



HOW TO BUILD A NETAPP ONTAP 9 LAB



FOR
FREE!

NEIL ANDERSON

Table of Contents

Introduction	3
Demo Videos.....	3
About the Author	3
Lab Topology Diagram	4
IP Addressing Tables	5
Lab Topology Notes	7
Lab Notes	8
VMware Workstation Player Install	9
Optional: VMware Workstation Professional	16
VyOS Router Build.....	20
ONTAP Simulator Build – C1N1.....	35
ONTAP Simulator Build – C1N2.....	54
ONTAP Simulator Build – C2N1.....	70
Optional: Upgrade clusters to latest ONTAP version.....	89
Windows Server Build	110
Linux Build.....	162
Simplified Lab Topology Diagram for ‘VMware vSphere on ONTAP Storage’ Labs	186
VMware ESXi1 Host and VCSA Build	187
Optional: VMware ESXi2 Host Build for NetApp VSC.....	257
Optional: CentOS ‘API’ Host Installation for OnCommand API Services.....	300
SuperPutty Install.....	317
SPECIAL OFFER: NetApp ONTAP Complete Training Course.....	331

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Introduction

Thanks very much for taking the time to download this free eBook where you'll see the step-by-step process to build an entire NetApp lab from scratch, for free. All you need is a PC to run the lab on. I hope you can make use of it to expand your storage knowledge and further your career.

The lab build outlined here is the same one I use for the hands-on demonstrations in my tutorials at www.flackbox.com. By building this lab, you'll be able to follow along and gain the hands-on skills you need to configure, manage and maintain NetApp storage systems.

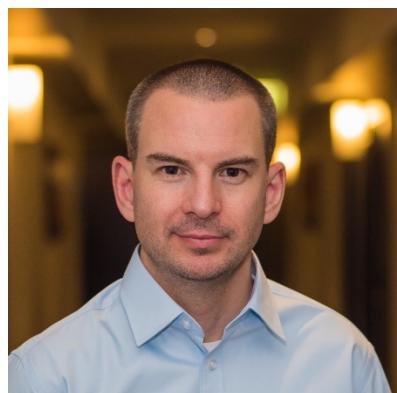
If you find any errors in the book, please let me know so I can correct them. You can email me at neil@flackbox.com

Demo Videos

You can watch a series of demo videos walking you through how to build the lab here:

<https://www.flackbox.com/how-to-build-a-netapp-ontap-lab-course>

About the Author



I'm Neil Anderson, you can visit my blog at www.flackbox.com to learn about Cloud and Data Center technologies.

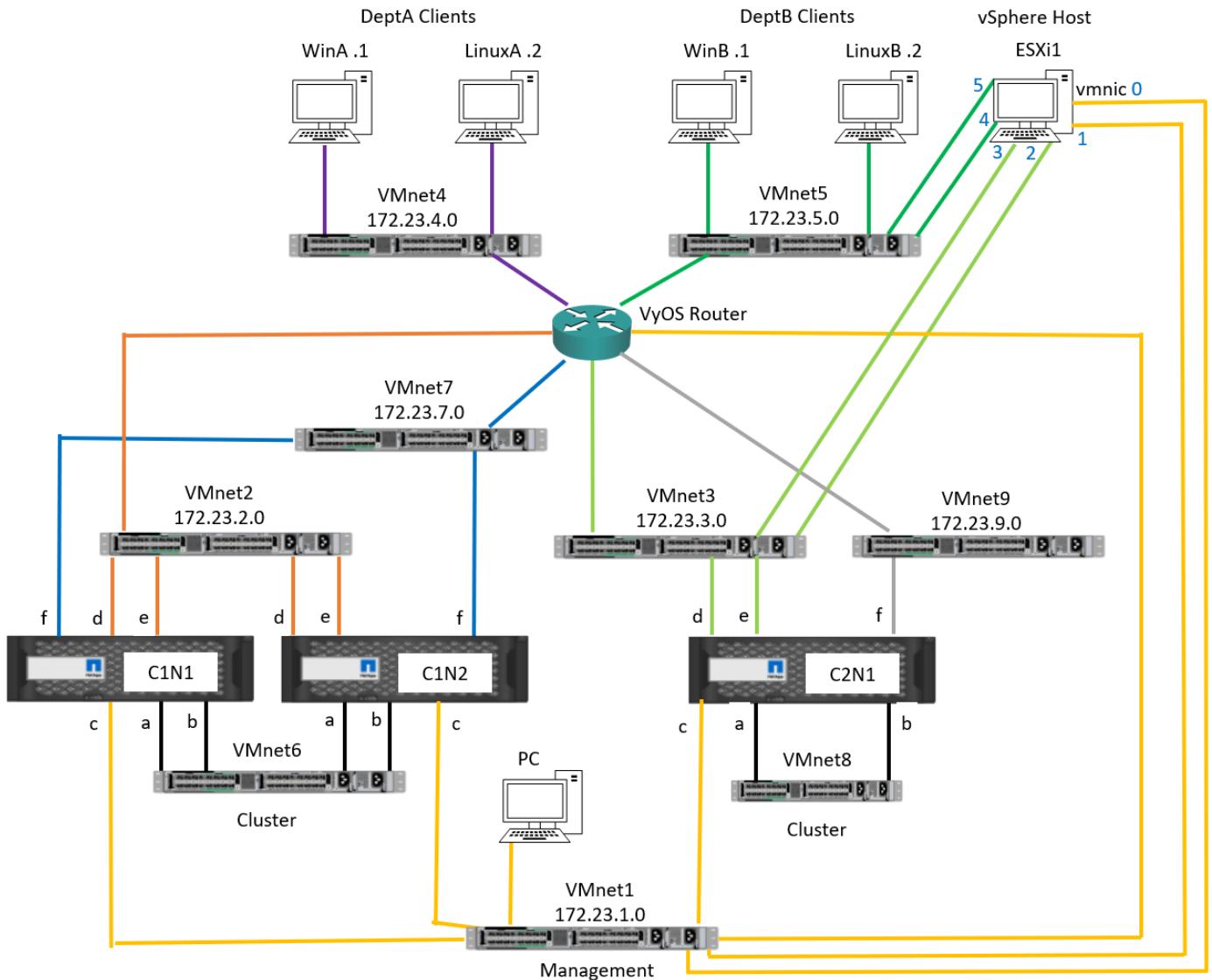
The main focus of my current role is delivery of technical training and development of course content for large enterprise and service provider customers such as NetApp, Cisco, Verizon and IBM.

Prior to focusing on training I worked in the field in a variety of systems and network engineering roles. I've always embraced change and I've worked in consultancy roles for dozens of companies, big and small, and enjoyed soaking up knowledge across all areas of information technology.

Connect with me on social media:



Lab Topology Diagram



IP Addressing Tables

Management IP Addresses	
Host	IP Address
Cluster1 cluster management	172.23.1.11
Cluster2 cluster management	172.23.1.21
ESXi1 management	172.23.1.31
ESXi2 management	172.23.1.32
vSphere VCSA management	172.23.1.101
WinA	172.23.4.1
LinuxA	172.23.4.2
API Linux	172.23.4.3
WinB	172.23.5.1
LinuxB	172.23.5.2

VyOS Router			
Int.	VMnet	Network	IP Address
eth0	1	Management	172.23.1.254
eth1	2	Data/Intercluster-2	172.23.2.254
eth2	3	Data/Intercluster-3/VM Storage	172.23.3.254
eth3	4	Dept-A Clients	172.23.4.254
eth4	5	Dept-B Clients/Virtual Machines	172.23.5.254
eth5	7	Data/Intercluster-7	172.23.7.254
eth6	9	Data/Intercluster-9	172.23.9.254

Cluster1 Node1			
Int.	VMnet	Network	IP Address
e0a	6	Cluster	169.254.x.x
e0b	6	Cluster	169.254.x.x
e0c	1	Node Mgmt	172.23.1.12
e0d	2	Data/Intercluster-2	172.23.2.x
e0e	2	Data/Intercluster-2	172.23.2.x
e0f	7	Data/Intercluster-7	172.23.7.x

Cluster1 Node2			
Int.	VMnet	Network	IP Address
e0a	6	Cluster	169.254.x.x
e0b	6	Cluster	169.254.x.x
e0c	1	Node Mgmt	172.23.1.13
e0d	2	Data/Intercluster-2	172.23.2.x
e0e	2	Data/Intercluster-2	172.23.2.x
e0f	7	Data/Intercluster-7	172.23.7.x

Cluster2 Node1			
Int.	VMnet	Network	IP Address
e0a	8	Cluster	169.254.x.x
e0b	8	Cluster	169.254.x.x
e0c	1	Node Mgmt	172.23.1.22
e0d	3	Data/Intercluster-3	172.23.3.x
e0e	3	Data/Intercluster-3	172.23.3.x
e0f	9	Data/Intercluster-9	172.23.9.x

VMware ESXi Host Networks			
Int.	VMnet	Network	IP Range
vmnic0	1	Management	172.23.1.0/24
vmnic1	1	Management	172.23.1.0/24
vmnic2	3	Storage	Any (ESXi client and storage subnet must match)
vmnic3	3	Storage	Any (ESXi client and storage subnet must match)
vmnic4	5	Virtual Machines	172.23.5.0/24
vmnic5	5	Virtual Machines	172.23.5.0/24

Cluster2 Node1 Configuration for VMware Clients			
Int.	VMnet	Network	IP Address
e0a	8	Cluster	169.254.x.x
e0b	8	Cluster	169.254.x.x
e0c	1	Node Mgmt	172.23.1.22
e0d	3	Storage	Any (ESXi client and storage subnet must match)
e0e	3	Storage	Any (ESXi client and storage subnet must match)

Lab Topology Notes

The lab contains two NetApp ONTAP clusters.

Cluster1 contains two nodes, C1N1 and C1N2.

Cluster2 is a single node cluster with node C2N1.

Cluster1 represents the main production site, Cluster2 represents a Disaster Recovery and Backup site.

SnapMirror is used for the Disaster Recovery, SnapVault for long-term disk-to-disk backups.

There are two departments, DeptA and DeptB. You can configure dedicated SVMs for both DeptA and DeptB on the Cluster1 production cluster.

The DeptA clients are on the 172.23.4.0/24 subnet. The Windows host WinA has IP address 172.23.4.1, the Linux host LinuxA has IP address 172.23.4.2. WinA is the Active Directory Domain Controller and DNS server for the DeptA domain, flackboxA.lab

The DeptB clients are on the 172.23.5.0/24 subnet. The Windows host WinB has IP address 172.23.5.1, the Linux host LinuxB has IP address 172.23.5.2. WinB is the Active Directory Domain Controller and DNS server for the DeptB domain, flackboxB.lab

The Cluster1 NetApp system is connected to the 172.23.2.0/24 and 172.23.7.0/24 subnets which can be used for client data access or intercluster replication traffic. It is also connected to the 172.23.1.0/24 subnet for management access.

The Cluster2 NetApp system is connected to the 172.23.3.0/24 and 172.23.9.0/24 subnets which can be used for client data access or intercluster replication traffic. It is also connected to the 172.23.1.0/24 subnet for management access. Both Cluster1 and Cluster2 use the 172.23.1.0/24 subnet for management.

The vSphere ESXi1 host has dual, redundant connections to the management network (ESXi1 interfaces vmnic0 and vmnic1), a storage network (vmnic2 and vmnic3) and a virtual machine network (vmnic4 and vmnic5). A single switch is shown for each of the networks to keep the diagram simple, but you can assume dual switches are being used for redundancy.

Use the single node Cluster2 when practicing with VMware vSphere as it uses less RAM than the two nodes of Cluster1.

A VyOS virtual router provides connectivity between all the IP subnets. It has an IP address ending in .254 for each subnet, and should be used as the default gateway for each subnet.

The PC which you run the lab on is configured with an additional virtual network card for connectivity to the lab. It has IP address 172.23.1.10 in the management network and a static route for all lab subnets pointing at the VyOS router. Your PC will still have connectivity to all other networks including the Internet via its main network card.

Lab Notes

The VMware Hypervisor

The virtualization software I use in the lab guide is VMware Workstation Player because I wanted to show how you can build the entire lab for free. You may also want to consider using the paid version of VMware Workstation Professional as this will give you the benefit of being able to take snapshots. Snapshots allow you to save the state of the lab at any point in time and easily revert back to that state later. This can save you time and make your lab experience more convenient and reliable.

Memory Requirements

Each instance of the Clustered ONTAP v9 simulator needs 5GB RAM to power on, so it is recommended to install the lab on a PC with at least 16GB RAM in order to run all 3 nodes.

Powering on Virtual Machines

To maximise performance, only power on the virtual machines which are required for the individual task you want to practice (for example, do not power on Windows when you're practicing NFS).

Powering on both NetApp v9 clusters will require 15GB RAM, so only do this when you are practicing SnapMirror or SnapVault, and do not run any other unnecessary applications or services on your PC. If you need to free up memory you can run the VyOS router with only 128MB RAM instead of the usual 512MB.

Normally you will only need to power on Cluster1 (not Cluster2), and normally you will only need to power on the DeptA Windows or Linux host (not DeptB).

Downloading the Software

All software referenced here can be downloaded for free from the vendor's websites. Download of the NetApp ONTAP simulator requires you to log in to the NetApp website with a user account which is associated with a NetApp partner with a valid support contract.

[Click Here to get my 'NetApp ONTAP Storage Complete' course. Become a NetApp expert with over 30 hours of HD video tutorials and a Lab Exercise Guide with full GUI and CLI solutions for every ONTAP feature.](#)

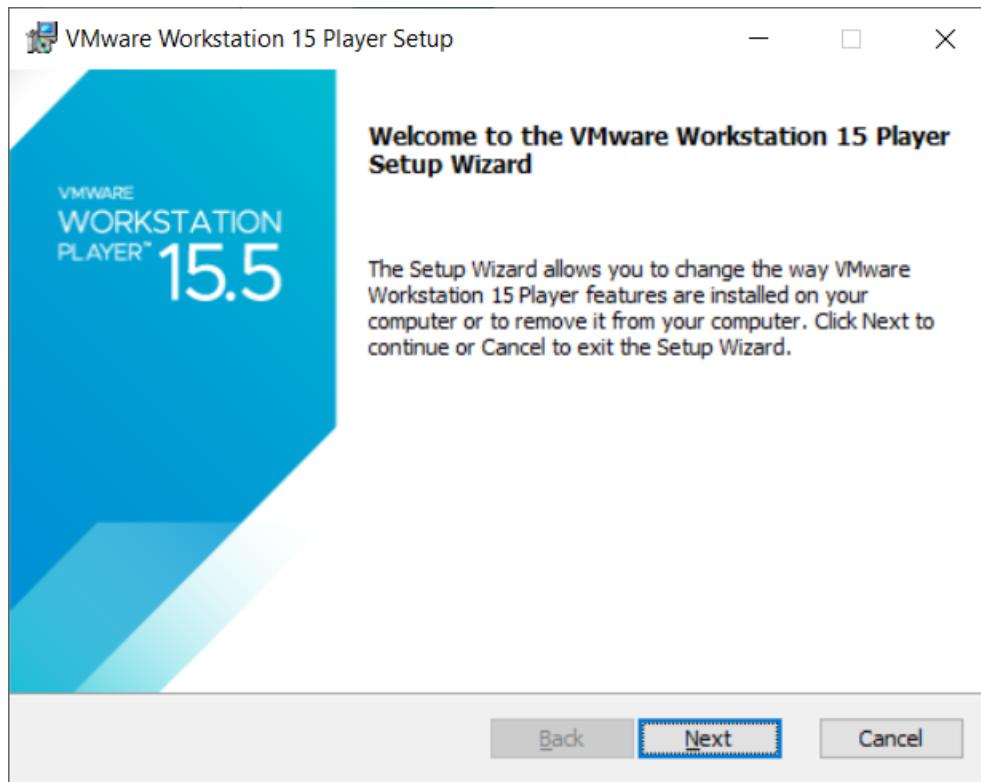
VMware Workstation Player Install

In this section we will install VMware Workstation Player and configure connectivity through the lab management network.

1. Ensure Virtualization Technology VT is enabled in your laptop's BIOS. The method for doing this varies slightly between different laptop manufacturers. Power on your laptop and then press the manufacturer dependent function key to enter the BIOS settings. In the BIOS settings, ensure that Virtualization Technology VT is turned on. It may also be called Vanderpool Technology or Virtual Machine Extensions. Save the settings, power off, then power back on again.
2. Open the VMware downloads page at <https://my.vmware.com/web/vmware/downloads> in your browser
3. Click on the link to **Download Product** for VMware Workstation Player

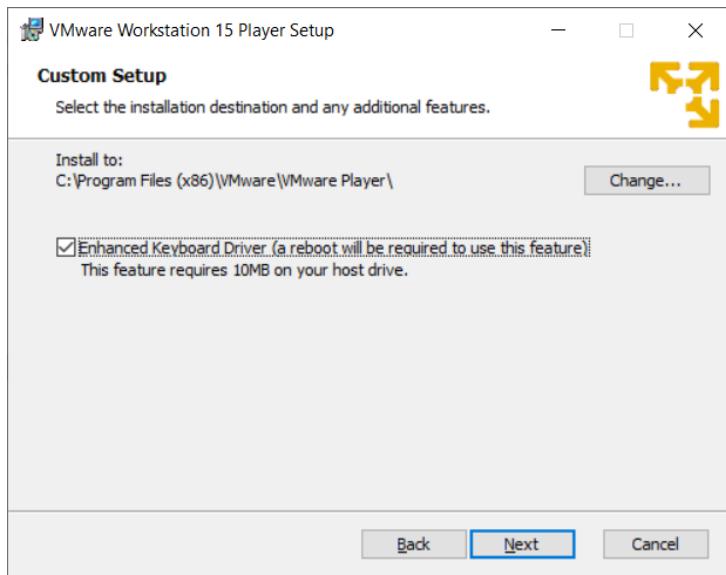


4. Download VMware Workstation Player and run the installer

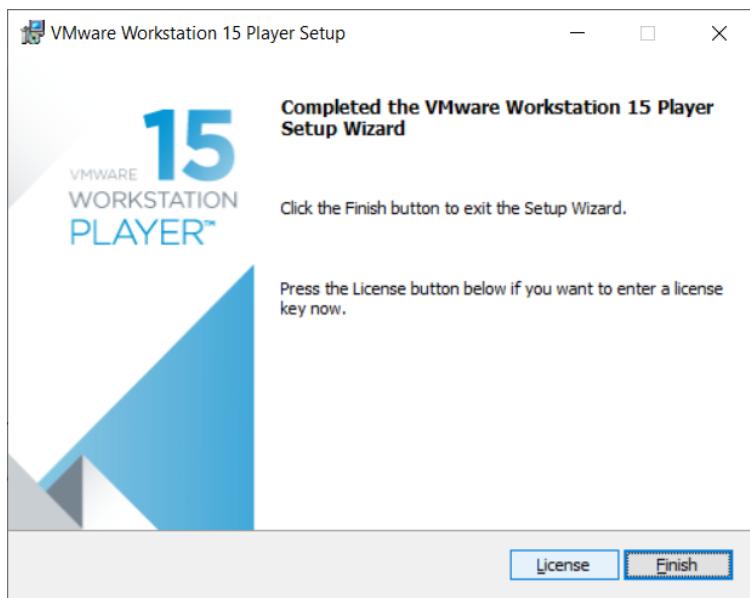


5. Accept the license agreement and click Next

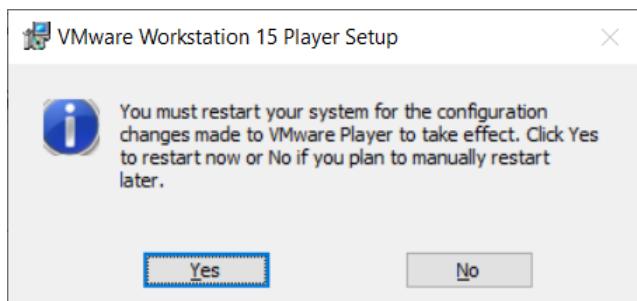
6. Tick the checkbox to install the Enhanced Keyboard Driver



7. Accept the defaults and click **Next** on the remaining pages in the installation wizard, then click **Install**
8. When the installation has completed click **Finish**. There is no need to enter a license.



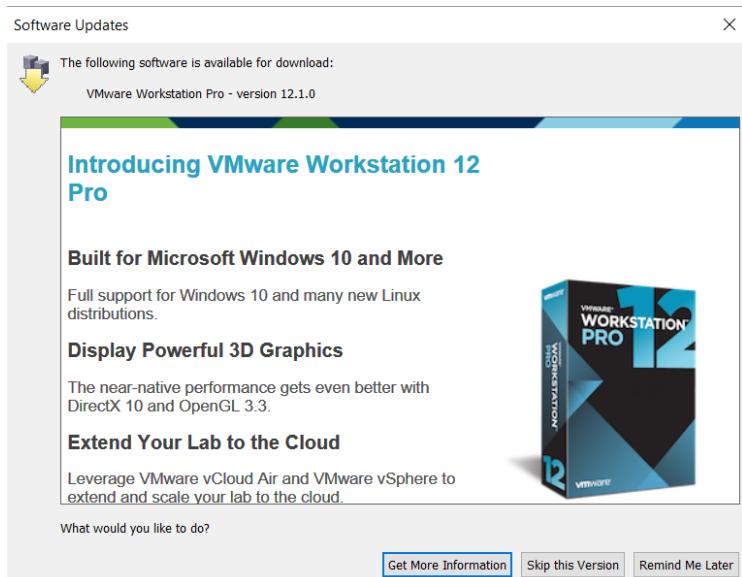
9. Click **Yes** to reboot.



10. Open VMware Workstation Player from the Start menu or the shortcut on your desktop
11. If prompted, choose the option to use VMware Workstation Player for free and click **Continue** and then **Finish**

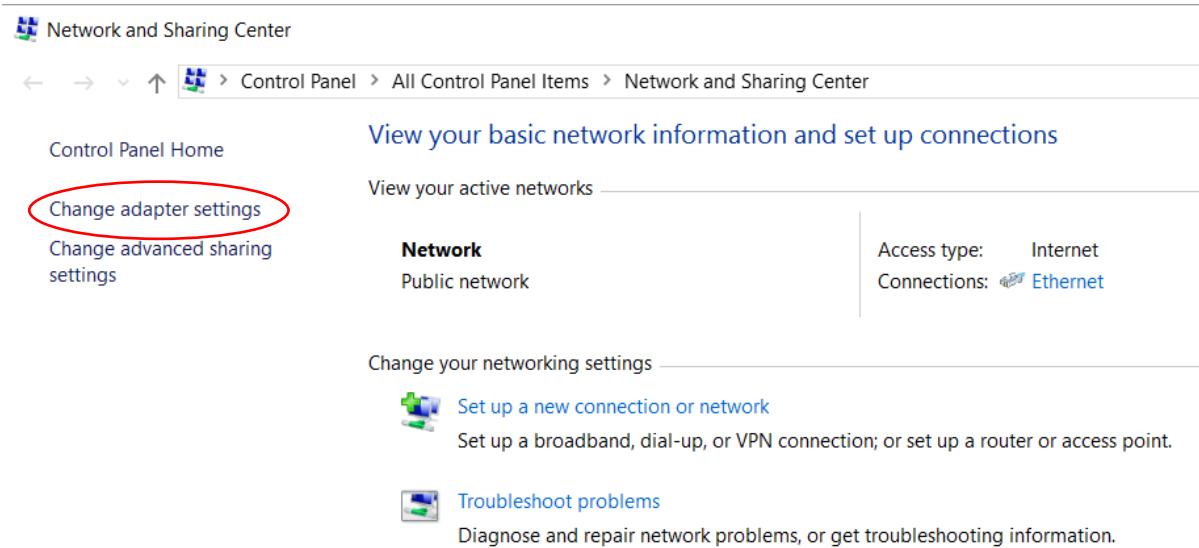


12. Click **Skip This Version** if prompted to download VMware Workstation Pro. The Pro version requires a paid license.

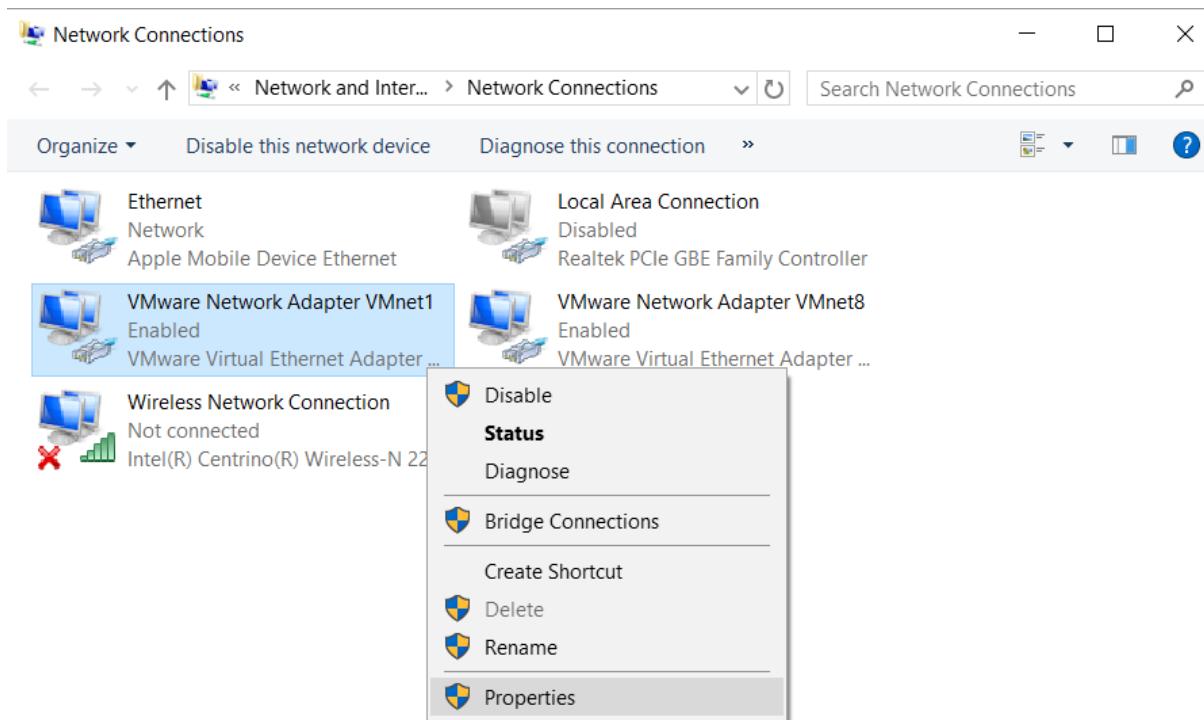


13. VMware Workstation Player installation is now completed.
14. Next we need to configure an IP address on your laptop for connectivity to the lab.
15. In Windows, open **Control Panel > Network and Sharing Center**

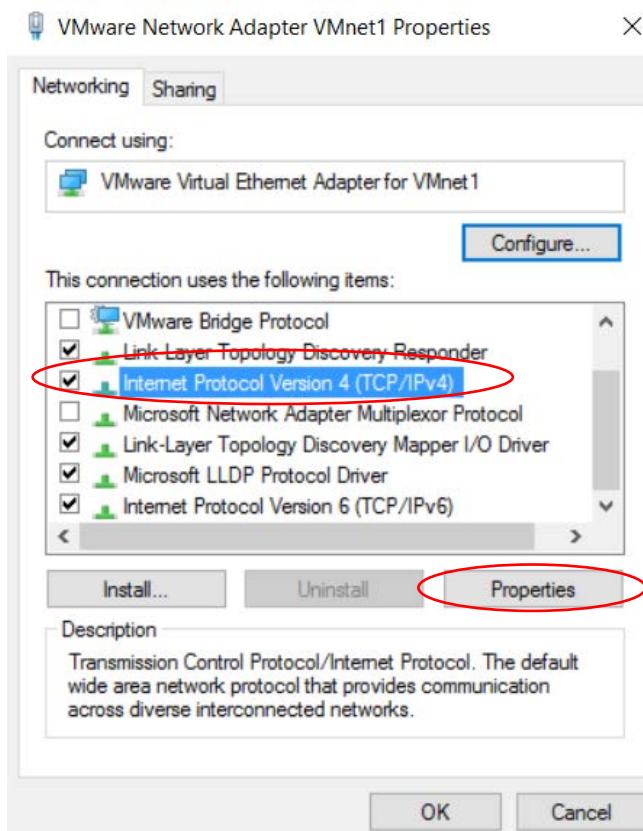
16. Click on **Change adapter settings**



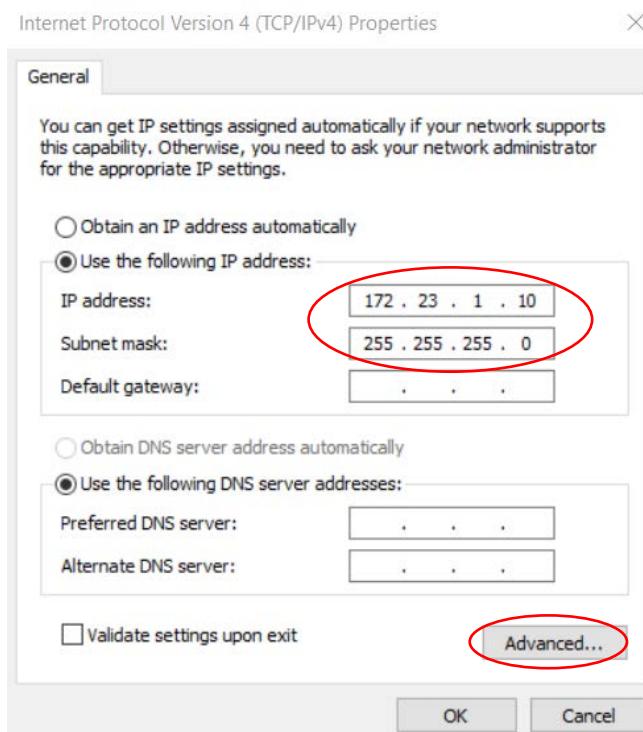
17. Right-click **VMware Network Adapter VMnet1** and select **Properties**



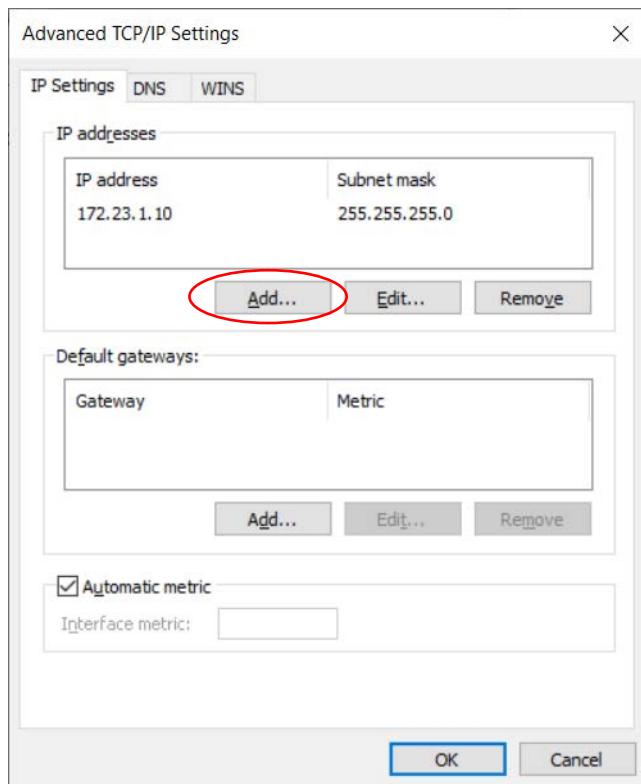
18. Click **Internet Protocol Version 4 (TCP/IPv4)** and select **Properties**



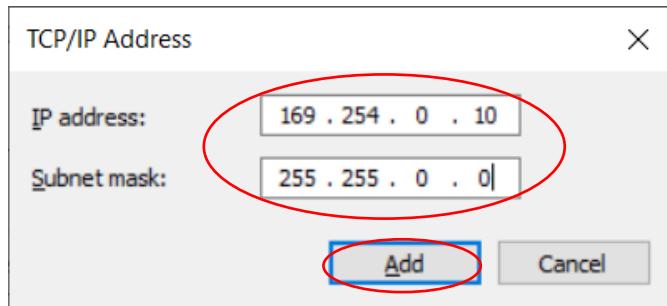
19. Configure the **IP address 172.23.1.10** and **Subnet mask 255.255.255.0**. Leave the rest of the settings blank and click the **Advanced...** button



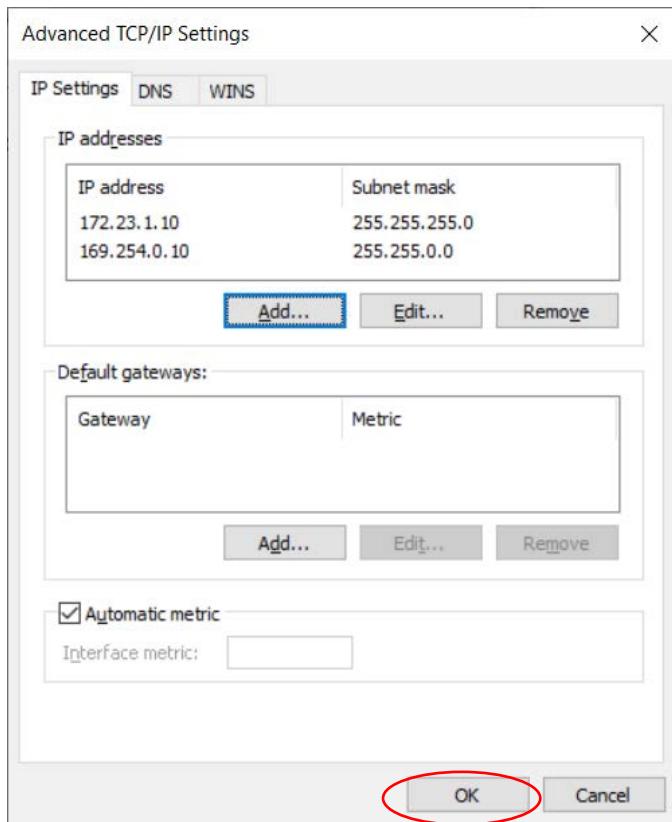
20. Click **Add...** to add an additional IP address.



21. Configure the **IP address 169.254.0.10** and **Subnet mask 255.255.0.0** then click **Add**.

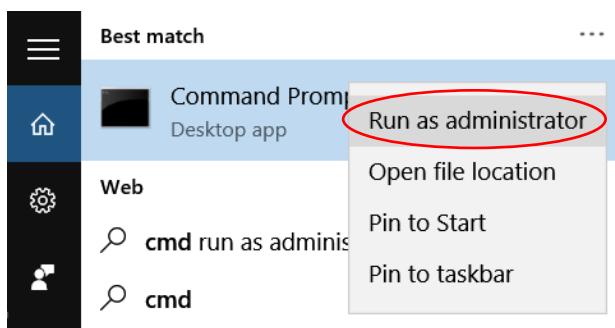


22. Click **OK** then **OK** again then **Close**



23. Next we need to configure a static route to the lab's IP subnets.

24. Open a command prompt on your laptop by clicking the Windows button and then type **cmd** in the search box. Right-click **Command Prompt** and choose the option to **Run as administrator**.



25. Enter the command **route add 172.23.0.0 mask 255.255.0.0 172.23.1.254 -p**

A lot of people make a typo here such as missing the 'mask' keyword. Please be careful to enter all commands in this guide **exactly** as shown so the lab will work.

```
C:\WINDOWS\system32>route add 172.23.0.0 mask 255.255.0.0 172.23.1.254 -p  
OK!
```

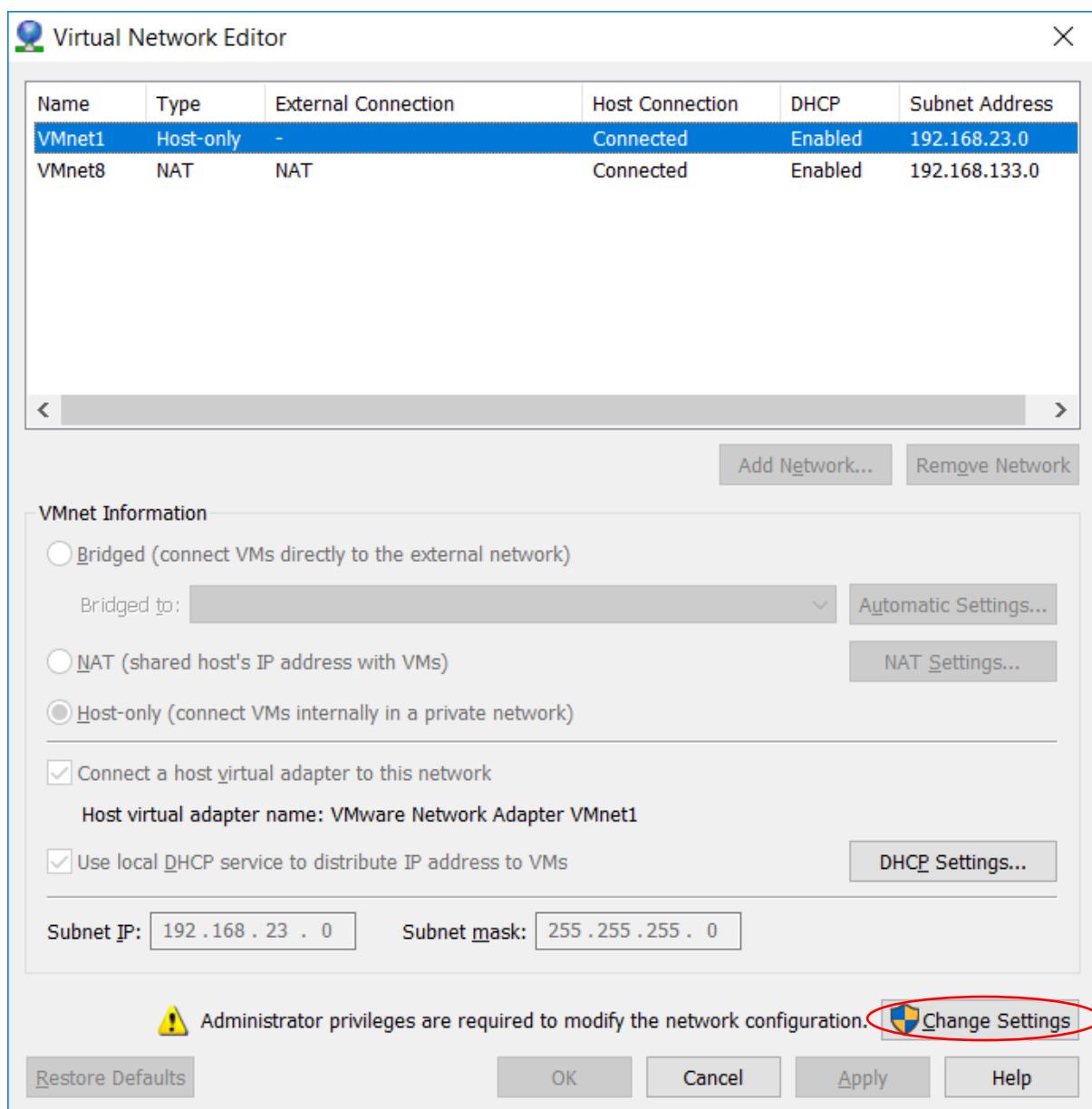
26. VMware Workstation Player setup is now complete.

Optional: VMware Workstation Professional

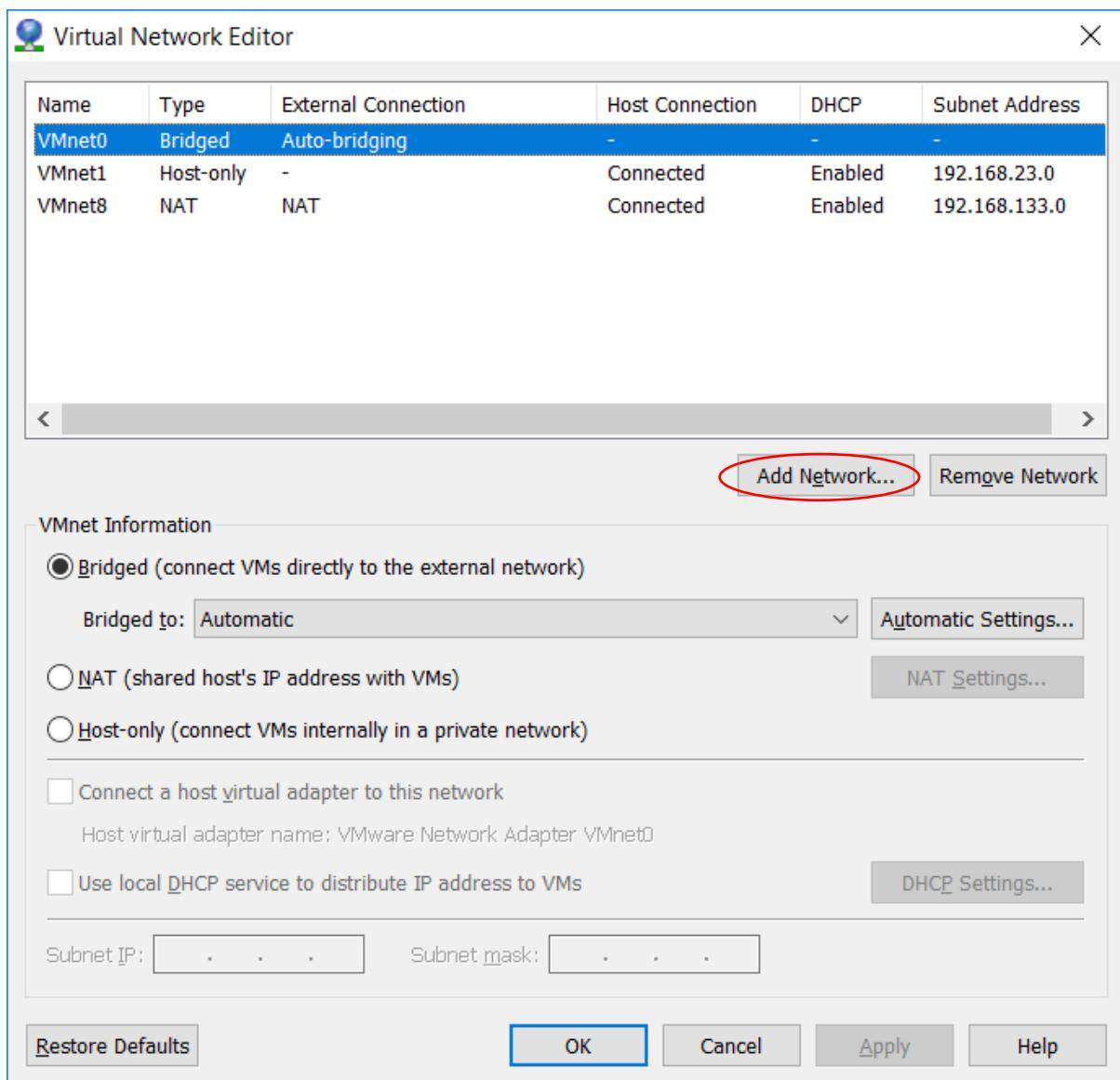
If you're using VMware Workstation Professional instead of VMware Workstation Player you'll also need to manually add the VMnet networks. The main benefit you get from using the Pro version is you can save your work in snapshots, but it requires a paid license.

Follow the instructions below to manually add the VMnet networks, only if you are using VMware Workstation Pro. Skip this section and move on to the VyOS Router Build if you're using the free VMware Workstation Player.

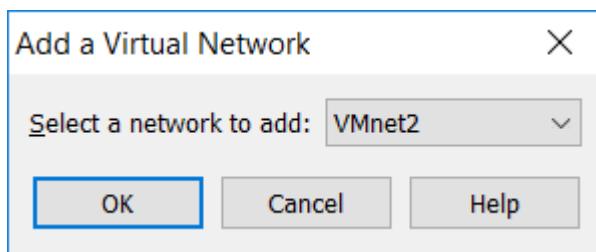
1. Open **Virtual Network Editor** (under VMware in your Start menu programs), then click on **Change Settings**.



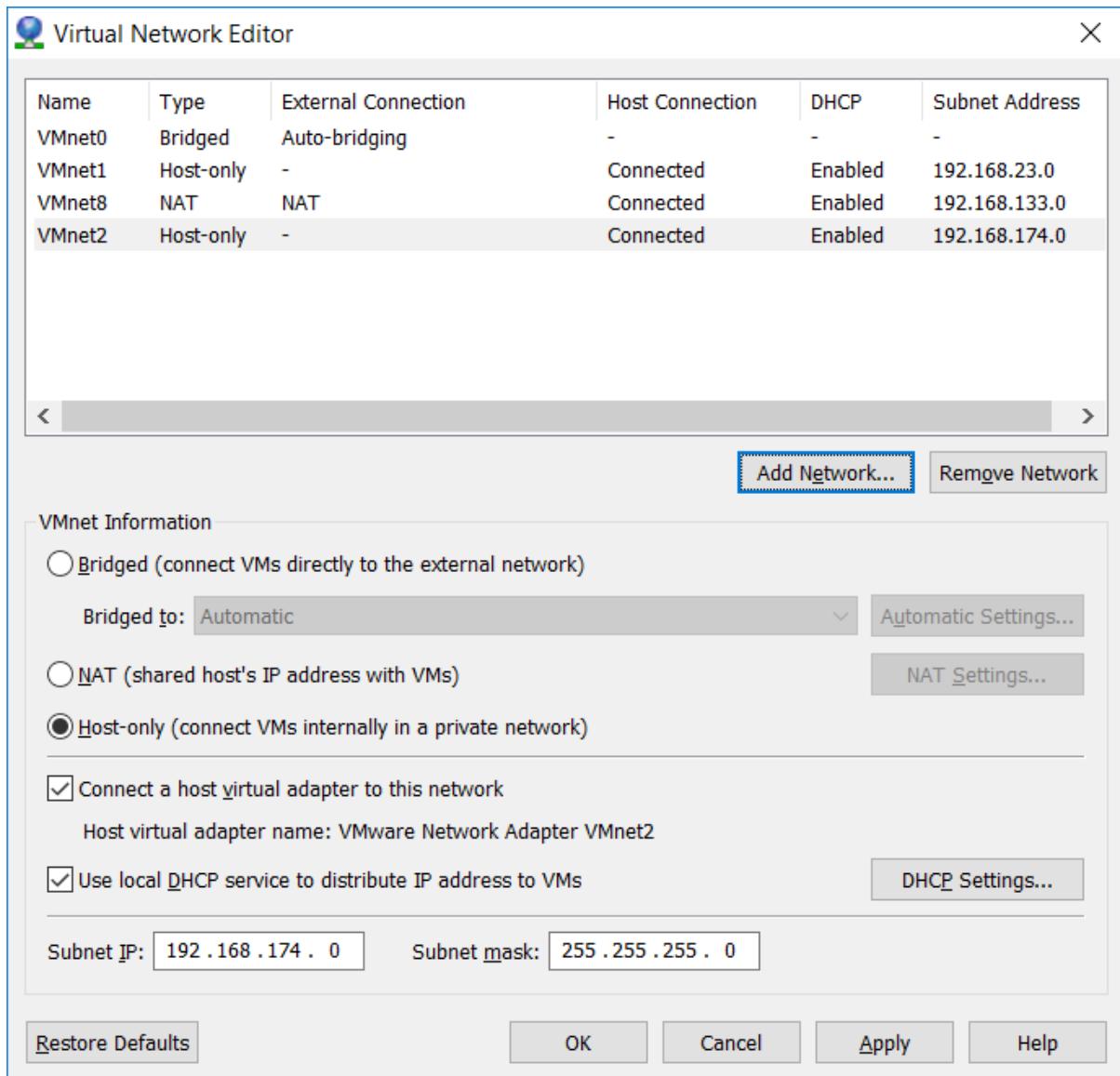
2. Click **Add Network**.



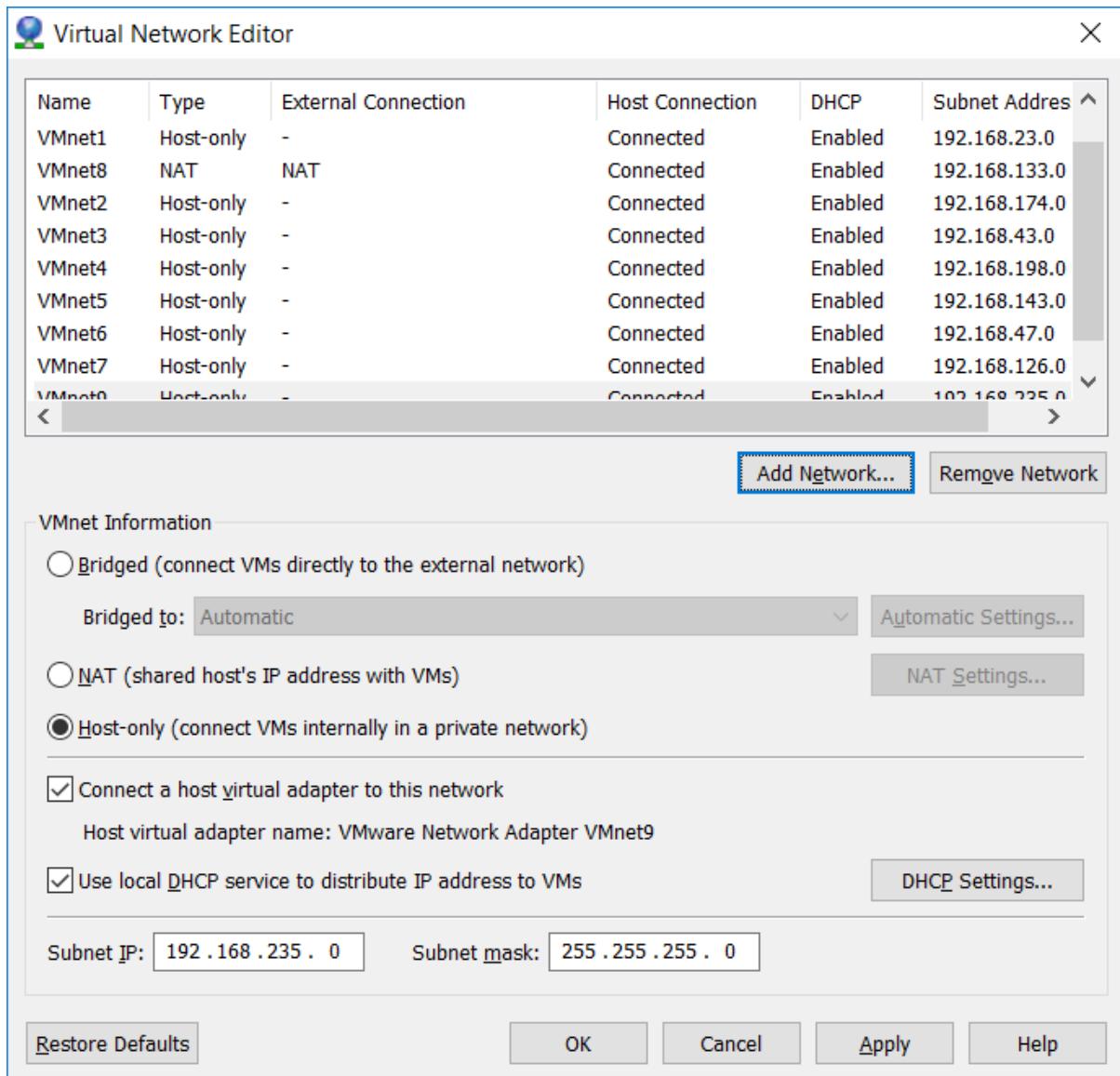
3. Click **OK** to add VMnet2.



4. The settings should be similar to below. You can ignore the ‘**Subnet IP**’, it is only important when assigning IP addresses with DHCP. We are manually configuring all IP addresses so the Subnet IP is irrelevant.



5. Click **Add Network** again and repeat to add VMnet 3 to 9. The Virtual Network Editor should look similar to the example below when you have added all networks.

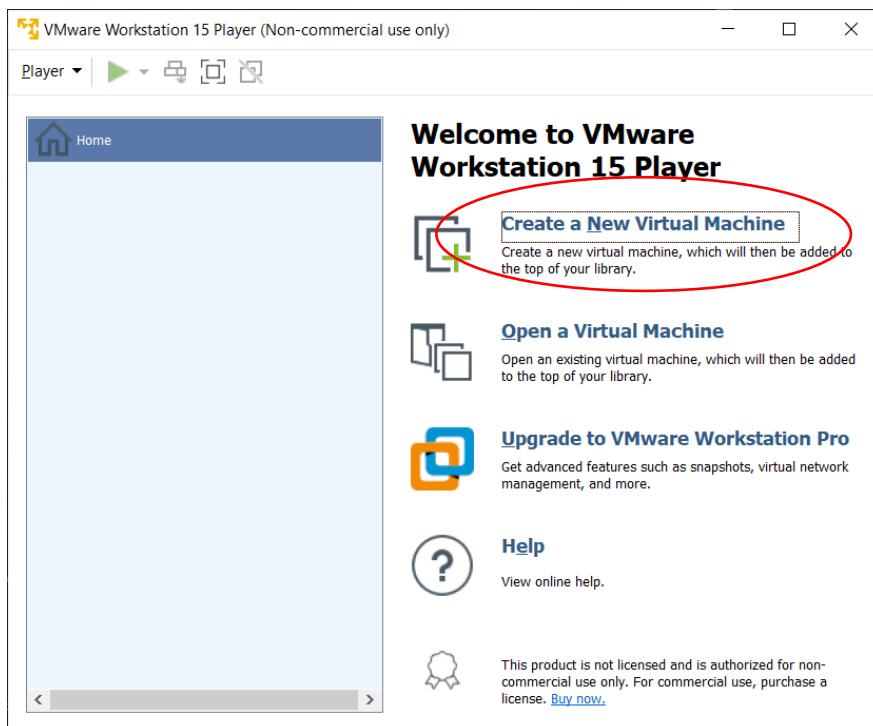


6. VMware Workstation Professional setup (optional) is now complete.

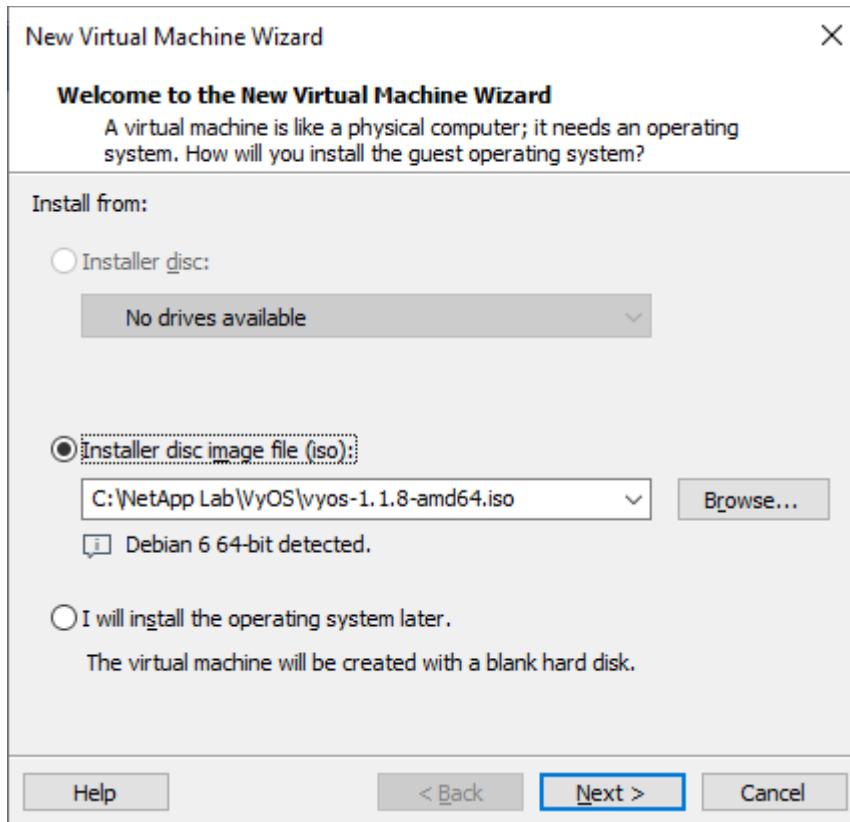
VyOS Router Build

In this section we will install the VyOS router.

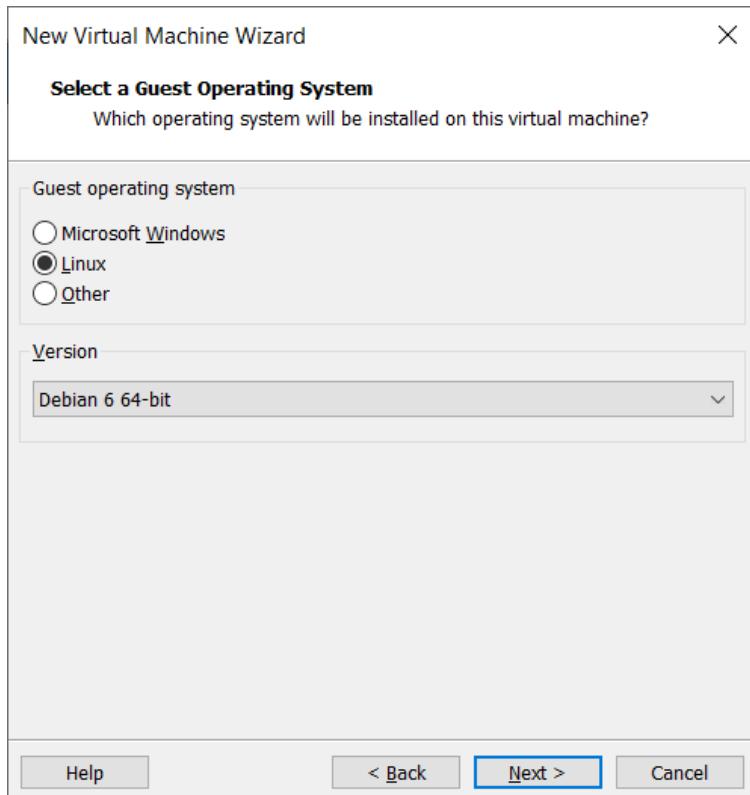
1. Open <https://vyos.net/get/nightly-builds/> in your browser.
2. Click on the link to download the latest available ISO image.
3. After the file has completed downloading, open Windows Explorer and browse to the folder you created earlier on your laptop named **NetApp Lab**.
4. In the NetApp Lab folder, make a subfolder named **VyOS**. We will create the VyOS Router in here.
5. Find the VyOS Router ISO file you downloaded and move it into the **VyOS** folder. It will have a name similar to **vyos-1.5-rolling-202401030023-amd64.iso**
6. Open VMware Workstation Player
7. Click **Create a New Virtual Machine**



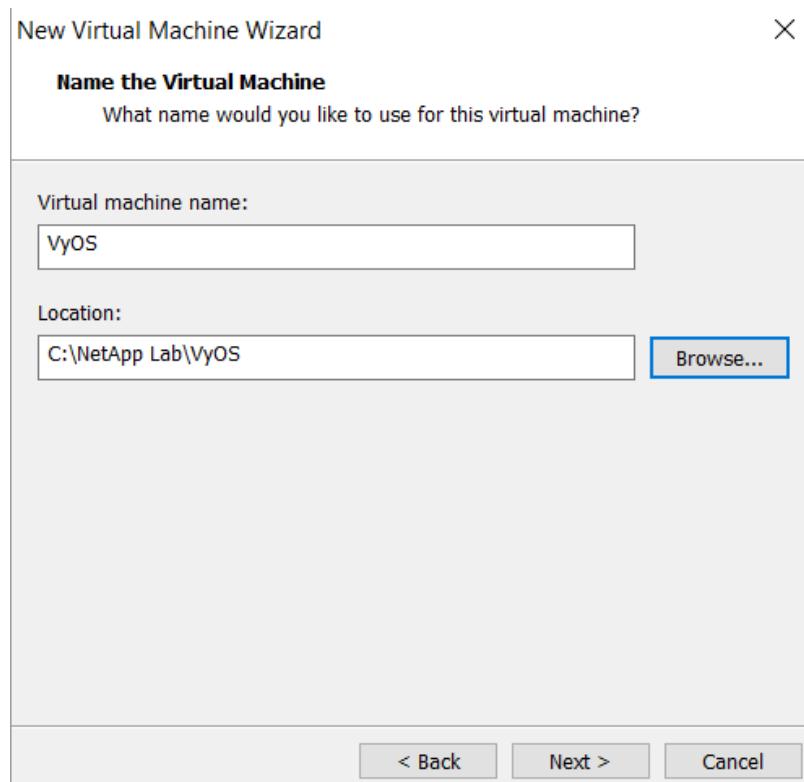
8. Select **Installer disc image file (iso)**: and **Browse** to the VyOS router ISO file in the VyOS folder.



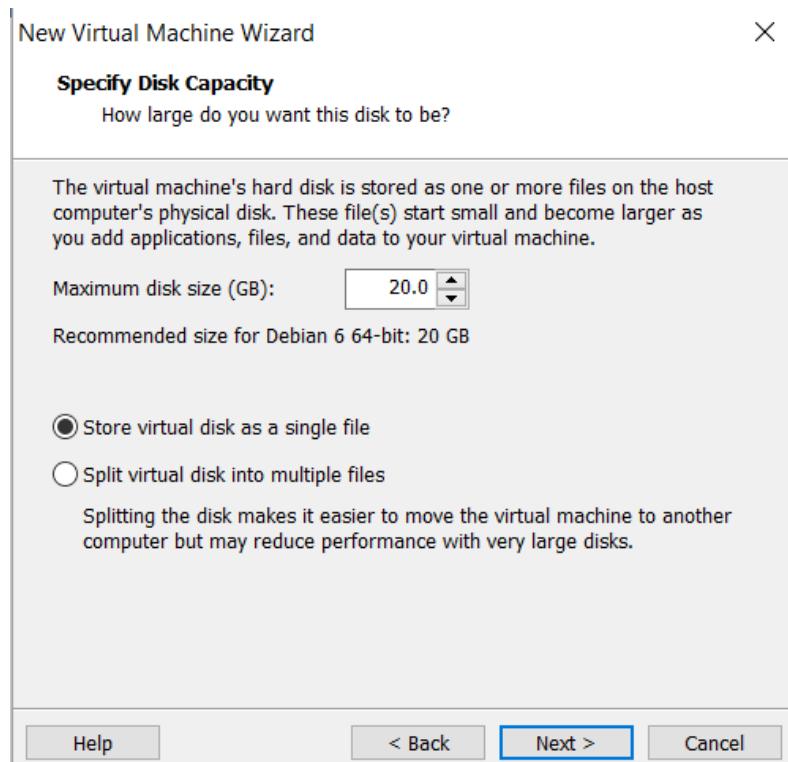
9. Select **Linux** and **Debian 6 64-bit** as the Guest Operating System if prompted.



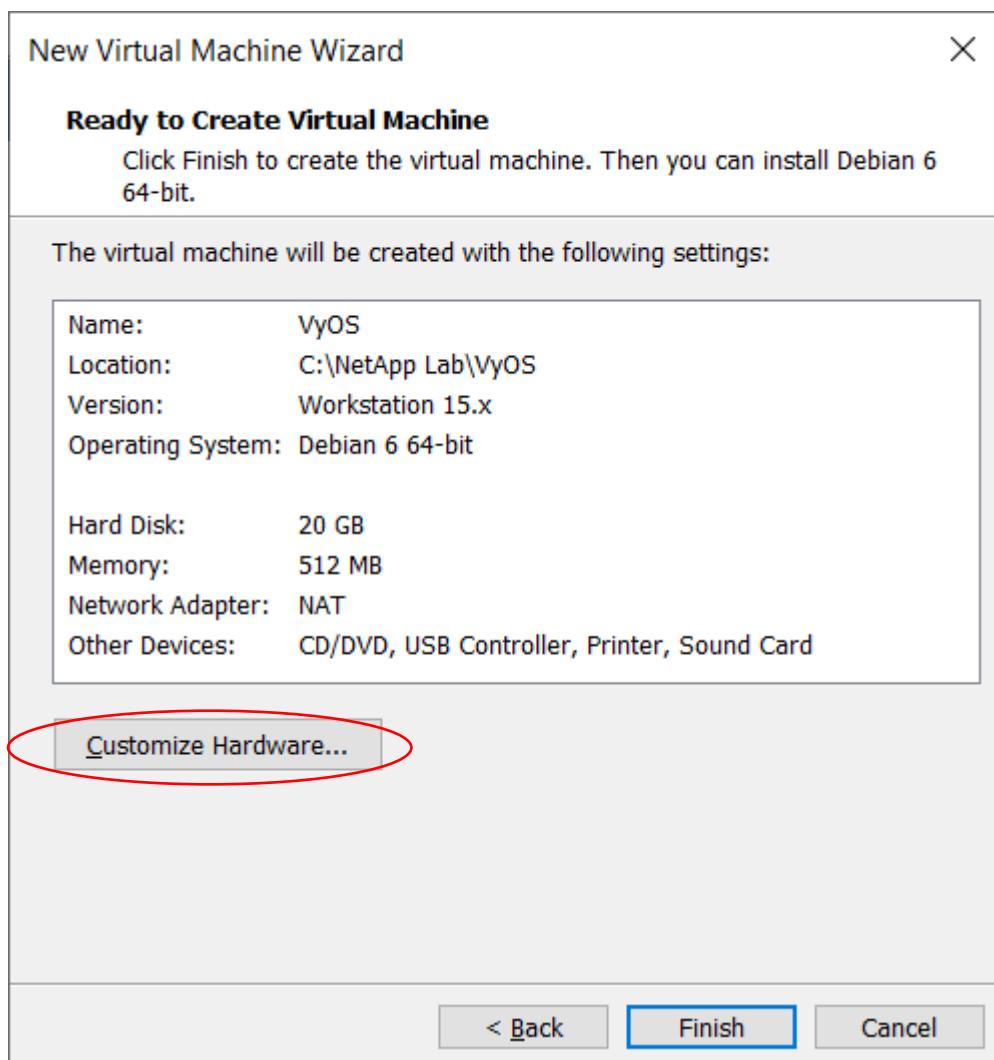
10. Name the virtual machine **VyOS** and save it in the **NetApp Lab\VyOS** folder



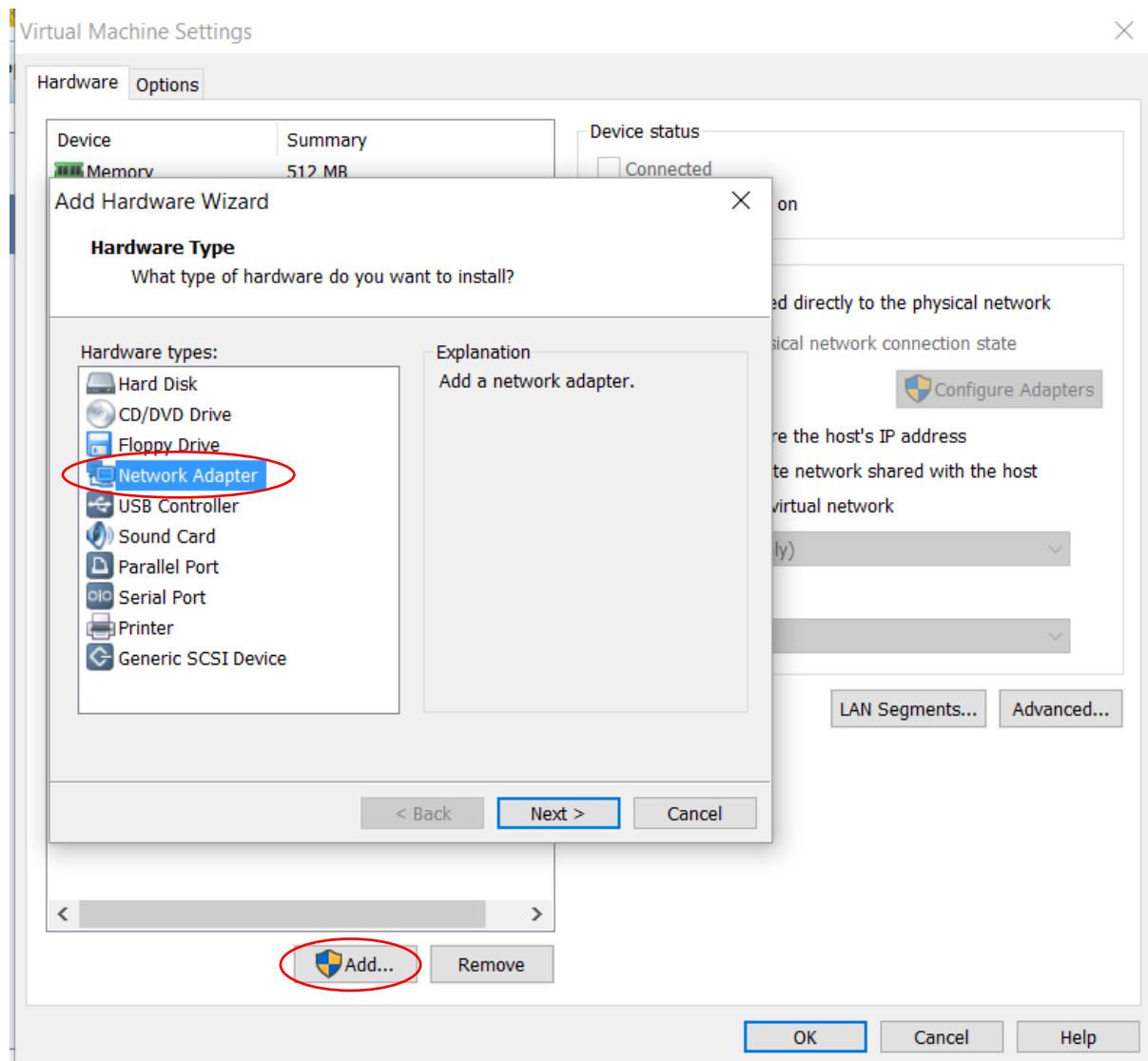
11. Select the option to **Store Virtual Disk as a single file** and click **Next**.



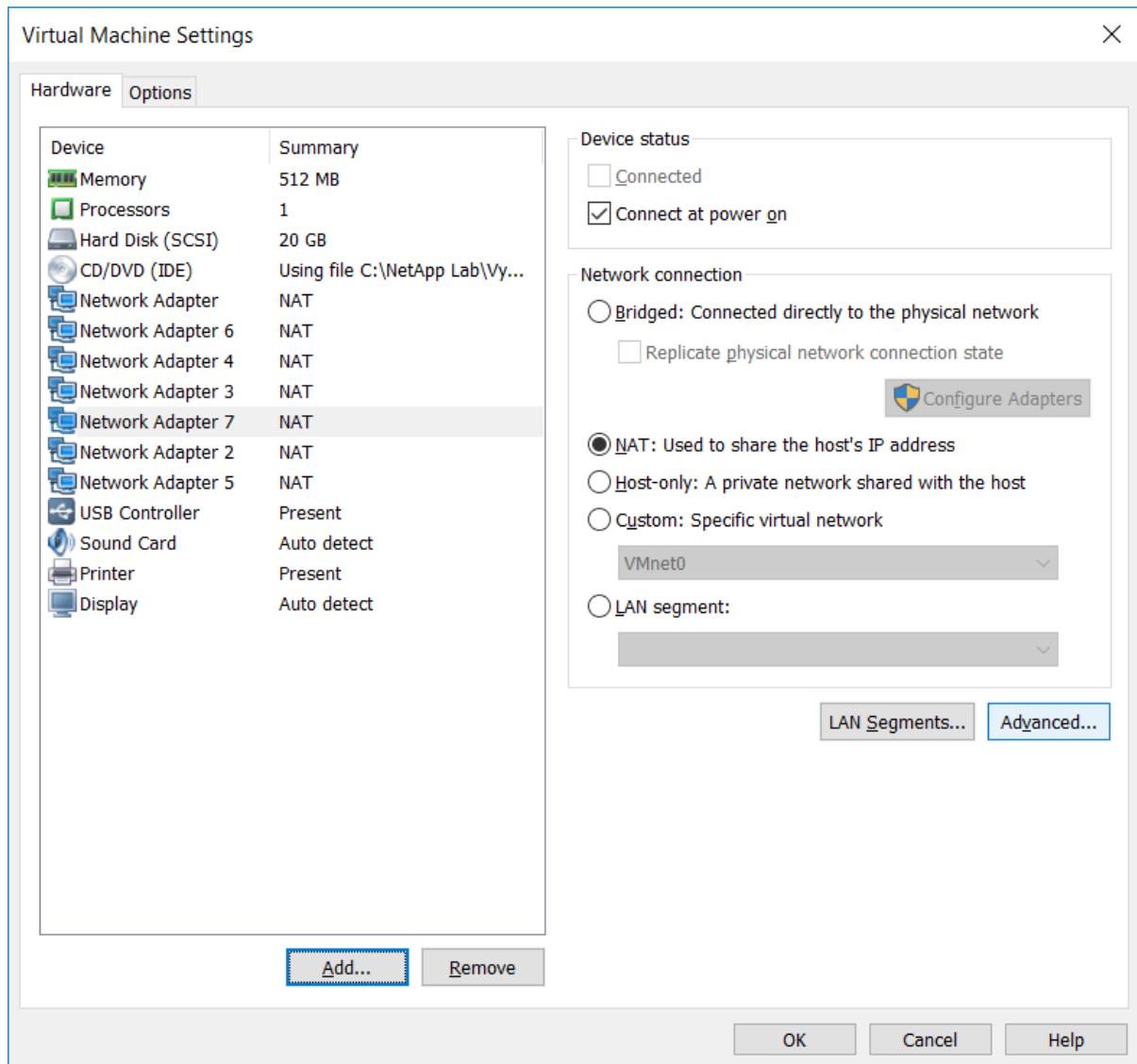
12. Click **Customize Hardware**



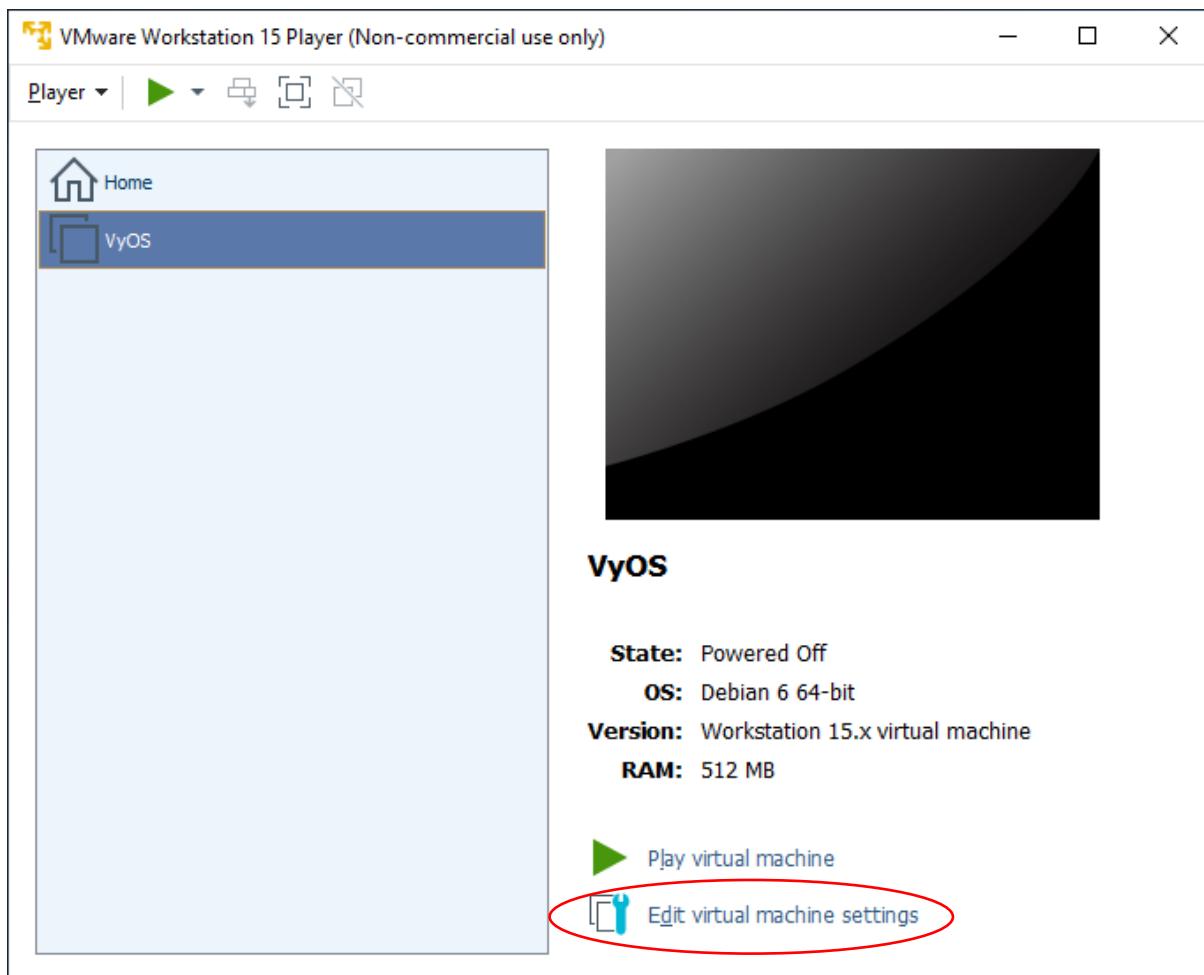
13. We need to add Network Adapters for the lab IP networks. Click on the **Add** button and choose **Network Adapter** then click **Finish**



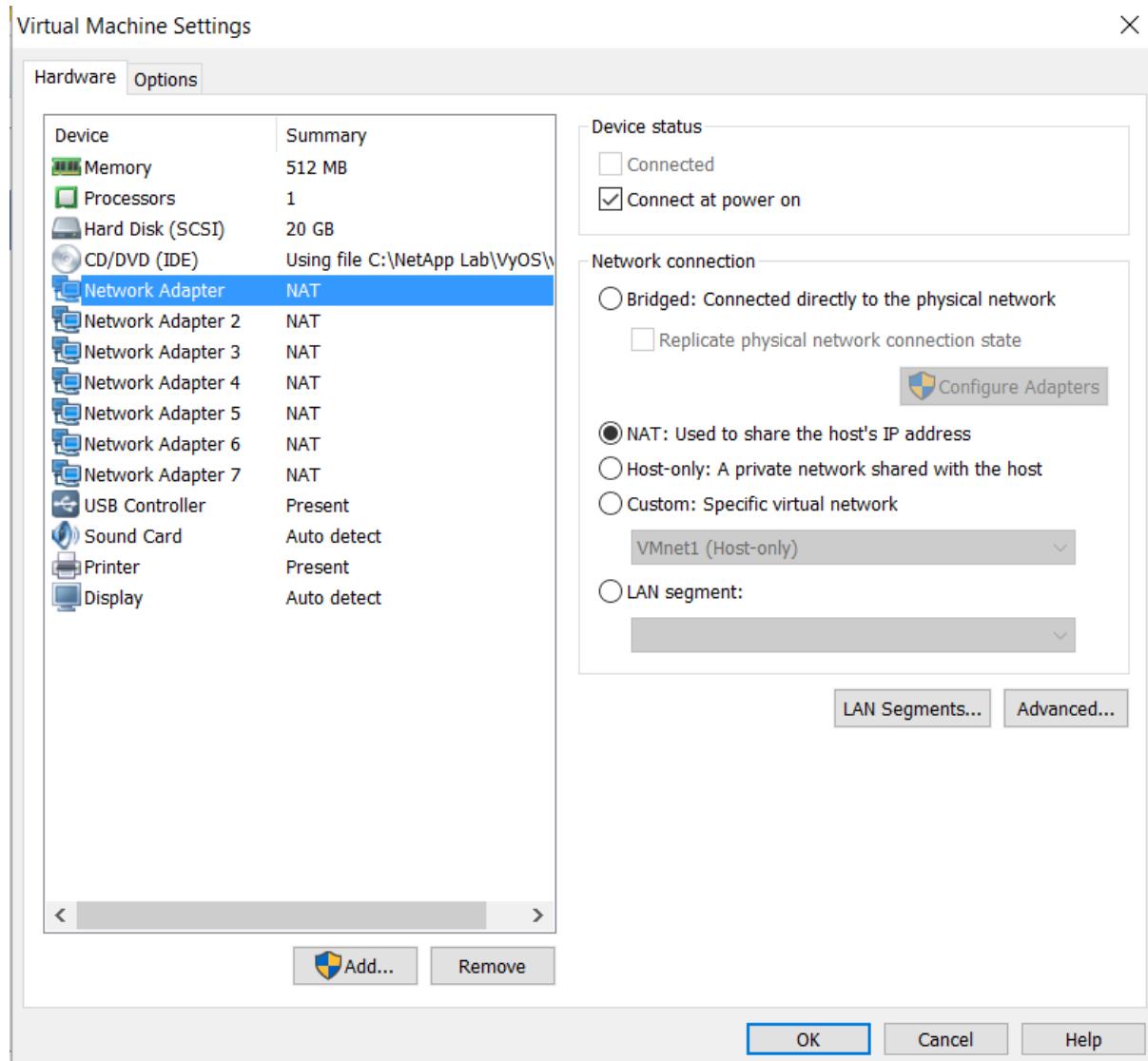
14. This will add **Network Adapter 2**. Repeat 5 more times to add Network Adapters 3 to 7. Your virtual machine settings should look similar to below. The network adapters may be listed in a non-sequential order. Click **OK**.



