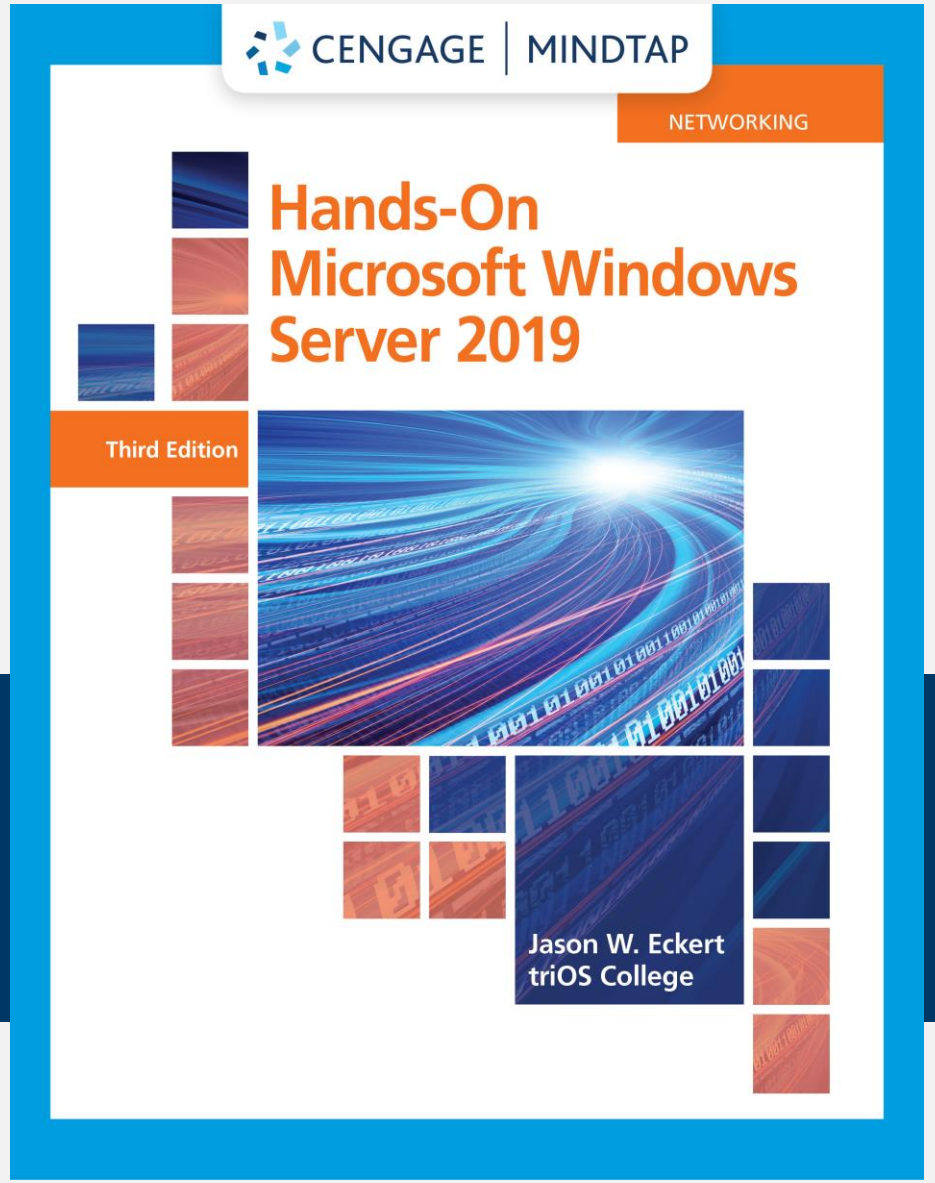

Getting Started with Windows Server 2019

Module 1

Learning Objectives (1 of 2)

After completing this module you should be able to:

- Summarize the different ways that Windows Server 2019 can be used within an on-premises or cloud environment
- Explain the purpose and function of Windows virtual machines and containers
- Outline the key features of Windows Server 2019
- Identify the differences between Windows Server 2019 editions
- Discuss the considerations necessary to plan for a Windows Server 2019 installation

Learning Objectives (2 of 2)

After completing this module you should be able to:

- Describe the concepts and processes used to perform a Windows Server 2019 installation
- Outline common post-installation configuration tasks for Windows Server 2019
- Identify the different virtualization configurations that can be used to explore Windows Server 2019 within an IT lab environment

Using Windows Server 2019 within an Organization (1 of 2)

- Computer networks and the Internet in the 1990s
  - PCs (client) connected to other computers across a computer network
  - Obtained access to shared resources
- Server: computer that shared the resource
  - On-premises servers, cloud servers, rackmount servers, blade servers
- Rack servers (1U and 2U)
  - Storage area network (SAN) devices, uninterruptible power supply (UPS) devices

Using Windows Server 2019 within an Organization (2 of 2)

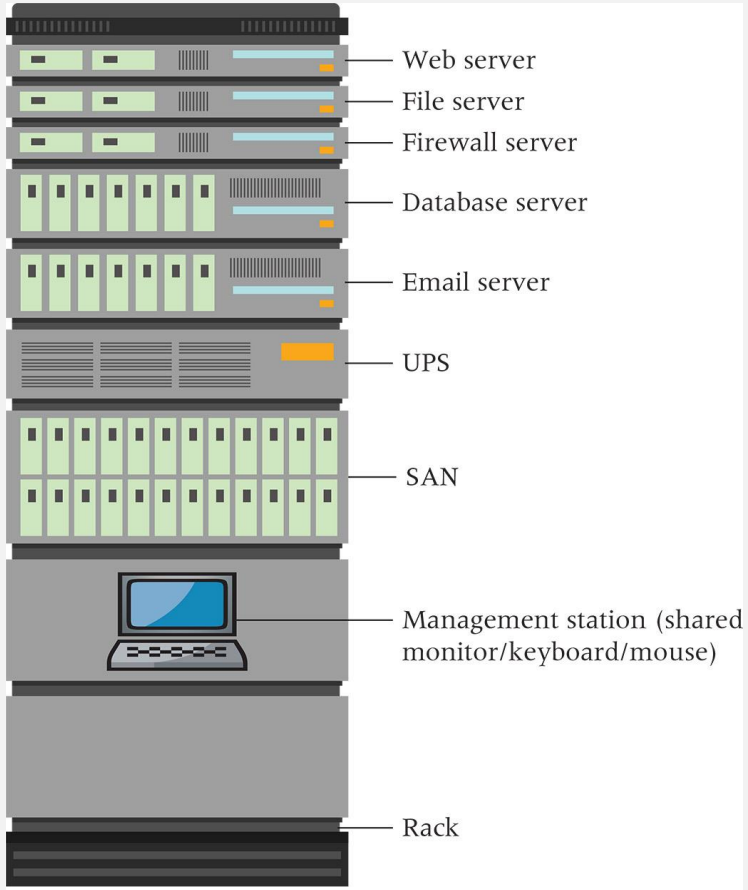

Figure 1-1 A sample server rack

Understanding Windows Server Virtualization (1 of 4)

- Virtualization
  - Process of running more than one operating system at the same time on a single computer
  - Requires hypervisor software
- Type 2 hypervisors run on top of an existing workstation operating system
- Type 1 hypervisors interact with the hardware directly
  - Contain a small operating system to manage the hypervisor configuration and virtual machines
  - Example: Microsoft Hyper-V

Understanding Windows Server Virtualization (2 of 4)

- Hypervisor requirements
  - Hypervisor acceleration
  - Second Level Address Translation (SLAT) extensions
- Virtual machine configuration file
  - Stored within a file specific to the hypervisor
- Operating system virtual hard disk file
  - Thick provisioning: allocates fixed space for the file when created
  - Thin provisioning: dynamically allocating space as needed

Understanding Windows Server Virtualization (3 of 4)

- On-premises and cloud operating systems
  - Virtual machines with virtual hard disk files hosted on a SAN within the organization or cloud data center
- Nested virtualization
  - Running other virtual machines within an existing virtual machine
  - Example: Hyper-V
  - Provides ability to implement a more complex virtualization structure
  - Provides ability to create complex virtualization structure on Windows 10 PCs for learning and testing purposes

