



RQF LEVEL 4



NITWA401

**NETWORKING
AND INTERNET
TECHNOLOGIES**

Windows Server Administration

TRAINER'S MANUAL

October, 2024



WINDOWS SERVER ADMINISTRATION

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ACRONYMS

AD LDS: Active Directory Lightweight Directory Services

AD: Active Directory

ADDS: Active Directory Domain Services

ADSS: Active Directory Sites and Services

ADUC: Active Directory Users and Computers

ARPA: Advanced Research Projects Agency

BIOS: Basic Input/ Output System

CBT/A: Competency-Based Training/Assessment

CD: Compact Disc

CGI: Common Gateway Interface

CName: Canonical Name

CPU: Central Processing Unit

CSR: Certificate Signing Request

DHCP: Dynamic Host Configuration Protocol

DNS: Domain Name System

DNSBL: Domain Name System-based Blackhole List

DSRM: Set Directory Services Restore Mode

DVD: Digital Video Disc or Digital Versatile Disc

FQDN: Fully Qualified Domain Name

FTP: File Transfer Protocol

GPMC: Group Policy Management Console

GPOs: Group Policy Objects

HTTPS: Hypertext Transfer Protocol Secure

IIS: Internet Information Services

IP: Internet Protocol

IPConfig: Internet Protocol Configuration

IPV4: Internet Protocol Version 4

IPV6: Internet Protocol Version 6

KOICA: Korea International Cooperation Agency

MAC: Media Access Control Address

MFT: Managed File Transfer

MTA: Message transfer agent

MX: Mail Exchange

NAT: Network Address Translation

NOS: Network Operating System

NS: Name Server

OS: Operating System

OU: Organizational Unit
PC: Personal Computer
PTR: Pointer Record
SFTP: SSH File Transfer Protocol
SSL: Secure Sockets Layer
TLS: Transport Layer Security
TTL: Time To Live
UAC: User Account Control
UAT: User Acceptance Testing
WSUS: Windows Server Update Services

INTRODUCTION

This trainer's manual includes all the methodologies required to effectively deliver the module titled "**Windows Server Administration.**" Trainees enrolled in this module will engage in practical activities designed to develop and enhance their competencies.

The development of this training manual followed the Competency-Based Training and Assessment (CBT/A) approach, offering ample practical opportunities that mirror real-life situations.

The trainer's manual is organized into Learning Outcomes, which is broken down into indicative content that includes both theoretical and practical activities. It provides detailed information on the key competencies required for each learning outcome, along with the objectives to be achieved.

As a trainer, you will begin by asking questions related to the activities to encourage critical thinking and guide trainees toward real-world applications in the labor market. The manual also outlines essential information such as learning hours, didactic materials, and suggested methodologies.

This manual outlines the procedures and methodologies for guiding trainees through various activities as detailed in their respective trainee manuals. The activities included in this training manual are designed to offer students opportunities for both individual and group work. Upon completing all activities, you will assist trainees in conducting a formative assessment known as the end learning outcome assessment. Ensure that students review the key reading and the points to remember section.

MODULE CODE AND TITLE: NITWA401 WINDOWS SERVER ADMINISTRATION

Learning Outcome 1: Prepare Server Environment.

Learning Outcome 2: Deploy Active Directory Services.

Learning Outcome 3: Deploy DHCP services

Learning Outcome 4: Deploy DNS service.

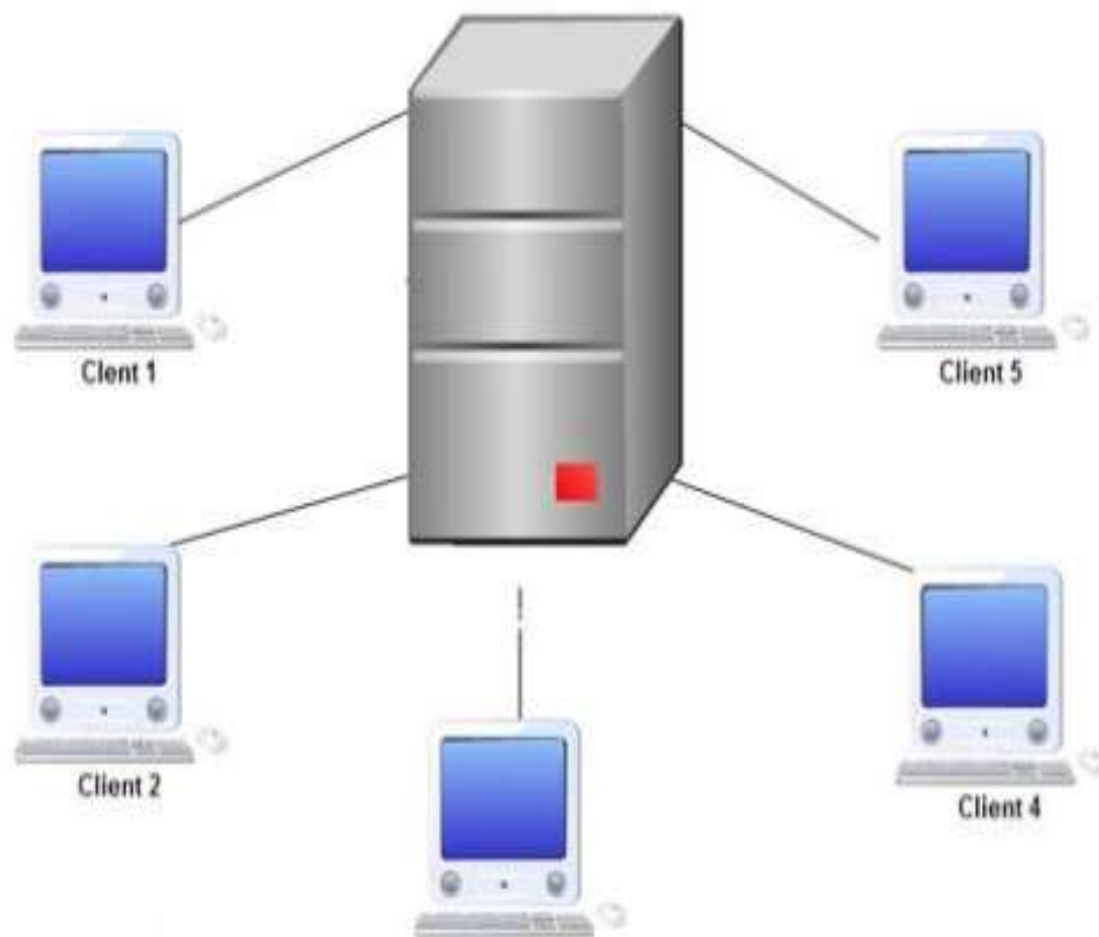
Learning Outcome 5: Deploy web services.

Learning Outcome 6: Deploy FTP services.

Learning Outcome 7: Perform Load balancing

Learning Outcome 8: Perform server maintenance

Learning Outcome 1: Prepare Server Environment



Indicative contents

1.1 Selection of Windows Server

1.2 Identification of Server Tools and Equipment

1.3 Installation of Windows Server.

Key Competencies for Learning Outcome 1: Prepare Server Environment

Knowledge	Skills	Attitudes
• Description of windows server concepts • Description of virtualization concepts. • Description of types of OS • Identification of server tools and equipment • Description of hardware server requirement • Description of windows server requirements	• Installing virtualization software • Selecting server based on criteria • Prepare Installation Media • Selecting Installation type • Configuring network adapter • Updating server drivers and services	• Having Adaptability • Having Teamwork • Have self-motivation • Being analytical thinker and details oriented • Having Time management ability



Duration: 15 hrs



Learning outcome 1 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe clearly windows server concepts as used in server administration.
2. Describe clearly virtualization concepts used in server administration.
3. Install properly virtualization software based on server requirements.
4. Describe clearly the types of OS as used in server administration.
5. Select properly Server based on server criteria
6. Identify correctly server tools and equipment as used in server
7. Describe clearly hardware server requirements as used in windows server administration.
8. Describe clearly windows server requirements as used in windows server administration.
9. Install properly windows server OS in virtual machine based on hardware requirements
10. Configure correctly network adapter in server based on Microsoft standards
11. Update properly Server drivers and services based on Microsoft standards



Resources

Equipment	Tools	Materials
● Projector ● Computer ● UPS ● Rack	● VMWare workstation ● VMWare ESXI ● Oracle VirtualBox ● VMWare V-Sphere ● Windows Server OS bootable image ● Browser ● Flash disk ● CD/DVD Drive ● Rufus ● PowerISO	● Electricity ● Data Cable ● Internet



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail computer lab equipped by computer working in good conditions.



Indicative content 1.1: Selection of Windows Server



Duration: 5 hrs



Theoretical Activity 1.1.1: Description of windows server concepts



Notes to the trainer:

- Trainer may use small group for describing of windows server concepts
- The use of physical objects, images, videos, and illustrations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- What do you understand by the following terms as used in windows server?
 - Windows server
 - Client-side
 - Server-side
 - Server core
 - Server manager
 - Hyper-V
- What is the different Version of Windows Server?
- Explain Window server editions
- Explain the benefits of server core

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 1.1.1 in their manuals.



Points to Remember

- **Windows Server** is a group of server operating systems developed by Microsoft that supports enterprise-level management, data storage, applications, and communications.
- **Client-side:** Refers to the components and services that run on the user's devices, allowing them to access server resources.
- **Server-side:** Involves the backend services and processes that manage requests from client devices, including data processing and storage.

- **Hyper-V:** is a Microsoft virtualization technology that enables users to create and manage virtual machines (VMs) on a physical server.
- **Server Manager:** is a central administrative tool for managing multiple roles and features in a Windows Server environment.
- **Server Core:** is a minimal installation option for Windows Server that was first introduced with Windows Server 2008.

✓ **Windows Server Versions**

- ✚ Windows Server 2003 or 2003 R2
- ✚ Windows Server 2008
- ✚ Windows Server 2008 R2
- ✚ Windows Server 2012
- ✚ Windows Server 2012 R2
- ✚ Windows Server 2016
- ✚ Windows Server 2019
- ✚ Windows Server 2022

✓ **Editions of Windows Server**

- Essentials
- Standard
- Data center

Benefits of a Server Core

- **Minimal Installation:** Server Core has a stripped-down version of Windows Server, which includes only essential components and services.
- **Reduced Attack Surface:** Fewer installed features mean fewer vulnerabilities, enhancing security.
- **Lower Resource Consumption:** Server Core uses less disk space, memory, and CPU resources compared to a full GUI installation.
- **Improved Performance:** Without the overhead of a graphical interface, Server Core can deliver better performance for certain server roles.
- **Command-Line Management:** Administration is primarily done through Windows PowerShell or command-line tools, which can be more efficient for experienced administrators.
- **Remote Management:** Server Core can be managed remotely using tools like PowerShell Remoting and Windows Admin Center, allowing for greater flexibility.



Theoretical Activity 1.1.2: Description of virtualization concepts.



Notes to the trainer:

- Trainer may use small group for describing of virtualization concepts
- The use of physical objects, images, videos, and illustrations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- i. What is virtualization?
- ii. What are the benefits of virtualization?
- iii. What is virtual machine?
- iv. Explain the types of Hypervisors?

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 1.1.2 in their manuals.



Points to Remember

- **Virtualization** is technology that you can use to create virtual representations of servers, storage, networks, and other physical machines.
- **Virtual Machine** is a computer system created using software on one physical computer in order to emulate the functionality of another separate physical computer.



Theoretical Activity 1.1.3: Description of types of OS



Notes to the trainer:

- Trainer may use small group for describing the types of OS
- The use of physical objects, images, videos, and illustrations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- i. Differentiate standalone from network operating system?
- ii. List the four examples of network operating system

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 1.1.3 in their manuals.



Points to Remember

- **Types of OS**
 1. **Standalone Operating System:** Runs on a single computer or device (e.g. desktop, laptop, mobile device)
 2. **Network Operating System:** Runs on a server to manage resources and services for multiple connected devices. Examples: Windows Server, Linux, Unix, Novell NetWar.



Practical Activity 1.1.4: Selecting windows server



Notes to the trainer

- Avail computer with computer and windows server OS.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to read the task described below:

- i. As networking and internet technology trainee, you are asked to go to the computer lab to select windows server

Step 2: Provide clear instructions.

Step 3: Demonstrate how to select windows server while demonstrating, explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify with the tasks are clearly performed.

Step 6: Ask trainees to read key reading 1.1.4.

Step 7: Ask trainees to perform application of learning 1.1.



Points to Remember

Steps for Selecting a Windows Server:

- **Assess Business/Technical Needs:**
- **Select the Appropriate Edition:** Choose from Essentials, Standard, Datacenter, or Hyper-V based on your business size, virtualization, and feature needs.
- **Evaluate Hardware Requirements:** Ensure compatibility and plan for scalable hardware that supports your current and future needs.
- **Consider Virtualization Needs:** Choose based on the number of virtual machines and container support.
- **Check Storage Options:** Look for features like Storage Spaces Direct (S2D), ReFS, and data deduplication.
- **Consider Cloud Integration:** Look for hybrid cloud support and integration with Azure.
- **Ensure Infrastructure Compatibility:** Make sure the server will integrate with your Active Directory, network services, and critical applications.



Application of learning 1.1.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for selecting windows sever operating system.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Windows server OS is properly selected	1.1 Technical Requirements are assessed		
		1.2 Appropriate Edition is selected		
		1.3 Hardware Requirements are evaluated		
		1.4 Virtualization needs are considered		
		1.5 Storage is checked		
		1.6 Integration with Existing Infrastructure is evaluated		
		1.7 Cloud Integration and Hybrid Capabilities are conducted		



Indicative content 1.2: Identification of Server Tools and Equipment



Duration: 2 hrs



Theoretical Activity 1.2.1: Identification of hardware requirement



Notes to the trainer:

- Trainer may use small group for describing server hardware requirement.
- The use of physical objects, images, videos, and illustrations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- Which of the following is the minimum processor requirement for installing Windows Server 2022?
 - 1.4 GHz 64-bit processor
 - 2.0 GHz 32-bit processor
 - 1.3 GHz 64-bit processor
 - 2.5 GHz 64-bit processor
- What is the minimum RAM requirement for Windows Server 2022 installation?
 - 512MB
 - 1GB
 - 2GB
 - 4 GB

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 1.2.1 in their manuals.



Points to Remember

- About CPU Minimum Requirement is 1.4 GHz x64 processor with required extensions and Recommended Requirement are 3.1 GHz or higher multi-core processor.
Memory (RAM): minimum Requirement are 512 MB (2 GB for desktop experience), recommended requirement are 4 GB for general, 16+ GB for heavy workloads.
- **Storage:** 32 GB minimum (40+ GB for desktop experience) and 4 GB for general, 16+ GB for heavy workloads is recommended.



