**Description**

Active Directory (AD) is a directory service developed by Microsoft, allowing users to manage and organize users, computers, and other resources on a Windows network. In this lab we will be building a small Windows server in Oracle VirtualBox, a virtualization software used to create and run virtual machines. At the end of this, we will have a working server with 1000+ users.

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**Prerequisites**

* **Windows Server 2019 Installation Media**: Can be obtained on Microsoft’s official website and will be used to set up the domain controller. [Windows Server 2019](https://www.microsoft.com/en-us/evalcenter/download-windows-server-2019)
* **Virtualization Platform**: For a controlled testing environment, platforms like VirtualBox or Hyper-V. [Oracle VirtualBox Download](https://www.oracle.com/virtualization/technologies/vm/downloads/virtualbox-downloads.html)
* **System Requirements**: Ensure your hardware meets the [minimum requirements](https://learn.microsoft.com/en-us/windows-server/get-started/hardware-requirements?tabs=cpu&pivots=windows-server-2019) for Windows Server 2019
* **Create Accounts Script (Optional):** This script will automate the creation of about 1000 users using PowerShell. Created by Josh Madakor ([script](https://github.com/joshmadakor1/AD_PS/archive/master.zip)). Copy the link into the internet explorer of the DC to download it on the DC VM.

**Step 1 (Setting up our domain controller)**:

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1. Creating our domain controller (DC):

* Open virtualization platform and create a new VM
* Allocate appropriate resources (4GB RAM, 50GB storage, can increase CPU cores for faster processing)
* Attach Windows Server ISO to VM
* Go to properties and enable 2nd network adapter for the internal network (see Figure 1)
* Custom install either “desktop experience" Windows version (see Figure 2)

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Figure 1:Enable 2nd Adapter for internal network

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Figure 2: Installing a non-desktop experience only gives us a command line

1. Setting up IP addressing:

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The NIC that is on the internet will use DHCP to assign an IP address automatically. However, we will have to assign the IP address for the internal NIC manually.

* Open up network & internet settings and click on change adapter options (see Figure 3)
* Identify which NIC is the external/internal. The external one will have received packets, and when accessing Network Connection Details, it would also have a “10.” something IP address (see Figure 4). You can rename these accordingly.
* In that same window go to your internal NIC’s properties and change the IP address. Double click “Internet Protocol Version 4” to change IP address (see Figure 5)

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Figure 3: Click on change adapter options to see the two NICs

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Figure 4: In this case, my "Ethernet" NIC is my external

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Figure 5: Setting IP address manually. Following the diagram and addresses provided.

1. Install Active Directory Domain Services and create domain

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* In the server manager, click “Add roles and features” and click next until you get to server roles and install “Active Directory Domain Services” (see Figure 6)
* Promote the server to a domain controller using the “Add new forest” deployment configuration. It can be named whatever you’d like and use any password you’d like. Leave the rest default and install (see Figures 7 and 8)
* After logging in again, you can create a new admin user instead of the built-in admin account. Search for “Active Directory Users and Computers” and in your domain, create a new organizational unit (can be done under Action-New-Organizational Unit dropdown) for Admins. (see Figure 9)
* In new OU create new user and name it whatever and use a conventional naming convention for logon name (e.g. a-firstintiallastname) (see Figure 10). Now make this new account an admin by adding it to a new member of “Domain Admins” in the account properties (see Figure 11). Login to new account (see Figure 12)

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Figure 6: Install Active Directory Domain Services

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Figure 7: Click on the flag and promote server to a domain controller

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Figure 8: Deploying new domain

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Figure 9: New OU for Admins

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Figure 10: Create new user

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Figure 11: Add new account to admins

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Figure 12: Login to new account

1. Installing Remote Access Server and Network Address Translation

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This will enable our clients to access the internet via the domain controller while being on a private virtual network.

* First, we’re going to install Remote Access in server roles. This is done exactly like how we installed AD DS, but we will be choosing “Remote Access” this time (see Figure 13). Add Routing and DirectAccess and VPN (RAS) to the Remote Access role services when prompted. Everything else defaults
* After installing remote access we must configure NAT and that is done using the “Routing and Remote Access” tool (see Figure 14). Now in the Routing and Remote Access Server Setup Wizard choose NAT as the configuration and choose your external NIC that connects to the internet (see Figures 15 and 16). If the top option is grayed out when choosing a public interface, restart the wizard (Figure 16).