Understanding Windows Server Virtualization (4 of 4)

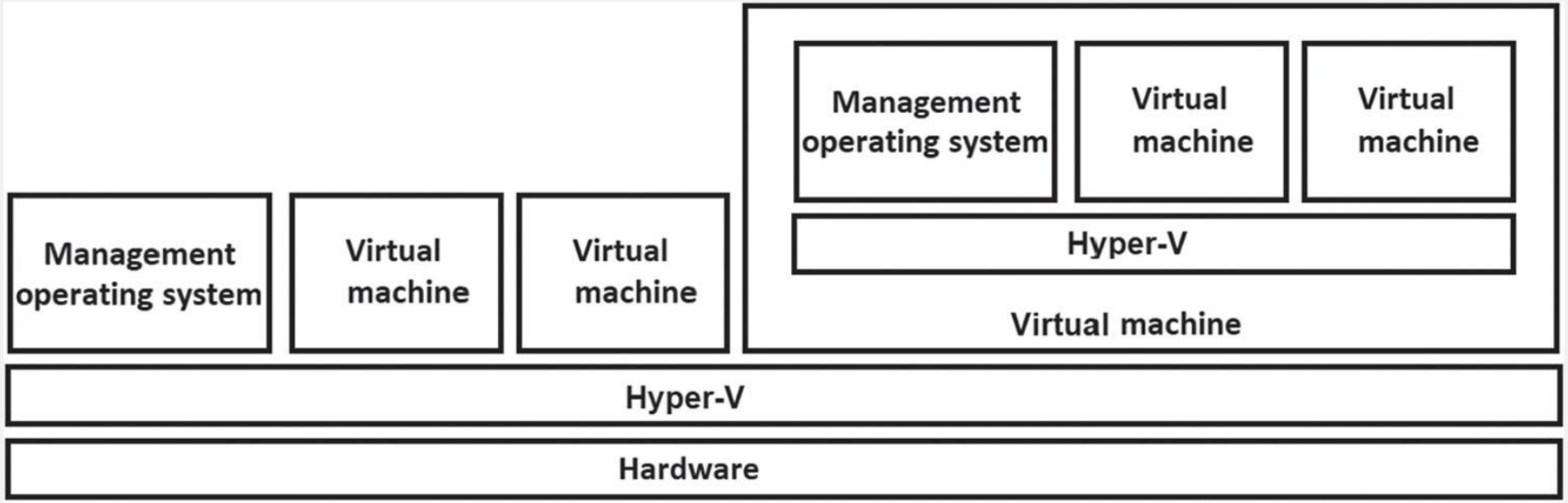

Figure 1-4 Nested virtualization using Hyper-V

Understanding Windows Containers (1 of 3)

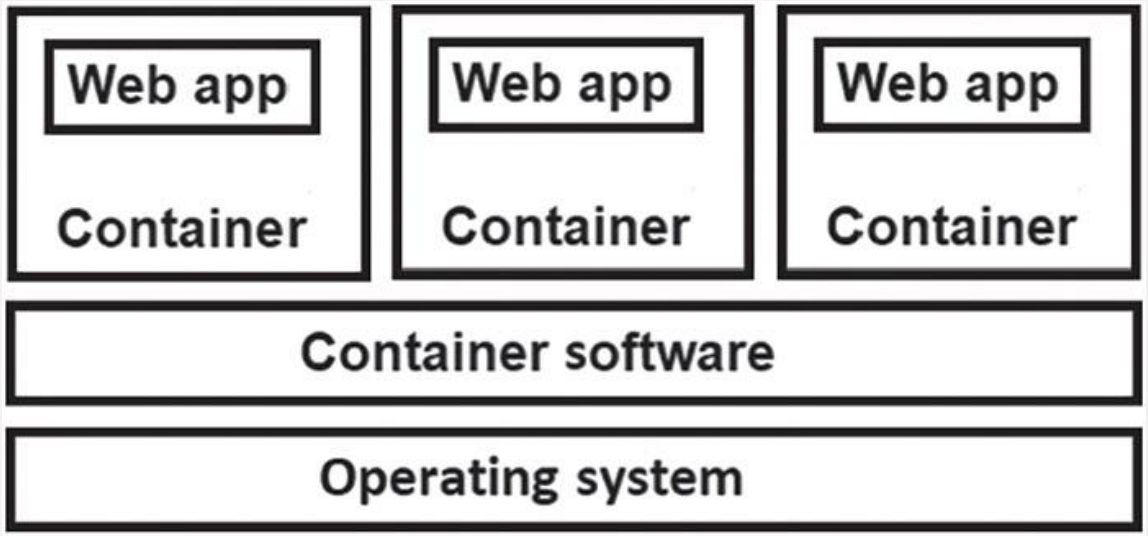

Figure 1-5 Using containers to run multiple Web apps

Understanding Windows Containers (2 of 3)

- Sandboxing
  - Enclosing executed Web apps in a way that isolates them from Web apps running within other containers and the underlying operating system
- Docker: common container software
- Windows Containers: Windows Server component needed to use Docker
- Kernel: core operating system component
- Hyper-V containers
  - Provide additional performance and security features to Web apps

Understanding Windows Containers (3 of 3)

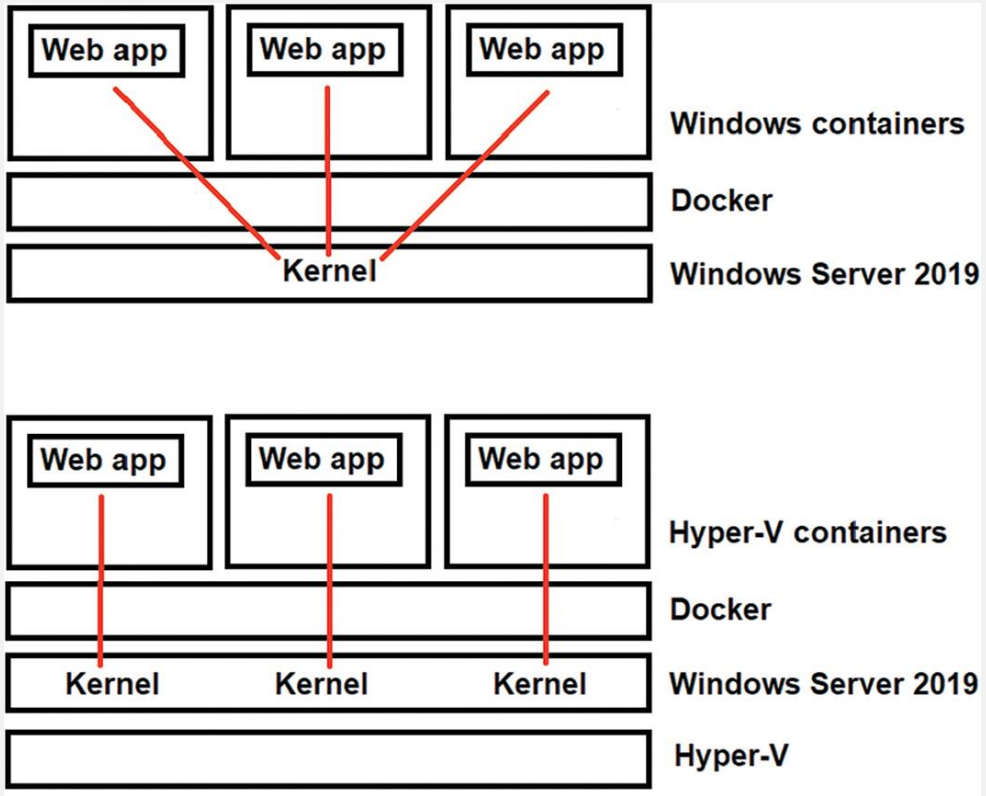

Figure 1-6 Comparing Windows containers and Hyper-V containers

Windows Server 2019 Features (1 of 11)

- Active Directory
  - Provides single sign-on using domain and domain controller environment
  - Windows Server as an Active Directory domain controller
    - Provides single sign-on for other computers joined to a domain
  - Contains Group Policy and Active Directory Certificate Services features
- Azure Active Directory
  - Service hosted within Microsoft's Azure cloud
  - Provides Active Directory services to an organization

