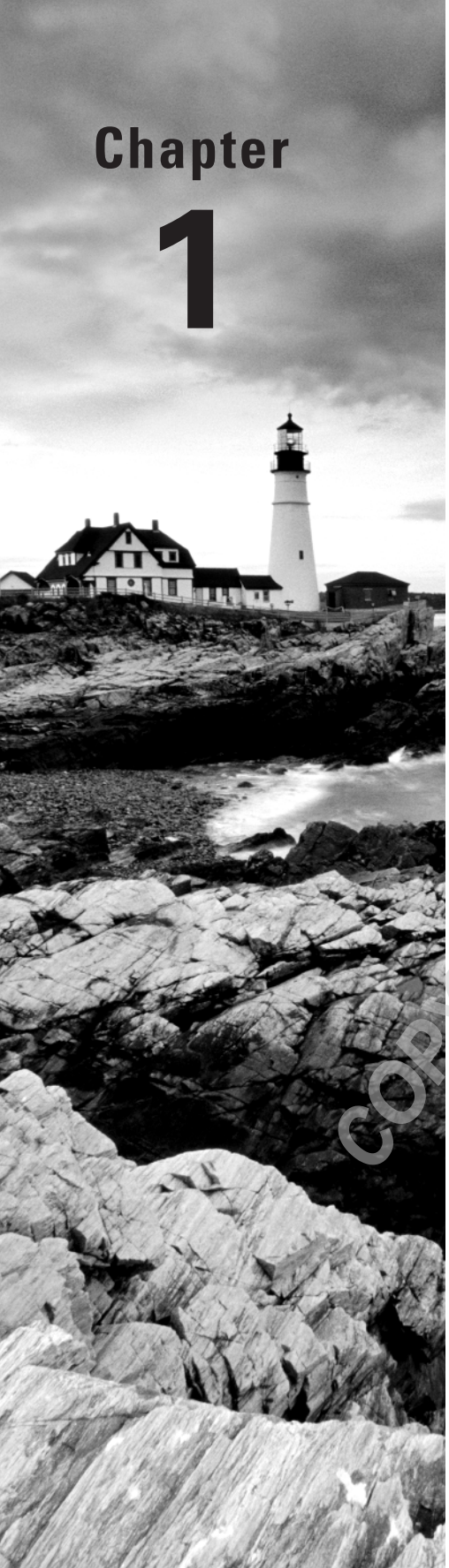

Chapter

1

Introduction to Windows Server 2022

So, you have decided to start down the track of Windows Server 2022. The first question we must ask ourselves is, what's the first step? Well, the first step is to learn what's new about the Windows Server 2022 features and benefits that are available and how these features can help improve your organization's network.

So that's where I am going to start. I will talk about the different Windows Server 2022 versions and what version may be best for you. In this chapter, I will introduce you to Windows Server 2022, but you probably won't see too many questions on the exam for this chapter. But it's important you understand the features that have been added and removed so that you can do the job properly and not just pass the exams.

So, let's dive right into the server by talking about some of the features and advantages of Windows Server 2022.

Features and Advantages of Windows Server 2022

Before you decide to install and configure Windows Server 2022, it's first important to learn about some of the features and the advantages it offers. Windows Server 2022 is built off the solid foundation of Windows Server 2016 and Windows Server 2019, but Microsoft has stated that Windows Server 2022 is "the cloud-ready operating system." This means that many of the features of Windows Server 2022 are built and evolve around cloud-based software and networking.

I will talk about all of these features in greater detail throughout this book. What follows are merely brief descriptions of some of the features of Windows Server 2022:

Built-in Security Microsoft has always tried to make sure that their operating systems are as secure as possible, but with Windows Server 2022, Microsoft has included Windows Defender Advanced Threat Protection (ATP). This feature helps stop attackers on your system and allows your company to meet any compliance requirements.

Active Directory Certificate Services *Active Directory Certificate Services (AD CS)* provides a customizable set of services that allow you to issue and manage *public key infrastructure (PKI) certificates*. These certificates can be used in software security systems that employ public key technologies.

Active Directory Domain Services *Active Directory Domain Services (AD DS)* includes new features that make deploying domain controllers simpler and that let you implement them faster. AD DS also makes the domain controllers more flexible, both to audit and to authorize for access to files. Moreover, AD DS has been designed to make performing administrative tasks easier through consistent graphical and scripted management experiences.

Active Directory Federation Services *Active Directory Federation Services (AD FS)* provides Internet-based clients with a secure identity access solution that works on both Windows and non-Windows operating systems. AD FS gives users the ability to do a *single sign-on (SSO)* and access applications on other networks without needing a secondary password. Federation Services is one of the ways that you can connect your on-site domain with the cloud.

Active Directory Lightweight Directory Services *Active Directory Lightweight Directory Services (AD LDS)* is a *Lightweight Directory Access Protocol (LDAP)* directory service that provides flexible support for directory-enabled applications, without the dependencies and domain-related restrictions of AD DS.

Active Directory Rights Management Services *Active Directory Rights Management Services (AD RMS)* provides management and development tools that let you work with industry security technologies, including encryption, certificates, and authentication. Using these technologies allows you to create reliable information protection solutions.

Application Server *Application Server* provides an integrated environment for deploying and running custom, server-based business applications.

BitLocker *BitLocker* is a tool that allows you to encrypt the hard drives of your computer. By encrypting the hard drives, you can provide enhanced protection against data theft or unauthorized exposure of your computers or removable drives that are lost or stolen.

