

Worksheet 1

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Worksheet 1

Task 1: VM creation and Operating System installations

Installing the Server

Installing the Client

Task 2: Virtual Network Configurations

Task 3: Observational Tasks

The difference between Type 1/2 Hypervisors & the benefits/drawbacks

Type 1

Type 2

The significance of the subnet mask in IPv4 addressing

The use of cloud computing and its benefits/drawbacks

Descriptions of Different Terminologies

Ping

Firewall

Server Management

Oobe

Virtualisation

Physical Address Extension

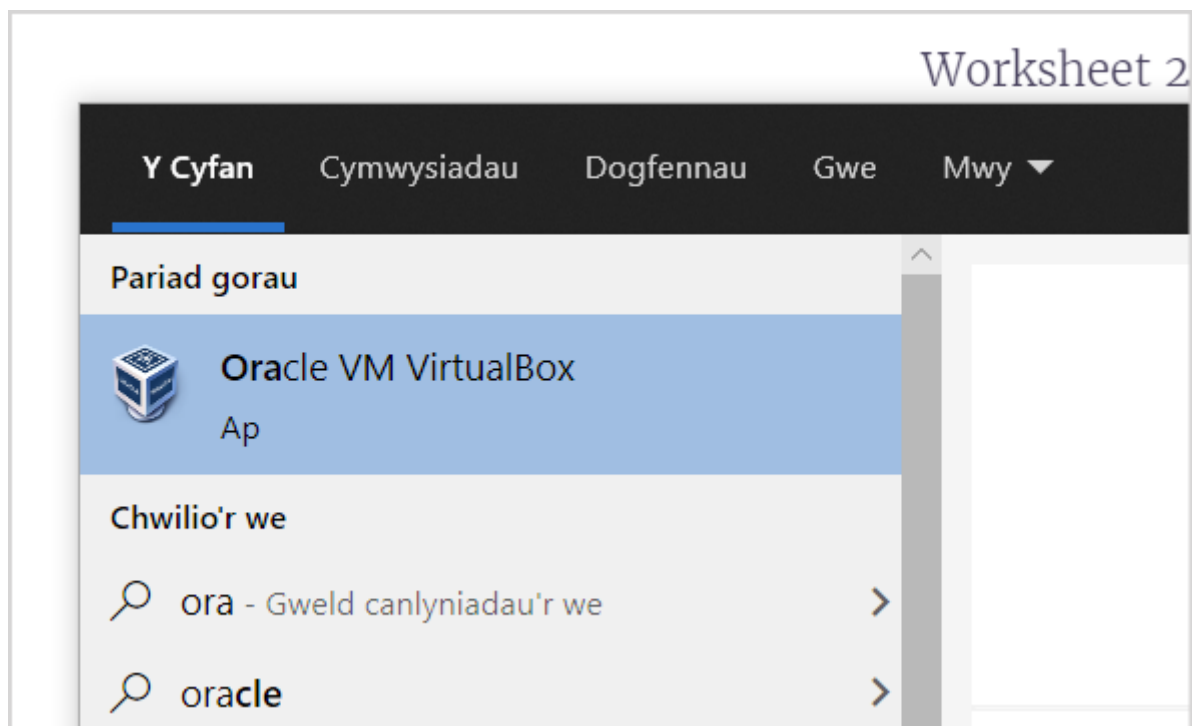
Switch

References

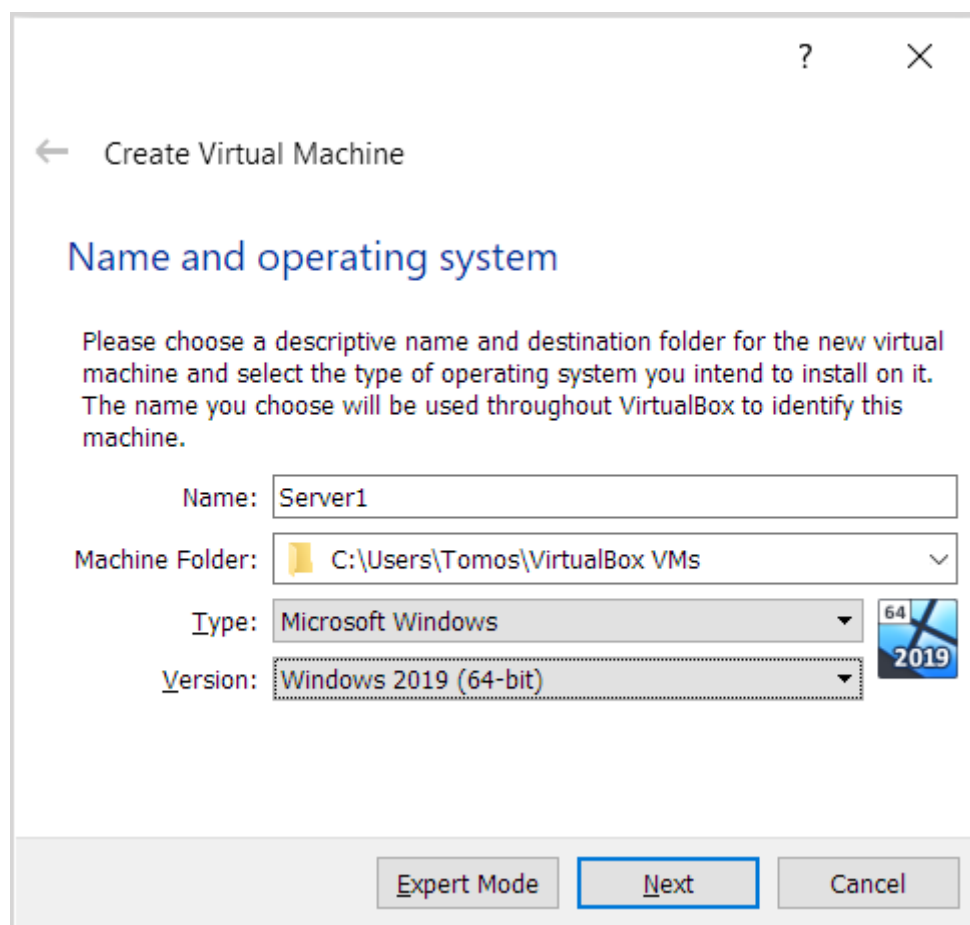
Task 1: VM creation and Operating System installations

Installing the Server

In order to complete the practical work, the author was required to install VirtualBox, luckily, the author had already obtained a copy of VirtualBox for a previous assignment, and the software is already present on their system:

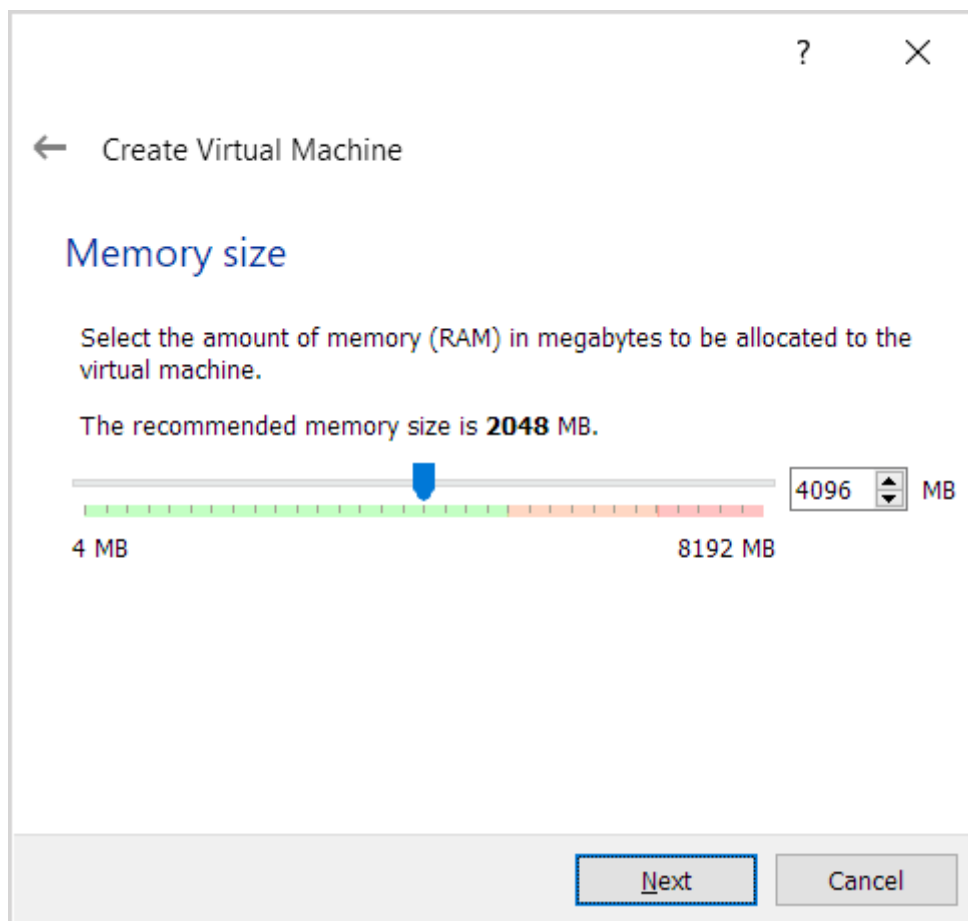


The brief instructed 4 virtual machines to be created. The first virtual machine was created, named **Server1**:

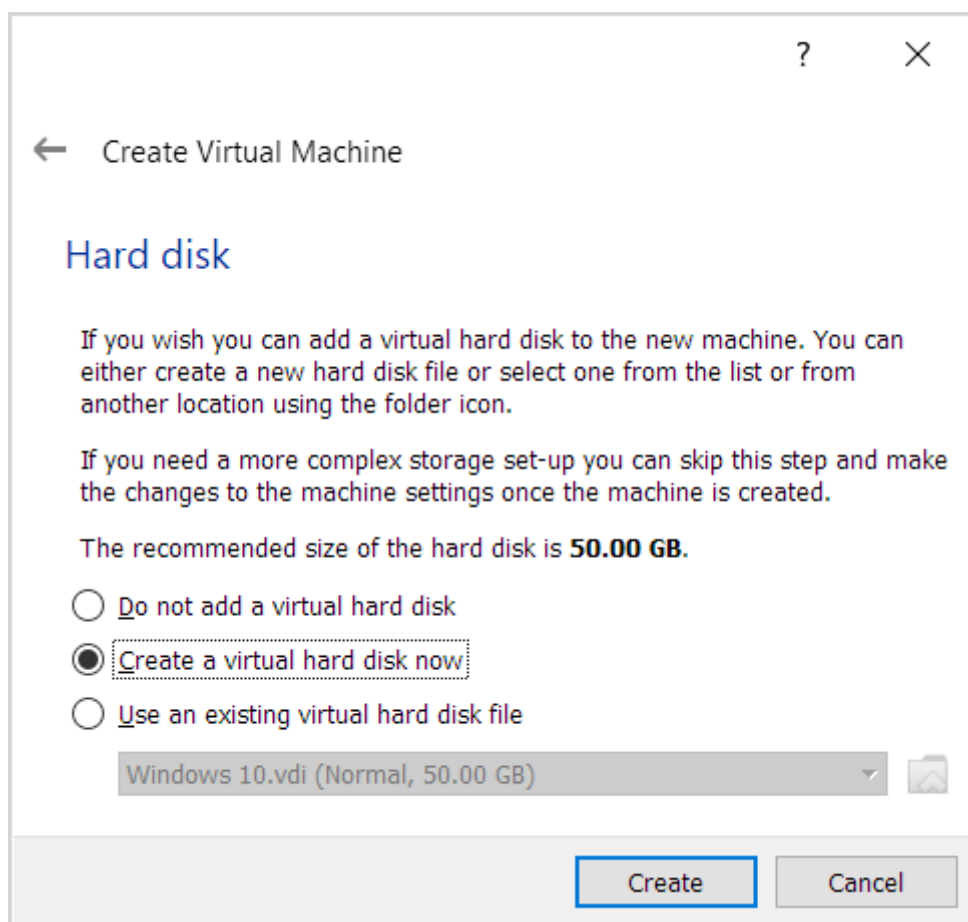


The version was set to **Windows 2019 (64-bit)**.

The memory size was set to **4GB of RAM**:



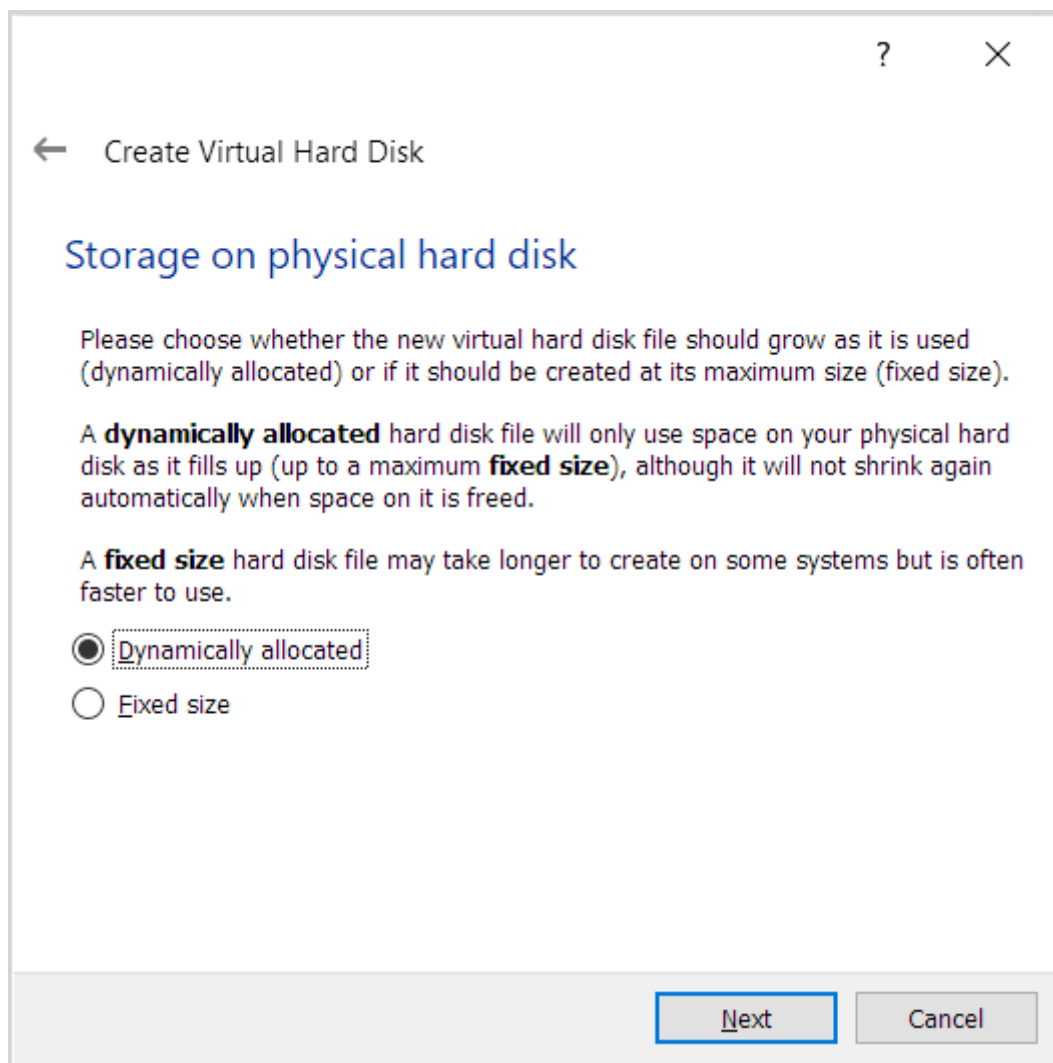
The author chose to **Create a virtual hard disk now**:



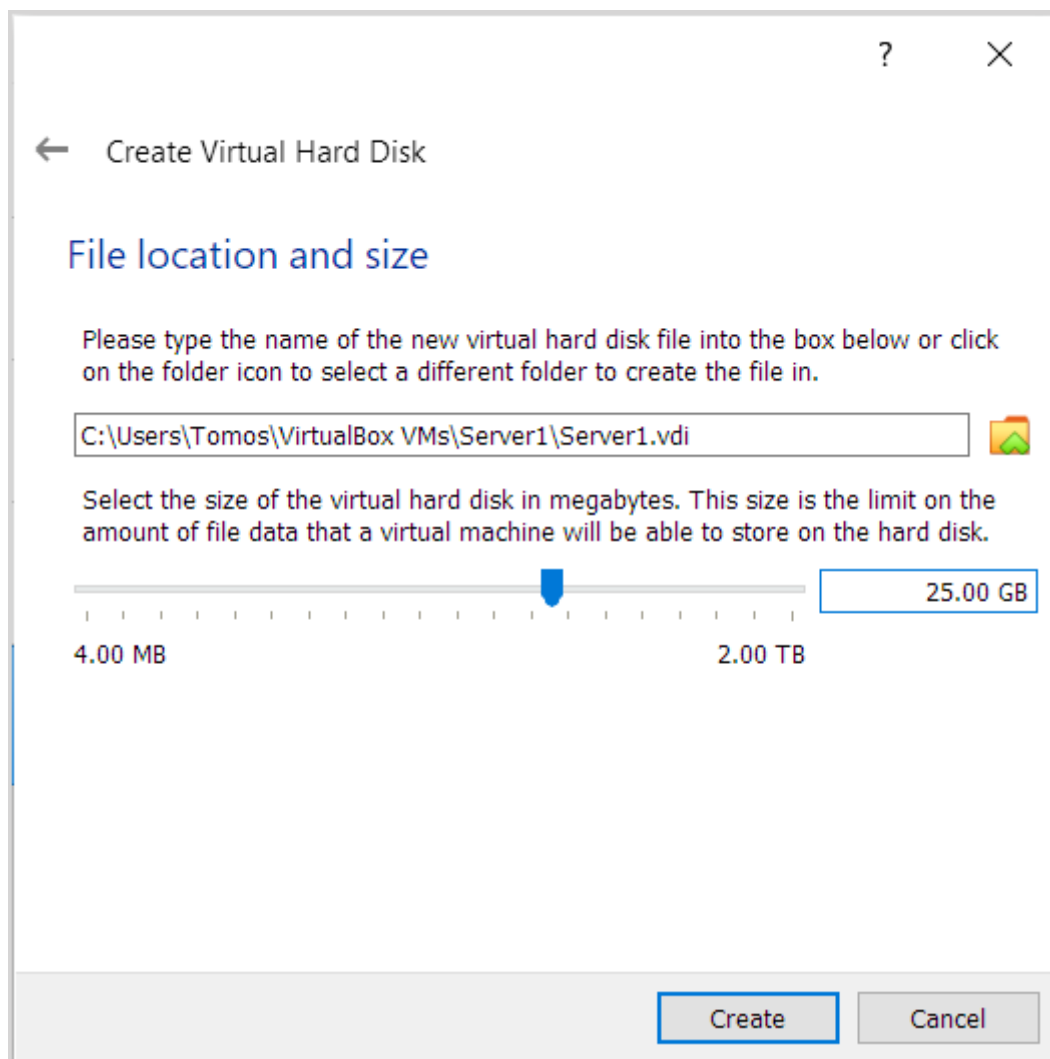
A new **VDI (Virtual Disk Image)** was set as the Hard disk file type, as the author did not need to use it with other virtualization software:



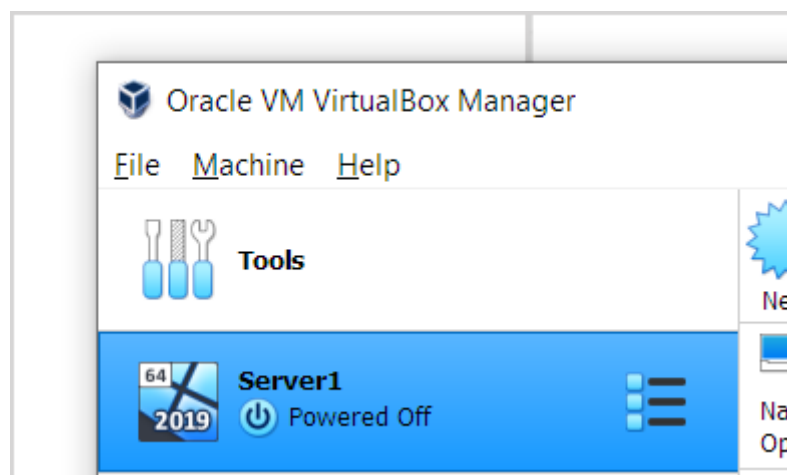
The disk was set as a **Dynamically allocated** disk to save storage on the Host Disk:



The VHD size was set to **25GB** of storage to save storage space on the host:

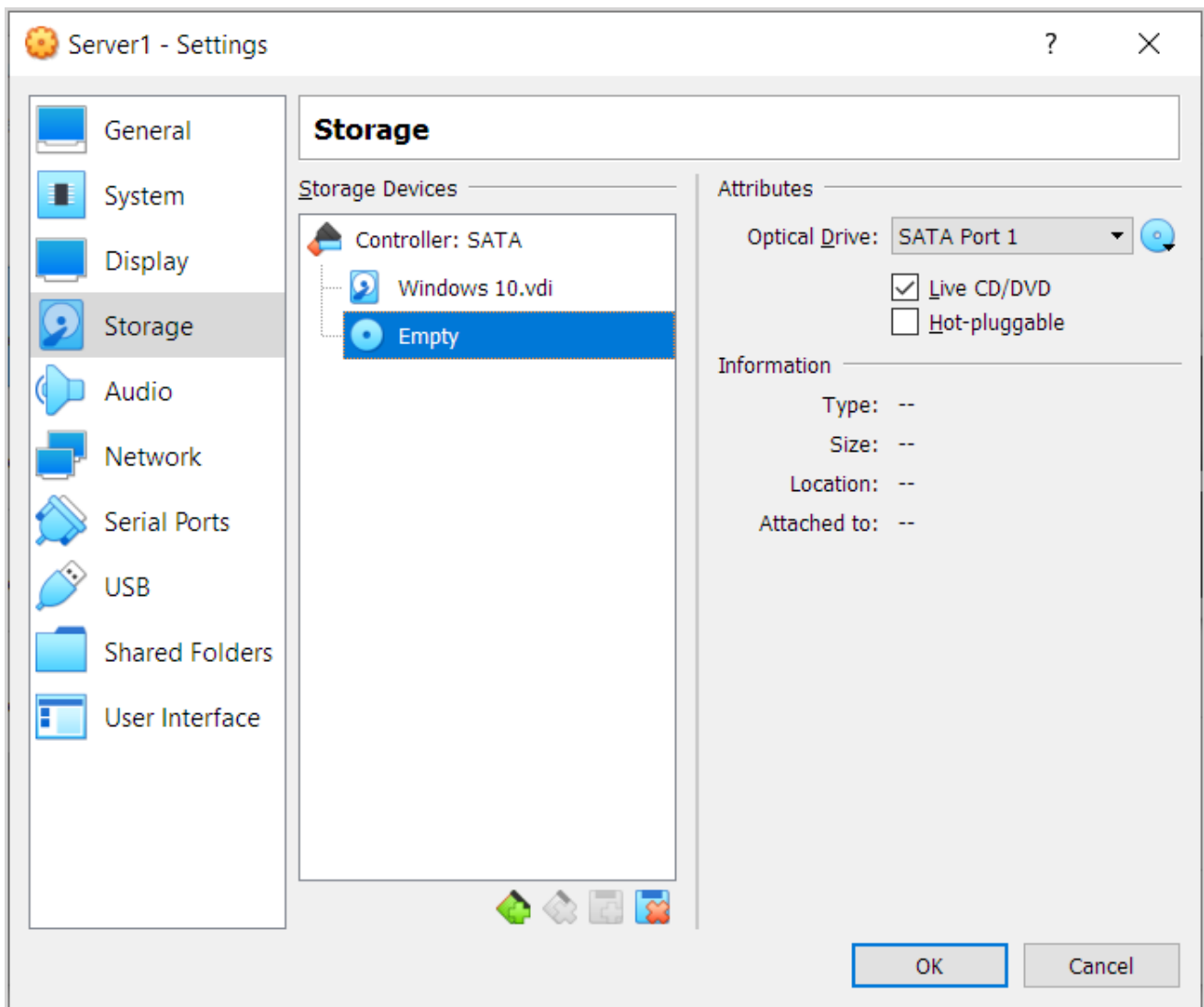


Server1 was successfully created:

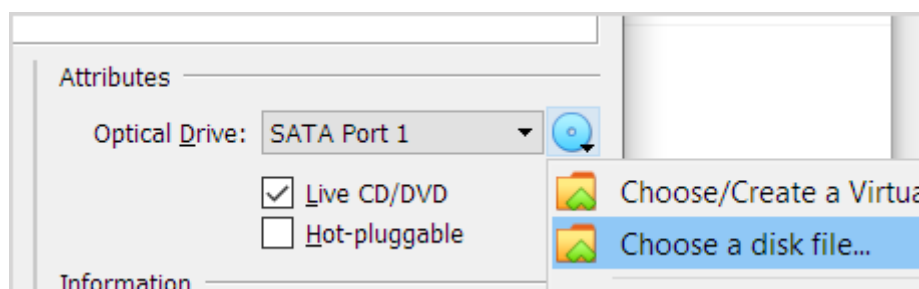


The **Windows Server 2019** ISO was required to install the operating system, which could be obtained from a shared OneDrive link. The author installed the ISO successfully.

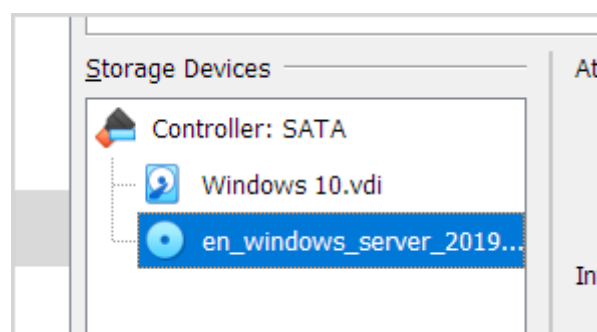
The disk image itself needed to be inserted into the machine:



Through the Settings page of Server1, you could insert a virtual disk image into the virtual optical drive to install Windows Server 2019.

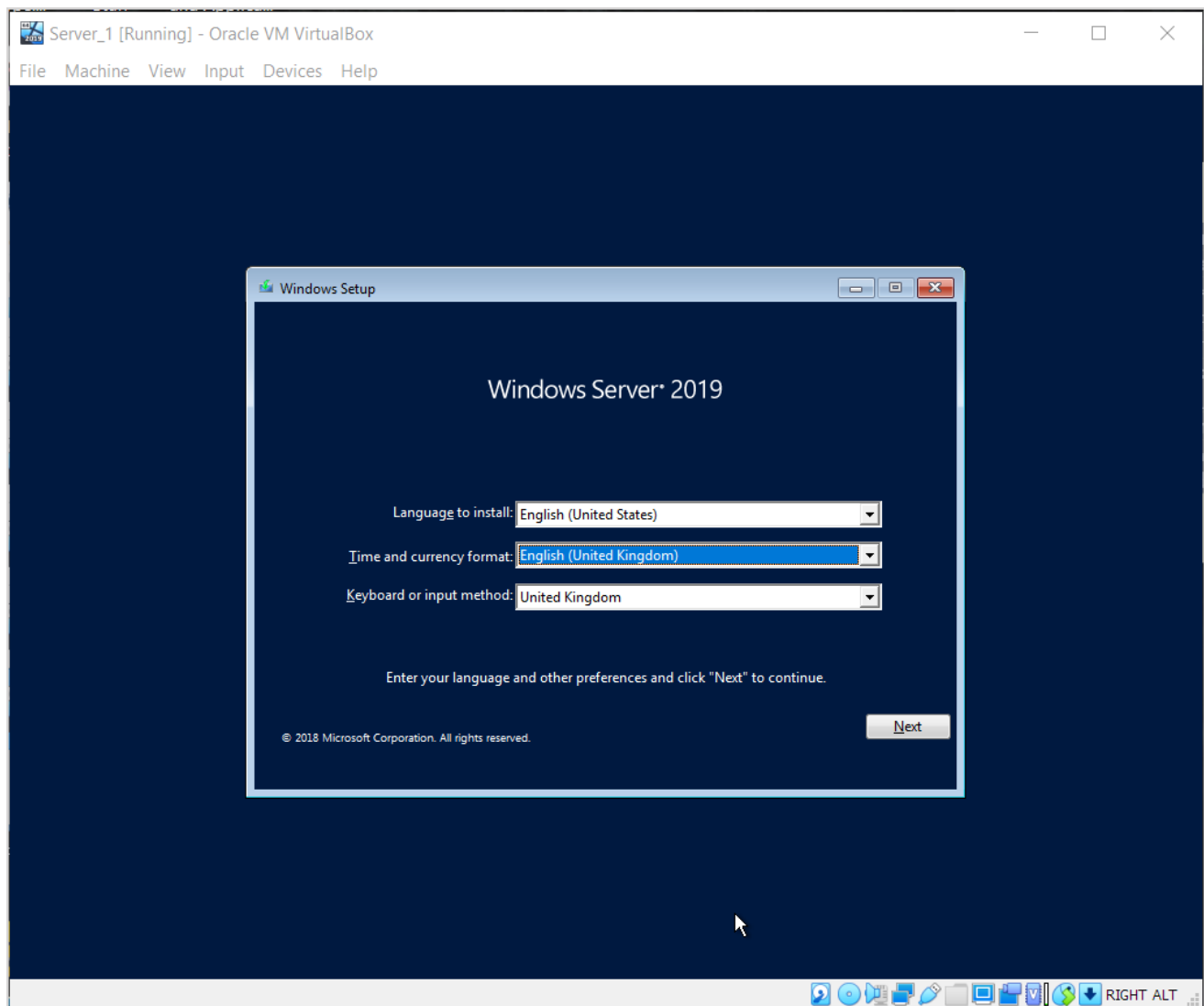


The ISO file for **Windows Server 2019** was inserted into the optical drive successfully:

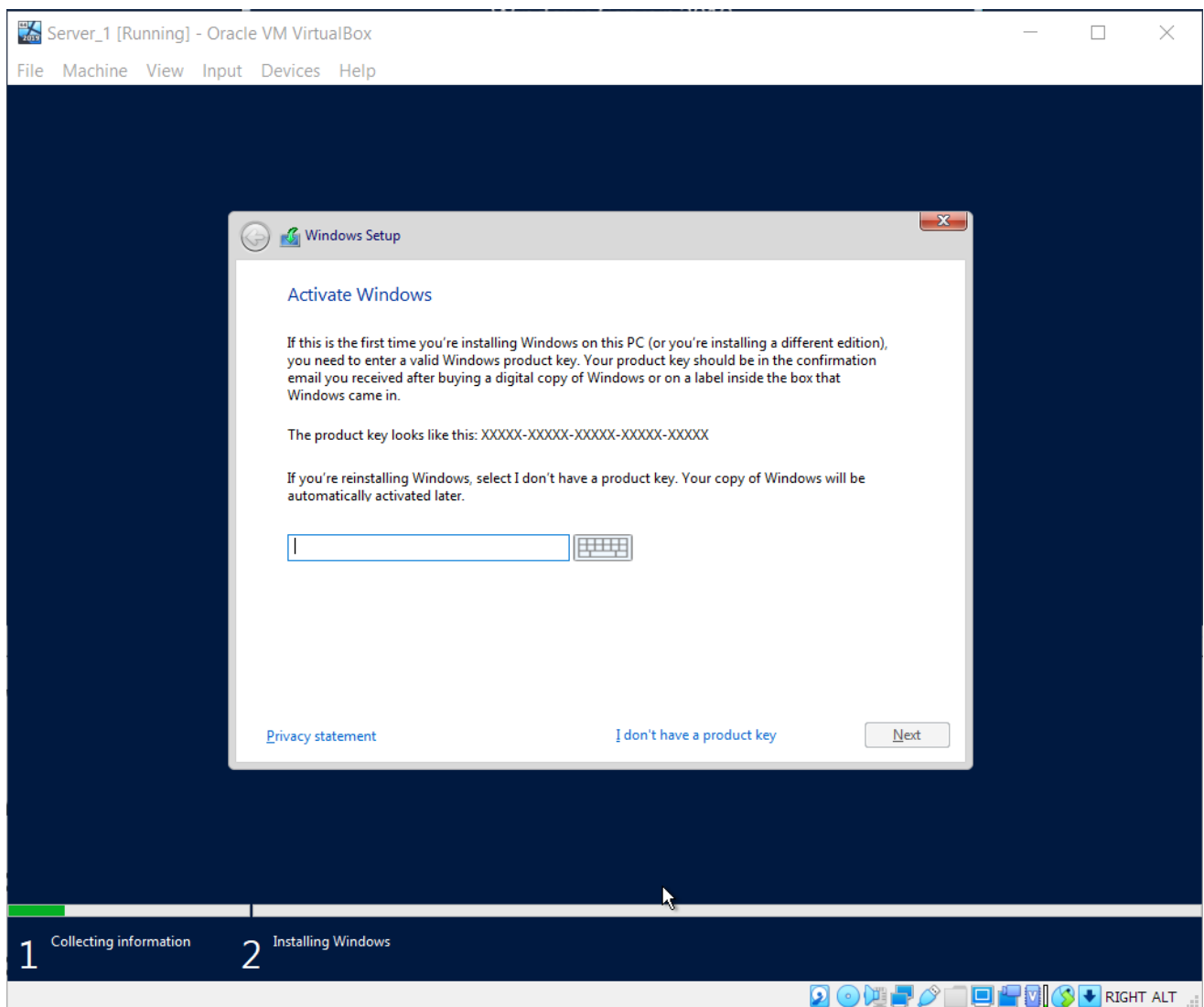


The Virtual Machine booted successfully:

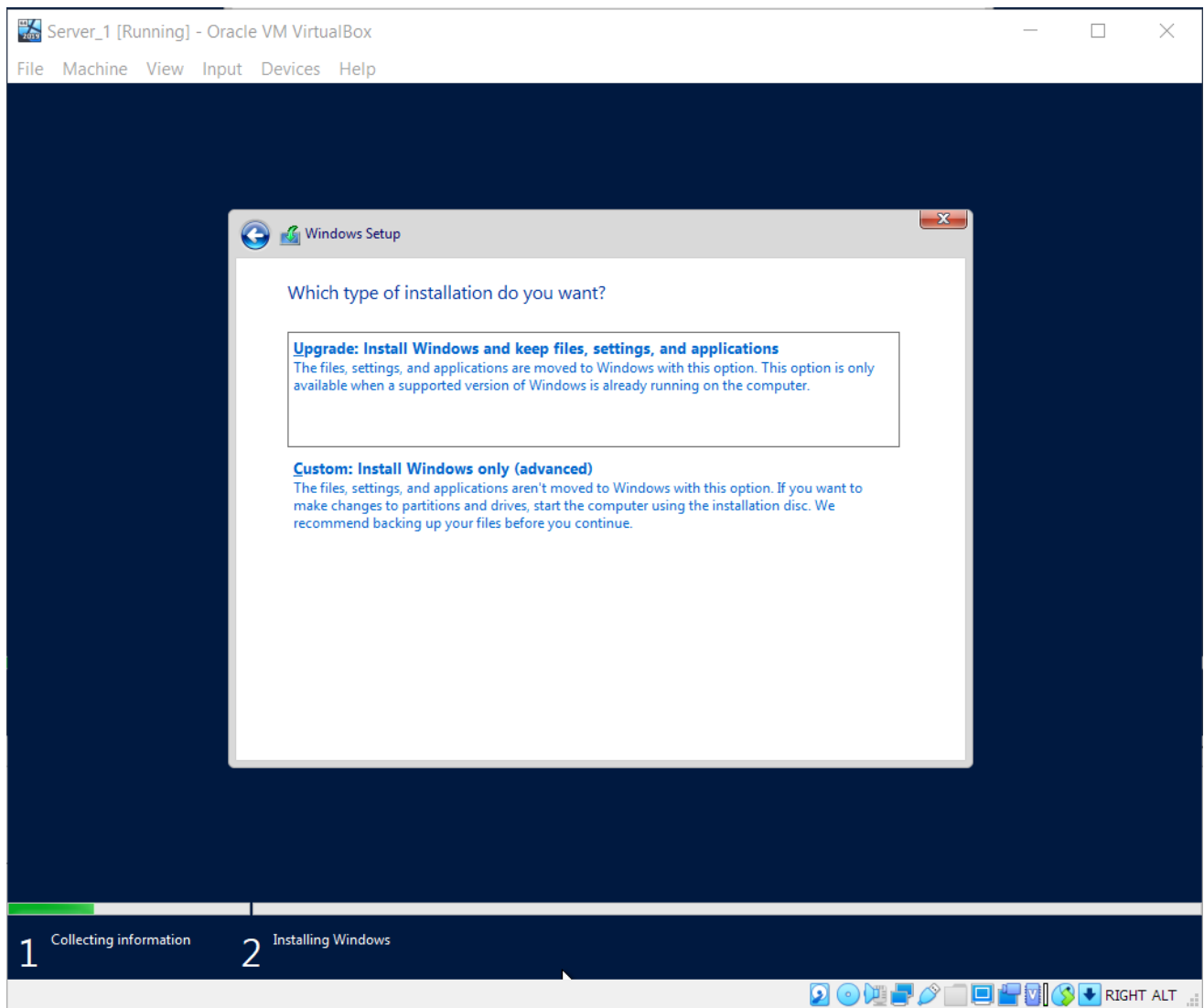
The **Keyboard or input method** was switched to **United Kingdom**



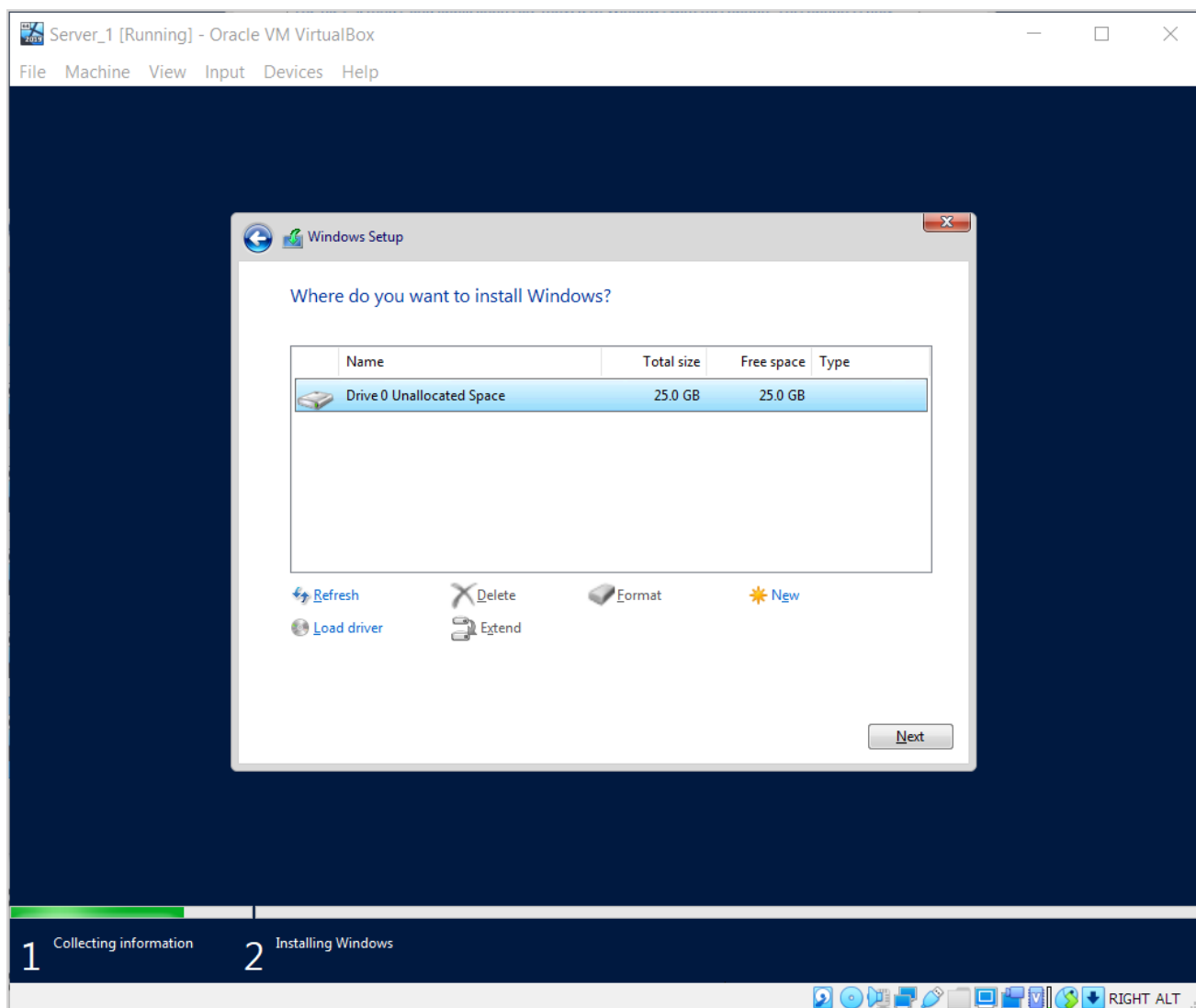
I don't have a product key was selected, as the functionality unlocked with a product key isn't necessary at this time.



