Introduction

Saturday, May 21, 2022 7:16 PM

This project was started out of a desire to obtain system administration experience from my computer at home. After searching around on the internet for a path to jumpstart my career into IT as a system admin, I stumbled upon a reddit forum for building a testing environment at home. The testing environment sounded like an amazing idea considering it would give me hands on experience while being gated by not having a job in the field. My goal with this home lab is to gain a solid understanding of the tools/concepts a System Administrator deals with on a daily basis. So my journey starts here, on the road to a System Administrator.

The idea behind documenting this process is to first, reiterate the process step by step for better retention. Following the steps to configure and manage this project is not enough, it is crucial for myself to create documentation to map out the journey. Second, it is to illustrate my journey for others to follow for themselves or expand upon.

Planning

Saturday, May 21, 2022 7:41 PM

Key:
RED = Not Learned
YELLOW = Learning In Progress
GREEN = Learned

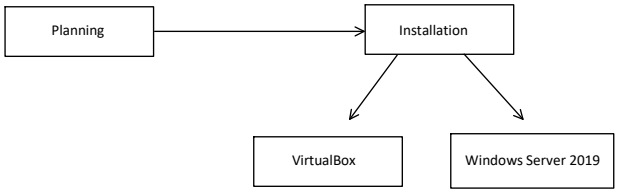
Concepts & Tools to learn:

- [x] Virtual Machines
- [x] Windows Server 2019
- [x] Domains and Domain Controller
- [ ] TCP/IP
- [x] DHCP
- [ ] Print Servers
- [ ] Group Policy
- [x] DNS
- [x] Active Directory
- [x] PowerShell
- [ ] Backups and Restores
- [ ] Windows Deployment Services
- [x] Windows Software Update Services
- [ ] Disk Management
- [ ] Subnets
- [ ] Firewall Configuration
- [ ] Failover Clustering

Bonus:

- [ ] Cloud Migration to Azure
- [ ] Azure Active Directory
- [ ] Azure Group Policy

Mind Map:



Installation/Setup

Saturday, May 21, 2022 8:36 PM

Installing VirtualBox and Creating Virtual Machine

1. Navigated to the VirtualBox website and downloaded the platform package for Windows hosts

2. Installed VirtualBox with default settings
   - Install location: Used the default installation location which was "Program Files" on my M.2 drive. This was satisfactory as I have the most space on this drive and the speed of this drive outperforms my other drives.

3. Navigated to the Microsoft Evaluation Center website and downloaded Windows Server 2019 and Windows 10 iso file.
   - Renamed the iso file to "WS2019" for ease of access

4. Created a new Virtual Machine
   - Routed the Machine Folder to a new folder rather than the default
   - Set the type to "Microsoft Windows"
   - Set the version to "Other Windows 64-bit"
     - Could not find the 64-bit option at first. Went into my BIOS and found out that Intel Virtualization Technology was disabled. Enabling this option exposed the 64-bit selection.
   - ~~Allocated 4096 MB of RAM (4GB)~~
   - Changed My allocation to 2048 MB of RAM (2GB) so I could run more virtual machines
   - Created a Virtual Hard Disk upon VM creation
     - Set the disk file type to VDI (VirtualBox Disk Image)
     - Set the storage to be dynamically allocated
     - Set the file storage size to 60 GB

Starting the Virtual Machine and Virtually Installing Windows Server 2019 through Windows Setup

1. Started up the newly created Virtual Machine and selected the Windows Server 2019 iso file as the virtual optical disk file

2. Selected English as the language and the US as the time and keyboard format/method

3. Selected the "Windows Server 2019 Standard (Desktop Experience)" operating system to install
   - This allows me to use the GUI environment rather than just CMD, PowerShell, and Windows Admin tools

4. Chose a custom installation to the 60 GB Drive allocated to the VM

Configuring the OS

1. Set the Password for the Administator account
   - Password: BruceL33BTC!

2. Log Into OS
   - Could not press Ctrl+Alt+Del to log in. Had to figure out the keybinds for inserting this command into the VM

Changes:

In the VirtualBox settings for the HomeLab Virtual Machine, I went into the Network settings and created another Adapter (Adapter 2) that will be attached to the internal network. This caused the DNS server to change for the network connection that we made Static before. I went in and added the DNS server address back in.

I then renamed this network to "_INTERNET_" and renamed the internal network to "_INTERNALxNET_".