BranchCache *BranchCache* allows data from files and web servers on a wide area network (WAN) to be cached on computers at a local branch office. By using BranchCache, you can improve application response times while also reducing WAN traffic. Cached data can be either distributed across peer client computers (distributed cache mode) or centrally hosted on a server (hosted cache mode). BranchCache is included with Windows Server 2022 and Windows 10/11.

Containers Windows Server 2022 has continued focusing on an isolated operating system environment called *Dockers*. Dockers allow applications to run in isolated environments called *containers*. Containers are separate locations where applications can operate without affecting other applications or other operating system resources. To understand Dockers and containers, think of virtualization.

Virtual machines are operating systems that run in their own space on top of another operating system. Dockers and containers allow an application to run in its own space, and because of this, it doesn't affect other applications. There are two different types of containers you should focus on:

Windows Server Containers Windows Server 2022 allows an isolated application to run by using a technology called process and namespace isolation. Windows Server 2022 containers allow applications to share the system's kernel with their container and all other containers running on the same host.

Hyper-V Containers Windows Server 2022 Hyper-V containers add another virtual layer by isolating applications in their own optimized virtual machine. Hyper-V containers work differently than Windows Server containers in that the Hyper-V containers do not share the system's kernel with other Hyper-V containers.

Credential Guard Credential Guard helps protect a system's credentials, and this helps avoid pass-the-hash attacks. Credential Guard offers better protection against advanced persistent threats by protecting credentials on the system from being stolen by a compromised administrator or malware.

Credential Guard can also be enabled on Remote Desktop Services servers and Virtual Desktop Infrastructure so that the credentials for users connecting to their sessions are protected.

DHCP *Dynamic Host Configuration Protocol (DHCP)* is an Internet standard that allows organizations to reduce the administrative overhead of configuring hosts on a TCP/IP-based network. Some of the features are DHCP failover, policy-based assignment, and the ability to use Windows PowerShell for DHCP Server.

DNS *Domain Name System (DNS)* services are used in TCP/IP networks. DNS will convert a computer name or fully qualified domain name (FQDN) to an IP address. DNS also has the ability to do a reverse lookup and convert an IP address to a computer name. DNS allows you to locate computers and services through user-friendly names.

Failover Clustering *Failover Clustering* gives an organization the ability to provide high availability and scalability to networked servers. Failover clusters can include file share storage for server applications, such as Hyper-V and Microsoft SQL Server, and for applications that run on physical servers or virtual machines.

File Server Resource Manager *File Server Resource Manager* is a set of tools that allows you to manage and control the amount and type of data stored on the organization's servers. By using File Server Resource Manager, you have the ability to set up file management tasks, use quota management, get detailed reports, set up a file classification infrastructure, and configure file-screening management.

File and Storage Services *File and Storage Services* allows you to set up and manage one or more file servers. These servers can provide a central location on your network where you can store files and then share those files with network users. If users require access to the same files and applications or if centralized backup and file management are important issues for an organization, you should set up network servers as a file server.

Group Policy *Group Policies* are a set of rules and management configuration options that you can control through the Group Policy settings. These policy settings can be placed on users' computers throughout the organization.

Hyper-V *Hyper-V* is one of the most changed features in Windows Server 2022. Hyper-V allows you to consolidate servers by creating and managing a virtualized computing environment. It does this by using virtualization technology that is built into Windows Server 2022.

Hyper-V allows you to run multiple operating systems simultaneously on one physical computer. Each virtual operating system runs in its own virtual machine environment.

Windows Server 2022 Hyper-V now allows you to protect your corporate virtual machines using the feature called *Shielded Virtual Machine*. Shielded Virtual Machines are encrypted using BitLocker and the VMs can only run on approved Hyper-V host systems.

Hyper-V also now includes a feature called *containers*. Containers add a new unique additional layer of isolation for containerized applications.

IPAM *IP Address Management (IPAM)* is one of the features first introduced with Windows Server 2012. IPAM allows you to customize and monitor the IP address infrastructure on a corporate network.

Kerberos Authentication Windows Server 2022 uses the *Kerberos authentication* protocol and extensions for password-based and public key authentication. The Kerberos client is installed as a *security support provider (SSP)*, and it can be accessed through the *Security Support Provider Interface (SSPI)*.

Managed Service Accounts Stand-alone *managed service accounts*, originally created for Windows Server 2008 R2 and Windows 7, are configured domain accounts that allow automatic password management and *service principal names* (SPNs) management, including the ability to delegate management to other administrators.

Nested Virtualization Windows Server 2022 allows you to use a Hyper-V feature called *Nested Virtualization*. Nested Virtualization allows you to create virtual machines within virtual machines. As an instructor, I find this to be an awesome new feature. Now I can build a Windows Server 2022 Hyper-V Server with a training virtual machine. Then when I get to the part when I need to teach Hyper-V, I can just do that right on the classroom virtual machine. There are numerous possibilities, and we will talk more about them throughout this book.

Nano Server Windows Server 2022 allows you to set up a unique type of server installation called Nano Server. Nano Server requires you to remotely administer the server operating system. It was primarily designed and optimized for private clouds and datacenters. Nano Server is very similar to Server Core, but the Nano Server operating system uses significantly smaller hard drive space, has no local logon capability, and only supports 64-bit applications and tools.

Networking There are many networking technologies and features in Windows Server 2022, including BranchCache, Data Center Bridging (DCB), NIC Teaming, and many more.

Network Load Balancing The *Network Load Balancing (NLB)* feature dispenses traffic across multiple servers by using the TCP/IP networking protocol. By combining two or more computers that are running applications in Windows Server 2022 into a single virtual cluster, NLB provides reliability and performance for mission-critical servers.

