

# Project Tutorial: Building a Multi-OS Virtual Lab

## Introduction

In the modern cybersecurity landscape, Security Operations Center (SOC) analysts must have hands-on experience with multiple operating systems. Corporate environments commonly deploy both Windows and Linux servers, each generating distinct logs, alerts, and vulnerabilities. This project focuses on building a safe and controlled virtual lab environment to simulate real-world scenarios. The purpose is to understand system behavior, test security tools, and strengthen analysis skills across diverse OS platforms.

## Project Goal

The objective is to create a virtual environment consisting of two virtual machines (VMs): one running Windows 11 (representing a corporate workstation) and the other running Debian Linux (representing a Linux server). This lab setup will be connected through carefully selected network configurations to simulate realistic enterprise conditions.

## Part 1: Understanding VMware Networking

Before deploying the virtual machines, it is essential to understand the networking modes available in VMware. The correct choice ensures both functionality and safety.

### 1. NAT (Network Address Translation)

- **What it does:** Shares your host computer's IP address. The VM can access the internet but remains invisible to other devices on the local network.
- **Example:** You want to browse the web or download tools inside your VM without exposing it to other devices in your home or office. Perfect for **safe internet use** during practice.

### 2. Bridged Adapter

- **What it does:** Connects the VM directly to your physical network. The VM receives its own IP address from your router, just like another real device.
- **Example:** You want to run a **web server on your Linux VM** and test it from your phone or another PC on the same Wi-Fi. Since the VM has its own IP, any device can connect to it.

### 3. Host-Only Adapter

- **What it does:** Creates a private network between your host machine and your VMs. The VM cannot access the internet.

- **Example:** You're practicing **file transfers, ping tests, or software setup** between your host and VM without needing internet. It's safe and isolated—ideal for **basic networking practice**.

## 4. Internal Network

- **What it does:** A completely closed network where VMs can talk only to each other. No internet and no host access.
- **Example:** You're testing **malware or attack simulations** between two VMs (like a Kali Linux attacker and a Windows victim). This ensures the malware cannot escape into your real network.

## 5. NAT Network

- **What it does:** Similar to NAT but allows multiple VMs to communicate with each other while sharing the host's internet connection.
- **Example:** You're building a **mini corporate lab** with a Windows workstation VM and a Linux server VM. They can both access the internet and also talk to each other for client-server testing.

## Part 2: Creating VM #1 – Windows 11 (Corporate Workstation)

### Step 1: Download VMware Workstation (or Fusion)

On November 11, 2024, VMware announced that its desktop hypervisor products—**VMware Workstation** (for Windows/Linux) and **VMware Fusion** (for macOS)—would be made **completely free for all users**. The link is give below the screenshot.

your current contract concludes, you can continue using the product. However, please note that support ticketing for troubleshooting will no longer be available. All users will have access to a wealth of online resources, including documentation, user guides, and community forums, to assist you in making the most of your desktop hypervisor experience.

#### The Free Tier Support Model

For new users joining us under the free model, we're providing a robust support ecosystem designed to help you succeed:

- **Community Access:** Join a growing community of users to share insights, tips, and solutions.
  - Workstation: <https://community.broadcom.com/communities/communityhomeblogs?CommunityKey=fb707ac3-9412-4fad-b7af-018f5da56d9f>
  - Fusion: <https://community.broadcom.com/communities/communityhomeblogs?CommunityKey=0c3a2021-5113-4ad1-a9e-018f5da40bc0>
- **Extensive Product Documentation:** Our detailed documentation ensures you have all the information you need to maximize the use of our tools.
  - Workstation: <https://docs.vmware.com/en/VMware-Workstation-Pro/index.html>
  - Fusion: <https://docs.vmware.com/en/VMware-Fusion/index.html>
- **Knowledge Base Articles:** Access a rich library of articles covering everything from troubleshooting to advanced features.
  - Link here: <https://knowledge.broadcom.com/external/article?legacyId=80807>

#### The Road Ahead

Here's how we're ensuring continued innovation and alignment with customer needs:

<https://blogs.vmware.com/cloud-foundation/2024/11/11/vmware-fusion-and-workstation-are-now-free-for-all-users/>

**Step 1.2:** Find the How to Download VMware Fusion and Click on the given link.

Welcome to the Broadcom Fusion Community!

By: Julia Klaus

We're glad to have you here. Below are some helpful resources to get you started and stay informed.

**Handy Links**

- [How to Download VMware Fusion](#)
- [Download & License VMware Desktop Hypervisors](#)
- [Fusion Release Notes](#)
- [Fusion Pro 13.0 – Release Notes](#)
- [Using VMware Fusion Pro – Product Documentation](#)
- [Fusion Pro 13.0 – User Guide](#)

**Important News**

If you encounter the error message:

*"The update server could not be resolved"* when checking for Fusion updates—  
you're not alone. This issue is currently known, and a workaround is available.

[Click here for more info and solutions](#)

**Step 1.3:** If you are using **macOS**, you can proceed by downloading **VMware Fusion**, which is designed specifically for Apple systems. However, since my system runs on **Windows**, I selected **VMware Workstation Pro** as the preferred virtualization platform.

**Resolution**

The following table provides links to the download locations of VMware Fusion Pro and VMware Workstation Pro.

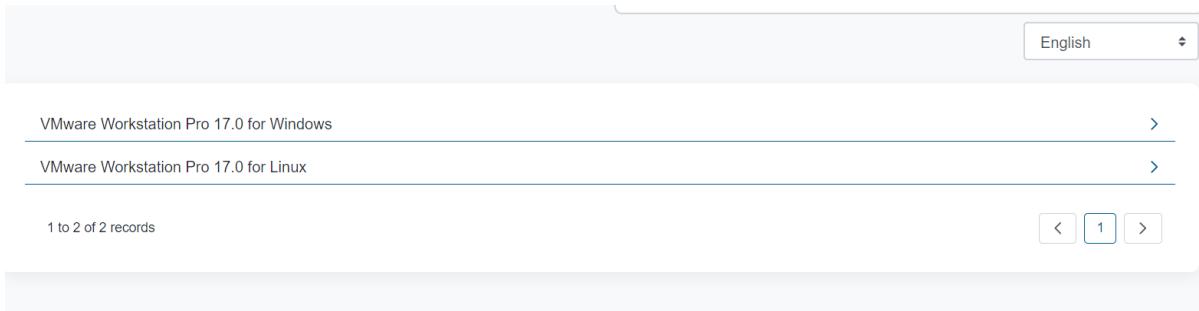
**NOTE:** In order to access the following locations, you will need to either register or login with your existing Broadcom Support Portal account. For information on registering for a basic account, refer to KB article: [Register for an account on the Broadcom Support Portal and Communities](#)

| Product                | Download Link              |
|------------------------|----------------------------|
| VMware Fusion Pro      | <a href="#">Click Here</a> |
| VMware Workstation Pro | <a href="#">Click Here</a> |

**Licensing Information:** No license key is required for the free version. When installing either application, you will be asked for a License Key and there will be an option to select **FINISH (For free version)**.

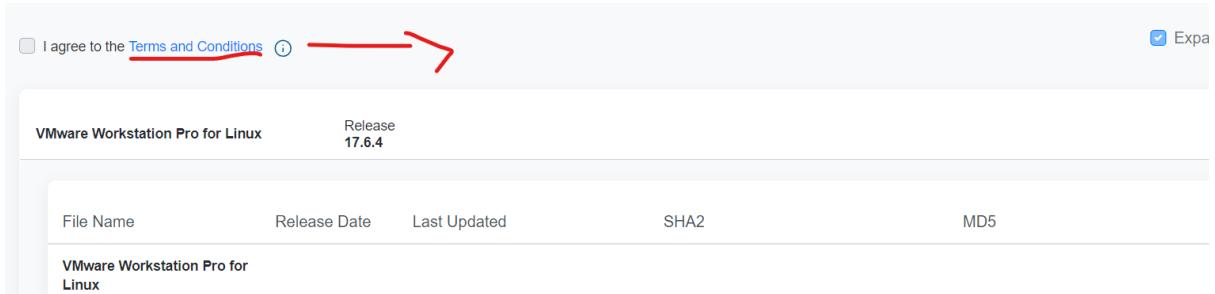
**Additional Information**

**Step 1.4:** Since I am using a **Windows-based system**, I selected **VMware Workstation Pro for Windows** from the available download options. VMware also provides a dedicated version for **Linux users**, ensuring cross-platform support.



