WHITEPAPER

A logo for a company

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Creating a Virtual Windows Server environment using VMWare with additions of AD DS, FSRM, DHCP, DNS, and Client virtual machine.

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Executive Summary

This whitepaper gives a deep overview of creating a Windows server environment while using VMWare software. This paper explains the setup and how to integrate Active Directory Domain Services (AD DS), File Server Resource Manager (FSRM), Dynamic Host Configuration Protocol (DHCP), and Domain Name System (DNS) into the server. It also explains how to create and configure a Windows client server. This paper will give instructions on what requirements are needed, and how this will apply in real-world environments.

Introduction

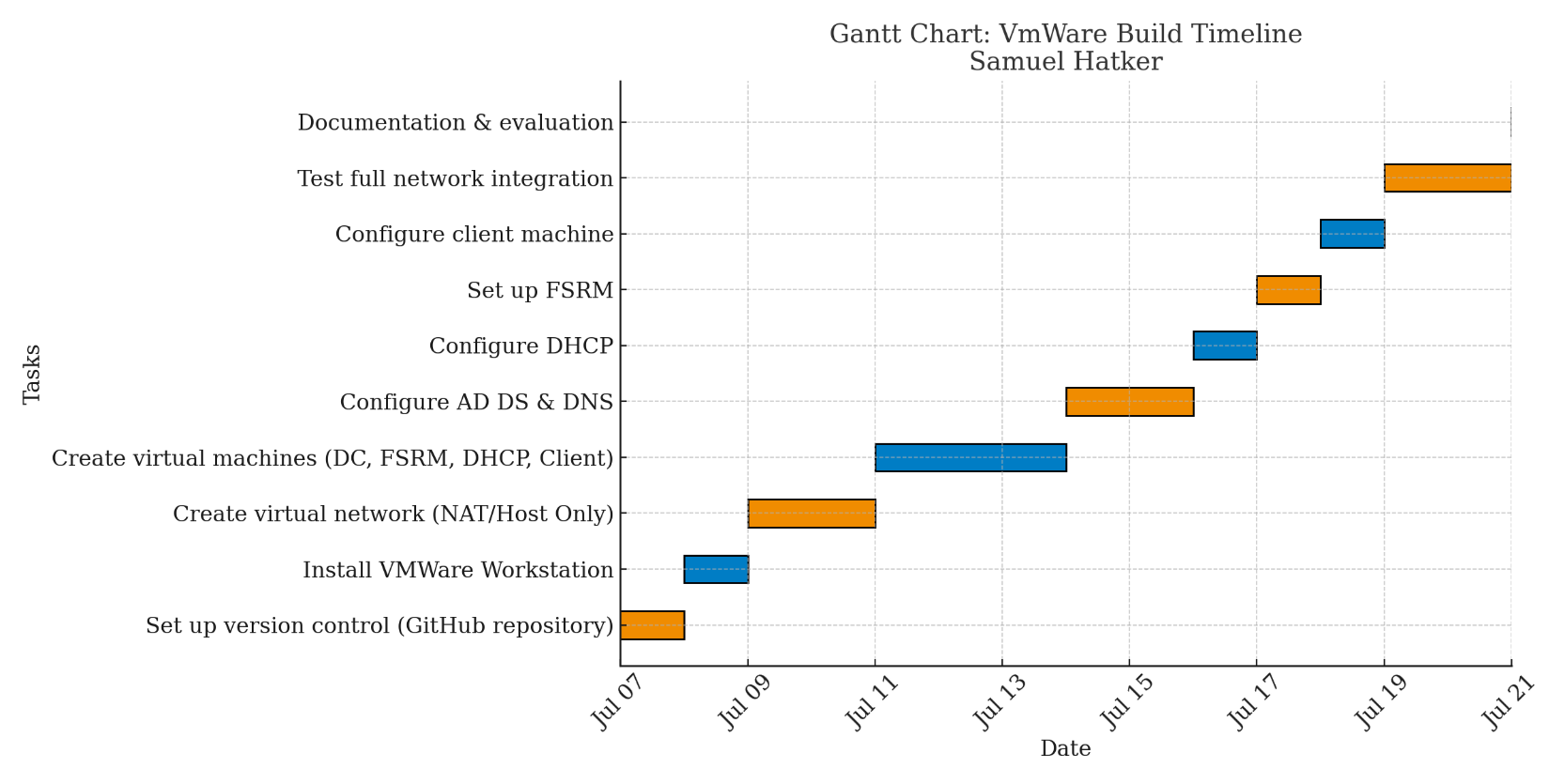
Being able to create a virtual environment has become a great strategy because of its scalability, low cost, and flexibility. IT Professional and students can use VMWare to simulate different full network environments using a virtual machine. This paper demonstrates how to make a Windows Server 2022 environment that meets technical requirements and customer expectations.