15. Click **Edit Virtual Machine Settings** again.



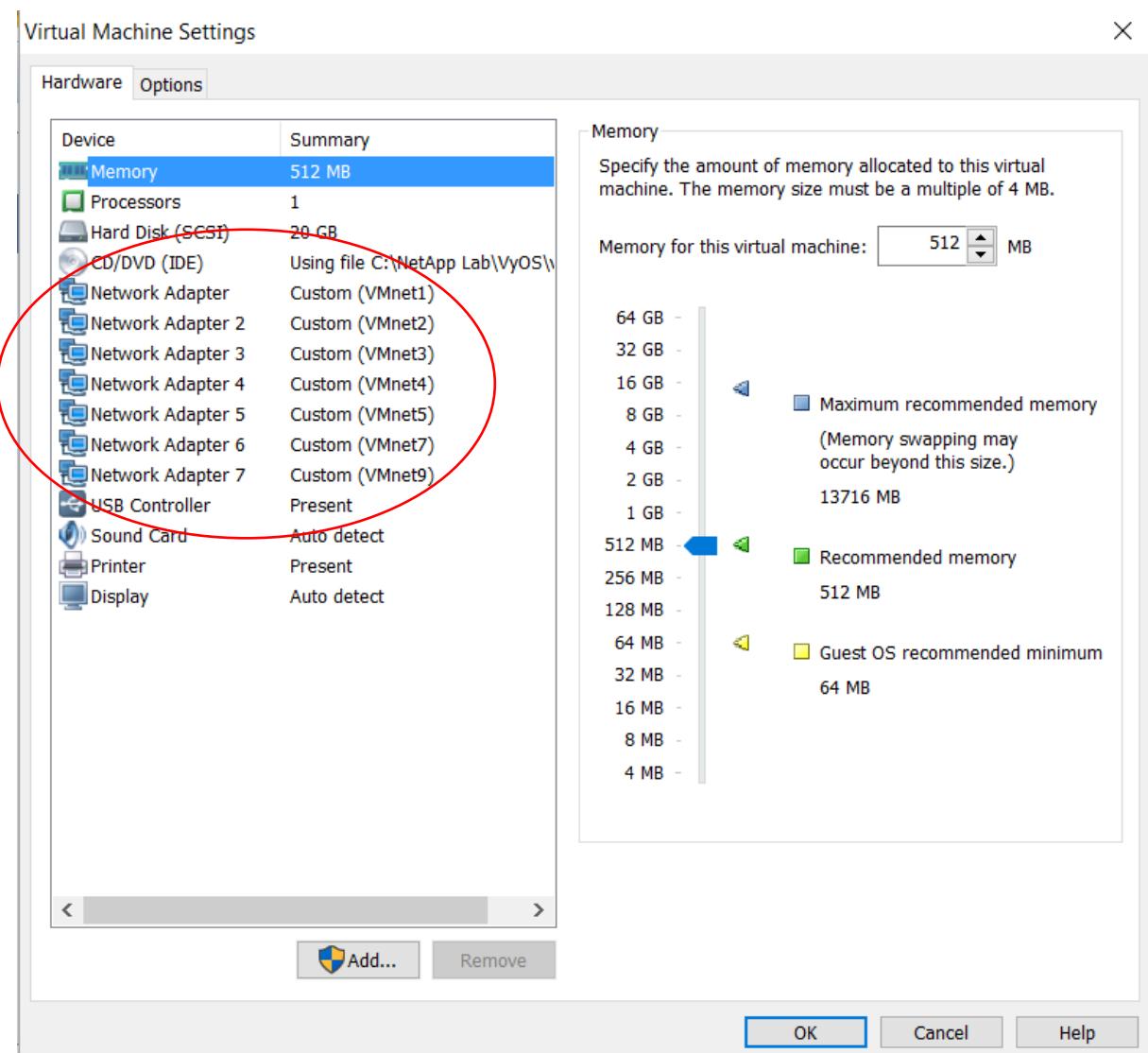
16. The network adapters should now be listed in sequential order.



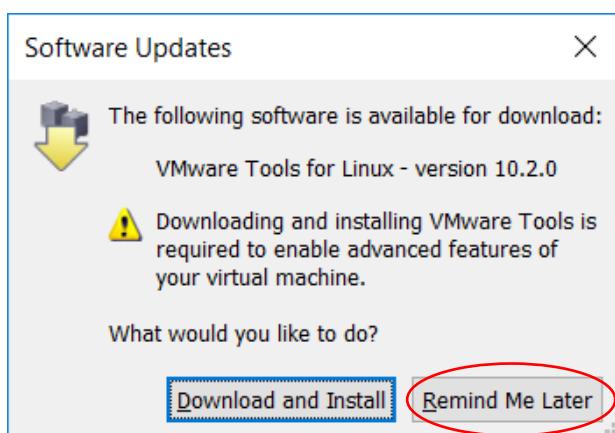
17. Configure the network adapters according to the table below. To do this, select the network adapter then click 'Custom' and assign the correct network. Note the last two networks are VMnet 7 and 9, not 6 and 7.

Adapter	Custom: Specific virtual network
1	VMnet1
2	VMnet2
3	VMnet3
4	VMnet4
5	VMnet5
6	VMnet7
7	VMnet9

18. Click **Player > Manage > Virtual Machine Settings...** again to verify your settings are the same as shown below. Make sure each adapter has the correct VMnet setting. Click **OK** to close the Settings window.



19. Click **Play Virtual Machine** to power on the router
20. Click **Remind Me Later** if prompted to download VMware Tools



21. When the router boots up, click inside the virtual machine window with your mouse to make your keyboard active for the virtual machine. (Note that you need to press the **Ctrl and Alt** keys simultaneously to release the mouse when you want to return to your desktop.)
22. Log in with username **vyos** and password **vyos**
23. The router is currently booting from the CD image, we need to install onto the virtual hard drive. Enter the command **install image**
24. Type **Yes** when prompted to continue. Accept the defaults for all the following options...
25. Hit the **Enter** key to accept the default **Auto** partition

```
vyos@vyos:~$ install image
Welcome to the VyOS install program. This script
will walk you through the process of installing the
VyOS image to a local hard drive.
Would you like to continue? (Yes/No) [Yes]: yes
Probing drives: OK
Looking for pre-existing RAID groups...none found.
The VyOS image will require a minimum 1000MB root.
Would you like me to try to partition a drive automatically
or would you rather partition it manually with parted? If
you have already setup your partitions, you may skip this step

Partition (Auto/Parted/Skip) [Auto]: _
```

26. Hit the **Enter** key again to accept the default and install on **sda**
27. Type **Yes** to continue

```
I found the following drives on your system:
sda    21474MB

Install the image on? [sda]:
This will destroy all data on /dev/sda.
Continue? (Yes/No) [No]: Yes_
```

28. Hit the **Enter** key again to accept the default and create the maximum root partition size
29. Hit the **Enter** key again to accept the default image name

```
How big of a root partition should I create? (1000MB - 21474MB) [21474]MB:
Creating filesystem on /dev/sda1: OK
Done!
Mounting /dev/sda1...
What would you like to name this image? [1.1.8]:
OK. This image will be named: 1.1.8
```

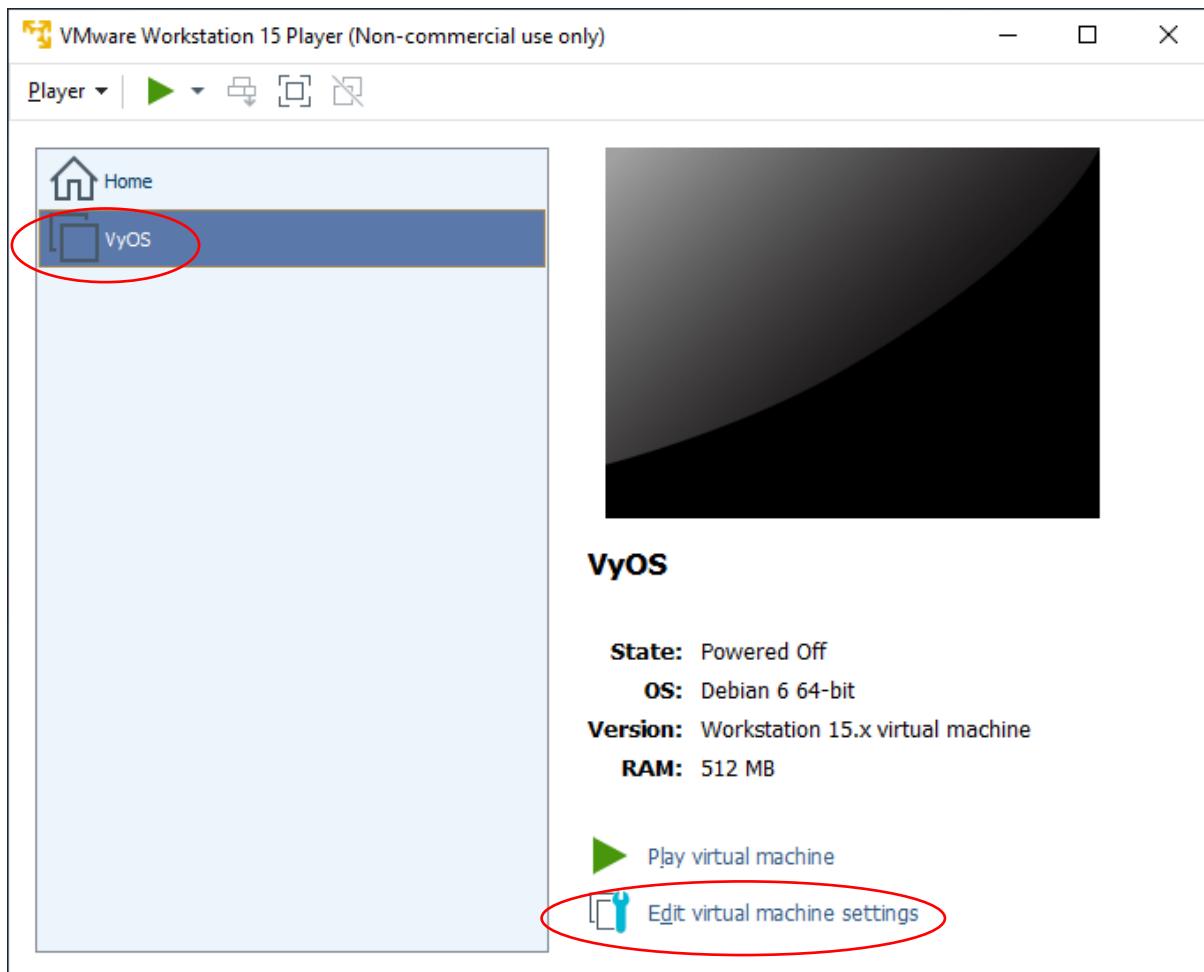
30. Hit the **Enter** key again to accept the default and copy the **/config/config.boot** configuration file
31. Enter and confirm the password **vyos** for the **vyos** admin user

```
I found the following configuration files:
  /config/config.boot
  /opt/vyatta/etc/config.boot.default
Which one should I copy to sda? [/config/config.boot]:
Copying /config/config.boot to sda.
Enter password for administrator account
Enter password for user 'vyos':
Retype password for user 'vyos':
```

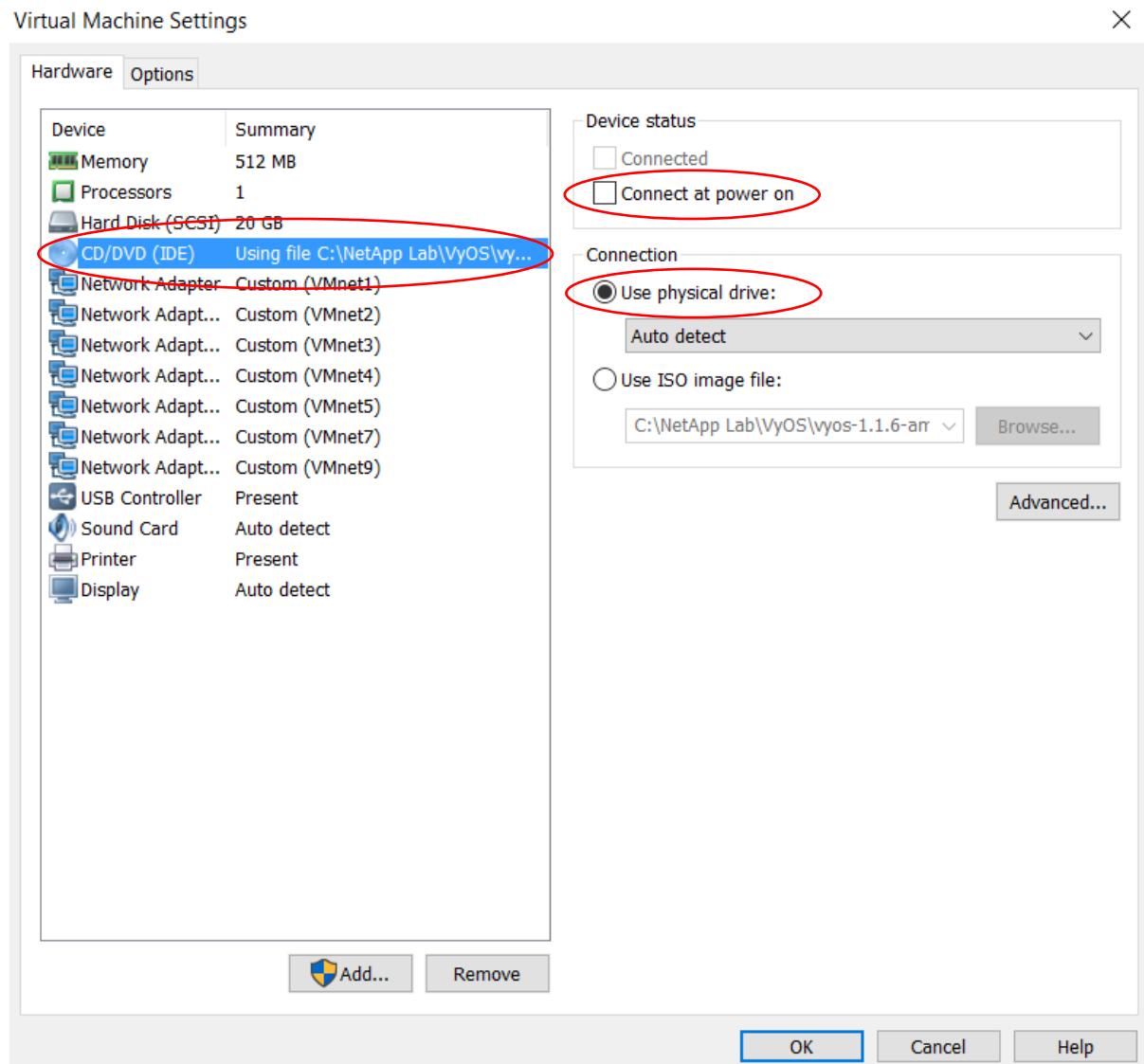
32. Hit the **Enter** key to accept the default and modify the boot partition on **sda**
33. Type **poweroff** to shut down the system and **yes** when prompted to confirm

```
Which drive should GRUB modify the boot partition on? [sda]:  
Setting up grub: OK  
Done!  
vyos@vyos:~$ poweroff_
```

34. When the virtual machine has completed its shutdown, reopen VMware Workstation Player, select the **VyOS** image and click **Edit Virtual Machine Settings**



35. We now need to configure the router to boot from its hard disk rather than the CD. This will allow us to make a permanent configuration which will survive reboots.
36. Click on **CD/DVD (IDE)**, uncheck **Connect at power on** and select **Use physical drive**



37. Click **OK** and then **Play virtual machine**
38. When the router boots up, login with the username **vyos** and password **vyos**
39. Enter the command **configure** to enter configuration mode
40. Configure the eth0 network interface with the command **set interfaces ethernet eth0 address 172.23.1.254/24**

41. Repeat for the other interfaces according to the table below. Note the IP addresses for the last two interfaces are non-sequential. Be careful to configure the interfaces exactly as shown.

Interface	IP Address
eth1	172.23.2.254/24
eth2	172.23.3.254/24
eth3	172.23.4.254/24
eth4	172.23.5.254/24
eth5	172.23.7.254/24
eth6	172.23.9.254/24

```
vyos@vyos:~$ configure
[edit]
vyos@vyos# set interfaces ethernet eth0 address 172.23.1.254/24
[edit]
vyos@vyos# set interfaces ethernet eth1 address 172.23.2.254/24
[edit]
vyos@vyos# set interfaces ethernet eth2 address 172.23.3.254/24
[edit]
vyos@vyos# set interfaces ethernet eth3 address 172.23.4.254/24
[edit]
vyos@vyos# set interfaces ethernet eth4 address 172.23.5.254/24
[edit]
vyos@vyos# set interfaces ethernet eth5 address 172.23.7.254/24
[edit]
vyos@vyos# set interfaces ethernet eth6 address 172.23.9.254/24
[edit]
```

You can use **delete interfaces ethernet eth5 address 172.23.6.254/24** for example if you make a mistake and need to remove an IP address.

42. Enter the command **set service ssh** to enable SSH access.

```
vyos@vyos# set service ssh
[edit]
```

43. Enter the command **commit** to activate your changes.

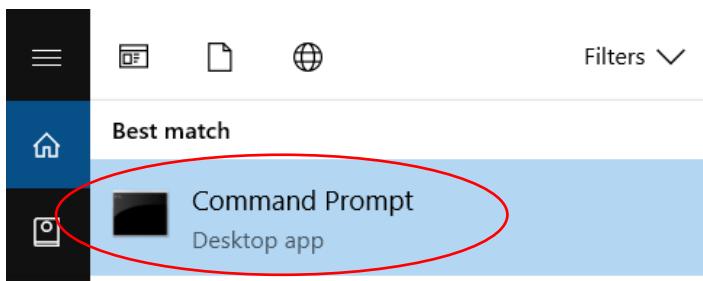
44. Enter the command **save** to make your changes persistent over a reboot.

```
vyos@vyos# commit
[ service ssh ]
Restarting OpenBSD Secure Shell server: sshd.

[edit]
vyos@vyos# save
Saving configuration to '/config/config.boot'...
Done
[edit]
vyos@vyos# _
```

45. Hold down the **Ctrl** and **Alt** keys simultaneously to exit the virtual machine interface.

46. Open a command prompt on your laptop by clicking the Windows button and then type **cmd** in the search box.



47. Enter the command **ping 172.23.2.254** to verify connectivity between your laptop and the VyOS router. **If the ping fails then you have made a misconfiguration and the lab will not work**, start the lab setup again from Step 15 in the VMware Workstation Player Install section, being careful to follow the instructions exactly as shown.

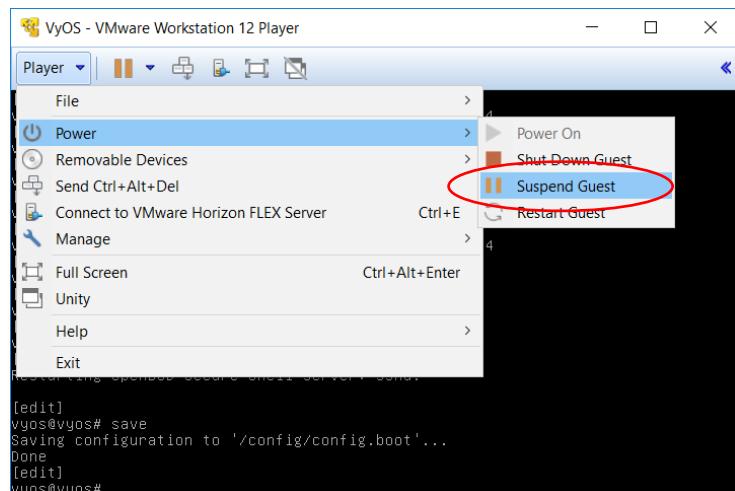
```
Microsoft Windows [Version 10.0.19041.450]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\Neil A>ping 172.23.2.254

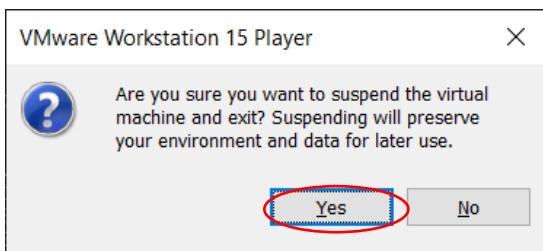
Pinging 172.23.2.254 with 32 bytes of data:
Reply from 172.23.2.254: bytes=32 time<1ms TTL=64
Reply from 172.23.2.254: bytes=32 time=1ms TTL=64
Reply from 172.23.2.254: bytes=32 time<1ms TTL=64
Reply from 172.23.2.254: bytes=32 time=1ms TTL=64

Ping statistics for 172.23.2.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

48. In VMware Workstation Player, click **Player > Power > Suspend Guest** to suspend the virtual machine. This will allow you to start it more quickly and reliably when you are ready to work with the lab than if you shut it down.



49. Click **Yes** when asked to confirm.



50. If you are using VMware Workstation Player you can take a clean backup of the node at this point by copying the VyOS folder to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)
51. Installation of the VyOS router is now complete. To start the VyOS virtual machine later, browse to the 'NetApp Lab\VyOS' folder and run the 'VyOS.vmx' file.
Do not forget to start the VyOS router for all lab exercises as it is essential for connectivity.

▼ ↑ > This PC > Local Disk (C:) > NetApp Lab > VyOS

Name	Date modified	Type	Size
vmware.log	1/3/2019 11:50 PM	Text Document	251 KB
vmware-0.log	1/3/2019 11:49 PM	Text Document	253 KB
vmware-1.log	6/10/2018 11:07 PM	Text Document	273 KB
vmware-2.log	5/17/2018 6:43 AM	Text Document	310 KB
VyOS.nvram	4/2/2018 7:39 PM	NVRAM File	9 KB
VyOS.vmdk	5/16/2018 12:38 AM	VMware virtual dis...	259,520 KB
VyOS.vmsd	5/16/2018 12:38 AM	VMSD File	1 KB
VyOS.vmx	1/3/2019 11:50 PM	VMware virtual m...	5 KB
VyOS.vmxsf	4/2/2018 7:10 PM	VMXF File	1 KB
VyOS-000001.vmdk	1/3/2019 11:49 PM	VMware virtual dis...	4,864 KB
vyos-1.1.8-amd64.iso	4/2/2018 6:42 PM	PowerISO File	235,520 KB
VyOS-c242fa22.vmem	4/2/2018 7:20 PM	VMEM File	524,288 KB
VyOS-c242fa22.vmss	1/3/2019 11:50 PM	VMware suspende...	1,781 KB
VyOS-Snapshot1.vmem	5/16/2018 12:38 AM	VMEM File	524,288 KB
VyOS-Snapshot1.vmsn	5/16/2018 12:38 AM	VMware virtual m...	1,771 KB

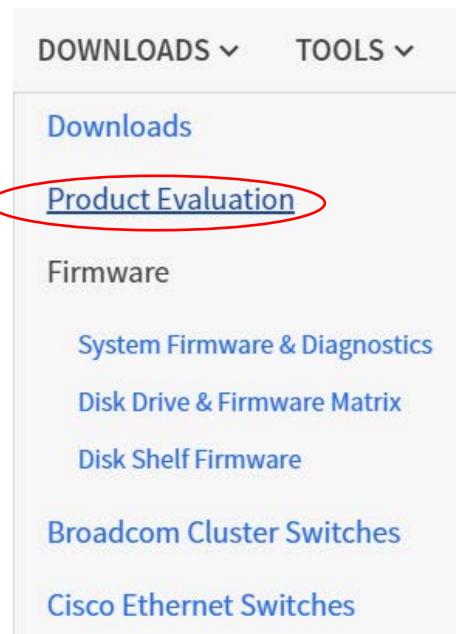
ONTAP Simulator Build – C1N1

In this section we will build the Cluster 1 Node 1 NetApp storage system.

1. Open <https://mysupport.netapp.com/> in your browser
2. Click on the **Sign In** button near the top right of the page.



3. Enter your username and password. (Click on '**Sign Up Now**' if you don't have an existing account. Speak to your NetApp rep or the vendor manager at your company to get your login account associated with your company and unlock full access – you need this to download the simulator.)
4. Click on the **Downloads** tab and select **Product Evaluation**



DOWNLOADS ▾ TOOLS ▾

Downloads

[Product Evaluation](#) (circled in red)

Firmware

[System Firmware & Diagnostics](#)

[Disk Drive & Firmware Matrix](#)

[Disk Shelf Firmware](#)

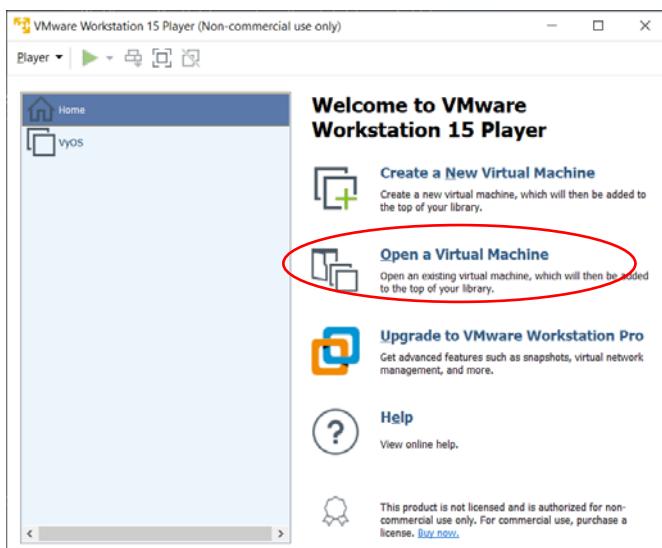
[Broadcom Cluster Switches](#)

[Cisco Ethernet Switches](#)

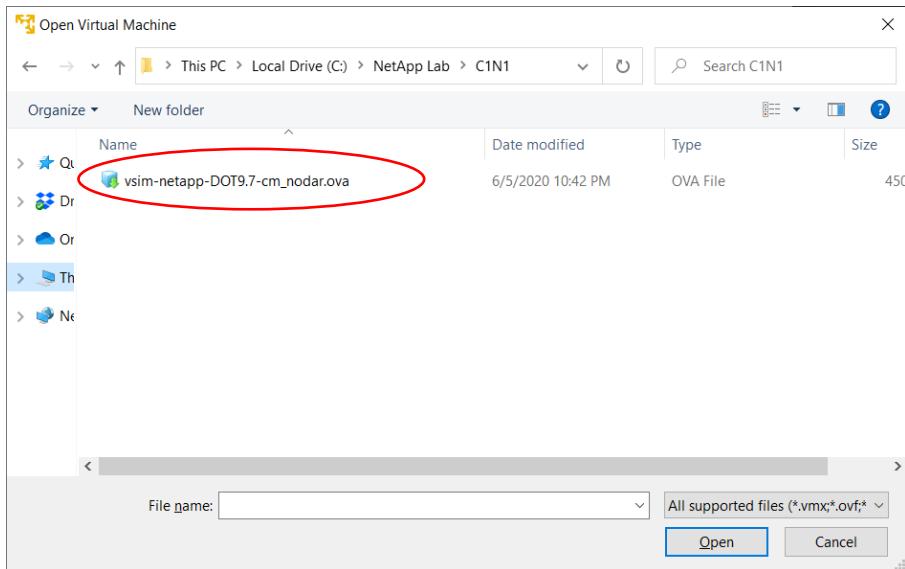
5. Click the **Data ONTAP Simulator** link
6. The Simulate ONTAP for ONTAP 8.x and 9.x page will open
7. Tick the checkbox at the bottom of the page to indicate **I have read the End User License Agreement** and click **Accept & Continue**
8. Download the latest **vsim-netapp-DOT9.x-cm_nodar.ova** file. Also download the matching **CMode Licenses** text file and the **Simulate ONTAP Quick Start Guide** and **Simulate ONTAP Installation and Setup Guide** PDFs. You can refer to the guides for help if you have issues installing the simulator.

The screenshot shows a web page titled "Simulate 9.7". Below the title, there is a download link for "vsim-netapp-DOT9.7-cm_nodar.ova [439.60 MB]". Underneath this, there are four more links: "Simulate_ONTAP_97_Quick_Start_Guide.pdf [163.85 KB]", "MD5Checksums_9.7.txt [0.10KB]", "Simulate_ONTAP_97_Installation_and_Setup_Guide.pdf [594.38 KB]", and "CMode_licenses_9.7.txt [3.29 KB]".

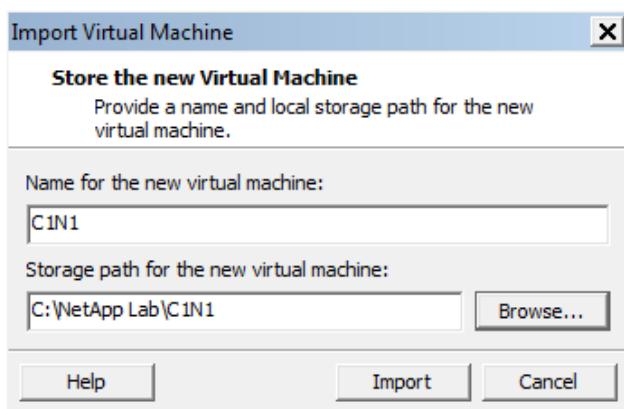
9. In your **NetApp Lab** folder, make a subfolder named **C1N1**. We will create Cluster 1 Node 1 in here.
10. Find the simulator VMware image OVA file you downloaded from the NetApp website and move it into the **C1N1** folder. It will have a name similar to **vsim-netapp-DOT9.7-cm_nodar.ova**.
11. Open a new instance of VMware Workstation Player
12. Click **Open a Virtual Machine**



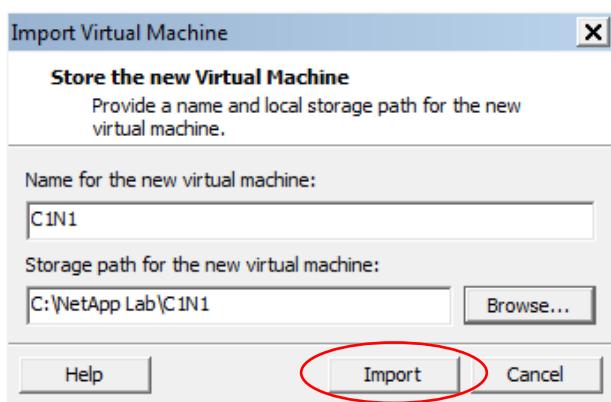
13. Browse to the C1N1 folder and double-click on the VMware image OVA file



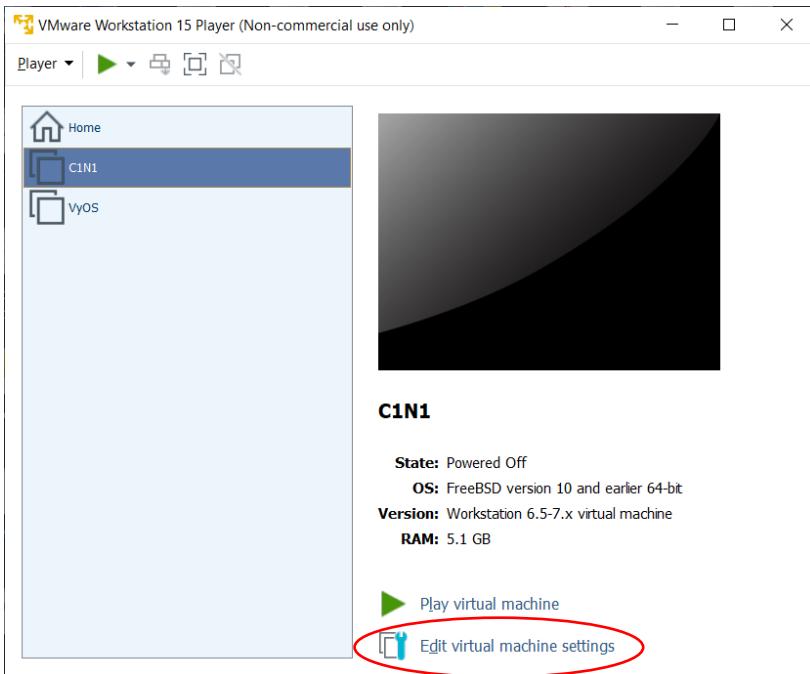
14. Name the virtual machine **C1N1** and save it in the **NetApp Lab\C1N1** folder



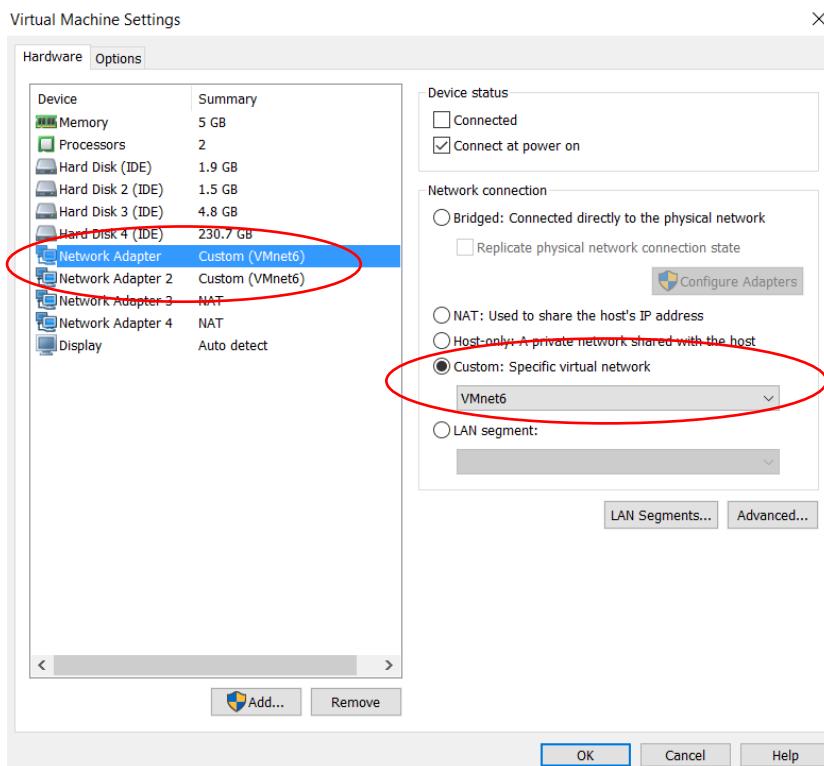
15. Click the **Import** button to create your first node.



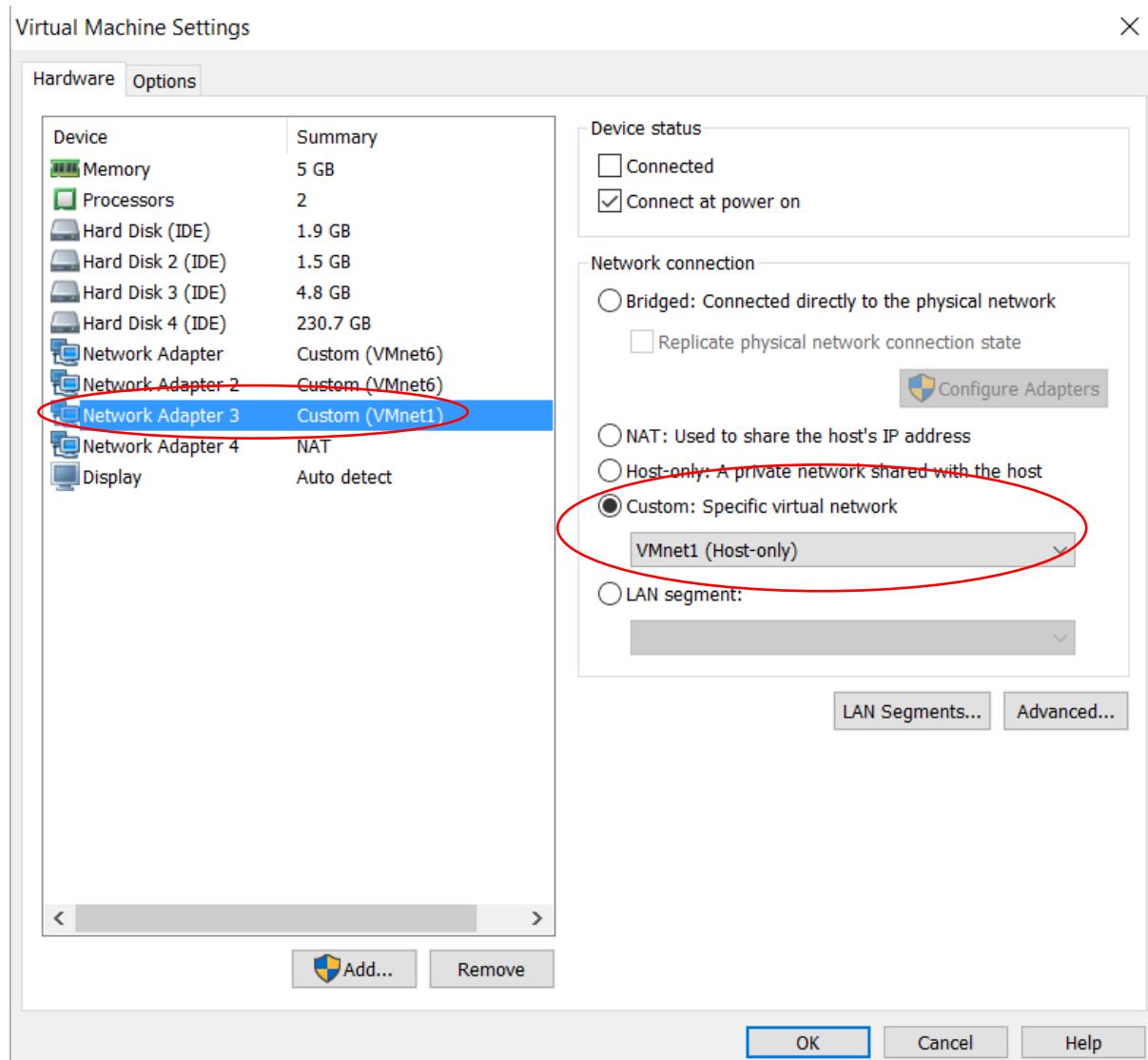
16. After the image has completed importing, click **Edit virtual machine settings**



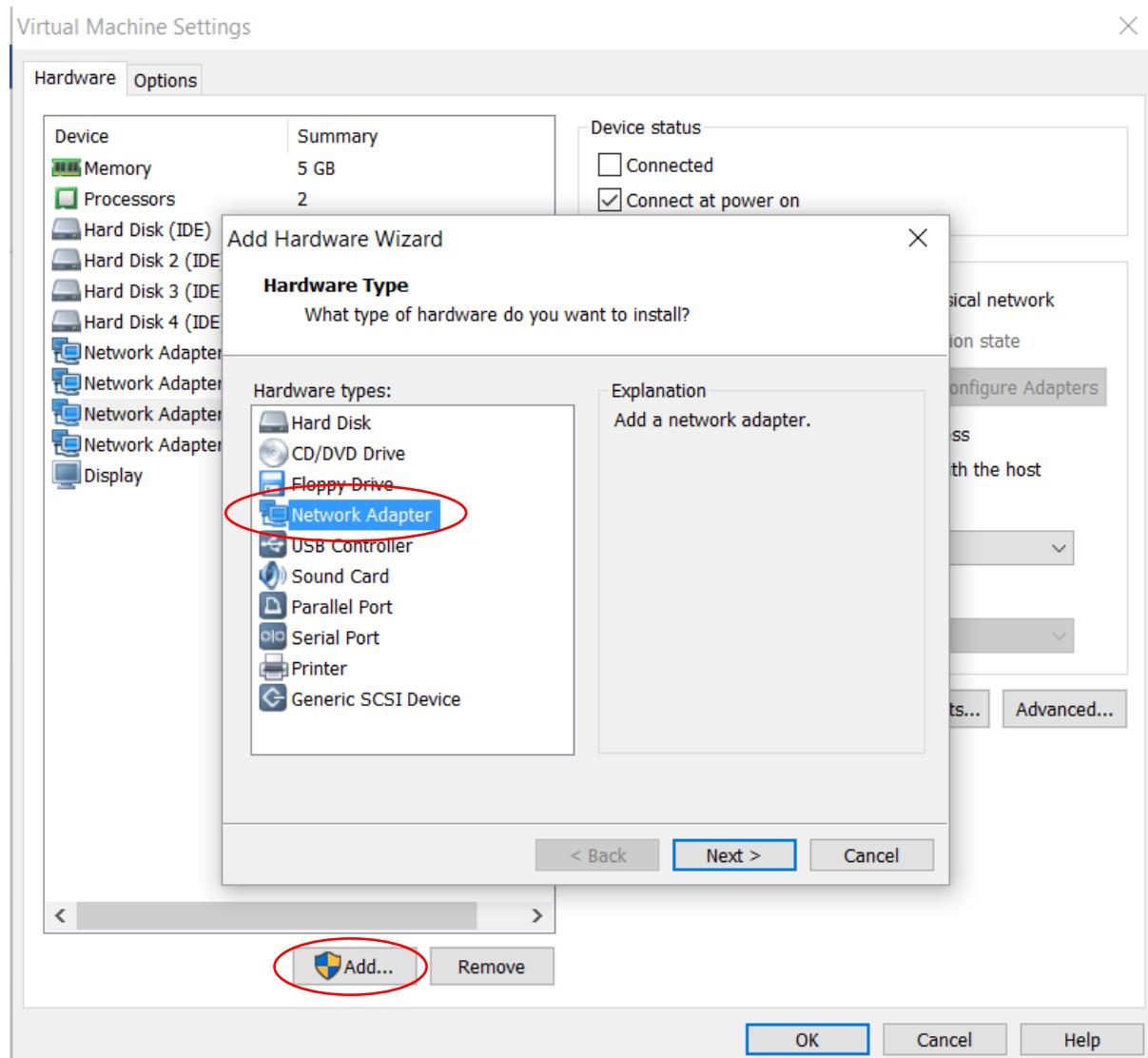
17. The first two network adapters are the Cluster Interconnect adapters. We will put them in their own private network. Click on the first **Network Adapter** and select Custom: Specific virtual network **VMnet6**. Repeat to set **Network Adapter 2** also to Custom: Specific virtual network **VMnet6**.



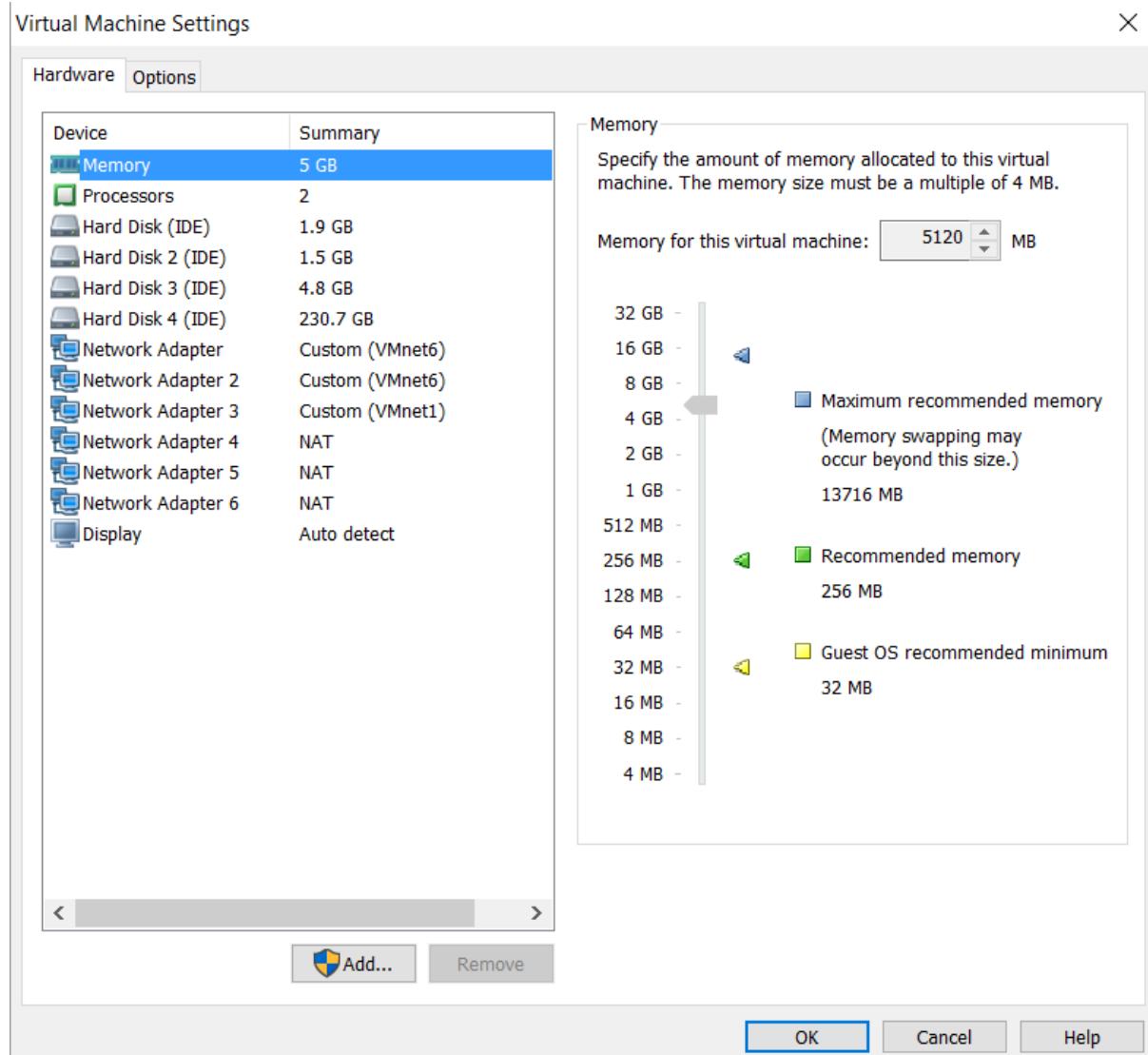
18. Click on **Network Adapter 3** and select Custom: Specific virtual network **VMnet1 (Host-only)**. This will be our management network.



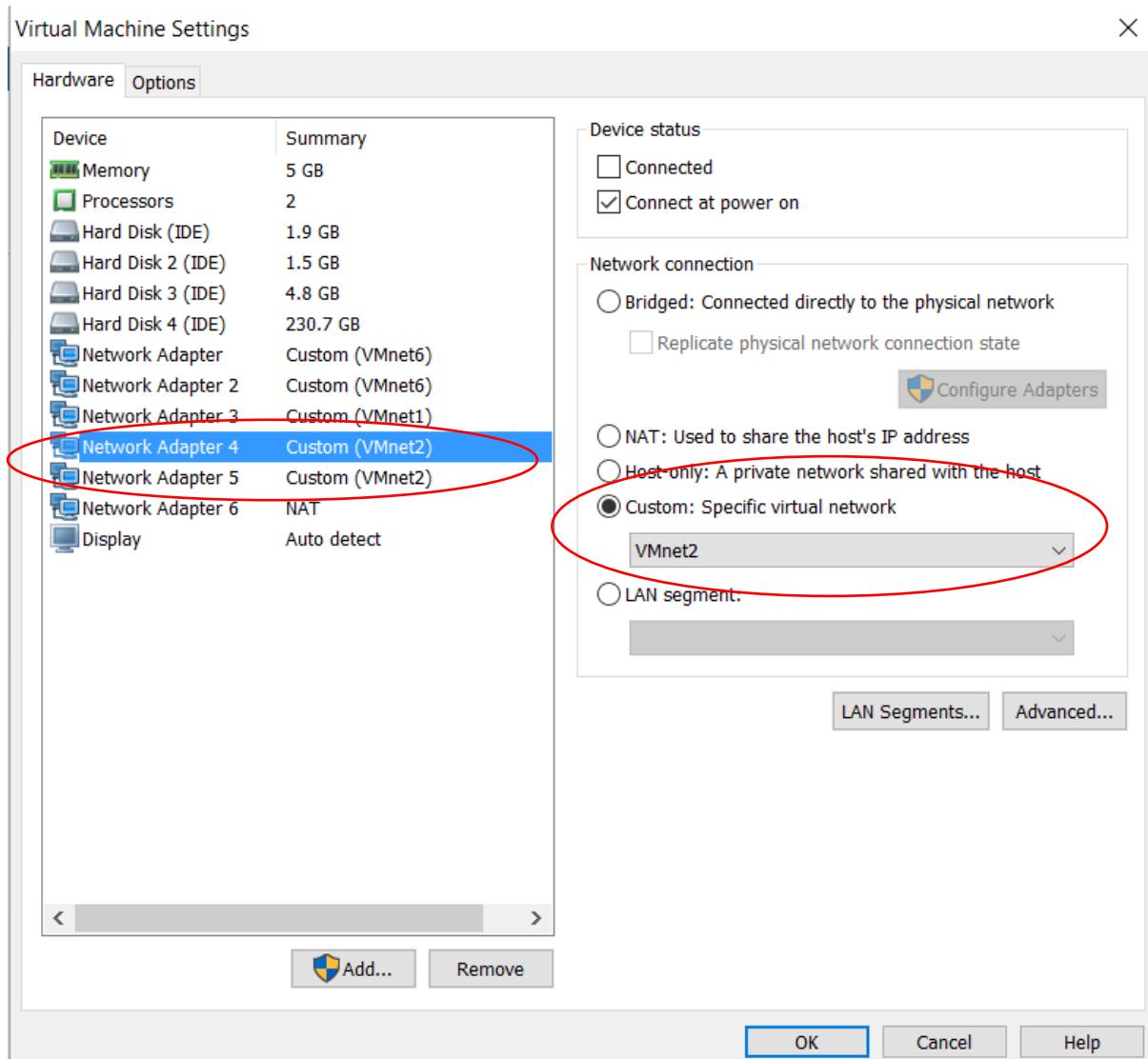
19. Add additional adapters for our data networks. Click on the **Add** button and choose **Network Adapter** then click **Finish**.



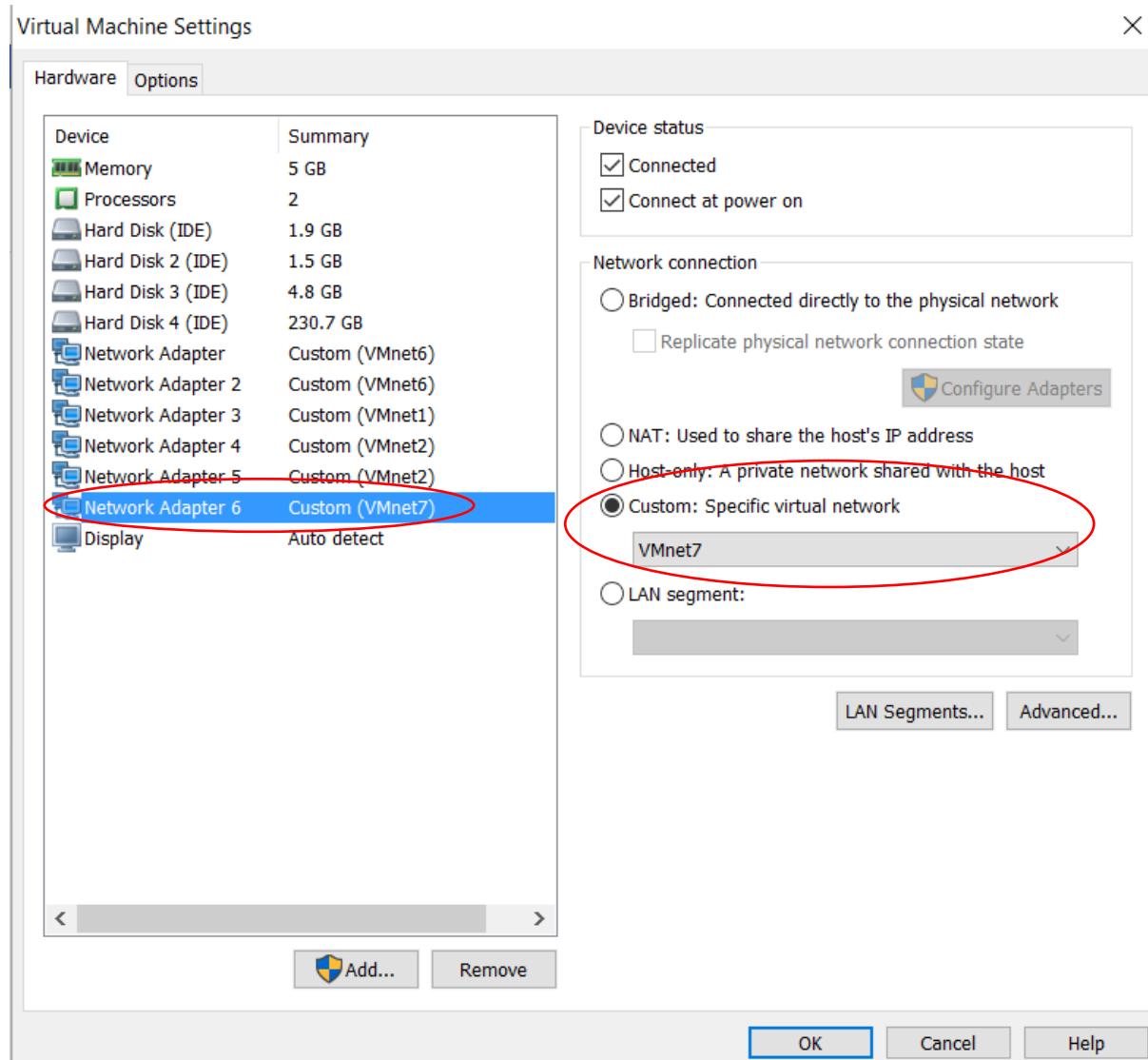
20. This will add **Network Adapter 5**. Repeat to add **Network Adapter 6**. You can click on **OK** and then **Edit Virtual Machine Settings** again to ensure the network adapters are listed in sequential order.



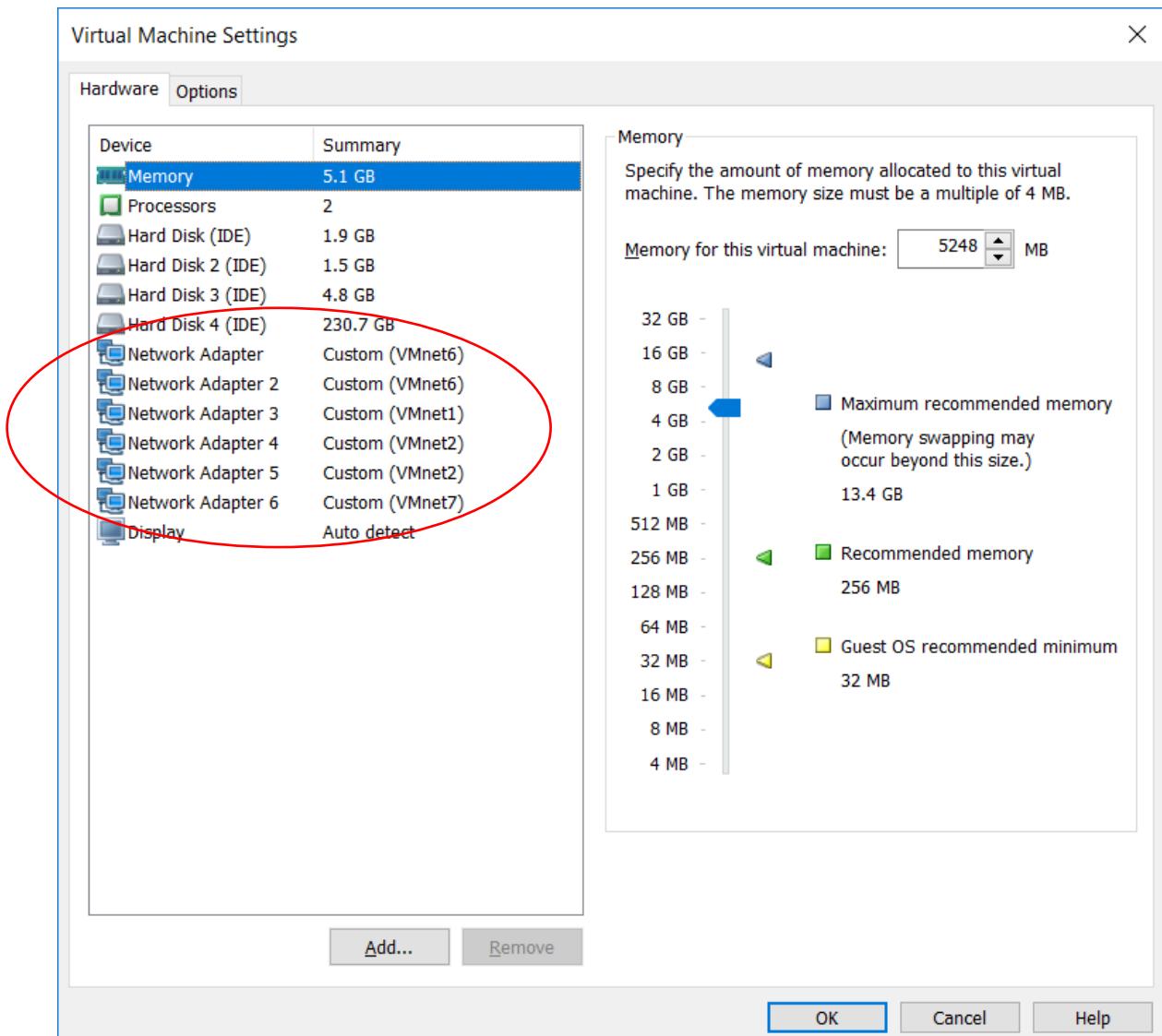
21. Click on **Network Adapter 4** and then select Custom: Specific virtual network **VMnet2**. Repeat to set **Network Adapter 5** also to Custom: Specific virtual network **VMnet2**.



22. Click on **Network Adapter 6** and then select Custom: Specific virtual network **VMnet7** then click **OK**.



23. Click **Player > Manage > Virtual Machine Settings...** again to verify your settings are the same as shown below. Make sure each adapter has the correct VMnet setting. Click **OK** to close the Settings window.

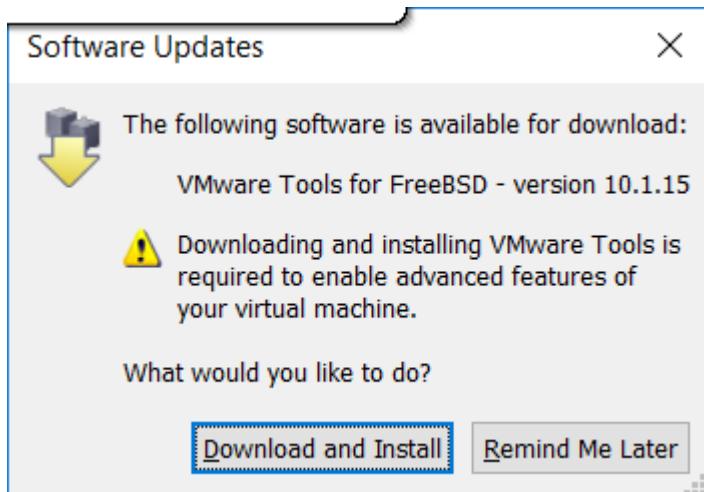


24. Click **Play Virtual Machine** to power it on.

25. Click inside the VMware window with your mouse then press the **Enter** key when prompted to boot the machine immediately. (Note that you can click back outside the window again by pressing **Ctrl-Alt** on your keyboard.)

```
Hit [Enter] to boot immediately, or any other key for command prompt.  
Booting in 1 second... _
```

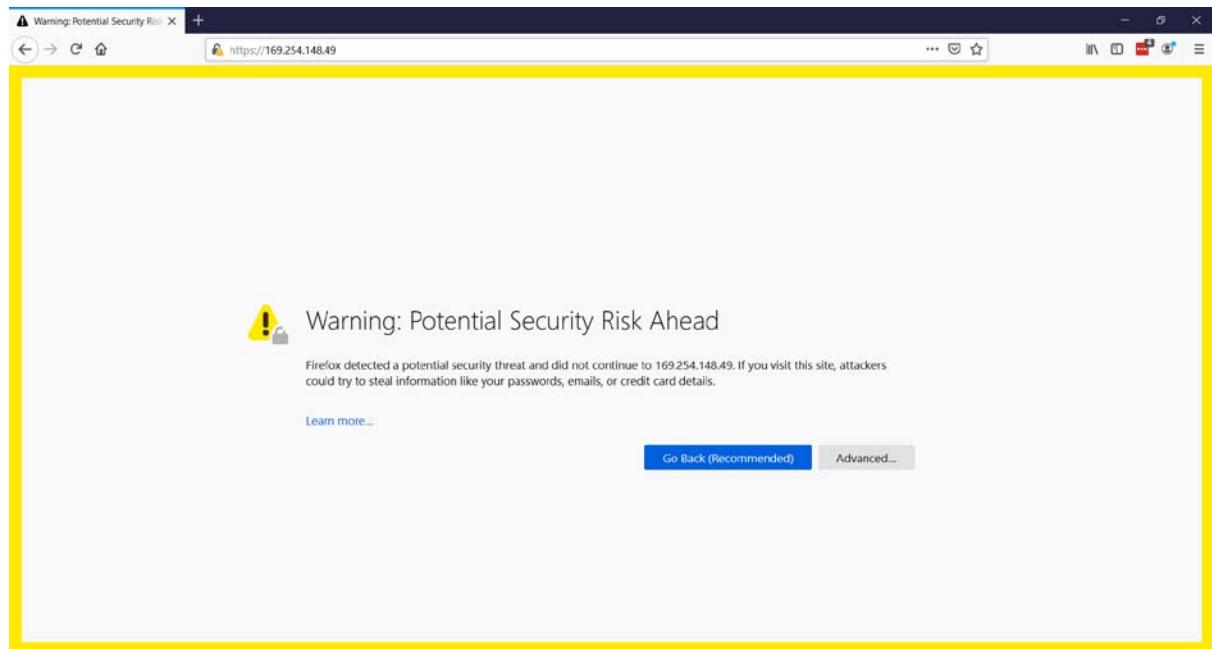
26. Click **Remind me later** if prompted to install VMware Tools.



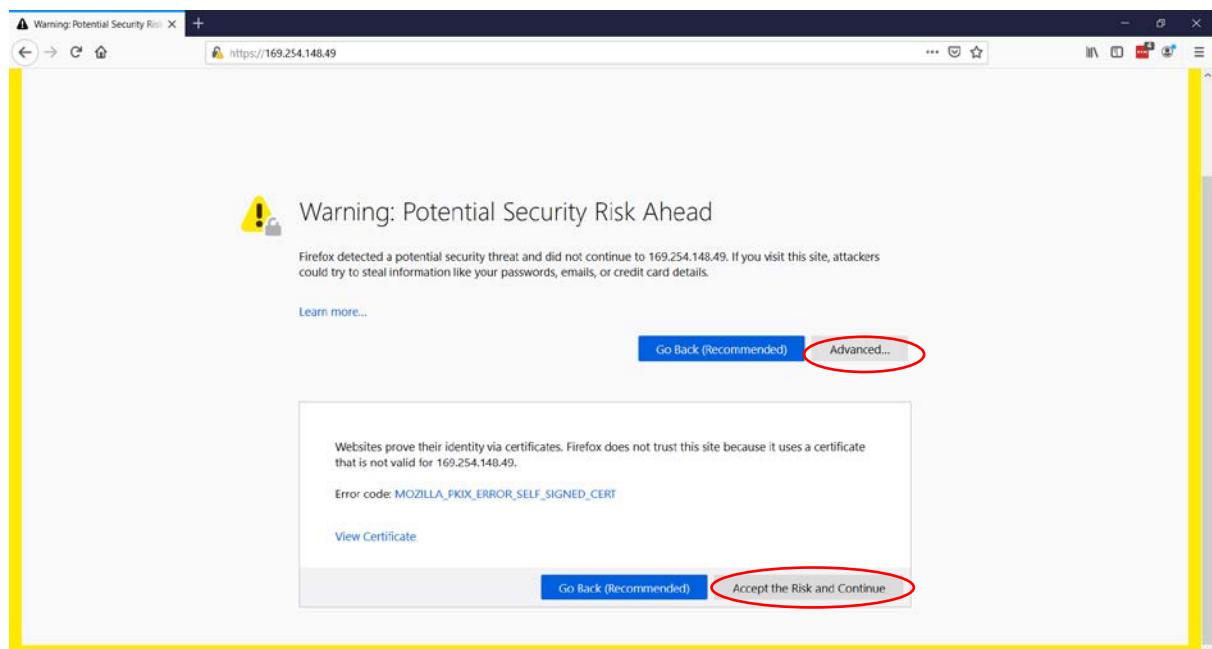
27. You will receive a message that System Initialization has completed successfully, and then the Node Management IP has been assigned. It may take several minutes for the messages to appear.
28. Note the Management IP address which has been automatically assigned. It is 169.254.148.49 in the example below, but your node may have a different address.

```
dded for tape device SN[42420701].  
Aug 20 21:56:30 [localhost:tapemc.alias.addOK:notice]: Alias st2 automatically a  
dded for tape device SN[42420702].  
Aug 20 21:56:30 [localhost:tapemc.alias.addOK:notice]: Alias st3 automatically a  
dded for tape device SN[42420703].  
Aug 20 21:56:30 [localhost:kern.syslog.msg:notice]: Registry is being upgraded t  
o improve storing of local changes.  
Aug 20 21:56:30 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.  
Aug 20 21:56:30 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domai  
n xing interrupt: false  
System initialization has completed successfully.  
ERROR: missing pmroot_late.tgz file  
server closed connection unexpectedly  
wrote key file "/tmp/rndc.key"  
*****  
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.148.49  
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON  
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP  
*****  
FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION  
BEFORE PROCEEDING WITH CLUSTER SETUP  
*****  
Thu Aug 20 21:58:17 UTC 2020  
login: ■
```

29. Open a web browser on your laptop and connect to the Management IP address. Firefox is usually reliable if you have issues with another browser. **Make sure you use https:// (not http://)**



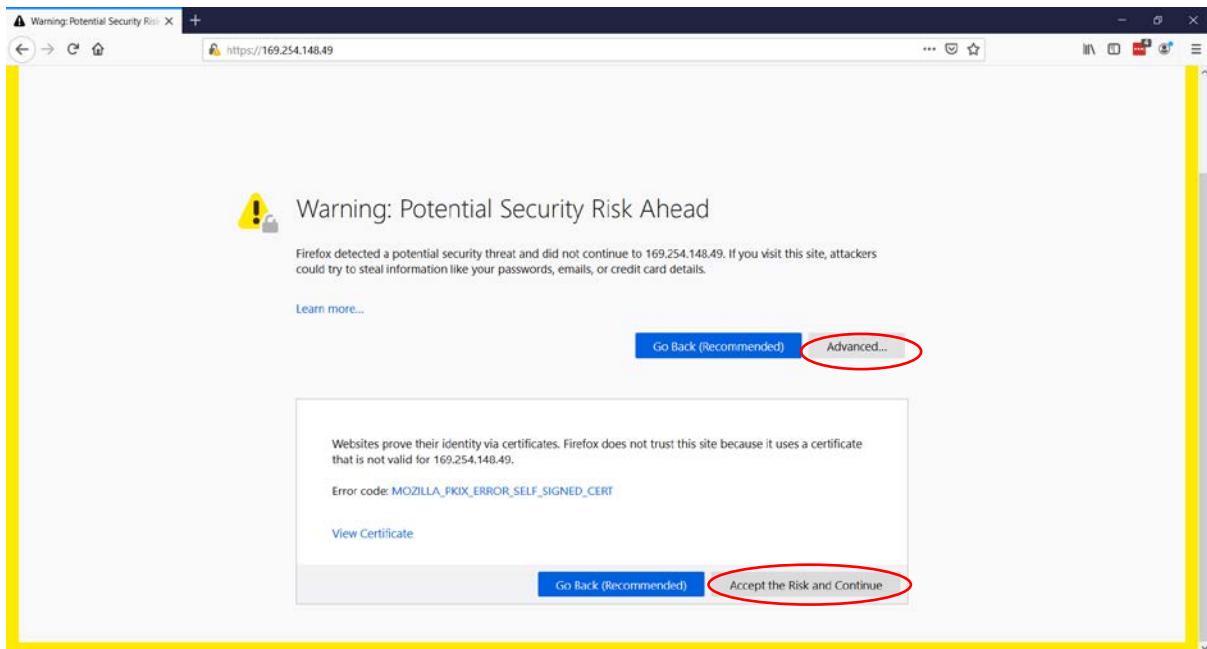
30. You will receive a certificate warning because the cluster uses a Self Signed Certificate which is not trusted by your browser. Bypass the certificate warning. If you're using Firefox, click **Advanced** then **Accept the Risk and Continue**



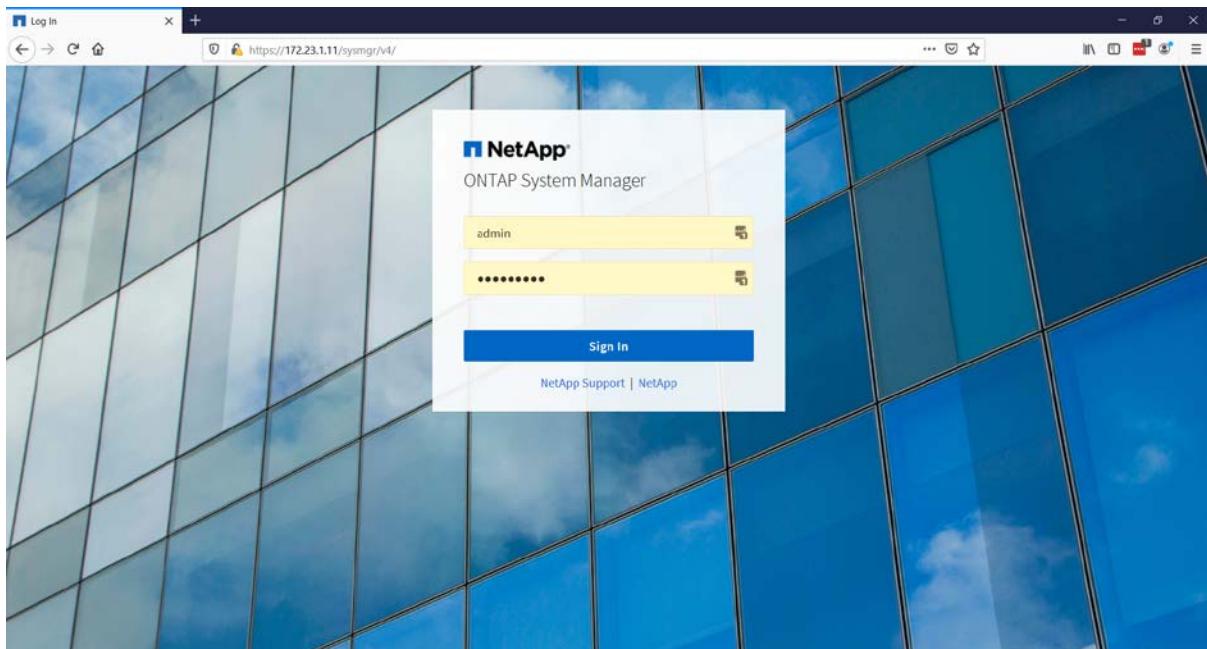
31. System Manager will open. You can ignore the ‘partner details were not found’ error message.

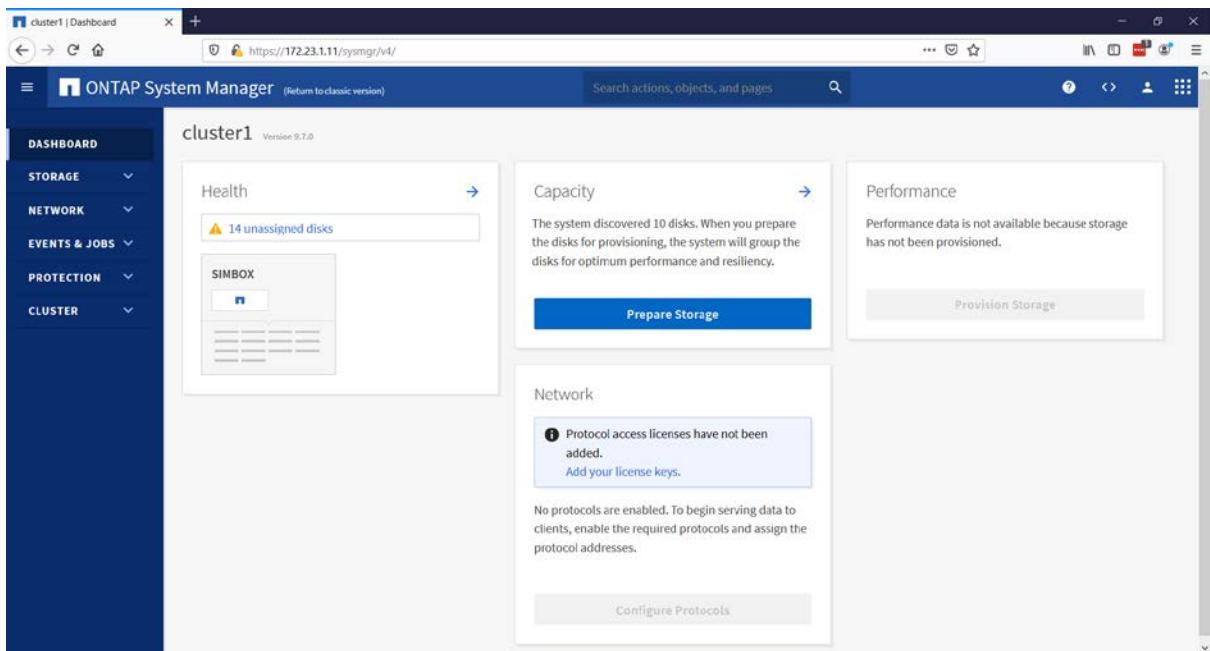
32. If you have any issues with how System Manager displays pages then try a different web browser or Java version on your laptop.
33. Enter these details, leaving the other checkboxes unchecked, then click **Submit**:
- Storage System Name: **cluster1**
 - Administrative Password: **Flackbox1**
 - Cluster IP Address: **172.23.1.11**
 - Subnet Mask: **255.255.255.0**
 - Gateway: **172.23.1.254**
 - Node IP Addresses: **172.23.1.12**

34. It will take some time for cluster setup to complete. You will receive a certificate warning again. Bypass the certificate warning. If you're using Firefox, click **Advanced** then **Accept the Risk and Continue**



35. Sign in using username **admin** and password **Flackbox1**





36. Back in the VMware Workstation Player window, log in with the username **admin** and the password **Flackbox1**

```
Player ▾ | || ▾ □ □ ▾ ▾
dded for tape device SN[42420703].
Aug 20 22:37:53 [localhost:kern.syslog.msg:notice]: Registry is being upgraded to improve storing of local changes.
Aug 20 22:37:53 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.
Aug 20 22:37:53 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domain xing interrupt: false
System initialization has completed successfully.
Aug 20 22:38:00 [localhost:monitor.globalStatus.ok:notice]: The system's global status is normal.
ERROR: missing pmroot_late.tgz file
server closed connection unexpectedly
wrote key file "/tmp/rndc.key"
*****
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.148.49
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP

FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION
BEFORE PROCEEDING WITH CLUSTER SETUP
*****
Thu Aug 20 22:39:14 UTC 2020
login: admin
Password:
cluster1::> 
```

37. Next we will add additional disks to the simulator. We need to be in the systemshell mode to do this which requires the use of the diag account. Unlock the diag user with the command **security login unlock –username diag**
38. Assign the diag user a password with the command **security login password -username diag**. You will be prompted to enter and then confirm the password. Use the password **Flackbox1**

```
cluster1::> security login unlock -username diag
cluster1::> security login password -username diag
Enter a new password:
Enter it again:
cluster1::> █
```

39. Enter the diag privilege level with the **set –privilege diag** command. Type **yes** to confirm. Notice the command prompt changes to cluster1::*>

```
cluster1::> set -privilege diag
Warning: These diagnostic commands are for use by NetApp personnel only.
Do you want to continue? {y\!n}: yes
cluster1::*> █
```

40. Enter the systemshell on Node 1 with the **systemshell local** command. Login with the password **Flackbox1**. Notice the command prompt changes to cluster1-01%

```
cluster1::*> systemshell local
(system node systemshell)
diag@127.0.0.1's password:
Warning: The system shell provides access to low-level
diagnostic tools that can cause irreparable damage to
the system if not used properly. Use this environment
only when directed to do so by support personnel.
cluster1-01% █
```

41. Add the disk tools directory to the command path with the command **setenv PATH "\${PATH}:/usr/sbin"**

```
cluster1-01% setenv PATH "${PATH}:/usr/sbin"
cluster1-01% █
```

42. Change to the correct directory with the **cd /sim/dev** command

```
cluster1-01% cd /sim/dev
cluster1-01% █
```

43. Add 14 additional 1GB (type 23) disks on adapter 2 with the command
sudo vsim_makedisks -n 14 -t 23 -a 2

```
cluster1-01% sudo vsim_makedisks -n 14 -t 23 -a 2
Creating ,disks/v2.16:NETAPP__:VD-1000MB-FZ-520:22814800:2104448
Creating ,disks/v2.17:NETAPP__:VD-1000MB-FZ-520:22814801:2104448
Creating ,disks/v2.18:NETAPP__:VD-1000MB-FZ-520:22814802:2104448
Creating ,disks/v2.19:NETAPP__:VD-1000MB-FZ-520:22814803:2104448
Creating ,disks/v2.20:NETAPP__:VD-1000MB-FZ-520:22814804:2104448
Creating ,disks/v2.21:NETAPP__:VD-1000MB-FZ-520:22814805:2104448
Creating ,disks/v2.22:NETAPP__:VD-1000MB-FZ-520:22814906:2104448
Creating ,disks/v2.24:NETAPP__:VD-1000MB-FZ-520:22814907:2104448
Creating ,disks/v2.25:NETAPP__:VD-1000MB-FZ-520:22814908:2104448
Creating ,disks/v2.26:NETAPP__:VD-1000MB-FZ-520:22814909:2104448
Creating ,disks/v2.27:NETAPP__:VD-1000MB-FZ-520:22814910:2104448
Creating ,disks/v2.28:NETAPP__:VD-1000MB-FZ-520:22814911:2104448
Creating ,disks/v2.29:NETAPP__:VD-1000MB-FZ-520:22814912:2104448
Creating ,disks/v2.32:NETAPP__:VD-1000MB-FZ-520:22814913:2104448
Shelf file Shelf:DiskShelf14 updated
```

44. Add 14 additional 500MB SSD (type 35) disks on adapter 3 with the command **sudo vsim_makedisks -n 14 -t 35 -a 3**

```
cluster1-01% sudo vsim_makedisks -n 14 -t 35 -a 3
Creating ,disks/v3.16:NETAPP__:VD-500MB-SS-520_:25852600:1080448
Creating ,disks/v3.17:NETAPP__:VD-500MB-SS-520_:25852601:1080448
Creating ,disks/v3.18:NETAPP__:VD-500MB-SS-520_:25852602:1080448
Creating ,disks/v3.19:NETAPP__:VD-500MB-SS-520_:25852603:1080448
Creating ,disks/v3.20:NETAPP__:VD-500MB-SS-520_:25852604:1080448
Creating ,disks/v3.21:NETAPP__:VD-500MB-SS-520_:25852605:1080448
Creating ,disks/v3.22:NETAPP__:VD-500MB-SS-520_:25852606:1080448
Creating ,disks/v3.24:NETAPP__:VD-500MB-SS-520_:25852607:1080448
Creating ,disks/v3.25:NETAPP__:VD-500MB-SS-520_:25852608:1080448
Creating ,disks/v3.26:NETAPP__:VD-500MB-SS-520_:25852609:1080448
Creating ,disks/v3.27:NETAPP__:VD-500MB-SS-520_:25852610:1080448
Creating ,disks/v3.28:NETAPP__:VD-500MB-SS-520_:25852611:1080448
Creating ,disks/v3.29:NETAPP__:VD-500MB-SS-520_:25852612:1080448
Creating ,disks/v3.32:NETAPP__:VD-500MB-SS-520_:25852613:1080448
Shelf file Shelf:DiskShelf14 updated
```

45. Enter the command **exit** to revert back to the clustershell command prompt
 46. Reboot the node so that the new disks can be detected. Use the command **system node reboot cluster1-01 --ignore-quorum-warnings** and type **y** when prompted to confirm

```
cluster1::>* system node reboot cluster1-01 --ignore-quorum-warnings
Warning: Are you sure you want to reboot node "cluster1-01"?
{y\|n}: y

login: ■
```

47. When the system has rebooted, log in with username **admin** and password
Flackbox1. Please be patient as it can take a long time to reboot (you might need to hit **Enter** to bring up the login prompt).
 48. Add all existing disks to Cluster 1 Node 1 with the command **storage disk assign -all true -node cluster1-01** (if you get an error message it's because the system already auto-assigned the disks, you can ignore it)

```
cluster1::> storage disk assign -all true -node cluster1-01
```

49. There is a limited amount of disk space on the node root volume vol0. If it runs out of space the simulator will fail so we need to fix that. First we will delete snapshots.
50. Enter the command **run local** to enter the local node shell. Notice that the command prompt changes.
51. Enter the command **snap delete -a -f vol0** to force the deletion of any existing snapshots.
52. Enter the command **snap sched vol0 0 0 0** to disable automatic snapshots on the root volume.
53. Enter the command **exit** to return to the cluster shell. The command prompt changes back to the cluster shell prompt.

