

System Administration 1

Prepared by Dr. Ahmed Omar

IT391

System Administration 1

Lecture 3



Windows Server

Lecture 3

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Agenda

- ☐ Introduction to Windows Server
- ☐ Specialized Capabilities
- ☐ Advanced Technologies
- ☐ Server Roles and Services
- ☐ Administration Tools
- ☐ Windows Server Editions
- ☐ Installation Options
- ☐ Practical Installation Steps

Introduction to Windows Server

What is Windows Server?

Windows Server is a group of operating systems designed by **Microsoft** specifically for **server** environments, providing enterprise-level *management, data storage, applications, and communications*.



Introduction to Windows Server

- ☰ Designed for business applications and enterprise-level services
- 🏗️ Powers network infrastructure and centralized resource management
- 🗄️ Optimized for stability, security, and reliability
- 👥 Supports large-scale user and resource administration



Introduction to Windows Server

Key Purposes



Infrastructure

Provides core IT services like DNS, DHCP, and file sharing



Security

Centralized authentication and authorization via Active Directory



Applications

Hosting business applications and web services

History and Evolution

Windows Server Timeline

Windows NT Server (1993)

First true 32-bit Windows server OS, introducing the NT kernel that forms the foundation of modern Windows Server.

Windows 2000 Server (2000)

Introduced Active Directory, a cornerstone of Windows Server identity management to this day.

Windows Server 2003 (2003)

Enhanced security features and improved performance. First release under the "Windows Server" brand.

Windows Server 2008/R2 (2008-2009)

Introduced Server Core installation option and Hyper-V virtualization technology.

Windows Server 2012/R2 (2012-2013)

Major improvements to Hyper-V, storage, and networking capabilities. Enhanced cloud integration.

Windows Server 2016 (2016)

Added container support, Nano Server deployment option, and enhanced security features.

Windows Server 2019 (2018)

Improved hybrid cloud capabilities, advanced security, and better container support.

Windows Server 2022 (2021)

Enhanced security, Azure hybrid integration, and application platform improvements.

History and Evolution

Key Evolution Trends



Security Focus

Increasing emphasis on security features with each release



Cloud Integration

Evolution from on-premises to hybrid cloud capabilities



Containerization

Modern application deployment with container support

Key Differences

While Windows Server and Windows client operating systems share the same core, they are optimized for different purposes and environments.

Feature	Windows Client OS	Windows Server
Primary Use	Personal computing	Enterprise services
User Connections	Limited (20 max)	Unlimited
Hardware Limits	Lower RAM/CPU support	Higher RAM/CPU support
Licensing	Per device	Per server + CALs
GUI	Always included	Optional (Server Core)

Specialized Server Capabilities

Active Directory

Active Directory (AD) is a directory service developed by Microsoft for Windows domain networks. It is a central component of Windows Server that enables administrators to manage permissions and access to network resources.

Key Benefits :

- ✓ Centralized resource management
- ✓ Single sign-on to resources
- ✓ Standardized access control
- ✓ Scalable directory services

Specialized Server Capabilities

Active Directory

Core Components

Domain Controllers

Servers that store directory data and manage user/domain interactions, including authentication and directory searches.

Organizational Units (OUs)

Containers within the AD database that can hold users, groups, computers, and other OUs for organizing directory objects.

Group Policy

Infrastructure used to implement specific configurations for users and computers, controlling the working environment.

Trusts

Mechanisms that allow users in one domain to access resources in another domain through established trust relationships.

Specialized Server Capabilities

Advanced Networking Capabilities

Windows Server provides robust networking features designed for enterprise environments, enabling secure and efficient network management.

Key Networking Features

Network Controller

- ✓ Centralized management for physical and virtual networks
- ✓ Automated network configuration and monitoring
- ✓ REST API for programmatic control

Software Load Balancing (SLB)

- ✓ Layer 4 load balancing for network traffic
- ✓ High availability and scalability
- ✓ Lower cost alternative to hardware load balancers

Remote Direct Memory Access (RDMA)

- ✓ High-throughput, low-latency networking
- ✓ Supports Storage Spaces Direct and Hyper-V
- ✓ Reduces CPU overhead for network operations

Encrypted Networks

- ✓ Automatic encryption of network traffic
- ✓ Protection against man-in-the-middle attacks
- ✓ Secure communication between virtual machines

Specialized Server Capabilities

Hyper-V Overview

Hyper-V is Microsoft's hardware virtualization product that allows you to create and run virtual machines on Windows Server, providing efficient use of hardware resources.

Key Benefits

- ✓ **Server Consolidation** Run multiple server workloads on a single physical host
- ✓ **Resource Optimization** - Dynamically allocate computing resources
- ✓ **Isolation** - Separate workloads for improved security and reliability
- ✓ **Disaster Recovery** - Simplified backup and recovery options

Specialized Server Capabilities

Security Features

Windows Server implements a defense-in-depth approach with multiple security layers to protect against modern threats and vulnerabilities.

Advanced Security Features

Secured-core Server

- Hardware root-of-trust
- Firmware protection
- Virtualization-based security (VBS)

Windows Defender

- Advanced threat protection
- Real-time monitoring
- Behavior-based detection

Secure Connectivity

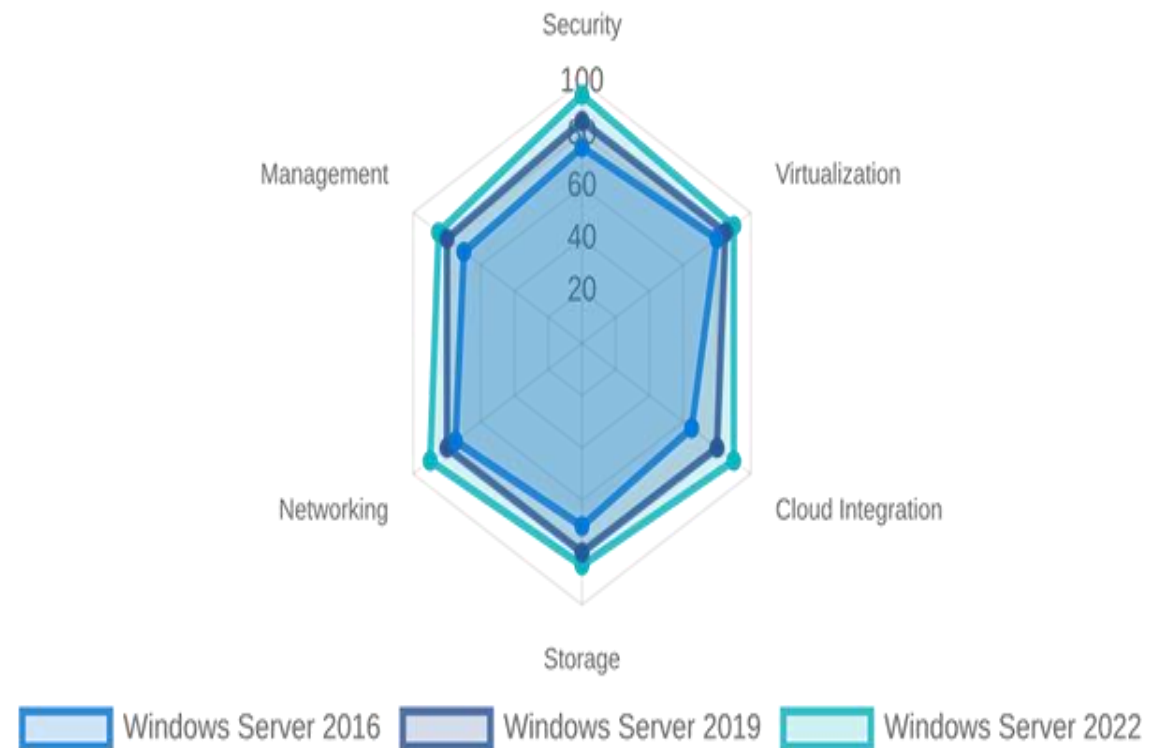
- DNS-over-HTTPS (DoH)
- TLS 1.3 support
- SMB encryption

Credential Protection

- Credential Guard
- Remote Credential Guard
- Protected Users security group

Feature Evolution

Feature Evolution Across Windows Server Versions



Server Roles and Services

What are Server Roles?

Server roles are collections of software programs that, when installed and properly configured, allow a computer to perform a specific function for multiple users or other computers within a network.

Role Installation

Server roles can be installed and managed through:

- Server Manager GUI
- PowerShell using Install-WindowsFeature
- Windows Admin Center
- Deployment tools like MDT or SCCM

Server Roles and Services

Common Server Roles

Identity & Security

-  **Active Directory Domain Services** - User and resource management
-  **Active Directory Certificate Services** - PKI infrastructure
-  **Network Policy Server** - Network access control

Web & Application

-  **Web Server (IIS)** - Hosting websites and web applications
-  **Remote Desktop Services** - Virtual desktop infrastructure
-  **Application Server** - Hosting business applications

File & Storage

-  **File Server** - Centralized file storage and sharing
-  **Storage Services** - Advanced storage management
-  **DFS** - Distributed File System for replication

Networking

-  **DHCP Server** - IP address management
-  **DNS Server** - Name resolution services
-  **Remote Access** - VPN and routing capabilities

Administration Tools

Windows Server provides multiple tools for administrators to manage servers efficiently

- **Windows Admin Center**

Browser-based management tool for servers, clusters, and infrastructure.

- **ServerManager**

Traditional GUI tool for managing server roles and features.

- **PowerShell**

Command-line shell and scripting language for automation.

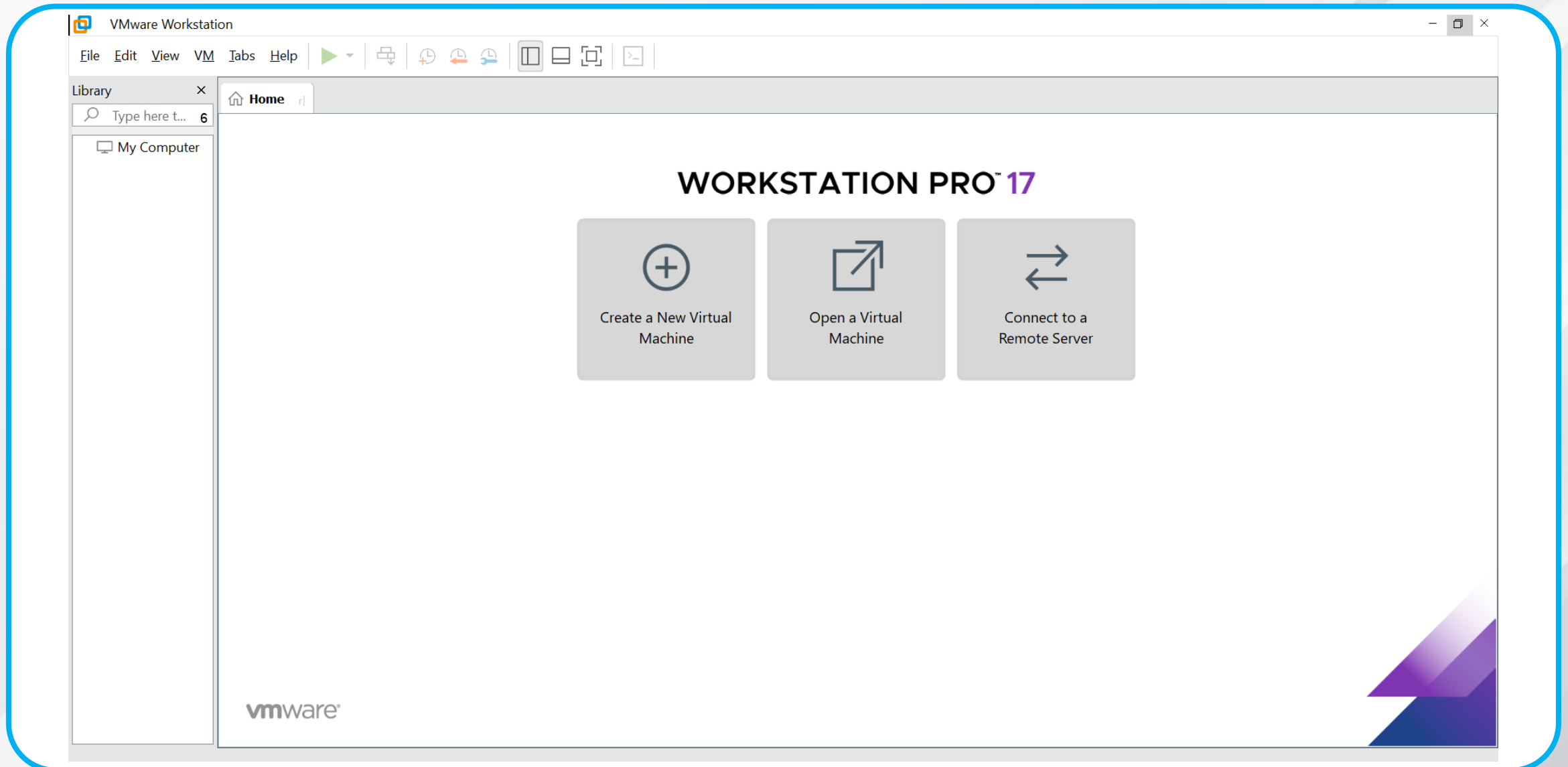
Windows Server Editions Overview

- ❑ **Windows Server Standard** is intended for physical or minimally virtualized environments, providing essential features and supporting **two** virtual machine instances . It includes core functionality like **Hyper-V containers**, **Storage Migration Service**, and limited Storage Replica capabilities
- ❑ **Windows Server Datacenter** is designed for **highly** virtualized data centers and **cloud** environments, offering unlimited virtualization rights and advanced features like Shielded Virtual Machines and Software-Defined Networking . It supports unlimited virtual instances and includes comprehensive enterprise features.
- ❑ **Windows Server Essentials** is tailored for small businesses, supporting a maximum of 25 users and 50 devices without requiring Client Access Licenses (CALs) . It's only available through Microsoft OEM partners

Installation Options and Considerations

- ☐ **Server Core Installation** provides a minimal, command-line driven environment without the traditional Windows graphical interface, This option offers several advantages:
 - Smaller disk space requirements
 - Lower RAM consumption
 - Reduced attack surface
 - Better performance for server roles
 - Management through PowerShell and remote tools
- ☐ **Server with Desktop Experience** includes the full Windows graphical interface, Windows Explorer, and traditional management tools . While this provides a familiar environment, it requires more system resources and presents a larger attack surface

Open VMware Workstation



Open VMware Workstation



Download Windows server

Windows Server 2022

Download link

<https://www.microsoft.com/en-us/evalcenter/download-windows-server-2022>

Download Windows server

Please select your Windows Server 2022 download

English (United States)	ISO downloads 64-bit edition >	VHD download 64-bit edition >	Try on Azure Learn more >	Create a VM in Azure Learn more >
Chinese (Simplified)	ISO downloads 64-bit edition >			
French	ISO downloads 64-bit edition >			

Open VMware Workstation



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New Virtual Machine Wizard

Guest Operating System Installation

A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

☐ Installer disc:

No drives available

☒ Installer disc image file (iso):

H:\MidOcean\IT391 - System Administration 1\Materail
Browse...

i Windows Server 2022 detected.
This operating system will use Easy Install. [\(What's this?\)](#)

☐ I will install the operating system later.