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Planning for Small Enterprise Example with Timeline

**Customer wants a virtualized network to replicate a small enterprise. This setup would need:**

1. Create separate virtual machines for each network
2. Assign IP addresses automatically
3. DNS resolution
4. Manage users and devices in the company in a centralized manner
5. File sharing is secured

System Requirements

**Hardware Requirements:**

1. 16 GB RAM minimum
2. 64-bit Processor
3. 500 GB HDD or SSD

**Software Requirements:**

1. VMWare Workstation Pro
2. Windows Server 2022 ISO
3. Windows 10 (or 11) ISO (For client machine)

**Version Control was demonstrated by using GitHub to track the progress of changes in the paper.**

Virtual Network Setup

1. **Install VMWare Workstation**
2. **Create the Virtual Machines:**
   * Domain Controller (ADDS, DNS) – Domc25
   * File Server (FSRM) – Fsrm25
   * DHCP Server – Dhcp25
   * Windows 10 Client – Winclient25

Configure Domain Controller (ADDS, DNS)

1. **Choose to Create a New Virtual Machine**
   * Make sure you choose custom, Next
   * Keep Hardware compatibility at Workstation 17.5 or later
   * Installer disc image file (iso):
     + Click Browse and choose your server ISO or you can install later
     + Next
   * Don’t add product key, Next
   * Name VM (Domc25)
   * Keep UEFI if using Windows Server 2016-2022, BIOS if installing Windows Server 2008 or older.
   * For processor configuration, switch the numbers (2,1 to 1,2) due to it being a test environment.
   * Keep Memory, Next.
   * Keep NAT for now, Next.
   * Next
   * Disk Type is SCSI not NVMe
   * Create New Disk
   * Next, Next
   * For Ready to Create VM, choose Finish.
2. **Install Windows Server 2022**

* Boot Domain Controller
* Press any key to boot from CD/DVD, Press any key.
* Windows Server installation wizard:
  + Select language/keyboard layout
  + Install
  + Skip product key
  + Select Windows Server edition (Desktop)
  + Choose where to install the VM disk
* After, Installation starts.
* Set Username and Password (SMALL is the domain name, small.net):
  + Username: SMALL\Administrator
  + Password: Password1

1. **Configure IP and DNS**
   * On desktop, right-click Start > Network Connections
   * Click Ethernet > Change adapter options
   * Right-click Ethernet > Properties
   * Double click Internet Protocol Version 4 (TCP/ IPv4)
   * Select the IP, Subnet Mask, Default Gateway
   * Add Preferred DNS server, leave alternate DNS blank
   * Click OK > OK > Close
   * TEST:
     + Open Command Prompt as administrator:
       - Ipconfig /all

ping (address here)

1. **Install the roles of AD DS on Domc25**
   * Open Server Manager (opens automatically)
   * Click Manage
   * Click “Add Roles and features”
   * Before you begin, select Next
   * Select Role-based or feature-based installation, Next
   * Choose server (hostname), Next
   * Scroll down and check Active Directory Domain Services:
     + Click Add Features: DNS Server

* Click Next
* Leave defaults on Select Features, Next
* Next
  + Complete installation
  + After installation, in Server Manager select Promote this server to a domain controller

1. **Promote to Domain Controller**
   * Select Add a new forest
   * Enter a domain name (small.net)
   * For Domain Controller Options, leave defaults checked
   * Set Directory Services Restore Mode (DSRM) password
   * DNS options, ignore warning
   * Confirm NetBIOS name (SMALL)
   * For paths, leave default, then Install
2. **Verify ADDS and DNS**
   * In Server Manager:
     + Tools > Active Directory Users and Computers
     + Domain should be there (small.net)

* Check DNS:
  + Tools > DNS

1. **Create Structure for Clients**
   * Create Organizational Units (OUs):
     + In Active Directory Users and Computers:
       - Right-click domain > New > OU

* Create OUs (Groups and Users)
* Add Users:
  + Right-click > New > User
  + Add name, last name, and username for User
  + Set password and uncheck “User must change password at next login”