**Step 1.5:** Before downloading, VMware requires users to **accept the End User License Agreement (EULA)**. Initially, the checkbox to agree to the Terms and Conditions appeared **greyed out**. To enable it, I clicked the Terms and Conditions link, which opened in a new window. Once I reviewed the document, the checkbox became active, allowing me to proceed with the download of **VMware Workstation Pro**.

This step is important because it ensures that users acknowledge VMware's licensing terms before installation—maintaining compliance and legal use of the software.



**Step 1.6:** After the download was complete, I proceeded with the installation process. VMware provides a straightforward **installation wizard** that guides the user step by step. I simply launched the installer, accepted the default settings, and completed the setup. Once finished, VMware Workstation Pro was successfully installed and ready to use.

This step is important because the installation wizard ensures all necessary components (such as drivers and services) are correctly configured, allowing the virtual environment to run smoothly without manual intervention.

## Step 2: Downloading Windows 11 ISO and Running it on VMware.

**Step 2.1:** I accessed the link, downloaded the Windows 11 ISO (x64) file from Microsoft, and waited for the disc image to complete downloading.

**Link:** <https://www.microsoft.com/en-us/evalcenter/download-windows-11-enterprise>

# Download Windows 11 Disk Image (ISO) for x64 devices

This option is for users that want to create a bootable installation media (USB flash drive, DVD) or create a virtual machine (.ISO file) to install Windows 11. This download is a multi-edition ISO which uses your product key to unlock the correct edition.

**Windows 11 ISOs for Arm64 devices are available [here](#).**

Windows 11 (multi-edition ISO for x64 devices) ▾

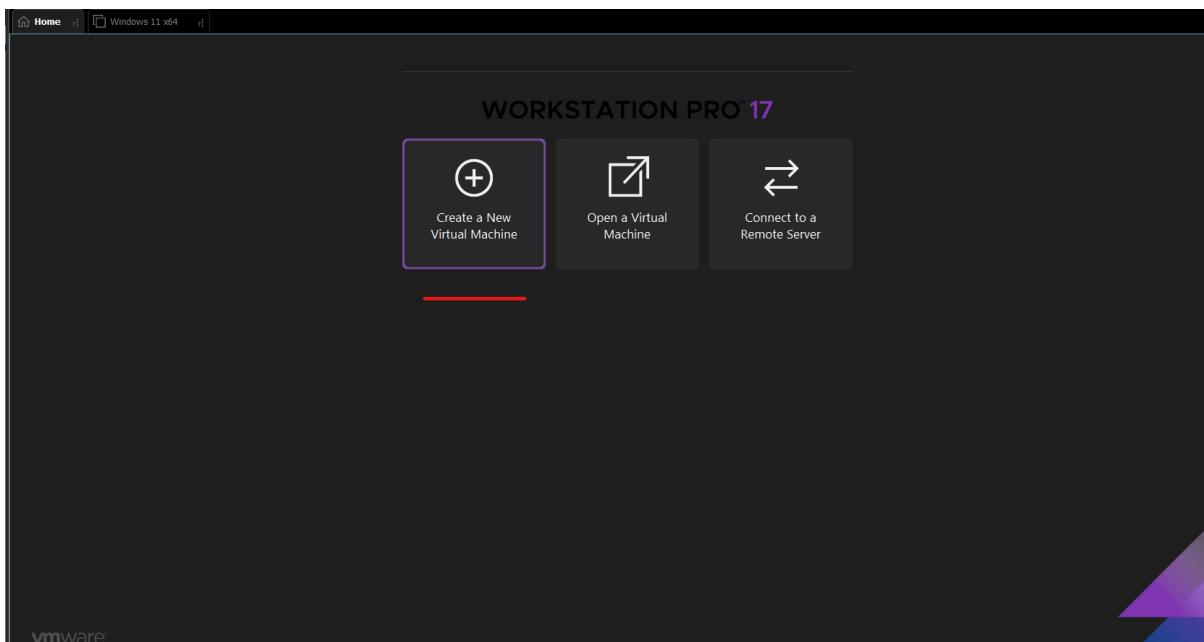
## ▼ Before you begin downloading an ISO

Make sure you have:

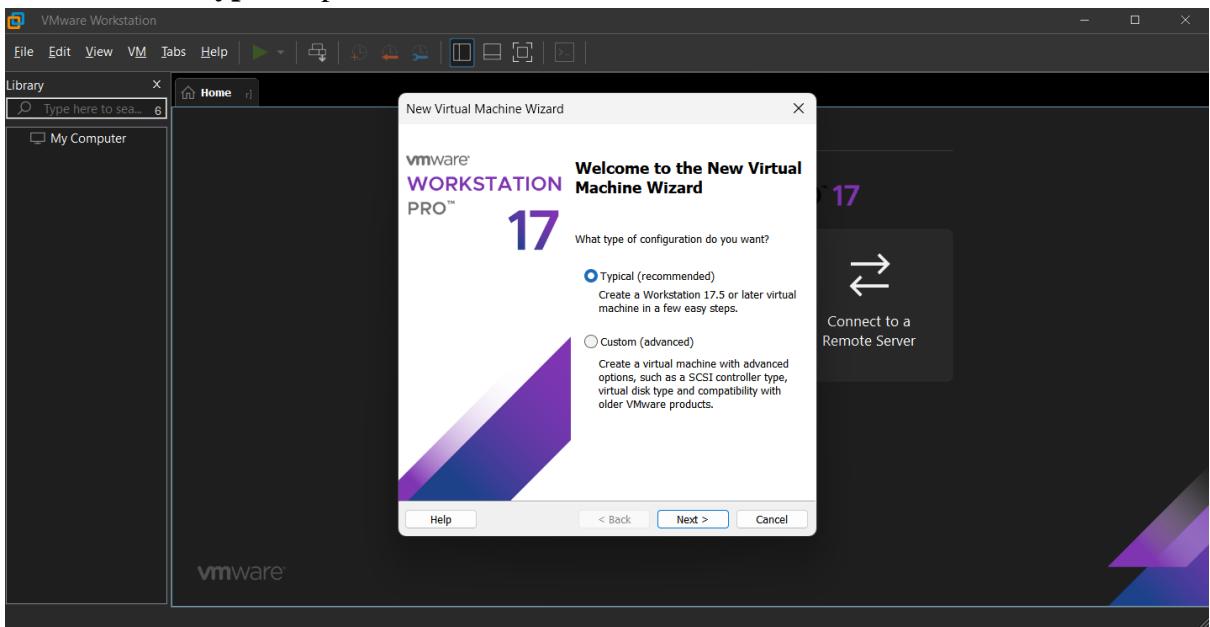
- An internet connection (internet service provider fees may apply).
- Sufficient data storage available on the computer, USB, or external drive you are downloading the .iso file to.
- A blank DVD disc with at least 8GB (and DVD burner) to create a bootable disc. We recommend using a blank USB or blank DVD, because any content on it will be deleted during installation.
- If you receive a "disc image file is too large" message while attempting to burn a DVD bootable disc from an ISO file, consider using a higher capacity Dual Layer DVD.