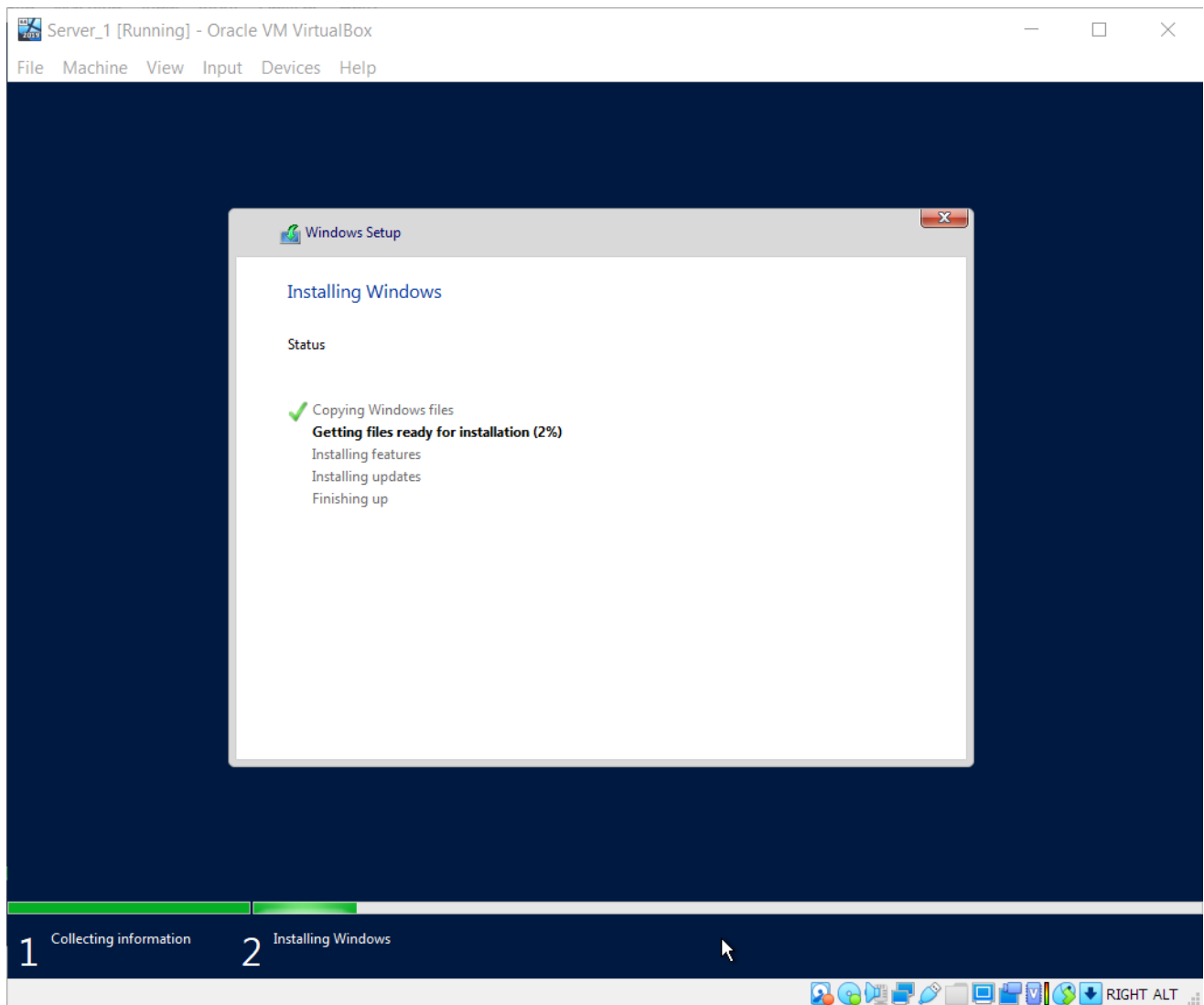
A **Custom** installation was selected, as a previous Windows build wasn't present on the system:



Drive o which has unallocated space, was selected as the drive to install Windows onto:

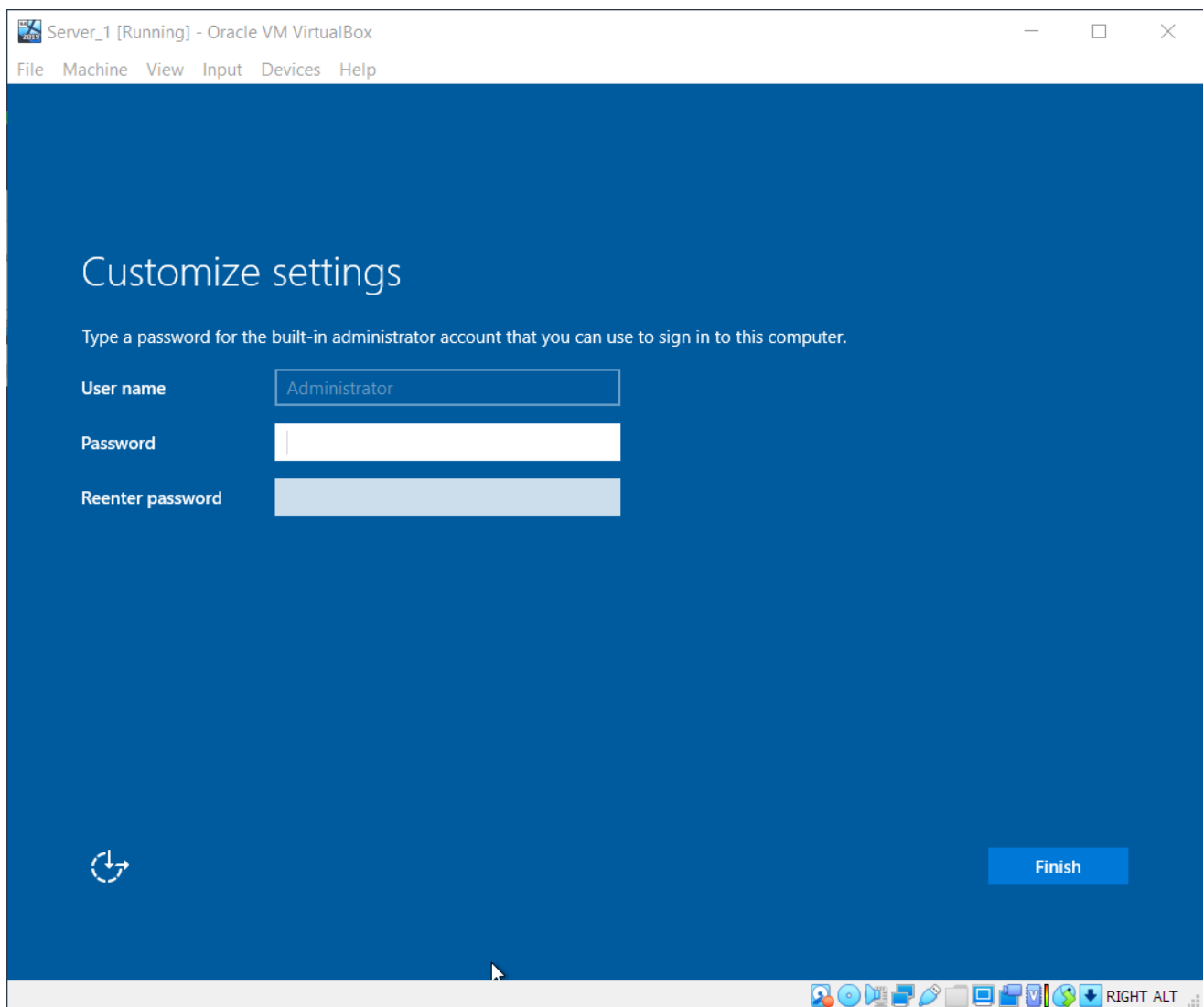


The installation proceeded:

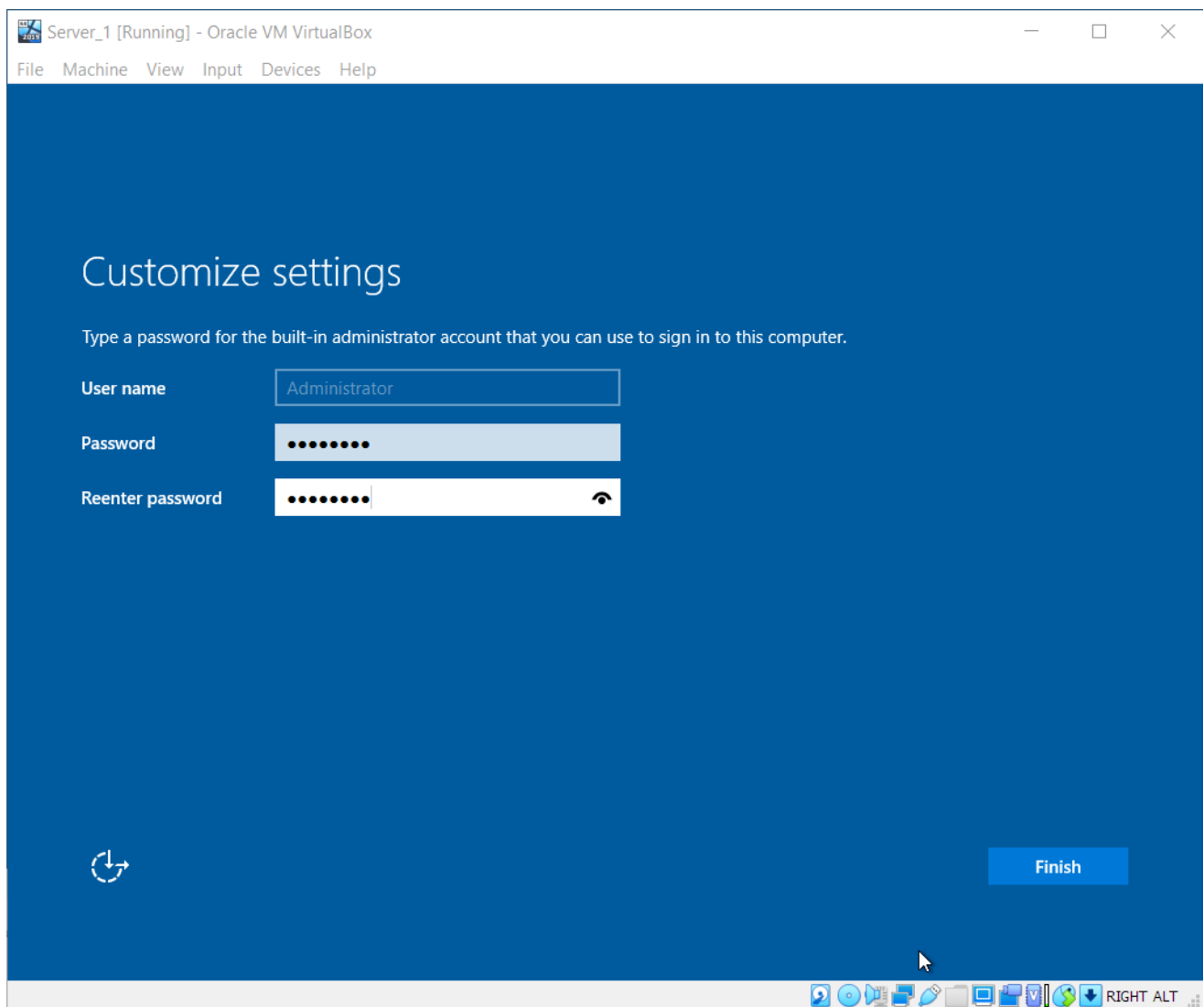


The installation completed and the system restarted.

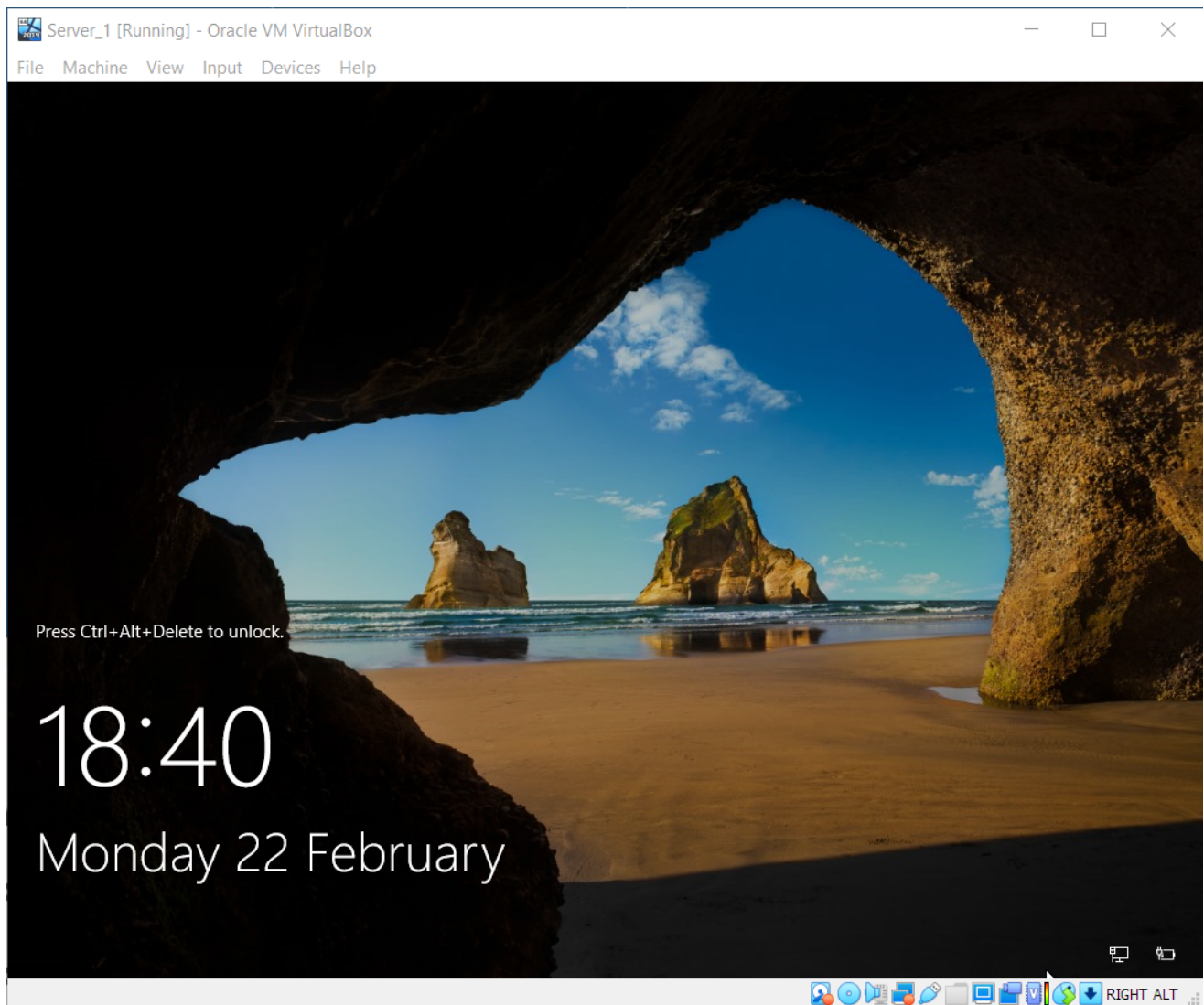
The system asked for a password:



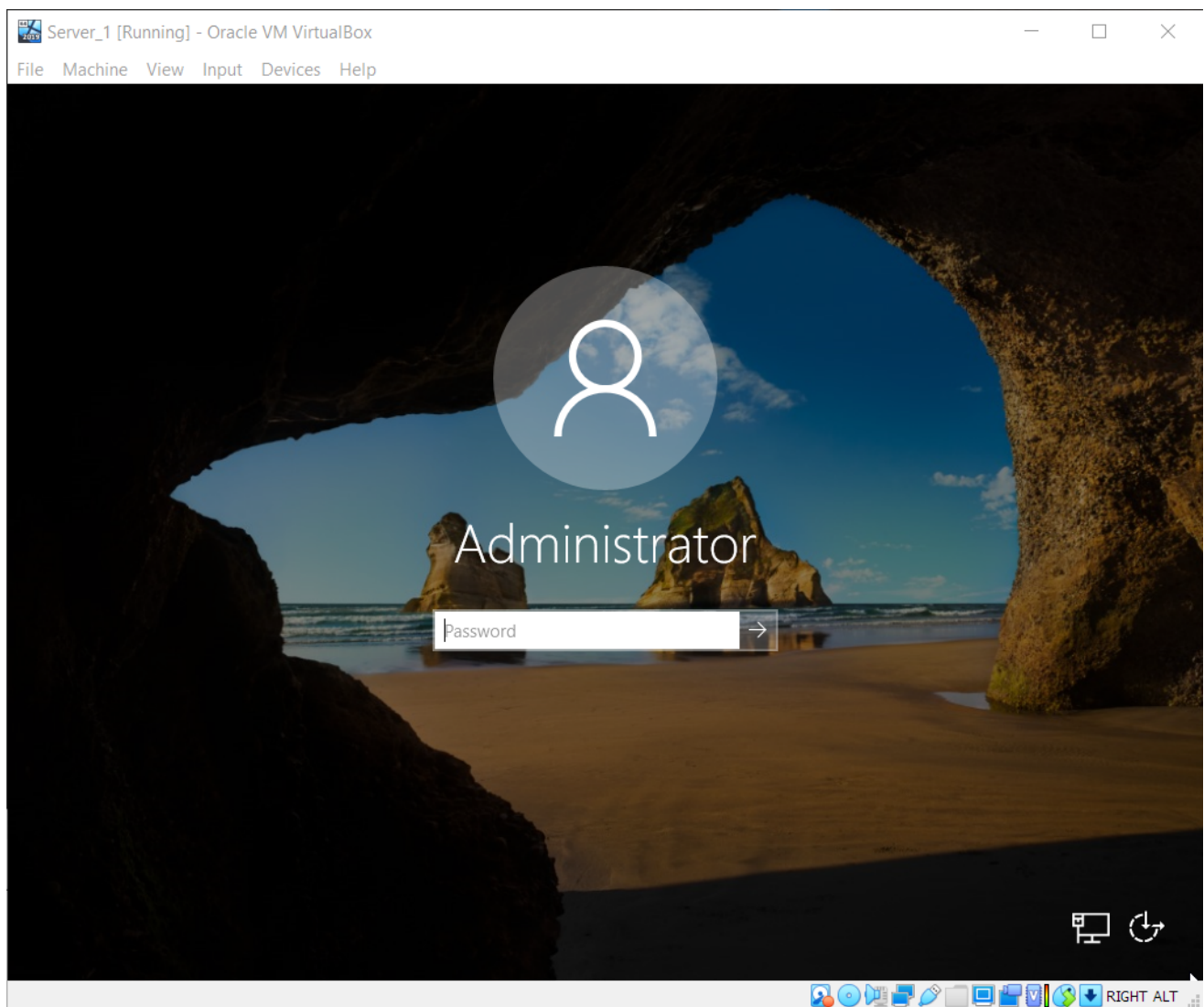
The password was set as **P@ssw0rd**:



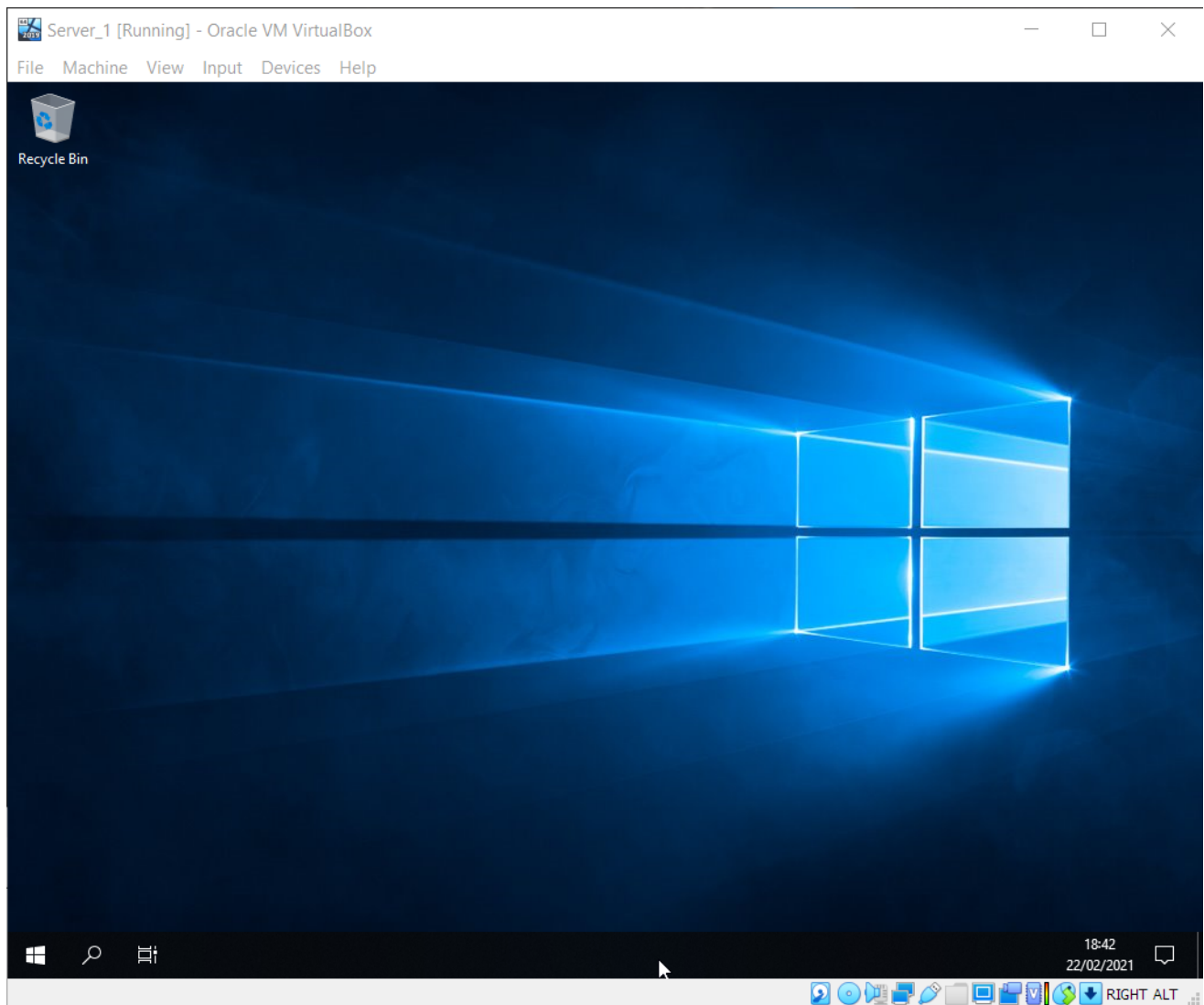
The login screen appeared:



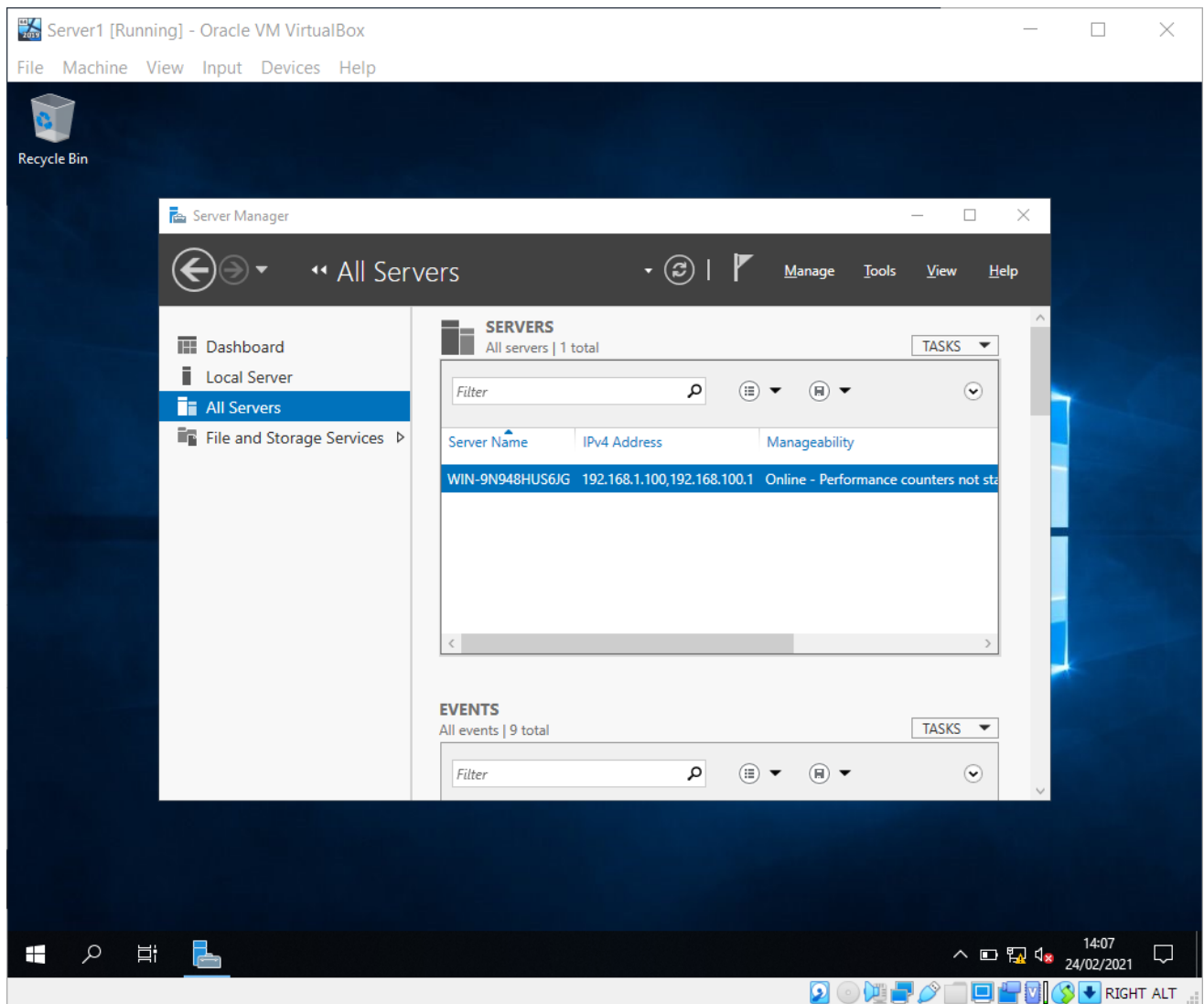
After pressing **HOST + DELETE**, the lock screen dismissed and a password field appeared:



After entering the correct password, the **Desktop** appeared:



Opening the **Windows Server Manager** showcasing the correct installation of Windows Server:



This process was repeated a second time for the second server: (Server 2).

Installing the Client

Next, the author was tasked with setting up a client. A new virtual machine was created, and was named “**Client1**”.

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← Create Virtual Machine

Name and operating system

Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

Name:

Machine Folder:  ▾

Type: ▾

Version: ▾ 

The Operating System **Version** was set to **Windows 10 (64-bit)** as this was a client installation of Windows 10, rather than a server installation.

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← Create Virtual Machine

Memory size

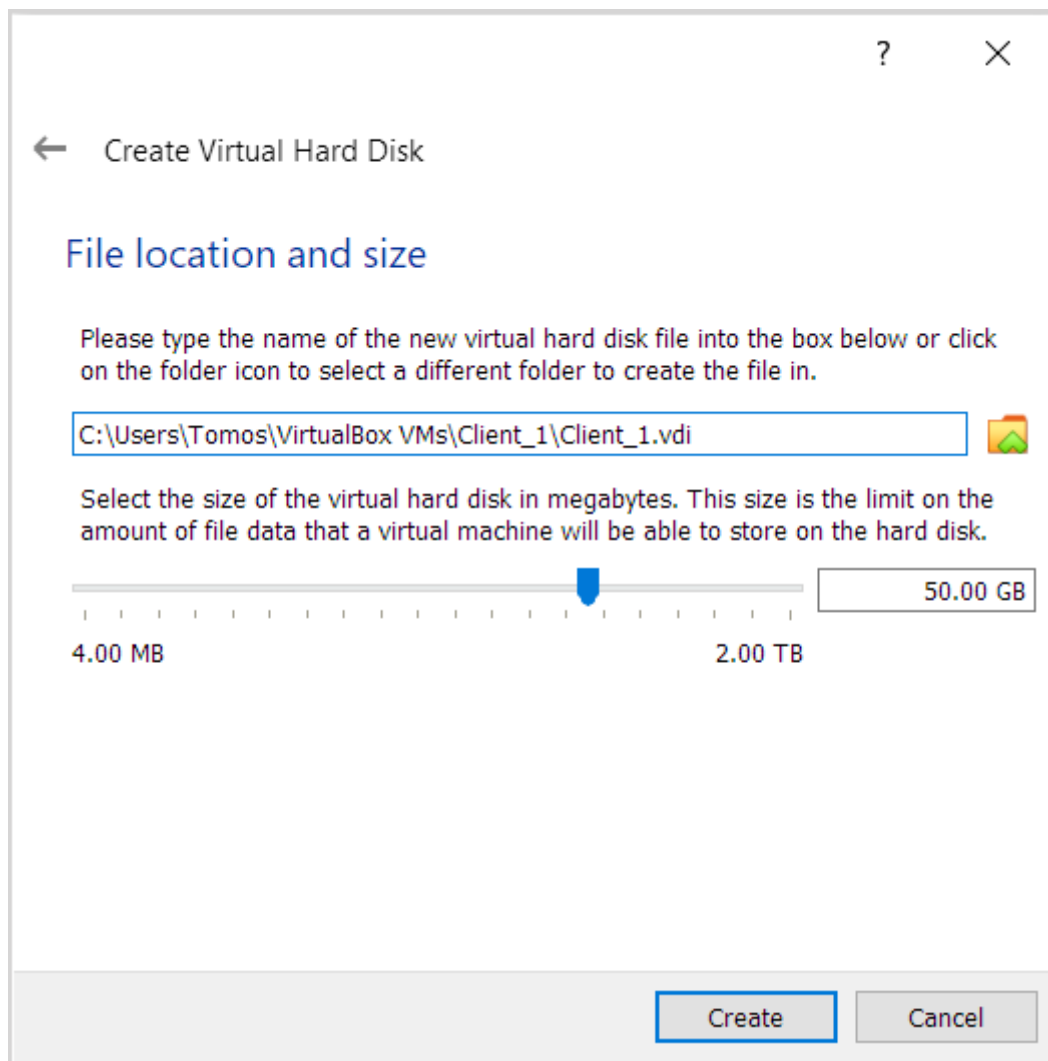
Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is **2048** MB.

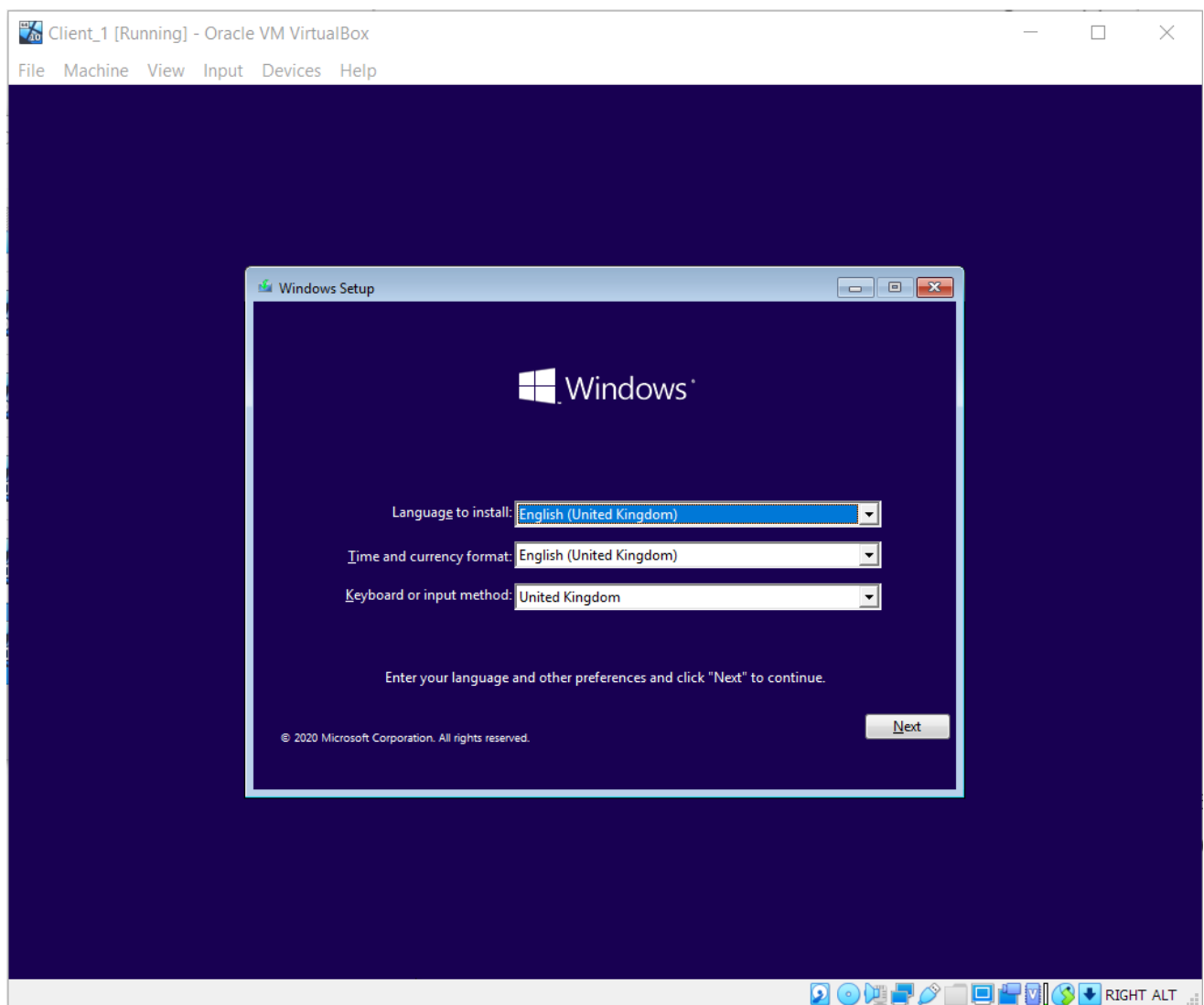
 MB

4 MB 8192 MB

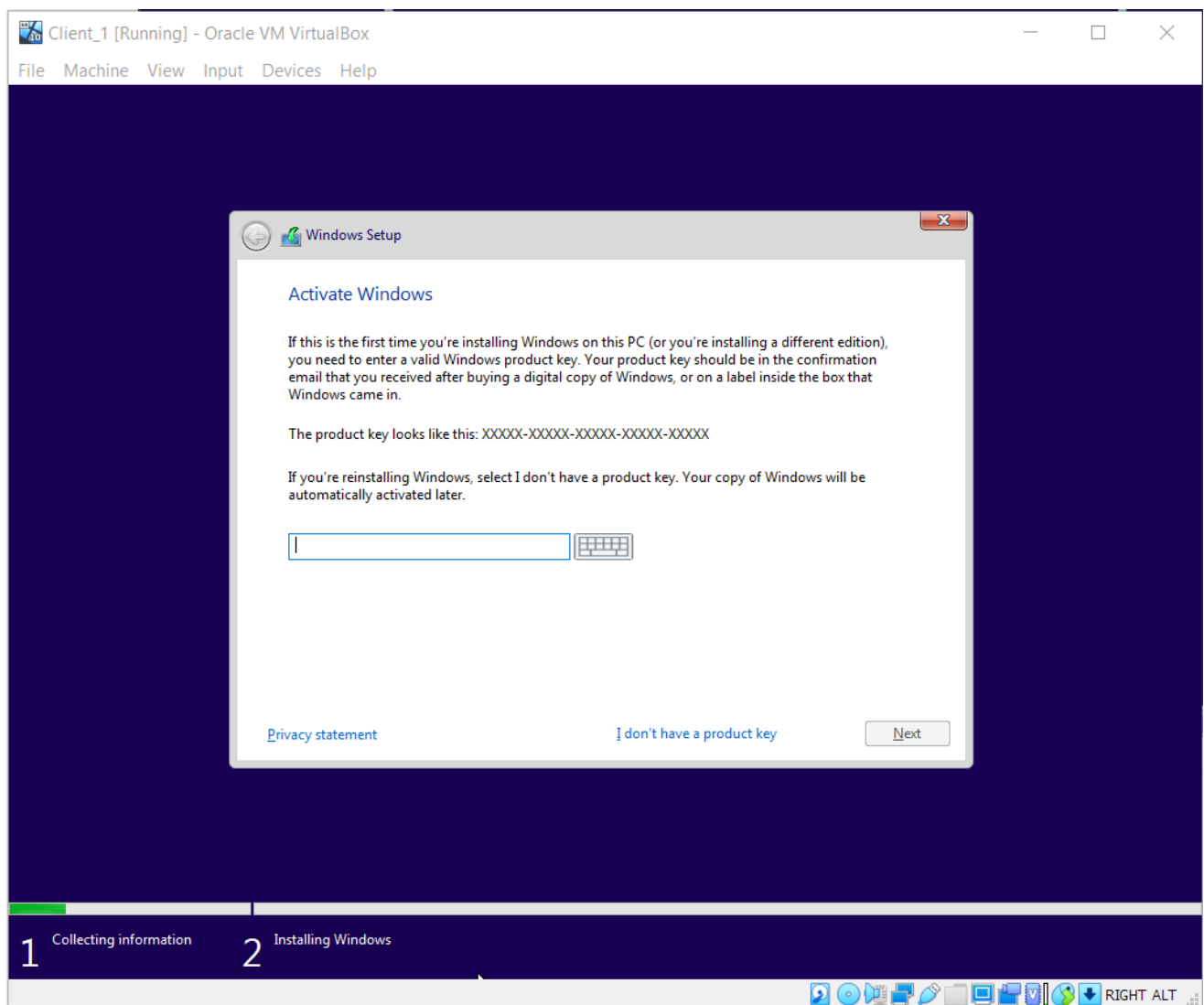
4000MB of RAM was allocated as the Memory Size for this Virtual Machine, as Windows 10 runs best on at least **4GB of RAM**.



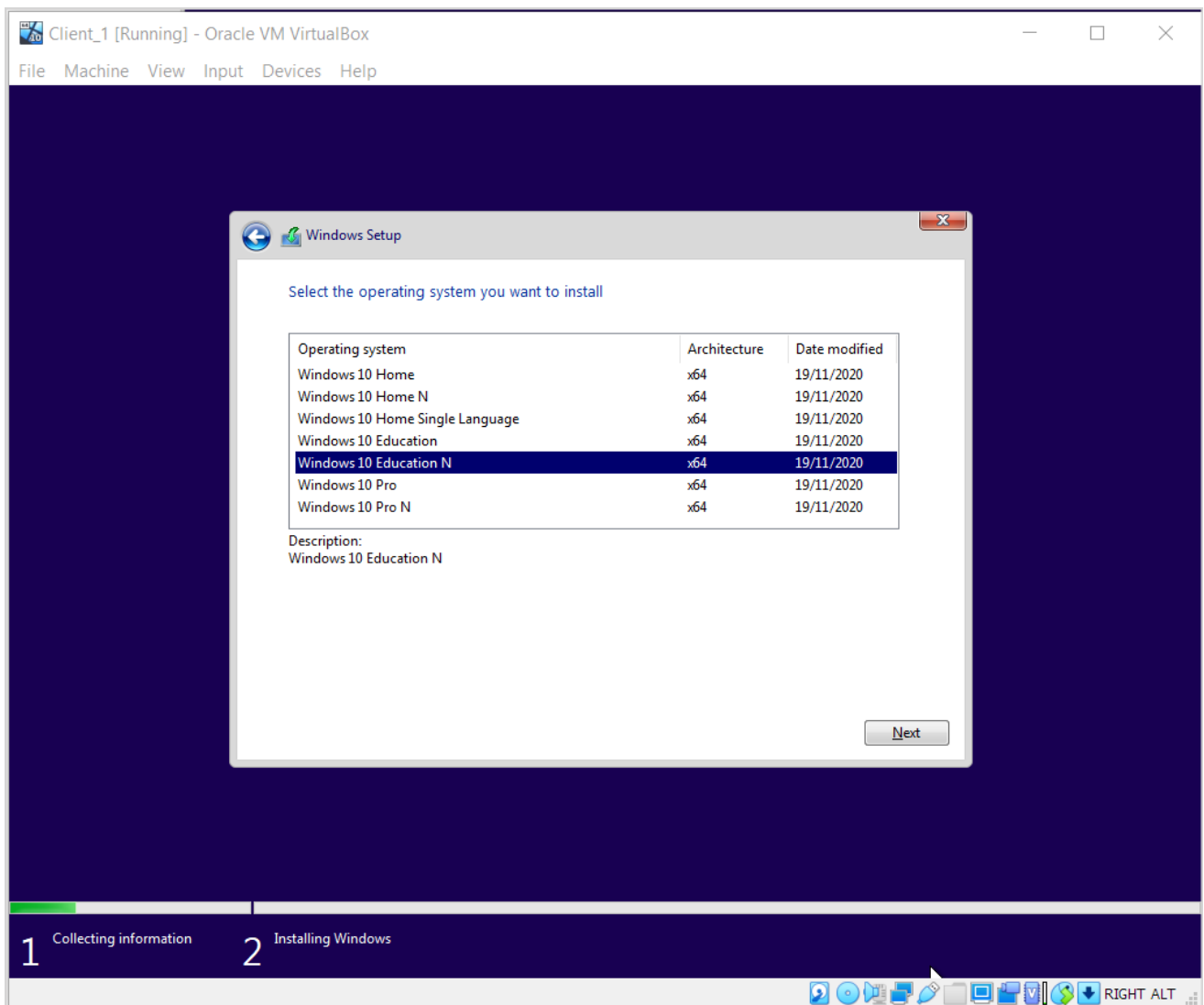
For the Virtual Hard Disk, the exact same setup schematics were used as the Server, except for the **size** of the Virtual Hard Disk, which was increased to **50.00 GB** to ensure Windows 10 ran smoothly.