Windows Server 2019 Features (2 of 11)

- Security
  - Microsoft Defender Advanced Threat Protection (ATP)
    - Performs deeper inspection of files and processes
  - Shielded virtual machines feature protects Hyper-V virtual hard disk files
  - More emphasis on Internet Information Services (IIS) Web server software
  - Additional basic security features
    - File and folder permissions, security policies, encryption of data, event auditing, various authentication methods, server management and monitoring tools

Windows Server 2019 Features (3 of 11)

- Volume and filesystem features
  - NTFS features
    - Built-in support for file and folder permissions, compression, Encrypting File System (EFS) encryption, user quotas, data deduplication, journaling, self-healing capability
  - ReFS v3 features
    - Data deduplication, improved performance with Storage Spaces
  - Storage Replicas have better performance
  - Storage Migration Service simplifies the moving of data

Windows Server 2019 Features (4 of 11)

- Performance and reliability features
  - Privileged mode
  - Protected processes
  - Multitasking
  - Multithreading
  - Processor scalability
  - Server clustering

Windows Server 2019 Features (5 of 11)

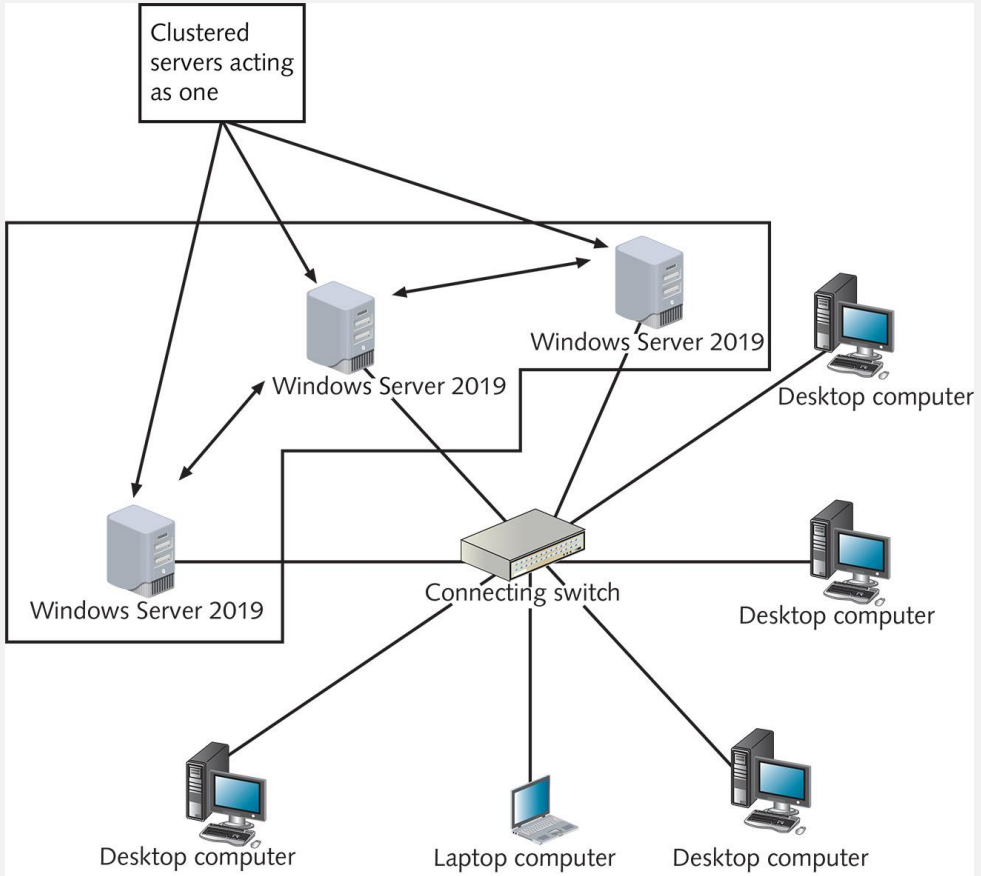

Figure 1-7 A server cluster

Windows Server 2019 Features (6 of 11)

- Administration tools manage the servers and services on the network
  - Server Manager
    - Monitors and manages server local configurations or network servers
    - MMC snap-in performs most configurations
  - Windows PowerShell
    - Provides features for computers running Windows and Windows Server
  - Windows Admin Center
    - Web-based management tool new to Windows Server 2019

Windows Server 2019 Features (7 of 11)

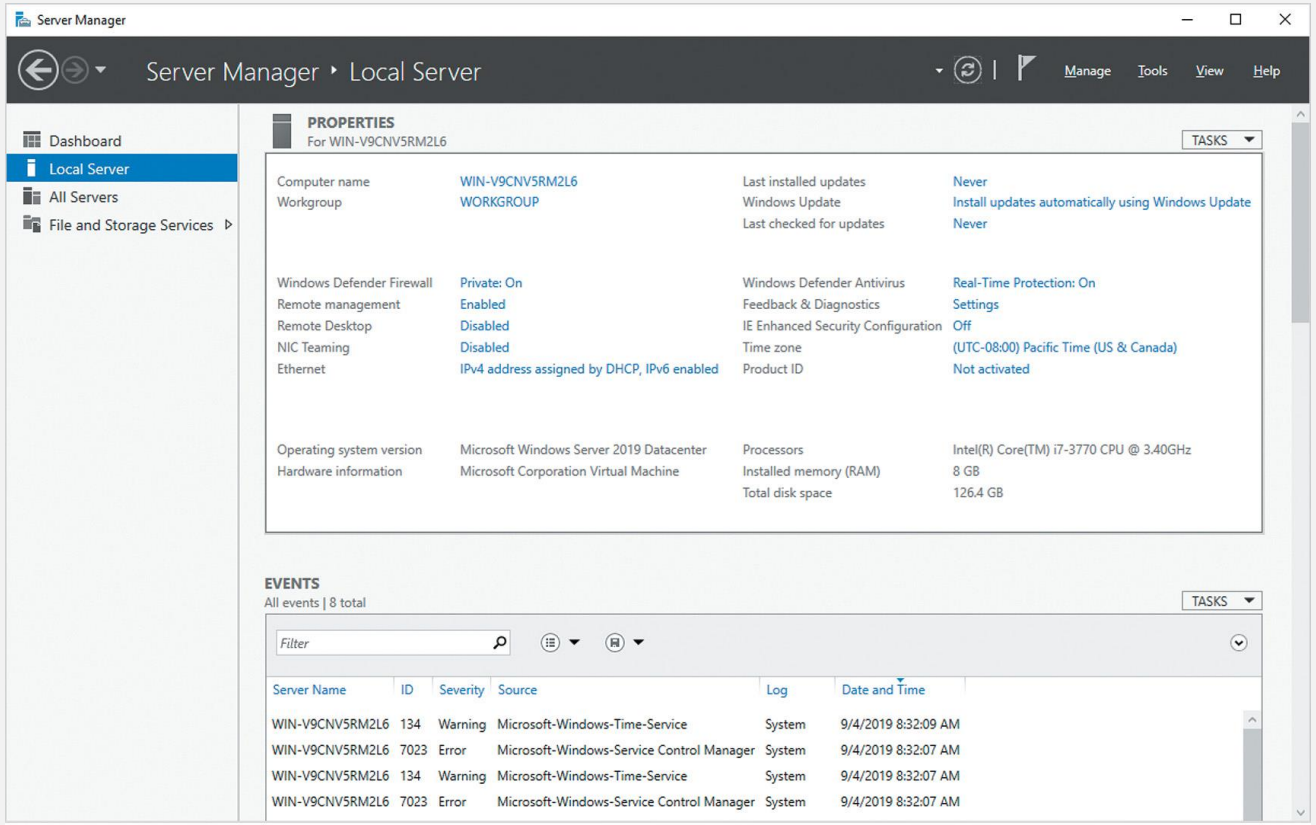

Figure 1-8 Configuring local server properties within Server Manager

Windows Server 2019 Features (8 of 11)

