V is a hypervisor. The problem with this answer is that it will likely lead you to the question of "what is a hypervisor?" A hypervisor is a piece of software that is designed

to delegate access to physical resources, such as CPU and memory, to multiple virtualized operating systems or applications as shown in figure 1.1.

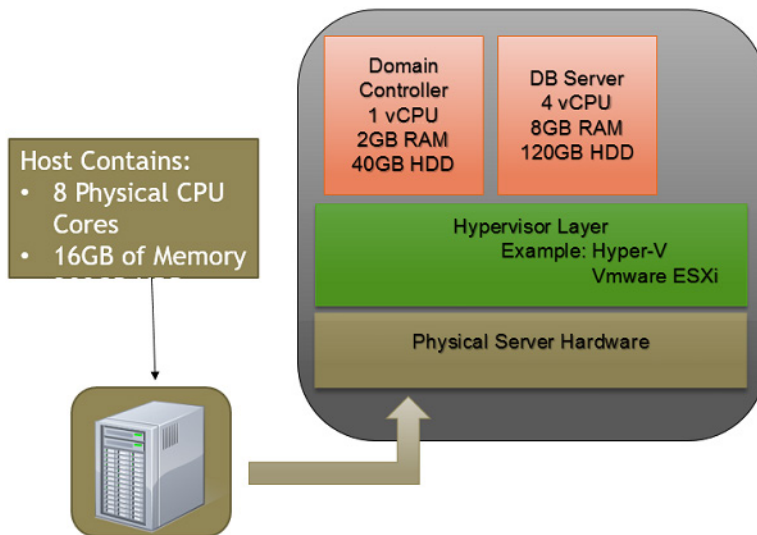


Figure 1.1 The Logical Layout of a Hypervisor

In figure 1.1 we have a physical server that contains 8 physical CPUs and 16GB of memory. The hypervisor layer gets installed directly on top of the physical hardware and acts as a broker for the resources contained in the host machine. Figure 1.1 shows that two “virtualized” servers have been created and each are being given a portion of the host’s physical resources. Each of these virtual machines (VMs) contain fully functional operating systems and will act just like physical servers on your network. They are also isolated and separated from each other, just like physical servers. This is the most basic function of a hypervisor like Hyper-V.

The hypervisor is truly the core of any virtualization platform. Hyper-V itself performs the core functions of Microsoft’s virtualization platform but other technologies, such as System Center Virtual Machine Manager and Failover Clustering, help create a more holistic virtualization solution. We cover these technologies later in the book after you’ve learned about the core functions of Hyper-V itself.

Sometimes its not enough to just know what a technology does. We also need to understand how it benefits us and how it can help us solve our business problems. With that in mind as you read the text, picture the fictional company XYZ Corp which is a company with aging IT infrastructure that is badly in need of updating. As we work though the first couple of chapters we’ll be using this fictional company as an example of how this technology benefits you and your organization.

1.2 Is this book for you?

One constant in the world of IT is that things are always changing. Businesses need to stay competitive which means more efficient. Many are turning to virtualization as one of those efficiencies. Most IT departments and hiring managers now require virtualization know-how as a core skill in most IT job descriptions. If you're a junior level IT professional looking to branch out, get a promotion or, increase your job security this book is for you. If you're looking to change roles within your organization, the knowledge from this book will help. Maybe you're a developer who would like to understand more about the test environment you're working in.

Another common situation is a merger where the incoming company already has some Hyper-V hosts in place. Or maybe your company has historically gone with a different vendor and you're in the process of moving to Hyper-V for its many advantages and costs savings. If you're an IT pro finding yourself in this situation, this book is for you as well!

Whatever the reason, you'll find Hyper-V to be a mature, powerful, but still evolving technology that will aid you in your everyday work if leveraged and utilized properly. This book will teach you the best practices for using Hyper-V on a day-to-day basis.

In order for this book to be most effective in teaching you the target material, there is a pre-requisite level of knowledge needed. You should have "at least" some experience in each of the following:

- The installation and configuration of Windows Server Operating Systems
- Basic Active Directory Management
- NTFS file level permissions
- IPv4 Networking
- Understanding of Server Hardware Platforms
- Basic Knowledge of PowerShell
- Storage concepts including: Direct Attached Storage, Network Attached Storage, iSCSI, NFS, and Fibre Channel

1.3 How to use this book

This book is designed to be read in manageable chunks. Ideally each chapter could be fit into a lunch hour. This will most commonly be broken down to roughly 40 minutes for reading, and perhaps 20 minutes or so for lab work, or study questions.

THE MAIN CHAPTERS

The primary material of this reading will be covered in chapters 2 through 19, which will take roughly one month of working lunches to get through. By no means does this have to be consecutive day after day reading. The chapters are laid out in such a way that you can pick up where you left off and begin building on the foundation that is laid out in the early chapters of the book. Don't leave too long between chapters though as you forget what you've already learned.