The virtual machine will be created with a blank hard disk.

Help
< Back
Next >
Cancel

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New Virtual Machine Wizard

Guest Operating System Installation
A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

☐ Installer disc:
No drives available

☐ Installer disc image file (iso):
H:\MidOcean\IT391 - System Administration 1\Materail Browse...

☒ I will install the operating system later.
The virtual machine will be created with a blank hard disk.

Help < Back Next > Cancel

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New Virtual Machine Wizard

Select a Guest Operating System

Which operating system will be installed on this virtual machine?

Guest operating system

☒ Microsoft Windows

☐ Linux

☐ VMware ESX

☐ Other

Version

Windows Server 2022

Help

< Back

Next >

Cancel

Cancel

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New Virtual Machine Wizard

Firmware Type

What kind of boot device should this virtual machine have?

Firmware type

☐ BIOS

☒ UEFI

☐ Secure Boot

< Back

Next >

Cancel

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New Virtual Machine Wizard

Processor Configuration
Specify the number of processors for this virtual machine.

Processors

Number of processors:	2
Number of cores per processor:	2
Total processor cores:	4

Help < Back Next > Cancel

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New Virtual Machine Wizard

Memory for the Virtual Machine
How much memory would you like to use for this virtual machine?

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine: 1260 MB

128 GB -
64 GB -
32 GB -
16 GB -
8 GB -
4 GB -
2 GB -
1 GB -
512 MB -
256 MB -
128 MB -
64 MB -
32 MB -
16 MB -
8 MB -
4 MB -

Maximum recommended memory:
6.0 GB

Recommended memory:
2 GB

Guest OS recommended minimum:
1 GB

Help < Back Next > Cancel

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New Virtual Machine Wizard

Network Type
What type of network do you want to add?

Network connection

- ☐ Use bridged networking
Give the guest operating system direct access to an external Ethernet network. The guest must have its own IP address on the external network.
- ☒ Use network address translation (NAT)
Give the guest operating system access to the host computer's dial-up or external Ethernet network connection using the host's IP address.
- ☐ Use host-only networking
Connect the guest operating system to a private virtual network on the host computer.
- ☐ Do not use a network connection

Help < Back Next > Cancel

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New Virtual Machine Wizard

Select I/O Controller Types
Which SCSI controller type would you like to use for SCSI virtual disks?

I/O controller types

SCSI Controller:

☐ BusLogic (Not available for 64-bit guests)

☐ LSI Logic (Not supported by Windows Server 2022)

☒ LSI Logic SAS (Recommended)

☐ Paravirtualized SCSI

Help < Back Next > Cancel

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New Virtual Machine Wizard

Select a Disk Type
What kind of disk do you want to create?

Virtual disk type

☐ IDE

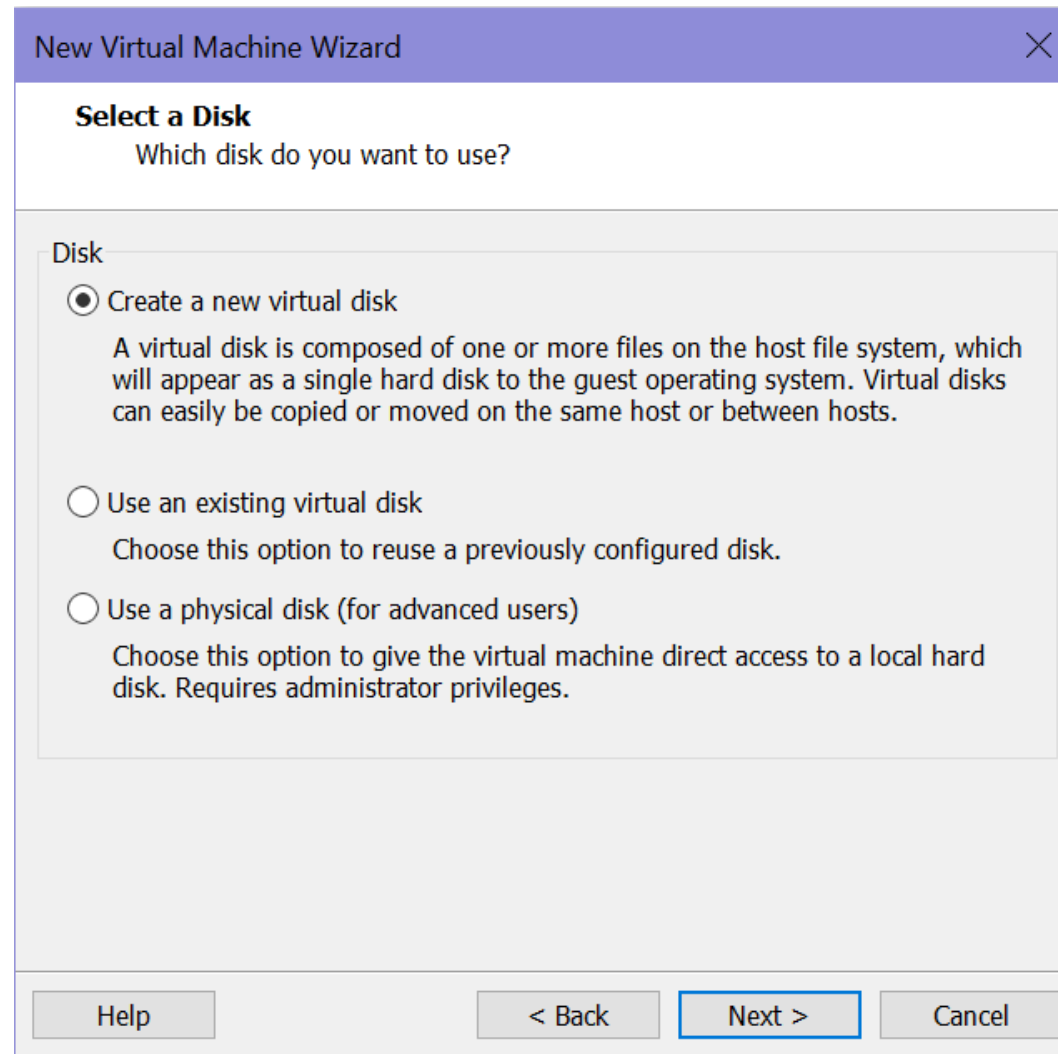
☐ SCSI

☐ SATA

☒ NVMe (Recommended)

Help < Back Next > Cancel

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The screenshot shows a 'New Virtual Machine Wizard' window with a purple title bar and a close button. The main content area is titled 'Select a Disk' with the subtitle 'Which disk do you want to use?'. Below this, there is a 'Disk' section containing three radio button options. The first option, 'Create a new virtual disk', is selected and includes a descriptive paragraph. The second option is 'Use an existing virtual disk' with a sub-description. The third option is 'Use a physical disk (for advanced users)' with a sub-description. At the bottom of the window, there are four buttons: 'Help', '< Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted with a blue border.

New Virtual Machine Wizard

Select a Disk
Which disk do you want to use?

Disk

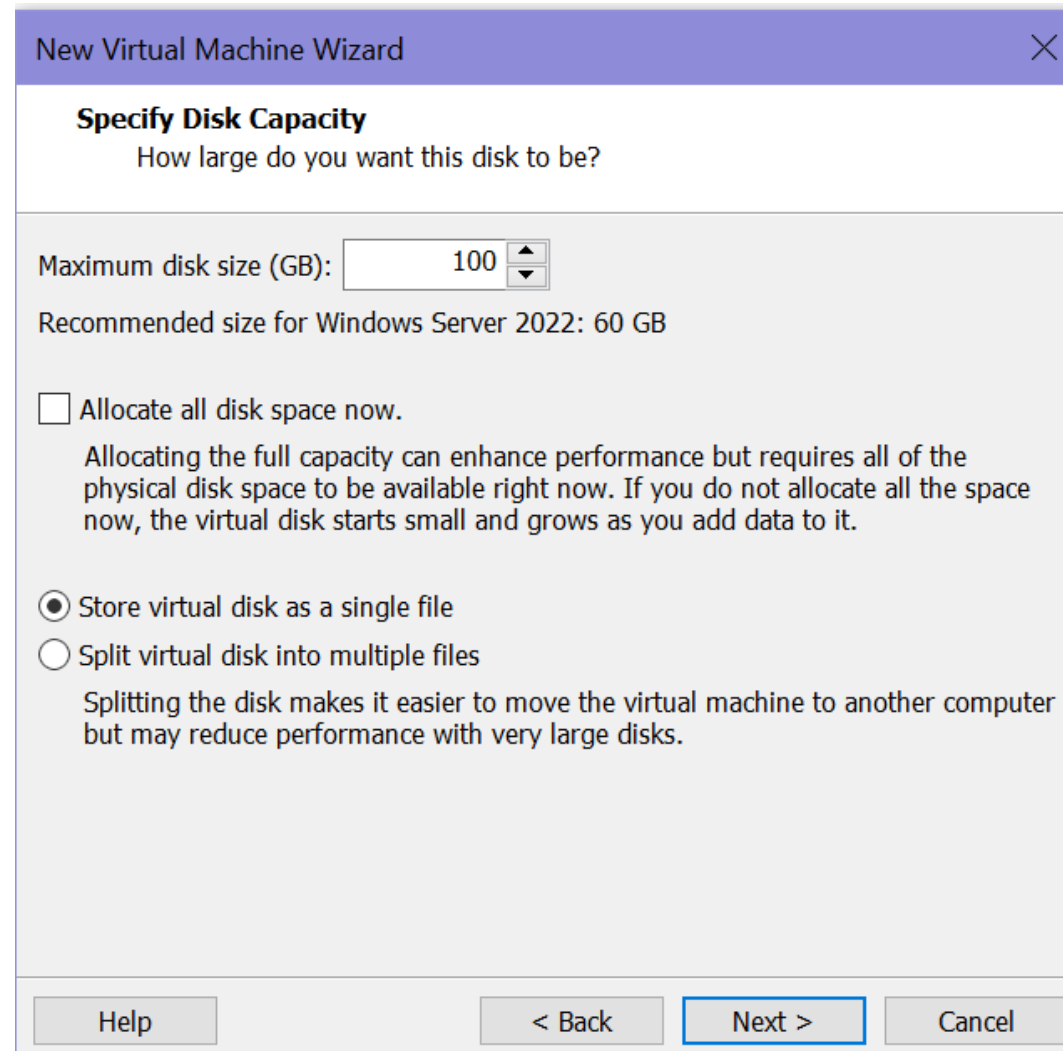
☒ Create a new virtual disk
A virtual disk is composed of one or more files on the host file system, which will appear as a single hard disk to the guest operating system. Virtual disks can easily be copied or moved on the same host or between hosts.

☐ Use an existing virtual disk
Choose this option to reuse a previously configured disk.

☐ Use a physical disk (for advanced users)
Choose this option to give the virtual machine direct access to a local hard disk. Requires administrator privileges.

Help < Back Next > Cancel

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The screenshot shows a 'New Virtual Machine Wizard' window with a purple title bar. The current step is 'Specify Disk Capacity', which asks 'How large do you want this disk to be?'. A text box for 'Maximum disk size (GB):' contains the value '100'. Below it, it states 'Recommended size for Windows Server 2022: 60 GB'. There are two radio button options: 'Allocate all disk space now.' (which is unchecked) and 'Store virtual disk as a single file' (which is selected). A third option, 'Split virtual disk into multiple files', is also present and unchecked. Below the radio buttons, there is explanatory text for each option. At the bottom of the window are four buttons: 'Help', '< Back', 'Next >', and 'Cancel'.

New Virtual Machine Wizard

Specify Disk Capacity
How large do you want this disk to be?