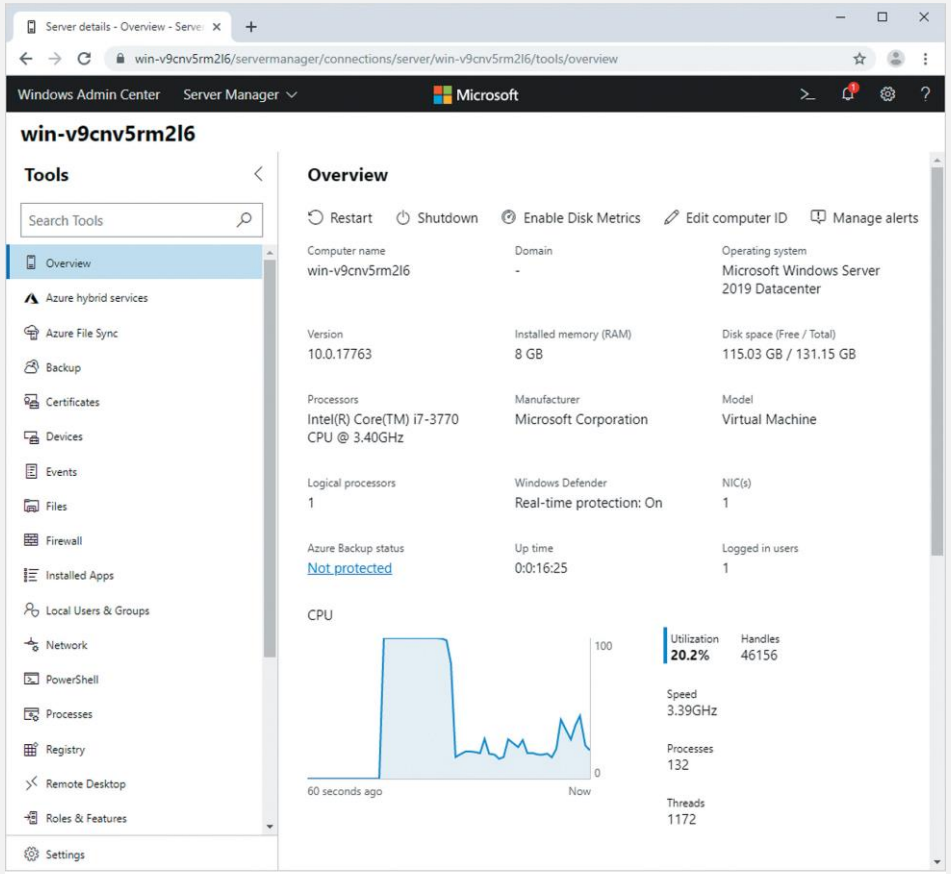

Figure 1-10 The Windows Admin Center tool

Windows Server 2019 Features (9 of 11)

- Small footprint installation options
  - Install Server 2019 with a minimal set of services, features, and functionality
  - Produces a smaller attack surface
  - More suitable for cloud environments
    - Uses far less server storage, memory, and processor resources
    - Can be installed within a virtual machine or used as a container
  - Windows Server 2019 offers two small footprint installation options
    - Server Core and Nano Server

Windows Server 2019 Features (10 of 11)

- Hybrid cloud features
  - Hybrid cloud
    - Integration between on-premises Windows Servers and Windows Servers and services running within the Azure cloud
  - Windows Server Azure Network Adapter feature
  - Azure Backup feature
  - Azure Update Management feature
  - Azure Site Recovery feature
  - Kubernetes software coordinates container execution

Windows Server 2019 Features (11 of 11)

- Linux application support
  - Web apps running in the cloud run within Linux containers
  - Microsoft's Windows Subsystem for Linux (WSL)
    - Makes it easier for Web app developers to create and test Linux apps on their Windows 10 PCs

Windows Server 2019 Editions (1 of 3)

Table 1-1: Comparing the major Windows Server 2019 editions			
Limitations	**Essentials Edition**	**Standard Edition**	**Datacenter Edition**
Maximum users	25	Limited by number of CALs	Limited by number of CALs
Licensing	Per server	Per processor core	Per processor core
Maximum memory	64 GB	24 TB	24 TB
Maximum processor sockets	2	64	64
Can join a domain	Only to enable migration	Yes	Yes
Maximum file sharing connections	16.8 million	16.8 million	16.8 million
Maximum remote access connections	50	Unlimited	Unlimited
Hyper-V	No	Yes (2 virtual machines)	Yes (unlimited virtual machines)
Containers	No	Yes (unlimited)	Yes (unlimited)
Hyper-V containers	No	Yes (up to 2)	Yes (unlimited)

Windows Server 2019 Editions (2 of 3)

- Windows Storage Server 2019
  - Cannot be purchased directly from Microsoft
  - OEMs can offer Windows Storage Server 2019 on the server-based products they sell
  - Windows Storage Server 2019 turns a server into a central storage center for data in an organization
    - Takes advantage of the storage utilities offered in Windows Server 2019

Windows Server 2019 Editions (3 of 3)

- Microsoft Hyper-V Server 2019
  - Hyper-V hypervisor
  - Free to download and use
    - Each Windows Server virtual machine running it requires a valid license
    - Note: Linux virtual machines do not require a license
  - Installs a small footprint version of Windows Server
    - Contains a PowerShell interface for creating and managing virtual machines

Preparing for a Windows Server 2019 Installation (1 of 3)

- Perform advanced planning
- Review and exceed minimum hardware requirements
- Consider capacity planning questions
- Consider processing speed, paying attention to the number of processors
- Ensure server has enough memory for the applications that it will host
- Consider the amount and type of storage
  - Redundant Array of Independent Disks (RAID) in the BIOS of the server
  - Additional hard disks, SSDs, virtual machine hard disk files

Preparing for a Windows Server 2019 Installation (2 of 3)

Table 1-2: Minimum hardware requirements for Windows Server 2019		
Hardware	**Minimum requirements**	**Additional considerations**
Basic Input/Output System (BIOS)	Unified Extensible Firmware Interface (UEFI) 2.3.1c BIOS or higher for physical server installation	Trusted Platform Module (TPM) is also required for secure boot and encryption features.
Processor	1.4 GHz 64-bit processor (includes support for NX, DEP, CMPXCHG16b, LAHF/SAHF, PrefetchW, EPT, or NPT)	Processor clock speed, amount of processor cache, and number of processor cores should be considered based on planned usage. Hyper-V also requires processor virtualization extensions (Intel VT or AMD-V, with SLAT).
Memory	512 MB (2 GB for a server with the GUI desktop)	Each virtual machine requires 800 MB for setup (although this can be scaled back after setup is complete). ECC memory is recommended for physical (non-virtualized) server installations.
Storage	32 GB	32 GB is the minimum for Server Core, while 36 GB is the minimum for installing a full Windows Server.

Preparing for a Windows Server 2019 Installation (3 of 3)

Table 1-2: Minimum hardware requirements for Windows Server 2019		
Hardware	**Minimum requirements**	**Additional considerations**
Network interface	1 gigabit or faster Ethernet adapter that is compatible with PCI Express architecture and Pre-boot Execution Environment (PXE)	Additional adapters are recommended if you support multiple virtual machines.
Optical drive	DVD drive (optional)	While a DVD drive is needed for installations from DVD media, many administrators install from a USB drive today.
Display	Super VGA at 1024 3 768 or higher resolution	Multiple servers can share one display via the use of a keyboard video-mouse (KVM) switch.
Interactive devices	Keyboard and pointing device	Multiple servers can share a keyboard and pointing device via the use of a KVM switch box.