```
cluster1::> run local
Type 'exit' or 'Ctrl-D' to return to the CLI
cluster1-01> snap delete -a -f vol0
Deleted vol0 snapshot hourly.0.
cluster1-01> snap sched vol0 0 0 0
cluster1-01> █
```

54. Add a disk to the root aggregate aggr0 with the command **aggr add**

aggr0_cluster1_01 1

Enter **y** both times when asked Do you want to continue?

```
cluster1::> aggr add aggr0_cluster1_01 1
Warning: Aggregate "aggr0_cluster1_01" is a root aggregate. Adding disks to the
root aggregate is not recommended. Once added, disks cannot be removed
without reinitializing the node.
Do you want to continue? {y\!n}: y

Info: Disks would be added to aggregate "aggr0_cluster1_01" on node
"cluster1-01" in the following manner:

First Plex

      RAID Group rg0, 4 disks (block checksum, raid_dp)
      Position   Disk           Type       Usable Size  Physical Size
      -----   -----
      data       NET-1.1        FCAL       1000MB  1.00GB

      Aggregate capacity available for volume use would be increased by 900MB.

Do you want to continue? {y\!n}: y
cluster1::> █
```

55. Attempt to add the capacity of the additional 1GB disk to vol0 with the command **vol modify -vserver cluster1-01 -volume vol0 -size +1g**

The command will fail with an error message indicating the maximum volume growth (+889MB in the example screenshot below).

```
cluster1::> vol modify -vserver cluster1-01 -volume vol0 -size +1g
Error: command failed: Unable to set volume attribute "size" for volume "vol0"
on Vserver "cluster1-01". Reason: Request to grow volume 'vol0' failed
because there is not enough space in the aggregate. Either create 136MB
of free space in the aggregate or select a growth of at most +889MB.

cluster1::> █
```

Enter the command **vol modify -vserver cluster1-01 -volume vol0 -size +889MB** to increase the volume size. (You may have a different maximum volume size).

```
cluster1::> vol modify -vserver cluster1-01 -volume vol0 -size +889MB
Volume modify successful on volume vol0 of Vserver cluster1-01.
```

56. Set up of Cluster 1 node 1 is now complete.
57. Back in the System Manager GUI, open **Cluster > Overview**

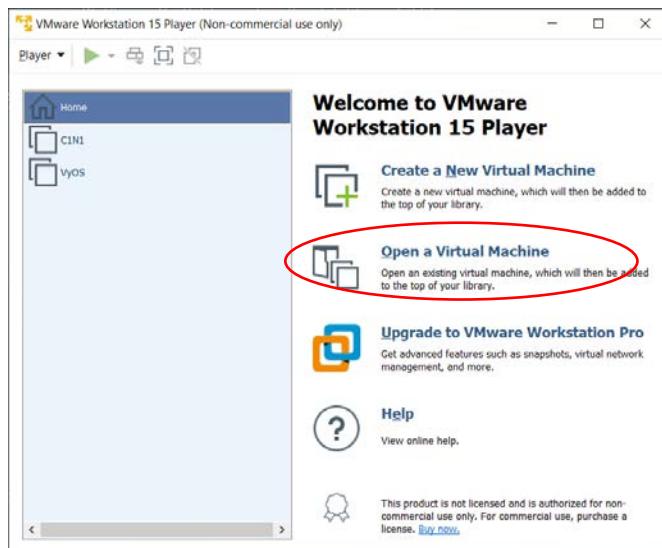
The screenshot shows the ONTAP System Manager interface. The left sidebar has a dark blue background with white text. It lists several categories: DASHBOARD, STORAGE, NETWORK, EVENTS & JOBS, PROTECTION, and CLUSTER. Under CLUSTER, 'Overview' is highlighted with a blue bar. Below the sidebar, there's a navigation bar with icons for back, forward, search, and other system functions. The main content area has a light gray background. At the top of the main area, it says 'cluster1 | Cluster Overview'. Below that is a header bar with the URL 'https://172.23.1.11/symmgr/v4/cluster/overview'. To the right of the URL are icons for refresh, search, and other actions. A search bar with the placeholder 'Search actions, objects, and pages' is followed by a magnifying glass icon. The main content is divided into sections: 'Overview' and 'Nodes'. The 'Overview' section contains details about the cluster: NAME: cluster1, MANAGEMENT INTERFACES: 172.23.1.11, VERSION: NetApp Release 9.7: Thu Jan 09 11:10:19 UTC 2020, and DATE AND TIME: August 20, 2020, 11:12 PM Etc/UTC. The 'Nodes' section has a table with columns: Nodes, Name, Up Time, Serial Number, Management IP, and Service Processor IP. One row is shown: cluster1-01, cluster1-01, 00:21:42, 4082368-50-7, 172.23.1.12, and an empty field for Service Processor IP.

58. We are now ready to set up Cluster 1 Node 2. Leave Cluster 1 Node 1 running while you set up Cluster 1 Node 2.

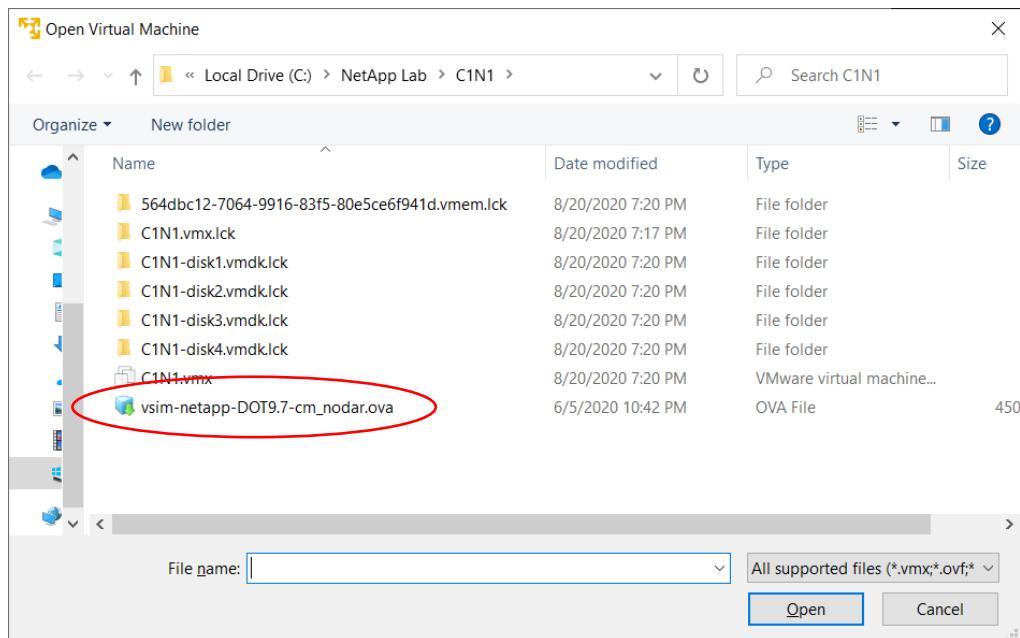
ONTAP Simulator Build – C1N2

In this section you will build the Cluster 1 Node 2 NetApp storage system.

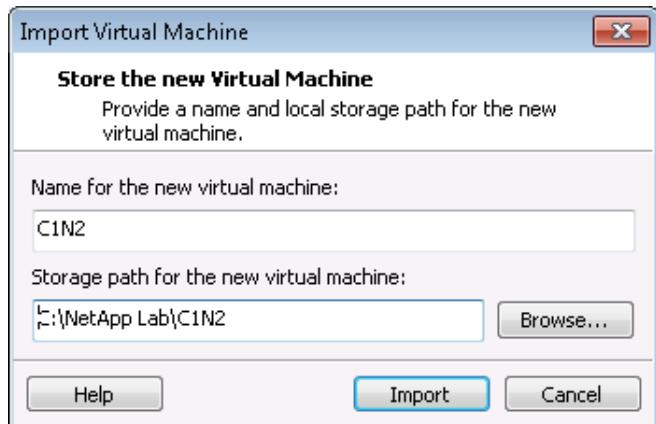
1. Open Windows Explorer and browse to your NetApp Lab folder. Make a subfolder named **C1N2**.
2. Open a second instance of VMware Workstation Player from the Windows Start menu.
3. Click **Open a Virtual Machine**



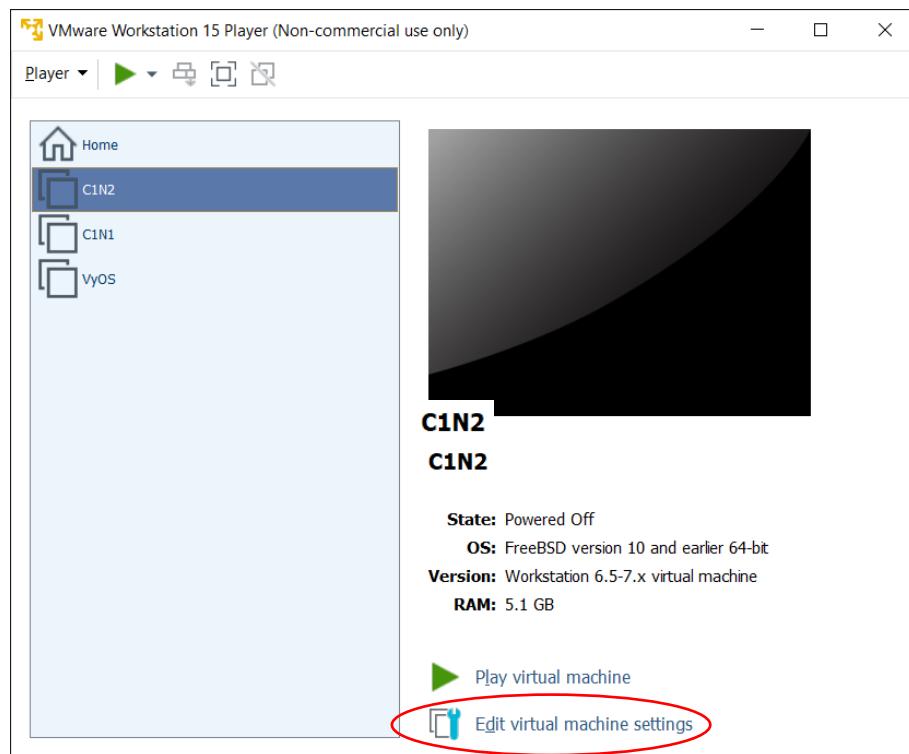
4. Browse to the C1N1 folder and double-click on the VMware image OVA file



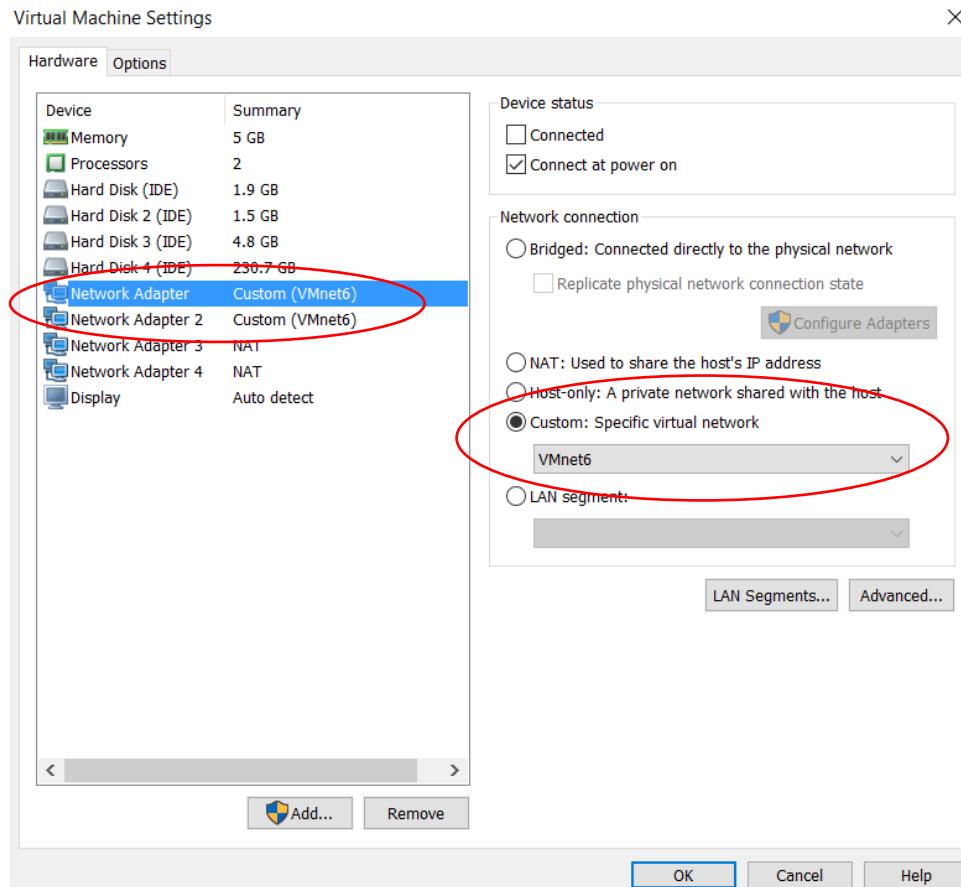
5. Name the virtual machine **C1N2** and save it in the **NetApp Lab\C1N2** folder



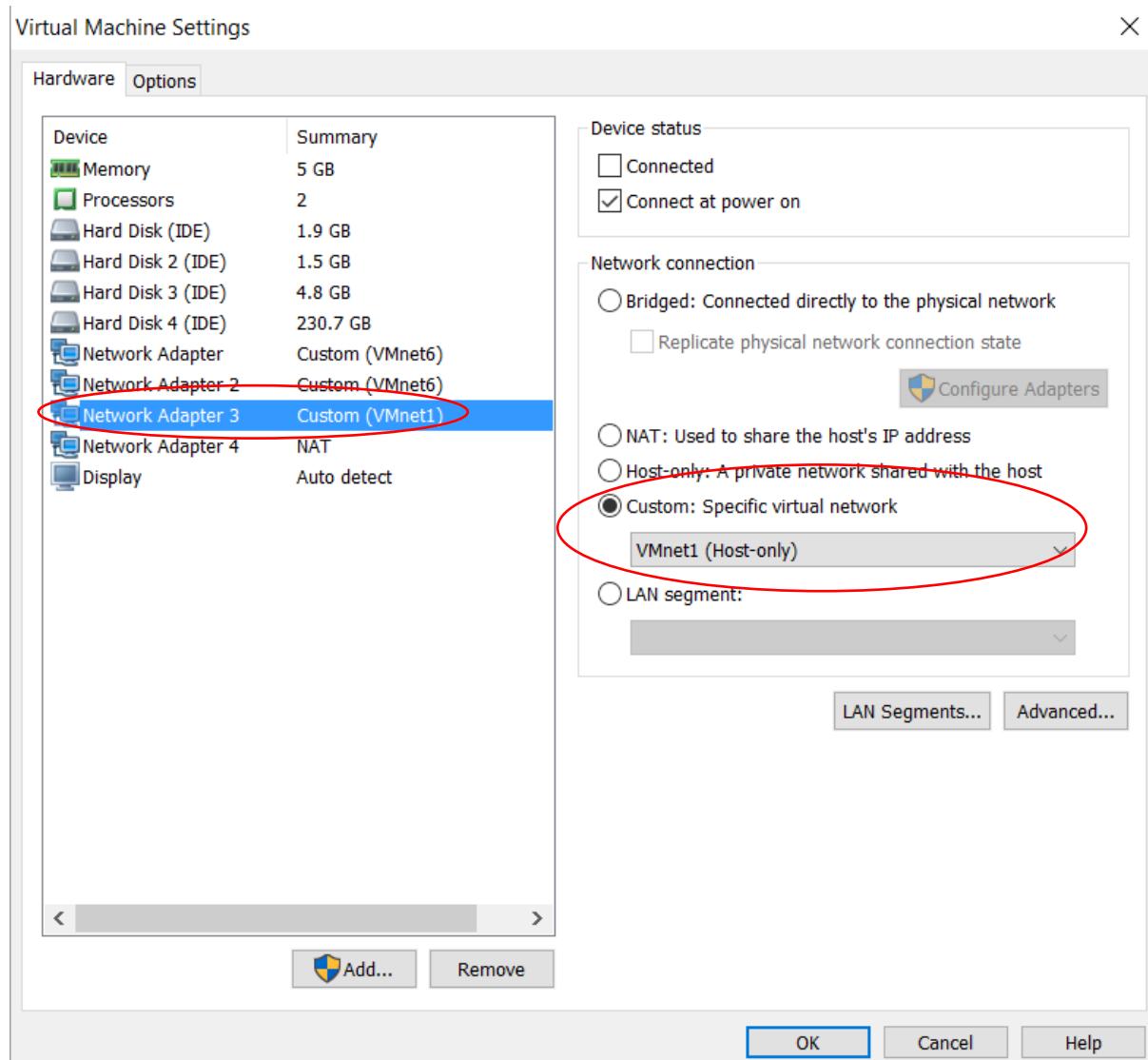
6. Click the **Import** button to create your 2nd node.
7. After the image has completed importing, click **Edit virtual machine settings**



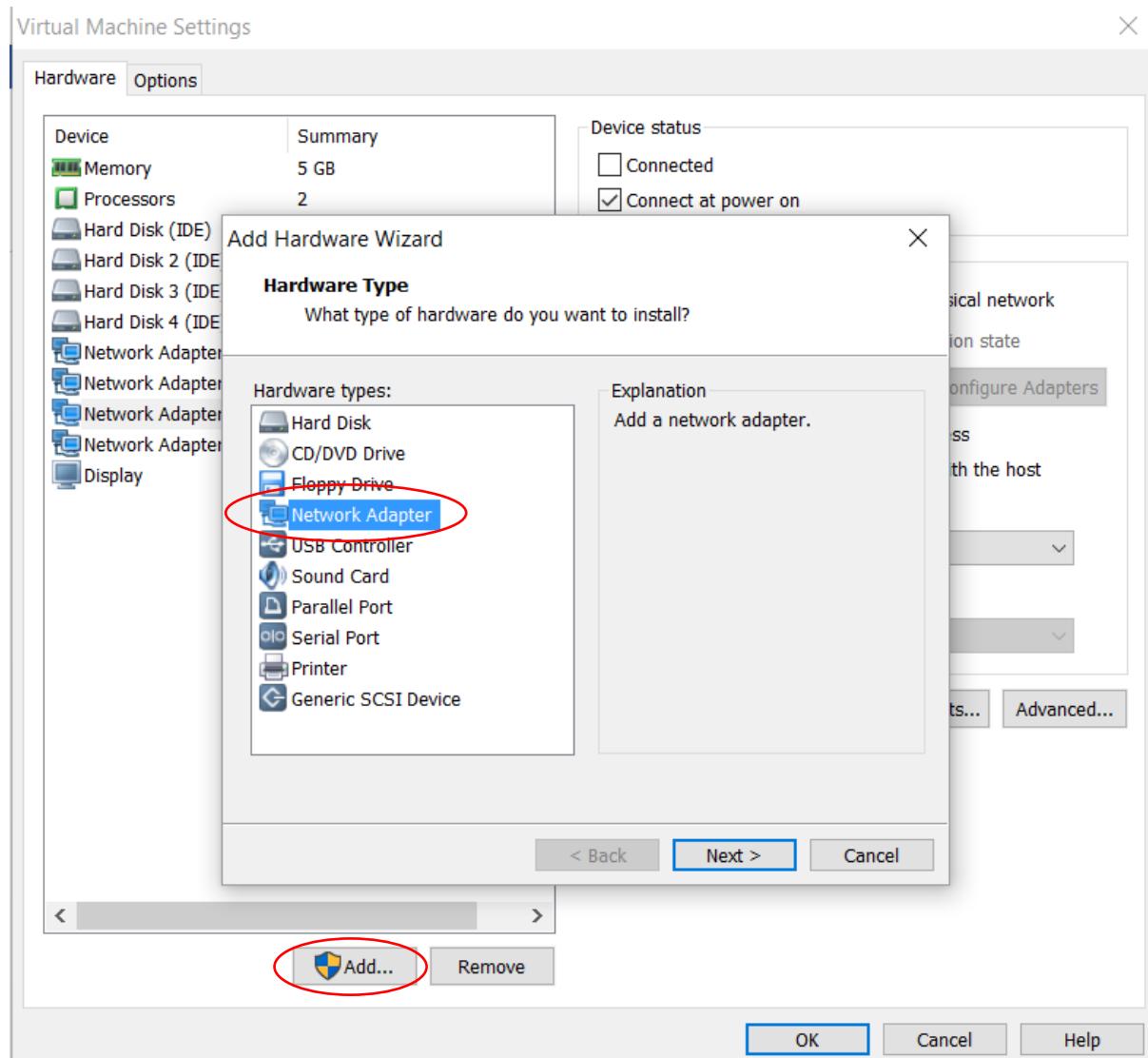
8. This node is also in Cluster 1 so it will have identical network settings to C1N1.
9. The first two network adapters are the Cluster Interconnect adapters. We will put them in their own private network. Click on the first **Network Adapter** and select Custom: Specific virtual network **VMnet6**. Repeat to set **Network Adapter 2** also to Custom: Specific virtual network **VMnet6**.



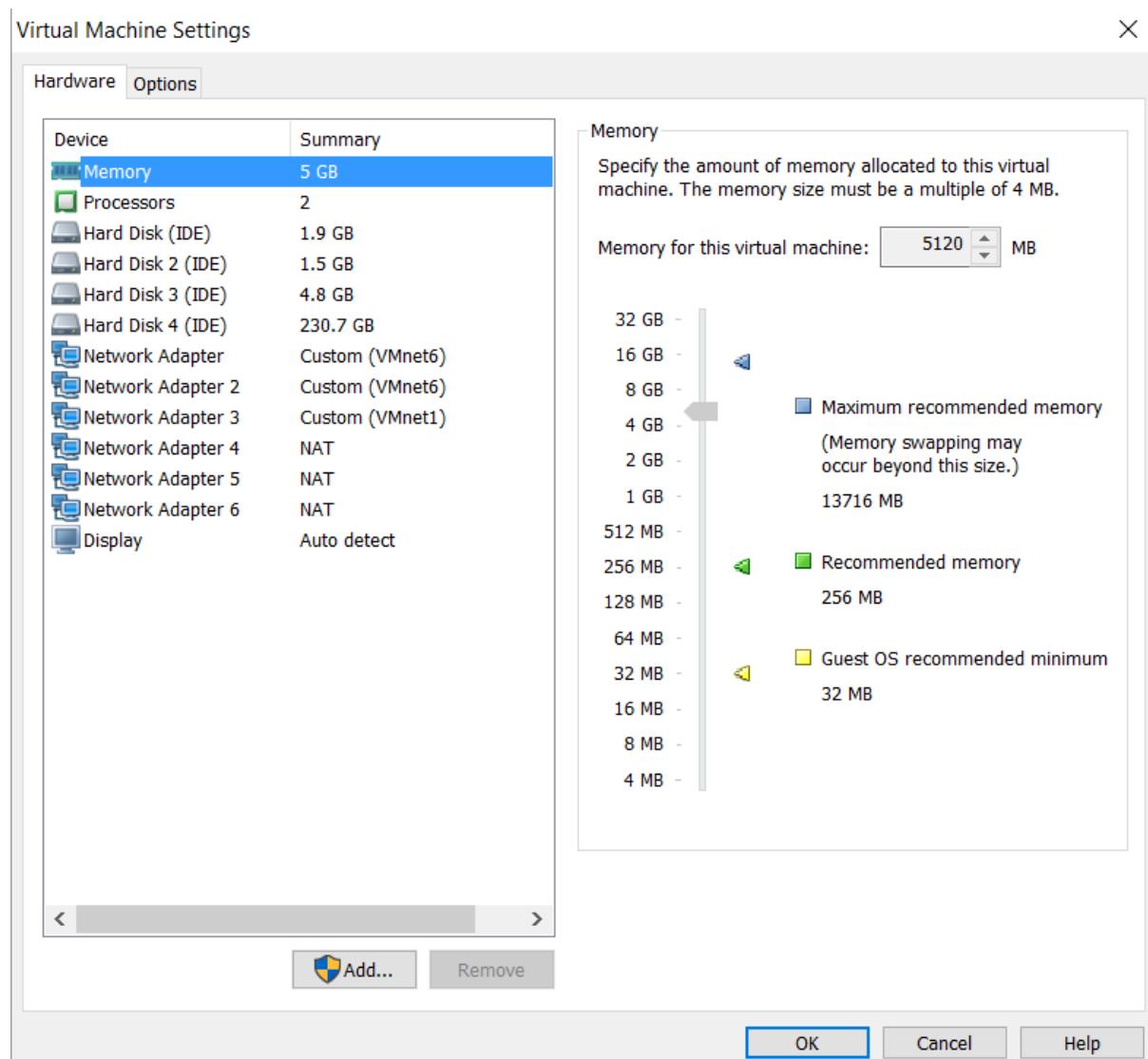
10. Click on **Network Adapter 3** and select Custom: Specific virtual network **VMnet1 (Host-only)**. This will be our management network.



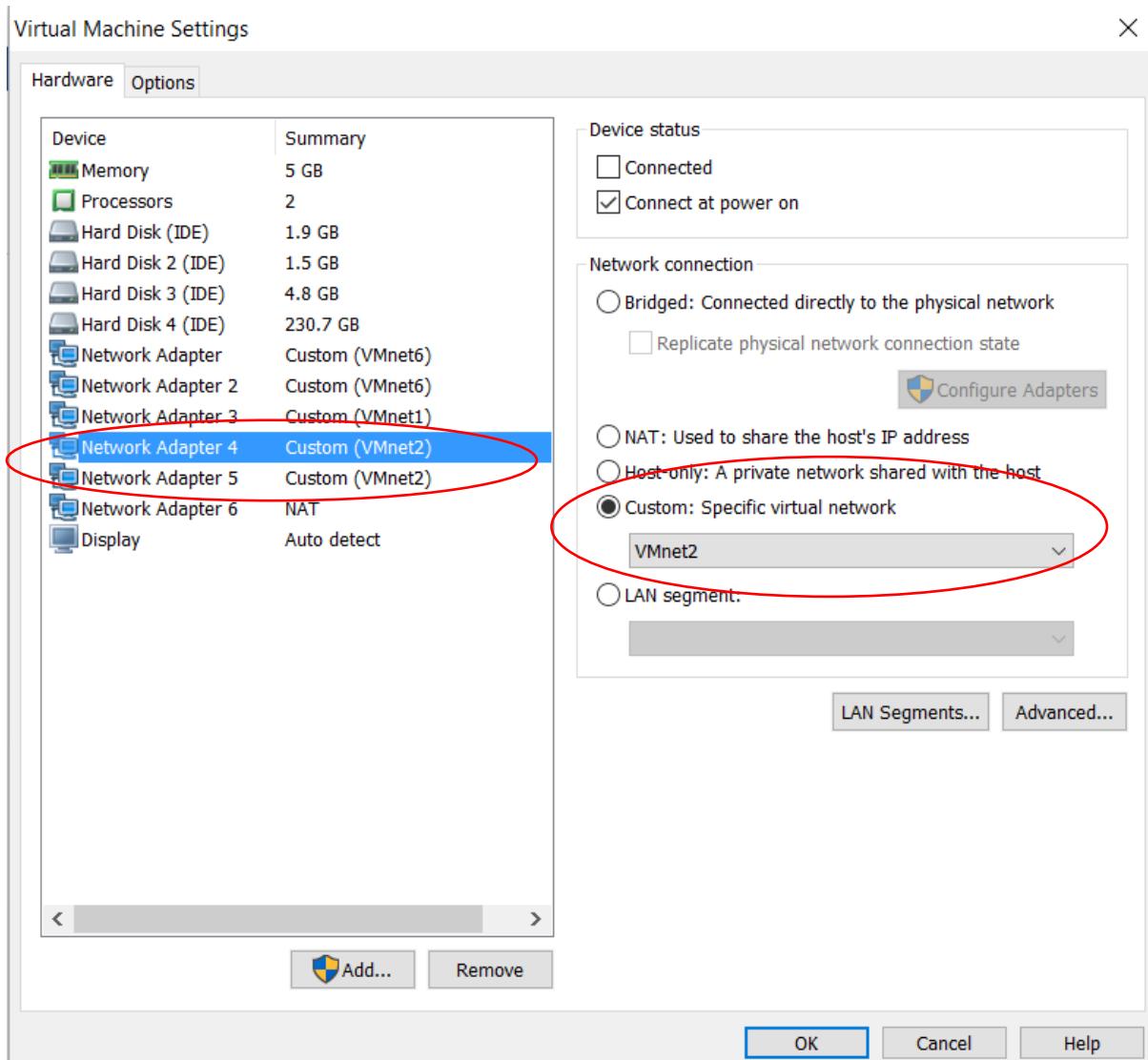
11. Add additional adapters for our data networks. Click on the **Add** button and choose **Network Adapter** then click **Finish**.



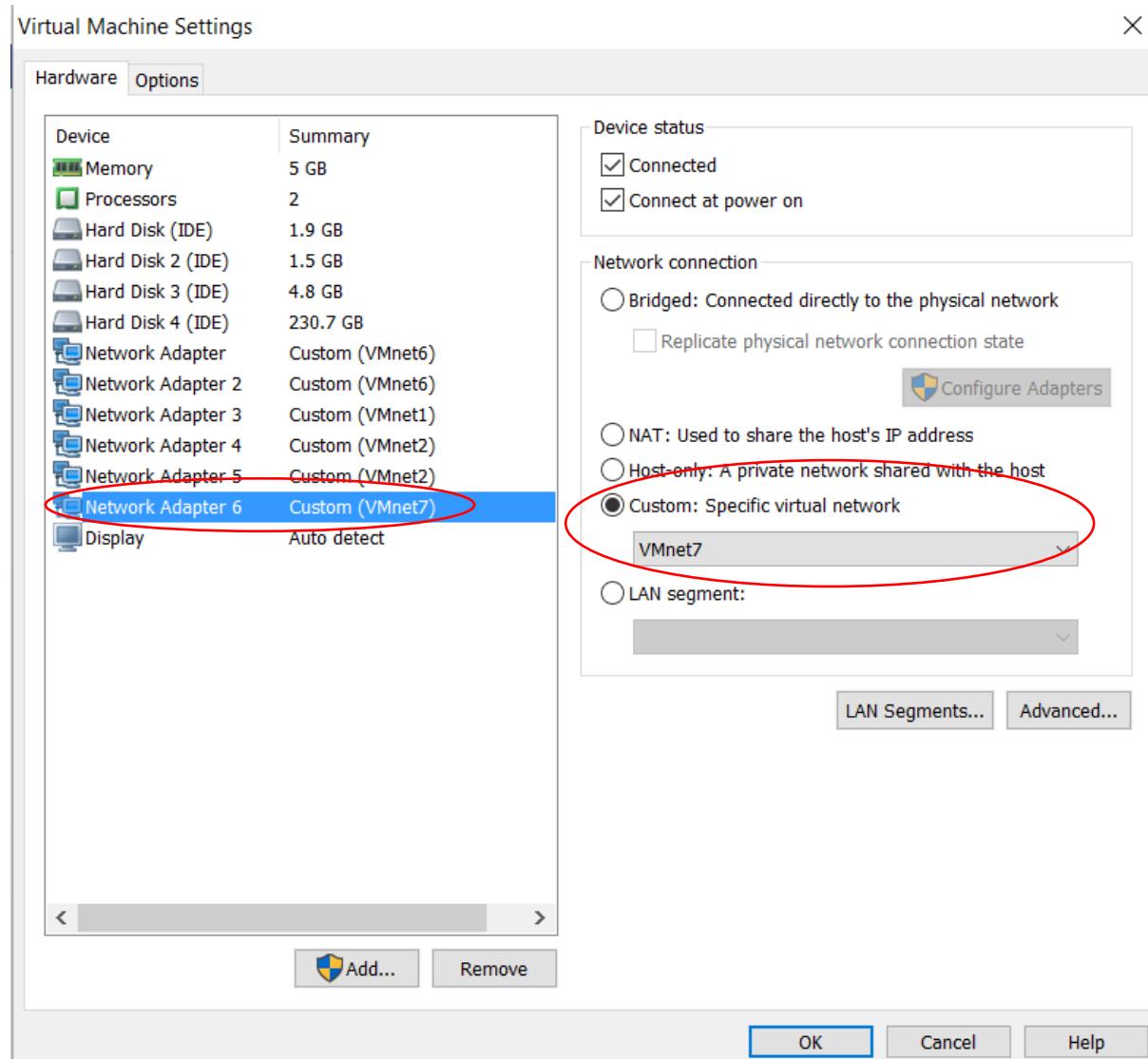
12. This will add **Network Adapter 5**. Repeat to add **Network Adapter 6**.



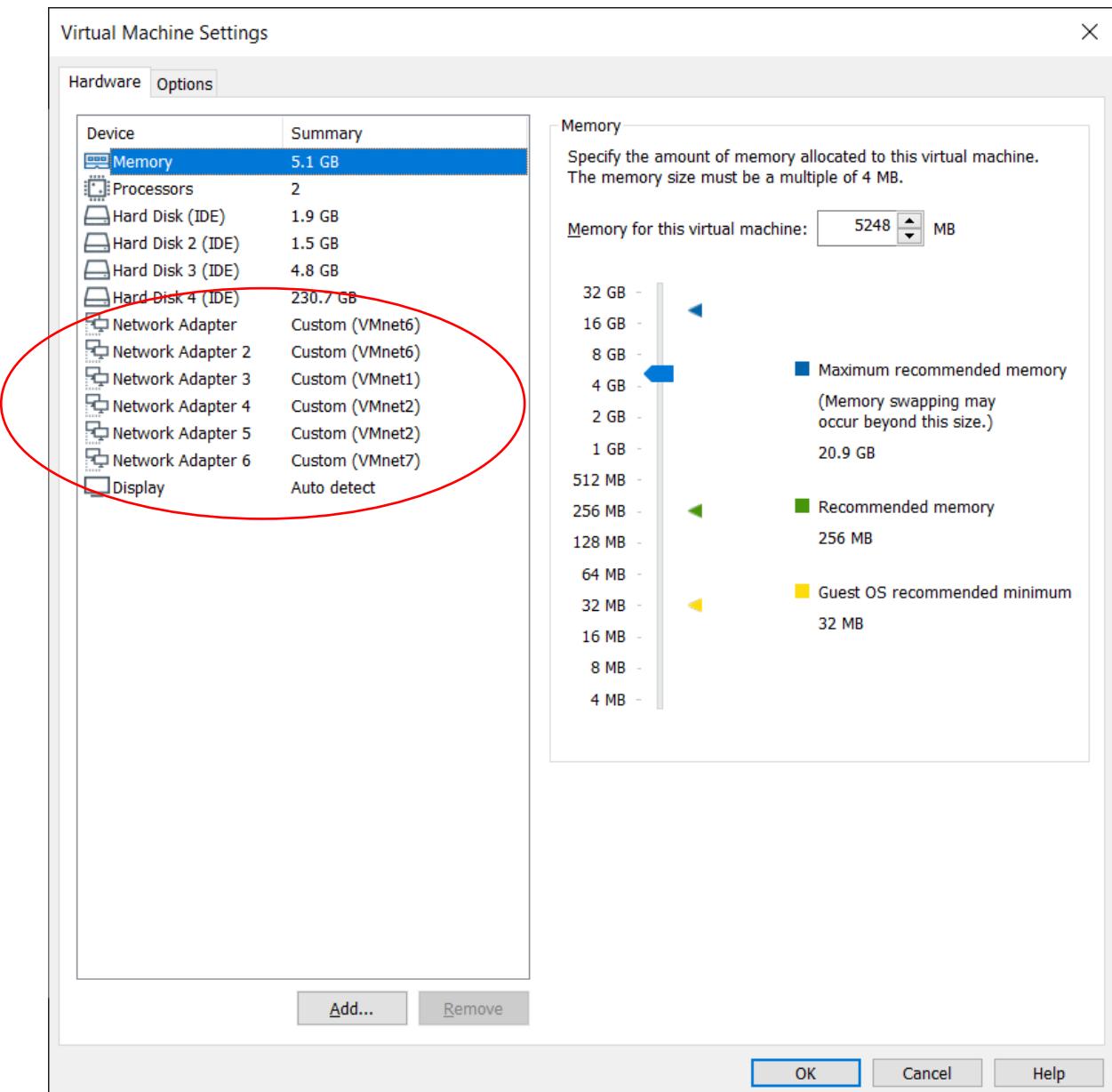
13. Click on **Network Adapter 4** and then select Custom: Specific virtual network **VMnet2**. Repeat to set **Network Adapter 5** also to Custom: Specific virtual network **VMnet2**.



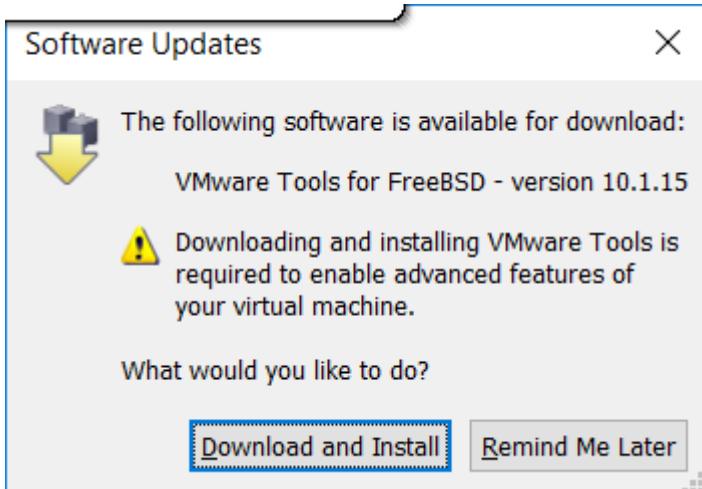
14. Click on **Network Adapter 6** and then select Custom: Specific virtual network **VMnet7** then click **OK**.



15. Click **Player > Manage > Virtual Machine Settings...** again to verify your settings are the same as shown below. Make sure each adapter has the correct VMnet setting. Click **OK** to close the Settings window.



16. We need to change the serial number on Node 2 to prevent a conflict with Node 1. Follow the next two steps exactly as described and **be ready to click in the virtual machine window and press the spacebar quickly** – if you miss this then you will need to delete the virtual machine and create it again from scratch.
17. Click **Play Virtual Machine** to power it on. Click **Remind me later** if prompted to install VMware Tools.



18. Click inside the virtual machine window with your mouse to make your keyboard active for the virtual machine. Press the spacebar key immediately when you see the message **Hit [Enter] to boot immediately, or any other key for command prompt.**
19. At the VLOADER prompt, enter **setenv SYS_SERIAL_NUM 4034389-06-2**
20. Enter **setenv bootarg.nvram.sysid 4034389062**
21. This will change the serial number and system ID to different values from Node 1, which will allow us to join Node 2 to the cluster without error messages.

```

BTX loader 1.00 BTX version is 1.02
Consoles: internal video/keyboard
BIOS drive A: is disk0
BIOS drive C: is disk1
BIOS drive D: is disk2
BIOS drive E: is disk3
BIOS drive F: is disk4
BIOS 638kB/3143616kB available memory

FreeBSD/i386 bootstrap loader, Revision 1.1
(rroot@bldrh6sv106.eng.netapp.com, Thu Nov 5 01:45:20 PST 2015)
Loading /boot/defaults/loader.conf
:
Hit [Enter] to boot IMMEDIATELY, or any other key for command prompt.
Booting in 8 seconds...

Type '?' for a list of commands, 'help' for more detailed help.
VLOADER> setenv SYS_SERIAL_NUM 4034389-06-2
VLOADER> setenv bootarg.nvram.sysid 4034389062
VLOADER> -

```

22. Type **boot** and press **Enter** to boot the node.
23. You will receive a message that System Initialization has completed successfully, and then the Node Management IP has been assigned. It may take several minutes for the messages to appear.

```

Aug 20 22:15:55 [localhost:tapemc.alias.addOK:notice]: Alias st2 automatically added for tape device SNI42426202].
Aug 20 22:15:55 [localhost:tapemc.alias.addOK:notice]: Alias st3 automatically added for tape device SNI42426203].
Aug 20 22:15:55 [localhost:kern.syslog.msg:notice]: Registry is being upgraded to improve storing of local changes.
Aug 20 22:15:55 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.
Aug 20 22:15:55 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domain xing interrupt: false
System initialization has completed successfully.
Aug 20 22:16:00 [localhost:monitor.globalStatus.ok:notice]: The system's global status is normal.
ERROR: missing pmroot_late.tgz file
wrote key file "/tmp/rndc.key"
*****
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.23.46
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP

FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION
BEFORE PROCEEDING WITH CLUSTER SETUP
*****
```

Thu Aug 20 22:17:09 UTC 2020
login:

24. Log in with the username **admin** and a blank password. Then create a password for the admin account with the command **security login password -username admin**
 Enter your current password: Leave blank and hit Enter
 Enter a new password: **Flackbox1**

```

o improve storing of local changes.
Aug 20 23:10:26 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.
Aug 20 23:10:27 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domain xing interrupt: false
System initialization has completed successfully.
ERROR: missing pmroot_late.tgz file
wrote key file "/tmp/rndc.key"
*****
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.23.46
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP

FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION
BEFORE PROCEEDING WITH CLUSTER SETUP
*****
```

Thu Aug 20 23:11:41 UTC 2020
login: admin
::> security login password -username admin

Enter your current password:
Enter a new password:
Enter it again:

::>

25. Go back to the VMware Workstation Player window for Cluster 1 **Node 1**, and enter the command **network interface show**

Note the IP address of the first interface cluster1-01_clus1. It is 169.254.148.29 in the example below but may be different on your node.

cluster1::> network interface show						
Userserver	Logical Interface	Status Admin/Oper	Network Address/Mask	Current Node	Current Port	Is Home
<hr/>						
Cluster	cluster1-01_clus1	up/up	169.254.148.29/16	cluster1-01	e0a	true
	cluster1-01_clus2	up/up	169.254.148.39/16	cluster1-01	e0b	true
cluster1	cluster1-01_Mgmt	up/up	172.23.1.12/24	cluster1-01	e0c	true
	cluster1-01_Mgmt_auto	up/up	169.254.148.49/16	cluster1-01	e0c	true
	cluster_mgmt	up/up	172.23.1.11/24	cluster1-01	e0c	true
5 entries were displayed.						

26. Back in the VMware Workstation Player window for Cluster 1 **Node 2**, enter the command **cluster join -clusteripaddr <cluster1-01_clus1 IP>**, where <cluster1-01_clus1 IP> is the IP address you just noted on Node 1. This will join Node 2 to Cluster 1.

```
::> cluster join -clusteripaddr 169.254.148.29
System start up ......

This node has joined the cluster cluster1.

cluster1::> █
```

27. Add all remaining disks to Cluster 1 Node 2 with the command **storage disk assign -all true -node cluster1-02** (if you get an error message it's because the system already auto-assigned the disks, you can ignore it)

```
cluster1::> storage disk assign -all true -node cluster1-02
```

28. There is a limited amount of disk space so we will delete snapshots on the root volume vol0.
29. Enter the command **run local** to enter the local node shell. Notice that the command prompt changes.
30. Enter the command **snap delete -a -f vol0** to force the deletion of any existing snapshots.
31. Enter the command **snap sched vol0 0 0 0** to disable automatic snapshots on the root volume.
32. Enter the command **exit** to return to the cluster shell. The command prompt changes back to the cluster shell prompt.

```

cluster1::> run local
Type 'exit' or 'Ctrl-D' to return to the CLI
cluster1-02> snap delete -a -f vol0
cluster1-02> snap sched vol0 0 0 0
cluster1-02> exit
logout

```

33. Add a disk to the root aggregate aggr0 with the command **aggr add aggr0_cluster1_02 1**

Enter **y** both times when asked Do you want to continue?

```

cluster1::> aggr add aggr0_cluster1_02 1

Warning: Aggregate "aggr0_cluster1_02" is a root aggregate. Adding disks to the
root aggregate is not recommended. Once added, disks cannot be removed
without reinitializing the node.
Do you want to continue? {y\!n}: y

Info: Disks would be added to aggregate "aggr0_cluster1_02" on node
"cluster1-02" in the following manner:

First Plex

RAID Group rg0, 4 disks (block checksum, raid_dp)
-----+-----+-----+-----+-----+-----+
Position   Disk           Type      Usable Size  Physical Size
-----+-----+-----+-----+-----+-----+
    data     NET-2.1       FCAL      1000MB  1.00GB

Aggregate capacity available for volume use would be increased by 900MB.

Do you want to continue? {y\!n}: y

cluster1::>

```

34. Attempt to add the capacity of the additional 1GB disk to vol0 with the command **vol modify -vserver cluster1-02 -volume vol0 -size +1g**

The command will fail with an error message indicating the maximum volume growth (+892MB in the example screenshot below).

```

cluster1::> vol modify -vserver cluster1-02 -volume vol0 -size +1g

Error: command failed: Unable to set volume attribute "size" for volume "vol0"
on Userver "cluster1-02". Reason: Request to grow volume 'vol0' failed
because there is not enough space in the aggregate. Either create 132MB
of free space in the aggregate or select a growth of at most +892MB.

.
.

cluster1::>

```

Enter the command **vol modify -vserver cluster1-02 -volume vol0 -size +892MB** to increase the volume size. (You may have a different maximum volume size).

```

cluster1::> vol modify -vserver cluster1-02 -volume vol0 -size +892MB
Volume Modify successful on volume vol0 of Userver cluster1-02.

```

35. Set up of Cluster 1 Node 2 is now complete. There is no need to add additional disks on Node 2 (the extra disks on Node 1 are enough to practice all features).

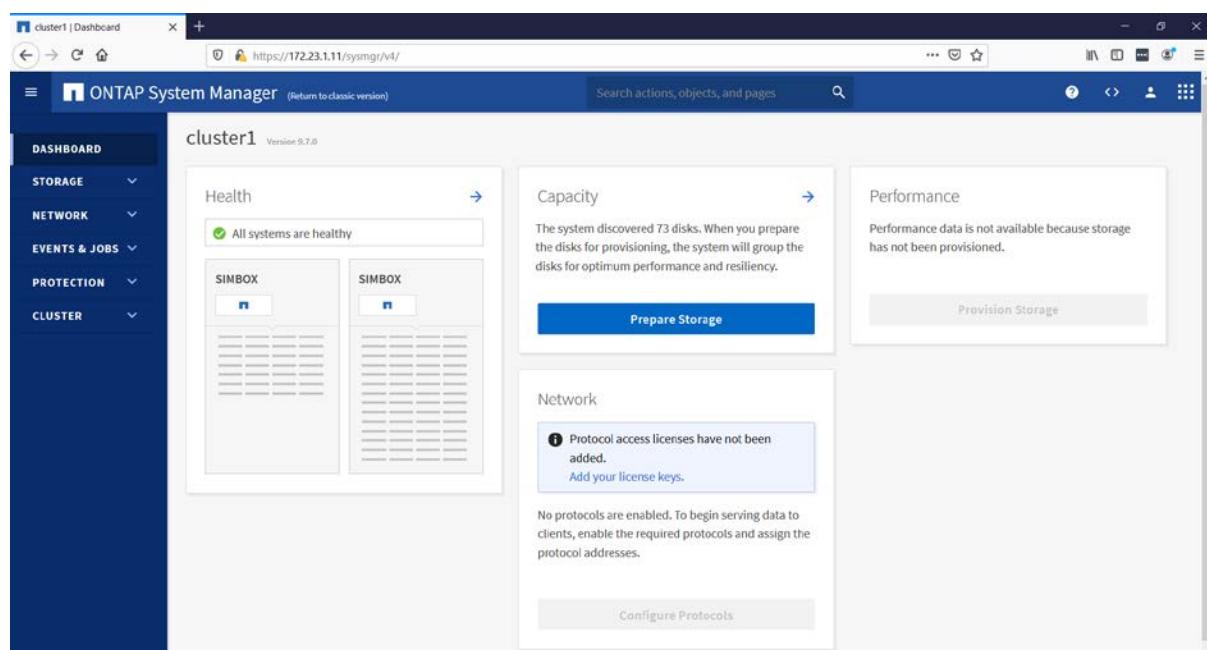
36. A common problem at this point is that the cluster management IP address may be homed on the wrong port. Enter the **network interface show** command to check. (This is the first thing to check anytime you cannot connect to the management interface. The next thing to check is the vmnet network settings in VMware Player.)

User/Server	Logical Interface	Status Admin/Oper	Network Address/Mask	Current Node	Current Port	Is Home
<hr/>						
Cluster	cluster1-01_clus1	up/up	169.254.105.151/16	cluster1-01	e0a	true
	cluster1-01_clus2	up/up	169.254.105.161/16	cluster1-01	e0b	true
	cluster1-02_clus1	up/up	169.254.213.179/16	cluster1-02	e0a	true
	cluster1-02_clus2	up/up	169.254.213.189/16	cluster1-02	e0b	true
cluster1	cluster1-01_Mgmt1	up/up	172.23.1.12/24	cluster1-01	e0c	true
	cluster1-02_Mgmt1	up/up	172.23.1.13/24	cluster1-02	e0c	true
	cluster_Mgmt	up/up	172.23.1.11/24	cluster1-01	e0d	false
7 entries were displayed.						

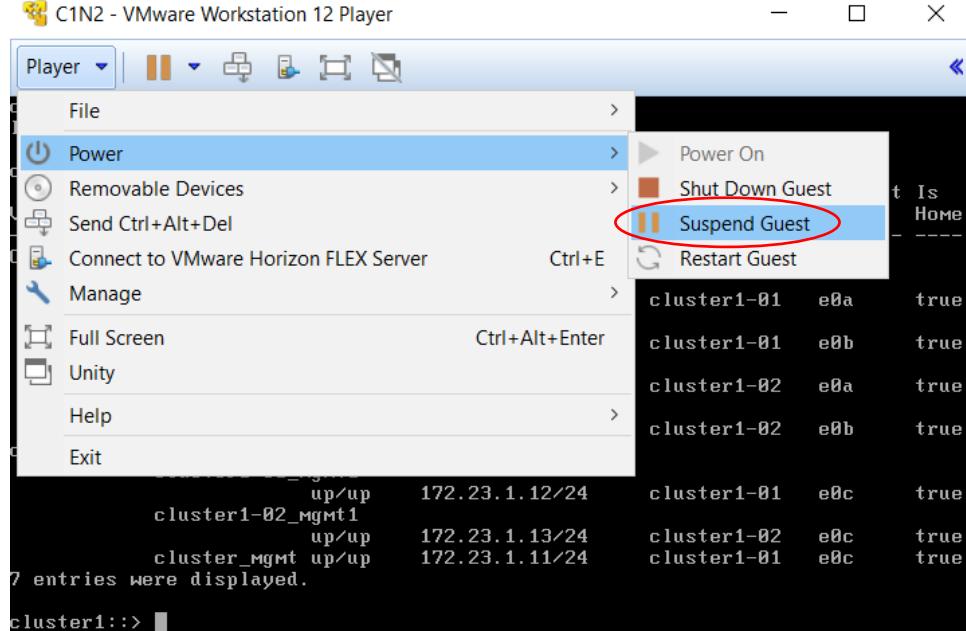
37. If the **cluster_mgmt** interface 172.23.1.11/24 reports **false** in the **Is Home** column, then revert it back to its home port with the command **network interface revert ***

```
cluster1::> network interface revert *
1 entry was acted on.
```

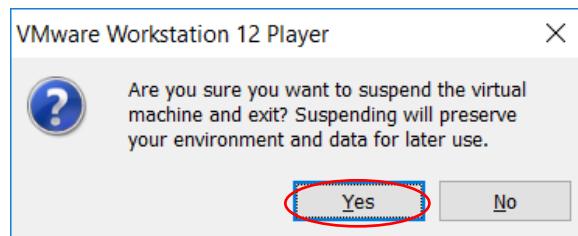
38. To perform administration of Cluster 1 from now on, connect to the cluster management address 172.23.1.11



39. We will suspend both nodes of Cluster 1 to save resources while we configure Cluster 2. Suspending is much more stable than shutting down the nodes – the simulator will not always start cleanly if you power it off and may require a rebuild. Suspending takes up some additional disk space but does not use any memory resources on your laptop.
40. On both C1N1 and C1N2, click **Player > Power > Suspend Guest** to suspend the virtual machines. Suspend both nodes immediately one after the other.



41. Click **Yes** when asked to confirm.



42. Set up of Cluster 1 is now complete. If you are using VMware Workstation Player it is a good idea to take a clean backup of the nodes at this point by copying the C1N1 and C1N2 folders to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)

43. To start the virtual machines later, browse to the 'NetApp Lab\C1N1' folder and run the 'C1N1.vmx' file, then immediately browse to the 'NetApp Lab\C1N2' folder and run the 'C1N2.vmx' file. Always run both nodes for Cluster 1 (not just a single node).

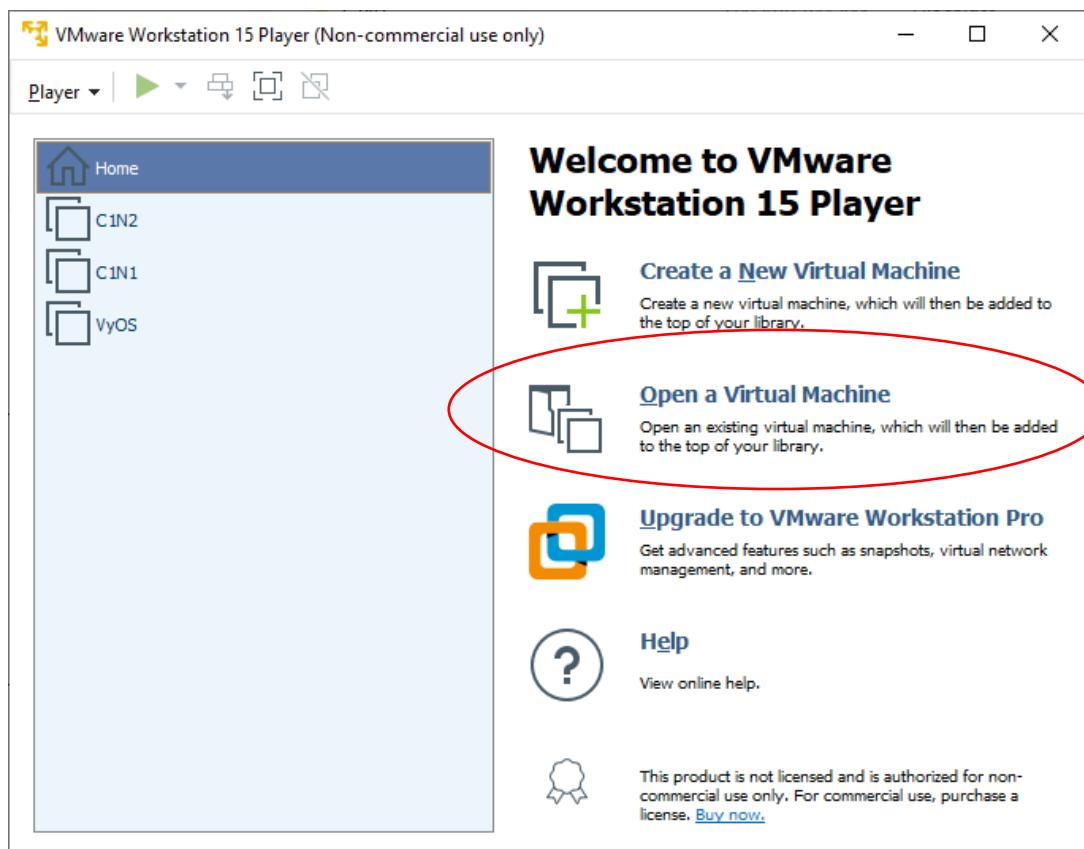
Name	Date modified	Type	Size
C1N1.vmsd	8/06/2017 1:04 PM	VMware snapshot ...	0 KB
C1N1.vmx	10/06/2017 12:02 ...	VMX File	4 KB
C1N1.vmxsf	8/06/2017 1:55 PM	VMware Team Me...	1 KB
C1N1-c2375c64.vmem	8/06/2017 1:41 PM	VMEM File	5,242,880 ...
C1N1-c2375c64.vmss	10/06/2017 12:02 ...	VMware suspende...	2,022 KB
C1N1-disk1.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	208,512 KB
C1N1-disk2.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	3,410,880 ...
C1N1-disk3.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	823,616 KB
C1N1-disk4.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	3,584 KB
nvram	10/06/2017 12:02 ...	File	9 KB
vmware.log	10/06/2017 12:02 ...	Text Document	286 KB
vmware-0.log	9/06/2017 12:44 PM	Text Document	246 KB

Name	Date modified	Type	Size
C1N2.vmsd	9/06/2017 10:14 PM	VMware snapshot ...	0 KB
C1N2.vmx	10/06/2017 12:02 ...	VMX File	4 KB
C1N2.vmxsf	9/06/2017 10:49 PM	VMware Team Me...	1 KB
C1N2-c2375c65.vmem	9/06/2017 10:17 PM	VMEM File	5,242,880 ...
C1N2-c2375c65.vmss	10/06/2017 12:02 ...	VMware suspende...	2,020 KB
C1N2-disk1.vmdk	9/06/2017 11:57 PM	VMware virtual dis...	704 KB
C1N2-disk2.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	1,902,400 ...
C1N2-disk3.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	821,120 KB
C1N2-disk4.vmdk	10/06/2017 12:02 ...	VMware virtual dis...	3,392 KB
nvram	10/06/2017 12:02 ...	File	9 KB
vmware.log	10/06/2017 12:02 ...	Text Document	246 KB
vmware-0.log	9/06/2017 11:57 PM	Text Document	240 KB

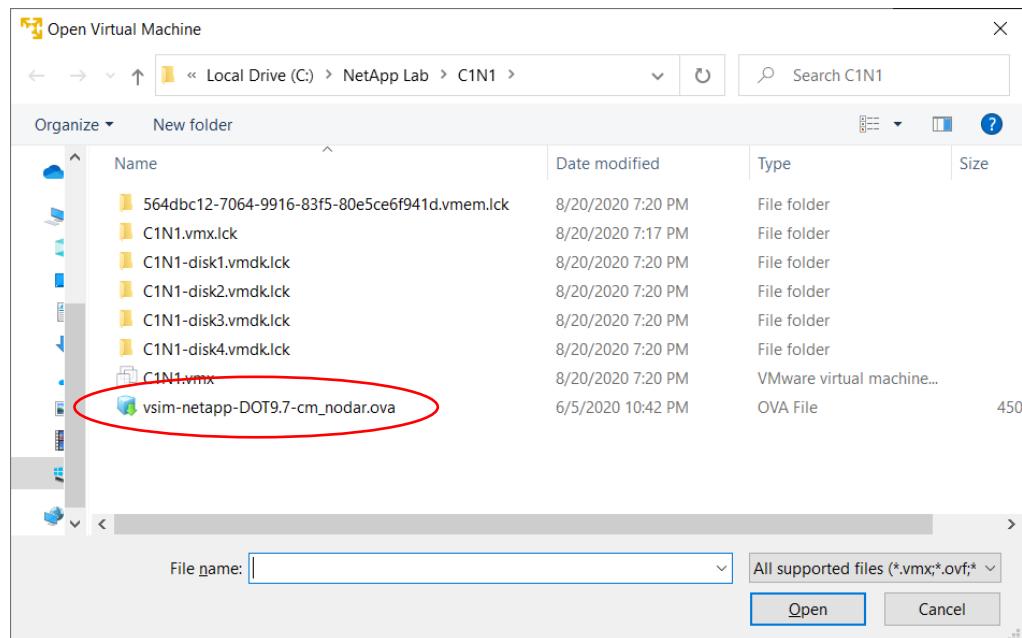
ONTAP Simulator Build – C2N1

In this section you will build the Cluster 2 Node 1 NetApp storage system.

1. We are now ready to build Cluster 2. There is only one node in Cluster 2. There is no need to change the serial number as it is a different cluster – there is no conflict with the identical serial number on Cluster 1.
2. Open Windows Explorer and browse to your NetApp Lab folder. Make a subfolder named **C2N1**.
3. Open VMware Player from the Windows Start menu.
4. Click **Open a Virtual Machine**



5. Browse to the C1N1 folder and double-click on the VMware image OVA file

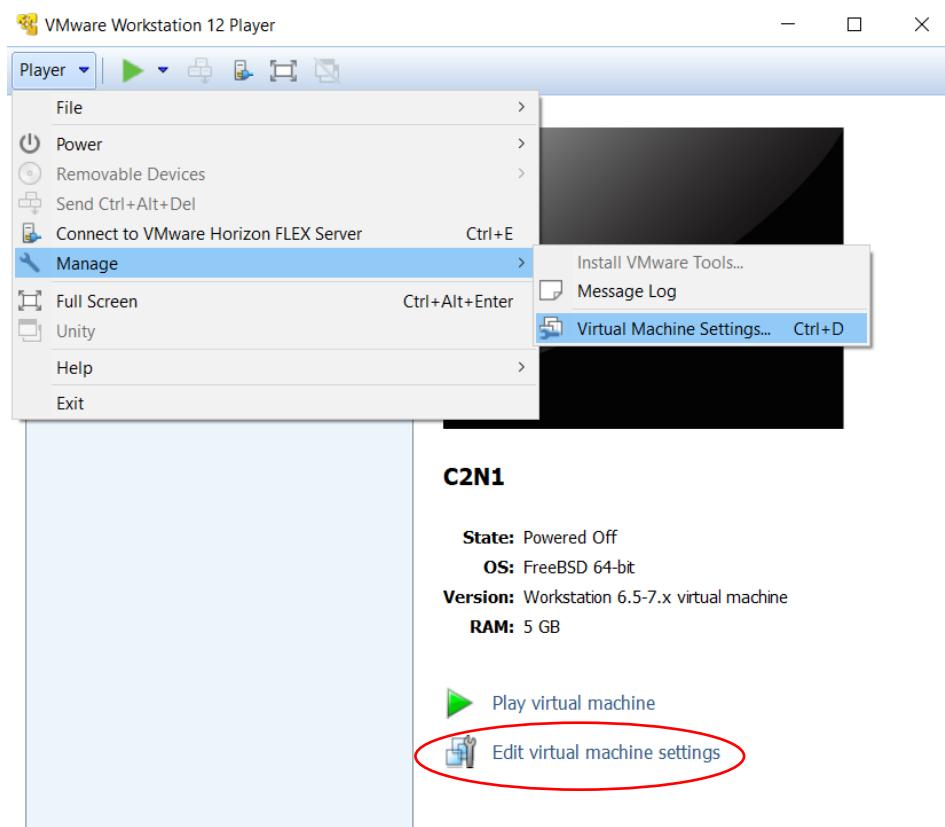


6. Name the virtual machine **C2N1** and save it in the **NetApp Lab\C2N1** folder



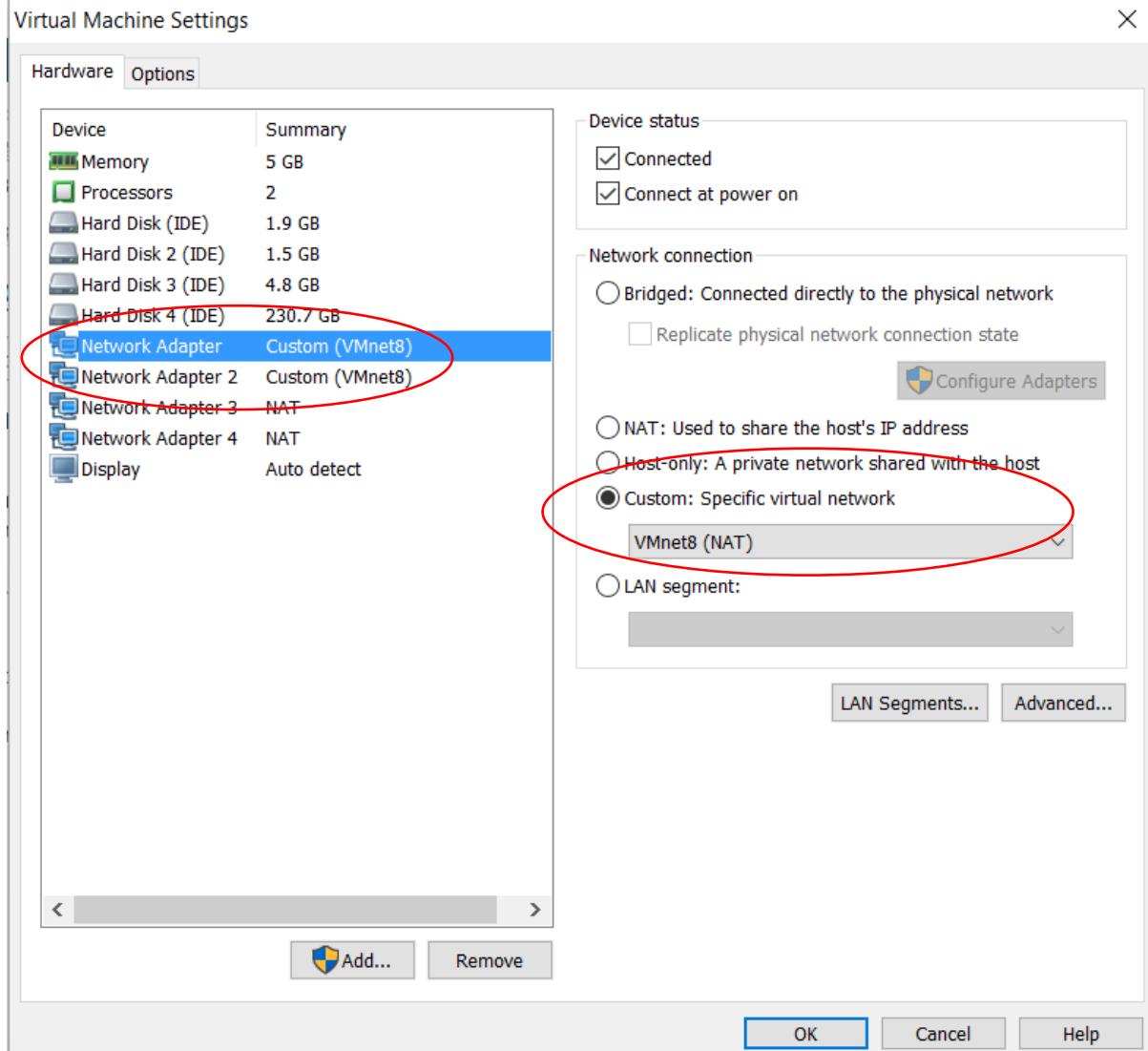
7. Click the **Import** button to create the node.

8. After the image has completed importing, click **Edit virtual machine settings**

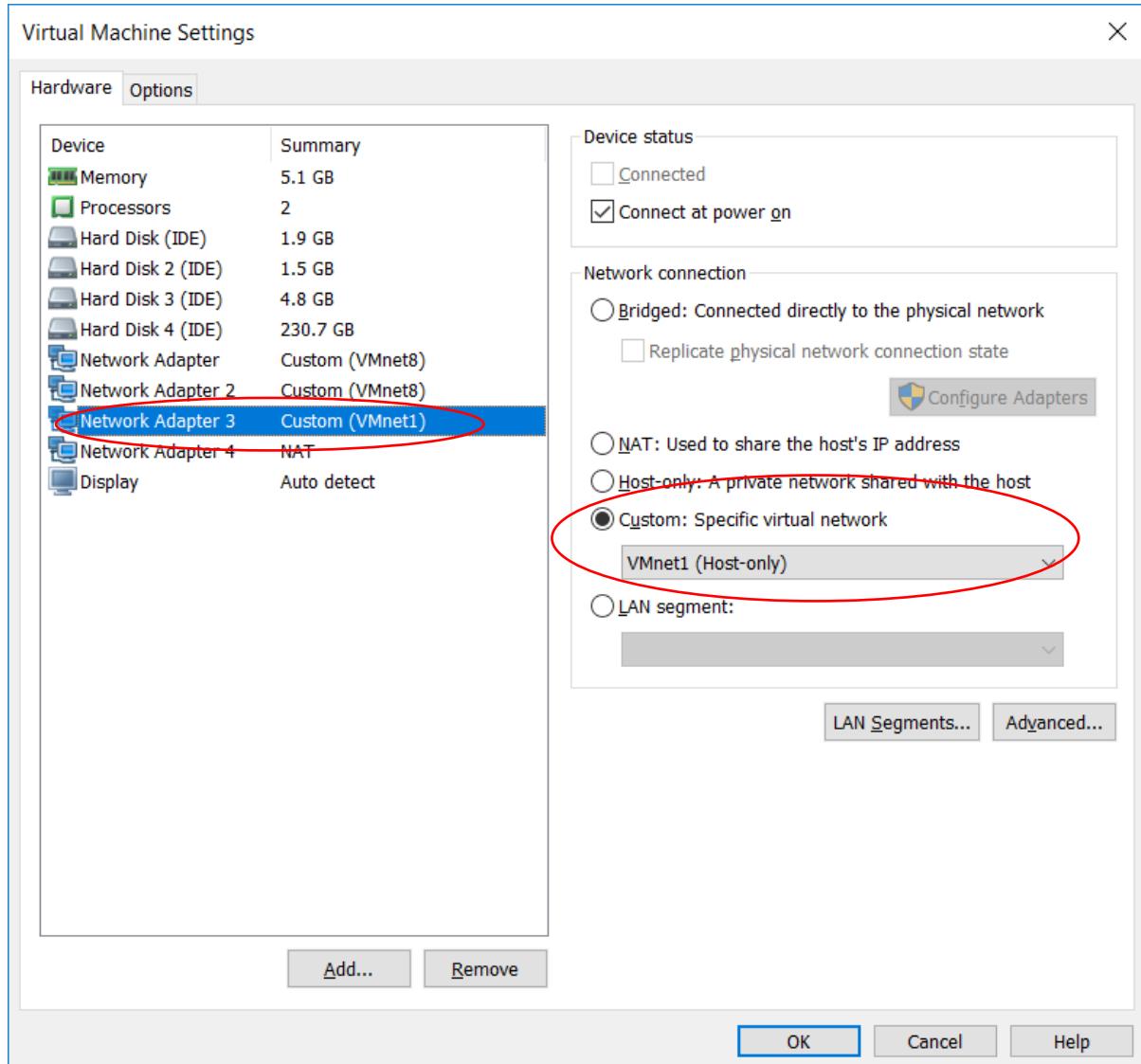


9. This is a different cluster so we will configure different network settings than on cluster1.

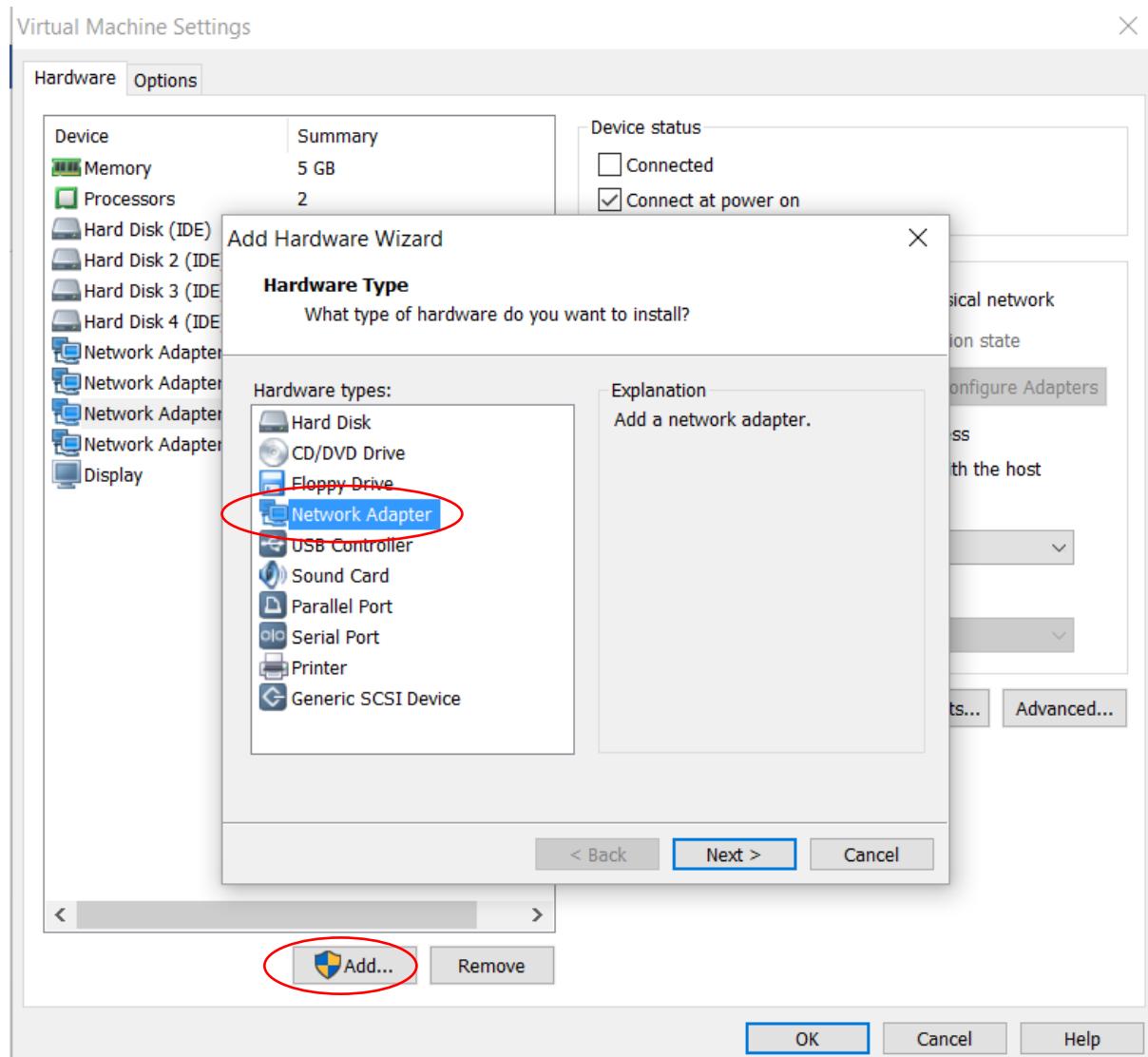
10. The first two network adapters are the Cluster Interconnect adapters. We will put them in their own private network. Click on the first **Network Adapter** and select Custom: Specific virtual network **VMnet8 (NAT)**. Repeat to set **Network Adapter 2** also to Custom: Specific virtual network **VMnet8 (NAT)**. We will not actually be using NAT, we just need a separate network for the Cluster Interconnect adapters and VMnet8 is the next available.



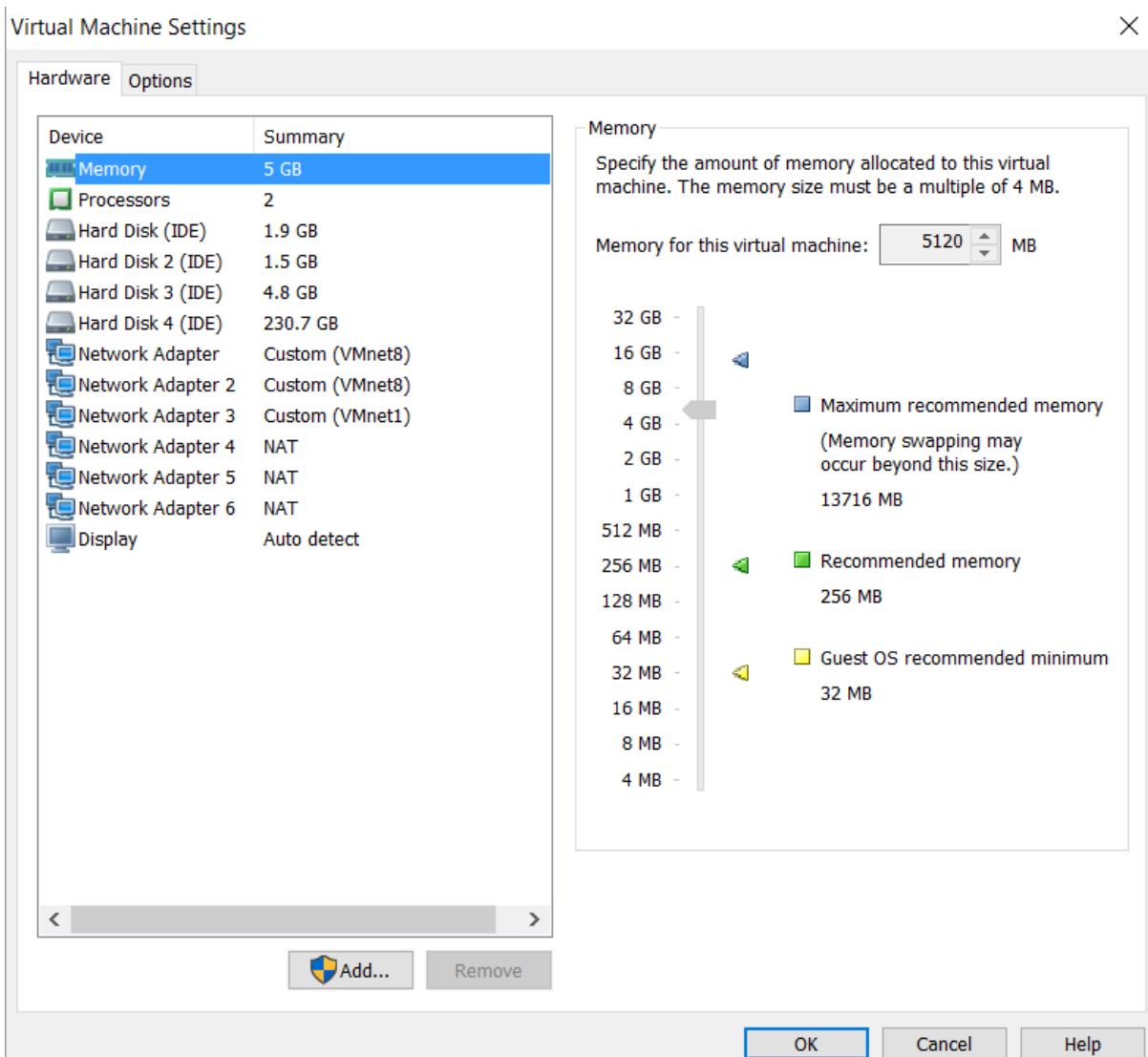
11. Click on **Network Adapter 3** and select Custom: Specific virtual network **VMnet1 (Host-only)**. This is our management network.



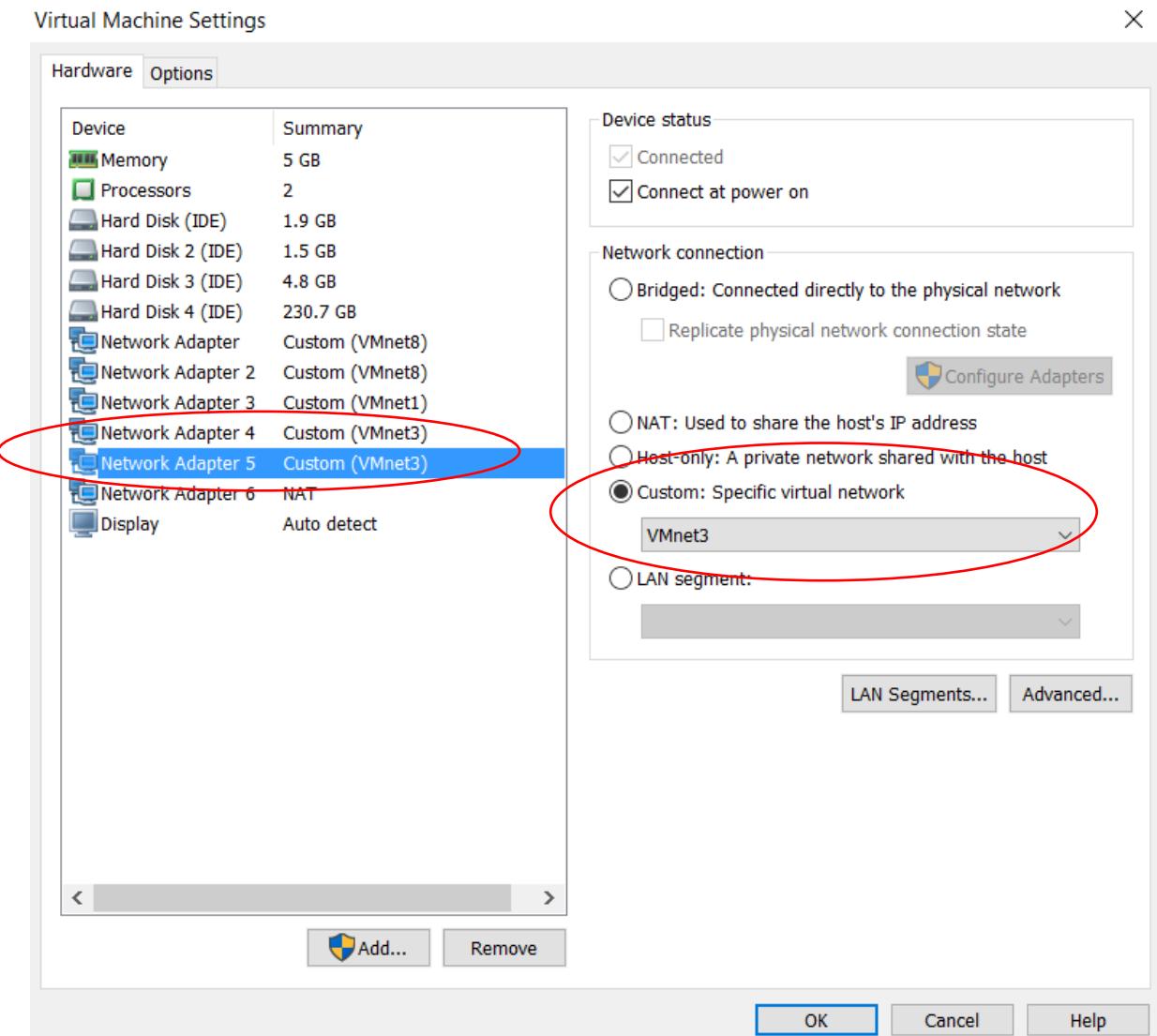
12. Add additional adapters for our data networks. Click on the **Add** button and choose **Network Adapter** then click **Finish**.



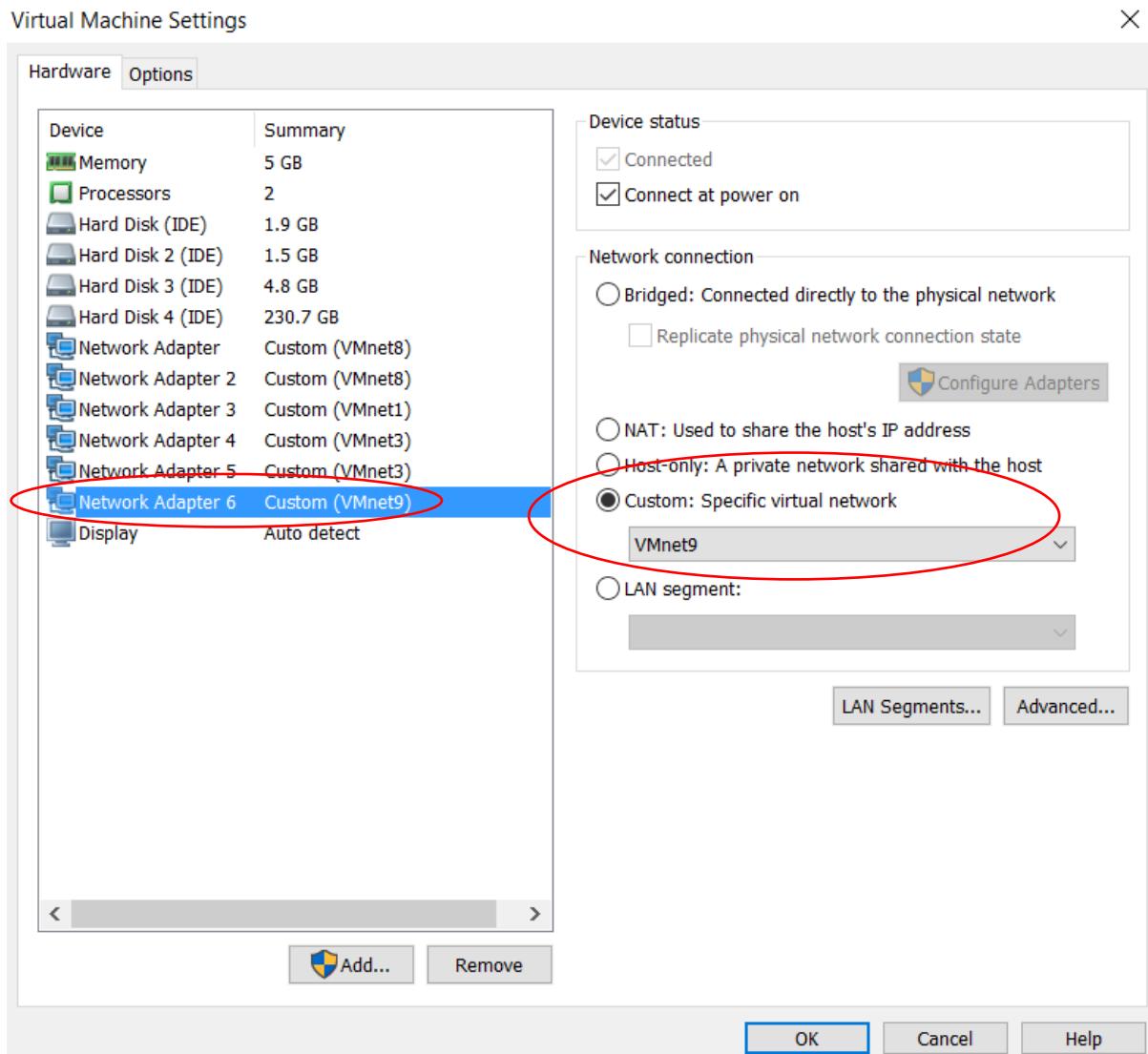
13. This will add **Network Adapter 5**. Repeat to add **Network Adapter 6**.



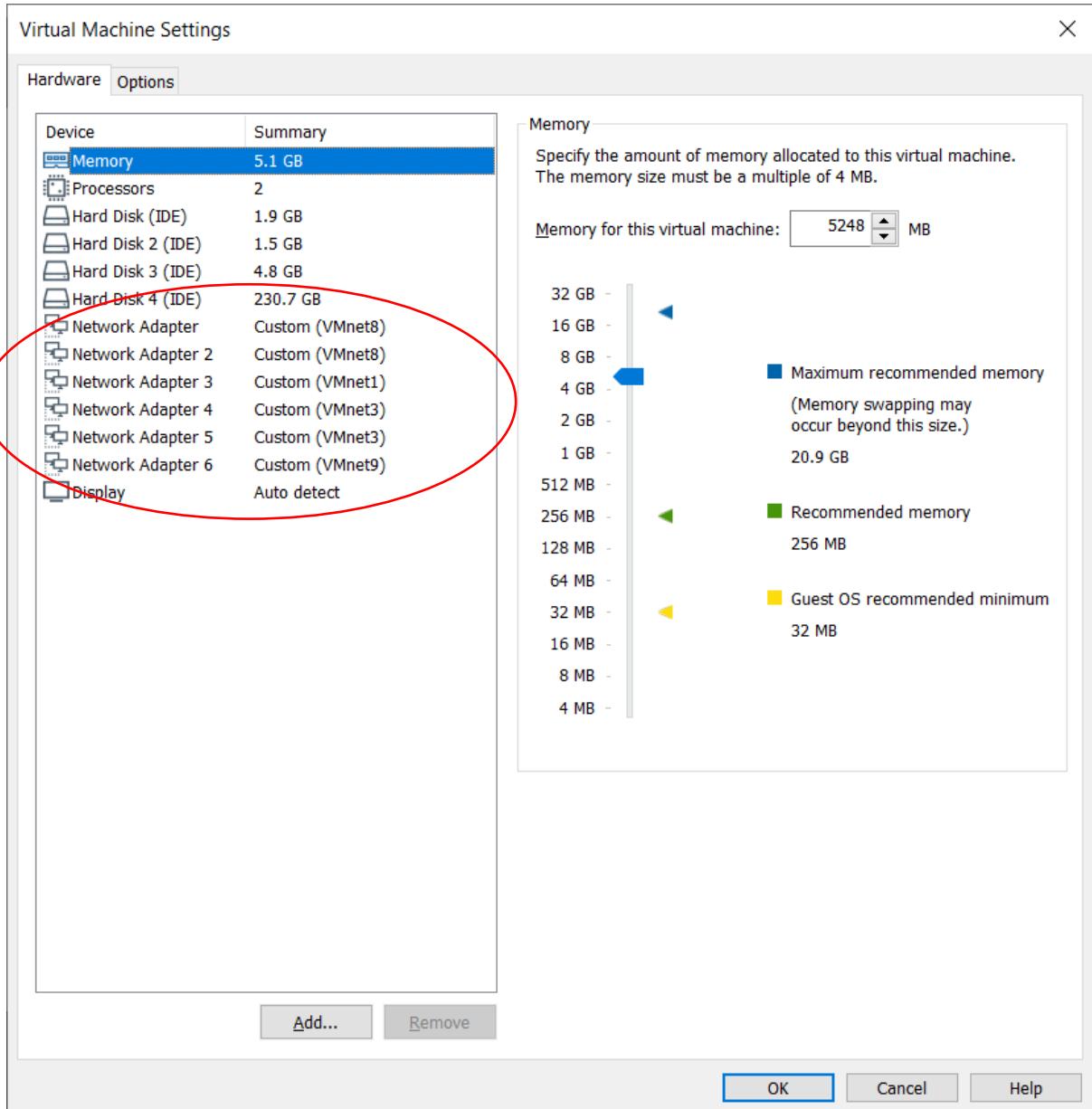
14. Click on **Network Adapter 4** and then select Custom: Specific virtual network **VMnet3**. Repeat to set **Network Adapter 5** also to Custom: Specific virtual network **VMnet3**.



15. Click on **Network Adapter 6** and then select Custom: Specific virtual network **VMnet9** then click **OK**.



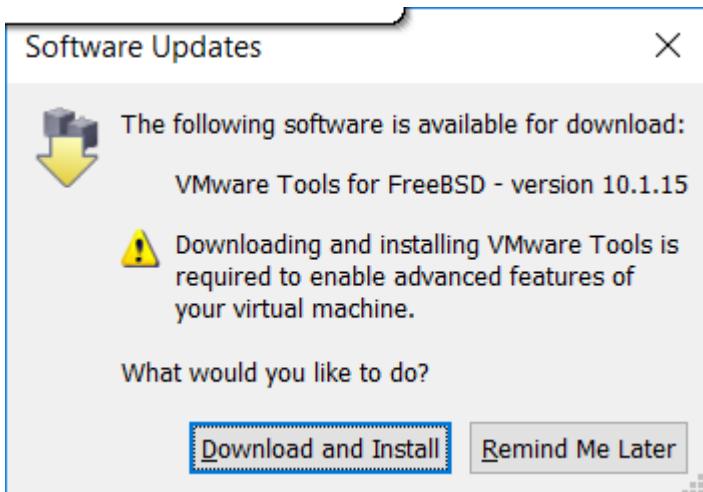
16. Click **Player > Manage > Virtual Machine Settings...** again to verify your settings are the same as shown below. Make sure each adapter has the correct VMnet setting. Click **OK** to close the Settings window.



17. Click **Play Virtual Machine** to power it on.
18. Click inside the VMware window with your mouse then press the **Enter** key when prompted to boot the machine immediately. (Note that you can click back outside the window again by pressing **Ctrl-Alt** on your keyboard.)

