

Hardware and Network Servicing

Level-III

Based on November 2023, Curriculum Version-II



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Unit one: Confirm server specification

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Overview of Server Operating System
- Confirming network operating system, server applications and server Design
- Identifying product, vendor architecture and equipment
- Identifying technology and resource

This unit will also support you to accomplish the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Explain Server Operating System
- Define network operating system, server applications and server Design
- Identify product, vendor architecture and equipment
- Identify technology and resource

1. Overview of Server Operating System

- A server operating system is an advanced operating system designed to run on servers.
- It has the necessary features and subsystems to operate in a client-server architecture and serve clients' requests .
- Server operating systems are optimized to provide more advanced features and functions for client-server architectures or enterprise IT environments .
- Server operating systems offer various benefits compared to standard operating systems, including unlimited user connections, more memory, and advanced network optimizations
- They facilitate the implementation of various server platforms, such as web servers, mail servers, file servers, database servers, application servers, and print servers
- **Windows Server 2008**
 - Released on February 2008
 - GUI (graphical user interface) o Pictorial representation of computer function NOS GIUs
 - Enable administrator to manage files, users, groups, security, and printers
 - Enhanced security, reliability, remote client support, and performance
 - Has New server management features
 - Editions: Standard Edition, Web Edition, Enterprise Edition, Datacenter Edition

UNIX and Linux

- Popular NOS Provide resource sharing
- ✓ UNIX developed in 1969
- ✓ UNIX preceded, led to TCP/IP protocol suite development
- ✓ Most Internet servers run UNIX
- ✓ Efficient and flexible

Window server 2012

- Edition: Foundation Edition , Essentials Edition, Standard Edition and Datacenter Edition.

1.1. Confirming network operating system

Network Operating system

- A network operating system (NOS) is a specialized operating system designed to run on network devices such as routers, switches, and firewalls.
- It provides networking capabilities such as file and printer sharing, client-server model, and Internet protocols .

Server application

- A server application is a program that runs on a server and provides services to clients.
- It is designed to handle multiple requests from clients and provide them with the necessary resources.
- Server applications can be used for various purposes, such as web hosting, email hosting, file sharing, and database management.
- An **application server** is a server-side program that uses one or more communication protocols to offer business logic behind any consumer or business application in a single or distributed network
- It is designed to provide a platform for running business-critical applications, such as a self-hosted CRM or a SaaS.
- An application server usually functions as a shared environment for various collaborative applications.
 - A **web server** is a server that hosts programs and data and responds to client requests for web pages or other web-based services. Common web servers are Apache, Microsoft Internet Information Services (IIS).
 - A **mail server** allows users to forward and receive emails for and from their business and controls individual email accounts based on a specific domain.
 - A **file server** involves a joint storage point for a business to store documents or data a network drive.
 - A **database server** includes database integration, which facilitates dynamic web page building based on the database contents.
 - A **print server** allows multiple machines to use a single printer.

Server Design

- Server design can refer to two different things:
 - server operating systems and
 - server applications.
- A server operating system is an advanced operating system designed to run on servers.
- It has the necessary features and subsystems to operate in a client-server architecture and serve clients' requests.
- A server OS is designed from the ground up to provide features suitable for multi-user, business-critical applications.
- It provides the central interface for managing users, implementing security, and other administrative processes. The focus of a server operating system is usually security, stability, and cooperation.

1.2. Identifying product, vendor architecture and equipment

Identify specifications

- Once requirements have been defined and client needs are clarified, it's time to start thinking about identifying products that fit the solution. In this case, we need to focus on the possible server solutions.
- Remember: a server consists of
 - Hardware
 - Software
 - Network connections.
- There are different types of server designs that need to be considered when identifying equipment.
- here are multiple server architectures to choose from, including
 - Mainframe architecture
 - File sharing architecture
 - Client/server architecture
 - Web based architecture
 - Thin client architecture
 - Blade architecture.

Product architecture

- Product architecture is the organization of a product’s functional elements and the ways these elements interact.
- It plays a significant role in how to design, make, sell, use, and repair a new product offering .
- There are two fundamental types of product architecture: Modular and Integral.

Modular

- In the modular type, well-defined component interfaces functionally self-contain modules.
- Organize a product into a number of modules to develop and complete a specific function.
- The interaction of these modules carries out the product’s overall purpose.
- The advantages of modular include task allocation and outsourcing. As well as, economies of scale, reuse/standardization for developing new products, maintenance, and mass customization.

Integral

- With integral product architecture, functions are shared by physical elements.
- There’s greater complexity of mapping between components and functions.

Identify vendor architecture

- Each vendor in the marketplace supports specific platforms and server architecture.
- When selecting equipment for the server, you will need to consider the hardware and software platforms from each vendor.
 - **Hardware platform** refers to the hardware components that make up the computer system.
- **Software platform** refers to the operating system or programming language developed for the hardware.

1.3. Identifying technology and resource

- Detailed information about server hardware is available from the server documentation and from the hardware manufacturer’s website.
- At a minimum, the server vendor will have a component list detailing what hardware is in the server.

Identify and evaluate resources

Overview of server technologies

- Hardware technology refers to the physical components that make up a computer system, such as the CPU, RAM, hard disk, and display.
- It can also mean the technology, materials, tools, and documents that are necessary or useful to commercialize, develop, test, manufacture, or use certain hardware products, such as sensors.
- It can also mean the term used to describe how a computer's hardware and software work together.
- Some common server-side technologies include backend frameworks, backend development platforms, and server-side programming languages

Self-check test-1

Instruction: -Read all questions which given below and you to answer the correct one.

Part I. choose the correct answer

1. A cross-platform program is one that runs _____.
 - a. only on one operating system
 - b. the same on multiple operating systems
 - c. differently on every operating system
 - d. differently on one operating system
2. What is the purpose of a Request for Information (RFI) in the vendor selection process?
 - a. Pricing negotiation
 - b. Detailed product evaluation
 - c. Initial vendor introduction
 - d. Contract finalization
3. When assessing a vendor's financial stability, which factor is essential to consider?
 - a. Number of product features
 - b. Market reputation and longevity
 - c. Short-term pricing discounts
 - d. Availability of customer support
4. Which factor is crucial in evaluating the scalability of a product?
 - a. User interface design
 - b. Number of years the vendor has been in business
 - c. The ability to handle increased workload or user base
 - d. Compatibility with existing systems

Part II. Give short Answer

- What is system requirement?

- List some of the hardware and software requirement consideration before installing server 2012 operating system

- Define hardware and software plat form

- What are the common hardware server technologies on?

Unit Two: Verify server compatibility and inter-operability

This Unit is developed to provide you the necessary information regarding the following content coverage and topics

- Reviewing Hardware and software to ensure compatibility
- Obtaining all hardware required
- Installing required operating system and software
- Installing additional tools or third-party software
- Patching operating system and applications

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to

- Review Hardware and software to ensure compatibility
- Obtain all hardware required
- Install required operating system and software
- Install additional tools or third-party software
- Define operating system and applications

2.1. Reviewing Hardware and software to ensure compatibility

Server compatibility

Ensuring server compatibility involves a comprehensive evaluation of various components to guarantee seamless integration and optimal performance.

- Firstly, confirm that the chosen central processing unit (CPU) aligns with the motherboard by checking the CPU socket type and chipset compatibility.
- Verify that Random Access Memory (RAM) modules are supported by both the motherboard and CPU, taking into account factors like RAM type, capacity, and recommended operating speeds.
- Additionally, check the compatibility of storage drives, RAID controllers, and networking interface cards (NICs) to guarantee proper functionality.
- Ensure that the power supply unit (PSU) matches the server chassis and motherboard, providing sufficient power output and appropriate connectors. For graphics processing units (GPUs), if applicable, confirm compatibility with the motherboard's PCIe slots and check for any power supply requirements.
- Matching the server chassis and motherboard form factors is crucial, as well as ensuring cooling solutions are compatible with both the CPU and chassis.
- Lastly, confirm that the chosen operating system is supported, considering driver availability and compatibility with the server's hardware. Regularly consult manufacturer documentation and compatibility lists, and conduct testing in a controlled environment to preemptively identify and address any compatibility issues.

Ensuring Hardware Compatibility

- Networking is hardware-dependent, and not all hardware products are compatible. In order for two computers to communicate, they must use the same protocol.
- Computer hardware raises similar issues.
- In some instances, two pieces of hardware simply can't communicate with each other. For example, consider an analogy to automobile parts: two parts might look alike and be able to perform the same function, but each is designed to work in a different car.

When Hardware Is a Problem

- Hardware incompatibilities are a fact of life.
- In today's computer industry, hundreds of manufacturers develop hardware and software.
- Each developer has a unique perspective on the best way to accomplish the same task, and each will provide a unique solution.
- Copyright and patent issues further complicate the matter.
- Evaluating and selecting hardware is a major part of planning for network implementation.
- It is likely that you will have to create a network out of an existing collection of hardware.
- The most common incompatibilities occur between hardware and software.
- Changing or upgrading a computer or network operating system can lead to major problems.

Reading the Documentation

- Read all the documentation about the products involved. Your hardware or software might have a recurring problem or might conflict with another product. Frequently, the manufacturer will document these conflicts and provide a fix. If you do not find the solution in the supplied documentation, you might contact the manufacturer of the product and ask for undocumented conflicts.

Detection during Installation

- When you install a new computer or network operating system, your computer will usually attempt to detect the hardware in the system during the installation process and load the appropriate drivers for it.

- Check the list of detected hardware and ensure that it matches what is already in the machine.
- If you are installing Novell's Intranet Ware, for example, the install utility will automatically scan your computer for hardware such as hard disks, CD-ROM drives, and NICs. If the devices are recognized, the appropriate drivers will then be loaded for the recognized devices

Checking Minimum Requirements

- As a first step before you install, make sure that you exceed the minimum requirements for the resources in the computer.
- These resources include processor speed, memory, and disk space.
- Table lists some minimum hardware requirements for server 2008

Table 1. Minimum Hardware Requirements for window server 2008 operating system

Category	Minimum / Recommended Requirements
Processor	<ul style="list-style-type: none"> • Minimum: 1.4GHz (x64 processor) • Recommended: 2GHz or faster <p>Note: For Itanium based systems an Intel Itanium 2 processor is required.</p>
Memory	<ul style="list-style-type: none"> • Minimum: 512MB RAM • Recommended: 2GB RAM or greater • Maximum: 8GB (Foundation) 32GB (Standard) or 2TB (Enterprise, Datacenter and Itanium-Based Systems)
Available Disk Space	<ul style="list-style-type: none"> • Minimum: 10GB • Recommended: 40GB or greater <p>Note: Systems with RAM in excess of 16GB will require greater amounts of disk space to accommodate paging, hibernation, and dump files</p>
Drive	DVD-ROM drive
Display and Peripherals	<ul style="list-style-type: none"> • Super VGA or greater-resolution monitor (800x600) • Keyboard • Microsoft Mouse or compatible pointing device

Network Hardware

- Network hardware is not as susceptible as software to conflicts and compatibility problems. Connectivity Devices, covers the basics of how these devices (repeaters, bridges, routers, routers, and gateways) work.
- Since these devices are common to many different types of networks and work mainly with data packets, they are less likely to present conflicts.
- The manufacturers of these products maintain strict adherence to the IEEE 802.x standards.
- Therefore, any device that meets an IEEE standard can communicate with another device that meets the same standard.

Obtaining all hardware required

- The first step in obtaining a networking device is to put suppliers of that device. Then, there are factors you need to consider about the supplier and the devices on offer, such as support provided and purchase price.
- This will help you to compare and choose the most appropriate supplier and the exact model of the device according to client requirements.
- Finally, you are ready to place an order for your organization or client to purchase the device.

2.3. Installing required operating system and software

- A server operating system is an advanced operating system designed to run on servers. It has the necessary features and subsystems to operate in a client-server architecture and serve clients' requests. A server OS is designed from the ground up to provide features suitable for multi-user, business-critical applications. It provides the central interface for managing users, implementing security, and other administrative processes.
- Server operating systems are designed for platforms that act as web servers, application servers, database servers, email servers, or other platforms running on a dedicated server. Server operating systems offer various benefits compared to standard operating systems, including unlimited user connections, more memory, and advanced network optimizations

- Figure 2.1 on operation sheet 1.1 is the first screen you'll see. It allows you to customize the installation language and the regional and keyboard settings of the server. You'll need to change some settings here if the defaults do not match your language, region, and keyboard.
- For example, if you are in Ireland using an Irish-based keyboard, then these defaults won't suit you at all! The time zone won't work correctly, currency symbols will be wrong, and the keyboard layout will be totally wrong. For example, you will struggle to find the backslash (\), which is kind of important in the Windows world.

2.4. Installing additional tools or third-party software

- Third-party software is any software application or program that is developed by a company or individual other than the original manufacturer or creator of the device or operating system it is intended to run on.
- Third-party software is created by external developers or companies who are not directly affiliated with the manufacturer of the hardware or the creator of the operating system.
- Third-party software can encompass a wide range of applications, including productivity tools, games, utilities, security software, and more.
- Third-party software is typically distributed separately from the operating system or device it is designed for. Users can obtain it through various channels, such as official app stores, websites, or other distribution platforms.
- Updates and support for third-party software are the responsibility of the developers or companies that created the application. Users need to keep their third-party software up to date to benefit from new features, bug fixes, and security patches.
- Third-party software can be designed to integrate seamlessly with operating systems or other software. Developers may create plugins, extensions, or APIs that allow their software to interact with existing systems or applications.
- Third-party software often provides users with options for customization, allowing them to tailor the software to their specific needs. It also allows for specialization, as developers can focus on creating tools for specific niches or industries.

2.5. Patching operating system and applications

- Patching an operating system is a process of updating the operating system to address security vulnerabilities, fix bugs, and introduce new features.
- Operating system vendors regularly release updates, known as patches or updates, to maintain the security and functionality of a computer system.
- The process of patching an operating system involves downloading and installing the latest updates from the vendor’s website or through an automatic update mechanism.
- It is important to keep the operating system up-to-date to ensure that it is protected against the latest security threats and that it is functioning optimally. Security considerations are paramount, urging users to download from trusted sources, keep software updated, and remain cautious about potential risks.
- Updates, support services, and different licensing models, such as freeware or subscription-based approaches, characterize the landscape of patching an operating system.

Self-check 2

Directions: Answer all the questions listed below.

Part 1: Choose the correct answer from the given alternatives

1. Hardware and software compatibility is important to ensure smooth and efficient operation of computer systems.
2. Drivers are a type of software that play a crucial role in facilitating communication between hardware and the operating system.
3. Upgrading hardware components, such as a graphics card, may require updating corresponding software drivers to maintain compatibility.

Part 2: Elaborate the following

1. How you can get operating system? (5pts)

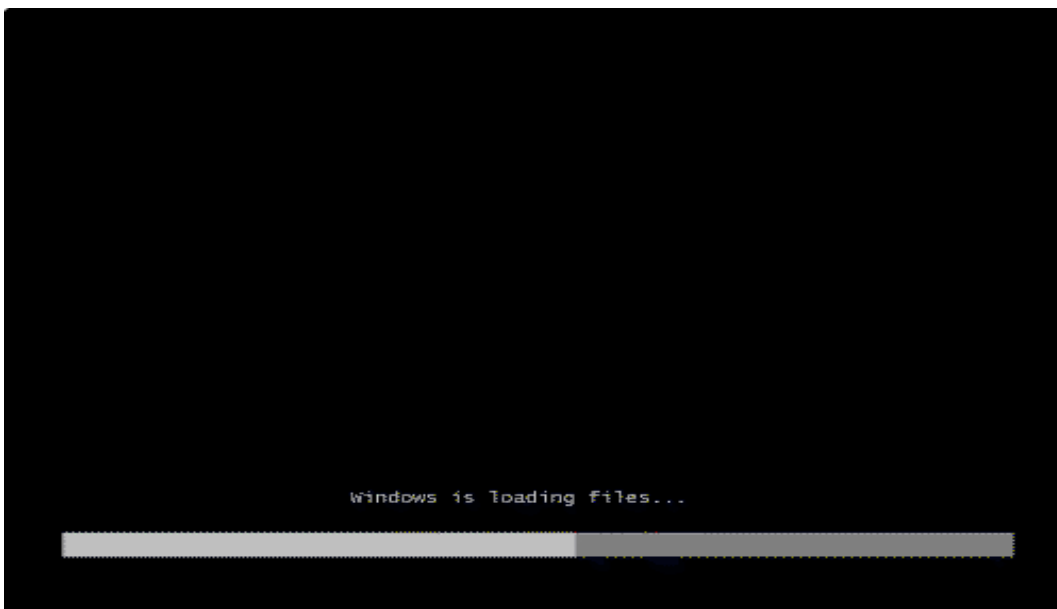
2. Explain Hardware equipment to use in server configuration?

3. Define hardware compatibility.

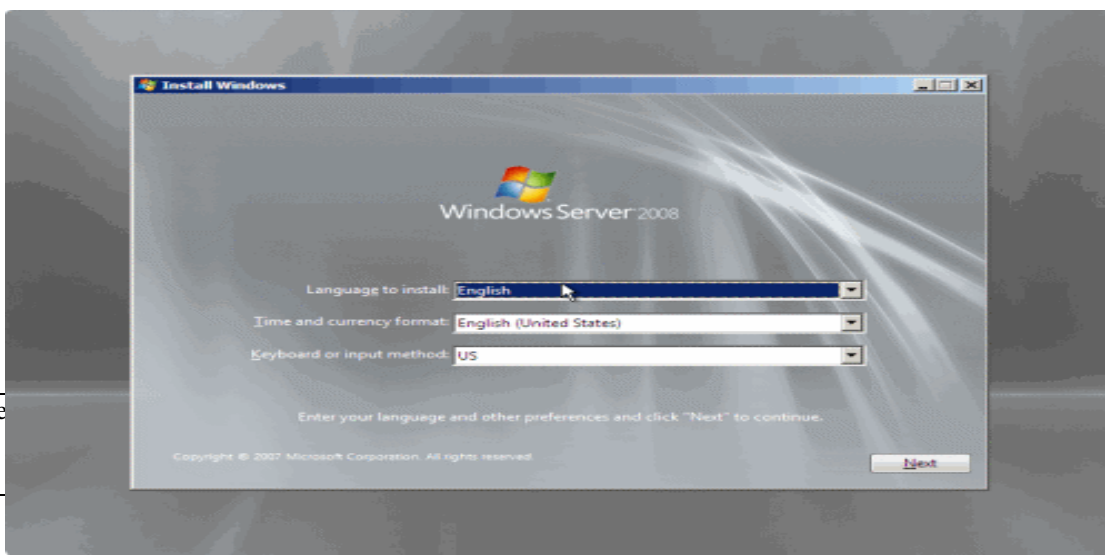
Operation sheet 2.1. Install Server Operating system

How to Install Windows Server 2008 Step by Step

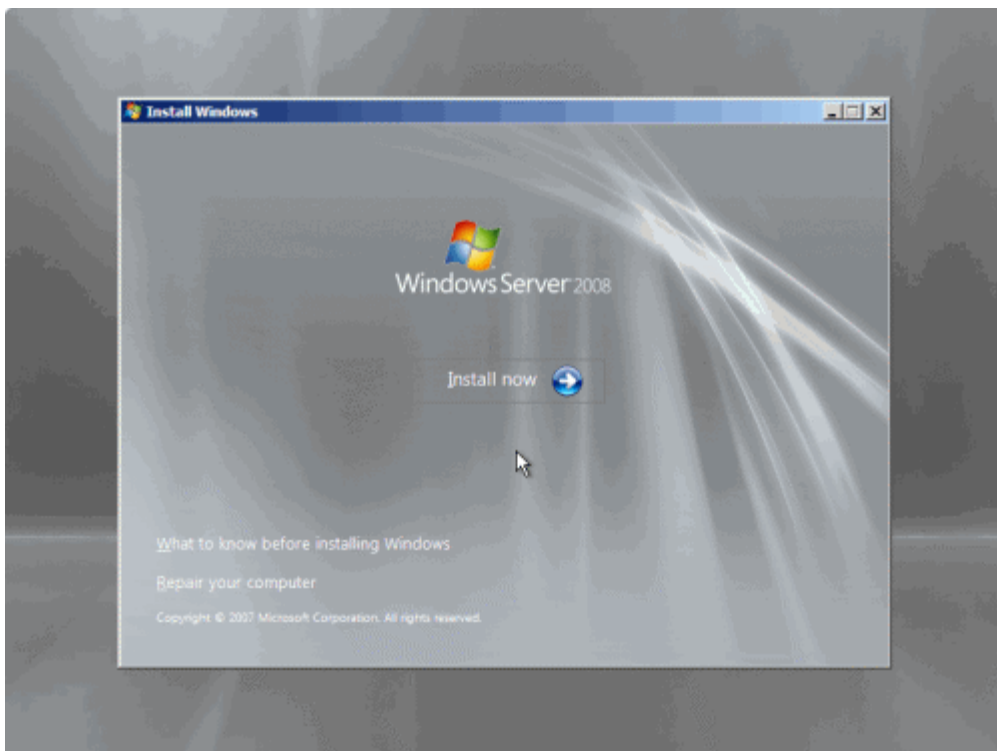
1. Insert the appropriate Windows Server 2008 installation media into your DVD drive. If you don't have an installation DVD for Windows Server 2008



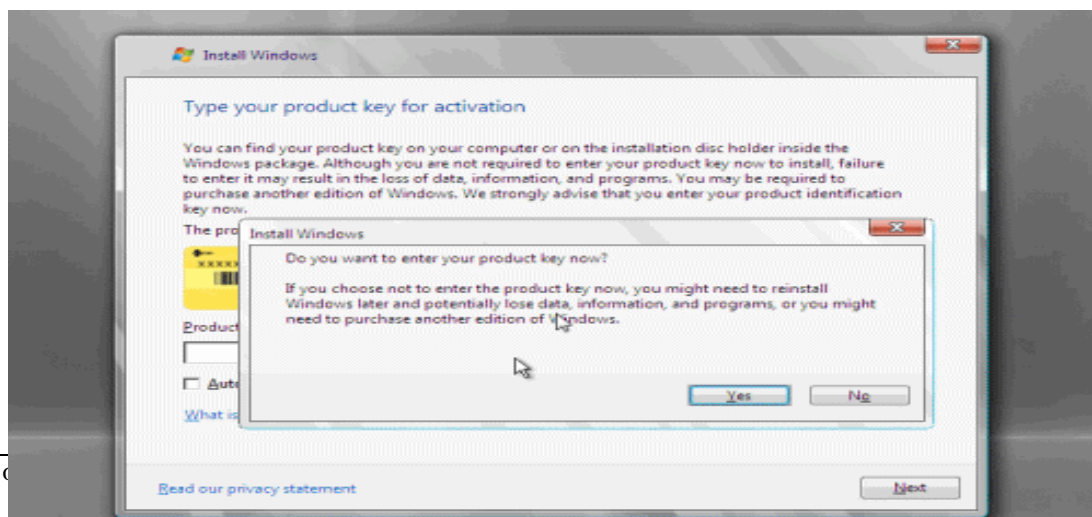
2. Reboot the computer.