Installing Windows Server 2019

- Installation broken into three separate tasks
  - Obtaining installation media
  - Starting the installation process
  - Completing the installation process

Obtaining Installation Media

- Common method used to install Windows Server
  - Booting a computer or virtual machine from installation media
    - Bootable DVD or USB flash drive or ISO image file
  - Use disk-burning software to download ISO image: Burnaware or Rufus
  - Download the correct Windows Server 2019 ISO image file

Starting the Installation Process

- Ensure BIOS boot order if necessary
- Create a new virtual machine within a virtualization configuration program
  - Attach an ISO image file to the virtual DVD drive within the virtual machine
  - Configure the virtual machine BIOS boot order
    - Boot from a DVD before the virtual hard disk file
  - Start virtual machine within the virtual machine software
    - Machine boots ISO image attached to the virtual DVD
  - Installation process starts

Completing the Installation Process (1 of 8)

- First step: enter regional locale and keyboard format
- Second step: choose whether to start an installation or repair a system
- Third step: select desired Windows Server 2019 edition
  - Accept the Microsoft license terms for Windows Server 2019
- Fourth step: select installation type – custom or upgrade
  - Normally, select Custom installation for new installation
- Fifth step: select Windows Server operating system storage location
- Reboot and specify a password for the local Administrator user account

Completing the Installation Process (2 of 8)

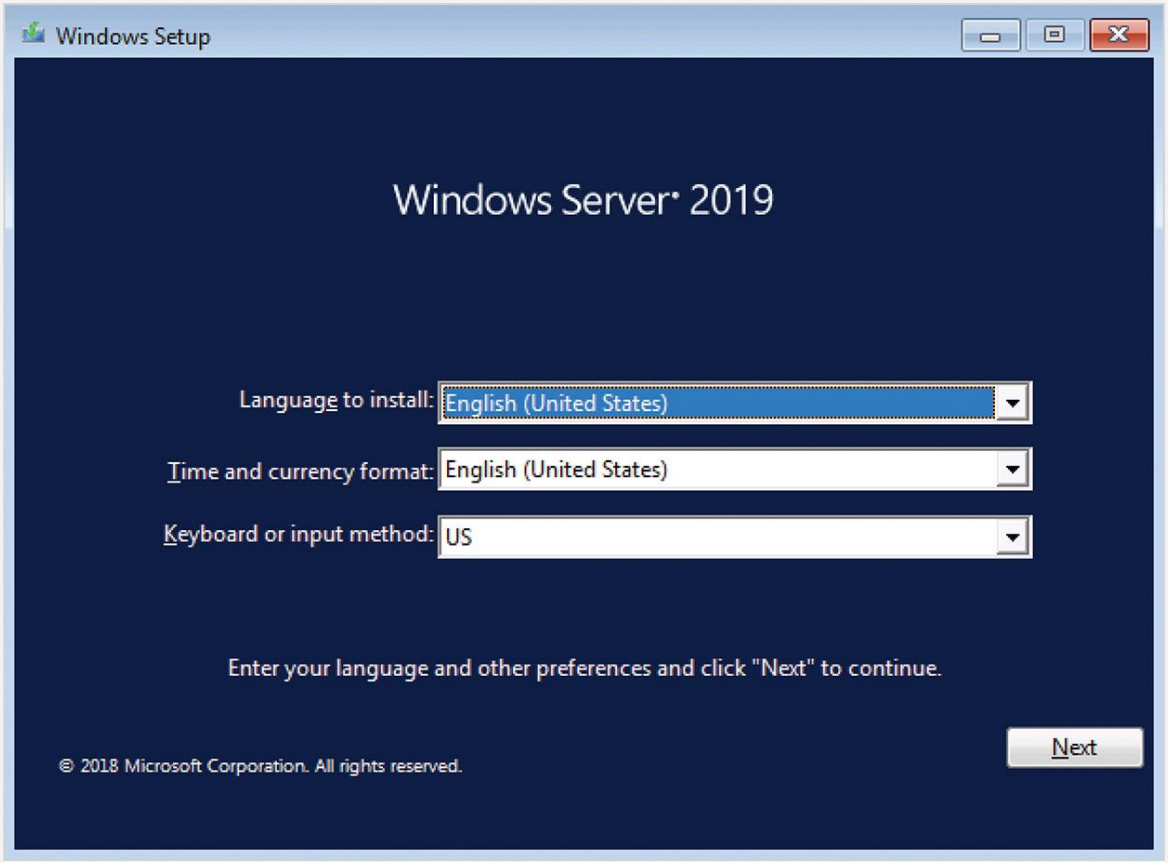

Figure 1-15 Specifying locale and keyboard information

Completing the Installation Process (3 of 8)

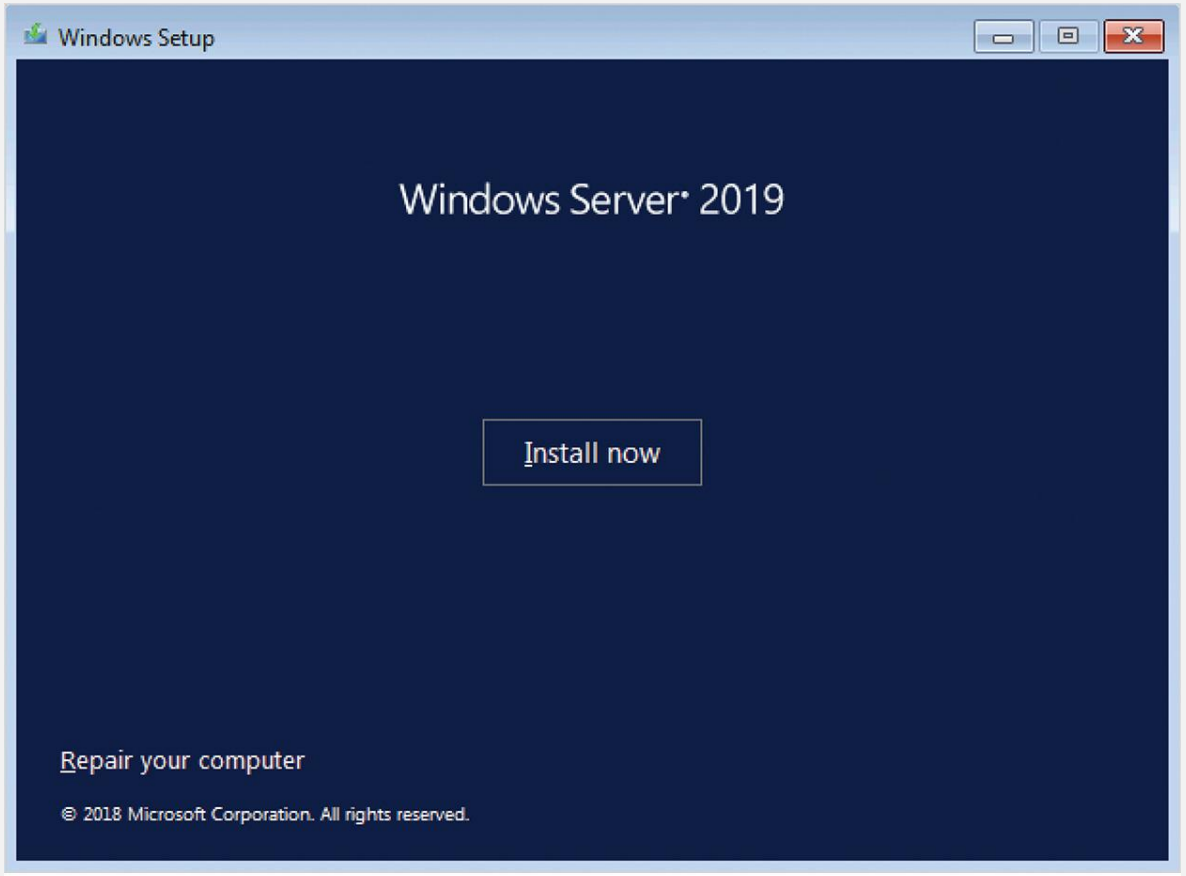

Figure 1-16 Starting a Windows Server 2019 installation

Completing the Installation Process (4 of 8)