```
Hit [Enter] to boot immediately, or any other key for command prompt.  
Booting in 1 second... _
```

19. Click **Remind me later** if prompted to install VMware Tools.

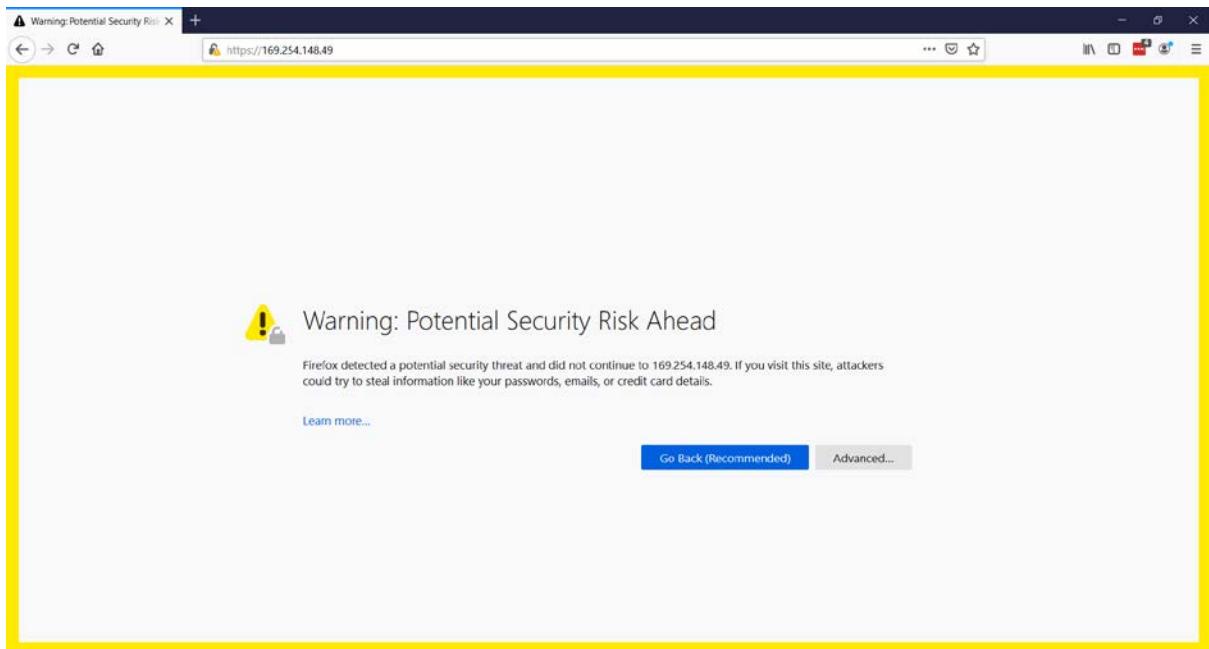


20. You will receive a message that System Initialization has completed successfully, and then the Node Management IP has been assigned. It may take several minutes for the messages to appear.
21. Note the Management IP address which has been automatically assigned. It is 169.254.171.215 in the example below, but your node may have a different address.

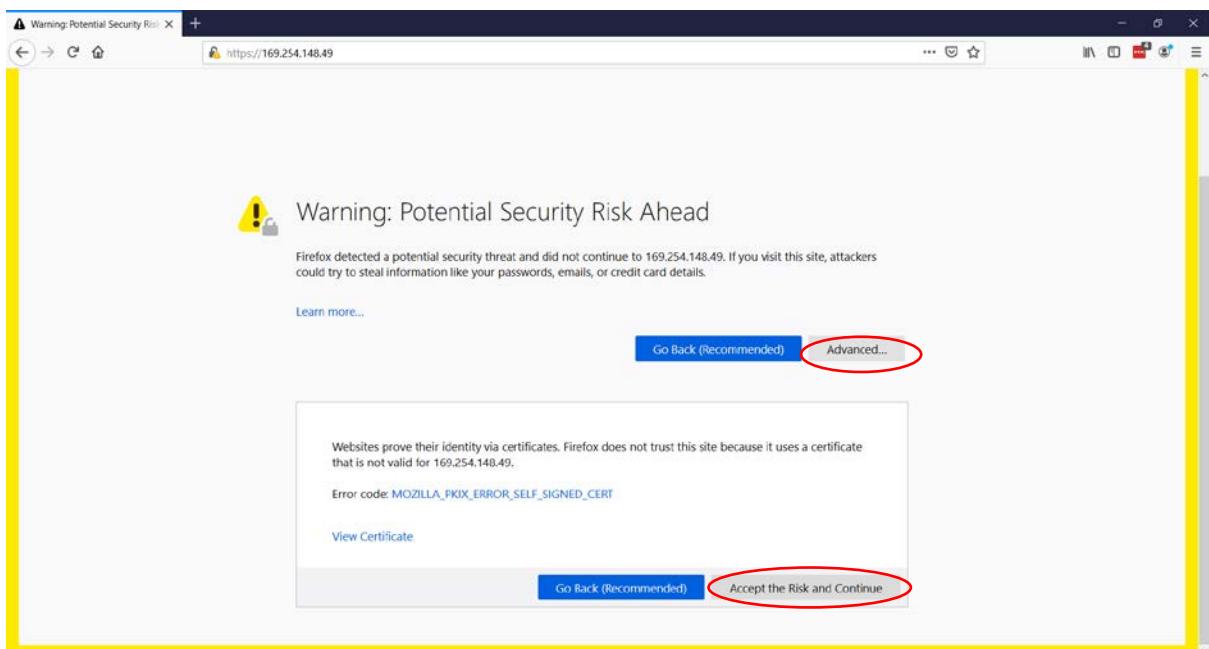
```
Aug 21 00:25:32 [localhost:tapemc.alias.addOK:notice]: Alias st1 automatically added for tape device SNI424207011.
Aug 21 00:25:32 [localhost:tapemc.alias.addOK:notice]: Alias st2 automatically added for tape device SNI424207021.
Aug 21 00:25:32 [localhost:tapemc.alias.addOK:notice]: Alias st3 automatically added for tape device SNI424207031.
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: Registry is being upgraded to improve storing of local changes.
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domain xing interrupt: false
System initialization has completed successfully.
ERROR: missing pmroot_late.tgz file
wrote key file "/tmp/rndc.key"
*****
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.171.215
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP

FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION
BEFORE PROCEEDING WITH CLUSTER SETUP
*****
Fri Aug 21 00:26:43 UTC 2020
login: [REDACTED]
```

22. Open a web browser on your laptop and connect to the Management IP address. Firefox is usually reliable if you have issues with another browser. **Make sure you use https:// (not http://)**



23. You will receive a certificate warning because the cluster uses a Self Signed Certificate which is not trusted by your browser. Bypass the certificate warning. If you're using Firefox, click **Advanced** then **Accept the Risk and Continue**



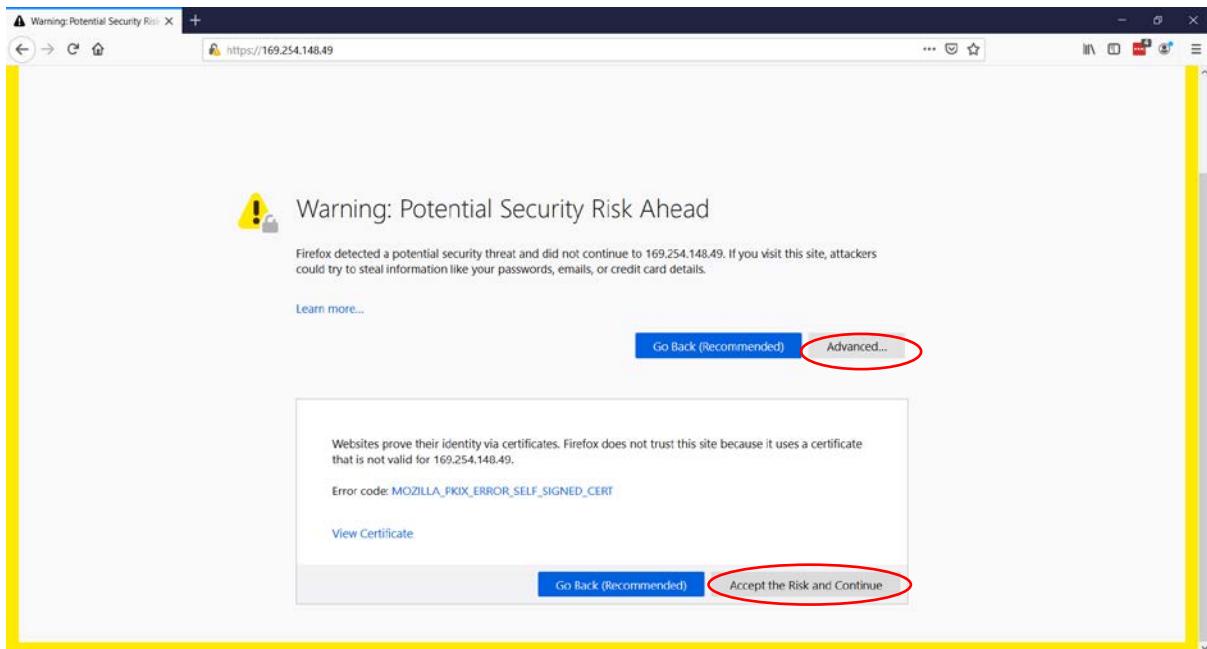
24. System Manager will open. You can ignore the ‘partner details were not found’ error message.

The screenshot shows the ONTAP System Manager interface. On the left, there's a 'Health' section indicating 'One healthy node was found' (SIMBOX). The main area is titled 'Initialize Storage System'. A prominent yellow warning box states: 'The partner node details were not found for the node with the following serial number: 4082368-50-7. If all the nodes were not found, then check the node connections, reload the cluster setup wizard, and then try to set up the cluster again.' Below this, there are fields for 'STORAGE SYSTEM NAME' (Enter cluster name), 'ADMINISTRATIVE PASSWORD' (Enter new password, Confirm password), and 'Networking' settings (CLUSTER IP ADDRESS, SUBNET MASK, GATEWAY).

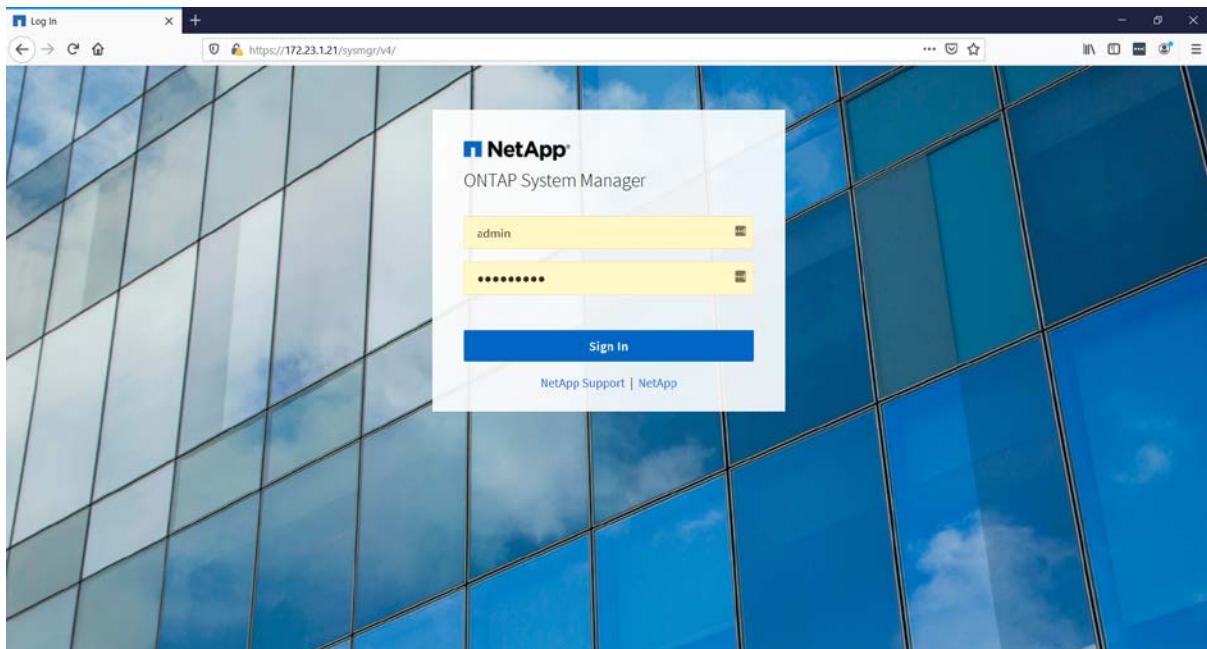
25. If you have any issues with how System Manager displays pages then try a different web browser or Java version on your laptop.
26. Enter these details, leaving the other checkboxes unchecked, then click **Submit**:
- Storage System Name: **cluster2**
Administrative Password: **Flackbox1**
Cluster IP Address: **172.23.1.21**
Subnet Mask: **255.255.255.0**
Gateway: **172.23.1.254**
Node IP Addresses: **172.23.1.22**

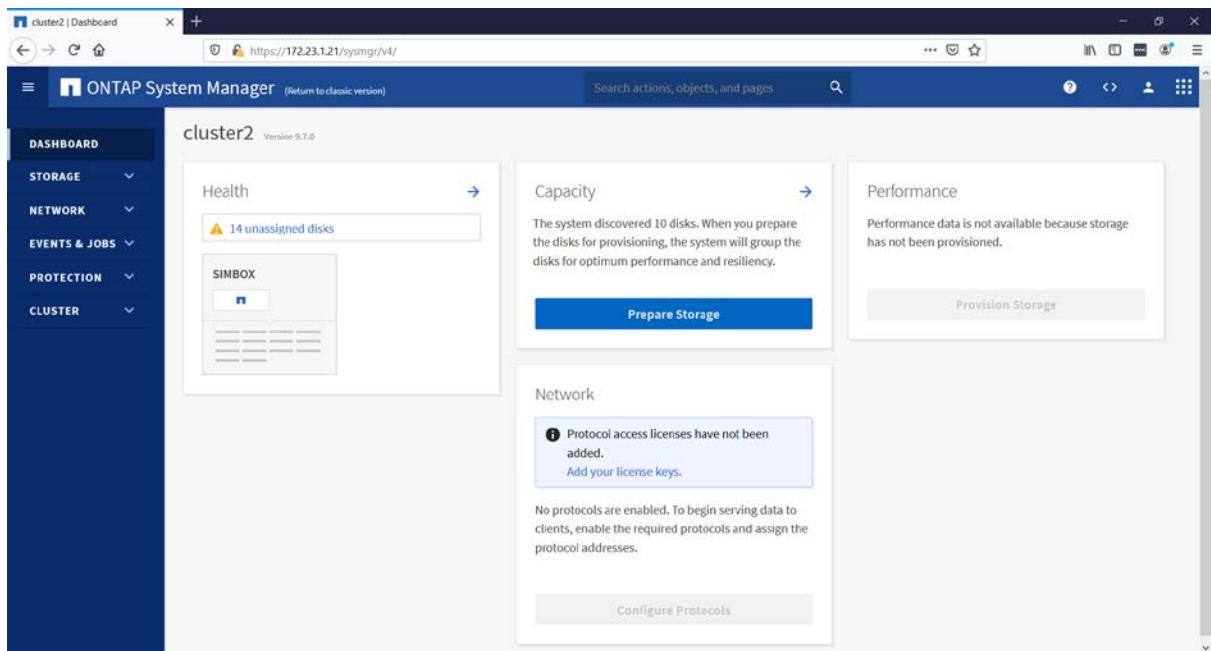
The screenshot shows the 'Initialize Storage System' configuration page. It includes fields for 'STORAGE SYSTEM NAME' (cluster2), 'ADMINISTRATIVE PASSWORD' (*****), and 'NODE SERIAL NUMBERS' (172.23.1.22). Below these, there are sections for 'CLUSTER IP ADDRESS' (172.23.1.21), 'SUBNET MASK' (255.255.255.0), 'GATEWAY' (172.23.1.254), and 'NODE IP ADDRESSES' (172.23.1.22). At the bottom, there is a checkbox for 'Use Domain Name Service (DNS)'.

27. It will take some time for cluster setup to complete. You will receive a certificate warning again. Bypass the certificate warning. If you're using Firefox, click **Advanced** then **Accept the Risk and Continue**



28. Sign in using username **admin** and password **Flackbox1**





29. Back in the VMware Workstation Player window, log in with the username **admin** and the password **Flackbox1**

```
C2N1 - VMware Workstation 15 Player (Non-commercial use only)
```

Player ▾ | || ▾ | ⇤

```
Aug 21 00:25:32 [localhost:tapemc.alias.addOK:notice]: Alias st2 automatically added for tape device SNI[42420702].  
Aug 21 00:25:32 [localhost:tapemc.alias.addOK:notice]: Alias st3 automatically added for tape device SNI[42420703].  
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: Registry is being upgraded to improve storing of local changes.  
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: Registry upgrade successful.  
Aug 21 00:25:32 [localhost:kern.syslog.msg:notice]: domain xing mode: off, domain xing interrupt: false  
System initialization has completed successfully.  
ERROR: missing pmroot_late.tgz file  
wrote key file "/tmp/rndc.key"  
*****  
THE NODE MANAGEMENT IP HAS BEEN ASSIGNED WITH LINK LOCAL IP : 169.254.171.215  
PLEASE REFER TO THE DOCUMENTATION FOR MORE DETAILS ON  
HOW TO LOGIN TO SYSTEM MANAGER FOR CLUSTER SETUP  
*****  
FOR CONFIGURING A 2-NODE CLUSTER PLEASE REFER TO THE DOCUMENTATION  
BEFORE PROCEEDING WITH CLUSTER SETUP  
*****  
Fri Aug 21 00:26:43 UTC 2020  
login: admin  
Password:  
cluster2::>
```

30. We have created cluster2 to add support for replication between clusters to the lab, but all other configuration can be performed using just cluster1. There is no need to add additional disks on cluster2.

Add all existing cluster2 disks to Cluster 2 Node 1 with the command **storage disk assign -all true -node cluster2-01** (if you get an error message it's because the system already auto-assigned the disks, you can ignore it)

```
cluster2::> storage disk assign -all true -node cluster2-01
```

31. There is a limited amount of disk space so we will delete snapshots on the root volume vol0.
32. Enter the command **run local** to enter the local node shell. Notice that the command prompt changes.
33. Enter the command **snap delete -a -f vol0** to force the deletion of any existing snapshots.
34. Enter the command **snap sched vol0 0 0 0** to disable automatic snapshots on the root volume.
35. Enter the command **exit** to return to the cluster shell. The command prompt changes back to the cluster shell prompt.

```
cluster2::> run local
Type 'exit' or 'Ctrl-D' to return to the CLI
cluster2-01> snap delete -a -f vol0
cluster2-01> snap sched vol0 0 0 0
cluster2-01> exit
logout

cluster2::>
```

36. Add a disk to the root aggregate aggr0 with the command **aggr add aggr0_cluster2_01 1**
Enter **y** both times when asked Do you want to continue?

```
cluster2::> aggr add aggr0_cluster2_01 1
Warning: Aggregate "aggr0_cluster1_01" is a root aggregate. Adding disks to the
root aggregate is not recommended. Once added, disks cannot be removed
without reinitializing the node.
Do you want to continue? {y\!n}: y

Info: Disks would be added to aggregate "aggr0_cluster1_01" on node
"cluster1-01" in the following manner:

First Plex

      RAID Group rg0, 4 disks (block checksum, raid_dp)
      Position   Disk                               Type           Usable Size  Physical Size
      -----   -----
      data       NET-1.1                           FCAL          1000MB  1.00GB

Aggregate capacity available for volume use would be increased by 900MB.

Do you want to continue? {y\!n}: y
```

37. Attempt to add the capacity of the additional 1GB disk to vol0 with the command **vol modify -vserver cluster1-01 -volume vol0 -size +1g**

The command will fail with an error message indicating the maximum volume growth (+891MB in the example screenshot below).

```
cluster2::> vol modify -vserver cluster2-01 -volume vol0 -size +1g
Error: command failed: Unable to set volume attribute "size" for volume "vol0"
on Userver "cluster2-01". Reason: Request to grow volume 'vol0' failed
because there is not enough space in the aggregate. Either create 133MB
of free space in the aggregate or select a growth of at most +891MB.
.
cluster2::>
```

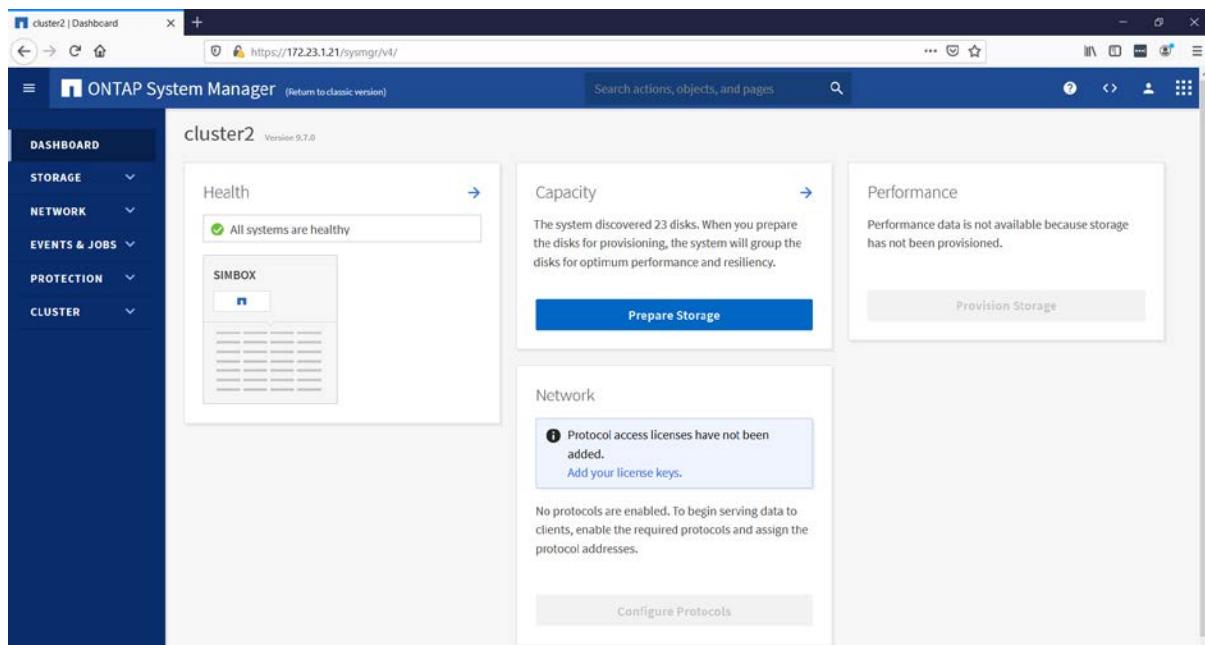
Enter the command **vol modify -vserver cluster2-01 -volume vol0 -size +891MB** to increase the volume size. (You may have a different maximum volume size).

```
cluster2::> vol modify -vserver cluster2-01 -volume vol0 -size +891MB
Volume Modify successful on volume vol0 of Userver cluster2-01.

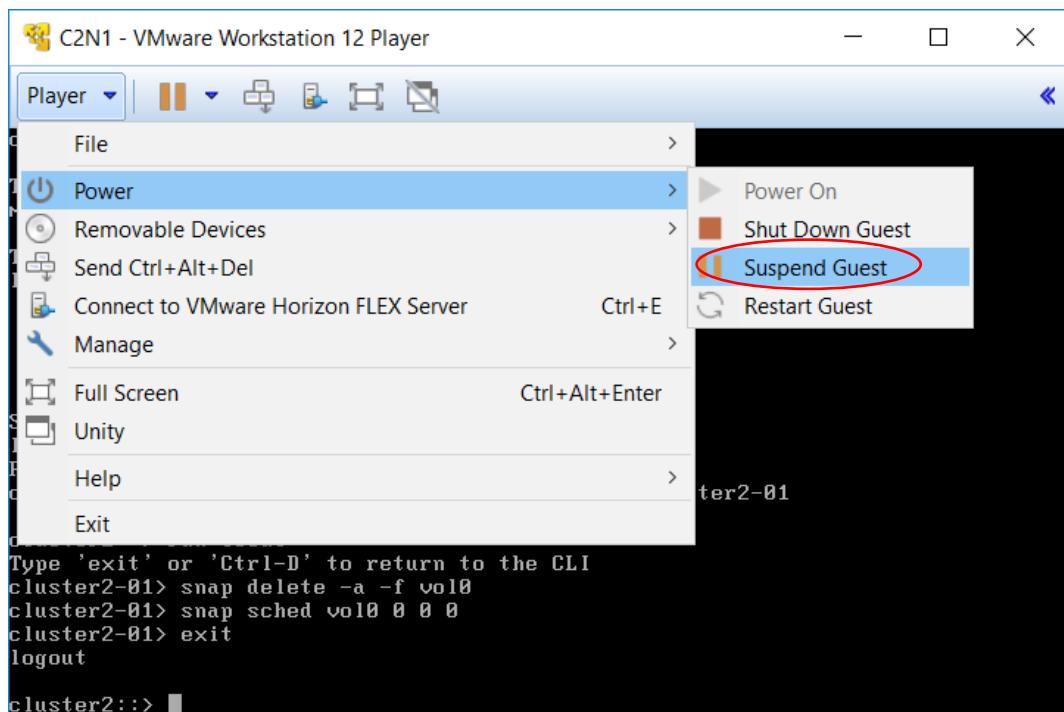
cluster2::>
```

38. Set up of Cluster 2 is now complete.

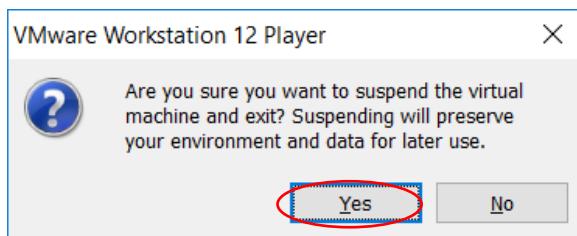
39. To perform administration of Cluster 2 from now on, connect to the cluster management address 172.23.1.21



40. Click **Player > Power > Suspend Guest** to suspend the virtual machine.



41. Click **Yes** when asked to confirm.



42. If you are using VMware Workstation Player you can take a clean backup of the node at this point by copying the C2N1 folder to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)

43. To start the virtual machine later, browse to the 'NetApp Lab\C2N1' folder and run the 'C2N1.vmx' file. You will only need to start this node when you want to practice replication features such as SnapMirror or SnapVault.

Name	Date modified	Type	Size
C2N1.vmsd	10/06/2017 12:10 ...	VMware snapshot ...	0 KB
C2N1.vmx	10/06/2017 1:24 A...	VMX File	4 KB
C2N1.vmxsf	10/06/2017 12:44 ...	VMware Team Me...	1 KB
C2N1-c23760a5.vmem	10/06/2017 12:25 ...	VMEM File	5,242,880 ...
C2N1-c23760a5.vmss	10/06/2017 1:24 A...	VMware suspend...	2,019 KB
C2N1-disk1.vmdk	10/06/2017 1:24 A...	VMware virtual dis...	704 KB
C2N1-disk2.vmdk	10/06/2017 1:24 A...	VMware virtual dis...	1,671,104 ...
C2N1-disk3.vmdk	10/06/2017 1:24 A...	VMware virtual dis...	821,440 KB
C2N1-disk4.vmdk	10/06/2017 1:24 A...	VMware virtual dis...	3,200 KB
nvram	10/06/2017 1:24 A...	File	9 KB
vmware.log	10/06/2017 1:24 A...	Text Document	236 KB

Optional: Upgrade clusters to latest ONTAP version

In this optional section you will upgrade the ONTAP clusters to the latest available software version. You need to have an active license for ONTAP to be able to download the software from the NetApp website. The instructions here show an upgrade of the simulators from ONTAP 9.5 to 9.6 – you can follow the same steps for upgrading between newer versions.

1. Open <https://mysupport.netapp.com/> in your browser
2. Click on the **Sign In** button near the top right of the page.
3. Enter your username and password.
4. Click on the **Downloads** tab and select **Software**

A screenshot of the NetApp Support website's navigation bar. The 'DOWNLOADS' tab is selected, highlighted in blue. Below it, a sidebar menu has 'Software' circled in red, and other options like 'Product Evaluation', 'Firmware', 'System Firmware & Diagnostics', 'Disk Drive & Firmware Matrix', 'RLM Firmware', and 'Disk Shelf Firmware' are listed.

5. In the **ONTAP / Data ONTAP** row in the Software Downloads section, select your controller model and click **Go**. The controller model must support the latest version of ONTAP.

A screenshot of the ONTAP / Data ONTAP software download page. At the top, there is a message: "Downloads are moving to our new Product Pages, check to see if your products have been moved. [Find your product](#)". Below this, a table shows controller models and their status. The 'AFF-A200' row is highlighted with a red circle around the 'View & Download' button. A 'Go!' button is also circled in red.

Products	Subscription Status	View & Download
▶ ONTAP / Data ONTAP	Active/Renewed	AFF-A200 Go!

6. Click **View and Download** on the latest version of ONTAP.

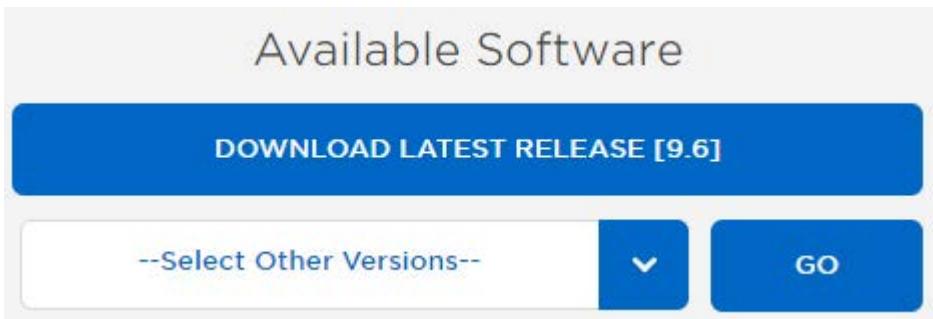
Downloads > Software

ONTAP / Data ONTAP for AFF-A200

A screenshot of the General Availability Releases page for ONTAP 9.6. It lists several versions of ONTAP from 9.6 down to 9.1, each with a 'View & Download' button. The 'View & Download' button for ONTAP 9.6 is circled in red.

General Availability Releases	[Definition]
▶ ONTAP 9.6	View & Download
▶ ONTAP 9.5	View & Download
▶ ONTAP 9.4	View & Download
▶ ONTAP 9.3	View & Download
▶ ONTAP 9.2	View & Download
▶ ONTAP 9.1	View & Download

7. Click Download Latest Release



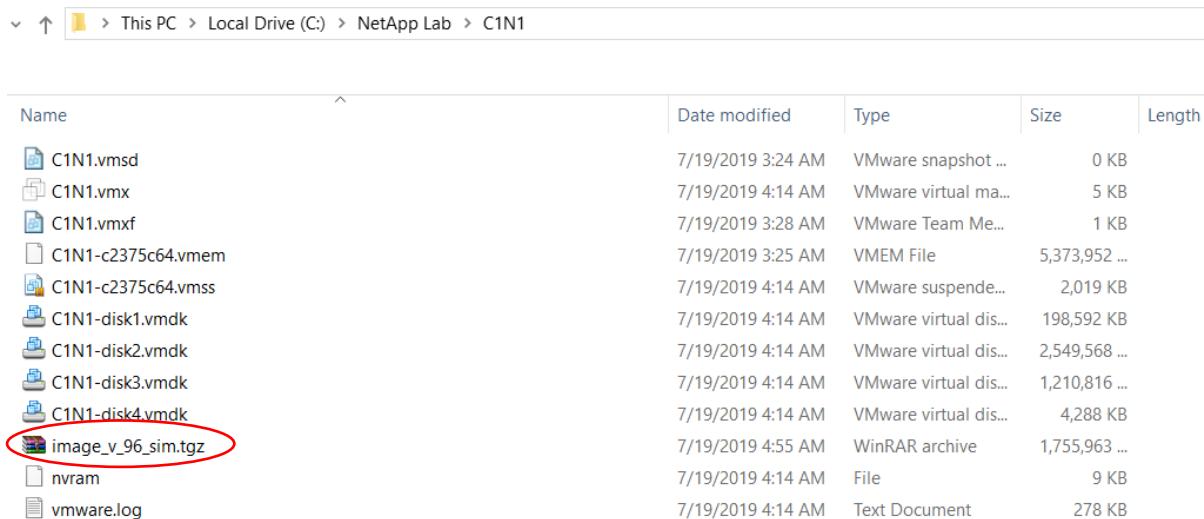
8. Tick I have read the Caution / Must Read and I have read the End User Licensing Agreement then Accept and Continue

The screenshot displays two stacked pages. The top page is titled "Caution/MustRead" and contains a note about filesystem timestamp drift. It features a checkbox labeled "I have read the Caution / Must Read" which is circled in red. The bottom page is titled "End User License Agreement" and lists definitions for various terms. It also features a checkbox labeled "I have read the End User Licensing Agreement" which is circled in red. At the bottom of this page are two buttons: "ACCEPT & CONTINUE" (circled in red) and "BACK".

9. Click Download 9.6 Simulator with NetApp Volume Encryption

The screenshot shows the "ONTAP 9" downloads page. It lists three download options under "Download & Save": 1. "DOWNLOAD 9.6 WITH NETAPP VOLUME ENCRYPTION FOR FAS SYSTEMS [1.65 GB]" (with a "View and Download Checksums" link). 2. "DOWNLOAD 9.6 WITHOUT NETAPP VOLUME ENCRYPTION FOR FAS SYSTEMS [1.65 GB]" (with a "View and Download Checksums" link). 3. "DOWNLOAD 9.6 SIMULATOR WITH NETAPP VOLUME ENCRYPTION [1.67 GB]" (with a "View and Download Checksums" link, this option is circled in red). 4. "DOWNLOAD 9.6 SIMULATOR WITHOUT NETAPP VOLUME ENCRYPTION [1.67 GB]" (with a "View and Download Checksums" link).

10. When the image has finished downloading, move it to the **NetApp Lab\C1N1** folder.
The image will have a name similar to **image_v_96_sim.tgz**.



Name	Date modified	Type	Size	Length
C1N1.vmsd	7/19/2019 3:24 AM	VMware snapshot ...	0 KB	
C1N1.vmx	7/19/2019 4:14 AM	VMware virtual ma...	5 KB	
C1N1.vmxn	7/19/2019 3:28 AM	VMware Team Me...	1 KB	
C1N1-c2375c64.vmem	7/19/2019 3:25 AM	VMEM File	5,373,952 ...	
C1N1-c2375c64.vmss	7/19/2019 4:14 AM	VMware suspende...	2,019 KB	
C1N1-disk1.vmdk	7/19/2019 4:14 AM	VMware virtual dis...	198,592 KB	
C1N1-disk2.vmdk	7/19/2019 4:14 AM	VMware virtual dis...	2,549,568 ...	
C1N1-disk3.vmdk	7/19/2019 4:14 AM	VMware virtual dis...	1,210,816 ...	
C1N1-disk4.vmdk	7/19/2019 4:14 AM	VMware virtual dis...	4,288 KB	
image_v_96_sim.tgz	7/19/2019 4:55 AM	WinRAR archive	1,755,963 ...	
nvram	7/19/2019 4:14 AM	File	9 KB	
vmware.log	7/19/2019 4:14 AM	Text Document	278 KB	

11. Open <http://www.rejetto.com/hfs/?f=dl> in your browser.
12. Click on the Download link to download HFS HTTP File Server.



HFS ~ HTTP FILE SERVER
the other way to share your files

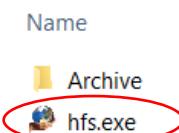
Latest version: **2.3m**
Build #300

Consider even \$2

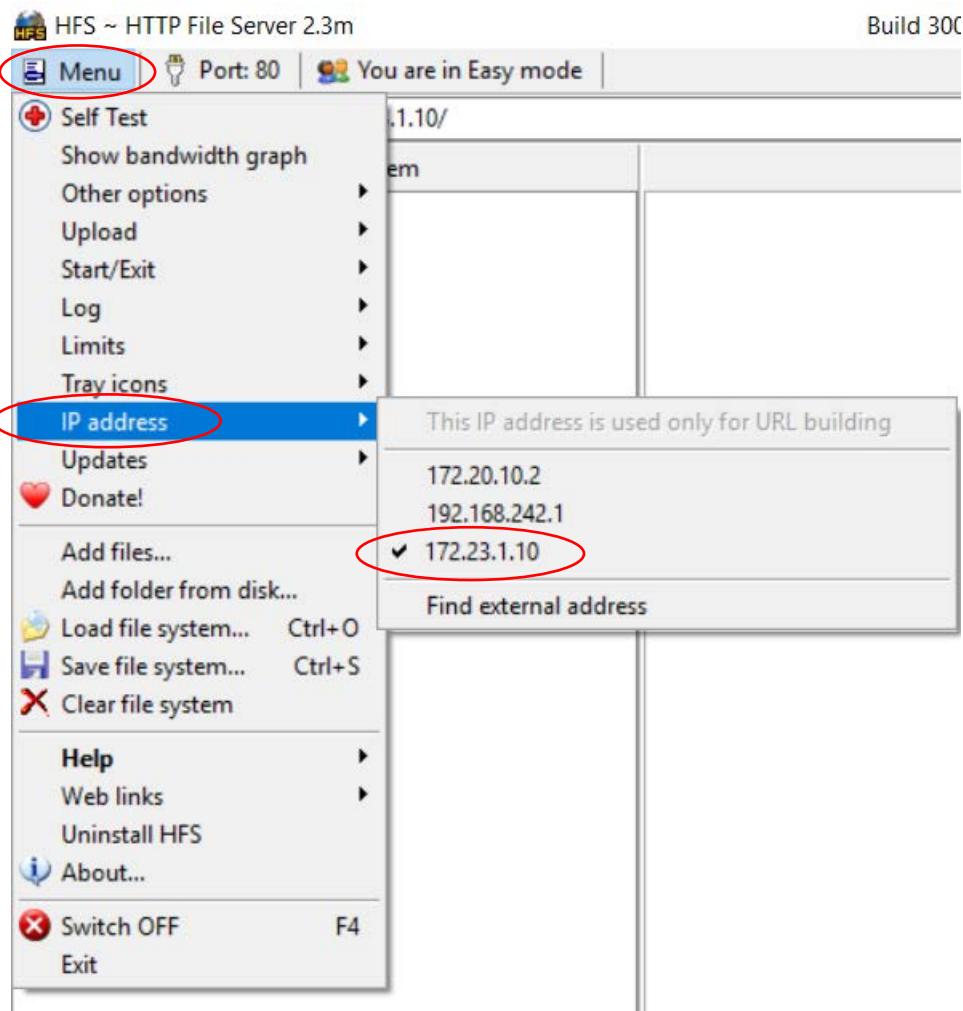
Introduction Screenshots **Download** Awards What's new To-do-list The next one Support



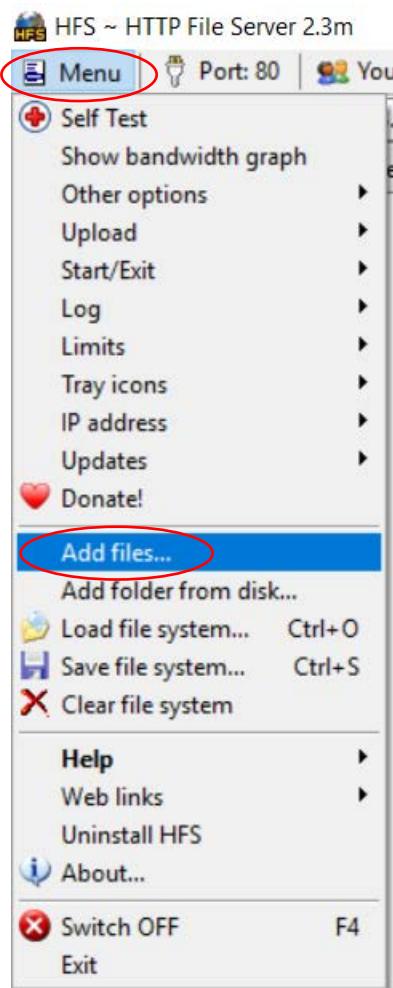
13. Double-click on **hfs.exe** in Windows File Explorer to run it (no install is required).



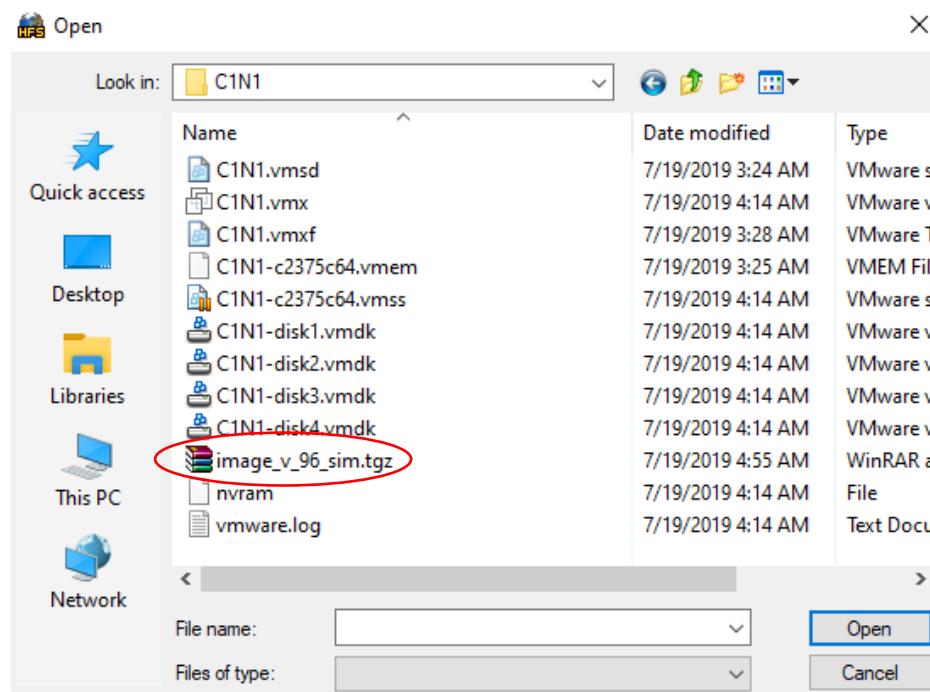
14. Click **Menu > IP address** then select the **172.23.1.10** address which is connected to the lab.



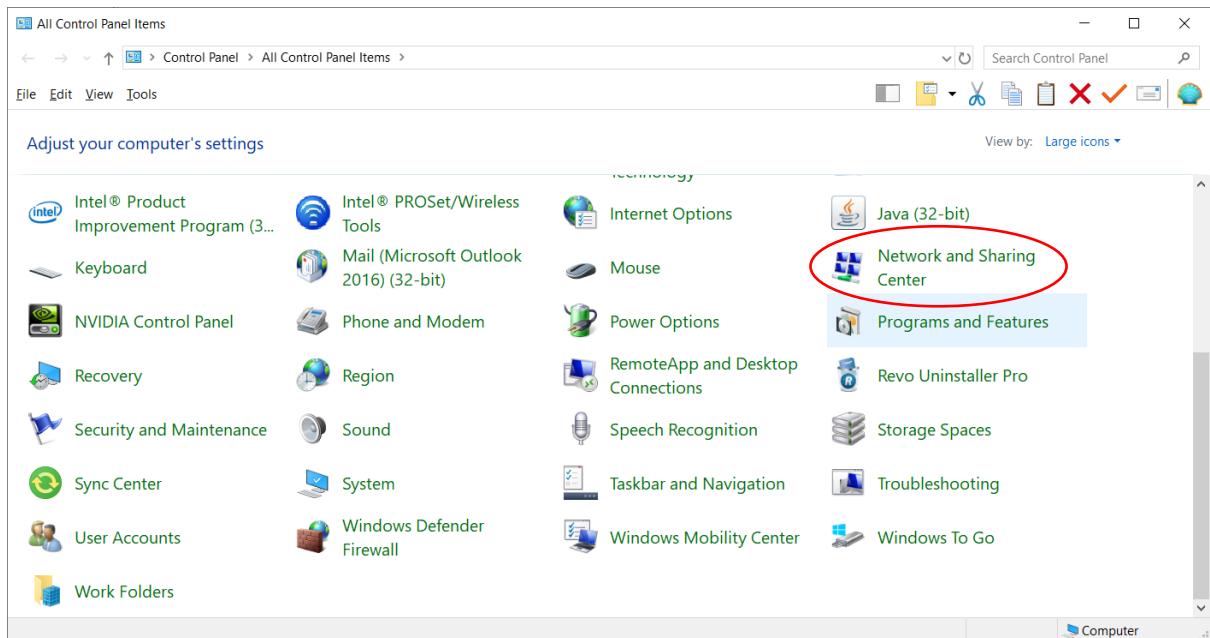
15. Click **Menu > Add files...**



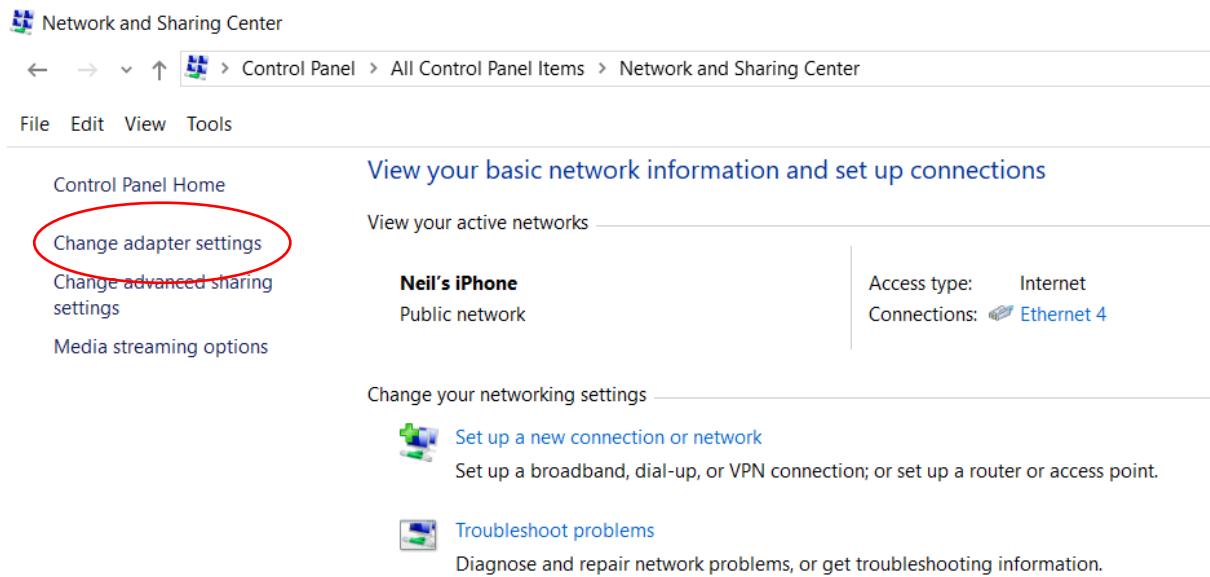
16. Browse to the **NetApp Lab\C1N1** folder and select the ONTAP software image



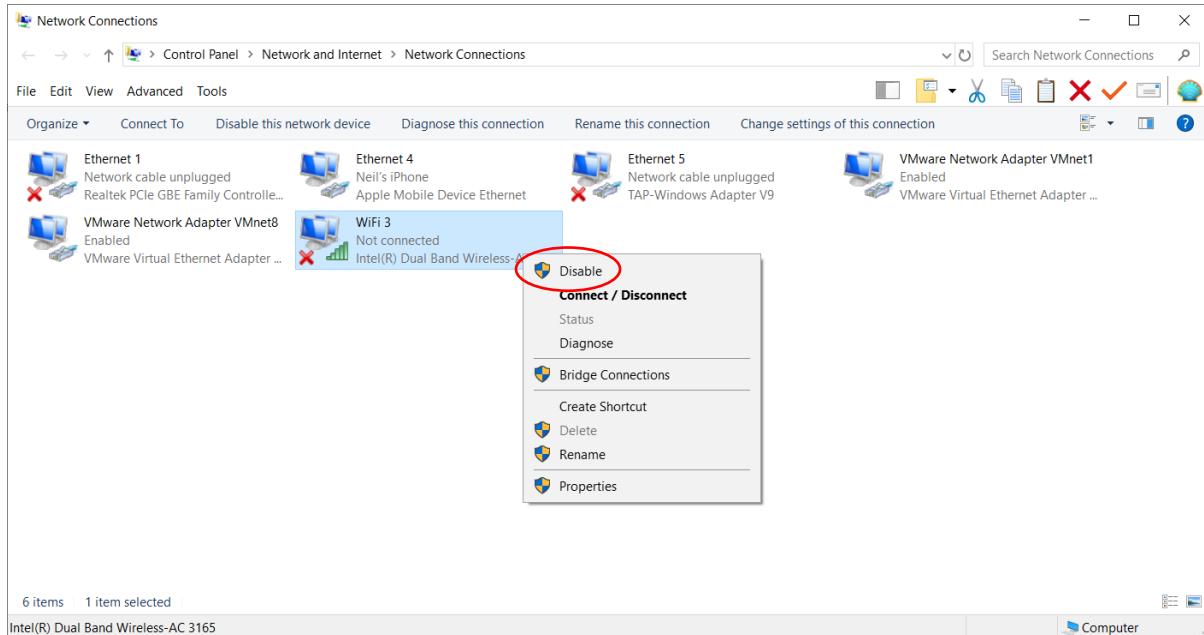
17. We need to disable the Windows firewall to copy the image to the lab, so we'll disable our Internet connection first to be safe. Open Windows **Control Panel** then **Network and Sharing Center**



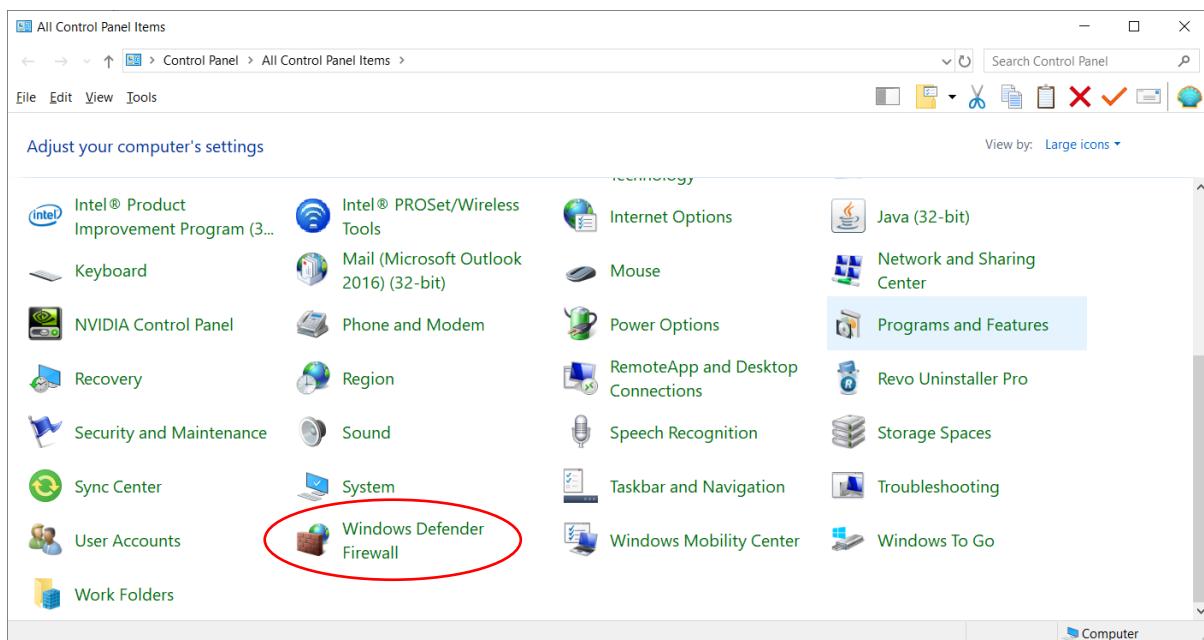
18. Click Change Adapter Settings



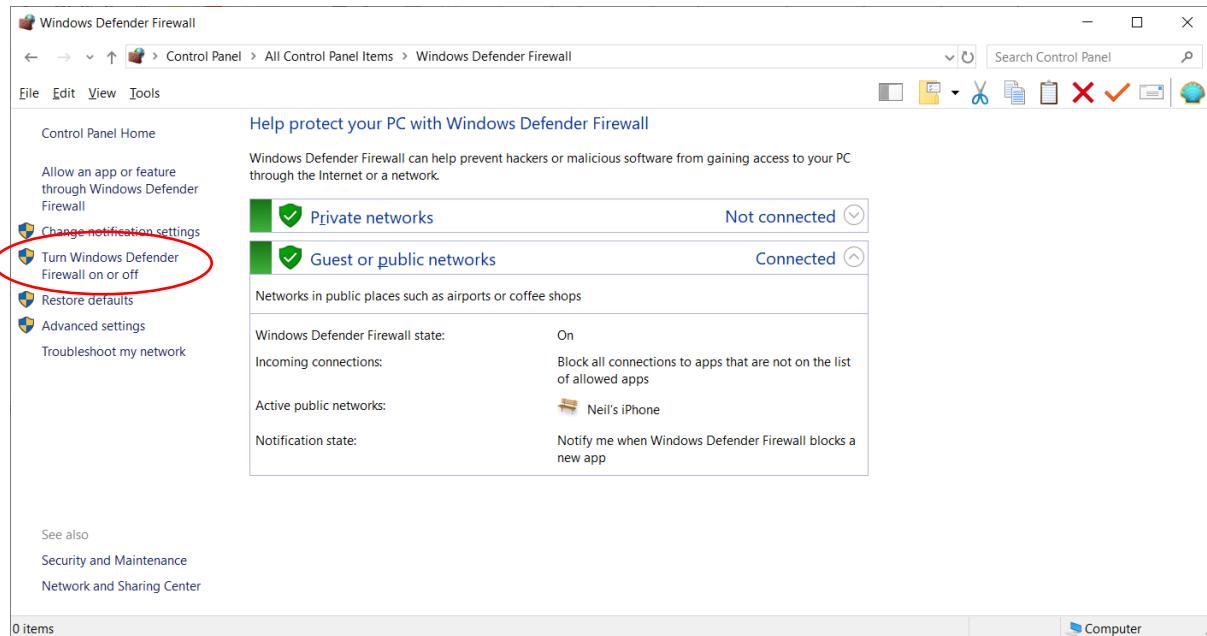
19. Right-click on your network adapter which is connected to the Internet and select **Disable**



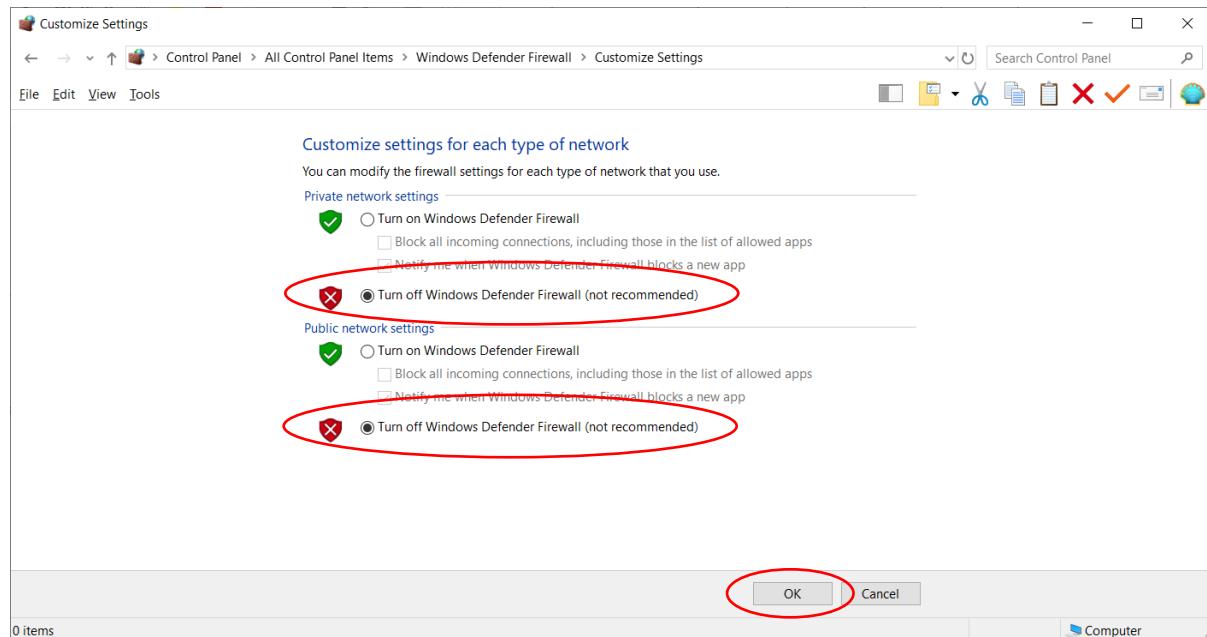
20. Back in Windows Control Panel, select **Windows Defender Firewall**



21. Click Turn Windows Defender Firewall on or off



22. Turn off Windows Defender Firewall under Private Network Settings and Public Network Settings then click OK



23. Turn off any other firewall software which you have installed on your PC

24. Start the **C1N1** and **C1N2** virtual machines.
25. Upgrade the 1st node C1N1 next. Click in the C1N1 virtual machine window and log in with the username **admin** and password **Flackbox1**.
26. Enter the command **system node reboot cluster1-01 -ignore-quorum-warnings**. Enter **y** to confirm and reboot the node. Be ready to hit Ctrl-C when prompted.

```
cluster1::> system node reboot cluster1-01 -ignore-quorum-warnings
Warning: Are you sure you want to reboot node "cluster1-01"?
{y\ln}: y
```

27. Hit **Ctrl-C** when prompted to enter the Boot Menu.
28. Select option **(7) Install new software first** and **y** to continue

```
Please choose one of the following:
(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
Selection (1-9)? 7
This procedure is not supported for Non-Disruptive Upgrade on an HA pair.
The software will be installed to the alternate image, from which the node is
not currently running. Do you want to continue? {y\ln} y
```

29. Enter port **e0c** then **y** to reboot

```
This procedure is not supported for Non-Disruptive Upgrade on an HA pair.
The software will be installed to the alternate image, from which the node is
not currently running. Do you want to continue? {y\ln} y
In order to download the package, a temporary network interface needs to be
configured.

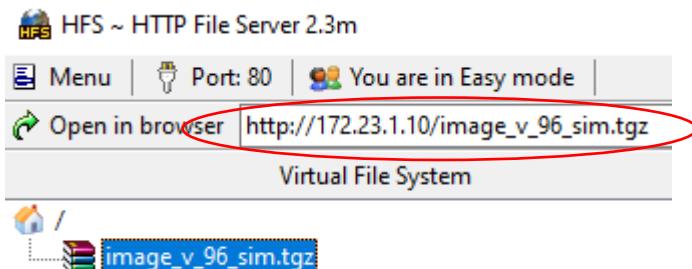
Select the network port you want to use for the download (for example, 'e0a')
[e0c] e0c
The node needs to reboot for this setting to take effect. Reboot now? {y\ln}
(selecting yes will return you automatically to this install wizard) y
```

30. After the node reboots, configure these network settings:
 IP address for port e0c: **172.23.1.12**
 Netmask for port e0c: **255.255.255.0**
 IP address of default gateway: **172.23.1.254**

```
In order to download the package, a temporary network interface needs to be
configured.

Enter the IP address for port e0c: 172.23.1.12
Enter the netmask for port e0c: 255.255.255.0
Enter IP address of default gateway: 172.23.1.254
```

31. Check the URL for the image in HFC, it should be
http://172.23.1.10/image_v_96_sim.tgz or a similar filename.



32. Enter the URL in the C1N1 virtual machine window. Leave the user name blank and hit **Enter**.

```
What is the URL for the package? http://172.23.1.10/image_v_96_sim.tgz
What is the user name on "172.23.1.10", if any? █
```

33. After the new image has copied, enter **y** to use it after a reboot, and **y** again to reboot now.

```
Checking network link... success.
Checking route to host "172.23.1.10"... success.
Attempting to reach 172.23.1.10... success.
Looking up URL "http://172.23.1.10/image_v_96_sim.tgz"... success.
Computed package size is 2056M
Using ramdisk size of 2056M
Downloading package... success.
Checking package contents... success.
Extracting install script from package... success.
Invoking script (validation phase).
INSTALL running in check-only mode: the image will be validated only
Mode of operation is COPY
Current image is image1
Alternate image is image2
█
```

```
Package MD5 checksums pass
Available space on boot device is 731 MB
Required space on boot device is 690 MB
Kernel binary matches install machine type
Invoking script (install phase). This may take up to 20 minutes.
Mode of operation is COPY
Current image is image1
Alternate image is image2
Available space on boot device is 731 MB
Required space on boot device is 690 MB
Kernel binary matches install machine type
Getting ready to install image
Directory /cfcard/x86_64/freebsd/image2 created
Syncing device...
Extracting to /cfcard/x86_64/freebsd/image2...
Installed MD5 checksums pass
Installing diagnostic and firmware files
Firmware MD5 checksums pass
Installation complete.

Do you want to set the newly installed software as the default to be used for
subsequent reboots? {y\!n} y
The node must be rebooted to start using the newly installed software. Do you
want to reboot now? {y\!n} y█
```

34. After the system has rebooted, log in with username **admin** and password **Flackbox1**.

```
*****
** SYSTEM MESSAGES **
*****  
  
The upgrade of this node is in progress or not completed. The ability to provide  
data service to clients is not affected while the upgrade completes. You can  
check on the status of the upgrade by running "system node upgrade-revert show"  
in advanced privilege mode. The status for this node should be listed as  
'complete'. If the upgrade has stopped, you can restart the upgrade by running  
"system node upgrade-revert upgrade" in advanced privilege mode. If this command  
does not complete the node's upgrade, contact technical support immediately. The  
node will be ready for management operations once the upgrade is completed  
successfully.  
  
Warning: The cluster is in a mixed version state. Update all of the nodes to the  
same version as soon as possible.  
  
cluster1::> ■
```

35. Enter advanced mode by entering the command **set advanced** then **y** to confirm.

```
cluster1::> set advanced  
  
Warning: These advanced commands are potentially dangerous; use them only when  
directed to do so by NetApp personnel.  
Do you want to continue? {y\!n}: y
```

36. Check the upgrade with the **system node upgrade-revert show** command. You should see 'upgrade successful'.

```
cluster1::*> system node upgrade-revert show  
  
Node: cluster1-01 Status: complete  
  
Status Message: The upgrade is complete.  
  
Vers Phase Status Upgrade Phase Status Message  
--- ---  
1000 pre-root applied No upgrade is required for this phase.  
1000 pre-apps applied Upgrade successful.  
1000 post-apps applied Upgrade successful  
3 entries were displayed.
```

37. Reboot the system again with the command **system node reboot cluster1-01 -ignore-quorum-warnings**.
38. After the system has rebooted, log in with username **admin** and password **Flackbox1**.

39. Upgrade the 2nd node C1N2 next. Log in to C1N2 with username **admin** and password **Flackbox1**.
40. Enter the command **system node reboot cluster1-02 -ignore-quorum-warnings**. Enter **y** to confirm and reboot the node. Be ready to hit Ctrl-C when prompted.

```
cluster1::> system node reboot cluster1-02 -ignore-quorum-warnings
Warning: Are you sure you want to reboot node "cluster1-02"?
{y\!n}: y█
```

41. Hit **Ctrl-C** when prompted to enter the Boot Menu.
42. Select option **(7) Install new software first** and **y** to continue

```
Please choose one of the following:

(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance Mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
(9) Configure Advanced Drive Partitioning.
Selection (1-9)? 7

This procedure is not supported for Non-Disruptive Upgrade on an HA pair.
The software will be installed to the alternate image, from which the node is
not currently running. Do you want to continue? {y\!n} y█
```

43. Enter port **e0c** then **y** to reboot

```
This procedure is not supported for Non-Disruptive Upgrade on an HA pair.
The software will be installed to the alternate image, from which the node is
not currently running. Do you want to continue? {y\!n} y

In order to download the package, a temporary network interface needs to be
configured.

Select the network port you want to use for the download (for example, 'e0a')
[e0c] e0c

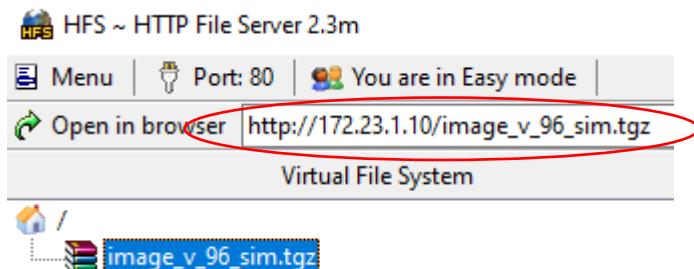
The node needs to reboot for this setting to take effect. Reboot now? {y\!n}
(selecting yes will return you automatically to this install wizard) y█
```

44. After the node reboots, configure these network settings:
 IP address for port e0c: **172.23.1.13**
 Netmask for port e0c: **255.255.255.0**
 IP address of default gateway: **172.23.1.254**

```
In order to download the package, a temporary network interface needs to be
configured.

Enter the IP address for port e0c: 172.23.1.13
Enter the netmask for port e0c: 255.255.255.0
Enter IP address of default gateway: 172.23.1.254█
```

45. Check the URL for the image in HFC, it should be
http://172.23.1.10/image_v_96_sim.tgz or a similar filename.



46. Enter the URL in the C1N2 virtual machine window. Leave the user name blank and hit **Enter**.

```
What is the URL for the package? http://172.23.1.10/image_v_96_sim.tgz
What is the user name on "172.23.1.10", if any? █
```

47. After the new image has copied, enter **y** to use it after a reboot, and **y** again to reboot now.

```
Checking network link... success.
Checking route to host "172.23.1.10"... success.
Attempting to reach 172.23.1.10... success.
Looking up URL "http://172.23.1.10/image_v_96_sim.tgz"... success.
Computed package size is 2056M
Using ramdisk size of 2056M
Downloading package... success.
Checking package contents... success.
Extracting install script from package... success.
Invoking script (validation phase).
INSTALL running in check-only mode: the image will be validated only
Mode of operation is COPY
Current image is image1
Alternate image is image2
█
```

```
Package MD5 checksums pass
Available space on boot device is 731 MB
Required space on boot device is 690 MB
Kernel binary matches install machine type
Invoking script (install phase). This may take up to 20 minutes.
Mode of operation is COPY
Current image is image1
Alternate image is image2
Available space on boot device is 731 MB
Required space on boot device is 690 MB
Kernel binary matches install machine type
Getting ready to install image
Directory /cfcard/x86_64/freebsd/image2 created
Syncing device...
Extracting to /cfcard/x86_64/freebsd/image2...
Installed MD5 checksums pass
Installing diagnostic and firmware files
Firmware MD5 checksums pass
Installation complete.

Do you want to set the newly installed software as the default to be used for
subsequent reboots? {y\!n} y
The node must be rebooted to start using the newly installed software. Do you
want to reboot now? {y\!n} y█
```

48. After the system has rebooted, log in with username **admin** and password **Flackbox1**.
 49. Enter advanced mode by entering the command **set advanced** then **y** to confirm.

```
cluster1::> set advanced

Warning: These advanced commands are potentially dangerous; use them only when
         directed to do so by NetApp personnel.