3. When prompted for an installation language and other regional options, make your selection and press Next.

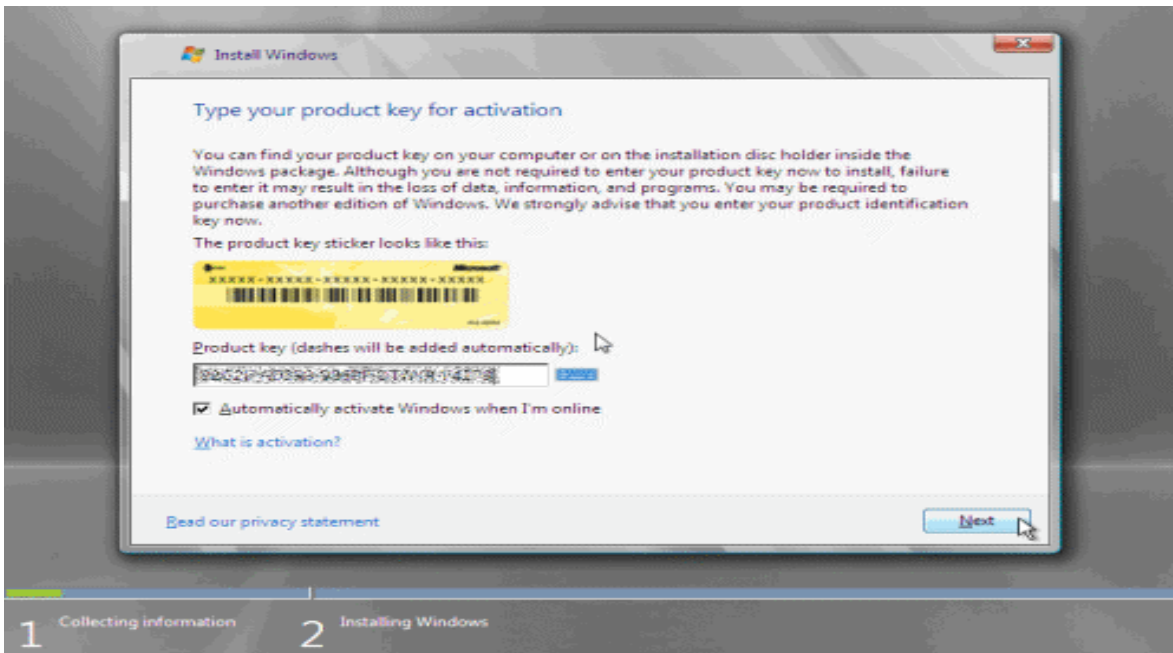


4. Next, press Install Now to begin the installation process.

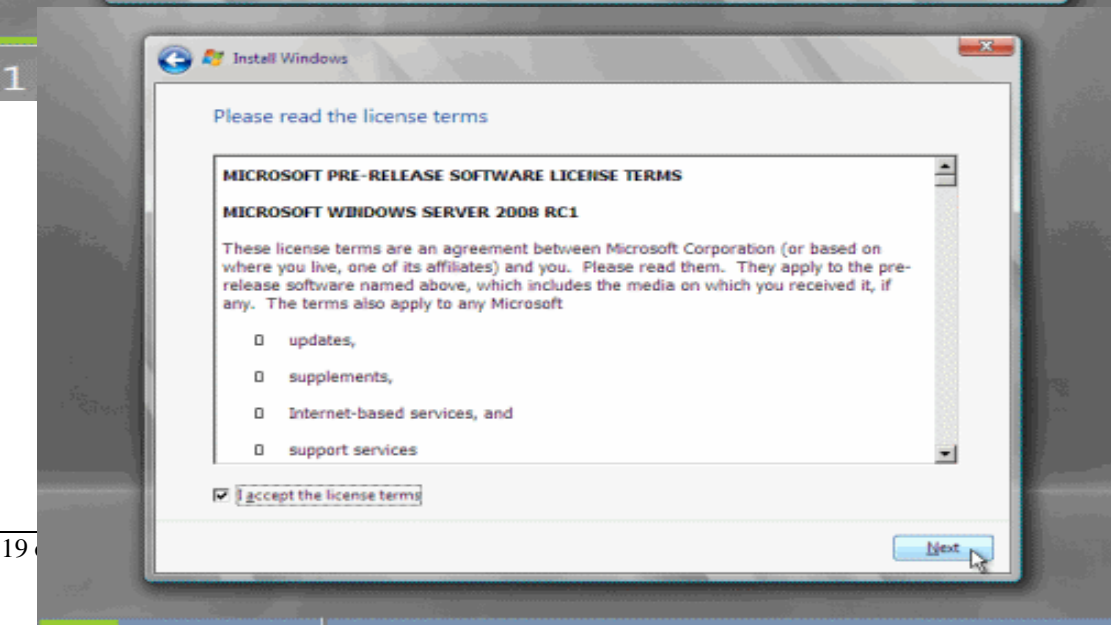
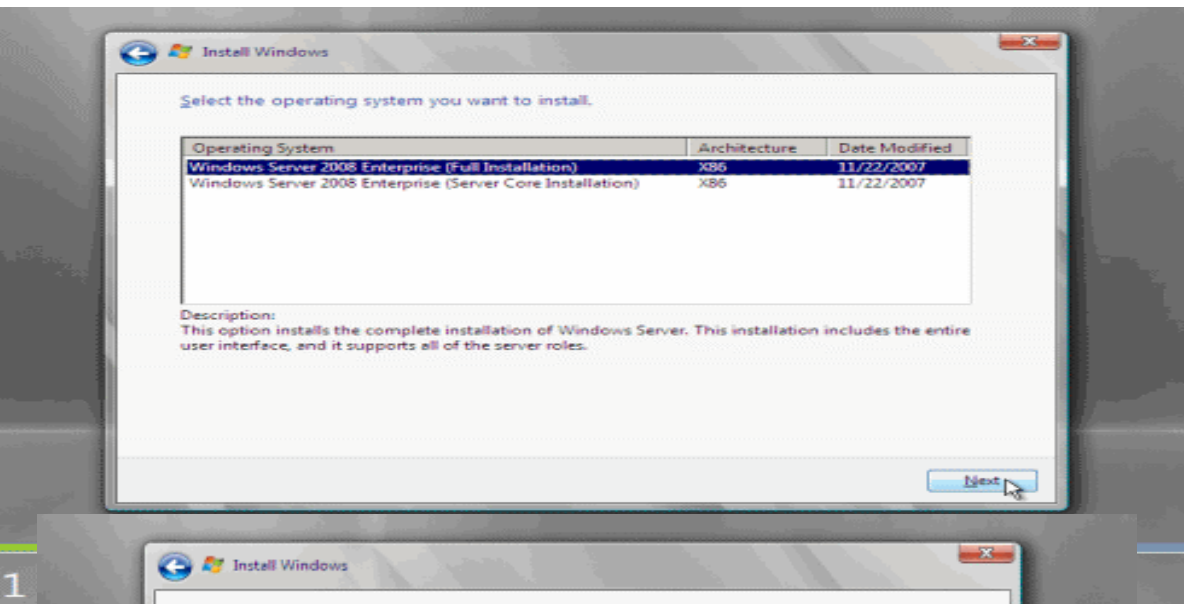
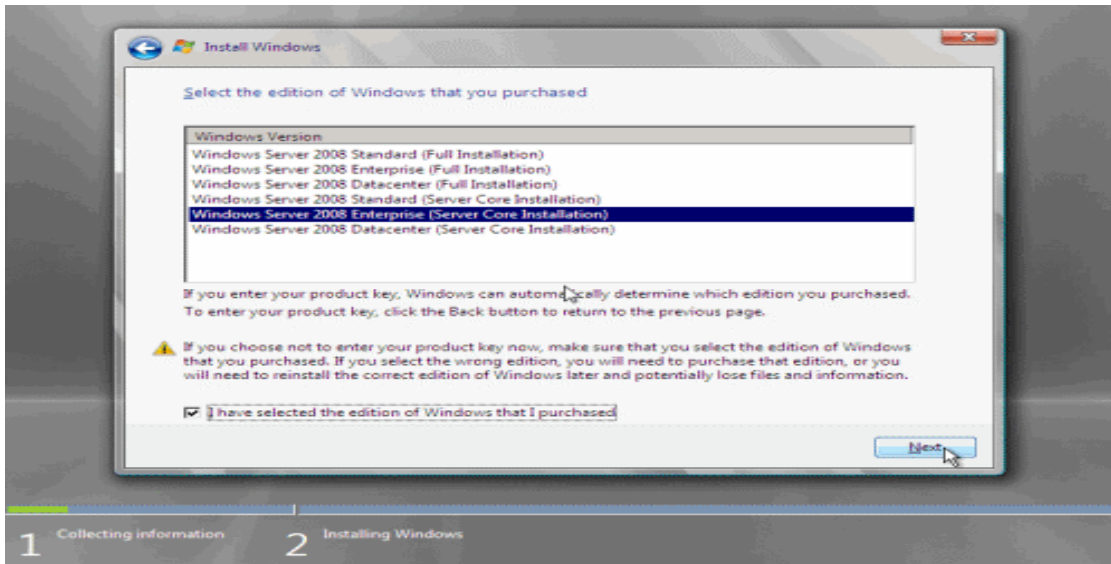


5. Product activation is now also identical with that found in Windows Vista. Enter your Product ID in the next window, and if you want to automatically activate Windows the moment the installation finishes, click Next.

If you do not have the Product ID available right now, you can leave the box empty, and click Next. You will need to provide the Product ID later, after the server installation is over. Press No.

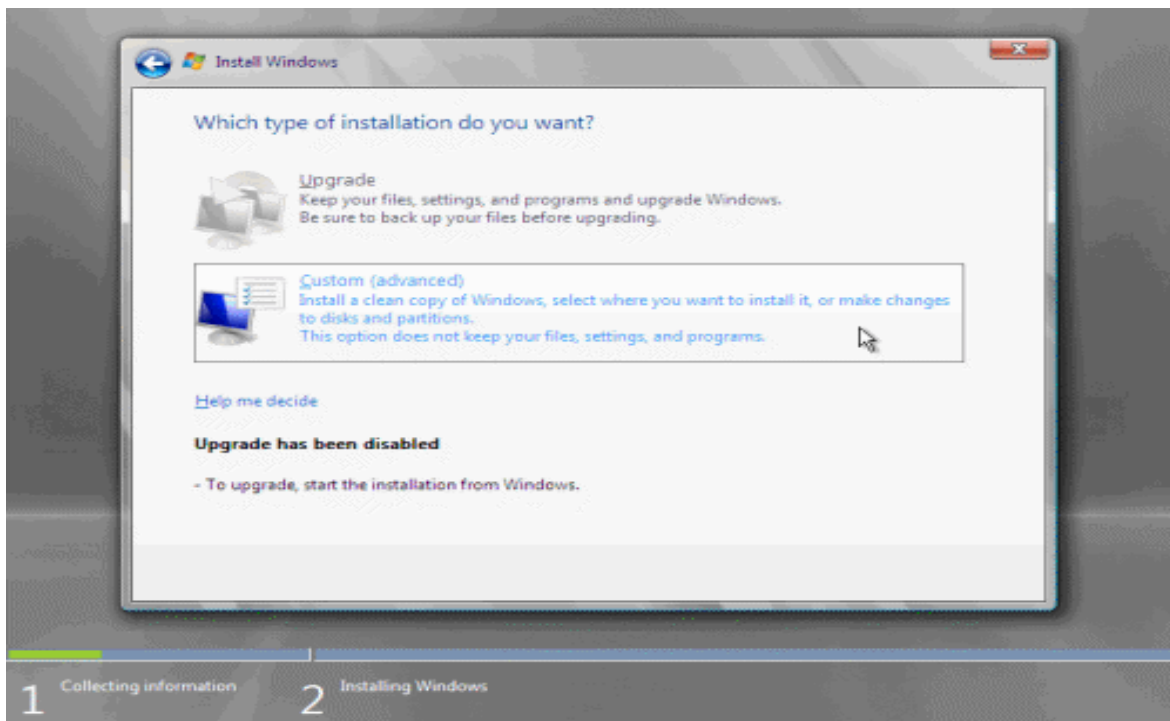


- Because you did not provide the correct ID, the installation process cannot determine what kind of Windows Server 2008 license you own, and therefore you will be prompted to select your correct version in the next screen, assuming you are telling the truth and will provide the correct ID to prove your selection later on.

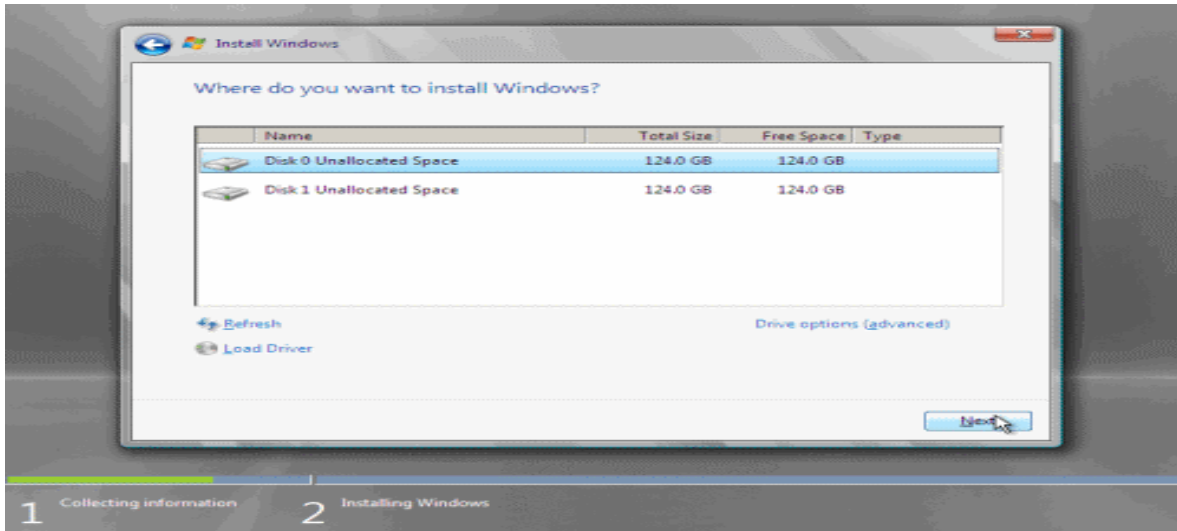


7. If you did provide the right Product ID, select the Full version of the right Windows version you're prompted, and click Next.

8. Read and accept the license terms by clicking to select the checkbox and pressing Next.

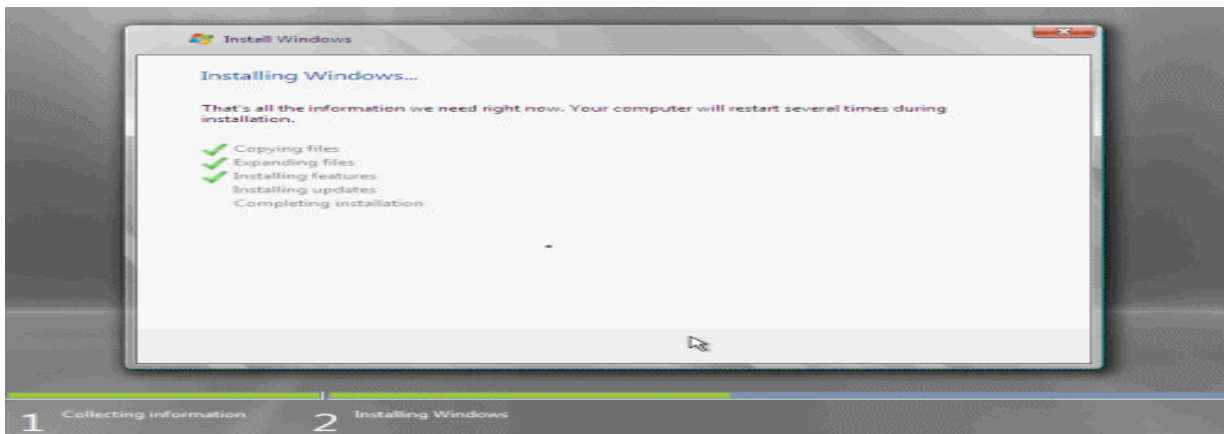


9. In the "Which type of installation do you want?" window, click the only available option –Custom (Advanced).

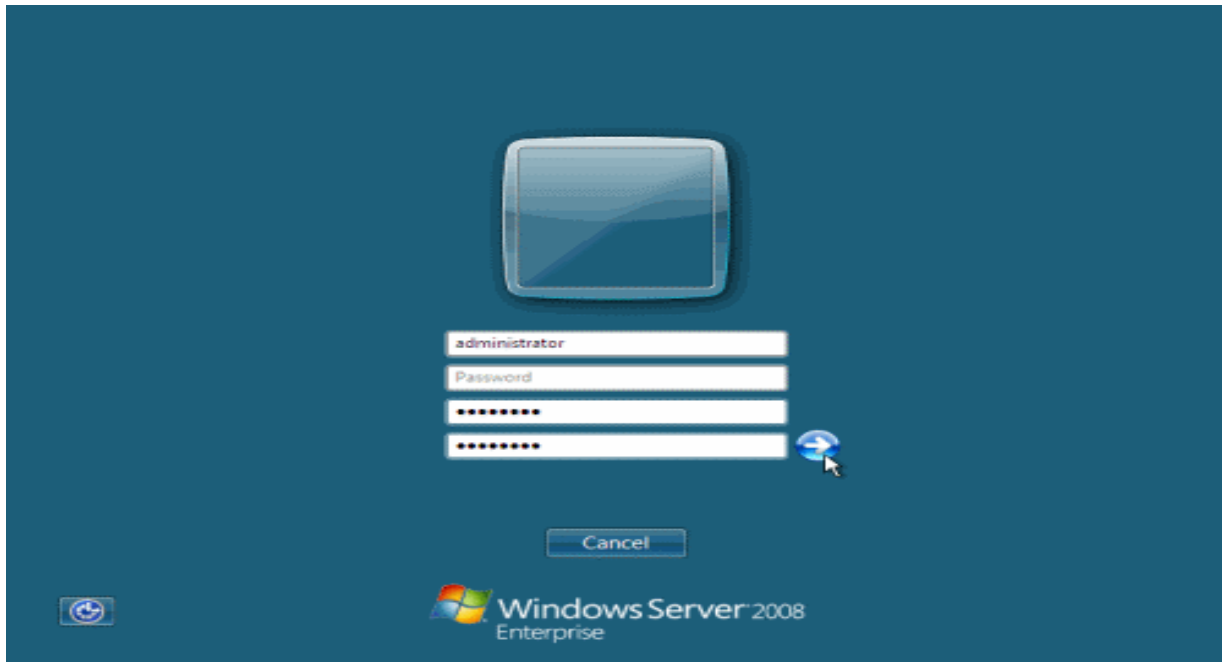


10. In the "Where do you want to install Windows?", if you're installing the server on a regular IDE hard disk, click to select the first disk, usually Disk 0, and click Next.