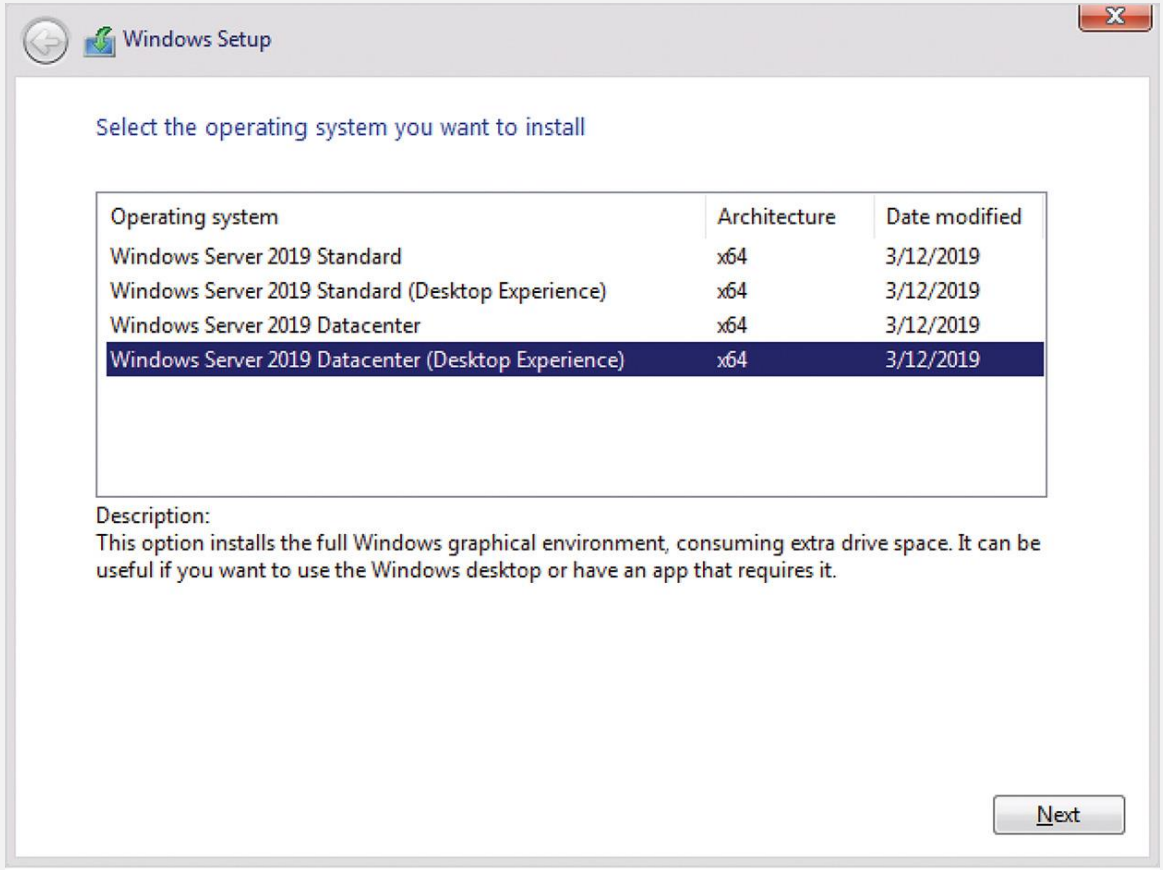

Figure 1-17 Selecting a Windows Server 2019 edition

Completing the Installation Process (5 of 8)

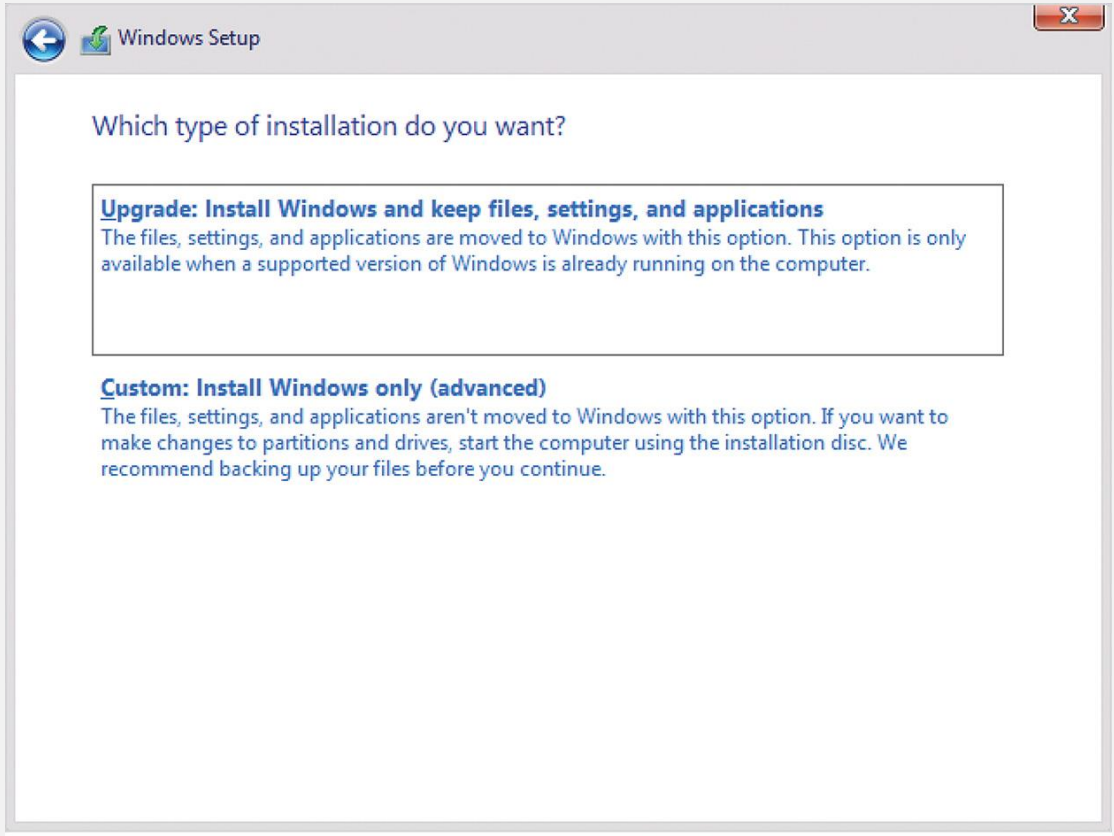

Figure 1-18 Selecting an installation type

Completing the Installation Process (6 of 8)

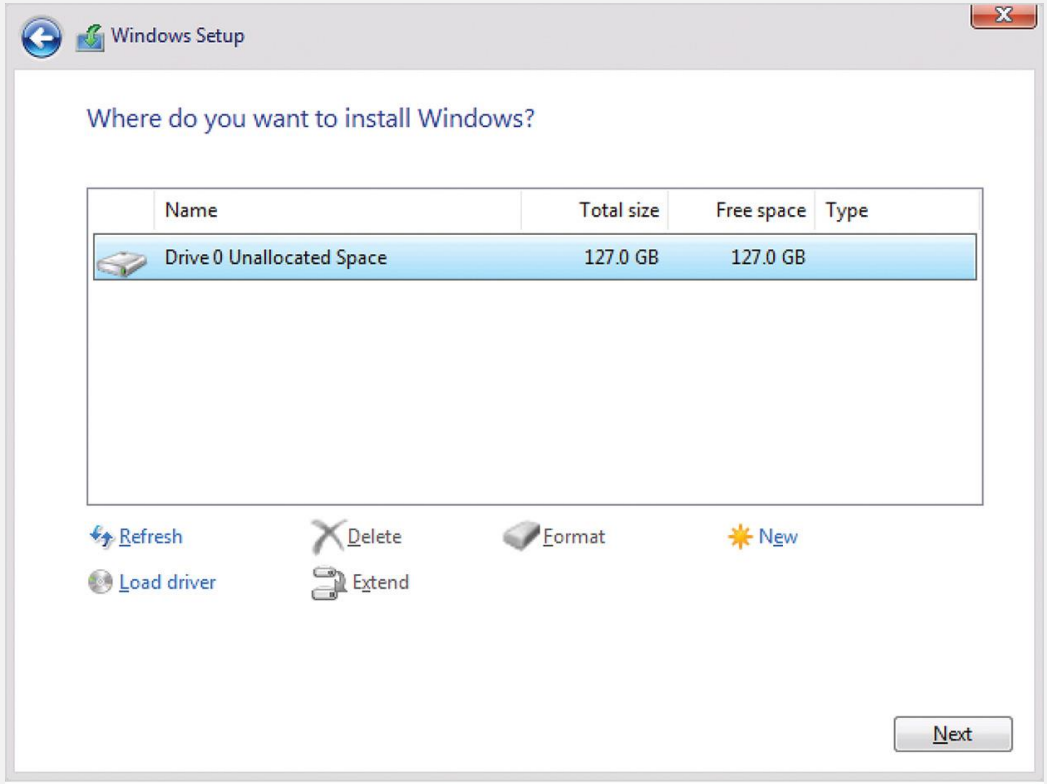

Figure 1-19 Selecting the location of the Windows Server operating system

Completing the Installation Process (7 of 8)

