STRUCTURE AND OBJECTIVES

Host System

Hypervisor: KVM/QEMU (Virt-Manager)
Host OS: Arch Linux
CPU: Ryzen 5 7600X
RAM: 32 GB DDR5
Storage: 2 TB NVMe SSD

Virtual Machines

Domain Controller
OS: Windows Server 2022 Standard Evaluation
Disk: 40 GB
RAM: 4 GB
CPU: 2 cores

Windows Client
OS: Windows 11 Enterprise Trial
Disk: 40 GB
RAM: 4 GB
CPU: 2 cores

Linux Client
OS: AlmaLinux (RHEL clone)
Disk: 40 GB
RAM: 4 GB
CPU: 2 cores

Network Configuration

Internal Domain Network (AD-LAN)
Adapter: Internal virtual network
Subnet: 10.10.10.0/24
Domain: lab.local

Domain Controller
IP: 10.10.10.10
Role: DNS, DHCP, AD DS

Clients
IP: DHCP from domain controller

External Network (UPLINK)
Adapter: NAT/bridged via host
Purpose: Internet access for updates and package installs

Objectives

- Deploy Active Directory Domain Services
- Design OU structure
- Create users and groups
- Configure and test GPOs
- Implement DNS and DHCP
- Configure shared drives and permissions
- Test policy propagation

AD Lab 01 - Domain Controller Installation

The objective of this lab was to deploy a basic Active Directory domain environment to serve as the foundation for further infrastructure, GPO, and security exercises.

Characteristics:
• Segregated internal AD network
• Dedicated domain controller
• Local DNS and DHCP services
• File and storage services

SETUP

Initial preparation:

Obtained ISOs from Microsoft Evaluation Programs and AlmaLinux repository
VMs created and resources allocated via **virt-manager** (KVM/QEMU) in Arch host
Initial installation from images

NOTE:
Issue encountered: - TPM module pass-through was causing issues. This functionality is mandatory for the installation of Windows Corporate as well as Server 2022.

Solution: - The issue was resolved by generating a software TPM module for each VM using virt-manager.

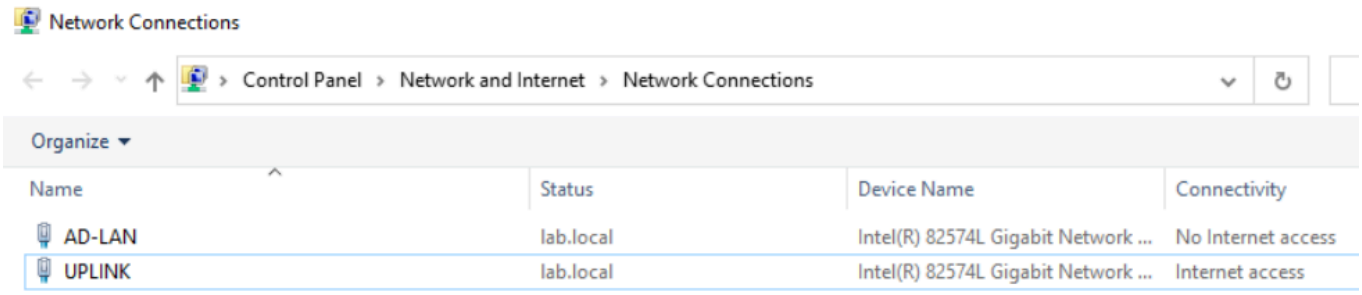
CONFIGURATION

Server 2022:

Configured 2 network adapters:

- AD-LAN: isolated internal network used by the lab.local domain
- UPLINK: bridged adapter used exclusively for internet access, updates, and external connectivity

