Installing and Configuring Windows Server 2025

A practical guide to management and optimization of Windows Server environment

Bekim Dauti

www.bpbonline.com

First Edition 2025

ISBN: 978-93-65894-295

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Dedicated to

"To our planet Earth, the home that sustains us all.
May this book inspire a deeper commitment to preserving and protecting the environment for future generations."

About the Author

Bekim Dauti is a dedicated computer technology expert with a bachelor's degree in informatics from the University of Tirana, a master's in information technology from UMGC Europe, and a doctorate in computer science from Aspen University. Bekim is a Cisco Certified Academy Instructor (CCAI) and a Microsoft Certified Trainer (MCT) specializing in server administration, computer networking, and training.

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Acknowledgement

I want to express my heartfelt gratitude to my parents and family for their unwavering love, support, and encouragement—this book would not have been possible without them. Their sacrifices and guidance were a constant source of motivation throughout this journey. To my colleagues at TeKnowledge and Dautti, thank you for your continuous support and belief in me. I am also profoundly grateful to BPB Publications for their expert guidance in bringing this book to life. The revision of this book was a long and rewarding process, made even more valuable by the contributions of reviewers, technical experts, and editors. Above all, I thank god for granting me life, health, and the opportunity to contribute to the sharing of knowledge. I also pray that god rewards my family, friends, colleagues, and all those who supported me throughout this endeavor. Finally, I wish peace, health, and blessings to every reader.

Preface

Windows Server 2025 is the server operating system developed by Microsoft as part of the Windows NT family of operating systems. This book is designed to get you started with Windows Server 2025. At the same time, this book aims to introduce you to the roles that Windows Server 2025 supports. In addition, the book teaches you how to install roles using the Add Roles and Features Wizard and Windows PowerShell cmdlets. Furthermore, the book provides instructions for configuring client/server network services using various graphical user interface (GUI) wizards, tools, and Windows PowerShell cmdlets.

The book begins with an introduction to computer networks and Windows Server 2025. Then, it continues with the installation and post-installation tasks of Windows Server 2025. You will then move on to more advanced aspects of working with Windows Server 2025, such as installing roles and configuring client/server network services like AD DS, DNS, DHCP, WDS, PDS, WSUS, Web Server, Hyper-V, and other essential network services. The book also explores new and advanced features On-Premises Server Hotpatching with Azure Arc, next-generation Active Directory and SMB enhancements, improved storage performance with NVMe SSDs and better SAN integration, and robust in-place upgrades for streamlined version updates. Next, with the help of real-world examples, you will get to grips with the fundamentals of Windows Server 2025, which will help you solve complex tasks the easy way. Later, the book also shows you maintenance and troubleshooting tasks, where, with the help of best practices, you can easily manage Windows Server 2025. By the end of this book, you will have the knowledge required to administer and manage Windows Server environments.

Chapter 1: Understanding Network Components - This chapter aims to provide a comprehensive introduction to networking within Windows Server 2025 environments. It begins with the historical context of the Birth of the Internet. It progresses to modern computer networks, covering essential topics such as network components, architecture, topologies, IP addressing, and subnets. The goal is to equip IT professionals with a solid understanding of network fundamentals crucial for effective management and optimization. Additionally, the chapter discusses the role of Network Operating Systems (NOS) and emerging technology trends. To illustrate practical implementation, it concludes with a hands-on example demonstrating Hyper-V configuration in Windows 11 Pro using Settings and Windows PowerShell, offering actionable insights for real-world scenarios.

Chapter 2: Introduction to Windows Server 2025 - This chapter will provide a comprehensive understanding of server hardware and its critical components, such as the processor, memory, storage, and network interfaces. You will be introduced to Windows Server 2025 while learning the hardware fundamentals. This introduction will cover key details, including its release timeline, the various editions available, notable new features, and the system requirements for successful deployment. The chapter will conclude with a practical hands-on activity, where you will download both Windows Server 2025 and the Windows Admin Center. This exercise will reinforce your understanding by allowing you to apply the concepts discussed in a real-world scenario.