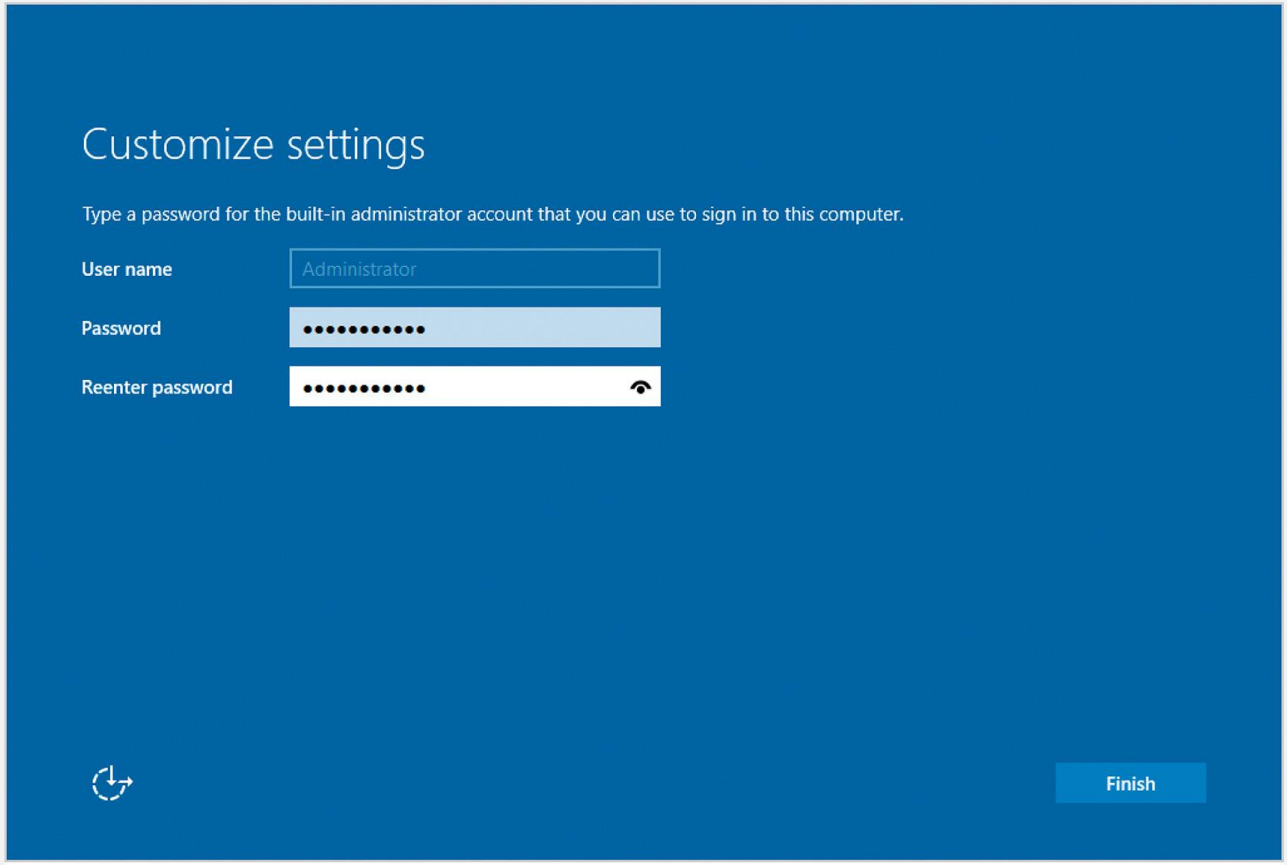

Figure 1-20 Specifying a new password for the local Administrator account

Completing the Installation Process (8 of 8)

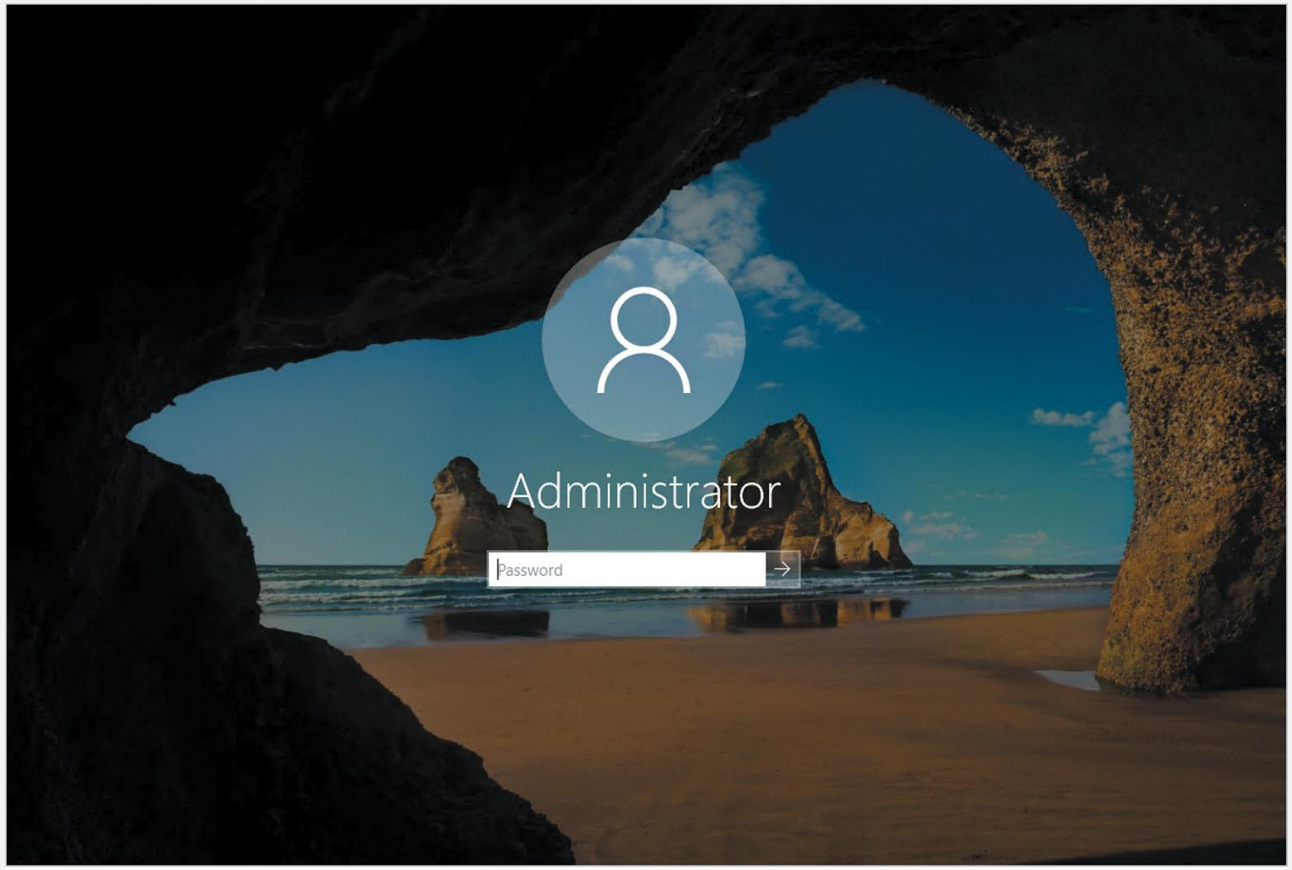

Figure 1-21 The Windows Server login screen

Post-Installation Configuration

- Key configuration tasks following any Windows Server 2019 installation
  - Setting the correct time and time zone
  - Configuring the Internet Protocol (IP) on the server's network interfaces
  - Configuring the firewall
  - Changing the default computer name and domain membership
  - Installing a modern Web browser
  - Activating the Windows Server operating system