Theoretical Activity 1.2.1: Identification of hardware requirement



Notes to the trainer:

- Trainer may use small group for describing sever hardware requirement.
- The use of physical objects, images, videos, and illustrations as didactic materials is required



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- i. What is the role of Microsoft Management Console (MMC) in server management?
- ii. Can you explain the importance of the .NET Framework in server management applications?
- iii. Identify some popular virtualization platforms?

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 1.2.2 in their manuals.



Points to Remember

- Choosing the right server management and virtualization software is essential for optimizing your Windows Server environment. Built-in tools like Server Manager and Windows Admin Center offer robust capabilities. Ensure that your hardware meets the requirements for both management and virtualization software to achieve optimal performance.
- Windows Admin Center: A modern, browser-based tool that provides comprehensive management capabilities for Windows Server environments. Can be deployed locally without Azure or integrated into the Azure portal. Supports single-server deployments and hyper-converged clusters.
- popular virtualization platforms:
 - Microsoft Hyper-V:
 - VMware vSphere (ESXi).
 - Oracle VM VirtualBox
 - Citrix Hypervisor (formerly XenServer)
 - Proxmox VE



Indicative content 1.3: Installation of Windows Server



Duration: 8 hrs



Practical Activity 1.3.1: Preparing installation media



Notes to the trainer

- Avail computer with computer and windows server OS.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to prepare windows server installation media.

Step2: Explain the task and provide clear work instruction.

Step3: Demonstrate how to prepare windows server installation media and explain all steps.

Step4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step5: Verify whether the tasks are clearly performed.

Step6: Ask trainees to read key reading 1.3.1.

Step7: Ask trainees to perform application of learning 1.3.



Points to Remember

- **While prepare installation media, performs the following key steps:**
 1. Download the Windows Server ISO Image meet with your server requirements. If you haven't.
 2. Download and Launch Rufus:
 3. Prepare Your USB Drive
 4. Select Boot Selection
 5. Configure Image Options
 6. Choose the appropriate partition scheme
 7. Click on the **Start** button to begin creating the bootable USB drive.
 8. Completion



Practical Activity 1.3.2: Installing windows server



Notes to the trainer

- Avail computer with computer and booted media.
- Avail computer with computer and OS image and virtualization software.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to installing windows server.

Step2: Explain the task and provide clear work instruction.

Step3: Demonstrate how to install windows server and explain all steps.

Step4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step5: Verify whether the tasks are clearly performed.

Step6: Ask trainees to read key reading 1.3.2.

Step7: Ask trainees to perform application of learning 1.3. in their manuals.



Points to Remember

- **Windows server installation methods:**

On Physical Machine, Clean Installation completely erases all existing data from the selected partition or drive, deal for new installations or when you want to start with a fresh system and Requires backing up any critical data before proceeding.

1. **Clean installation:** The most common option for virtual machines, as it creates a fresh installation of Windows Server on a new VHD file.
2. **Upgrade:** Only available if you are cloning an existing virtual machine with Windows Server installed.
3. **Consider your specific needs:** Determine whether you need a clean installation or an upgrade based on your goals and the existing configuration of your virtual machines.

Steps of installing windows server in physical machine:

Step 1: Insert a DVD of Windows Server 2012 R2 into your system and start it. Once you get a message

Step 2: Choose the language, time and currency format, keyboard or input method and click **next**.

Step 3: Click Install now

Step 4: Choose the operating system you want to install and click **Next**

Step 5: Click Custom : Install Windows only (advanced)

- Step 6:** Click **new** to partition the hard disk and provide size in MB for this drive, **delete** for delete exiting partition and click **format** to format partition. When done, click Apply
- Step 7:** Choose the drive other than Primary and click **Next**. Sit back and relax while Installation takes a moment
- Step 8:** Upon reboot, provide an administrative password and click **Finish**
- Step 9:** Login with your current password and start enjoying Windows Server 2012 R2 by press Alt+Ctr+Del



Practical Activity 1.3.3: Performing network adapter configuration



Notes to the trainer

- Avail computer with computer with installed windows server operating system.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to configure server network adapter.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to configure server network adapter and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 1.3.3.

Step 7: Ask trainees to perform application of learning 1.3 in their manuals.



Points to Remember

- Network discovery has three basic levels of configuration:
 - Enable
 - Disable
 - Customized
- **Assign an IP Address to server:**
 - **Static IP Address (DHCP):**
 - Right-click on the network adapter and select **Properties**.
 - Double-click on **Internet Protocol Version 4 (TCP/IPv4)**.
 - Select **Use the following IP address**.
 - Enter the IP address, subnet mask, default gateway, and preferred DNS server addresses.

- Click **OK**.
- **Dynamic IP Address (DHCP):**
 - Right-click on the network adapter and select **Properties**.
 - Double-click on **Internet Protocol Version 4 (TCP/IPv4)**.
 - Select **Obtain an IP address automatically** and **Obtain DNS server address automatically**.
 - Click **OK**.



Practical Activity 1.3.4: Updating Server drivers and services



Notes to the trainer

- Avail computer with installed windows server operating system.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to update Server drivers and services.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to update Server drivers and services and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 1.3.4.

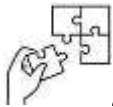
Step 7: Ask trainees to perform application of learning 1.3. in their manuals



Points to Remember

- **Steps to Install Services via GUI in Windows Server**
 1. Open Server Manager
 2. Select Add Roles and Features from the dropdown menu.
 3. On the Before you begin page, read any prerequisites and click Next.
 4. Select Installation Type
 5. Select Destination Server
 6. Select Server Roles
 7. Select Features if is needed
 8. Confirm Installation Selections
 9. Installation Progress
 10. Verify Installation

- While you are performing manually update via device manager consider the following steps:
 1. Open Device Manager by right clicking the Start button and selecting it.
 2. Expand the category of the device you want to update.
 3. Right-click on the specific device and select Update driver.
 4. Choose Search automatically for updated driver software. Follow the prompts if newer drivers are found.



Application of learning 1.3.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for installing windows sever operating system and perform network adapter configuration.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Windows server is properly installed	1.1 Bootable software selected		
		1.2. Installation media is booted		
		1.3 Type of installation is identified		
2	Windows server installation	2.1 Windows server is installed		
		2.2. Installed server is verified		
3	Configuration Network adapter is properly configured	3.1 Physical connection is configured		
		3.2 server network settings are properly configured		
		3.3 IP address is assigned		
		3.4 connectivity is tested		



Learning outcome 1 end assessment

Theoretical assessment

Multiple choice questions: Circle the letter corresponding to the correct answer:

- I. Which of the following is NOT a type of virtualization?
- a) Storage Virtualization
 - b) Network Virtualization
 - c) Application Virtualization
 - d) Directory Virtualization

Answer: D) Directory Virtualization

- II. What is the role of a guest operating system in virtualization?
- a) To act as the primary server OS
 - b) To run independently of any virtual environment
 - c) To run on top of a virtual machine managed by the hypervisor
 - d) To replace the physical machine's hardware

Answer: C) To run on top of a virtual machine managed by the hypervisor

- III. Which of the following is an advantage of virtualization?
- a) Reducing the number of physical servers
 - b) Slower resource allocation
 - c) Increased power consumption
 - d) Increased hardware dependency

Answer: A) Reducing the number of physical servers

- IV. Which of the following is a client-side operating system?
- a) Hyper-V
 - b) Network OS
 - c) Standalone
 - d) Server Core

Answer: C) Standalone

- V. What is Hyper-V used for?
- a) Network management
 - b) Virtualization
 - c) File storage
 - d) Web hosting

Answer: B) Virtualization

Practical assessment

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for selecting, installing windows sever operating system and perform network adapter configuration.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Selection of windows server	1.1. selection of windows server		
2	Windows server is properly installed	2.1 Bootable software selected		
		2.2 Installation media is booted		
		2.3 Type of installation is identified		
		2.4 Windows server is installed		
		2.5 Installed server is verified		
3	Configuration Network adapter is properly configured	3.1 server network settings are properly configured		
		3.2 IP address is assigned		
		3.3. driver is installed		



Further information to the trainer

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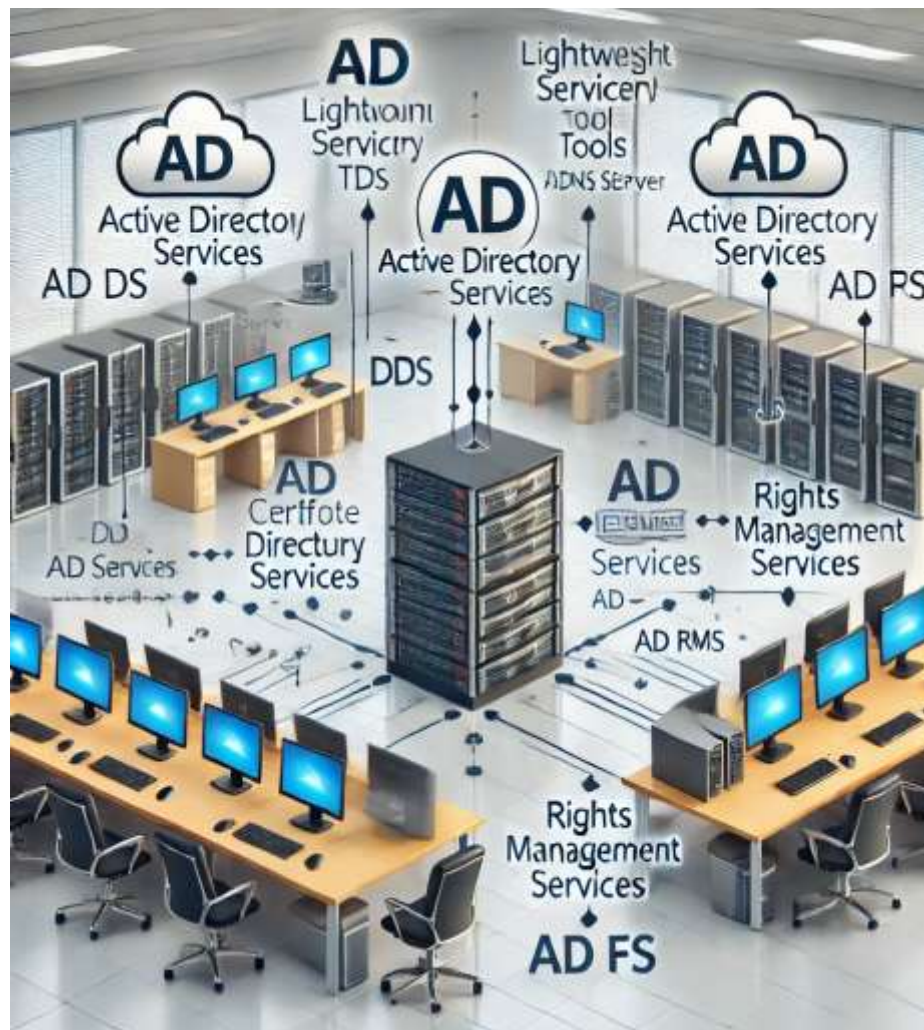
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Indicative contents

2.1 Installation of Active Directory Domain Services

2.2 Configuration of Active Directory

2.3 Joining client Computer to the domain

2.4 Management of GPO

2.5 Deployment of Mail Exchange Server

Key Competencies for Learning Outcome 2: Deploy Active Directory Services

Knowledge	Skills	Attitudes
• Describe active directory concepts • Description of Group policy object	• Installing Active Directory Domain Services (AD DS) • Promoting the Server to a Domain Controller • Post-Installation Configuration	• Have self-motivation • Being analytical and details oriented



Duration: 20 hrs



Learning outcome 2 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Install properly Active Directory Domain Services as used in windows server
2. Configure correctly Active Directory Domain Services based on windows server
3. Manage properly GPO settings in server machine based on windows server
4. Deploy properly of Mail Exchange Server used in windows server
5. Join properly client to the domain as used in windows server



Resources

Equipment	Tools	Materials
• Projector • Computer • UPS	• Modem • Router • VMware Workstation • Windows server 2016 OS • Windows client OS • Bootable device software • DVD • USB	• Electricity • Cables • Internet



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Avail computer with installed windows server operating system.
- Avail video or images as didactic material



Indicative content 2.1: Installation of Active Directory Domain Services



Duration: 5 hrs



Theoretical Activity 2.1.1: Definition of active directory concepts



Notes to the trainer:

- Avail computer with installed windows server operating system.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- Define the following terms as used in windows server:
 - Active Directory(AD)
 - Domain Controller (DC)
 - Organizational Unit (OU)
 - Global Catalog (GC)
 - Group Policy Object(GPO)
 - Active Directory Domain Service(ADDS)

Step2: Ask trainees to write their answers on papers or flipchart.

Step3: Ask trainees to present their findings to whole class.

Step4: Provides expert view and clarifies ideas.

Step5: Ask trainees to read the Key readings 2.1.1 in their manuals.



Points to Remember

- **Active Directory (AD):** A directory service developed by Microsoft for Windows domain networks.
- **Domain Controller (DC):** A server running Active Directory Domain Services (AD DS).
- **Organizational Unit (OU):** A container within Active Directory used to organize objects like users, computers, and other OUs.
- **Global Catalog (GC):** A special type of domain controller that stores a partial copy of every object in the Active Directory forest.
- **Group Policy Object (GPO):** A collection of settings that can be applied to user accounts and computers within Active Directory.

- **Active Directory Domain Services (AD DS):** The core service that provides the directory service functionality of Active Directory.



Theoretical Activity 2.1.2: Description of active directory concepts



Notes to the trainer:

- Avail computer with installed windows server operating system.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following question related to active directory concepts:

- i. Define the following terms as used in windows server:
 - a) Domain
 - b) Forest
 - c) Tree
 - d) Trust Relationship

Step2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 2.1.2 in their manuals.



Points to Remember

- **Domain:** is a logical grouping of users, computers, and other objects that share a common database and security policies.
- **Forest:** is a collection of one or more domains that share a common schema, global catalog, and forest-wide configuration settings.
- **Tree:** is a contiguous set of domains in a forest that share a common root domain.
- **Trust Relationship:** is a security association between two domains that allows users in one domain to access resources in another domain.



Practical Activity 2.1.3: Performing ADDC installation process



Notes to the trainer

- Avail computer with installed windows server operating system and configured Prerequisites.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to Perform ADDC installation process.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to Perform ADDC installation process and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 2.1.3.

Step 7: Ask trainees to perform application of learning 2.1.