Ensure the PC you want to install Windows 11:

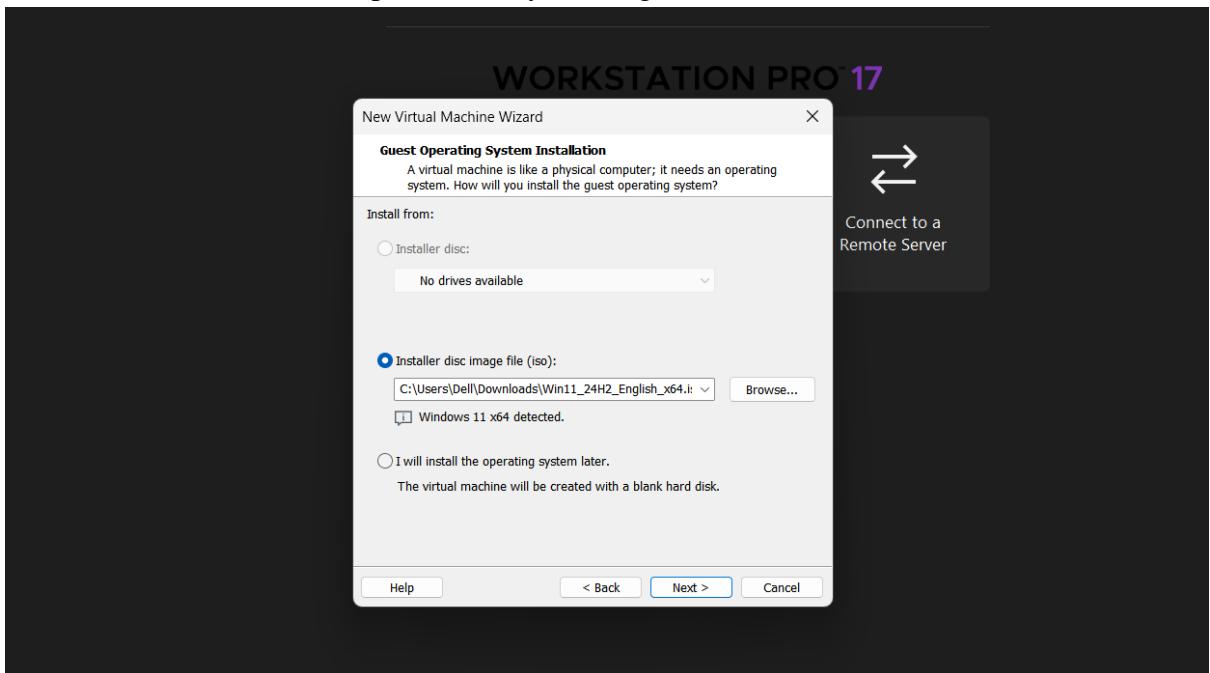
**Step 2.2:** Next, I opened VMware Workstation and selected the option to create a new virtual machine.



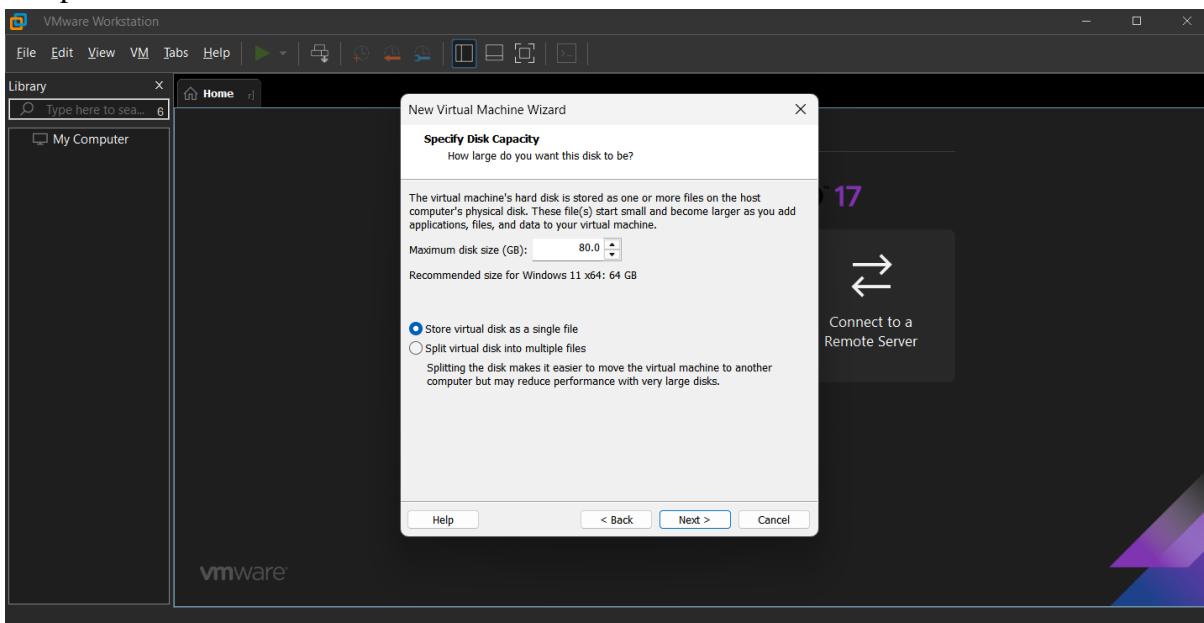
**Step 2.3:** It directed me to the Virtual Machine Wizard, where I selected the recommended **Typical** option, as shown in the screenshot.



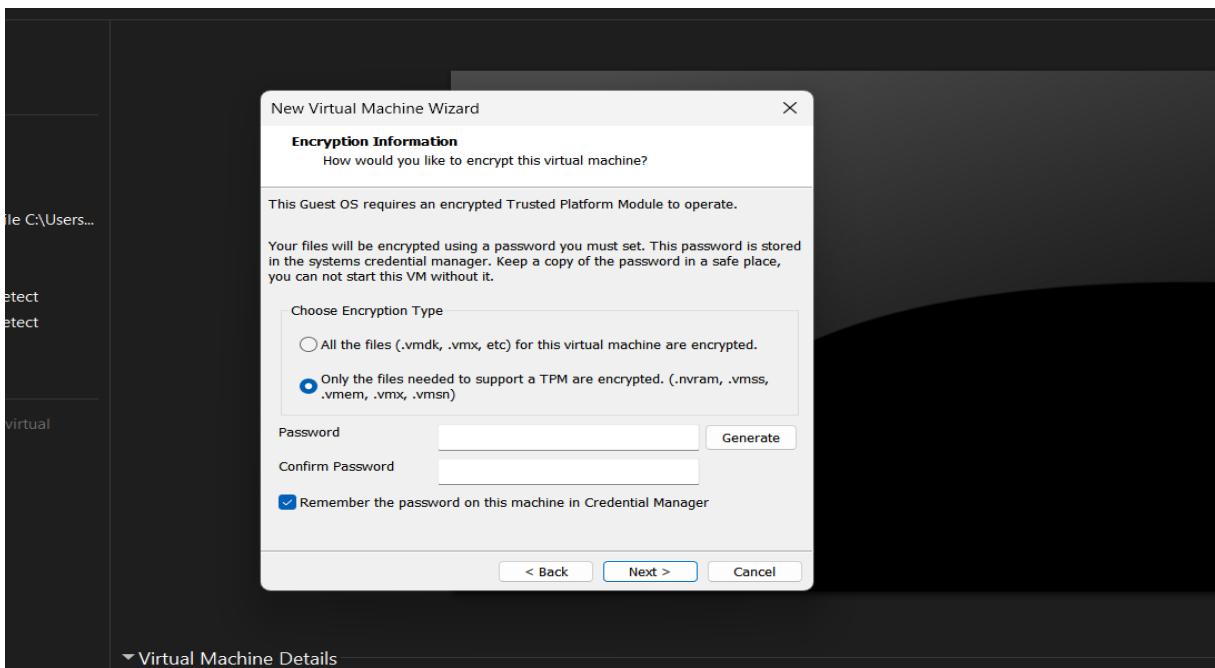
**Step 2.4:** Next, I selected the Windows 11 ISO image from my local drive to serve as the installation source, and then proceeded by clicking **Next**.