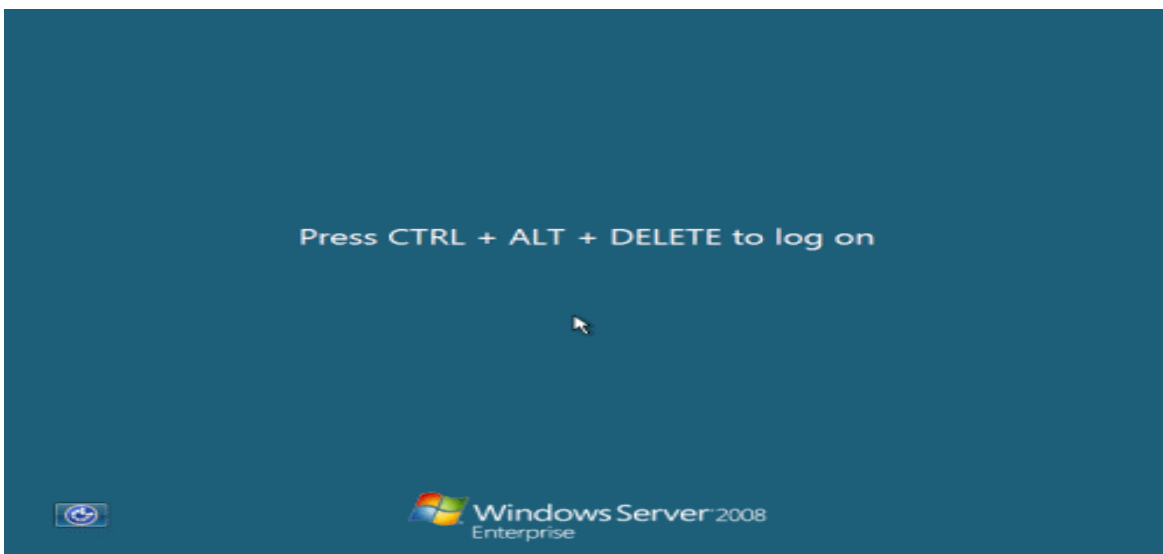
If you must, you can also click Drive Options and manually create a partition on the destination hard disk.



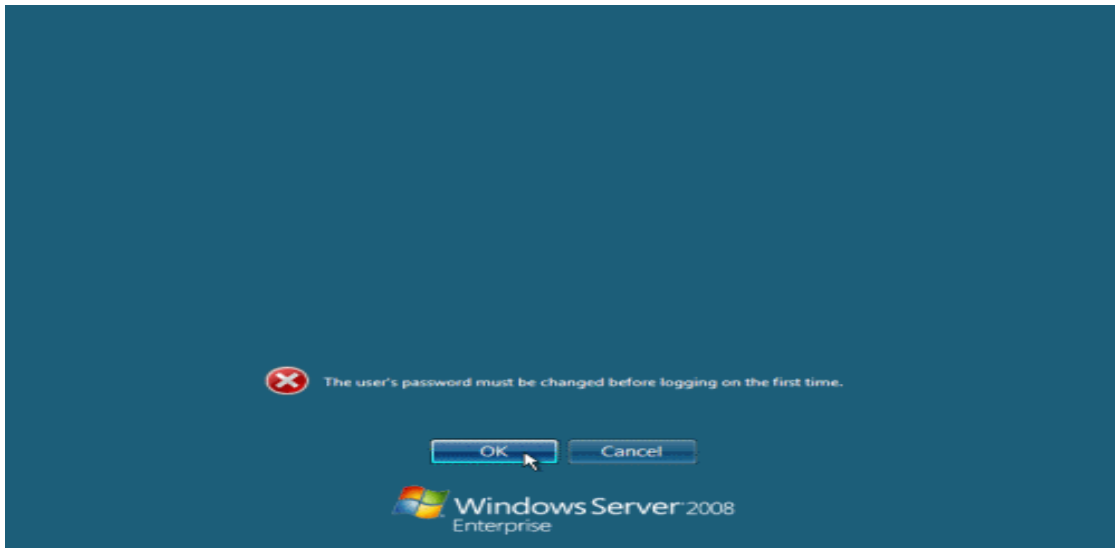
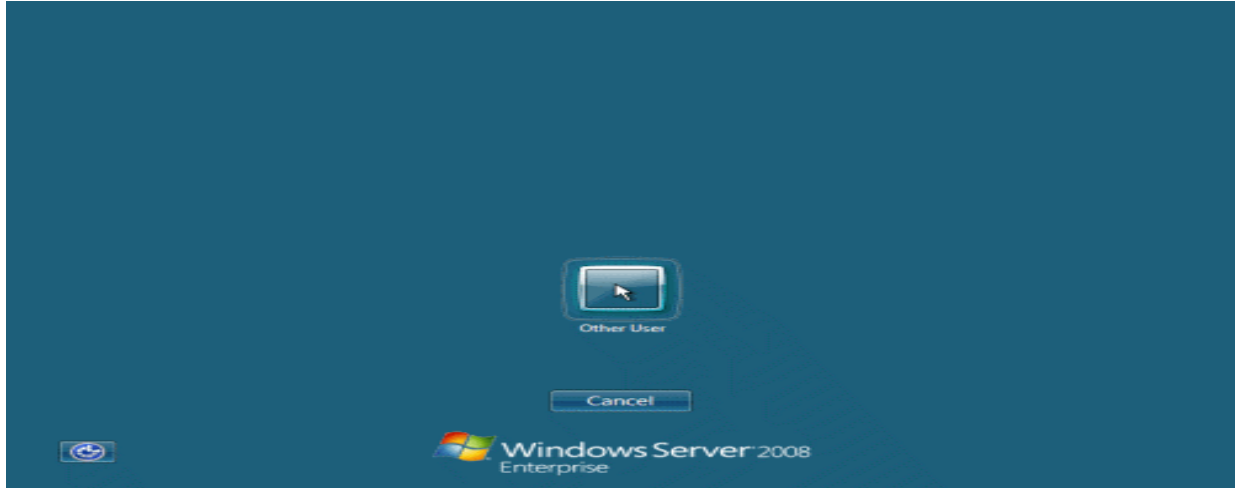
11. The installation now begins, and you can go and have lunch. Copying the setup files from the DVD to the hard drive only takes about one minute.



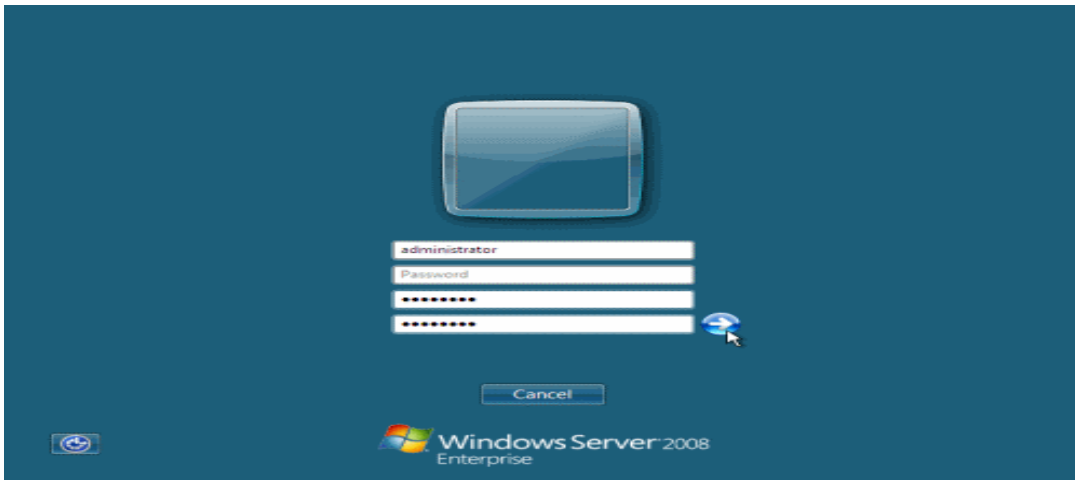
12. Then the server reboots you'll be prompted with the new Windows Server 2008 type of login screen. Press CTRL+ALT+DEL to log in.



13. Click on Other User.



14. The default Administrator is blank, so just type Administrator and press Enter.



15. You will be prompted to change the user's password. You have no choice but to press Ok.

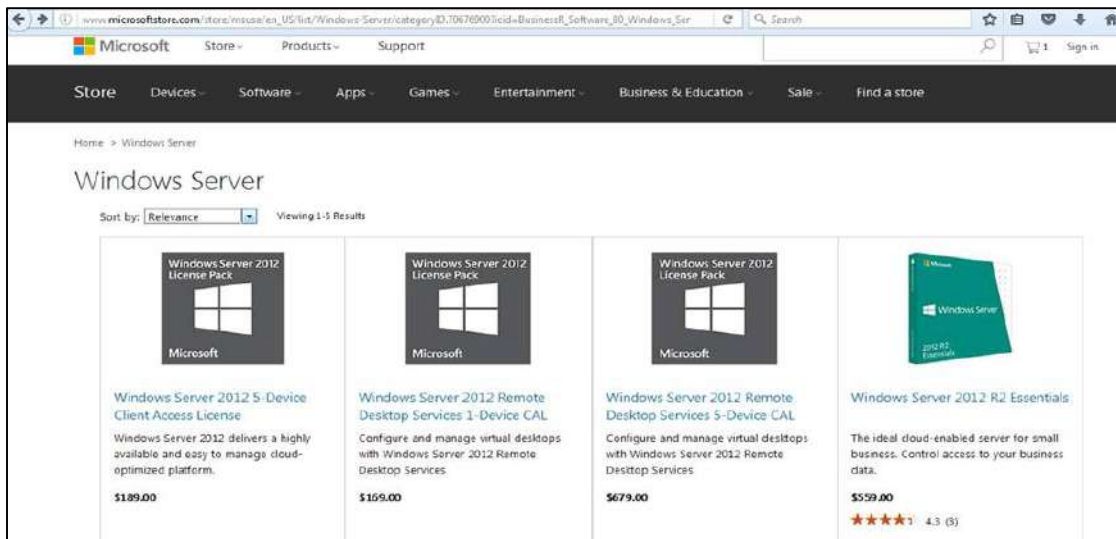


16. In the password changing dialog box, leave the default password blank (duh, read step #15...), and enter a new, complex, at-least-7-characters-long new password twice. A password like "top secret" is not valid (it's not complex), but one like "T0pSecreT!" sure is. Make sure you remember it.
17. Finally, the desktop appears and that's it, you're logged on and can begin working.

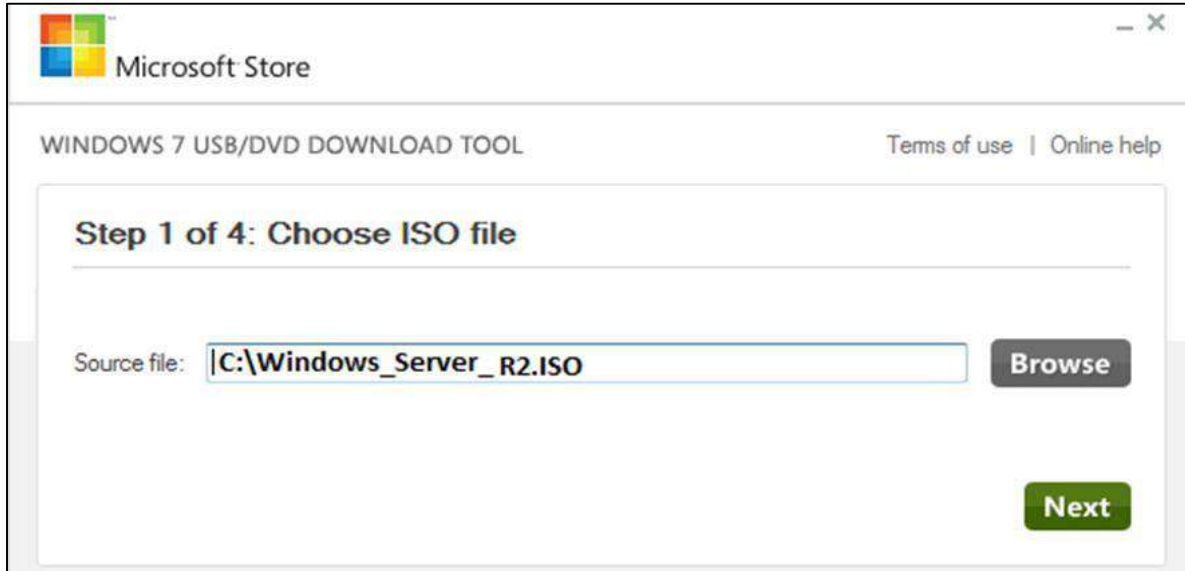
Operation sheet 2.2: Installation of Windows Server 2012



Step 1: We can download the evaluation ISO of Windows Server 2012 R2 from the following link:



Step 2: After downloading the ISO of Microsoft, create a boot USB driver which can be created with the Microsoft tool called Windows USB/DVD Download Tool and can be downloaded from the following link:



Step 3: After completing the above given steps, plug-in the USB to the server and wait for a while till it loads the files. This will continue for about a couple of minutes as shown in the following screenshot.



Step 4: After the files are loaded, you will see the screen of language settings of installation, keyboard, time and currency format. Generally, all the default ones are also good enough to start with. Click Next.

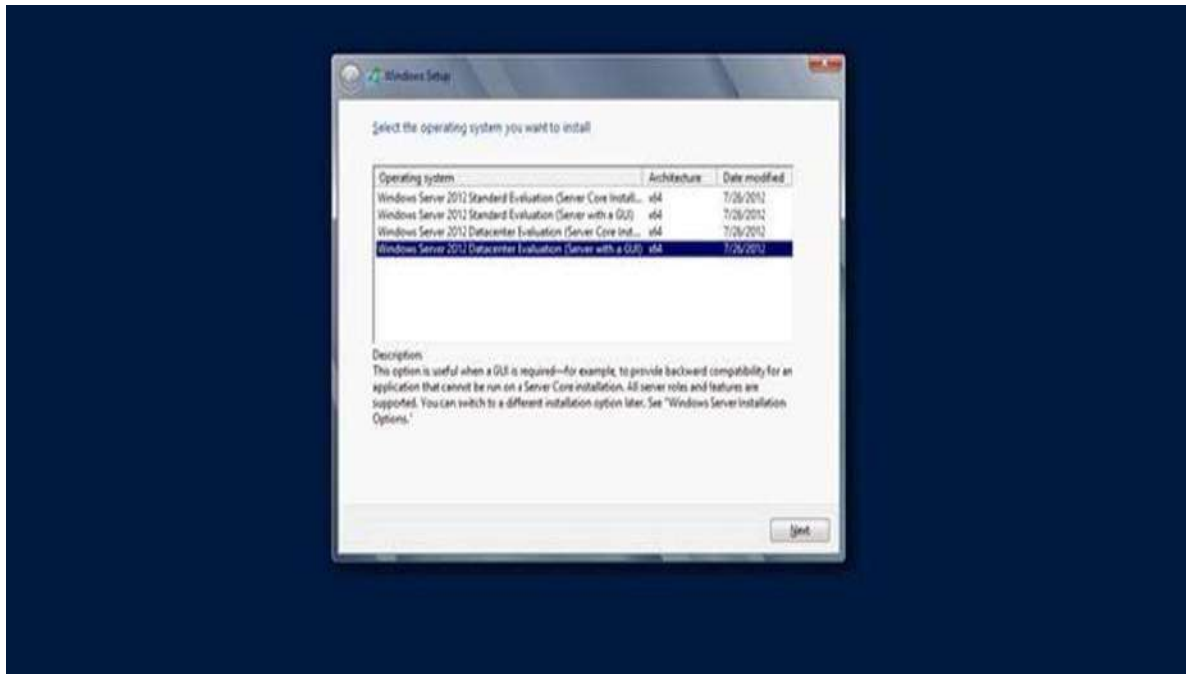
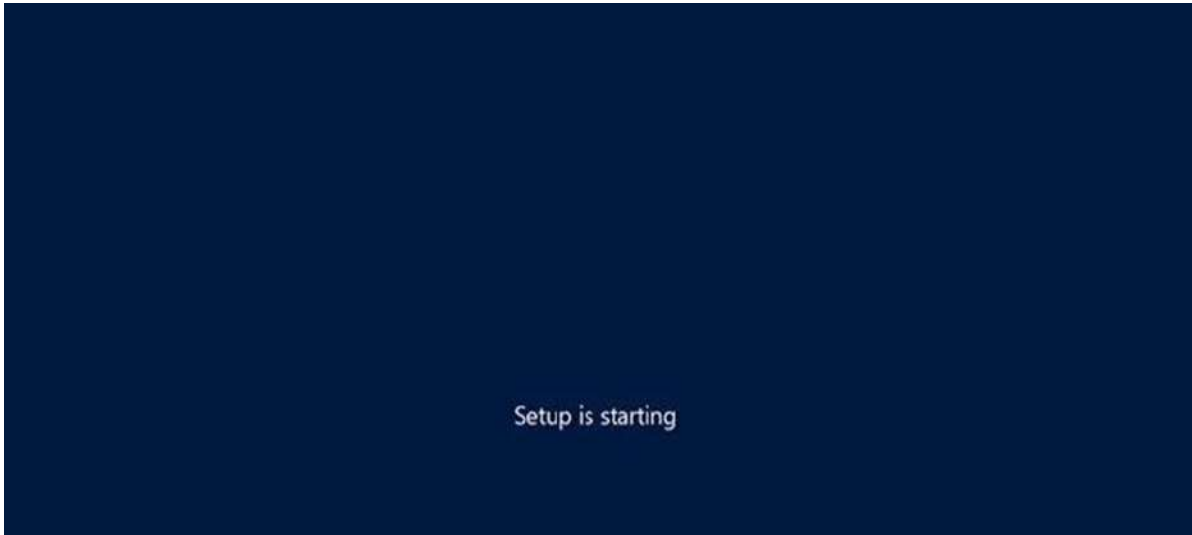


Step 5: Click “Install now”.



Step 6: Once you have clicked on Install Now, the setup will start and it will load all the files and the screen will look as shown in the following screenshot.

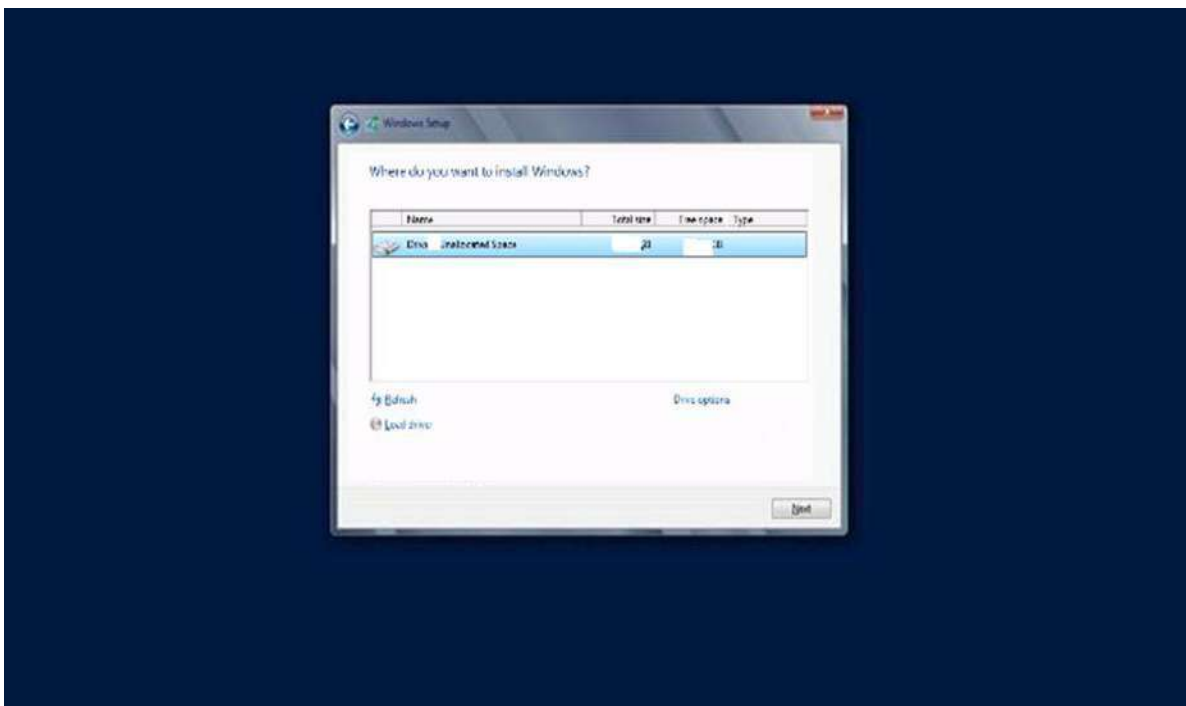
Step 7: Wait until the files are loaded and then you will see the following screen. Let's select Windows Server 2012 Data Center Evaluation (Server with GUI) and click Next.



