Unit I

Installing and Configuring Windows Server 2012: Introduction, Selecting a Windows Server 2012 Edition, Supporting Server Roles and Features, Server Licensing, Installing Windows Server 2012: System Requirement, Performing a Clean Installation, Working with Installation Partitions, Server Core Defaults, Server Core Capabilities, Completing Post-Installation Tasks, Converting Between GUI and Server Core, Upgrade paths, Installing Windows Server Migration Tools, Configuring NIC Teaming, Configuring local storage, Configuring WDS to install OS through networking.

Introduction: - Server Administration means managing, monitoring and optimizing the servers and networks so that we can ensure they work properly and safely. It requires 24/7 availability and monitoring to guarantee business operations at all times.

Windows Server Administration is an advanced computer networking topic that includes server installation and configuration, server roles, storage, Active Directory and Group Policy, file, print, and web services, remote access, virtualization, application servers, troubleshooting, performance, and reliability.

Difference between Client OS and Server OS: -

Client OS	Server OS
• It is an operating system that operates within desktop. It is used to obtain services from a server. It run on the client devices like laptop, computer and is very simple operating system. • Default domain of such system is 'Workstations'. • Works on low bandwidth. • Can't handle more network connections. • It provides less security. • It has less processing power. • It is less stable. • It is less efficient. • Examples: Windows (XP, 7, 8, 10, 11), Android, etc.	• It is an operating system that is designed to be used on server. It is used to provide services to multiple clients at a time and is very advanced operating system. • Here, it is server or domain controller. • Works on high bandwidth. • Can handle more network connections • It provides more security. • Here, Hardware is used more efficiently. It has more memory support. • It has greater processing power. • It is more stable. • It is highly efficient. • Example: - Windows server (2008, 2012, 2016, 2022), Red Hat, Linux etc.

Supporting Server Roles and Features: - The services that are provided by the server for network clients are called server roles. Windows Server 2012 includes predefined combinations of services called ***roles*** that implement common server functions.

After you install the Windows Server 2012 operating system, you can use Server Manager or ***Windows PowerShell*** to assign one or more roles to that computer. The roles included with Windows Server 2012 fall into three basic categories:

- **Directory services** store, organize, and supply information about a network and its resources.
- **Infrastructure services** provide support services for network clients.
- **Application services** provide communications services, operating environments, or programming interfaces for specific applications.

Directory Services: - Store, organize & supply information about network and its resources.
Active Directory: - An Active Directory is a directory structure used on Microsoft Windows based servers and computers to store data and information about networks and domains. It is a centralized and hierarchical database.

- It is used for centralized domain management.
- Store information about the objects on networks and makes this information available to administrator and users for use.
- Its main purpose is to authenticate the users.

Its features of directory services are as: -

1. **Active Directory Certificate Services (ADCS):** - implements certification authorities (CAs) and other services that facilitate the creation and management of the public key certificates used by the identity and access control elements of the Windows Server 2012 security infrastructure.
    - It provides digital certificates for the organization which can be used by the organization to encrypt the network traffic and to authenticate user etc.
    - Example: - Whenever 'https' request is made, it keeps on using the certificate to encrypt your request to communicate from the client to the server.

2. **Active Directory Domain Services (ADDS): -** configures the server to function as an Active Directory domain controller, which stores and manages a distributed database of network resources and application-specific information. It is for the organization security and authentication. [*Domain: - it can be defined as a logical structure of the container or the hierarchical structure of users, groups, computers, networks and many more. It can include security services that provides authentication.]*

3. **Active Directory Federation Services (ADFS): -** creates a single sign-on environment by implementing trust relationships that enable users on one network to access applications on other networks without providing a secondary set of logon credentials. It connects Domain Services to the web-based applications outside the domain by using the federated trust in order to authenticate user access. It allows centralized web access under Domain Services Credentials.

4. **Active Directory Rights Management Services:** - makes up a client/server system that uses certificates and licensing to implement persistent usage policies, which can control access to information, no matter where a user moves it.

It provides methods for protecting information. it protects documents by defining who can open, modify, print, forward or to take other actions. It can be done by using the certificates to encrypt the documents to have better security.

Infrastructure Services: - provide support services for network clients. Its features are as:

1. **Dynamic Host Configuration Protocol (DHCP): -** provides network clients with dynamically assigned IP addresses and other TCP/IP configuration settings, such as subnet masks, default gateway addresses, and Domain Name System (DNS) server addresses so that they can communicate with IP network.
2. **DNS Servers: -** provides name-to-address and address-to-name resolution services for ADDS and Internet clients. The Windows Server 2012 DNS server implementation also supports dynamic DNS and DHCP integration. It associates the domain name; the people use to access web pages with their IP address. It uses ARP and RARP protocols for IP to MAC and MAC to IP respectively..
3. **Hyper-V: -** provides a hypervisor-based environment in which administrators can create virtual machines, each of which provides an isolated instance of the operating system environment.
4. **Remote Access:** - provides remote users with access to network resources by using DirectAccess and VPNs, as well as LAN and NAT routing services.
5. **Windows Deployment Services (WDS): -** enables you to install Windows operating systems remotely on computers throughout the enterprise.
6. **Windows Server Update Services (WSUS): -** automates the process of disseminating operating-system updates to Windows computers throughout the enterprise.

Application Services: - provide communication services, operating environments or programming interfaces for specific application.

1. **Application Server: -** provides an integrated environment for deploying and running server-based business applications designed within (or expressly for) the organization, such as those requiring the services provided by Internet Information Services (IIS), web servers etc.
2. **Fax Server: -** enables you to manage fax devices and clients to send and receive faxes over the network.
3. **File and Storage Services:** - installs tools and services that enhance Windows Server 2012's basic ability to provide network clients with access to files stored on server drives.
4. **Print and Document Services: -** provides clients with access to printers attached to the server or to the network, as well as centralized network printer. Document services enable you to route images from network attached scanners to users.
5. **Web Server (IIS): -** installs Internet Information Services (IIS), which enables the organization to publish websites and web-based applications for use by intranet, extranet, and/or Internet clients.

Selecting a Windows Server 2012 Editions: - When planning a server deployment, you should choose the operating system edition based on multiple factors, including the following:

- The roles you intend the servers to perform
- The virtualization strategy, you intent to implement
- The licensing strategy you plan to use

There are four editions of Windows Server 2012 which are as follows: -

1. **Windows Server 2012 Datacenter: -**
    - Designed for large and powerful servers
    - Support all the features of directory, infrastructure and application services.
    - Fault-tolerant and available through volume-licensing program
    - Uses Client Access License (CALs) for accessing the server's services for each user and device.
    - Supports full storage replica feature for complete disaster recovery.

2. **Windows Server 2012 Standard: -**
    - Designed for medium to large businesses
    - Uses CALs for accessing the server's services for each user and device.
    - Fault-tolerant
    - It supports all the features but vary in the numbers of virtual machine instances permitted by license
    - supports limited Storage Replica feature (volume of 2TB)

3. **Windows Server 2012 Essentials: -**
    - Supports only necessary tools and utilities
    - Limited to 25 to 50 users only
    - doesn't require buying CALs, making it an affordable option for small companies.
    - But doesn't support
        - Remote access
        - Hyper-V
        - Active Directory Federation Services
        - Active Directory Rights Management Services
        - Active Directory domain services

4. **Windows Server 2012 Foundation**
    - Designed for small businesses
    - Limited to 15 users only

- Implemented in environments where features such as file sharing, printer sharing and security are required.
- But doesn't support:
    - Active Directory Federation Services
    - Hyper-V

Supporting Server Virtualization: -

The Windows Server 2012 Datacenter and Standard editions both include support for Hyper-V, but they vary in the number of virtual machines permitted by their licenses. Each running instance of it is classified as being in POSE or VOSE.

- **POSE (Physical Operating System Environment): -** A POSE is a physical computer with its own hardware. When you purchase a Windows Server 2012 license, you can perform a POSE installation of the operating system, as always.
  Key features of POSE are as:
    - Runs directly on physical hardware.
    - Manages hardware resources like CPU, memory, storage, and peripherals.
    - Examples include Windows, mac OS, various Linux distributions.
    - Each physical machine typically hosts only one operating system instance.
    - Requires dedicated hardware for each operating system environment.
    - Hardware upgrades or changes impact the specific OS environment directly.

- **VOSE (Virtual Operating System Environment):** - VOSE is a virtual machine running on a Hyper-V server with virtualized hardware. After installing the Hyper-V role, you can then create virtual machines (VMs) and perform VOSE installations on them. The number of VOSE installations permitted by your license depends on the edition you purchased.
  Key Features of VOSE are as:
    - Runs on a virtualization layer, which abstracts physical hardware.
    - Supports concurrent execution of multiple operating system instances on a single physical host.
    - Each virtual machine can run its own OS, independent of others.
    - Managed by a hypervisor, which allocates and manages resources for VMs.
    - Enables better resource utilization and flexibility in resource allocation.
    - Resources like CPU, memory, and disk space can be dynamically adjusted based on demand.
    - Examples of virtualization platforms include VMware, Hyper-V, VirtualBox.

Edition	POSE Instances	VOSE Instances
Datacenter	1	Unlimited
Standard	1	2
Foundation	1	0
Essentials	1 (POSE or VOSE)	1 (POSE or VOSE)

Server Licensing: -

The licensing structure for Windows Server 2012 is considerably simpler than it has been in previous versions of the operating system. The licenses you need to purchase for a given server installation are affected by the following criteria: -

- **Processors**—Both the Datacenter and the Standard edition come with a license that supports up to two physical processors. To run either one on a computer with more than two processors, you must purchase additional licenses.

- **Virtual instances**—The Standard edition license supports one physical instance and as many as two virtual operating system instances on a Hyper-V installation. If you want to create more than two virtual machines running Windows Server 2012 Standard, you must purchase additional licenses at the rate of two virtual instances per license. The Datacenter edition supports an unlimited number of virtual instances. The Essentials license enables you to install the operating system on one physical computer or one virtual machine, but not both. The Foundation license includes no virtual instances.

- **Clients**—The Foundation license supports up to 15 users and the Essentials edition up to (25-100) users. For the Standard and Datacenter editions, you must purchase client access licenses (CALs).

Installing Windows Server 2012: -

If a computer is brand new and has no operating system installed on it, it cannot start until you supply a boot disk, such as a Windows Server 2012 installation disk. During installation, you select the disk partition on which you want to install the operating system, and the Setup program copies the operating system files there.

System Requirements: -

As of this writing, the minimum system requirements for all editions of Windows Server 2012 are as follows:

- 1.4 GHz 64-bit processor
- 512 MB RAM

- 32 GB disk space
- DVD or USB flash drive
- Super VGA (800x600) or higher resolution monitor

Having 32 GB of available disk space should be considered an absolute minimum. The system partition needs extra space if you install the system over a network or your computer has more than 16 GB of RAM installed. The additional disk space is required for paging, hibernation, and dump files. In practice, you are unlikely to come across a computer with 32 GB RAM and only 32 GB disk space. If you do, free more disk space or invest in additional storage hardware.

Maximum hardware configuration can be: -

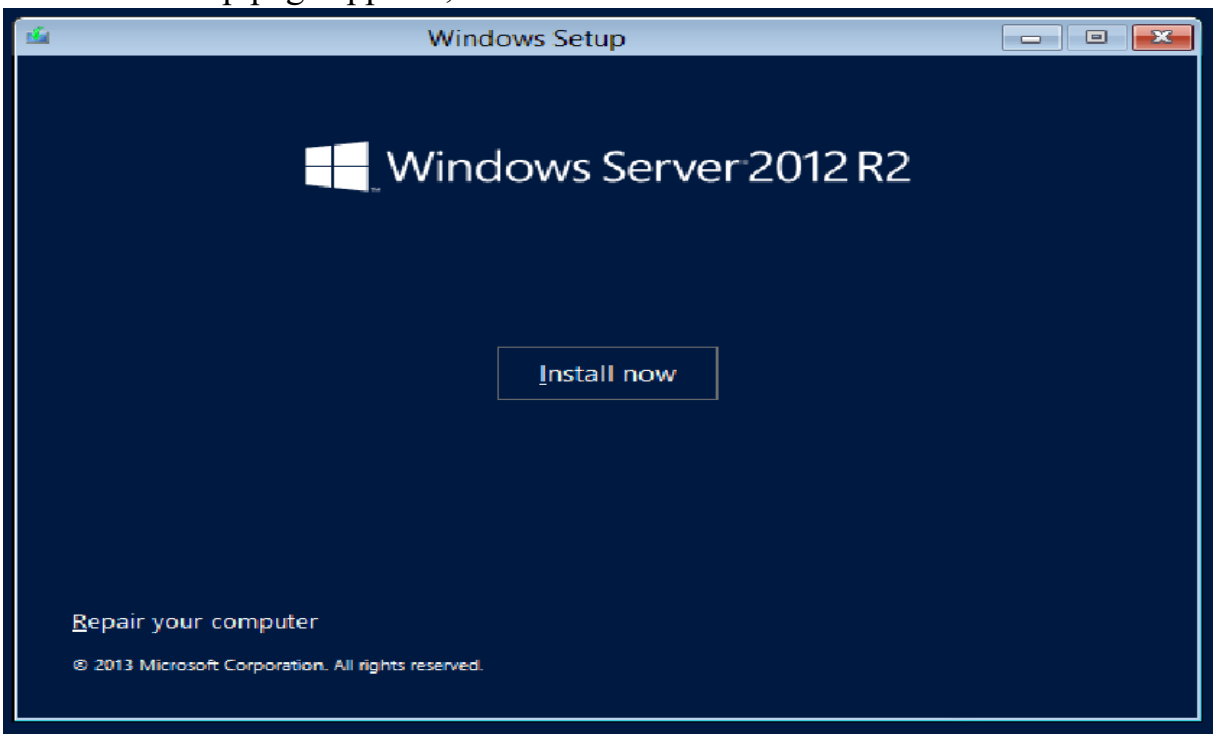
	Windows Server 2012	Windows Server 2008 R2
Logical Processors	640	256
RAM	4 terabytes	2 terabytes
Failover cluster nodes	63	16

Performing a clean Installation: -

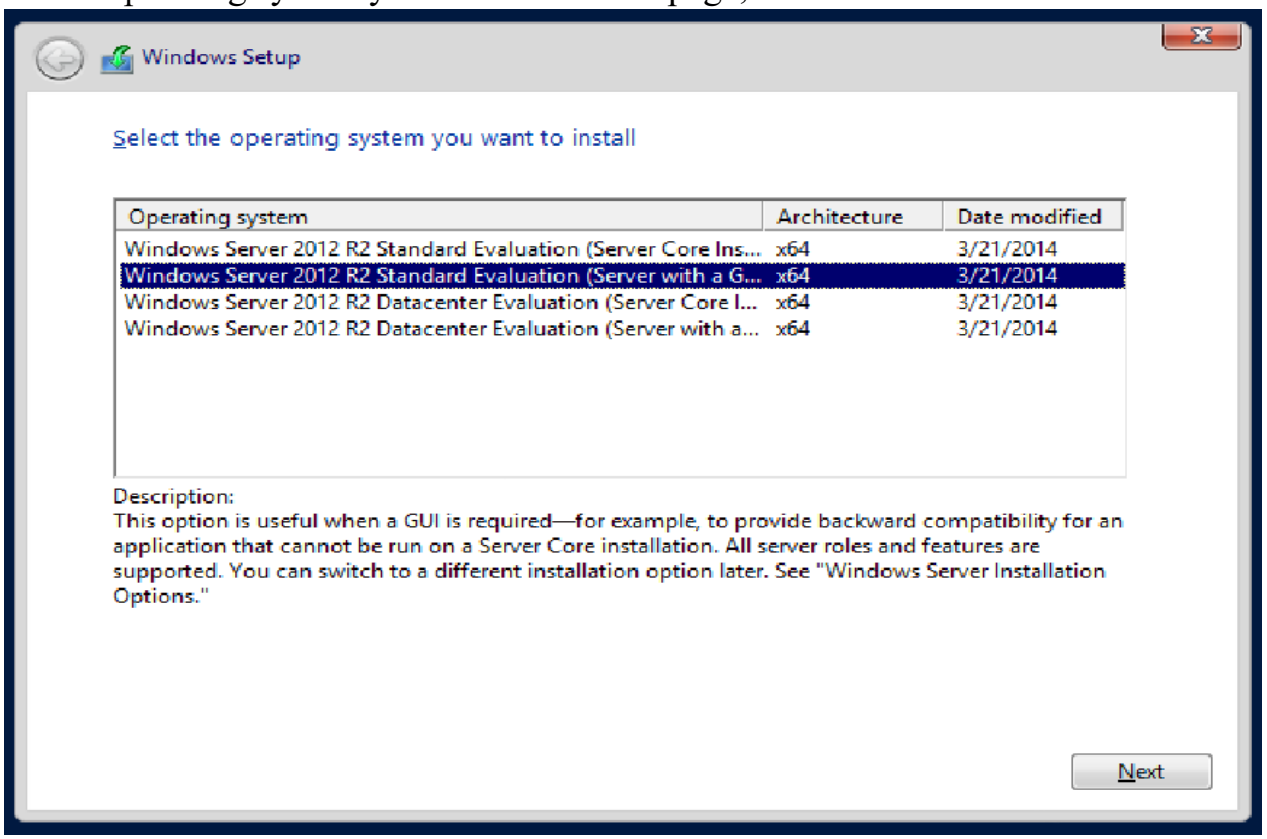
Steps to install Windows server 2012 are as follows: -