Network Policy and Access Services Use the *Network Policy Server (NPS) and Access Services* server role to install and configure *Network Access Protection (NAP)*, secure wired and wireless access points, and use RADIUS servers and proxies.

Print and Document Services *Print and Document Services* allows you to centralize print server and network printer tasks. This role also allows you to receive scanned documents from network scanners and route the documents to a shared network resource, Windows SharePoint Services site, or email addresses. Print and Document Services also provides fax servers with the ability to send and receive faxes while also giving you the ability to manage fax resources such as jobs, settings, reports, and fax devices on the fax server.

PowerShell Direct Windows Server 2022 includes a simple way to manage Hyper-V virtual machines called PowerShell Direct. PowerShell Direct is a powerful set of parameters for the `PSSession` cmdlet called `VMName`. This will be discussed in greater detail in the Hyper-V chapters, and it is included with Windows Server 2022.

Remote Desktop Services Before Windows Server 2008, we used to refer to this as Terminal Services. *Remote Desktop Services* allows users to connect to virtual desktops, RemoteApp programs, and session-based desktops. Using Remote Desktop Services allows users to access remote connections from within a corporate network or from the Internet.

Security Auditing *Security auditing* gives you the ability to help maintain the security of your enterprise. By using security audits, you can verify authorized or unauthorized access to machines, resources, applications, and services. One of the best advantages of security audits is to verify regulatory compliance.

Smart Cards Using *smart cards* (referred to as *two-factor authentication*) and their associated *personal identification numbers (PINs)* is a popular, reliable, and cost-effective way to provide authentication. When using smart cards, the user not only must have the physical card but must also know the PIN to be able to gain access to network resources. This is effective because even if the smart card is stolen, thieves can't access the network unless they know the PIN.

Software-Defined Networking The Software-Defined Networking (SDN) solution allows you to centrally configure and manage your physical and virtual network devices. These devices include items such as routers, switches, and gateways in your datacenter.

Telemetry The *Telemetry* service allows the Windows Feedback Forwarder to send feedback to Microsoft automatically by deploying a Group Policy setting to one or more organizational units. Windows Feedback Forwarder is available on all editions of Windows Server 2022, including Server Core.

TLS/SSL (Schannel SSP) *Schannel* is a security support provider (SSP) that uses the *Secure Sockets Layer (SSL)* and *Transport Layer Security (TLS)* Internet standard authentication protocols together. The Security Support Provider Interface is an API used by Windows systems to allow security-related functionality, including authentication.

Volume Activation Windows Server 2022 *Volume Activation* will help your organization benefit from using this service to deploy and manage volume licenses for a medium to large number of computers.

Web Server (IIS) The *Web Server (IIS)* role in Windows Server 2022 allows you to set up a secure, easy-to-manage, modular, and extensible platform for reliably hosting websites, services, and applications.

Windows Deployment Services *Windows Deployment Services* allows you to install Windows operating systems remotely. You can use Windows Deployment Services to set up new computers by using a network-based installation.

Windows PowerShell Desired State Configuration Windows Server 2022 allows you to create a PowerShell management platform called Windows PowerShell Desired State Configuration (DSC). DSC enables the deployment and management of configuration data for software services and also helps you manage the environment in which these services run.

DSC allows you to use Windows PowerShell language extensions along with new Windows PowerShell cmdlets and resources. DSC lets you declaratively specify how your corporation wants their software environment to be configured and maintained.

DSC allows you to automate tasks like enabling or disabling server roles and features, manage Registry settings, manage files and directories, manage groups and users, deploy software, and run PowerShell scripts, to name just a few.

Windows Server Backup Feature The *Windows Server Backup* feature gives your organization a way to back up and restore Windows servers. You can use Windows Server Backup to back up the entire server (all volumes), selected volumes, the system state, or specific files or folders.

Windows Server Update Services *Windows Server Update Services (WSUS)* allows you to deploy application and operating system updates. By deploying WSUS, you have the ability to manage updates that are released through Microsoft Windows Update to computers in your network. This feature is integrated with the operating system as a server role on a Windows Server 2022 system.

Deciding Which Windows Server 2022 Version to Use

You may be wondering which version of Windows Server 2022 is best for your organization. After all, Microsoft offers the following four versions of Windows Server 2022:

Windows Server 2022 Datacenter This version is designed for organizations that are looking to migrate to a highly virtualized, private cloud environment. Windows Server 2022 Datacenter has full Windows Server functionality with unlimited virtual instances.

Windows Server 2022 Standard This version is designed for organizations with physical or minimally virtualized environments. Windows Server 2022 Standard has full Windows Server functionality with two virtual instances.

Windows Server 2022 Datacenter: Azure Edition Windows Server Azure Edition is a Windows Server version designed specifically to operate either as an Azure IaaS VM or as a VM on an Azure Stack HCI cluster.

Windows Server 2022 Essentials This version is ideal for small businesses that have as many as 25 users and 50 devices. Windows Server 2022 Essentials has a simpler interface and preconfigured connectivity to cloud-based services but no virtualization rights.

Table 1.1 shows the locks and limitations of Windows Server 2022 Standard and Windows Server 2022 Datacenter. The information in this chart was taken directly from Microsoft's website.

