



Republic of Rwanda  
Ministry of Education



RTB | RWANDA  
TVET BOARD

**NITWA401**

## WINDOWS SERVER ADMINISTRATION

### Administer Windows Server

#### Competence

RQF Level: 4

Learning Hours



100

Credits: 10

Sector: ICT and Multimedia

Trade: Networking and Internet Technologies

Module Type: Specific

Curriculum: ICTNIT4001- TVET Certificate IV in networking and internet technologies

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Purpose statement	This module describes the skills, knowledge and attitude required to Administer Windows server. This module is intended to prepare trainees pursuing TVET Level 4 in Networking and internet technologies. At the end of this module the trainees will be able to Prepare Server Environment, Deploy Active Directory Services, Deploy DHCP services, Deploy DNS service, Deploy web services, Deploy FTP services, Perform Load balancing and Perform server maintenance.					
Learning assumed to be in place	▪ Set up WAN					
Delivery modality	Training delivery		100%	Assessment		Total 100%
	Theoretical content		30%	Formative assessment	30%	50%
	Practical work:		70%		70%	
	Group project and presentation	20%				
	Individual project /Work	50%				
			Summative Assessment		50%	

## Elements of Competence and Performance Criteria

Element of competency	Performance criteria
<b>1. Prepare Server Environment</b>	1.1.Server is properly selected based on specifications
	1.2.Server tools and equipment are effectively identified based on server specifications
	1.3. Windows server is properly installed based on Microsoft Standards
<b>2. Deploy Active Directory Services</b>	2.1 Active Directory Domain Services are successfully installed according to Microsoft standards
	2.2 Active Directory is properly configured according to the forest needs
	2.3 Group Policy Objects are efficiently managed in line with Authorization Authentication Accounting (AAA)
	2.4 Mail exchange is properly deployed according to the organization's requirements
	2.5 Client PC is successfully joined to the domain in accordance with ADDS configurations
<b>3. Deploy DHCP services</b>	3.1 DHCP server is properly installed based on Microsoft standards
	3.2 DHCP server is properly configured based on organization requirements
	3.3 DHCP server is properly tested according to the organization's requirements

<b>4. Deploy DNS service</b>	4.1 DNS server is properly installed based on organization requirements
	4.2 DNS server is properly configured based on DNS records
	4.3 DNS server is properly tested according to the domain name functionality
<b>5. Deploy web services</b>	5.1 Web services are properly installed according to the user requirement
	5.2 Web server is properly configured based on user requirement
	5.3 Security access control is properly implemented based on web application requirements
	5.4 Web application is properly deployed based on web hosting infrastructure
	5.5. Web application is properly tested according to its intended use
<b>6. Deploy FTP services</b>	6.1 FTP services are properly installed according to the Microsoft standards
	6.2 FTP server is properly configured based on server requirement
	6.3 FTP server file sharing is properly implemented based on user permissions
<b>7. Perform Load balancing</b>	7.1 Load balancing is properly installed according to server performance
	7.2 Load Balancing manager is properly configured based on the Server Load Requirement

	7.3 Load balancing clusters are effectively managed based on Server Load Requirement
<b>8.Perform server maintenance</b>	8.1 Windows Server Update Service is properly deployed based on system requirements
	8.2 Backup is properly performed according to the backup plan
	8.3 Troubleshooting is accurately performed based on server performance
	8.4 Migration is successfully performed according to the organization needs

### Intended Knowledge, Skills and Attitude

Knowledge	Skills	Attitude
<ul style="list-style-type: none"> <li>✓ Describe windows server concepts</li> <li>✓ Describe Load balancing concepts</li> <li>✓ Describe virtualization concepts</li> <li>✓ Identify Server tools and equipment</li> <li>✓ Describe web servers softwares</li> </ul>	<ul style="list-style-type: none"> <li>✓ Install virtualization software</li> <li>✓ Install windows server OS</li> <li>✓ Configure window server roles and features</li> <li>✓ Deploy Web application</li> <li>✓ Configure Load Balancer</li> <li>✓ Perform server back up</li> <li>✓ Perform server troubleshooting</li> </ul>	<ul style="list-style-type: none"> <li>✓ Flexibility</li> <li>✓ Adaptability</li> <li>✓ Team work</li> <li>✓ Persistence</li> <li>✓ Time management</li> </ul>

