

# Hands-On Microsoft® Windows® Server 2016

Second Edition



Michael Palmer



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# Hands-On Microsoft® Windows® Server 2016

**Michael Palmer**

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## **Dedication**

I dedicate this book to Maria.



# Introduction

*Hands-On Microsoft® Windows® Server 2016* is the perfect resource for learning Windows Server 2016 from the ground up. Designed to build a foundation in basic server administration, this book requires no previous server experience. It covers all of the critical Windows Server 2016 features, including the features unique to this new server operating system. You learn how to choose the right server edition for your needs, and you learn to install, configure, customize, manage, and troubleshoot your server. If you are new to server administration, this book gives you the knowledge you need to manage servers on small to large networks. If you are an experienced server administrator, the book provides a fast way to get up to speed on Windows Server 2016 administration.

The book offers you administrator skills to install and configure Windows Server 2016, use Active Directory, set up server resources for clients, configure and manage printing services, manage data storage, manage network services, configure remote access for clients, create a virtual server, establish strong security, monitor a server, and create a reliable server environment.

Each chapter is written for easy understanding and the book contains over 135 hands-on activities to make what you learn come alive. These activities give you the experience you need to truly learn Windows Server 2016 and retain what you have learned.

In addition to the hands-on activities, the book is filled with many learning aids to help you maximize what you learn. The objectives at the start of each chapter give you an overview of what you will be able to accomplish and can be used for a fast review of the chapter contents. At the end of each chapter, there are chapter summaries for more in-depth point-by-point review. There also are review questions and realistic case studies to enable you to stretch your learning. The case studies put you in the shoes of a Windows Server 2016 consultant who works in all kinds of situations fulfilling the needs of clients. Other learning tools include a list of key terms that you have encountered in the chapter and application examples provided throughout to help you understand different ways to use Windows Server 2016.

The goal when you complete this book is to give you the knowledge and confidence to be a capable server administrator. The book also provides a foundation for pursuing a Microsoft certification in Windows Server 2016 server administration.

## Intended Audience

*Hands-On Microsoft Windows Server 2016* is intended for anyone who wants to learn and practice using Windows Server 2016. It also can be used as a starting block in preparing for the Microsoft Server administrator certification exam track. No prior server operating system experience is required, but some basic experience with client systems, such as Windows 7, 8/8.1, or 10, is helpful.

## New to this Edition

- Step-by-step hands-on activities for learning nearly every phase of Windows Server 2016, with all activities tested by a technical editor, reviewers, and validation experts
- Broad training in planning, installation, configuration, security, networking, monitoring, and troubleshooting of Windows Server 2016
- Coverage of features critical or new to Windows Server 2016, including using the graphical user interface, Windows Server Core, Nano Server, Windows PowerShell, Hyper-V, Server Manager, security features, network services, role services, monitoring tools, and much more
- An appendix to cover using Windows Server 2016 with Hyper-V virtualization
- An appendix showing Windows PowerShell command examples for managing and troubleshooting a server

## Chapter Descriptions

The chapters are balanced to provide a similar amount of coverage. There are twelve chapters and two appendices. The beginning chapters introduce the Windows Server 2016 operating system, and show how to plan for, install, and configure Windows Server 2016. Because it can be vital to a server installation, you also learn about Active Directory in the early portion of the book. The middle chapters address how to configure key services, such as file and folder services, printing, data storage, network services, and remote access. The chapters at the end of the book focus on configuring security, server and network monitoring, and ensuring server reliability. The appendices provide supplementary information about using virtualization through Hyper-V and a full range of Windows PowerShell command examples you can use in your work.

- **Chapter 1, Introduction to Windows Server 2016**, explains and compares each of the Windows Server 2016 editions. The chapter discusses client systems that can be used with Windows Server 2016, identifies important features, reviews introductory networking concepts, and shows how to plan a network model to use.
- **Chapter 2, Installing Windows Server 2016**, discusses how to prepare for an installation, describes different installation methods (including using virtualization), and steps through an actual installation. The chapter additionally discusses how to implement Windows Server Core, how to implement Windows Deployment Services, how to install service packs, how to troubleshoot installation problems, and how to uninstall the operating system.
- **Chapter 3, Configuring the Windows Server 2016 Environment**, starts by familiarizing you with the Server Manager management tool. You also learn how to install and uninstall server roles, how to use the Best Practices Analyzer, configure hardware, and configure and tune the operating system. Other topics include using the System File Checker, understanding the Registry, and using Windows PowerShell.
- **Chapter 4, Introduction to Active Directory and Account Management**, presents an extensive introduction to Active Directory, including how to install and configure it. You additionally learn how to create Active Directory containers, and how to create and manage user accounts and security groups. The chapter additionally provides an introduction to Azure Active Directory for cloud services.
- **Chapter 5, Configuring, Managing, and Troubleshooting Resource Access**, teaches you how to manage folders and files, particularly in relation to setting up security. You learn how to create shared objects, such as folders, and how to publish them in Active Directory.