**8. Apply Group Policies**

* Server Manager > Tools > Group Policy Management
* Right click OU > Create GPO
* Right click GPO > Edit > Set Company Wallpaper

Configure DHCP

1. **Choose to Create a New Virtual Machine**
   * Make sure you choose custom, Next
   * Keep Hardware compatibility at Workstation 17.5 or later
   * Installer disc image file (iso):
     + Click Browse and choose your server ISO or you can install later
     + Next
   * Don’t add product key, Next
   * Name VM (Dhcp25)
   * Keep UEFI if using Windows Server 2016-2022, BIOS if installing Windows Server 2008 or older.
   * For processor configuration, switch the numbers (2,1 to 1,2) due to it being a test environment.
   * Keep Memory, Next.
   * Keep NAT for now, Next.
   * Next
   * Disk Type is SCSI not NVMe
   * Create New Disk
   * Next, Next
   * For Ready to Create VM, choose Finish.
2. **Install Windows Server 2022**

* Boot Domain Controller
* Press any key to boot from CD/DVD, Press any key.
* Windows Server installation wizard:
  + Select language/keyboard layout
  + Install
  + Skip product key
  + Select Windows Server edition (Desktop)
  + Choose where to install the VM disk
* After, Installation starts.
* Set Username and Password (SMALL is the domain name, small.net):
  + Username: SMALL\Administrator
  + Password: Password1

1. **Configure IP and DNS**
   * On desktop, right-click Start > Network Connections
   * Click Ethernet > Change adapter options
   * Right-click Ethernet > Properties
   * Double click Internet Protocol Version 4 (TCP/ IPv4)
   * Select the IP, Subnet Mask, Default Gateway
   * Add Preferred DNS server, leave alternate DNS blank
   * Click OK > OK > Close
   * TEST:
     + Open Command Prompt as administrator:

Ipconfig /all

ping (address here)

1. **Install the roles of DHCP**
   * Open Server Manager (opens automatically)
   * Click Manage
   * Click “Add Roles and features”
   * Before you begin, select Next
   * Select Role-based or feature-based installation, Next
   * Choose server (Domain Controller)
   * Next, Scroll down and check DHCP Server:
   * Click Add Features, Skip features
   * Click Next
   * Install, Wait for Finish
   * Click complete DHCP Configuration
2. **Authorize DHCP Server**
   * During Install Wizard:
     + Enter domain credentials (admin account)
     + Click Commit
     + Finished
3. **Create DHCP Scope**
   * Server Manager > Tools > DHCP
   * Right-click IPv4 > New Scope
   * In Scope wizard, add:
     + Name
     + Start IP
     + End IP
     + Subnet Mask
     + Lease Duration (Default)

* Configure DHCP Options
  + Default Gateway (Router’s IP)
  + DNS Server (Domain Controller IP)
  + Domain Name (Domain)
* Click yes to activate Scope

Configure File Server Resource Manager

**1****. Choose to Create a New Virtual Machine**

* + Make sure you choose custom, Next
  + Keep Hardware compatibility at Workstation 17.5 or later
  + Installer disc image file (iso):
    - Click Browse and choose your server ISO or you can install later
    - Next
  + Don’t add product key, Next
  + Name VM (Fsrm25)
  + Keep UEFI if using Windows Server 2016-2022, BIOS if installing Windows Server 2008 or older.
  + For processor configuration, switch the numbers (2,1 to 1,2) due to it being a test environment.
  + Keep Memory, Next.
  + Keep NAT for now, Next.
  + Next
  + Disk Type is SCSI not NVMe
  + Create New Disk
  + Next, Next
  + For Ready to Create VM, choose Finish.

1. **Install Windows Server 2022**

* Boot Domain Controller
* Press any key to boot from CD/DVD, Press any key.
* Windows Server installation wizard:
  + Select language/keyboard layout
  + Install
  + Skip product key
  + Select Windows Server edition (Desktop)
  + Choose where to install the VM disk
* After, Installation starts.
* Set Username and Password (SMALL is the domain name, small.net):
  + Username: SMALL\Administrator
  + Password: Password1

1. **Install FSRM Role (File Server Resource Manager)**
   * Open Server Manager (opens automatically)
   * Click Manage
   * Click “Add Roles and features”
   * Before you begin, select Next
   * Select Role-based or feature-based installation, Next
   * Choose server (Domain Controller)
   * For Roles:
     + Expand File and Storage Services
     + Do the same for File and iSCSI Services
     + Check File Server Resource Manager