TABLE 1.1 Windows Server 2022 locks and limits

Locks and Limits	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Maximum number of users	Based on CALs	Based on CALs
Maximum SMB connections	16,777,216	16,777,216
Maximum RRAS connections	Unlimited	Unlimited
Maximum IAS connections	2,147,483,647	2,147,483,647
Maximum RDS connections	65,535	65,535

Locks and Limits	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Maximum number of 64-bit sockets	64	64
Maximum number of cores	Unlimited	Unlimited
Maximum RAM	24TB	24TB
Can be used as virtualization guest	Yes, two virtual machines, plus one Hyper-V host per license	Yes, unlimited virtual machines, plus one Hyper-V host per license
Server can join a domain	Yes	Yes
Edge network protection/firewall	No	No
DirectAccess	Yes	Yes
DLNA codecs and web media streaming	Yes, if installed as Server with Desktop Experience	Yes, if installed as Server with Desktop Experience

Table 1.2 shows the differences between Windows Server 2022 Standard and Windows Server 2022 Datacenter. The information in this chart was also taken directly from Microsoft's website.

TABLE 1.2 Windows Server 2022 Standard vs. Datacenter

Windows Server roles available	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Active Directory Certificate Services	Yes	Yes
Active Directory Domain Services	Yes	Yes
Active Directory Federation Services	Yes	Yes
AD Lightweight Directory Services	Yes	Yes

TABLE 1.2 Windows Server 2022 Standard vs. Datacenter *(Continued)*

Windows Server roles available	Windows Server 2022 Standard	Windows Server 2022 Datacenter
AD Rights Management Services	Yes	Yes
Device Health Attestation	Yes	Yes
DHCP Server	Yes	Yes
DNS Server	Yes	Yes
Fax Server	Yes	Yes
File and Storage Services	Yes	Yes
Host Guardian Service	Yes	Yes
Hyper-V	Yes	Yes, including Shielded Virtual Machines
Network Controller	No	Yes
Network Policy and Access Services	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Print and Document Services	Yes	Yes
Remote Access	Yes	Yes
Remote Desktop Services	Yes	Yes
Volume Activation Services	Yes	Yes
Web Services (IIS)	Yes	Yes
Windows Deployment Services	Yes*	Yes
Windows Server Essentials Experience	No	No
Windows Server Update Services	Yes	Yes

Table 1.3 shows the features of Windows Server 2022 Standard and Windows Server 2022 Datacenter. The information in this chart was also taken directly from Microsoft's website.

TABLE 1.3 Windows Server 2022 Standard vs. Datacenter

Windows Server features installable with Server Manager (or PowerShell)	Windows Server 2022 Standard	Windows Server 2022 Datacenter
.NET Framework 3.5	Yes	Yes
.NET Framework 4.7	Yes	Yes
Background Intelligent Transfer Service (BITS)	Yes	Yes
BitLocker Drive Encryption	Yes	Yes
BitLocker Network Unlock	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
BranchCache	Yes	Yes
Client for NFS	Yes	Yes
Containers	Yes (unlimited Windows containers; up to two Hyper-V containers)	Yes (unlimited Windows and Hyper-V containers)
Data Center Bridging	Yes	Yes
Direct Play	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Enhanced Storage	Yes	Yes
Failover Clustering	Yes	Yes
Group Policy Management	Yes	Yes
Host Guardian Hyper-V Support	No	Yes
I/O Quality of Service	Yes	Yes
IIS Hostable Web Core	Yes	Yes

TABLE 1.3 Windows Server 2022 Standard vs. Datacenter *(Continued)*

Windows Server features installable with Server Manager (or PowerShell)	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Internet Printing Client	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
IPAM Server	Yes	Yes
iSNS Server service	Yes	Yes
LPR Port Monitor	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Management OData IIS Extension	Yes	Yes
Media Foundation	Yes	Yes
Message Queueing	Yes	Yes
Multipath I/O	Yes	Yes
MultiPoint Connector	Yes	Yes
Network Load Balancing	Yes	Yes
Peer Name Resolution Protocol	Yes	Yes
Quality Windows Audio Video Experience	Yes	Yes
RAS Connection Manager Administration Kit	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Remote Assistance	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Remote Differential Compression	Yes	Yes
RSAT	Yes	Yes
RPC over HTTP Proxy	Yes	Yes

Windows Server features installable with Server Manager (or PowerShell)	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Setup and Boot Event Collection	Yes	Yes
Simple TCP/IP Services	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
SMB 1.0/CIFS File Sharing Support	Installed	Installed
SMB Bandwidth Limit	Yes	Yes
SMTP Server	Yes	Yes
SNMP Service	Yes	Yes
Software Load Balancer	Yes	Yes
Storage Replica	Yes	Yes
Telnet Client	Yes	Yes
TFTP Client	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
VM Shielding Tools for Fabric Management	Yes	Yes
WebDAV Redirector	Yes	Yes
Windows Biometric Framework	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Windows Defender features	Installed	Installed
Windows Identity Foundation 3.5	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Windows Internal Database	Yes	Yes
Windows PowerShell	Installed	Installed

TABLE 1.3 Windows Server 2022 Standard vs. Datacenter *(Continued)*

Windows Server features installable with Server Manager (or PowerShell)	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Windows Process Activation Service	Yes	Yes
Windows Search Service	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Windows Server Backup	Yes	Yes
Windows Server Migration Tools	Yes	Yes
Windows Standards-Based Storage Management	Yes	Yes
Windows TIFF IFilter	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
WinRM IIS Extension	Yes	Yes
WINS Server	Yes	Yes
Wireless LAN Service	Yes	Yes
WoW64 support	Installed	Installed
XPS Viewer	Yes, when installed as Server with Desktop Experience	Yes, when installed as Server with Desktop Experience
Features available generally	**Windows Server 2022 Standard**	**Windows Server 2022 Datacenter**
Best Practices Analyzer	Yes	Yes
Direct Access	Yes	Yes
Dynamic Memory (in virtualization)	Yes	Yes
Hot Add/Replace RAM	Yes	Yes