## Course content

<b>Learning outcomes</b>	<b>At the end of the module the learner will be able to:</b> <ol style="list-style-type: none"> <li>1. Prepare Server Environment</li> <li>2. Deploy Active Directory Services</li> <li>3. Deploy DHCP services</li> <li>4. Deploy DNS service</li> <li>5. Deploy web services</li> <li>6. Deploy FTP services</li> <li>7. Perform Load balancing</li> <li>8. Perform server maintenance</li> </ol>
<b>Learning outcome 1: Prepare Server Environment</b>	<b>Learning hours: 15</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Selection of windows server</b> <ul style="list-style-type: none"> <li>✓ Definition</li> <li>✓ Key concepts of windows server                             <ul style="list-style-type: none"> <li>✚ Client-side</li> <li>✚ Server-side</li> <li>✚ Hyper-V</li> <li>✚ Server manager</li> <li>✚ Server core</li> </ul> </li> <li>✓ Description of virtualization concepts</li> <li>✓ Types of OS                             <ul style="list-style-type: none"> <li>✚ Standalone(client-side)</li> <li>✚ Network OS(server side)</li> </ul> </li> <li>✓ Server selection criteria</li> </ul> </li> <li>• <b>Identification of Server tools and equipment</b></li> </ul>	

- ✓ Hardware requirement
  - + CPU
  - + RAM
  - + Storage
  - + Rack Enclosures
  - + Uninterruptible Power Supply (UPS)
  - + Form Factor and Rack Space
- ✓ Windows server requirement
  - + Server Management Software
  - + Virtualization Software

- **Installation of Windows server**


- ✓ Prepare Installation Media
- ✓ Selection Installation Type
  - + Physical machine
  - + Virtual machine
- ✓ Configuration of network adapter
  - + Physical Connections
  - + Configure server network settings
  - + Network sharing and Discovery
  - + Firewall and Security
  - + Assign static/Automatic IP Addressing
  - + Test connectivity
- ✓ Updating Server drivers and services
  - + Get the drivers installed
  - + Installation of services

### Resources required for the learning outcome

#### Equipment

- Projector

	<ul style="list-style-type: none"> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Rack</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Windows Server OS</li> <li>▪ Windows client OS</li> <li>▪ VM Software</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Individual and group work</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> <li>▪ Trainer guided</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

<b>Learning outcome 2: Deploy Active Directory Services</b>	<b>Learning hours: 20</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Installation of Active Directory Domain Services</b> <ul style="list-style-type: none"> <li>✓ Definition of key terms</li> <li> Active Directory(AD)</li> </ul> </li> </ul>	



- + Domain Controller (DC)
- + Organizational Unit (OU)
- + Global Catalog (GC)
- + Group Policy Object(GPO)
- + Active Directory Domain Service(ADDS)

✓ Describe active directory concepts

- + Domain
- + Domain Controller (DC)
- + Forest
- + Tree
- + Organizational Units (OUs)
- + Global Catalog (GC)
- + Trust Relationship
- + Group Policy (GPO)
- + User Accounts
- + Computer Accounts
- + Security Groups and Distribution Groups
- + Schema

✓ Perform ADDC installation process

• **Configuration of Active Directory**

- ✓ Description of AD
- ✓ Selection of domain deployment operation
  - + Add a domain controller to an existing domain
  - + Add a new domain to an existing forest
  - + Add a new forest
- ✓ Perform promoting windows server AD to DC processes

