USAL جامعة العلوم والآداب اللبنانية UNIVERSITY OF SCIENCES & ARTS IN LEBANON	**Faculty of Computer Sciences Dept** **Final Project (Spring 2025)** **SECU316 System and Network Administration**	

Instructor Name: Hisham Yassine **Section:**	**Exam Type: Hands-On** **Allowed Tools: Nothing**	**Booklet Needed:** Choose an item. **Exam Date:15-May-25**
Exam Time: ----		**Grade: ……../100**

System and Network Administration Final Course Project Using GNS3 Simulator

Project Title

Deploying and Securing Network Services: Windows Server & Ubuntu Linux

Objective:

This project aims to provide hands-on experience in deploying, configuring, and securing network services using **GNS3**. You will set up a simulated enterprise network with:

- A **Windows Server** providing **Active Directory (AD) and DHCP** services.
- An **Ubuntu Linux** server providing **Apache Web Server (HTTP/HTTPS) and SSH** services.

You will also configure **firewall rules, VLANs, and basic security policies** to ensure a secure network environment.

Lab Requirements:

1. Software & Tools Needed:

- **GNS3** (Latest version)
- **GNS3 VM** (Recommended for better performance)
- **Windows Server 2019/2022** (ISO or pre-configured VM)
- **Ubuntu Server 22.04 LTS** (ISO or pre-configured VM)
- **Wireshark** (For packet analysis)
- **Putty/SSH Client** (For remote access)

2. Network Topology:

(Present GNS3 topology diagram)

- **1x Router (Cisco IOS or VyOS)**
- **1x Layer 2 Switch (Cisco IOS or GNS3 built-in)**
- **1x Windows Server VM**
- **1x Ubuntu Linux VM**
- **2x End-user PCs (Optional for testing)**

3. IP Addressing Scheme:

Device	Interface	IP Address	Subnet Mask	Gateway
Router (LAN)	Gi0/0	192.168.10.1	255.255.255.0	N/A
Windows Server	NIC	192.168.10.10	255.255.255.0	192.168.10.1
Ubuntu Server	NIC	192.168.10.20	255.255.255.0	192.168.10.1
PC1 (Optional)	NIC	DHCP (from WinSrv)	DHCP	192.168.10.1

Lab Tasks (Step-by-Step):

Part 1: Setting Up the GNS3 Environment

1. **Install GNS3 and Import VMs**
   - Download and install GNS3.
   - Import Windows Server and Ubuntu VMs into GNS3.
   - Configure the VMs with appropriate RAM (2GB+ for Windows, 1GB+ for Ubuntu).
2. **Build the Network Topology**
   - Add a router (Cisco IOS or VyOS).
   - Add a switch and connect all devices.
   - Configure the router with basic IP addressing and NAT if needed.

Part 2: Windows Server Configuration (Active Directory & DHCP)

1. **Install Windows Server & Promote to Domain Controller**
   - Install **Active Directory Domain Services (AD DS)**.
   - Promote the server as a **Domain Controller** (e.g., `corp.local`).
   - Create sample users (e.g., `admin`, `user1`).

2. **Configure DHCP Server**
   - Install the **DHCP Server** role.
   - Create a DHCP scope:
     - Range: `192.168.10.50 - 192.168.10.100`
     - Default Gateway: `192.168.10.1`
     - DNS Server: `192.168.10.10`
3. **Test DHCP from a Client**
   - Connect a test PC and verify it receives an IP via DHCP.

Part 3: Ubuntu Linux Server Configuration (Apache & SSH)

1. **Install & Configure Apache Web Server**
   - Update packages
   - Install Apache
   - Enable HTTPS
2. **Secure SSH Access**
   - Modify `/etc/ssh/sshd_config` with needed configuration
3. **Test Web & SSH Access**
   - From a client, browse to `http://192.168.10.20`.
   - Log in to SSH into the server using specific command.

Part 4: Network Security & Testing

1. **Configure Firewall Rules (Windows & Linux)**
   - **Windows:** Use **Windows Defender Firewall** to block unnecessary ports.
   - **Ubuntu:** Configure `ufw`
2. **Test Security Policies**
   - Try accessing blocked ports (e.g., Telnet).
   - Verify SSH only allows key-based authentication.
3. **Packet Capture**
   - Use Wireshark to analyze DHCP, HTTP, and SSH traffic.

Part 5: Advanced Additions to the Project

1. Multi-VLAN Configuration with Inter-VLAN Routing

Task: Configure two VLANs for Manageable switch and for router (VLAN 10 for servers, VLAN 20 for clients) with inter-VLAN routing.

2. Windows Server: Group Policy Implementation

Task: Create and apply Group Policy Objects (GPOs) for security hardening.

a. Open Group Policy Management

b. Create a new GPO named "Workstation Security Policy"

c. Configure:

- Password Policy: Minimum length 12 characters, complexity enabled
- Account Lockout Policy: 5 invalid attempts, 30-minute lockout
- Disable USB storage devices via Device Installation Restrictions

d. Link the GPO to the appropriate OU

3. Ubuntu Server: Advanced Firewall Configuration

Task: Implement rate limiting and geo-blocking using UFW.

- Install UFW and enable basic rules
- Implement rate limiting for SSH
- Install geoip module for country blocking
- Block traffic from specific countries

4. Network Monitoring with SNMP

Task: Configure SNMP monitoring for both servers.

1. On Windows Server:
   - Install SNMP Service via Server Manager
   - Configure community string (use complex string, not "public")
   - Set allowed management stations
2. On Ubuntu:

5. Web Server Hardening (Ubuntu)

Task: Implement advanced Apache security measures.

1. Install and configure ModSecurity
2. Configure security headers

6. Advanced DHCP Configuration (Windows)

Task: Implement DHCP failover and reservations.

1. Install DHCP on a second Windows Server VM
2. Configure DHCP failover:
   - Right-click the scope in DHCP Manager
   - Select "Configure Failover"
   - Set up load balancing (50/50) with automatic state switching
3. Create reservations for critical devices:
   - Right-click "Reservations" and create new
   - Enter MAC address and desired IP

7. Automated Backup Solution

Task: Implement automated backups for both servers.

1. On Windows:
   - Install Windows Server Backup feature
   - Schedule daily backups to a network share
   - Configure backup of System State and Critical Volumes
2. On Ubuntu: use specific commands

Grading Criteria

Task	Points
GNS3 Topology Setup with VLANs	15
Windows AD, DHCP & GPO Configuration	20
Ubuntu Services & Hardening	20
Network Security Implementation	20
Monitoring & Backup Solutions	15
Testing & Comprehensive Documentation	10
Total	**100**

Deliverables (Submission Requirements):

1. **GNS3 Project File** (.gns3project) with the configured topology.
2. **Screenshots** of:
   - Active Directory Users.
   - DHCP Lease Assignments.

- Apache Default Page.
- Successful SSH Login.

3. **Lab Report** (PDF) containing:
   - Network Diagram.
   - Step-by-Step Configuration.
   - Testing Results & Troubleshooting.

Good Luck