Setting the Correct Time and Time Zone

- Within Server Manager
  - Navigate to Local Server
  - Select the hyperlink to Time zone in the Properties window
- Within the Windows Server Configuration Wizard on Server Core
  - Select option 9

Configuring the Network (1 of 5)

- Requirements to connect computer to a network
  - Network interface, protocol, packets, routers, and other devices on a network
- Three default Windows protocols
  - TCP/IP, UDP/IP, ICMP
- TCP ensures retransmission of lost packets
- IP network participant requires a valid Internet Protocol (IP) address
  - IP version 4 (IPv4)
  - IP version 6 (IPv6)

Configuring the Network (2 of 5)

- Understanding IPv4
- Participation on an IPv4 network
  - Requires valid IP address and a subnet mask
  - Optionally requires configuration of a default gateway
  - Unicast communication: from one computer to another computer using IP
  - Octets: most common format for IPv4 addresses
  - IPv4 address's two parts: network ID and host ID
  - IPv4 address must be configured with a subnet mask

Configuring the Network (3 of 5)

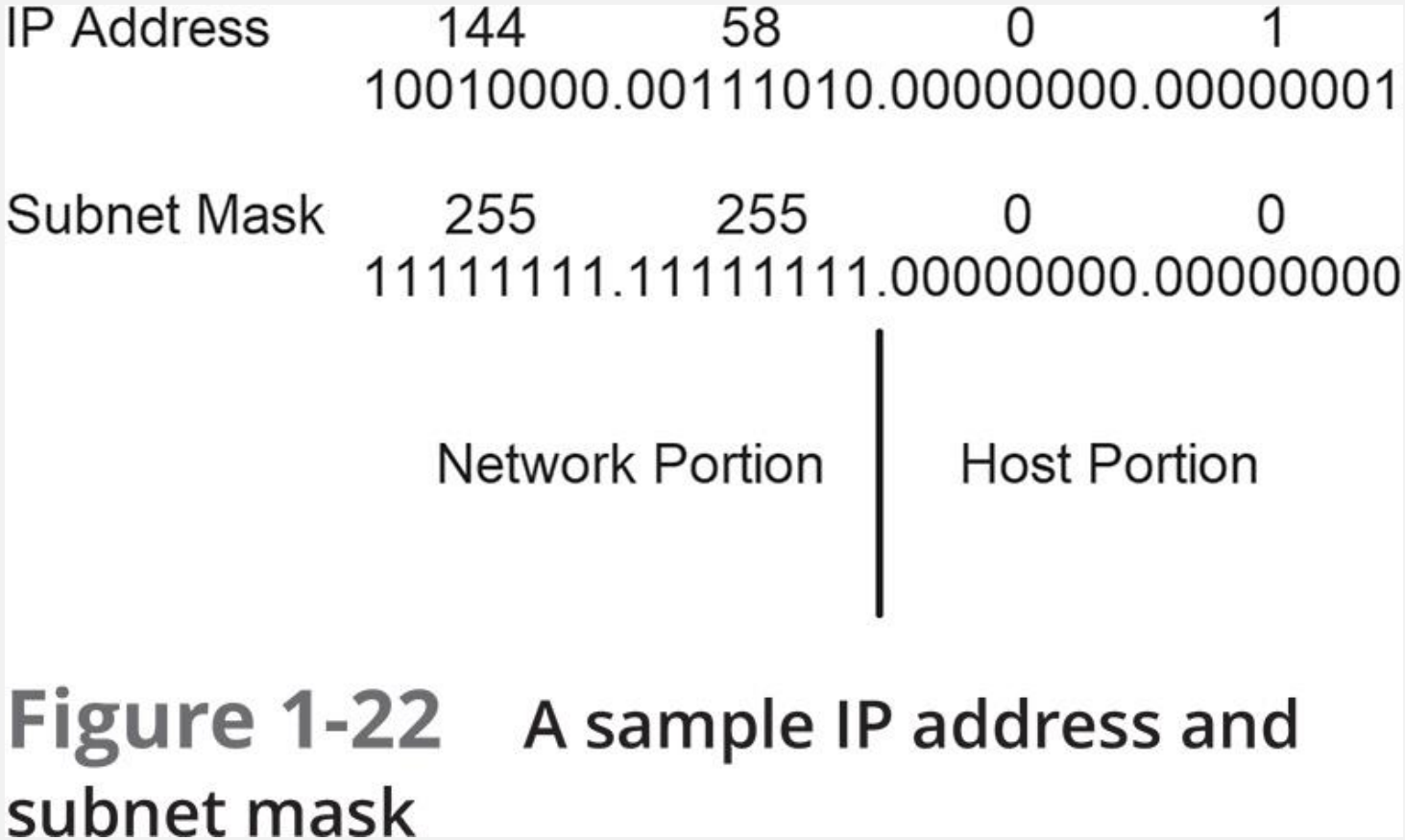

Figure 1-22 A sample IP address and subnet mask

Configuring the Network (4 of 5)

- Understanding IPv6
  - Accommodates far more IP addresses: uses 128 bits to identify computers
  - IP addresses written using 8 colon-delimited 16-bit hexadecimal numbers
  - IPv6 addresses can be expressed several ways
  - Adopted by small Internet-connected devices
    - Collectively referred to as the Internet of Things (IoT)
    - Uses Teredo protocol to work within IPv4-only networks
- Proxy servers and Network Address Translation (NAT) routers allow more IPv4 addresses

Configuring the Network (5 of 5)

- Configuring IP on a network interface
  - Automatic from Dynamic Host Configuration Protocol (DHCP) or Boot Protocol (BOOTP) server
- Process varies on IPv4 or IPv6 networks
- Automatic address assignment features
  - Automatic Private IP Addressing (APIPA)
  - Internet Control Message Protocol version 6 (ICMPv6)
- Can manually configure IP on a network interface within Server Manager

Configuring the Firewall

- Perimeter network or demilitarized zone (DMZ)
  - Contains servers surrounded by routers
  - Routers implement advanced firewall capabilities for traffic passing into network
- Disable or modify DMZ servers' firewall configurations within Server Manager
  - Navigate to Local Server
  - Select hyperlink next to Windows Defender Firewall in the Properties window

Changing the Default Computer Name and Domain Membership

- Installation assigns randomly generated computer name for the server
- Change within Server Manager
  - Navigate to Local Server
  - Select hyperlink next to Computer name in the Properties window
  - Click the Change button and supply a new computer name
- Change within Windows Server Configuration Wizard on Server Core
  - Select option 2
- Finish by joining the server to a domain

Installing a Modern Web Browser

- Default Windows Server 2019 Web browser: Internet Explorer
  - Provided for legacy application support only
- Internet Explorer Enhanced Security Configuration (IE ESC) blocks Web sites
- Disable IE ESC within Server Manager
  - Navigate to Local Server
  - Select hyperlink next to IE Enhanced Security Configuration in the Properties window
  - Disable IE ESC for all users or system administrators

Activating the Windows Server Operating System

- Automatic activation performed based on Generic Volume License Key (GVLK)
  - Requires organization's Key Management Services (KMS) installed on a network server
  - Requires Active Directory-based Activation role installed on a domain controller within the domain
- Organization can purchase a retail product key or Multiple Activation Key (MAK)
- Activation within Server Manager by navigating to Local Server
  - Select hyperlink next to Product ID in the Properties window
  - Enter license key and click Activate to complete the activation process

Selecting a Windows Server 2019 Lab Environment

- Hands-On Projects within this book will require Hyper-V
- Can install Windows Server 2019 directly on a computer
  - Not necessarily practical
- Can use Windows 10 Professional, Enterprise, and Education editions
  - These releases provide support for Hyper-V and nested virtualization

Summary

- Windows Server 2019 installs on an on-premises rackmount server or a VM
- Microsoft's Hyper-V is often used with the nested virtualization feature
- Windows Server 2019 has many key features and containers to host Web apps
- Several tools are used to configure and manage Windows Server 2019
- Server Core and Nano Server are two small footprint installation options
- Three major editions of Windows Server 2019 exist
- Several installation and post-installation tasks are typically performed