Do you want to continue? {y\!n}: y
```

50. Check the upgrade with the **system node upgrade-revert show** command. You should see 'upgrade successful'.

```
cluster1::*> system node upgrade-revert show

Node: cluster1-01                               Status: complete

Status Message: The upgrade is complete.

Vers Phase      Status     Upgrade Phase Status Message
----- -----
1000 pre-root    applied    No upgrade is required for this phase.
1000 pre-apps   applied    Upgrade successful.
1000 post-apps  applied    Upgrade successful.

Node: cluster1-02                               Status: complete

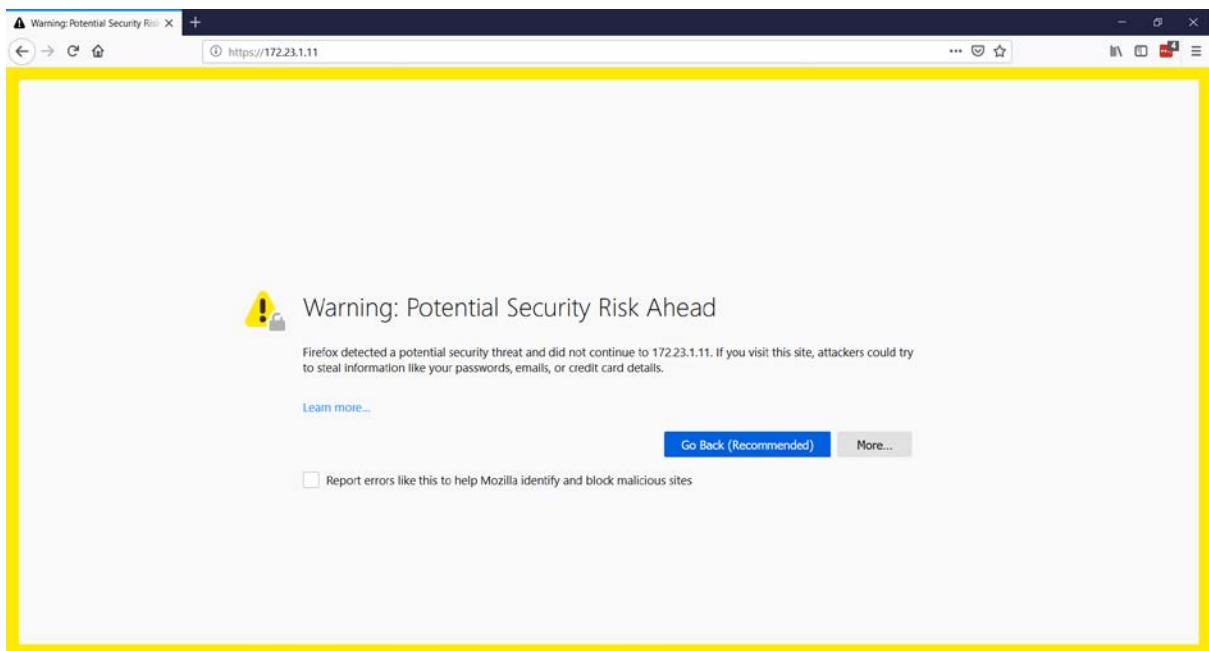
Status Message: The upgrade is complete.

Vers Phase      Status     Upgrade Phase Status Message
----- -----
1000 pre-root    applied    No upgrade is required for this phase.
1000 pre-apps   applied    Upgrade successful.
1000 post-apps  applied    Upgrade successful.