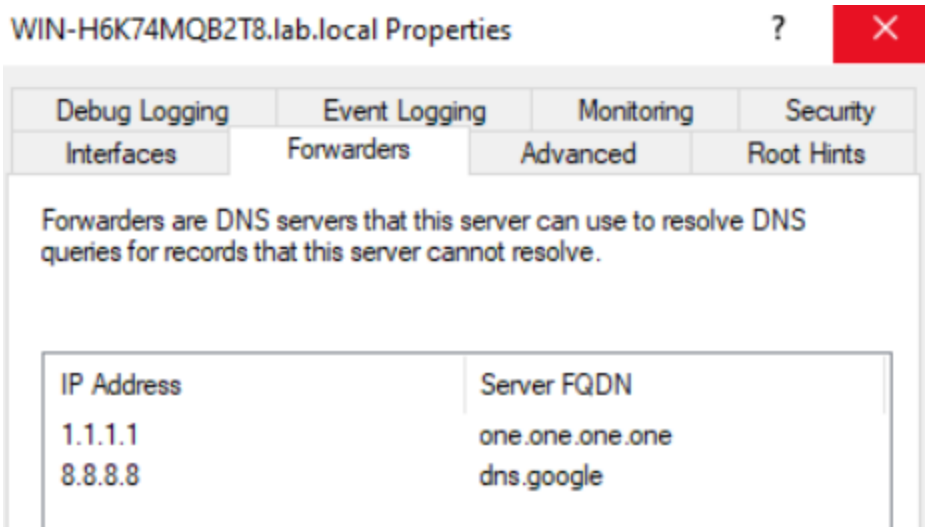
Set domain **lab.local** for AD DS



DNS

Minimal configuration using direct DNS forwarders
(Cloudflare and Google) instead of the virtual router.

- Server 2022 DNS points internally to 127.0.0.1
- 1.1.1.1 and 8.8.8.8 as main and fallback respectively
- Clients are set to point to the DC for DNS - 10.10.10.10