• **Joining client Computer to the domain**

- ✓ Add client to the domain

+ Change from workgroup to domain

+ Domain name

+ Administrator username

+ Administrator password

✓ Integrate Client computer to organization network

✓ Test domain for reachability between client over a network

- **Management of GPO**

✓ Description of GPO

+ GPO types(Local, Nonlocal and Starter)

+ GPO hierarchy policies (Local policy, Site policy, Domain policy and OU policy)

✓ Creation Accounts

+ Computer account

+ User account

✓ Sharing networked resources

✓ Administration of objects

✓ User authentication method

+ LDAP

+ RADIUS

- **Deployment of Mail Exchange Server**

✓ Description of mail exchange server

✓ Selection of mail server exchange versions & roles

+ Mailbox (Mailbox Server)

+ Hub Transport Server


+ Edge Transport Server








✓ Apply installation process of mail exchange server

### Resources required for the indicative content

Resources required for the indicative content	
<b>Equipment</b>	<ul style="list-style-type: none"><li>▪ Projector</li><li>▪ Computer</li></ul>









	<ul style="list-style-type: none"> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity,</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> <li>▪ Trainer guided</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

<b>Learning outcome 3: Deploy DHCP services</b>	<b>Learning hours: 10</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Installation of DHCP Services</b> <ul style="list-style-type: none"> <li>✓ Description of DHCP operations</li> <li> Discover</li> </ul> </li> </ul>	

<ul style="list-style-type: none"> <li> Offer</li> <li> Lease</li> <li> Request</li> <li> Acknowledgement</li> <li>✓ Installation of DHCP roles</li> <li>✓ Perform DHCP installation process</li> </ul> <ul style="list-style-type: none"> <li>• <b>Configuration of DHCP</b> <ul style="list-style-type: none"> <li>✓ Enable the DHCP server</li> <li>✓ Scope Configuration <ul style="list-style-type: none"> <li> Set scope name</li> <li> Range of IP address</li> <li> Start DHCP service</li> </ul> </li> </ul> </li> <li>• <b>Testing DHCP Configuration</b> <ul style="list-style-type: none"> <li>✓ Start DHCP Service</li> <li>✓ Check IP address of the DHCP client or Client devices</li> <li>✓ Check IP addresses from the DHCP server</li> </ul> </li> </ul>	
<b>Resources required for the indicative content</b>	
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Projector</li> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ VMware Workstation</li> </ul>

	<ul style="list-style-type: none"> <li>Windows server 2016 OS</li> <li>Windows client OS</li> <li>Bootable device software</li> <li>DVD</li> <li>USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>Demonstration and simulation</li> <li>Practical exercise</li> <li>Individualized</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>Written assessment</li> <li>Performance assessment</li> <li>Product based assessment</li> <li>Project based assessment</li> </ul>

<b>Learning outcome 4: Deploy DNS service</b>	<b>Learning hours: 10</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li><b>Installation of DNS service</b> <ul style="list-style-type: none"> <li>✓ Description of DNS records <ul style="list-style-type: none"> <li>A</li> <li>CNAME</li> <li>MX</li> <li>PTR</li> <li>NS</li> <li>SOA</li> </ul> </li> <li>✓ Description of DNS queries <ul style="list-style-type: none"> <li>Recursive Query</li> <li>Iterative Query</li> <li>Non-Recursive Query</li> </ul> </li> </ul> </li> </ul>	

<ul style="list-style-type: none"> <li> DNS Resolver</li> <li> DNS Root Server</li> <li> Authoritative DNS Server</li> <li>✓ Description of DNS zones and zone files <ul style="list-style-type: none"> <li> Forward lookup zone</li> <li> reverse lookup zone</li> <li> Standard primary zone</li> <li> AD-integrated zone</li> <li> Standard secondary zone</li> </ul> </li> <li>✓ Perform DNS installation process</li> </ul> <ul style="list-style-type: none"> <li>• <b>Configuration of DNS Settings</b> <ul style="list-style-type: none"> <li>✓ Choose a DNS Hosting Provider</li> <li>✓ Public DNS IP addresses (IPv4)</li> <li>✓ Public DNS IP addresses (IPV6)</li> </ul> </li> <li>• <b>Testing of DNS Configuration</b> <ul style="list-style-type: none"> <li>✓ Verify DNS Settings</li> <li>✓ Ping a Domain Name</li> <li>✓ Resolve a Domain Name</li> </ul> </li> </ul>	
<b>Resources required for the indicative content</b>	
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Projector</li> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>