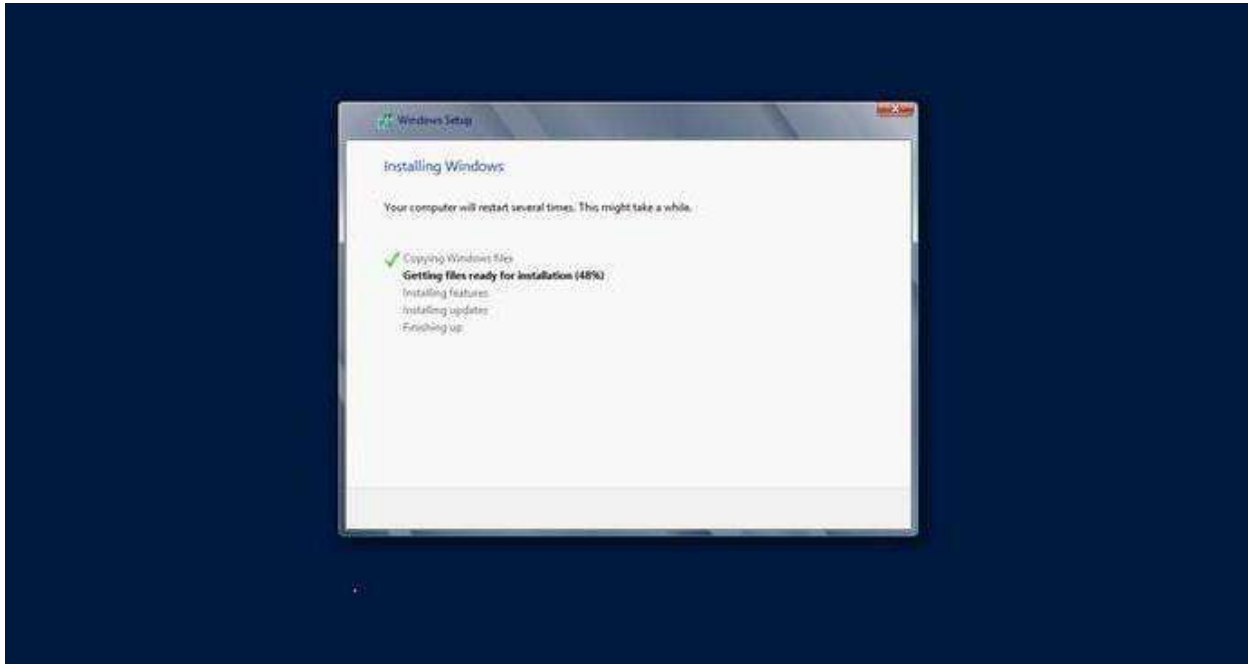
Step 8: Click "I accept the license terms" and then click on the Next button as shown in the following screenshot.



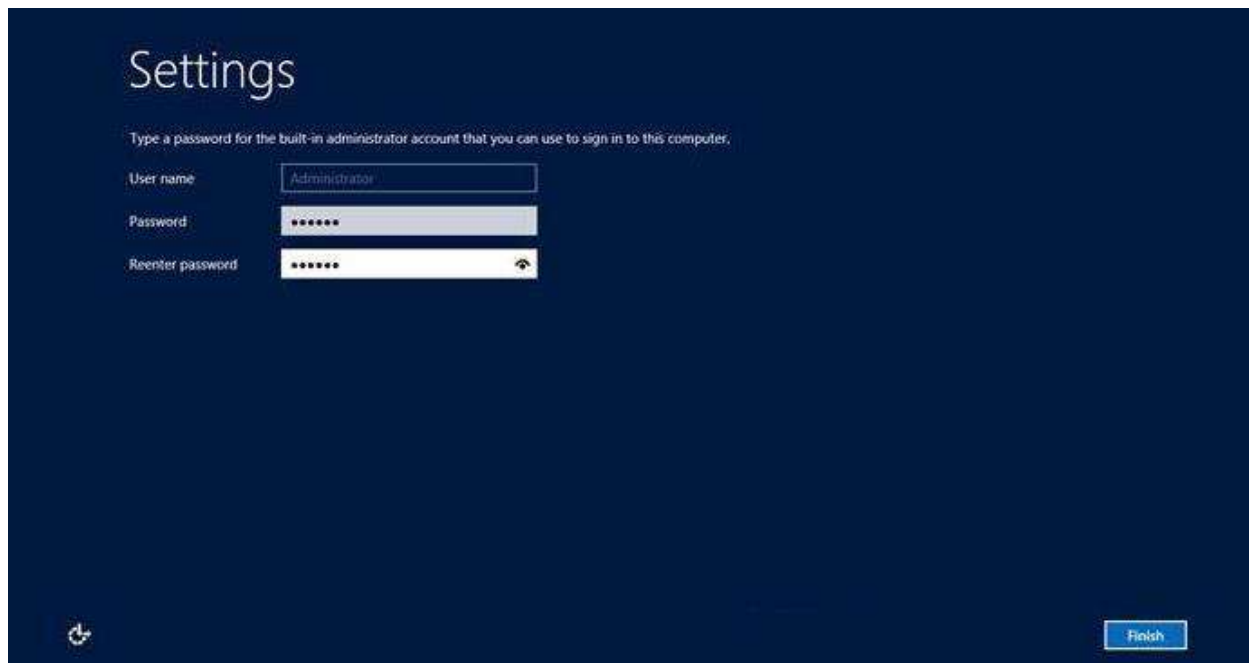
Step 9: The following screen will appear. In “Driver Options” you can create a new partition, delete or format the Hard disk. After you have done this process then you can select the partition where the Windows server 2012 R2 will be installed in our case we have one partition. Once all this is done, then click on Next.



Step 10: Let's wait until this process finishes during this time and then the server will reboot.



Step 11: Once the reboot is done the following screen will appear. Set the password for the server and then click on “Finish”.



Step 12: It will take some minutes until the setup finishes completely.



Step 13: Once all this is done, you have completed the installation process and the following screen will appear.

Congratulations



Unit Three: Configure and test server

This unit is developed to provide you the necessary information regarding the following content coverage and topics

- Configuring server
- Defining scope and applicability of testing
- Developing test plan
- Running system test
- Analyzing error report and making changes
- Validating changes or additions against specifications

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to:

- Configure server
- Defining scope and applicability of testing
- Developing test plan
- Running system test
- Analyzing error report and making changes
- Validating changes or additions against specifications

3.1. Configuring server

- Active Directory Domain Services (AD DS), a core component of Windows Server.
- AD DS is a service that helps manage and organize a networked environment, such as a company or an organization.
- It stores information about network resources, such as users, computers, printers, and groups, in a centralized database called the Active Directory.
- The Active Directory has a hierarchical, tree-like structure, called the Active Directory forest. The forest consists of domains, which are security boundaries that have their own policies and objects. Domains are organized into trees, and multiple trees can form a forest. For example, a company may have a forest with domains for different regions or departments.
- The network resources in the Active Directory are represented by objects, which have attributes that define their characteristics. For example, a user object may have attributes like username, email address, and group memberships. Objects can be organized into containers called organizational units (OUs), which allow administrators to manage them more easily.
- AD DS provides authentication and authorization services, which means it verifies the identity of users and determines what resources and actions they are allowed to access based on their permissions and group memberships. AD DS also enables Single Sign-On (SSO), which means users can access multiple resources within the network without having to re-enter their credentials.
- AD DS allows administrators to define and enforce security settings, configurations, and restrictions across the network using Group Policies.
- Group Policies are applied to users and computers based on their location in the Active Directory hierarchy. For example, a Group Policy may specify the password policy or the desktop wallpaper for a certain OU.

Active Directory Lightweight Directory Services

- AD LDS is a feature of Windows Server that provides a lightweight, directory-access protocol (LDAP) directory service.
- AD LDS is designed to offer directory services for applications without the need for the full complexity of Active Directory Domain Services (AD DS).
-

- Key aspects of AD LDS:

Lightweight Directory Access Protocol (LDAP): AD LDS uses LDAP, a protocol for accessing and maintaining distributed directory information services.

- It provides a standards-based method for interacting with the directory service.
- **Application Directory Partition:** AD LDS operates as an independent instance of the directory service, known as an application directory partition. It allows organizations to create and manage multiple directory instances on a single server.
- **Schema and Configuration Partitions:** AD LDS has its own schema and configuration partitions, separate from those used by AD DS. This enables independent schema extensions and configurations for each AD LDS instance.
- **Independent Instances:** Multiple instances of AD LDS can run on the same server, each with its own configuration, schema, and directory data. This makes it suitable for scenarios where different applications require distinct directory services.
- **Lightweight and Flexible:** AD LDS is designed to be lightweight and flexible, making it suitable for scenarios where a full-fledged Active Directory environment may be unnecessary or impractical.
- **Custom Schema Extensions:** Organizations can extend the schema within AD LDS to define custom object classes and attributes based on the specific requirements of their applications.
- **Secure Directory Services:** AD LDS supports secure communication using protocols like SSL/TLS, ensuring the confidentiality and integrity of directory data.
- **Integration with AD DS:** While AD LDS is distinct from AD DS, it can be integrated with AD DS to provide additional directory services.

DNS server

- A Domain Name System (DNS) server is a crucial component of computer networks that translates human-readable domain names into IP addresses.
- It plays a fundamental role in facilitating the communication between devices on a network.
- Key aspects of a DNS server:
 - **Name Resolution:** DNS servers resolve domain names to IP addresses, allowing users to

access websites

and other resources

using human-readable names instead of numerical IP addresses.

- **Hierarchical Structure:** DNS uses a hierarchical structure with various components like top-level domains (TLDs), domain names, and subdomains.
- **Recursive and Iterative Queries:** DNS queries can be recursive or iterative. In a recursive query, the DNS server provides the complete answer to the client. In an iterative query, the server provides a referral to another DNS server, and the client continues the query process.
- **Authoritative and Non-Authoritative Servers:** An authoritative DNS server is responsible for storing and providing information about a specific domain. Non-authoritative servers may cache information obtained from authoritative servers.
- **DNS Records:** DNS servers store information in records such as A (address) records for mapping domain names to IPv4 addresses, AAAA records for IPv6 addresses, MX (Mail Exchange) records for email routing, CNAME (Canonical Name) records for aliasing one domain to another, and more.
- **Forwarders:** DNS servers can be configured with forwarders, which are other DNS servers that handle queries on behalf of the local server. This helps in reducing the time taken to resolve queries by leveraging the caching capabilities of the forwarder.
- **Root DNS Servers:** The DNS system begins with root DNS servers that maintain information about top-level domains (TLDs). They direct queries to the authoritative servers for specific TLDs.
- **DNS Caching:** DNS servers cache query results to reduce the time taken to resolve subsequent queries for the same domain name. This helps in improving the performance of the DNS system.

DHCP server

- DHCP is a protocol that automates the assignment of IP addresses and other configuration parameters to devices on a network.
- A DHCP server is responsible for managing and distributing IP addresses and related information to devices on the network.
- IP addresses assigned by DHCP servers are leased for a specific duration and must be renewed before expiration.
- DHCP servers have several benefits, such as preventing IP address conflicts, simplifying

network administration, and supporting both IPv4 and IPv6 protocols.

DHCP Scope

- A DHCP scope is a range of IP addresses and configuration settings that a DHCP server is configured to provide.
 - This means that a DHCP scope is a set of possible IP addresses that a server can assign to devices on a network. For example, a DHCP scope might be 192.168.1.1 to 192.168.1.100, meaning that the server can give any of these addresses to a device that requests one.
 - A DHCP scope also includes some other settings that affect how the devices communicate on the network, such as the subnet mask, the default gateway, and the DNS servers.
 - Each scope is associated with a specific subnet and includes settings such as lease duration and default gateway.
 - ✓ This means that a DHCP scope is linked to a subset of a larger network, called a subnet. A subnet is a group of devices that share a common prefix in their IP addresses. For example, all the devices in the scope 192.168.1.1 to 192.168.1.100 belong to the subnet 192.168.1.0/24, where /24 indicates the length of the prefix. A DHCP scope also includes settings that determine how long a device can keep an IP address (lease duration) and how to reach other networks (default gateway).
 - Reservations are optionally used to ensure that a DHCP client always receives the same IP address.
 - ✓ This means that a DHCP scope can have some exceptions, called reservations, that assign a specific IP address to a specific device. For example, a reservation might be 192.168.1.10 for a printer, meaning that the server will always give this address to the printer and not to any other device. Reservations are useful for devices that need a fixed IP address for identification or access purposes.

Hyper-V

- Hypervisor Technology: Hyper-V is a Type 1 hypervisor, which means it runs directly on the hardware without a host operating system. This improves the efficiency and performance of

virtualization.

- **Host Operating System:** Hyper-V is available as a feature on Windows Server editions and Windows 10 Pro, Enterprise, and Education editions. Users can enable Hyper-V on their Windows-based systems for server or desktop virtualization.
- **Virtual Machines:** Hyper-V allows users to create and run multiple virtual machines (VMs) on a single physical server. Each VM has its own operating system, applications, and settings, and is isolated from other VMs.
- **Supported Guest Operating Systems:** Hyper-V supports a wide range of guest operating systems, including various versions of Windows, Linux, and other compatible operating systems. Users can choose the operating system that suits their needs and preferences for each VM.
- **Integration Services:** Hyper-V provides Integration Services, which are drivers and services that enhance the interaction between the host and guest operating systems.
- They include features such as improved performance, mouse integration, time synchronization, and more.
- **Dynamic Memory:** Hyper-V includes Dynamic Memory, which allows the memory allocation to VMs to be adjusted dynamically based on workload demands. This optimizes the memory usage on the host and prevents wastage or shortage of memory resources.
- **Live Migration:** Hyper-V supports Live Migration, which enables the movement of running VMs from one host to another with minimal downtime. This feature is useful for load balancing and maintaining high availability of VMs.
- **Snapshot and Checkpoints:** Hyper-V allows users to take snapshots or checkpoints of VMs at specific points in time. This feature allows users to save the state of a VM and restore it later if needed. It can be helpful for testing, troubleshooting, or backup purposes.

Active directory certificate services

- **AD CS:** A Windows Server role that provides a PKI solution for securing communication within an organization. It issues and manages digital certificates for various security scenarios.
- **PKI:** A system that uses asymmetric cryptography to bind public keys to identities of entities (such as users, computers, or devices). It enables secure communication, authentication, and data integrity.
- **CA:** A component of AD CS that validates the identity of entities and issues digital certificates to them. It can be either Enterprise or Standalone, depending on the integration with Active

Directory.

- Certificate Templates: Definitions of the properties and purpose of digital certificates. AD CS provides predefined and custom templates for different scenarios.

File services

- File Sharing: This is the ability to store and access files and directories across a network, enabling collaboration and data accessibility among users and applications.
- NFS and SMB: These are two common protocols for network file sharing, each suitable for different operating system environments (Unix/Linux and Windows, respectively).
- File Servers: These are servers that host shared files and provide access to clients over a network, with configuration options for permissions, access control, and file storage.
- File Permissions and Access Control: These are mechanisms for setting and enforcing rules on who can read, write, or execute specific files and directories on the network.
- Distributed File Systems: These are systems that organize and manage files across multiple servers or storage devices, providing a unified namespace and a centralized view of the files.
- File Replication: This is the process of duplicating files across multiple servers for redundancy and fault tolerance, enhancing data availability and resilience.
- File Caching: This is the technique of storing frequently accessed files locally, reducing the need to retrieve them from the server every time they are requested, and improving file access speed.
- File Locking: This is the technique of preventing multiple users from simultaneously modifying the same file, avoiding data inconsistency and corruption.

Print services

- Print server, which is a device or software that manages and coordinates print jobs on a network.
- The text explains the main function of a print server, which is to provide a centralized point for controlling and directing print requests from client devices to one or more printers.
- A print server simplifies the administration and configuration of printers and print jobs within a network.
- Users do not need to install or update printer drivers on their devices, as they can send print jobs to the print server, which then handles the distribution of print tasks to the appropriate printers.
- A print server can enforce security and access policies for printers and print jobs, such as authentication, authorization, encryption, quotas, watermarking, etc. A print server can also

monitor and audit

the print activity and

usage in the network, and generate reports and statistics.

- A print server can improve the performance and reliability of printing by balancing the network workload and avoiding printer congestion. A print server can also reduce the cost of printing by optimizing the use of printer resources and eliminating duplicate or unnecessary print jobs. It covers the following points:
 - **Print Server:** A role service that manages and coordinates printing tasks for multiple printers on a network.
 - **Printer Sharing:** A feature that enables users from different devices to send print jobs to a central printer.
 - **Print Queues:** A mechanism that organizes print jobs in the order they are received by the print server.
 - **Printer Drivers:** Software components that enable communication between the client and the printer, ensuring that print jobs are formatted correctly.
 - **Network Printing Protocols:** Standards that facilitate communication between client devices and the print server, such as IPP, LPD, and SMB.
 - **Print Management:** A tool for administrators to manage printers, print queues, and print jobs, including monitoring, setting priorities, and configuring properties.
 - **Print Policies:** Rules that control and manage the use of printers on the network, such as setting quotas, restricting access, or implementing cost-saving measures.
- **Print Logging and Auditing:** Features that track print activities, such as monitoring printer usage, troubleshooting problems, or generating reports.

Windows server Update Server

- **WSUS:** A Microsoft tool for managing updates for Microsoft products in a corporate network. It acts as a local update repository and allows administrators to approve, distribute, and monitor updates.
- **Update Management:** WSUS categorizes updates into different types, such as security, critical, or service packs. Administrators can configure WSUS to automatically approve and deploy specific categories of updates to client computers.
- **Deployment Rings:** WSUS enables administrators to organize computers into deployment rings, which help in testing updates on a subset of computers before rolling them out to the entire

organization.

- **Reporting and Monitoring:** WSUS provides reporting and monitoring features that allow administrators to track the status of updates across the network. Reports include information on update compliance, failed installations, and update history.

Web server(IIS)

- Internet Information Services (IIS), a web server software developed by Microsoft.
- It explains the following aspects of IIS:
 - **Web Server Functionality:** How IIS handles web requests and delivers web content.
 - **HTTP and HTTPS Protocols:** How IIS supports secure and unsecure web communication using SSL/TLS encryption.
 - **Hosted Content Types:** What types of web content IIS can host, including static and dynamic content generated by server-side technologies.
 - **Application Pools:** How IIS separates and isolates web applications for stability and security purposes.
 - **Integration with ASP.NET:** How IIS works with ASP.NET, a server-side web application framework based on the .NET framework.
 - **Modular Architecture:** How IIS allows administrators to customize and optimize their web server configuration by installing only the necessary components.
 - **Centralized Management Console:** How IIS provides a user-friendly interface for managing and configuring server roles and features.

Routing and remote access server

- Routing and Remote Access Service (RRAS) feature in Windows Server operating systems.
- It explains that RRAS provides a range of networking services, such as routing, VPN, and dial-up, that enable different scenarios for remote access and network interconnection.
- It also lists some key aspects of RRAS, such as:
 - **RRAS Multitenant Gateway:** A software gateway and router that allows network traffic routing between virtual and physical networks, including the Internet. It supports Hyper-V Network Virtualization and VLANs, and enables VPN and NAT for tenants.
 - **Remote Access:** A service that allows end users and sites to connect to a corporate network or another network by using VPN or dial-up connections.
 - **Routing:** A service that offers routing and networking capabilities for LAN-to-LAN, LAN-to-WAN, VPN, and NAT scenarios. It supports various routing protocols and

features.

- **Microsoft Azure virtualization solutions:** A link to learn more about how Microsoft Azure provides similar functionality in the cloud, such as hybrid virtualization and VPN.