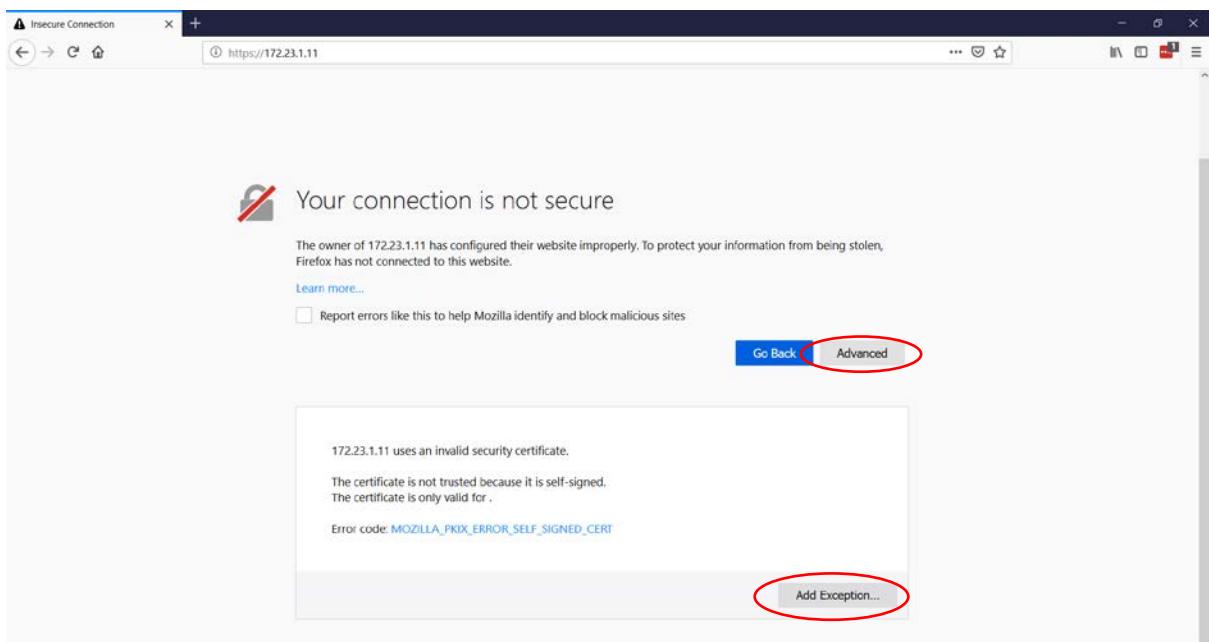
6 entries were displayed.
```

51. Reboot the system again with the command **system node reboot cluster1-02 -ignore-quorum-warnings**.
 52. After the system has rebooted, log in with username **admin** and password **Flackbox1**.

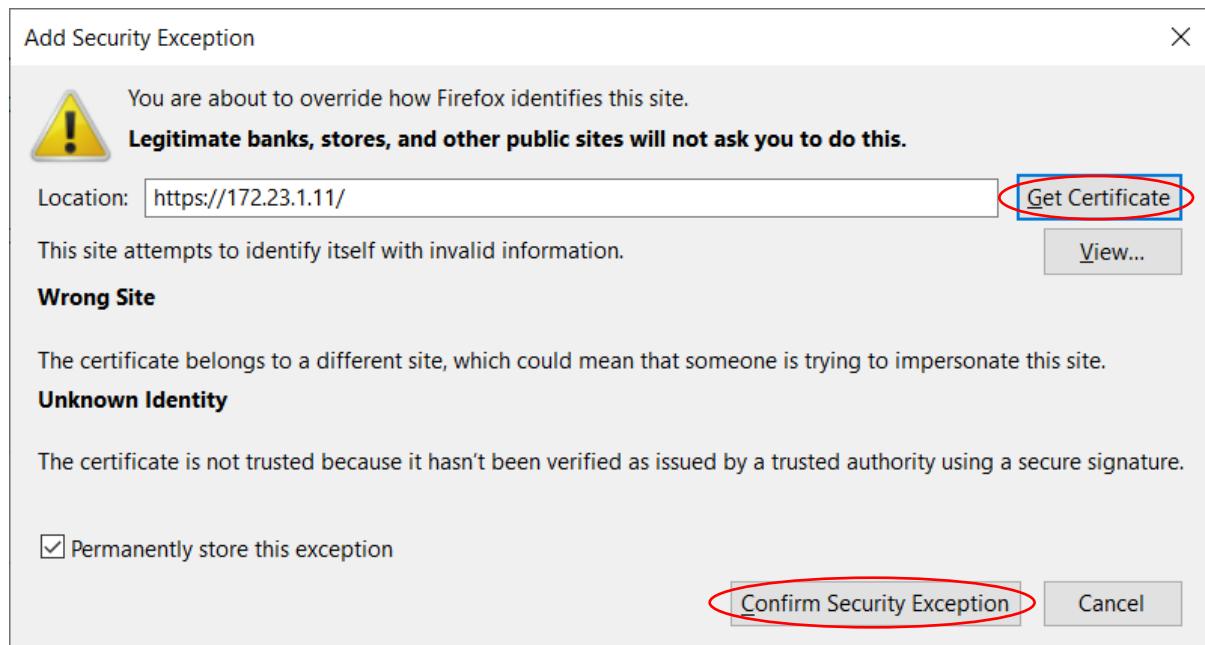
53. After the upgrade has completed, open a web browser on your laptop and connect to the cluster management address at <https://172.23.1.11>. Firefox is usually reliable if you have issues with another browser. **Make sure you use https:// (not http://)**



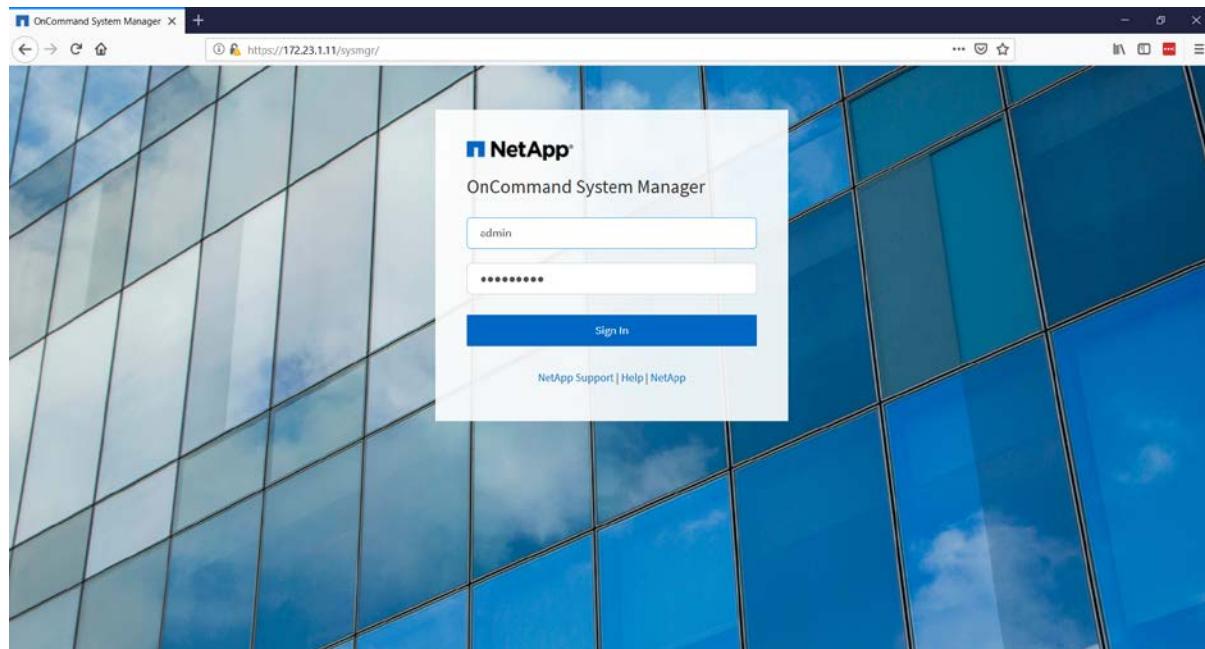
54. You will receive a certificate warning because the cluster uses a Self Signed Certificate which is not trusted by your browser.
55. Bypass the certificate warning in your browser. If you're using Firefox, click **Advanced** then **Add Exception...**



56. Click **Get Certificate** then **Confirm Security Exception**.



57. Log in to System Manager with the username **admin** and the password **Flackbox1**



58. The System Manager dashboard will open and you are ready to configure the first cluster

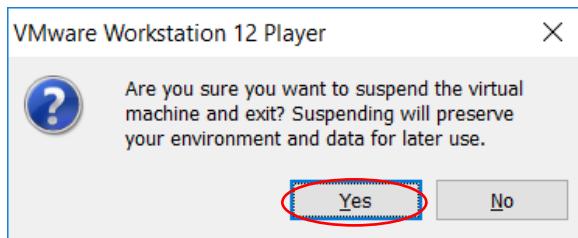
The screenshot shows the OnCommand System Manager interface for cluster1. The left sidebar includes options like Dashboard, Applications & Tiers, Storage, Network, Protection, Events & Jobs, and Configuration. The main dashboard features four panels: 'Alerts and Notifications' (1 Emergency EMS Events), 'Health Overview' (Capacity, Efficiency, Protection tabs, showing savings from storage efficiency), 'Nodes' (2 Nodes: cluster1-01, cluster1-02, both labeled as SIMBOX), and 'Applications and Objects' (Top 5 Applications by Capacity: Applications are not provisioned). On the right, there are three performance graphs: Latency (ms/op), IOPS (ops/s), and Throughput (MB/s).

59. On both C1N1 and C1N2, click **Player > Power > Suspend Guest** to suspend the virtual machines. Suspend both nodes immediately one after the other.

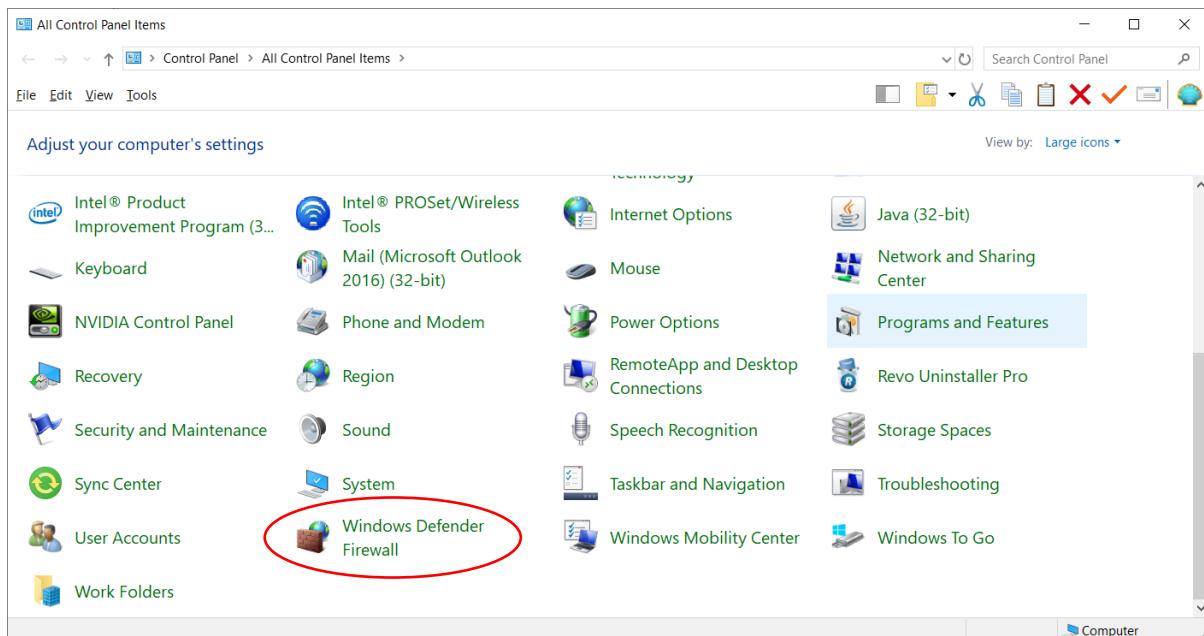
The screenshot shows the VMware Workstation Player interface. The 'Player' menu is open, and the 'Power' option is selected. A submenu is displayed with four items: 'Power On', 'Shut Down Guest', 'Suspend Guest' (which is highlighted with a red oval), and 'Restart Guest'. To the right of the menu, a terminal window shows a list of VMs and their status. At the bottom, it says '7 entries were displayed.'

Name	Status	IP Address	Is Home
cluster1-01	up/up	172.23.1.12/24	true
cluster1-01	up/up	172.23.1.13/24	true
cluster1-02	up/up	172.23.1.11/24	true
cluster1-02	up/up	172.23.1.12/24	true
cluster1-01	up/up	172.23.1.13/24	true
cluster1-02	up/up	172.23.1.11/24	true
cluster1-01	up/up	172.23.1.12/24	true

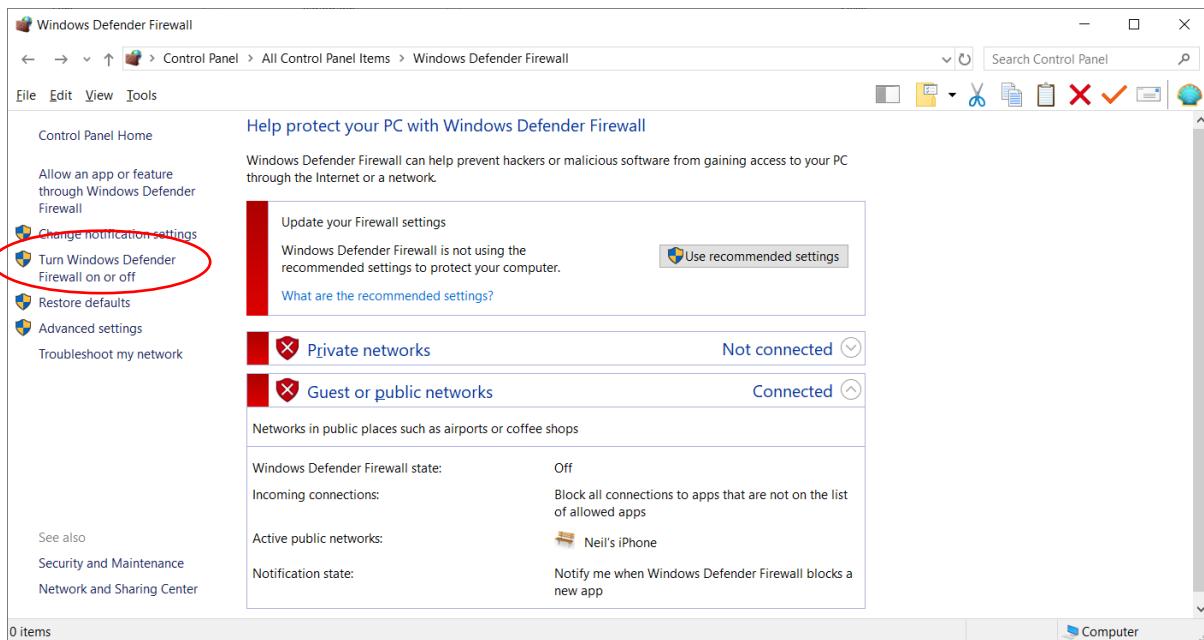
60. Click **Yes** when asked to confirm.



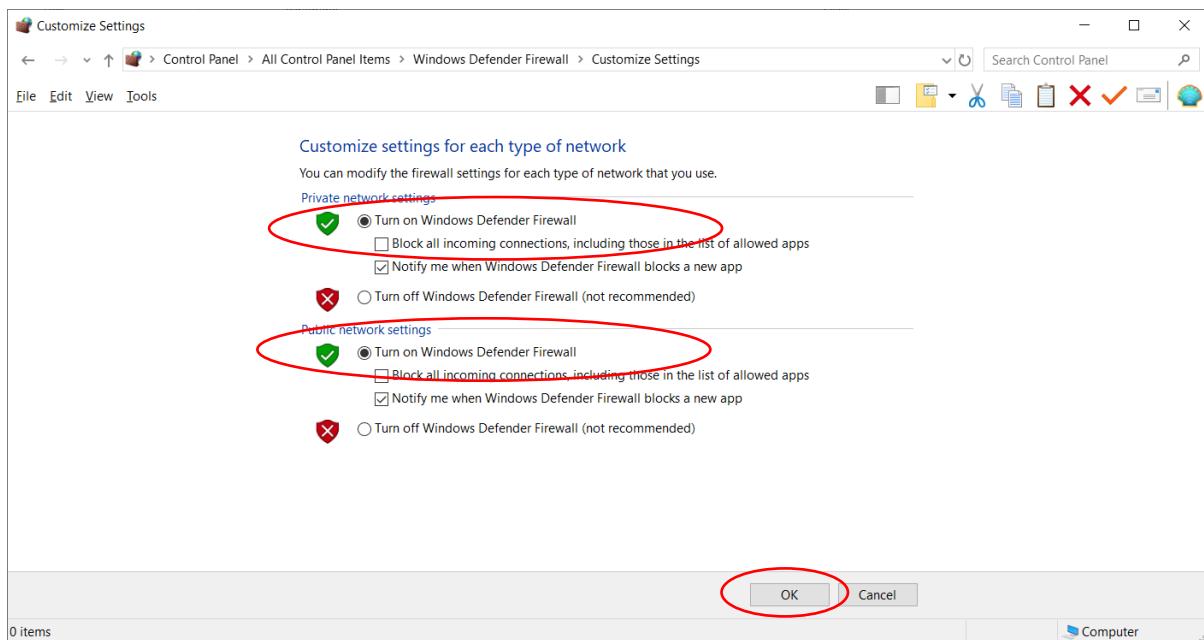
61. Set up of Cluster 1 is now complete. If you are using VMware Workstation Player it is a good idea to take a clean backup of the nodes at this point by copying the C1N1 and C1N2 folders to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)
62. Repeat the procedure to upgrade the 2nd cluster.
To reboot: **system node reboot cluster2-01 -ignore-quorum-warnings**
IP address to use for port e0c during upgrade: **172.23.1.22**
All other settings are the same.
63. We can re-enable the firewall and Internet connection now.
64. In Windows **Control Panel**, select **Windows Defender Firewall**



65. Click Turn Windows Defender Firewall on or off

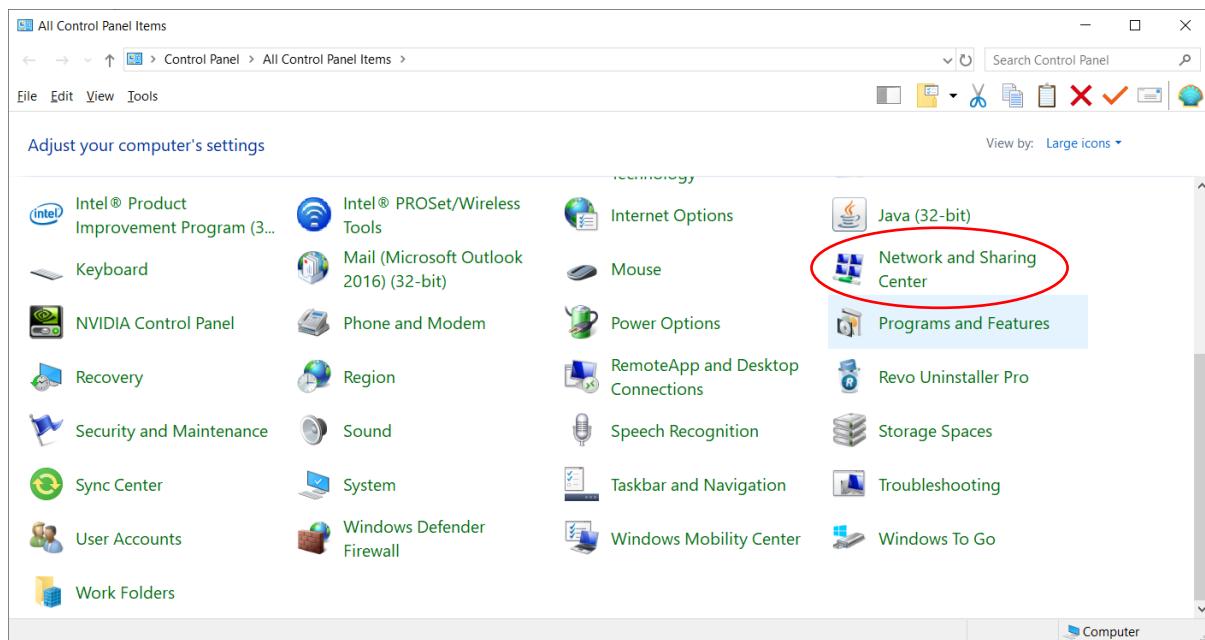


66. Turn on Windows Defender Firewall under Private Network Settings and Public Network Settings then click OK

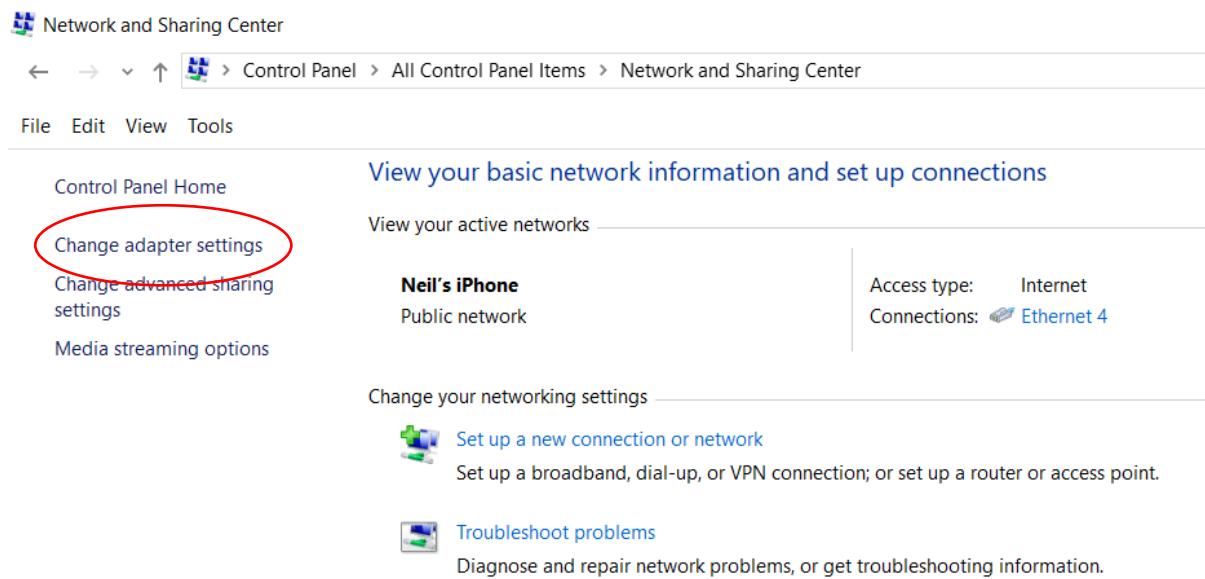


67. Turn on any other firewall software which you have installed on your PC

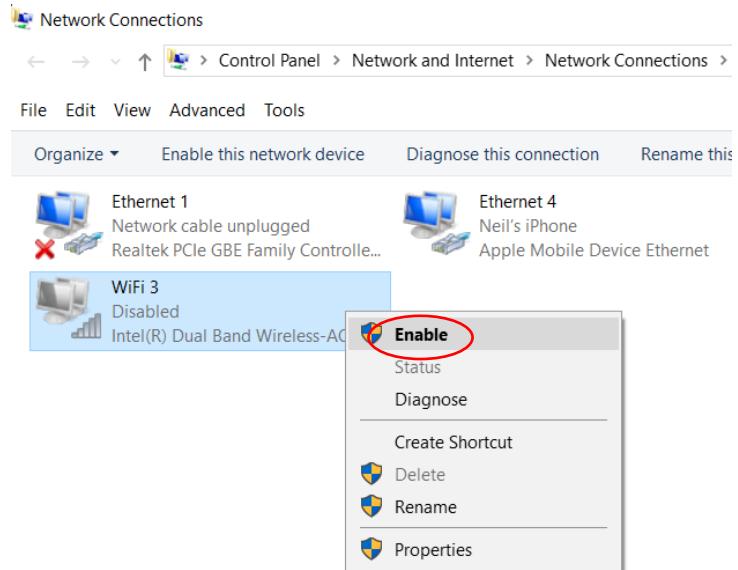
68. Open Windows Control Panel then Network and Sharing Center



69. Click Change Adapter Settings



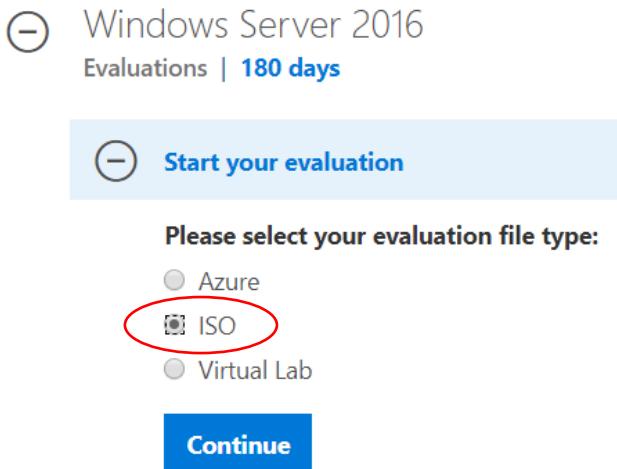
70. Right-click on your network adapter which is connected to the Internet and select **Enable**



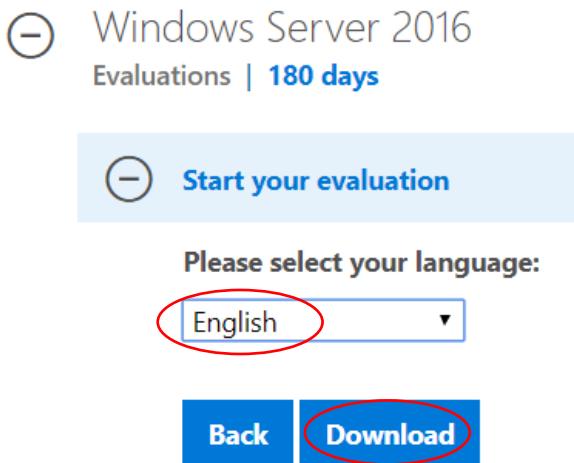
Windows Server Build

In this section you will build the Windows servers for Department A and Department B.

1. Open the Windows Server 2016 evaluation page at <https://www.microsoft.com/en-us/evalcenter/evaluate-windows-server-2016> in your browser
2. Choose **ISO** as the File Type and click Continue

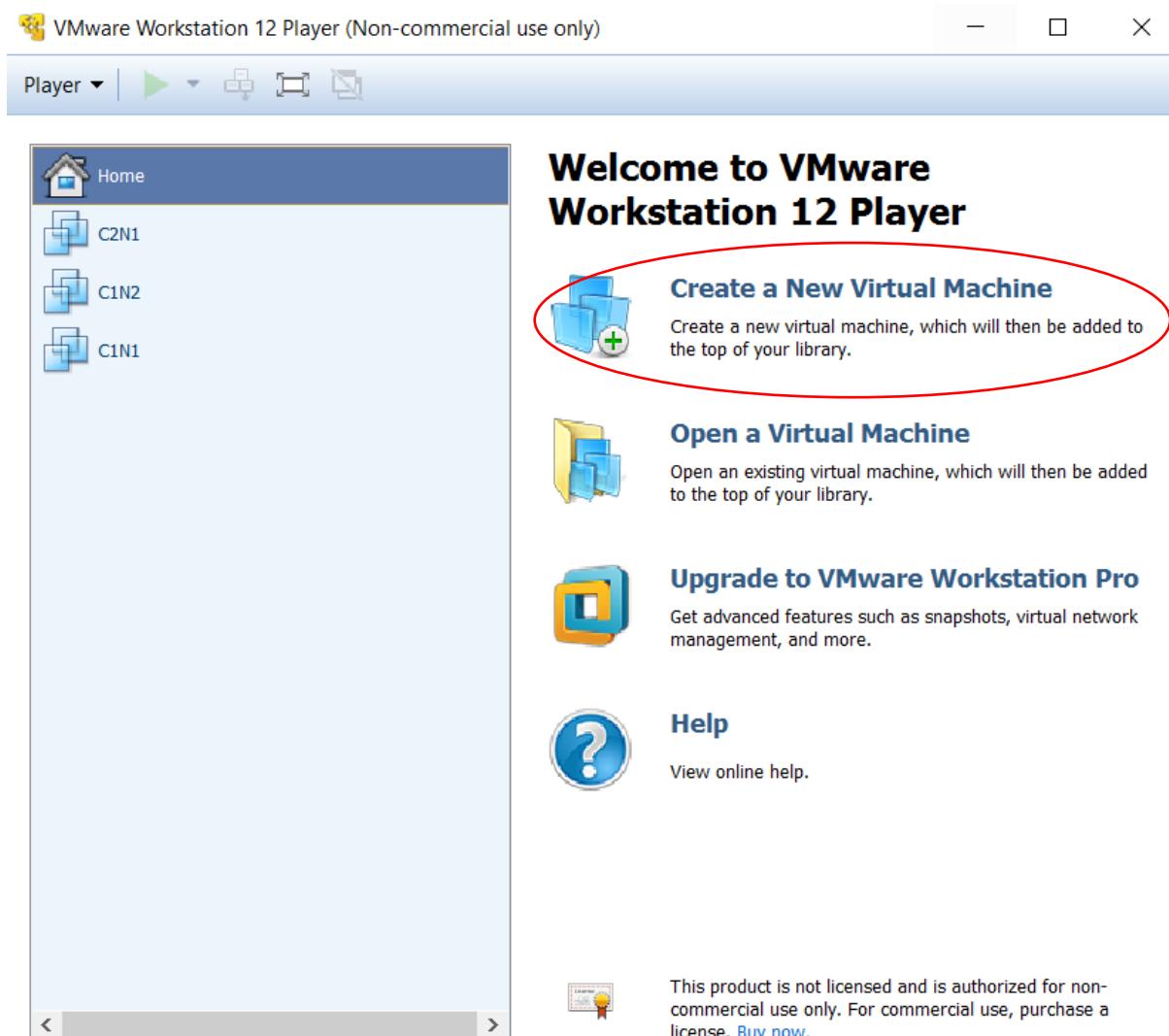


3. Fill in the registration form with your details and select Continue
4. Select your language and click **Download**. The ISO file will then download. Be patient as it is over 6GB in size.

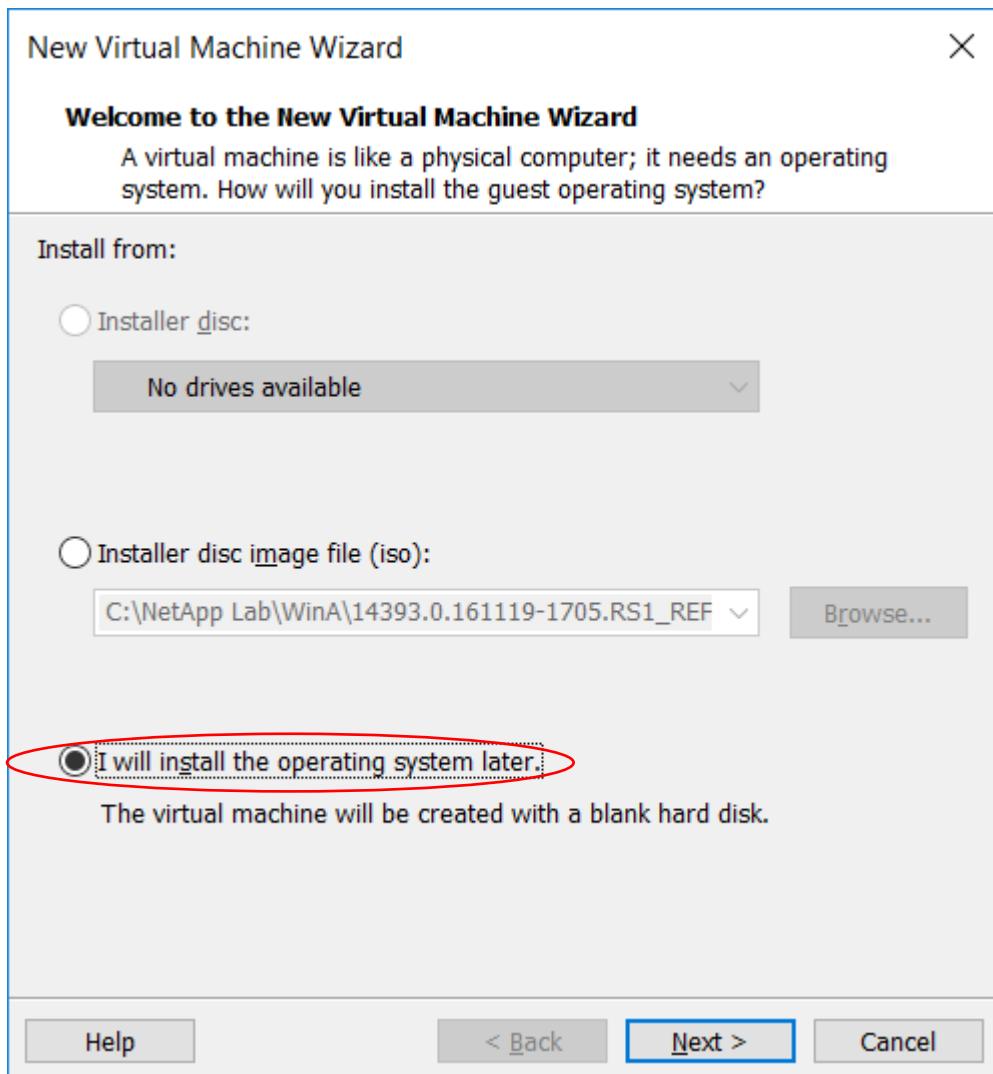


5. Open Windows Explorer and browse to the folder you created earlier on your laptop named **NetApp Lab**.
6. In the NetApp Lab folder, make a subfolder named **WinA**. We will create the Windows Server in here.
7. Find the Windows Server ISO file you downloaded from the Microsoft website and move it into the **WinA** folder. It will have a name similar to **14393.0.161119-1705.RS1_REFRESH_SERVER_EVAL_X64FRE_EN-US.ISO**

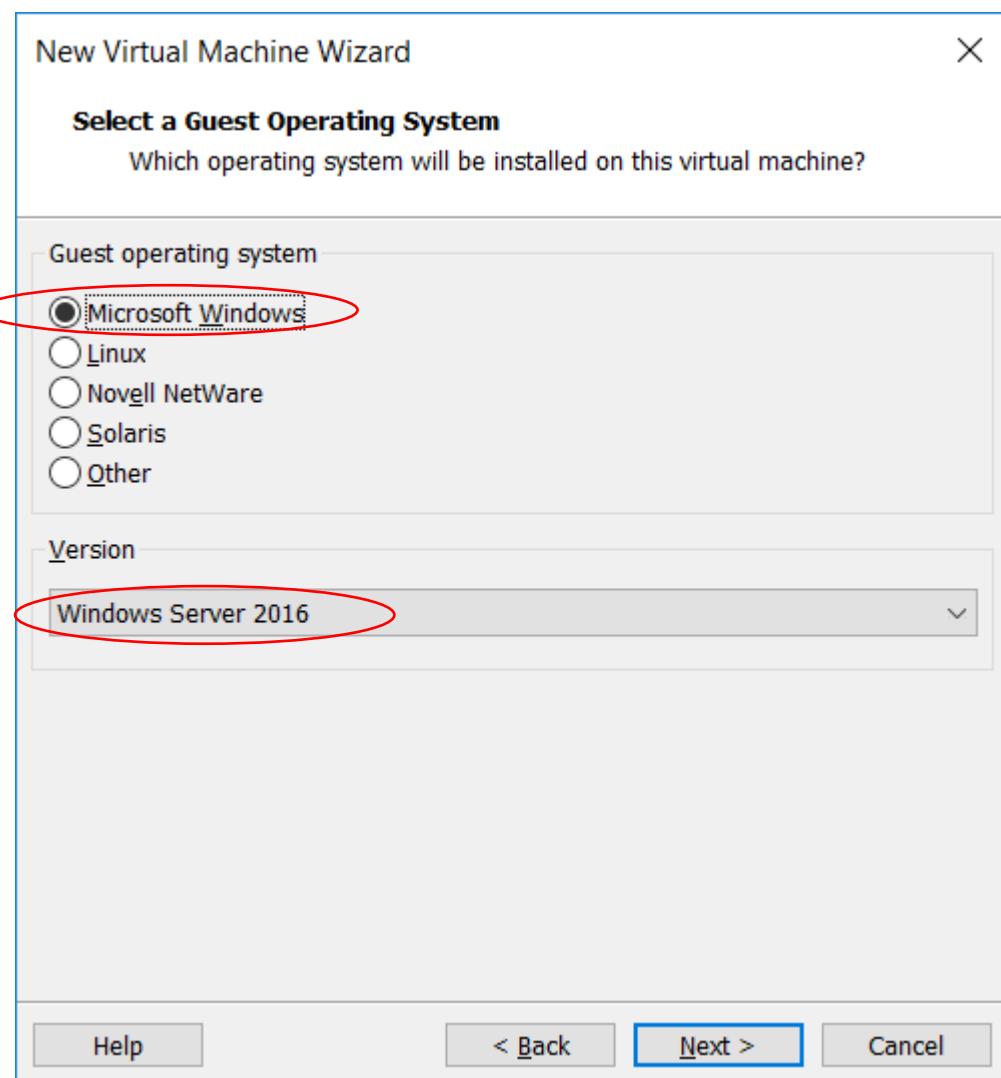
8. Open VMware Player
9. Click **Create a New Virtual Machine**



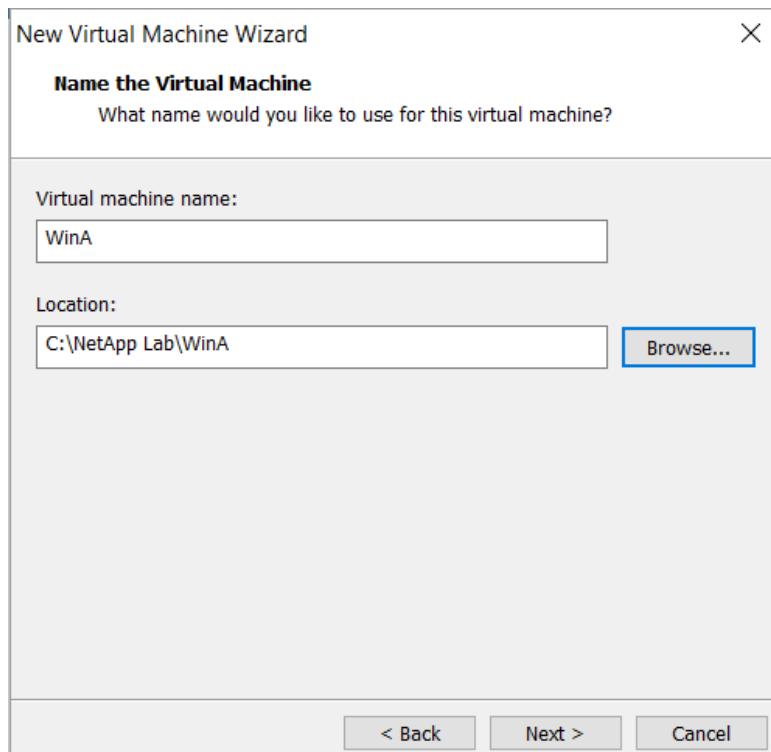
10. Select **I will install the operating system later** then click **Next**



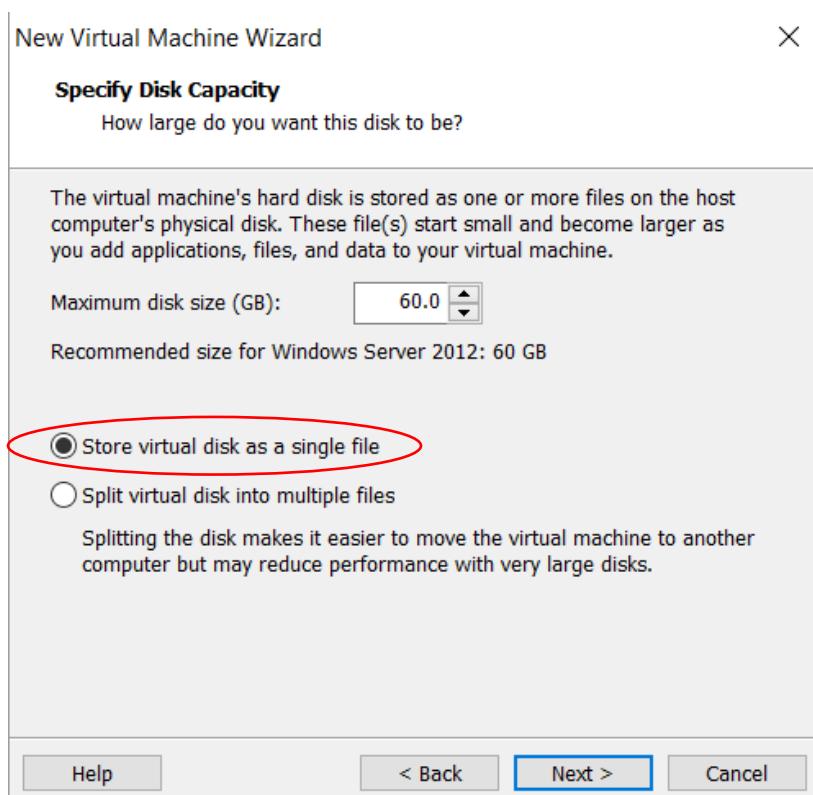
11. Select ‘Microsoft Windows’ and ‘Windows Server 2016’



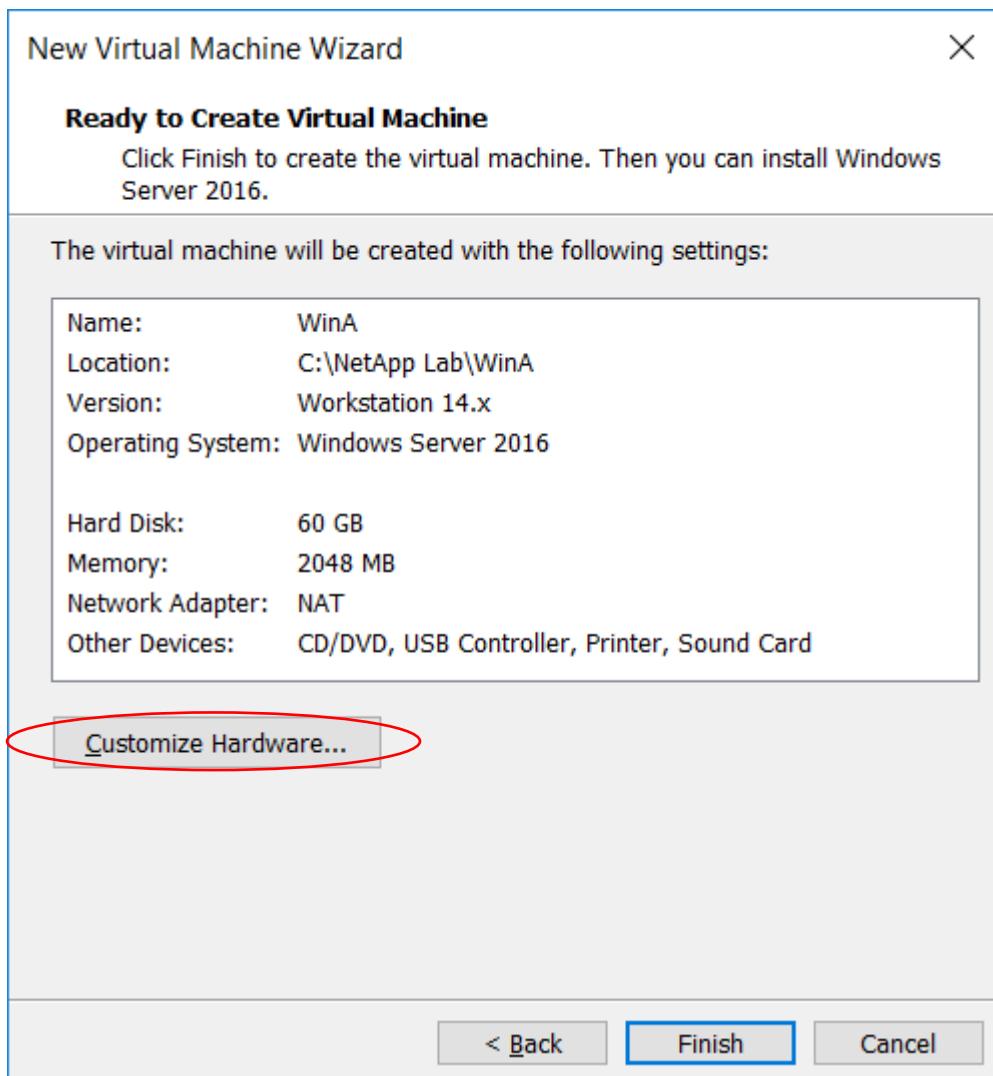
12. Name the virtual machine **WinA** and save it in the **NetApp Lab\WinA** folder



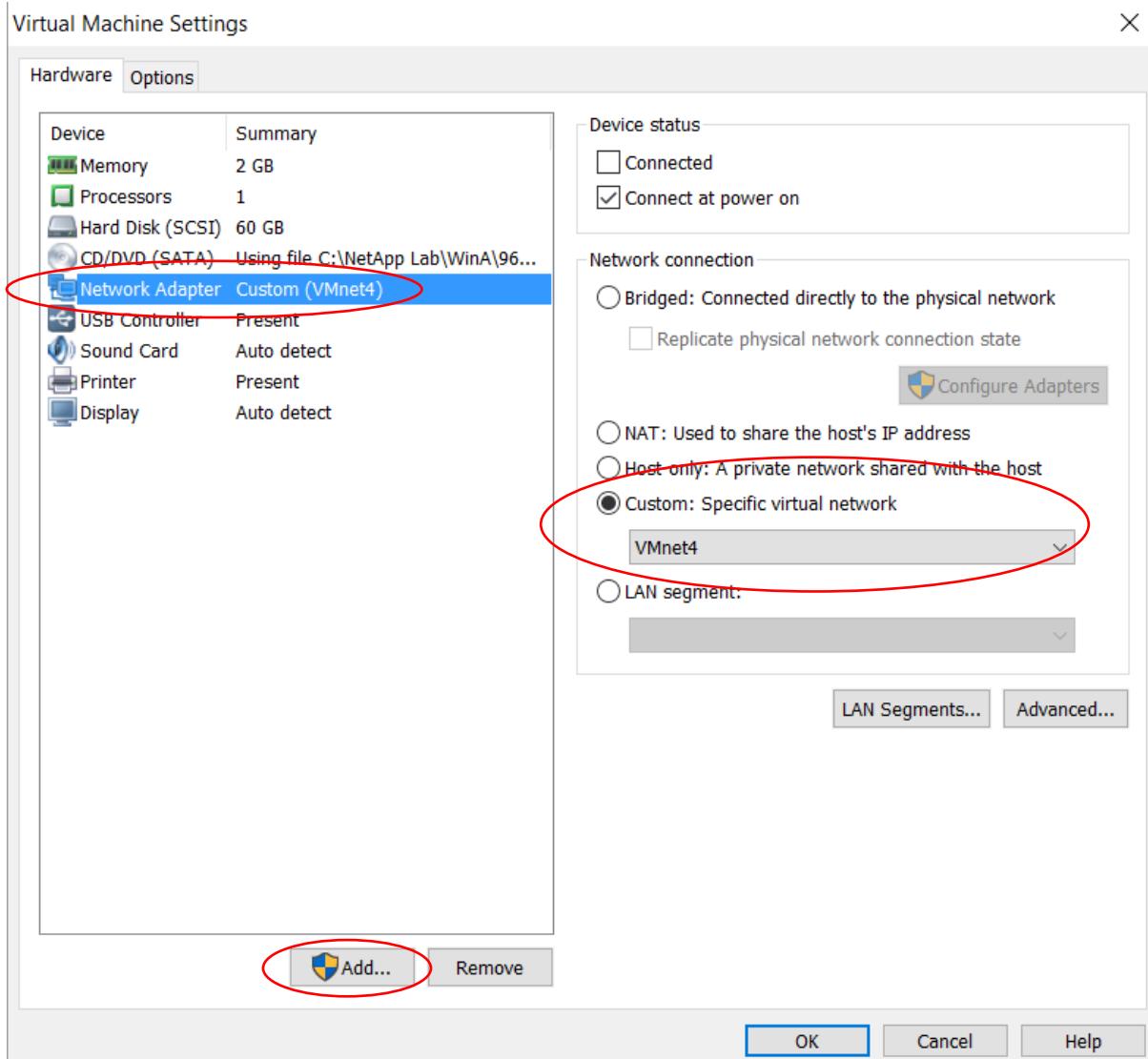
13. Select the option to **Store Virtual Disk as a single file** and click **Next**.



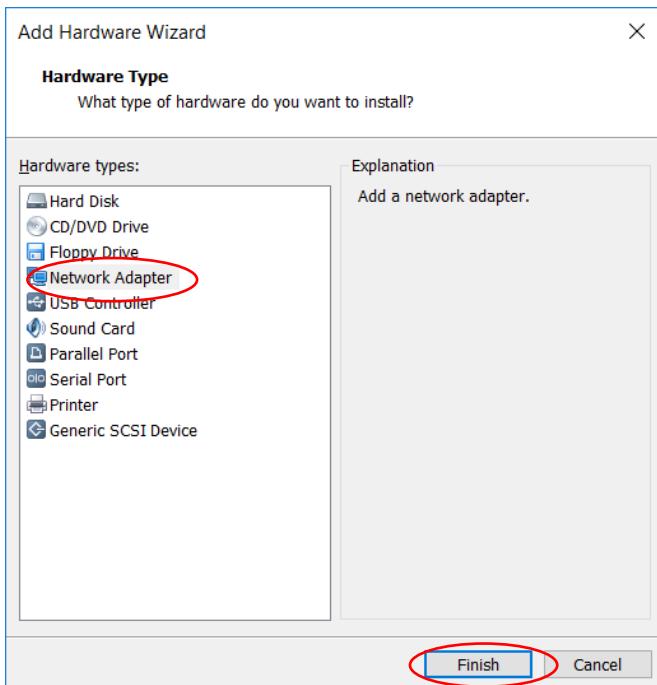
14. Click **Customize Hardware**



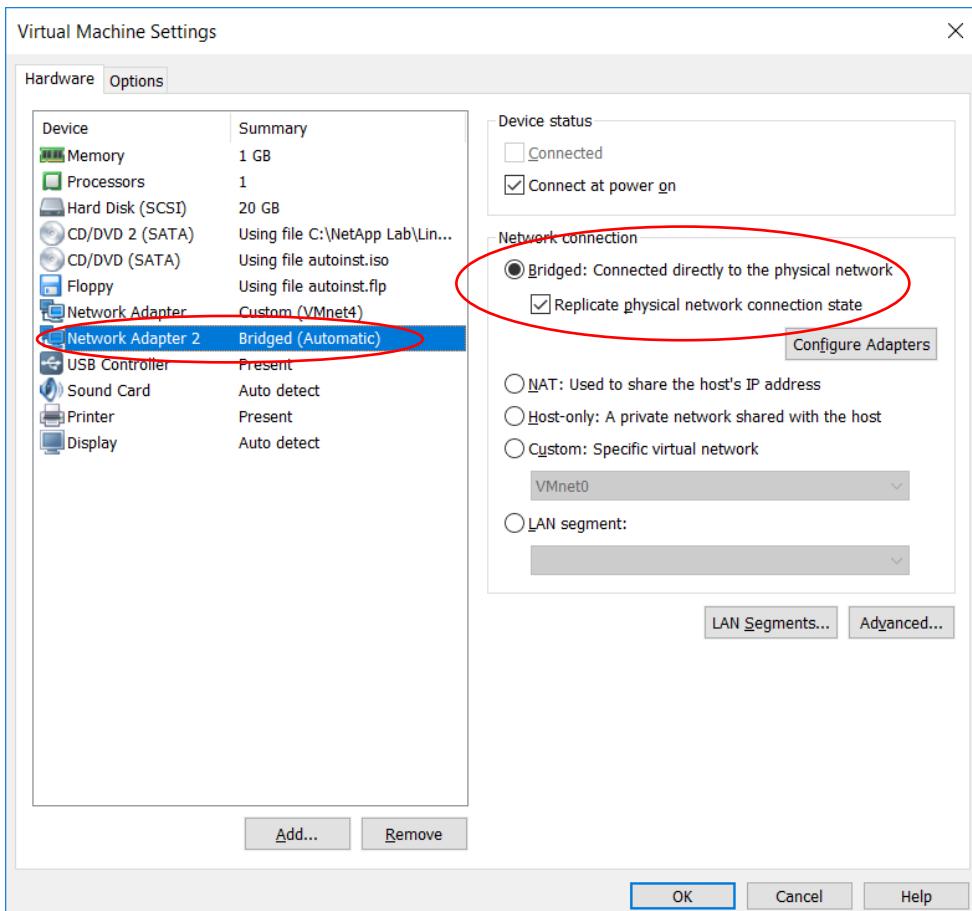
15. Click on **Network Adapter** and select **Custom** virtual network VMnet4, then click the **Add** button.



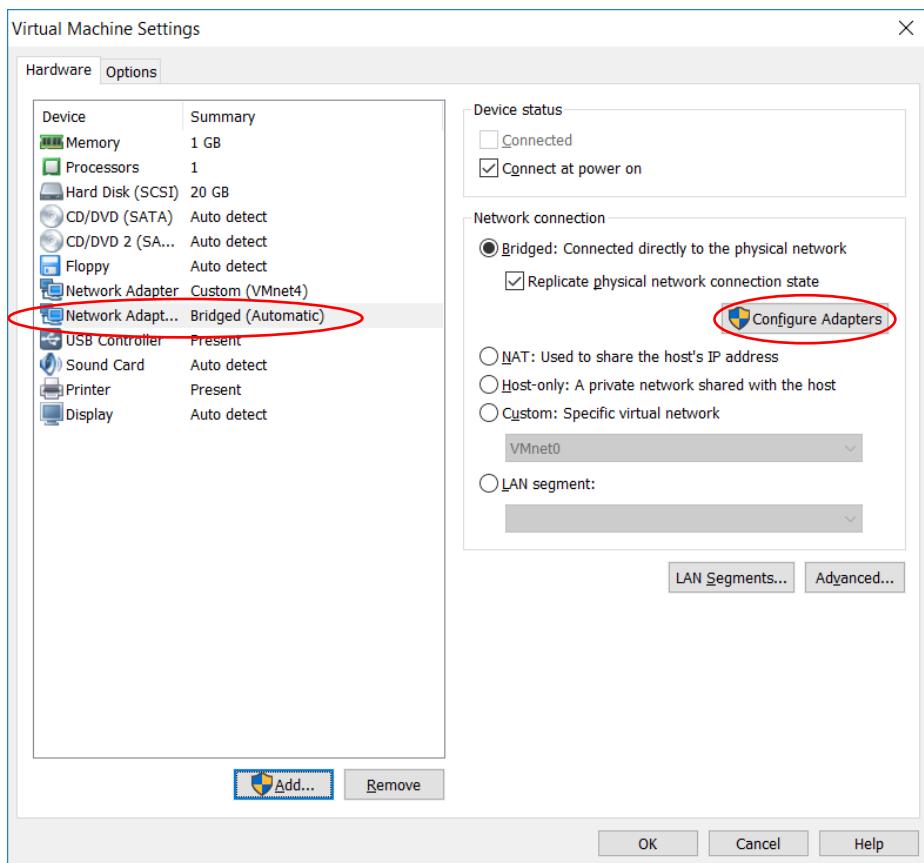
16. Choose Network Adapter and click Finish



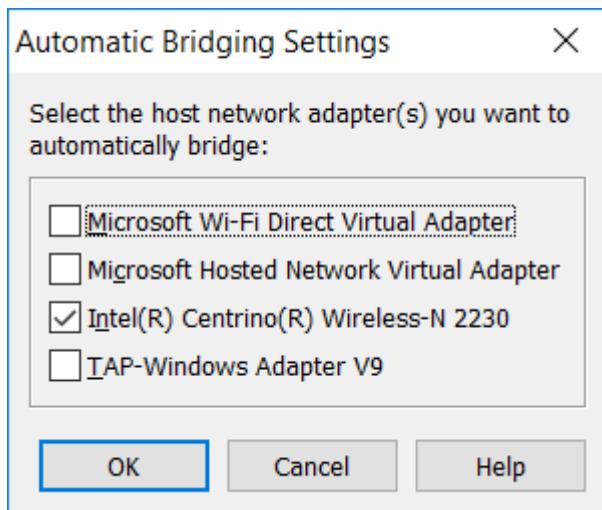
17. Select Network Adapter 2 and then configure it as Bridged and tick the checkbox to Replicate physical network connection state



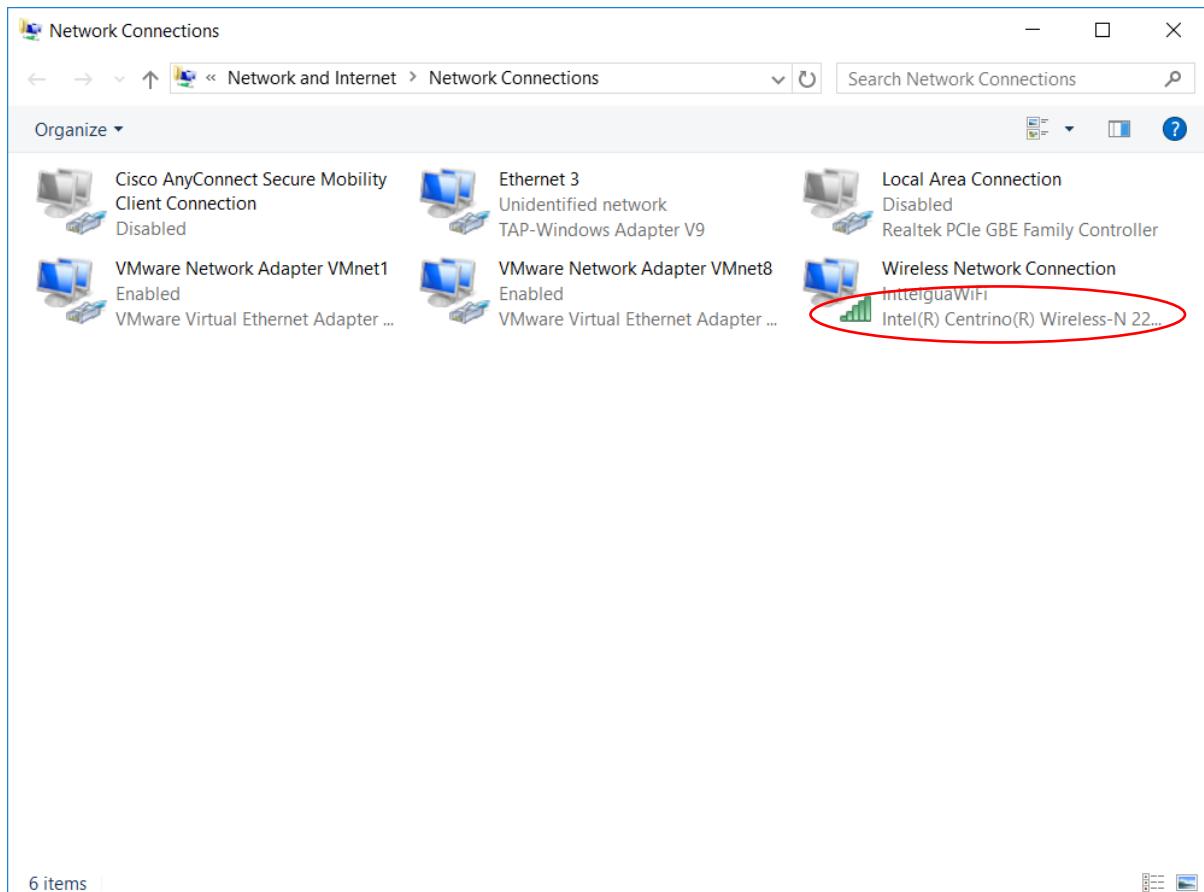
18. With the Bridged network adapter selected, click the **Configure Adapters** button (skip to step 21 if the Configure Adapters button is not visible).



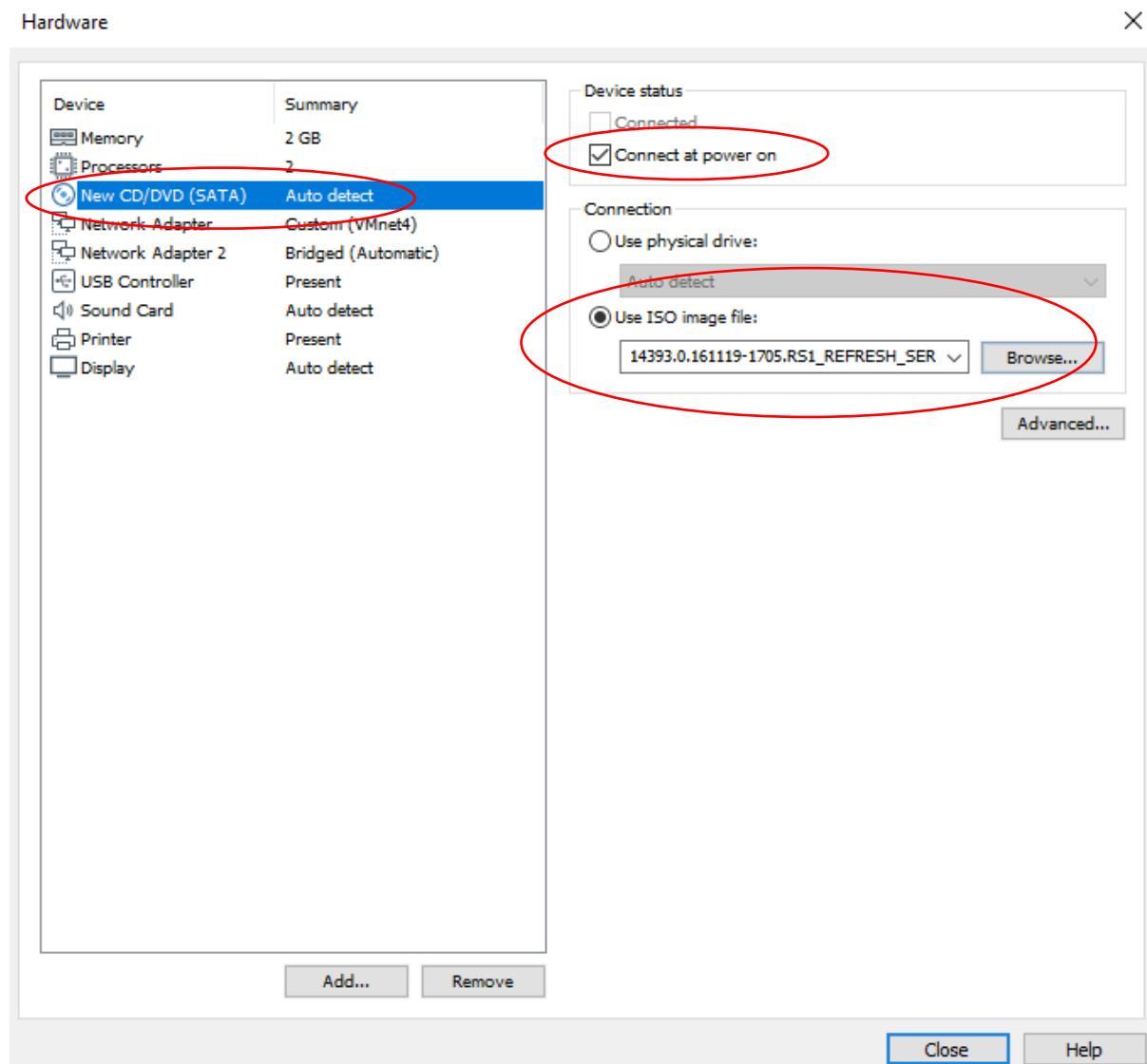
19. Select the checkbox for the network adapter which has Internet connectivity on your laptop. Deselect any other network adapters. Click **OK**



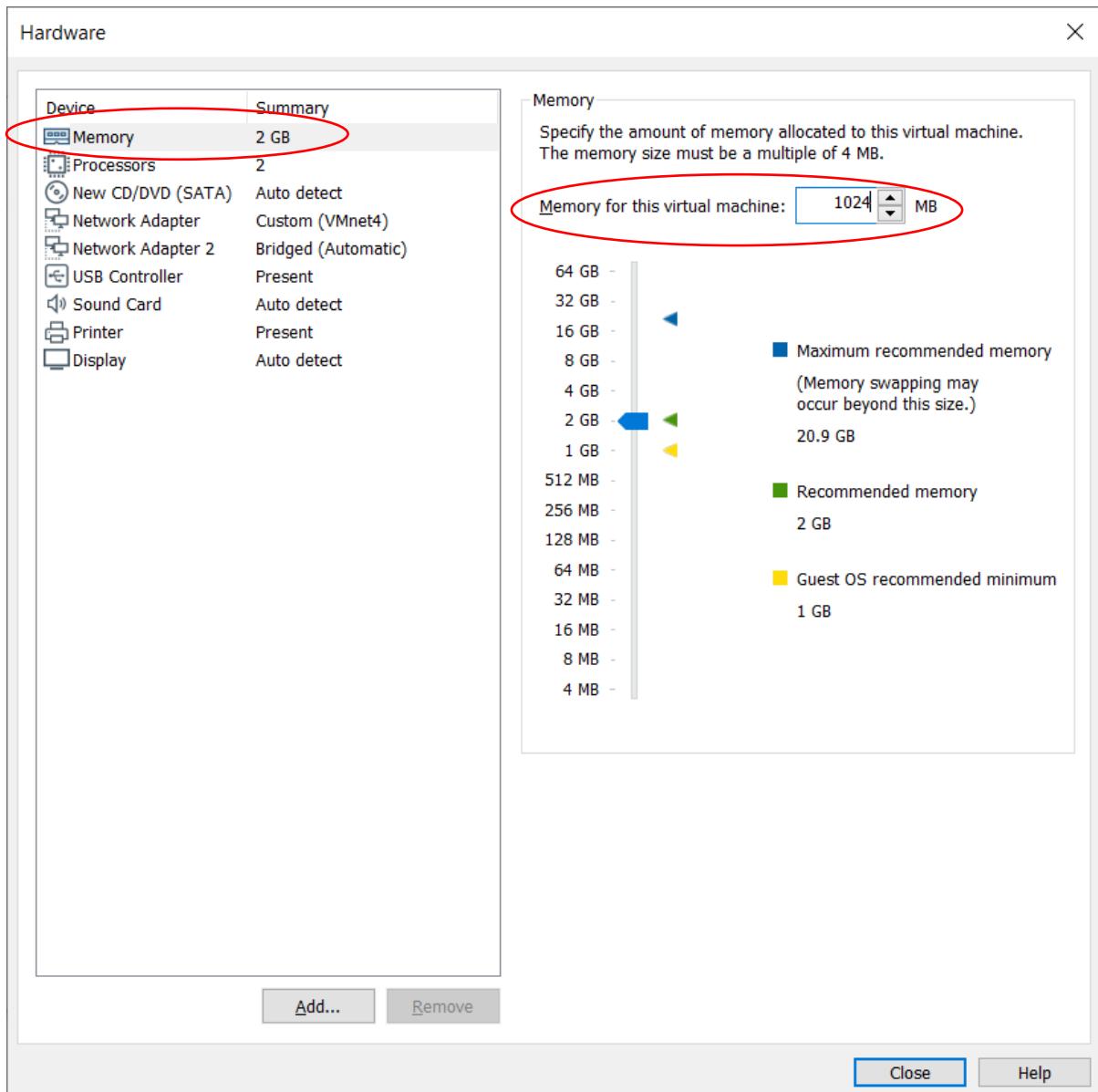
20. If you need to check which network adapter to use in the previous step, open **Control Panel** > **Network and Sharing Center** and click **Change Adapter Settings**



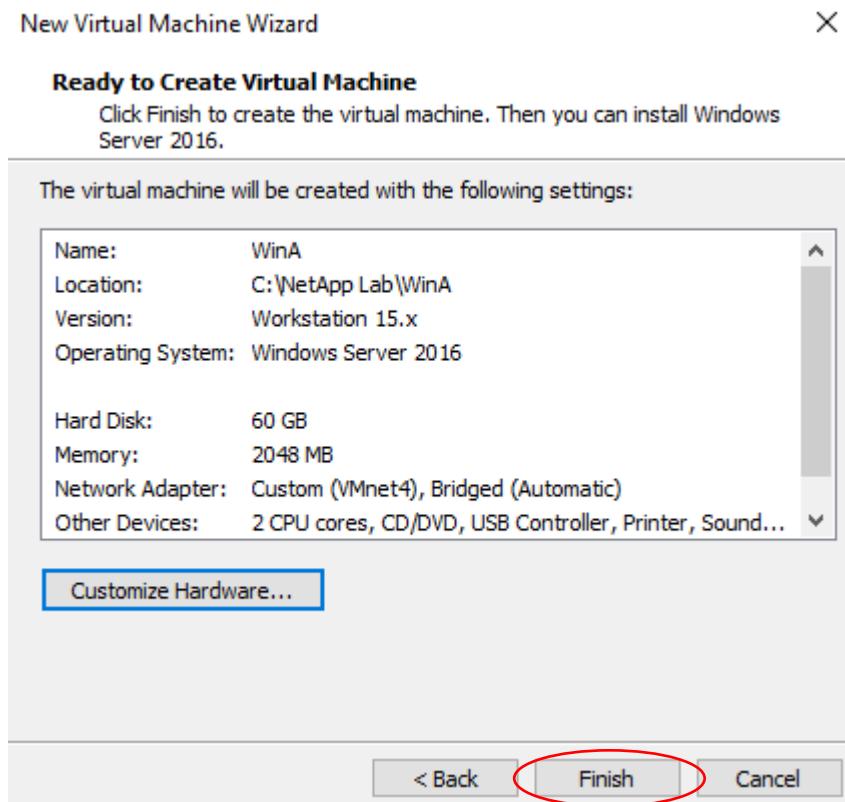
21. Click **New CD/DVD (SATA)** then **Use ISO image file**. Browse to and select the Windows Server 2016 ISO file in the C:\NetApp Lab\WinA folder. Tick the '**Connect at power on**' checkboxes. Click **OK**.



22. If your laptop has more than 16GB RAM you can skip this step. Reduce the amount of RAM the virtual machine will use by clicking **Memory** then set the **Memory for this virtual machine** to **1024 MB** then click **Close**.

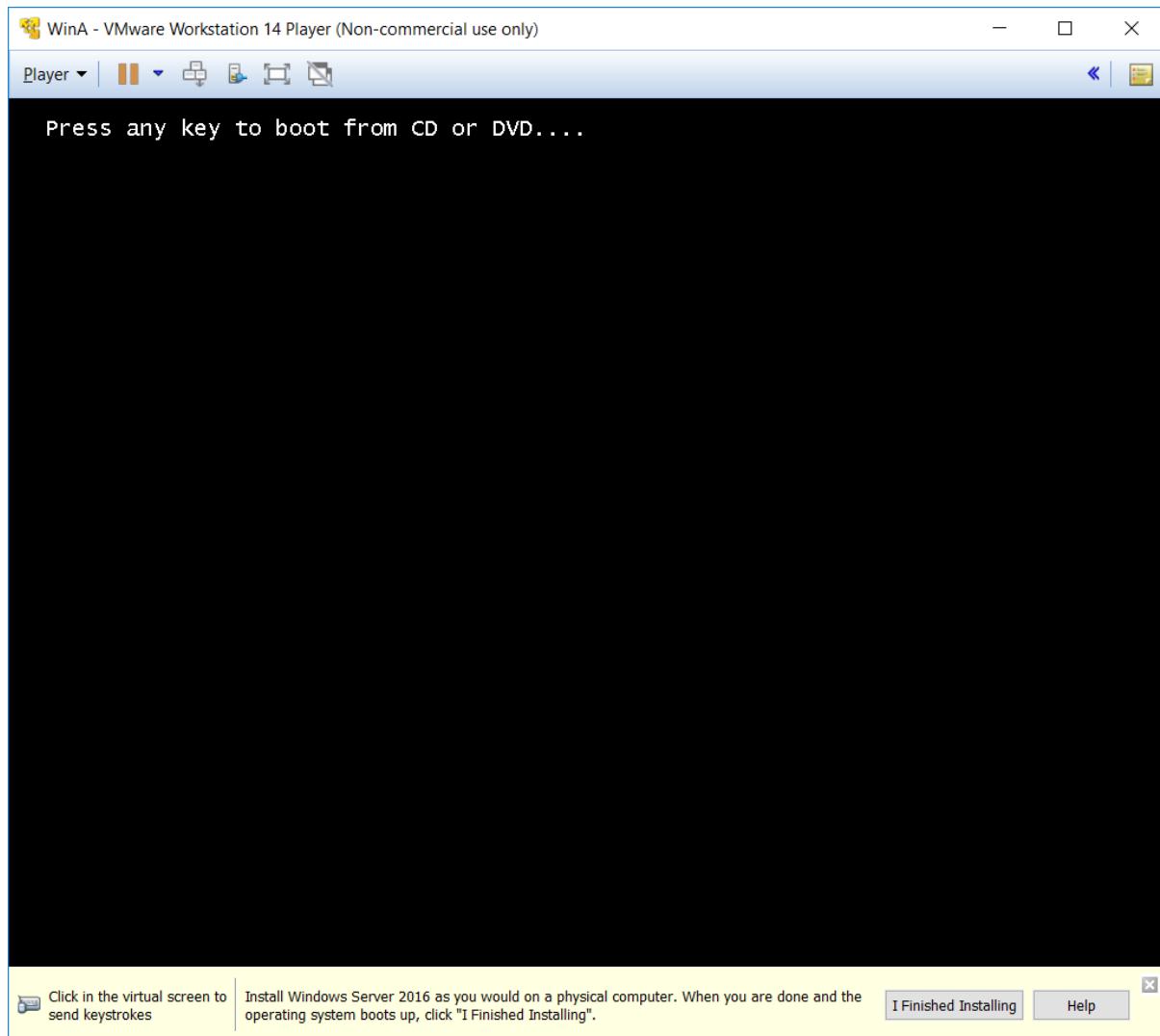


23. Click **Finish**

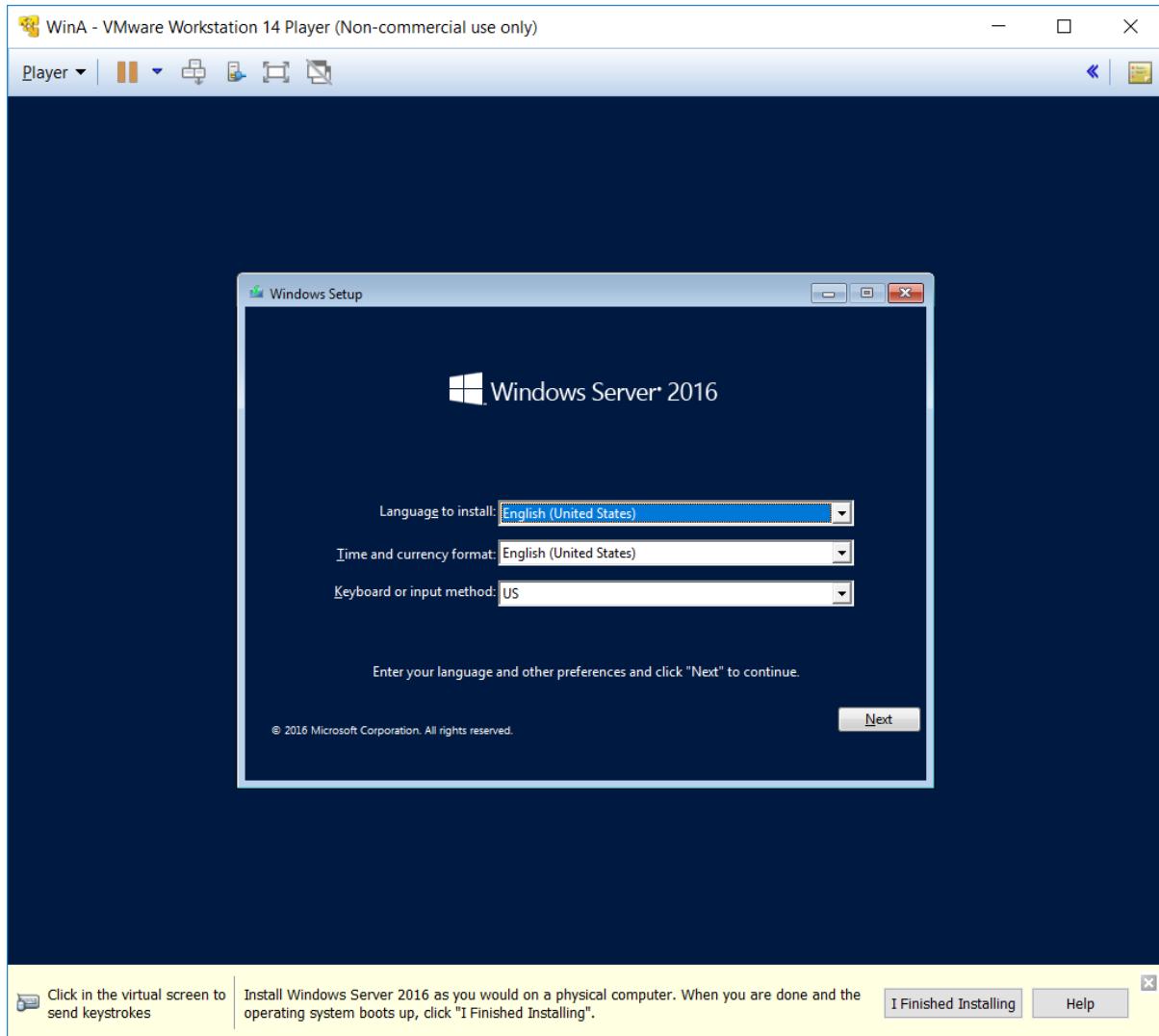


24. Click **Play Virtual Machine** to power on the server.

25. Click inside the virtual machine. Press the spacebar when you are prompted '**Press any key to boot from CD or DVD**'. **Be ready to press the spacebar when the prompt appears.** If you miss it you can reboot by clicking '**Player > Power > Restart Guest**' then try again.

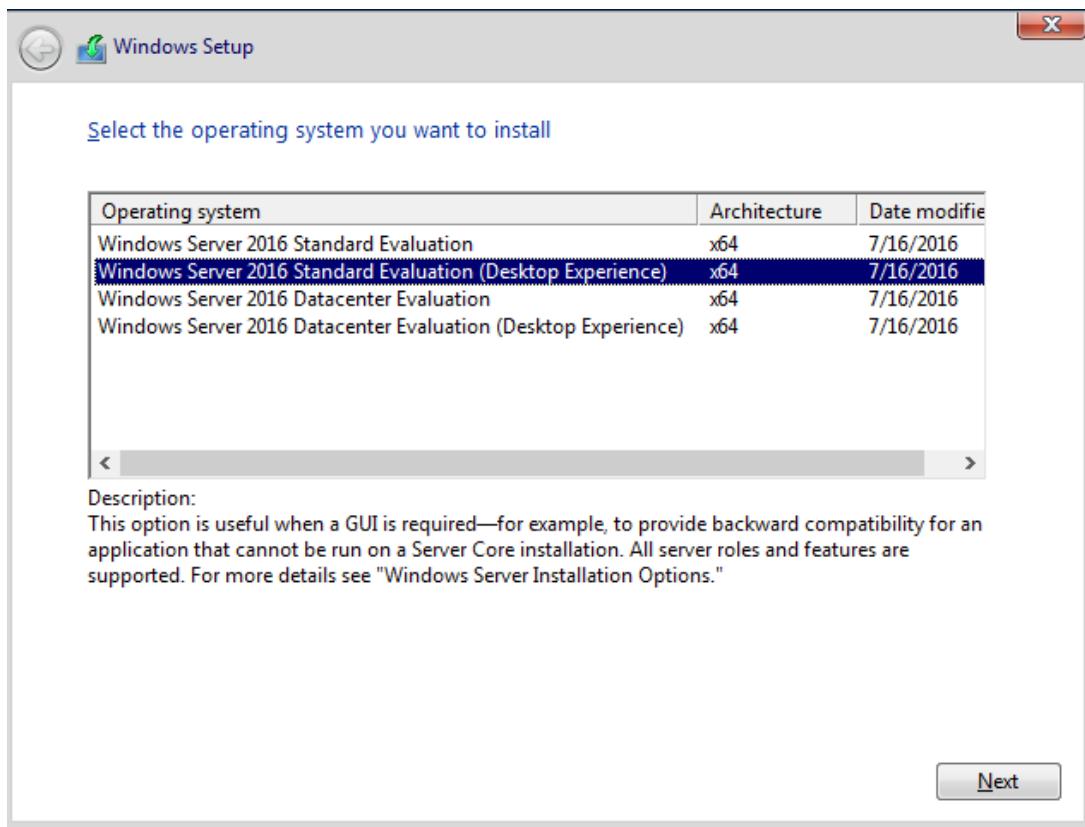


26. Enter your language preferences then click **Next**



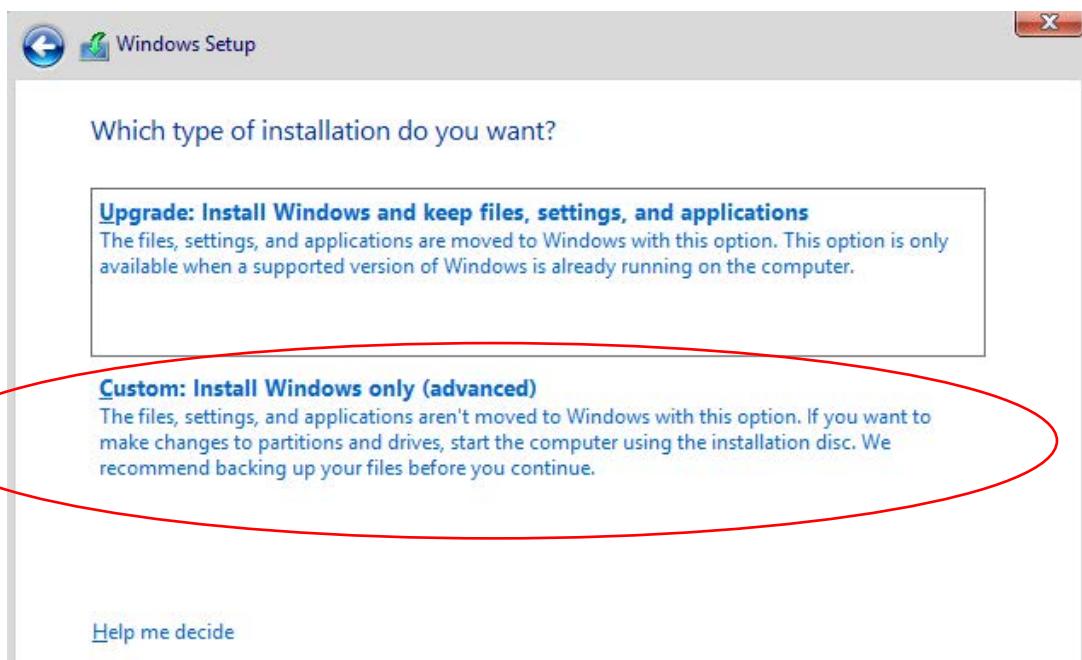
27. Click **Install Now.**

28. Select **Windows Server 2016 Standard Evaluation (Desktop Experience)** and click **Next**

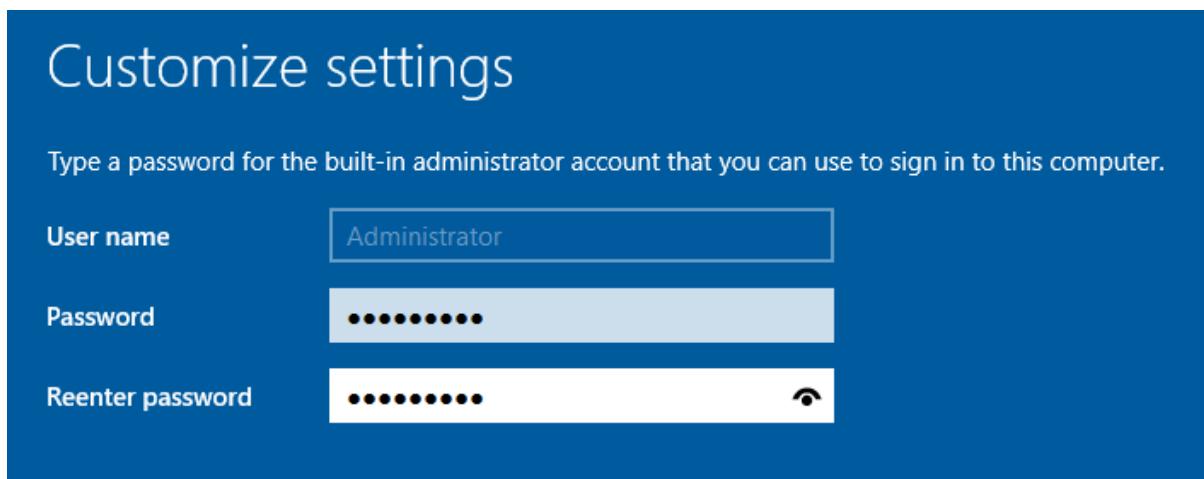


29. Accept the license terms and click **Next**

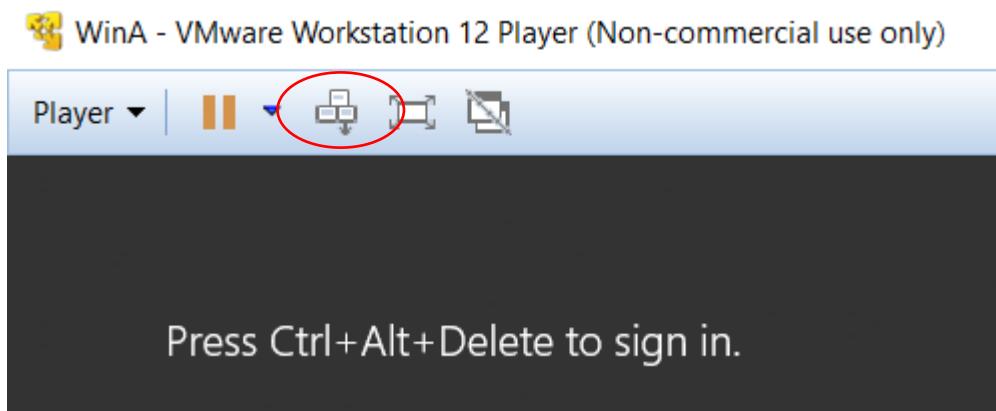
30. Select the option **Custom: Install Windows only (advanced)**



31. Leave the default on the 'Where do you want to install Windows?' page and click **Next**
32. Windows will then complete installation.
33. Wait for the installation to complete, and then enter **Flackbox1** for the administrator password and click **Finish**.

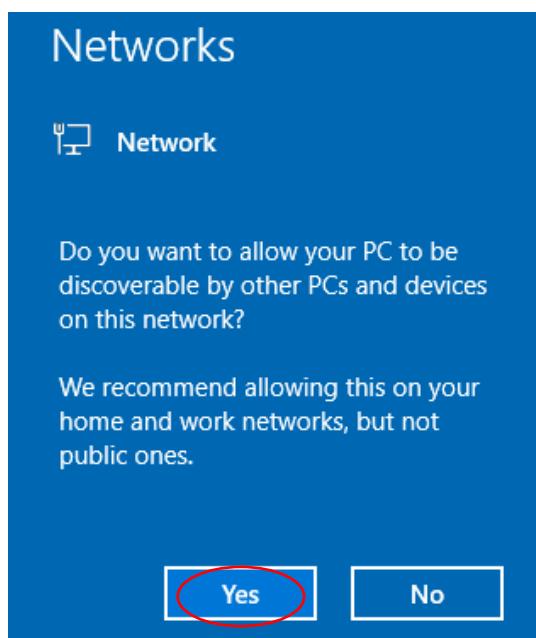


34. Click on the button to send Ctrl-Alt-Del to the virtual machine (do not press Ctrl-Alt-Del on your keyboard as this will send the keystrokes to your local machine).

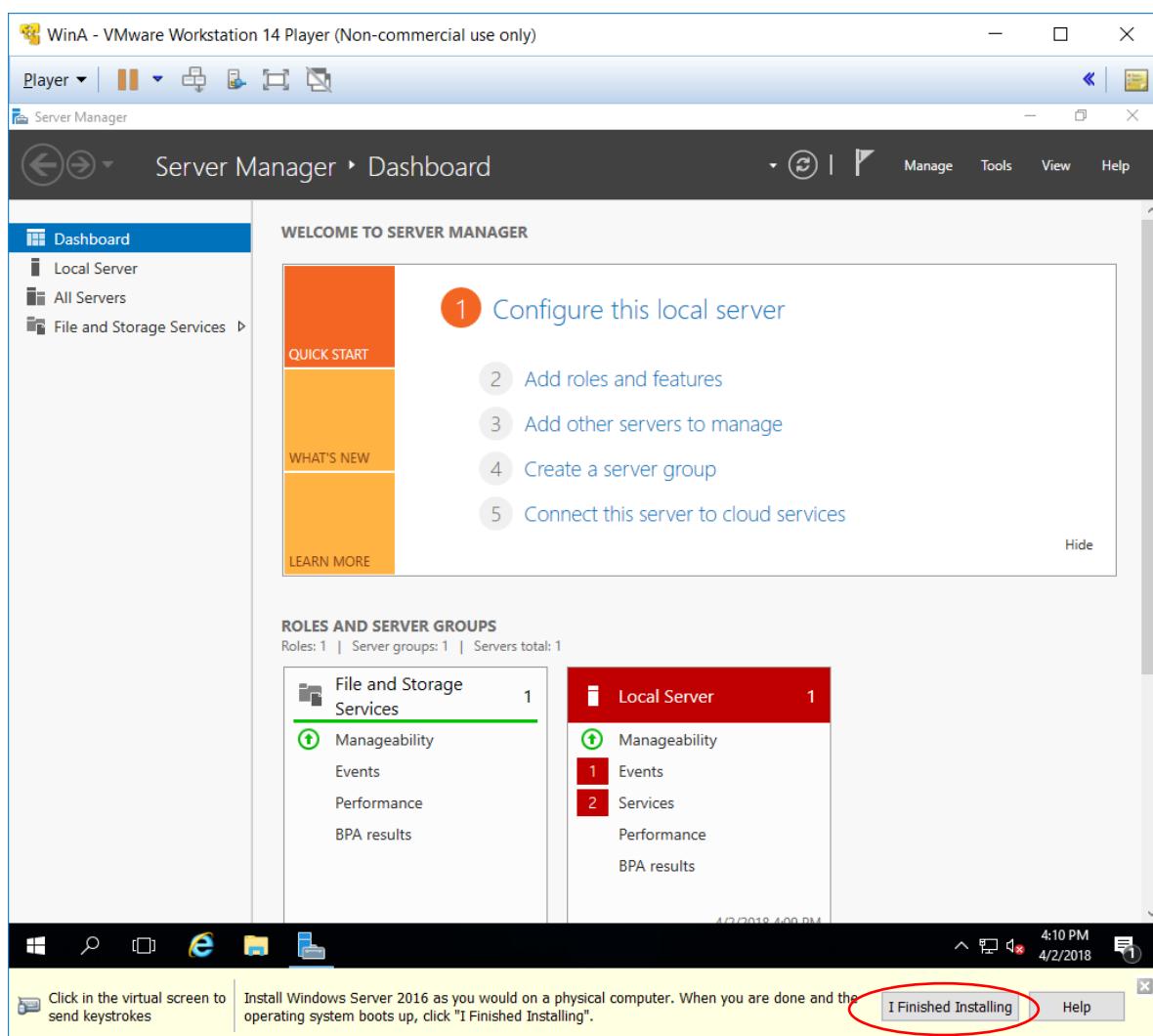


35. Log in as username **administrator** and password **Flackbox1**

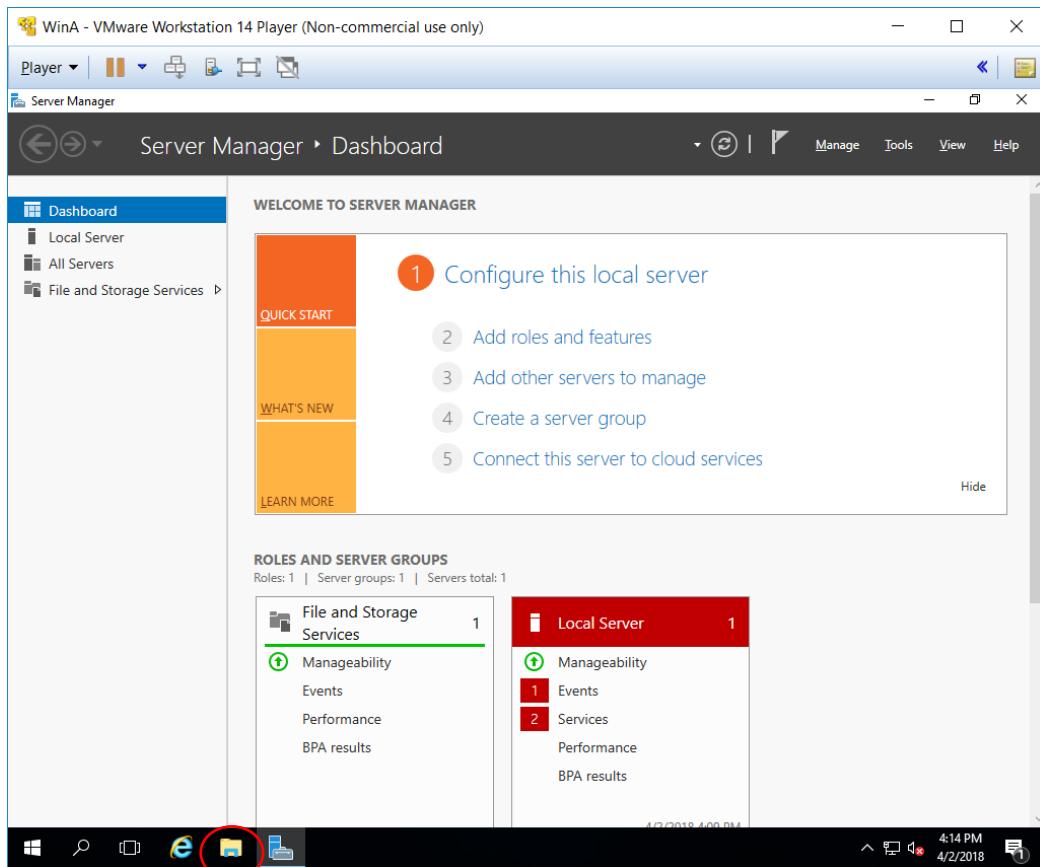
36. Click **Yes** when asked if you want the PC to be discoverable



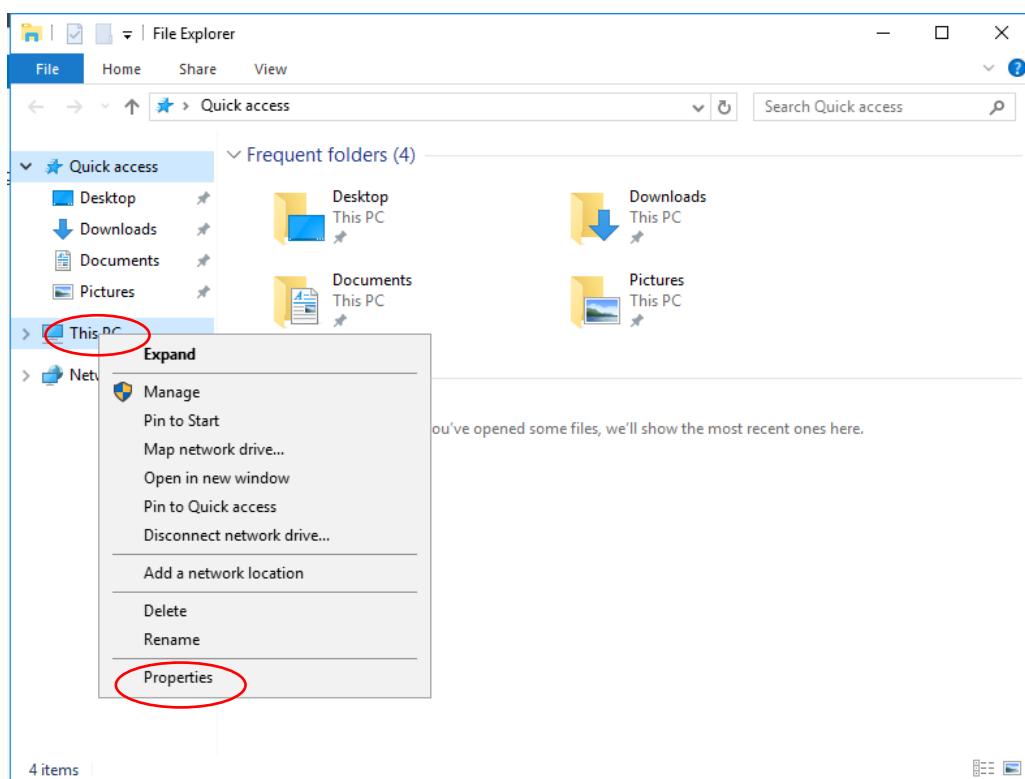
37. Click I Finished Installing if asked in the VMware window



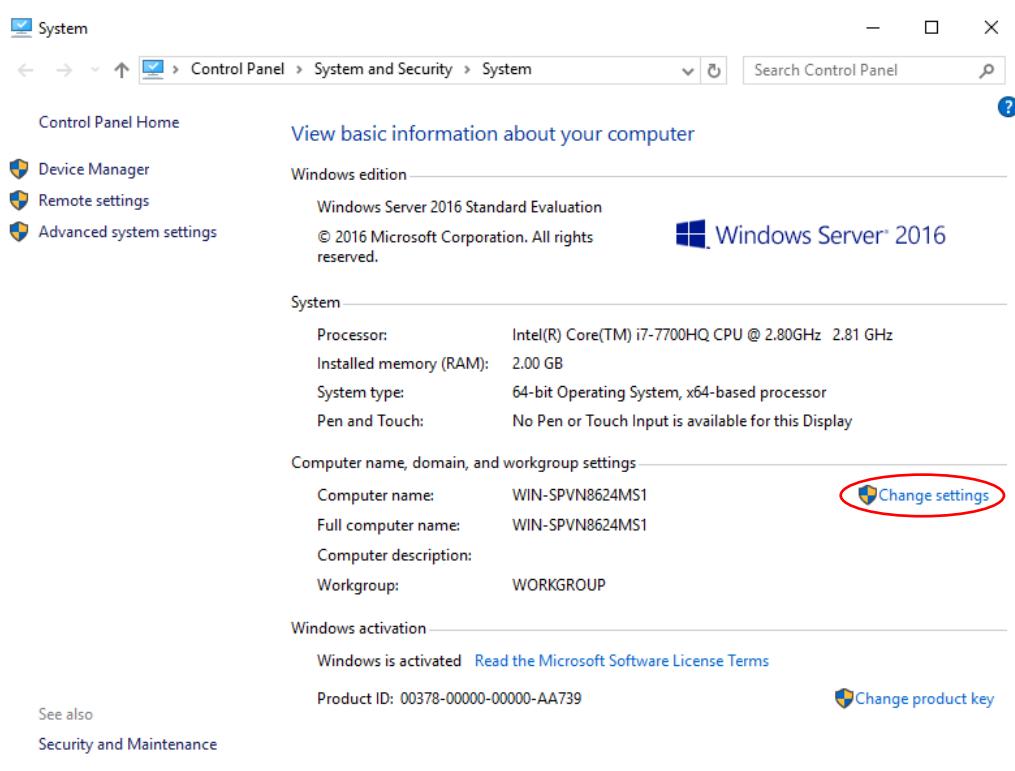
38. Click on the Windows File Explorer button in the taskbar



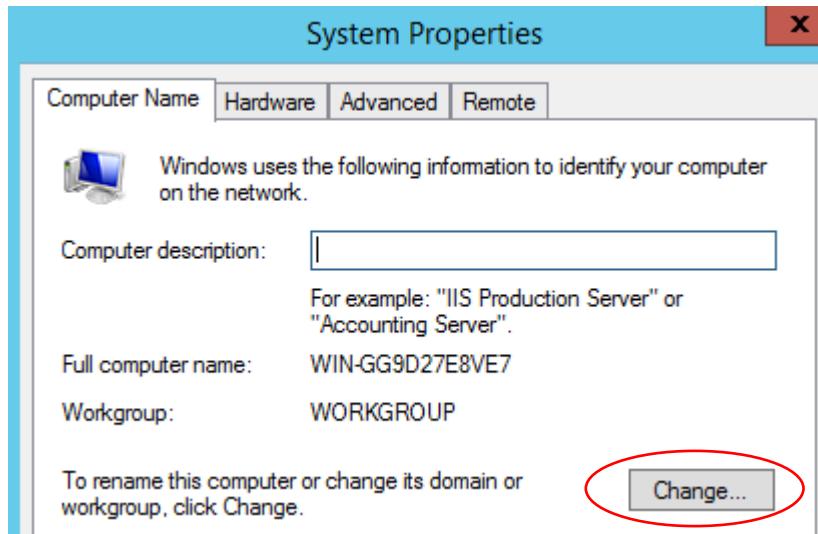
39. Right-click on This PC and select Properties



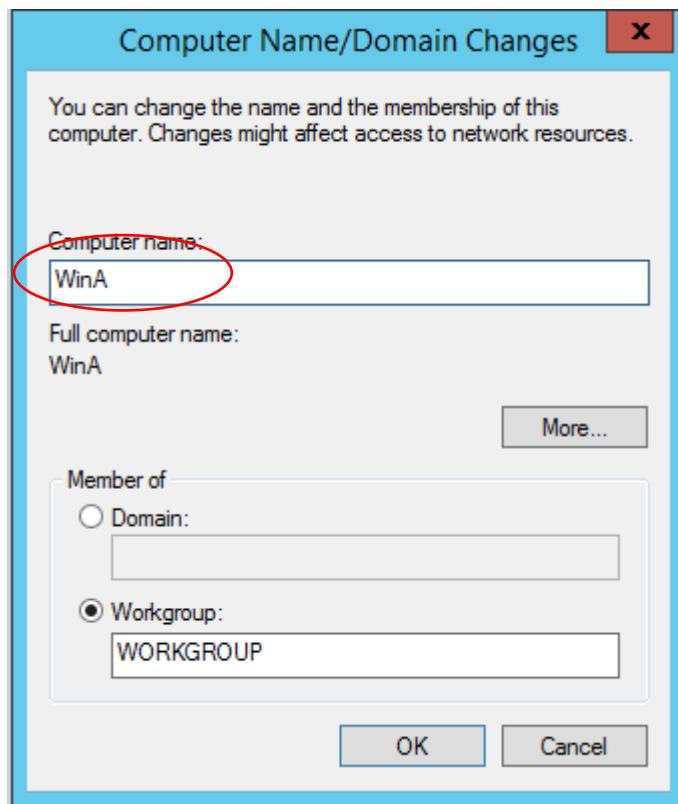
40. Click on **Change Settings** to set the server's computer name



41. Click **Change**

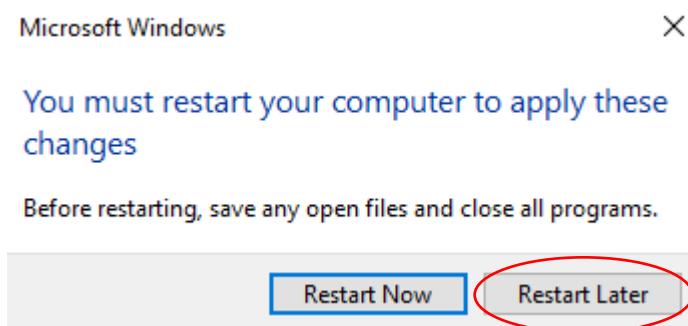


42. Set the Computer Name **WinA** and click **OK**

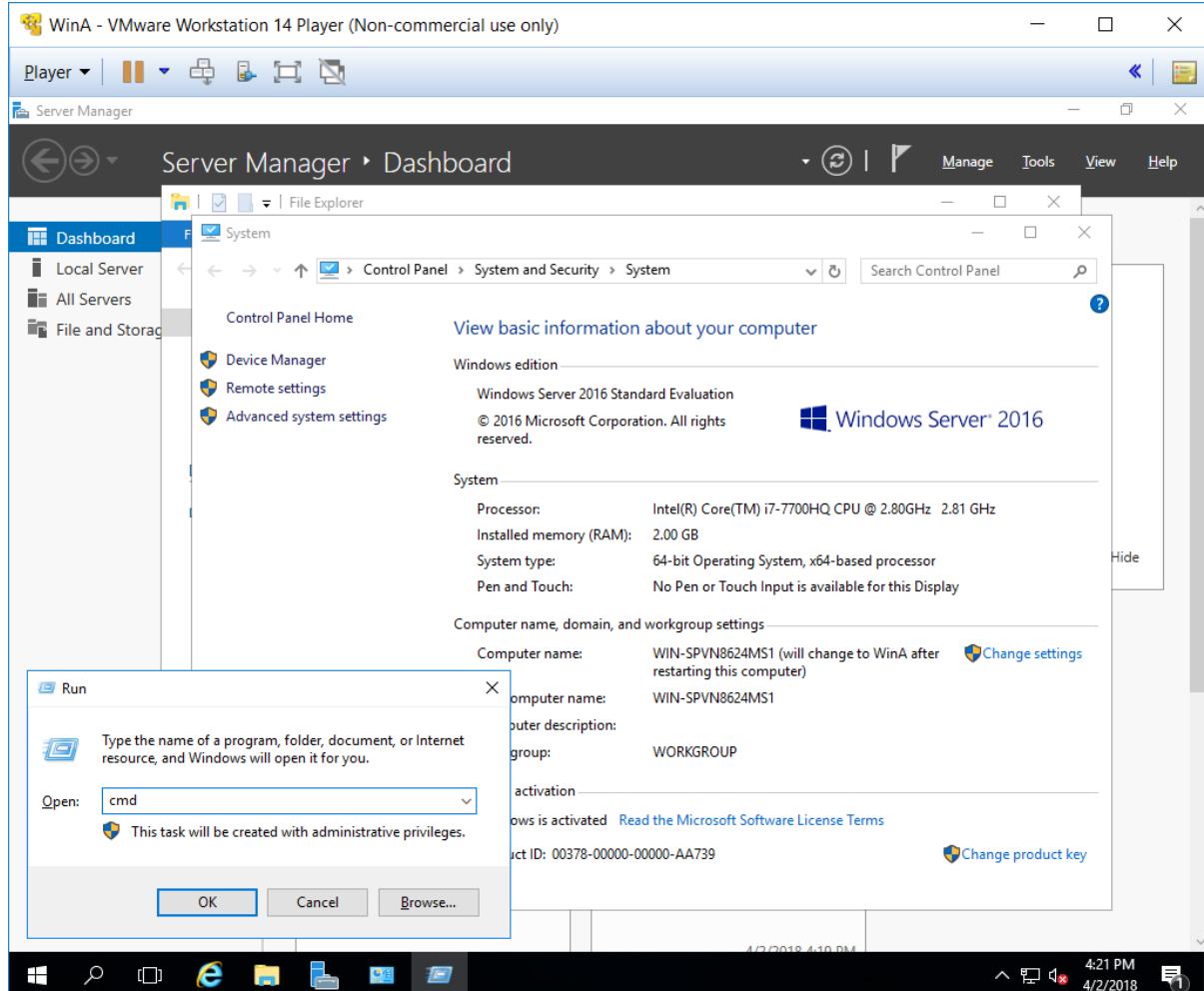


43. You will be prompted to restart to apply the change. Click **OK** and then **Close** the dialog window

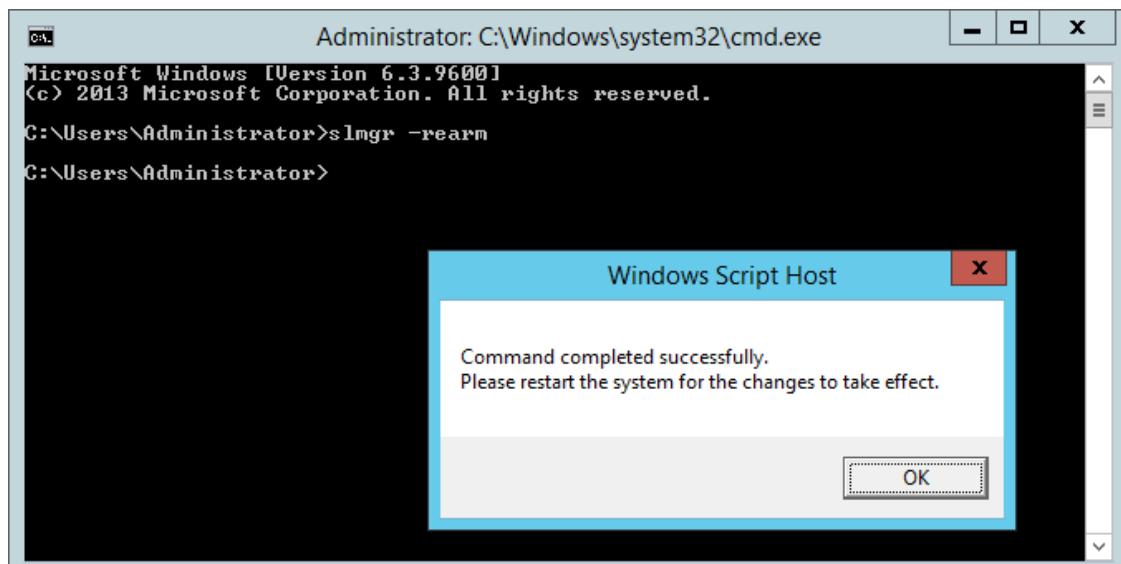
44. Select **Restart Later**



45. On your keyboard, press the **Windows key** (near the bottom left corner, next to the Alt key) and the **R** key simultaneously to open a Run prompt, then type **cmd** and hit **Enter** to open a command prompt



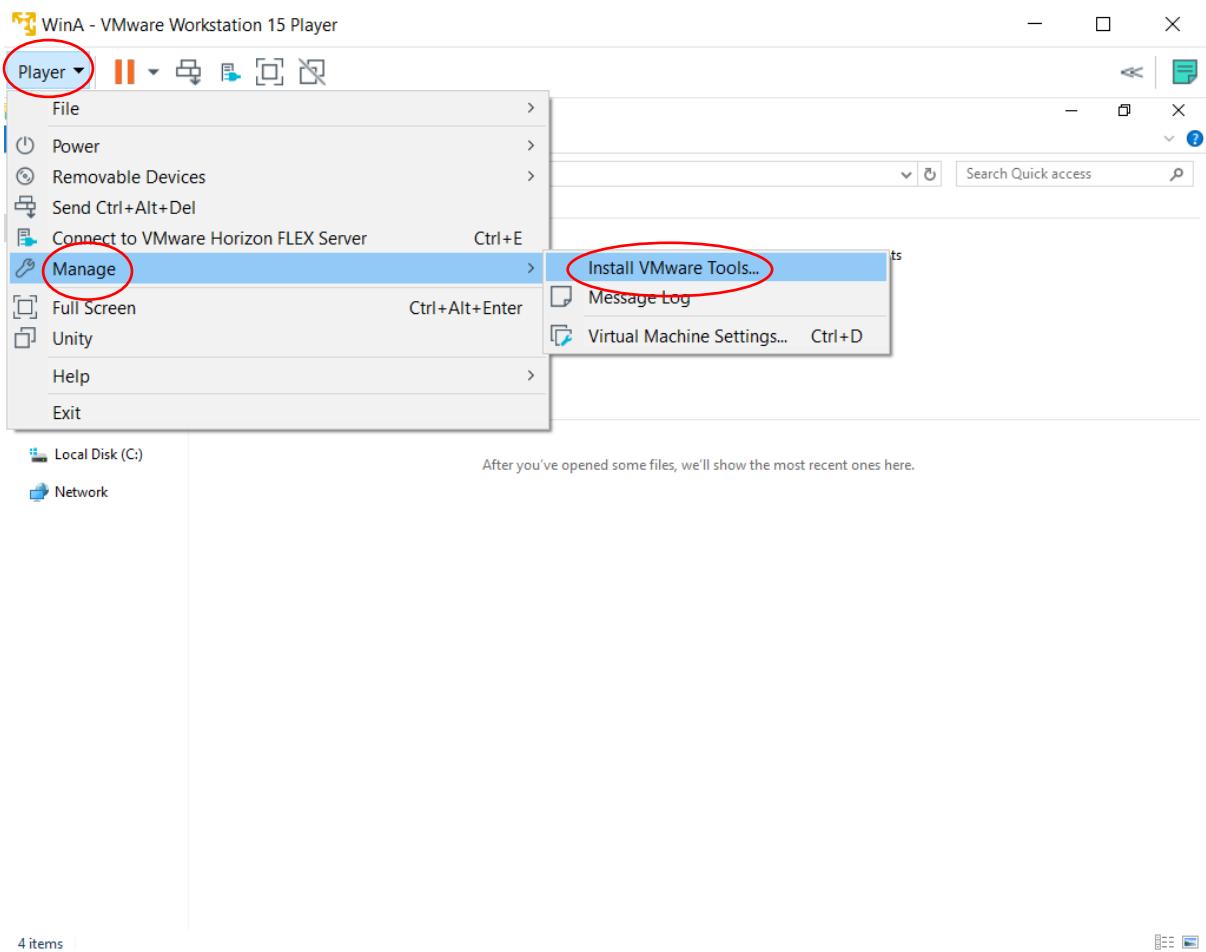
46. Type **slmgr –rearm** to activate the Windows evaluation license and prevent the server from automatically shutting down every hour. Click **OK**.



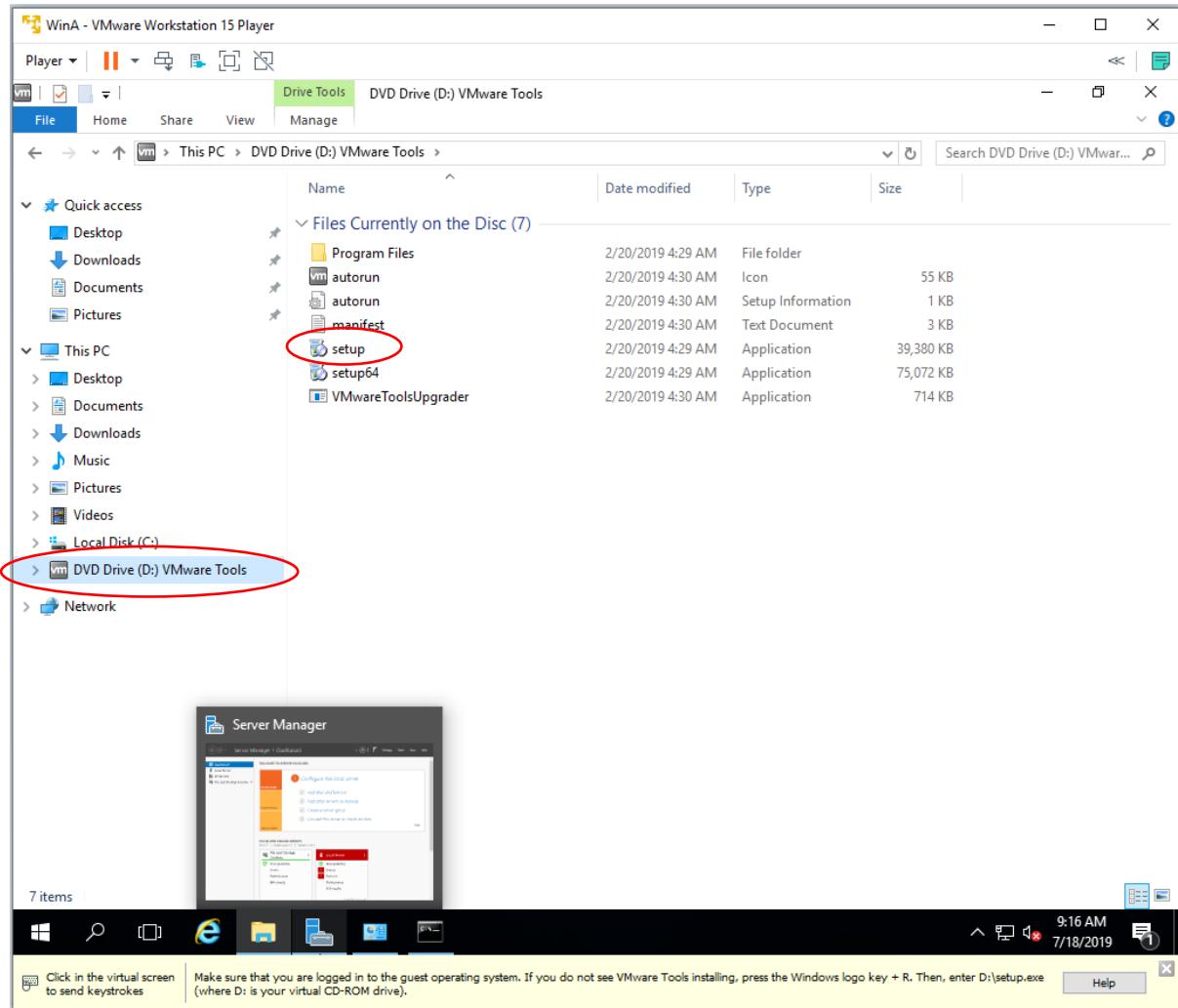
47. Click the **Windows File Explorer** button



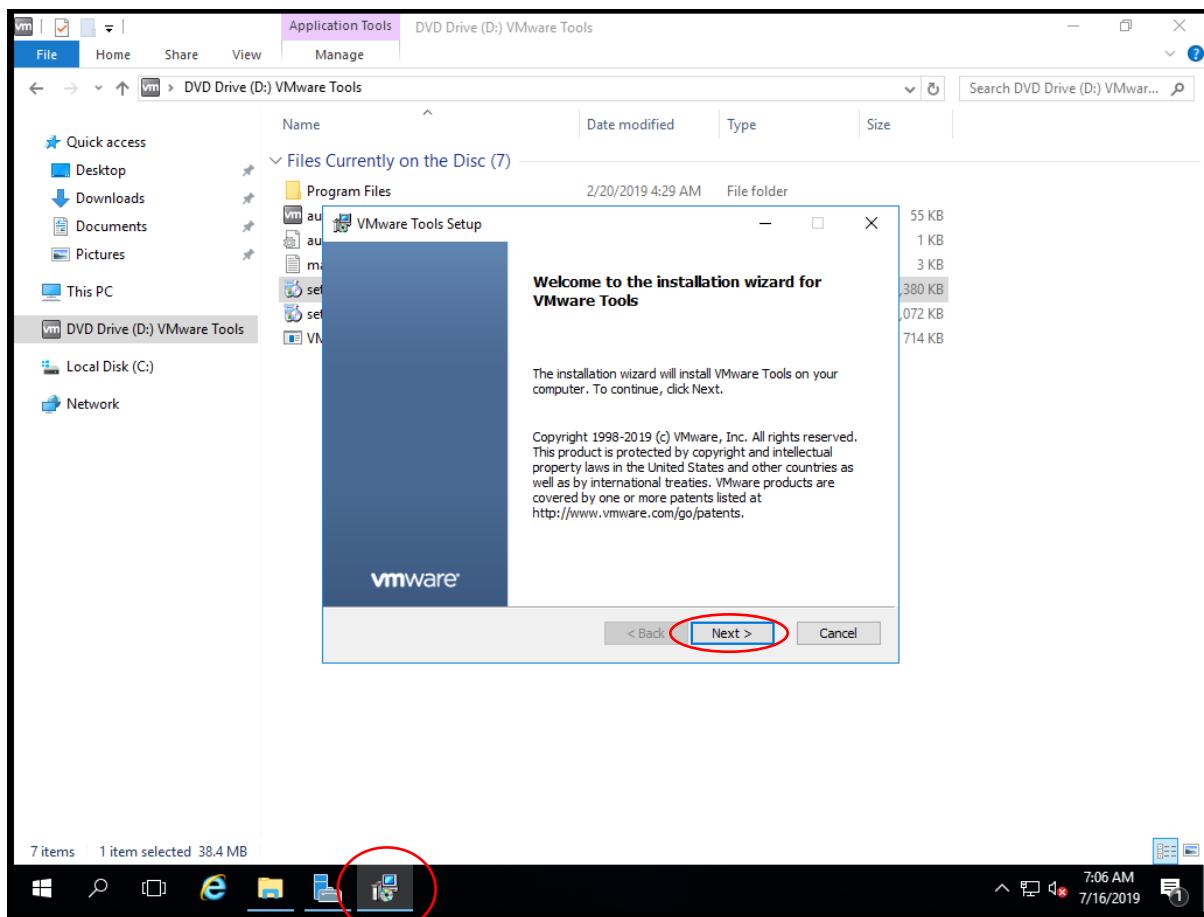
48. In the VMware Player menu, click **Player > Manage > Install VMware Tools...**



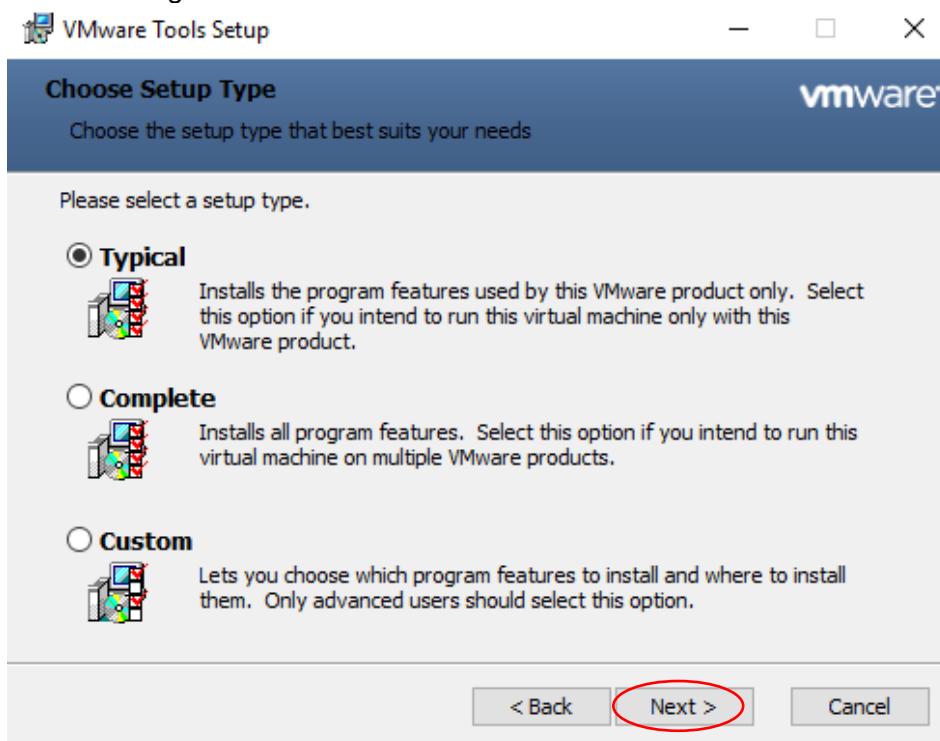
49. In Windows File Explorer, click on **DVD Drive (D:) VMware Tools** in the left hand window, then double-click **setup** in the right hand window to install VMware Tools.



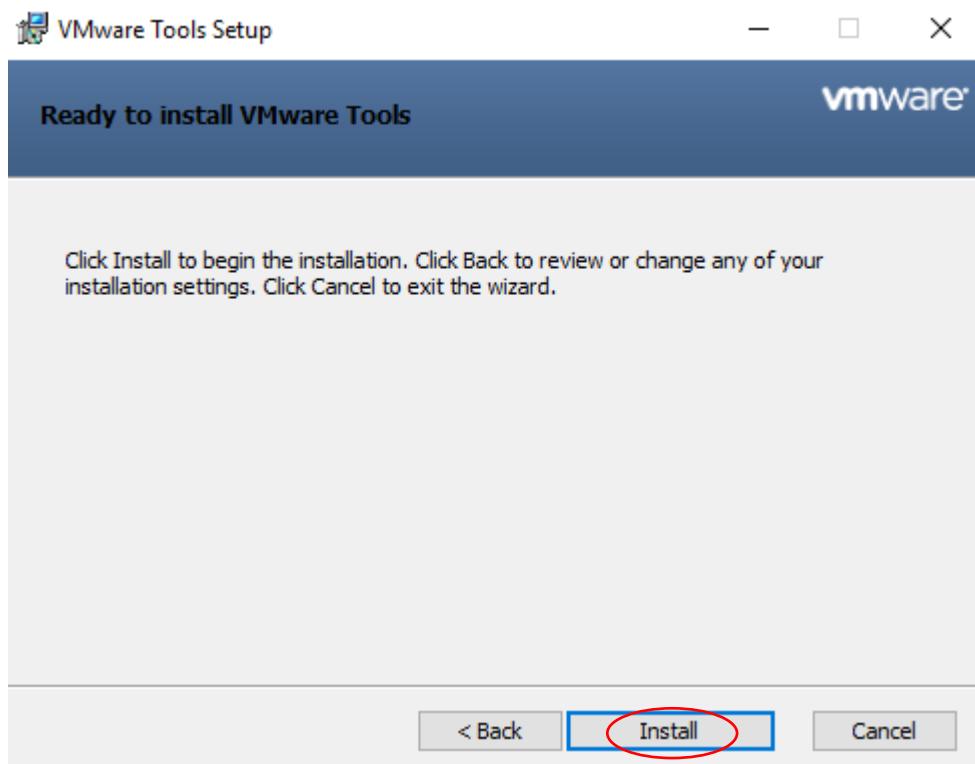
50. Click **Next** in the VMware Tools installation wizard (you might need to click the icon in the taskbar first to see the installation wizard window).



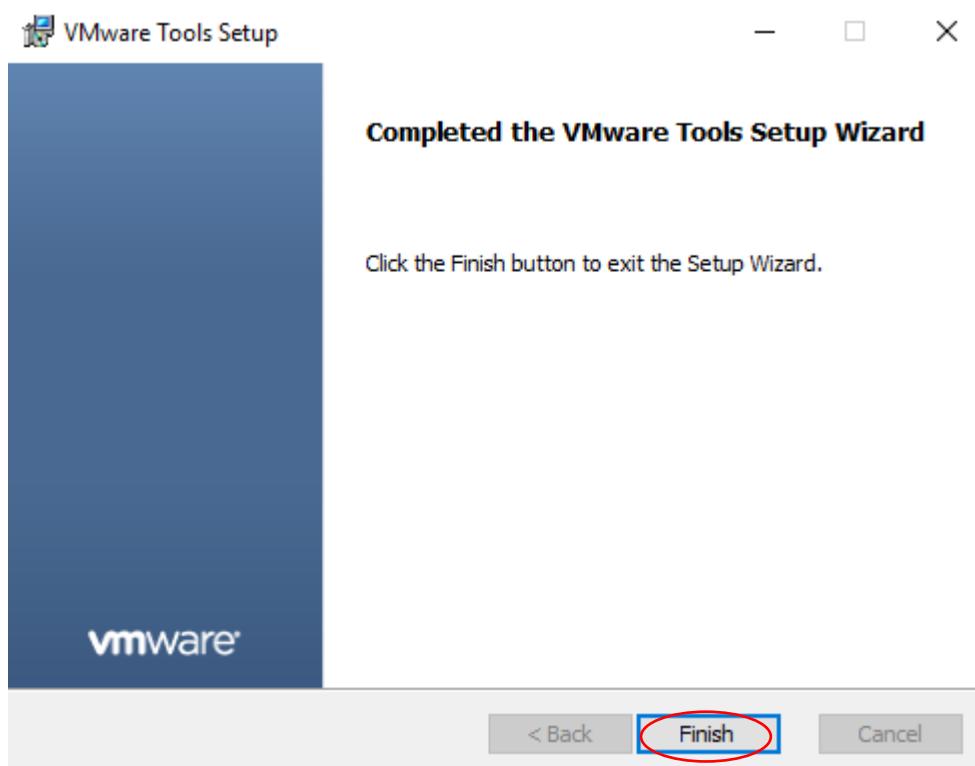
51. Click **Next** again.



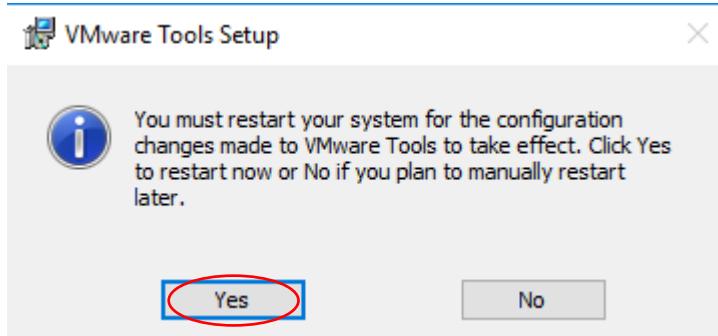
52. Click Install.



53. Click Finish.



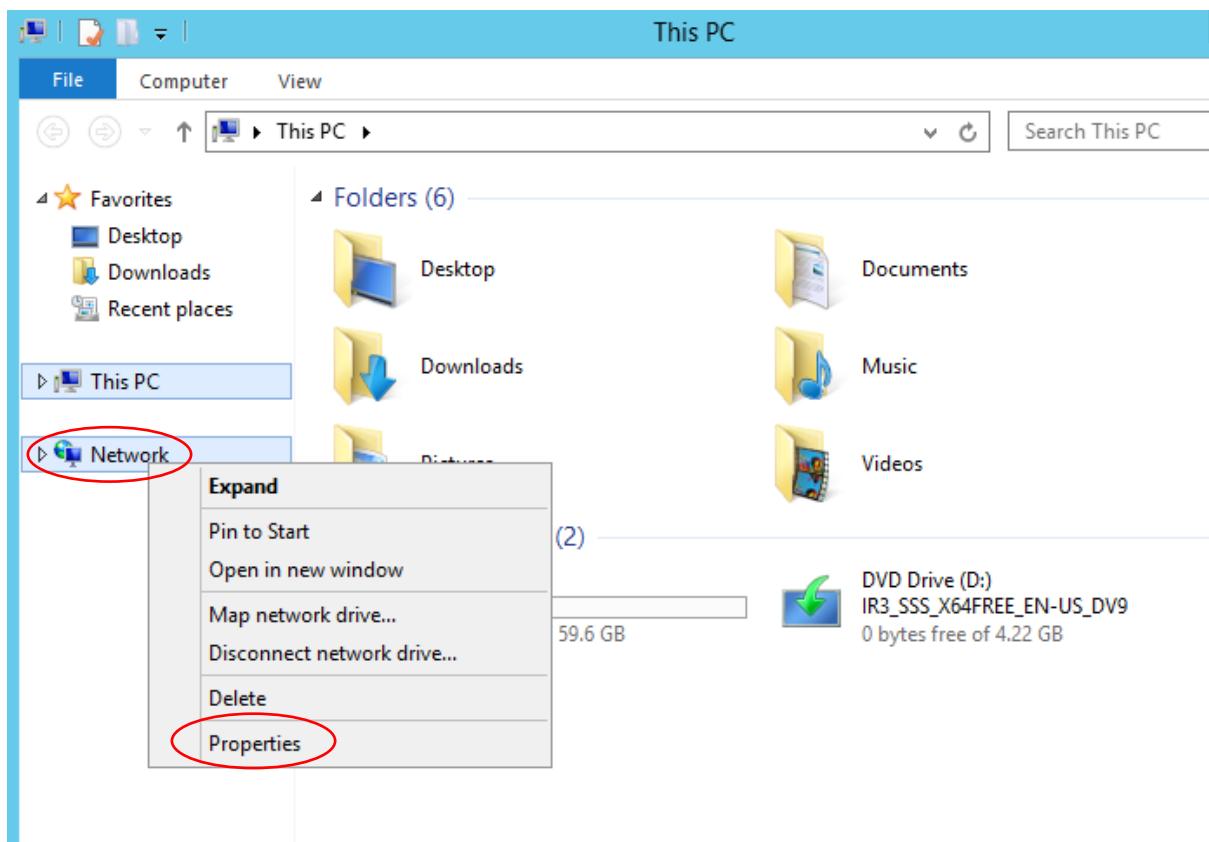
54. Click Yes to restart and complete the installation. Log back in when the server has restarted.



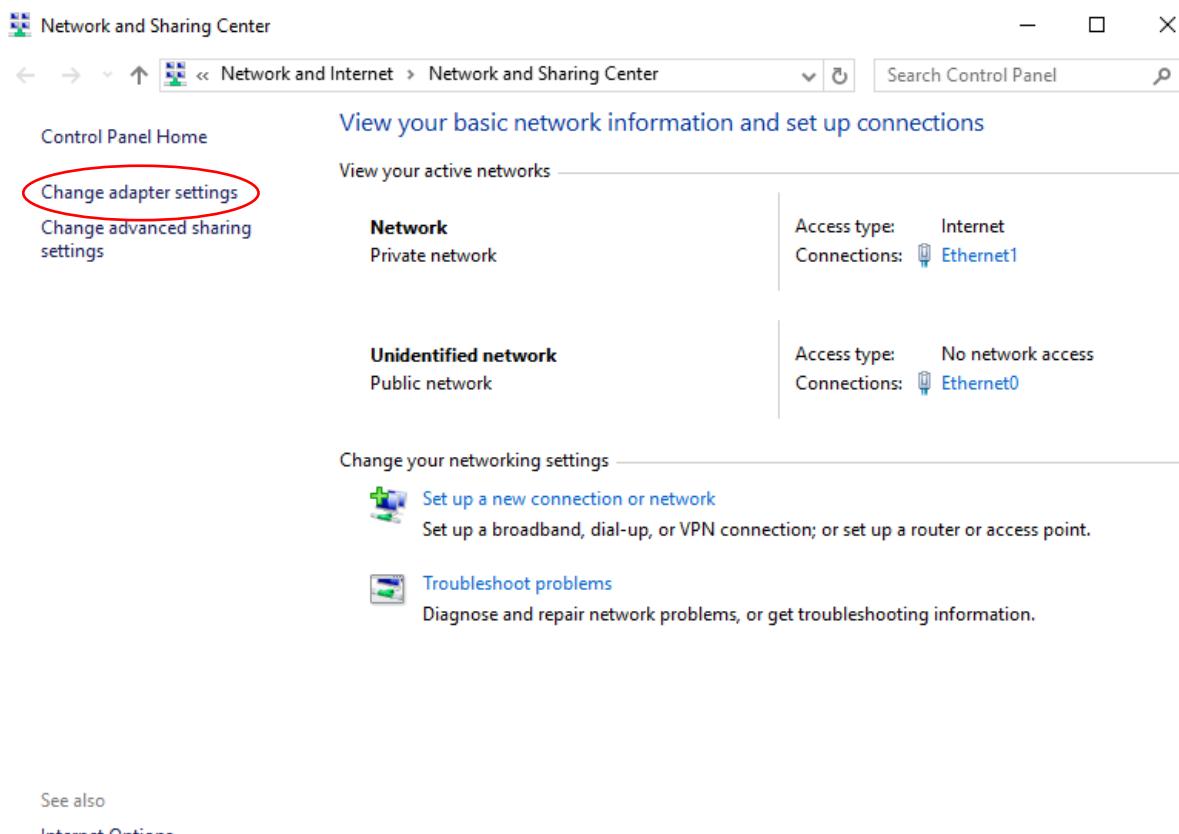
55. Click the **Windows File Explorer** button



56. Right-click on **Network** and select **Properties**



57. Click **Change Adapter Settings**



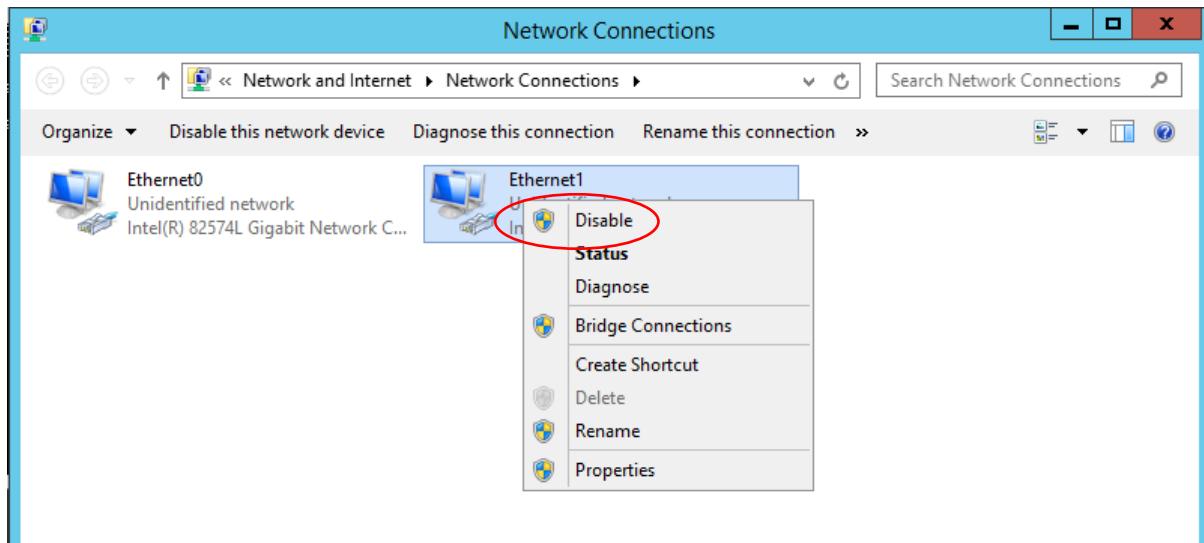
See also

[Internet Options](#)

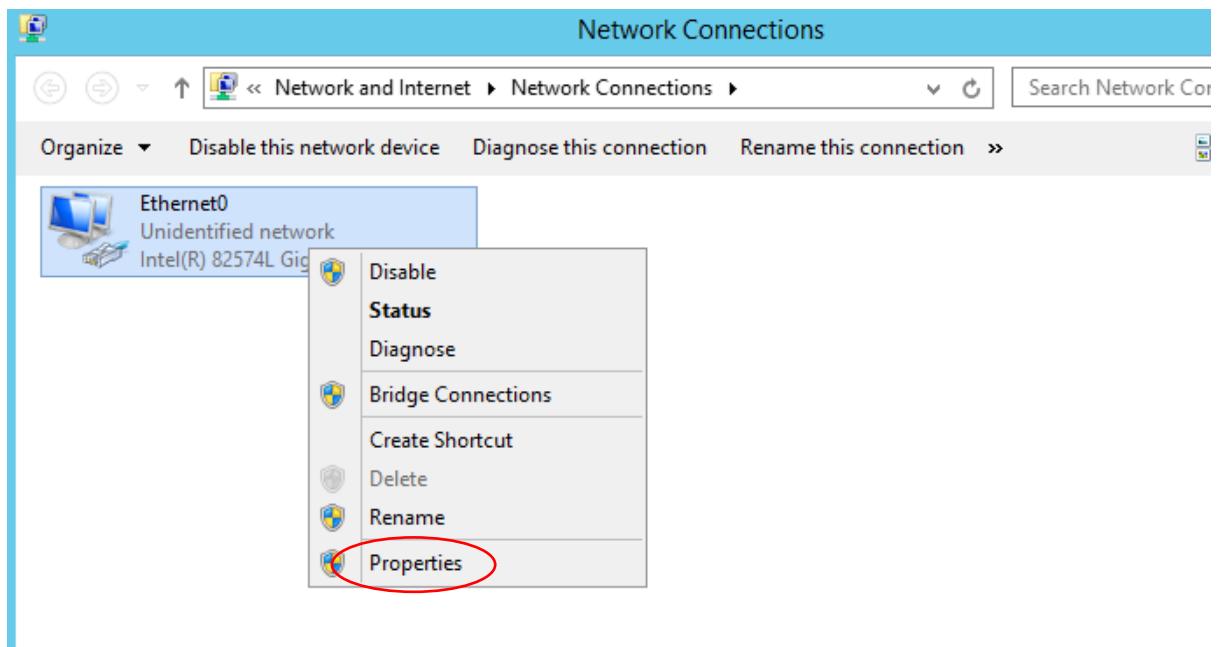
[Windows Firewall](#)

58. The Ethernet0 connection gives the virtual machine access to the other lab devices, the Ethernet1 connection gives the virtual machine access to the Internet. Only one should be used at a time. We needed Internet connectivity to enable the evaluation license. We need to disable Internet access now to allow the virtual machine to access the other lab devices.

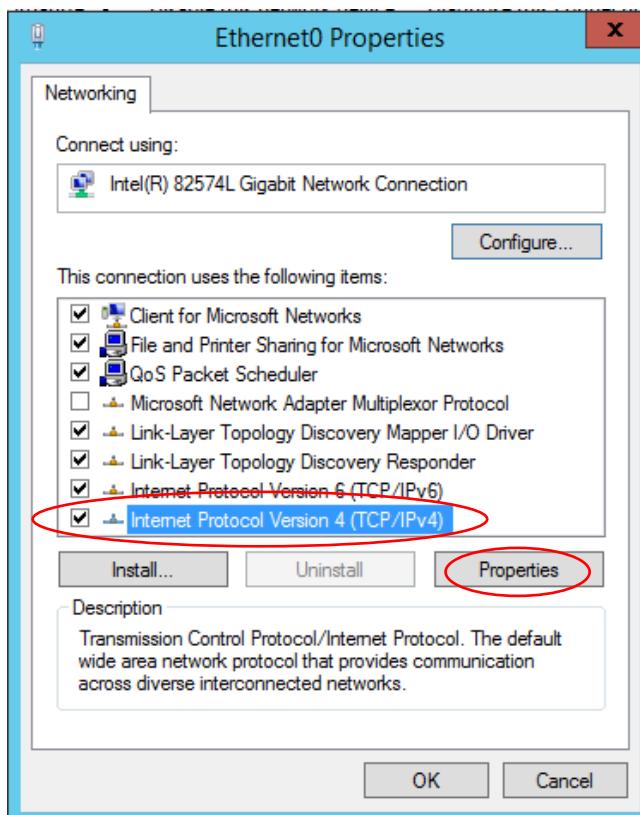
59. Right-click on the **Ethernet1** network card and select **Disable**. If you need Internet connectivity on the Windows host in future (for example to install additional software) then disable Ethernet0 and enable Ethernet1. Switch them back to re-enable connectivity to the lab.



60. Right-click on the **Ethernet0** network card and select **Properties**

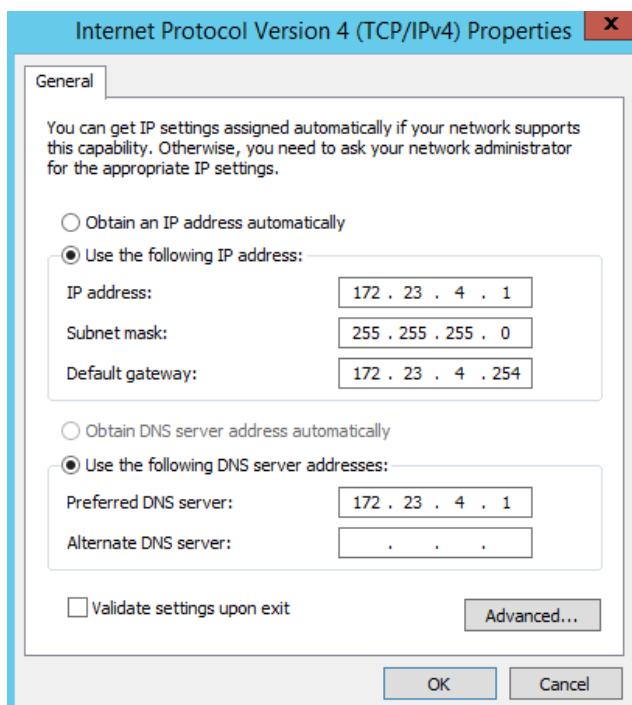


61. Click on **Internet Protocol Version 4 (TCP/IPv4)** and select **Properties**



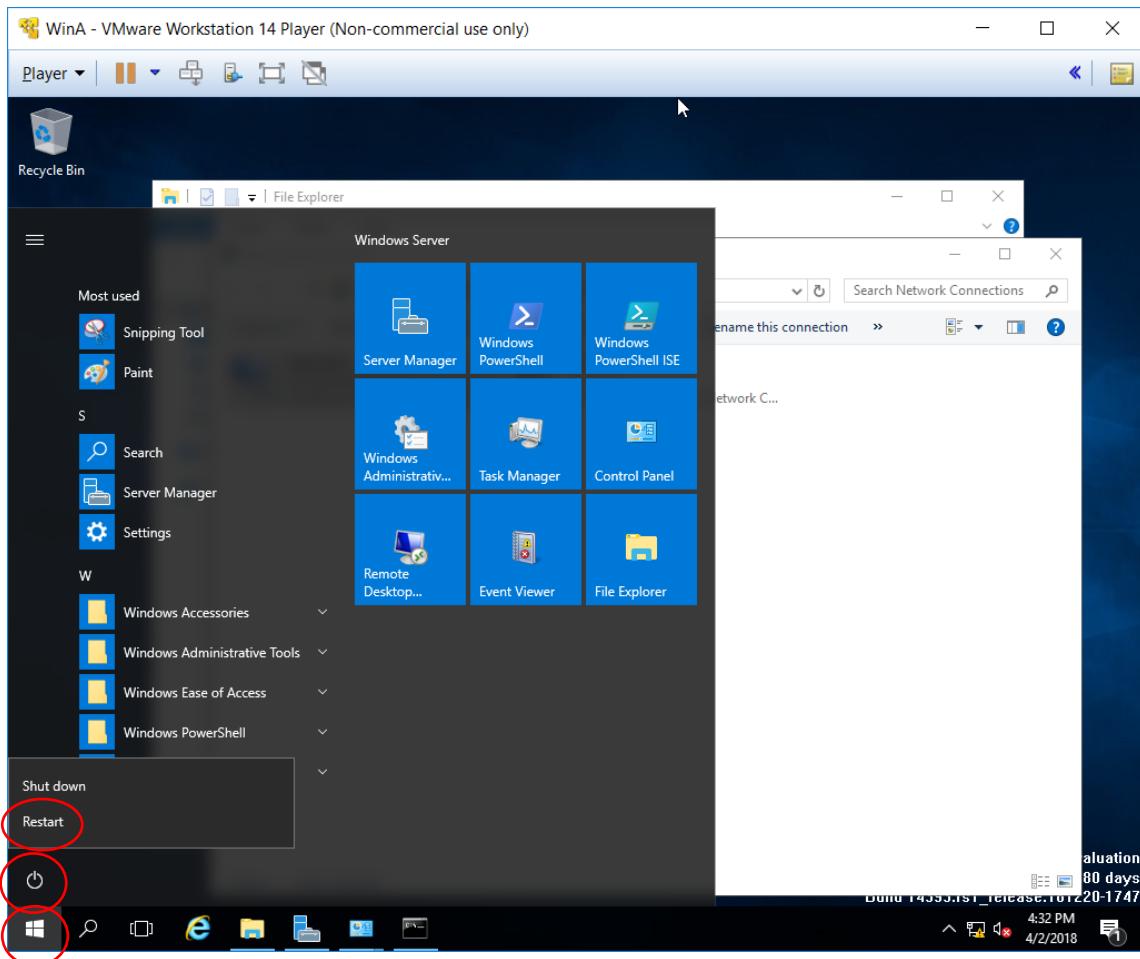
62. Enter the following IP settings:

IP Address	172.23.4.1
Subnet Mask	255.255.255.0
Default Gateway	172.23.4.254
Preferred DNS Server	172.23.4.1



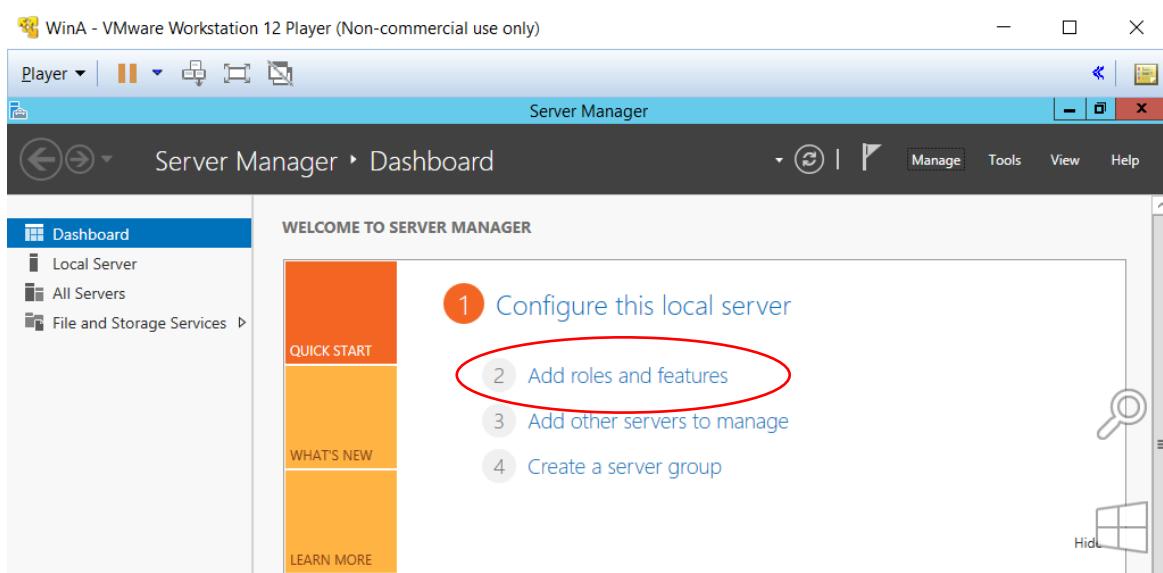
63. Click **OK** and **Close** the Network Properties windows

64. Click on the **Start** button and then **Restart** the server

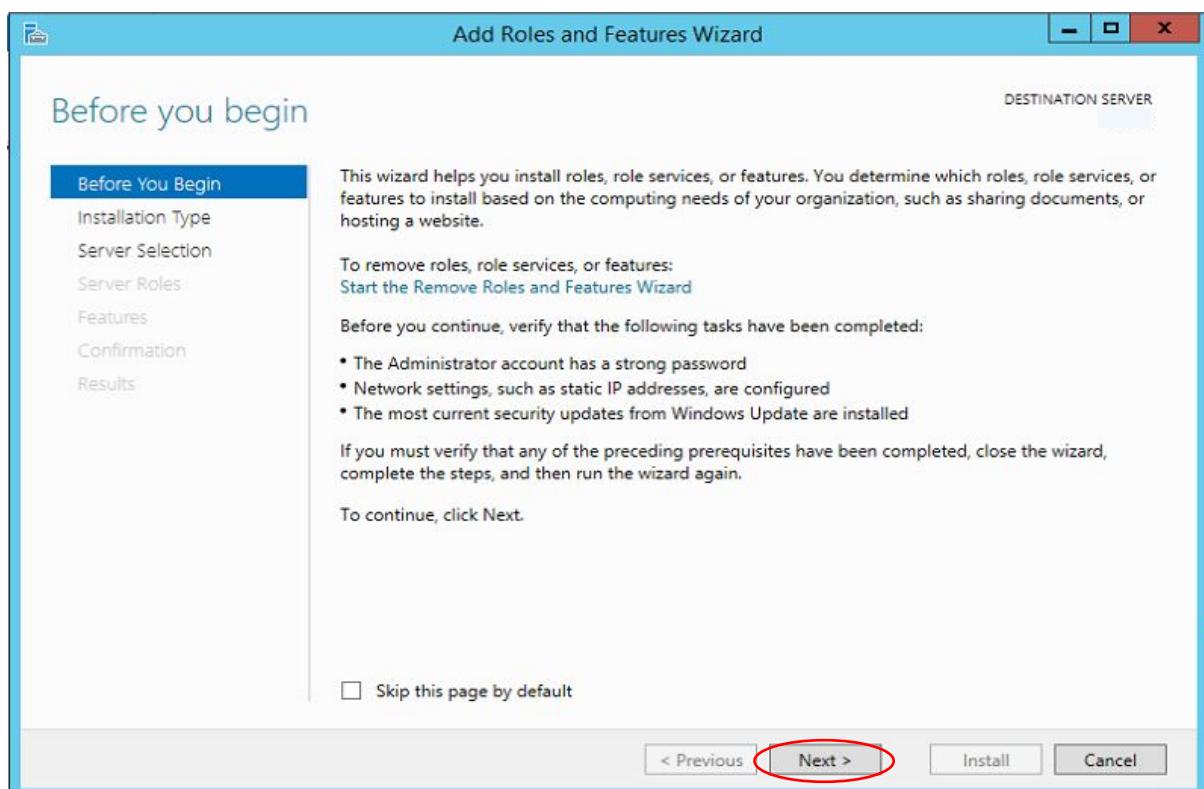


65. Log back in when the server reboots

66. **Server Manager** will open by default. Click **Add Roles and Features**

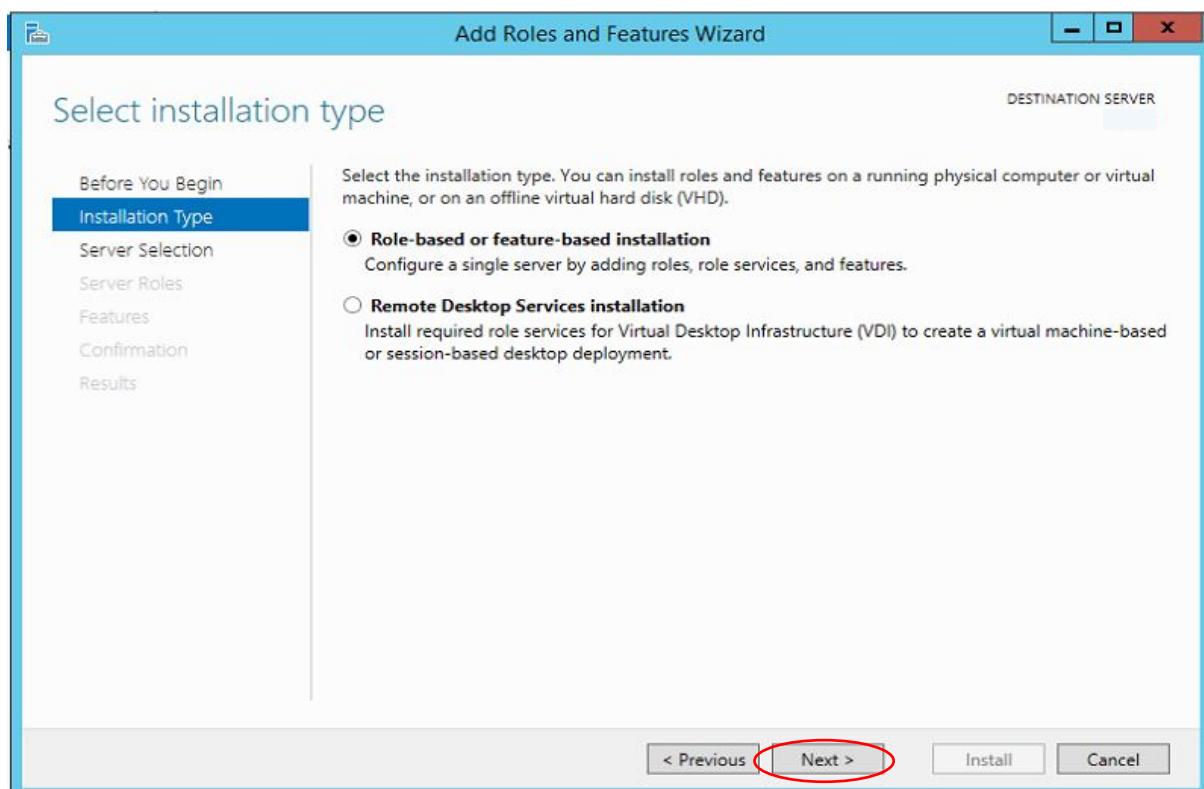


67. The Add Roles and Features wizard opens.

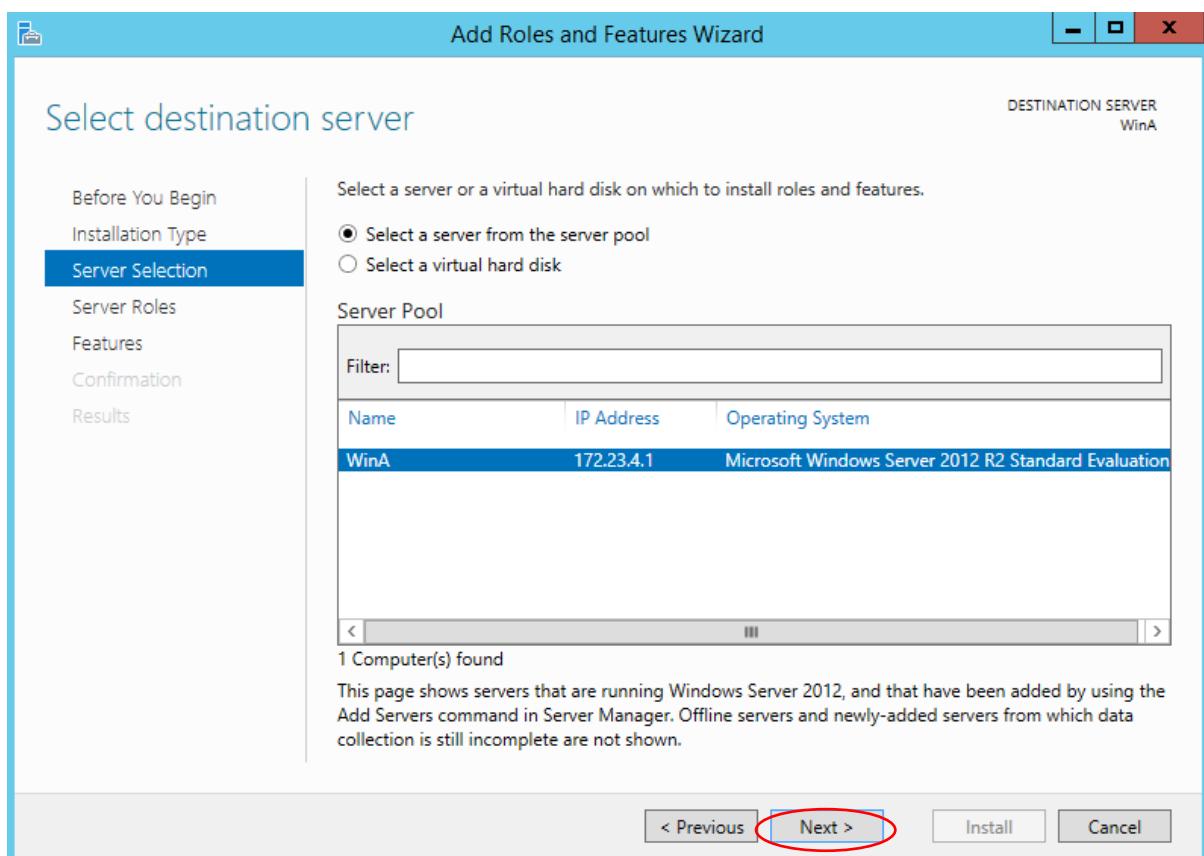


68. Click **Next** on the Before You Begin page

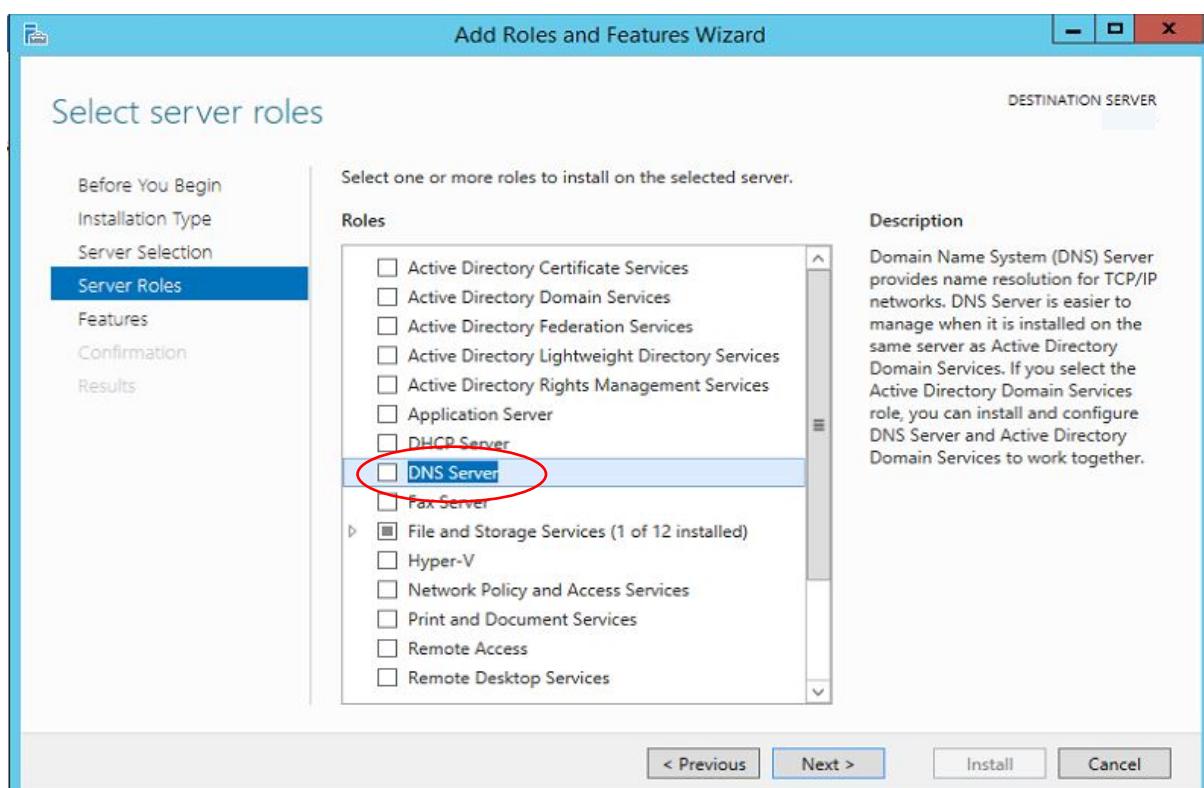
69. For installation type, select **Role-based or feature-based installation**



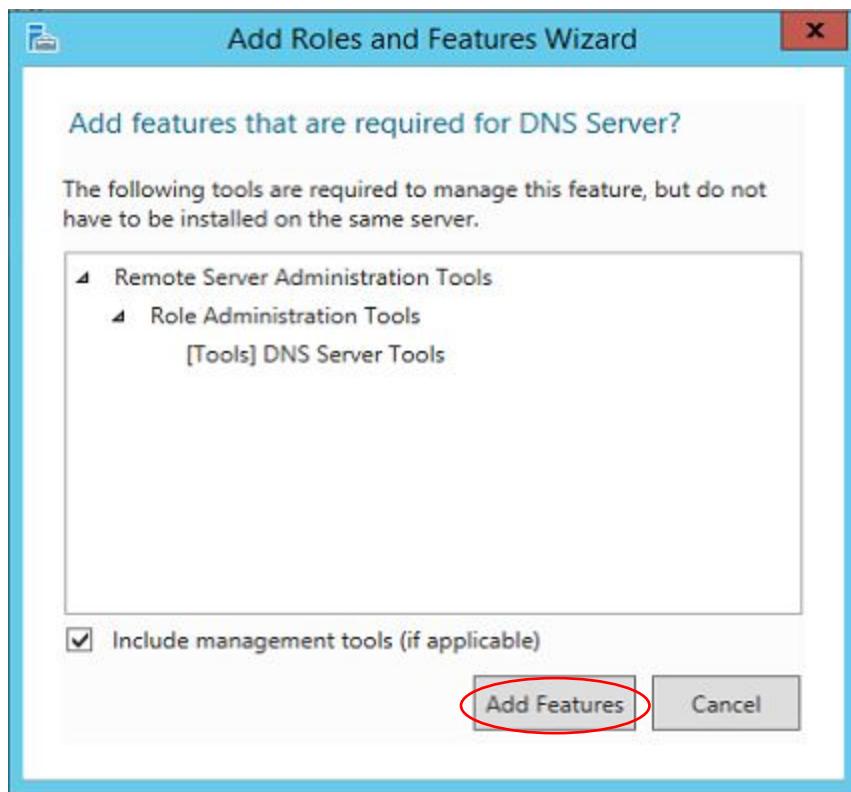
70. Accept the defaults and click **Next** on the Server Selection page



71. Select **DNS Server** on the Server Roles page



72. Click **Add Features** and then click **Next**



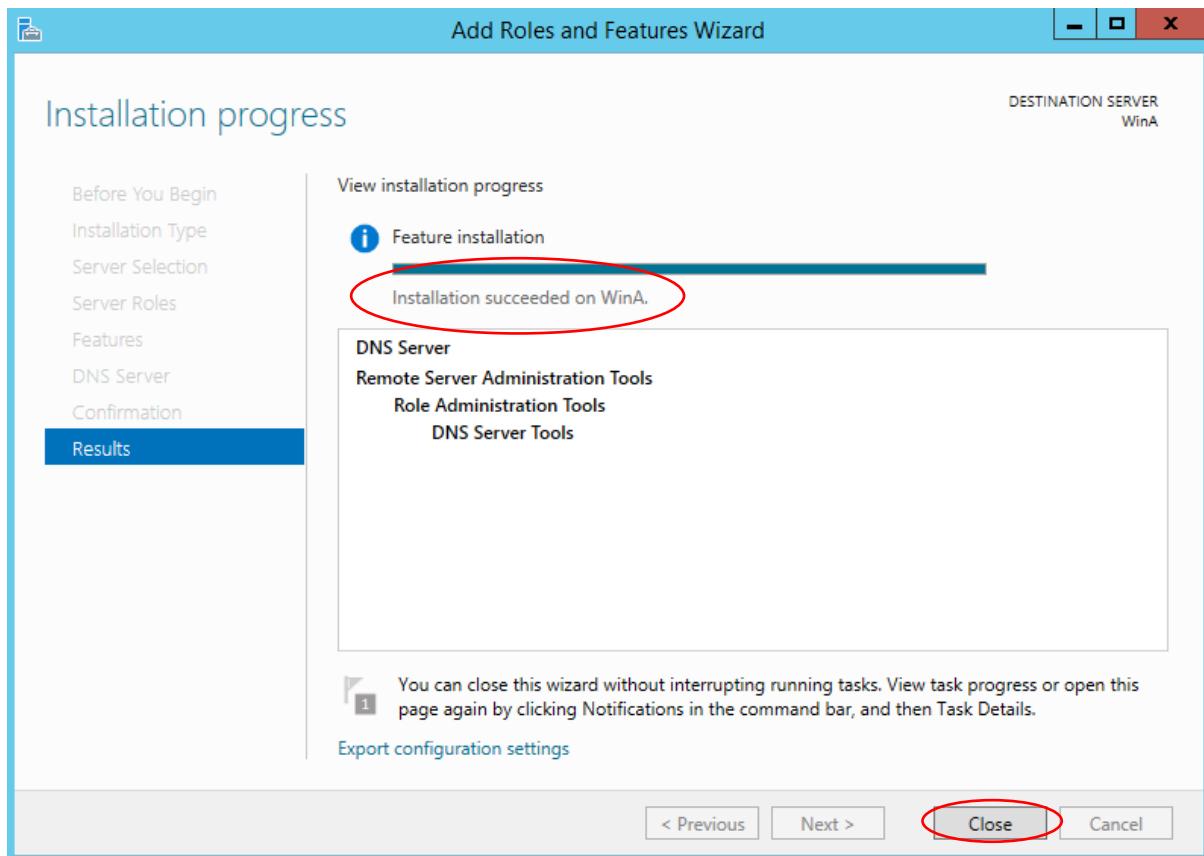
73. Accept the defaults and click **Next** on the Features page

74. Read the information and click **Next** on the DNS Server page

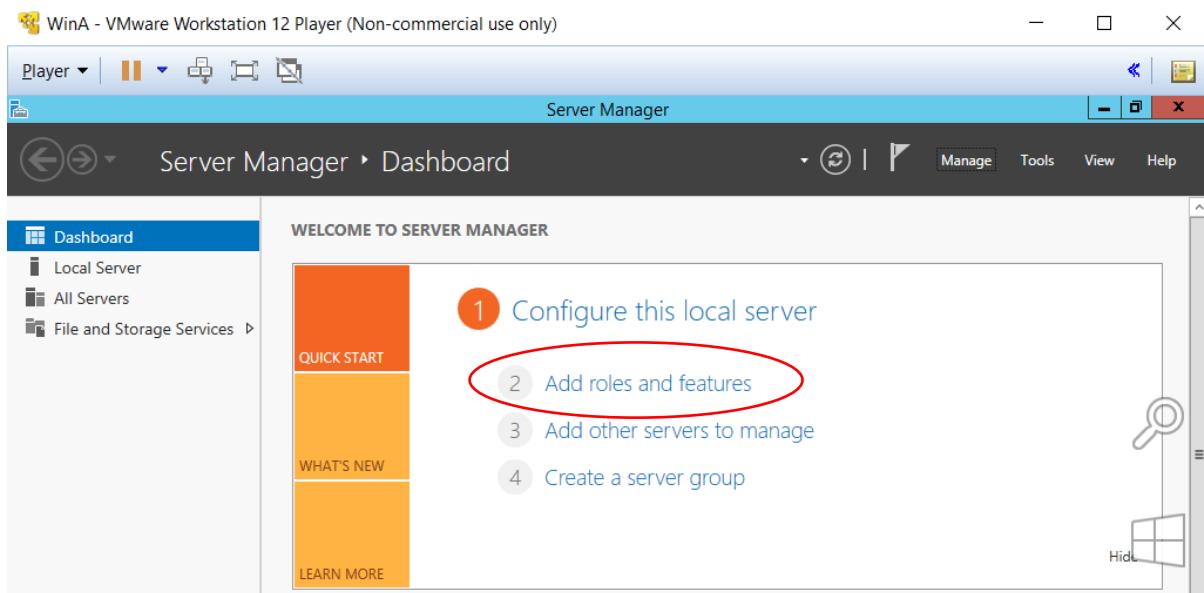
75. Click **Install** on the Confirmation page