<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> <li>▪ Group discussion</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

<b>Learning outcome 5: Deploy web services</b>	<b>Learning hours: 10</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Installation of web server</b> <ul style="list-style-type: none"> <li>✓ Describing web servers software <ul style="list-style-type: none"> <li>+ Apache Web Server</li> <li>+ IIS</li> <li>+ Nginx Web Server</li> <li>+ LiteSpeed Web Server</li> <li>+ Apache Tomcat</li> </ul> </li> <li>✓ Installation prerequisites <ul style="list-style-type: none"> <li>+ Hardware</li> </ul> </li> </ul> </li> </ul>	


 Software

✓ Perform installation process


- **Configure Web Server (IIS)**

✓ Create real/virtual host

✓ Host website

 Add website

 Site name

 Physical path

 Test connectivity

- **Implement Security access control**

✓ Install SSL and antimalware


✓ Make password uncrackable

✓ Update website


✓ Do regular backup

- **Deploying Web application**

✓ Description of deployment Method

 Manual Deployment

 Version Control

 Containerization

✓ Test the Deployment

- **Test Web application**



✓ Monitoring tools

✓ Maintenance tools

 Security

 Performance



 Scalability  Documentation	
Resources required for the indicative content	
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Projector</li> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ Router</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

**Indicative content**

- **Installation of FTP server**

- ✓ Definition of key terms

- ✚ FTP

- ✚ FileZilla

- ✚ Hosting account

- ✓ Select an FTP client

- ✓ Install FTP client

- ✓ Install FTP services

- **Configure the FTP Server**

- ✓ Root directory for the FTP server

- ✓ Access permissions

- ✚ Read

- ✚ write

- ✚ Execute

- ✓ Configure Passive FTP Mode (Optional)

- ✓ Enable Logging (Optional)

- ✓ Test the FTP Server

- **Implement FTP server file sharing**

- ✓ Choose an FTP Server Software

- ✓ Set Permissions for Shared Directory







- ✓ Test FTP File Sharing

**Resources required for the indicative content**
**Equipment**

- Projector
- Computer

	<ul style="list-style-type: none"> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> <li>▪ Trainer guided</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

<b>Learning outcome 7: Perform Load balancing</b>	<b>Learning hours: 10</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Description of Load balancer installation</b> <ul style="list-style-type: none"> <li>✓ Load balancing concepts</li> <li>✓ Methods and technologies <ul style="list-style-type: none"> <li>+ DNS-based Load Balancing</li> </ul> </li> </ul> </li> </ul>	

<ul style="list-style-type: none"> <li> Hardware Load Balancer</li> <li> Software Load Balancer(Nginx, HAProxy, and Apache mod_proxy)</li> <li> Layer 4 Load Balancing</li> <li> Layer 7 Load Balancing</li> <li>✓ Perform load balancing installation</li> <li>• <b>Configuration of windows server load balancer</b> <ul style="list-style-type: none"> <li>✓ Description of load balancing</li> <li>✓ Install NLB server manager feature</li> <li>✓ Configure Network Load Balancing Manager <ul style="list-style-type: none"> <li> Start the Cluster</li> <li> Test Load Balancing</li> </ul> </li> </ul> </li> <li>• <b>Management of load balancing cluster</b> <ul style="list-style-type: none"> <li>✓ Capacity Planning</li> <li>✓ Configuration</li> <li>✓ Disaster Recovery</li> <li>✓ Security</li> <li>✓ Maintenance</li> <li>✓ Scaling</li> <li>✓ Monitoring</li> </ul> </li> </ul>	
<b>Resources required for the indicative content</b>	
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Projector</li> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ Route</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Practical exercise</li> <li>▪ Individualized</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> <li>▪ Project based assessment</li> </ul>