Points to Remember

- **Steps of installing AD DS:**
 - ✓ In Server Manager, click **Manage** and then **Add Roles and Features**.
 - ✓ Choose **Role-based or feature-based installation** and click **next**.
 - ✓ Select the server where you want to install AD DS and click **next**.
 - ✓ Select **Active Directory Domain Services** and click **next**.
 - ✓ Click **Add Features** and then **Next**.
 - ✓ Review the installation selections and click **Install**.



Application of learning 2.1.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for installing Active Directory Domain Services.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Selection of windows server	1.1. Selection of windows server		
2	Windows server is properly installed	2.1 Bootable software selected		
		2.2 Installation media is booted		
		2.3 Type of installation is identified		
		2.4 Windows server is installed		
		2.5 Installed server is verified		
3	Configuration Network adapter is properly configured	3.1 server network settings are properly configured		
		3.2 IP address is assigned		
		3.3. driver is installed		
4	Installation of Active Directory Domain Services	4.1. ADDC is installed		



Indicative content 2.2: Configuration of Active Directory



Duration: 5 hrs



Theoretical Activity 2.2.1: Description of Active Directory



Notes to the trainer:

- Avail computer with installed Active Directory Domain Service (AD DS).
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- i. What is Active Directory?
- ii. What are the main components of Active Directory?

Step2: Ask trainees to write their answers on papers or flipchart.

Step3: Ask trainees to present their findings to whole class.

Step4: Provides expert view and clarifies ideas.

Step5: Ask trainees to read the Key readings 2.2.1 in their manuals.



Points to Remember

- Active Directory (AD) is a directory service developed by Microsoft for Windows domain networks. It serves as a centralized database that stores information about network objects, such as users, computers, groups, and resources.



Practical Activity 2.2.2: Promoting windows server AD to DC



Notes to the trainer

- Avail computer with installed windows server operating system and Installed Active Directory Domain Services (AD DS).
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

Go to the computer lab to Promote windows server AD to DC.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to promote windows server AD to DC and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

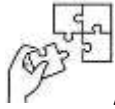
Step 6: Ask trainees to read key reading 2.2.2.

Step 7: Ask trainees to perform application of learning 2.2.



Points to Remember

- **Steps of promoting windows server AD to DC:**
 - ✓ Launch the DC Promotion Wizard: Click it and select Promote this server to a domain controller
 - ✓ Select Deployment Operation
 - ✓ Configure Domain Controller Options
 - ✓ Configure DNS Options
 - ✓ Additional Options like SYSVOL Share Location and Database and Log Files Location
 - ✓ Review Options
 - ✓ Prerequisites Check
 - ✓ Promotion



Application of learning 2.2.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required to promote Active Directory to domain controller.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Quality of process	Promote Server to Domain Controller		
2	Installation process	Deployment Operation selected		
		Domain Controller Options is configured		
		New forest is added		
		Active Directory restore service model password is specified		
		Prerequisites Check is done		



Indicative content 2.3: Joining Client Computer to the Domain



Duration: 5 hrs



Practical Activity 2.3.1: Adding client to the domain



Notes to the trainer

- Avail computer with installed windows server operating system and Configured Active Directory.
- Avail computer with installed client operating system
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab to Add client to the domain.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to add client to the domain. and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 2.3.1.

Step 7: Ask trainees to perform application of learning 2.3.



Points to Remember

- **The steps for adding a client to a domain**
 - ✓ Log in to the Client Computer: Use a local administrator account to log in.
 - ✓ Open System Properties: Go to Control Panel > System and Security > System. Alternatively, you can right-click on This PC and select Properties.
 - ✓ Change Computer Name/Domain Settings: Click on Change settings.
 - ✓ Join the Domain:
 - ✓ Provide Credentials: You will be prompted to enter the credentials of a domain user account
 - ✓ Restart the Computer: After joining the domain, restart the computer for the changes to take effect.



Application of learning 2.3.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for Configuring Active Directory and Joining client Computer to the domain.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Selection of windows server	1.1. selection of windows server		
2	Windows server is properly installed	2.1 Bootable software selected		
		2.2 Installation media is booted		
		2.3 Type of installation is identified		
		2.4 Windows server is installed		
		2.5 Installed server is verified		
3	Configuration Network adapter is properly configured	3.1 server network settings are properly configured		
		3.2. IP address is assigned		
		3.3 driver is installed		
4	Installation of Active Directory Domain Services	4.1. ADDC is installed		
		4.2. Active Directory are Configured		
		4.3. client Computer Joined to the domain		



Indicative content 2.4: Management of GPO



Duration: 5 hrs



Theoretical Activity 2.4.1: Description of GPO



Notes to the trainer:

- Avail computer with installed windows server operating system and configured Active Directory.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the activity and ask trainees to answer the following questions:

- What is a Group Policy Object (GPO)?
- What are the different types of GPOs?
- How does GPO processing order work?

Step2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 2.4.1 in their manuals.



Points to Remember

- Understanding the types of GPOs and their hierarchical processing order is essential for effective management of policy settings in Windows Server environments.



Practical Activity 2.4.2: Creating Accounts



Notes to the trainer

- Avail computer with installed windows server operating system and configured Active Directory.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab to add client to the domain.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to add client to the domain and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 2.3.1.

Step 7: Ask trainees to perform application of learning 2.3.



Points to Remember

- **The steps of Joining Windows Server to An Active Directory Domain**
 - ✓ click on Server Manager
 - ✓ click on Local Server
 - ✓ , click on the server's current computer name or the workgroup name.
 - ✓ click the Change button
 - ✓ Select the Domain option. Enter the name of the domain to which you want to join the server. Then click OK
 - ✓ Enter the username and password of an account with domain join privileges. Then click OK



Application of learning 2.4.

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for installing Active Directory Domain Services promote windows server AD to DC.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Pre-installation is well prepared	1.1. Server specifications are verified		
		1.2. Static IP address is applied		
		1.3. Windows Server is installed, and updates are applied		
		1.4. Network and internet connectivity is checked		
		1.5. Administrative rights are granted		
2	Active Directory Domain Services	2.1. AD DS role is installed		
		2.2. AD DS role visibility is confirmed		
		2.3.DC are configured		
		2.4.DNS are configured		



Learning outcome 2 end assessment

Theoretical assessment

Multiple choice questions: Circle the letter corresponding to the correct answer:

1. What is the primary function of Active Directory Domain Services (AD DS)?
 - a) To manage network resources and user accounts.
 - b) To provide network security.
 - c) To facilitate remote access to network resources.
 - d) All of the above.

Answer: d

2. A hierarchical structure of domains that share a common namespace is known as a(n):
 - a) Forest
 - b) Tree
 - c) Organizational Unit (OU)
 - d) Domain

Answer: a

3. What is the role of a Domain Controller (DC)?
 - a) To store and replicate Active Directory database.
 - b) To authenticate users and computers.
 - c) To authorize access to network resources.
 - d) All of the above.

Answer: d

4. Which of the following is NOT a core component of Active Directory?
 - a) Schema
 - b) Global Catalog
 - c) DNS Server
 - d) File Server

Answer: d

5. What is the purpose of a Global Catalog server?
 - a) To store a complete copy of the Active Directory database.
 - b) To provide a single point of contact for user authentication.
 - c) To store a partial copy of the Active Directory database, including attributes of all objects in the forest.
 - d) To store user profiles and settings.

Answer: c

6. What is the process of transferring changes to Active Directory objects between Domain Controllers called?
 - a) Replication
 - b) Synchronization

- c) Propagation
- d) Mirroring

Answer: a

7. Which of the following is a security mechanism used in Active Directory to control access to resources?
- a) Kerberos
 - b) NTLM
 - c) Access Control Lists (ACLs)
 - d) All of the above.

Answer: d

8. What is the primary tool used to manage Active Directory?
- a) Active Directory Users and Computers
 - b) Microsoft Management Console (MMC)
 - c) PowerShell
 - d) All of the above.

Answer: d

9. Which of the following is NOT a common AD DS administrative task?
- a) Creating and managing user accounts
 - b) Configuring Group Policy Objects (GPOs)
 - c) Managing DNS records
 - d) Installing network drivers

Answer: d

10. What is the primary tool used to troubleshoot Active Directory replication issues?
- a) Repadmin
 - b) DCDIAG
 - c) Netdiag
 - d) Event Viewer

Answer: b

Practical assessment

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for Configuring Active Directory and Joining client Computer to the domain.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Selection of windows server	1.1. selection of windows server		
2	Windows server is properly installed	2.1 Bootable software selected		
		2.2 Installation media is booted		
		2.3 Type of installation is identified		
		2.4 Windows server is installed		
		2.5 Installed server is verified		
3	Configuration Network adapter is properly configured	3.1 Server network settings are properly configured		
		3.2 IP address is assigned		
		3.3. driver is installed		
4	Installation of Active Directory Domain Services	4.1. ADDC is installed		
		4.2. Active Directory are Configured		
		4.3. client Computer Joined to the domain		



Further information to the trainer

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Learning Outcome 3: Deploy DHCP services



Indicative contents

3.1 Installation of DHCP Services

3.2 Configuration of DHCP

3.3 Testing DHCP Configuration

Key Competencies for Learning Outcome 3: Deploy DHCP services

Knowledge	Skills	Attitudes
● Description of DHCP concept ● Description of DHCP operations.	● Performing DHCP installation. ● Configuring DHCP scopes, IP ranges, and options (default gateway, DNS server). ● Enabling the DHCP server ● Start DHCP Service ● Testing DHCP Configuration.	● Being patience ● Being problem solver ● Working in a Team ● ●



Duration: 10 hrs



Learning outcome 3 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe properly DHCP operations based on Microsoft standard.
2. Perform correctly DHCP installation based on organisation requirements.
3. Configure clearly DHCP server as used in organisation.
4. Test effectively DHCP configuration based on organization requirement.



Resources

Equipment	Tools	Materials
● Projector ● Computer ● UPS ● Router ● Switch	● Modem ● Router ● VMware Workstation ● Windows server 2016 OS ● Windows client OS ● Bootable device software ● DVD ● USB	● Electricity ● Cables ● Internet



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare workplace by having dedicated materials and equipment for teaching web services deployment.



Indicative content 3.1: Installation of DHCP Services



Duration: 3 hrs



Theoretical Activity 3.1.1: Description of DHCP operations



Notes to the trainer:

- While delivering this content, small groups can be used for describing on DHCP services.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions related to DHCP services:

- What do you understand by DHCP services?
- What do you understand by DHCP discover?
- Describe briefly the DHCP operation to perform dynamic IP address assignment?

Step 2: Ask trainees to write their findings on the paper or flipchart

Step 3: Ask trainees to present their findings to the whole class

Step 4: Provide details explanation on the topic and address any questions or concerns

Step 5: Ask trainees to read the Key readings 3.1.1 in the trainee manuals.



Points to Remember

- A DHCP server (Dynamic Host Configuration Protocol) is a server that automatically assigns IP addresses to computers and other devices on the network.
- Dynamic IP address assigned to client through DHCP server operations: DHCP discover, offer, lease, request and acknowledgement as main DHCP process.
- When a client (PC) is booted, it broadcasts a DHCP Discover message over the Ethernet network to locate all available DHCP servers on the same subnet network (by setting the destination MAC address in the Ethernet header as Broadcast MAC=FF:FF:FF:FF:FF:FF), reaching all the DHCP servers on the same subnet network.



Practical Activity 3.1.2: Performing DHCP installation



Notes to the trainer

- Avail computer with windows server OS installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
i. Go to the computer lab and install DHCP role and DHCP server.
- Step 2:** Explain the task and provide clear work instruction.
- Step 3:** Demonstrate how to install web server role and explain all steps.
- Step 4:** Asks trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 3.1.2.
- Step 7:** Ask trainees to perform application of learning 3.1.



Points to Remember

- During installation of DHCP server be carefully to select HDCP server roles and then you have to consider the following steps:
Step 1: Open Server Manager. Click the start button then click the Server Manager.
Step 2: Add roles and features.
Step 3: Select Role-based or feature-based installation.
Step 4: Select the destination server.
Step 5: Select server roles.
Step 6: Feature, DHCP Server.
Step 7: Confirmation.



Application of learning 3.1

Suppose that your school needs to establish DHCP server, you are asked to install DHCP role and DHCP services for assign IP address to the computer lab's devices.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DHCP server is well installed	1.1 Role-based or feature-based installation in selected		
		1.2 The destination server selected		
		1.3 server roles are selected		
		1.4 Installation is confirmed		



Indicative content 3.2: Configuration of DHCP



Duration: 4 hrs



Practical Activity 3.2.1: Configuring DHCP based on Microsoft Standard



Notes to the trainer

- Avail computer with windows server OS and DHCP server installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- Go to the computer lab to configure DHCP server.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to install web server role and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 3.2.

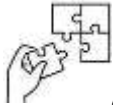
Step 7: Ask trainees to perform application of learning 3.2.



Points to Remember

- The scope must be activated in order to broadcast IP address to the client.
- Use valid scope IP address range.
- During configuration of DHCP server scope be carefully to the following steps:
 1. open the DHCP management tool, and expand the tree on the left-hand side until you find IPv4. **Right-click on IPv4** (or IPv6 if this is what you're using) **and click on "New scope"**.
 2. **Click on "Next" to continue**.
 3. **Give a name and description for your new scope**.
 4. On the next screen, you will be asked to **enter a range of IP addresses**. These are the IP addresses that will be available for DHCP clients connected to this scope. All you need to do is **enter a start and an end IP address**.
 5. Assign a range of IP addresses and a subnet mask for your new DHCP scope
 6. Specify any excluded IP addresses within your IP range
 7. Set a lease duration for your new scope
 8. Choose to configure your DHCP options now
 9. Configure the default gateway for the scope
 10. Enter the domain name and DNS servers

11. Add the WINS servers for your new scope
12. Choose whether to activate the scope now or later
13. finish



Application of learning 3.2.

Suppose that your school needs to establish DHCP server, you are asked to configure DHCP server by creating scope called '**L4NIT**' and assign IP address from range of 192.168.16.100 to 192.168.16.200 and DNS server address in 192.168.16.1.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DHCP server is well configured	IPv4 DHCP Scope created		
		Scope name is defined		
		Range of IP address is used		
		DNS server addresses used		
		The Scope is Activate		



Indicative content 3.3: Testing DHCP Configuration



Duration: 3 hrs



Practical Activity 3.3.1: Testing DHCP Configuration



Notes to the trainer

- Avail computer with DHCP server installed and configured DHCP.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- Go to the computer lab to test DHCP server configurations.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to install web server role and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 3.3.

Step 7: Ask trainees to perform application of learning 3.3.