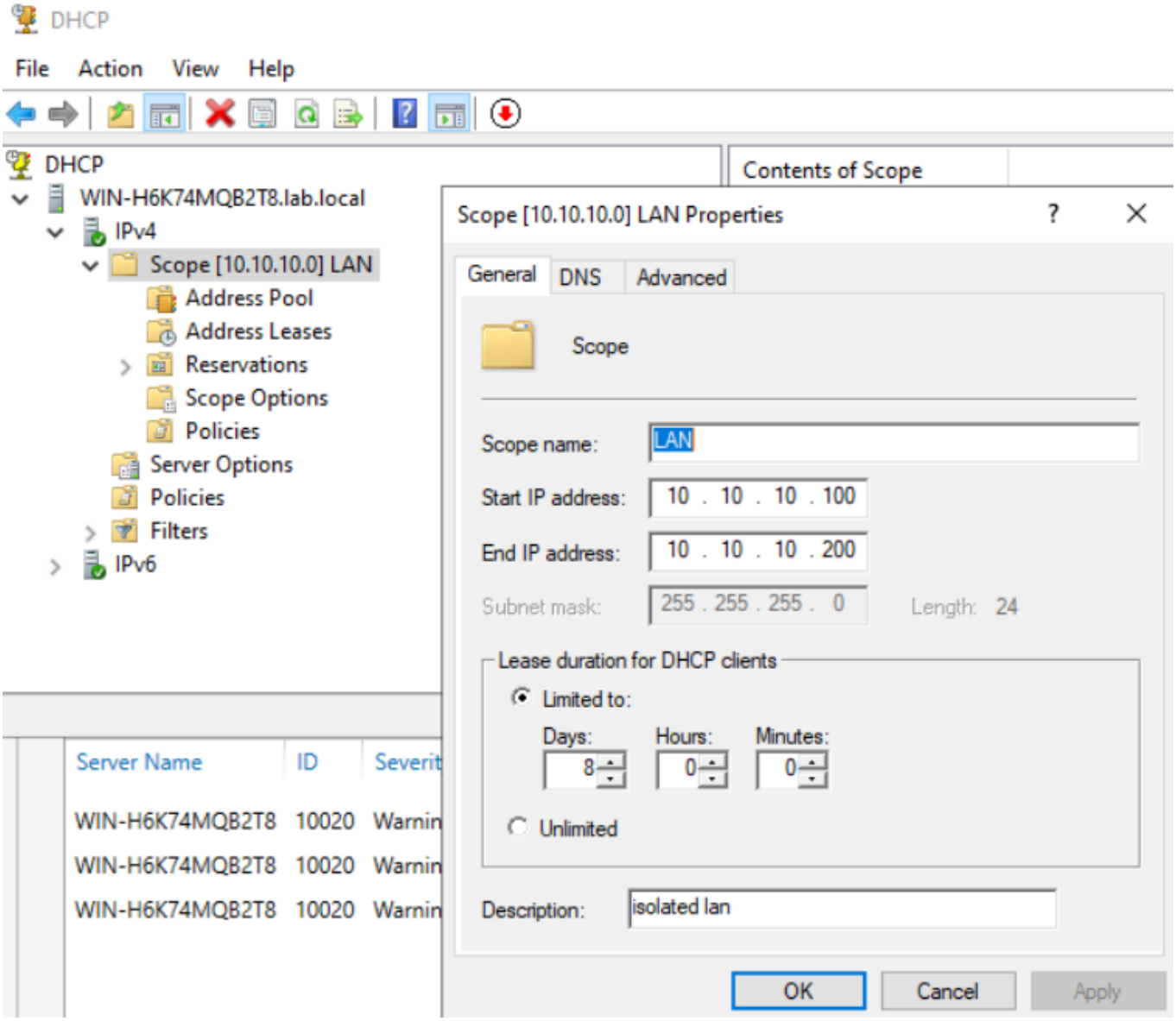
DHCP

A DHCP scope was configured for the internal AD-LAN network.

Scope configuration:
• Network: 10.10.10.0/24
• Address range: 10.10.10.100 – 10.10.10.200

• Lease duration: 8 days
• DNS server: 10.10.10.10 (domain controller)
• Domain name: lab.local

The DHCP service was authorized in Active Directory, and client systems successfully obtained IP leases.



Client connectivity verification

Two client VMs (Windows and Linux) were connected to the AD-LAN network to validate DHCP, DNS, and routing.

Verification results:
• Both clients received IP addresses from DHCP
• Correct gateway and DNS settings applied
• Successful external DNS resolution
• Network connectivity confirmed

```
C:\Users\Xeon>ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : DESKTOP-G60UG3P
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : lab.local

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . : lab.local
   Description . . . . . . . . . . . : Intel(R) 82574L Gigabit Network Connection
   Physical Address. . . . . . . . . : 52-54-00-B7-0A-19
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::7c1c:499e:5dde:bf9d%5(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.10.10.100(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Tuesday, 10 February 2026 11:56:46
   Lease Expires . . . . . . . . . . : Wednesday, 18 February 2026 11:56:45
   Default Gateway . . . . . . . . . : 10.10.10.10
   DHCP Server . . . . . . . . . . . : 10.10.10.10
   DHCPv6 IAID . . . . . . . . . . . : 89281536
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-30-78-79-76-52-54-00-B7-0A-19
   DNS Servers . . . . . . . . . . . : 10.10.10.10
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

```
C:\Users\Xeon>nslookup google.com
Server:  UnKnown
Address:  10.10.10.10

Non-authoritative answer:
Name:    google.com
Addresses:  2a00:1450:400a:1000::65
          2a00:1450:400a:1000::71
          2a00:1450:400a:1000::64
          2a00:1450:400a:1000::66
          74.125.29.100
          74.125.29.102
          74.125.29.139
          74.125.29.113
          74.125.29.101
          74.125.29.138


C:\Users\Xeon>
```

```
xeon@localhost:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 52:54:00:67:ea:ae brd ff:ff:ff:ff:ff:ff
    altname enx52540067eaae
    inet 10.10.10.101/24 brd 10.10.10.255 scope global dynamic noprefixroute enp1s0
       valid_lft 690733sec preferred_lft 690733sec
    inet6 fe80::5054:ff:fe67:eaae/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
xeon@localhost:~$ ping google.com
PING google.com (74.125.29.100) 56(84) bytes of data.
64 bytes from qg-in-f100.1e100.net (74.125.29.100): icmp_seq=1 ttl=111 time=13.9 ms
64 bytes from qg-in-f100.1e100.net (74.125.29.100): icmp_seq=2 ttl=111 time=18.4 ms
64 bytes from qg-in-f100.1e100.net (74.125.29.100): icmp_seq=3 ttl=111 time=14.8 ms
64 bytes from qg-in-f100.1e100.net (74.125.29.100): icmp_seq=4 ttl=111 time=12.9 ms
64 bytes from qg-in-f100.1e100.net (74.125.29.100): icmp_seq=5 ttl=111 time=16.3 ms
^C
--- google.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 6620ms
rtt min/avg/max/mdev = 12.865/15.262/18.369/1.921 ms
xeon@localhost:~$
```

RESULT

A functional Active Directory lab environment was successfully deployed.

Components:
• Domain controller (lab.local)
• DNS and DHCP services
• Segmented internal client network
• Verified client connectivity (Windows and Linux)

The environment is now ready for user, group,
and Group Policy configuration in subsequent labs.