

VIRTUAL LAB

Setup & Configuration

On **VMware Workstation Pro 17.5** for **Windows 10**
With **Parrot OS, Windows 11 & Windows Server 2022**

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Introduction

A virtual lab, in the context of cybersecurity, is an isolated, simulated computing environment that replicates real-world network infrastructure, operating systems, and applications within a host machine. It is a fundamental tool for both cybersecurity students and professionals, providing a safe, sandboxed space to practice, learn, and experiment without risking damage to production systems or violating legal statutes.

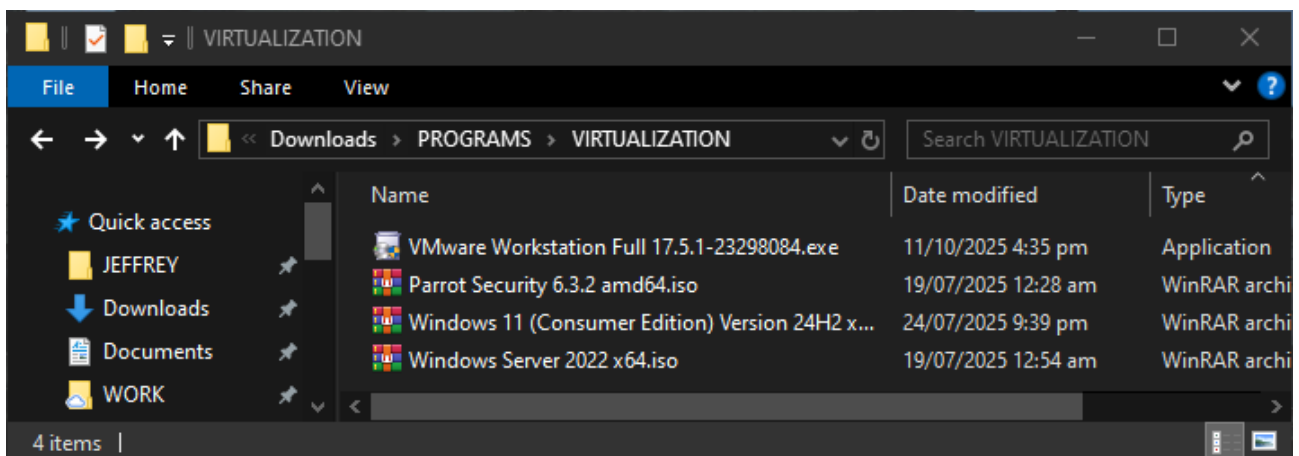
For students, a virtual lab offers hands-on experience with tools and concepts—such as penetration testing, malware analysis, forensic investigation, and secure configuration—that are crucial for developing practical skills. For professionals, it is an essential environment for threat intelligence analysis, simulating attacks to test defenses (red team/blue team exercises), reverse engineering malicious software, and conducting vulnerability research in a controlled, non-disruptive setting.

This report details the steps taken to create a functional virtual home-lab environment. This environment was constructed using VMware Workstation Pro 17.5 installed on a Windows 10 x64 host machine. The lab infrastructure consists of three primary virtual machines (VMs): Parrot Security OS (Linux), Windows 11, and Windows Server 2022. The subsequent sections of this report provide a step-by-step procedure outlining the acquisition, installation, and configuration process for the virtualizer and each guest operating system to establish a foundational and versatile cybersecurity practice environment.

Procedure

Step 1: Download Virtualizer & Operating Systems

The initial steps for setting up the environment involve downloading the **VMware Workstation Pro 17.5** virtualizer for the **Windows 10 x64** host machine, and acquiring the necessary ISO image files for the target Operating Systems, which are **Parrot Security (Linux)**, **Windows Server 2022**, and **Windows 11**.



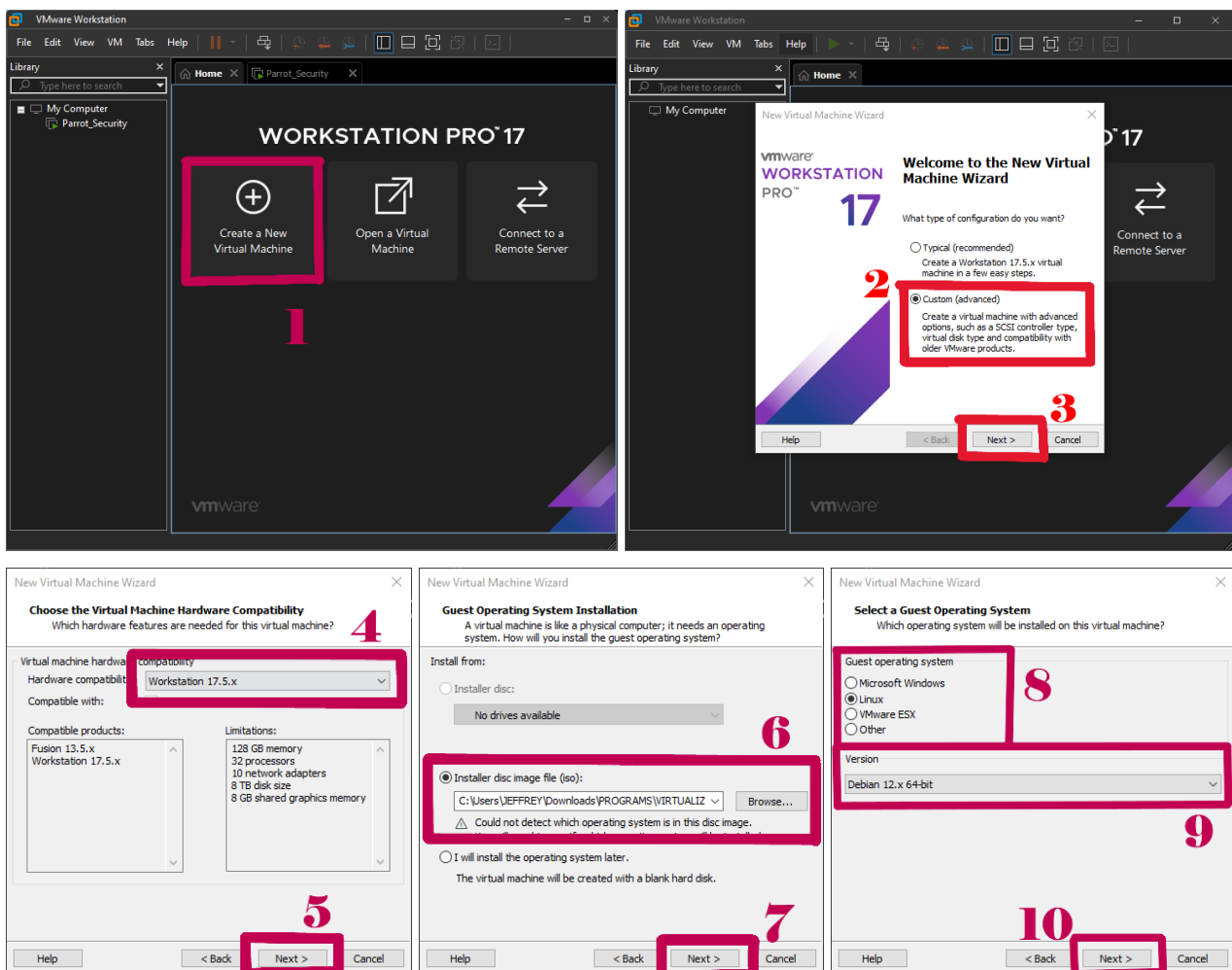
Step 2: Install Virtualizer on Host Machine (Windows 10)

To install **VMware Workstation Pro 17.5**, first **Launch** the **EXE** file, **Read and accept** the **License Agreement**, and then proceed through the Setup Wizard to configure the installation; specifically, ensure **“Enhanced Keyboard Driver”** is **not selected**, but **“Add VMware Workstation console tools into system PATH”** is **selected**. For User Experience Settings, **“Check for product updates on startup”** is **selected** for security, but **“Join the VMware Customer Experience Improvement Program”** is **not selected**, and shortcuts are only created in the Start menu. After these configurations, click **"Install"**, then select the **“License”** button on the "Completed" dialog, **Enter** the **license key**, and finally click the **“Finish”** button.