Chapter 3: Windows Server 2025 Installation - This chapter will guide you through the installation process of Windows Server 2025. Before initiating the installation, you will learn about partition schemes, boot options, and installation methods. Familiarizing yourself with these concepts will provide a solid foundation for smoothly installing Windows Server 2025. Additionally, you will set up the virtual switch and virtual machine (VM) within the Hyper-V Client, utilizing the ISO image you acquired in Chapter 2, which introduced you to Windows Server 2025. These tasks have been thoughtfully designed to be interactive and engaging, ensuring that you quickly grasp the process of installing Windows Server 2025. Moreover, this chapter incorporates new and improved technologies in Windows Server 2025, offering enhanced performance, security, and management capabilities to streamline your server setup experience.

Chapter 4: Initial Configuration of Windows Server 2025 - This chapter aims to provide clear explanations and instructions for post-installation tasks and the initial configuration of Windows Server 2025. The post-installation tasks section will cover essential topics such as managing devices and drivers, Plug and Play, IRQ, DMA, interrupts, driver signing, registry and services, registry entries, service accounts, and dependencies. The initial configuration section will offer step-by-step instructions for hands-on exercises, including setting up the IP address, changing the time zone, activating Windows Server 2025, and many more tasks in an understandable and straightforward format. The goal is to guide you through the process and demonstrate how to perform these tasks step by step, ensuring you have a solid foundation for effectively managing and configuring Windows Server 2025.

Chapter 5: Installing Roles Using Server Manager and PowerShell - The primary objective of this chapter is to provide comprehensive guidance on installing roles in Windows Server 2025. This is achieved through detailed, step-by-step instructions and clear explanations on using the Add Roles and Features Wizard in Server Manager and PowerShell to install various roles such as Active Directory Domain Services (AD DS), Domain Name System

(DNS), Dynamic Host Configuration Protocol (DHCP), Hyper-V, Internet Information Services (IIS), Print and Document Services (PDS), Remote Access, Remote Desktop Services (RDS), and Windows Server Update Services (WSUS). Additionally, this chapter aims to help readers understand the purpose of each role and configure them to meet their organization's specific needs. By the end of this chapter, readers will have acquired the necessary skills and knowledge to install roles effectively and customize their Windows Server 2025 efficiently, allowing them to tailor it to their organizational requirements.

Chapter 6: Azure Arc On-Premises Hotpatching - The primary objective of this chapter is to provide comprehensive guidance on implementing On-Premises Server Hotpatching with Azure Arc in Windows Server 2025. This is achieved through step-by-step instructions and clear explanations on configuring Azure Arc for hotpatching, implementing hotpatching policies and schedules, and monitoring and managing hotpatching updates. Additionally, this chapter aims to help readers understand the benefits of hotpatching, best practices for deployment, and real-world use cases. By the end of this chapter, readers will have gained the necessary skills and knowledge to effectively implement hotpatching, enhance security and minimize downtime in their on-premises server environments.

Chapter 7: Next-Generation Active Directory and SMB Enhancements - The primary objective of this chapter is to provide an in-depth understanding of the evolution and advancements in Active Directory (AD) and Server Message Block (SMB) protocols in Windows Server 2025. This chapter will guide you through detailed explanations and practical examples of the new features and enhancements in Active Directory Domain Services (AD DS) and the SMB protocol. By the end of this chapter, readers will have gained the knowledge and skills to implement and optimize AD and SMB in Windows Server 2025, focusing on enhanced security, improved performance, and scalability. You will be equipped to effectively manage authentication, access control, and file sharing in your organization’s infrastructure, whether upgrading from a previous version or deploying new capabilities.

Chapter 8: Configuring Windows Server 2025 Services - This chapter equips readers with the knowledge and skills to configure and manage client/server network services in Windows Server 2025 using Windows PowerShell cmdlets. Readers will learn to efficiently set up and manage critical services, including DHCP, Active Directory Domain Services (AD DS), DNS, virtual machines, and web servers, to meet the demands of dynamic infrastructure environments. Additionally, the chapter covers configuring print servers, Windows Deployment Services (WDS), Virtual Private Networks (VPNs), Remote Desktop Services (RDS) users, and Windows Server Update Services (WSUS) to enhance operations and provide secure, centralized management. Through practical, step-by-

step instructions and PowerShell automation, readers will gain hands-on experience and develop the expertise to effectively manage these essential network services in a modern and hybrid server environment.