76. Wait for the DNS Server installation to complete

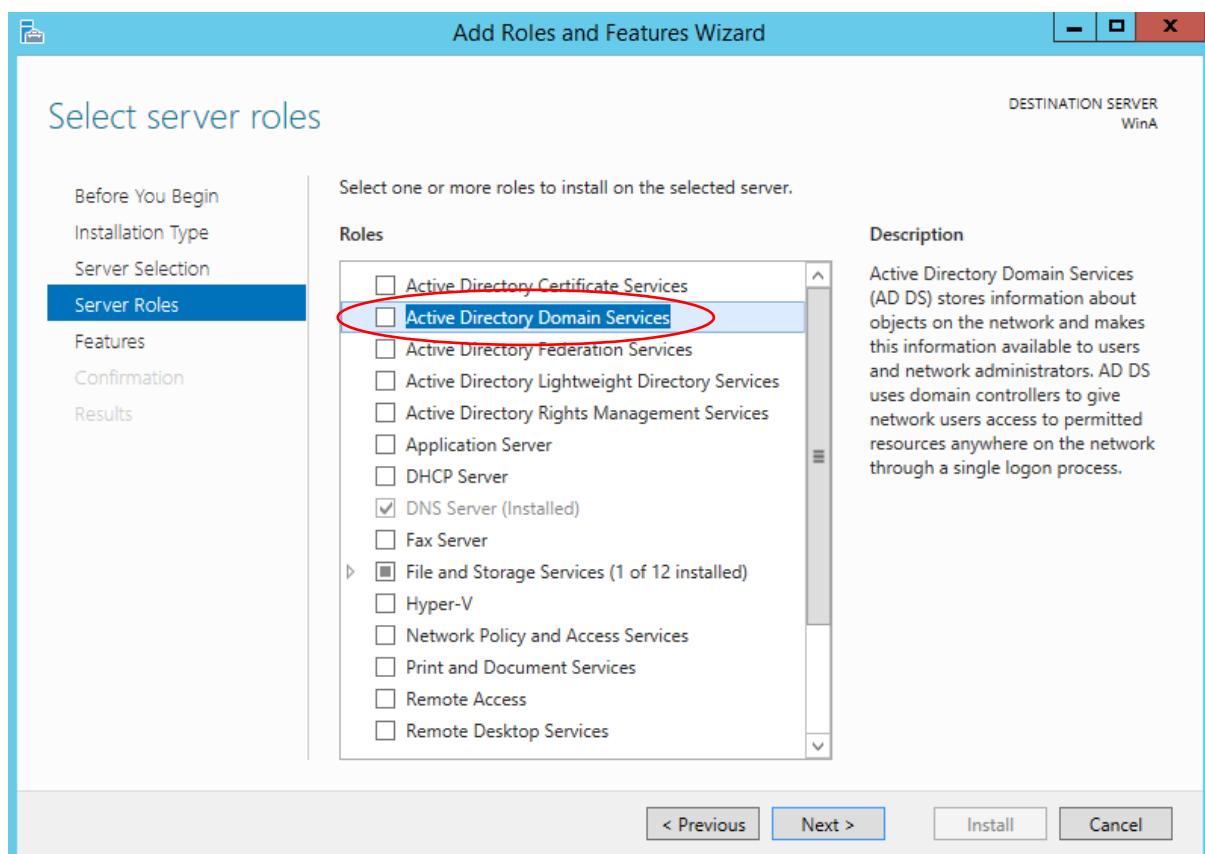
77. When you see the message ‘Installation succeeded on WinA’ click **Close**



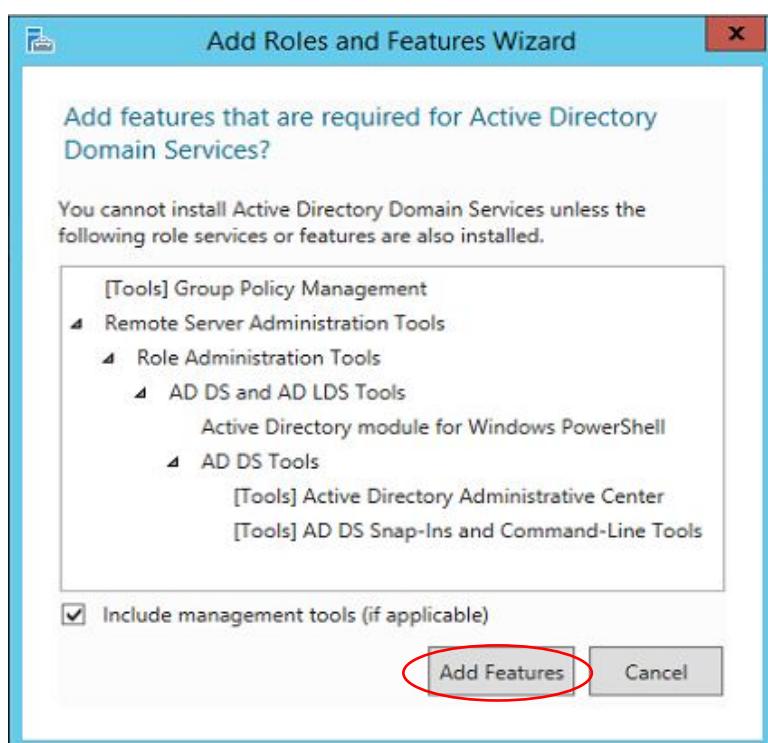
78. Click **Add Roles and Features** in Server Manager again



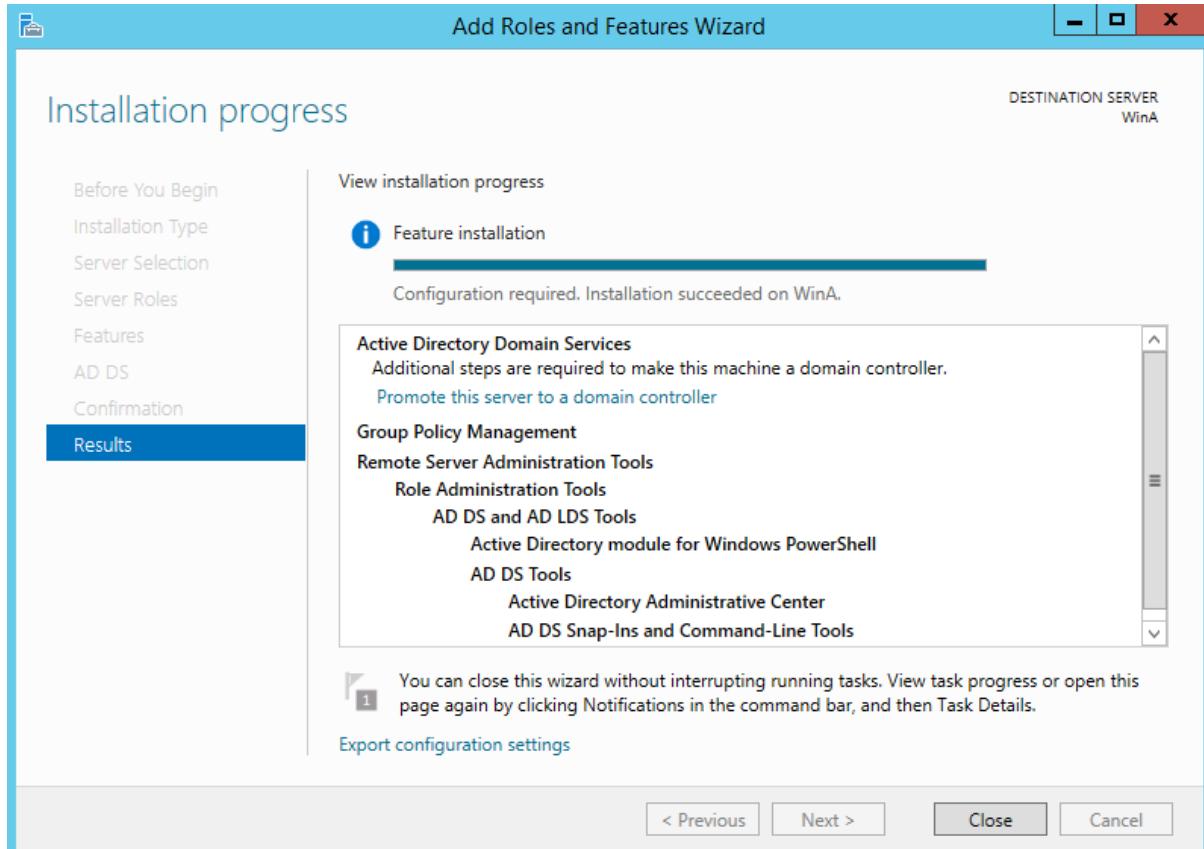
79. Click **Next** on the Before You Begin page
80. For installation type, select **Role-based or feature-based installation**
81. Accept the defaults and click **Next** on the Server Selection page
82. Select **Active Directory Domain Services** on the Server Roles page



83. Click **Add Features** and then click **Next**

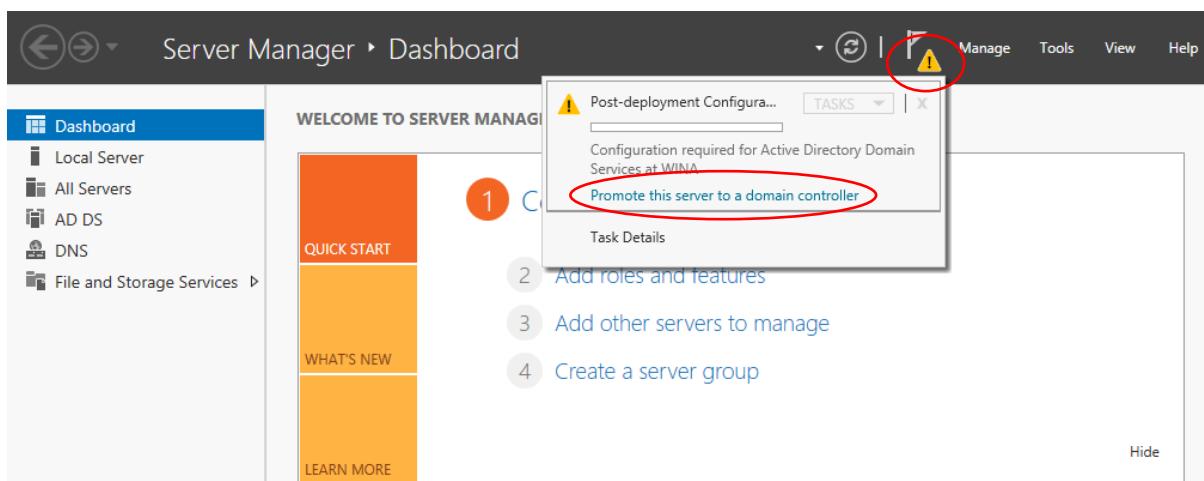


84. Accept the defaults and click **Next** on the Features page
85. Read the information and click **Next** on the Active Directory Domain Services page
86. Click **Install** on the Confirmation page
87. Wait for the Active Directory Domain Services installation to complete
88. When you see the message 'Configuration required. Installation succeeded on WinA' click **Close**

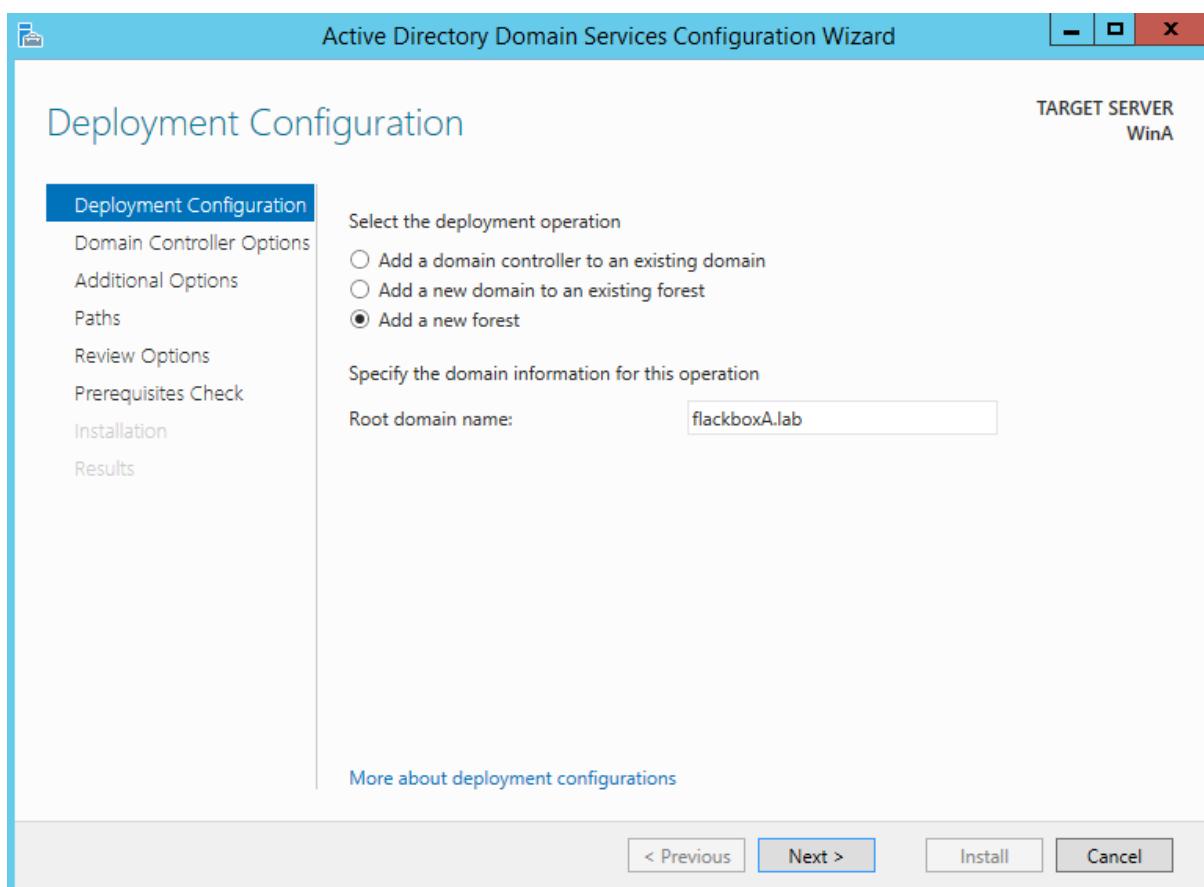


89. Click on the **Start** button and then **Restart** the server
90. Log back in when the server reboots

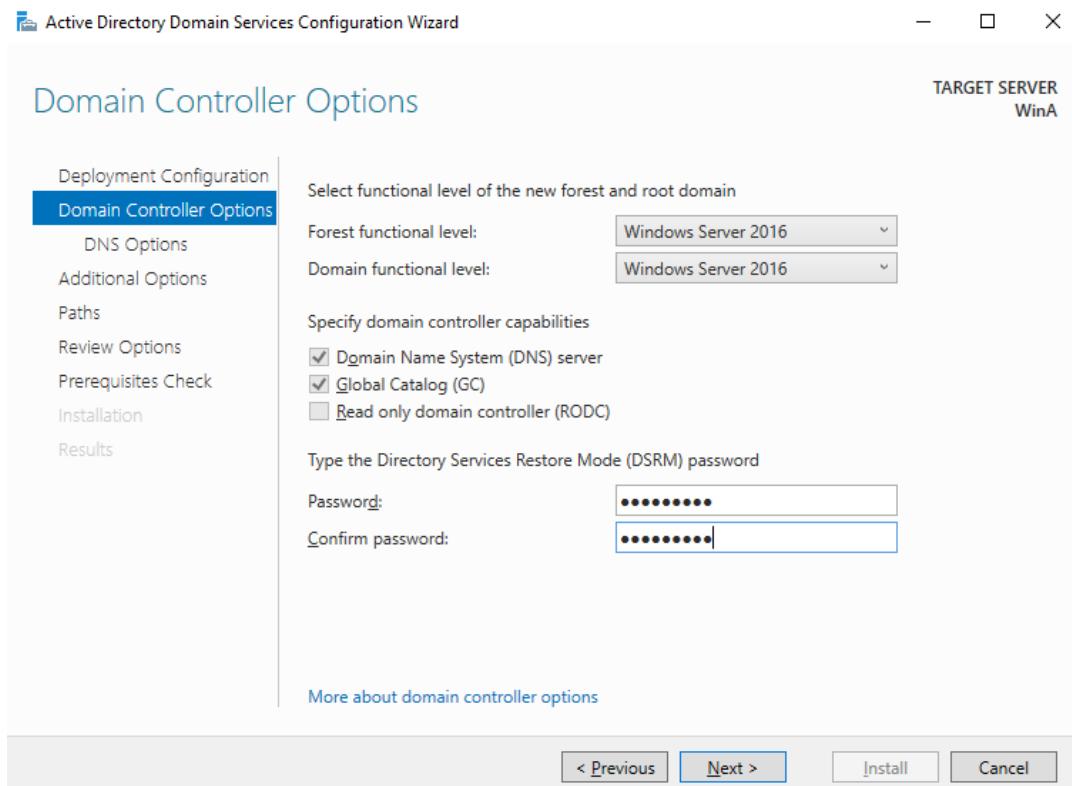
91. In Server Manager, click on the Notifications flag yellow warning triangle and then select **Promote this server to a domain controller**



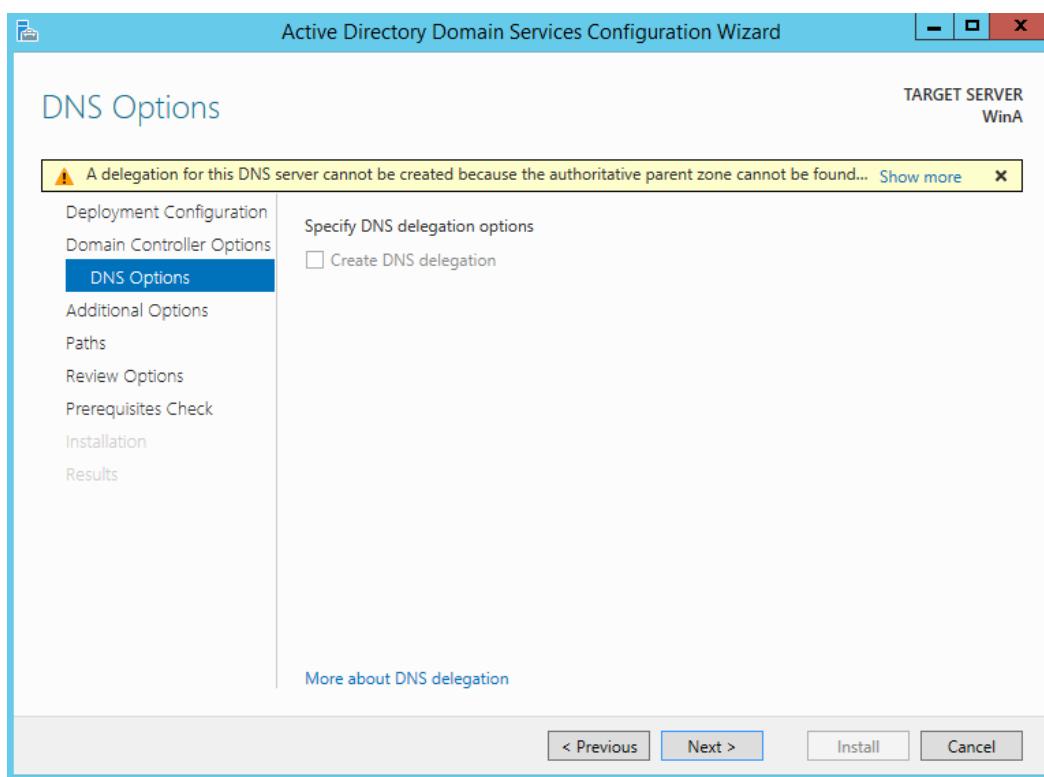
92. Select **Add a new forest** and enter the Root domain name **flackboxA.lab** and click **Next** (it may take some time for the next page to become available)



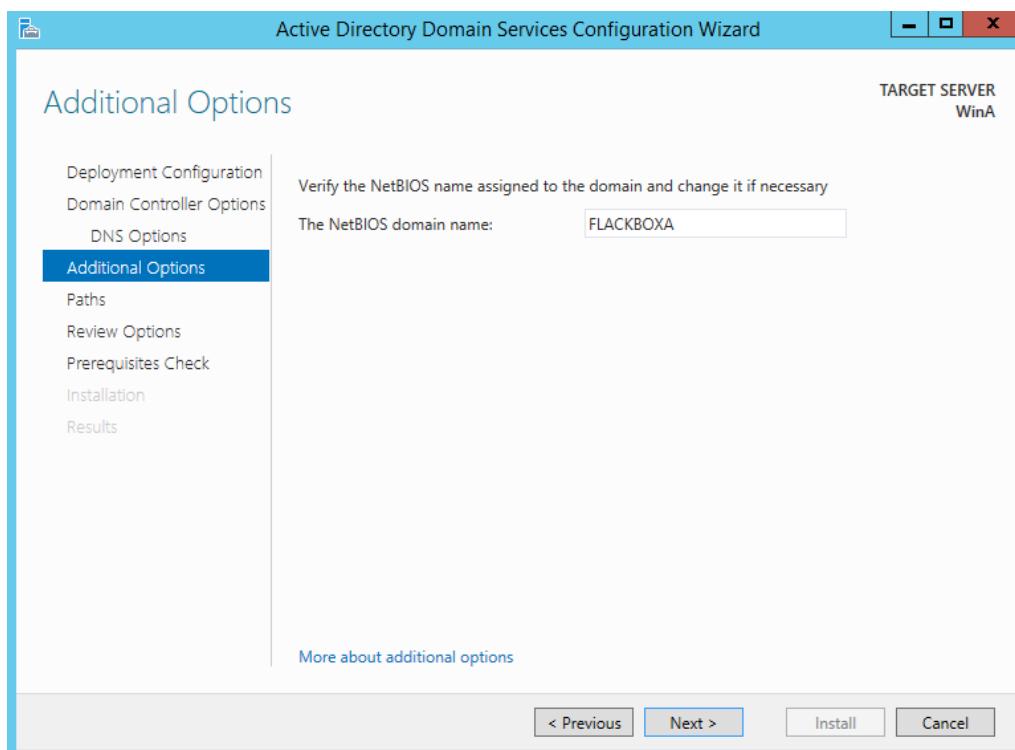
93. Enter **Flackbox1** for the Directory Services Restore Mode (DSRM) password. Leave all other options at the defaults and click **Next**



94. Ignore the warning message on the DNS Options page and click **Next**



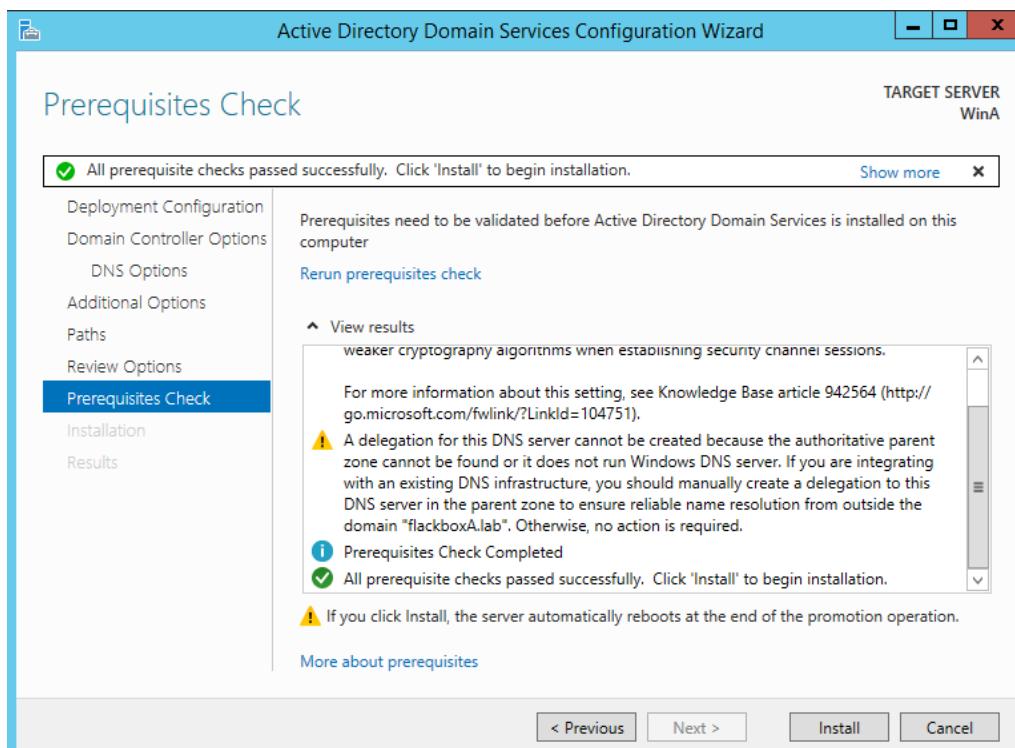
95. **FLACKBOXA** will be automatically filled in as the NetBIOS domain name on the Additional Options page. Click **Next**



96. Accept the defaults on the Paths page and click **Next**

97. Read the information and click **Next** on the Review Options page

98. Read the information on the Prerequisites Check page. The warning messages are normal and expected. Click **Install**

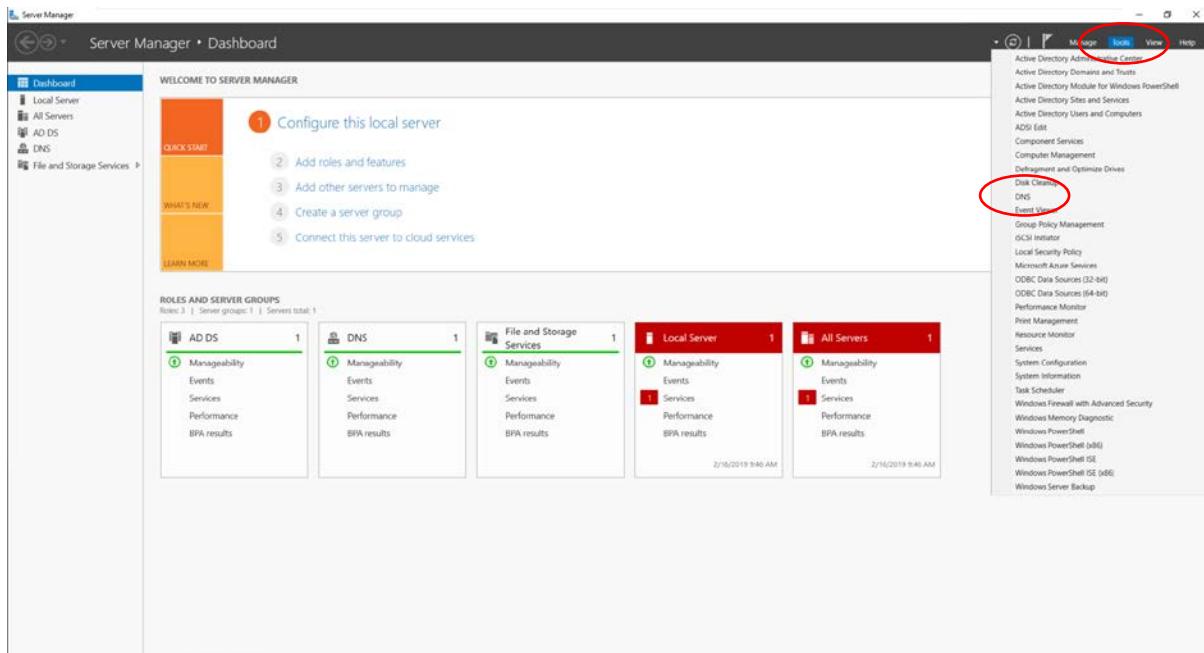


99. The installation will take some time. The server will automatically reboot when the installation is complete.

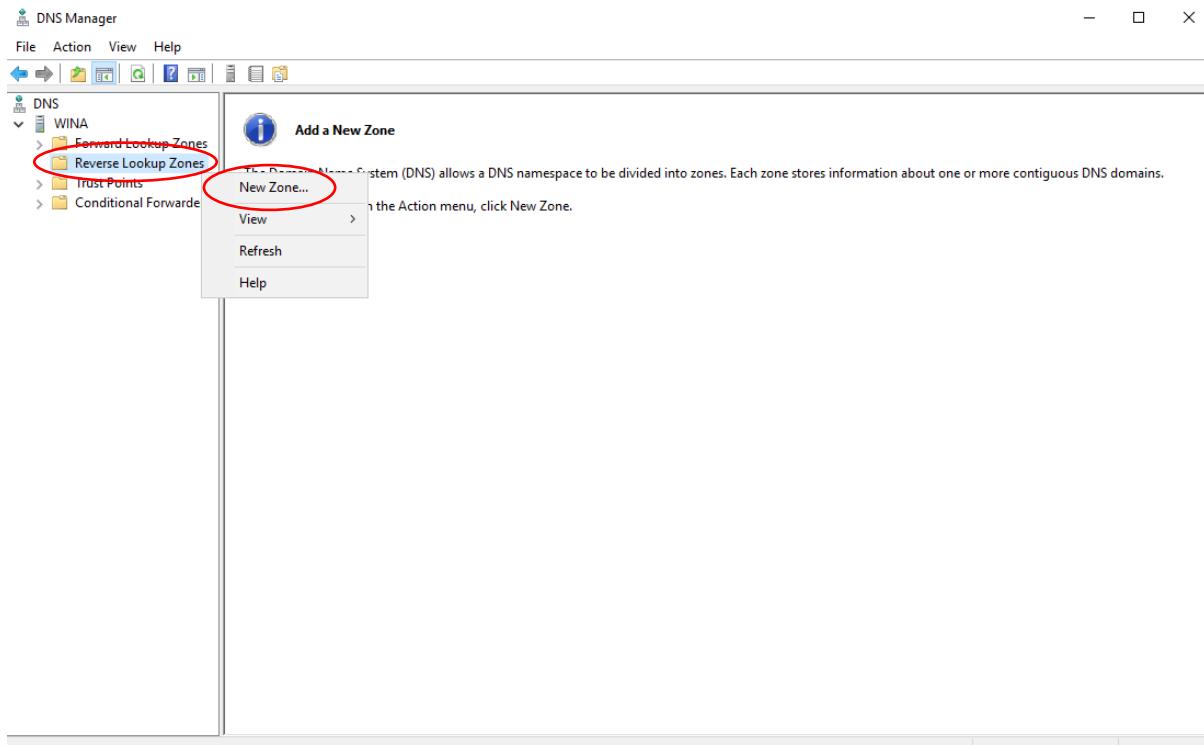
100. Log back in when the server has rebooted

101. You need to configure DNS host entries for the VMware ESXi host and VCSA vCenter Server Appliance virtual machines which will be built later.

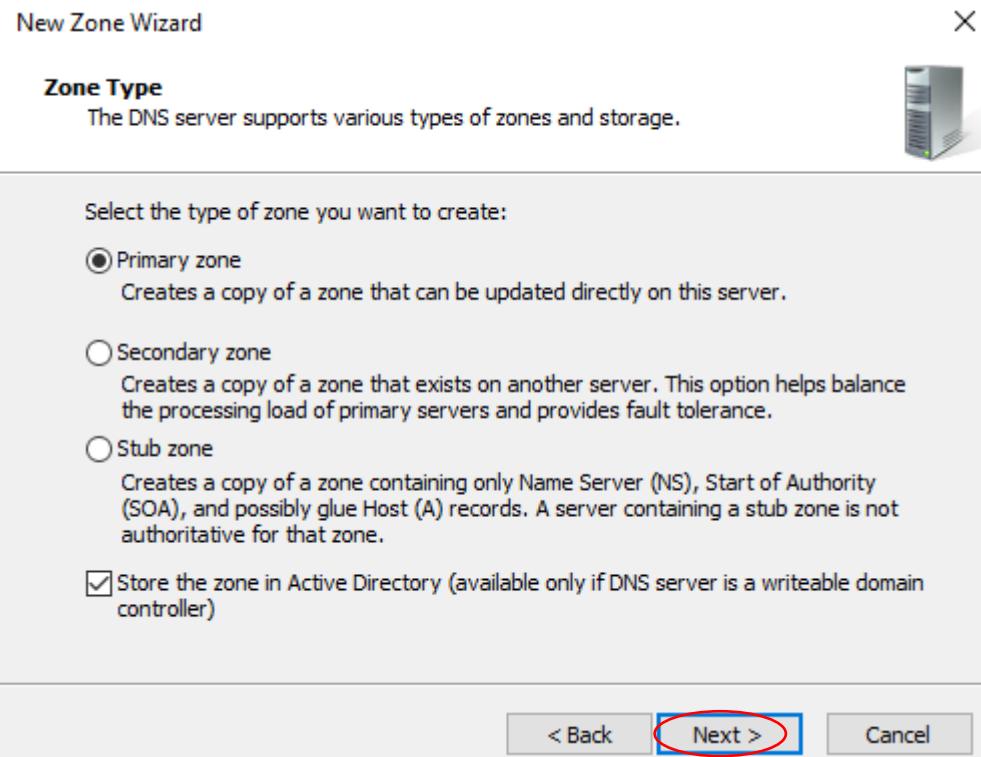
102. Open the **Tools > DNS** applet from Server Manager.



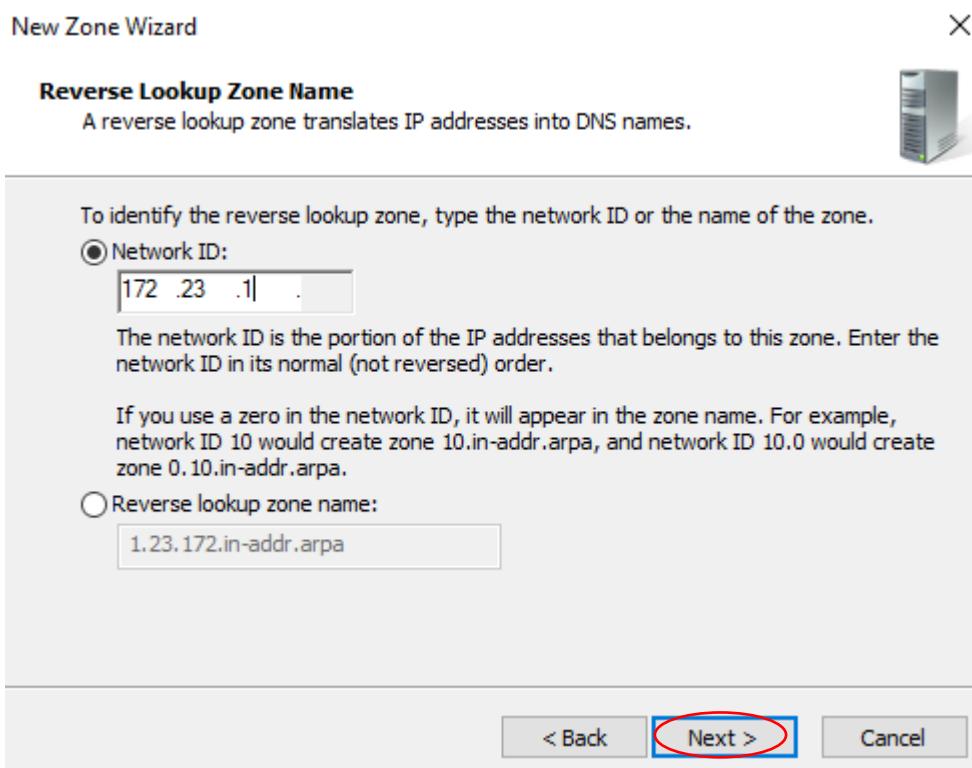
103. Expand the menu in the left-hand window, then right-click on **Reverse Lookup Zones** and select **New Zone...**



104. Click **Next** on the New Zone Wizard welcome page
105. Accept the defaults on the Zone Type page and click **Next**

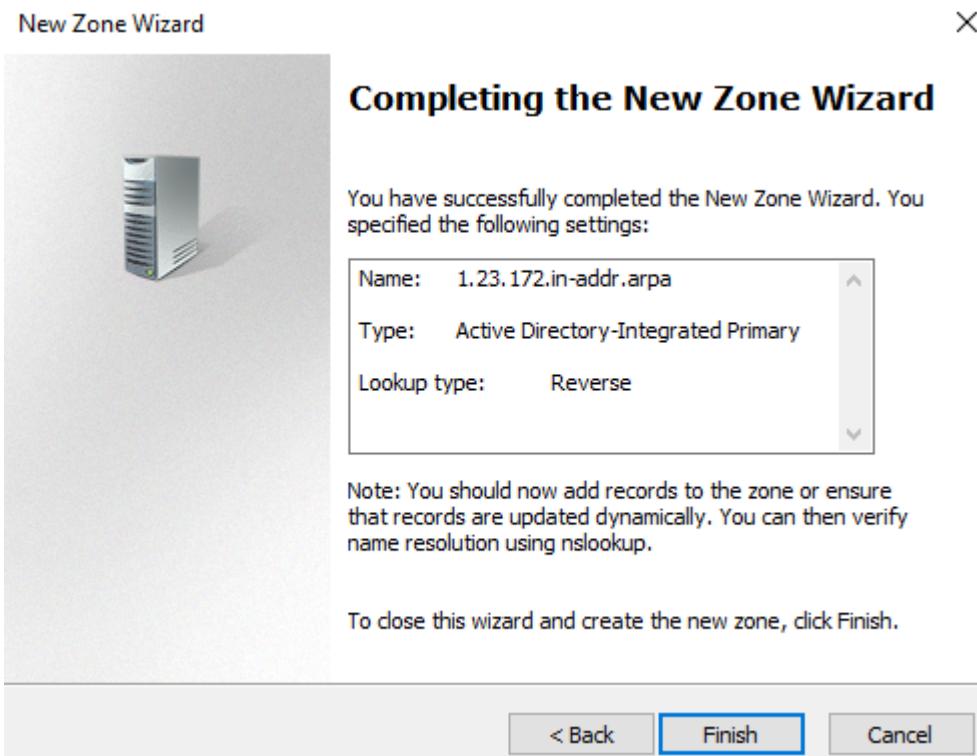


106. Click **Next** on the Active Directory Zone Replication Scope page
107. Click **Next** on the Reverse Lookup Zone Name Scope page
108. Enter **172.23.1** as the Network ID and click **Next**



109. Click **Next** on the Dynamic Update page

110. Click **Finish** to complete the New Zone Wizard

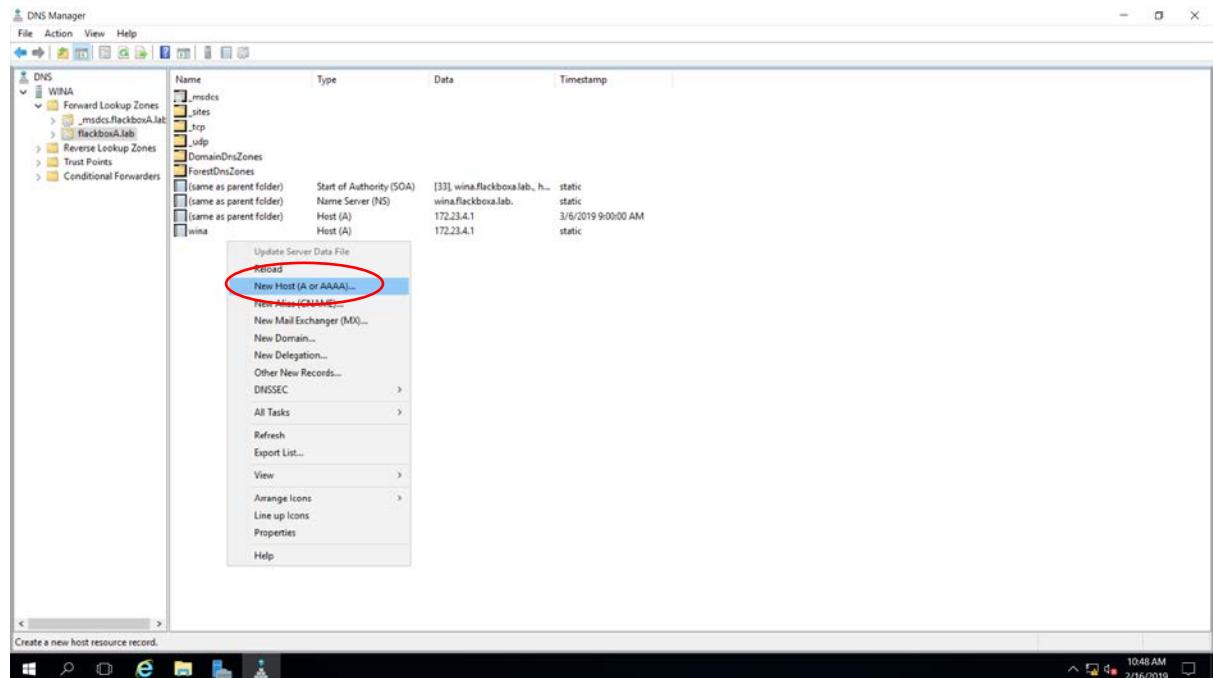


111. Expand Forward Lookup Zones in the left-hand window and select the **flackboxA.lab** domain.

The screenshot shows the Windows DNS Manager interface. The left pane displays a tree view of DNS objects under the 'DNS' node, including 'WINA', 'Forward Lookup Zones' (with '_msdcs.flackboxA.lab' and 'flackboxA.lab' expanded), 'Reverse Lookup Zones', 'Trust Points', and 'Conditional Forwarders'. The 'flackboxA.lab' folder is circled in red. The right pane shows a table of DNS records:

Name	Type	Data	Timestamp
_msdcs			
_sites			
_tcp			
_udp			
DomainDnsZones			
ForestDnsZones			
(same as parent folder)	Start of Authority (SOA)	[29], wina.flackboxa.lab, h...	static
(same as parent folder)	Name Server (NS)	win.a.flackboxa.lab.	static
(same as parent folder)	Host (A)	172.23.4.1	8/6/2019 3:00:00 PM
wina	Host (A)	172.23.4.1	static

112. Right-click in the right-hand window and select **New Host (A or AAAA)...**



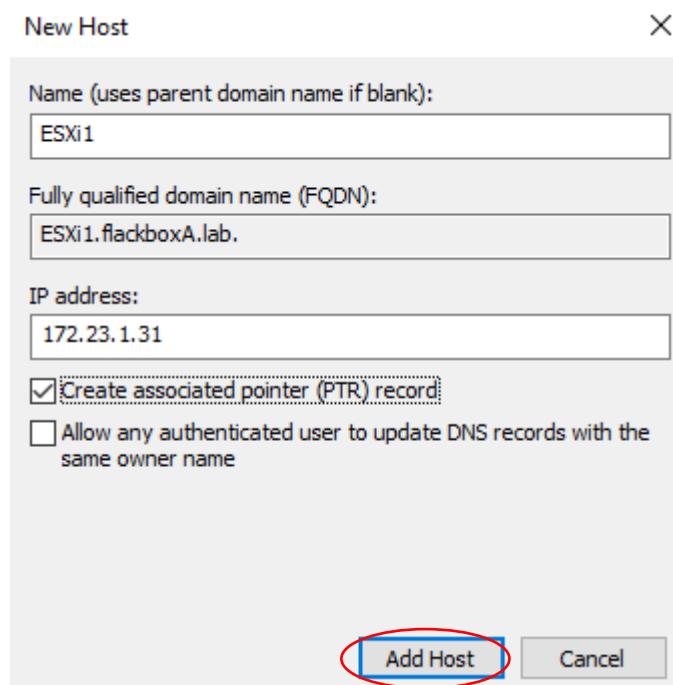
113. Add an Address (A) record for the ESXi1 host with these details:

Name: ESXi1

FQDN: ESXi1.flackboxA.lab (*this will be populated for you*)

IP address: 172.23.1.31

Create associated pointer (PTR) record: *checked*



DNS

X



The host record ESXi1.flackboxA.lab was successfully created.

OK

114. Add an Address (A) record for the VCSA appliance with these details:

Name: VCSA

FQDN: VCSA.flackboxA.lab (*this will be populated for you*)

IP address: 172.23.1.101

Create associated pointer (PTR) record: *checked*

New Host

X

Name (uses parent domain name if blank):

VCSA

Fully qualified domain name (FQDN):

VCSA.flackboxA.lab.

IP address:

172.23.1.101

Create associated pointer (PTR) record

Allow any authenticated user to update DNS records with the same owner name

Add Host

Done

DNS

X



The host record VCSA.flackboxA.lab was successfully created.

OK

115. Add an Address (A) record for the ESXi2 host with these details:

Name: ESXi2

FQDN: ESXi2.flackboxA.lab (*this will be populated for you*)

IP address: 172.23.1.32

Create associated pointer (PTR) record: *checked*

New Host X

Name (uses parent domain name if blank):
ESXi2

Fully qualified domain name (FQDN):
ESXi2.flackboxA.lab.

IP address:
172.23.1.32

Create associated pointer (PTR) record
 Allow any authenticated user to update DNS records with the same owner name

Add Host Cancel

DNS X

i The host record ESXi2.flackboxA.lab was successfully created.

OK

116. You should now have the DNS records shown below.

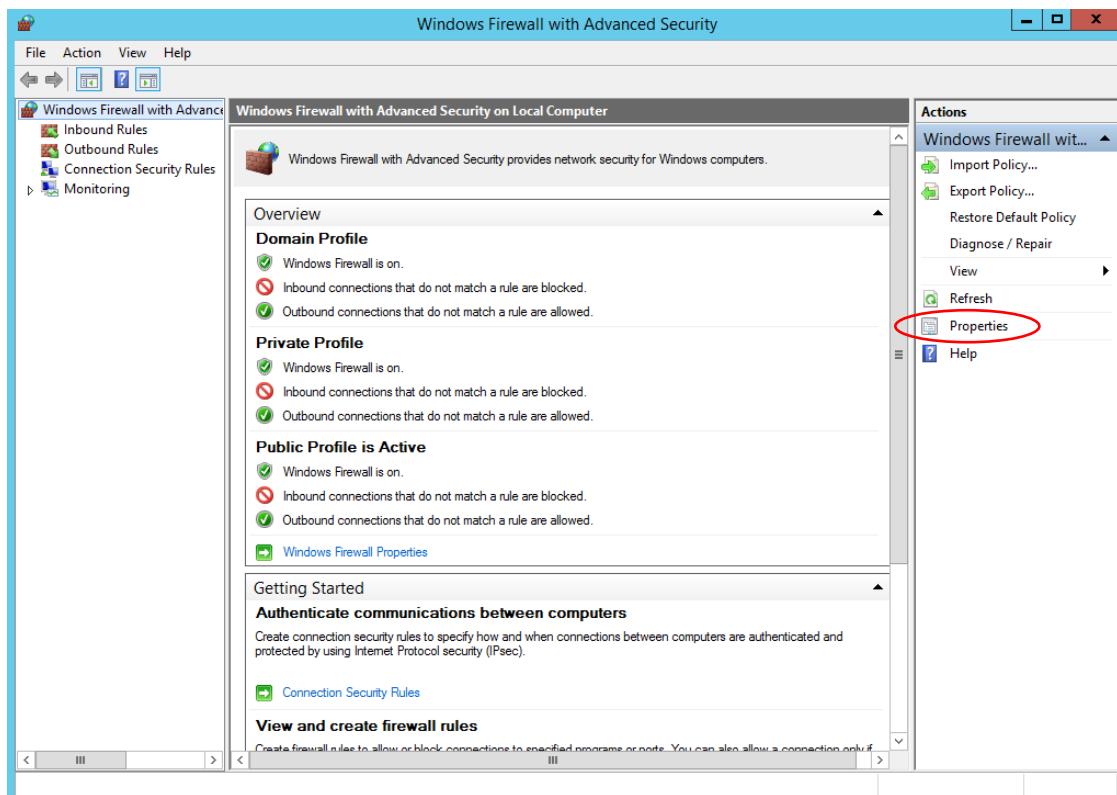
The screenshot shows the Windows DNS Manager interface. On the left, the navigation pane displays a tree structure under the 'DNS' node, including 'WINA' (Forward Lookup Zones: '_msdc', '_sites', '_tcp', '_udp', 'DomainDnsZones', 'ForestDnsZones'), 'flackboxA.lab' (Forward Lookup Zones: '_msdc', '_sites', '_tcp', '_udp', 'DomainDnsZone', 'ForestDnsZones'), and Reverse Lookup Zones, Trust Points, and Conditional Forwarders. On the right, a table lists DNS records for the 'flackboxA.lab' zone:

Name	Type	Data	Timestamp
_msdc	Start of Authority (SOA)	[38], wina.flackboxa.lab, h...	static
_sites	Name Server (NS)	wina.flackboxa.lab.	static
_tcp	Host (A)	172.23.4.1	9/2/2019 8:00:00 AM
_udp	Host (A)	172.23.1.31	static
DomainDnsZones	(same as parent folder)		
ForestDnsZones	(same as parent folder)		
ESXi1	Host (A)	172.23.1.101	static
VCSA	Host (A)	172.23.4.1	static
wina	Host (A)	172.23.1.32	static
ESXi2	Host (A)		

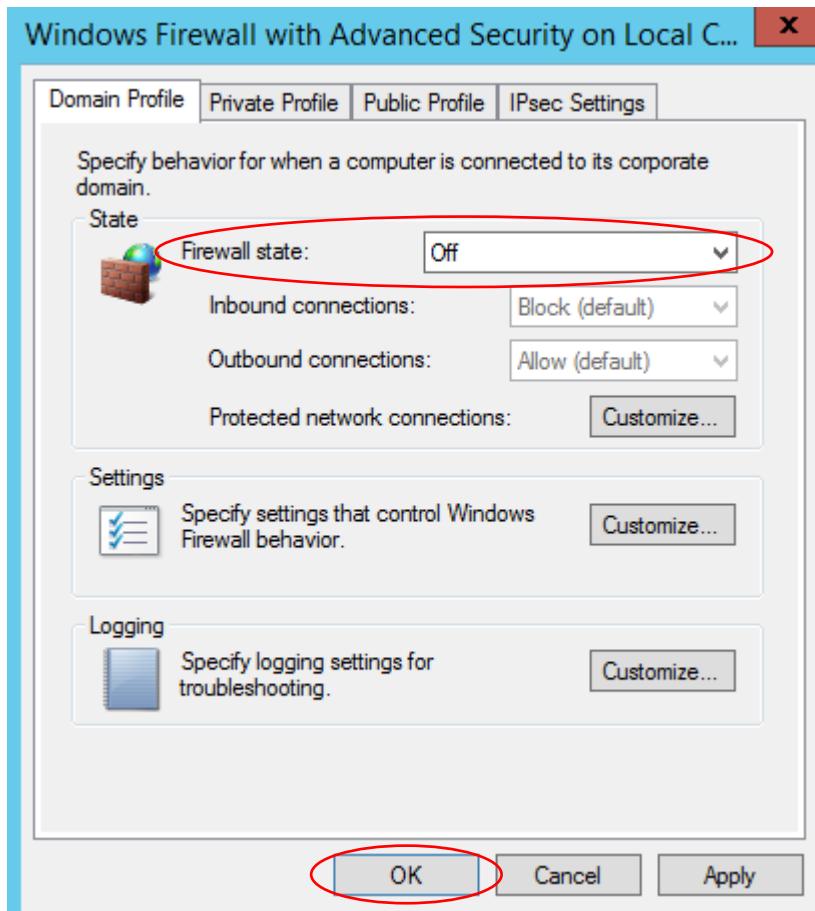
117. In Server Manager, click **Tools > Windows Firewall with Advanced Security**

The screenshot shows the Windows Server Manager dashboard. The left sidebar includes links for Local Server, All Servers, AD DS, DNS, and File and Storage Services. The main area features a 'WELCOME TO SERVER MANAGER' section with 'QUICK START' steps (Configure this local server, Add roles and features, Add other servers to manage, Create a server group) and a 'WHAT'S NEW' section. Below this is a 'ROLES AND SERVER GROUPS' summary: Roles: 3 | Server groups: 1 | Servers total: 1. Two cards are displayed: 'AD DS' (Manageability, Events, Services, Performance, BPA results) and 'DNS' (Manageability, Events, Services, Performance, BPA results). On the right, the 'Tools' menu is open, listing various management tools. The 'Windows Firewall with Advanced Security' option is circled in red.

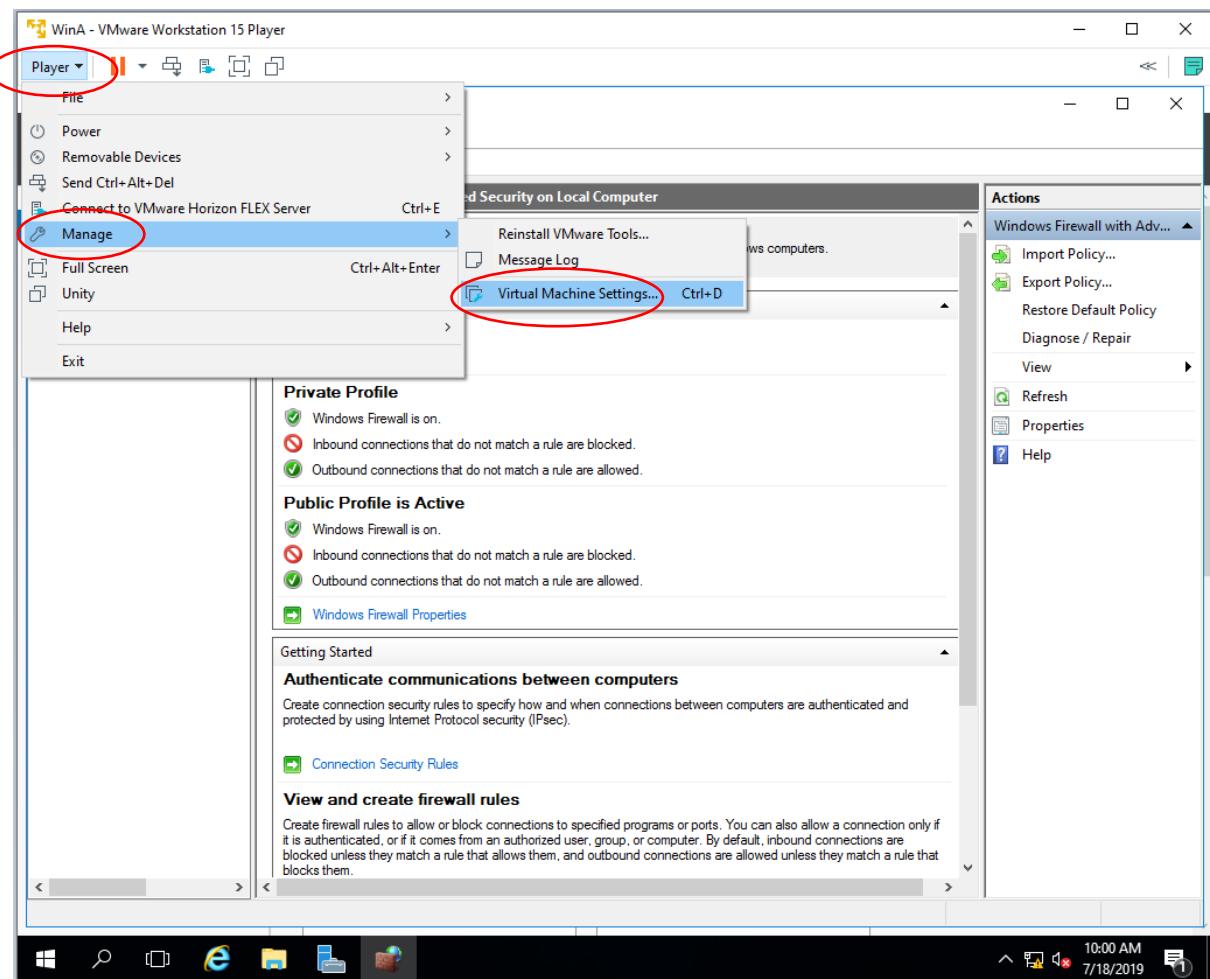
118. Click Properties



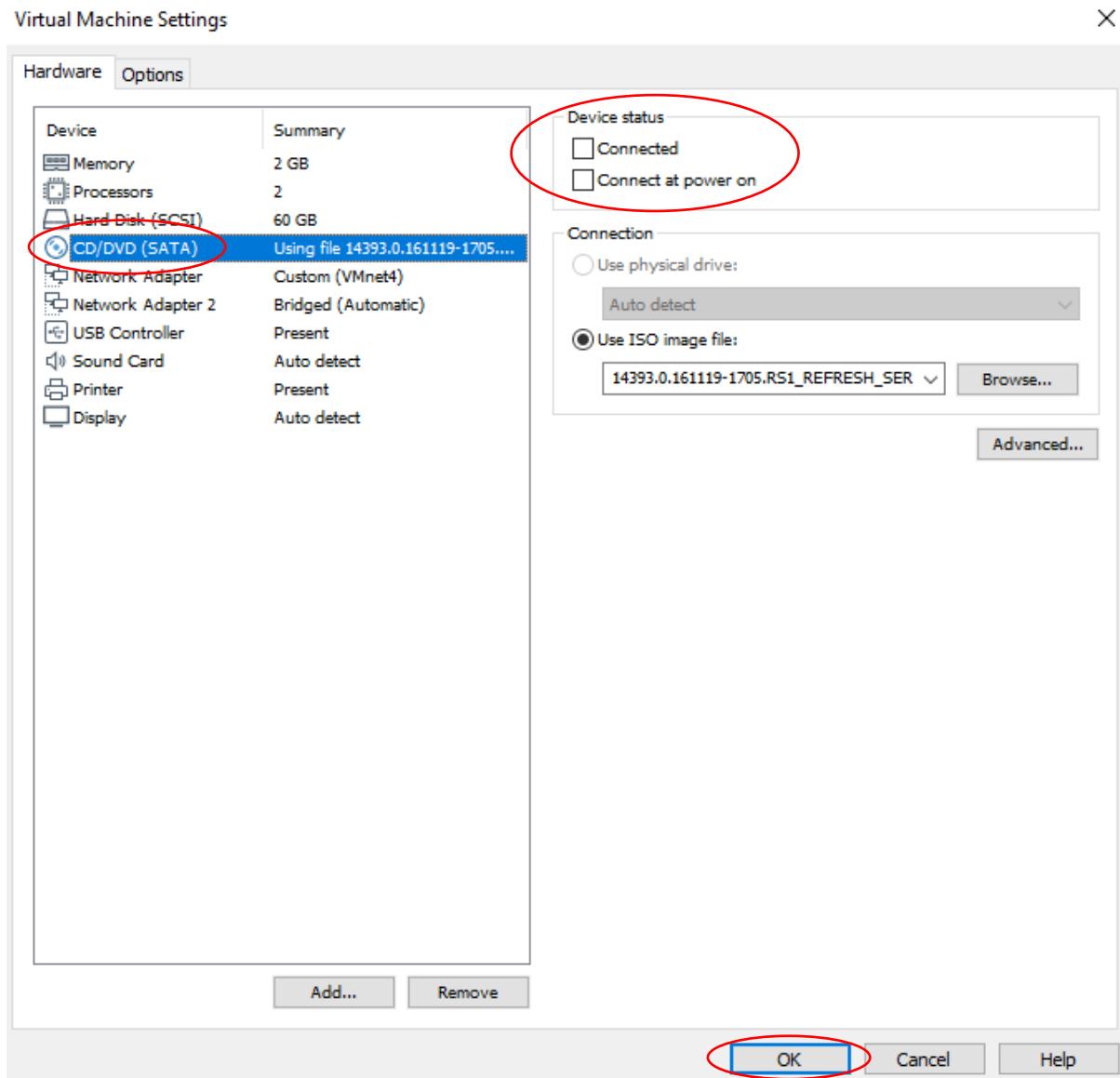
119. Set the Firewall State to Off and click OK



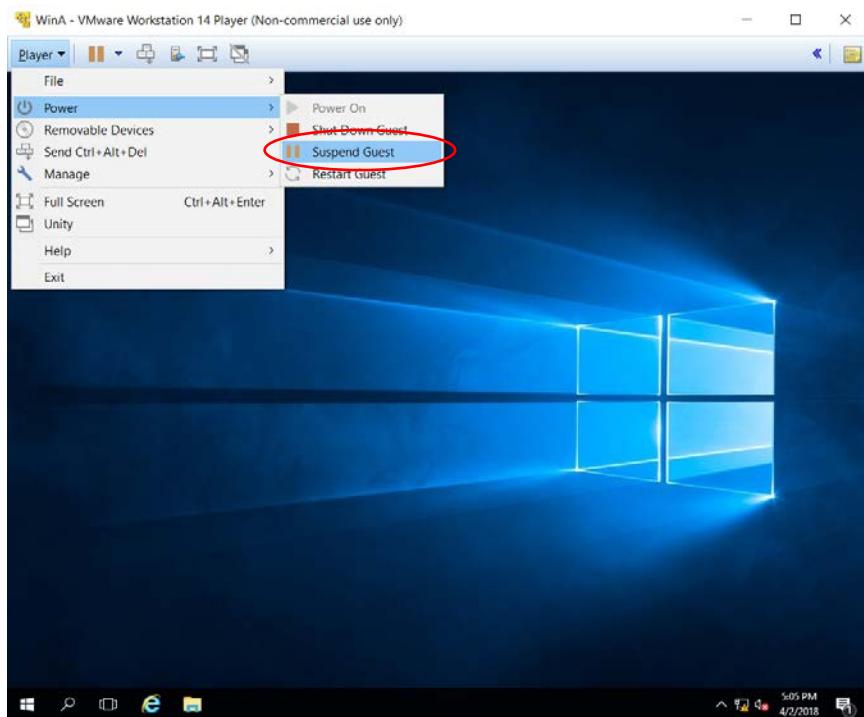
120. Click Player > Manage > Virtual Machine Settings... in the VMware Player menu



121. Click CD/DVD (SATA) then uncheck the Connected and Connect at power on checkboxes. Click OK

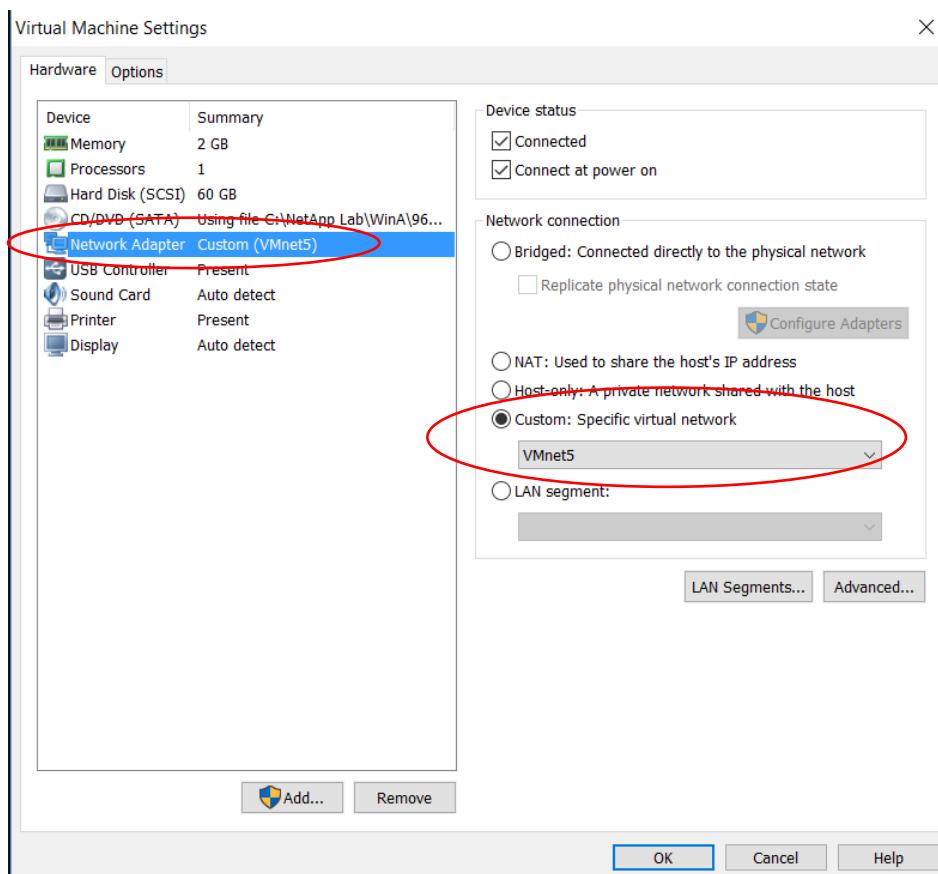


122. Set up of WinA is now complete. Close all windows then click **Player > Power > Suspend Guest** to suspend the virtual machine.



123. Repeat steps 8 to 97 to create another server named **WinB** in folder WinB. Use VMnet5 as the virtual network, IP address 172.23.5.1, and the domain name flackboxB.lab

Step	Setting	Value
12	Folder Name	WinB
12	Virtual Machine Name	WinB
15	Custom Virtual Network	VMnet5
42	Computer Name	WinB
55	IP Address	172.23.5.1
55	Subnet Mask	255.255.255.0
55	Default Gateway	172.23.5.254
55	Preferred DNS Server	172.23.5.1
85	Root Domain Name	flackboxB.lab
88	NETBIOS Name	FLACKBOXB

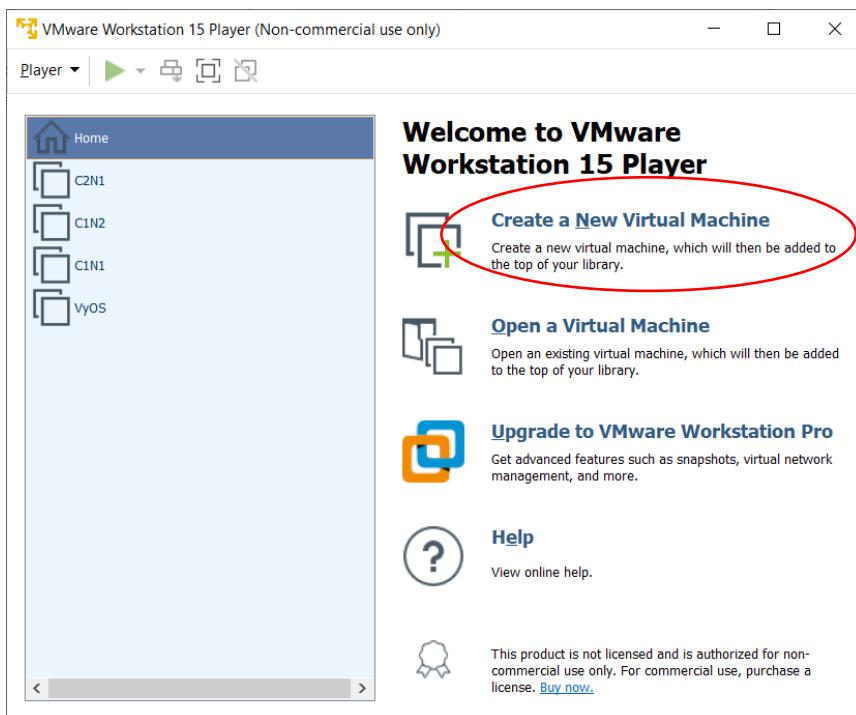


124. Installation of the Windows servers is now complete.
 125. If you are using VMware Workstation Player you can take a clean backup of the node at this point by copying the WinA folder to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)

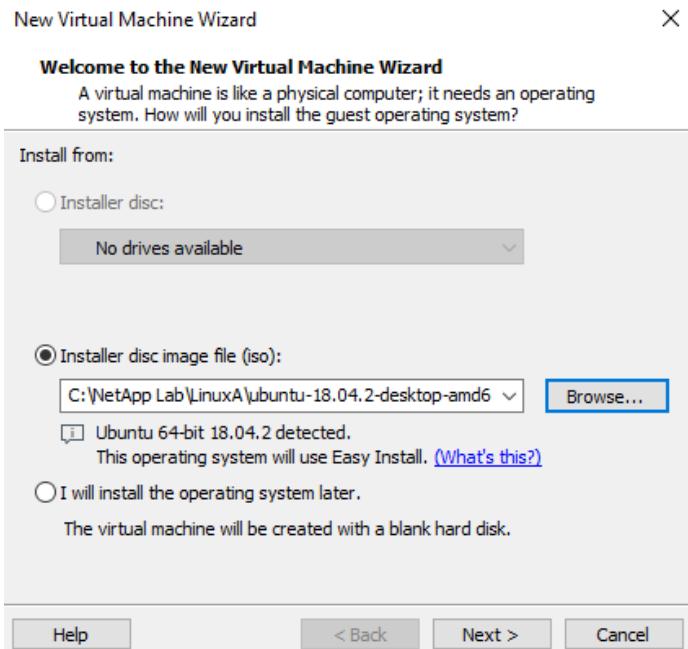
Linux Build

In this section you will install the Linux hosts for Department A and Department B.

1. Download the Ubuntu Linux ISO installer file from <http://old-releases.ubuntu.com/releases/18.04.2/ubuntu-18.04.2-desktop-amd64.iso>
2. After the file has completed downloading, open Windows Explorer and browse to the folder you created earlier on your laptop named **NetApp Lab**.
3. In the NetApp Lab folder, make a subfolder named **LinuxA**. We will create the Department A Linux host in here.
4. Find the Ubuntu ISO file you downloaded and move it into the **LinuxA** folder. It will have a name similar to **ubuntu-18.04.1-desktop-amd64.iso**
5. Open VMware Player
6. Click **Create a New Virtual Machine**



7. Select **Installer disc image file (iso)**: then **Browse** to the Ubuntu ISO file in the LinuxA folder and click **Next**.



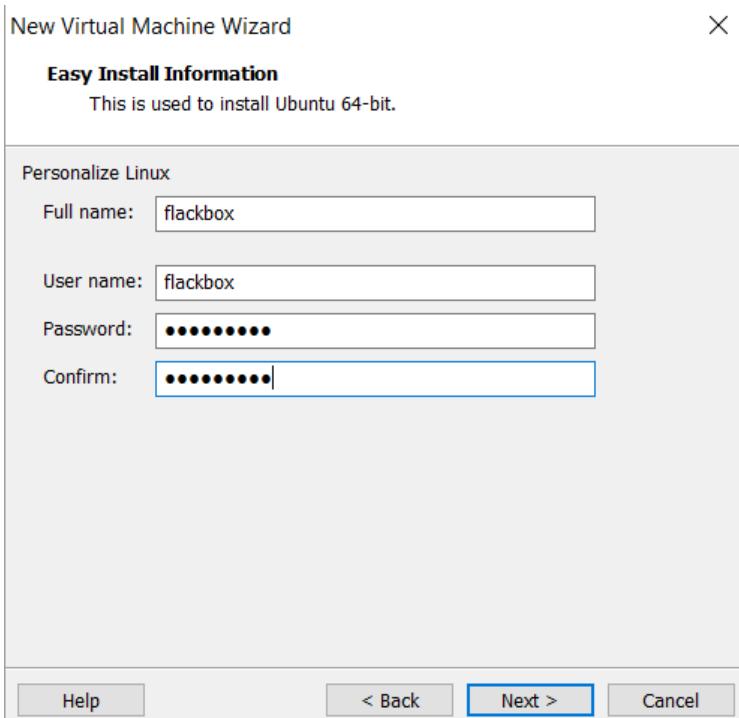
8. On the Easy Install Information page, enter the information below.

Full name: **flackbox**

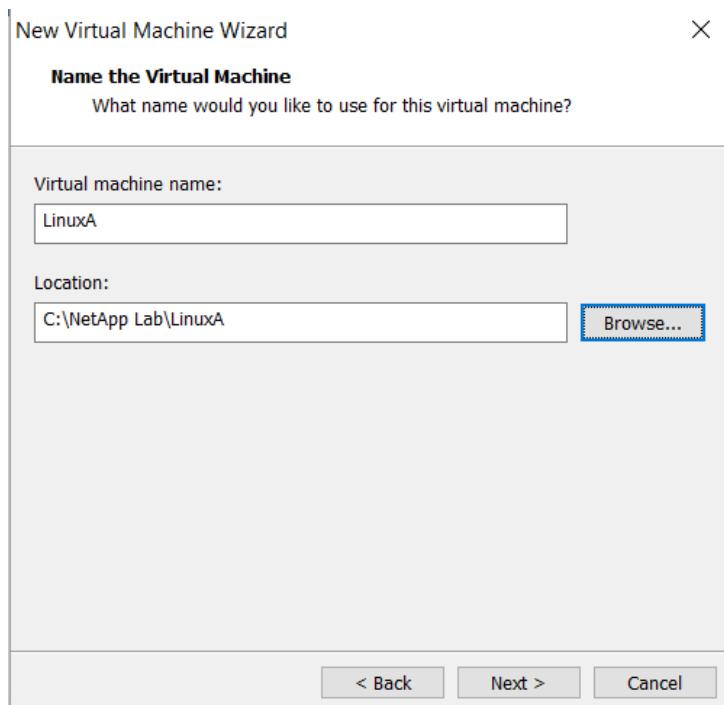
User name: **flackbox**

Password: **Flackbox1**

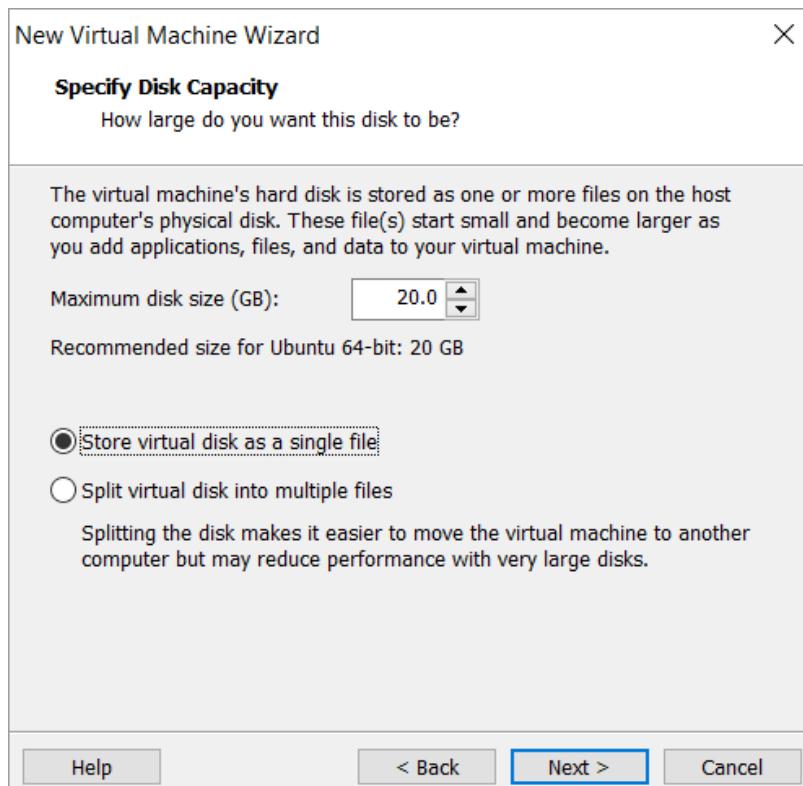
Confirm: **Flackbox1**



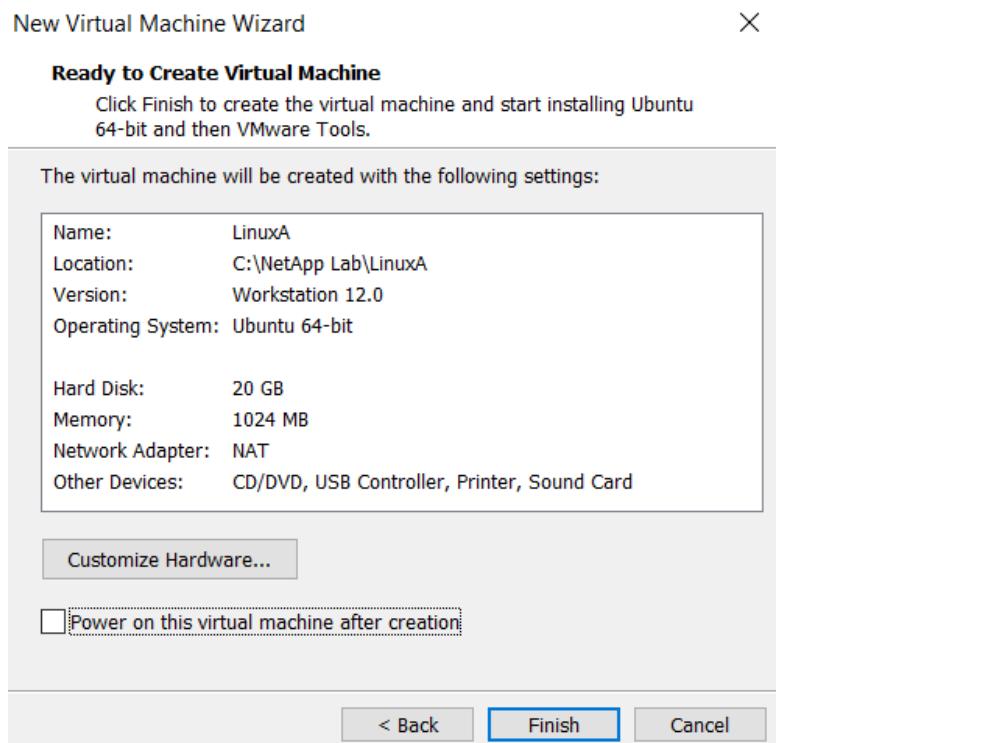
9. Name the virtual machine **LinuxA** and save it in the **NetApp Lab\LinuxA** folder



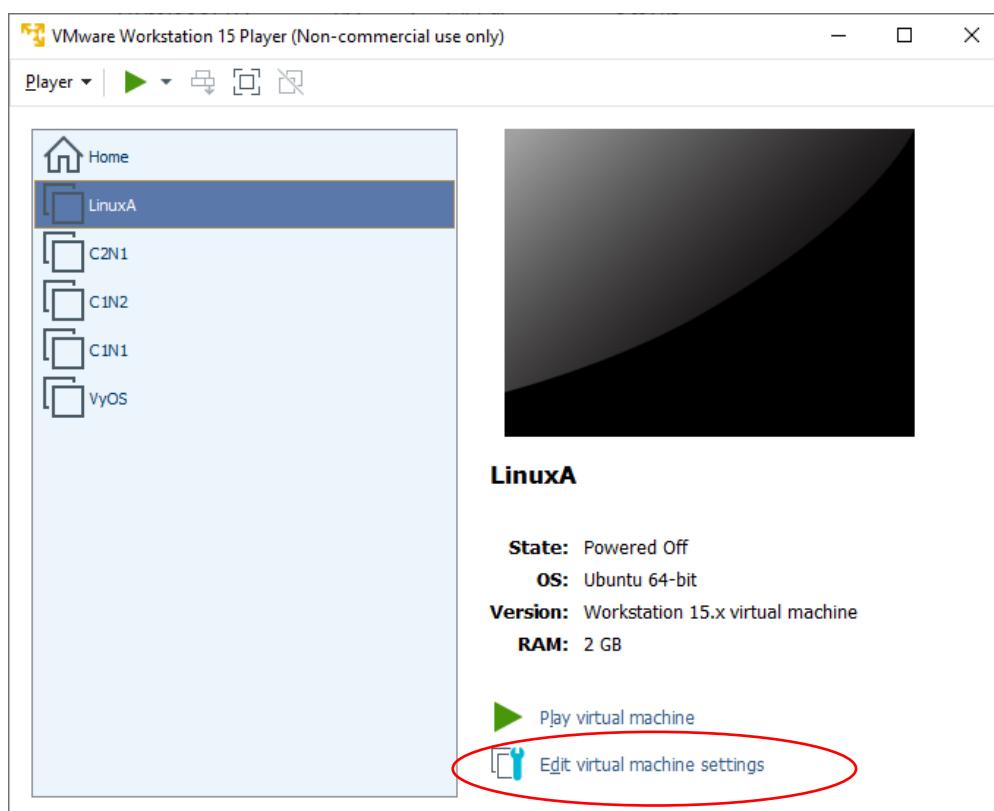
10. Select the option to **Store Virtual Disk as a single file** and click **Next**.



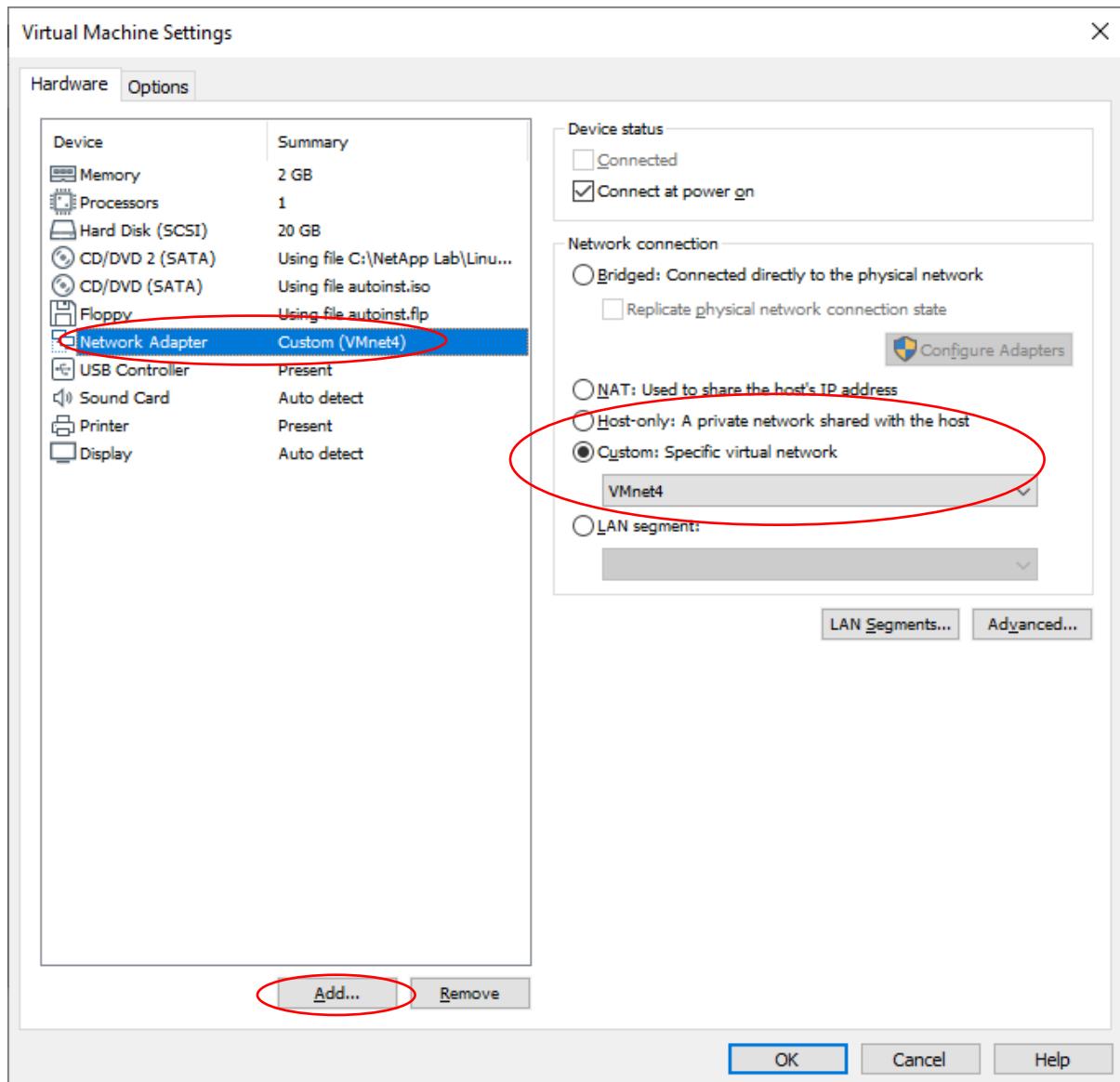
11. **Uncheck** the option to **Power on this virtual machine after creation** and click **Finish**



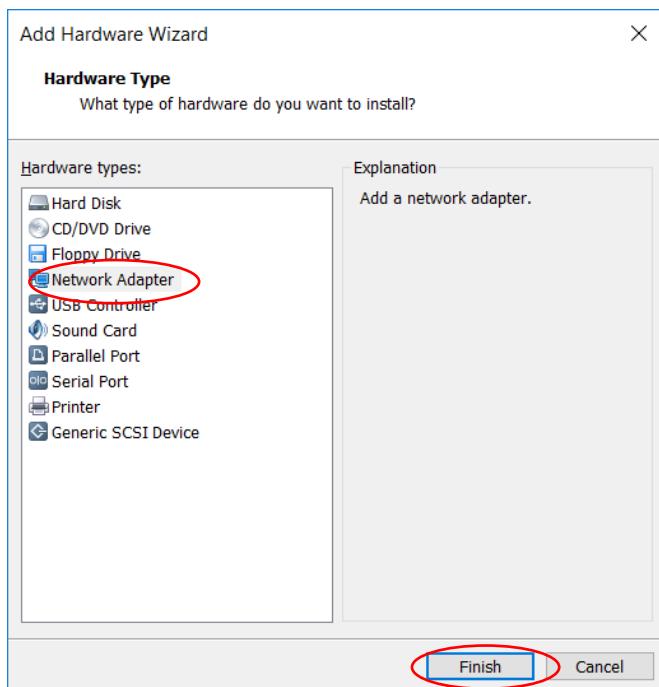
12. Click **Edit Virtual Machine Settings**



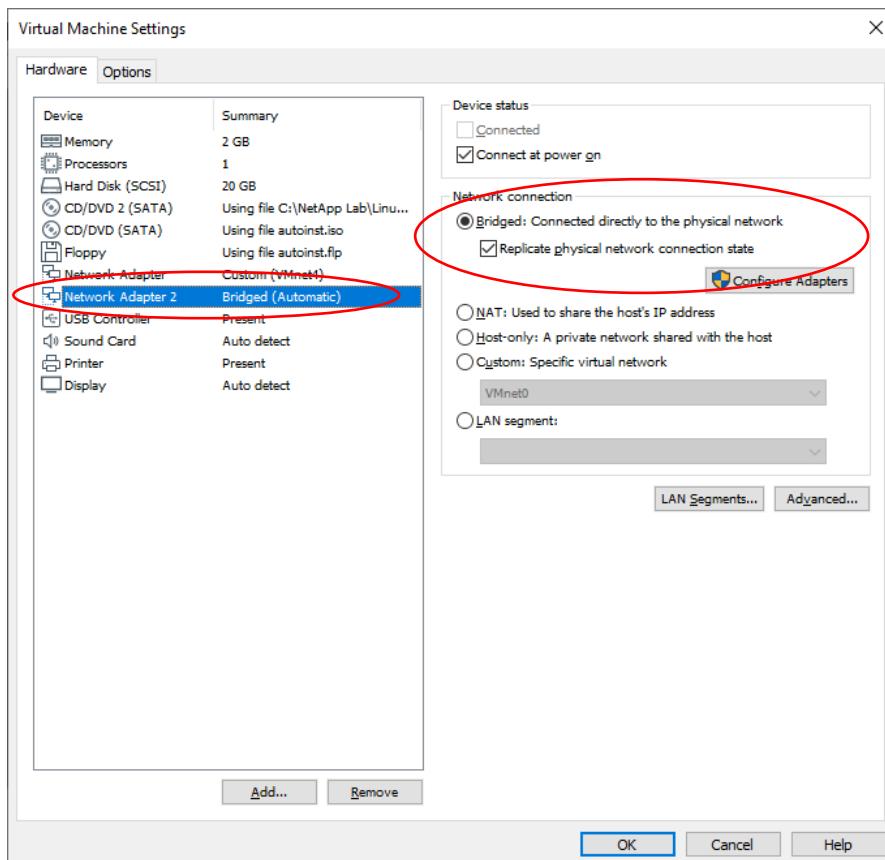
13. Click on **Network Adapter** and select **Custom** virtual network **VMnet4**, then click on the **Add** button



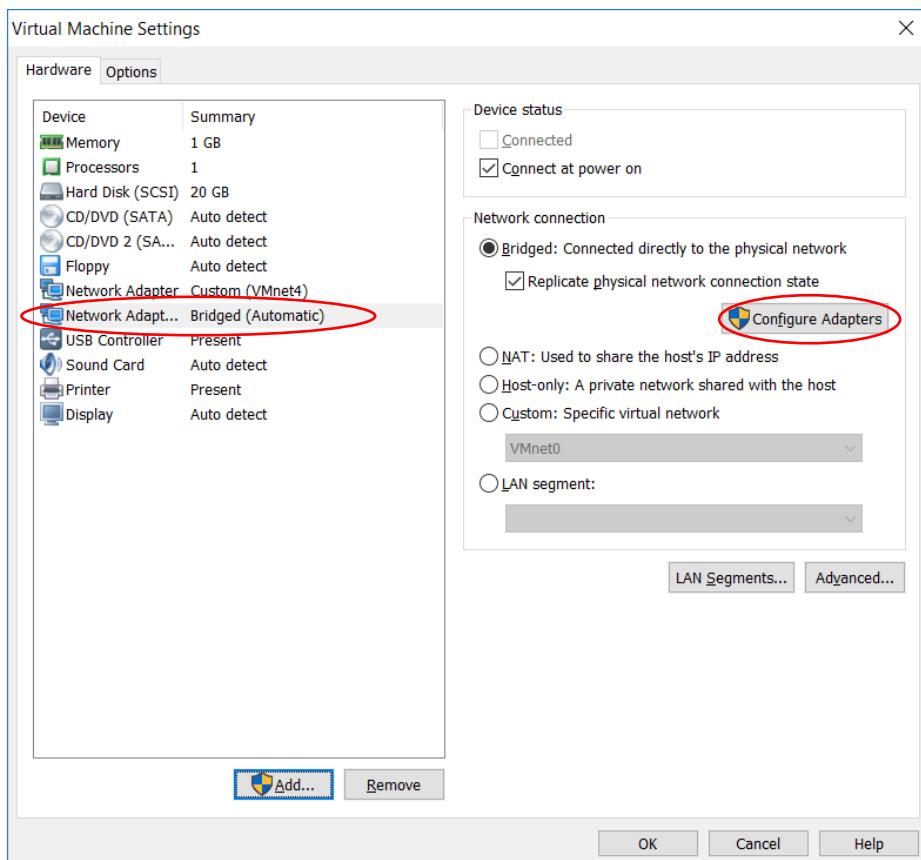
14. Choose Network Adapter and click Finish



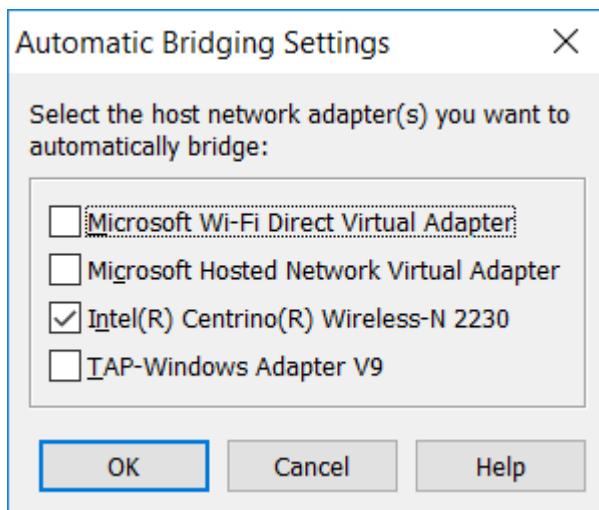
15. Select Network Adapter 2 and then configure it as Bridged and tick the checkbox to Replicate physical network connection state



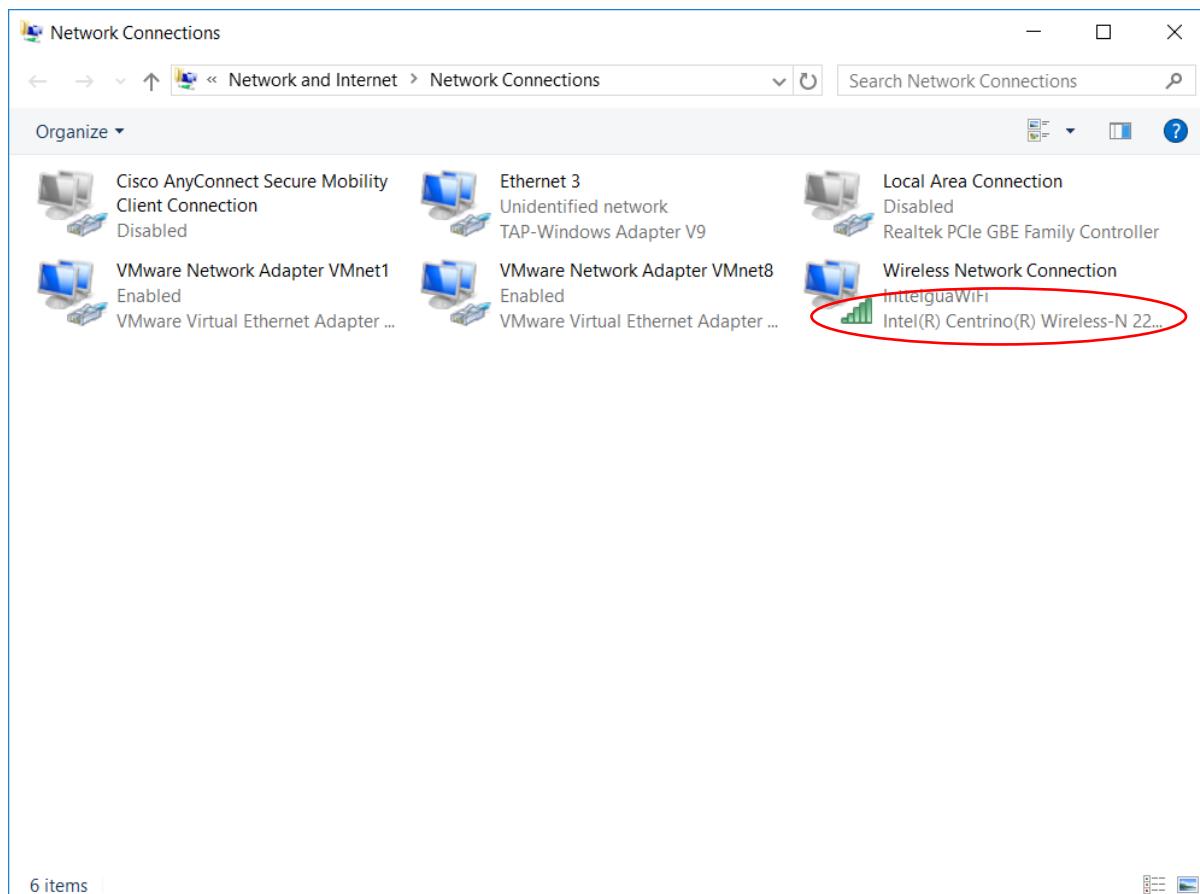
16. With the Bridged network adapter selected, click the **Configure Adapters** button (skip to step 22 if the Configure Adapters button is not visible).



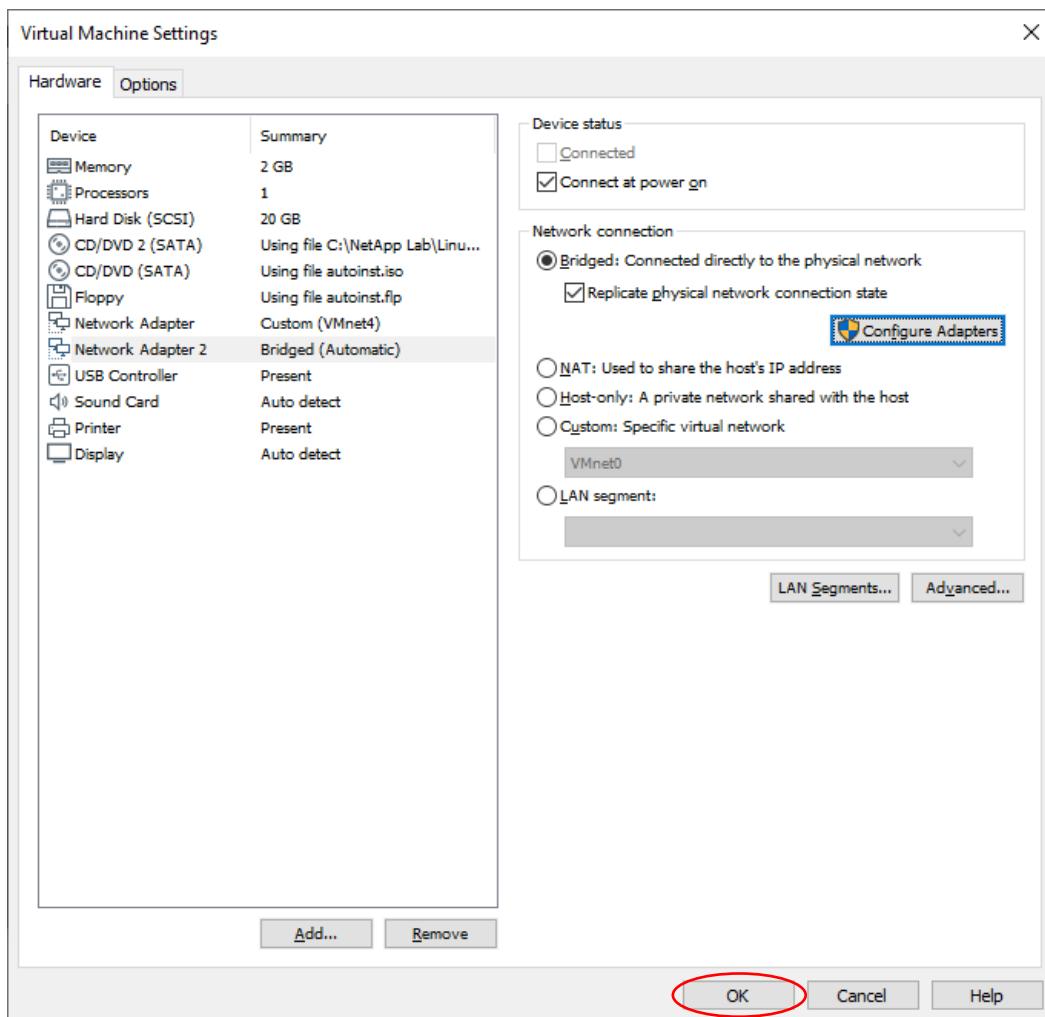
17. Select the network adapter which has Internet connectivity on your laptop. Deselect any other network adapters. Click **OK**



18. If you need to check which network adapter to use in the previous step, open **Control Panel > Network and Sharing Center** and click **Change Adapter Settings**

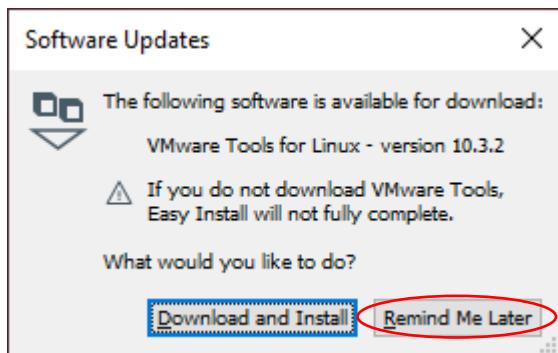


19. The Virtual Machine Settings for the network adapters should look like the picture below. Click **OK** to close



20. Click **Play Virtual Machine** to power on the Linux host

21. Click Remind Me Later if prompted to download VMware Tools for Linux

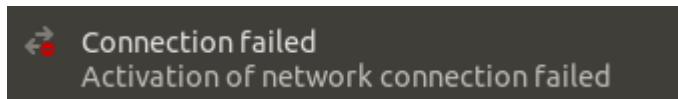


22. The host will run through the Ubuntu install process, this will take some time

23. You'll see some error messages because the VMnet4 network interface is failing to get an IP address from DHCP. That's okay, we're going to give it a static IP address. Ignore the message if you see **Failed to start Network Manager Wait Online**.

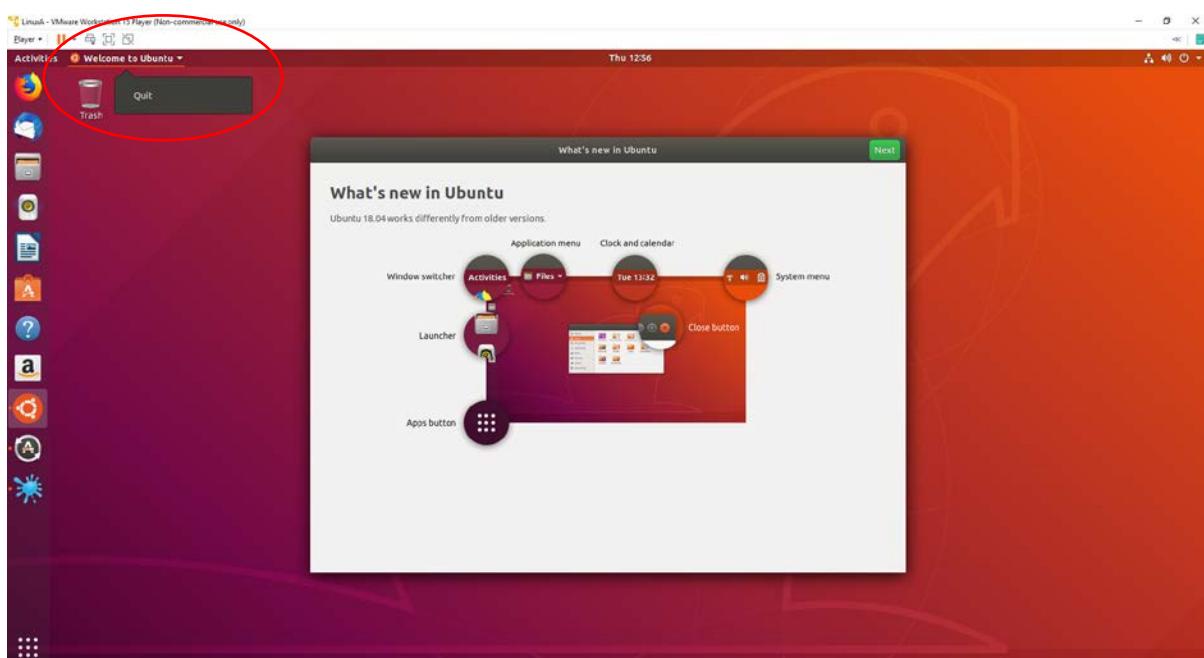
```
[ OK ] Mounted Mount unit for gnome-system-monitor.  
[FAILED] Failed to start Network Manager Wait Online.  
See 'systemctl status NetworkManager-wait-online.service' for details.
```

24. Ignore the message if you see **Connection failed. Activation of network connection failed**.

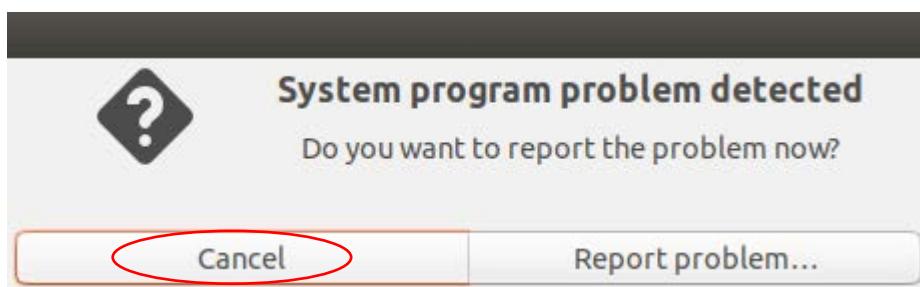


25. When the installation has completed, log in as username **flackbox** and password **Flackbox1**

26. Click on **Welcome to Ubuntu** near the top left corner then **Quit**



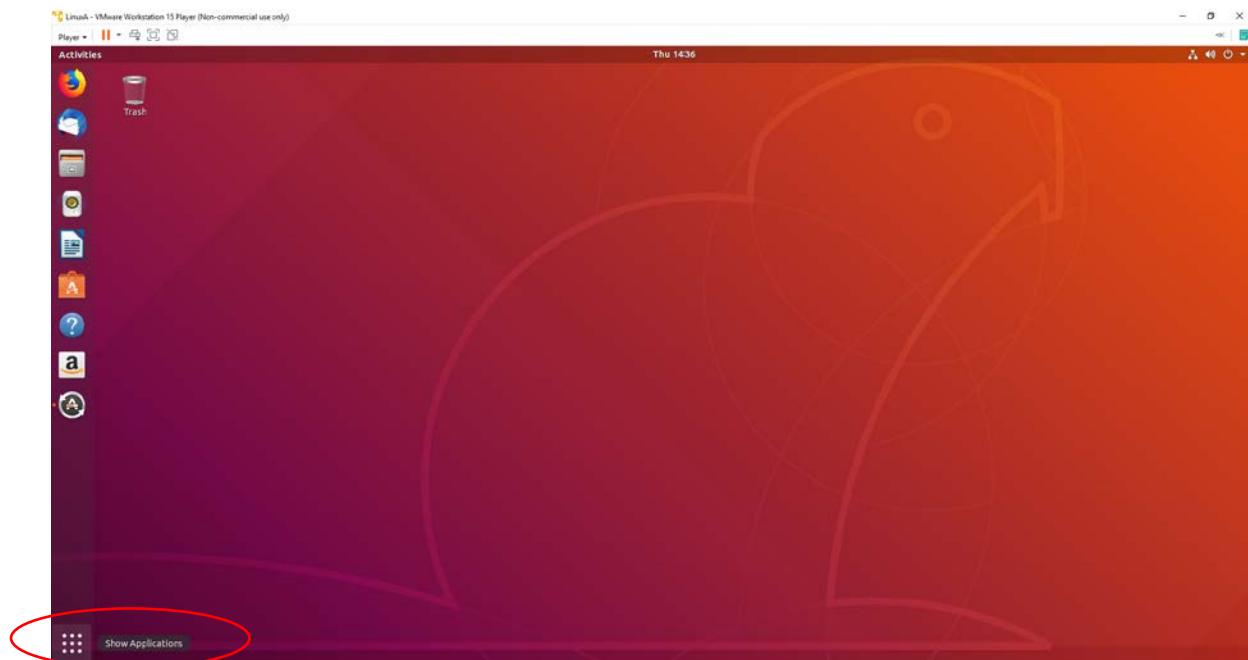
27. **Cancel** any 'System program problem detected' messages during the setup



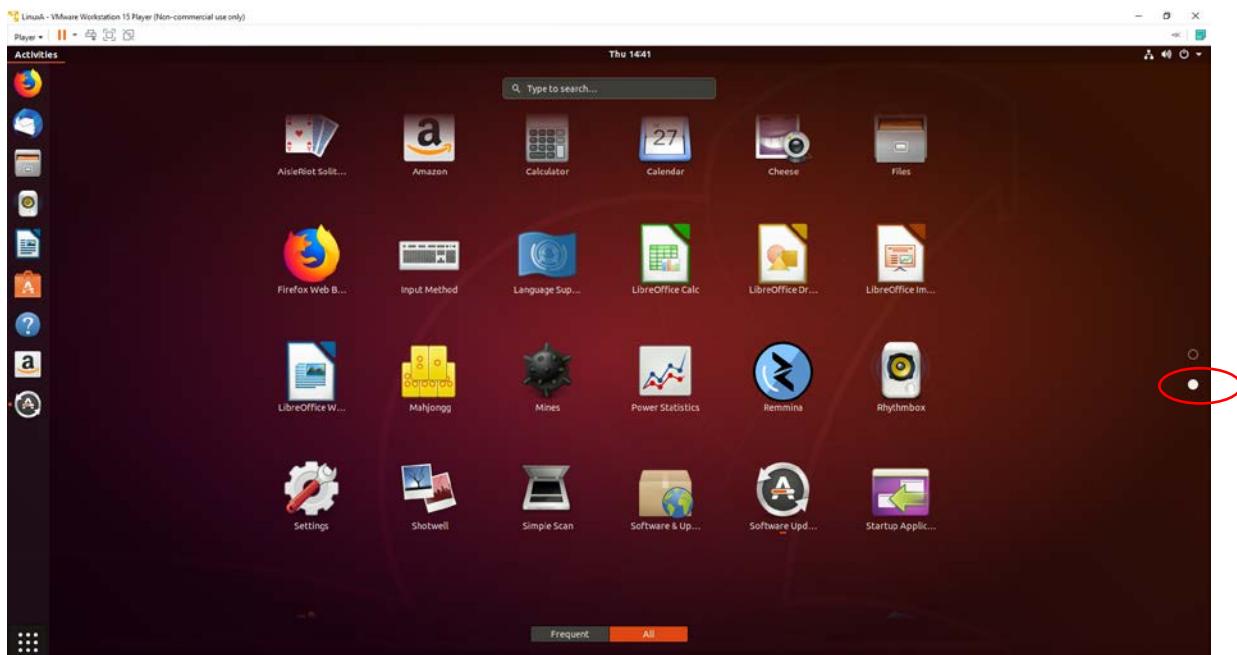
28. Close the **Software Updater** window when it opens



29. Click on the **Show Applications** button in the bottom left corner



30. Click on the right hand side to see the 2nd page of applications



31. Double-click Terminal



32. Elevate your privilege level to root by typing **sudo su -**

33. Enter the password **Flackbox1** when prompted

34. Update the software package list by typing **apt-get update**