You additionally learn how to troubleshoot security issues, how to use work folders, how to implement the Distributed File System, and how to establish disk quotas.

- **Chapter 6, Configuring Windows Server 2016 Printing**, provides information about the inner workings of Windows Server 2016 printing, including how to install local, network, and Internet printers. You implement the Print and Document Services role and learn about the XPS Print Path. You discover how to manage print jobs and how to troubleshoot printing problems. You also learn to use the Print Management tool.
- **Chapter 7, Configuring and Managing Data Storage**, shows you how to use the Disk Management tool to configure basic and dynamic disks. You learn about RAID, Storage Spaces, and other disk storage and fault tolerance options. You also learn to perform backups and restores and how to troubleshoot storage problems.
- **Chapter 8, Managing Windows Server 2016 Network Services**, focuses on how to configure the essential services needed for a smooth functioning Windows Server 2016 network, including DNS, DHCP, and Internet Information Services (Web Server). You also learn about network interface card teaming and about the IP Address Management tool.
- **Chapter 9, Configuring Remote Access Services**, enables you to learn how to set up and troubleshoot Windows Server 2016 as a virtual private network (VPN) for remote access, such as from the Internet. You additionally learn how to set up and use a DirectAccess server and how to configure and manage Remote Desktop Services for running applications directly on the server.
- **Chapter 10, Securing Windows Server 2016**, shows you a wealth of new and time-tested security features. You learn how to configure security policies, set up Active Directory rights, manage security on clients, create security templates, encrypt files and folders, use the powerful BitLocker Drive Encryption, implement Network Address Translation, configure Windows Firewall, and implement the Windows Defender virus checking software.
- **Chapter 11, Server and Network Monitoring**, teaches you how to monitor a server and a network for troubleshooting and to prevent problems. You learn how to use monitoring tools such as Resource Monitor, the Services tool, Task Manager, Performance Monitor, Data Collector Sets, and the SNMP service. Many of these tools have been enhanced in Windows Server 2016 to offer more functionality.
- **Chapter 12, Managing System Reliability and Availability**, enables you to develop problem-solving strategies for handling server difficulties. You learn how to resolve boot problems, use the Advanced Boot Options, use repair tools on the installation DVD, protect critical systems, use and configure Event Viewer, troubleshoot network problems, and how to remotely administer one or more servers.
- **Appendix A, Windows Server 2016 Virtualization and Hyper-V**, provides a foundation for understanding virtualization and virtual machines. After you learn about virtualization, you learn the ins and outs of Hyper-V, which is virtualization software included with Windows Server 2016. You also learn about using Hyper-V with Windows 8.1 Professional and above and Windows 10 and above.
- **Appendix B, Sample Windows PowerShell Cmdlets**, gives you 60 sample Windows PowerShell cmdlet examples to help you learn how to use this powerful tool. The cmdlets are presented by topical areas: file processing, system-related, network, and security.

## Features

To help you better understand how Microsoft Windows Server 2016 and network management concepts and techniques are applied in real-world organizations, this book includes the following learning features:

- **Chapter Objectives**—Each chapter begins with a detailed list of the concepts to be mastered. This list provides you with a quick reference to the chapter's contents and is a useful study aid.

- **Hands-On Activities**—Over 135 hands-on activities are incorporated throughout the text, giving you practice in setting up, managing, and troubleshooting a server. The activities give you a strong foundation for carrying out server administration tasks in the real world. Many of the activities present questions for you to investigate and answer, such as by recording your answers in a Microsoft Word file. This is intended to help retention and to provide a study aid that you can go back to.

For the activities in this book, you can obtain the free Windows Server 2016 evaluation installation DVD from Microsoft or make an installation DVD (or thumb drive) from an .iso file downloaded from Microsoft's download center website. Go to [www.microsoft.com](http://www.microsoft.com) and search for downloads or click a link for downloads. Also, on a home or lab computer running Windows 8.1 Professional or above or Windows 10 Professional or above, you can use Hyper-V to create a Windows Server 2016 virtual machine running Windows Server 2016. You learn how to do this in Chapter 2, Installing Windows Server 2016, and in Appendix A, Windows Server 2016 Virtualization and Hyper-V.