Features available generally	Windows Server 2022 Standard	Windows Server 2022 Datacenter
Microsoft Management Console	Yes	Yes
Minimal Server Interface	Yes	Yes
Network Load Balancing	Yes	Yes
Windows PowerShell	Yes	Yes
Server Core installation option	Yes	Yes
Server Manager	Yes	Yes
SMB Direct and SMB over RDMA	Yes	Yes
Software-Defined Networking	No	Yes
Storage Migration Service	Yes	Yes
Storage Replica	Yes, (1 partnership and 1 resource group with a single 2TB volume)	Yes, unlimited
Storage Spaces	Yes	Yes
Storage Spaces Direct	No	Yes
Volume Activation Services	Yes	Yes
VSS (Volume Shadow Copy Service) integration	Yes	Yes
Windows Server Update Services	Yes	Yes
Windows System Resource Manager	Yes	Yes
Server license logging	Yes	Yes
Inherited activation	As guest if hosted on Datacenter	Can be a host or a guest
Work Folders	Yes	Yes

Once you choose what roles are going on your server, you must then decide how you're going to install Windows Server 2022. There are two ways to install Windows Server 2022: you can upgrade a Windows Server 2012 R2 (or above) machine to Windows Server 2022, or you can do a clean install of Windows Server 2022. If you are running any version of Server before 2012 R2, you must first upgrade to Windows Server 2012 R2 or 2016 before upgrading to Windows Server 2022. If you decide that you are going to upgrade, you must follow specific upgrade paths.

Microsoft best practice recommendation for installing servers is to always do a clean install and not an upgrade. Upgrading from Windows Server 2012 R2 and higher is possible. But Microsoft recommends that you always do a clean install of a server.

Your choice of Windows Server 2022 version is dictated by how your current network is designed. If you are building a network from scratch, then it's pretty straightforward. Just choose the Windows Server 2022 version based on your server's tasks. However, if you already have a version of Windows Server 2012 installed, you should follow the recommendations in Table 1.4, which briefly summarize the supported upgrade paths to Windows Server 2022.

TABLE 1.4 Supported Windows Server 2022 upgrade path recommendations

Current system	Upgraded system
Windows Server 2012 Standard	Windows Server 2016 Standard or Datacenter
Windows Server 2012 Datacenter	Windows Server 2016 Datacenter
Windows Server 2012 R2 Standard	Windows Server 2022 Standard or Datacenter
Windows Server 2012 R2 Datacenter	Windows Server 2022 Datacenter
Windows Server 2012 R2 Essentials	Windows Server 2022 Essentials
Windows Storage Server 2016 Standard	Windows Storage Server 2022 Standard
Windows Storage Server 2016 Datacenter	Windows Storage Server 2022 Datacenter

Deciding on the Type of Installation

One of the final choices you must make before installing Windows Server 2022 is what type of installation you want. There are three ways to install Windows Server 2022, which we'll look at next.

Windows Server 2022 (Desktop Experience)

This is the version with which most administrators are familiar. This is the version that uses *Microsoft Management Console (MMC)* windows, and it is the version that allows the use of a mouse to navigate through the installation.

Windows Server 2022 Server Core

This is a bare-bones installation of Windows Server 2022. You can think of it this way: if Windows Server 2022 (Desktop Experience) is a top-of-the-line luxury car, then Windows Server 2022 Server Core is the stripped-down model with manual windows, cloth seats, and no air-conditioning. It might not be pretty to look at, but it gets the job done.

Real World Scenario

Server Core

Here is an explanation of Server Core that I have used ever since it was introduced in Windows Server 2008.

I am a *huge* sports fan. I love watching sports on TV, and I enjoy going to games. If you have ever been to a hockey game, you know what a hockey goal looks like. Between hockey periods, the stadium workers often bring out a huge piece of Plexiglas onto the ice. There is a tiny square cut out of the bottom of the glass. The square is just a bit bigger than a hockey puck itself.

Now they pick some lucky fan out of the stands, give them a puck at center ice, and then ask them to shoot the puck into the net with the Plexiglas in front of it. If they get it through that tiny little square at the bottom of the Plexiglas, they win a car or some such great prize.

Well, Windows Server 2022 (Desktop Experience) is like regular hockey with an open net, and Windows Server 2022 Server Core is the Plexiglas version. Because Windows Server 2022 Server Core has the plexiglass, Microsoft refers to this as a smaller attack surface.

Server Core supports a limited number of roles:

- Active Directory Certificate Services (AD CS)
- Active Directory Domain Services (AD DS)
- Active Directory Federation Services (AD FS)
- Active Directory Lightweight Directory Services (AD LDS)
- Active Directory Rights Management Services (AD RMS)
- Application Server
- DHCP Server
- DNS Server

- Fax Server
- File and Storage Services
- BITS Server
- BranchCache
- Hyper-V
- Network Policy and Access Services
- Print and Document Services
- Remote Access
- Remote Desktop Services
- Volume Activation Services
- Web Server (IIS)
- Windows Deployment Services
- Windows Server Update Services
- .NET Framework 3.5 Features
- .NET Framework 4.5 Features
- Streaming Media Services
- Failover Clustering
- iSCSI
- Network Load Balancing
- MPIO
- qWave
- Telnet Server/Client
- Windows Server Migration Tools
- Windows PowerShell 5.0

Server Core does not have the normal Windows interface or GUI. Almost everything has to be configured via the command line or, in some cases, using the Remote Server Administration Tools from a full version of Windows Server 2022. Although this might scare off some administrators, it has the following benefits:

Reduced Management Because Server Core has a minimum number of applications installed, it reduces management effort.