Points to Remember

- To test DHCP configuration check client side by using ipconfig with option like /all, /release and renew.
- Don't forget to check DHCP server settings, by run the net start command, and look for DHCP Server.



Application of learning 3.3

Suppose that your school needs to establish DHCP server, you are asked to test if DHCP server is able to assign IP address dynamic to client. The scope to test is called '**L4NIT**' and has IP address from range of 192.168.16.100 to 192.168.16.200 and DNS server address in 192.168.16.1.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DHCP server well test	1.1 Start DHCP Service		
		1.2 Event logs checked		
		1.3 DHCP Server log checked		
2	Client tested	2.1 Windows command line used		
		2.2 Windows GUI used		



Learning outcome 3 end assessment

Theoretical assessment

Multiple choice questions: Circle the letter corresponding to the correct answer:

1. What does DHCP stand for?

- a) Dynamic Host Configuration Protocol
- b) Dynamic Host Control Protocol
- c) Dynamic Hypertext Configuration Protocol
- d) None of the above

Answer: a) Dynamic Host Configuration Protocol

2. What is the primary function of a DHCP server?

- a) To assign static IP addresses
- b) To provide dynamic IP addresses to clients
- c) To manage DNS records
- d) To control network traffic

Answer: b) To provide dynamic IP addresses to clients.

3. Which of the following is a benefit of using DHCP?

- a) Reduces manual configuration errors
- b) Provides faster internet speeds
- c) Increases network security
- d) None of the above

Answer: a) Reduces manual configuration errors.

4. What happens when a client requests an IP address from a DHCP server?

- a) The server immediately assigns the IP address without confirmation.
- b) The server sends a DHCP Offer message.
- c) The client must wait indefinitely for an IP address.
- d) The server denies the request.

Answer: b) The server sends a DHCP Offer message.

5. How long is an IP address typically leased to a client by DHCP?

- a) For an unlimited period
- b) For a limited period
- c) Until the server shuts down
- d) Only during active sessions

Answer: b) For a limited period.

6. What is a DHCP scope?

- a) A range of IP addresses that the DHCP server can assign to clients
- b) A security feature of the DHCP server
- c) A method for reserving IP addresses for specific devices
- d) None of the above

Answer: a) A range of IP addresses that the DHCP server can assign to clients.

7. What is required before a DHCP server can lease IP addresses in an Active Directory environment?

- a) The server must be rebooted.
- b) The DHCP server must be authorized in Active Directory.
- c) The server must have a static IP address.
- d) Both b and c are correct.

Answer: d) Both b and c are correct.

8. How can you test if your DHCP server is functioning correctly?

- a) By checking the event logs only
- b) By connecting a client device configured to obtain an IP address automatically
- c) By manually assigning IP addresses to clients
- d) By disabling the DHCP service

Answer: b) By connecting a client device configured to obtain an IP address automatically.

Practical assessment

Our school needs to establish DHCP server for assign IP addresses to all computer lab's machine dynamically from 192.168.1.100 to 192.168.1.200. however, assigned a static IP address. This ensures that the server's IP address is assigned statically. Your task is to configure DHCP server according to required addresses.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DHCP server is properly installed based on Microsoft standards	1.1 DHCP roles are installed		
		1.2 Installation process is performed		
		1.3 DHCP server is installed		
2	DHCP server is properly configured based on organization requirements	2.1 DHCP server is configured		
3	DHCP server is properly tested according to the organization's requirements	3.1 Tool are used		
		3.2 DHCP server is tested		



Further information to the trainer

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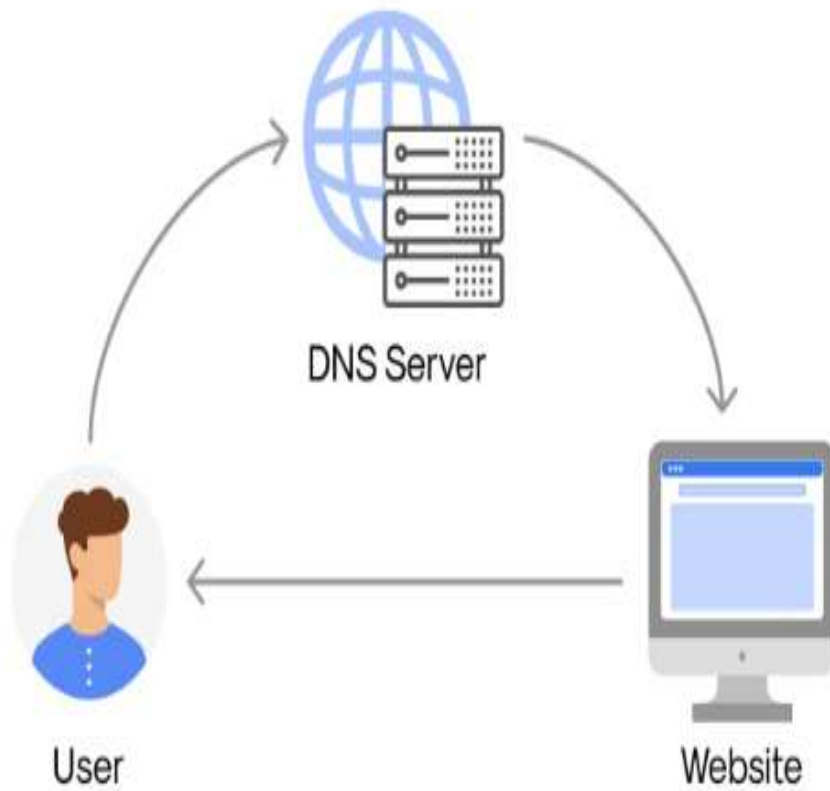
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Learning Outcome 4: Deploy DNS service



Indicative contents

4.1 Installation of DNS service

4.2 Configuration of DNS Settings

4.3 Testing of DNS Configuration

Key Competencies for Learning Outcome 4: Deploy DNS Service

Knowledge	Skills	Attitudes
• Description of DNS records • Description of DNS queries • Description of DNS zones and zone files • Choose a DNS Hosting Provider	• Performing DNS installation. • Configuring of DNS Settings • Testing DNS configuration.	• Having Attention to detail • Being Adaptive • Being collaborative



Duration: 10 hrs



Learning outcome 4 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe clearly DNS records as used in DNS server.
2. Install properly DNS server based on organization requirements.
3. Configure properly DNS server based on DNS records.
4. Test properly DNS server according to the domain functionality.



Resources

Equipment	Tools	Materials
● Projector ● Computer ● UPS ● Router ● Switch	● Modem ● Router ● VMware Workstation ● Windows server 2016 OS ● Windows client OS ● Bootable device software ● DVD ● USB	● Electricity ● Cables ● Internet



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare workplace by having dedicated materials and equipment for teaching DNS service deployment.



Indicative content 4.1: Installation of DNS Service



Duration: 4 hrs



Theoretical Activity 4.1.1: Description of DNS records



Notes to the trainer:

- While delivering this content, small groups can be used for describing on DNS services.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions related to DNS service:

- What do you understand by DNS service?
- What do you understand by CNAME and PTR?

Step 2: Ask trainees to write their findings on the paper or flipchart

Step 3: Ask trainees to present their findings to the whole class

Step 4: Provide details explanation on the topic and address any questions or concerns

Step 5: Ask trainees to read the Key readings 4.1.1 in the trainee manuals.



Points to Remember

DNS, or Domain Name System, is a fundamental component of the Internet that translates human-readable domain names into machine-readable IP addresses. This process allows users to access websites without needing to memorize complex numerical addresses.

A **CNAME record** is used to create an alias for a domain name. It maps one domain name (the alias) to another (the canonical name). This is particularly useful for pointing multiple subdomains to a single domain, simplifying DNS management.



Theoretical Activity 4.1.2: Description of DNS queries



Notes to the trainer:

- While delivering this content, small groups can be used for describing on DNS queries.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking trainees to answer:

- i. What do you understand by Recursive Query?
- ii. What do you understand by Iterative Query and Non-Recursive Query?
- iii. Differentiate DNS Resolver from DNS Root Server?

Step 2: Involve trainees in presentation of their findings.

Step 3: Provides expert view and clarifies ideas by using didactic materials.

Step 4: Address any questions or concerns.

Step 5: Ask trainees to read the key reading 4.1.2 in the trainee manual.



Points to Remember

- A **recursive query** in DNS is a type of request where a DNS resolver (also known as a recursive DNS server) takes on the responsibility of fully resolving a domain name into its corresponding IP address. This process involves the resolver making multiple queries to various DNS servers on behalf of the client, allowing the user to receive a complete answer without needing to manage each step.
- **Non-Recursive Query**
The term non-recursive query is often used interchangeably with iterative query. It emphasizes that the queried DNS server does not perform any additional queries on behalf of the client but responds directly with either an answer or a referral.
- **Iterative Query**
An **iterative query** is a type of DNS request where the DNS resolver queries a server and expects either a direct answer or a referral to another server. If the queried server does not have the requested information, it will respond with the address of another DNS server that may have the answer.



Theoretical Activity 4.1.3: Description of DNS zones and zone files



Notes to the trainer:

- While delivering this content, small groups can be used for describing on DNS zones and zone files



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking trainees to answer:

- i. What do you understand by zone files?
- ii. Explain DNS zone?
- iii. Differentiate DNS zones from zone file?

Step 2: Involve trainees in presentation of their findings.

Step 3: Provides expert view and clarifies ideas by using didactic materials.

Step 4: Address any questions or concerns.

Step 5: Ask trainees to read the key reading 4.1.3 in the trainee manual.



Points to Remember

- A **zone file** is a plain text file stored on a DNS server that contains all the resource records for a particular DNS zone. This file is essential for the functioning of the DNS as it specifies how domain names are resolved to IP addresses and includes various types of records.
- A DNS zone is a distinct administrative space within the DNS hierarchy that allows for the management of a specific portion of the domain namespace. It can encompass a domain and its subdomains, enabling administrators to control DNS records, name servers, and other components for that segment.

Feature	DNS Zone	Zone file
Definition	An administrative space in the DNS hierarchy	A text file containing resource records for a zone
Purpose	Manages a specific portion of the domain namespace	Provides data necessary for resolving domain names
Structure	Can contain multiple subdomains	Contains various types of DNS records
Control	Allows granular control by administrators	Represents actual data used in queries
Updates	Managed through zone file	Updated directly in the zone file



Practical Activity 4.1.4: Performing DNS installation



Notes to the trainer

- Avail computer with windows server OS installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
- Go to the computer lab and install DNS server.
- Step 2:** Explain the task and provide clear work instruction.
- Step 3:** Demonstrate how to install DNS role and explain all steps.
- Step 4:** Asks trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 4.1.4.
- Step 7:** Ask trainees to perform application of learning 4.1.



Points to Remember

- **Prerequisites**

Before configuring our DNS, we must have the following information:

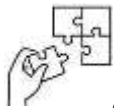
- Our domain name.
- The IP address and hostname of each server that we want to provide name resolution for.

Additionally, before we configure our computer as a DNS, we need to verify that the following minimum conditions are proper:

- A server running Windows Server 2012R2, 2016, 2019, or 2022 operating system and an open Remote Desktop Protocol (RDP) 3389 port.
- A domain user with appropriate administrative privileges in configuring the DNS.
- Minimum of 4 GB of RAM and 2-core CPU
- **Installing the DNS Server Role**

- 1: Launch the Server Manager, as illustrated below:
- 2: Select Add roles and features.
- 3: Selecting Role based and feature based installation.
- 4: Choose a server from the pool and press Next.
- 5: Pick the DNS server.
- 6: Double check all settings before clicking the Install button to begin the installation

8: Allow some time for the installation to complete. Once done, click the Close to exit the installation wizard.



Application of learning 4.1

Suppose that your school needs to establish DNS server, you are asked to install DNS role. All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DNS server is well installed	1.1. Role-based or feature-based installation in selected		
		1.2. The destination server selected		
		server roles are selected		
		1.3. Installation is confirmed		



Indicative content 4.2: Configuration of DNS Settings



Duration: 3 hrs



Practical Activity 4.2.1: Configuring DNS Settings



Notes to the trainer

- Avail computer with windows server OS installed.
- Avail computer with DNS role installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- Go to the computer lab and configure DNS server settings

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to configure DNS server settings and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 4.2.1

Step 7: Ask trainees to perform application of learning 4.2.



Points to Remember

- **Steps of DNS Settings Configuration**

Configuring the Forward Lookup Zone

- Step 1:** On the server manager, navigate to Tools > DNS to access the DNS manager
- Step 2:** Right click on the server's name and select Properties.
- Step 3:** Select the New Zone option.
- Step 4:** Choose the Primary zone and press Next.
- Step 5:** Click Next after selecting the Forward lookup zone.
- Step 6:** Enter the name of our zone and press Next
- Step 7:** Choose "Create a file with the file name" and press Next.
- Step 8:** Check the box next to "Do not allow dynamic update" and click Next.
- Step 9:** Press the Finish button

- **Configuring the Reverse Lookup Zone**

- Step 1:** On the server manager, navigate to Tools > DNS to access the DNS manager:

- Step 2:** Right click on the server's name and select Properties.
- Step 3:** Here, selects the New Zone option.
- Step 4:** 4: Now, choose the Primary zone and press Next.
- Step 5:** From this step forward, the setup is different from our previous section.
- Step 6:** After, select IPv4 Reverse Lookup Zone and click on Next.
- Step 7:** Define your network ID and click Next.
- Step 8:** Further, choose "Create a file with the file name" and press Next.
- Step 9:** Please check the box next to "Do not allow dynamic update" and click Next.
- Step 10:** press the Finish button.



Application of learning 4.2

Suppose that your school needs to establish DNS server, you are asked to configure DNS role for domain name translation.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Configure DNS Settings	4.2. DNS server role is installed		
		4.2. Forward Lookup Zone is configured		
		4.2. Reverse Lookup Zone is configured		



Indicative content 4.3: Testing DNS Configuration



Duration: 3 hrs



Practical Activity 4.3.1: Testing DNS Configuration



Notes to the trainer

- Avail computer with windows server OS installed.
- Avail computer with DNS role installed.
- Avail computer with configured DNS server.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- Go to the computer lab to test DNS server configuration settings

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to test DNS server role and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 4.3.1

Step 7: Ask trainees to perform application of learning 4.3.



Points to Remember

- To test your DNS configuration effectively, follow these steps:

Step 1: Verify DNS Settings

- **For Windows:**

Step 1: Open Control Panel.

Step 2: Navigate to Network and Internet > Network and Sharing Center.

Step 3: Click on Change Adapter Settings.

Step 4: Right-click your active network connection and select Properties.

Step 5: Select Internet Protocol Version 4 (TCP/IPv4) and click Properties.