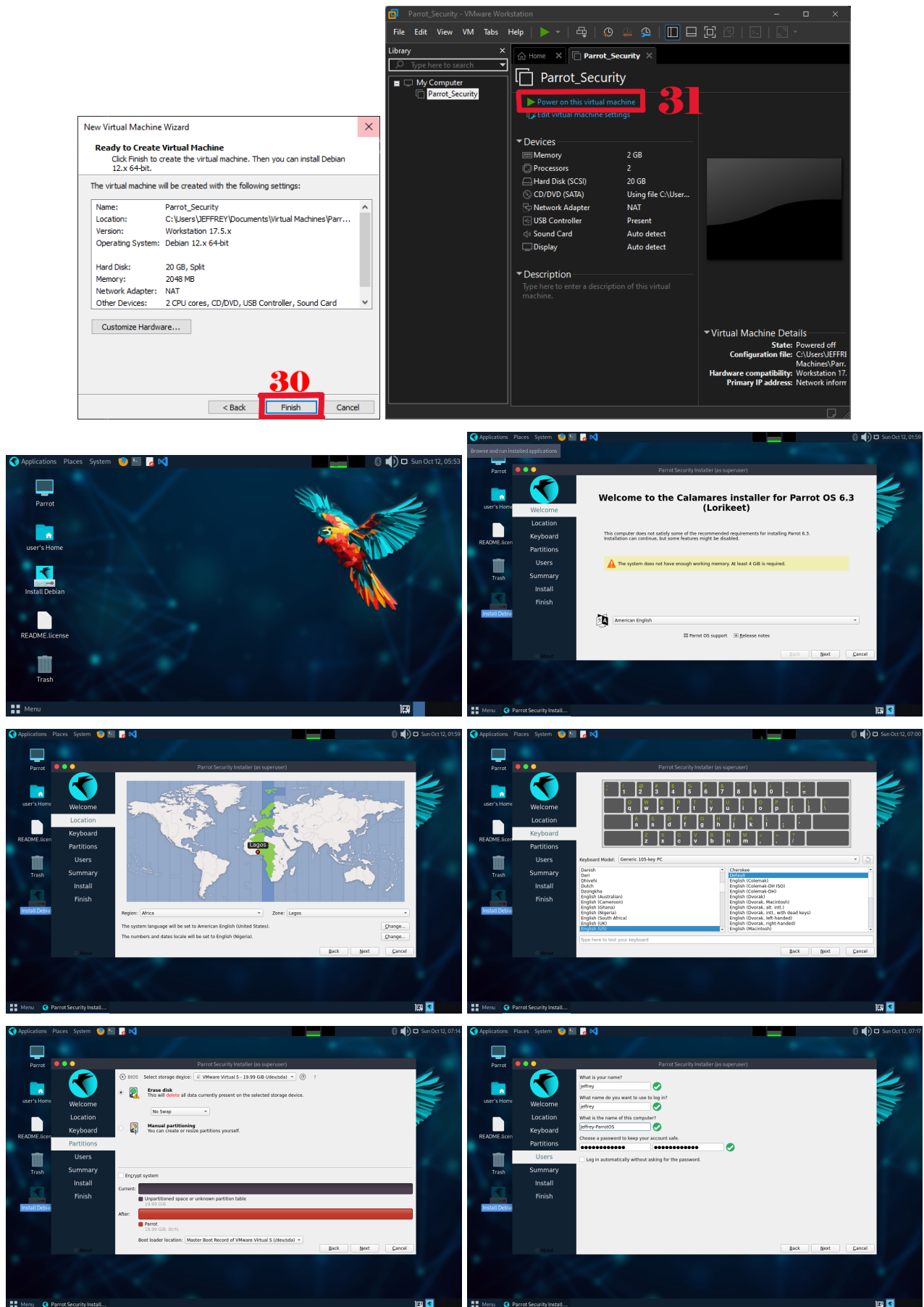
Step 3: Install Parrot Security (Linux) Operating System

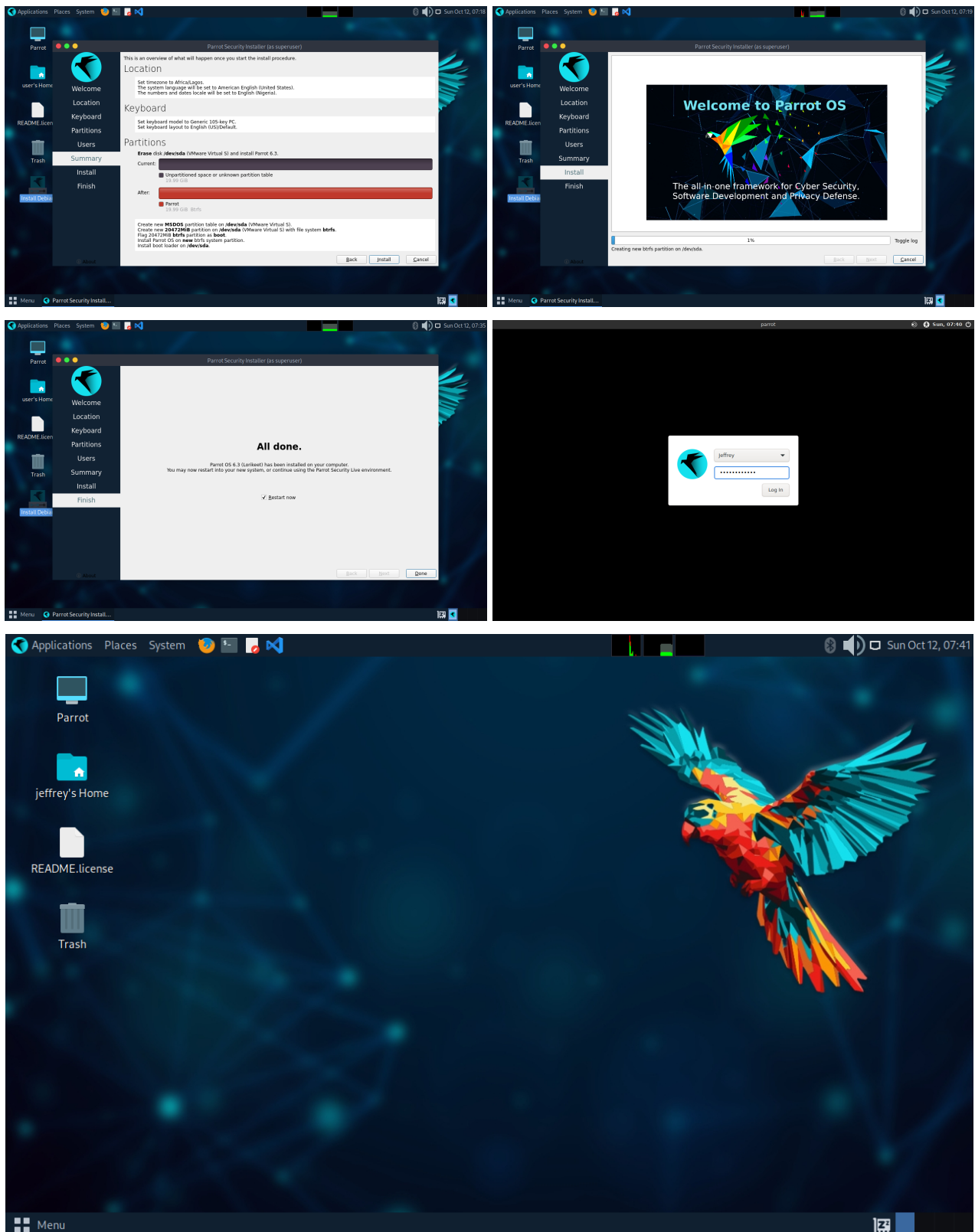
The process involves first launching **VMware Workstation Pro 17.5** and creating a **Parrot Security (Linux)** virtual machine by selecting **Custom (advanced)** configuration, **Workstation 17.5x** compatibility, and choosing **Linux** with **Debian 12.x 64-bit**. Key specifications include naming the VM (**Parrot_Security**), configuring 1 processor/2 cores, allocating **4096mb** of memory, selecting **Use Network Address Translation (NAT)**, and setting up a new **SCSI** virtual disk with **20GB** maximum size, split into multiple files, and named (**Parrot_Security.vmdk**). Following creation, the installation is set up by selecting **Try/Install**, launching the OS installer, choosing the geographical location (Lagos, Nigeria) and US keyboard layout, selecting **Erase Disk** for partitioning, specifying user credentials, confirming the **Summary**, and proceeding to the installation until the machine restarts for login.