* Click Next and Install Roles

**4. Create a Shared Folder (For Client Machine)**

* Create a folder to be shared to client machine
* Right click the folder created > Properties
* Sharing tab > Advanced sharing
* Check share this folder
* Click permissions
* Remove Everyone and add Domain Users or group to get the folder
* Can set permissions to just read and change
* Click OK

**5. Set Security Permissions for shared file (NTFS)**

* In the same properties tab for folder
* Click Security
* Add the same user/group
* Set permissions:
  + Read and Execute > View-only access
  + Modify > Read/write access
  + Full Control > Admins only
* Click OK

Configure Client Machine

**1. Choose to Create a New Virtual Machine**

* + Make sure you choose custom, Next
  + Keep Hardware compatibility at Workstation 17.5 or later
  + Installer disc image file (iso):
    - Click Browse and choose your server ISO or you can install later
    - Next
  + Don’t add product key, Next
  + Name VM (Winclient25)
  + Keep UEFI or BIOS
  + For processor configuration, switch the numbers (2,1 to 1,2) due to it being a test environment.
  + Keep Memory, Next.
  + Keep NAT for now, Next.
  + Next
  + Disk Type is SCSI not NVMe
  + Create New Disk
  + Next, Next
  + For Ready to Create VM, choose Finish.

**2. Install Windows**

* Start up Client machine
* Install Windows 10/11
* Use a local admin account:
  + At “Let’s add a Microsoft Account” select “Domain join instead”
  + Create local admin account with Username and Password

**3. Configure IP and DNS**

* Open up control panel > Network and Sharing Center > Change adapter settings
* Right click Ethernet > Properties > TCP/IPv4
* Select Obtain for the IP address and DNS Server automatically
* Test the network:
  + Open command prompt and ping small.net (DC)
  + Should show DNS that is the same for Domain Controller (small.net)

**4. Join Client machine to Domain**

* Open Settings > System > About > Rename this PC
* Click change
* Select Domain and enter domain name (small.net)
* Enter Domain admin credentials (SMALL\Administrator)
* Reboot machine
* AFTER:
  + Login to machine with Client Username and Password

**5. Check for file from File Server**

* Login with client credentials as the domain user
* Open File Explorer > This PC
* Look for a Driver not previously there (Z: or any other letter)
* Driver > File from FSRM
* Complete

**6. Install Microsoft Office**

* Install Office 365
* Install any software needed

**7. Install Remote Server Administration Tools**

* Open Settings > Apps > Optional Features
* Click Add a feature > Search RSAT
* Add Active Directory Users and Computers, DNS, and DHCP server tools

**8. Install Antivirus**

* Enable Windows Defender

**9. Install Remote Desktop**

* Settings > System > Remote Desktop > Enable Remote Desktop
* Allow Connections
* Advanced Settings > Enable Network Level Authentication
* Done, After:
  + Open Control Panel > System and Security > Windows Defender Firewall
  + Click Allow an app or feature > Remote Desktop > Check Private and Public

Bring It Together: Domain Controller, DHCP, DNS, and FSRM in a Small Enterprise

* **Domain Controller (DC)**
  + This acts as the main authoritarian for user authentication, management of computers, security using Active Directory Domain Services (ADDS).
* **DNS Server**
  + Controller of IP addresses, allows the smooth interaction of client machines and servers within the Enterprise. It also includes ADDS for updates.
* **DHCP Server**
  + Assigns IP addresses automatically and configure network to client devices. Helps with making sure there is consistency and also removing manual errors with configuration throughout the organization.
* **FSRM** 
  + Gives the ability to shared storage with advances management features, these include quotas for disk usage, storage reports and file screening in order to block any unauthorized files.
* **Group Policy Objects**
  + Ability to set restrictions and software configuration.
* **Client Machine** 
  + Machine used to replicate machines for associates in the Enterprise. Can access shared folders, printers, and applications for the Enterprise. This machine is managed by DHCP and GPO makes the machines secured.

With the servers and client machine, this form an IT environment where users can have a smooth access to resources, Centralized control maintained by administrators, and lastly showing what the Enterprise will benefit from by using this small lab.

Conclusion

Using VMWare is an important and efficient way to create an environment for testing, education, and just practicing your networking configuration skills. When you add AD DS, DNS, DHCP, and FSRM this can give the user gain experience with making good grade level environments for potential jobs or clients. This also gives students a great understanding for jobs that specialize in networking and support jobs.