Maximum disk size (GB): 100

Recommended size for Windows Server 2022: 60 GB

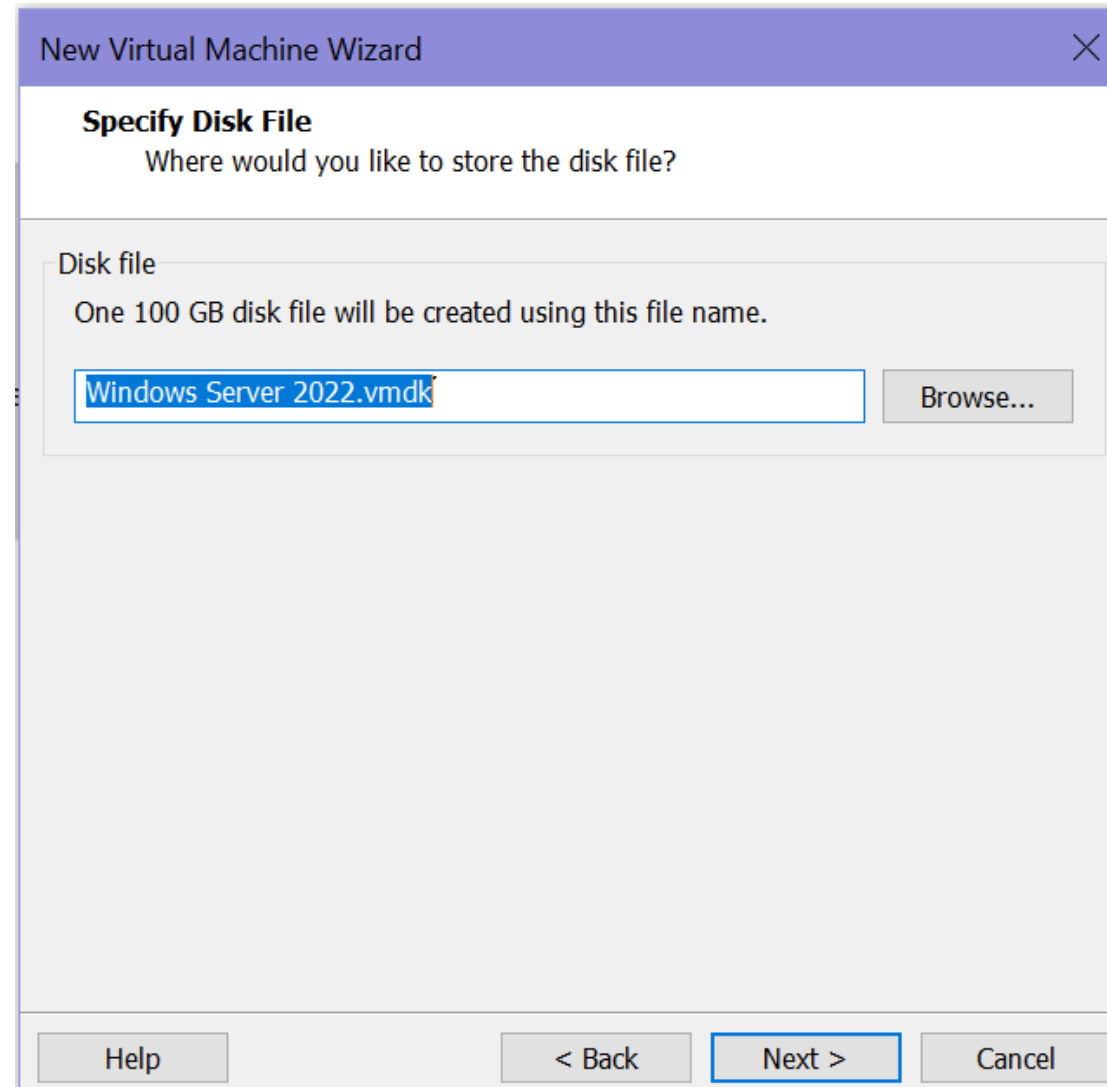
☐ Allocate all disk space now.
Allocating the full capacity can enhance performance but requires all of the physical disk space to be available right now. If you do not allocate all the space now, the virtual disk starts small and grows as you add data to it.

☒ Store virtual disk as a single file

☐ Split virtual disk into multiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

Help < Back Next > Cancel

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The image shows a screenshot of the 'New Virtual Machine Wizard' dialog box, specifically the 'Specify Disk File' step. The dialog box has a purple title bar with the text 'New Virtual Machine Wizard' and a close button (X). Below the title bar, the text 'Specify Disk File' is displayed, followed by the question 'Where would you like to store the disk file?'. A section titled 'Disk file' contains the text 'One 100 GB disk file will be created using this file name.' Below this text is a text input field containing 'Windows Server 2022.vmdk' and a 'Browse...' button. At the bottom of the dialog box, there are four buttons: 'Help', '< Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted with a blue border.

New Virtual Machine Wizard

Specify Disk File
Where would you like to store the disk file?

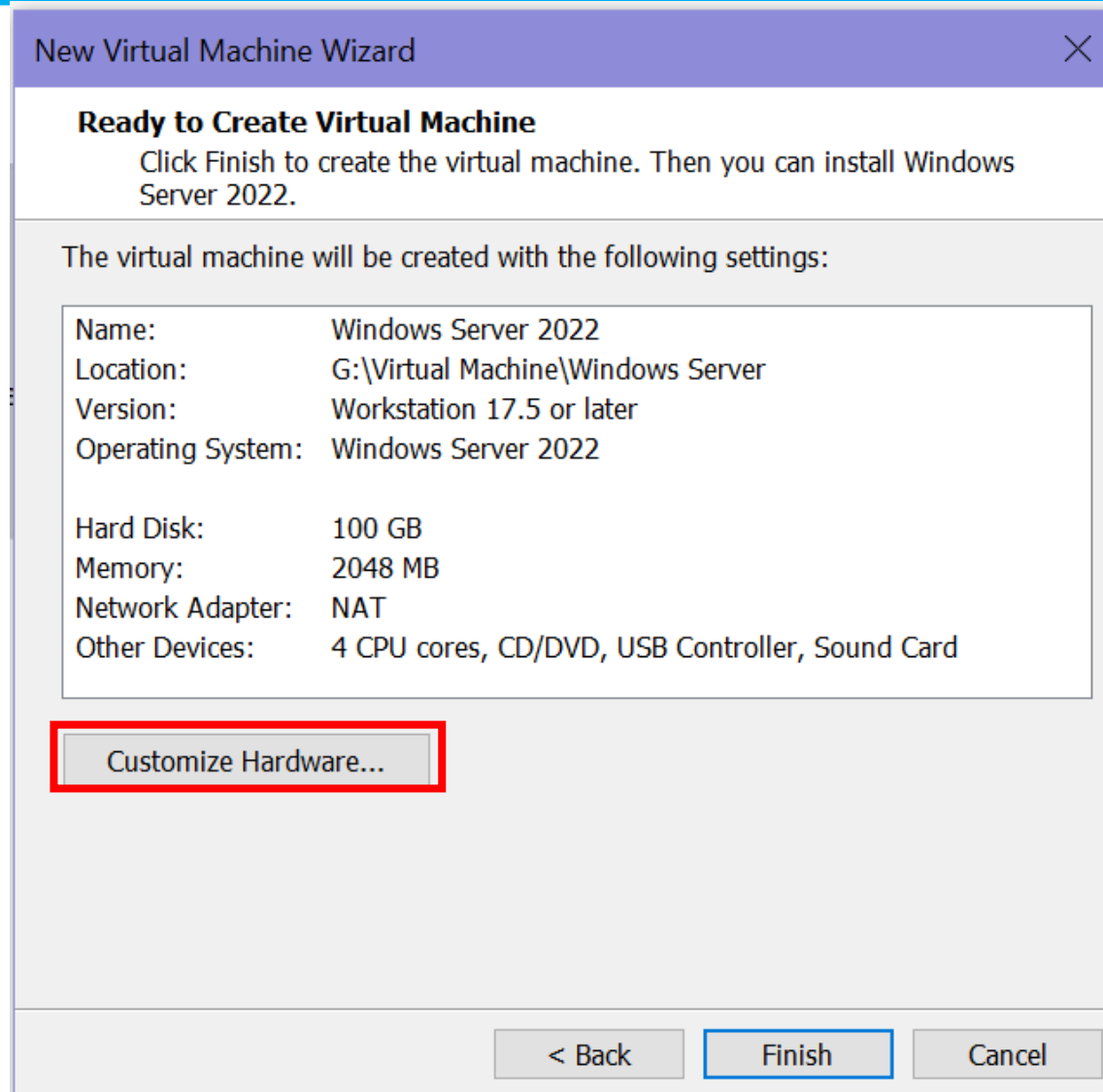
Disk file
One 100 GB disk file will be created using this file name.

Windows Server 2022.vmdk

Browse...

Help < Back Next > Cancel

install Windows server ISO



install Windows server ISO

Hardware

Device	Summary
Memory	2 GB
Processors	4
New CD/DVD (SATA)	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Display	Auto detect

Add...

Remove

Device status

☐ Connected

☒ Connect at power on

Connection

☐ Use physical drive:

Auto detect

☒ Use ISO image file:

H:\MidOcean\IT391 - System Administration 1\Matei

Browse...

Advanced...

Close

Help

install Windows server ISO

New Virtual Machine Wizard

Ready to Create Virtual Machine

Click Finish to create the virtual machine. Then you can install Windows Server 2022.

The virtual machine will be created with the following settings:

Name:	Windows Server 2022
Location:	G:\Virtual Machine\Windows Server
Version:	Workstation 17.5 or later
Operating System:	Windows Server 2022
Hard Disk:	100 GB
Memory:	2048 MB
Network Adapter:	NAT
Other Devices:	4 CPU cores, CD/DVD, USB Controller, Sound Card

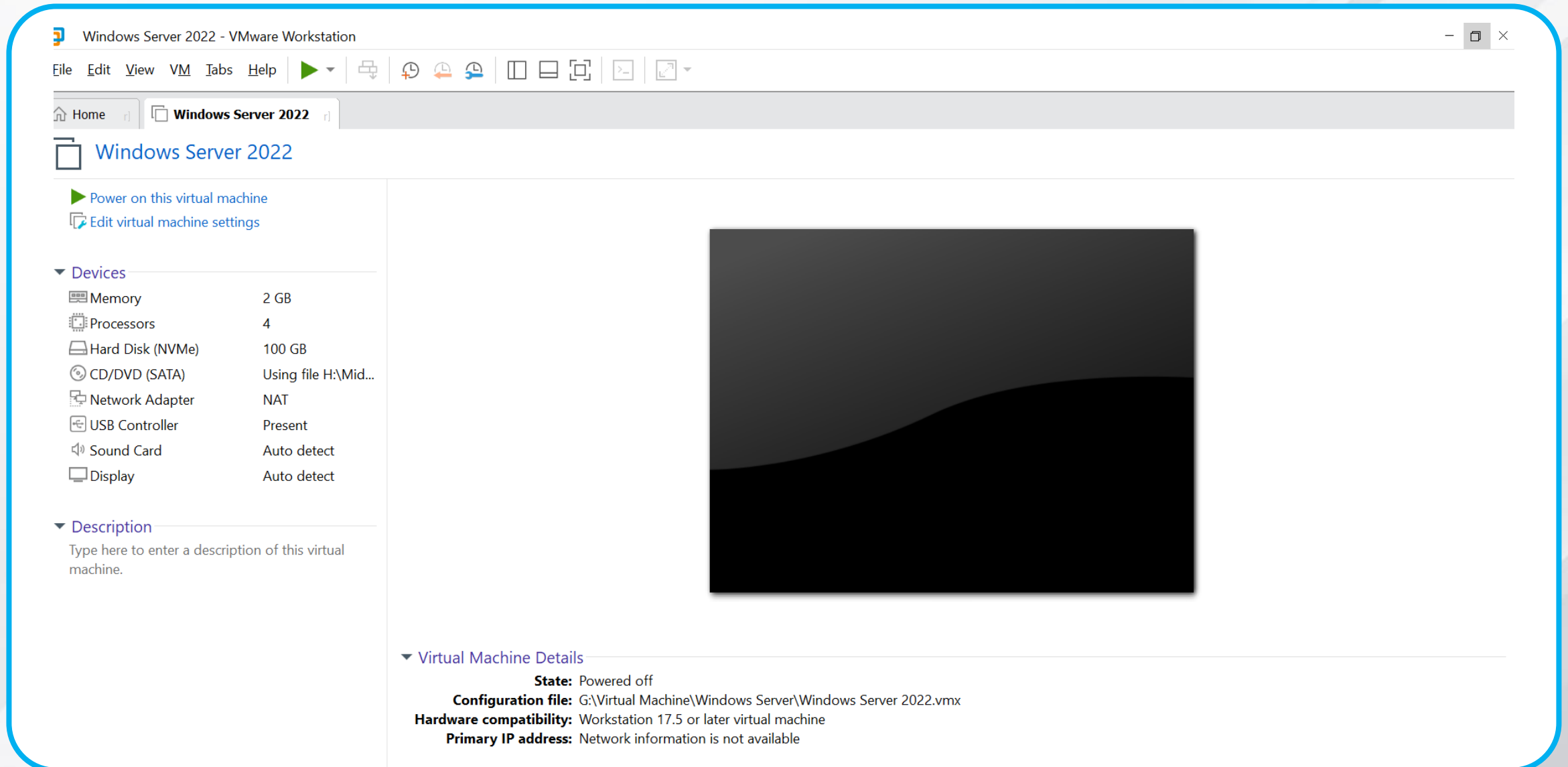
Customize Hardware...