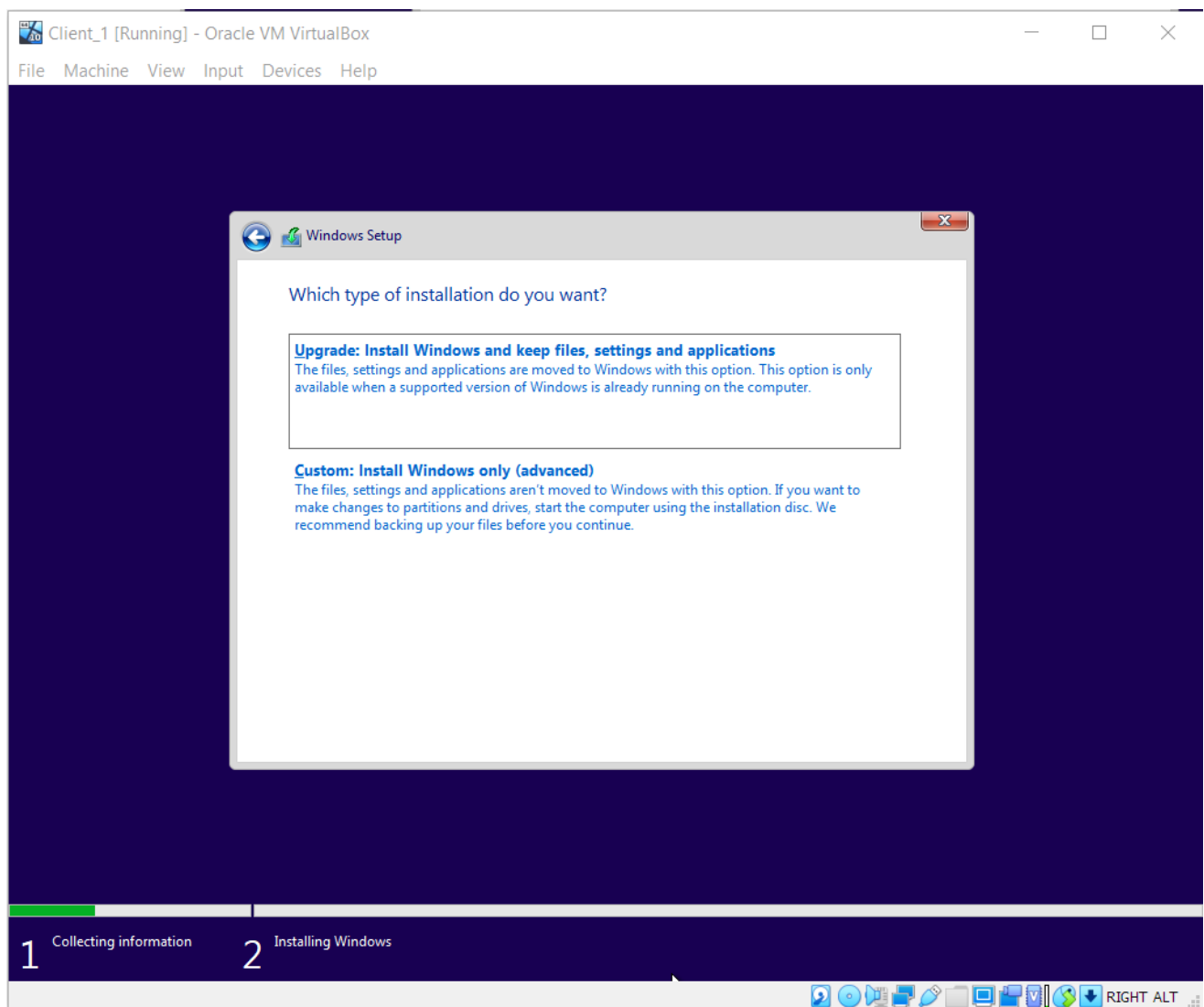
The disk image inserted into this Virtual Machine was a standard Windows 10 ISO from Microsoft with the latest version of Windows 10.



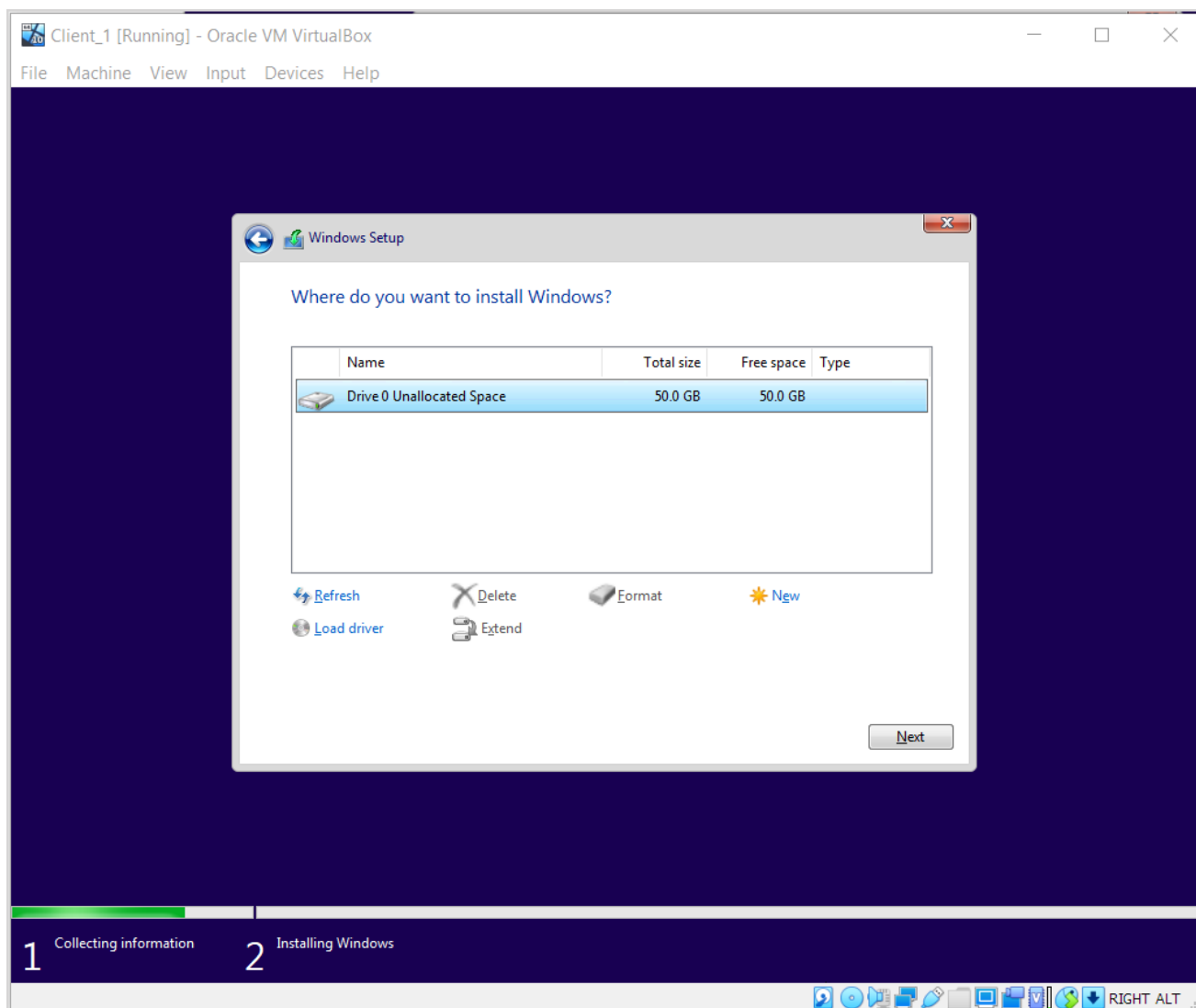
The author selected **I don't have a product key**



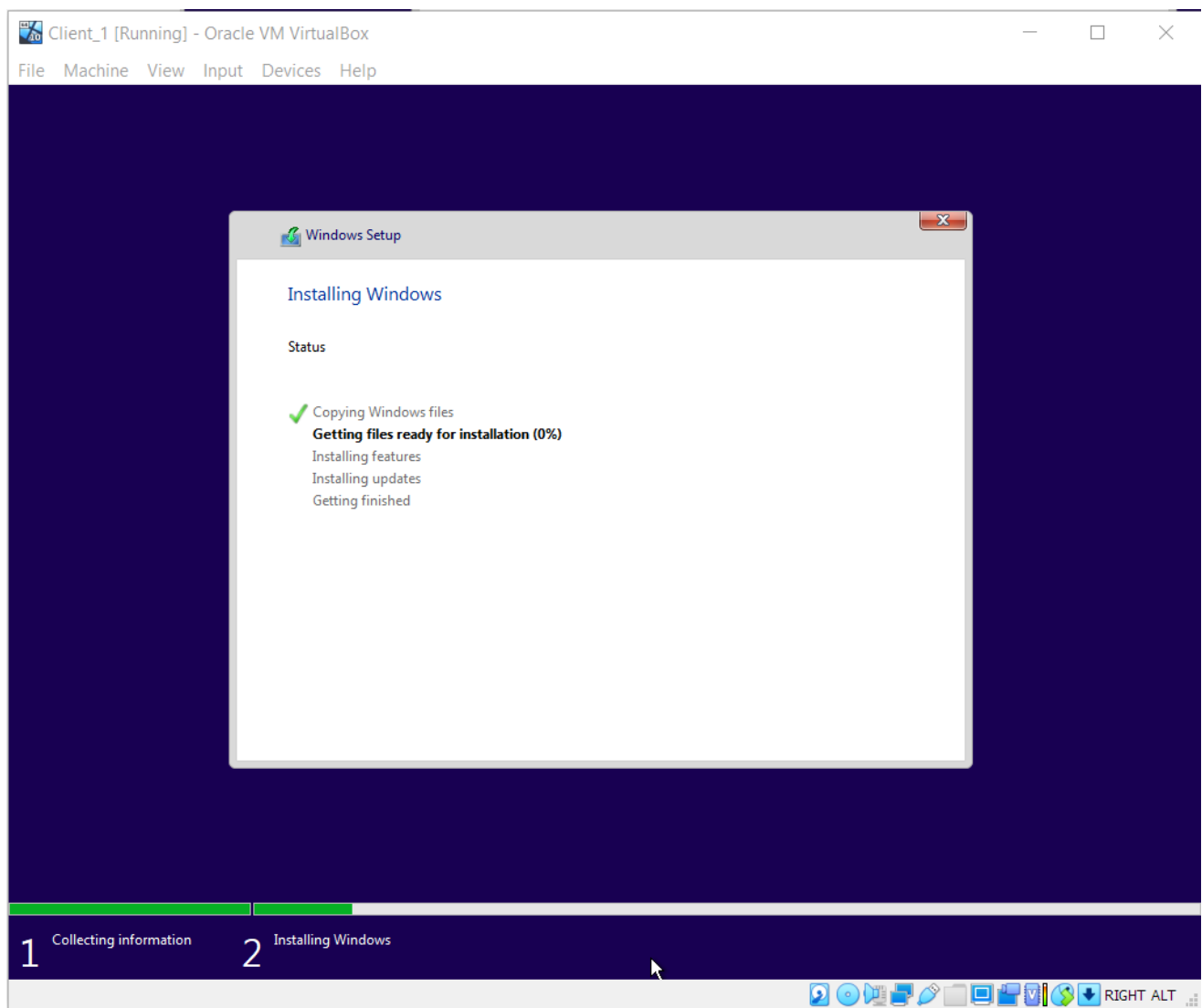
Windows 10 Education Edition N was selected to ensure all Pro features worked out of the box. The N edition of Windows is a stripped down version of Windows that doesn't come with unnecessary features such as Skype, OneDrive, Cortana etc.



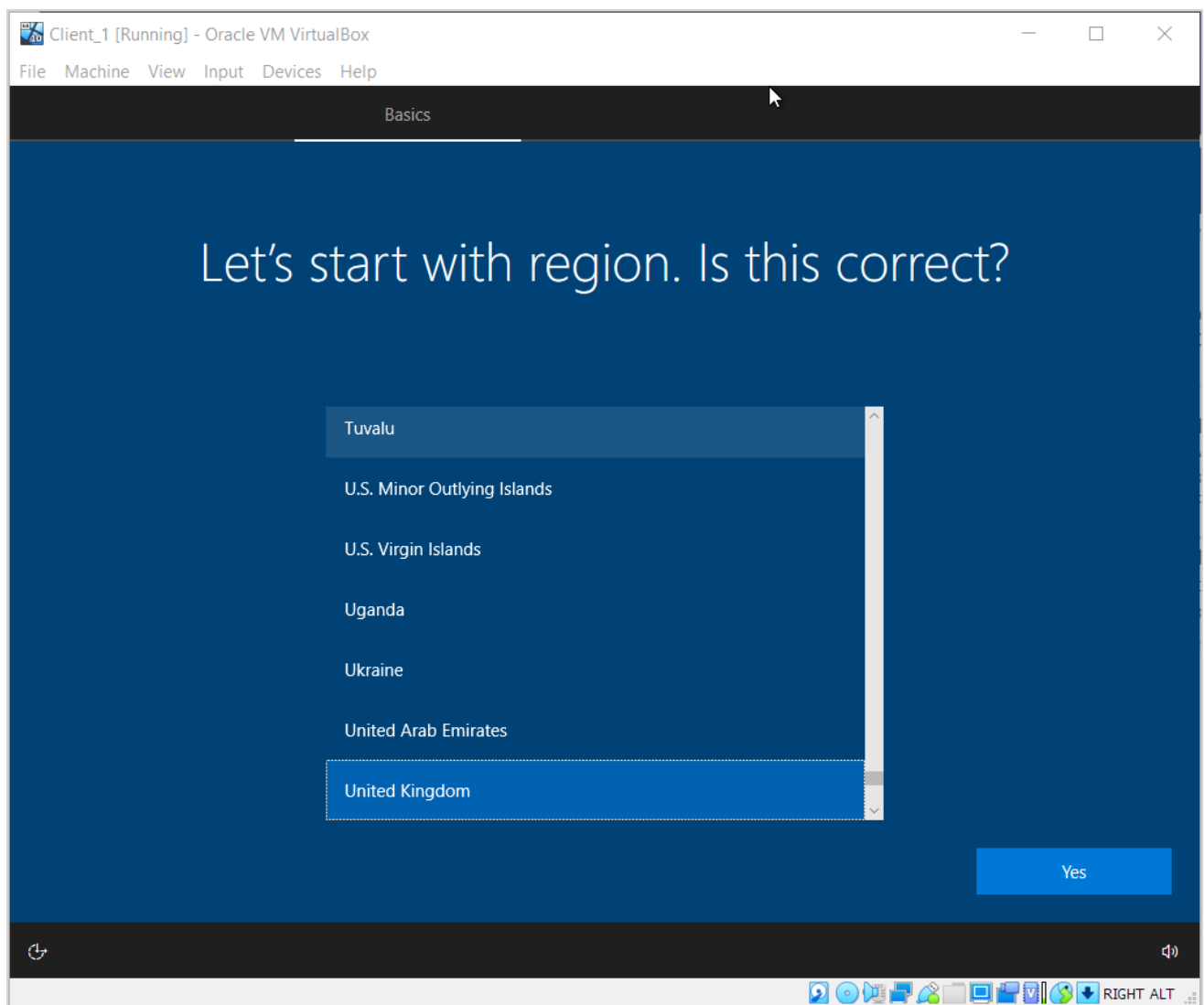
A **Custom** install was requested.



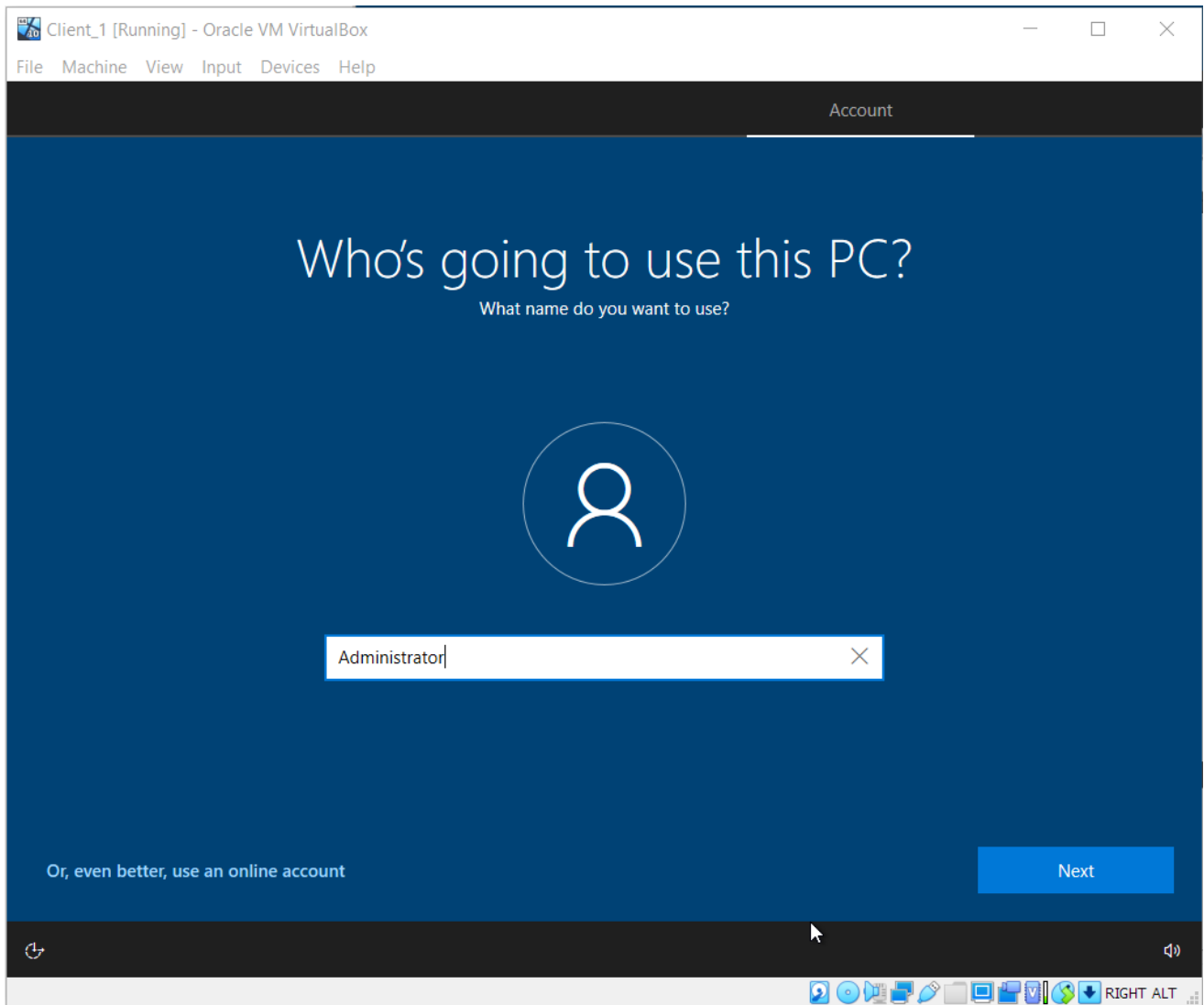
Windows Setup showcased the available drives that Windows could be installed to, which proves that the Virtual Hard Disk is functional.



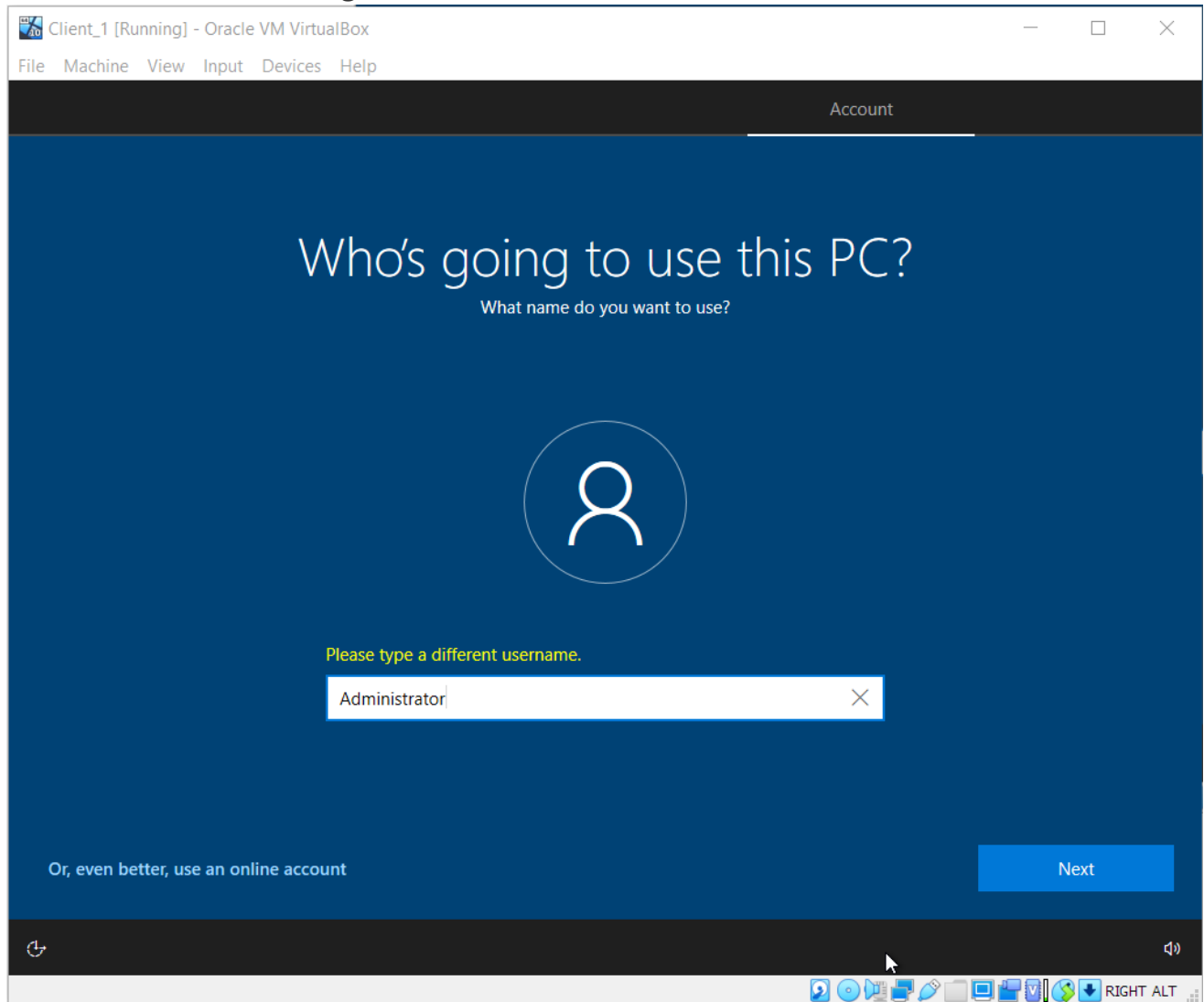
The installation began...