<b>Learning outcome 8: Perform server maintenance</b>	<b>Learning hours: 15</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Deployment of Windows Server Update Service</b> <ul style="list-style-type: none"> <li>✓ Description of Windows server update service</li> <li>✓ Install the necessary roles and features <ul style="list-style-type: none"> <li>+ Open Server Manager</li> <li>+ Add Roles and Features</li> </ul> </li> <li>✓ Enable the WSUS role</li> </ul> </li> <li>• <b>Configure WSUS</b> <ul style="list-style-type: none"> <li>✓ Synchronize Updates</li> </ul> </li> </ul>	

- ✓ Approve Updates
  - + Configure Client Settings
  - + Client Detection and Update
  - + Regularly review and approve new updates on the WSUS server.
  - + Monitor the health and performance of the WSUS server and its database.
  - + Periodically clean up expired and unneeded updates to save disk space.

- **Perform server backup**

- ✓ Assess data to be backed up
- ✓ Plan the Backup and recovery strategies
- ✓ Backup type
- ✓ Select Backup Location
- ✓ Schedule Backups
- ✓ Secure Backup Storage
- ✓ Test Restorations
- ✓ Documentation of backup
  - + Regularly review
  - + Update backup strategy as your data and server requirements evolve
  - + Periodic mock drills
  - + Produce DRP document

- **Perform troubleshooting**

- ✓ Gather Information
  - + Server hardware specifications,
  - + Software configuration
  - + Logs
  - + Error messages
  - + Recent changes
- ✓ Check Server Status
  - + Verify that the server is up and running

<ul style="list-style-type: none"> <li>✚ Check Resource Utilization(Monitor CPU, memory, disk, and network usage on <b>the server</b>)</li> <li>✓ Verify Network Connectivity <ul style="list-style-type: none"> <li>✚ DNS settings</li> <li>✚ Network configurations</li> </ul> </li> <li>✓ Use Diagnostic Tools <ul style="list-style-type: none"> <li>✚ Utilize network diagnostic tools</li> <li>✚ Performance monitoring tools</li> </ul> </li> <li>✓ Document Findings and Solutions</li> </ul> <ul style="list-style-type: none"> <li>• <b>Perform migration</b> <ul style="list-style-type: none"> <li>✓ Plan and prepare servers and services that need to be migrated <ul style="list-style-type: none"> <li>✚ Timeline</li> <li>✚ Potential risks</li> </ul> </li> <li>✓ Configure RAIDs</li> <li>✓ Perform migration process</li> <li>✓ Data Transfer methods (rsync, scp, or FTP for files, and database migration for databases)</li> <li>✓ Monitoring and Validation</li> </ul> </li> </ul>	
<b>Resources required for the indicative content</b>	
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Projector</li> <li>▪ Computer</li> <li>▪ UPS</li> <li>▪ Router</li> <li>▪ Switch</li> </ul>
<b>Materials</b>	<ul style="list-style-type: none"> <li>▪ Electricity</li> <li>▪ Cables</li> <li>▪ Internet</li> </ul>
<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Windows client OS</li> <li>▪ Bootable device software</li> <li>▪ DVD</li> <li>▪ USB</li> </ul>
<b>Facilitation techniques or Learning activity</b>	<ul style="list-style-type: none"> <li>▪ Demonstration and simulation</li> <li>▪ Individual and group work</li> <li>▪ Practical exercise</li> </ul>
<b>Formative assessment methods /(CAT)</b>	<ul style="list-style-type: none"> <li>▪ Written assessment</li> <li>▪ Performance assessment</li> <li>▪ Product based assessment</li> </ul>

### Integrated/Summative assessment

#### Integrated situation

BCbc TVET is one of TVET Schools in Rwanda and it is located at NYANZA district. The staff and student share files (Assignments, assessments' marks, Notes, ...) through their personal emails. In addition to that, the students' reports are physically issued.