The image displays a 3x3 grid of screenshots from the VMware Workstation 'New Virtual Machine Wizard'. Each screenshot is numbered in red (1-29) and has a red box highlighting a specific step. The steps are as follows:

- 1** Name the Virtual Machine: Parrot_Security
- 2** Location: C:\Users\JEFFREY\Documents\Virtual Machines\Parrot_Security
- 3** Processor Configuration: 1 processor, 2 cores per processor
- 4** Memory for the Virtual Machine: 4096 MB
- 5** Network Type: Use network address translation (NAT)
- 6** Select I/O Controller Type: LSI Logic (Recommended)
- 7** Select a Disk Type: SCSI (Recommended)
- 8** Select a Disk: Create a new virtual disk
- 9** Specify Disk Capacity: 20.0 GB
- 10** Specify Disk File: Parrot_Security.vmdk

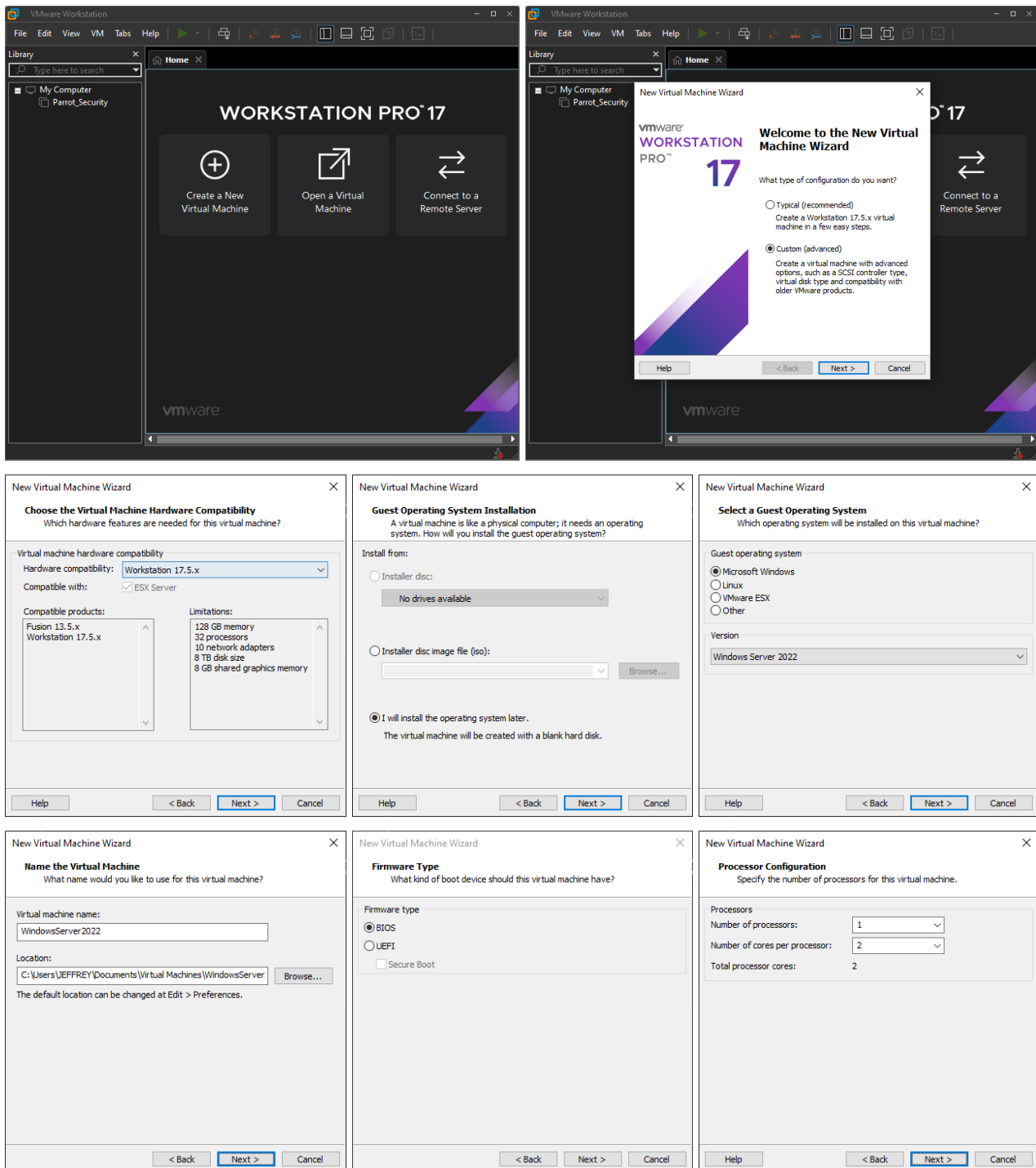




Step 4: Install Windows Server 2022 Operating System

To create and configure a Windows Server 2022 virtual machine using **VMware Workstation Pro 17.5**, first launch the hypervisor and select **Custom (advanced)** configuration, choosing **Workstation 17.5x** compatibility, **BIOS** firmware, 1 processor with 2 cores, **4096mb** of memory,

Use **Network Address Translation (NAT)** networking, **Paravirtualized SCSI** controller, and a new **SCSI** virtual disk of **30GB** split into multiple files, named **WindowsServer2022.vmdk**. Next, in the VM's **Settings**, configure the **CD/DVD (SATA)** drive to **Use ISO Image file** with the Windows Server 2022 image, selecting **SCSI 0:1** under **Advanced** settings. Power on the VM and proceed with the installation, choosing **Windows Server 2022 Standard Evaluation (Desktop Experience)**, accepting the license terms, selecting **Custom** installation, setting up the drive, creating a password, and logging into the Desktop before shutting down. Finally, re-enter the VM's **Settings** and change the **CD/DVD (SATA)** drive to **Use physical drive** for post-installation setup.



New Virtual Machine Wizard

Memory for the Virtual Machine

How much memory would you like to use for this virtual machine?

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

128 GB -

64 GB -

32 GB -

16 GB -

8 GB -

4 GB -

2 GB -

1 GB -

512 MB -

256 MB -

128 MB -

64 MB -

32 MB -

16 MB -

8 MB -

4 MB -

Memory for this virtual machine: 4096 MB

Maximum recommended memory: 9.7 GB

Recommended memory: 2 GB

Guest OS recommended minimum: 1 GB

Help < Back Next > Cancel

New Virtual Machine Wizard

Network Type

What type of network do you want to add?

Network connection

☐ Use bridged networking
Give the guest operating system direct access to an external Ethernet network. The guest must have its own IP address on the external network.

☒ Use network address translation (NAT)
Give the guest operating system access to the host computer's dial-up or external Ethernet network connection using the host's IP address.

☐ Use host-only networking
Connect the guest operating system to a private virtual network on the host computer.

☐ Do not use a network connection

Help < Back Next > Cancel

New Virtual Machine Wizard

Select I/O Controller Types

Which SCSI controller type would you like to use for SCSI virtual disks?

I/O controller types

SCSI Controller:

☐ BusLogic (Not available for 64-bit guests)

☐ LSI Logic (Not supported by Windows Server 2022)

☐ LSI Logic SAS (Recommended)

☒ Paravirtualized SCSI

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Disk Type

What kind of disk do you want to create?

Virtual disk type

☐ IDE

☒ SCSI

☐ SATA

☐ NVMe (Recommended)

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Disk

Which disk do you want to use?

Disk

☒ Create a new virtual disk
A virtual disk is composed of one or more files on the host file system, which will appear as a single hard disk to the guest operating system. Virtual disks can easily be copied or moved on the same host or between hosts.

☐ Use an existing virtual disk
Choose this option to reuse a previously configured disk.

☐ Use a physical disk (for advanced users)
Choose this option to give the virtual machine direct access to a local hard disk. Requires administrator privileges.

Help < Back Next > Cancel

New Virtual Machine Wizard

Specify Disk Capacity

How large do you want this disk to be?

Maximum disk size (GB): 30.0

Recommended size for Windows Server 2022: 60 GB

☐ Allocate all disk space now.
Allocating the full capacity can enhance performance but requires all of the physical disk space to be available right now. If you do not allocate all the space now, the virtual disk starts small and grows as you add data to it.

☐ Store virtual disk as a single file

☒ Split virtual disk into multiple files
Splitting the disk makes it easier to move the virtual machine to another computer but may reduce performance with very large disks.

Help < Back Next > Cancel

New Virtual Machine Wizard

Specify Disk File

Where would you like to store the disk file?

Disk file

A 30 GB virtual disk will be created using multiple disk files. The disk files will be automatically named based on this file name.

WindowsServer2022.vmdk

Browse...

Help < Back Next > Cancel

New Virtual Machine Wizard

Ready to Create Virtual Machine

Click Finish to create the virtual machine. Then you can install Windows Server 2022.