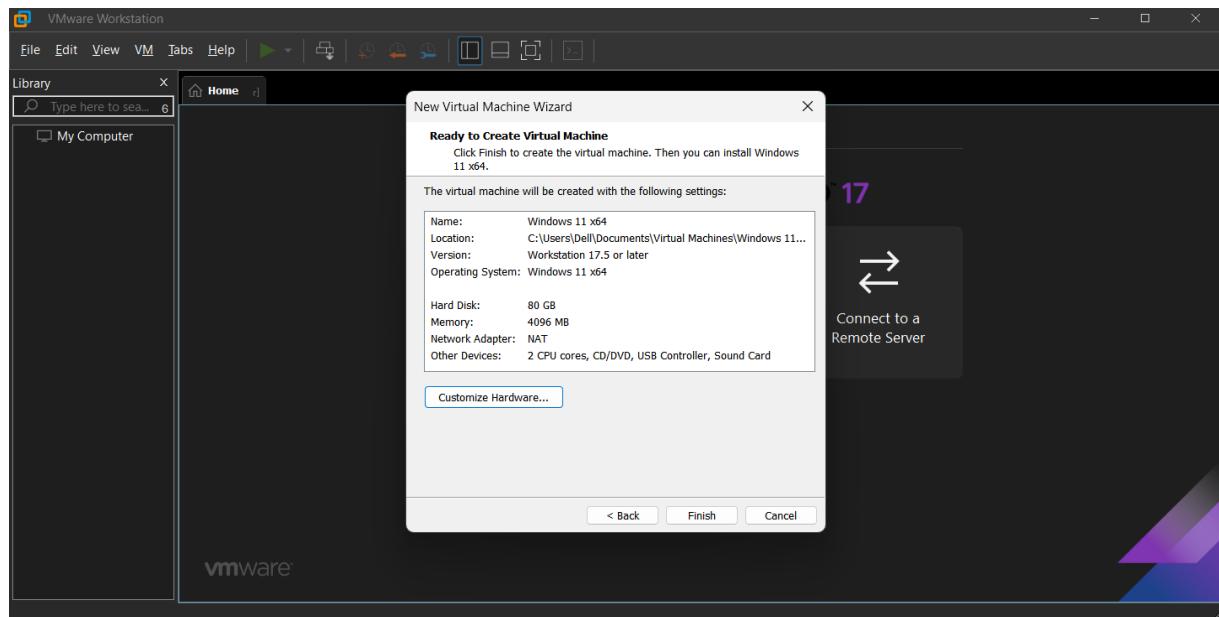
**Step 2.5:** In the next step, I was prompted to select the disk size for the virtual machine. Although the recommended size was 64 GB, I allocated 80 GB to allow for additional storage capacity. I also chose to store the virtual disk as a single file for improved performance and easier management, since I do not plan to move this VM to another computer.



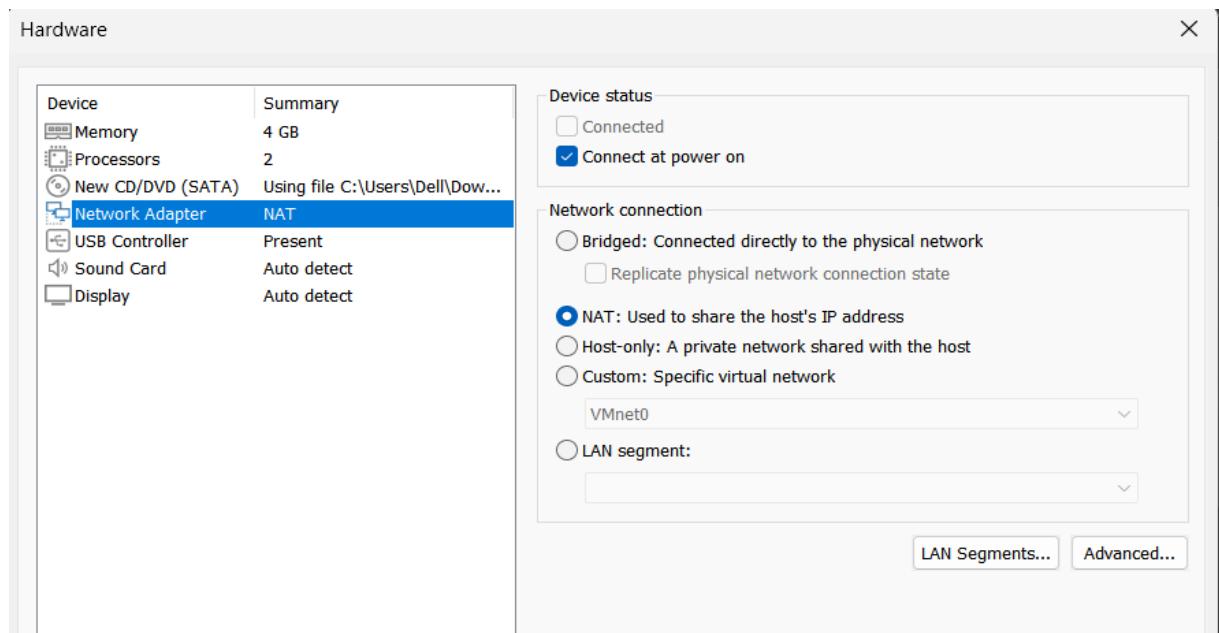
**Step 2.6:** Next, I was prompted with the encryption window, where I had to set a password to enable encryption. The wizard provided the option to encrypt either all files or only the files necessary to support TPM (Trusted Platform Module), which is required for Windows 11.



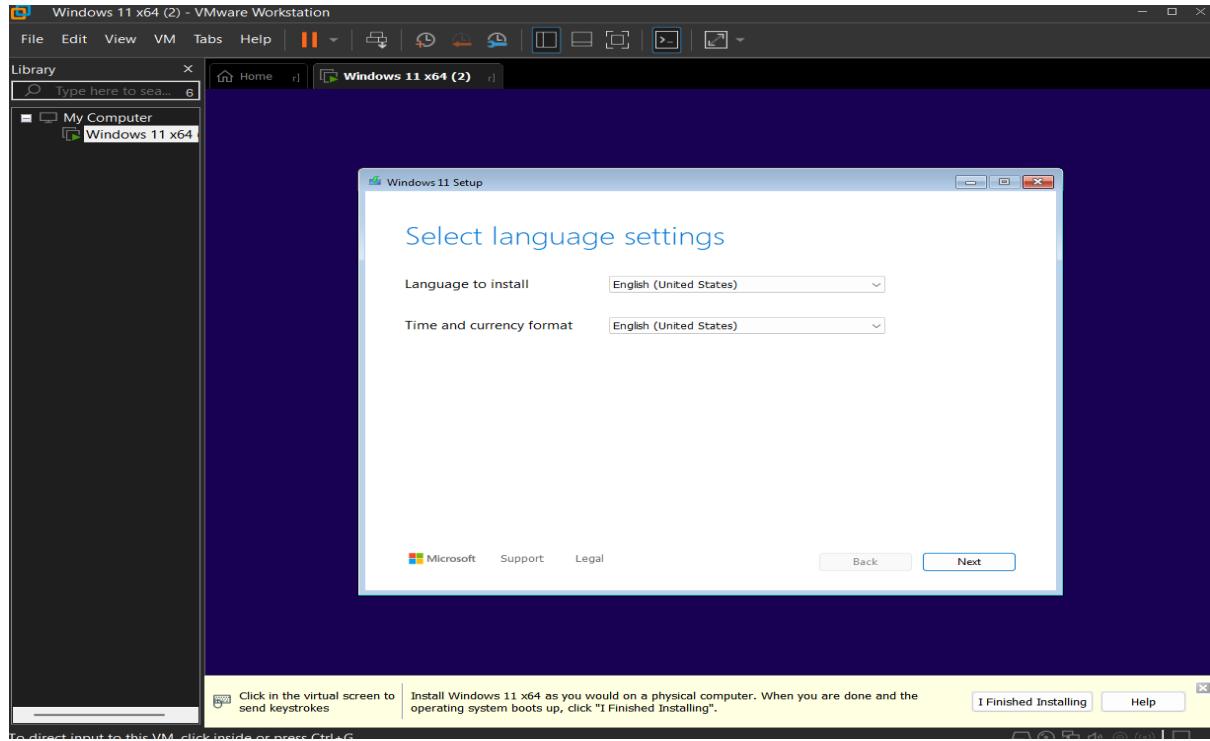
**Step 2.7:** In the final window of the Virtual Machine Setup Wizard, you are given the option to either customize the hardware settings (such as memory, processors, and network configuration) or simply click **Finish** to proceed with the default configuration.