- **Screen Captures, Illustrations, and Tables**—Numerous reproductions of screens and illustrations of concepts aid you in the visualization of theories, concepts, and how to use tools and desktop features. In addition, many tables provide details and comparisons of both practical and theoretical information and can be used for a quick review of topics. Some screen captures are cropped to emphasize the concept you are learning.
- **Chapter Summary**—Each chapter's text is followed by a summary of the concepts introduced in the chapter. These summaries provide a helpful way to recap and revisit the ideas covered in each chapter.
- **Key Terms**—All of the terms within the chapter that were introduced with boldfaced text are gathered together in the Key Terms list at the end of the chapter. This provides you with a method of checking your understanding of the terms introduced.
- **Review Questions**—The end-of-chapter assessment begins with a set of review questions that reinforce the ideas introduced in each chapter. Answering these questions will ensure that you have mastered the important concepts.
- **Case Projects**—Each chapter closes with a multipart case project. In this realistic case example, as a consultant at Aspen Consulting, you implement the skills and knowledge gained in the chapter through real-world setup and administration scenarios.

## Text and Graphic Conventions

Additional information and exercises have been added to this book to help you better understand what's being discussed in the chapter. Icons throughout the text alert you to these additional materials. The icons used in this book are described below:



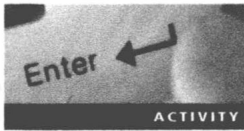
Tips offer extra information on resources, how to attack problems, and time-saving shortcuts.



Notes present additional helpful material related to the subject being discussed.



The Caution icon identifies important information about potential mistakes or hazards.



Each Hands-On Activity in this book is preceded by the Activity icon.



Case project icons mark the end-of-chapter case projects, which are scenario-based assignments that ask you to independently apply what you have learned in the chapter.

## Instructor Resources

Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via [www.cengage.com/login](http://www.cengage.com/login). Access and download PowerPoint presentations, the Instructor's Manual, and more.

- *Electronic Instructor's Manual*—The Instructor's Manual that accompanies this book includes additional instructional material to assist in class preparation, including suggestions for classroom activities, discussion topics, and additional quiz questions.
- *Solutions*—The instructor's resources include solutions to all end-of-chapter material, including review questions and case projects.
- *Cengage Testing Powered by Cognero*—This flexible, online system allows you to do the following:
  - Author, edit, and manage test bank content from multiple Cengage solutions.
  - Create multiple test versions in an instant.
  - Deliver tests from your LMS, your classroom, or wherever you want.
- *PowerPoint presentations*—This book comes with Microsoft PowerPoint slides for each chapter. They're included as a teaching aid for classroom presentation, to make available to students on the network for chapter review, or to be printed for classroom distribution. Instructors, please feel free to add your own slides for additional topics you introduce to the class.

## System Requirements

**Hardware** Listed in the Windows Server Catalog or has the Windows Server 2016 Certified sticker on the hardware, including:

- 1.4 GHz CPU or faster 64-bit processor
- 512 MB RAM or more (more is better)
- 36 GB or more disk space (more is better)
- Optical drive or USB drive or both
- Super VGA or higher resolution monitor
- Mouse or pointing device
- Keyboard
- Network interface card connected to the classroom, lab, or school network for on-ground students—or Internet access (plus a network interface card installed) for online students
- Printer (optional, but helps to practice setting up a network printer)

**Software** Windows Server 2016 Standard or Datacenter Edition

**Virtualization** Windows Server 2016 can be loaded into a virtual server environment, such as Microsoft Hyper-V or VMware. You can download from Microsoft's download center a free copy of Hyper-V for your Windows 8.1 Professional or above personal computer. Hyper-V is included with Windows 10 Professional or above. Using Hyper-V, you can create a virtual machine in which to run Windows Server 2016. See Chapter 2 and Appendix B for details.

## About the Author

Michael Palmer is an industry consultant and teacher who has written numerous networking and operating systems books, including best-selling books about Windows Server systems and UNIX/Linux. He holds a Ph.D. degree from the University of Colorado at Boulder and has worked over 30 years in higher education and in the industry as a teacher/professor, systems and networking specialist, technical manager, and consultant. He is president of CertQuick, which provides computer and network consulting services, technical authoring services, and computer science curriculum development for schools. Dr. Palmer is the author of many other books in the industry.

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