TRY IT NOWS

These are key Month of Lunches elements that you'll see present in each chapter. They are presented as short sidebars and callouts that will instruct the reader to act on some of the information that is covered in that section. It is strongly recommended that you attempt these items in your own lab environment. It is one thing to read about it in a book, it's another thing to see the technology in action. You'll learn best by pairing these sections with the material covered in the book.

ABOVE AND BEYOND

These sidebars, while not always specific to the topic being discussed will touch on related items and topics. Hyper-V is closely inter-related with many other technologies in the Microsoft software stack and many of those relationships and pairings may be discussed as part of those sidebars throughout the text.

HANDS ON LABS

At the end of each chapter we'll discuss some basic lab excersices that can be done to increase your understanding of the concepts that are taught in each section. If you're anything like us, hands-on is the best way to learn technology. It goes without saying that you do NOT want to use a production environment for a lab. The last thing you want is to break something by trying to learn it in more detail. It's best to not have to learn on the job if at all possible.

SUPPLEMENTAL MATERIALS

If you find yourself wanting more at the end of a chapter, keep an eye out for this section. While this book is designed to give you some working knowledge of Hyper-V in general, it will not cover every possible topic to its fullest. That would easily fill several volumes of this size! You'll find that material in these sections will link you to relevant blog articles, white papers, and some supporting videos available at MoreLunches.com

POWERSHELL CODE SNIPPETS

In today's Microsoft environments, if you're not learning PowerShell, you're really doing yourself a dis-service. The majority of the text will be covering each topic from a UI point of view. You'll also see several relevant code examples and cmdlets that will complete the same functions from a PowerShell prompt. In today's dynamic IT landscape, automation is power, and PowerShell is the primary engine behind automation in a Microsoft environment.

NOTE As this book focuses on Windows Server 2012 R2 and (at times) Windows Server 2016. The older WMI based CLI commands are not covered here. All CLI related commands mentioned in this book are compatible with the OSs mentioned above.

1.4 Creating your lab environment

As of the time of this writing, creating a lab environment for Hyper-V can be a bit difficult. It is possible to “nest” virtualized Hyper-V instances on top of a VMware ESXi host, but quite a bit of tweaking is needed. As far as nesting Hyper-V on top of Hyper-V, it is only supported in Windows Server 2016 and Windows 10 Anniversary edition. With that said, it’s best if you have a bit of spare hardware that can be used for your lab environment. You’ll at least want 2 physical hosts with a low end NAS, or other sharable storage, to be used by them. You’ll also need a gigabit switch and a couple of Ethernet cables.

The above items should carry you for the entirety of the book, but a single host with local storage will carry you up until the book starts covering clustering and working with multiple Hyper-V hosts.

Setting up a Hyper-V test environment from scratch can be quite a daunting task, but you’ll learn much in the process, and will be better off as a result. If you need additional resources for completing the lab setup, please review appendix A. This appendix contains a couple hardware examples and a walkthrough on installing the host’s operating system and the installation of the Hyper-V role.

1.5 Our Learning Path

When you’re beginning to learn the ins and outs of Hyper-V, you’ll find that a lot of the knowledge stacks on top of some more foundational type information. It’s the proverbial “walk before you can run” argument, and the course of this text takes this idea and applies it to the learning path.

Chapter 2 will start us off by providing an introduction to Hyper-V and Hypervisors in general. This chapter will set the stage for the rest of the book in that it covers the question of “How can Hyper-V help me?” The business case regarding the fictional company XYZ Corp. is spelled out in great detail and it goes on to explain how Hyper-V helped them resolve the problems the company was facing.

Chapters 3 through 11 will be focused on the use and management of a single Hyper-V host environment. These chapters will slowly introduce the basic management tasks in the care and feeding of a Hyper-V host.

We then take what was learned in those chapters and we begin to introduce some more advanced topics in chapters 12 through 19. The information contained in these chapters isn’t going to mean much without the foundational knowledge that is contained in the earlier chapters. Again, we need to learn to walk before we can run.

Each chapter will finish with some basic lab work and some study questions so that you can feel confident in your understanding of the material prior to moving onto the next chapter.

1.6 Being Immediately Effective

This book takes a task oriented approach to Hyper-V management, and as such, you will be able to immediately apply some of the knowledge gained in the day to day administration of Hyper-V. While this text doesn't specifically cover the setup and configuration of a new Hyper-V cluster from scratch, you'll be able to take over the management of an existing host or cluster when all is said and done.

With that said, it should be noted that while you may feel comfortable conducting some of these tasks, we'll go out of our way to instruct you as to which tasks should have extra care and attention. When it comes to infrastructure management tasks and virtualization, there may be times where you are working with some very sensitive items, such as storage, and any misconfiguration and/or incorrect setting could be potentially disastrous if the proper precautions are not taken. We're not trying to scare you, but with great power, comes great responsibility.

So, if you're ready for your foray into the world of virtualization and Microsoft Hyper-V, let's get started!