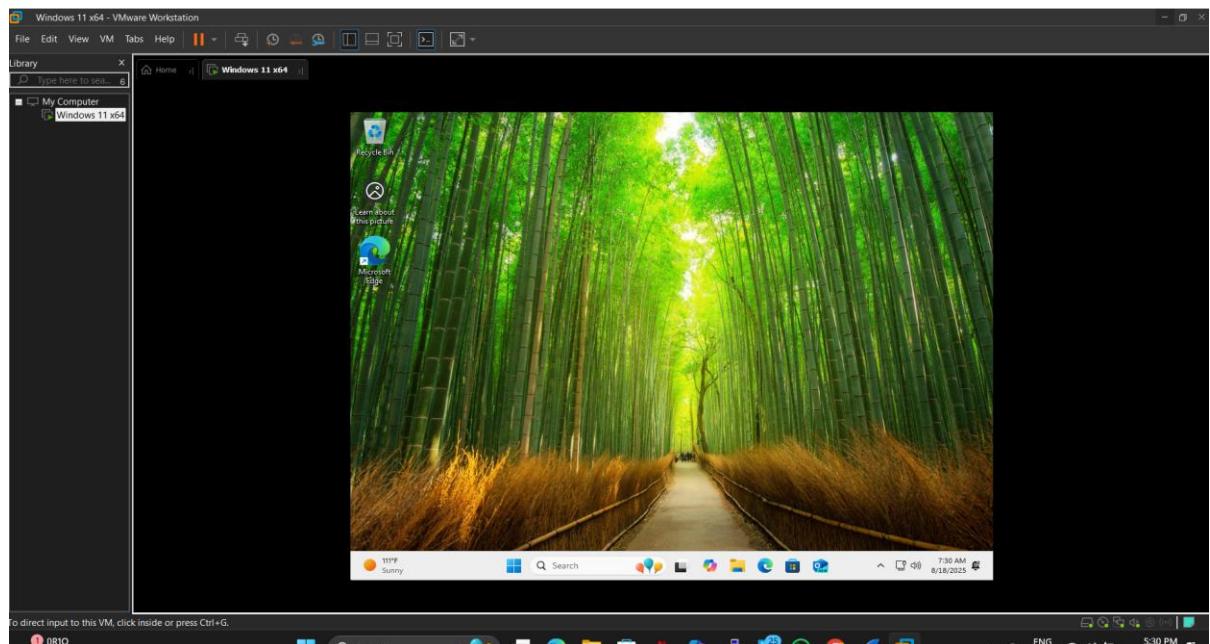
**Step 2.8 (Optional):** When selecting **Customize Hardware**, a window opens where you can adjust various hardware settings for the virtual machine, such as memory, processors, and display. In my case, I reviewed the **Network Adapter** settings and found that the default option was set to **NAT**, which was exactly what I needed.



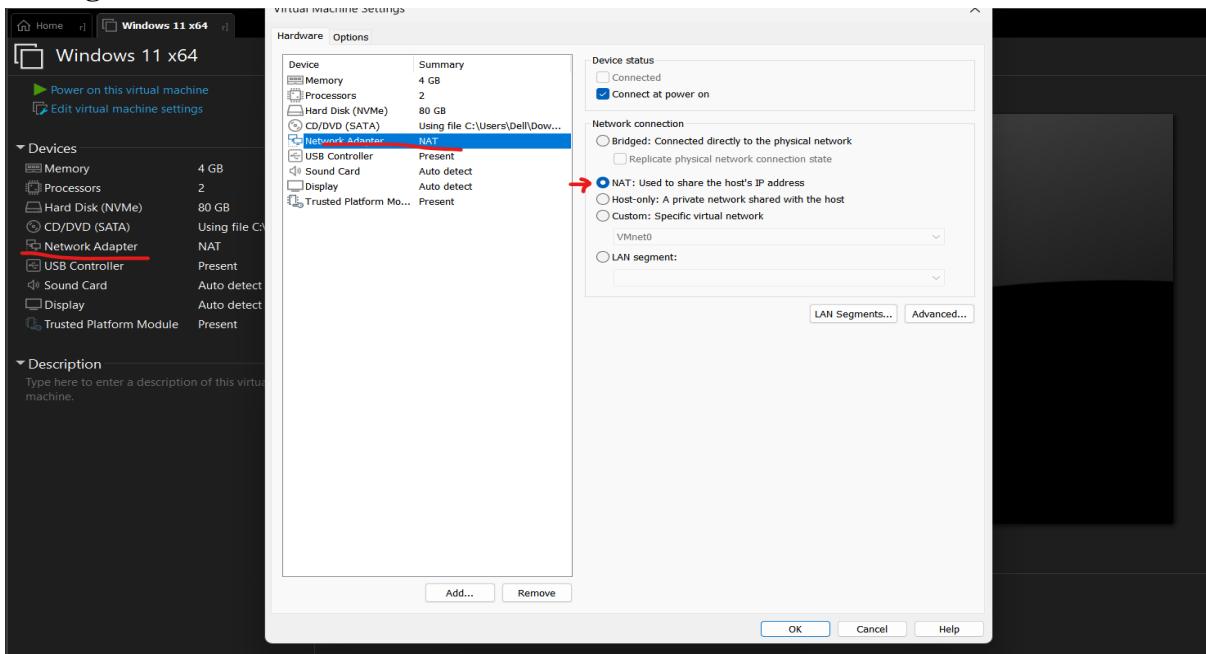
**Step 2.9:** After clicking **Finish**, the virtual machine starts automatically and begins booting the Windows setup from the CD/DVD (SATA), which is linked to the ISO image selected in step 2.4. Alternatively, this process could also be performed using a physical bootable device, such as a USB drive.