< Back

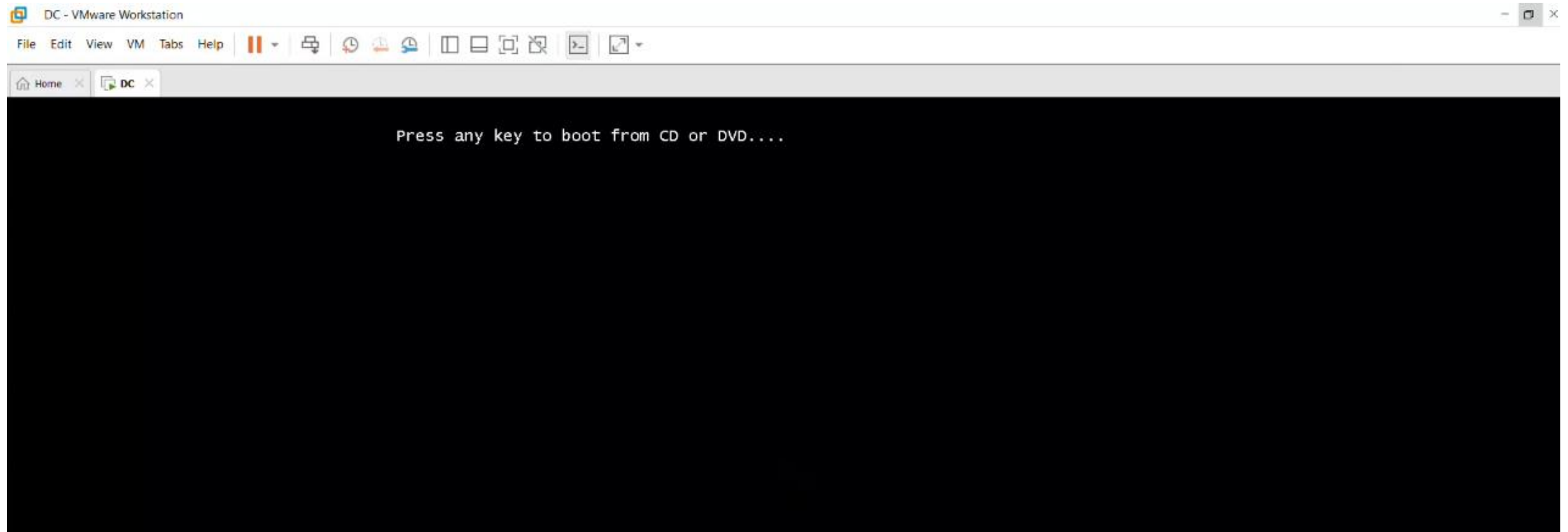
Finish

Cancel

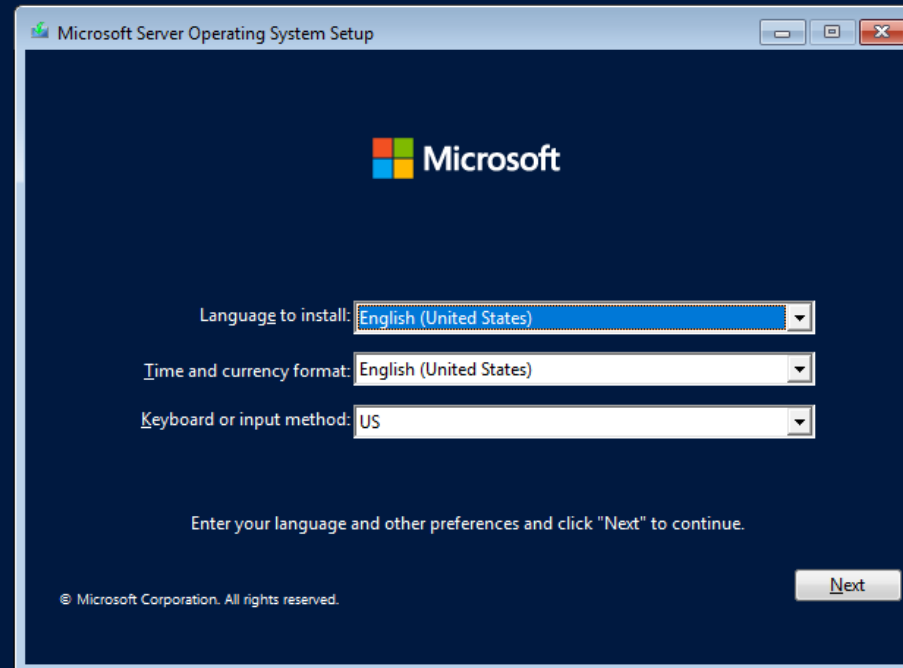
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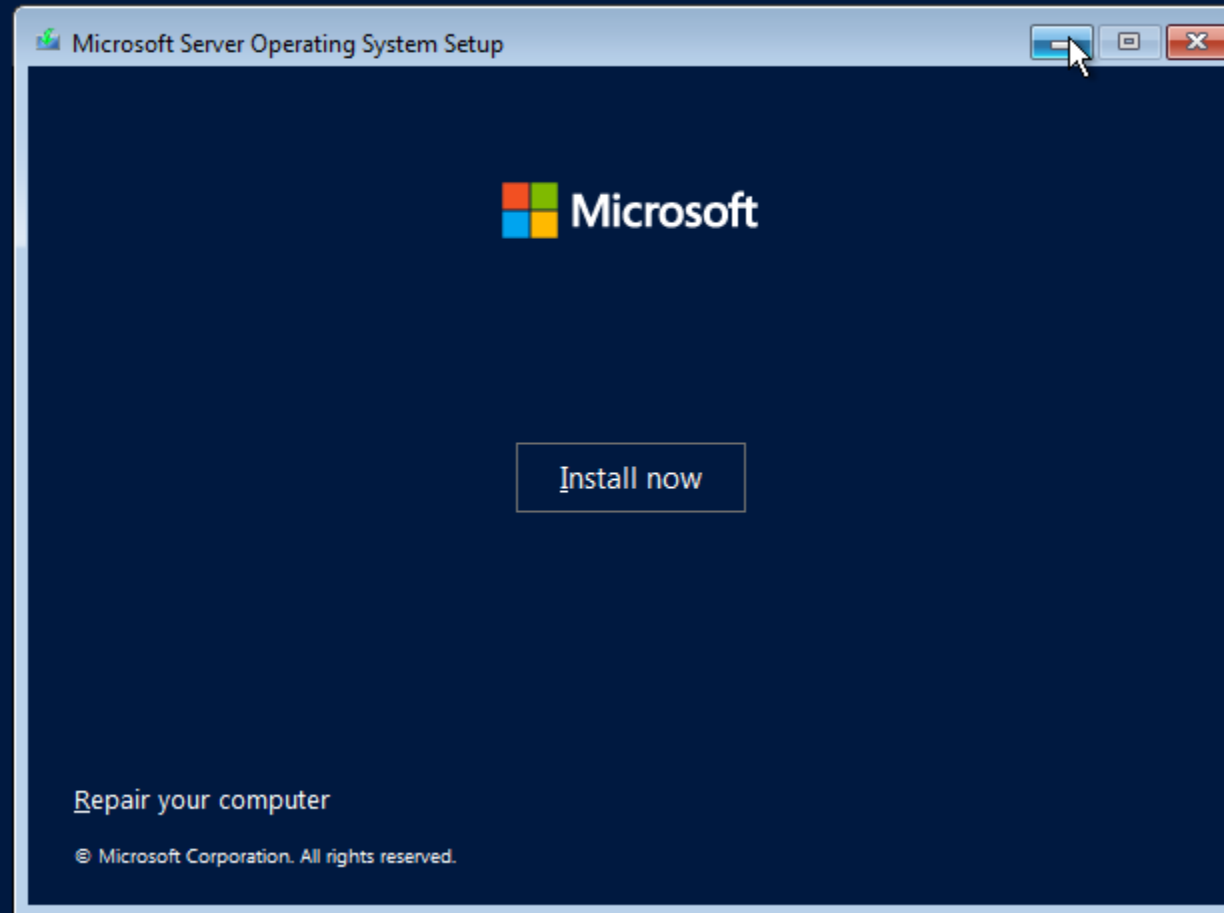
install Windows server ISO