The virtual machine will be created with the following settings:

Name: WindowsServer2022

Location: C:\Users\JEFFREY\Documents\Virtual Machines\Wind...

Version: Workstation 17.5.x

Operating System: Windows Server 2022

Hard Disk: 30 GB, Split

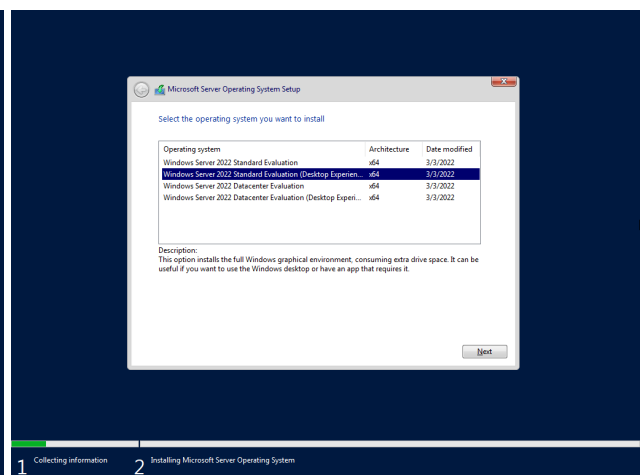
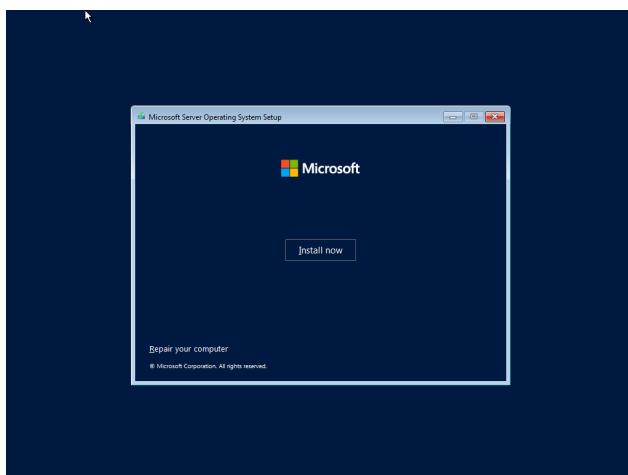
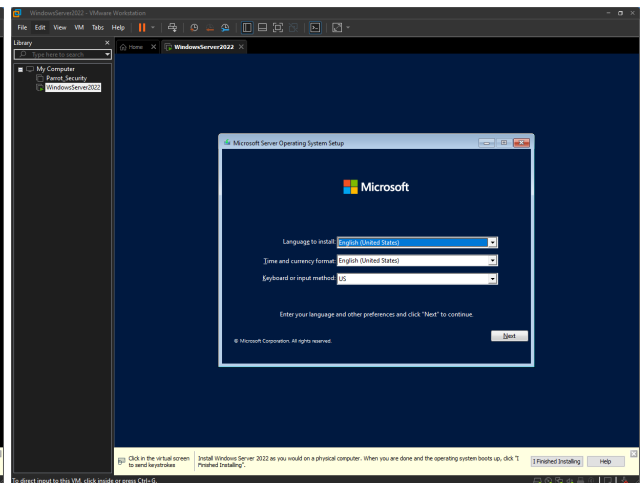
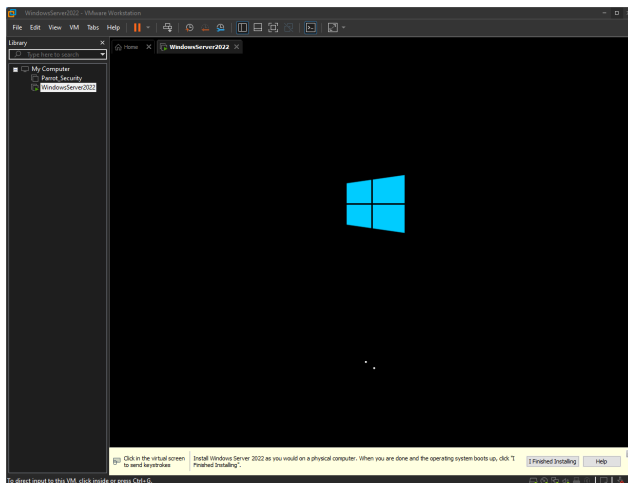
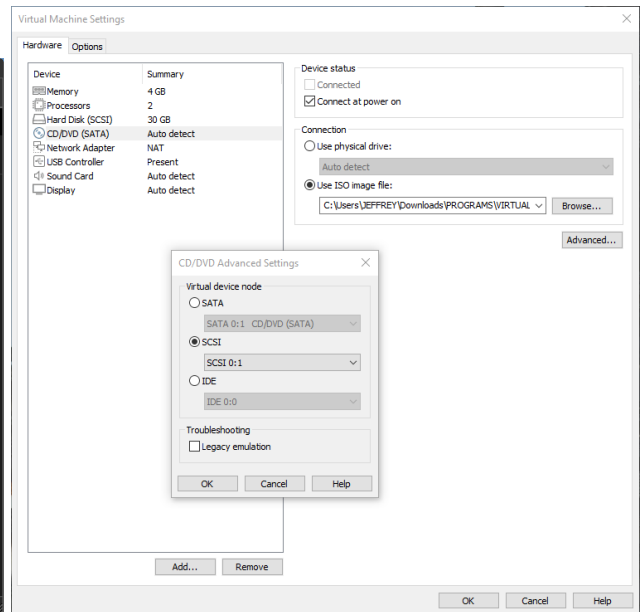
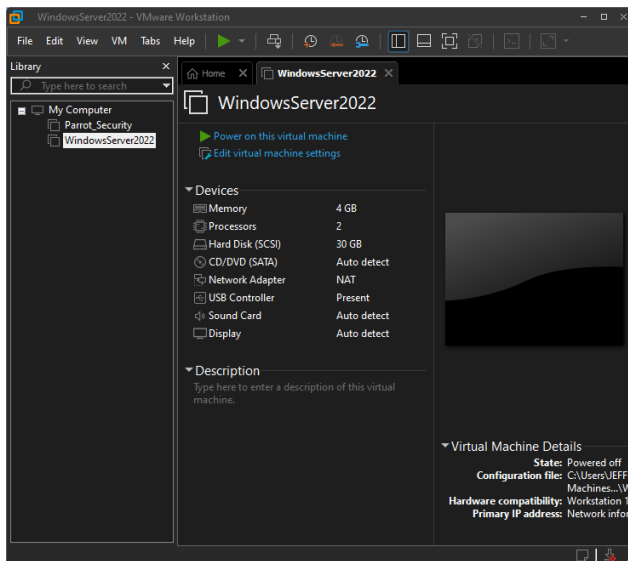
Memory: 4096 MB