Chapter 9: Enhancing Storage with NVMe SSDs and SAN - This chapter's primary objective is to guide readers in enhancing storage performance in Windows Server 2025. It provides step-by-step instructions on deploying and optimizing NVMe SSDs, integrating SAN solutions, and fine-tuning storage performance. The chapter also covers advanced topics like storage virtualization and Software-Defined Storage (SDS), offering practical insights for scalable, high-performance storage. By the end, readers will be equipped to implement modern storage solutions and maximize Windows Server 2025's storage capabilities.

Chapter 10: In-Place Upgrades for Version Updates - This chapter's primary objective is to guide readers in performing robust in-place upgrades for streamlined version updates in Windows Server 2025. It provides step-by-step instructions on understanding the benefits and prerequisites, planning and executing the upgrade, and preparing the environment. The chapter also covers advanced topics like validating compatibility, resolving issues, managing dependencies, mitigating risks, and ensuring data integrity. Additionally, it offers practical insights into fine-tuning and optimizing the upgraded environment. By the end, readers will be equipped to implement successful in-place upgrades and maximize the efficiency and performance of their Windows Server 2025 environments.

Chapter 11: Tuning Windows Server 2025 for Peak Performance - The primary objective of this chapter is to equip system administrators with the knowledge and skills necessary to optimize the performance of Windows Server 2025. It focuses on key areas such as understanding the role of server hardware components and making informed decisions when selecting and configuring hardware for maximum performance. The chapter also delves into using powerful tools like Windows Admin Center and Performance Monitor to efficiently track and assess server performance metrics. Additionally, it highlights the critical role that logs and alerts play in maintaining system health, guiding administrators through configuring them for real-time issue detection and resolution. By adhering to the best practices and techniques outlined, readers can ensure their Windows Server 2025 environments consistently operate at peak efficiency, with robust monitoring and management capabilities in place.

Chapter 12: Maintaining and Troubleshooting Windows Server 2025 - This chapter aims to equip readers with a thorough understanding of key tasks related to troubleshooting, updating, monitoring, and maintaining Windows Server 2025. It introduces practical

strategies to make these essential activities more manageable. The chapter explores the server startup process, advanced boot options, and Safe Mode as critical tools for diagnosing issues. Additionally, it covers creating and implementing backup and restoring disaster recovery plans and updating Windows Server 2025 to ensure system security and stability. The Event Viewer is highlighted as an invaluable tool for monitoring system logs and diagnosing errors, helping to reduce server downtime and prevent potential financial impacts. By the end, readers will have a firm grasp of these concepts and the confidence to apply them effectively in real-world server management scenarios.

Appendix A: Navigating Microsoft Certifications - This appendix aims to thoroughly understand Microsoft certifications, specifically in the context of Windows Server 2025. It will cover the fundamentals of certificates and certifications, detail the skills assessed in the certification exams, and offer practical tips for adequate exam preparation. Additionally, the chapter will equip professionals with the necessary resources to succeed in these certification exams and achieve the Microsoft Certified Professional (MCP) status. The ultimate goal is to guide professionals toward a successful career in Microsoft technologies by leveraging the latest advancements in Windows Server 2025.

Appendix B: Review and Solutions - This appendix is dedicated to answering the questions raised throughout the book, which are part of the dedicated Questions section in each chapter. Its purpose is to provide valuable insights and clarity to readers struggling with specific concepts or topics. The answers in this appendix are carefully crafted to help readers deepen their understanding of the material and ensure they have a solid grasp of the main ideas and concepts discussed in the book. By reviewing the answers provided here, readers can resolve any uncertainties they may have encountered and strengthen their comprehension of the subject matter. Whether you want to revisit key points, clarify specific concepts, or reinforce your knowledge, this appendix is an essential resource for enhancing your understanding of the content covered in the book.

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How can we hope to make the world a better place when, on
New Year's Eve alone, cities worldwide spend millions on fireworks
displays that cause significant air pollution?
Isn't it time we reflect and take steps to protect our planet?

- Bekim Dauti

Chapter 1
Understanding Network Components

Introduction

This chapter is a foundational introduction to the core elements of network infrastructure, tailored explicitly for IT professionals working with Windows Server environments. As part of the esteemed Windows NT series, Windows Server 2025 continues the legacy of its predecessors by delivering enhanced security, versatility, and stability. Noteworthy advancements include seamless integration with hybrid deployments through Windows Server 2025 Datacenter Azure, reflecting Microsoft's commitment to meeting the evolving demands of modern network environments. Understanding the role of Windows Server within network architecture is paramount, and this chapter begins by providing a detailed overview of essential network concepts. The *Computer Network Overview* section delves into critical terms such as hosts, nodes, peer-to-peer, and clients/servers, ensuring a solid grounding in network fundamentals.