1. Turn on the computer and insert the Windows Server 2012 installation disk into the DVD drive.
2. Press any key to boot from the DVD (if necessary). A progress indicator screen appears as Windows is loading files. A Windows Setup page appears, as shown below: -

3. By using the drop-down lists provided, select the appropriate language to install, time and currency format, and keyboard or input method, and then click Next. The Windows Setup page appears, as shown below: -

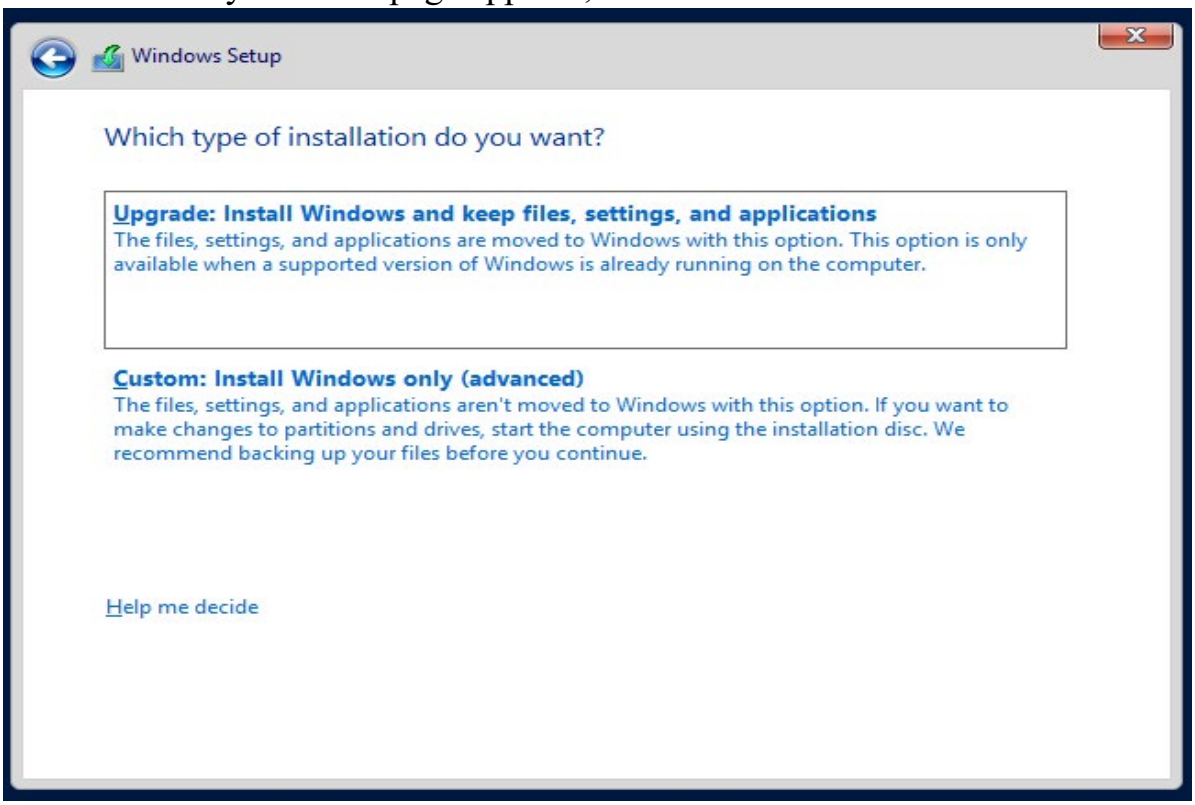


4. Click on 'Install Now'. The Windows Setup Wizard appears, displaying the 'Select the operating system you want to install' page, as shown below: -

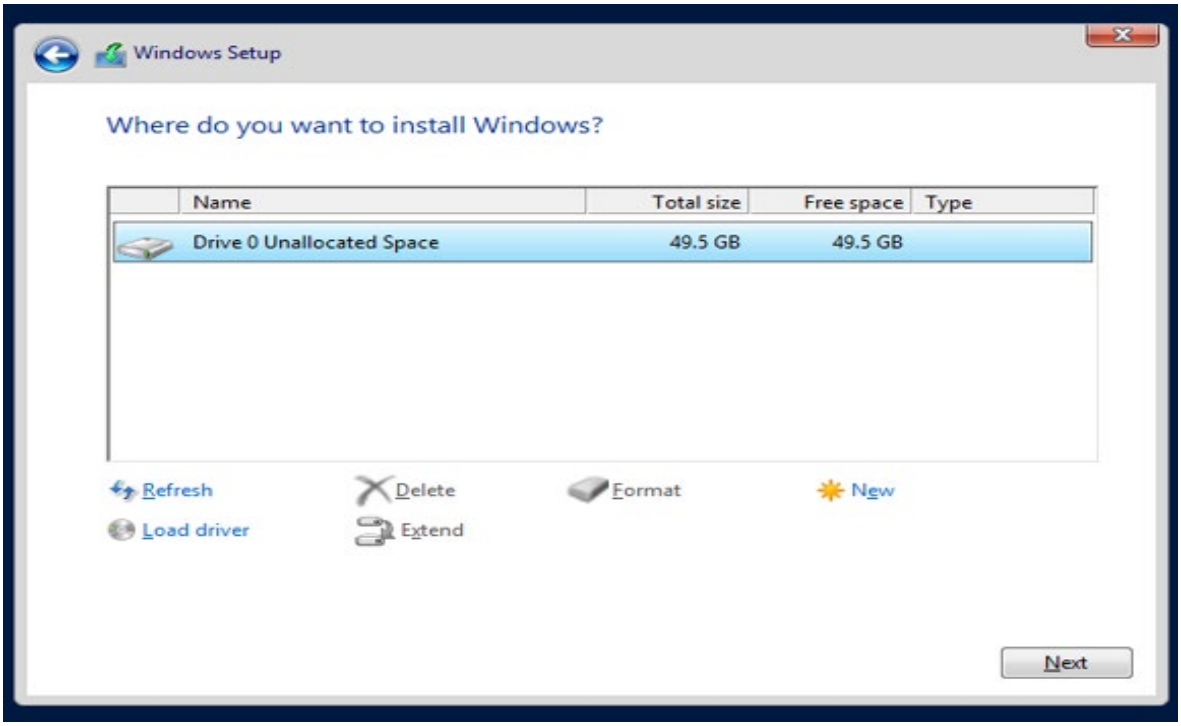


5. Select the operating system edition and installation option you want to install and click Next. The License Terms page appears.

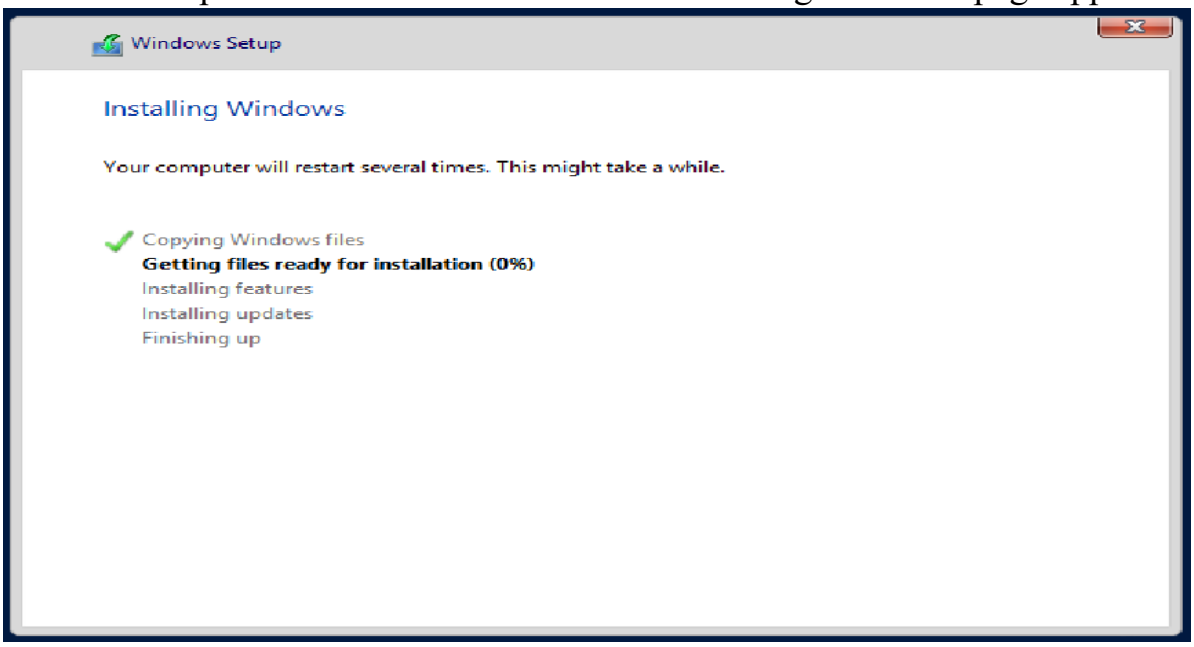
6. Select the 'I accept the license terms check box' and click Next. The Which type of installation do you want? page appears, as shown below: -



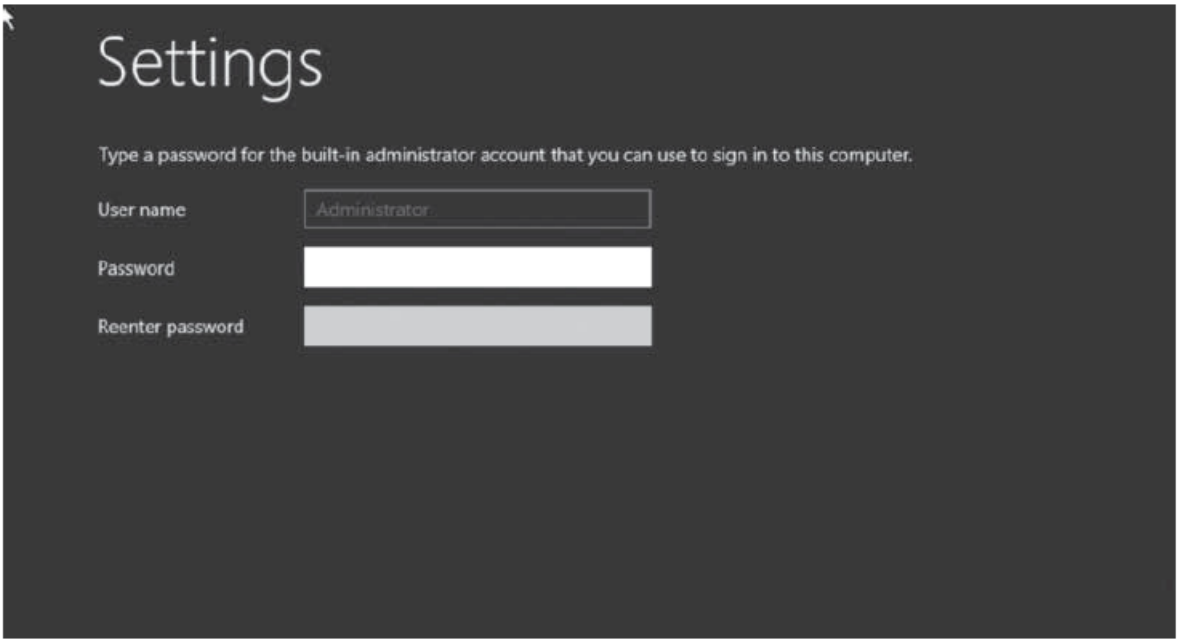
7. Because you are performing a clean installation and not an upgrade, click the 'Custom: Install Windows Only (advanced)' option. The 'Where do you want to install Windows?' page appears, as shown below: -



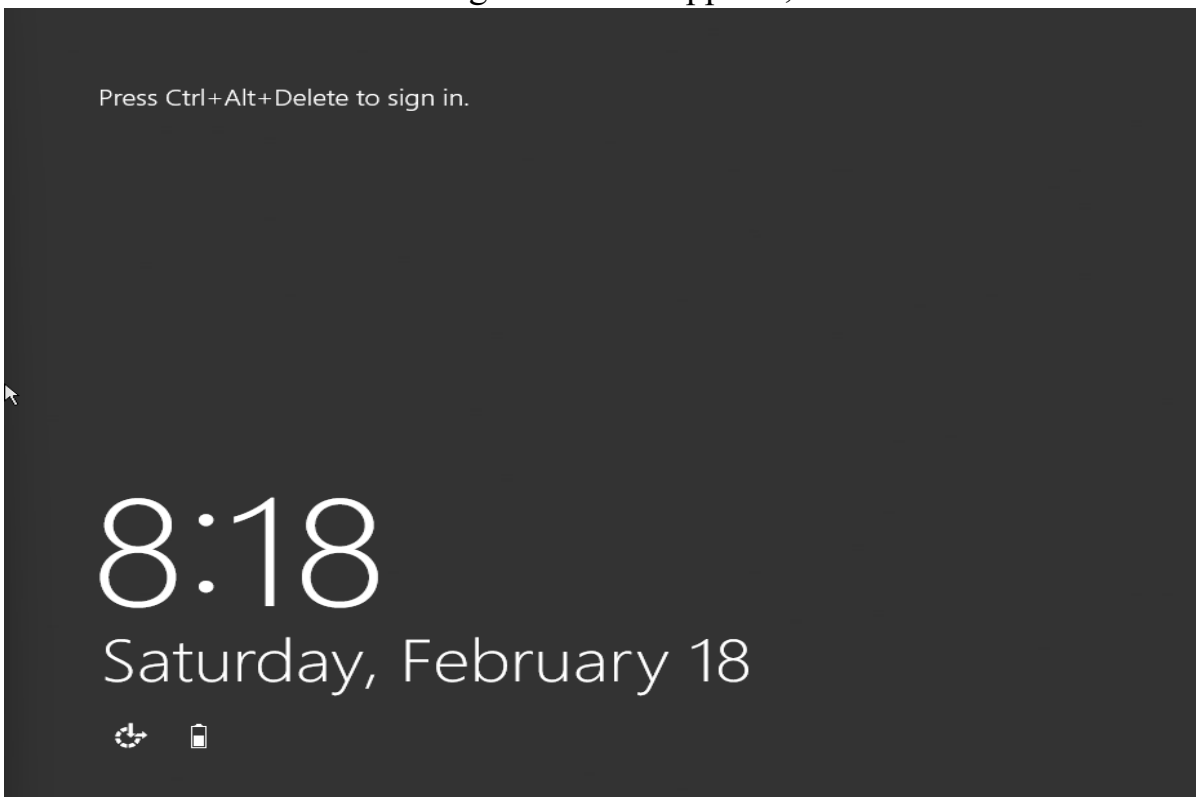
8. From the list provided, select the partition on which you want to install Windows Server 2012, or select an area of unallocated disk space where the Setup program can create a new partition. Then click Next. The Installing Windows page appears.



9. After several minutes, during which the Setup program installs Windows Server 2012, the computer restarts and the Settings page appears, as shown below: -



10. In the Password and Re-enter Password text boxes, type the password to be associated with the Administrator account and press Enter. The system finalizes the installation and the Windows sign-on screen appears, as shown below: -



Working with Installation Partitions: -

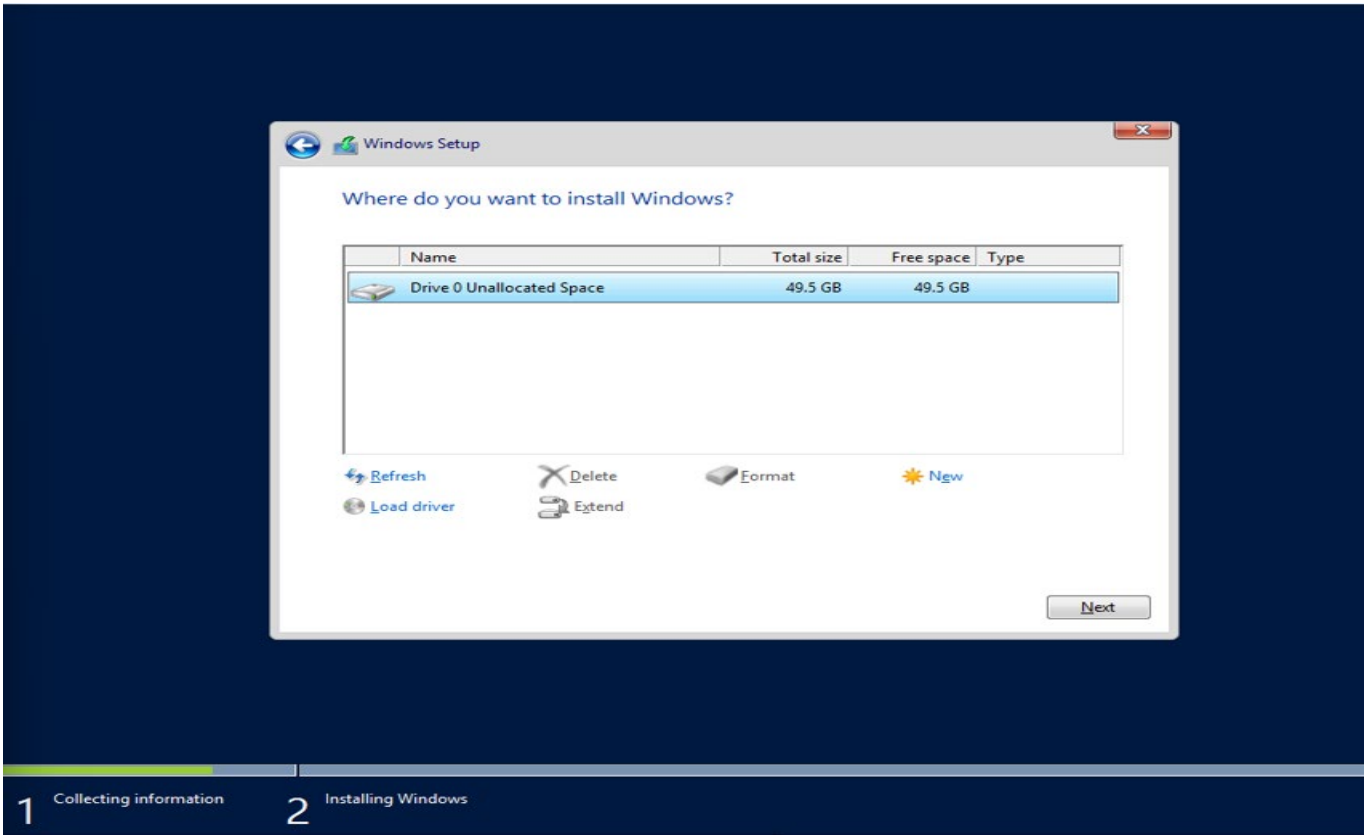
During the Windows Server 2012 installation procedure, the Setup program enables you to select the partition or area of unallocated disk space where you want to install the operating system. The *Where do you want to install Windows?* page lists the partitions on all the computer's disk drives that the Setup program can detect with its default drivers.