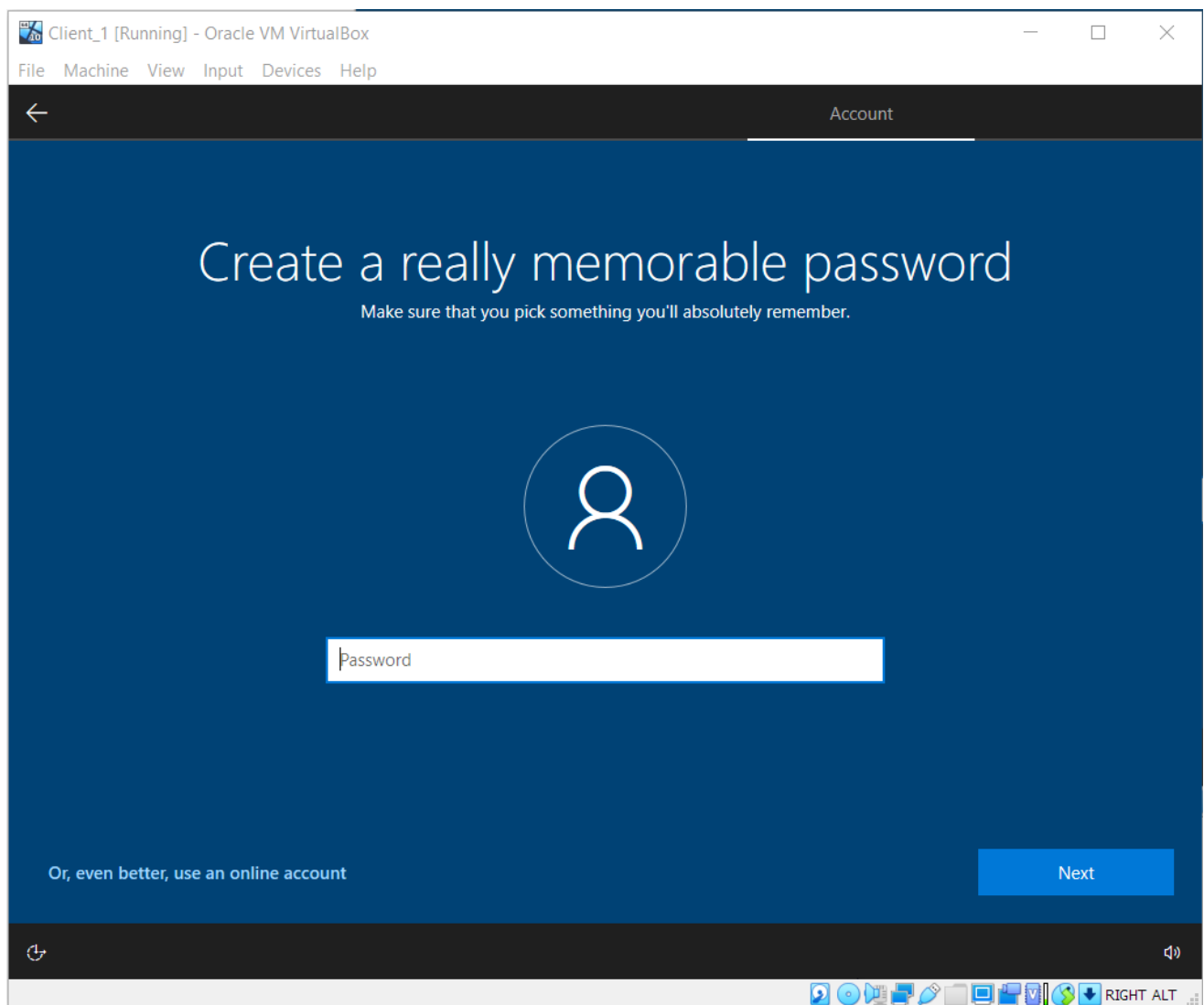
Once completed, the setup procedure began. **United Kingdom** was the selected region to assure the keyboard layout was correct between the host and the guest.



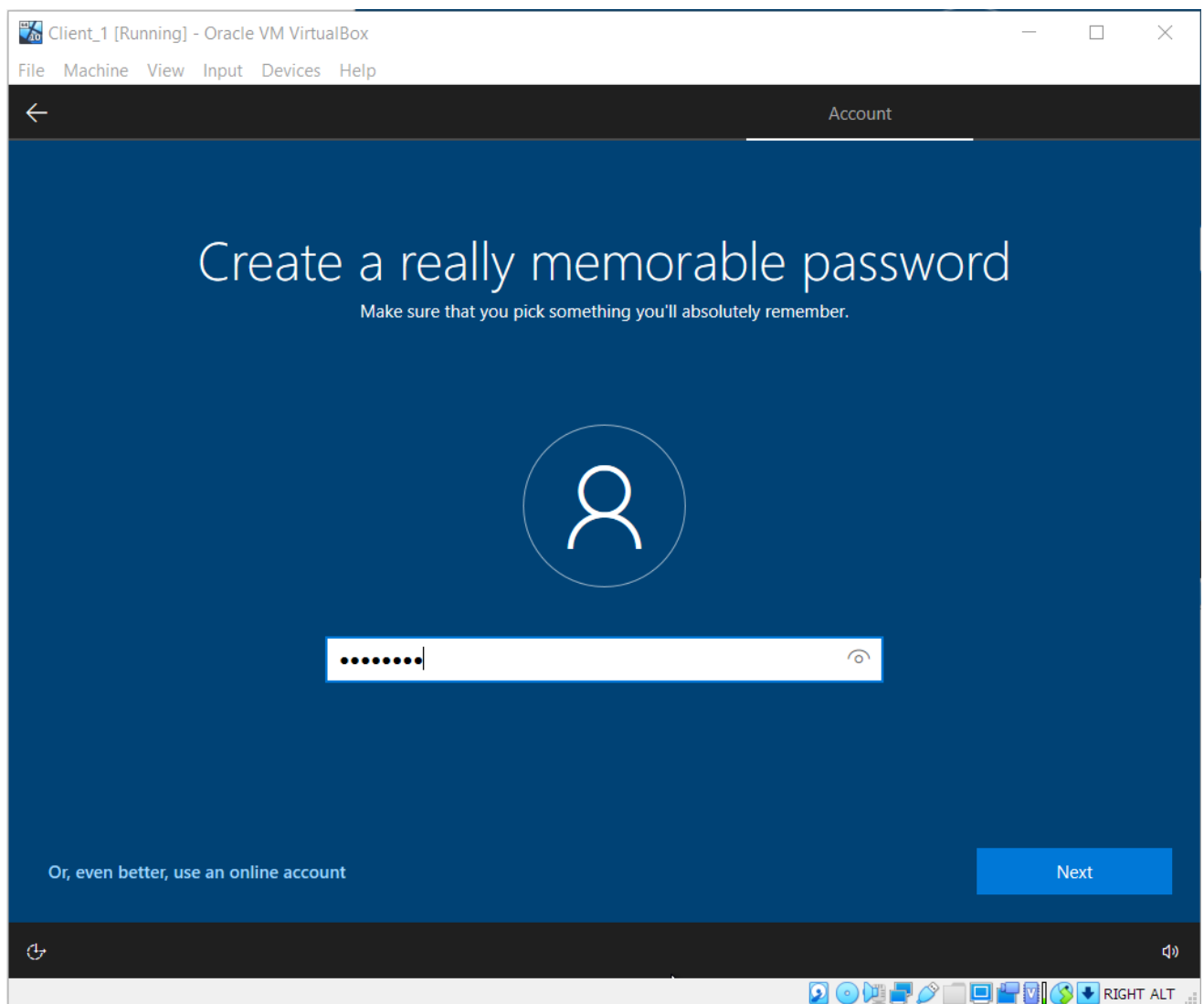
Administrator was assigned as the Username:



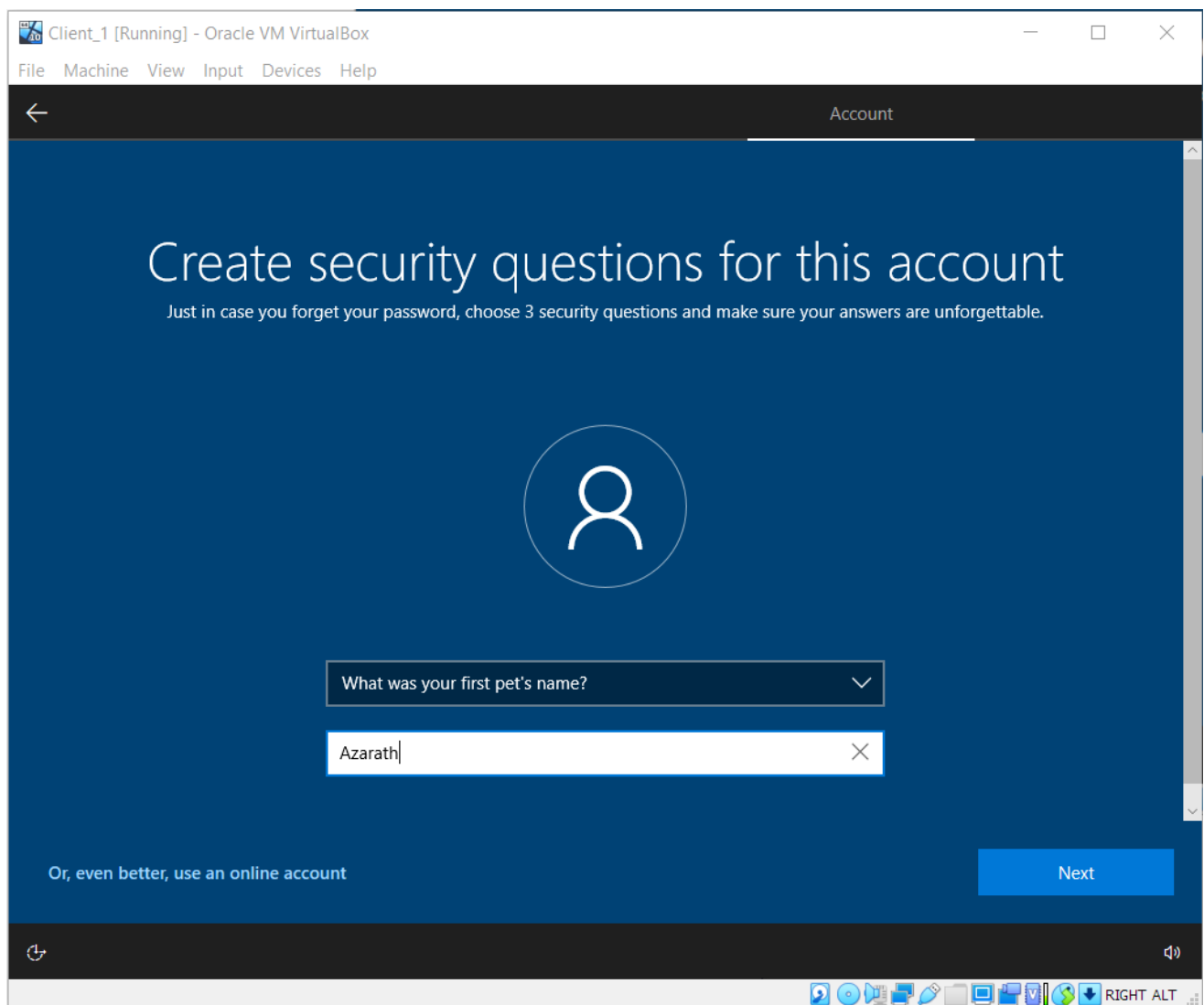
But that apparently does not work



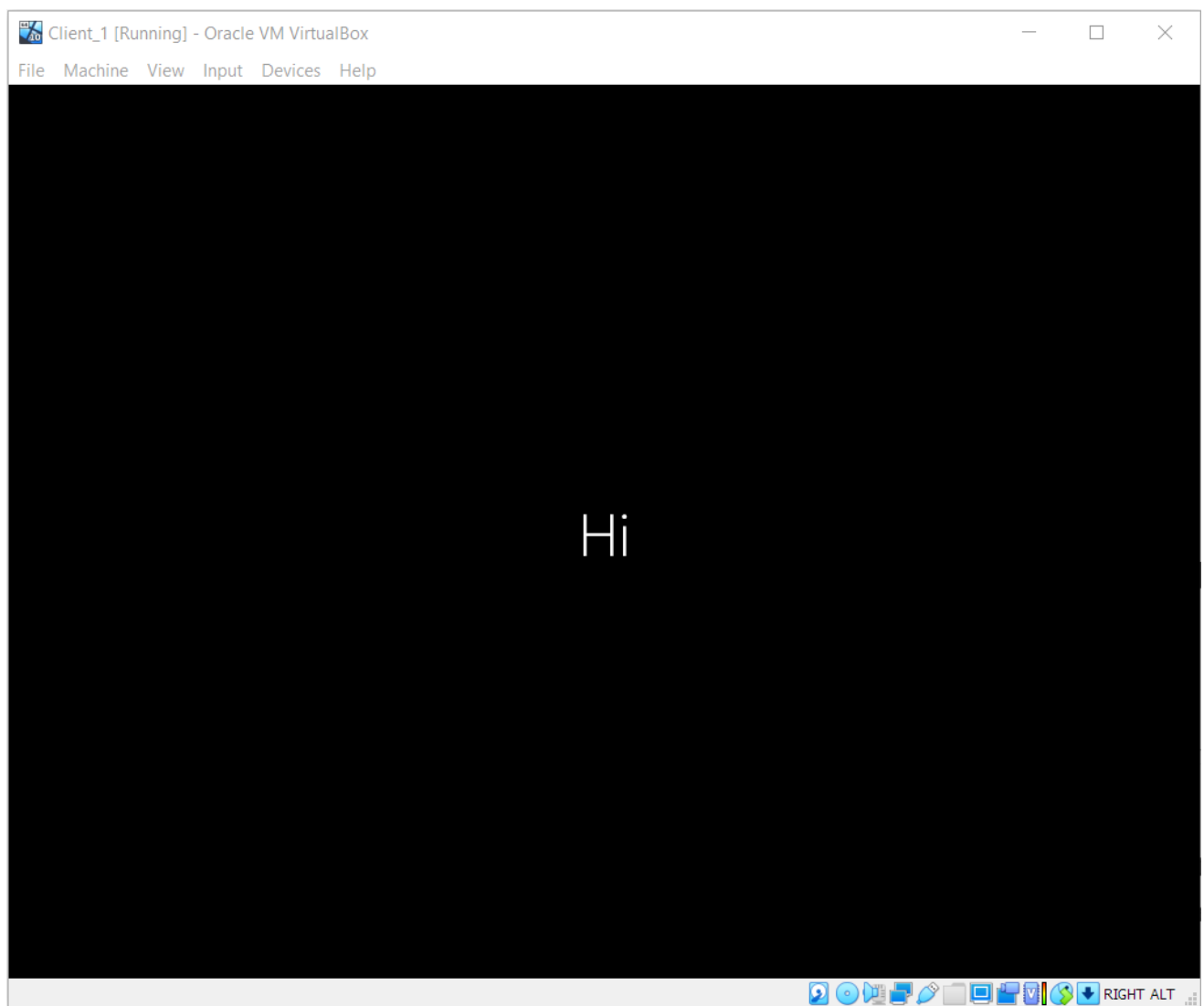
So **Admin** was assigned instead



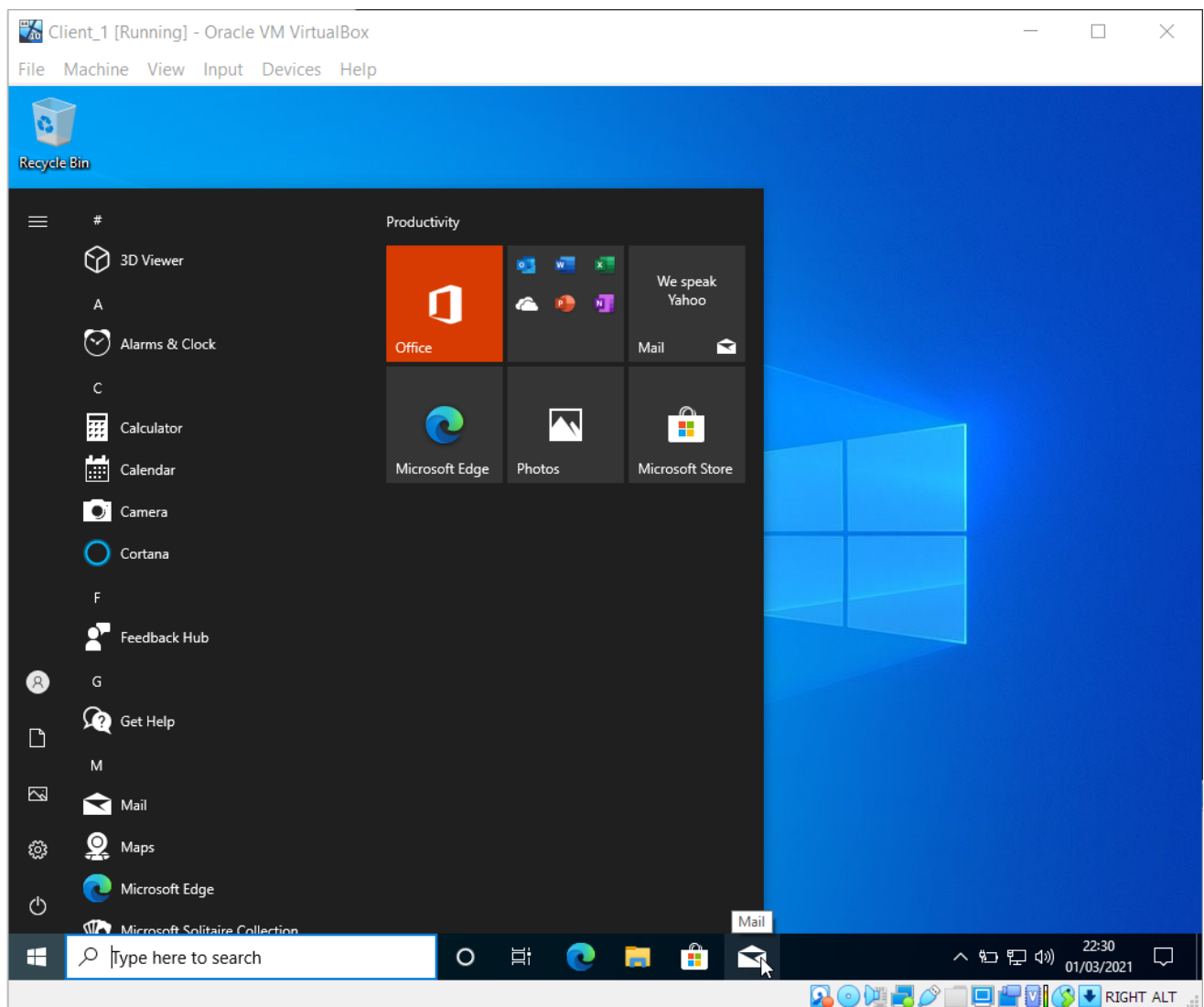
The password **P@ssw0rd** was assigned.



And the security questions were completed appropriately.