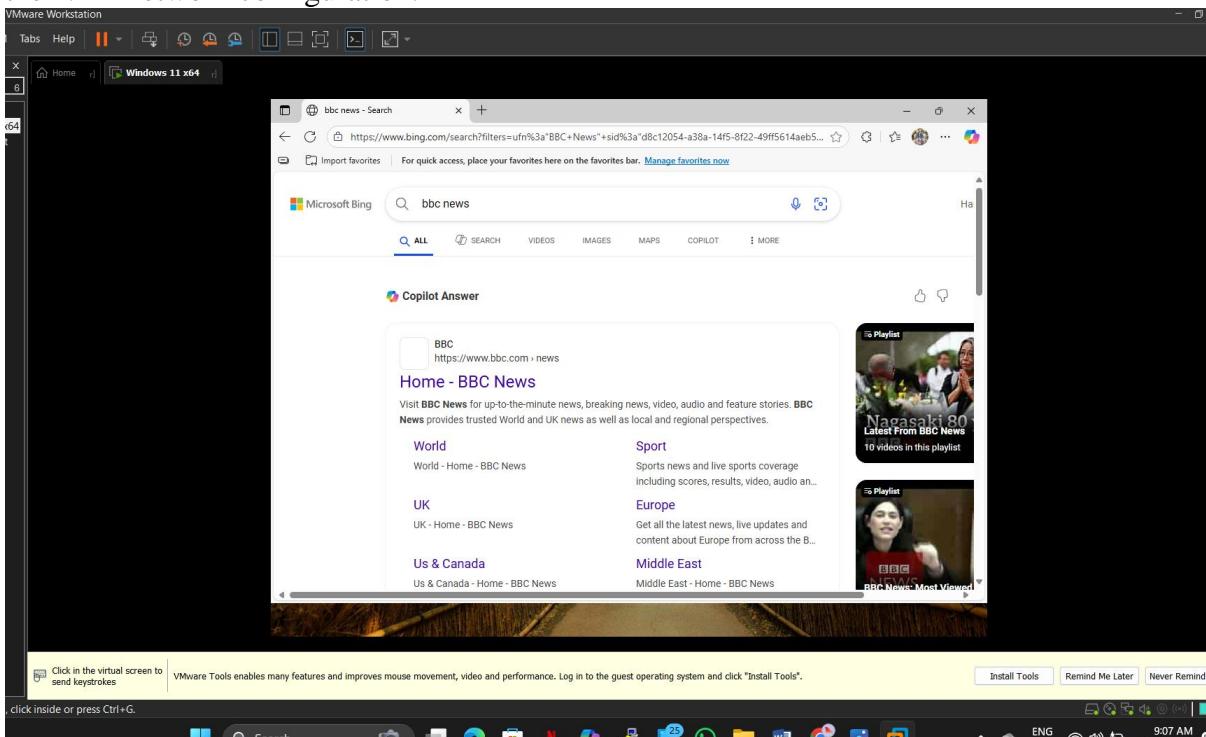
**Step 2.10:** In the next step, I proceeded through the standard Windows setup process, following the on-screen instructions as usual.



**Step 2.11:** To modify the virtual machine settings again, right-click on the VM and select **Settings**.



**Step 2.12:** At this stage, I confirmed that the virtual machine had internet access through the NAT network configuration.



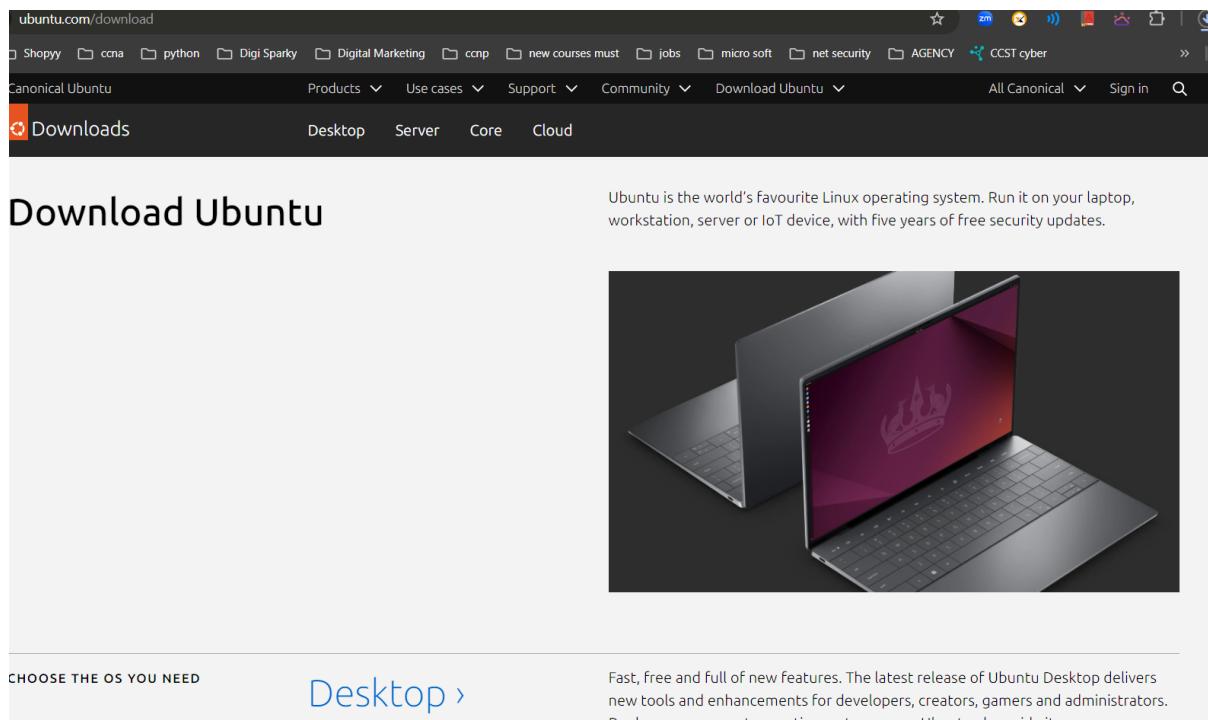
## Part 3: Creating VM #2 – Debian Linux (Ubuntu)

### Step 1: Downloading Ubuntu and Running It on Virtual Machine #2

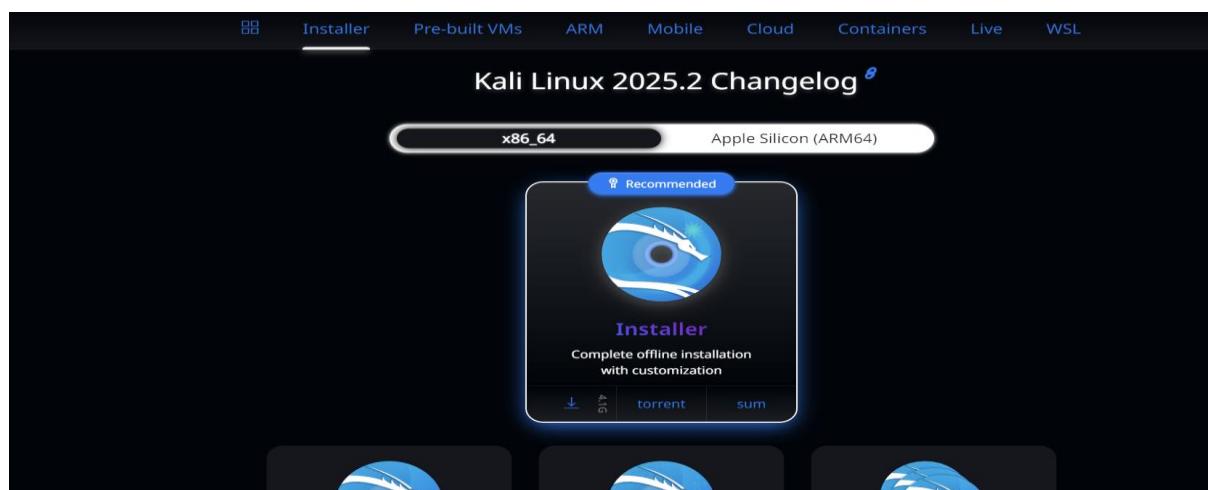
**Step 1.1:** I chose **Ubuntu** for this setup.