Minimal Maintenance Only basic systems can be installed on Server Core, so it reduces the upkeep you would need to perform in a normal server installation.

Smaller Footprint Server Core requires only 1 GB of disk space to install and 2 GB of free space for operations.

Tighter Security With only a few applications running on a server, it is less vulnerable to attacks.

Server Core App Compatibility Features on Demand Windows Server 2022 now includes the Server Core App Compatibility Features on Demand (FODs). This feature drastically improves the application compatibility of the Windows Server Core installation. It does this by containing a subset of components from Windows Server 2022 with the Desktop Experience but without adding the Windows Server Desktop Experience graphical environment. The advantage is that this helps increase the functionality and compatibility of Windows Server 2022 Server Core while keeping it as lean as possible.

The prerequisites for Server Core are basic. It requires the Windows Server 2022 installation media, a product key, and the hardware on which to install it.

After you install the base operating system, you use PowerShell or the remote administrative tools to configure the network settings, add the machine to the domain, create and format disks, and install roles and features. It takes only a few minutes to install Server Core, depending on the hardware.

Real World Scenario

Better Security

When I started in this industry more than 20 years ago, I was a programmer. I used to program computer hospital systems. When I switched to the networking world, I continued to work under contract with hospitals and with doctors' offices.

One problem I ran into is that many doctors are affiliated with hospitals, but they don't actually have offices within the hospital. Generally, they have offices either near the hospital or, in some cases, right across the street.

Here is the issue: do we put servers in the doctors' offices, or do we make the doctor log into the hospital network through a remote connection? Doctors' offices normally don't have computer rooms, and we don't want to place a domain controller or server on someone's desk. It's just unsafe!

This is where Windows Server 2022 Server Core can come into play. Since it is a slimmed-down version of Windows and there is no GUI, it makes it harder for anyone in the office to hack into the system. Also, Microsoft introduced a new domain controller in Windows Server 2008 called a *read-only domain controller (RODC)*. As its name suggests, it is a read-only version of a domain controller (explained in detail later in this book).

With Server Core and an RODC, you can feel safer placing a server on someone's desk or in any office. Server Core systems allow you to place servers in areas that you would never have placed them before. This can be a great advantage to businesses that have small, remote locations without full server rooms.

Windows Server 2022 Nano Server

Windows Server 2022 allows you to set up a type of server installation called Nano Server. Nano Server lets you remotely administer the server operating system. It was primarily designed and optimized for private clouds and datacenters. Nano Server is very similar to Server Core, but the Nano Server operating system uses significantly smaller hard drive space, has no local logon capability, and only supports 64-bit applications and tools. Nano Server has no local logon and must be administered remotely.

Removed Features

As with all new versions of Windows Servers, Microsoft decided to remove or retire features or services that are no longer needed. The following are features and services that were replaced starting with Windows Server 2022:

IIS 6 Management Compatibility The following features were removed in the first release of Windows Server 2022: IIS 6 Metabase Compatibility (Web-Metabase), IIS 6 Management Console (Web-Lgcy-Mgmt-Console), IIS 6 Scripting Tools (Web-Lgcy-Scripting), and IIS 6 WMI Compatibility (Web-WMI).

IIS Digest Authentication Microsoft plans to replace the IIS Digest Authentication method. You should use other authentication methods. These methods include Client Certificate Mapping and Windows Authentication.

Internet Storage Name Service (iSNS) iSNS is being replaced by the Server Message Block (SMB) feature. This feature offers basically the same functionality with additional features.

RSA/AES Encryption for IIS The RSA/AES Encryption for IIS method is being replaced by the improved Cryptography API: Next Generation (CNG) method.

Windows PowerShell 2.0 The Windows PowerShell 2.0 version has been surpassed by several more recent versions. You can get the superior features and performance if you use Windows PowerShell 5.0 or later.

The following are features and services that are being replaced starting with Windows Server 2022 version 1803:

File Replication Service File Replication Services were first introduced in Windows Server 2003 R2. They have now been replaced by DFS Replication.

Hyper-V Network Virtualization (HNV) Hyper-V Network Virtualization (HNV) has been replaced because Network Virtualization is now included in Windows Server 2022 as part of the Software-Defined Networking (SDN) solution. SDN also includes items such as the Network Controller, Software Load Balancing, User-Defined Routing, and Access Control Lists.

Table 1.5 shows all the features and roles that are no longer being developed. The information in the next two charts was taken directly from Microsoft's website.

TABLE 1.5 Features and roles no longer being developed

Feature or roles	You can use . . .
Business Scanning, also called Distributed Scan Management (DSM)	The Scan Management functionality was introduced in Windows Server 2008 R2 and enabled secure scanning and the management of scanners in an enterprise. Microsoft is no longer investing in this feature, and there are no devices available that support it.
IPv4/6 Transition Technologies (6to4, ISATAP, and Direct Tunnels)	6to4 has been disabled by default since Windows 10/11, version 1607 (the Anniversary Update), ISATAP has been disabled by default since Windows 10/11, version 1703 (the Creators Update), and Direct Tunnels has always been disabled by default. Please use native IPv6 support instead.
MultiPoint Services	Microsoft is no longer developing the MultiPoint Services role as part of Windows Server. MultiPoint Connector services are available through Features on Demand for both Windows Server and Windows 10/11. You can use Remote Desktop Services, in particular the Remote Desktop Services Session Host, to provide RDP connectivity.
Offline symbol packages (Debug symbol MSIs)	Microsoft is no longer making the symbol packages available as a downloadable MSI. Instead, the Microsoft Symbol Server is moving to be an Azure-based symbol store. If you need the Windows symbols, connect to the Microsoft Symbol Server to cache your symbols locally or use a manifest file with `SymChk.exe` on a computer with Internet access.
Remote Desktop Connection Broker and Remote Desktop Virtualization Host in a Server Core installation	Most Remote Desktop Services deployments have these roles co-located with the Remote Desktop Session Host (RDSH), which requires Server with Desktop Experience; to be consistent with RDSH Microsoft is changing these roles to also require Server with Desktop Experience. Microsoft is no longer developing these RDS roles for use in a Server Core installation. If you need to deploy these roles as part of your Remote Desktop infrastructure, you can install them on Windows Server 2016 with Desktop Experience.
These roles are also included in the Desktop Experience installation option of Windows Server 2022. You can test them in the Windows Insider build of Windows Server 2022—just be sure to choose the LTSC image.	
RemoteFX 3D Video Adapter (vGPU)	Microsoft is developing new graphics acceleration options for virtualized environments. You can also use Discrete Device Assignment (DDA) as an alternative.