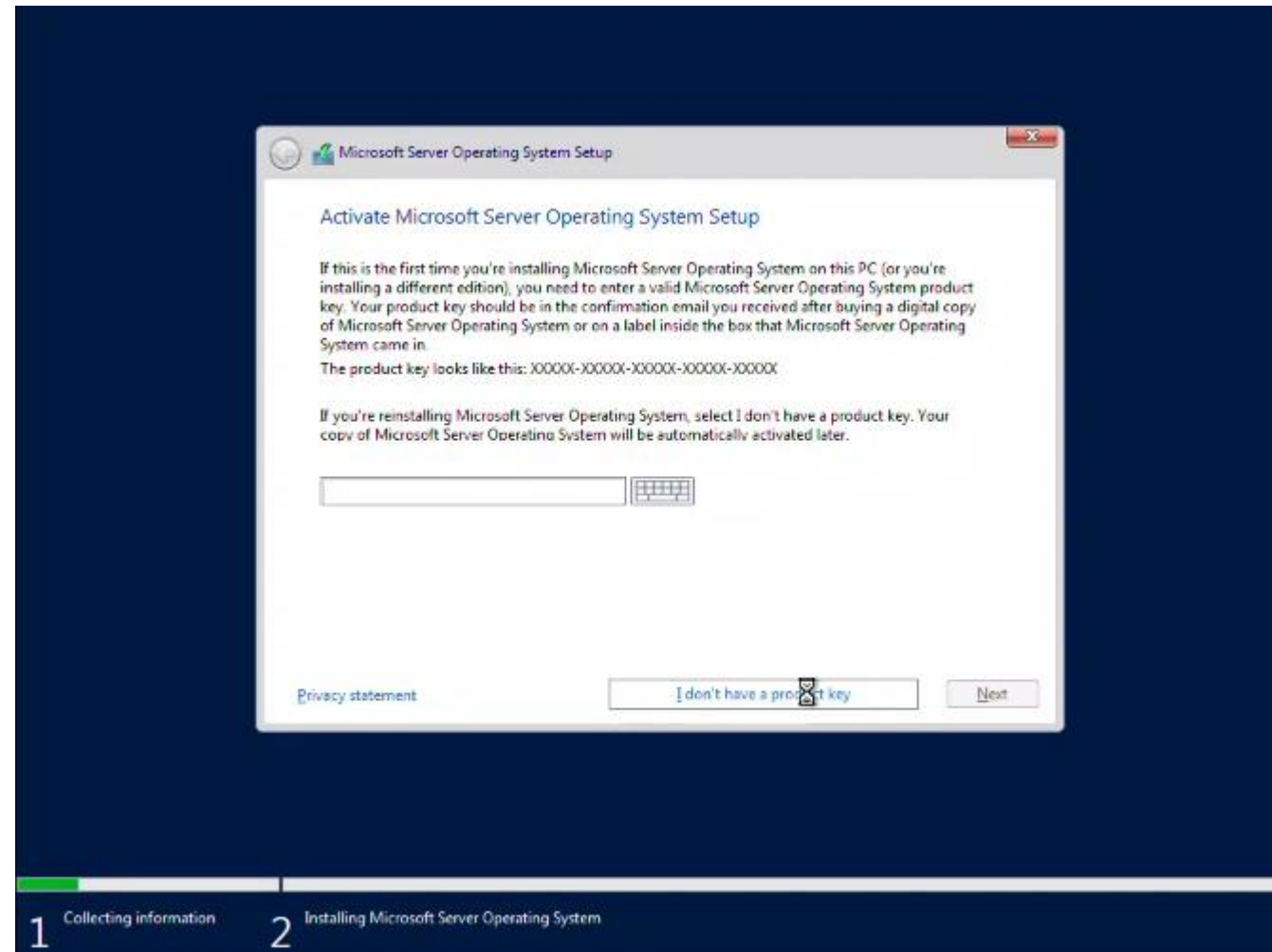
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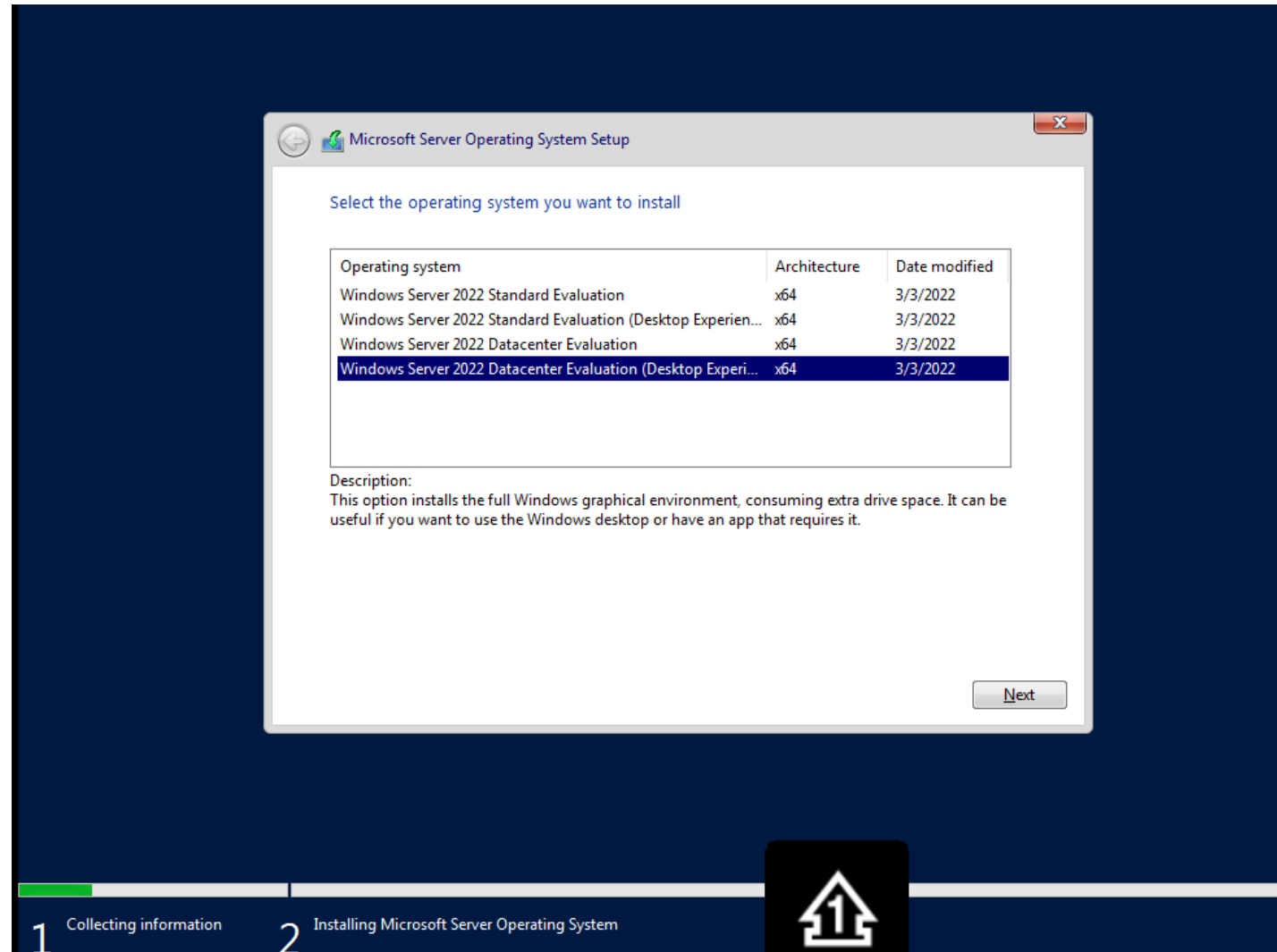
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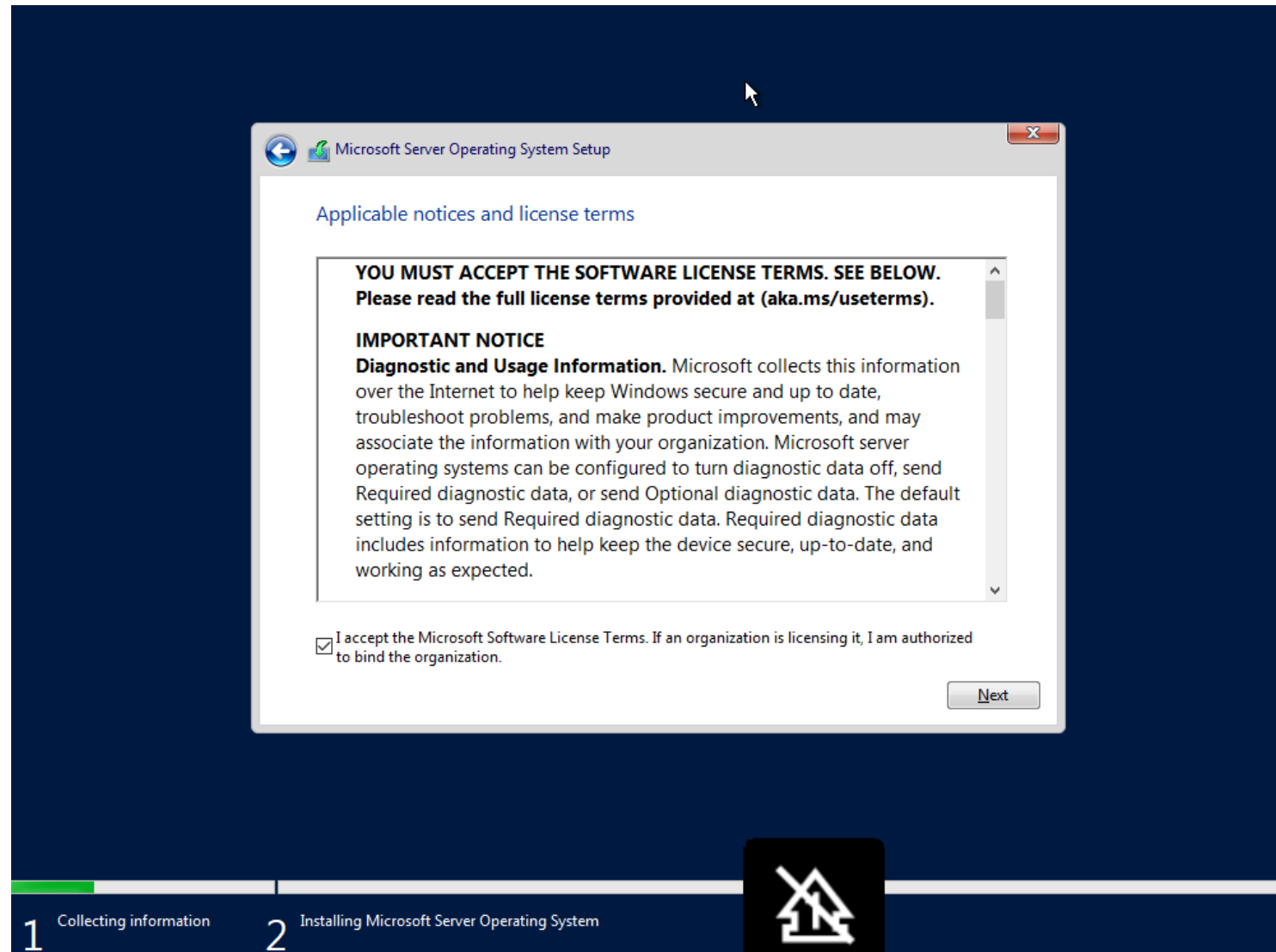
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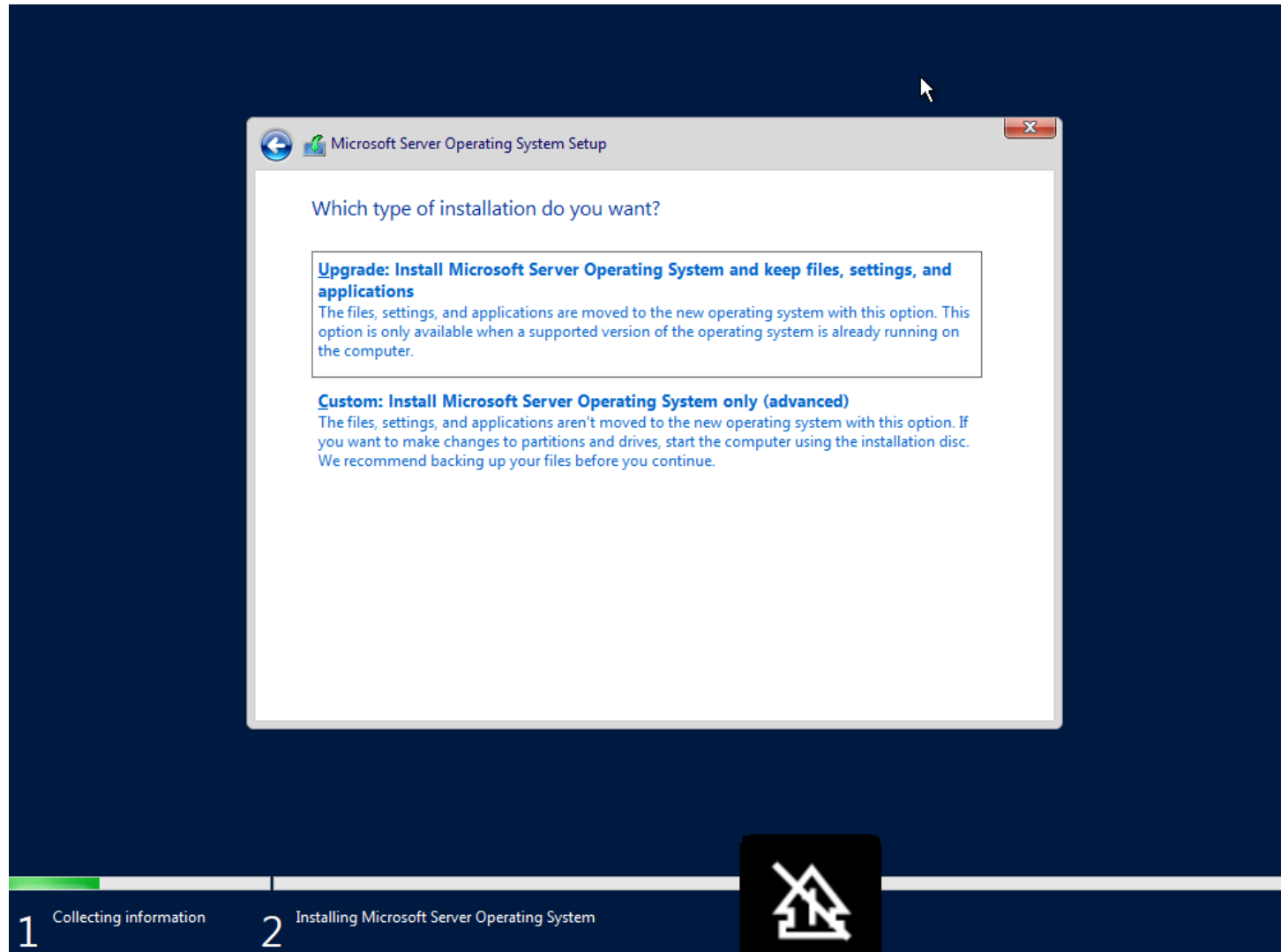
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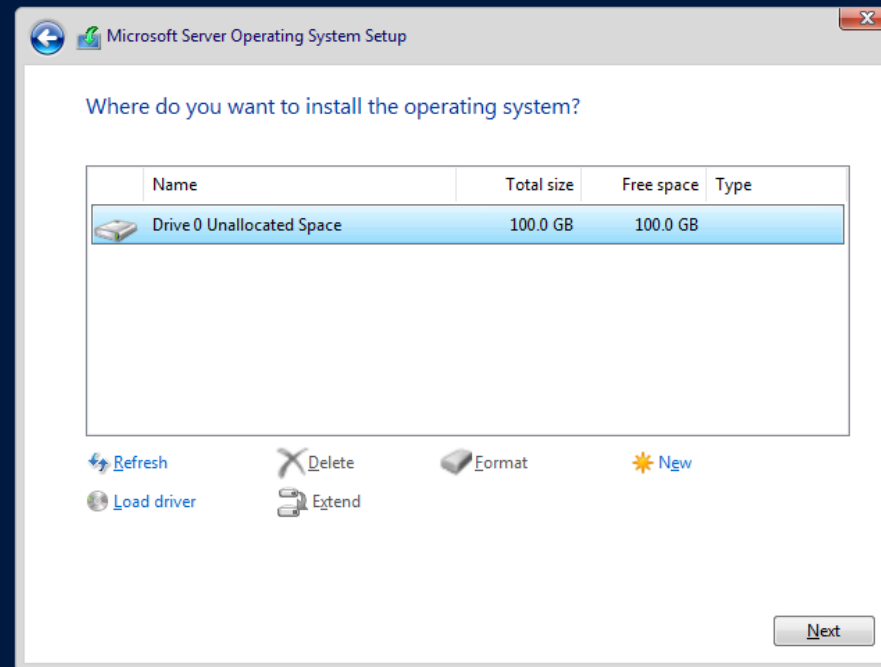
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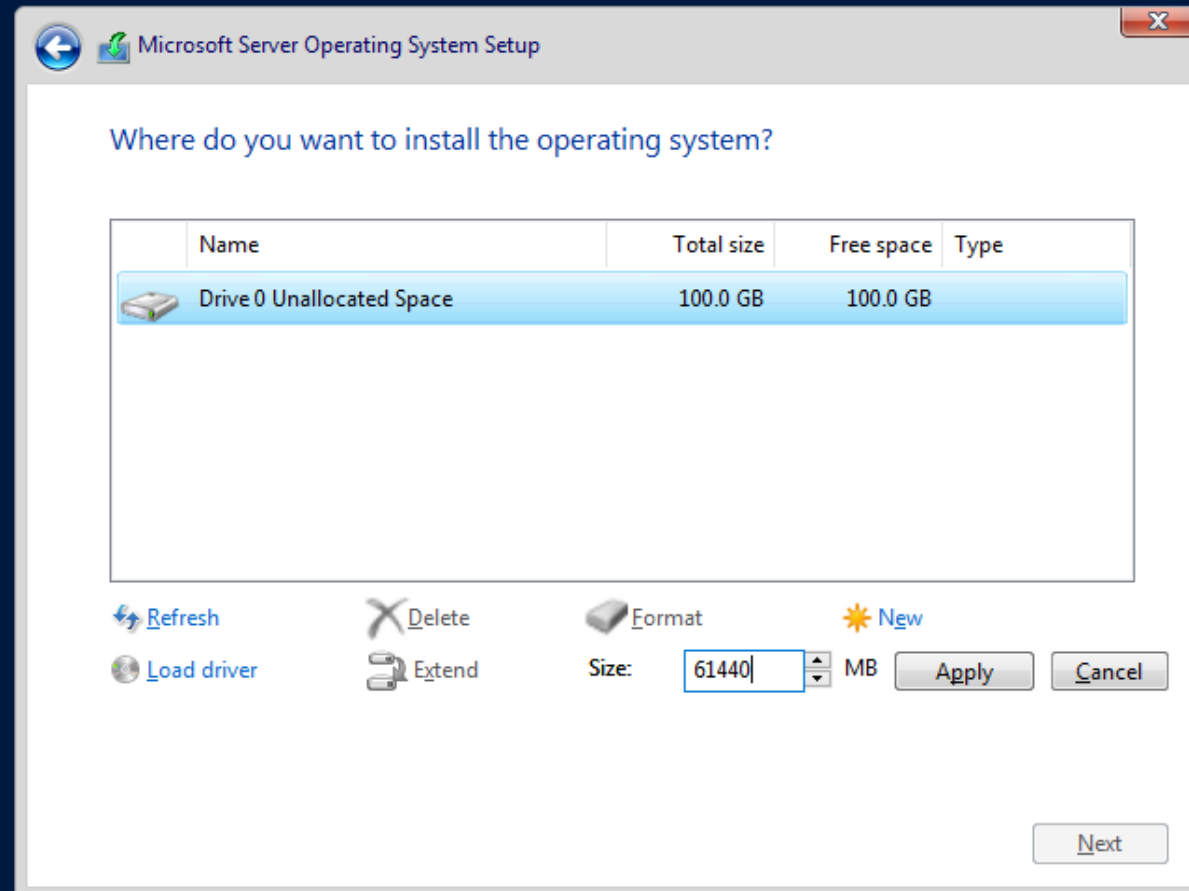
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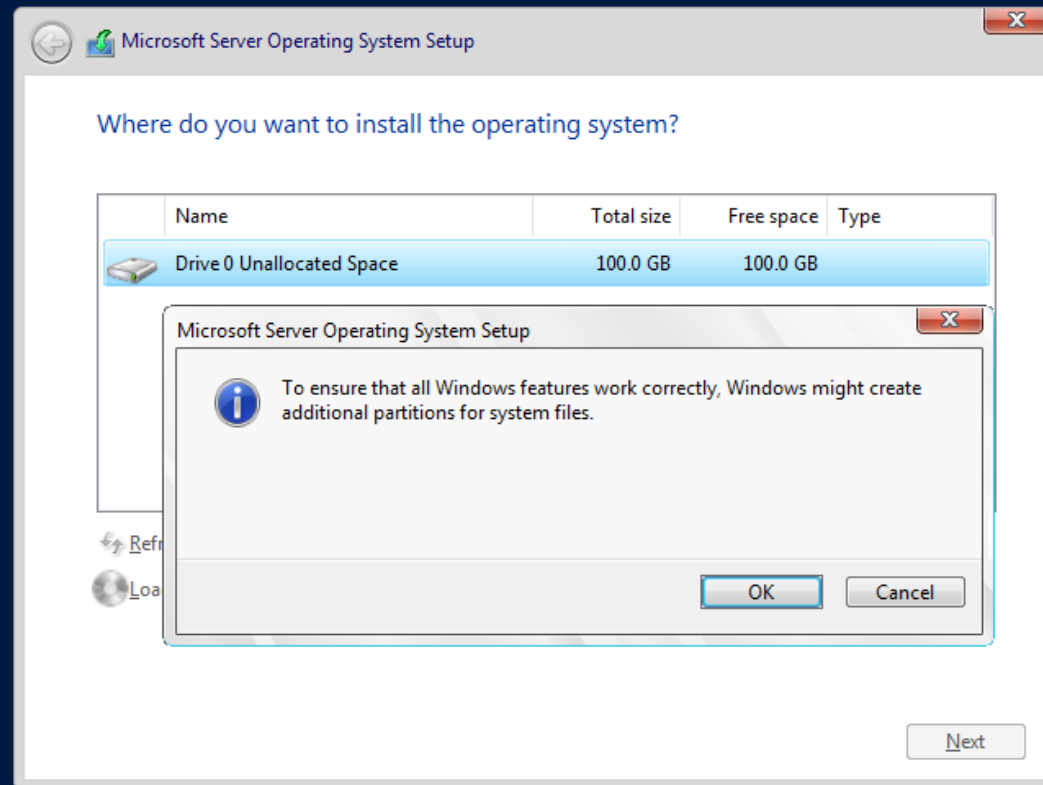
install Windows server ISO