In most cases, all the computer's drives should appear in the list; if they do not, it is probably because Windows does not include a driver for the computer's drive controller.

In addition to installing disk drivers, the '*Where do you want to install Windows?'* Page enables you to create, manage, and delete the partitions on your disks.

Clicking the *Drive options (advanced)* button on the page causes of additional buttons to appear. These buttons have the following functions:

- **Delete: -** removes an existing partition from a disk, permanently erasing all its data. You might want to delete partitions to consolidate unallocated disk space, enabling you to create a new, larger partition.
- **Format: -** enables you to format an existing partition on a disk, thereby erasing all its data. You do not need to format any new partitions you create for the install, but you might want to format an existing partition to eliminate unwanted files before installing Windows Server 2012 on it.
- **New: -** creates a new partition of a user-specified size in the selected area of unallocated space.
- **Load drivers: -** If during a Windows Server 2012 installation, no disk partitions or unallocated space appear on the '*Where do you want to install Windows?'* page, you must install the appropriate driver for your disk controller using this option before the installation can continue.
- **Extend: -** enables you to make an existing partition larger, as long as unallocated space is available immediately following the selected partition on the disk.



Post-Installation Tasks: - Post-Installation tasks can be termed as the tasks that will be performed after the installation of Windows Server 2012 on the system to configure various changes. These tasks can be as follows: -

1. Converting the System interface from GUI to Server Core and vice versa
2. Upgrading paths
3. Installing Migration tools
4. Configuring NIC Teaming
5. Configuring Local Storage

[Detailed explanation about these tasks is given further]

Server Core: - While installing Windows Server, there is an option for installing 'Server Core Installation'. With this version of the OS, it'll be supporting CLI interface rather than GUI. There is no Start menu, no desktop Explorer shell, no Microsoft Management Console, and virtually no graphical applications. All you see when you start the computer is a single window with a command prompt.

Benefits of running Server Core are as follows: -

- More Secure: -
- More Stable: -
- Reduces Disk Space: - Server Core requires less disk space for the installed operating system elements, as well as less swap space, which maximizes the utilization of the server's storage resources.
- Less need of maintenance: -
- Easy management: -
- Reduced patch frequency: - Windows Server 2012's graphical elements are among the most frequently patched features, so running Server Core reduces the number of patches (updates) that you must apply. Fewer patches also mean fewer server restarts and less downtime.
- Reduced attack surface: - The less software there is running on the computer, the fewer entrances are available for attackers to exploit. Server Core reduces the potential openings presented by the operating system, increasing its overall security.
- Hardware resource conservation: - Server Core eliminates some of the most memory and processor-intensive elements of the Windows Server 2012 operating system, thus devoting more of the system hardware to running essential services.

Server Core Defaults: -

In Windows Server 2012, Server Core is now the default installation option because in the new way of managing servers, you should rarely, if ever, have to work at the server console, either physically or remotely.

The new Server Manager application in Windows Server 2012 enables you to add servers from all over the enterprise and create server groups to facilitate the configuration of multiple

systems simultaneously. The new Windows PowerShell 3.0 environment increases the number of available commands—known as ***cmdlets***—from 230 to more than 2,430.

With tools like these, it is possible for you to install your servers using the Server Core option, execute a few commands to join each server to an AD DS domain, and then never touch the server console again.

You can perform all subsequent administration tasks, including deployment of roles and features, by using Server Manager and Windows PowerShell from a remote workstation.

Server Core Capabilities: -

The following table lists the roles and features that are available and not available in a Windows Server 2012 Server Core Installation: -

Roles Available in Server Core Installation	Roles Not Available in Server Core Installation
Active Directory Certificate Services	Active Directory Federation Services
Active Directory Domain Services	Application Server
Active Directory Rights Management Services	Fax Server
DNS Server	Windows Deployment Services
DHCP Server	Remote Desktop Services: • Remote Desktop Gateway • Remote Desktop Session Host • Remote Desktop Web Access
Windows Server Update Services	
File and Storage Services	
Hyper-V	
Print and Document Services	
Remote Desktop Services: • Remote Desktop Connection Broker • Remote Desktop Licensing • Remote Desktop Virtualization Host	
Remote Access	
Web Server (IIS)	

[Please note. For your university examination, you'll have to explain the above-mentioned capabilities. Explanation regarding these capabilities is already given under the topic "Server roles and Features".]

Converting between GUI and Server Core: -

In Windows Server 2012, you can convert a computer installed with the full GUI option to Server Core and add the full GUI to a Server Core computer.

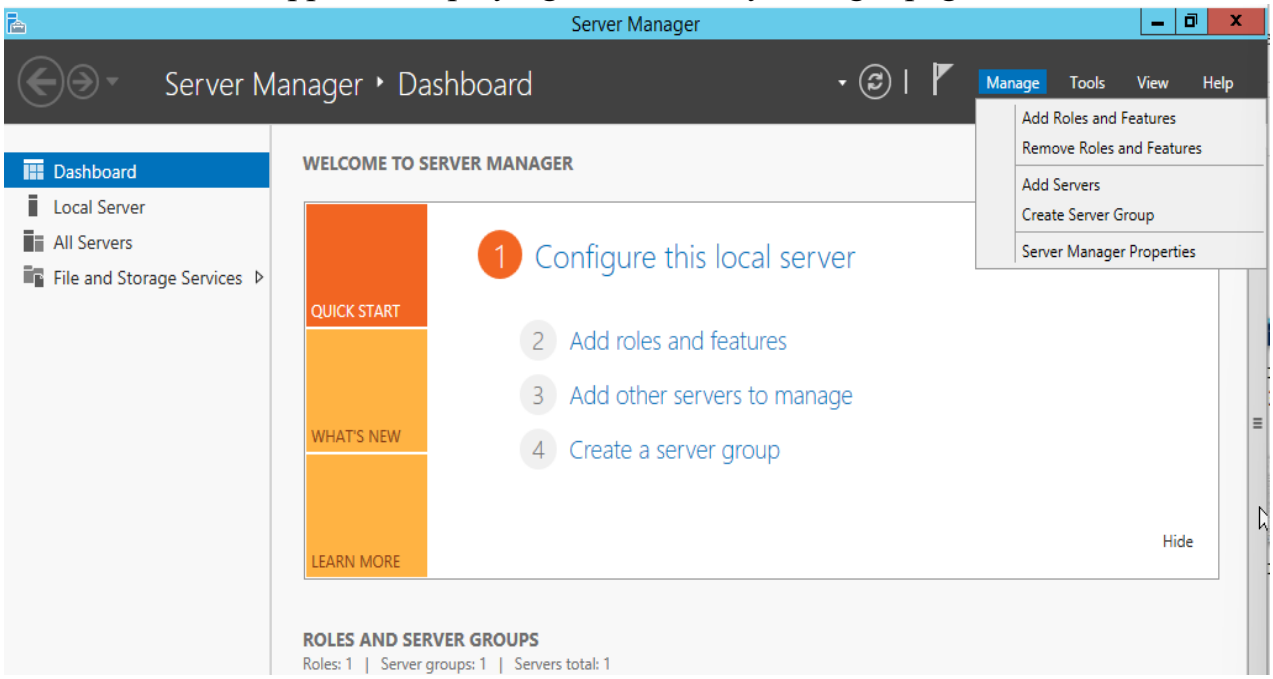
To convert a full GUI installation of Windows Server 2012 to Server Core using Server Manager, use the following procedure.

This can be done using GUI as well as CLI.

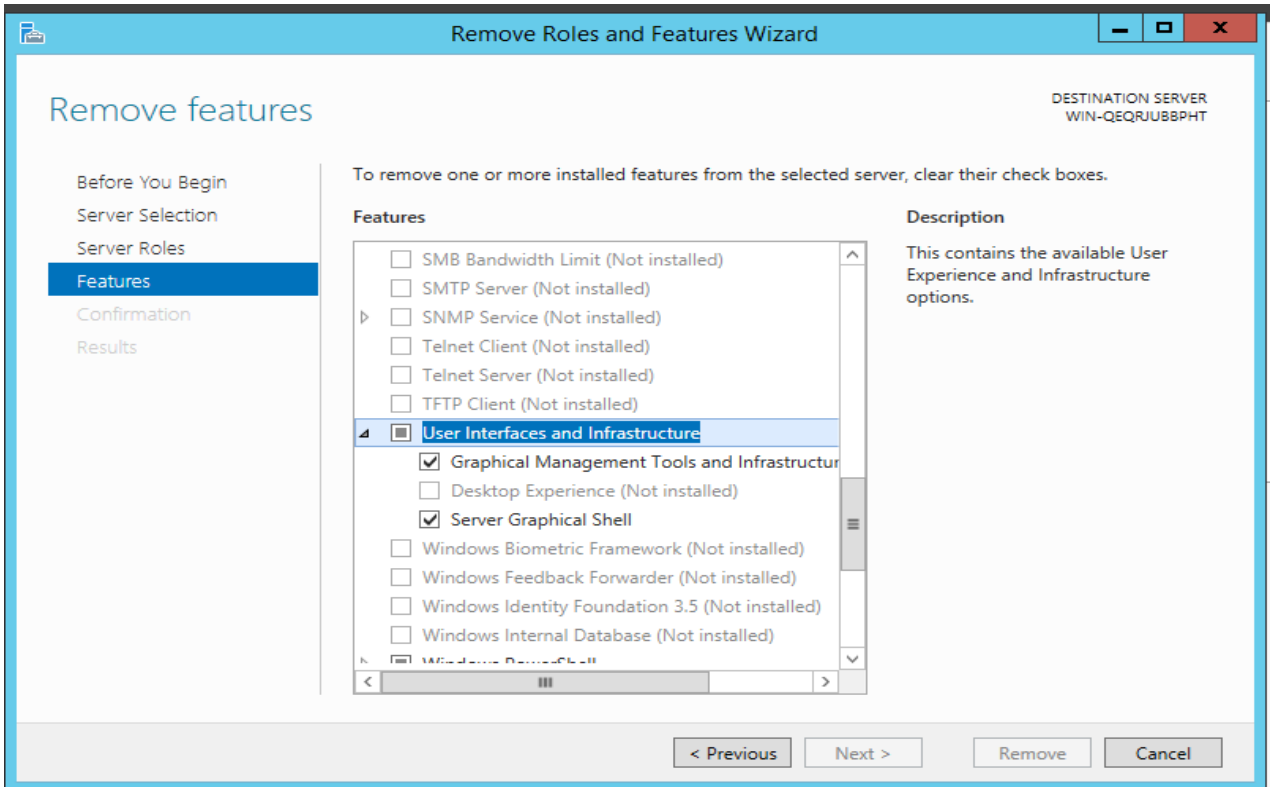
<u>At first, Let's do by using GUI: -</u>

Log on to the server running Windows Server 2012 by using an account with administrative privileges. The Server Manager window appears.

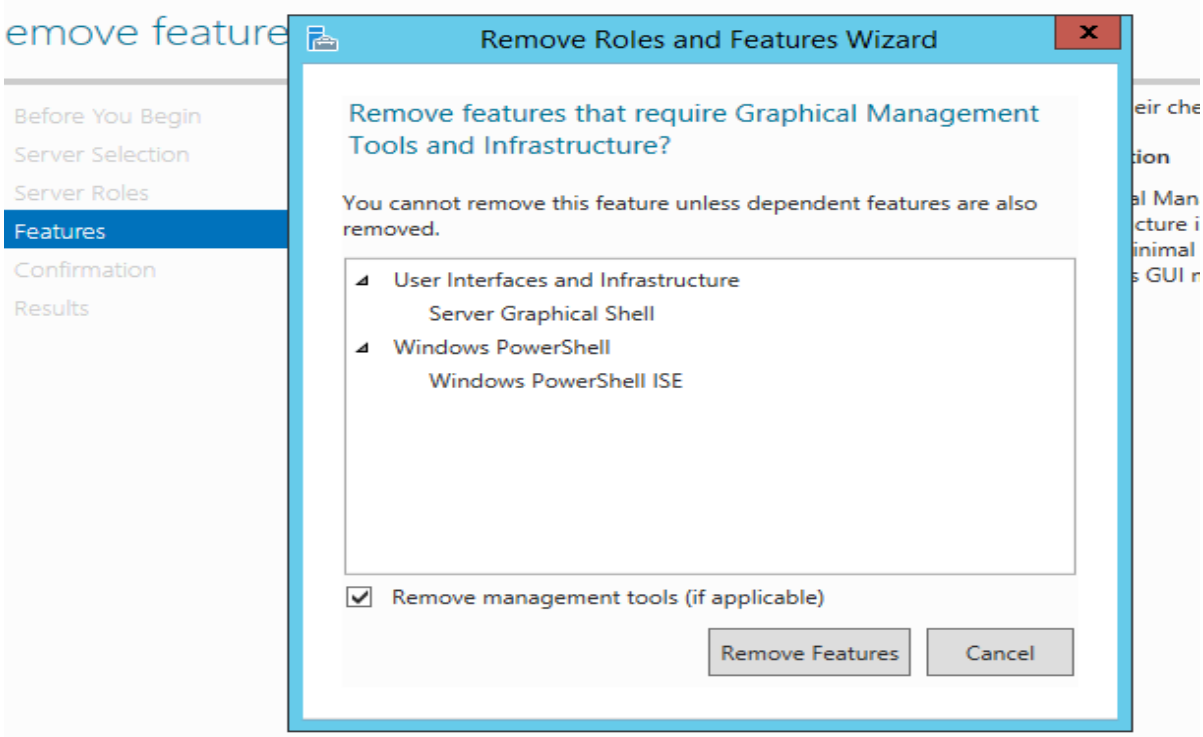
1. From the 'Manage' menu, select 'Remove Roles and Features'. The 'Remove Roles and Features Wizard' appears, displaying the 'Before you begin page'.



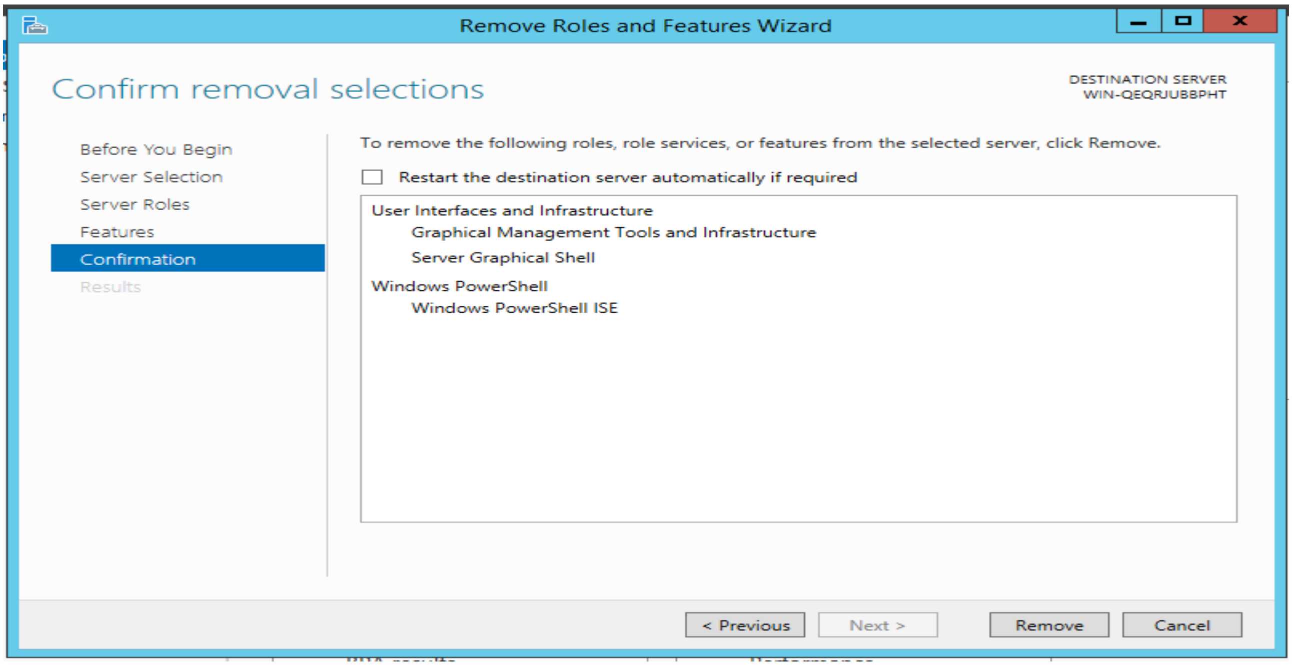
2. Click Next. The 'Select destination server' page appears.
3. Select the server you want to convert to Server Core and click Next. The Remove Server Roles page appears.
4. Click Next. The 'Remove features' page appears.
5. Scroll down in the list and expand the 'User Interfaces and Infrastructure' feature, as shown below: -



6. Clear the check boxes for the following components: -
   - Graphical Management Tools and Infrastructure
   - Server Graphical Shell
7. The 'Remove features that require Graphical Management Tools and Infrastructure' dialog box appears, as shown below, with a list of dependent features that must be uninstalled. Click 'Remove Features'.