Added VirtualBox Guest Additions by clicking the option when the VM was running. Opened the mounted disk image in file explorer in the VM and ran the VBOXWindowsAdditions-amd64 application. This speeds up the VM and adds more Quality of Life features.

I turned off "IE Enhanced Security Configuration" so the "are you sure you want to load this page" notifications stop popping up when browsing the internet. However this is something I would keep on during a production environment.

Configuration

Monday, May 23, 2022 2:32 AM

Setup Windows Server and Windows Domain

What is a Windows Domain?

- It is a logical grouping of computers or simply a Network of Computers where…
- User accounts, computers, resources and the security for all of those things are stored and defined on one or more servers called Domain Controllers
- Users and computers are authenticated via the Domain Controllers
- Permissions to resources are granted based on users and groups

A Windows Server with a Windows Domain allows for the server to be a Domain Controller giving you the above capabilities.

1. Open Server Manager and view the Dashboard
2. Quick Start should be visible with the options to setup the server
3. First click the "Configure this local server" option
   - Renamed the computer to "HomeLabServer" and restarted the server for changes to take effect
   - Checked for updates using Windows Update manager and proceeded to install those updates.
     - Updates Installed:
       - Windows Malicious Software Removal Tool x64 - V5.101(KB890830)
       - 2022-05 Cumulative Update for .NET Framework 3.5, 4.7.2 and 4.8 for Windows Server 2019 for x64 (KB5013868)
       - 2022-05 Cumulative Update for Windows Server 2019 (1809) for x64-based Systems (KB5013941)
       - 2022-02 Cumulative Update Preview for .NET Framework 3.5, 4.7.2 and 4.8 for Windows Server 2019 for x64 (KB5011267)
       - Windows Malicious Software Removal Tool x64 - v5.98 (KB890830)
       - Update for Removal of Adobe Flash Player for Windows Server 2019 for x64-based systems (KB4577586)
   - Restarted Server for updated to take effect.
4. Set the Time Zone to my respective Time Zone.
   - Navigated to the Internet Time tab to synchronize the time zone to a domain. The domain I chose was time.nist.gov
5. Verified that Windows Defender has Real-Time Protection On
6. Verified Windows Defender Firewall is On
   - Note: I am currently using the public network profile. I believe this is because my current network is not a private network
7. Remote Management is currently enabled
8. Remote Desktop is currently disabled
9. NIC Teaming is disabled

In order for this server to become a Domain Controller, we have to make it so that the IP does not change. This means we have to set the IP to a static IP rather than a dynamic IP.

1. Click the current configuration for Ethernet in the server properties
2. Right click the Network Connection
   - There is currently only one, as this is the default VirtualBox has setup
3. Click "Status"
4. The Ethernet status is now displayed. Click "Details" to view the Network Details that the built in DHCP server in VirtualBox sets
   - IPV4: 10.0.2.15
   - IPV4 Default Gateway: 10.0.2.2
   - IPV4 DNS Server: 9.9.9.9
5. Close the Network Details window and navigate back to the Status window. Click Properties and then open "Internet Protocol Version 4 (TCP/IPv4)"
   - Proceed to set a manual IP from the above details.
     - IP address: 10.0.2.15
     - Subnet mask: 255.255.255.0
     - Default Gateway: 10.0.2.2
     - Preferred DNS Server: 9.9.9.9
     - Alternate DNS Server: I left this blank
   - I did not check the box "Validate settings upon exit"
6. The basic settings are now set for the server to allow it to become a Domain Controller
   - Ethernet in the Server Properties now shows the current IP.

Now that the settings enabling the server to be a Domain Controller are set. I then proceed to Add roles and other Features using the QuickStart link in the Server Manager Dashboard.

Note: Before adding roles and features, it is required that the Administrator password is strong, the network settings are configured for a Domain Controller (Static IP enabled), and Windows has the most recent security updated installed.

1. Click the "Add roles and features" option in the Server Manager Dashboard
2. The "Add Roles and Features Wizard" pops up. The goal is to use Active Directory and Domain Services, so click next and make sure "Role-based or feature-based installation" is selected.
3. I selected my server from the server pool
   - If there are other servers in the server pool. It's possible to install roles to those as well, however we currently only have 1 setup.
4. I noticed there are quite a few Roles from the Planning Section of this documentation that I could add. For now I just added the "Active Directory Domain Services" role
5. In the Features section, I added Group Policy Management
6. After Clicking next, I decided to go back to Server Roles and add the "DNS Server" role.
7. I then installed the roles and features. After installation I clicked the option "Promote this server to a domain controller"

After adding the secondary adapter in the VM and making it attach to the internal network, I went into the network settings and set the IP for this network.