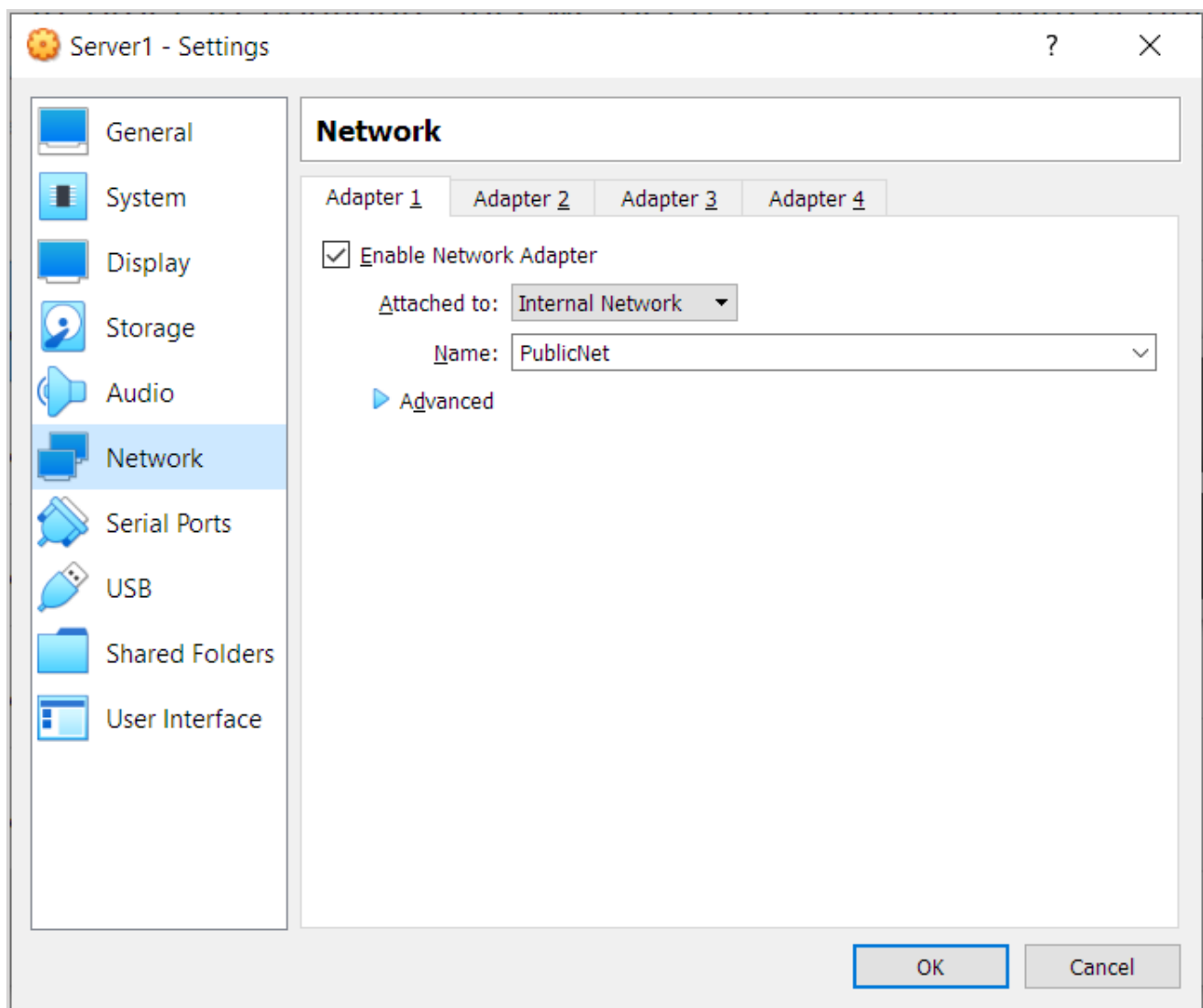
The setup process began.



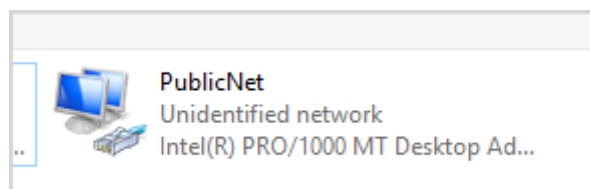
The setup process completed and the desktop appeared.

These steps were repeated for Server 2 and Client 2

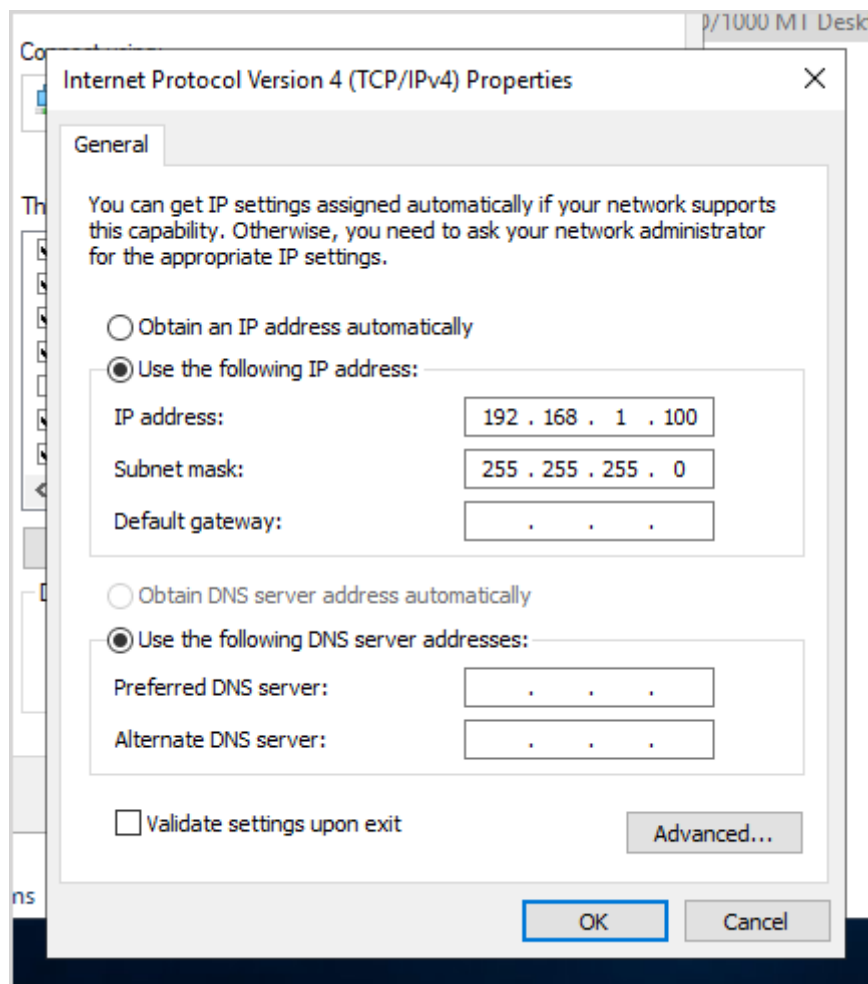
Task 2: Virtual Network Configurations



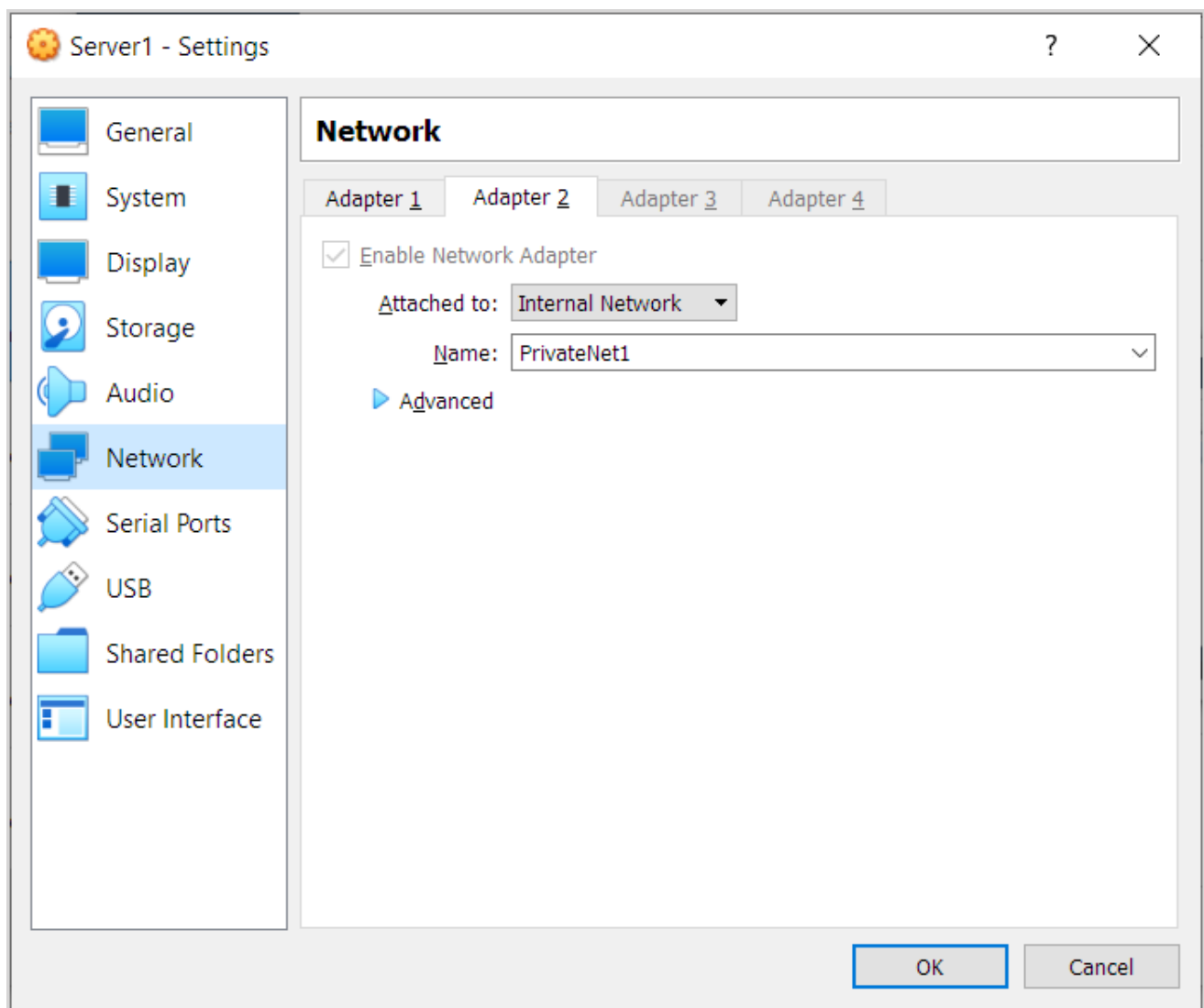
For Server 1, Adapter 1 was configured as an Internal Network named **PublicNet**.



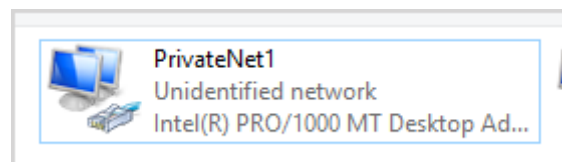
The adapter itself was renamed on the Guest OS to **PublicNet** appropriately.



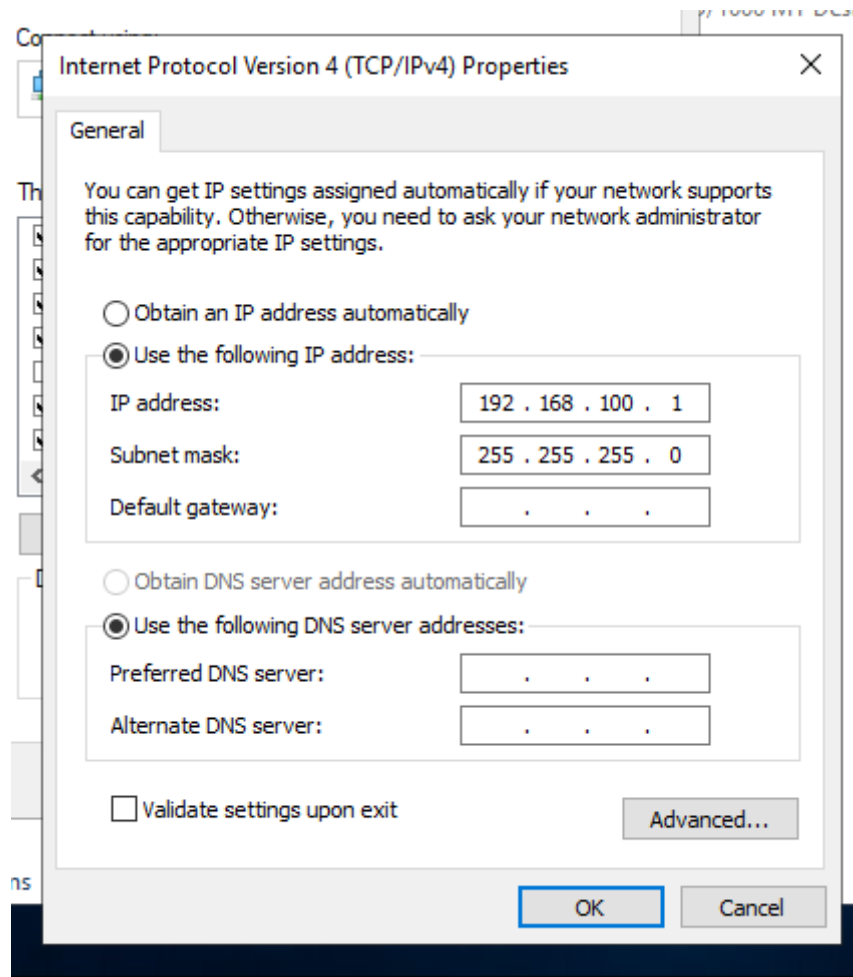
The **IP Address** and **Subnet Mask** was also configured correctly.



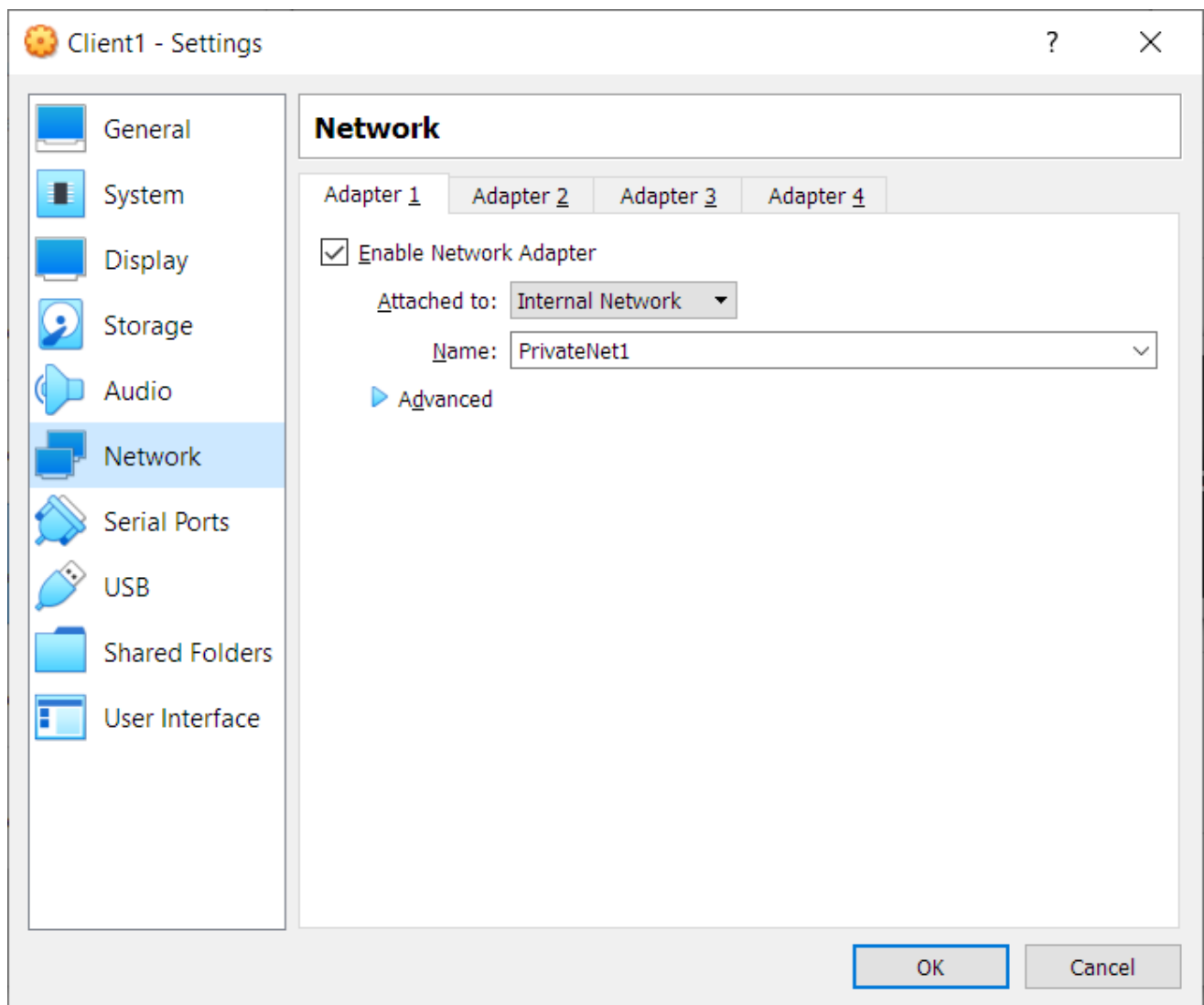
The **2nd adapter** was configured successfully and named **PrivateNet1** as the brief instructed.



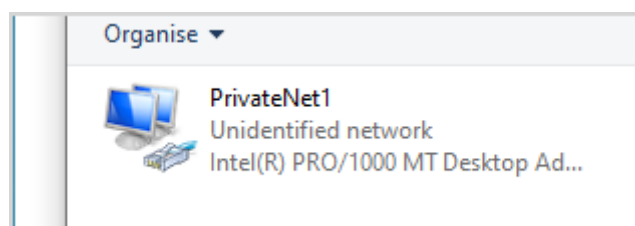
The connection was renamed to **PrivateNet1**.



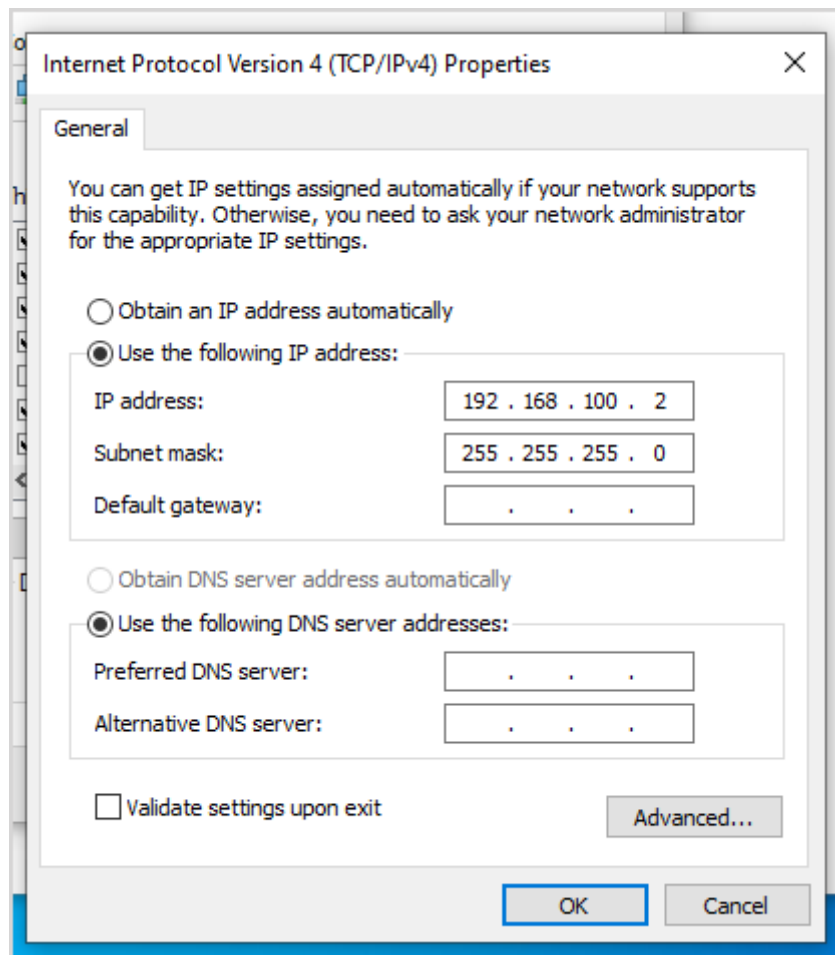
And the **IP Address** and **Subnet mask** was also configured appropriately.



The clients will only have 1 network adapter, so for Client 1, an Internal Network Adapter named “PrivateNet1” was given.