Step 6: Ensure the settings are correct, either obtaining DNS server addresses automatically or using specific DNS servers.

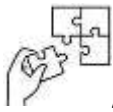
Step 2: Resolve a Domain Name

To explicitly test DNS resolution, use tools like **nslookup** or **dig**.

Using nslookup:

Step 1: Open a command prompt or terminal.

Step 2: Type the following command:
nslookup www.example.com



Application of learning 4.3

Suppose that your school needs to establish DNS server, you are asked to test DNS server for domain name translation.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	testing DNS server Settings	1.1 Ping command used		
		1.2 Nslookup is used		
		1.3 Dig is used		



Learning outcome 4 end assessment

Theoretical assessment

Multiple choice question: Circle the letter corresponding to the correct answer:

1. What does DNS stand for?
 - A) Domain Name System
 - B) Dynamic Network Service
 - C) Domain Network System
 - D) Dynamic Name Service

Answer: A) Domain Name System

2. Which of the following is an authoritative source of information about each DNS domain name?
 - A) Perfmon
 - B) Zone
 - C) Record
 - D) Sysprep

Answer: B) Zone

3. Which server is used to convert host names into IP addresses?
 - A) DNS server
 - B) Network server
 - C) Web server
 - D) File server

Answer: A) DNS server

4. What type of DNS query requires the server to respond with the best information it possesses at that time?
 - A) Recursive query
 - B) Iterative query
 - C) Action query
 - D) Parameter query

Answer: B) Iterative query

5. Which of the following records maps a domain name to an IPv4 address?
 - A) AAAA
 - B) CNAME
 - C) MX
 - D) A

Answer: D) AAAA

6. What is the purpose of a DNS forwarder?
 - A) To cache DNS queries
 - B) To forward DNS queries for external names to other DNS servers
 - C) To resolve local DNS queries only

D) To create new DNS zones

Answer: B) To forward DNS queries for external names to other DNS servers

7. Which zone type contains the master copy of the zone database?

- A) Stub zone
- B) Secondary zone
- C) Primary zone
- D) Hybrid zone

Answer: C) Primary zone

8. What is the Time to Live (TTL) in a DNS record used for?

- A) To specify how long the record is valid before being discarded
- B) To determine how long a resolver can cache the record
- C) To indicate when to refresh the record
- D) Both A and B

Answer: D) Both A and B

9. Which feature adds security to the DNS protocol by validating responses?

- A) DHCP
- B) DNSSEC
- C) Cache locking
- D) Forwarding

Answer: B) DNSSEC

10. What type of query does a resolver use when it needs an immediate response?

- A) Iterative query
- B) Recursive query
- C) Action query
- D) Parameter query

Answer: B) Recursive query

11. Which of the following statements about Dynamic DNS (DDNS) is true?

- A) DDNS requires a Microsoft DHCP server to work.
- B) DDNS clients may not register their own addresses.
- C) DDNS works only with Microsoft clients and servers.
- D) The Windows Server 2012 DDNS server can interoperate with recent versions of BIND.

Answer: D) The Windows Server 2012 DDNS server can interoperate with recent versions of BIND.

12. What does a CNAME record do in DNS?

- A) Maps an IP address to a domain name.
- B) Creates an alias for an existing record.
- C) Specifies mail exchange servers.
- D) Defines the start of authority for a zone.

Answer: B) Creates an alias for an existing record.

13. Which command can be used to check if a specific domain name resolves correctly?

- A) nslookup
- B) ping
- C) ipconfig
- D) tracert

Answer: A) nslookup

14. In Windows Server, which tool is primarily used for managing DNS zones and records?

- A) Active Directory Users and Computers
- B) DHCP Management Console
- C) DNS Manager
- D) Group Policy Management Console

Answer: C) DNS Manager

15. What is the function of a stub zone in DNS?

- A) It contains all records for a domain.
- B) It holds only the necessary records to identify authoritative name servers.
- C) It is used for caching purposes only.
- D) It stores reverse lookup records exclusively.

Answer: B) It holds only the necessary records to identify authoritative name servers

Practical assessment

Suppose that your school needs to implement server based on windows server as a trainee in networking and Internet Technology you are required for performing DNS server installation, configure and testing server configuration.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	DNS server is properly installed based on organization requirements	1.1. Installation process are performed		
		1.2. DNS Server is installed		
2	DNS server is properly configured based on DNS records	2.1. Configuration process is performed		
		2.2. DNS server is configured		
	DNS server is properly tested according to the domain name functionality	3.1 Tool is used		
		3.2.DNS server is tested		



Further information to the trainer

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Learning Outcome 5: Deploy Web Services



Indicative contents

5.1 Installation of web server

5.2 Configure Web Server (IIS)

5.3 Implement Security access control

5.4 Deploying Web application

5.5 Test Web application

Key Competencies for Learning Outcome 5: Deploy Web Services

Knowledge	Skills	Attitudes
● Description of web servers' software ● Identifications of web server installation prerequisites ● Description of deployment Method	● Selecting of web server hardware and software. ● Performing IIS installation. ● Configuring web services. ● Implementing server security ● Testing web server monitoring with maintenance tools	● Having self-motivation ● Being analytical and details oriented



Duration: 10 hrs



Learning outcome 5 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe correctly web servers' software based on Microsoft standard.
2. Identify clearly web server installation prerequisites based on Microsoft standard.
3. Describe clearly the deployment process as used in web services.
4. Perform properly web service installation process as used in windows server.
5. Perform correctly web service configuration as used in server administration.
6. Implement appropriately security access for web server based on Microsoft standard.



Resources

Equipment	Tools	Materials
• Projector • Computer • UPS	• Router • VMware Workstation • Windows server 2016 OS • Windows client OS • Bootable device software • DVD • USB	• Electricity • Cables • Internet •



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare workplace by having dedicated materials and equipment for teaching web services deployment.



Indicative content 5.1: Installation of Web Server



Duration: 2 hrs



Theoretical Activity 5.1.1: Introduction to Web Server



Notes to the trainer:

- Trainer may use small group for describing web server's software
- The use of Router VMware, Workstation, Windows server 2016 OS, Windows client OS, images, videos, and illustrations as didactic materials is required.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity by asking trainees to answer:

- ii. With your own word explain a web service?
- iii. Enumerate three advantages of using web services?

Step 2: Involve trainees in presentation of their findings.

Step 3: Provides expert view and clarifies ideas by using didactic materials.

Step 4: Address any questions or concerns.

Step 5: Ask trainees to read the key reading 5.1.1 in the trainee manual.



Points to Remember

- Do not forget IIS (Internet Information Services) as the main feature of webserver.
- Apache is basic element of web server.



Practical Activity 5.1.2: Installing web Server



Notes to the trainer

- Avail computer with windows server OS installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab and install web server

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how to install web server role and explain all steps.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 5.1.2.

Step 7: Ask trainees to perform application of learning 5.1.



Points to Remember

- Make sure that IIS is selected during installation of web server.
- After web server (IIS) installation process, verify installation completion.



Application of learning 5.1.

Suppose that your school needs to establish web server, you are asked to install web server within windows sever operating system.

All tools, materials and equipment are available in computer lab.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Web server is well installed	1.1 Web Server (IIS) selected		
		1.2 Installation is Initiated		
		1.3 Installation is completed		



Indicative content 5.2: Configure Web Server (IIS)



Duration: 2 hrs



Practical Activity 5.2.1: Creating real/virtual host and website hosting



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS installed.
- Avail computer with web Server installed.
- Sample of website to host.
- Avail video as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
As a network administrator, you are asked to go to the computer lab to perform the followings: create real or virtual host, configure web server, make sample of website and host created website.
- Step 2:** Explain the task and provide clear work instruction.
- Step 3:** Demonstrate how to host website.
- Step 4:** Asks trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 5.2.1.



Points to Remember

- **Configure Virtual Hosts**

To set up virtual hosting (multiple websites on the same server):

1. Edit Site Bindings:

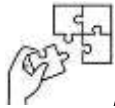
- In IIS Manager, right-click on the newly created site and select Edit Bindings
- In the Site Bindings dialog, click on the Add. button to add a new binding for another hostname.
- Enter the new hostname (e.g., www.anotherexample.com) in the Host name field and ensure that the port is set to 80.
- Click OK to save changes.

2.Repeat for Additional Sites:

Repeat the process of adding websites with unique hostnames as needed.

- **steps of creating real/virtual host**

1. Open IIS Manage: Navigate to **Control Panel**, select **Administrative Tools**, and then open **Internet Information Services (IIS) Manager**Add a New Website
2. Add a New Site
3. Configure firewall Settings
4. Test your website
5. Upload website



Application of learning 5.2

Our school has website for break news and announcement, also school manger after setup local area network wishes to host a school website by using windows server and its web server role as networking and internet student you are required to configure and host a school web server.

All tools, materials and equipment will be provided by the school.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
		1.3 Web Server (IIS) installed		
		1.4 Completion of Installation for web Server		
2	Configure Web Server	2.1 Real/virtual is created		
		2.2 Sample of website is created		
		2.3 website is added		
		2.4 Site name is created		
		2.5 Physical path is linked		
		2.6 Test connectivity		



Indicative content 5.3: Implement Security access control



Duration: 3 hrs



Theoretical Activity 5.3.1: Description of security access control concepts



Notes to the trainer:

- While delivering this content, small groups can be used for describing on security access control



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to respond to the following questions:

- SSL stand for?
- Differentiate antimalware from the antivirus
- Explain mechanism of create uncrackable password.
- Give any four benefits of performing regular backup

Step 3: Involve trainees in presentation of their findings.

Step 4: Provides expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.



Points to Remember

- Importance of SSL security access control
- Step of Installing SSL and antimalware
- Implementation of Password Complexity Requirements
- Regular backup concepts



Practical Activity 5.3.2: Performing security access control



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS installed.
- Avail computer with web Server installed.
- Avail computer well web Server configured.
- Avail video as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
As a network administrator, you are asked to go to the computer lab to perform the following: after configure web server in your windows server, install and configure SSL as security mechanism.
- Step 2:** Explain the task and provide clear work instruction.
- Step 3:** Demonstrate how to install web server.
- Step 4:** Asks trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 5.3.2.



Points to Remember

- **Install the SSL on IIS Website**

- Step 1:** Go to **Start > Administrative Tools > Internet Information Services (IIS) Manager**
- Step 2:** In the left pane, click on the server's name and double click on the **Server Certificates**.
- Step 3:** In the right pane, click on **Complete Certificate Request**.
- Step 4:** Browse the certificate file (.cer), provide your domain name, select Web Hosting in the certificate store option and click on the **OK** button.

- **To assign the certificate by following the below steps**

- Step 1:** Open the IIS Manager, expand the server's name and click on the Default Website then click on the **Bindings** in the right pane.
- Step 2:** Click on the **Add** button. You should see the following page:
- Step 3:** Select https, select the IP address of your website or leave it unassigned, type port 443, type your domain name, select the domain name on which you want to install SSL and click on the **OK** button to install the certificate.



Application of learning 5.3

Suppose that your school needs to establish Web server, you are asked to establish web server security feature by configure and enabling SSL certificate.
All tools, materials and equipment will be provided by the school.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Implementing security access control	1.1 Internet Information Services (IIS) Manager is selected		
		1.2 Certificate Request is performed		
		1.3 SSL is installed		
		1.4 Password is uncrackable Website can be updated		
		1.5 Regular backup is implemented		



Indicative content 5.4: Deploying a Web Application



Duration: 2 hrs



Theoretical Activity 5.4.1: Description of deployment method



Notes to the trainer:

- While delivering this content, a small group can be used for describing web application concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to answer to the following questions:

- Define the following terms:
 - Deployment
 - Version control system
 - containerization
- Explain manual deployment?

Step 3: Involve trainees in presentation of their findings.

Step 4: Provides expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 5.4.1 in the trainee manual.



Points to Remember

- Manual deployment involves hands-on involvement of IT teams in every step of the deployment process. It requires human intervention to provision infrastructure, configure settings, and install software.
- Version control systems track changes to code over time, allowing multiple developers to collaborate on a project. Popular version control tools include Git, Subversion, and Mercurial.
- Containerization packages an application's code, runtime, system tools and libraries into a single package called a container. Containers provide a consistent, isolated environment for running applications.



Practical Activity 5.4.2: Preforming web application deployment



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS and vs editor installed.
- Avail computer well web Server (IIS) configured.
- Avail of developed web application(website)
- Avail video as didactic material



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

As a server administrator, you are asked to go to the computer lab to perform the following: develop a web application and deploy it to the web server (IIS) by respecting all deployment steps.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how a web application was deployed.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

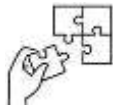
Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 5.4.2.



Points to Remember

- **Step to deploy website in IIS via file copy:**
 - Step 1:** Creation of web application
 - Step 2:** Open your application into VS code
 - Step 3:** Choose the 'Publish' Option from the context menu
 - Step 4:** choose the 'New Profile' to create a new Publish profile.
 - Step 5:** Provide the details of the profile.
 - Step 6:** Choose publication method and the target location then next
 - Step 7:** Click the Publish button in the final screen
 - Step 8:** Test publication by browsing target URL: <http://localhost/Demo.aspx>
place demo.sapx with your web application name
- Procedures of web application testing



Application of learning 5.4

Suppose that your school needs to host web application, you are asked to deploy web application so that every classmate can access. All tools, materials and equipment will be provided by the school.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Preparation of installation	1.1 VS code installed		
		1.2 Web application created		
2	Deploying Web application	2.1 Profile is created		
		2.2 Profile details provided		
		2.3 Publication methods mentioned		
		2.4 Target location URL in assigned		
		2.5 Testing is conducted		



Indicative content 5.5: Test Web Application



Duration: 1 hr



Theoretical Activity 5.5.1: Identification of web application testing tools



Notes to the trainer:

- While delivering this content, small groups can be used for describing on web application testing



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to respond to the following questions:

- Define the following terms:
 - ✓ Monitoring tools
 - ✓ Maintenance tools

Step 2: Involve trainees in presentation of their findings.

Step 3: Provides expert view and clarifies ideas by using didactic materials.

Step 4: Address any questions or concerns.



Points to Remember

- Effective monitoring tools are essential for tracking the performance and health of web applications hosted on Windows Server. Key tools include:
 - ✓ Microsoft Test Base.
 - ✓ Application Insights
 - ✓ Nagios
- Maintenance Tools: facilitate the ongoing support and management of web applications. These tools include Web Deploy, IIS Manager, SQL Server Management Studio (SSMS).