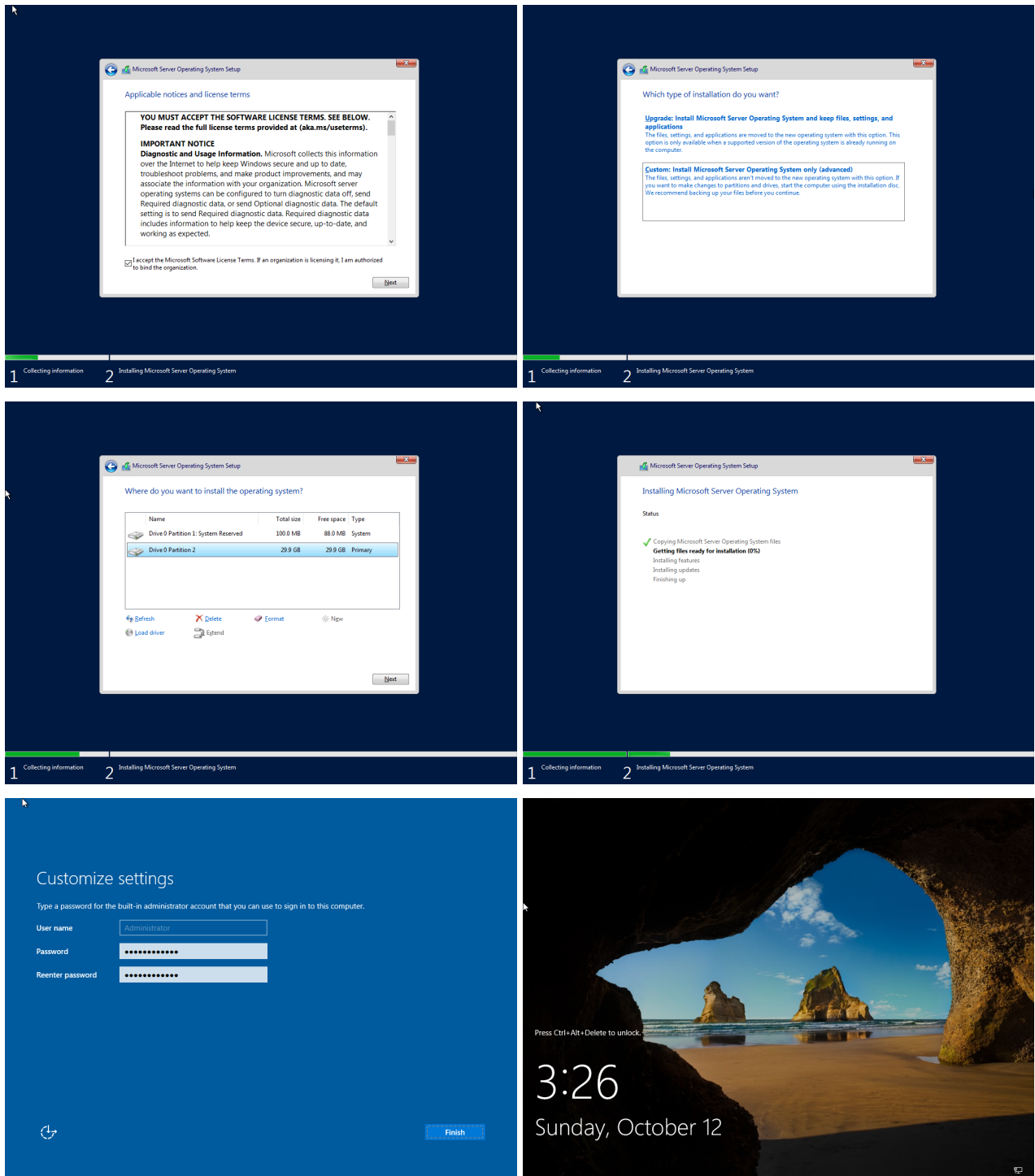
Network Adapter: NAT

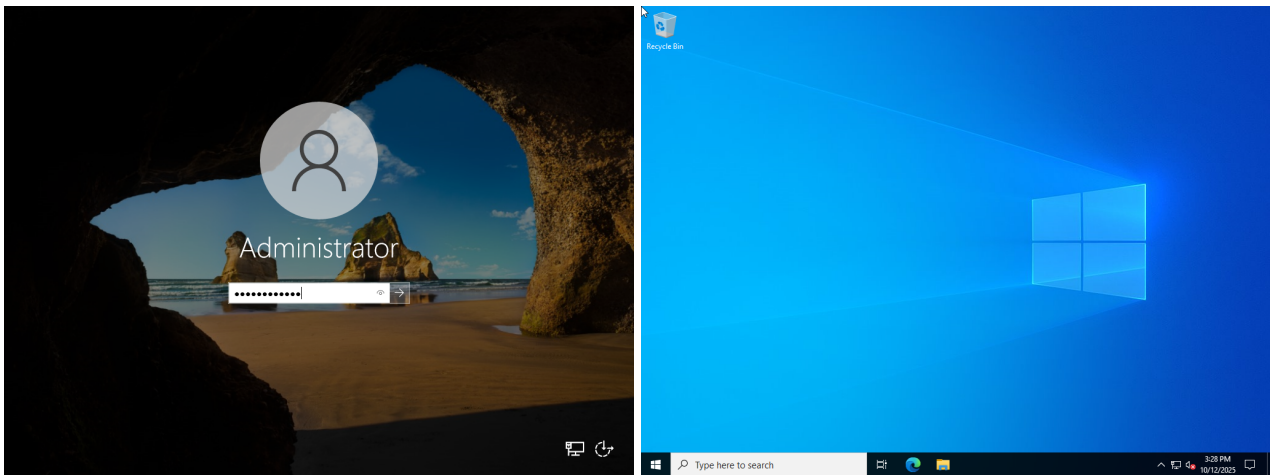
Other Devices: 2 CPU cores, CD/DVD, USB Controller, Sound Card

Customize Hardware...

Help < Back Finish Cancel

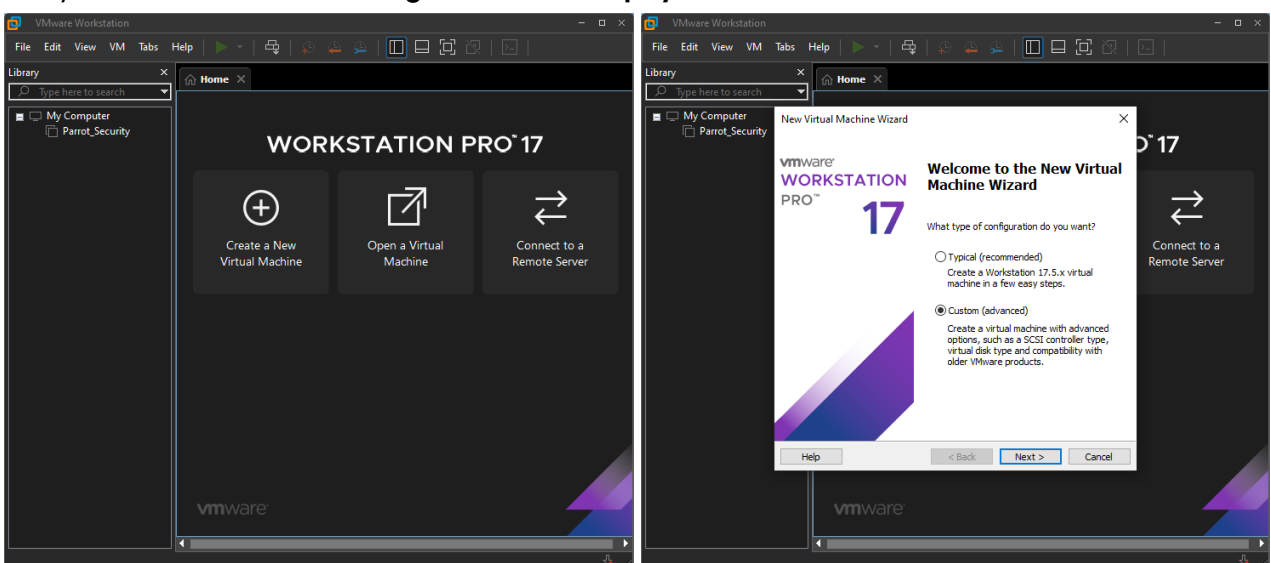






Step 5: Install Windows 11 Operating System

To create a **Windows 11** virtual machine, first launch **VMware Workstation Pro 17.5** and select **“Create New Virtual Machine,”** choosing **Custom (advanced)** configuration and **Workstation 17.5x** compatibility. Configure the guest OS as **Microsoft Windows 11 x64**, name the VM **(Windows11)**, select **Only the files needed to support a TPM are encrypted**, use **UEFI** firmware, and assign 1 processor with 2 cores and **4096mb** of memory. Select **Use Network Address Translation (NAT)**, **Paravirtualized SCSI** for the controller, **SCSI** disk type, and **Create a new virtual disk** with a maximum size of **30GB**, splitting the disk into multiple files named **(Windows11.vmdk)**, then finish. Next, right-click **Windows11**, go to **Settings**, select **CD/DVD (SATA)**, choose **Use ISO Image file**, browse to the image location, and in **Advanced Settings**, select **SCSI 0:2**. Power on the VM, complete the **Microsoft 11 Setup** by selecting language, inputting the **Product Key**, accepting terms, setting up drive allocation, and clicking **Install**. Finally, configure the OS by selecting country and input method, setting up a network, choosing **Set up for personal use**, creating local user credentials, and accepting Privacy Settings, then shut down the system and return to **Settings** to select **Use physical drive** for the **CD/DVD (SATA)** device.



New Virtual Machine Wizard

Choose the Virtual Machine Hardware Compatibility
Which hardware features are needed for this virtual machine?

Virtual machine hardware compatibility

Hardware compatibility: Workstation 17.5.x

Compatible with: ☒ ESX Server

Compatible products:

- Fusion 13.5.x
- Workstation 17.5.x

Limitations:

- 128 GB memory
- 32 processors
- 10 network adapters
- 8 TB disk size
- 8 GB shared graphics memory

Help < Back Next > Cancel

New Virtual Machine Wizard

Guest Operating System Installation

A virtual machine is like a physical computer; it needs an operating system. How will you install the guest operating system?