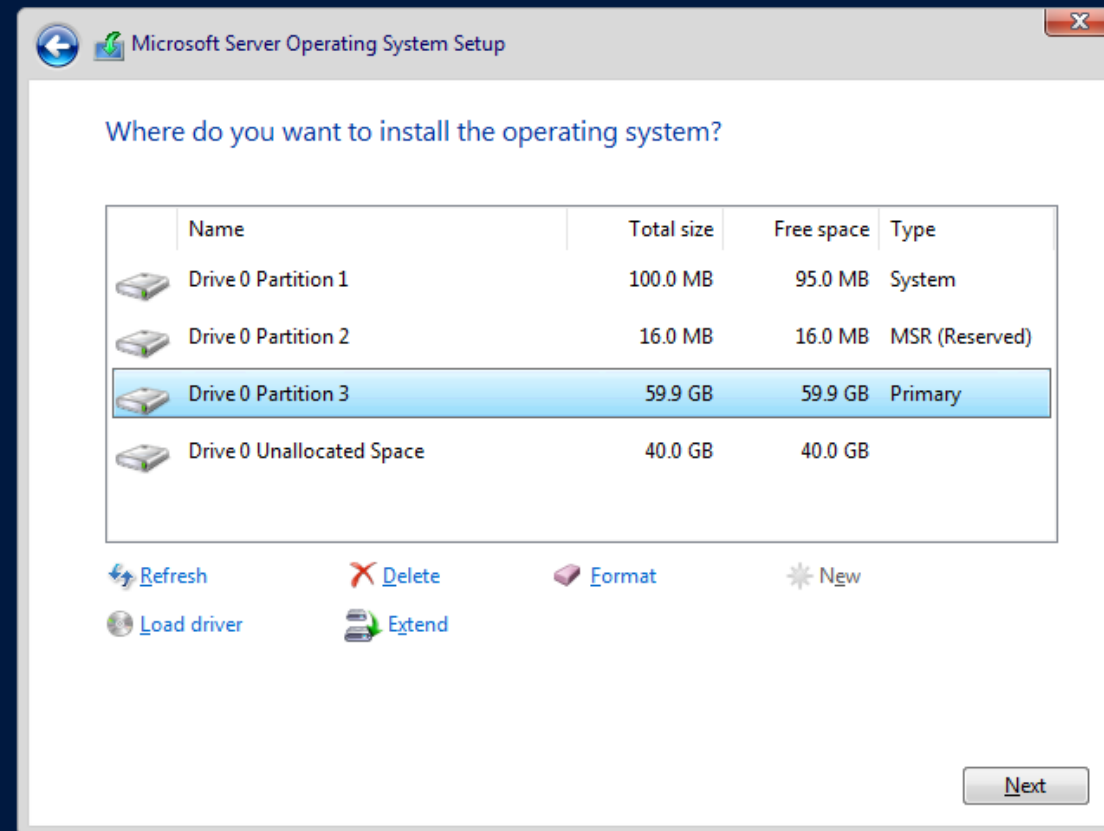
install Windows server ISO



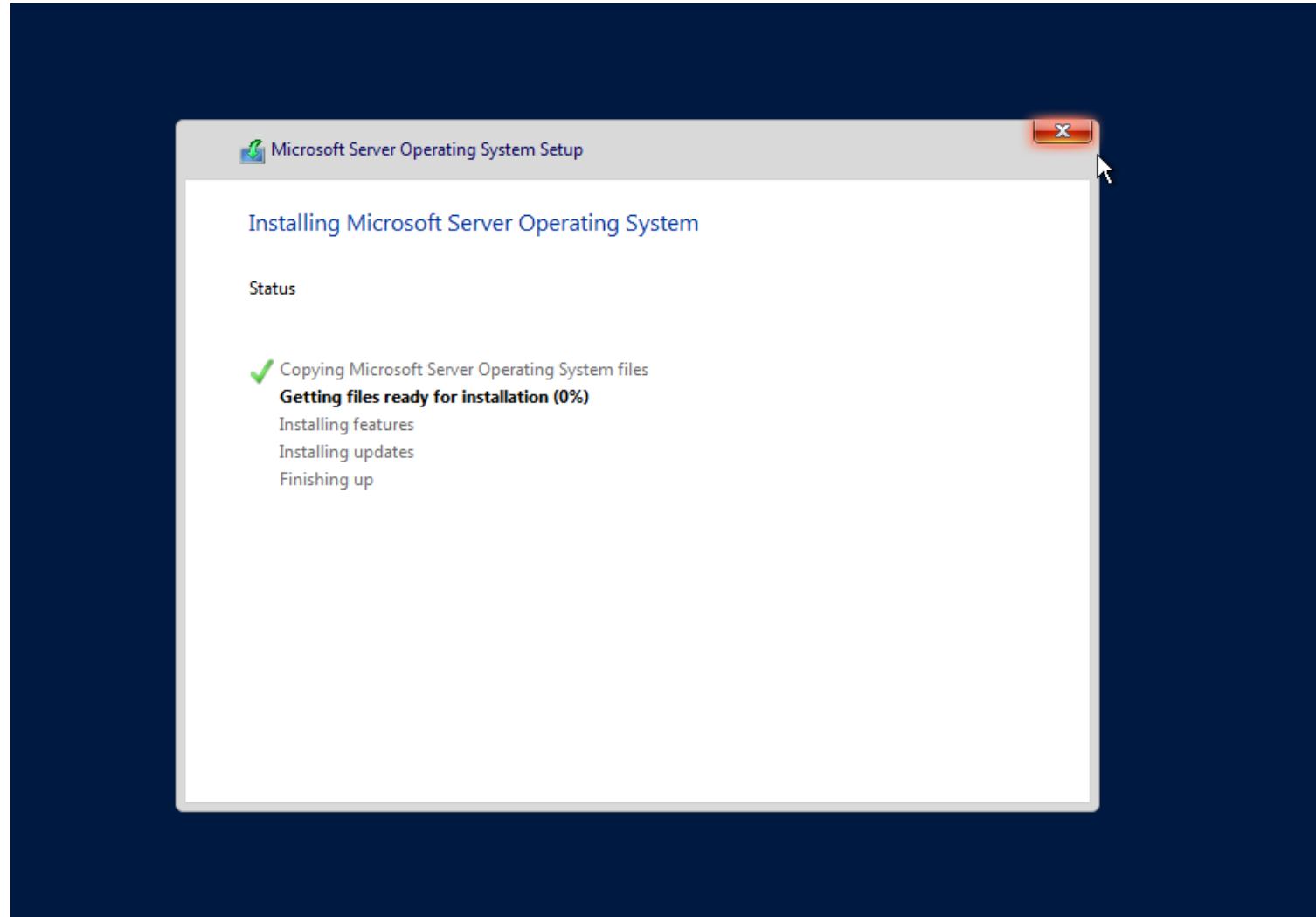
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Customize settings

Type a password for the built-in administrator account that you can use to sign in to this computer.

User name

Password

Reenter password



Finish

Configure Windows server ISO

Customize settings

Type a password for the built-in administrator account that you can use to sign in to this computer.

User name

The password you typed doesn't meet the password complexity requirements set by the administrator for your network or group. Get the requirements from your administrator, and then type a new password.