TABLE 1.5 Features and roles no longer being developed *(Continued)*

Feature or roles	You can use . . .
Software Restriction Policies in Group Policy	Instead of using the Software Restriction Policies through Group Policy, you can use AppLocker or Windows Defender Application Control to control which apps users can access and what code can run in the kernel.
Storage Spaces in a Shared configuration using an SAS fabric	Deploy Storage Spaces Direct instead. Storage Spaces Direct supports the use of HLK-certified SAS enclosures, but in a nonshared configuration, as described in the Storage Spaces Direct hardware requirements.
Windows Server Essentials Experience	Microsoft is no longer developing the Essentials Experience role for the Windows Server Standard or Windows Server Datacenter SKUs. If you need an easy-to-use server solution for small-to-medium businesses, check out the new Microsoft 365 for Business solution, or use Windows Server 2016 Essentials.

Table 1.6 shows the features that are no longer being developed starting with Windows Server 2022.

TABLE 1.6 Features no longer being developed in Server 2022

Feature	Instead, you can use . . .
Hyper-V vSwitch on LBFO	In a future release, the Hyper-V vSwitch will no longer have the capability to be bound to an LBFO team. Instead, it must be bound via Switch Embedded Teaming (SET).
XDDM-based remote display driver (new)	Starting with this release the Remote Desktop Services uses a Windows Display Driver Model (WDDM)-based Indirect Display Driver (IDD) for a single session remote desktop. The support for Windows 2000 Display Driver Model (XDDM)-based remote display drivers will be removed in a future release. Independent software vendors (ISVs) that use the XDDM-based remote display driver should plan a migration to the WDDM driver model. For more information on implementing remote display indirect display drivers, ISVs can reach out to `rdsdev@microsoft.com`.
UCS log collection tool (new)	The UCS log collection tool, while not explicitly intended for use with Windows Server, is nonetheless being replaced by the Feedback hub on Windows 10/11.

Feature	Instead, you can use . . .
Key Storage Drive in Hyper-V	Microsoft is no longer working on the Key Storage Drive feature in Hyper-V. If you're using generation 1 VMs, check out Generation 1 VM Virtualization Security for information about options going forward. If you're creating new VMs, use Generation 2 virtual machines with TPM devices for a more secure solution.
Trusted Platform Module (TPM) management console	The information previously available in the TPM management console is now available on the Device security page in the Windows Defender Security Center.
Host Guardian Service Active Directory attestation mode	Microsoft is no longer developing Host Guardian Service Active Directory attestation mode—instead, they have added a new attestation mode, host key attestation, that's far simpler and equally as compatible as Active Directory–based attestation. This new mode provides equivalent functionality with a setup experience, simpler management, and fewer infrastructure dependencies than the Active Directory attestation. Host key attestation has no additional hardware requirements beyond what Active Directory attestation required, so all existing systems will remain compatible with the new mode.
OneSync service	The OneSync service synchronizes data for the Mail, Calendar, and People apps. Microsoft has added a sync engine to the Outlook app that provides the same synchronization.
Remote Differential Compression API support	Remote Differential Compression API support enabled synchronizing data with a remote source using compression technologies, which minimized the amount of data sent across the network.
WFP lightweight filter switch extension	The WFP lightweight filter switch extension enables developers to build simple network packet filtering extensions for the Hyper-V virtual switch. You can achieve the same functionality by creating a full filtering extension. As such, Microsoft will remove this extension in the future.

Summary

In this chapter, you studied the latest advantages of using Windows Server 2022. You also learned about the different roles and features you can install on a Windows Server 2022 machine. We explored how to migrate those roles and features from a Windows Server 2008, 2008 R2, 2012, 2012 R2, 2016, and Windows Server 2019 machine to a Windows Server 2022 machine.

I discussed the different upgrade paths that are available and which upgrades are best for your current network setup. You learned that another important issue to decide when installing Windows Server 2022 is whether to use Server Core, Nano, or the GUI installation.

I discussed a feature called Features on Demand, which allows you to remove roles and features from the operating system and remove the associated files completely from the hard drive, thus saving disk space.

Exam Essentials

Understand the upgrade paths. It's important to make sure you understand the various upgrade paths from Windows Server 2012 R2 and higher to Windows Server 2022.

Understand Windows Server 2022 server roles. Understand what the Windows Server 2022 server roles do for an organization and its users.

Understand Features On Demand. Understand the purpose of Features on Demand. Microsoft loves to ask exam questions about its new features, and this will be no exception. Understand how features and roles stay on the system until you physically remove them from the hard drive.