Install from:

☐ Installer disc:

No drives available

☐ Installer disc image file (iso):

Browse...

☒ I will install the operating system later.

The virtual machine will be created with a blank hard disk.

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Guest Operating System

Which operating system will be installed on this virtual machine?

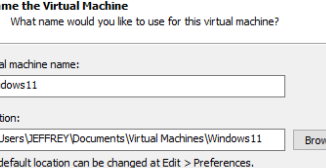
Guest operating system

- ☒ Microsoft Windows
- ☐ Linux
- ☐ VMware ESX
- ☐ Other

Version

Windows 11 x64

Help < Back Next > Cancel



New Virtual Machine Wizard

Name the Virtual Machine

What name would you like to use for this virtual machine?

Virtual machine name:

Windows11

Location:

C:\Users\JEFFREY\Documents\Virtual Machines\Windows11

Browse...

The default location can be changed at Edit > Preferences.

< Back Next > Cancel

New Virtual Machine Wizard

Encryption Information

How would you like to encrypt this virtual machine?

This Guest OS requires an encrypted Trusted Platform Module to operate.

Your files will be encrypted using a password you must set. This password is stored in the system's credential manager. Keep a copy of the password in a safe place, you can not start this VM without it.

Choose Encryption Type

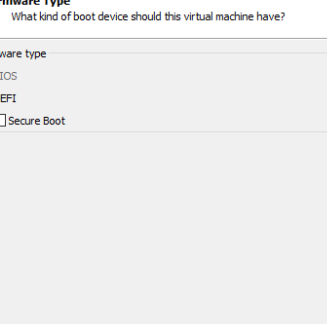
- ☐ All the files (.vmdk, .vmx, etc) for this virtual machine are encrypted.
- ☒ Only the files needed to support a TPM are encrypted. (.nvram, .vmss, .vmem, .vmx, .vsnr)

Password

Confirm Password

☒ Remember the password on this machine in Credential Manager

< Back Next > Cancel



New Virtual Machine Wizard

Firmware Type
What kind of boot device should this virtual machine have?

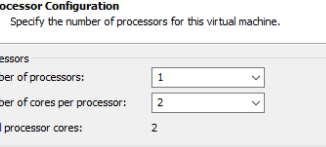
Firmware type

☐ BIOS

☒ UEFI

☐ Secure Boot

< Back Next > Cancel



New Virtual Machine Wizard

Processor Configuration
Specify the number of processors for this virtual machine.

Processors

Number of processors: 1

Number of cores per processor: 2

Total processor cores: 2

Help < Back Next > Cancel

New Virtual Machine Wizard

Memory for the Virtual Machine

How much memory would you like to use for this virtual machine?

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

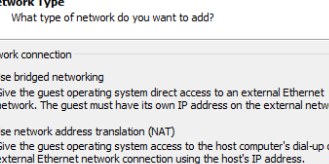
Memory for this virtual machine: 4096 MB

Maximum recommended memory: 9.7 GB

Recommended memory: 4 GB

Guest OS recommended minimum: 4 GB

Help < Back Next > Cancel



New Virtual Machine Wizard

Network Type

What type of network do you want to add?

Network connection

- ☐ Use bridged networking
Give the guest operating system direct access to an external Ethernet network. The guest must have its own IP address on the external network.
- ☒ Use network address translation (NAT)
Give the guest operating system access to the host computer's dial-up or external Ethernet network connection using the host's IP address.
- ☐ Use host-only networking
Connect the guest operating system to a private virtual network on the host computer.
- ☐ Do not use a network connection

Help < Back Next > Cancel

New Virtual Machine Wizard

Select I/O Controller Types

Which SCSI controller type would you like to use for SCSI virtual disks?

I/O controller types

SCSI Controller:

- ☐ BusLogic (Not available for 64-bit guests)
- ☐ LSI Logic (Not supported by Windows 11 x64)
- ☐ LSI Logic SAS (Recommended)
- ☒ Paravirtualized SCSI

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Disk Type

What kind of disk do you want to create?

Virtual disk type

- ☐ IDE
- ☒ SCSI
- ☐ SATA
- ☐ NVMe (Recommended)

Help < Back Next > Cancel

New Virtual Machine Wizard

Select a Disk

Which disk do you want to use?

Disk

☒ Create a new virtual disk

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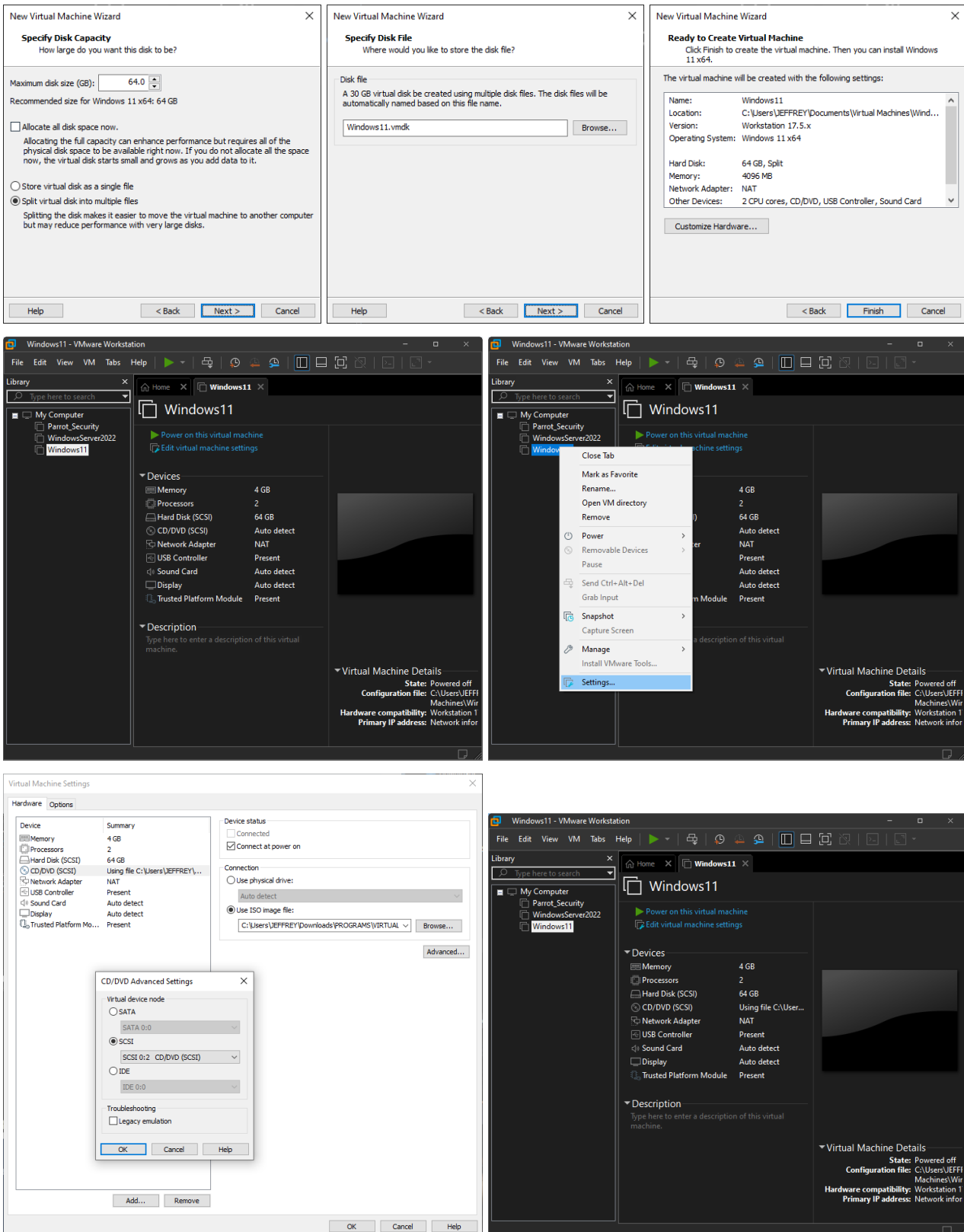
☐ Use an existing virtual disk