Password

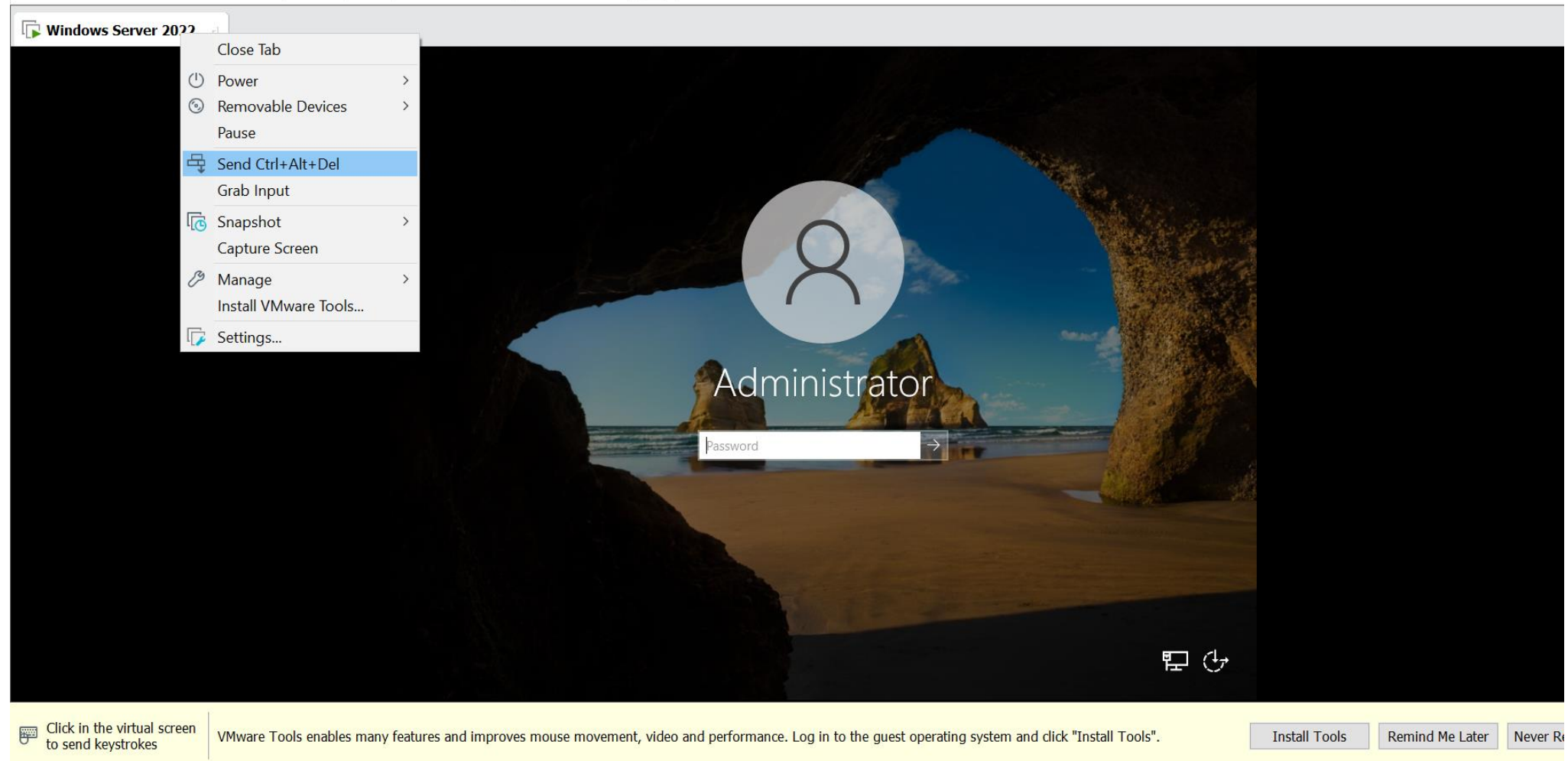
Reenter password 



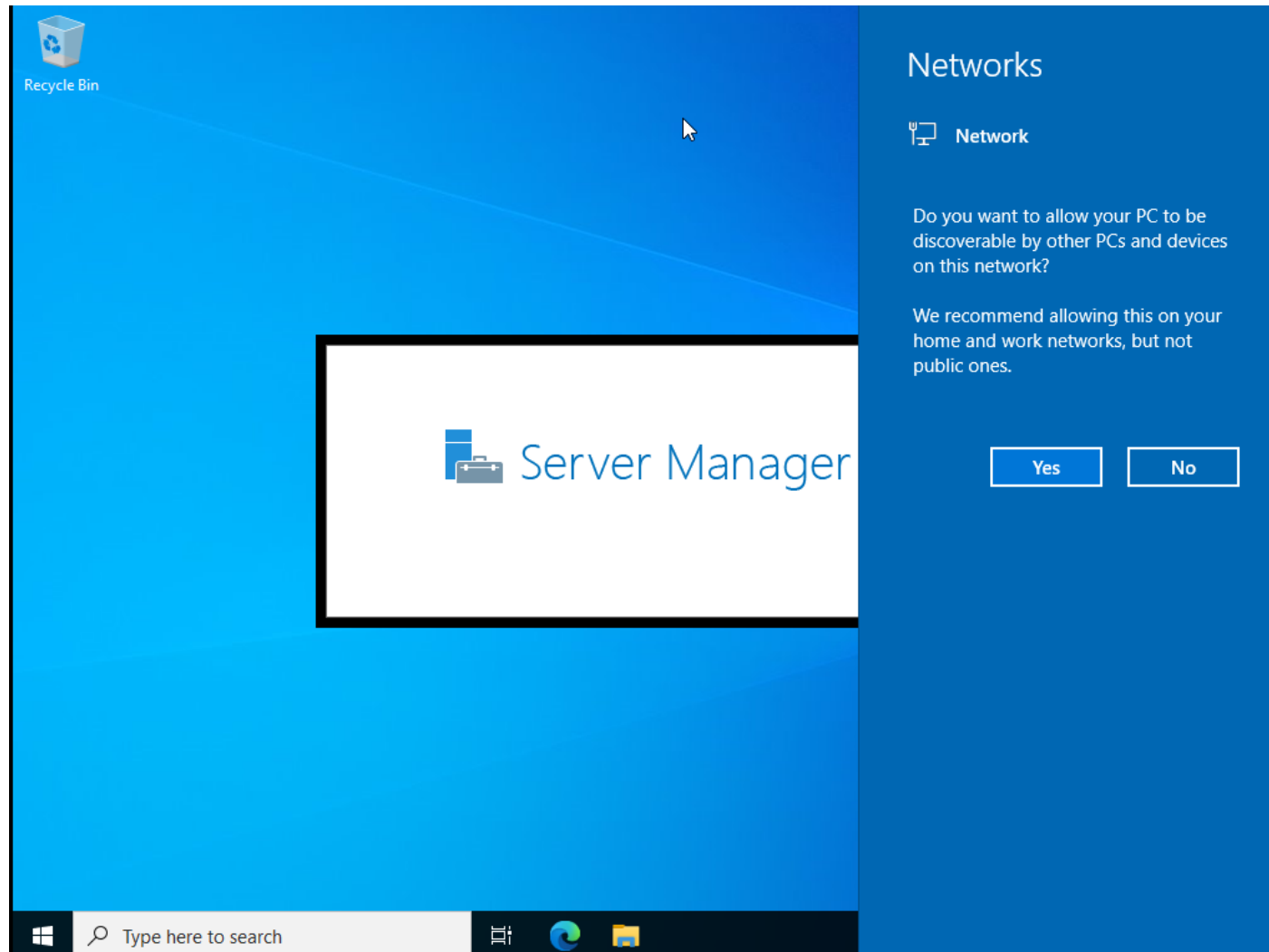
Configure Windows server ISO



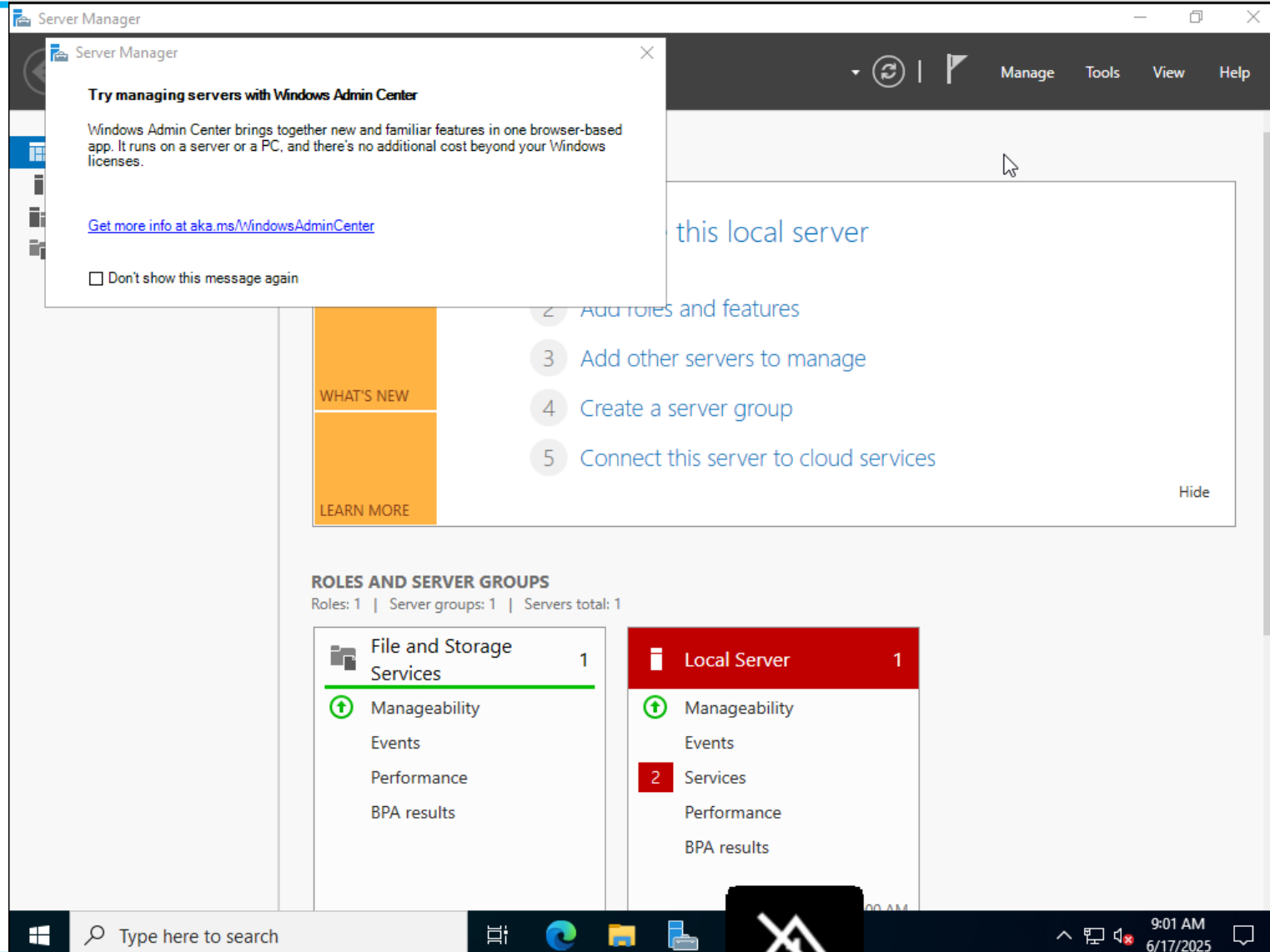
Configure Windows server ISO



Configure Windows server ISO



Configure Windows server ISO



Configure Windows server ISO

The screenshot displays the Windows Server Manager interface. The top navigation bar includes 'Server Manager' and 'Dashboard'. The left sidebar shows a tree view with 'Dashboard', 'Local Server', 'All Servers', and 'File and Storage Services'. The main content area is titled 'WELCOME TO SERVER MANAGER' and features a 'QUICK START' section with a numbered list of tasks: 1. Configure this local server, 2. Add roles and features, 3. Add other servers to manage, 4. Create a server group, and 5. Connect this server to cloud services. Below this, the 'ROLES AND SERVER GROUPS' section shows a summary of roles (1), server groups (1), and servers (1). It lists 'File and Storage Services' and 'Local Server' with their respective sub-items: Manageability, Events, Performance, and BPA results. The Windows taskbar at the bottom shows the search bar, taskbar icons, and system tray with the date and time (9:02 AM, 6/17/2025).