3.2. Defining scope and applicability of testing

- The scope and applicability of testing are critical aspects of the software testing process that define what will be tested, the objectives of testing, and the boundaries of the testing effort. Here is an overview of the scope and applicability of testing:
- **Scope of Testing:** The scope of testing outlines the boundaries and extent of the testing effort. It defines what aspects of the software will be tested and what will not be tested.
- The scope typically includes:
 - **Functional Features:** Identify the specific functionalities, features, and use cases that will be tested. This includes both primary and secondary functions of the software.
 - **Non-functional Features:** Identify the quality attributes, such as performance, usability, security, and reliability, that will be tested. This includes both quantitative and qualitative measures of the software.
 - **Test Levels:** Identify the different levels of testing, such as unit, integration, system, and acceptance, that will be performed. This includes the scope and objectives of each level, as well as the dependencies and interactions between them.
- **Test Types:** Identify the different types of testing, such as functional, non-functional, regression, and exploratory, that will be conducted. This includes the scope and objectives of each type, as well as the techniques and tools used for them.
- **Test Environment:** Identify the hardware, software, network, and data requirements for the testing activities.

3.3. Developing test plan

- A test plan is a document that outlines the scope, objectives, and strategy of testing a software product.
 - **Entry Criteria:** The conditions that must be met before testing can start, such as the completion of development and the availability of test environments.
 - **Exit Criteria:** The conditions that must be met for testing to be considered complete, such as achieving a certain level of test coverage and meeting quality criteria.

- Test Schedule: The timeline for testing activities, including the start and end dates for each testing phase, the milestones and the dependencies.
- Resource Planning: The allocation of resources for testing, such as the roles and responsibilities of the test team, the tools and equipment needed, and the budget and risks involved.

3.4. Running system test

System testing involves several steps, such as setting up the test environment, creating and executing test cases, reporting and logging defects, performing regression testing, and retesting. System testing also includes various types of testing, such as performance testing, load testing, security testing, usability testing, etc.

3.5. Analyzing error report and making changes

- Brief description of a general process for analyzing error reports and implementing changes in software development. It consists of three main steps:

Identifying, monitoring, and reporting errors:

- This step involves using tools and methods to detect and capture errors that occur in software solutions, such as crashes, bugs, or performance issues.
- Error reporting tools can help provide information about the error, such as the location, severity, frequency, and impact of the error.
- Examples of error reporting tools are Sentry and Sauce Labs.

Understanding the root causes:

- This step involves analyzing the error reports to find out why the error occurred, what factors contributed to it, and how it can be prevented or fixed.
- Root cause analysis can help identify the underlying problems in the code, design, logic, or environment of the software. Examples of root cause analysis methods are defect reports and error classification.

Making necessary changes:

- This step involves implementing solutions to correct or improve the software based on the root cause analysis.
- Changes can include modifying the code, updating the framework, fixing the configuration, or enhancing the functionality of the software.

- Changes should be tested and verified before deployment to ensure they work as expected and do not introduce new errors.

3.6. Validating changes

- Process and purpose of validating changes in a system, product, or process. Here are some elaborations and additional facts

Validation vs Verification

- Validation is different from verification, which is the process of checking whether the system, product, or process meets the design specifications.
- Verification answers the question “Are we building the product right?” while validation answers the question "Are we building the right product?"

Validation Methods

- There are different methods of validation depending on the type and scope of the changes.
- Some common methods include testing, inspection, analysis, simulation, demonstration, and review.
- Each method has its own advantages and limitations, and the choice of method depends on factors such as cost, time, risk, and complexity.

Self-Test 3

Instruction: -Read all questions which given below and you to answer the correct one. (2 points each)

Part I True/False Questions

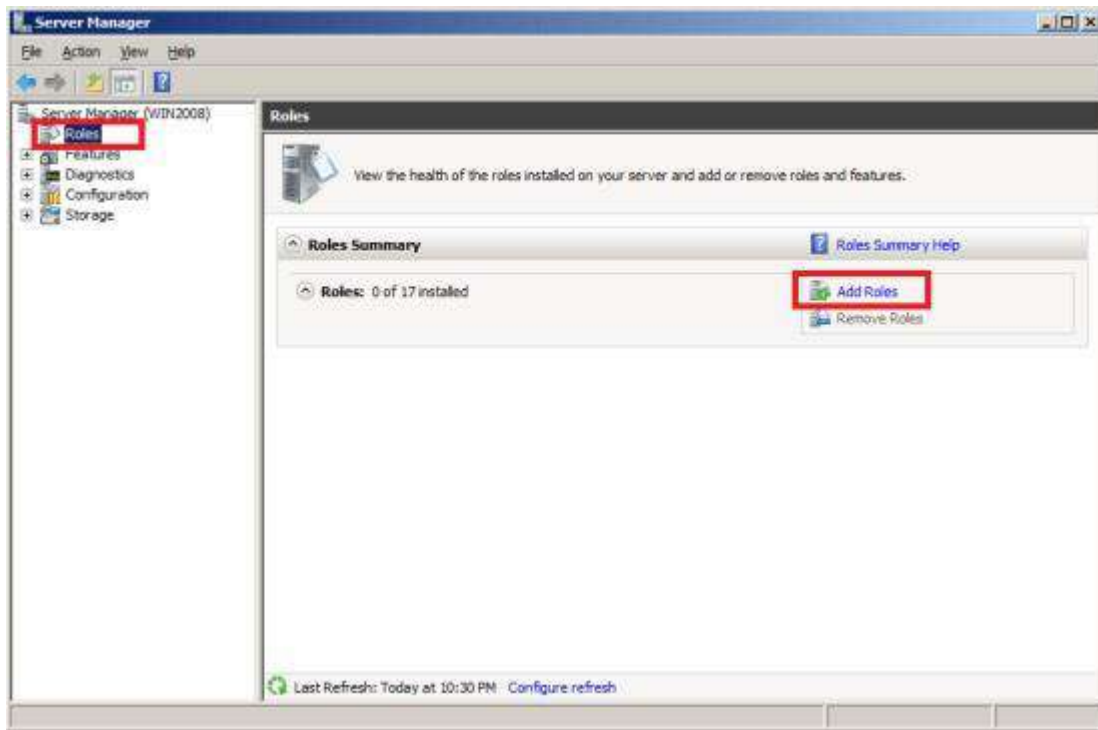
1. _____ A server is a computer that provides services or resources to other computers or devices on a network
2. _____ A web server is a type of server that hosts and delivers web pages to clients using the HTTP protocol
3. _____ A proxy server is a type of server that acts as an intermediary between clients and other servers, providing security, caching, or filtering functions
4. _____ A mail server is a type of server that handles the sending and receiving of emails using protocols such as SMTP, POP3, or IMAP

Part II. Multiple-Choice Questions

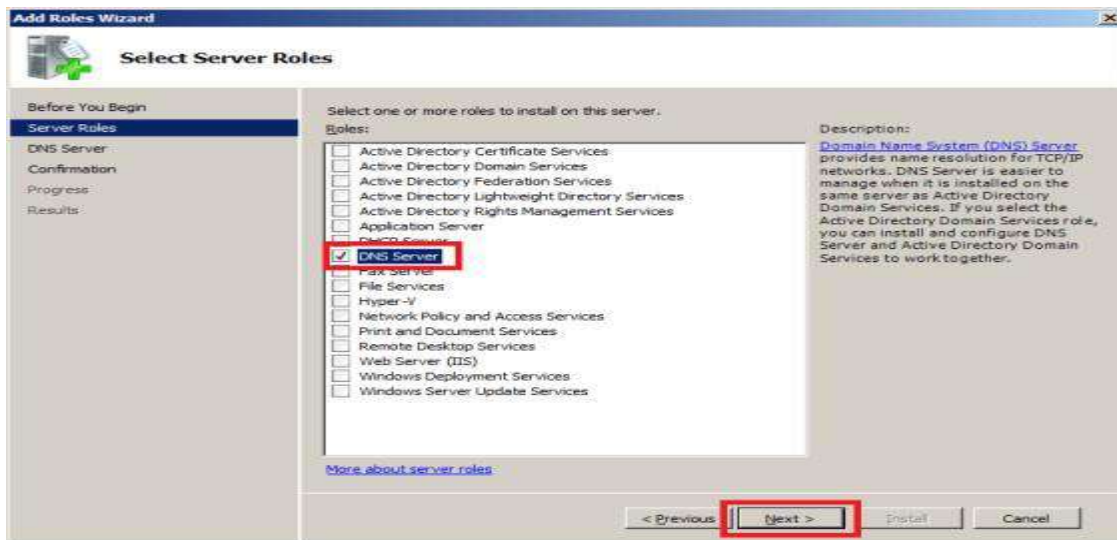
1. What is the main advantage of using a blade server over a tower server?
 - a. Lower power consumption
 - B. Higher performance
 - C. Greater scalability
 - D. Easier maintenance
2. What is the name of the technology that allows multiple operating systems to run on a single physical server?
 - A. Server clustering
 - B. Server virtualization
 - C. Server consolidation
 - D. Server replication
3. What is the name of the protocol that allows remote access and management of servers over a network?
 - A. RDP (Remote Desktop Protocol)
 - B. SSH (Secure Shell)
 - C. SNMP (Simple Network Management Protocol)
 - D. Telnet
 Answer: B. SSH (Secure Shell)
4. What is the name of the device that connects multiple servers to a shared storage system, such as a SAN (Storage Area Network)?
 - A. Switch
 - B. Router
 - C. Hub
 - D. HBA (Host Bus Adapter)

Operation sheet 3: Install DNS Server

Launch **Server Manager** by clicking **Start > Administrative Tools > Server Manager**.
Click **Roles** and then **Add Roles**.

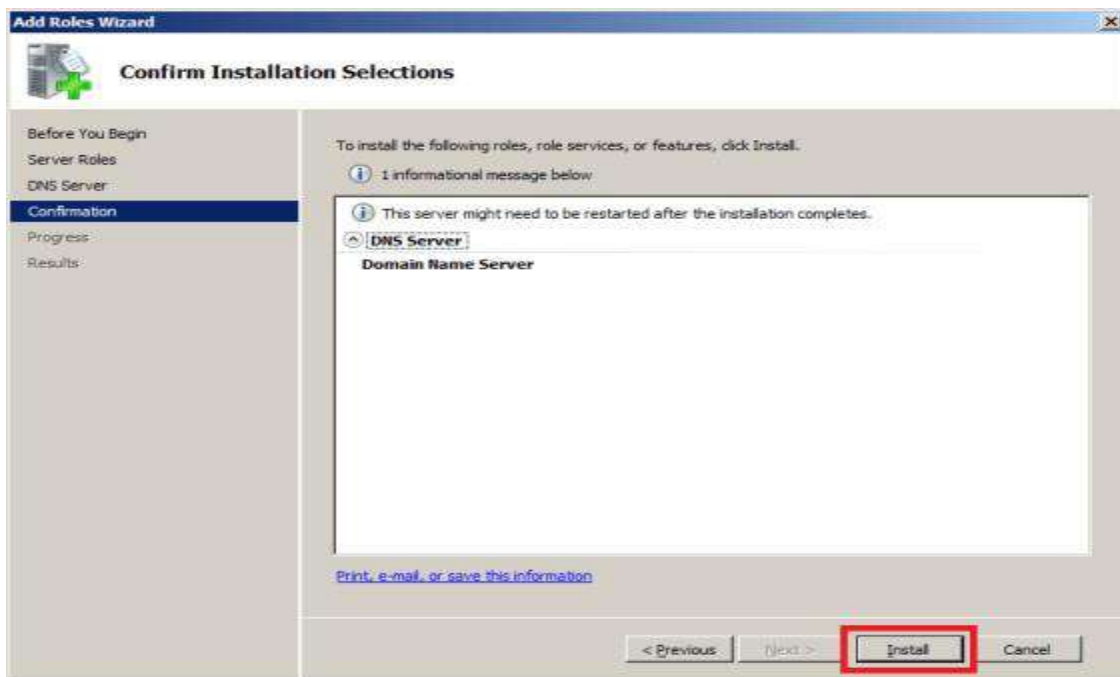


- Select **DNS Server** from the list and then click Next button.



- A little introduction to DNS Server and a few useful links for further details as shown in below image. Click Next to move on.

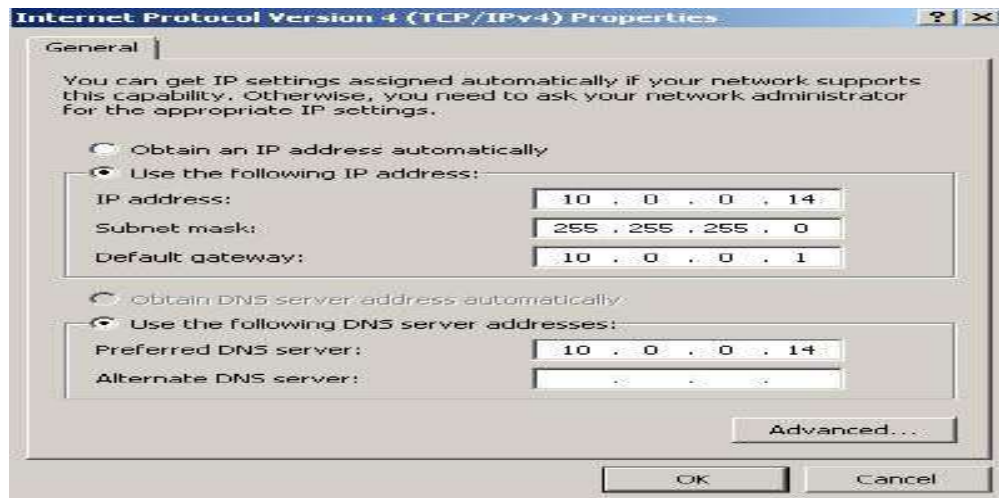
- DNS Server has been installed successfully as per below snapshot. Click Close to finish the **Add Roles Wizard**.



Click Install button.

Operation sheet 3.1 Install Active Directory

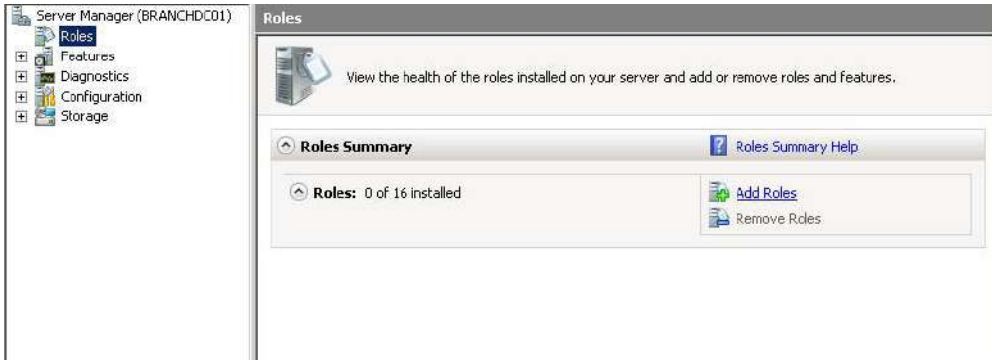
The first step is to assign a IP to the server that you going to deploy the AD. It's necessary to install it as DNS server too. So its better to have fixed IP it doesn't mean you cannot install AD without fixed IP address but it will solve lot of issues if you used fixed IP



In here the server ip is 10.0.0.14. Since we going to make it as DNS server too you should use the same ip as the preferred DNS server. Next step is to install the Active directory roles. Unlikely the older version of windows servers Microsoft highly recommend to use server manager option to install roles before you run dcpromo.

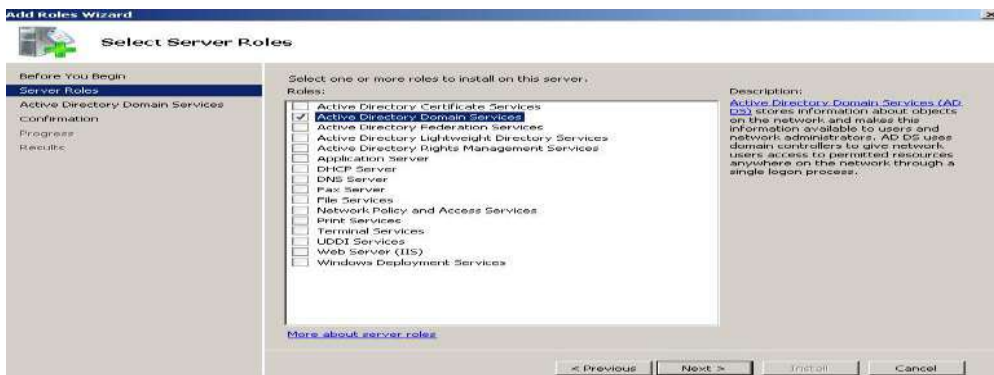


Click on start menu and select the Server Manager



Select the roles from the right hand panel and click on add roles option

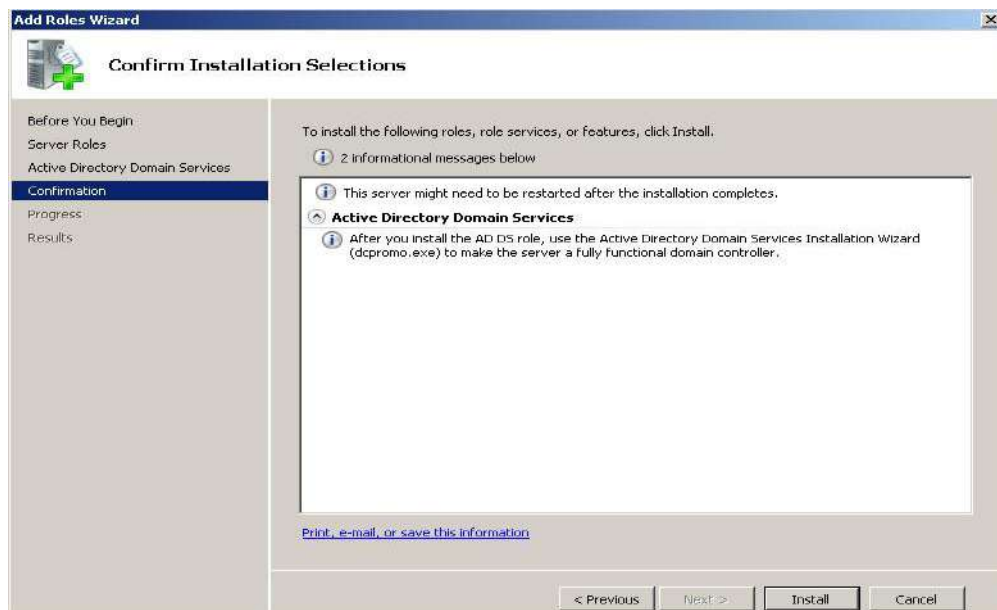
From the roles list select the "Active Directory Domain Services" role and Click "Next"



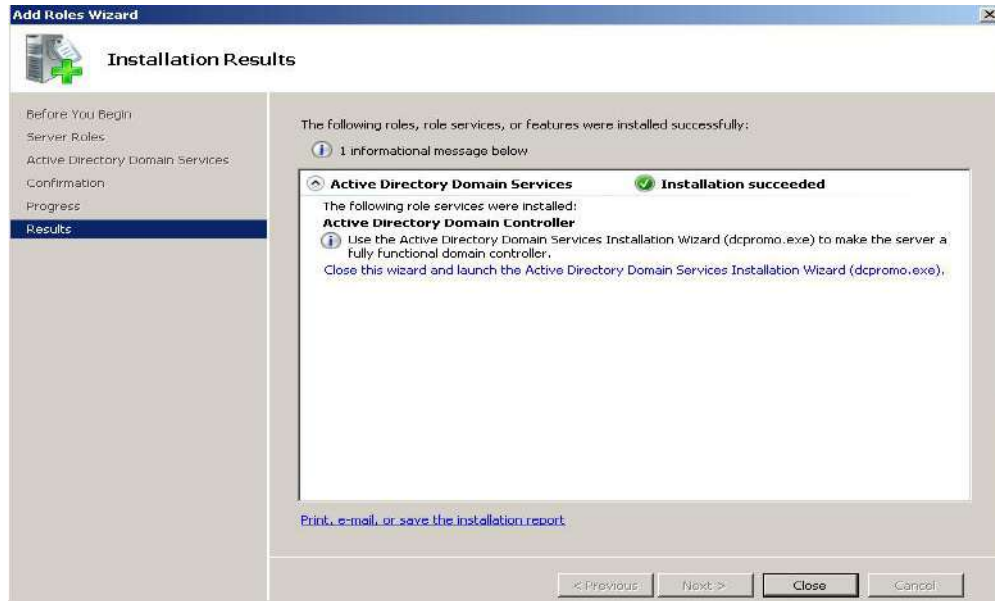
Review the confirmation and click on "Next"



Review the installation confirmation and click on "Next"



It will take few minutes to complete and when its done you will get this confirmation. And then click on "Close"

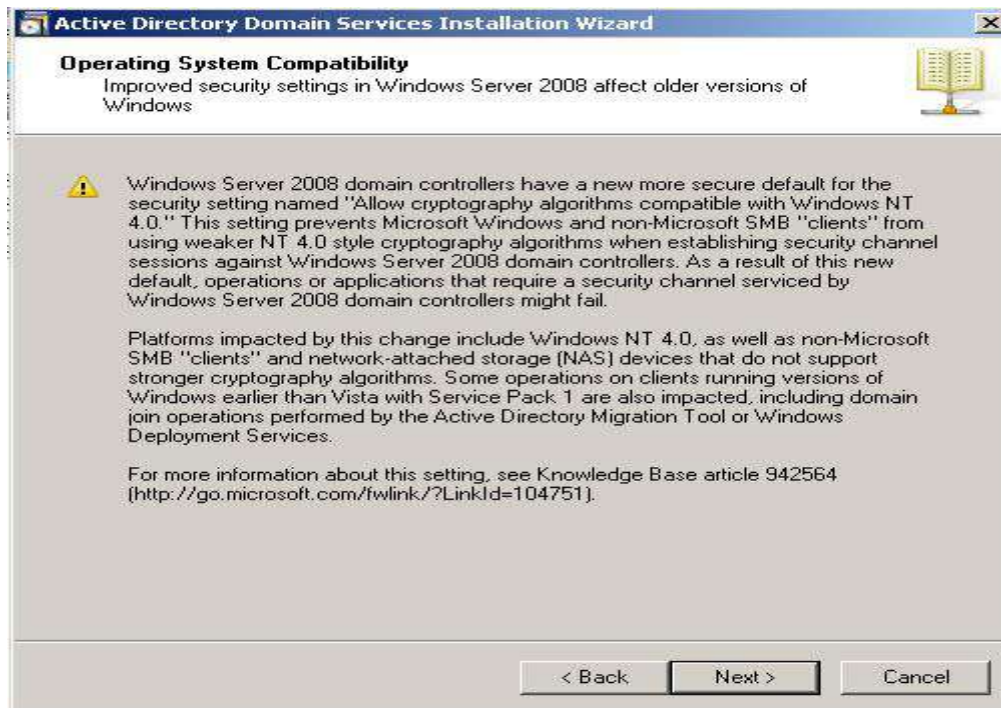


So please click on that link and it will start the DCPROMO wizard.