8. Click Next. The 'Confirm removal selections' page appears.
9. Select the 'Restart the destination server automatically if required' check box and click 'Remove'. The *Removal progress* page appears as the wizard uninstalls the feature.

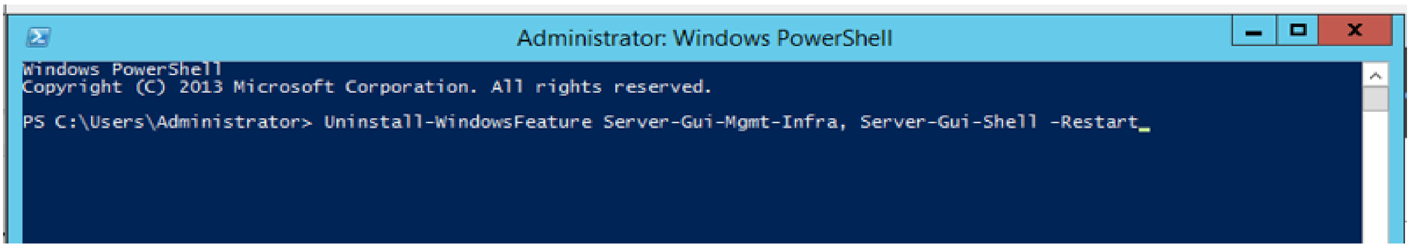


10. Click Close. When the removal is completed, the computer restarts.

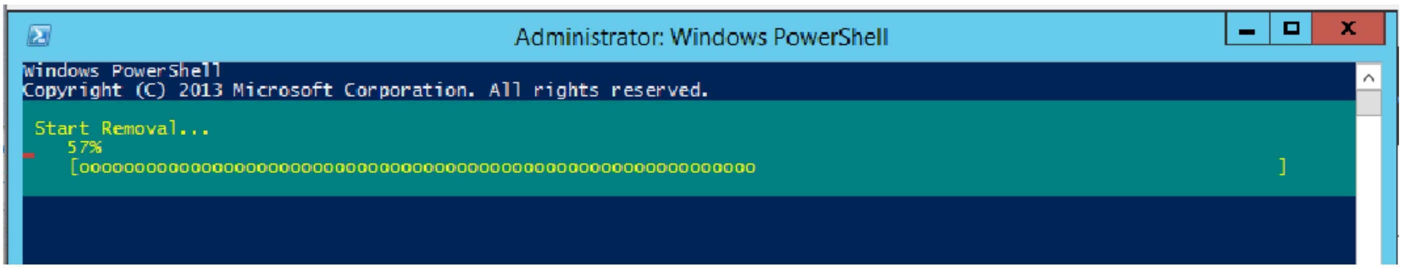
Converting from GUI to Server Core using command: -

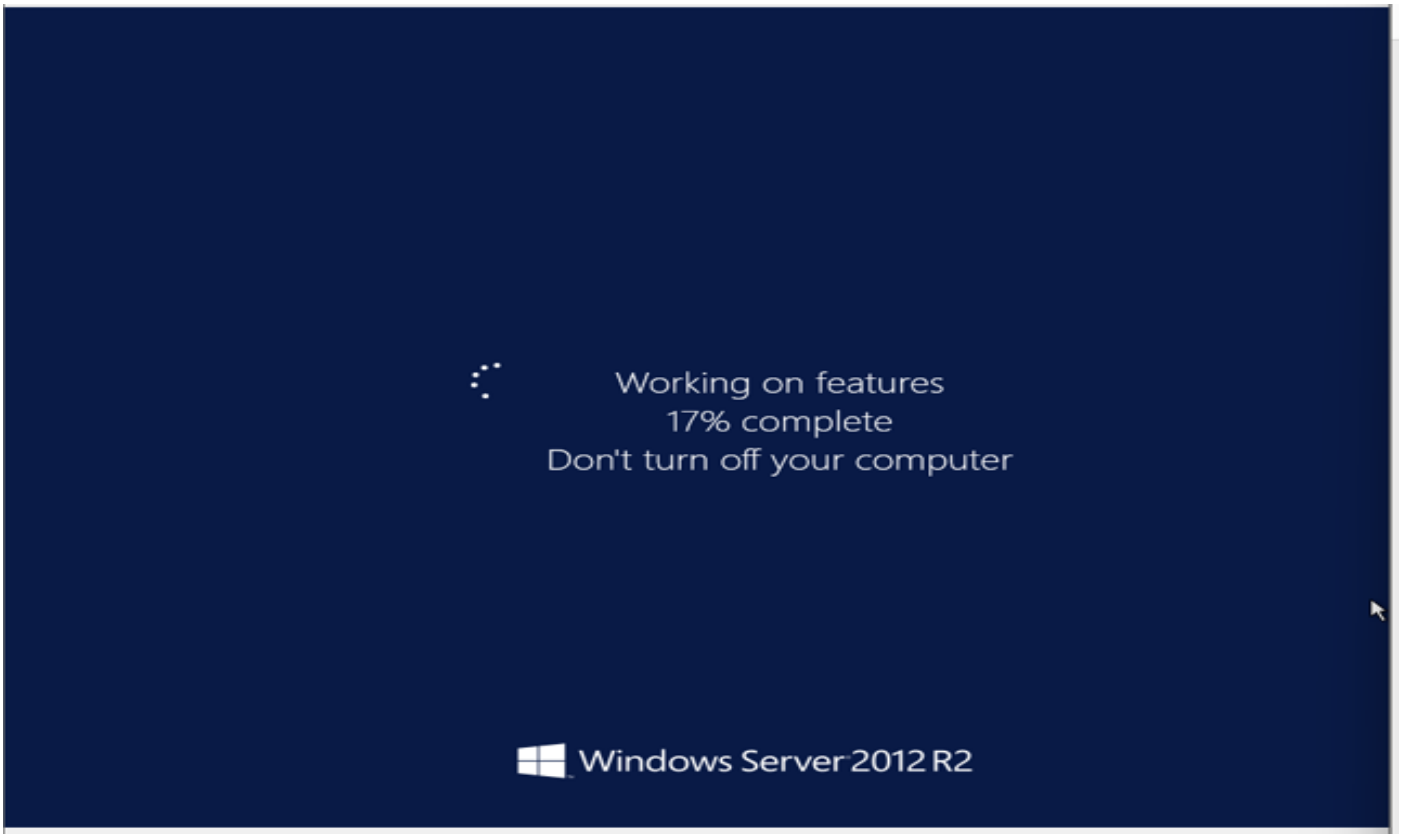
- Type the following Command in the Windows PowerShell: -

Uninstall-WindowsFeature Server-Gui-Mgmt-Infra, Server-Gui-Shell -Restart



On the successful execution of this command, processing will get started for interface conversion, as shown below.

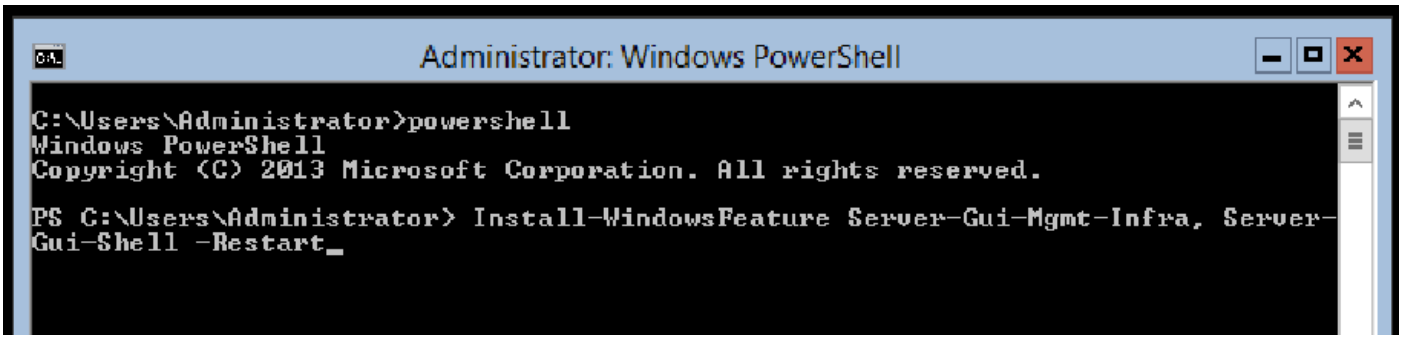




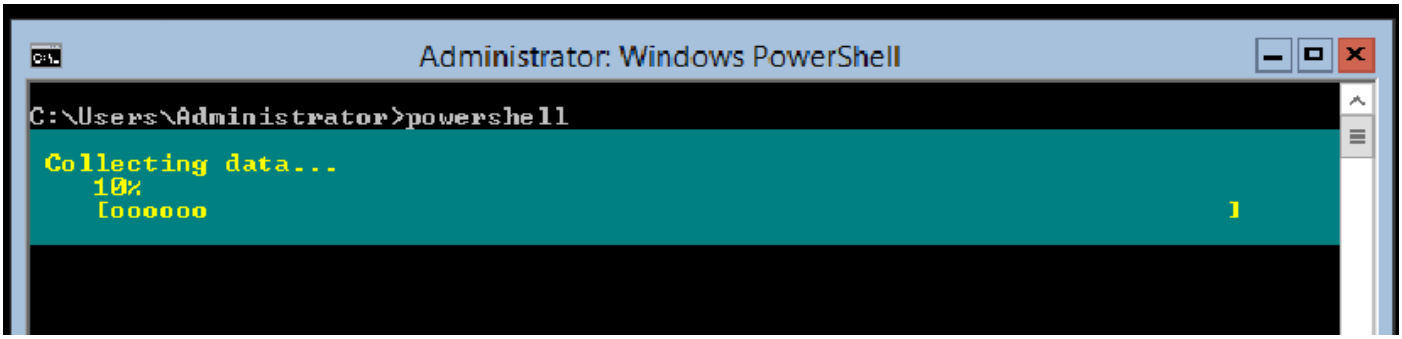
To convert a Windows Server 2012 Server Core installation to the full GUI option, use the following Windows PowerShell command:

Type the following command: -

1. First of all, type 'powershell' to shift to Windows PowerShell
2. Now type the following Command: -
   Install-WindowsFeature Server-Gui-Mgmt-Infra, Server-Gui-Shell -Restart



On the successful execution of command, processing will get started for interface conversion.



Installing Windows Server Migration Tools: -

Migration is the preferred method of replacing an existing server with one running Windows Server 2012. Unlike an in-place upgrade, a migration copies vital information from an existing server to a clean Windows Server 2012 installation.

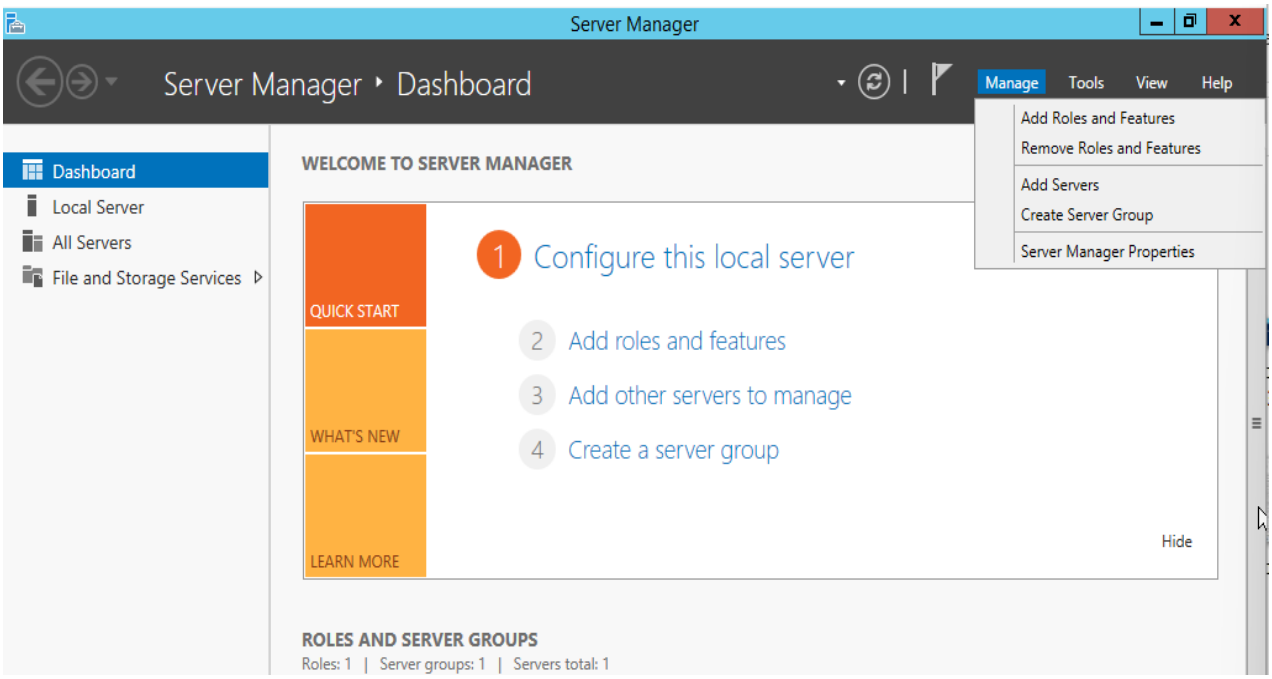
By using the Windows Server Migration Tools and migration guides supplied with Windows Server 2012, you can migrate data between servers under any of the following conditions:

- **Between versions:** You can migrate data from any Windows Server version since Windows Server 2008 R2 to Windows Server 2012. This includes migrations from one server running Windows Server 2012 to another.
- **Between platforms:** You can migrate data from an x32 or x64-based server to an x64-based server running Windows Server 2012.
- **Between editions:** You can migrate data between servers running different Windows Server editions.
- **Between physical and virtual instances:** You can migrate data from a physical server to a virtual one, or the reverse.

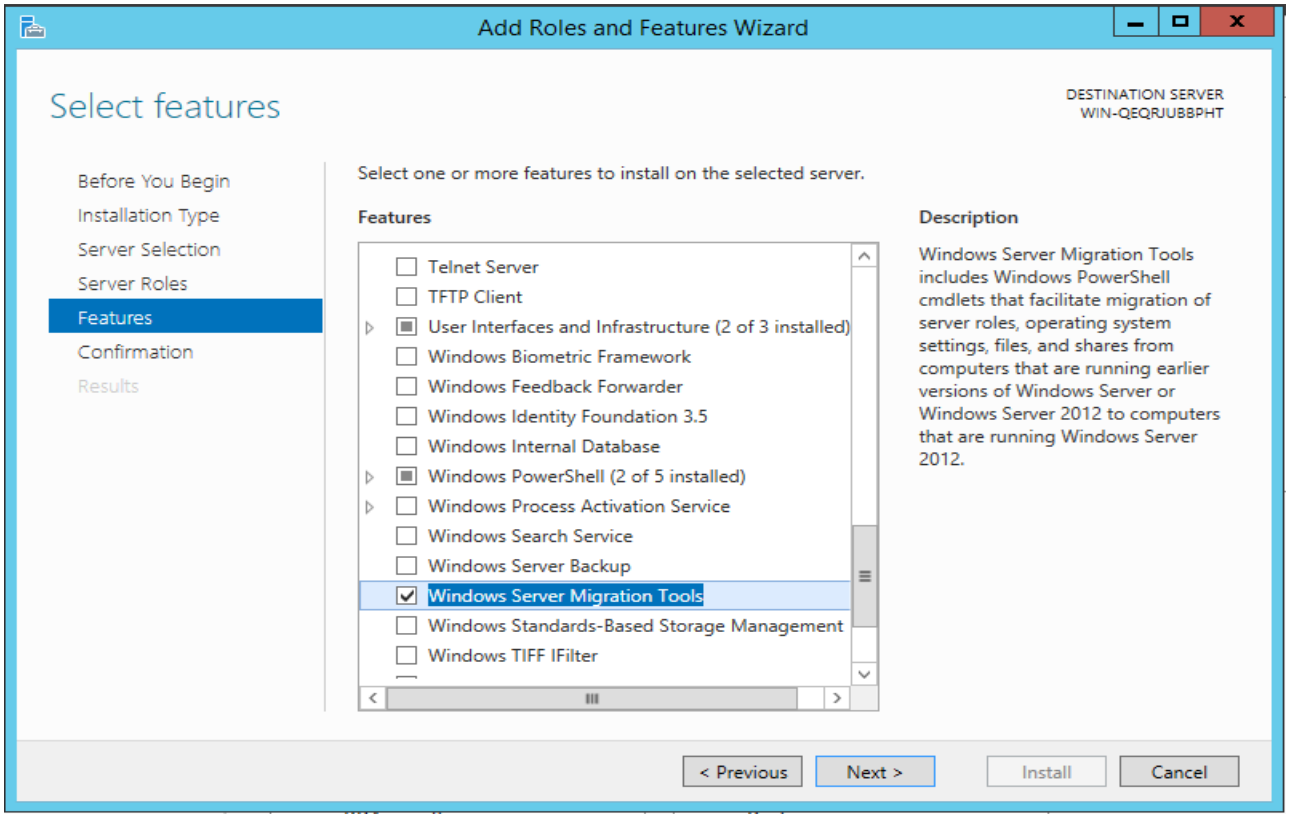
Before you can use the migration tools, however, you must install the Windows Server Migration Tools feature on the destination server running Windows Server 2012, and then copy the appropriate version of the tools to the source server.