Learning outcome 5 end assessment

Theoretical assessment

Multiple choice question: Circle the letter corresponding to the correct answer:

1. During IIS installation, which feature should be selected to enable HTTPS?
 - a) WebDAV Publishing
 - b) ASP.NET
 - c) Request Filtering
 - d) Security - SSL Certificate

Answer: d) Security - SSL Certificate

2. What is the default directory path where IIS websites are stored on a Windows Server?
 - a) C:\Windows\Web\IIS
 - b) C:\Program Files\IIS
 - c) C:\inetpub\wwwroot
 - d) C:\IIS\Webroot

Answer: c) C:\inetpub\wwwroot

3. Which tool is primarily used to install IIS on Windows Server?
 - a) PowerShell
 - b) Server Manager
 - c) Task Manager
 - d) Windows Defender

Answer: b) Server Manager

4. What is the first step in deploying IIS on a Windows Server?
 - a) Installing FTP service
 - b) Configuring DNS settings
 - c) Adding the Web Server (IIS) role
 - d) Installing a database

Answer: c) Adding the Web Server (IIS) role

5. Which tool in Windows Server can be used to monitor real-time IIS performance and resource usage?
 - a) IIS Manager
 - b) Event Viewer
 - c) Performance Monitor
 - d) Task Scheduler

Answer: c) Performance Monitor

6. What is Web Deploy used for in IIS?
 - a) Monitoring website traffic
 - b) Deploying websites and applications to IIS
 - c) Configuring application pools

- d) Enabling HTTP redirection

Answer: b) Deploying websites and applications to IIS

7. How is load balancing implemented in IIS?

- a) Using Application Pools
- b) Configuring a Web Farm
- c) Using only one server
- d) Disabling SSL

Answer: b) Configuring a Web Farm

8. What does the HTTP Redirect feature in IIS allow you to do?

- a) Redirect HTTP requests to another server
- b) Host multiple websites on the same server
- c) Change website language settings
- d) Bind SSL certificates

Answer: a) Redirect HTTP requests to another server

9. How do you ensure that only authorized users can access a website hosted on IIS?

- a) Enable FTP
- b) Use Authentication and Authorization features
- c) Use IP filtering
- d) Configure DNS settings

Answer: b) Use Authentication and Authorization features

10. What is the purpose of Application Initialization in IIS?

- a) It monitors website load time
- b) It ensures websites are initialized before the first request is made
- c) It compresses website content
- d) It limits the number of application pools

Answer: b) It ensures websites are initialized before the first request is made

Practical assessment

Our school wants to hire you in the implementation of the following task in order to achieve the central administration of school information.

From Windows Server with IIS or another web server software, create and a website with “Student Report” message so that everyone can browse through the network.

Checklist

SN	Criteria	Indicators	Observation	
			Yes	No
1	Web services are properly installed according to the user requirement	1.1 Web tools are selected		
		1.2 Web features are identified		
		1.3 Web services are installed		
2	Web server is properly configured based on user requirement	2.1 Configuration process is identified		
		2.2 Web server is configured		
3	Security access control is properly implemented based on web application requirements	3.1 Security monitoring is done		
		3.2 Security is identified		
		3.3 Security access control is implemented		
4	Web application is properly deployed based on web hosting infrastructure	4.1 Deployment method is applied		
		4.2 Web application is deployed		
5	Web application is properly tested according to its intended use	5.1 Testing tools are used		
		5.2 Web application is tested		



Further information to the trainer

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Learning Outcome 6: Deploy FTP Services



Indicative contents

6.1 Installation of FTP server

6.2 Configure the FTP Server

6.3 Implement FTP server file sharing

Key Competencies for Learning Outcome 6: Deploy FTP Services

Knowledge	Skills	Attitudes
• Description of FTP services • Preparation of FTP services installation • Test the FTP server • Choose an FTP Server Software • Test FTP File Sharing	• Configuring and installing FTP services • Installing FTP client • Installing FTP services • Setting permissions for Shared Directory	• Having self-motivation • Being analytical and details oriented



Duration: 10 hrs



Learning outcome 6 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe clearly the deployment process as used in FTP services
2. Perform properly FTP services installation as used in windows server.
3. Perform correctly FTP service configuration as used in server administration.
4. Implement appropriately permissions for Shared Directory as used in FTP server



Resources

Equipment	Tools	Materials
● Projector ● Computer ● UPS	● Modem ● Router ● VMware Workstation ● Windows server 2016 OS ● Windows client OS ● Bootable device software ● DVD ● USB	● Electricity ● Cables ● Internet

Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Prepare workplace by having dedicated materials and equipment for teaching FTP services deployment.



Indicative content 6.1: Installation of FTP Server



Duration: 4 hrs



Theoretical Activity 6.1.1: Introduction of FTP services and selection of FTP



Notes to the trainer:

- While delivering this content, a small group can be used for describing FTP concepts.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to respond to the following questions:

- i. Define FTP?.
- ii. Discuss the advantages and disadvantages of using File Transfer Protocol over FileZilla

Step 3: Involve trainees in presentation of their findings.

Step 4: Provides expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.



Points to Remember

- **File Transfer Protocol (FTP)**

File Transfer Protocol (FTP) is a standard network protocol used for transferring files between a client and a server over a computer network.

- **FileZilla**

FileZilla is a free, open-source FTP client that enables users to connect to FTP servers to transfer files securely. It supports various protocols including FTP, SFTP (SSH File Transfer Protocol), and FTPS (FTP Secure).

- **Hosting Account**

A hosting account refers to an online service provided by web hosting companies that allows individuals or organizations to store their website files on a server. This account typically includes access to an FTP server where users can upload or download files necessary for their websites.

- **Select an FTP client**

When choosing an FTP client, it's important to consider the following essential features:

- Speed and Reliability
- Security
- User-Friendly Interface

- Compatibility



Practical Activity 6.1.2: Installation of FTP client and FTP services



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

As a server administrator, you are asked to go to the computer lab to perform the following: select FTP client and FTP server based on requirement and perform FTP installation on client side and server side.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how a web application was deployed.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 6.1.2.



Points to Remember

- **Steps of FTP server installations**

Step 1: Launch Server Manager

Step 2: Proceed with the installation

Step 3: Select the Installation Type

Step 4: Select the Destination Server

Step 5: Select Server Roles to be Installed

Step 6: Select Server Features

Step 7: Web IIS overview

Step 8: Select Role Services

Step 9: Confirm Installation



Application of learning 6.1.

As network administrator you are asked to establish a web Server for hosting your school website, select all requirement and install web server within windows sever operating system based on school objectives and available materials and equipment's.

All tools, materials and equipment will be provided by the school.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
2	Web server is well installed	2.1 Web Server (IIS) installed		
		2.2 FTP server is Selected		
		2.3 FTP extensibility		
		2.4 Initiate the Installation		
		2.5 Completion of Installation		



Indicative content 6.2: Configure the FTP Server



Duration: 3 hrs



Practical Activity 6.2.1: Setup Root directory for the FTP server



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS.
- Avail computer with installed web server.
- Avail computer with installed FTP services



Key steps:

While delivering this activity, pass through the following steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

As a server administrator, you are asked to go to the computer lab to perform the following: configure FTP server root directory with its respected features.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how a web application was deployed.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 6.2.1.



Practical Activity 6.2.2: Configure Passive FTP Mode, Enable Logging (Optional) and Test the FTP Server



Notes to the trainer

- This activity should take place in a Computer Lab.

While delivering this content, you are required to:

- Avail computer with windows server OS.
- Avail computer with installed web server.
- Avail computer with installed FTP services
- Avail computer with configured FTP sever



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

As a network administrator, you are asked to go to the computer lab to perform the following: configure Passive FTP Mode, enable Logging and Test the FTP Server to achieve working goals.

Step 2: Explain the task and provide clear work instruction.

Step 3: Demonstrate how a web application was deployed.

Step 4: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 6.2.2.



Points to Remember

- **To Change User Permissions of an FTP Server**

1. Access the server preferences in **Server Functions > FTP Configuration**.
2. On the **FTP Users** tab, click the name of the user you want to modify.
3. Click **Permissions**.
4. Set the permissions of the user.
5. Click **Apply**.

- **To Change User Permissions of an FTP Server**

1. Access the server preferences in **Server Functions > FTP Configuration**.
2. On the **FTP Users** tab, click the name of the user you want to modify.
3. Click **Permissions**.
4. Set the permissions of the user.
5. Click **Apply**.

- **Setting Permissions on Windows FTP Server**

On a Windows Server running IIS for FTP services, permissions are managed through the file system's security settings:

Navigate to the Directory: Locate your FTP root directory (e.g., C:\inetpub\ftproot).

Modify Security Settings:

- ✓ Right-click on the directory and select **Properties**.
- ✓ Go to the **Security** tab.
- ✓ Click on **Edit** to change permissions for specific users or groups.
- ✓ Add or select a user/group and check the boxes for **Read**, **Write**, and **Modify** as needed.
- ✓ **Apply Changes:** After setting the desired permissions, click **OK** to apply changes.
- **Passive FTP mode**

Passive FTP mode is a method of transferring files using the File Transfer Protocol (FTP) where the client establishes both the command and data connections to the server. This mode is particularly useful in environments where firewalls or Network Address Translation (NAT) devices may block incoming connections.

- **Enable logging**

Enable logging refers to the process of activating a logging mechanism within software applications or systems to record events, errors, and other significant information during their execution. This functionality is essential for debugging, monitoring performance, and maintaining system health.

- **Test the FTP Server**

To test an FTP server, you can use several methods depending on the tools you have at hand.



Application of learning 6.2

As network administrator you are asked to establish a web Server for hosting your school website, select all requirement and install web server within windows sever operating system based on school objectives and available materials and equipment's.

All tools, materials and equipment will be provided by the school.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
2	Web server is well installed	2.1 Web Server (IIS) installed		
		2.2 FTP server is Selected		
		2.3 FTP extensibility		
		2.4 Initiate the Installation		
		2.5 Completion of Installation		



Indicative content 6.3: Implement FTP Server File sharing



Duration: 3 hrs



Practical Activity 6.3.1: Choose an FTP Server Software



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server OS.



Key steps:

While delivering this activity, pass through the following steps:

While delivering this activity, pass through the following steps:

Step 7: Introduce the topic and ask trainees to do the task described below:

As a server administrator, you are asked to go to the computer lab to perform the following: choose FTP software and set permissions to the directory.

Step 8: Explain the task and provide clear work instruction.

Step 9: Demonstrate how a web application was deployed.

Step 10: Asks trainees to perform the activity of step 3 and monitor the procedures.

Step 11: Verify whether the tasks are clearly performed.

Step 12: Ask trainees to read key reading 6.3.1.



Theoretical Activity



Notes to the trainer:

- While delivering this content, a small group can be used for describing FTP server software



Points to Remember

- key consideration when you choose an FTP server software

When choosing FTP server software, several key considerations must be taken into account to ensure it meets your organization's needs effectively. Here are the main factors to consider:

Security Features

- ❖ Performance and Scalability
- ❖ Platform Compatibility
- ❖ Ease of Use and Maintenance
- ❖ High Availability and Reliability
- Here are three examples of FTP server software:
 - ❖ FileZilla Server:
 - ❖ Cerberus FTP Server
 - ❖ Titan FTP Server



Learning outcome 6 end assessment

Written assessment

Multiple choice question: Circle the letter corresponding to the correct answer:

1. Which role must be installed to set up an FTP server on Windows Server?

- a) Web Server (IIS)
- b) File and Storage Services
- c) Remote Access
- d) Active Directory

Answer: a

2. In Windows Server, which tool is used to manage IIS and FTP settings?

- a) Server Manager
- b) Task Manager
- c) Control Panel
- d) Windows Explorer

Answer: a

3. Which of the following authentication methods can be used for an FTP site?

- a) Anonymous authentication
- b) Basic authentication
- c) Windows authentication
- d) All of the above

Answer: d

4. After installing the FTP server, which command can be used to connect to the server from the command line?

- a) ftp server_address
- b) connect server_address
- c) open server_address
- d) link server_address

Answer: a

5. In an FTP client, what does the "Passive Mode" do?

- a) Encrypts the data
- b) Changes the transfer mode
- c) Allows the client to open a data connection
- d) Requires the server to open a data connection

Answer: d

6. What is the purpose of using a "home directory" for FTP users?

- a) To restrict access to certain files
- b) To provide a default directory for file transfers
- c) To improve security
- d) All of the above

Answer: d

7. In Windows Server, how can you restrict FTP access to specific IP addresses?

- a) Change firewall settings
- b) Set up IP restrictions in IIS
- c) Use Windows Defender
- d) Enable Anonymous FTP

Answer: b

8. What is the main difference between FTP and SFTP?

- a) FTP is faster
- b) SFTP uses a different protocol for secure connections
- c) FTP supports large file sizes
- d) SFTP allows more users

Answer: b

9. Which feature allows FTP connections to be encrypted?

- a) Basic authentication
- b) SSL/TLS
- c) Passive mode
- d) Anonymous access

Answer: b

10. What should be done after setting up the FTP server for testing?

- a) Change all passwords
- b) Disable the firewall
- c) Attempt to connect with an FTP client
- d) Restart the server

Answer: c

Practical assessment

Our school wants to hire you in the implementation of FTP server with the following tasks:

- Allow trainees and trainers to upload files as assignments to the dedicated folder called “**Assignments**” created on the server.
- Grant both “Trainees” and “Trainers.” Read, write, execute permissions to the “**Assignments**” folder respectively.