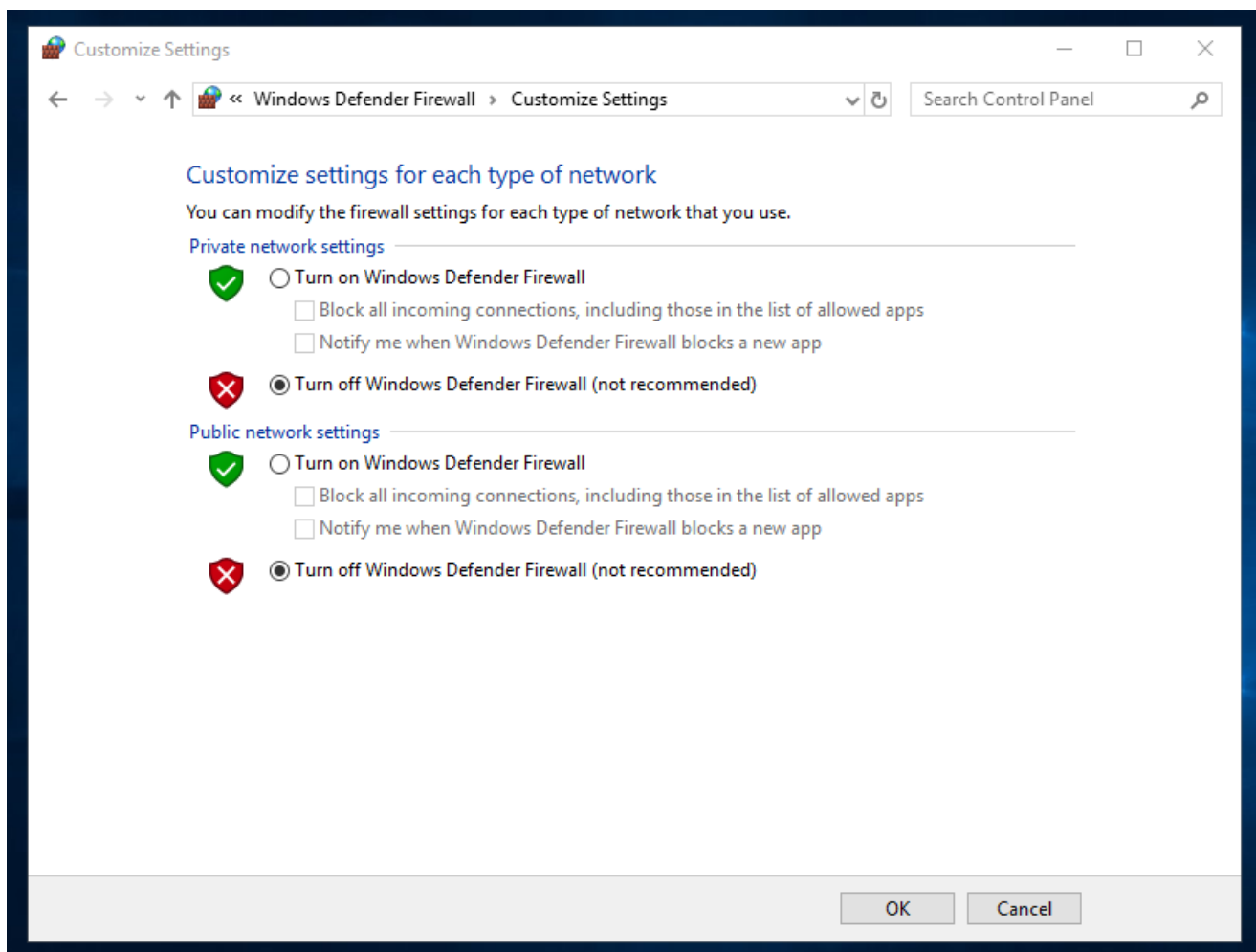


And on Client 1, the adapter was renamed appropriately.

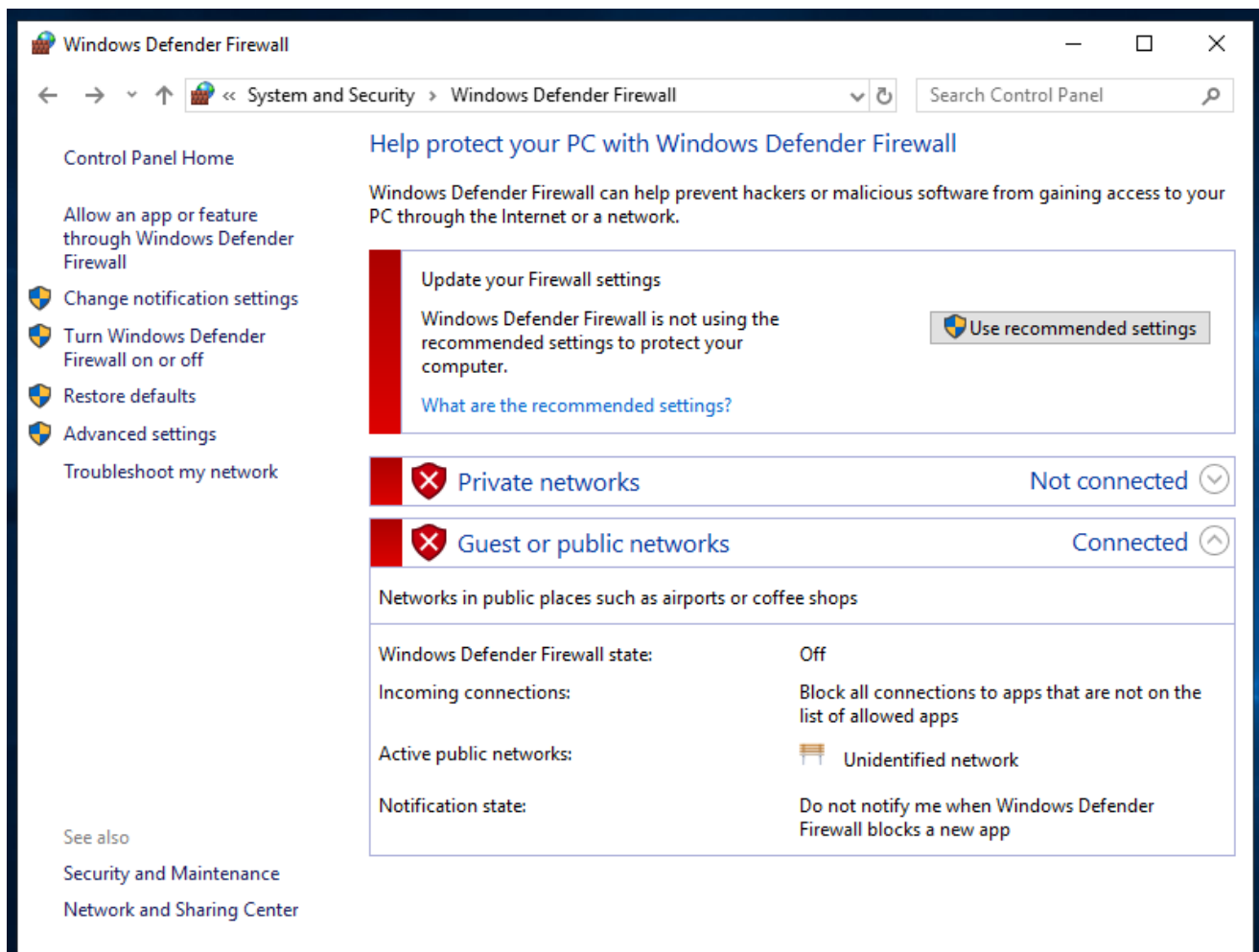


And the IP address and subnet mask was configured successfully.

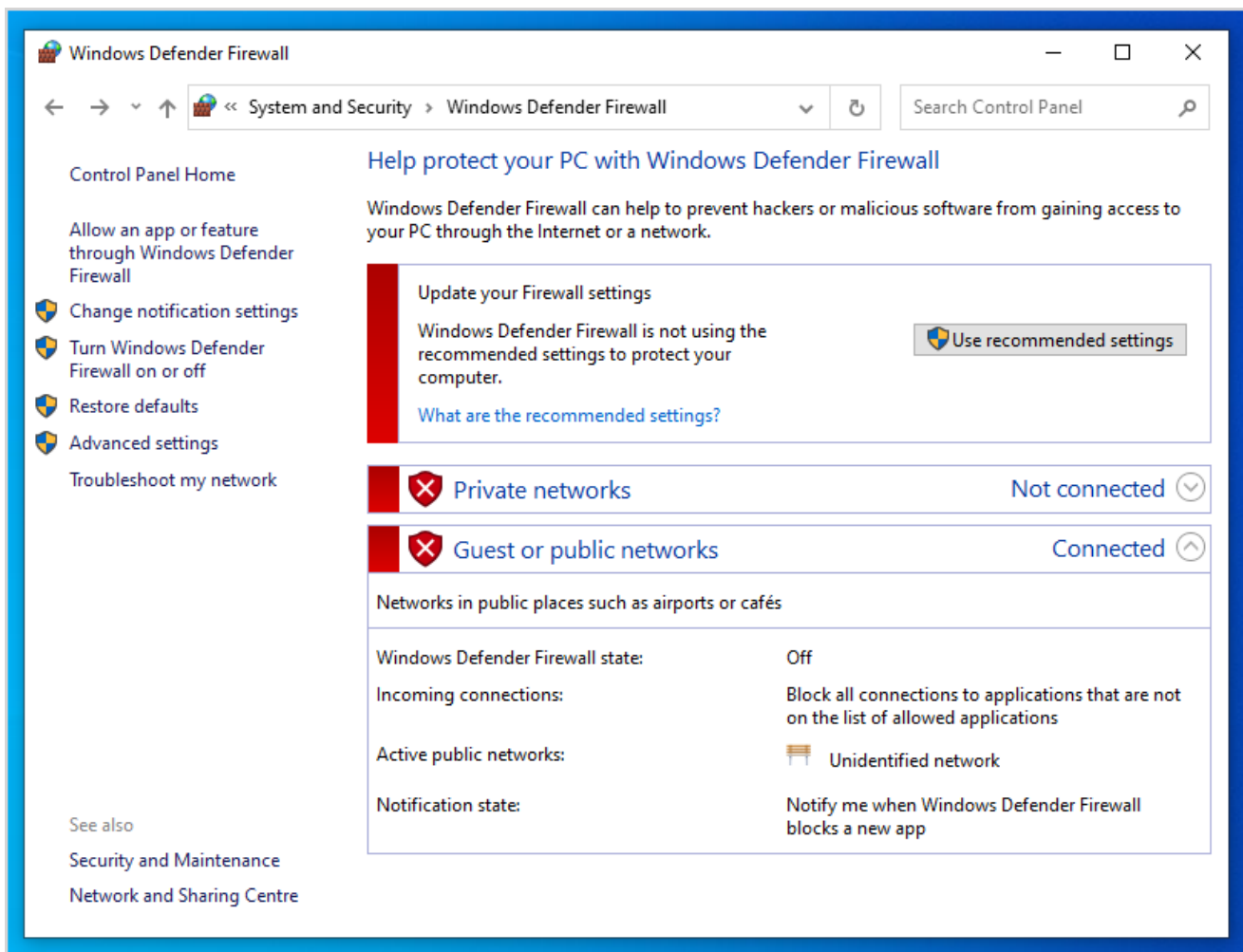
These steps were repeated for Server 2 and Client 2 with separate IP addresses



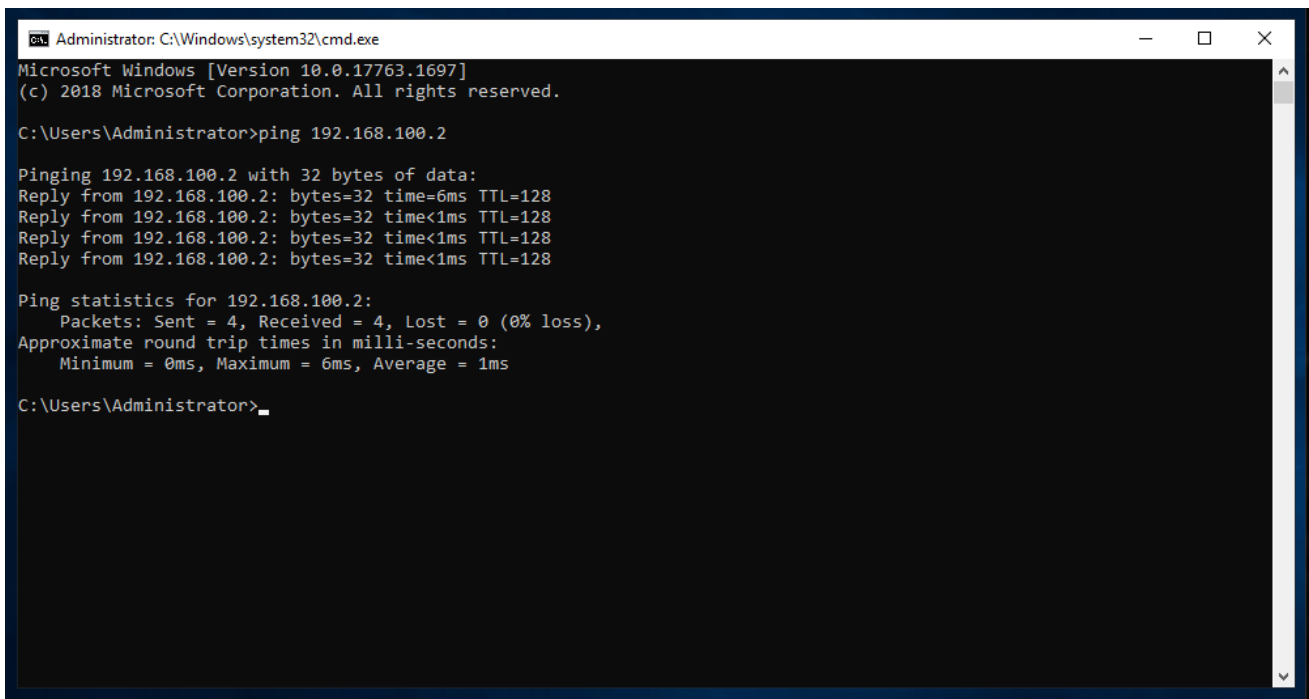
Windows Firewall was disabled on Server 1.



Further proof.



The firewall was also disabled on Client 1.



A successful ping was made on **Server1** when pingging **Client1** as seen above.

```
C:\Users\Administrator>ping 192.168.101.2

Pinging 192.168.101.2 with 32 bytes of data:
Reply from 192.168.101.2: bytes=32 time=1ms TTL=128
Reply from 192.168.101.2: bytes=32 time<1ms TTL=128
Reply from 192.168.101.2: bytes=32 time<1ms TTL=128
Reply from 192.168.101.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.101.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

A successful ping was made on **Server2** when pingging **Client2** as seen above.

Task 3: Observational Tasks

The difference between Type 1/2 Hypervisors & the benefits/drawbacks

Type 1

A Type 1 hypervisor is a method of running virtual machines natively without the need of a Host OS or Software in-between the virtual machine and the server/host.

Type 1 hypervisors themselves are extremely simple, only offer a set amount of functionality, and typically run a command line interface rather than a desktop interface, as they were designed typically for enterprise usage. [1]

One major advantage of a Type 1 hypervisor is dynamic resource allocation, where the resource usage is much more liberal, due to the lack of resources being used by a host OS and other software, virtual machines can utilise more system resources depending on whether or not they're currently in use, making them dynamic, and therefore, the performance is much greater compared to that of a Type 2 hypervisor. [2]

Type 2

A type 2 hypervisor runs on top of the operating system itself, and uses the operating system to make calls to the computer's components, such as the CPU, Memory, Storage etc. Examples include: QEMU, VMWare Workstation, Oracle VirtualBox etc. [3]

An advantage to using Type 2 Hypervisors would be their usefulness for sandboxing and testing, such as testing software to see how well they work in different environments and Operating Systems. [4]

Performance issues also arise when using a Type 2 Hypervisor, as the VM typically runs within the Operating System, the system resources are often in use by the Operating System, and the VM needs to share these resources with the OS and other software running, which means a lack of system resources could pose performance

issues within the virtual machine due to a lack of system resources.

Type 2 Hypervisors also pose security risks, as certain security loopholes may allow potentially harmful software to run on the Host OS via methods of sharing data between the Guest and Host OS. [5]

The significance of the subnet mask in IPv4 addressing

In IPv4 addressing, the subnet mask is used to determine whether the host is on a local subnet or on a remote network. [6] It is mostly used as a way to “mask” a certain part of the IP address to give the protocol an idea of how many hosts can exist on that subnet. [7]

The use of cloud computing and its benefits/drawbacks

Instead of buying servers, data centres or hardware yourself, you can purchase resources from a remote data centre on a pay-as-you-go basis, and connect to those servers/computers remotely via the internet, (referred to as “the cloud” due to the way cloud computers are visualised using networking diagrams and graphics [8]) thus saving money, space, time and energy with the luxury of only needing to use these services when you need to. [9]

One of the biggest advantages of cloud computing is cost. With cloud computing, the major cost of setting, maintaining and moderating an entire data centre and the software they use is eliminated entirely, as this is all fundamentally managed server-side by the provider, rather than you. [10]

Another major advantage is scalable performance, instead of relying on upgrading the hardware yourself, cloud computing providers are constantly scaling the hardware to adapt to today’s performance standards, ensuring maximum performance necessary for day to day business tasks without having to worry about out of date hardware. [11]

There are several advantages when it comes to the security of cloud computing solutions, for example:

Cloud computing technologies often have strong DDoS protection in place to ensure large amounts of traffic aren’t directed at company servers. Because the security aspect is maintained by large technology companies such as Microsoft or Amazon with a massive focus on security, cloud computing is often a lot more secure compared to the alternative of simply maintaining the security yourself, especially if you run a small business. [12]

Since cloud vendors take security more seriously, and have more resources to do so, physical data theft is much more unlikely, therefore, data security is another added advantage of cloud computing technology, as top level security is often in place in large data centres, the risk of physical disks and storage being stolen or breached is far less likely, protecting sensitive data from exposure. [13]

Another advantage to cloud computing is reliability, cloud vendors often make it their absolute best interest to ensure their services remain online, by using multiple safety nets, such as multiple methods of hosting and backups to ensure the customer is online at least 99.9% of the time, unlike self hosting, which is susceptible to costly downtime [14]

Descriptions of Different Terminologies

Ping

A “Ping” is a simple signal sent directly to a host – It requests a response from the host to ensure that the host is available. It’s also used as a way to measure how long the response takes, known as the “Ping” value you see on speed tests. [15]

The ping utility makes use of the ICMP (Internet Control Message Protocol) which sends an **echo request packet** to the host. When the host receives an echo request packet, it will return an **echo reply packet** which acts as a receipt with information about the connection established. [16]

The Windows version of the Ping command will send 4 Pings before exiting, however the Linux version of the Ping command will continue to send multiple Pings until the user manually hits Ctrl + C.

Firewall

A firewall is a computer term devoted to a service that blocks certain connections from outside sources based on a set of rules. It’s developed as a layer of protection to ensure that malicious connections aren’t established and data isn’t recieved from hackers or viruses. [17]

Server Management

Server Management Software is software that is used to ensure the performance of servers are maintained and properly managed with a visual or command line based interface with various tools and functions for managing servers. [18]

There are different Server Management platforms on the market, for example, the Windows Server Manager is used to help IT professionals manage local and remote Windows based servers without having to actually connect to the server itself either manually via physical interaction, or remotely via remote desktop software. [19]

Linux based Servers use in-built server management software, much like Windows Server, however Linux’ does not have a set server management software, instead, the choice of server management is based on the Linux distribution and software.

Oobe

The Oobe (Out of Box Experience) is a setup screen that appears typically when the user has installed the Operating System and is now setting it up for the first time. The Oobe allows users to set up various settings and accept license agreements, create/log into user accounts, connect to the internet etc. [20]

Virtualisation

Virtualisation is the act of running multiple operating systems or user environments on one machine without having to reboot into separate operating systems or use multiple devices. The process of virtualisation means the virtual operating system runs on a separate layer to the host OS. [21]

One major advantage of virtualisation is cost and efficiency, as with most servers, system resources are not being fully utilised unless they are being 100% used. Virtualisation allows servers to utilise full resources, by running various tasks on various operating systems at the same time, thus using the full resources available for that particular server, rather than running individual processes that often don't utilise the full potential of the resources available for servers. [22]

Physical Address Extension

A PAE (Physical Address Extension) is a feature embedded into Operating Systems that allow 32-bit (x86) processors to utilise more than 4GB of RAM. [23]

With 32 bit processors, there is ~3GB barrier limit to how much RAM can be utilised due to I/O limitations of these processors, that are later circumvented with 64 bit processors. [24]

Switch

A switch is a device that connects all network enabled devices in a small business network, such as printers, Personal Computers (PCs) and servers. Switches are vital in ensuring devices can communicate with each other within a small business network. [25]

References

- [1] "What's the difference between Type 1 vs. Type 2 hypervisor?", *TechTarget*, 2021. [Online]. Available: <https://searchservvirtualization.techtarget.com/feature/What-s-the-difference-between-Type-1-and-Type-2-hypervisors>. [Accessed: 01- Mar- 2021]
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