Additionally, you will gain insights into general concepts, including clients, servers, **Network Operating Systems** (**NOSs**), hardware, software, and networking architectures. By explaining these fundamental concepts in accessible language, we aim to equip IT professionals with the knowledge to navigate and understand network components in Windows Server environments. This comprehensive exploration lays the groundwork for effective network management and optimization in Windows Server 2025 environments.

Structure

In this chapter, we will cover the following topics:

- Birth of the Internet
- Computer networks
- Network components
- Network architectures
- Network topologies
- IP address and subnets
- Network Operating System
- Technology trends

Objectives

This chapter aims to provide a comprehensive introduction to networking within Windows Server 2025 environments. It begins with the historical context of the birth of the Internet. It progresses to modern computer networks, covering essential topics such as network components, architecture, topologies, IP addressing, and subnets. The goal is to equip IT professionals with a solid understanding of network fundamentals crucial for effective management and optimization. Additionally, the chapter discusses the role of NOS and emerging technology trends. To illustrate practical implementation, it concludes with a hands-on example demonstrating Hyper-V configuration in Windows 11 Pro using Settings and Windows PowerShell, offering actionable insights for real-world scenarios.

Birth of the Internet

The Internet, a cornerstone of modern communication, began with the US government's initiative to create a reliable and resilient communication network through the **Defense Advanced Research Projects Agency** (**DARPA**). This initiative led to developing two distinct projects: ARPANET, designed for research needs, and MILNET, focused on military operations. By 1985, the Internet had emerged as a different entity, marking the end of ARPANET's era with the adage, *Every new beginning is some beginning's end*.

On October 24, 1995, the **Federal Networking Council** (**FNC**) adopted a resolution defining the **Internet** as a global information system with three key characteristics:

- It is logically connected by a globally unique address space based on the **Internet Protocol** (**IP**).
- It supports communication through the TCP/IP protocol suite and compatible protocols.

- It provides accessible high-level services in communications and related Infrastructure.

As network technologies evolved, the need to connect an increasing number of computers across various locations became paramount. This necessity drove the development of precise terminologies and concepts in computer networking, resulting in diverse network topologies, architectures, and components.

Technological advancements have continued to shape the Internet's landscape in recent years, significantly impacting various sectors. Windows Server 2025 exemplifies these advancements, offering enhanced security, versatility, and seamless hybrid deployment capabilities through Windows Server 2025 Datacenter: Azure Edition. These features are essential for modern network environments, enabling efficient management and network infrastructure optimization.

Windows Server 2025 supports the latest internet applications and services, integrating advanced technologies such as AI and machine learning to enhance performance and security. Understanding the evolution of the Internet and its current capabilities is crucial for IT professionals, as it underscores the importance of mastering network fundamentals, topologies, architectures, and components. This knowledge is vital for leveraging the full potential of modern NOS like Windows Server 2025.

Note: For a comprehensive overview of the Internet's history, visit the Internet Society's webpage at https://www.internetsociety.org/internet/history-internet/. This resource covers significant milestones, developments, and contributions of various individuals and organizations, offering valuable insights into the Internet's evolution and global impact.

Computer networks

The intention of this section is not to compare computer networks and network components but rather to define a computer network and expound upon its components. Without delving into intricate academic or professional explanations, a **computer network** can be defined as a system that connects two or more computers to share resources. This fundamental definition shows that a pair of computers is the minimum requirement for constructing a network. Factors such as network coverage, accessibility of services, and the purpose of network servers contribute to determining the different types of computer networks. Various networks can be classified as follows:

- **Personal area network (PAN):** A PAN connects devices within an individual's workspace, enabling data transmission and reception. A notable example is the **wireless personal area network (WPAN)**, which employs Bluetooth technology to interconnect devices. Recent advancements include Bluetooth 5.0, which offers improved range, speed, and data capacity, enhancing device interoperability and efficiency.