Checklist

SN	Criteria	Indicators	Observation	
			Yes	No
1	FTP services are properly installed according to the Microsoft standards	1.1 Standards are respected		
		1.2 Hosting is done		
2	FTP server is properly configured based on server requirement	2.1 FTP services are installed		
		2.2 FTP server is configured		
3	FTP server file sharing is properly implemented based on user permissions	3.1 FTP file sharing is implemented		
		3.2 User permissions are identified		
		3.3 FTP server is tested		



Further information to the trainer

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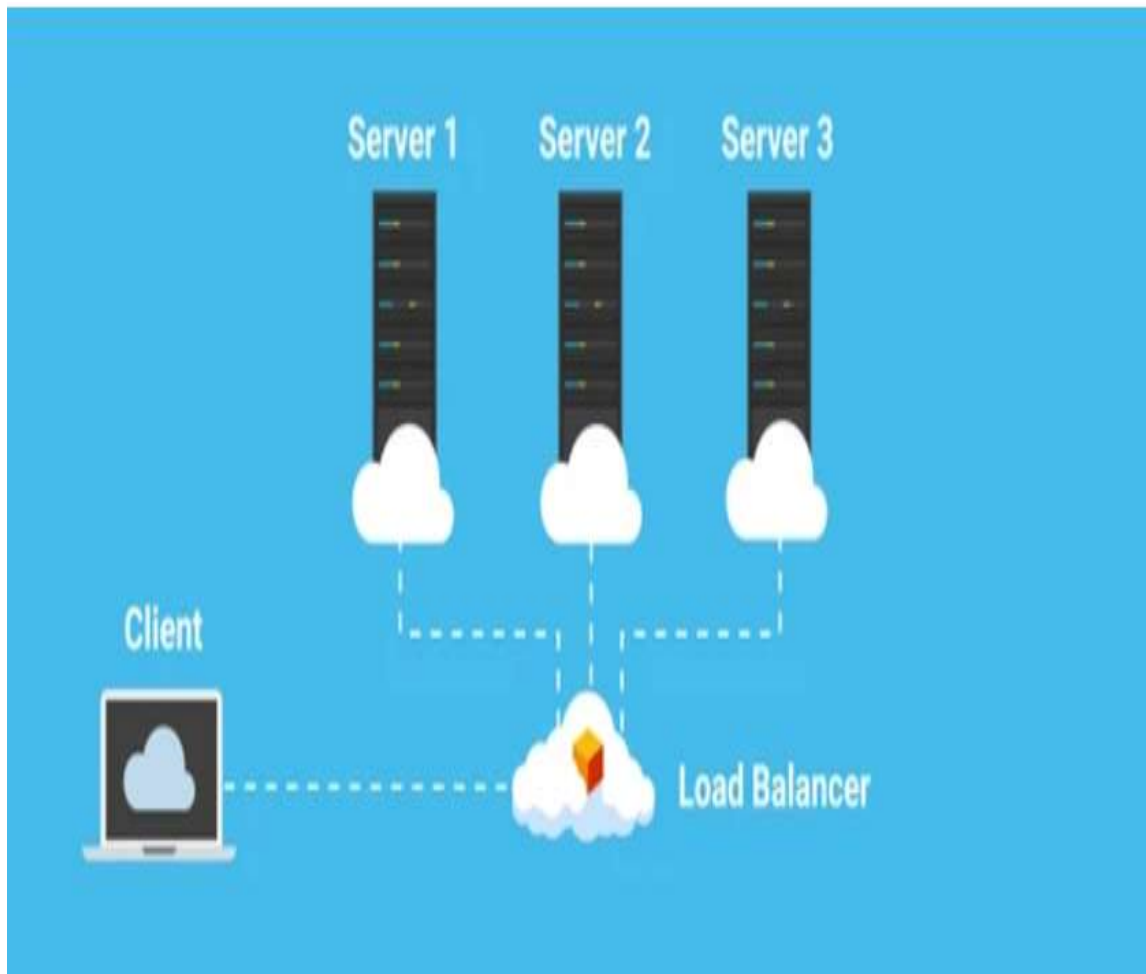
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Learning Outcome 7: Perform Load Balancing



Indicative contents

7.1 Description of Load balancer Installation

7.2 Configuration of Windows Server Load Balancer

7.3 Management of Load Balancing Cluster

Key Competencies for Learning Outcome 7: Perform Load Balancing

Knowledge	Skills	Attitudes
• Description of load balancing concepts. • Identification of methods and technologies.	• Installing load balancing. • Installing NLB server manager feature. • Configuring network load balancing manager. • Managing load balancing cluster	• Being Flexible • Being persistent • Having Adaptability • Having teamwork ability.



Duration: 10hrs



Learning outcome 7 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe correctly load balancing concepts according to server performance.
2. Identify correctly methods and technologies used in load balancing
3. Install correctly load balancing based on server load requirements
4. Install effectively NLB server manager feature based on server load requirement
5. Manage effectively load balancing cluster based on server load requirement.



Resources

Equipment	Tools	Materials
• Projector • Computer • UPS • Router • Switch	• Modem • Route • VMware workstation • Windows server 2016 OS • Windows client OS • Bootable device software • DVD • USD	• Electricity • Cables • Internet •



Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have prepared computer lab with internet connectivity
- Have computer with windows server installed



Indicative content 7.1: Description of load balancer installation



Duration: 4 hrs



Theoretical Activity 7.1.1: Description of load balancer installation



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of load balancer Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

- Define the following terms:
 - Load balancing
 - DNS-based load balancing
 - Hardware load balancer
 - Software load balancer.
- Differentiate the following terms used in function:
 - Layer 4 load balancing
 - Layer 7 load balancing.

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 7.1.1 in their manuals.



Points to Remember

- Load balancing ensures availability, reliability, and scalability.
- DNS-based, hardware, and software load balancers provide diverse methods for distributing traffic.
- Layer 4 load balancing is faster but limited in routing capabilities, while Layer 7 offers intelligent routing with deeper inspection.



Practical Activity 7.1.2: Load balancing installation



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - Avail computer with windows server installed.
 - Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
- i. Go to the computer lab and install load balancing.
- Step 2:** Explain the task and provide clear work instructions.
- Step 3:** Demonstrate how to Install NLB server manager feature and explain all steps.
- Step 4:** Ask trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 7.1.2
- Step 7:** Ask trainees to perform application of learning 7.1



Points to Remember

- While installing load balancing you have to check if server is already installed.
- While performing load balancing you have to understand methods and technologies.
- Do not forget installation prerequisites while selecting server.



Application of learning 7.1

BTEC LTD is a software development company located in Rusizi district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment to install windows server load balancer

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Windows server is well installed	1.1 Windows server OS is Installed		
		1.2 All Prerequisites are verified		
		1.3 Server name is created		
		1.4 The IP address of server is well configured		
		1.5 Time zone is well set		
2	Load balancing is well installed and configured	2.1. Installer file is downloaded or accessed on external drive		
		2.2 Run the Installer		
		2.3 Launch load balancing		



Indicative content 7.2: Configuration of Windows Server Load Balancer



Duration: 5 hrs



Theoretical Activity 7.2.1: Description of load balancing



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of load balancing Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and request trainees to answer to the following questions:

- i. Define the term Load balancing
- ii. What are the types of load balancing
- iii. What are benefits of load balancing.

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 7.2.1 in their manuals.



Points to Remember

- Make Ensure that all servers in the NLB cluster have the same configuration and that the NLB feature is installed on each server.
- Monitor the performance and health of the cluster using the NLB Manager or PowerShell commands for ongoing management.



Practical Activity 7.2.2: Install NLB server manager feature



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
- Avail computer with windows server installed.
- Avail video or images as didactic material



Key steps:

While delivering this activity, pass through the following steps:

- Step 1:** Introduce the topic and ask trainees to do the task described below:
- i. Go to the computer lab and install NLB server manager feature.
- Step 2:** Explain the task and provide clear work instructions.
- Step 3:** Demonstrate how to Install NLB server manager feature and explain all steps.
- Step 4:** Ask trainees to perform the activity of step 3 and monitor the procedures.
- Step 5:** Verify whether the tasks are clearly performed.
- Step 6:** Ask trainees to read key reading 7.1.2
- Step 7:** Ask trainees to perform application of learning 7.1



Points to Remember

- Make Ensure that all servers in the NLB cluster have the same configuration and that the NLB feature is installed on each server.
- After network load balancing (NLB) installation process, verify installation completion.
- Monitor the performance and health of the cluster using the NLB Manager or PowerShell commands for ongoing management.
- While testing NLB enables each host to detect and receive incoming TCP/IP traffic.
- Remember to connect a browser to the cluster IP address, for example: <http://192.168.0.23>.
- Do not forget to refresh the screen multiple times. If the cluster is operating successfully, web pages from different machines in the cluster appear after each refresh.
- Do not forget to set port range and selecting cluster operation mode during configuration of NLB.



Application of learning 7.2

Suppose that your school needs to install and configure load balancing, network load balancing based on windows server as a trainee in networking and Internet Technology you are required for performing this activity as it is required.

All tools, materials and equipment will be provided by the company.

Checklist

SN	Criteria	Indicators	Observation	
			Yes	No
1	Load balancing is well installed	1.1 Environment is well prepared		
		1.2 Network Load Balancing Feature is installed		
		1.3 Add Roles and Features are added		
		1.4 Hostname is assigned		
		1.5 Cluster IP Addresses are assigned		
2	Network load balancing	2.1 New NLB Cluster is Create		
		2.2 Cluster Operation Mode is selected		
		2.3 The Cluster Parameters are Configure		
		2.4 Add Roles and Features are added		
		2.5 Destination server is selected		
		2.6 Priority is setted		
		2.7 Port is selected		



Indicative content 7.3: Management of Load Balancing Cluster



Duration: 1 hr



Theoretical Activity 7.3.1 Description of management of load balancing



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of load balancing Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Introduce the activity and request trainees to answer to the following questions:

i. Define the following term:

- a) Capacity planning
- b) Configuration
- c) Disaster Recovery
- d) Security
- e) Maintenance
- f) Scaling
- g) monitoring

Step 2: Provide the answer for the asked questions and write them on papers.

Step 3: Present the findings/answers to the whole class

Step 4: For more clarification, read the key readings 7.1.3. In addition, ask questions where necessary.

Step 5: Involve trainees in presentation of their findings.

Step 6: Provides expert view and clarifies ideas by using didactic materials.

Step 7: Address any questions or concerns.

Step 8: Ask trainees to read the key reading 7.1.3 in the trainee manual.



Points to Remember

- Configuration
you can effectively configure and manage a load balancing cluster that enhances application performance and reliability.
- capacity planning

It is a crucial aspect of managing a load balancing cluster

- Security

It refers to every aspect of protecting an organization and its employees and assets against cyber threats.

- Maintenance

for load balancing clusters, organizations can ensure high availability, optimal performance, and efficient resource utilization.

- monitoring in a load balancing cluster is vital for maintaining optimal performance and reliability.

- Scaling

It refers to the ability of a system, application, or infrastructure to handle increased loads or demands by adjusting its resources accordingly.



Learning outcome 7 end assessment

Theoretical assessment

I. Multiple choice question: Circle the letter corresponding to the correct

1. What is the primary purpose of load balancing?

- a) Writing JavaScript code
- b) Debugging the application
- c) Load balancing is the process of distributing traffic among multiple servers to improve a service or application's performance and reliability.
- d) Creating a user interface

Answer: c)

2. Read the following statements and choose the right answer?

- a) Software load balancers are applications that can be installed and provisioned on more traditional compute resources like servers.
- b) Software load balancers operate at the application layer of the OSI model, allowing for more sophisticated traffic management compared to Layer 4 load balancing.
- c) Software load balancers are specifically designed to provide the best load balancing based on the task they are intended to address.

Answer: a)

3. Which of the following best defines NLB?

- a) It is a tool used by system administrators to detect when a cyberattack has occurred.
- b) It is a tool used for performing routine maintenance on servers.
- c) It is a Windows Server 2016 feature that is used to distribute network traffic across a cluster of servers.
- d) is a crucial technology used to distribute network traffic across multiple servers, enhancing both availability and scalability.

Answer: d

4. Which of the following best defines Server Manager?

- a) Server Manager is a vital management console in Windows Server, designed to help IT professionals manage both local and remote servers effectively.
- b) Server Manager is a management protocol in Windows Server, designed to help IT professionals manage both local and remote servers effectively.
- c) Server Manager is a Windows Server 2016 feature that is used to distribute network traffic across a cluster of servers.

Answer: a

5. Which is the types of load balancing depends on what you have seen?

- a) Hardware load balancers and Software load balancers
- b) Hyper-v and virtualization

- c) Least Connections and Least Response Time
- d) None of the above.

Answer: a

6. Which of the following is not Methods and technologies of load balancing?

- a) Dhcp
- b) DNS-based load balancing
- c) Hardware load balancer
- d) Software load balancer

Answer: a)

II. Read the following statement related to perform load balancing in column A and B and write the letter corresponding to the correct answer

Answer	Column A	Column B
....B.....	1. is a crucial aspect of managing a load balancing cluster	A. Performance Optimization
....A....	2. Ensures that the load balancing cluster can efficiently handle traffic without delays or downtime.	B. capacity planning
...D....	3. Helps avoid unnecessary expenditures by aligning resource allocation with actual needs.	C. Disaster Recovery
....C.....	4. is an organization's plan to protect its IT systems and data from disasters and recover quickly to minimize downtime and losses.	D. Cost Efficiency:
.....E.....	5. refers to every aspect of protecting an organization and its employees and assets against cyber threats.	E. Security
		F. you can effectively configure and manage a load balancing cluster that enhances application performance and reliability

III. Read the following statement related to perform load balancing and answer True if the statement is correct and False if the statement is wrong

1. Both TCP and UDP are protocols used in installation of Network Load Balancing?

- a) False
- b) True

Answer: b) True

2. In installation of load balancing is it possible to set port range and select cluster operation mode.

- a) True
- b) False

Answer: a) True

3. NLB is not technology used to distribute network traffic across multiple servers, enhancing both availability and scalability.

- a) True
- b) False

Answer: b) False

4. To set cluster operation mode as multicast in installation of load balancing is it possible.

- a) False
- b) True

Answer: b) True

5. While testing NLB enables each host to detect and receive incoming TCP/IP traffic.

- a) True
- b) False

Answer: a) True

Practical assessment

BTEC LTD is a software development company located in Rusizi district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment by installing and configuring the server load balancer, and set all other necessary settings in order to be ready for installation of server load balancer, testing the server.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Windows servers are well installed	1.1 Windows server OS is Installed		
		1.2 All prerequisites are verified		
		1.3 Server name is created		
		1.4 Server File is created		
		1.5 The IP address of server is well configured		
		1.6 Server is running		
		1.7 Time zone is well set		
		1.8 Windows is updated		
2	Load balancing is well installed and configured	2.1 Load balancing is Installed		
		2.2 Load balancing is Installed		



Further information to the trainer

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Learning Outcome 8: Perform Server Maintenance



Indicative contents

8.1 Deployment of Windows Server Update Service

8.2 Configure WSUS

8.3 Perform Server Backup

8.4 Perform Troubleshooting

8.5 Perform Migration

Key Competencies for Learning Outcome 8: Perform Server Maintenance

Knowledge	Skills	Attitudes
● Description of windows server update service ● Description of necessary roles and features	● Installing necessary roles and features. ● Configuring WSUS. ● Performing server backup ● Maintaining troubleshooting ● Maintaining migration	● Having self-motivation during installation. ● Being analytical and details oriented on each step.



Duration: 15 hrs



Learning outcome 8 objectives:

By the end of the learning outcome, the trainees will be able to:

1. Describe properly Windows server update service based on system requirements
2. Identify correctly necessary roles and features based on system requirements.
3. Perform clearly installation of roles and features based on server performance.
4. Perform clearly migration according to the organization needs
5. Perform clearly troubleshooting based on server performance.
6. Perform clearly server backup according to the backup plan.