When a staff member leaves the school, all the files sent to his/her email are not possible to be retrieved by the school.

To provide solutions to the stated challenges, The school needs to administer services in a one centralized place whereby file sharing and information access will be easily and efficiently managed.

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

##### 1. File/Folder and Resource Management:

- Create bcbc.local Active Directory Domain with two main groups "Trainees" and "Trainers."



- Create 2 user accounts Trainee1 and Trainer1 as members of the groups and assign each user account to its respective group.

#### 2. Upload Assignment File:

- 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.

#### 3. IP Addressing (Server & Client machines)

- Assign IP addresses to all client’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

#### 4. DNS Configuration

- Configure and map the www.bcbc.ac.rw DNS to the configured web server’s IP address so that trainees and trainers can browse the website from their respective client machines.

#### 5. Website Hosting and Browsing:

- From Windows Server with IIS or another web server software, create and a website with “Student’s marks report” message.

Task should be done in 4 hours

### Resources

<b>Tools</b>	<ul style="list-style-type: none"> <li>▪ Modem</li> <li>▪ Router</li> <li>▪ VMware Workstation</li> <li>▪ Windows server 2016 OS</li> <li>▪ Windows client OS</li> <li>▪ Bootable device software, DVD, USB</li> </ul>
<b>Equipment</b>	<ul style="list-style-type: none"> <li>▪ Computer</li> <li>▪ Network Switch</li> <li>▪ UPS</li> </ul>

	<ul style="list-style-type: none"> <li>Rank</li> </ul>				
<b>Materials/ Consumables</b>	<ul style="list-style-type: none"> <li>Electricity</li> <li>Internet</li> <li>Cables</li> </ul>				
Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
<b>Prepare Server Environment (10%)</b>	Server is properly selected based on specifications	Server is selected			1
	Server tools and equipment are effectively identified based on server specifications	Server tools are identified			1
		Server equipment are identified			1
		Windows server environment is prepared			1
	Windows server is properly installed based on Microsoft Standards	Windows Server installation is prepared			1
		Installation media are prepared			1

		Installation process is performed			1
		network adapter is configured			1
		Server drivers are updated			1
<b>Deploy Active Directory Services (20%)</b>	Active Directory Domain Services are successfully installed according to Microsoft standards	AD is promoted			2
		AD DC installation process is performed			1
		AD DS is installed			
	Active Directory is properly configured according to the forest needs	Domain deployment operations are selected			2
		AD is configured			3
	Group Policy Objects are efficiently managed in line with Authorization Authentication	User authentication method are applied			3
		GPO types are applied			1
		GPOs are managed			2

	Accounting (AAA)				
	Mail exchange is properly deployed according to the organization's requirements	Mail exchange is deployed			3
	Client PC is successfully joined to the domain in accordance with ADDS configurations	Client PC is joined to the domain			2
		Domain reachability is tested			1
<b>Deploy DHCP services (10%)</b>	DHCP server is properly installed based on Microsoft standards	DHCP roles are installed			2
		Installation process is performed			1
		DHCP server is installed			2
	DHCP server is properly configured based on organization requirements	DHCP server is configured			3

	DHCP server is properly tested according to the organization's requirements	Tool are used			1
		DHCP server is tested			1
<b>Deploy DNS service (10%)</b>	DNS server is properly installed based on organization requirements	Installation process are performed			1
		DNS Server is installed			2
	DNS server is properly configured based on DNS records	Configuration process is performed			2
		DNS server is configured			2
	DNS server is properly tested according to the domain name functionality	Tool are used			1
		DNS server is tested			2
<b>Deploy web services (20%)</b>	Web services are properly installed according to the user requirement	Web tools are selected			0.5
		Web features are identified			0.5
		Web services are installed			2