Steps are as follows: -

1. From Manage menu, Select ‘Add Roles and Features’. The ‘Add Roles and Features Wizard’ appears, displaying the ‘Before you begin’ page.



2. Select the destination server from Server Pool. Then, Click on ‘Next’.
3. On ‘Select features’ page, Scroll down and select “Windows Server Migration Tools” and click on ‘Next’.

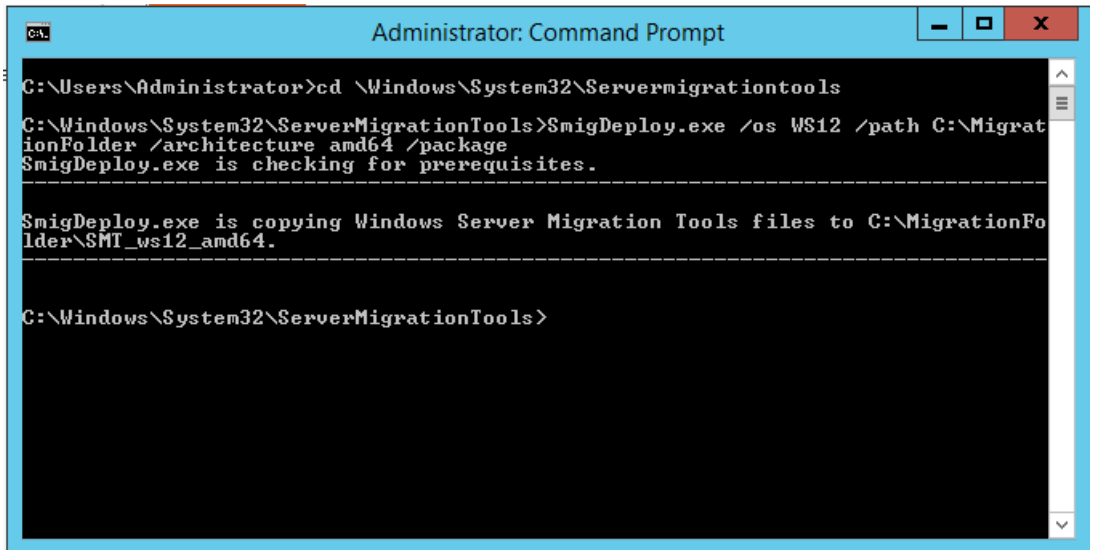


4. Then, 'Confirm installation selections' page appears and select 'Restart the destination server automatically if required' and the click on 'Install'
5. Then, it'll get installed after few moments.

After you install the Windows Server Migration Tools feature on the destination server, you must create a distribution folder containing the tools for the source server. This distribution folder must contain the appropriate files for the platform and the operating system version of the source server.

To create the distribution folder on a server running Windows Server 2012 with the Windows Server Migration Tools feature already installed, use the following procedure: -

1. Open the command prompt.
2. Switch to the directory containing the Windows Server Migration Tools files which is as: - C:\Windows\System32\ServerMigrationTools
3. To switch to this path, type: - cd \Windows\System32\ServerMigrationTools
4. The SmigDeploy.exe program creates a new folder in the directory you specify for the 'path' parameter, assigning it a name and location based on the command-line switches you specify.
5. Now, type the following command as: - SmigDeploy.exe /os WS12 /path C:\MigrationFolder /package /architecture amd64

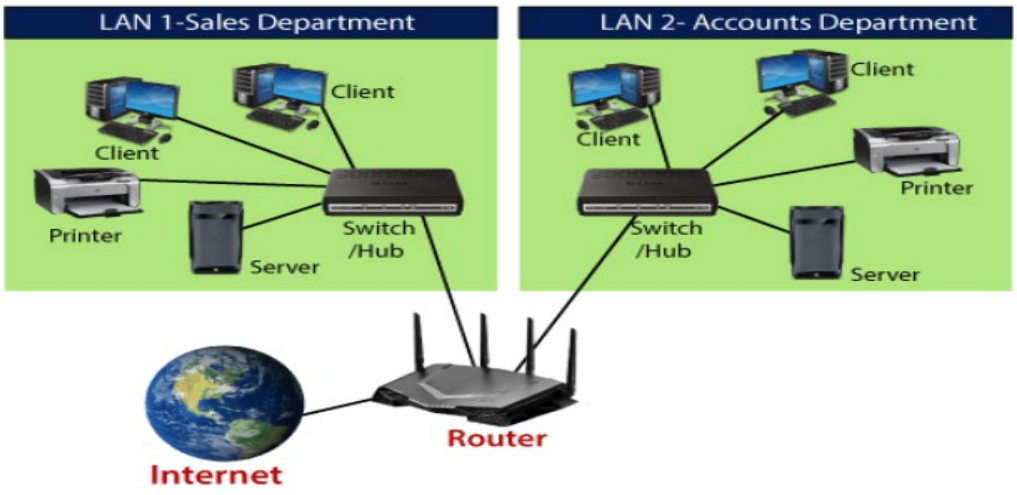


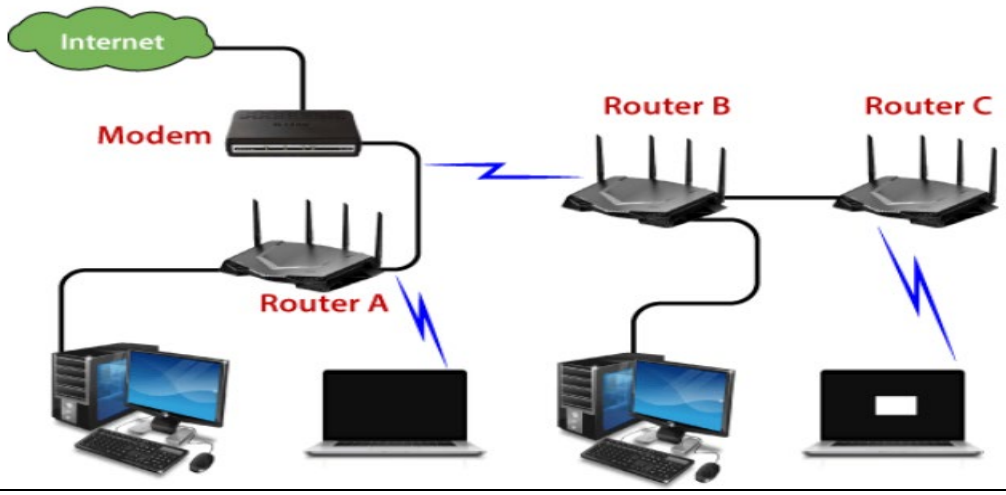
NIC Teaming: -

Points to remember: -

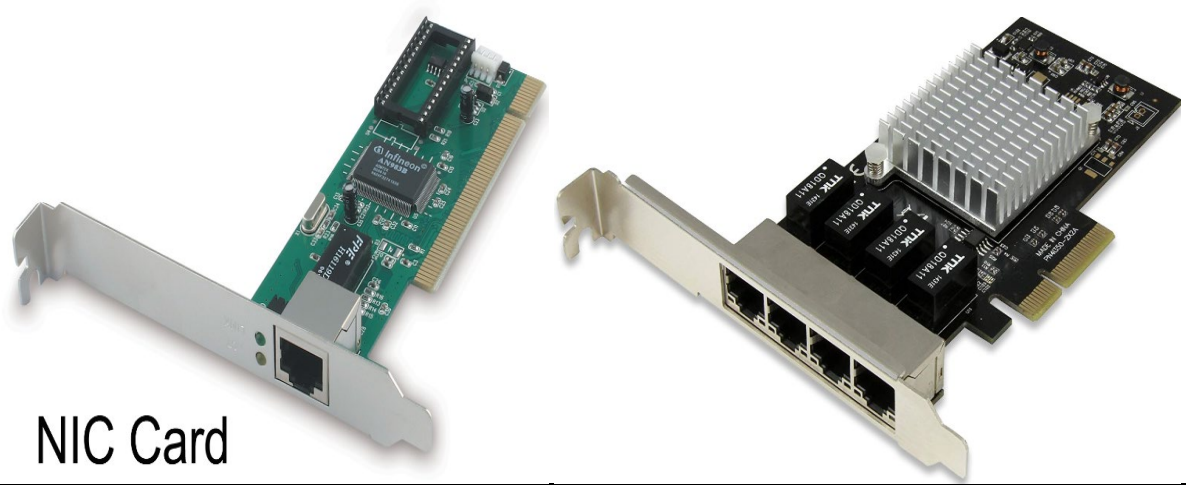
- ***Switch: -****A switch is a networking device, which provides the facility to share the information & resources by connecting different network devices,* such as computers, printers, and servers, *within a small business network.*

- ***Router:*** *-A router is a networking device used to connect multiple switches and their corresponding networks to build a large network.* These switches and their corresponding networks may be in a single location or different locations.





- ***NIC Cards: -*** *A network interface card (NIC) is a hardware component without which a computer cannot be connected over a network. It is a circuit board installed in a computer that provides a dedicated network connection to the computer. It is also called network interface controller, network adapter or LAN adapter.*



NIC Teaming: - NIC Teaming (or Load Balancing/Failover – LBFO, or NIC bonding) allows joining multiple physical network adapters (NICs) into a single logical network card or enables you to combine multiple physical network adapters into a single interface.

[*NIC teaming is a feature of Windows Server that allows the grouping of NICs into teams. The team members are the network adapters that are used to communicate with the switch. The team interfaces are the virtual network adapters created when making a team. Hence, NIC teaming maintains a connection to multiple physical switches but uses a single IP address. This ensures readily available load balancing and instant fault tolerance (instead of waiting for DNS records to timeout/update)*]

Benefits of NIC Teaming: -

- **Load balancing**
  In the case of NIC teaming, the network traffic is balanced across all active NICs equally. Hence, outgoing traffic is load balanced automatically between

the available physical NICs, based on the destination address. The incoming traffic is controlled by the switch routing the traffic to the server. The server does not control the physical NIC traffic.

- **Fault tolerance**
  Another benefit offered by NIC teaming is higher fault tolerance. If one of the underlying physical NICs is broken down or if the cable of the corresponding NIC is unplugged, the host/server detects the fault condition and moves the traffic to another NIC automatically. This reduces the possibility of a breakdown of the entire network, thus improving the fault tolerance of the system.

NIC Teaming Modes: -

The two NIC teaming modes are Switch Independent and Switch Dependent.

- **Switch Independent: -**
  As the name suggests, in the Switch Independent mode, it is hardware independent and the switches to which the NIC team members are connected do not know about the presence of the NIC team. Hence, those switches do not know how to distribute the network traffic to NIC team members, and instead, they distribute the inbound network traffic across NIC team members.

  If this mode is on, you can connect different network adapters to different switches to improve fault tolerance (protection against switch failure).

- **Switch Dependent: -** It is hardware dependent. In the Switch Dependent mode, the switch that is connected to NIC team members determines the distribution of the inbound network traffic among the NIC team members. Switch Dependent mode further has the following two options:
  i) **Static Teaming:** - It is a static operation mode depending on your network hardware. All team adapters must be connected to the same switch, which Ethernet ports are configured to use static channel aggregation (additional switch configuration is required); Requires manual configuration of the switch as well as the host to identify the links that form the team. Since this configuration is static, there is no additional protocol that assists the switch and host to identify errors such as incorrectly plugged cables. This can cause the team to fail.
  ii) **Link Aggregation Control Protocol (LACP):** LACP teaming identifies links connected between the switch and the host dynamically. This in turn enables the automatic creation of the team. This mode is supported by all server-class switches, but network operators must enable LACP on the switch port. You need to enable and configure the dynamic link aggregation using the LACP on your switch.

Using Switch Dependent mode with Dynamic distribution distributes the network traffic load based on Transport Ports address hash that is modified by the dynamic load balancing algorithm. This algorithm redistributes flows, optimizes team member

bandwidth utilization, and allows individual flow transmissions to move from one active team member to another. The algorithm also reduces the possibility of out-of-order deliveries but takes its possibility into account.

Load Balancing Modes: -

The load balancing distribution modes of NIC teaming are:

1. Address Hash

In this mode, a hash is created based on the address components of the packet. This hash is assigned to one of the available adapters, thus creating a reasonable balance across available adapters.

Windows PowerShell can be used to specify values for the hashing components like:

i. Source and destination TCP ports and source and destination IP addresses.
ii. Source and destination address only.
iii. Source and destination Media Access Control (MAC) addresses only.

2. Hyper-V Port

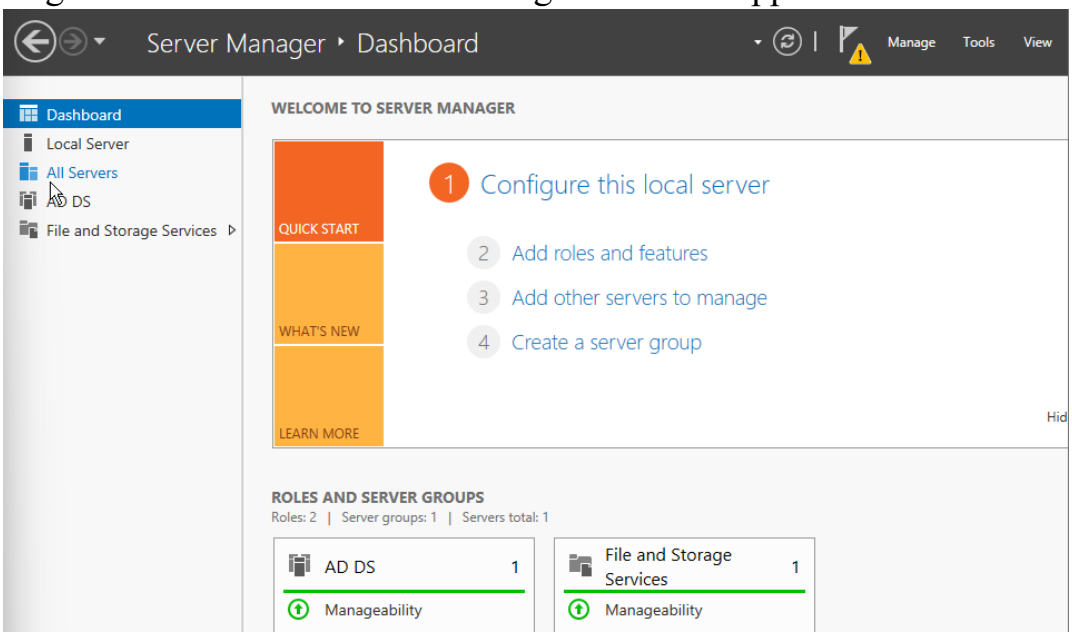
In this mode, the NIC teams that are configured on Hyper-V hosts give independent MAC addresses to Virtual Machines (VMs). The MAC address of the VMs or the VM ports connected to the Hyper-V switch are used to divide network traffic between NIC team members. It allows you to bind an adapter from your NIC Team to a specific port on a Hyper-V virtual switch.

3. Dynamic

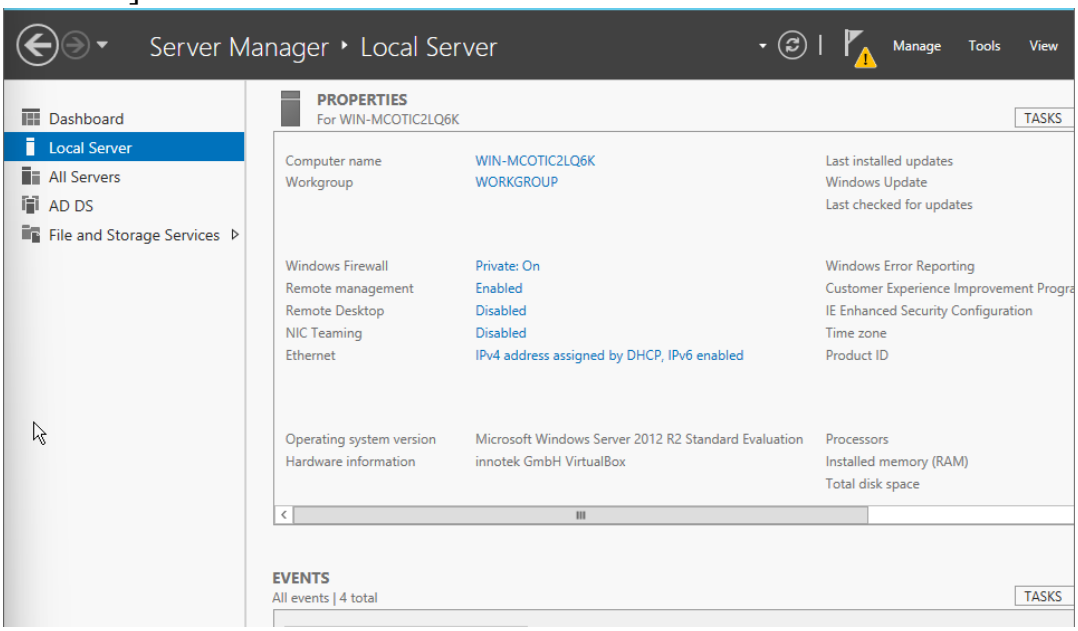
In this mode, the outbound loads are distributed based on the TCP port and IP address. This mode rebalances loads in real-time to ensure that a given outbound flow moves back and forth between team members. The inbound loads are distributed in the same way as the Hyper-V port. It utilizes both aspects of Address Hash and Hyper-V and is the highest performing load balancing mode.