Resources

Equipment	Tools	Materials
• Projector • Computer • UPS	• Modem • Router • VMware Workstation • Windows server 2016 OS • Windows client OS • Bootable device software • DVD • USB	• Electricity • Cables • Internet

Advance Preparation:

Before delivering this learning outcome, you are recommended to:

- Have prepared computer lab with internet connectivity
- Have computer with windows server installed



Indicative content 8.1: Deployment of Windows Server Update Service



Duration: 4 hrs



Theoretical Activity 8.1.1: Description of Windows server update service



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of windows server update service Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to answer to the following questions:

1. Define the term windows server update service
2. what are the key features of WSUS.
3. How it works.
4. what are benefits of WSUS.

Step 3: Involve trainees in presentation of their findings.

Step 4: Provides expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 8.1.1.



Points to Remember

- While installing roles and feature remember to Open **Server Manager** by clicking the Start button and selecting **Server Manager** from the menu.
- While installing roles and feature remember to check pre-installation requirements by setting strong administrator password and static Ip address.
- Don't forget to select destination server and installation type as main keywords.
- While installing roles and feature remember to select the roles you need (example: DNS, AD and DHCP.)
- While installing roles and feature remember to confirm installation selections by reviewing all selections on the confirmation page.



Practical Activity 8.1.2: Installing the necessary roles and features



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - Avail computer with windows server installed.
 - Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab and install roles and features.

Step2: Explain the task and provide clear work instructions.

Step3: Demonstrate how to Install roles, features and explain all steps.

Step4: Ask trainees to perform the activity of step 3 and monitor the procedures.

Step5: Verify whether the tasks are clearly performed.

Step5: Ask trainees to read key reading 8.1.2

Step7: Ask trainees to perform application of learning 8.1



Points to Remember

- While installing roles and feature remember to Open **Server Manager** by clicking the Start button and selecting **Server Manager** from the menu.
- While installing roles and feature remember to check pre-installation checks
- Don't forget to select destination server and installation type as main keywords
- Don't forget to restart if necessary and verify that the roles and features are functioning as expected by checking their status in Server Manager.



Application of learning 8.1.

XYZ LTD is a software development company located in Muhanga district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment by installing roles and features on the server.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Elements	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
2	Roles and features are well installed	2.1 Web Server (IIS) installed		
		2.2 AD is installed		
		2.3 DNS is installed		
		2.4 DHCP is installed		
		2.5 Completion of Installation		



Indicative content 8.2: Configure WSUS



Duration: 3hrs



Theoretical Activity 8.2.1: Description of WSUS



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of windows server update service Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to answer to the following questions:

1. Define the terms:
 - a. Synchronize updates
 - b. Approve Updates
2. differentiate how to configure client settings and client detection update in windows server
3. how to regularly review and approve new updates on the WSUS server?

Step 1: Involve trainees in presentation of their findings.

Step 2: Provides expert view and clarifies ideas by using didactic materials.

Step 3: Address any questions or concerns.

Step 4: Ask trainees to read the key reading 8.2.1.



Points to Remember

- Don't forget to Open WSUS Console:
- While configuring WSUS remember to navigate to Tools > Windows Server Update Services.
- Remember to Select updates from Microsoft Update or another WSUS server. For a new setup, choose to synchronize from Microsoft Update.



Practical Activity 8.2.2: Configuring WSUS



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - Avail computer with windows server installed.
 - Avail video or images as didactic material.
 - Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab and to configure WSUS.

Step 2: Explain the task and provide clear work instructions.

Step 3: Demonstrate how to **configure WSUS** and explain all steps.

Step 4: Ask trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 8.2.2

Step 7: Ask trainees to perform application of learning 8.2



Points to Remember

- Don't forget to **Open WSUS Console**:
- While configuring WSUS remember to navigate to Tools > Windows Server Update Services.
- Remember to Select updates from Microsoft Update or another WSUS server. For a new setup, choose to synchronize from Microsoft Update.



Application of learning 8.2.

ABC LTD is a software development company located in Kirehe district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment by configuring WSUS.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
2	WSUS is well configured	2.1 DNS is installed		
		2.2 The WSUS Configuration Wizard should start automatically		
		2.3 Completion of Installation		



Indicative content 8.3: Perform server backup



Duration: 3 hrs



Theoretical Activity 8.3.1: Description of server backup



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of server backup Key Concepts.
- Avail sample videos or images to be used as didactic materials.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Involve trainees in group formulation

Step 2: Introduce the activity and request trainees to answer to the following questions:

- Define the terms:
 - Server backup
 - Recovery strategies
- Differentiate types of backups in windows server
- How to secure backup storage

Step 3: Involve trainees in presentation of their findings.

Step 4: Provides expert view and clarifies ideas by using didactic materials.

Step 5: Address any questions or concerns.

Step 6: Ask trainees to read the key reading 8.3.1.



Points to Remember

- Don't forget to **automate backup processes**
- While perform server backup remember to implement backup strategy.
- Remember to Select backup options either local hard drives or cloud storage.
- Schedule backups to run automatically to minimize the risk of forgetting to perform them.
- Regularly test data restores
- Monitor backup status
- Secure and encrypt backups



Practical Activity 8.3.2: performing server backup



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - Avail computer with windows server installed.
 - Avail video or images as didactic material.
 - Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

I. Go to the computer lab to perform server backup.

Step 2: Explain the task and provide clear work instructions.

Step 3: Demonstrate how to **perform server backup** and explain all steps.

Step 4: Ask trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 8.3.2

Step 7: Ask trainees to perform application of learning 8.3



Points to Remember

- While performing server backup remember to open server manager and navigate through the wizard.
- Remember to Select backup configuration recommended as full server or custom.



Application of learning 8.3.

XYZ is a software development company located in Musanze district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment by performing server backup.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Backup configuration is performed		
2	Server backup is well performed	2.1 Backup location is selected.		
		2.2 Destination type is selected		
		2.3 Backup is tested		



Indicative content 8.4: Perform Troubleshooting



Duration: 3 hrs



Theoretical Activity 8.4.1: Description of troubleshooting



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of server backup Key Concepts.
- Avail sample videos or images to be used as didactic materials.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

i. Define the following terms:

- a) Gather information
- b) Troubleshooting

ii. List four (4) Diagnostic Tools used in troubleshooting

iii. Differentiate Check Server Status from Network Connectivity?

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 8.4.1 in their manuals.



Points to Remember

- When perform troubleshooting remember to gather detailed information.
- Don't forget to identify the problem.
- Enable temporarily disconnect or disable unnecessary hardware components to see if they are causing conflicts.
- When perform troubleshooting remember to use rollback recent changes.
- When perform troubleshooting remember to use diagnostic tools.
- While perform troubleshooting remember to use performance monitoring tools to check CPU, memory and disk usage for any anomalies that could indicate underlying issues.



Practical Activity 8.4.2: Performing Server troubleshooting



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - Avail computer with windows server installed.
 - Avail video or images as didactic material.
 - Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

- i. Go to the computer lab and to perform server backup.

Step 2: Explain the task and provide clear work instructions.

Step 3: Demonstrate how to perform server backup and explain all steps.

Step 4: Ask trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

Step 6: Ask trainees to read key reading 8.4.2

Step 7: Ask trainees to perform application of learning 8.4



Points to Remember

- **Step of performing server backup:**
 - Open Server Manager:
 - Navigate through the Wizard and Click Next.
 - Complete Installation:
 - Initiate Backup:
 - Choose Backup Options:
 - Specify Destination Type:
 - Select Backup Destination:
 - Review and Start Backup:
 - Finalize Settings:



Application of learning 8.4.

XYZ is a software development company located in Musanze district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment to perform troubleshooting on server.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Server backup is well performed	1.1 Windows server backup is selected		
		1.2 Backup is initiated		
		1.3 Backup option is choosen		
		1.4 Backup configuration is selected		
		1.5 Backup destination is selected		
		1.6 Server is responding well (i.e does not fail to start)		
		1.7 Backup is well secured		



Indicative content 8.5: Perform Migration



Duration: 2 hrs



Theoretical Activity 8.5.1: Description of migration



Notes to the trainer:

- While delivering this content, a small group can be used for Describing of migration Key Concepts.
- Avail sample videos or images to be used as didactic materials.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the activity and ask trainees to answer the following questions:

i. Define the following terms:

- a) Migration
- b) Timeline
- c) Potential risks

ii. Differentiate FTP for files, and database migration for databases.

iii. How to monitor and validate migration process.

Step 2: Ask trainees to write their answers on papers or flipchart.

Step 3: Ask trainees to present their findings to whole class.

Step 4: Provides expert view and clarifies ideas.

Step 5: Ask trainees to read the Key readings 8.5.1 in their manuals.



Points to Remember

- While performing migration remember to assess your current environment by identifying all servers, their roles, applications and dependencies.
- When performing migration remember to choose a migration strategy by upgrading the existing server to a newer version.
- Don't forget to use migration tools to facilitate data transfer and configuration replication.
- While performing migration remember to prepare migration to ensure that all data is backed up before starting the migration process.
- Remember to monitor migration progress to keep track of migration process to quickly identify and troubleshoot any issues that arise.



Practical Activity 8.5.2: performing migration process



Notes to the trainer

- This activity should take place in a Computer Lab.
- While delivering this content, you are required to:
 - ✓ Avail computer with windows server installed.
 - ✓ Avail video or images as didactic material.
 - ✓ Avail video as didactic material.



Key steps:

While delivering this activity, pass through the following steps:

Step 1: Introduce the topic and ask trainees to do the task described below:

I. Go to the computer lab to perform migration process.

Step 2: Explain the task and provide clear work instructions.

Step 3: Demonstrate how to **perform migration process** and explain all steps.

Step 4: Ask trainees to perform the activity of step 3 and monitor the procedures.

Step 5: Verify whether the tasks are clearly performed.

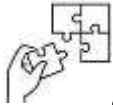
Step 6: Ask trainees to read key reading 8.5.2

Step 7: Ask trainees to perform application of learning 8.5



Points to Remember

- Determine what to migrate
- Check compatibility
- Backup source server
- Gather necessary tools
- Prepare Source and Destination Servers
- Install Windows Server Migration Tools
- Export Data from the Source Server
- Import Data to the Destination Serve
- Verify the Import settings



Application of learning 8.5.

Suppose that your school needs to implement server migration based on windows server as a trainee in networking and Internet Technology you are required for performing server migration based on the requirements of your school.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Migration process is well performed.	1.1 Pre-migration is determined		
		1.2 Compatibility is well checked		
		1.3 Backup source server is selected		
		1.4 Destination server is selected		
		1.5 Data is well imported		



Learning outcome 8 end assessment

Theoretical assessment

I. Multiple choice question: Circle the letter corresponding to the correct

1. What is the primary function of WSUS.?

- a) Writing JavaScript code
- b) Debugging the application
- c) It is a Microsoft tool that enables IT administrators to manage the distribution of updates released by Microsoft to computers in a corporate environment.
- d) Creating a user interface

Answer: c

2. Read the following statements and choose the right answer about centralized management?

- a) centralized management are applications that can be installed and provisioned on more traditional compute resources like servers.
- b) centralized management operate at the application layer of the OSI model, allowing for more sophisticated traffic management compared to Layer 4 load balancing.
- c) centralized management allows administrators to manage the deployment of updates for Windows operating systems, Microsoft Office, and other Microsoft software products from a central server.

Answer: c

3. Which of the following best defines Control over Deployment?

- a) It is a tool used by system administrators to detect when a cyberattack has occurred.
- b) It allows granular control by offering the ability to approve or decline updates, automatically approve certain update types, and schedule installations.
- c) It is a tool used for performing routine maintenance on servers.
- d) It is used to distribute network traffic across a cluster of servers.

Answer: b.

5. Read the following statements and choose the right answer about assess data to be backed up?

- a) Identify critical data, including user files, system configurations, databases, and applications, that need to be backed up to ensure business continuity
- b) Least Connections and Least Response Time
- c) Develop a comprehensive backup and recovery plan outlining the frequency of backups, retention policies, and recovery procedures.

Answer: a

6. Which of the following is not types of backups?

- a) full backups
- b) incremental backup
- c) differential backup

- d) DNS backup
- e) All above

Answer: d

II. Read the following statement related to perform load balancing in column A and B and write the letter corresponding to the correct answer

Answer	Column A	Column B
.....B.....	1. Implement security measures to protect backup data from unauthorized access, tampering, or loss. This may include encryption, access controls, and physical security measures for storage devices.	A. Schedule Backups
.....A....	2. Establish a backup schedule that ensures regular and consistent backups are performed according to the defined backup strategy. For example, you may schedule daily backups during non-business hours to minimize disruption.	B. Secure Backup Storage:
.....D....	3. Maintain detailed documentation of the backup process, including backup schedules, storage locations, and recovery procedures.	C. Regularly review
....C....	4. Periodically review and evaluate the backup strategy to ensure it remains aligned with changing data and server requirements.	D. Documentation of backup
...E...	5. Conduct periodic mock drills to simulate various disaster scenarios and test the effectiveness of the backup and recovery procedures.	E. Periodic mock drills
		F. you can effectively configure and manage a load balancing cluster that enhances application performance and reliability

III. Read the following statement related to perform load balancing and answer True if the statement is correct and False if the statement is wrong

1. Troubleshooting is a systematic approach to problem-solving that is often used to find and correct issues with complex machines, electronics, computers and software systems:

- a) False
- b) True

Answer: b) True

2. Configure Redundant Array of Independent Disks (RAID) arrays is to ensure data redundancy and fault tolerance, enhancing data integrity and availability during the migration process:

- a) True
- b) False

Answer: a) True

3. NLB is NOT technology used to distribute network traffic across multiple servers, enhancing both availability and scalability.

- c) True
- d) False

Answer: b) false

4. These tools (ping, traceroute, and nslookup) are network diagnostic tools?

- a) False
- b) True

Answer: b) true

5.To check server status is to Ensure that the server is operational and responsive by performing and verify that the server is powered on and accessible.

- a) False
- b) True

Answer: b) True

Practical assessment

AXZ LTD is a software development company located in Rubavu district, they want to manage all computers connected to the single server, due to different activities that they have, you are hired as system Administrator who is responsible for setting the working environment by. Perform migration and configure RAIDs.

All tools, materials and equipment will be provided by the company.

Checklist:

SN	Criteria	Indicators	Observation	
			Yes	No
1	Working environments well prepared	1.1 Windows server installed		
		1.2 Basic configuration is configured		
2	RAIDs are well configured	2.1 DNS is installed		
		2.2 The RAIDS Configuration Wizard should start automatically		
		2.3 Completion of Installation		



Further information to the trainer

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