- **Local area network (LAN):** A LAN connects devices within a specific area, such as a floor or a building, facilitating data exchange. A **wireless local area network (WLAN)** exemplifies a LAN, utilizing radio waves for interconnection. The most prevalent technology in WLANs is Wi-Fi, which now includes Wi-Fi 6 (802.11ax) and the emerging Wi-Fi 6E, operating on the 6 GHz band. These advancements provide higher speeds, lower latency, and increased capacity, essential for modern high-density environments.
- **Campus area network (CAN):** A CAN interconnects multiple LANs within a limited geographical area, such as a university campus or corporate premises. This extended LAN supports connectivity across various buildings. Modern CANs leverage **fiber-optic backbones and high-speed Ethernet** to ensure robust, scalable, high-performance networks supporting advanced applications and services.
- **Metropolitan area network (MAN):** A MAN connects LANs within a town, city, or metropolitan area, encompassing a more extensive geographical scope than a CAN. MANs often use technologies like **Metro Ethernet and 5G networks** to deliver high-speed data exchange and connectivity. These technologies enable efficient urban network infrastructures, supporting innovative city initiatives and widespread IoT deployments.
- **Wide area network (WAN):** A WAN extends across vast geographical areas, facilitating data transfer between MANs. The Internet is the quintessential example of a WAN, connecting networks globally and enabling worldwide communication and information exchange. Modern WANs increasingly utilize technologies like **Software-Defined Wide Area Networking (SD-WAN)** to optimize traffic management, enhance security, and improve performance over large distances.

Recent technological advancements in computer networking have significantly enhanced the capabilities and efficiency of these network types. For instance, integrating AI and machine learning in network management systems allows for predictive analytics and automated optimizations, ensuring higher reliability and performance. Additionally, the adoption of edge computing enables data processing closer to the source, reducing latency and improving real-time data handling.

Understanding these various network types and their **components** is crucial for IT professionals, as it enables the design and management of efficient, scalable, and secure network infrastructures. This knowledge is particularly relevant in modern **operating systems** (**OSs**) like Windows Server 2025, which support these advanced networking technologies and applications.

Network components

Once the fundamental concepts of a computer network are understood, identifying its various elements becomes more straightforward. These elements include computers, the

networking medium, networking devices, and the resources utilized within the network, as depicted in *Figure 1.1*.

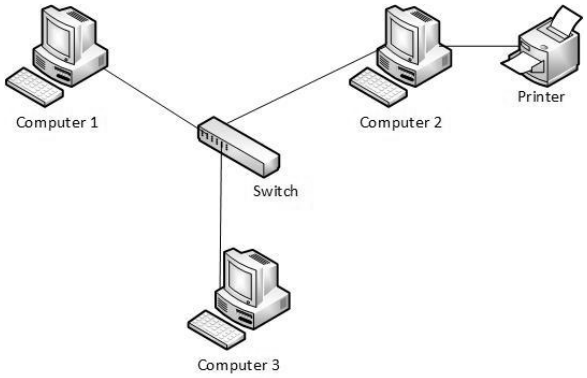

Figure 1.1: *The computer network and network components*

In modern network environments, computers are typically interconnected through network devices, such as switches, using advanced networking media. While traditional twisted pair cables (Ethernet) are still common, there has been a significant shift towards fiber-optic cables for higher bandwidth and more extended-distance communication. Wireless technologies like Wi-Fi 6 and the upcoming Wi-Fi 6E are becoming prevalent, offering enhanced speed, capacity, and reliability.

Substantial advancements have also been made in networking devices. Modern switches, often called smart or managed switches, now include **quality of service** (**QoS**), advanced security measures, and integration with network management software. These features are crucial for maintaining optimal network performance and security in increasingly complex environments.

OSs that facilitate resource sharing have also evolved. With Windows Server 2025 and Windows 11, IT professionals can leverage advanced features for resource management, such as enhanced virtualization through Hyper-V, improved file-sharing capabilities with the latest SMB protocol versions, and integrated cloud services for hybrid deployments.

For instance, within a Windows Server 2025 network, resources such as files, printers, and applications can be shared efficiently across connected devices. The integration with Azure services allows for seamless cloud backup and disaster recovery solutions, ensuring data integrity and availability. Additionally, AI and machine learning advancements integrated into these OSs facilitate predictive maintenance and automated optimizations, further enhancing network performance and reliability.

Hosts and nodes

By examining the computer network shown in *Figure 1.1*, we can identify computers 1 to 3 as hosts, the switch as a node, and the printer as a peripheral device. While this description