Steps to create NIC Teaming are as: -

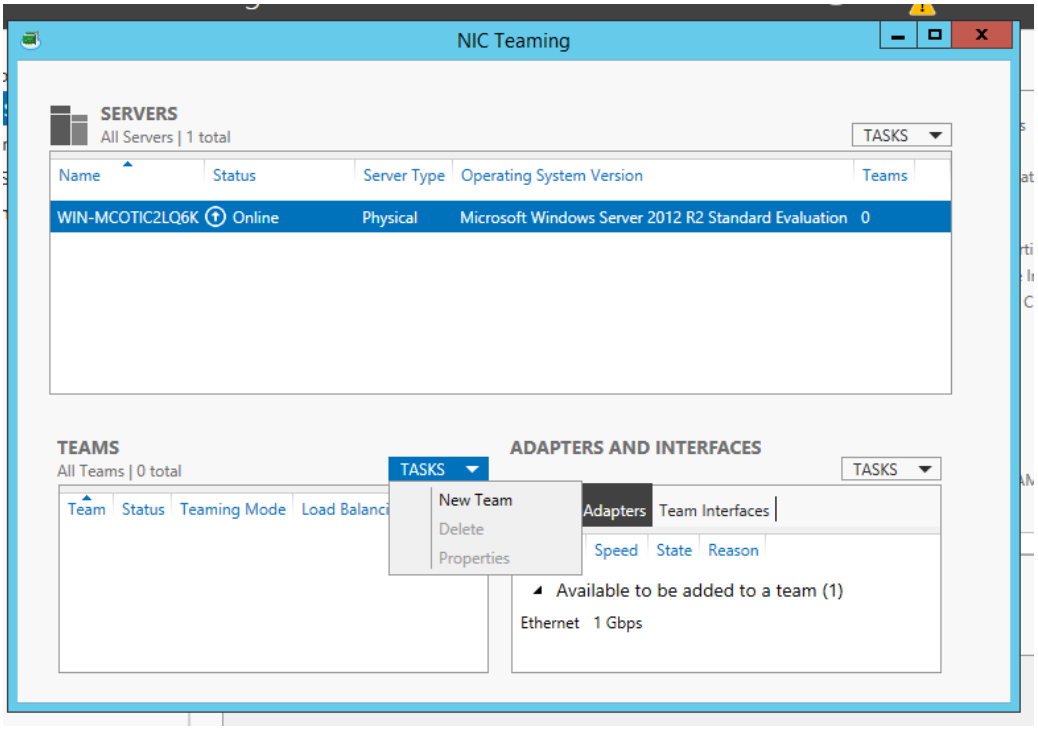
1. Log on the server. The server manager windows appear.



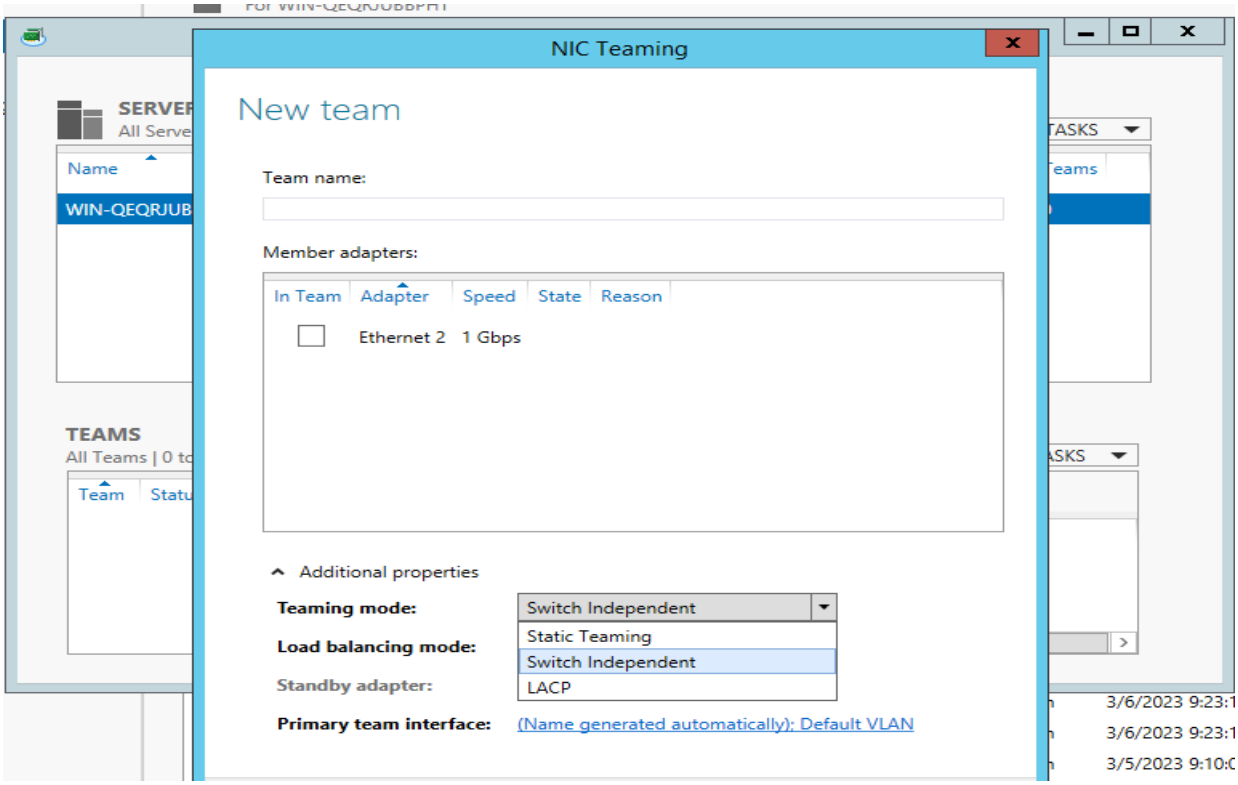
2. In the navigation pane, click the Local Server icon. The Local Server homepage appears. In the Properties tile, click the *NIC Teaming* hyperlink [which is initially disabled].



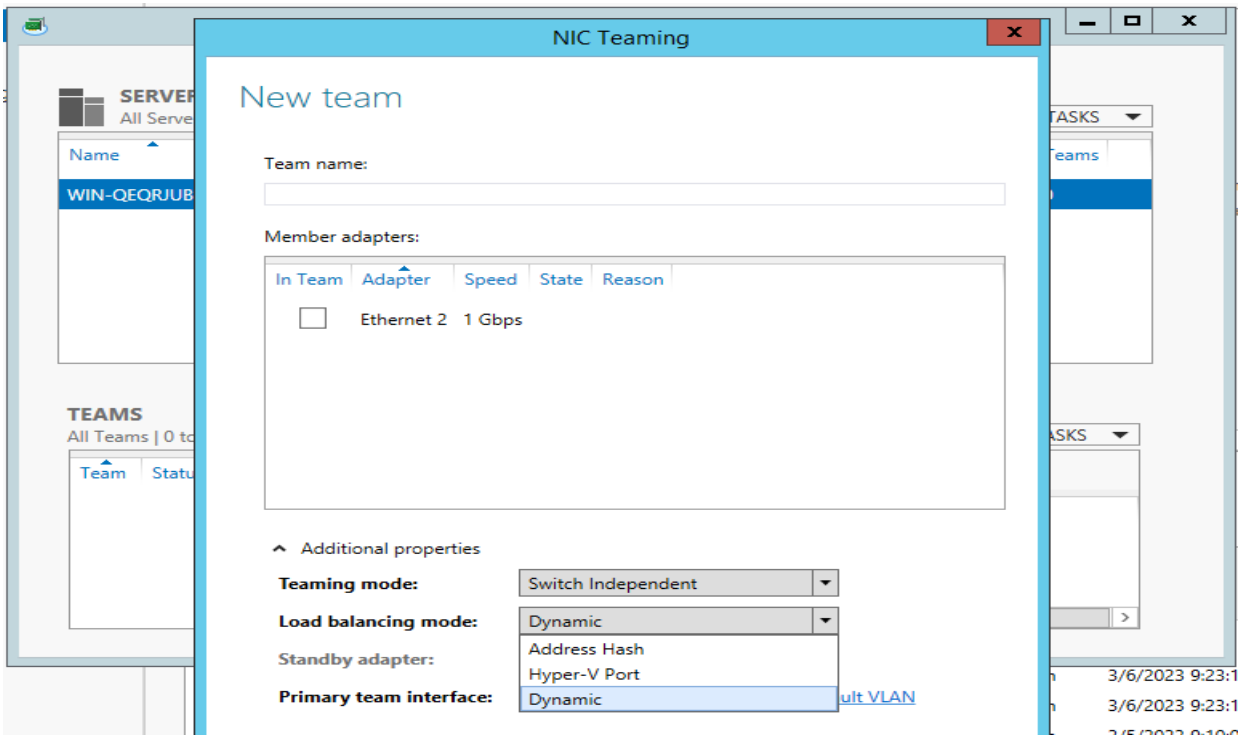
3. The *NIC Teaming* window appears. In the Teams tile, click the Tasks menu and select New Team.



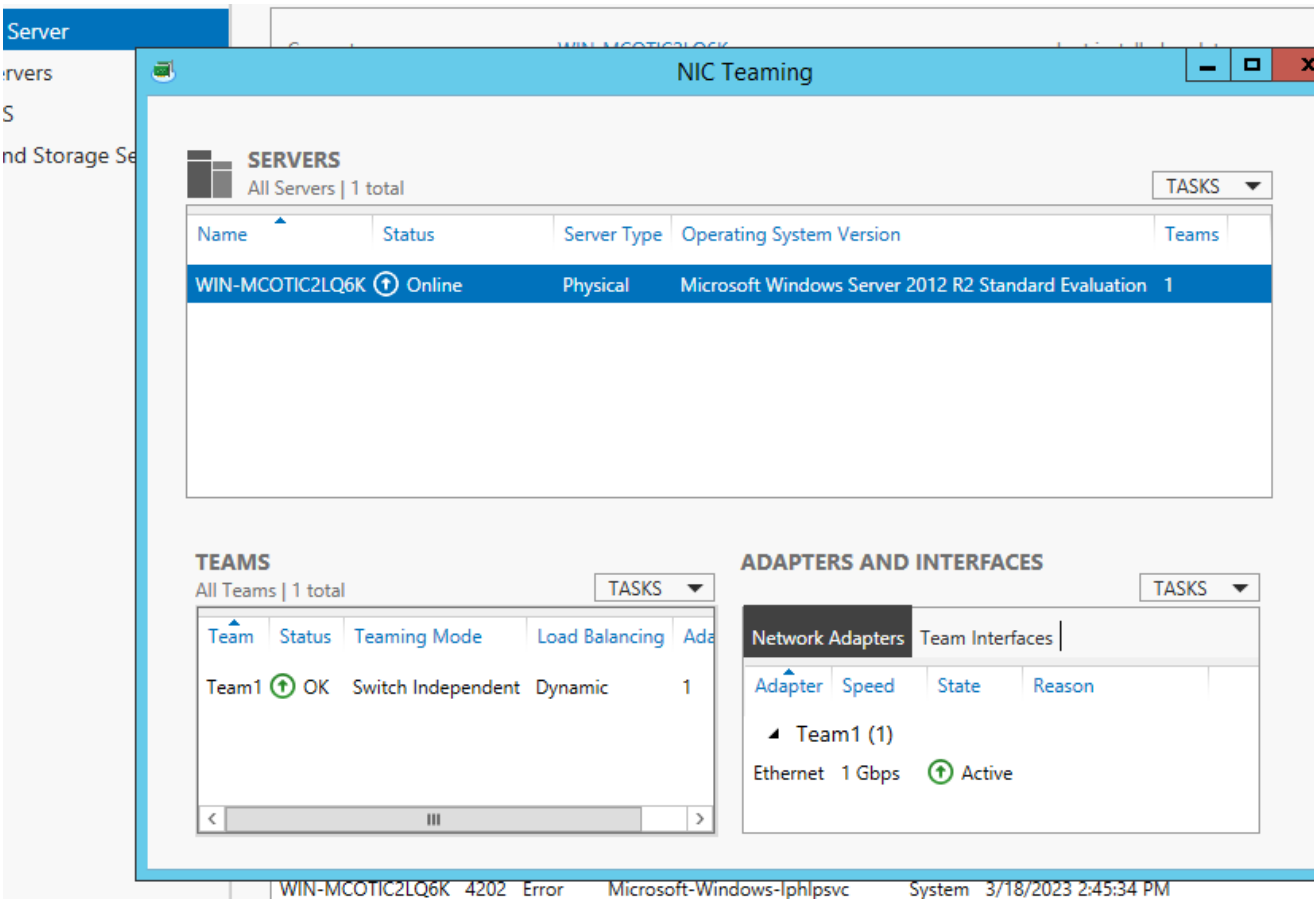
4. The *New team* page appears. In the Team Name text box, type the name you want to assign to the team.
5. In the Member adapters box, select the network adapters you want to add to the team.
6. In the Teaming Mode drop-down list, select one of the following options:
   - Static Teaming
   - Switch Independent
   - LACP



7. In the Load balancing mode drop-down list, select one of the following options:
   - Address Hash
   - Hyper-V Port
   - Dynamic



8. Click OK. The new team appears in the Teams tile,



After you create a NIC team, you can use the NIC Teaming window to monitor the status of the team and the team interface you created. The team itself and the individual adapters all have status indicators that inform you if an adapter goes offline.

Upgrading paths: - If you have a 64-bit computer running Windows Server 2008 or Windows Server 2008 R2, you can upgrade it to Windows Server 2012 as long as you use the same (or a lower) operating system edition.

Windows Server 2012 does not support the following: -

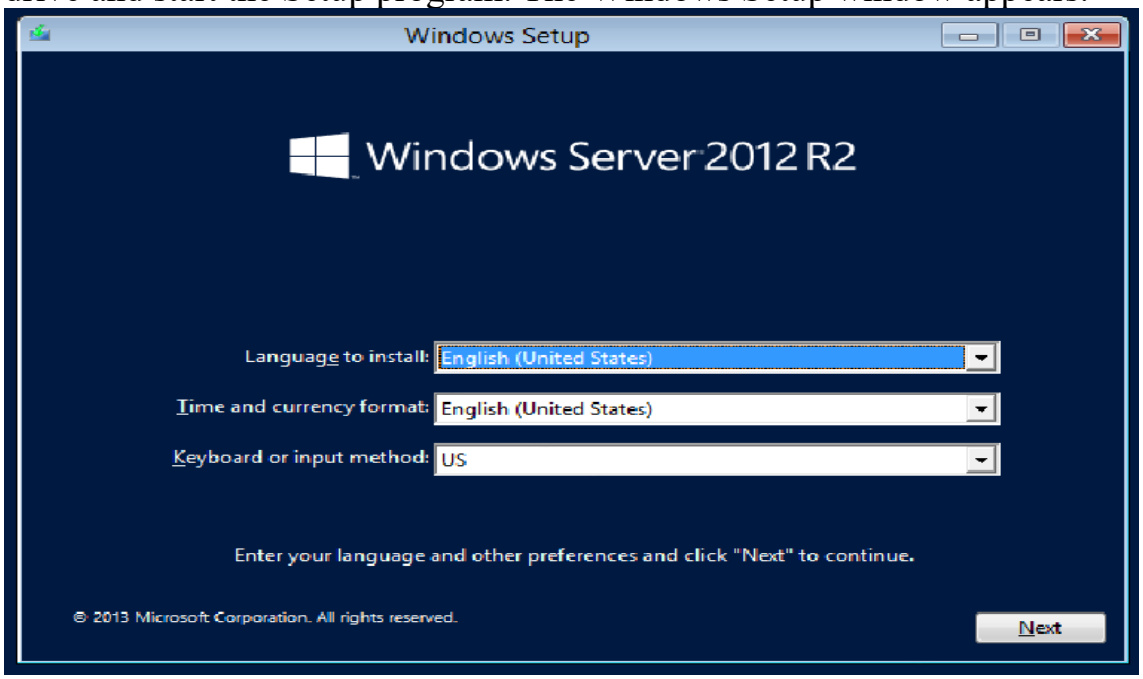
- Upgrades from Windows Server versions prior to Windows Server 2008
- Upgrades from Windows workstation operating systems
- Cross-edition upgrades, such as Windows Server 2008 Standard Edition to Windows Server 2012 Datacenter Edition
- Cross-platform upgrades, such as 32-bit Windows Server 2008 to 64-bit Windows Server 2012
- Cross-language upgrades, such as from Windows Server 2008, U.S. English, to Windows Server 2012, French

Performing Upgrade Installation: -

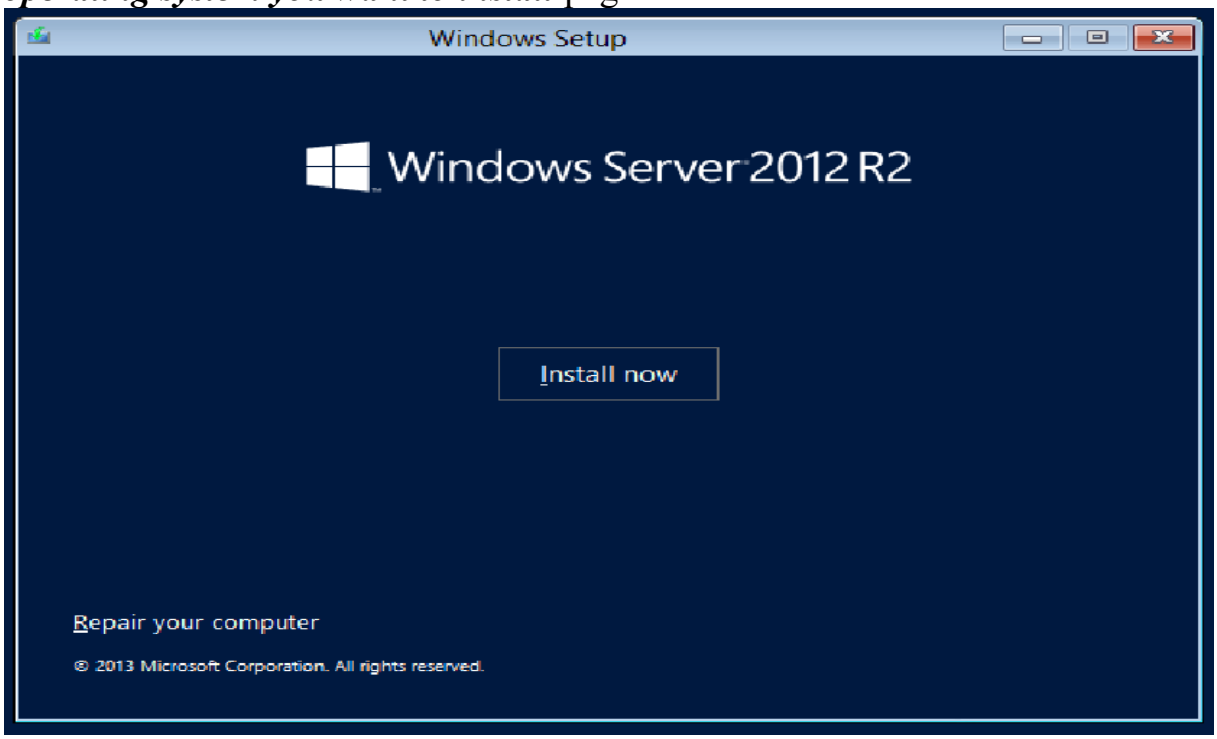
To perform a Windows Server 2012 upgrade installation from Windows Server 2008 or Windows Server 2008 R2, use the following procedure.