- IPV4: 172.16.0.1
- Subnet Mask: 255.255.255.0
- Default Gateway: This is left blank as it uses the Domain Controller as the default gateway
- Preferred DNS server: 127.0.0.1
  - This is the loopback address. That means 127.0.0.1 loops back to its own IP address, which is 172.16.0.1. This means the server will use itself as a DNS server

To promote the server to a domain controller, we first need to create a forest. A forest is a group of domains where there are multiple domain controllers controlling those domains.

1. After clicking the "Promote this Server to a domain controller" option, the ADDS config wizard pops up. I then checked "Add a new forest"
    - I used the domain name "homelab.local"
        - When creating a domain name here, we want to avoid anything that is an internet resource because when this domain name is accessed on a computer, the computer will assume the resource is in the domain. This means if I chose youtube.com as the domain name, the computers accessing this resource would not be able to access the website youtube.com.
2. The Domain Controller Options are now displayed. I went with the default options.
    - Having Windows Server 2019, the "Forest functional level" and "Domain functional level" default to Windows Server 2016.
    - The controller capabilities chosen were Domain Name System server, basically makes sure this is a DNS server, and a GC (Global Catalog) which is a record of all resources on the domain controller that is advertised to each computer based on their permissions. Being the first Domain Controller setup, it is required that this is a GC.
    - Since this is the first Domain Controller, it is not suitable for it to be a RODC (Read only Domain Controller) as it needs to have write permissions.
    - I then set the DSRM password. This is used to recover Directory Services in case of a disaster.
        - DSRM password: WiseOldMan!
    - I noticed I received a warning stating "A delegation for this DNS server cannot be created because the authoritative parent zone cannot be found or it does not run Windows DNS server". I ignored this and did not create a DNS delegation. I proceeded through the config wizard.
3. A NetBOIS default name of "HOMELAB" was created.
4. It is now required to specify the path for the Active Directory Domain Services Database, log files, and SYSVOL folder.
    - I had chosen the default paths:
        - Database folder: C:\Windows\NTDS
        - Log files folder: C:\Windows\NTDS
        - SYSVOL folder: C\Windows\SYSVOL
5. I then opened the auto generated PowerShell script that can be ran as an automated way to configure these settings. I saved this script to the desktop.
6. After looking at the prerequisite checklist, I was given 2 warnings.
    - Warning 1: This is a warning about allowing cryptography compatibility with older windows systems. This could be a potential security issue. I ignored it for now.
    - Warning 2: This is the same warning earlier about DNS server delegation. I ignored it once again.

After restarting, the Server is now a Primary Domain Controller on the HOMELAB domain.
I now noticed that my Administrator account is preceded by the HOMELAB domain when logging in.
After logging in and opening Server Manager, the dashboard now shows AD DS and DNS roles.

Working with Active Directory

Monday, May 23, 2022 11:07 PM

Structuring and Configuring Active Directory

What is Active Directory?

It is considered the foundation of the Windows Domain. It is also considered a catalogue of all the registered objects in the domain. It also provides authentication and security principles that allow users and computers to access the resources they have been granted permissions to.

Now it's time to structure the Active Directory Users and Computers.

Since this will be for a home lab and not an company, I need to reflect that in the structure of my users and computers.

1. I started by creating a separate account for myself instead of the built in administrator account Windows Server provides. I did this by navigating to Server Manager -> Tools Dropdown Menu -> Active Directory Users and Computers
2. Under the domain homelab.local, I created an (OU) Organizational Unit named "_ADMINS". This will house the administators
3. I then added a user in this OU
    - First Name: Tristan
    - Last Name: Marcus
    - Full Name: Tristan Marcus
    - User logon name: a-tmarcus
    - Password: BruceL33BTC!
    - I unchecked "User must change password at next logon"
    - I checked "password never expires"
        - The two above options should be reconsidered, however this is a homelab just for testing purposes so I removed these for convenience.
4. Updated this user to a Domain Admin by right clicking the user, clicking properties, and then Choosing the tab Member Of. Inside this tab I clicked Add… and entered the object "domain admins" and then clicked Check Names. Domain Admins was then added and I clicked okay. My user is now an admin.
5. I then proceeded to sign out of the built in admin account and signed into my new user.