Review Questions

1. You are the administrator for ABC Company. You are looking to install Windows Server 2022, and you need to decide which version to install. You need to install a version of Windows that is just for logon authentication and nothing else. You want the most secure option, and cost is not an issue. What should you install?
   - **A.** Windows Server 2022 Datacenter (Desktop Experience)
   - **B.** Windows Server 2022 Datacenter Server Core
   - **C.** Windows Server 2022 Standard (Desktop Experience)
   - **D.** Windows Server 2022 Web Server Core

2. You are the IT manager for a large organization. One of your co-workers installed a new Windows Server 2022 Datacenter Server Core machine, but now the IT team has decided that it should be a Windows Server 2022 Datacenter (Desktop Experience). What should you do?
   - **A.** Reinstall Windows Server 2022 Datacenter Server Core on the same machine.
   - **B.** Install a new machine with Windows Server 2022 Datacenter Server Core.
   - **C.** Convert the current Windows Server 2022 Datacenter Server Core to the Windows Server 2022 Datacenter (Desktop Experience) version.
   - **D.** Dual-boot the machine with both Windows Server 2022 Datacenter Server Core and Windows Server 2022 Datacenter (Desktop Experience).

3. You are the administrator for your company, and you are looking at upgrading your Windows Server 2012 R2 Standard with GUI to Windows Server 2022. Which version of Windows Server 2022 does Microsoft recommend you use to keep the GUI interface?
   - **A.** Windows Server 2022 Datacenter (Desktop Experience)
   - **B.** Windows Server 2022 Standard (Desktop Experience)
   - **C.** Windows Server 2022 Datacenter
   - **D.** Windows Server 2022 Standard

4. You are looking at upgrading your Windows Server 2012 R2 Datacenter with GUI machine to Windows Server 2022. Your organization is considering virtualizing its entire server room, which has 25 servers. To which version of Windows Server 2022 would you upgrade while keeping the GUI interface?
   - **A.** Windows Server 2022 Datacenter (Desktop Experience)
   - **B.** Windows Server 2022 Standard (Desktop Experience)
   - **C.** Windows Server 2022 Datacenter
   - **D.** Windows Server 2022 Standard

5. You have been hired to help a small company set up its first Windows network. It has had the same 13 users for the entire two years it has been open, and the company has no plans to expand. What version of Windows Server 2022 would you recommend?
   - **A.** Windows Server 2022 Datacenter (Desktop Experience)
   - **B.** Windows Server 2022 Standard (Desktop Experience)
   - **C.** Windows Server 2022 Datacenter
   - **D.** Windows Server 2022 Essentials

6. You have been hired to help a small company set up its Windows network. It has 20 users, and it has no plans to expand. What version of Windows Server 2022 would you recommend?
   - **A.** Windows Server 2022 Datacenter
   - **B.** Windows Server 2022 Standard
   - **C.** Windows Server 2022 Essentials
   - **D.** Windows Server 2022 Datacenter (Desktop Experience)

7. Which of the following are benefits of using Windows Server 2022 Server Core? (Choose all that apply.)
   - **A.** Reduced management
   - **B.** Minimal maintenance
   - **C.** Smaller footprint
   - **D.** Tighter security

8. You are a server administrator, and you are trying to save hard drive space on your Windows Server 2022 Datacenter machine. Which feature can help you save hard disk space?
   - **A.** `HDSaver.exe`
   - **B.** Features on Demand
   - **C.** ADDS
   - **D.** WinRM

9. You are the IT director for your company. Your company needs to install a version of Windows Server 2022 that uses the Current Branch for Business servicing model. What version would you install?
   - **A.** Windows Server 2022 Datacenter
   - **B.** Windows Server 2022 Standard
   - **C.** Windows Server 2022 Essentials
   - **D.** Windows Server 2022 Nano Server

10. What type of server would you install into an area where physical security is a concern?
    - **A.** Windows Server 2022 Datacenter (Desktop Experience)
    - **B.** Windows Server 2022 Standard (Desktop Experience)
    - **C.** Windows Server 2022 Datacenter
    - **D.** Do not install servers into a nonsecure location.

11. You are the network administrator for a large training company. You need to install a way to automate the installation of Windows operating systems by using an image or through the network. What can you install to complete this task using Windows Server 2022?

A. WSUS

B. WDS

C. RIS

D. WRIS

12. Which version of Windows Server 2022 would you install if you want reduced management, minimal installation files, and tighter security? (Choose all that apply.)

A. Windows Server 2022 Datacenter (Desktop Experience)

B. Windows Server 2022 Standard (Desktop Experience)

C. Windows Server 2022 Datacenter

D. Windows Server 2022 Standard

13. Which version of Windows Server 2022 has no local logon and must be administered remotely?

A. Windows Server 2022 Datacenter

B. Windows Server 2022 Standard

C. Windows Server 2022 Nano Server

D. Windows Server 2022 Essentials

14. You are the administrator for a large company. Your manager has approached you and asked you about the Current Branch for Business servicing model. He wants to know which version of Windows Server 2022 uses this model. What version would you tell him uses the CBB servicing model?

A. Windows Server 2022 Datacenter

B. Windows Server 2022 Standard

C. Windows Server 2022 Essentials

D. Windows Server 2022 Nano Server

15. You are the administrator for StormWind Studios. You are looking to install Windows Server 2022 and you need to decide which version to install. You have to install a version of Windows into a remote location that does not have a server room, so security is an issue. You want the most secure option, and cost is not an issue. What should you install?

A. Windows Server 2022 Datacenter (Desktop Experience)

B. Windows Server 2022 Datacenter (Server Core)

C. Windows Server 2022 Standard (Desktop Experience)

D. Windows Server 2022 Essentials