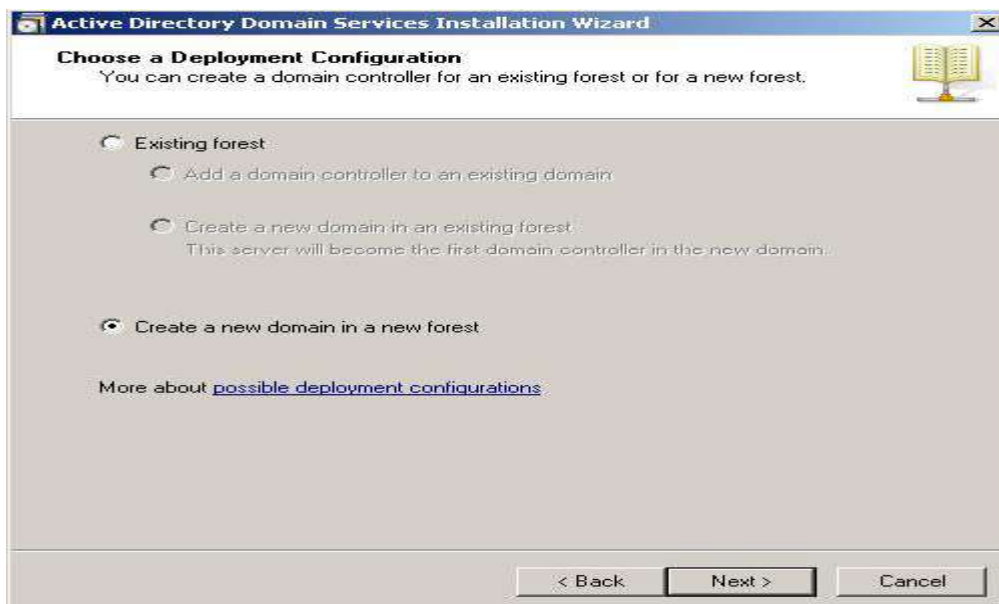
So next step to go through the DC promo wizard. To start the installation click on "Next"



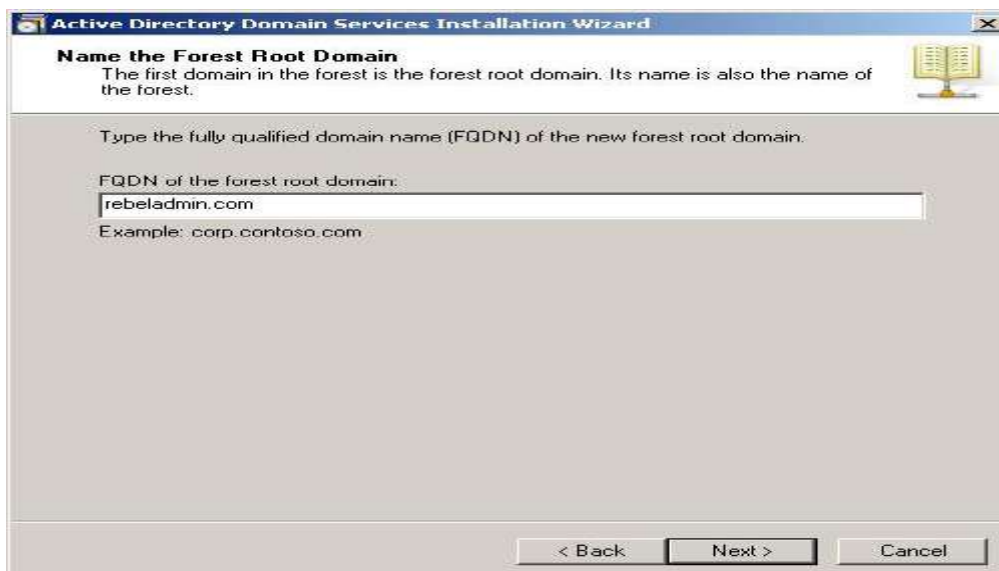
Click on "Next"



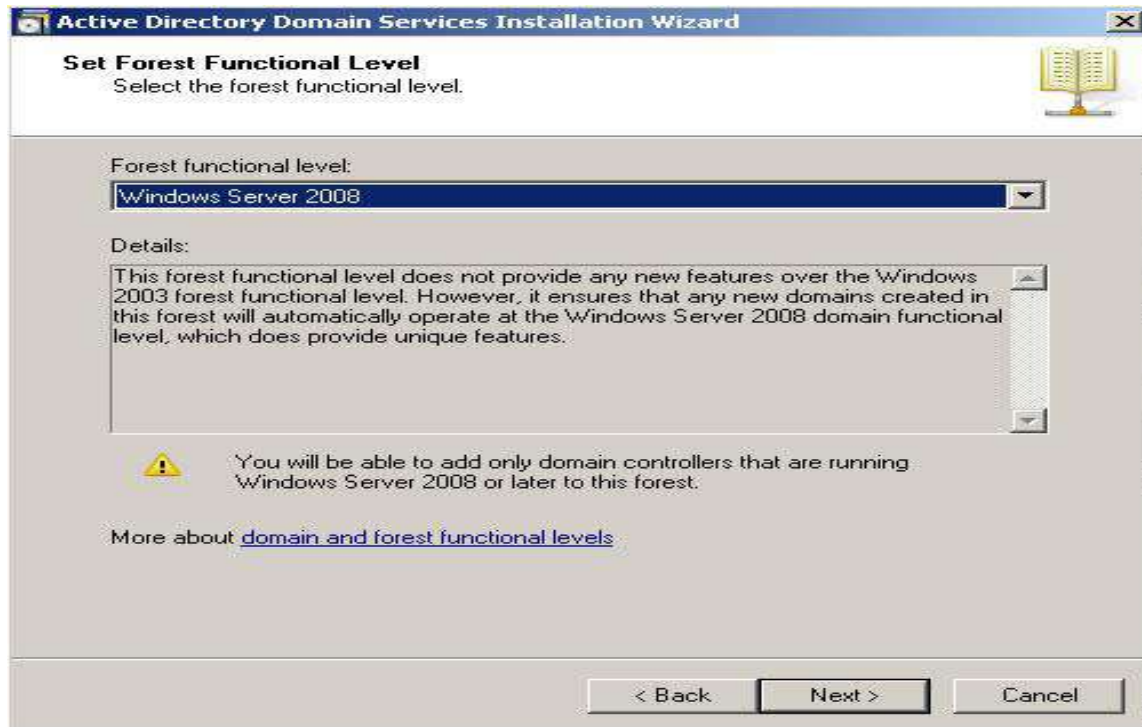
Since we going to install New Domain Controller in new forest please select the option "Create a new domain in new forest" option and click on "Next"



Now we have to provide the name for our domain controller. It must be FQDN. In our case I used rebeladmin.com as the domain. Please click "Next" after it.



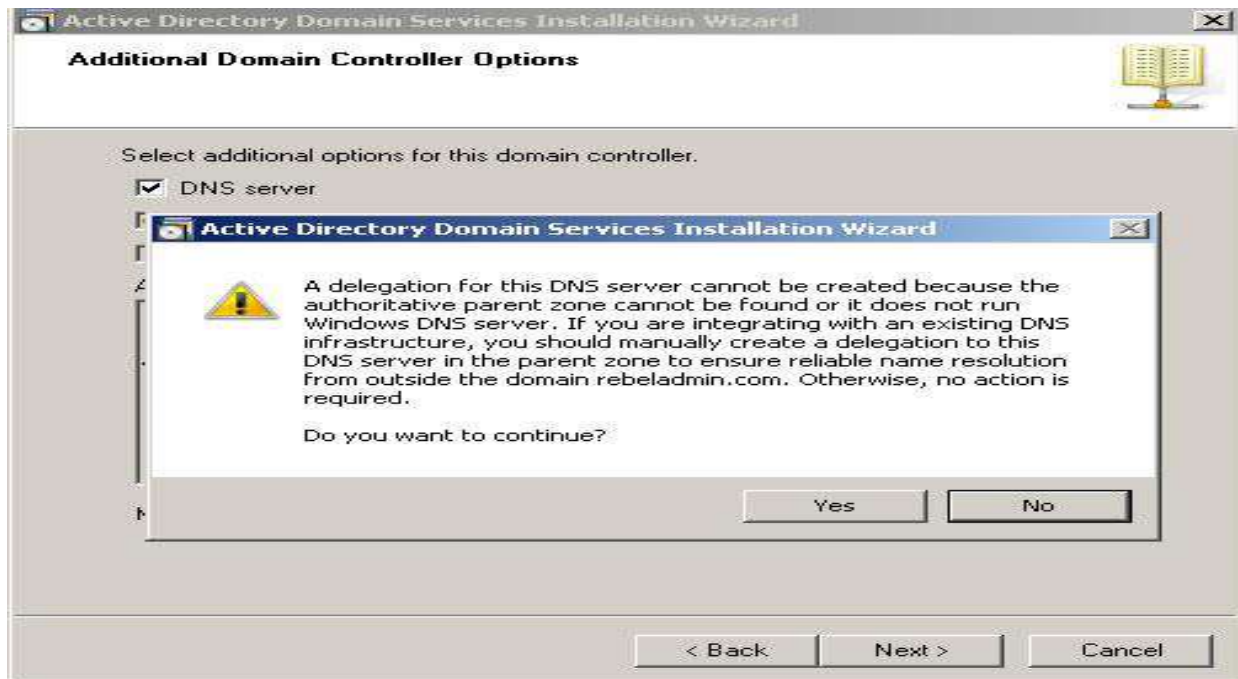
In this window it will ask to select forest function level. If you going to add server 2003 domain controller to your forest later don't select the function level as server 2008. If you going to use full features of 2008 Ad you must select forest function level as server 2008. In my case I used server 2008. Click on "Next" after the select.



In next window since it's the first DC we should make it as DNS server too. Leave the default selection and click on "Next"



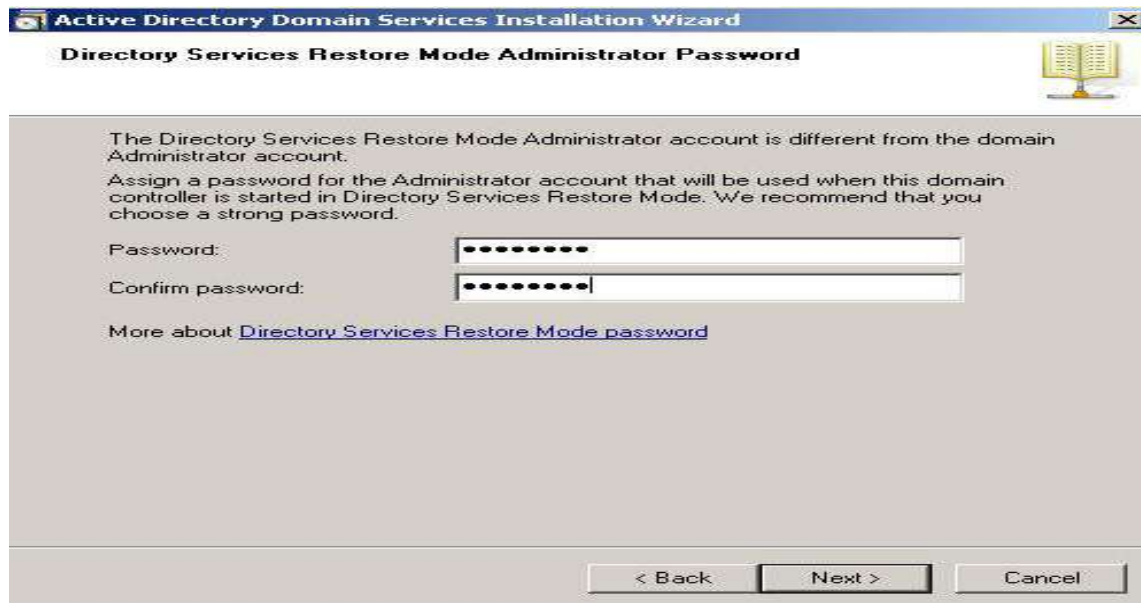
If the wizard cannot create a delegation for the DNS server, it displays a message to indicate that you can create the delegation manually. To continue, click "Yes"



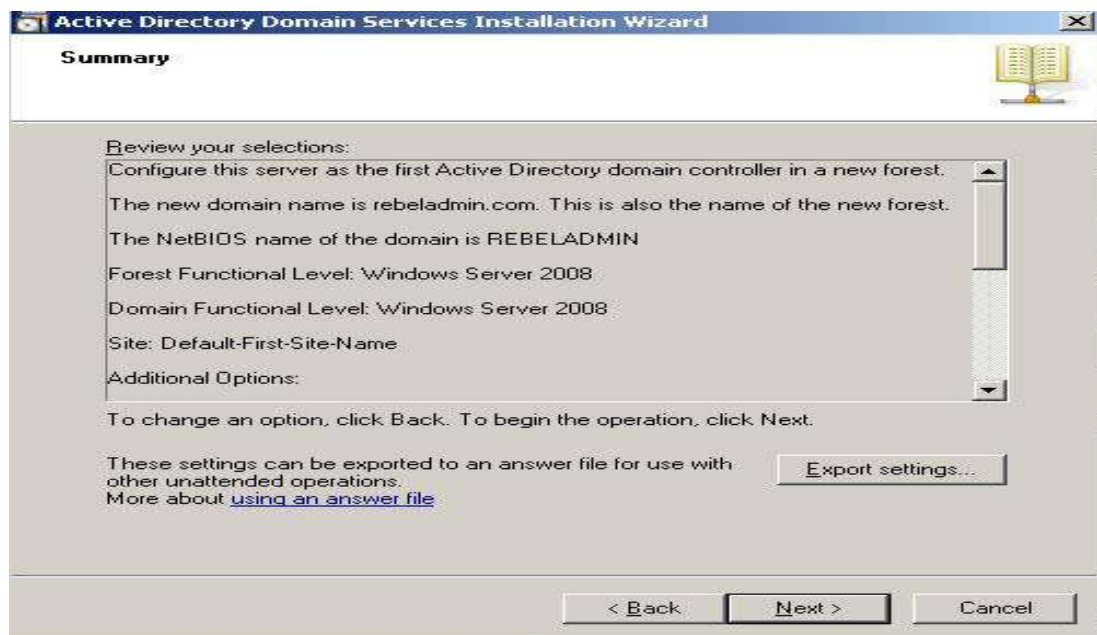
In next window it will show up the database location. It is going to be bigger AD its good if you can keep NTDS database in different partition. Click on "Next" after changes.



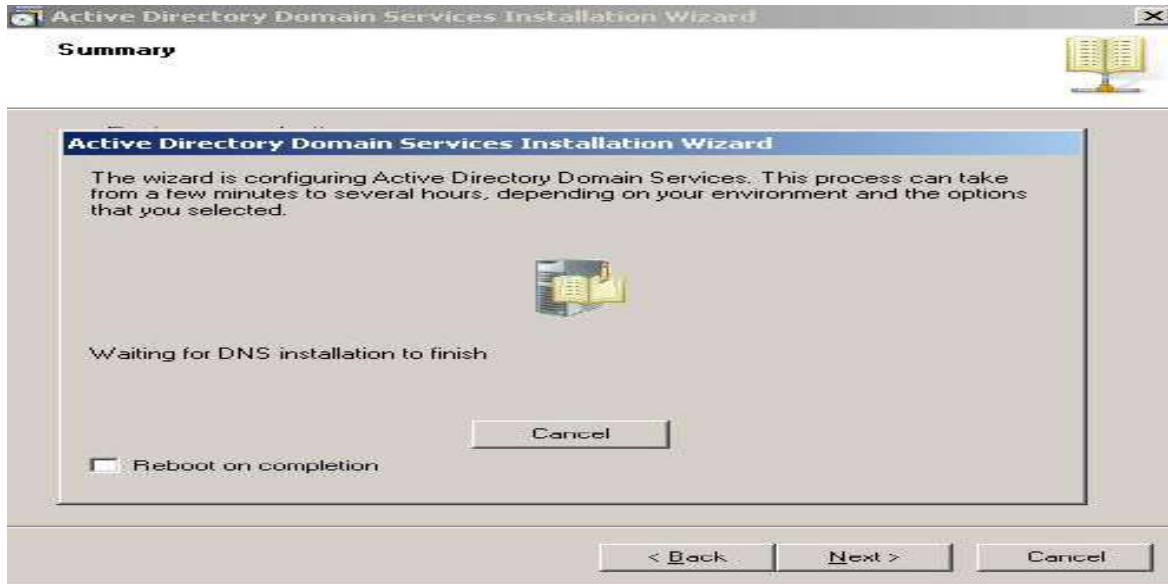
In next window its asking to define a restore mode password. Its more important if you had to do a restore from backup in a server crash. Click on "Next" after filling it.



Next window is giving you a brief of the installation. Click on "Next"



Then it will start the installation of the AD. It will take some time to complete. After complete of the installation perform a server reboot.