	Web server is properly configured based on user requirement	Configuration process is identified			1
		Web server is configured			1
	Security access control is properly implemented based on web application requirements	Security monitoring is done			0.5
		Security is identified			0.5
		Security access control is implemented			1
	Web application is properly deployed based on web hosting infrastructure	Deployment method is applied			0.5
		Web application is deployed			1
	Web application is properly tested according to its intended use	Testing tools are used			0.5
		Web application is tested			1
	<b>Deploy FTP services (10%)</b>	FTP services are properly	Standards are respected		1

	installed according to the Microsoft standards	Hosting is done			1
	FTP server is properly configured based on server requirement	FTP client and server are installed			1
		FTP services are installed			2
		FTP server is configured			2
	FTP server file sharing is properly implemented based on user permissions	FTP file sharing is implemented			1
		User permissions are identified			1
		FTP server is tested			1
	<b>Perform Load balancing (10%)</b>	Load balancer is properly installed			1
		Methods and techniques are applied			0.5
		DNS load balancer is configured			1

	Load Balancing manager is properly configured based on the Server Load Requirement	Load balancing manager features are selected			1
		Load balancing manager is configured			1.5
		Load balancing manager is tested			1
	Load balancing clusters are effectively managed based on Server Load Requirement	Load balancing clusters are configured			1.5
		Methods are applied			0.5
		Load balancing clusters are managed			1.5
<b>Perform server maintenance (10%)</b>	Windows Server Update Service is properly deployed based on system requirements	Back up monitoring is done			1
		Backup plan is selected			1
		WSUS is deployed			1
	Backup is properly	Diagnostic tools are selected			0.5



	performed according to the backup plan	Back up is performed			1
	Troubleshooting is accurately performed based on server performance	Troubleshooting process is selected			1
		Troubleshooting is performed			1
	Migration is successfully performed according to the organization needs	RAIDs are configured			1
		Data transfer methods are applied			0.5
		Migration is performed			1
		Back up report is generated			1
	Total marks		100		
Percentage Weightage		100%			
Minimum Passing line % (Aggregate):					70%

## References

1. Bigelow, S. J. (2021). 8. Bigelow, S. J., & Gillis, A. S. (2021). What is server virtualization? The ultimate guide. IT Operations.
2. Carpenter, T. P. (2011). 6. Carpenter, T. P. (2011). Microsoft Windows Server Administration Essentials. .
3. Dauti. (2022). . Dauti, B). Windows Server Administration Fundamentals - Third Edition: . dauti.
4. Dauti, B. (-T. (2022). Dauti, B. (2022). Windows Server 2022 Administration Fundamentals - Third Edition: .
5. Dauti, B. (2022). Windows ServerAdministration Fundamentals - Third Edition: .
6. GeeksforGeeks. (2022). 7. GeeksforGeeks. (2022). Types of Server Virtualization in Computer Network. GeeksforGeeks. .
7. Krause, J. (2019). Krause, J. (2019). (Krause, 2019) Mastering Windows Server 2019: The complete guide for IT professionals to install and manage Windows Server 2019 and deploy new capabilities, 2nd Edition. .
8. Krause, J. (2019). Mastering windows server, the complete guide for IT proessioals.
9. Krause, J. (n.d.). Krause, J. (2019). (Krause, 2019) Mastering Windows Server 2019: The complete guide for IT professionals to install and manage Windows Server 2019 and deploy new capabilities, 2nd Edition. .
10. Palmer, M. (-O. ((2017).). 4. Palmer, M. (2017). Hands-On Microsoft Windows Server 2016. Cengage Learning.
11. Perrott. (2019). Perrott, S. (2019). Windows Server 2019 & PowerShell All-in-One For Dummies. John Wiley & Sons.