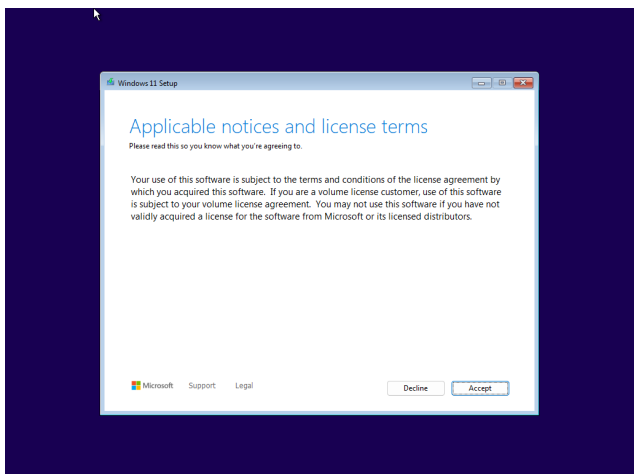
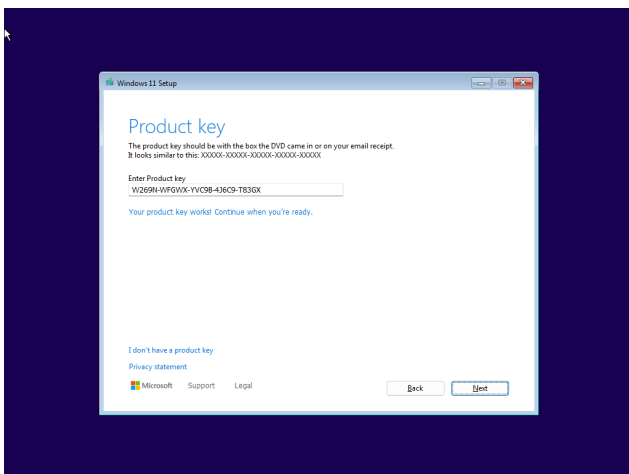
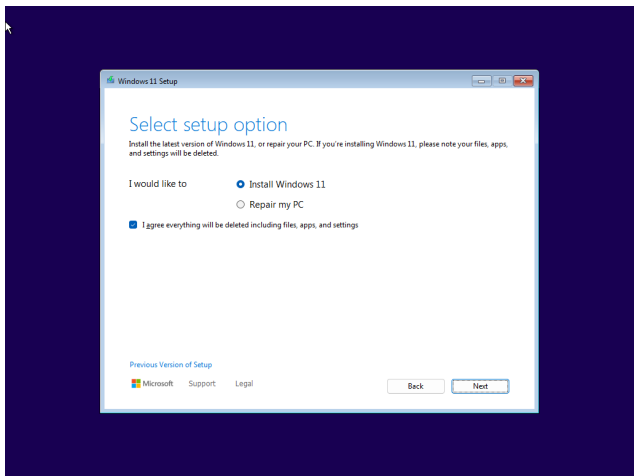
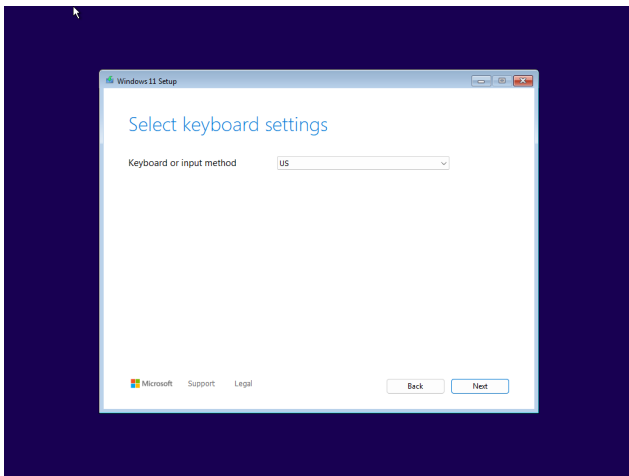
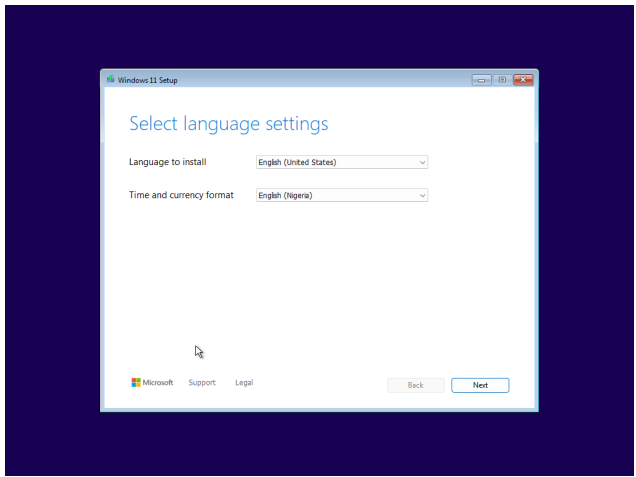
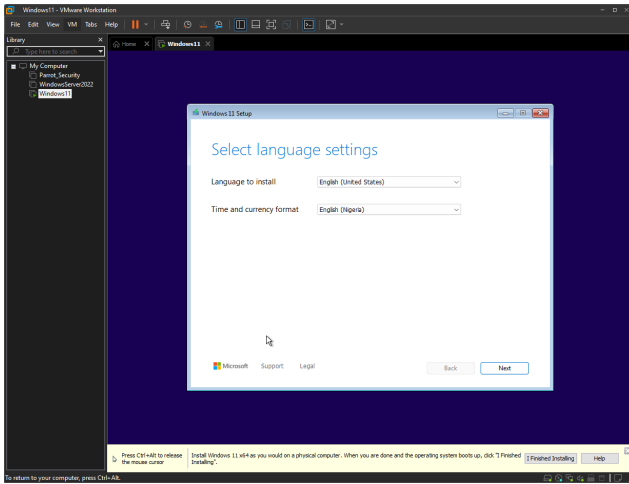
Choose this option to reuse a previously configured disk.

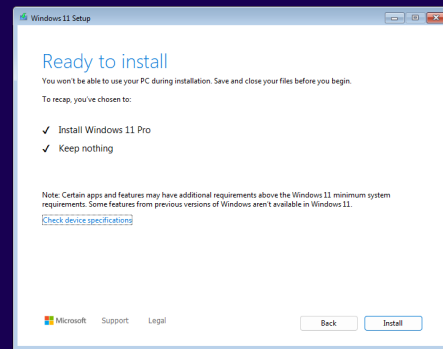
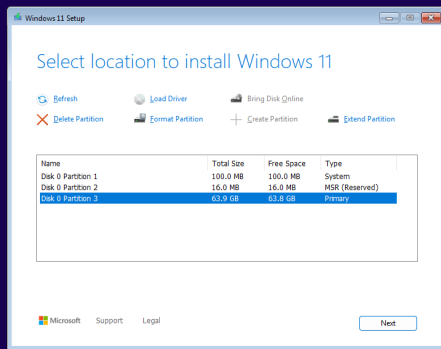
☐ Use a physical disk (for advanced users)

Choose this option to give the virtual machine direct access to a local hard disk. Requires administrator privileges.

Help < Back Next > Cancel







Installing Windows 11

Your PC will restart several times. This might take a while.

10% complete

Cancel

Installing 33%
Please keep your computer on.

Your computer may restart a few times.



Is this the right country or region?