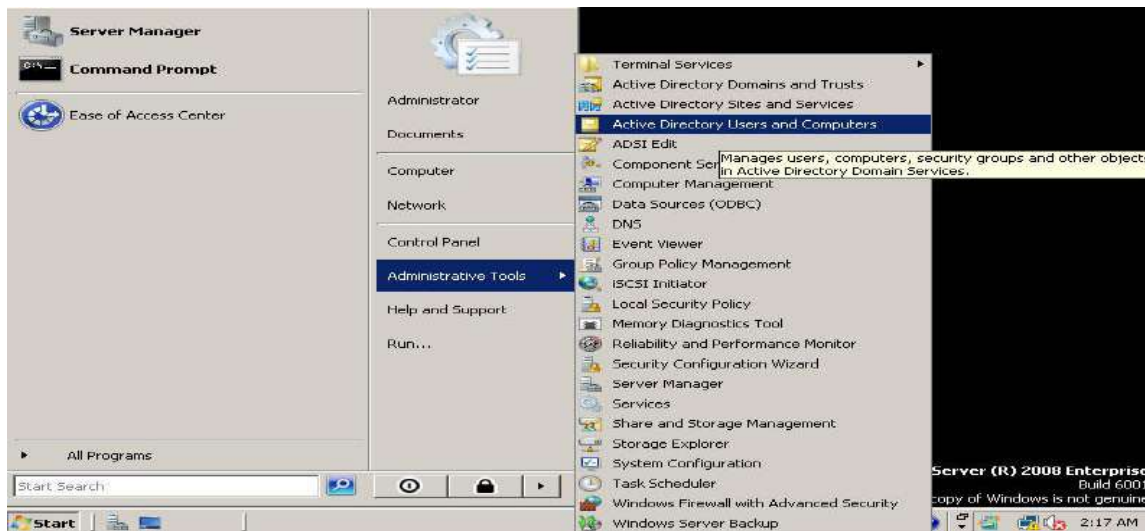


After the reboot now you can login to the domain. Please use the login as following example

User name : your domain\administrator

Password : XXXXXXXXX

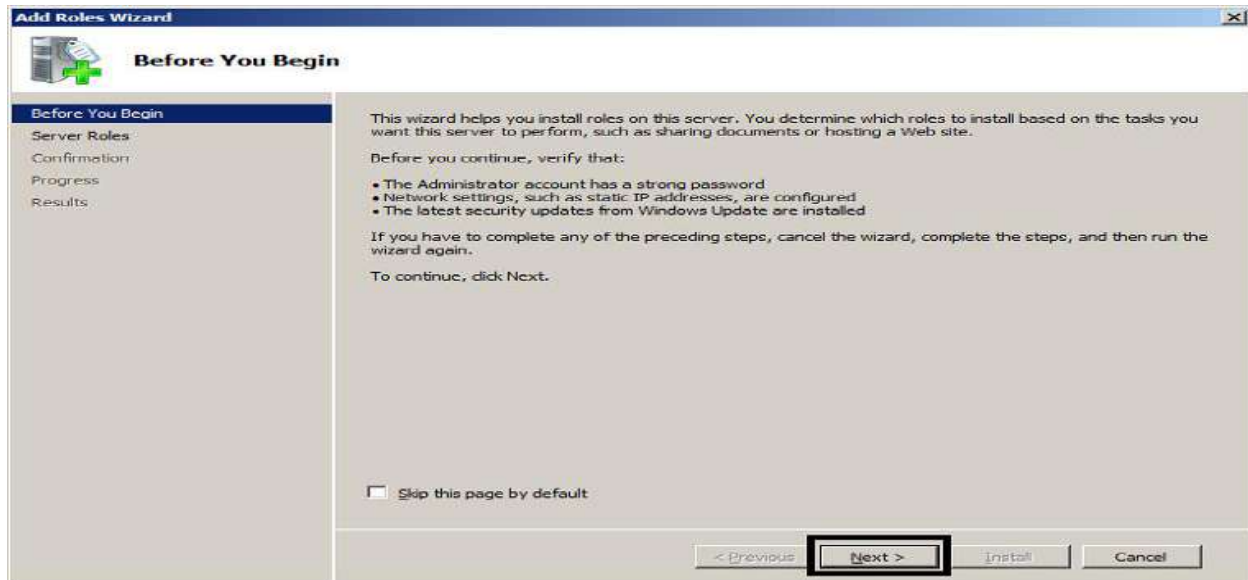
Now its done and you can view the active directory options on administrative tools menu



Operation sheet 3.3. Configure DHCP server

1 In Server Manager click Add Roles

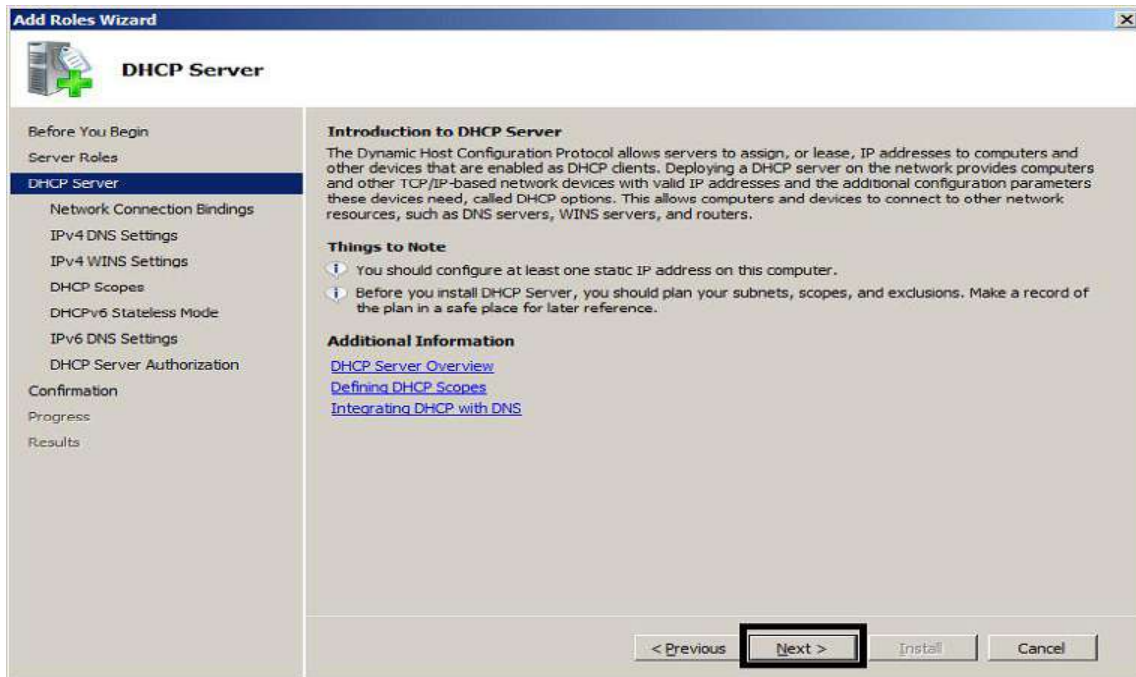
2 Click Next



3 Choose DHCP Server, and then click Next



4 Click Next



5 Choose the network interface, from which the DHCP server will service the clients. As you can see I have three NICs, one is for heartbeat communication among the cluster nodes (192.168.2.20), one is for iSCSI connection to the shared storage (192.168.1.20), while the last one is the only one connected to the production environment, so that is the one I have chosen here.

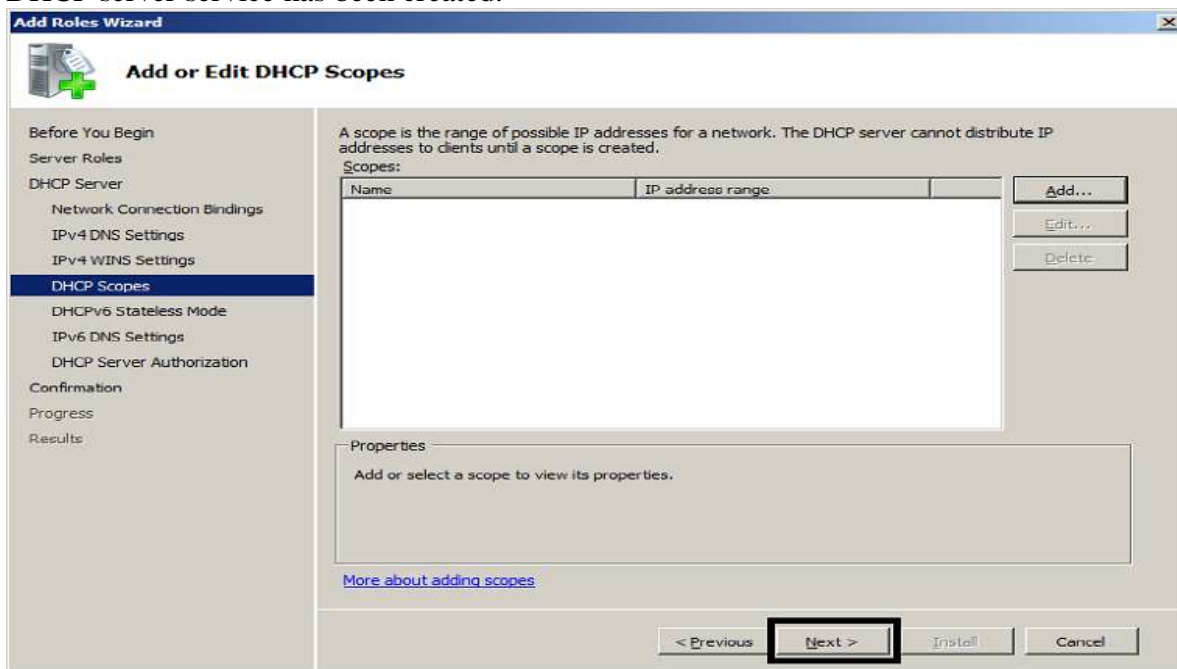


6 Fill in the DNS options for your DHCP server.

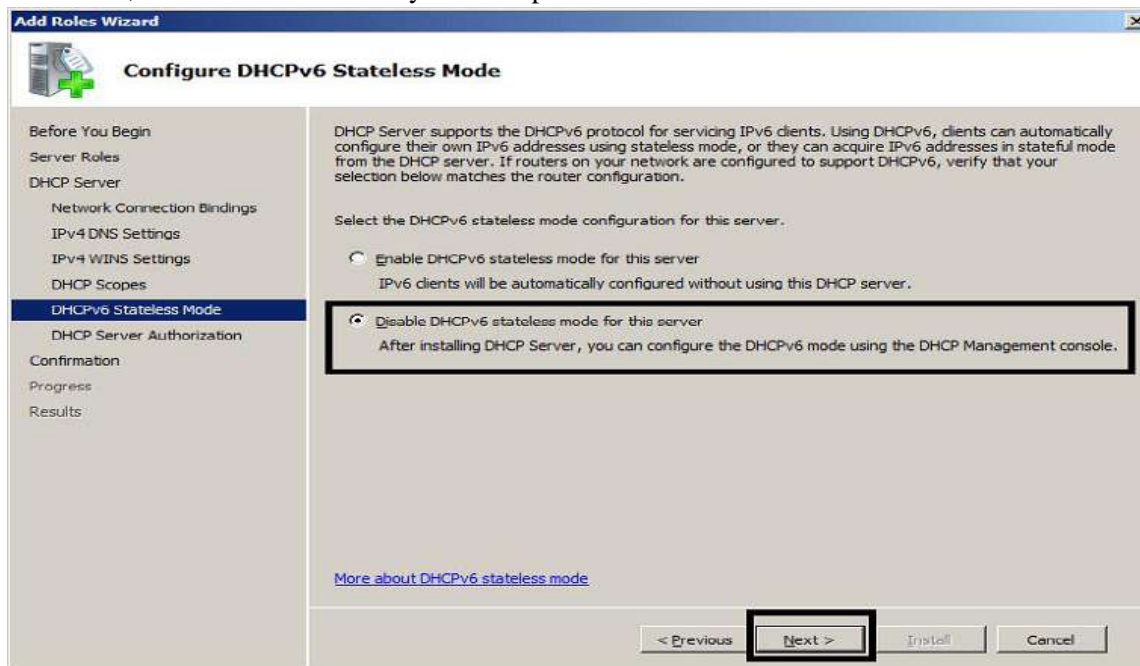


7 Click Next, as you are probably not utilizing Wins anymore

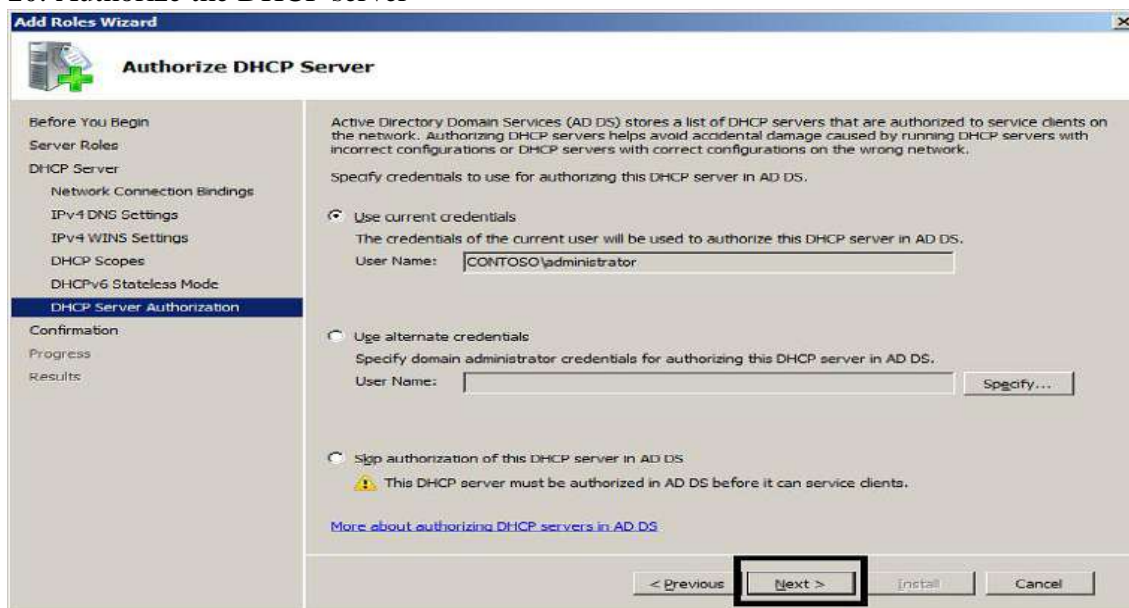
8 Do not add any scopes for now. You can obviously add or import scopes later, when the clustered DHCP server service has been created.



9 Unless your DHCP servers are going to service DHCPv6 clients, choose disable DHCPv6 stateless mode for this server, and then do not add any IPv6 scopes later on.



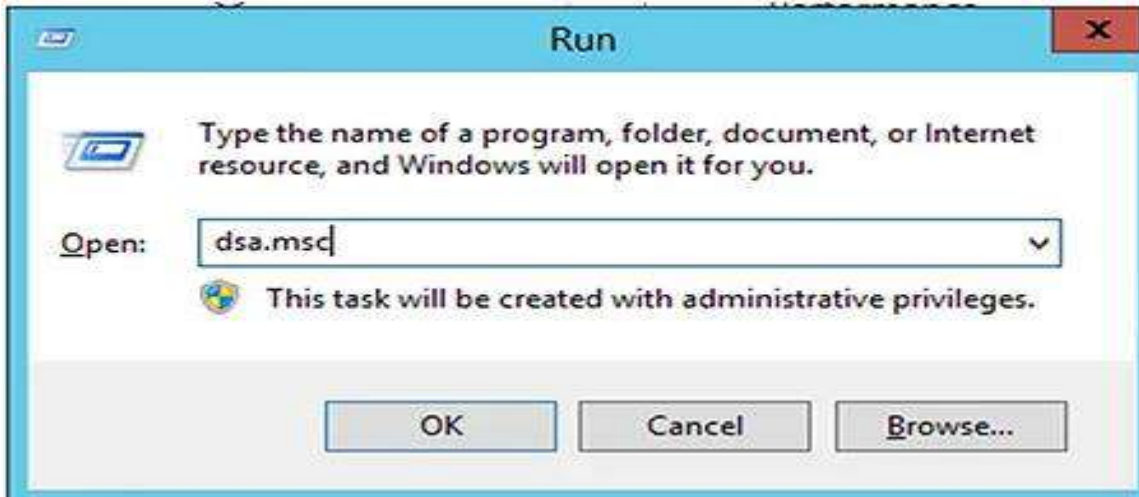
10. Authorize the DHCP server



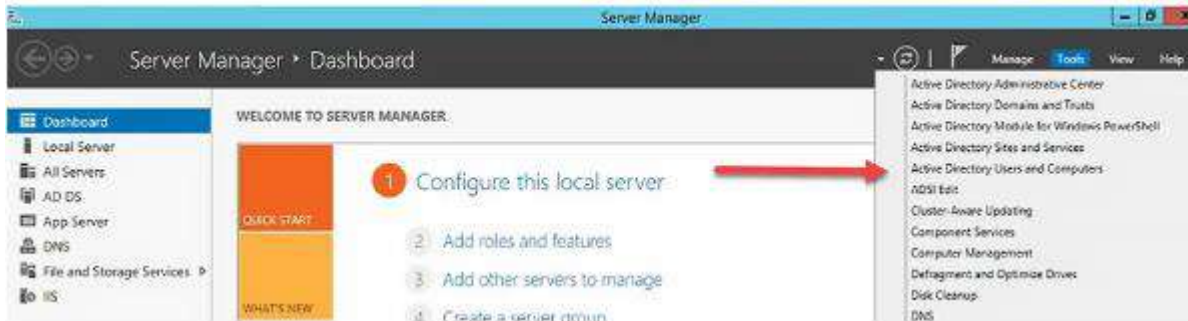
11 Click Install, and then click Close. Repeat the same procedure on the second node of the cluster.

Operation sheet 3.4: Create users using server 2012

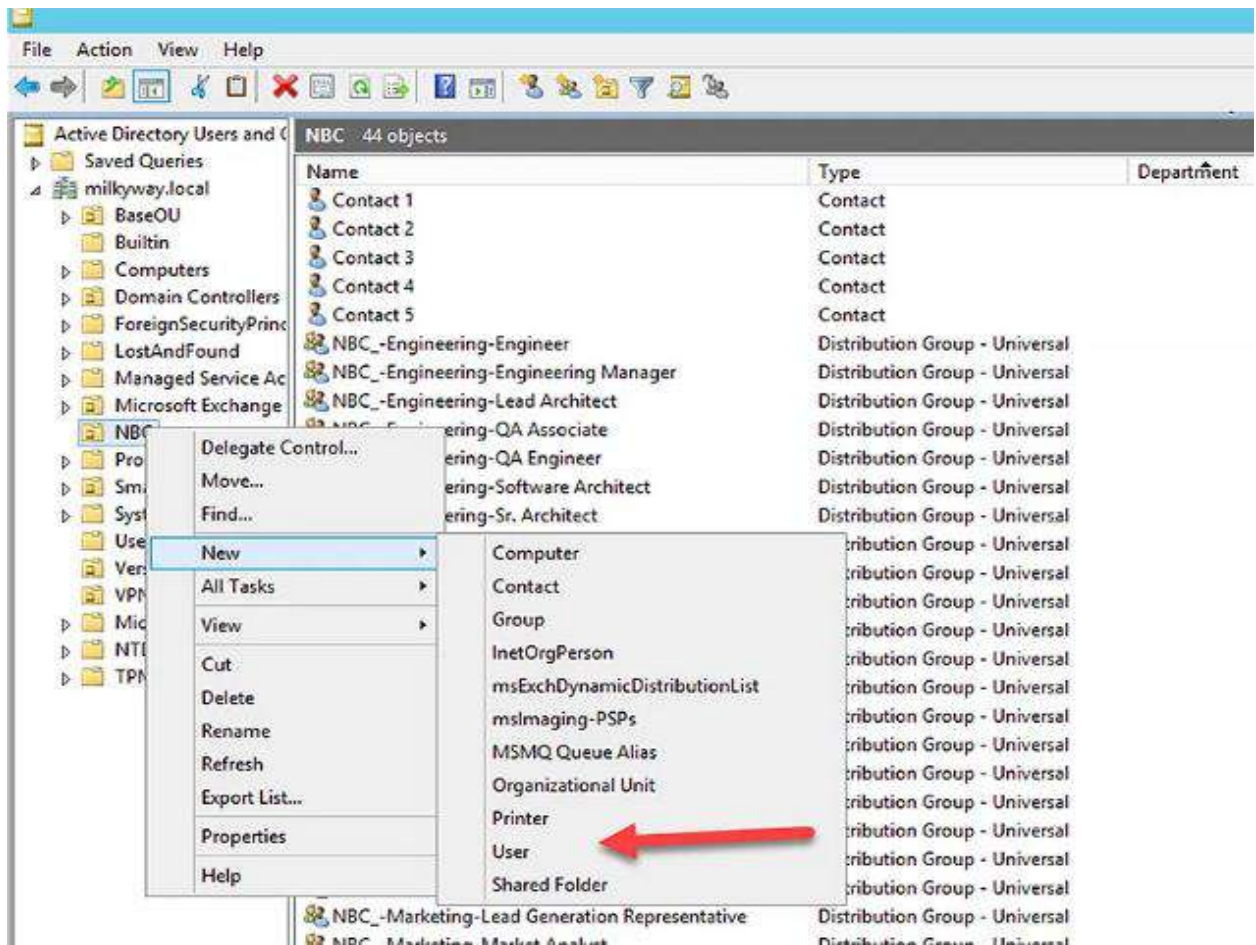
1. Open the ADUC console in either of the following ways:
2. Type **dsa.msc** in the Run dialog box and click **OK**



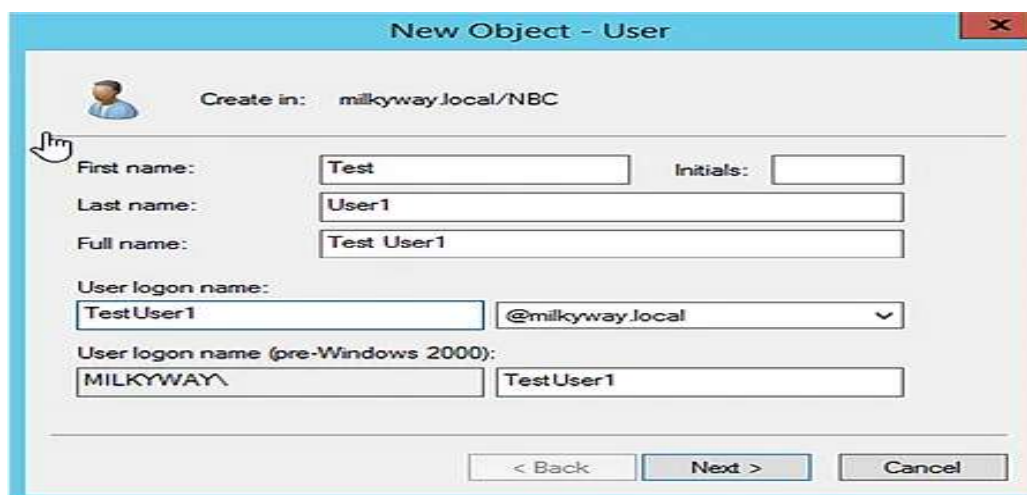
Open Server Manager and click **Tools > Active Directory Users and Computers**.