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Figure 13: Install remote access and add Routing and DirectAccess and VPN (RAS) to role services for Remote Access when prompted

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Figure 14: Open Routing and Remote Access menu to configure NAT

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Figure 15:Choose NAT

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Figure 16: Pick your external NIC used to access the internet

1. Setting up DHCP

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Allows our clients to get an IP address from the DC and browse the Internet. The scope is the range of IP addresses that will be given

* Add DHCP Server role to the server, same steps as when we installed AD DS and RAS, click next to all and install (see Figure 17)
* Access DHCP control panel in the tools section of the Server Manager (see Figure 18)
* Create a new scope and name it; the name can be anything, but in this lab, we’re going to name it after the scope (see Figure 19). Define the range in the Wizard (see Figure 20).
* Click Yes until you get to the Router (Default Gateway) window. We do not want to exclude any IP addresses in this lab, and with this being a lab, Lease Duration does not matter. Lease Duration is the time a computer can have the IP address before it has to be refreshed, this duration depends on your use case.
* Add the IP address 172.16.0.1 as our default gateway. This will then route the request of the client to our DC allowing them access to the Internet. Do not forget to click add (see Figure 21). Then click through the Wizard until finished
* Right click the DC, authorize and refresh it

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Figure 17: Install DHCP Server

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Figure 18:DHCP control

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Figure 19: Create new scope then name it

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Figure 20: Define range and subnet mask

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Figure 21: Add gateway

**Optional Step (Creating users with Script):**

* Paste the link of the script into Internet Explorer on the DC VM and save it on the desktop, then extract the folder AD\_PS-master to desktop (see Figure 22).
* You can add your name to the top of the “names” text file so that an account can also be created for you (see Figure 23).
* Run Windows PowerShell ISE as an administrator
* Click file-open and open up the “1\_CREATE\_USERS.ps1” script found in the folder of AD\_PS-master.
* For this script to run and for lab purposes, we’re going to set the execution policy to unrestricted (see Figure 24)
* Change directory to where the script is located (e.g. C:\users\a-pchau\Desktop\AD\_PS-master) (see Figure 25). Check that you are is the right directory using “ls”, this should show that the “names” text file and the PowerShell script are there. If you see AD\_PS-master only, then change directory to (C:\users\a-pchau\Desktop\AD\_PS-master\AD\_PS-master\AD\_PS-master\AD\_PS-master\ AD\_PS-master) and it should work. Of course, replacing “a-pchau” with the account you’re logged into. (see Figure 26)
* Run the script
* Check results of the script in Active Directory Users and Computers in the (see Figure 27)

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Figure 22: Save script on desktop then extract

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Figure 23: Add your name

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Figure 24: Set Execution policy to unrestricted



Figure 25: Change directory to where the script is before running

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Figure 26: This should be the result of "ls" command

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Figure 27:Result of the Script

**Step 2 (Setting up client):**

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1. Creating a new client

* Open virtualization platform and create a new VM
* Allocate appropriate resources (4GB RAM, 50GB storage, can increase CPU cores for faster processing)
* Attach Windows 10 ISO to VM
* Go to properties and change the network adapter to internal network (see Figure 28)
* Launch and Custom install “Windows 10 Pro" without a product key
* Finish setting up windows, skip unnecessary things. Use the username “user” and click next on password
* Check if the internet is working using the command prompt. Use command “ipconfig” to check that the computer is given an IP address in the scope we defined and that the default gateway is the IP address of the DC. Then ping a website like [www.google.com](http://www.google.com). (see Figure 29)
* Rename the PC and join the domain. In System setting navigate to “about” section and click on “Rename this PC (advanced)” then click “Change” top rename computer and change the name and add it to a member of your domain (see Figure 30), You can use the login of the domain admin account you created to confirm changes or your normal account created by the script.

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Figure 28: Change to Internal Network

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Figure 29: Check that internet works

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Figure 30: Changing computer name and joining domain at the same time