Server Manager Dashboard

WELCOME TO SERVER MANAGER

1 Configure this local server

2 Add roles and features

3 Add other servers to manage

4 Create a server group

5 Connect this server to cloud services

ROLES AND SERVER GROUPS

Roles: 1 | Server groups: 1 | Servers total: 1

File and Storage Services 1

Manageability

Events

Performance

BPA results

Local Server 1

Manageability

Events

2 Services

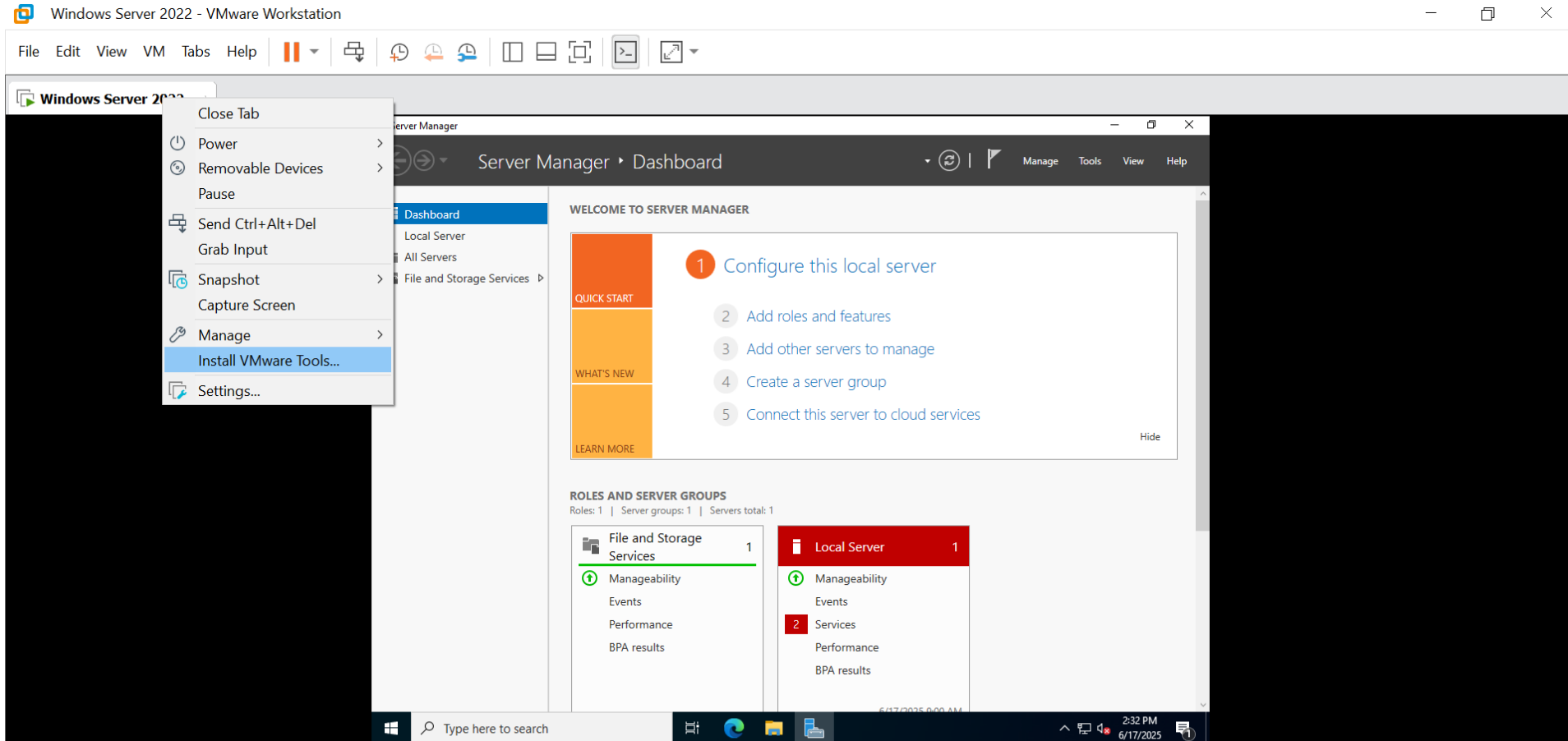
Performance

BPA results

Type here to search

9:02 AM 6/17/2025

Configure Windows server ISO



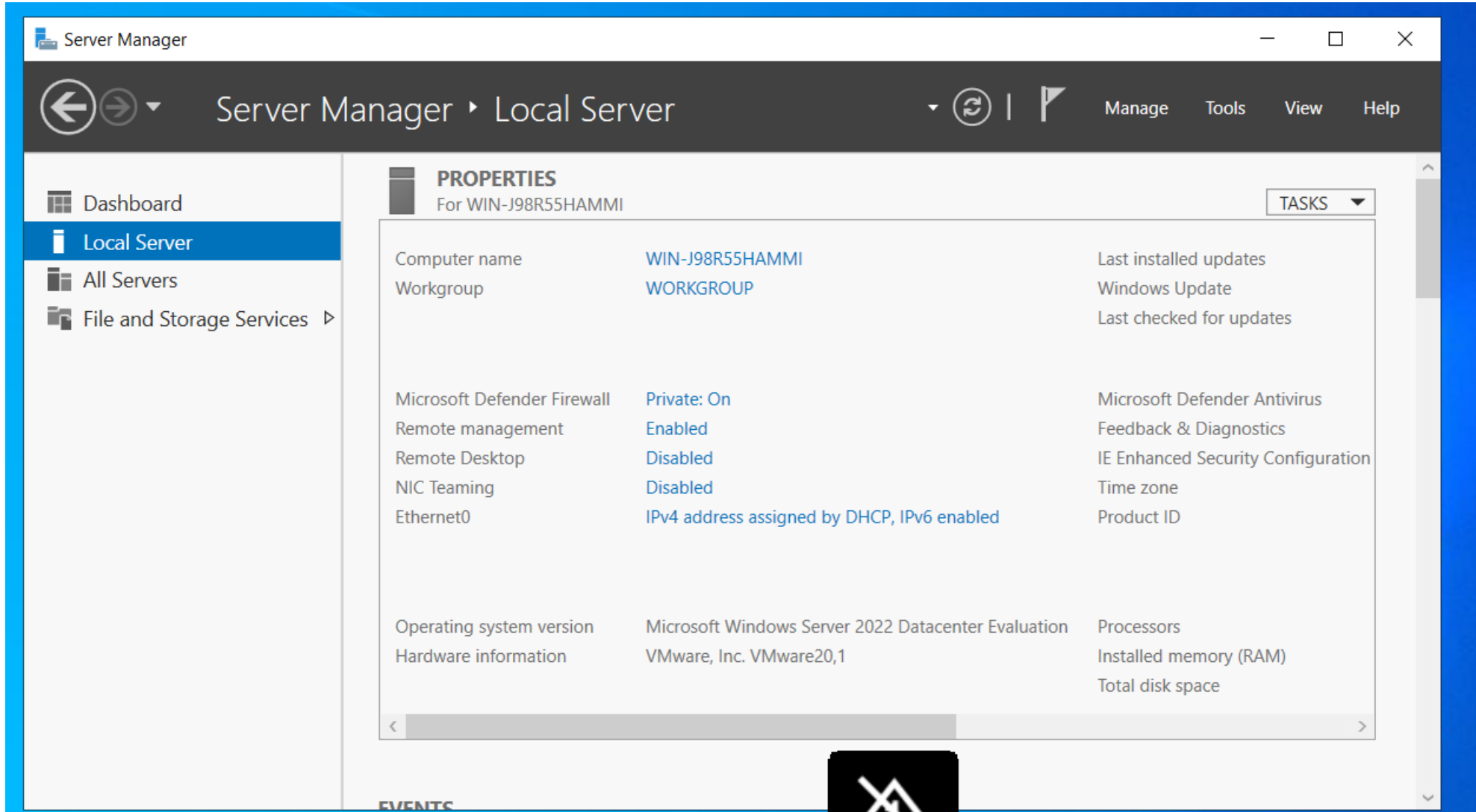
The screenshot shows a Windows Server 2022 virtual machine running in VMware Workstation. The VMware interface includes a menu bar (File, Edit, View, VM, Tabs, Help) and a toolbar. A context menu is open over the virtual screen, listing options such as 'Close Tab', 'Power', 'Removable Devices', 'Pause', 'Send Ctrl+Alt+Del', 'Grab Input', 'Snapshot', 'Capture Screen', 'Manage', 'Install VMware Tools...', and 'Settings...'. The 'Install VMware Tools...' option is highlighted. The virtual screen displays the Windows Server Manager dashboard, which includes a 'WELCOME TO SERVER MANAGER' section with a 'QUICK START' list (1. Configure this local server, 2. Add roles and features, 3. Add other servers to manage, 4. Create a server group, 5. Connect this server to cloud services) and a 'ROLES AND SERVER GROUPS' section showing 'File and Storage Services' and 'Local Server' with their respective components. The taskbar at the bottom of the virtual machine shows the search bar, task view, and several application icons. The system clock indicates 2:32 PM on 6/17/2025.

Click in the virtual screen to send keystrokes

VMware Tools enables many features and improves mouse movement, video and performance. Log in to the guest operating system and click "Install Tools".

Install Tools Remind Me Later Never Remind Me

Configure Windows server ISO



The screenshot displays the Windows Server Manager interface. The left-hand navigation pane includes links to the Dashboard, Local Server (which is currently selected), All Servers, and File and Storage Services. The main area of the window is titled 'Server Manager > Local Server' and shows the 'PROPERTIES' for the local server 'WIN-J98R55HAMMI'. A 'TASKS' dropdown menu is visible in the top right corner of the properties section.

PROPERTIES For WIN-J98R55HAMMI		
Computer name	WIN-J98R55HAMMI	Last installed updates
Workgroup	WORKGROUP	Windows Update
		Last checked for updates
Microsoft Defender Firewall	Private: On	Microsoft Defender Antivirus
Remote management	Enabled	Feedback & Diagnostics
Remote Desktop	Disabled	IE Enhanced Security Configuration
NIC Teaming	Disabled	Time zone
Ethernet0	IPv4 address assigned by DHCP, IPv6 enabled	Product ID
Operating system version	Microsoft Windows Server 2022 Datacenter Evaluation	Processors
Hardware information	VMware, Inc. VMware20,1	Installed memory (RAM)
		Total disk space

At the bottom of the window, the 'EVENTS' section is partially visible, and a small icon of a server with an arrow pointing up is located in the bottom center.

Configure Windows server ISO

The screenshot displays the Windows Server 2022 configuration interface. In the foreground, the 'System Properties' dialog box is open, showing the 'Computer Name' tab. The 'Computer description' field is empty. The 'Full computer name' is set to 'DC'. The 'Workgroup' is set to 'WORKGROUP'. A message at the bottom states: 'Changes will take effect after you restart this computer.' In the background, the 'Local Server' window is visible, showing the 'PROPERTIES' for 'WIN-J98R55HAMMI'. The properties are organized into three columns:

Property	Value	Property	Value
Computer name	WIN-J98R55HAMMI	Last installed updates	Windows Update
Workgroup	WORKGROUP	Last checked for updates	
Microsoft Defender Firewall	Private: On	Microsoft Defender Antivirus	
Remote management	Enabled	Feedback & Diagnostics	
Remote Desktop	Disabled	IE Enhanced Security Configuration	
NIC Teaming	Disabled	Time zone	
Ethernet0	IPv4 address assigned by DHCP, IPv6 enabled	Product ID	
Operating system version	Microsoft Windows Server 2022 Datacenter Evaluation	Processors	
Hardware information	VMware, Inc. VMware20,1	Installed memory (RAM)	
		Total disk space	

The taskbar at the bottom shows the Windows logo, a search bar with the text 'Type here to search', and several application icons. The system tray on the right shows the time '2:59 PM' and the date '6/17/2025'.

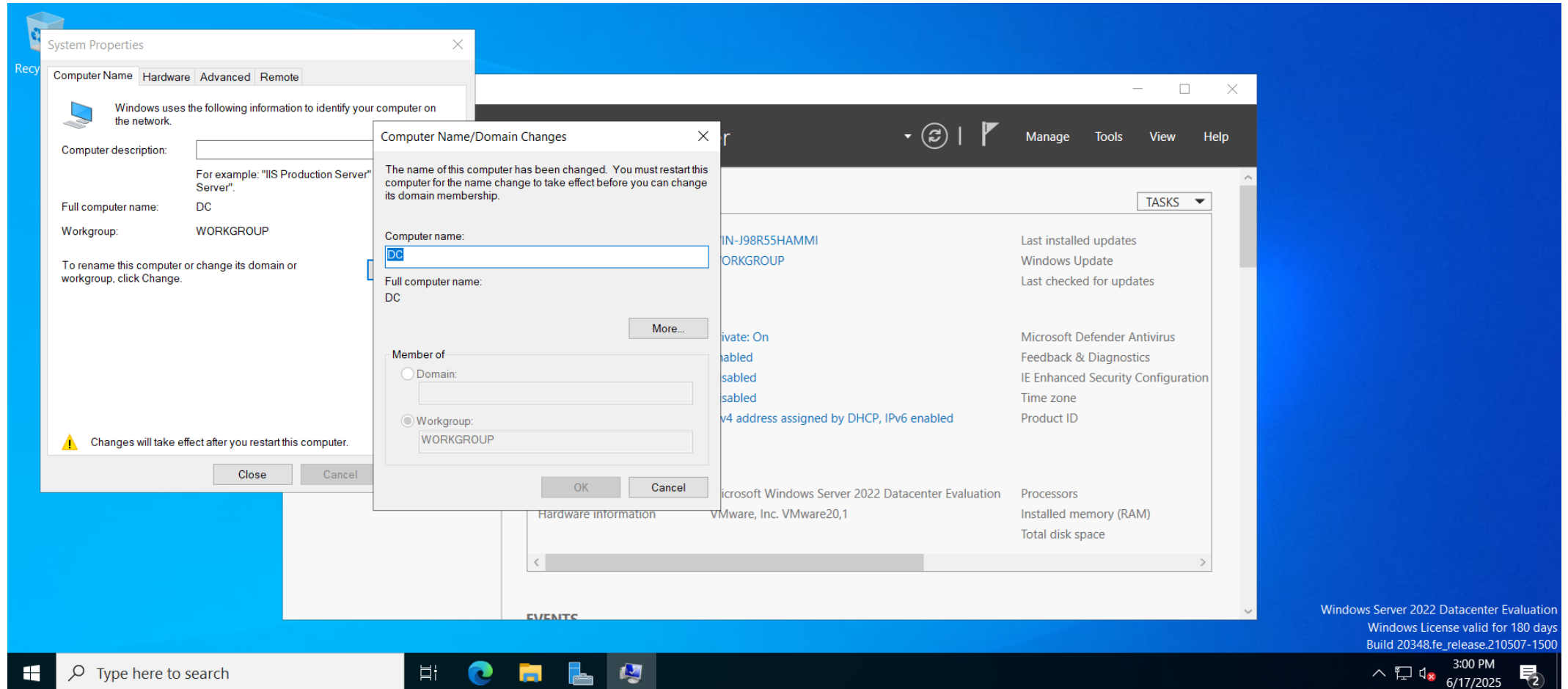
Configure Windows server ISO

The screenshot displays the Windows Server 2022 configuration interface. In the foreground, the 'System Properties' dialog box is open, showing the 'Computer Name' tab. The 'Computer description' field is empty. The 'Full computer name' is set to 'DC'. The 'Workgroup' is set to 'WORKGROUP'. A message at the bottom states: 'Changes will take effect after you restart this computer.' In the background, the 'Local Server' window is visible, showing the 'PROPERTIES' for 'WIN-J98R55HAMMI'. The properties are organized into three columns:

Property	Value	Property	Value
Computer name	WIN-J98R55HAMMI	Last installed updates	Windows Update
Workgroup	WORKGROUP	Last checked for updates	
Microsoft Defender Firewall	Private: On	Microsoft Defender Antivirus	
Remote management	Enabled	Feedback & Diagnostics	
Remote Desktop	Disabled	IE Enhanced Security Configuration	
NIC Teaming	Disabled	Time zone	
Ethernet0	IPv4 address assigned by DHCP, IPv6 enabled	Product ID	
Operating system version	Microsoft Windows Server 2022 Datacenter Evaluation	Processors	
Hardware information	VMware, Inc. VMware20,1	Installed memory (RAM)	
		Total disk space	

The taskbar at the bottom shows the Windows logo, a search bar with the text 'Type here to search', and several application icons. The system tray on the right indicates the time is 2:59 PM on 6/17/2025.

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Thank You