1. Start the server and log on using an account with administrative privileges.

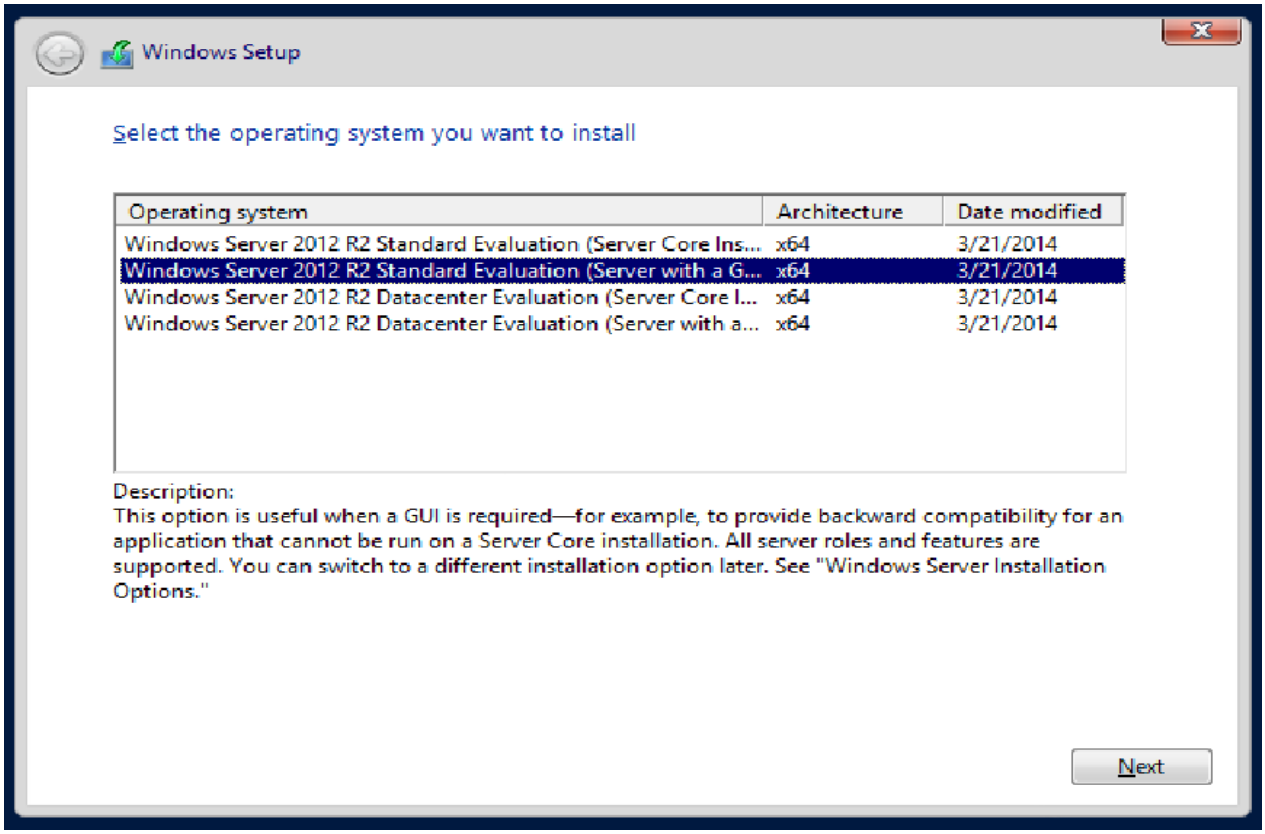
2. Insert the Windows Server 2012 installation disk into the DVD drive/bootable pen drive and start the Setup program. The Windows Setup window appears.



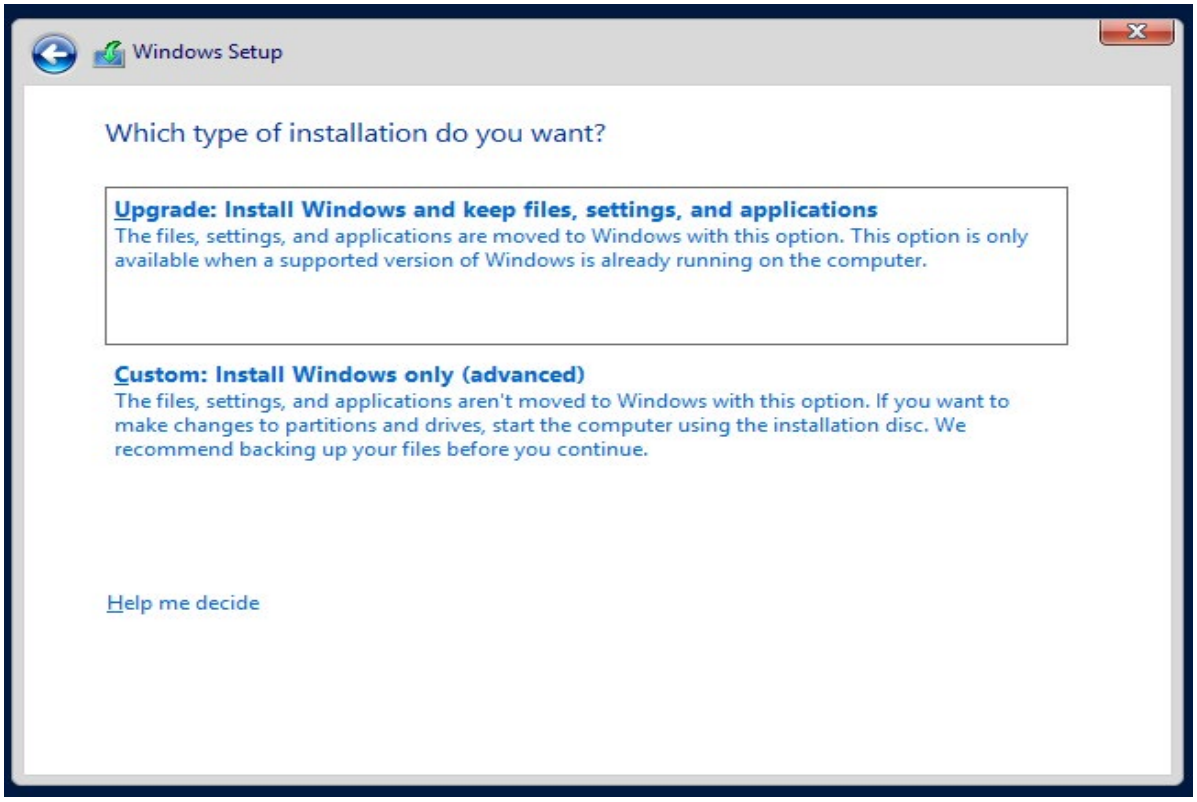
3. Click Install Now. The Windows Setup Wizard appears, displaying the ***Select the operating system you want to install*** page.



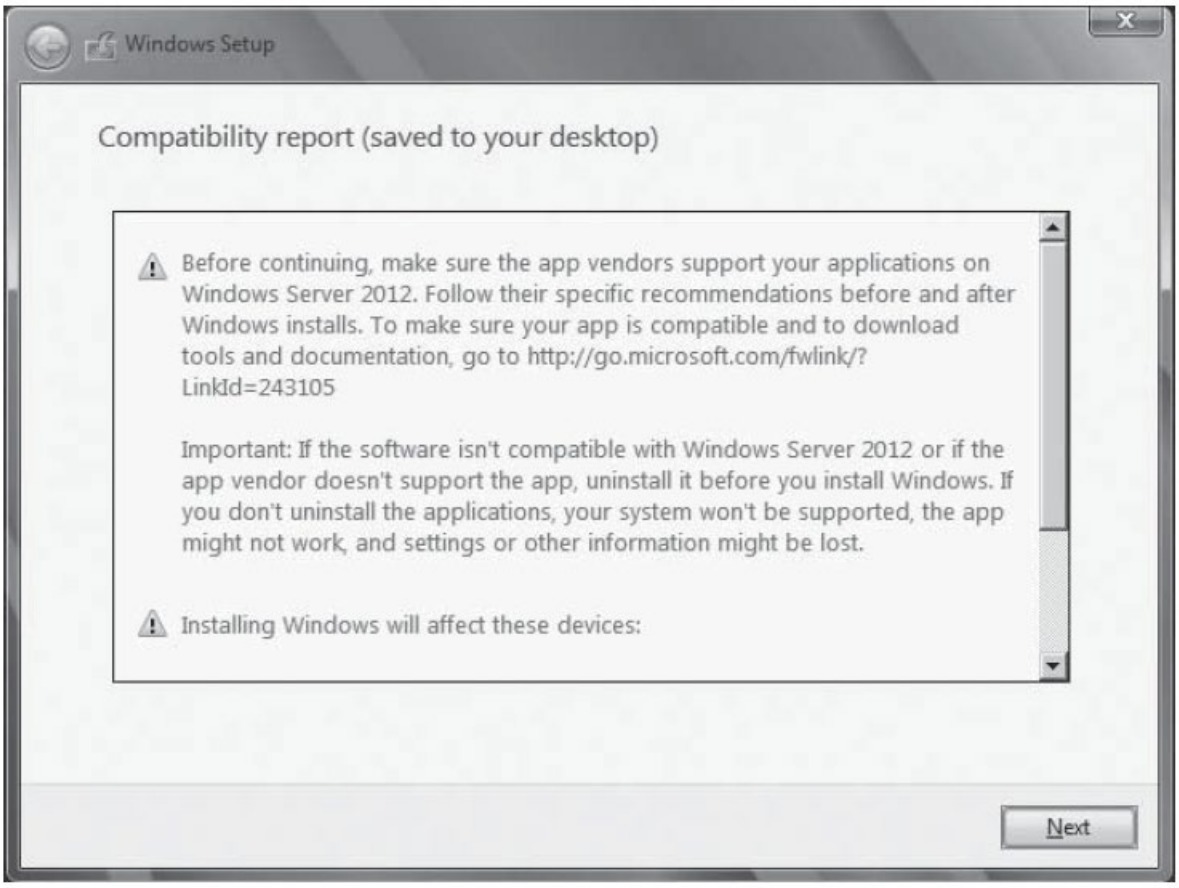
4. Select the operating system edition and installation option you want to install and click Next. The *License Terms* page appears.



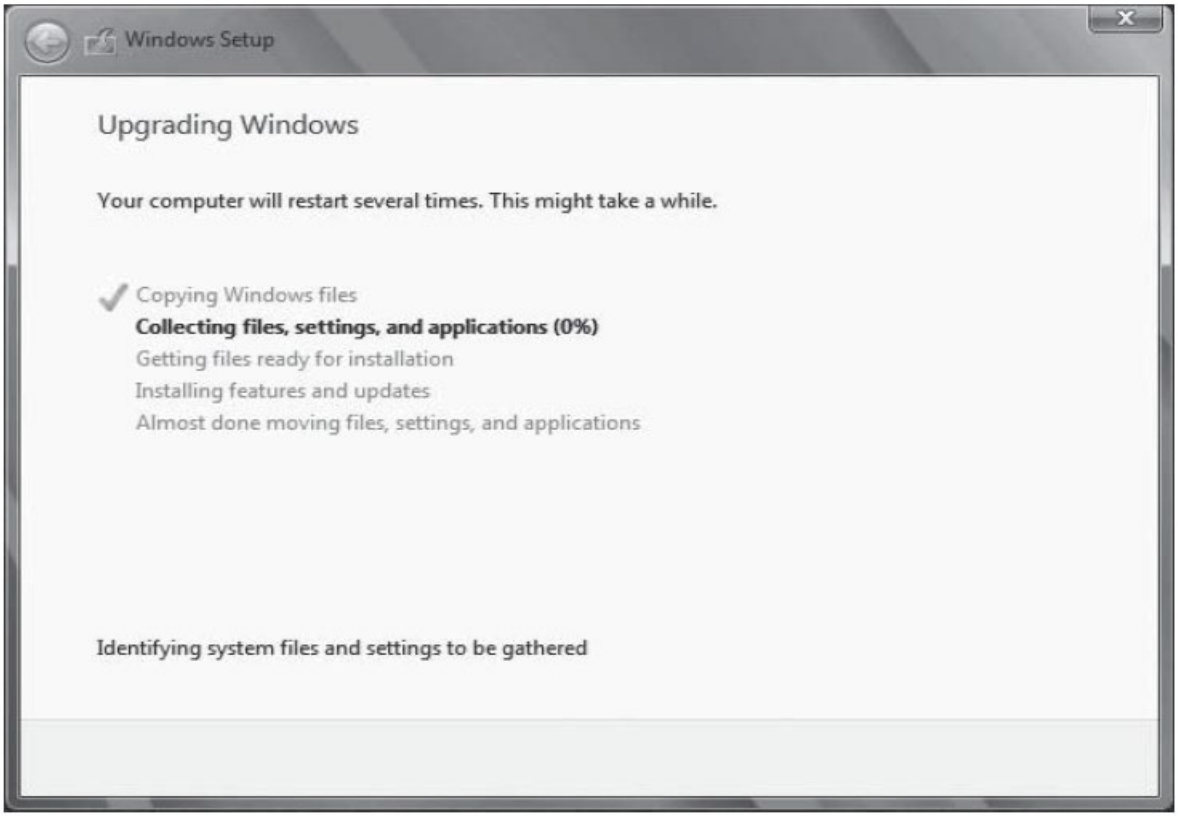
5. Select the I accept the license terms check box and click Next. *The Which type of installation do you want?* page appears.



6. Click the Upgrade: Install Windows and keep files, settings, and applications option. The *Compatibility report (saved to your desktop)* page appears,



7. Note the compatibility information provided by the Setup program and click Next. The *Upgrading Windows* page appears,

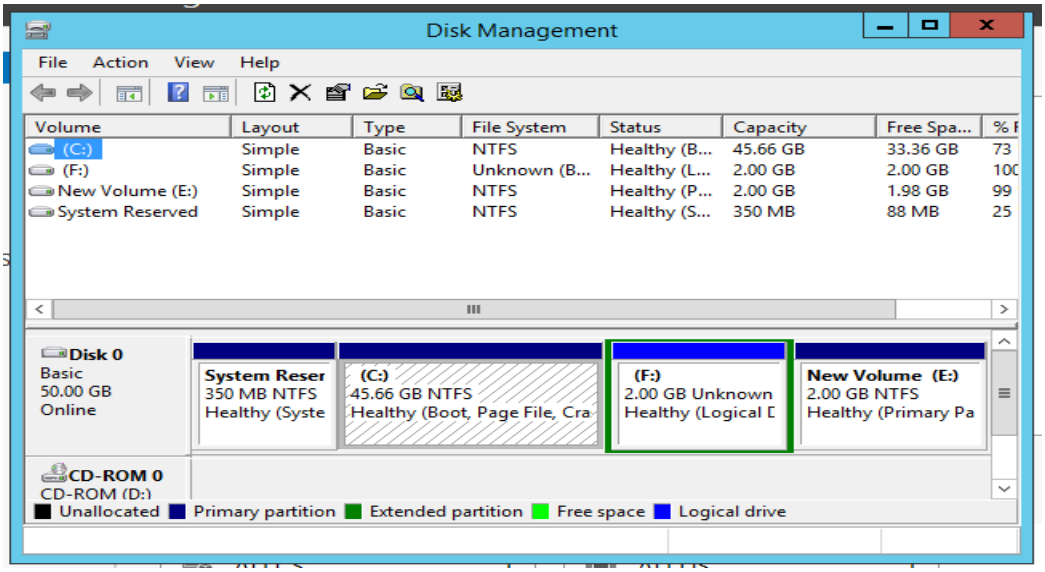


After several minutes, during which the Setup program upgrades Windows Server 2008 or Windows Server 2008 R2 to Windows Server 2012 and restarts the computer several times, the system finalizes the installation and the Windows sign-on screen appears.