You can choose to download either Ubuntu or Kali Linux based on your preference:

- For **Ubuntu**, visit: [ubuntu.com/download](https://ubuntu.com/download)
- For **Kali Linux**, visit: [debian.org/distrib](https://debian.org/distrib)

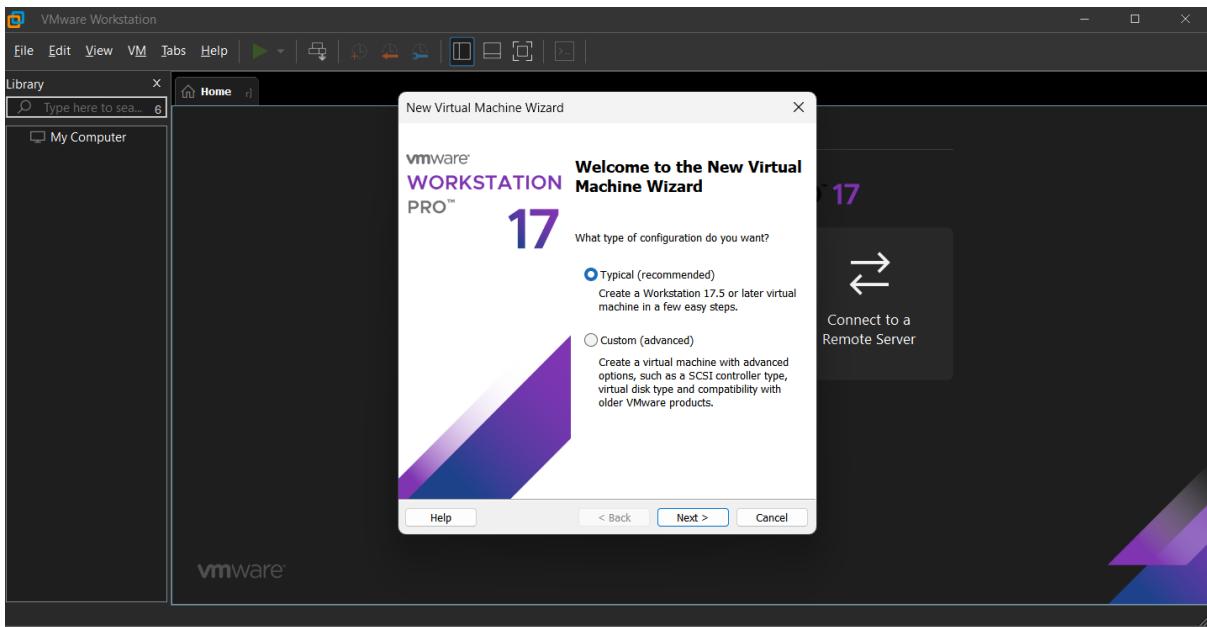
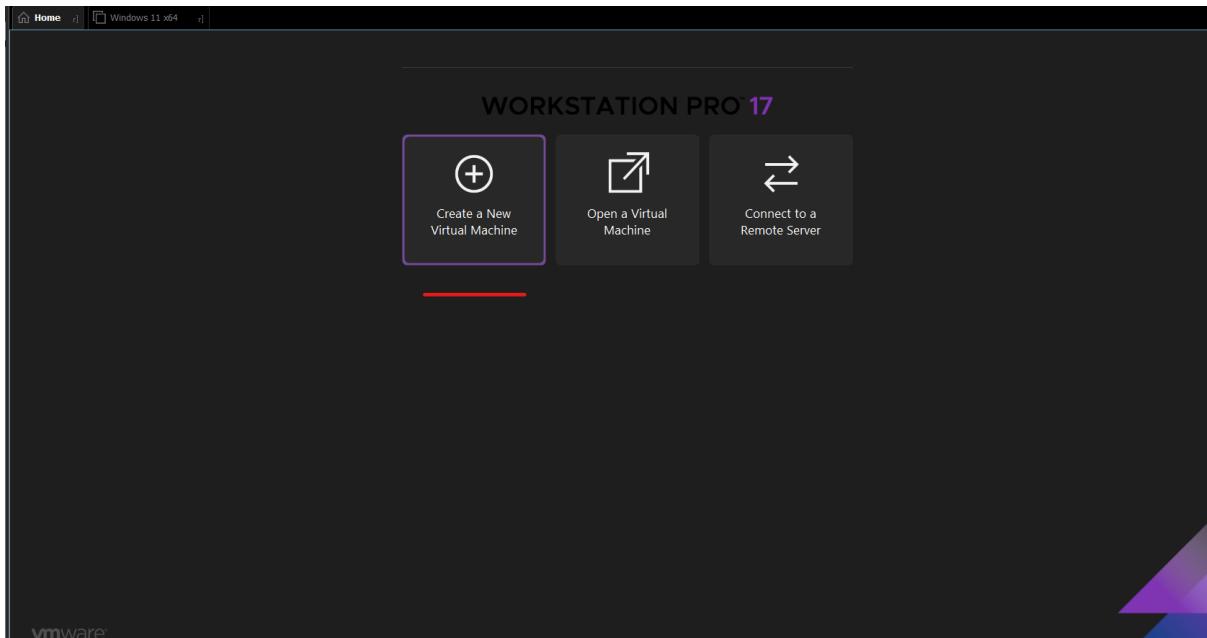


The screenshot shows the Ubuntu download page. At the top, there's a navigation bar with links like 'Shopify', 'ccna', 'python', 'Digi Sparky', 'Digital Marketing', 'ccnp', 'new courses must', 'jobs', 'micro soft', 'net security', 'AGENCY', 'CCST cyber', 'All Canonical', 'Sign in', and a search icon. Below the navigation bar, there's a secondary navigation bar with 'Downloads' (highlighted in orange), 'Desktop', 'Server', 'Core', and 'Cloud'. The main content area has a large heading 'Download Ubuntu' and a sub-headline: 'Ubuntu is the world's favourite Linux operating system. Run it on your laptop, workstation, server or IoT device, with five years of free security updates.' To the right, there's a photograph of a sleek, modern laptop with its screen open, displaying the Ubuntu desktop environment with a crown icon on the desktop. Below this, there's a section titled 'CHOOSE THE OS YOU NEED' with a 'Desktop' link. To the right, there's a brief description: 'Fast, free and full of new features. The latest release of Ubuntu Desktop delivers new tools and enhancements for developers, creators, gamers and administrators. Replace your current operating system or run Ubuntu alongside it.' At the bottom, there's a navigation bar with tabs for 'Installer' (which is selected and highlighted in blue), 'Pre-built VMs', 'ARM', 'Mobile', 'Cloud', 'Containers', 'Live', and 'WSL'. Below this, there's a section for 'Kali Linux 2025.2 Changelog' with a link to the changelog. A large button for the 'Installer' is prominently displayed, with options for 'x86\_64' (selected) and 'Apple Silicon (ARM64)'. The button also includes a 'Recommended' badge, a preview image of the installer interface, and text: 'Installer Complete offline installation with customization'. Below the main content, there are three smaller preview cards for other versions of Kali Linux.



The screenshot shows the Kali Linux download page. At the top, there's a navigation bar with tabs for 'Installer' (selected), 'Pre-built VMs', 'ARM', 'Mobile', 'Cloud', 'Containers', 'Live', and 'WSL'. Below this, there's a section for 'Kali Linux 2025.2 Changelog' with a link to the changelog. A large button for the 'Installer' is prominently displayed, with options for 'x86\_64' (selected) and 'Apple Silicon (ARM64)'. The button also includes a 'Recommended' badge, a preview image of the installer interface, and text: 'Installer Complete offline installation with customization'. Below the main content, there are three smaller preview cards for other versions of Kali Linux.

**Step 1.2:** I followed essentially the same process for setting up the Ubuntu virtual machine as I did for the Windows VM.