Adding Internet Access to Clients through the Domain Controller using DHCP

Monday, May 23, 2022 11:20 PM

Setting Up DHCP Server

I needed a way for internet to be accessed through the DC. This meant I needed to install RAS/NAT functionality.

1. I opened Server manager and clicked Add roles and features.
2. I chose to add Remote Access
3. Then I added the role service "Routing". By default "DirectAccess and VPN (RAS)" was added as well. I then proceeded to install the role.

The next step is to configure and enable routing and remote access on the domain.

1. In the server manager I click the Tools dropdown menu and then click Routing and Remote Access.
2. Right click the "HOMELABSERVER" domain and run the routing and remote access configuration wizard.

Since we want to allow internal clients to connect to the internet using the Domain Controller, we choose the NAT configuration. If you wanted remote clients and local clients to be able to use the internet through the Domain Controller, we would choose VPN and NAT. There are other options here for other configurations as well.

3. Choose the NAT option (Network Address Translation).
4. Then I chose the "_INTERNET_" network as the option to be used to connect to the internet.

Now we need to set up a DHCP server on the Domain Controller for the clients to obtain and IP address for accessing the internet

1. Install DHCP Server in the roles and features wizard.
2. Opened the DHCP tool and under the homelabserver.homelab.local domain, I right clicked IPV4 and created a new scope.
    - Name: 172.16.0.100-200
        - For the name I just set this to the IP ranges
3. The Start IP address would be 172.16.0.100 and the End IP address would be 172.16.0.200
4. For the Length I set this to 24 and the Subnet Mask was automatically set to 255.255.255.0
5. There is then an option for exclusions to leave out IP addresses within the ranges set. I left this blank as I don't need to exclude any addresses.
6. For the lease duration, I set this to 3 days. At my current job, the lease duration is 8 hours considering this is an average shift time but for a home server I don't mind allowing an IP to be taken for 7

days, however with the way I use the internet, I would like my clients to reset every 3 days.

7. Then I proceeded to configure the DHCP options
    - The router will be the IP the client uses to forward packets from the client to the internet through the Domain Controller. That means we will set the router IP to the Domain Controller's IP
        - Router (Default Gateway) IP address: 172.16.0.1
8. I skipped WINS servers configuration
9. Then I proceeded to run the scope and authorize the DHCP server. After refreshing, the IPV4 and IPV6 were configured

Client Setup

Thursday, May 26, 2022 3:48 AM

Generating Users for Client use

The goal for this homelab is to simulate a live server. This means I'll need to create users to simulate clients. I found a powershell script online that generates 1000 users using a for loop and some basic string parsing from a text file that has 1000 first & last name combinations.

1. I opened the powershell script in PowerShell ISE however in order to run this script I have to set the execution policy of scripts to Unrestricted
    - Set-ExecutionPolicy Unrestricted. This is not something I would do in a live production server as keeping this on will prevent the possibility of running a PowerShell that is not allowed.
2. I then navigate to the folder with names.txt and run the script.

There are now 1000 users in Active Directory under the _USERS organizational unit

Creating a Client Virtual Machine and Setting up the OS

1. In VirtualBox I created a new VM using Windows 10 to act as a client with the following settings:
    - 2048 MB of RAM (2 GB)
    - 50 GB of Storage dynamically allocated to a VDI
    - Changed the CPU core allowance to 4
    - The Network adapter was attached to the Internal Network rather than NAT
2. After running the client, I made to choose the Windows 10 ISO to launch with and proceeded to install Windows 10.
    - I chose a very limited setup with none of the Microsoft features turned on, no cortana, and no password.
3. Now to check if this client is connected to the server, I opened the CMD and typed in ipconfig. This showed me that the client was connected as the DNS suffix was homelab.local, the IP was 172.16.0.100, and the default gateway was 172.16.0.1 which is the Domain Controller's IP!
4. Next I renamed the PC and added it to the domain by navigating to system properties and clicking "Change"
    - I changed the name of the computer to CLIENT1
5. I then attempted to add the computer to the domain
    - Under Member Of, I typed in "homelab.local" however I was getting an error that stated the domain name did not exist. I knew that the domain was reachable because I had pinged it and it responded.
    - I then navigated to the Ethernet properties of the client and went to configure the IPV4 DNS settings. I added a DNS server address (homelab.local IP which is 172.16.0.1). This required a client restart. After doing this the error was resolved and I was able to log into an Active Directory user
    - I logged into my non admin account, logged out and logged into another account. The Client

is now routed through the Domain Controller