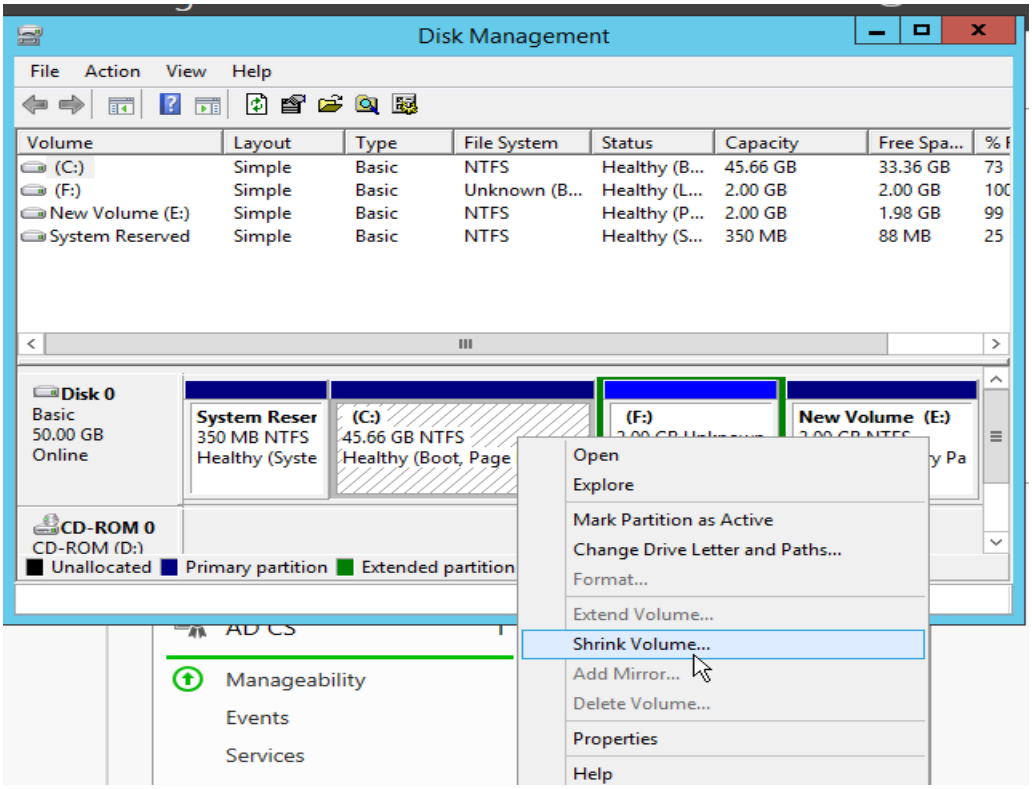
During the upgrade process, when the system restarts, the boot menu provides an option to roll back to the previous operating system version. However, after the upgrade is complete, this option is no longer available; uninstalling Windows Server 2012 and reverting to the old operating system version is not possible.

Configuring local storage in Windows Server 2012 involves several steps, including partitioning disks, formatting volumes then use these partitions for storage. Here's a step-by-step guide:

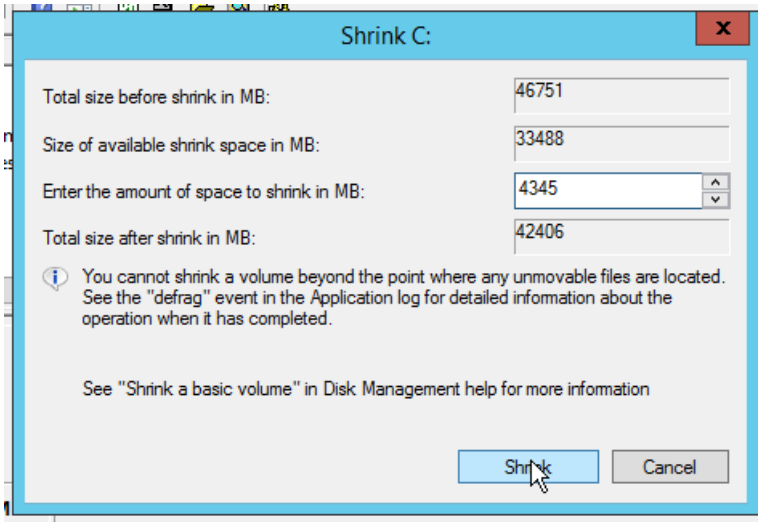
1. **Partition disks:** If you have not already done so, you will need to partition the disks to create separate storage areas. To partition a disk, follow these steps: -
    - Open the Disk Management tool by typing "diskmgmt.msc" in the Start menu search bar.



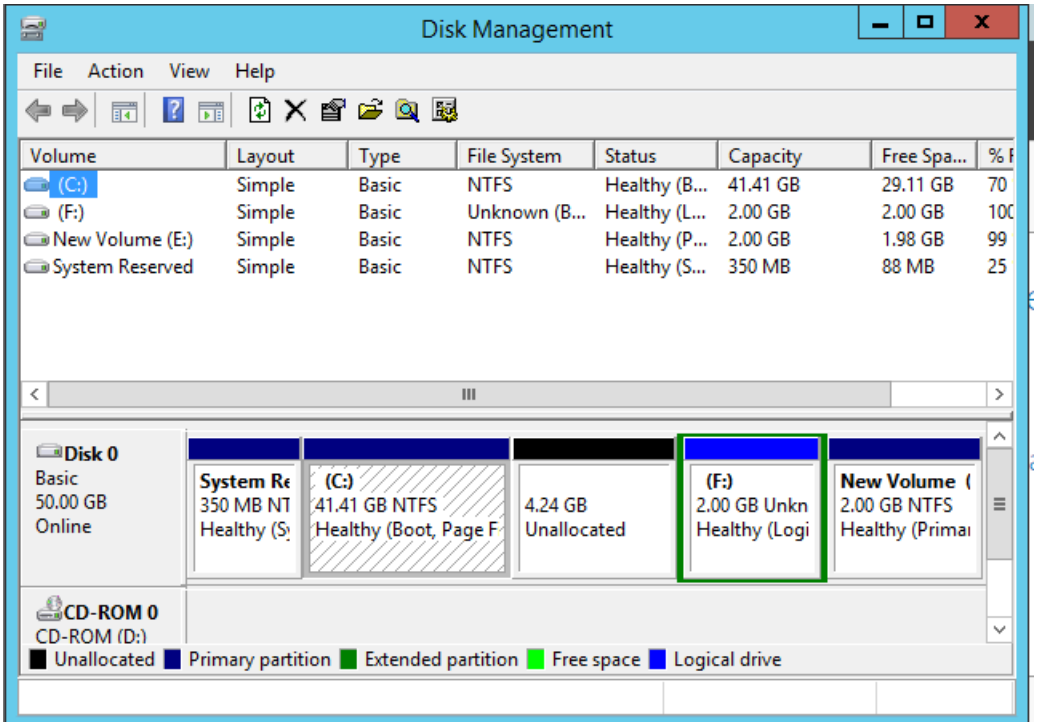
    - Right-click on the disk you want to partition and select "Shrink Volume."



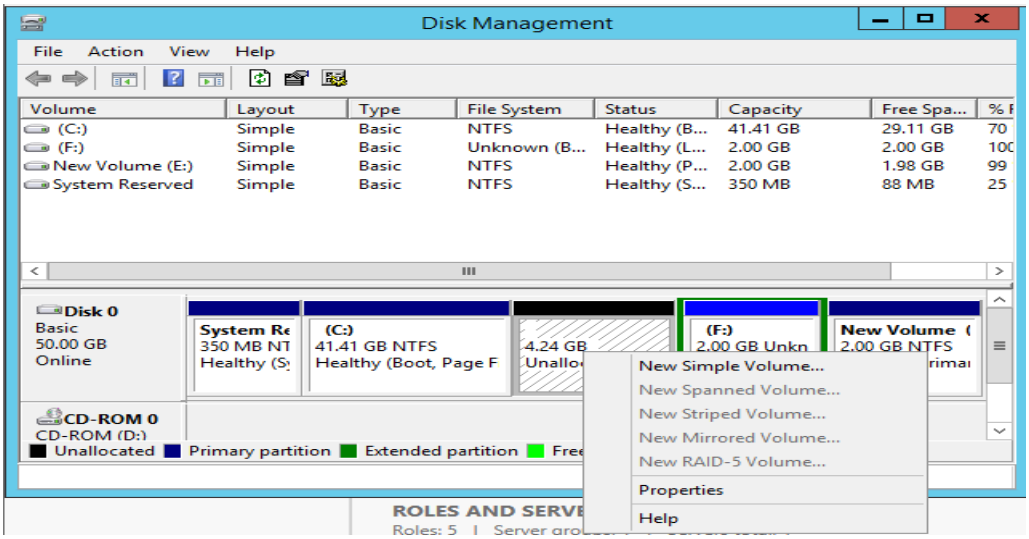
- Enter the amount of space you want to allocate to the new partition and click "Shrink."



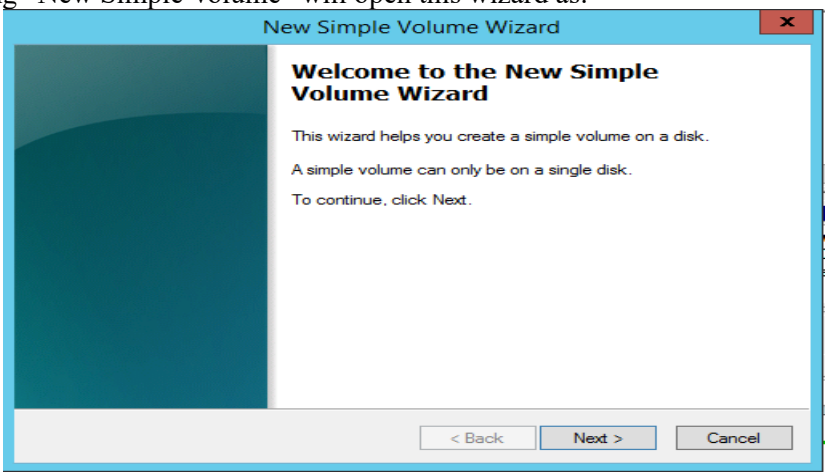
After clicking on “Shrink”, A partition of 4.24GB has been created which is unallocated.



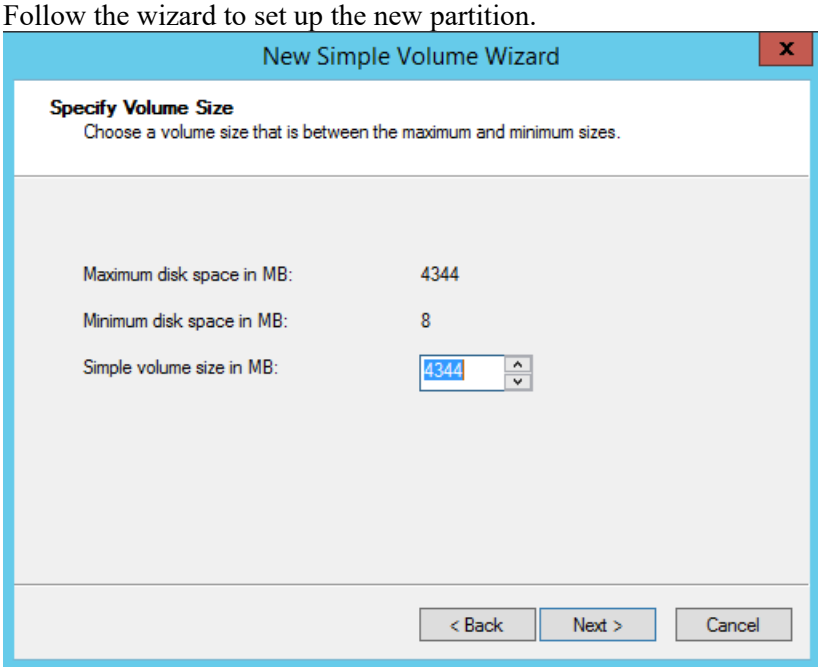
- Right-click on the unallocated space and select "New Simple Volume."



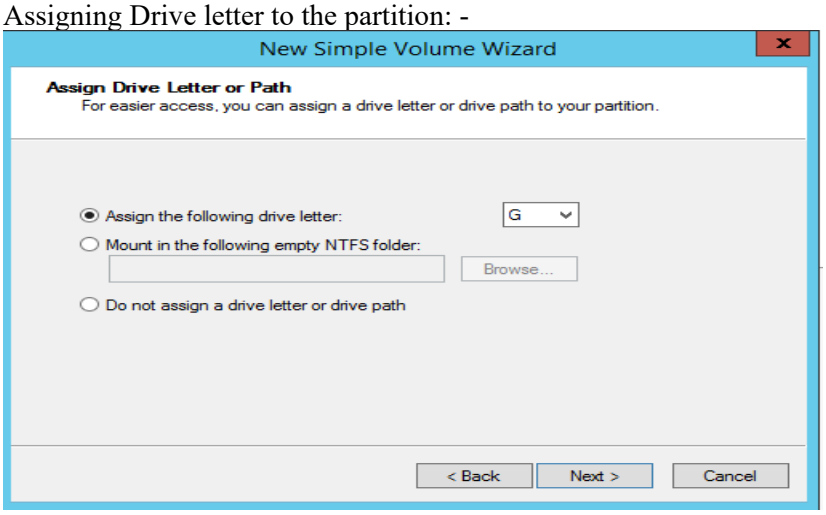
- Selecting “New Simple Volume” will open this wizard as: -



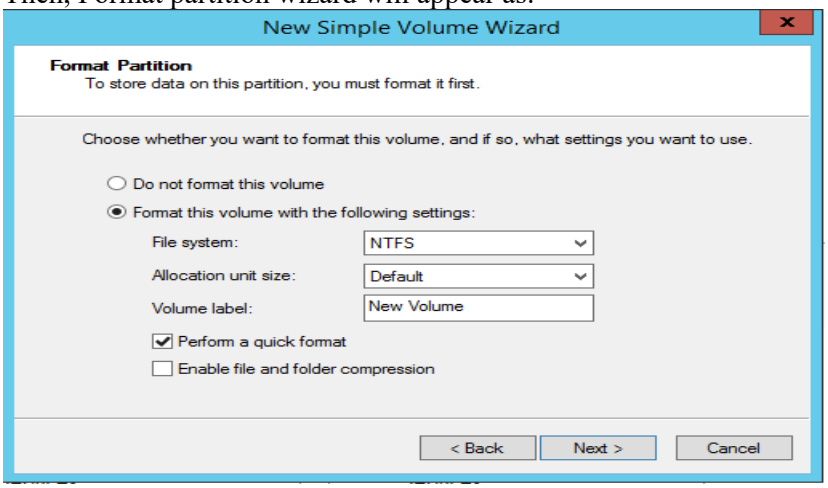
- Follow the wizard to set up the new partition.



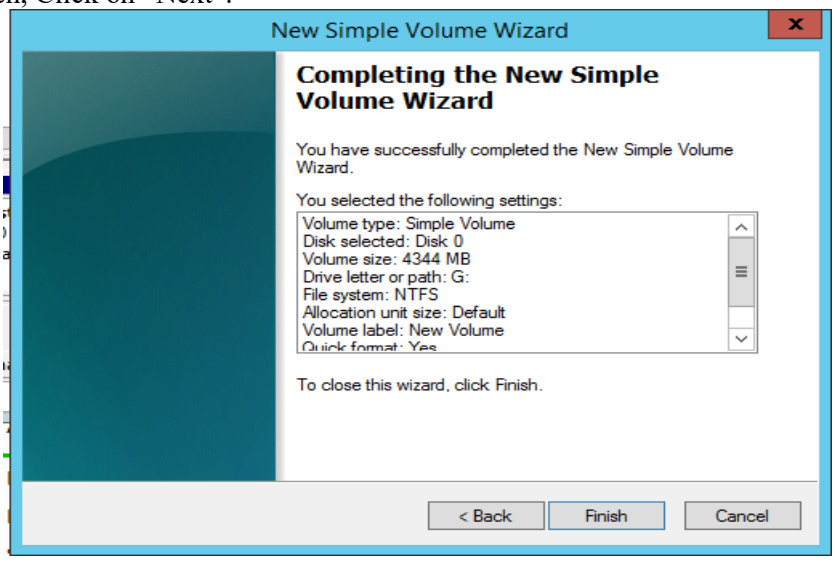
- Assigning Drive letter to the partition: -



- Then, Format partition wizard will appear as: -



Then, Click on “Next”.



- Then, Click “Finish”.

2. **Format volumes:** After creating a new partition, If partition has not been formatted, then you will need to format it before you can use it. To format a volume, follow these steps:
    - Open the Disk Management tool.
    - Right-click on the partition you want to format and select "Format."
    - Select the file system you want to use (such as NTFS or FAT32) and enter a volume label.
    - Click "OK" to format the volume.