Nigeria

Afghanistan

Åland Islands

Albania

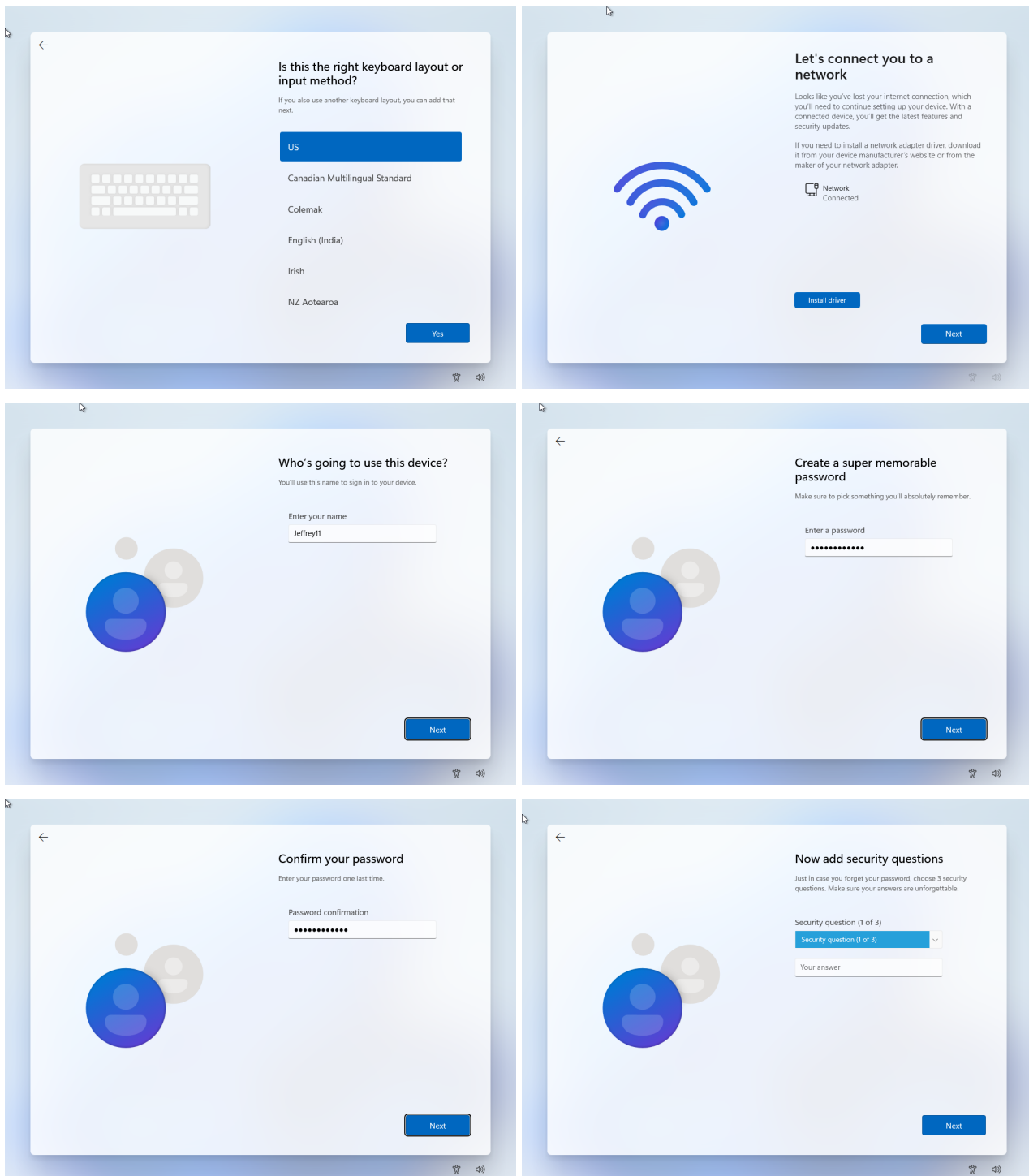
Algeria

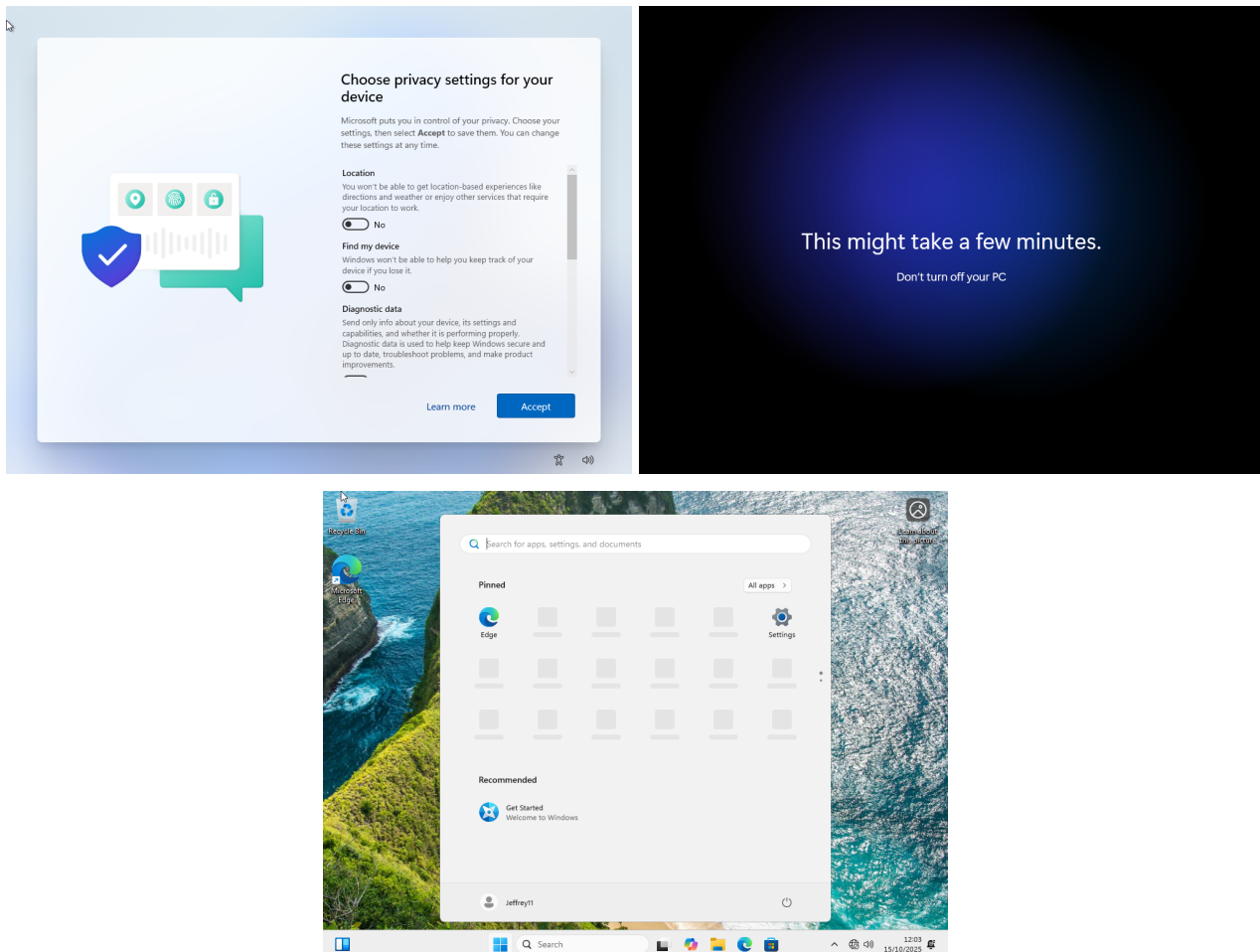
American Samoa

Andorra

Yes







Conclusion

The objective of establishing a functional and versatile virtual cybersecurity lab environment was successfully achieved. By leveraging **VMware Workstation Pro 17.5** on a **Windows 10** host machine, a three-node virtual infrastructure was constructed, comprising **Parrot Security OS (Linux)**, **Windows Server 2022**, and **Windows 11**. Each guest operating system was meticulously installed and configured, ensuring network connectivity via **NAT** and optimal resource allocation (4096MB RAM, 1 processor/2 cores). This environment is now an isolated, safe, and controlled sandbox ready for various cybersecurity exercises, including penetration testing, network analysis, and secure configuration practice, thereby fulfilling the foundational requirement for hands-on skill development.

Lessons Learned

The process of setting up the virtual lab yielded several practical insights:

- **Resource Management:** Allocating sufficient, yet balanced, memory and processor cores to each VM is crucial for performance. The initial attempt to run all three VMs with only

2048MB of RAM proved sluggish, necessitating an increase to **4096MB** for smooth operation, particularly for Windows Server 2022 and Windows 11.

- **VMware Configuration Nuances:** Specific configuration choices in VMware Workstation Pro were essential. For Windows 11, the requirement for **UEFI** firmware and an encrypted TPM (even if only supporting files are encrypted) was a necessary step that differentiates its installation from the others. Similarly, ensuring the correct **SCSI** controller and disk allocation were specified during the custom creation phase prevented potential boot issues.
- **Operating System Installation Differences:** The installation procedures varied significantly. The Parrot Security (Debian-based) installation was straightforward, focusing on user creation and disk partitioning. In contrast, Windows Server 2022 and Windows 11 required attention to specific editions (Desktop Experience for Server) and navigating the graphical setup wizards.
- **Importance of Network Configuration (NAT):** The consistent use of **Network Address Translation (NAT)** across all VMs was the simplest and most effective way to ensure all virtual machines could communicate with each other and the external internet, while remaining isolated from the host machine's primary network segment.
- **Pre- and Post-Installation Steps:** Meticulous attention to steps like changing the CD/DVD drive setting from the **ISO image file** to the **Use physical drive** after the OS installation was completed was vital for ensuring the VMs booted correctly from the virtual hard disk and could access physical drives if needed later.