Right-click the OU where you want to create the user and select **New > User**:



Specify the details about the user and click **Next**.




The screenshot shows the 'New Object - User' dialog box. The 'Create in' field is set to 'milkyway.local/NBC'. The fields are filled with the following information:

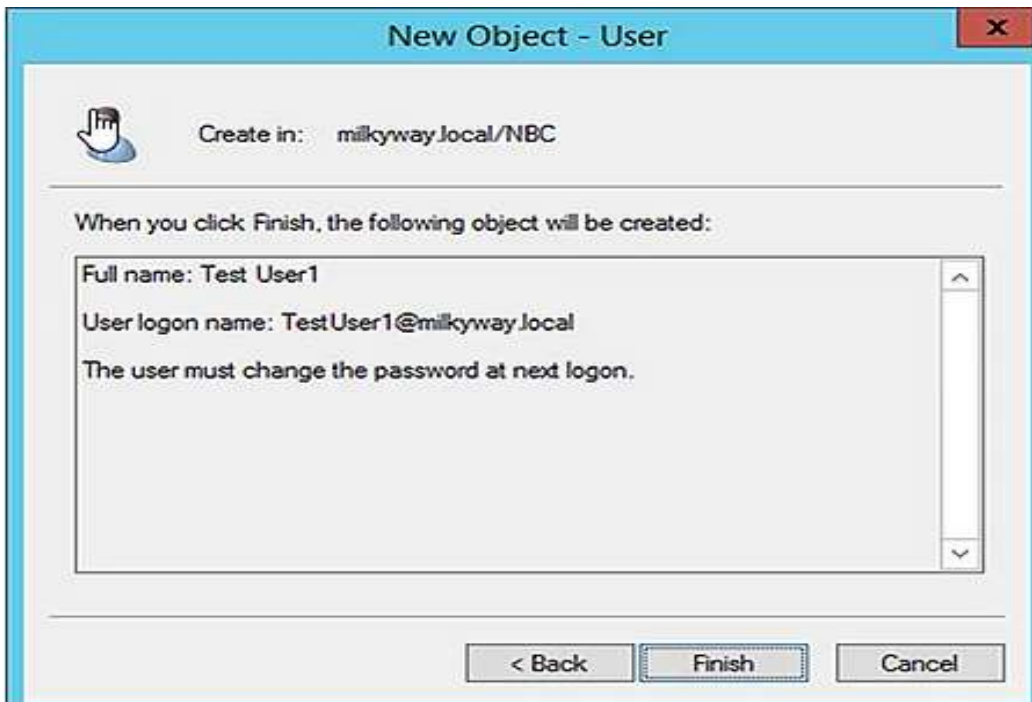
First name:	Test	Initials:	
Last name:	User1		
Full name:	Test User1		
User logon name:	TestUser1		@milkyway.local
User logon name (pre-Windows 2000):	MILKYWAY\		TestUser1

At the bottom, there are three buttons: '< Back', 'Next >', and 'Cancel'.

Provide the password and select the desired password options. Then click **Next**.

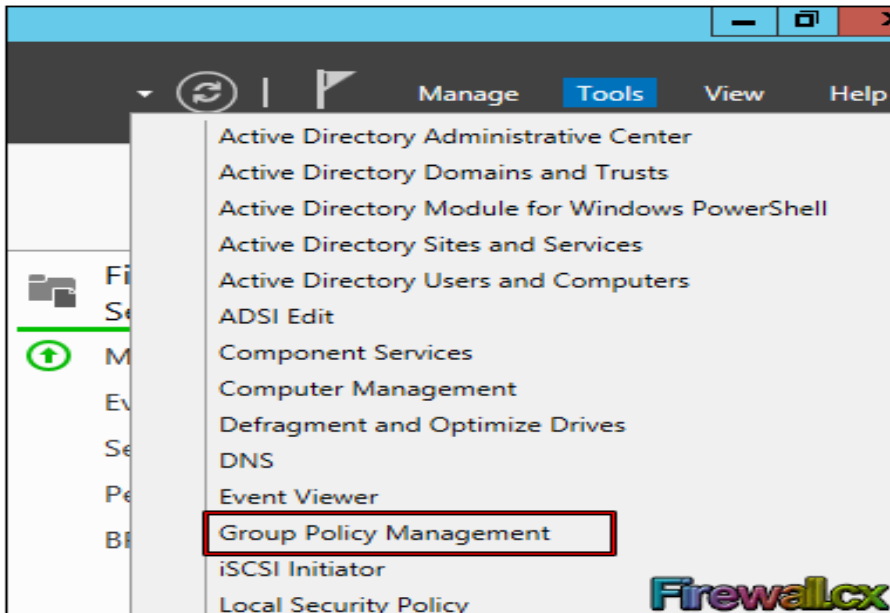


Review the details you specified and click **Finish** to create the user in Active Directory.

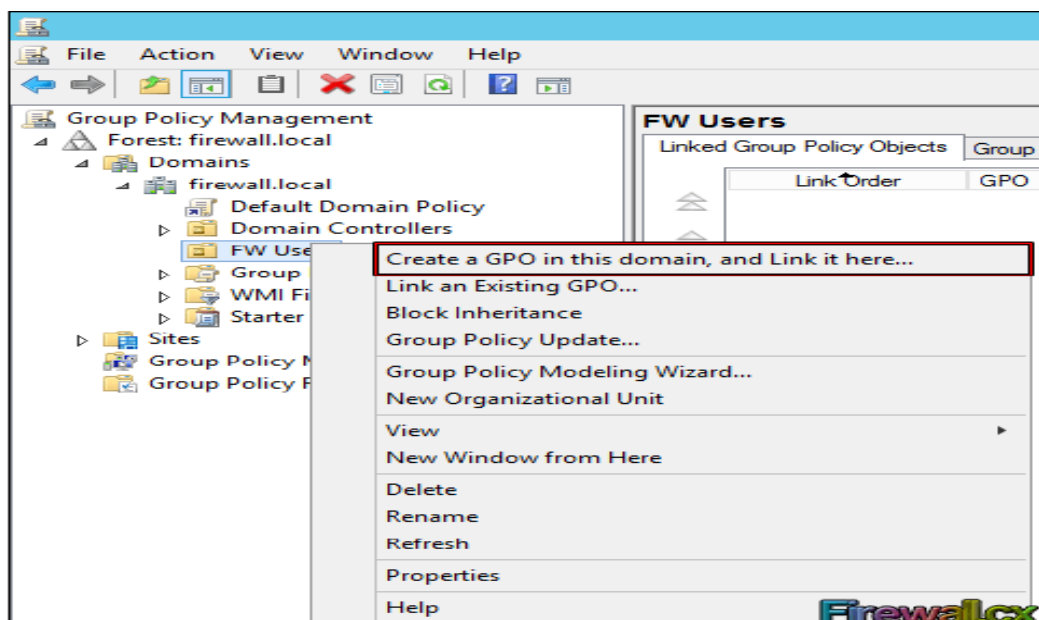


Operation sheet 3.5: Create a GPO in domain server 2012

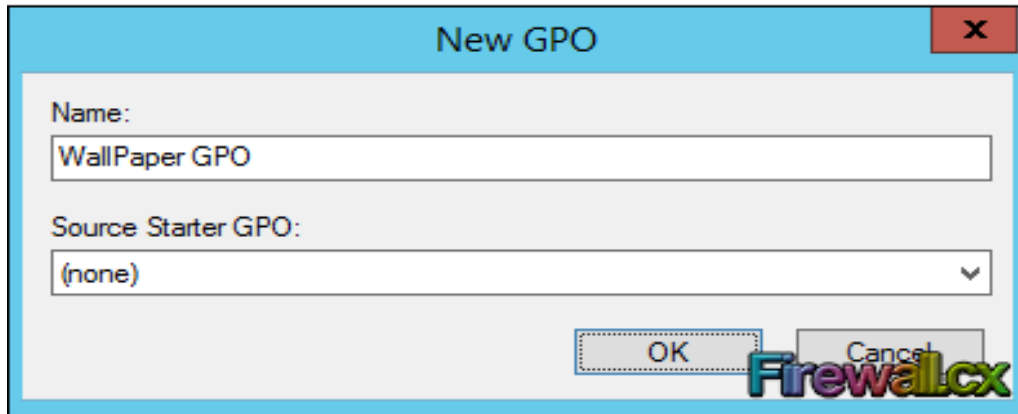
Open the **Group Policy Management Console (GPMC)** by going into **Server Manager>Tools** and select **Group Policy Management** as shown below:



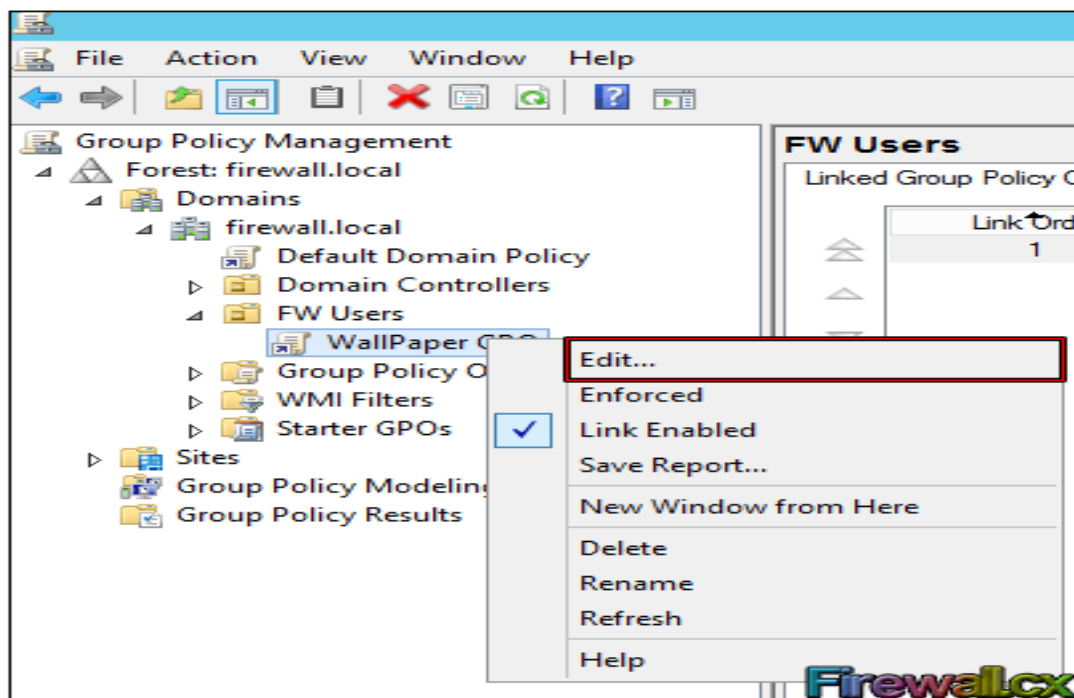
As the **GPMC** opens up, you will see the **tree hierarchy** of the **domain**. Now expand the domain, **firewall.local** in our case, and you will see the **FW Users OU** which is where our users reside. From here, **right-click** this **OU** and select the first option **Create a GPO in this domain and Link it here:**



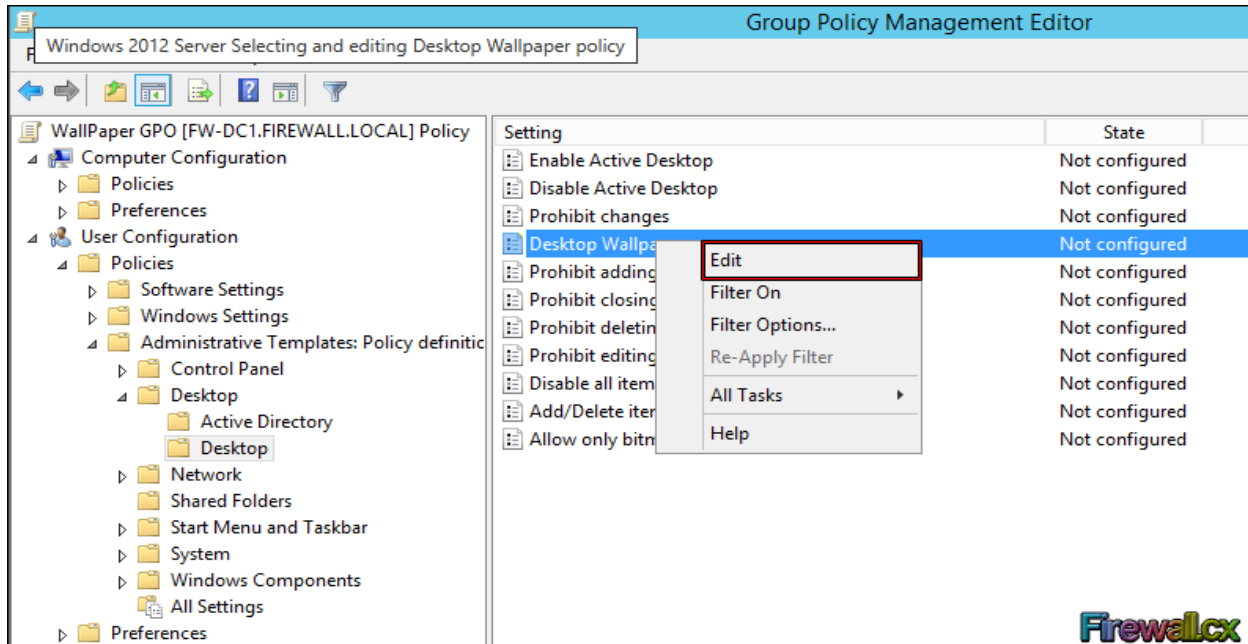
Now type the **Name** for this **GPO** object and click the **OK** button. We selected **WallPaper GPO**:



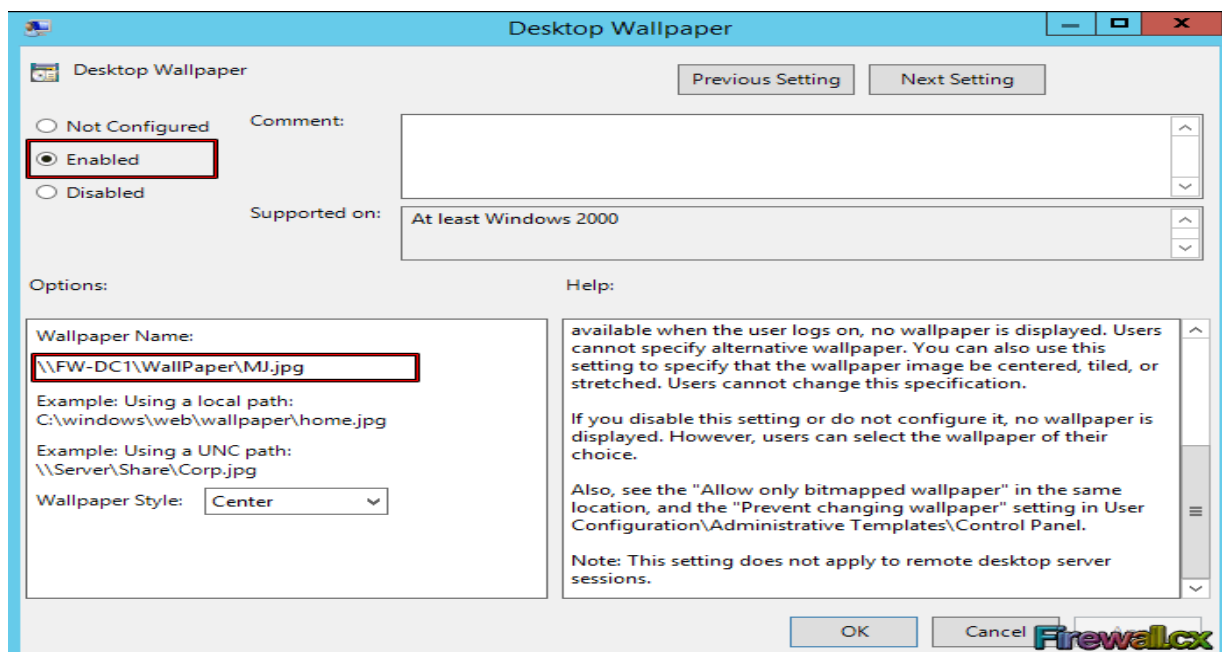
Next, **right-click** the **GPO** object and click **edit**:



To find the **Desktop Wallpaper**, go to **Expand User Configuration > Policies > Administrative Templates > Desktop > Desktop**. At this point we should be able to see the setting in right window. **Right-click** the **Desktop Wallpaper** setting and select **Edit**



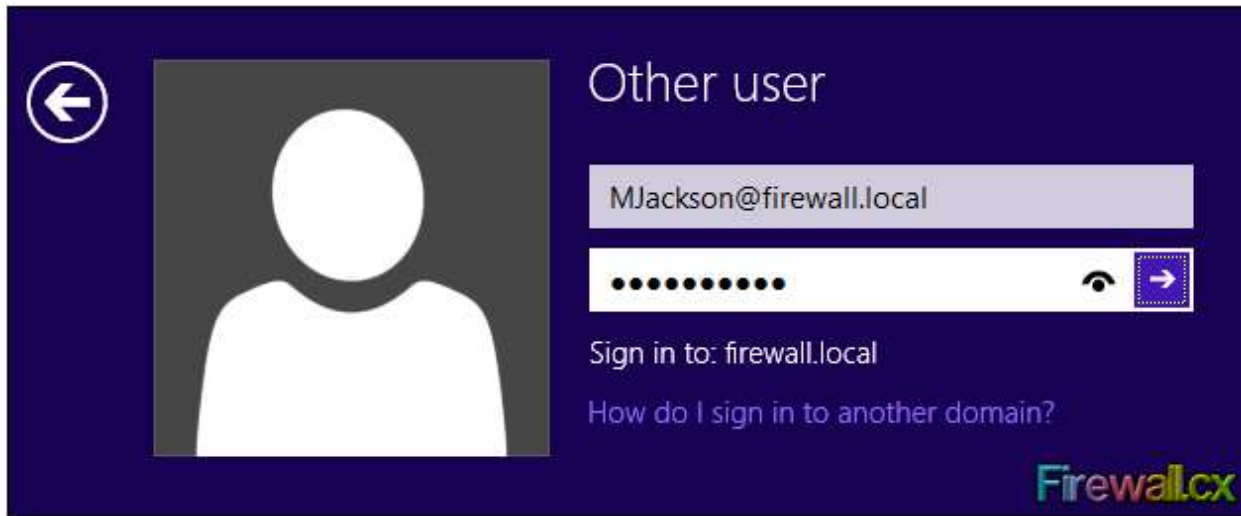
First we need to activate the policy by selecting the **Enabled**. When ready click **Apply** and then Ok



Now that we've configured our GPO, we need to apply it. To do so, we can simply log off and log back in the client computer or type following command in domain controller's command prompt to apply the settings immediately

```
C:\> gpupdate /force
```

As we can see below, our user's desktop now has the background image configured in the group policy we created



LAB Test 3.1 Install Operating System

Instructions: Given necessary templates, workshop, tools and materials you are required to perform the following tasks within 4 hours.

Task1: Installing server 2012 operating system

Task2: Install Driver

Task3: Create Domain

Task 4: Join client computer

Task 5: Create Users

Task 6: Create DHCP sever

Task 7: Create Organizational Unit

Task 8: Create Group Policy