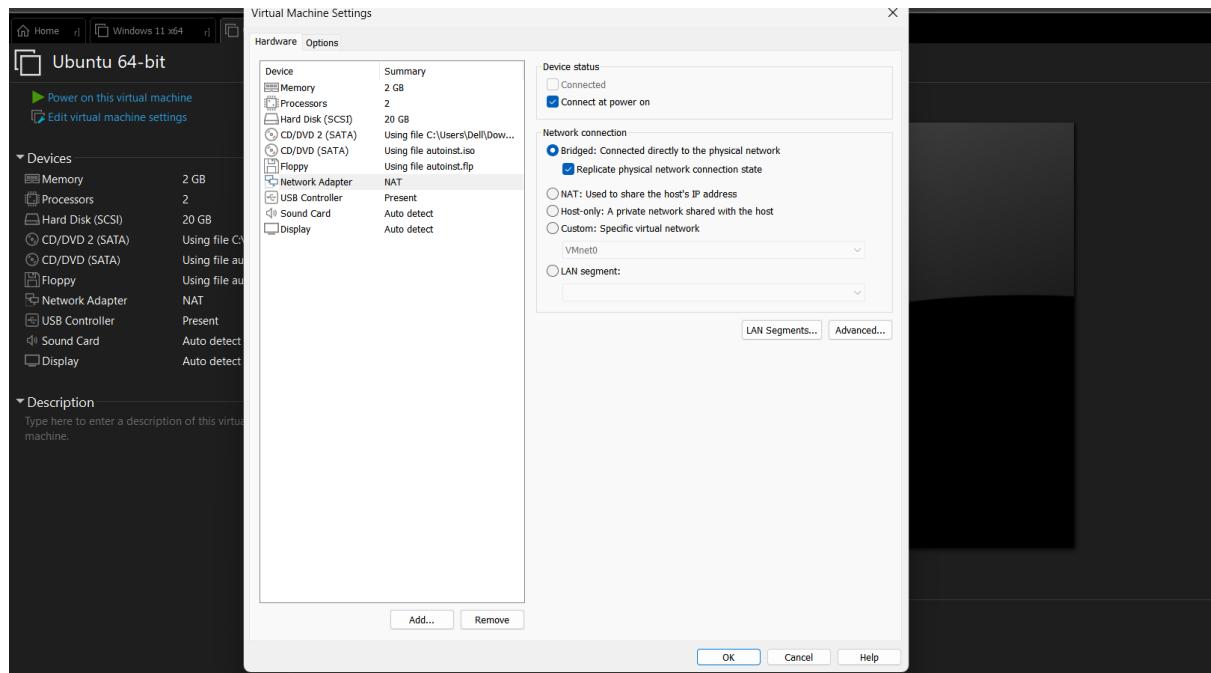
**Step 1.3:** The only change I made for the Ubuntu VM was to configure the **Network Adapter** in the VM settings and select the **Bridged** option. Initially, the network connection did not work, so I performed the following checks on the host system to ensure proper connectivity:

## Verify VMware Network Services on the Host:

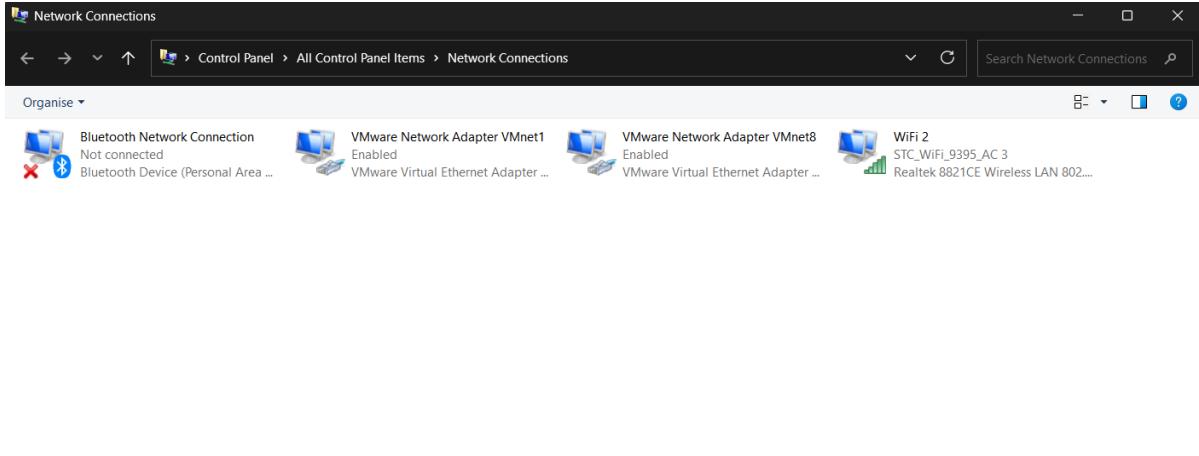
VMware creates virtual network adapters (VMnet0, VMnet1, VMnet8). If these adapters are disabled or corrupted, the VM will not have internet access.

### On a Windows 11 host:

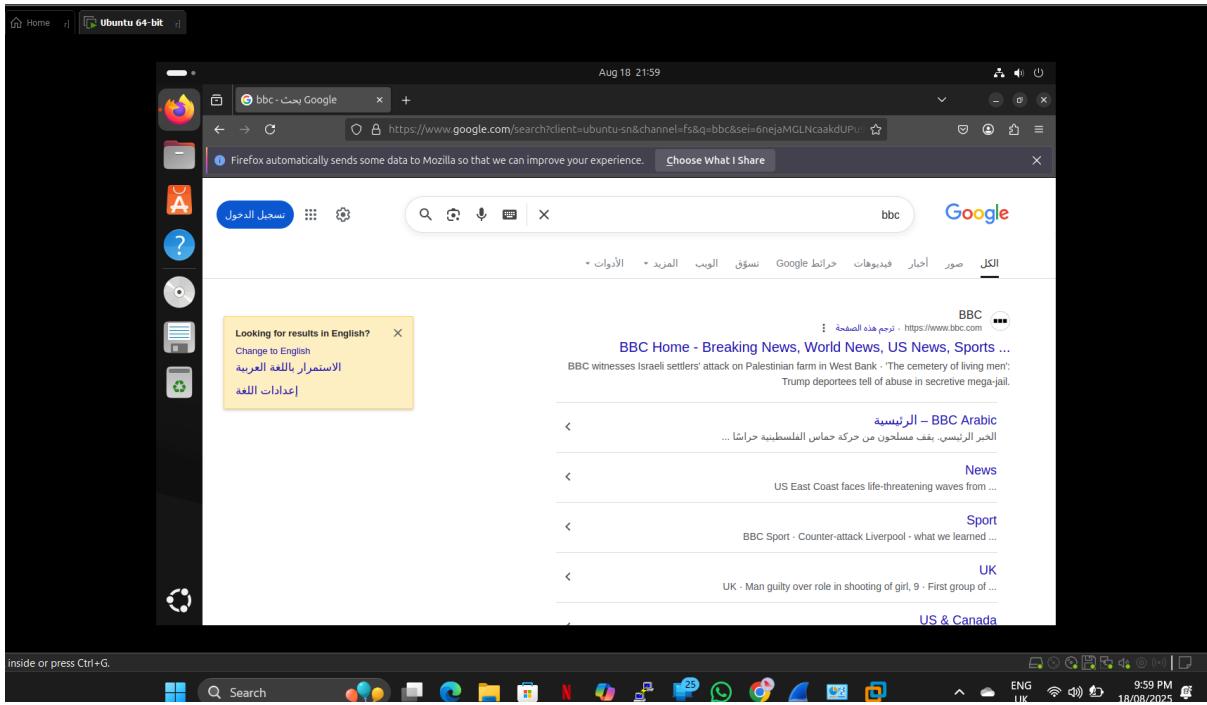
1. Press **Win + R**, type `ncpa.cpl`, and press **Enter**.
  - o Ensure that **VMware Network Adapter VMnet1 (Host-only)** and **VMnet8 (NAT)** are enabled (not greyed out).
2. Ensure VMware network services are running:
  - o Press **Win + R**, type `services.msc`, and press **Enter**.
  - o Locate **VMware DHCP Service** and **VMware NAT Service**.
  - o Confirm that both services are set to **Running** and **Automatic**. If not, right-click and select **Start**.



In my case, I selected the **Custom** network option and then chose the virtual network available on my local machine, either **VMnet1** or **VMnet8**, for the VM connection.



Finally, I was able to access the network inside the virtual machine using the **Bridged** network configuration.



### Conclusion:

By completing this project, I successfully established a multi-OS virtual lab, consisting of a Windows VM on a secure NAT network and a Debian Linux VM on a Bridged network. This environment enables safe experimentation with SOC tools, malware analysis, and cross-platform troubleshooting. The project highlights technical proficiency

in virtualization and demonstrates the ability to design practical, enterprise-like training environments that support hands-on learning and testing.