```
flackbox@ubuntu:~$ sudo su -
[sudo] password for flackbox:
root@ubuntu:~# apt-get update
```

35. Install the packages for NFS, CIFS, iSCSI and SSH with the command **apt-get install rpcbind nfs-common cifs-utils smbclient open-iscsi multipath-tools openssh-server alien open-vm-tools open-vm-tools-desktop**

```
root@ubuntu:~# apt-get install rpcbind nfs-common cifs-utils smbclient open-iscsi multipath-tools openssh-server alien open-vm-tools open-vm-tools-desktop
```

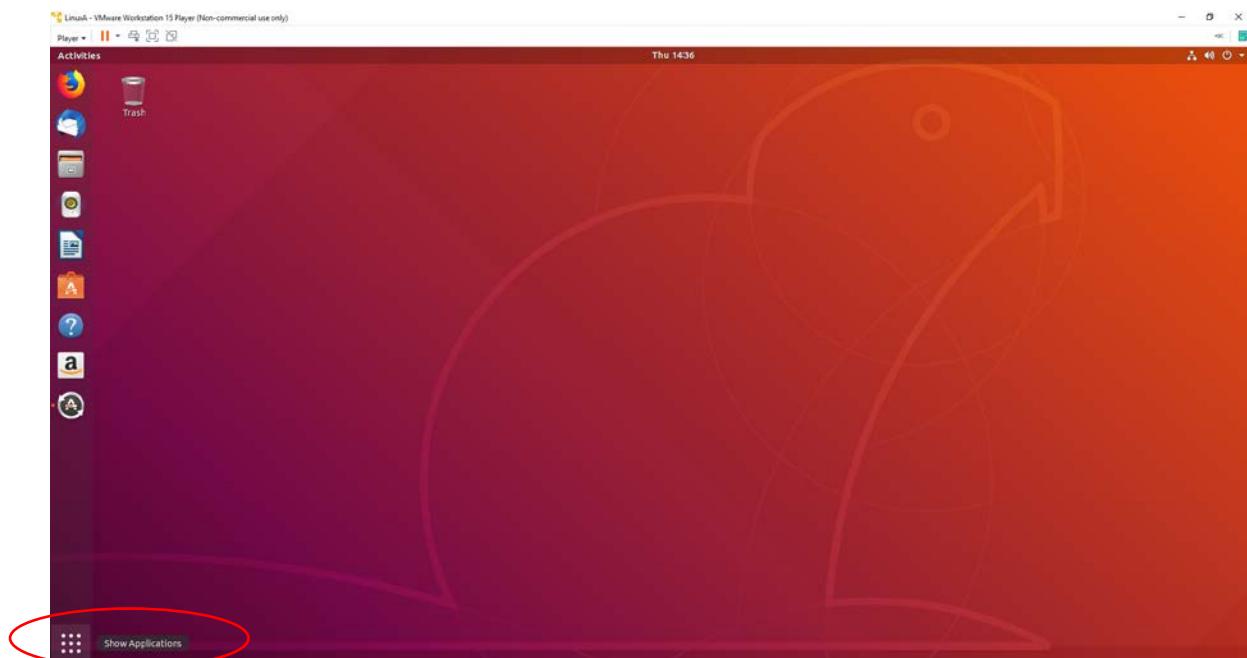
36. Enter Y when prompted then wait for the packages to install (it will take some time)

```
After this operation, 180 MB of additional disk space will be used.  
Do you want to continue? [Y/n] Y
```

37. Verify the packages have installed successfully with the command **apt list --installed | egrep -i 'rpcbind|nfs-common|cifs-utils|smbclient|open-iscsi|multipath-tools|openssh-server|alien|open-vm-tools|open-vm-tools-desktop'**

```
root@ubuntu:~# apt list --installed | egrep -i 'rpcbind|nfs-common|cifs-utils|smbclient|open-iscsi|multipath-tools|openssh-server|alien|open-vm-tools|open-vm-tools-desktop'  
  
WARNING: apt does not have a stable CLI interface. Use with caution in scripts.  
  
alien/bionic,bionic,now 8.95 all [installed]  
cifs-utils/bionic,now 2:6.8-1 amd64 [installed]  
libsmbclient/bionic-updates,bionic-security,now 2:4.7.6+dfsg~ubuntu-0ubuntu2.11 amd64 [installed]  
multipath-tools/bionic,now 0.7.4-2ubuntu3 amd64 [installed]  
nfs-common/bionic-updates,now 1:1.3.4-2.1ubuntu5.2 amd64 [installed]  
open-iscsi/bionic-updates,now 2:0.874-5ubuntu2.7 amd64 [installed]  
open-vm-tools/bionic-updates,now 2:10.3.10-1~ubuntu0.18.04.1 amd64 [installed]  
open-vm-tools-desktop/bionic-updates,now 2:10.3.10-1~ubuntu0.18.04.1 amd64 [installed]  
openssh-server/bionic-updates,bionic-security,now 1:7.6p1-4ubuntu0.3 amd64 [installed]  
rpcbind/bionic,now 0.2.3-0.6 amd64 [installed]  
smbclient/bionic-updates,bionic-security,now 2:4.7.6+dfsg~ubuntu-0ubuntu2.11 amd64 [installed]
```

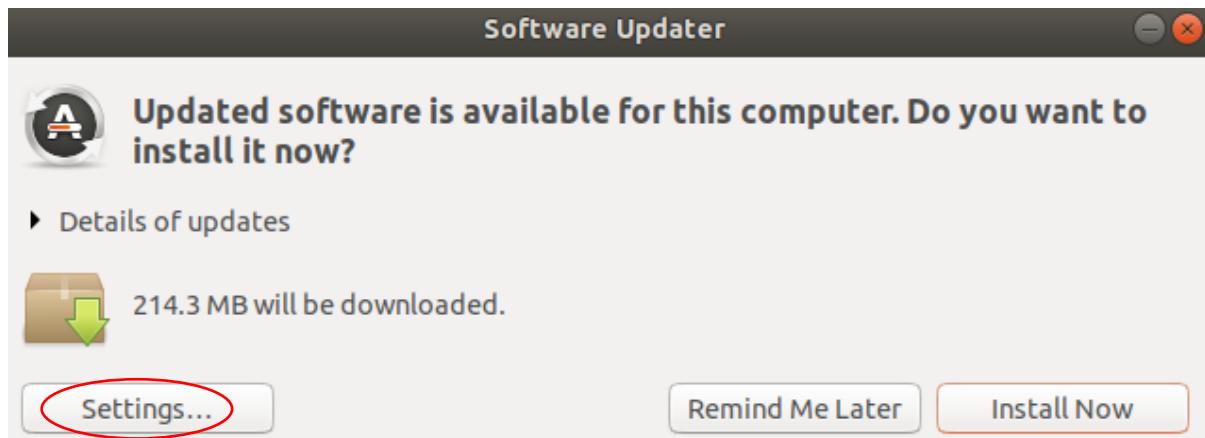
38. Click on the **Show Applications** button in the bottom left corner



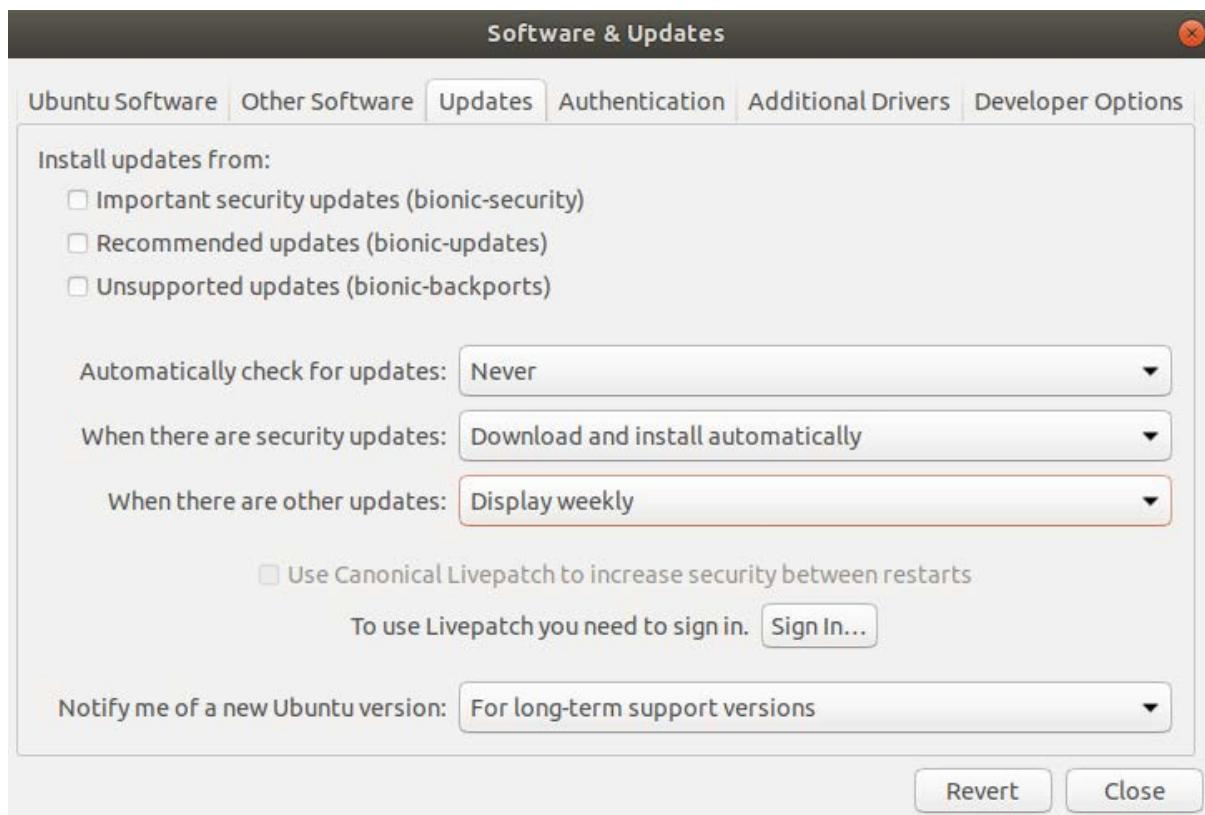
39. Open the **Software Updater**



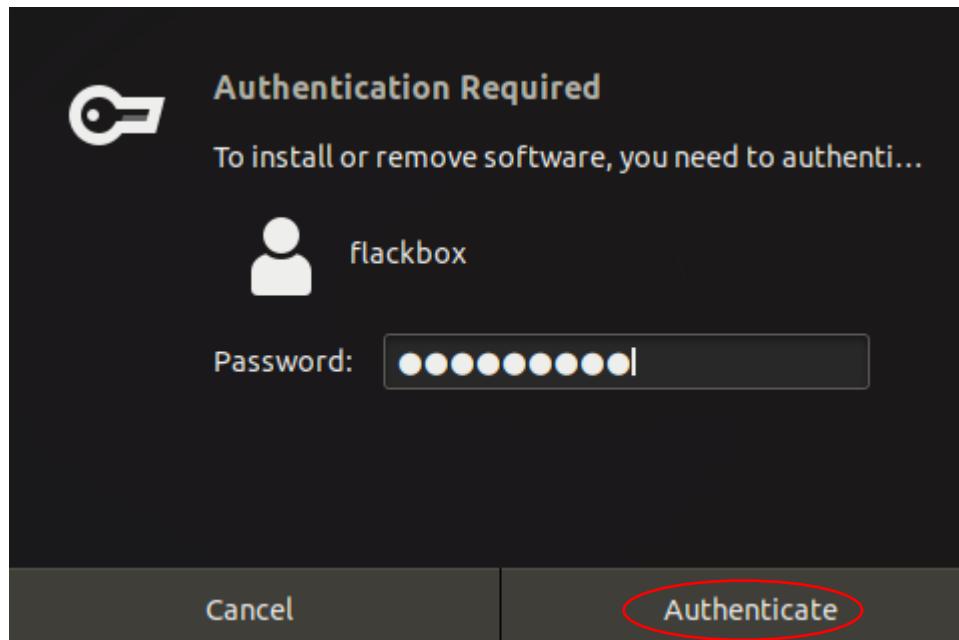
40. Click **Settings**



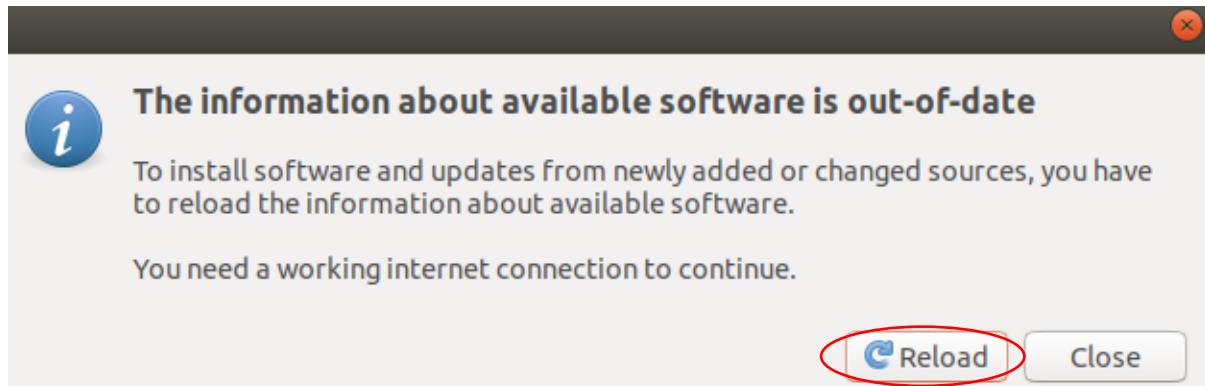
41. Uncheck all options and set Automatically check for updates to **Never**



42. Enter the password **Flackbox1** and **Authenticate**, then **Close** the Software & Updates window



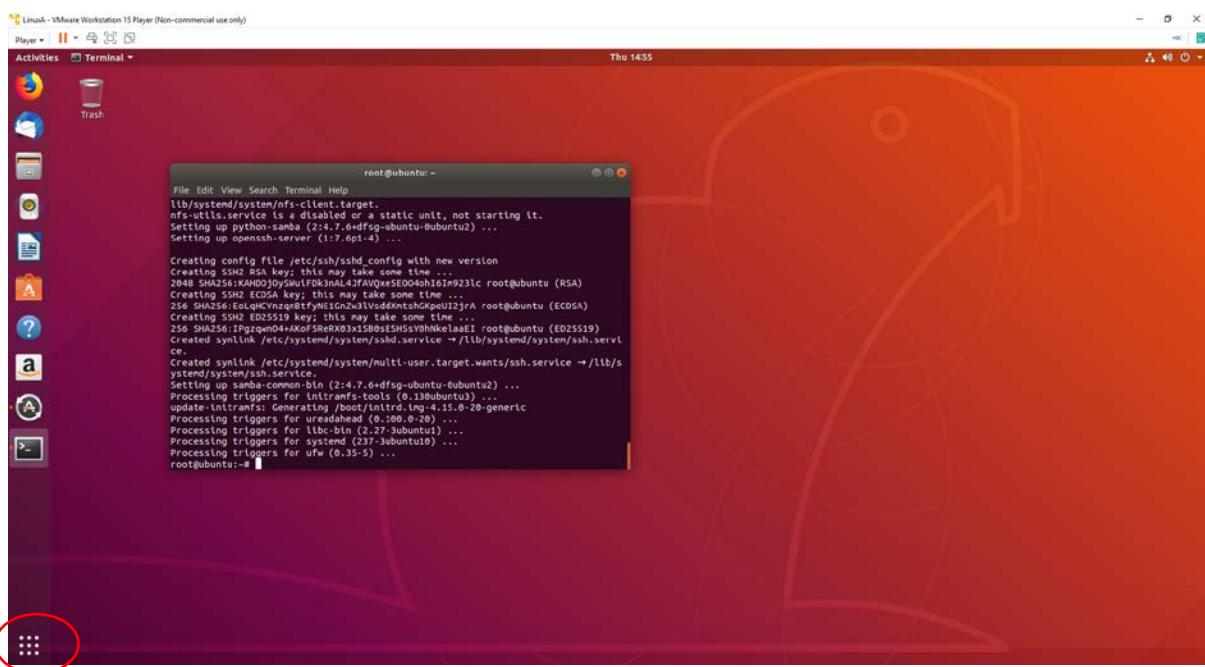
43. Click **Reload** if prompted to



44. Click **OK**



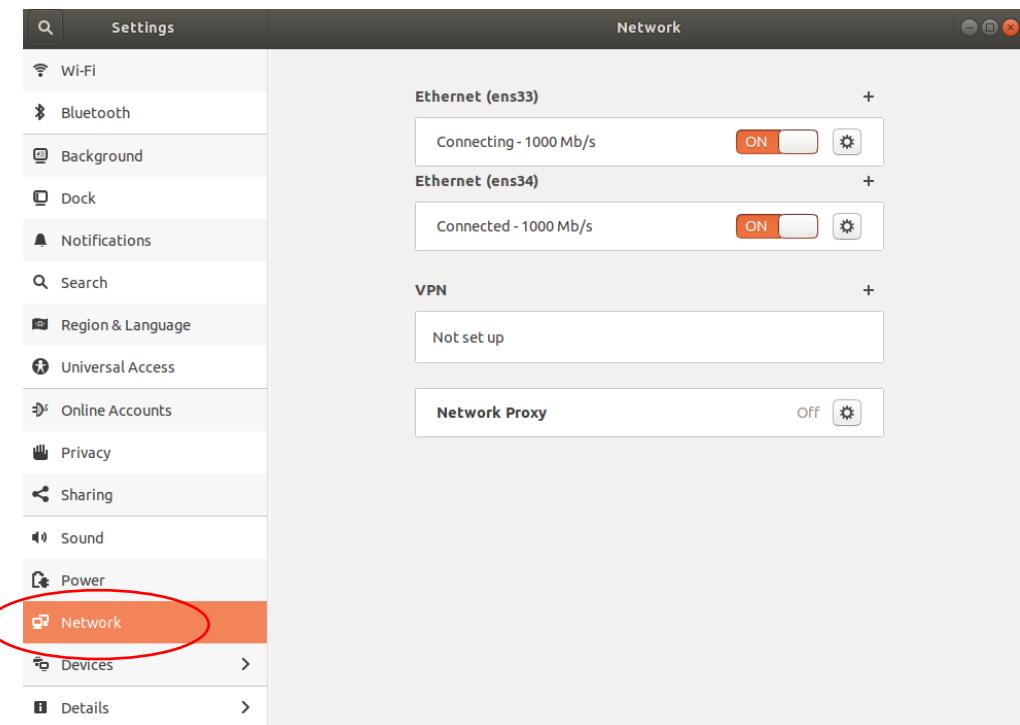
45. Click on the **Show Applications** button in the bottom left corner.



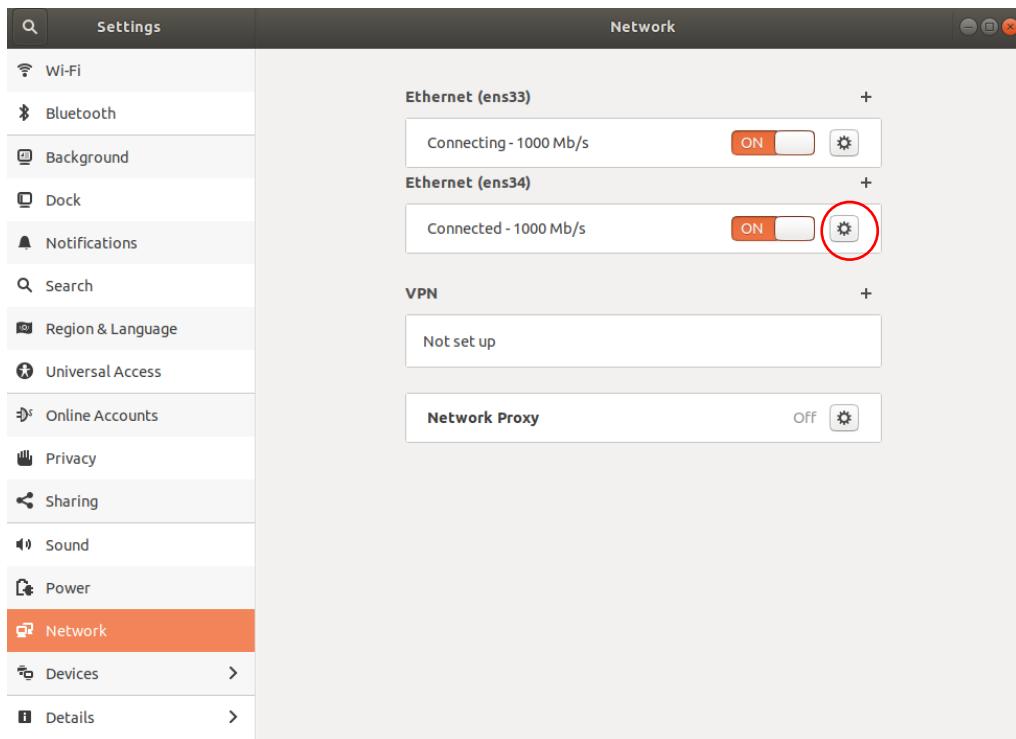
46. Double-click on **Settings**



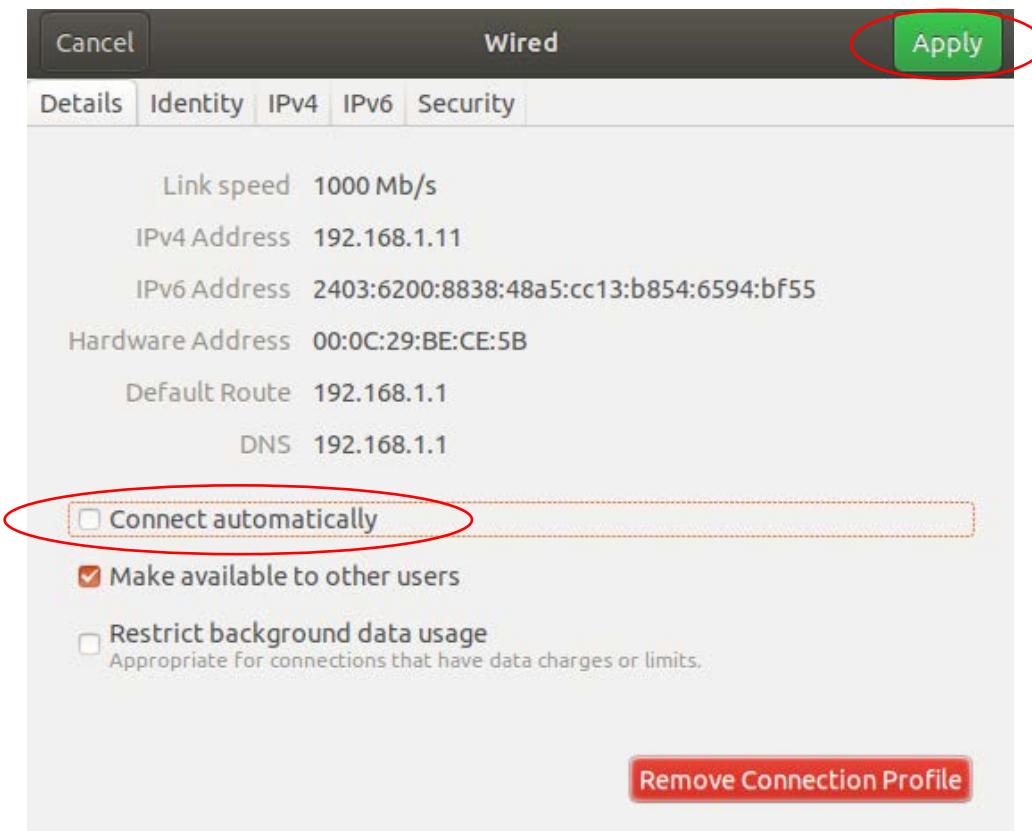
47. Click on **Network**



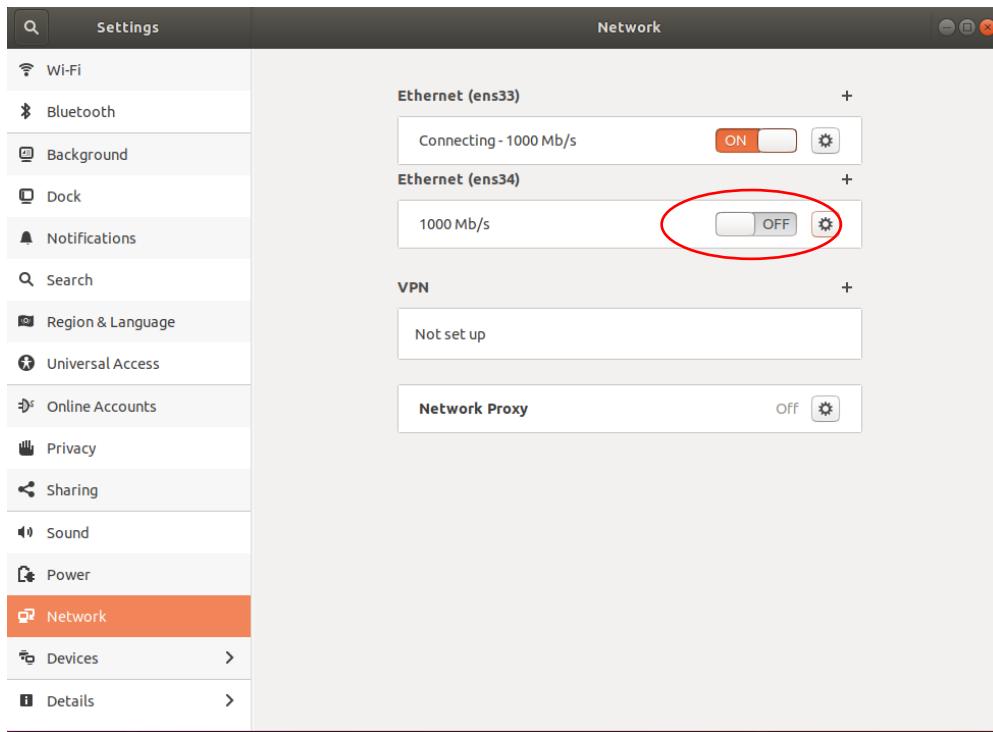
48. Click on the Settings button for the Ethernet interface which is **Connected** with Internet connectivity



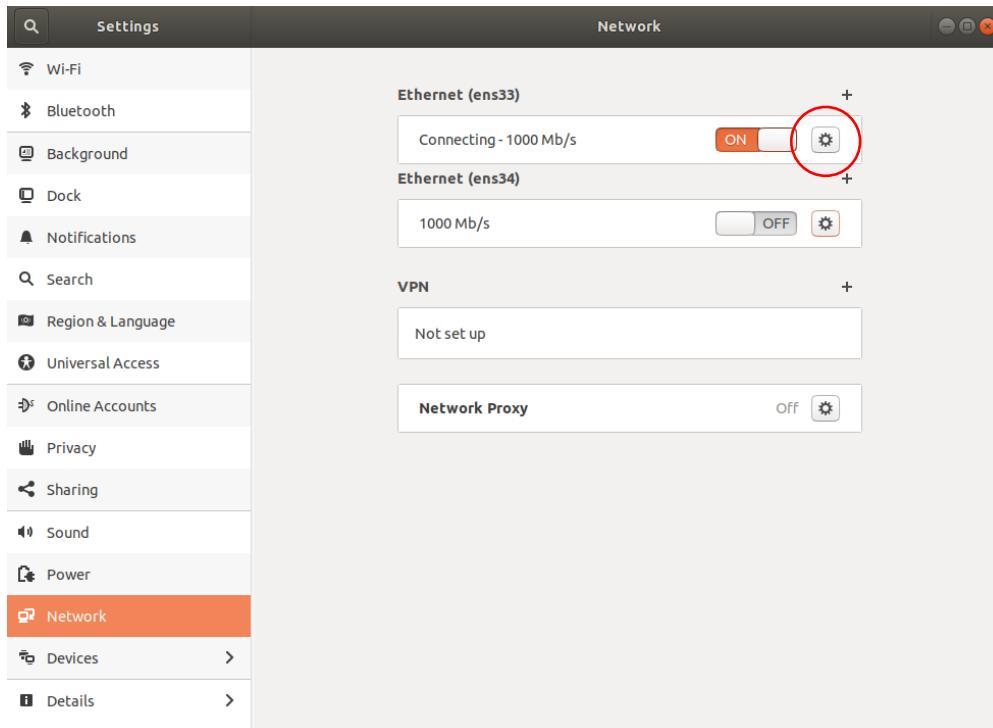
49. Uncheck **Connect automatically** then **Apply**



50. Turn the interface Off.



51. Click the **Settings** button on the other Ethernet interface



52. Click the **IPv4** tab
53. Select the **Manual** radio button
54. Enter the settings below then click **Apply**.

Address: **172.23.4.2**

Netmask: **255.255.255.0**

Gateway: **172.23.4.254**

DNS: **172.23.4.1**

The screenshot shows the 'Wired' network connection configuration window. The 'IPv4' tab is selected. Under 'IPv4 Method', the 'Manual' radio button is selected. In the 'Addresses' section, there is one entry: Address 172.23.4.2, Netmask 255.255.255.0, and Gateway 172.23.4.254. Below this, in the 'DNS' section, the 'Automatic' switch is turned 'ON' and the DNS value is 172.23.4.1. A note says 'Separate IP addresses with commas'. At the bottom, there is a checkbox for 'Use this connection only for resources on its network' which is unchecked.

Address	Netmask	Gateway
172.23.4.2	255.255.255.0	172.23.4.254

DNS Automatic **ON**

172.23.4.1

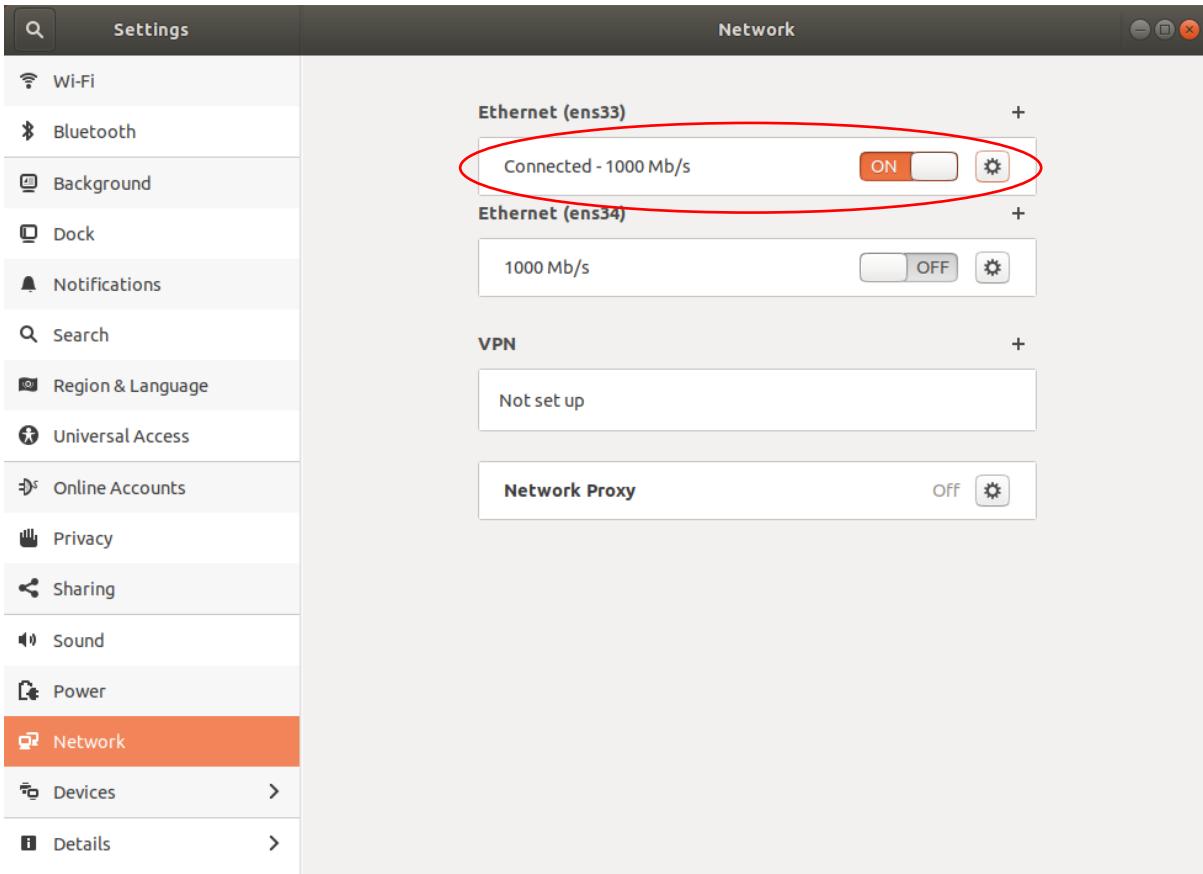
Separate IP addresses with commas

Routes Automatic **ON**

Address	Netmask	Gateway	Metric

Use this connection only for resources on its network

55. Check the interface is turned **On** and Connected



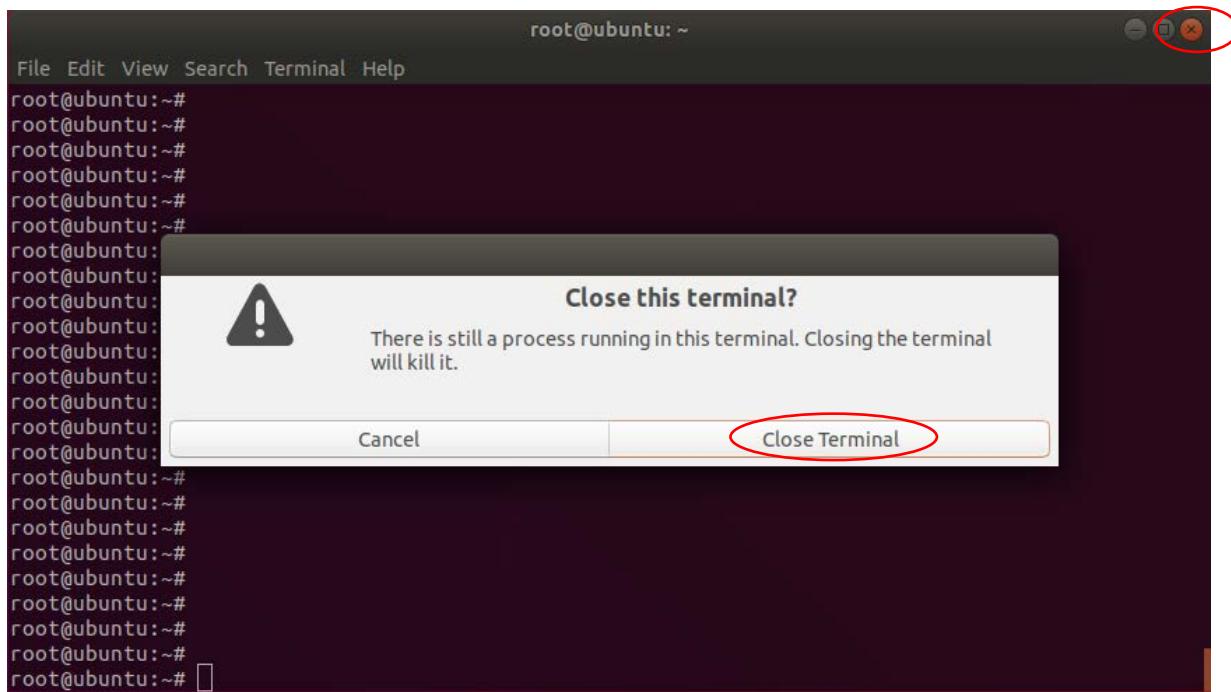
56. Back in the terminal window, enter the command **nmcli c show**

```
root@ubuntu:~# nmcli c show
NAME           UUID
Wired connection 1  e56c726c-72d4-33a3-bc16-c7f94649e10e  TYPE      ethernet  ens33
Wired connection 2  c2f6c725-42e0-31f0-8c5b-a831bb6fb040  ethernet  --
```

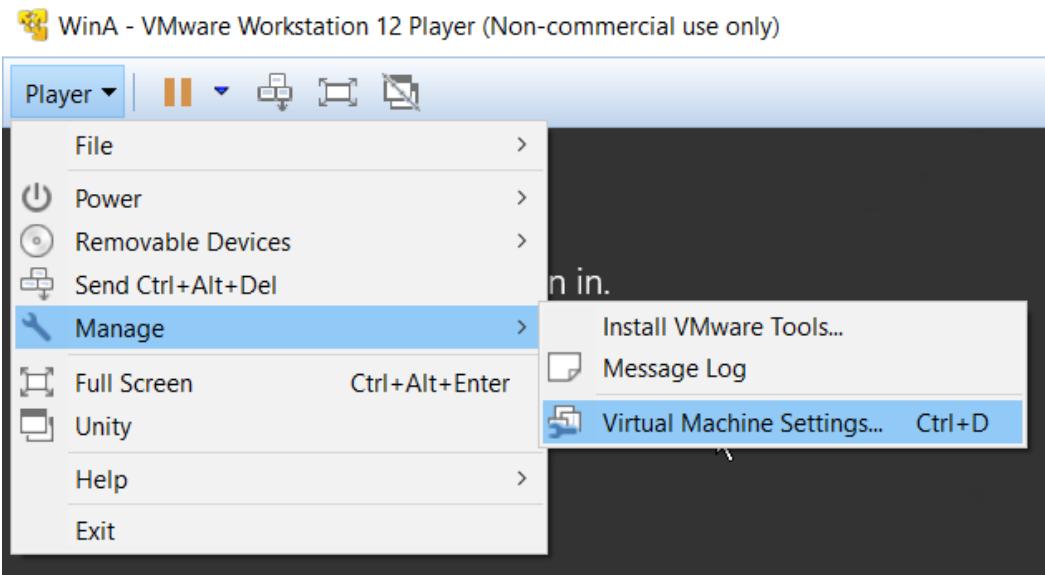
57. Note which is the connected (green) network adapter. It is ‘Wired connection 1’ in the example above.
58. Enter the command **nmcli c modify “Wired connection 1” ipv4.dns-search “flackboxA.lab”** to set the DNS search domain. Use the connected network adapter (either “Wired connection 1” or Wired connection 2”) and be aware the command is case sensitive.
59. Enter the command **nmcli c down “Wired connection 1” && nmcli c up “Wired connection 1”** to reset the interface. Use the connected network adapter (“Wired connection 1” or Wired connection 2”).

```
root@ubuntu:~# nmcli c modify "Wired connection 1" ipv4.dns-search "flackboxA.lab"
root@ubuntu:~# nmcli c down "Wired connection 1" && nmcli c up "Wired connection 1"
Connection 'Wired connection 1' successfully deactivated (D-Bus active path: /org/freedesktop/
NetworkManager/ActiveConnection/35)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveCo
nnnection/36)
root@ubuntu:~#
```

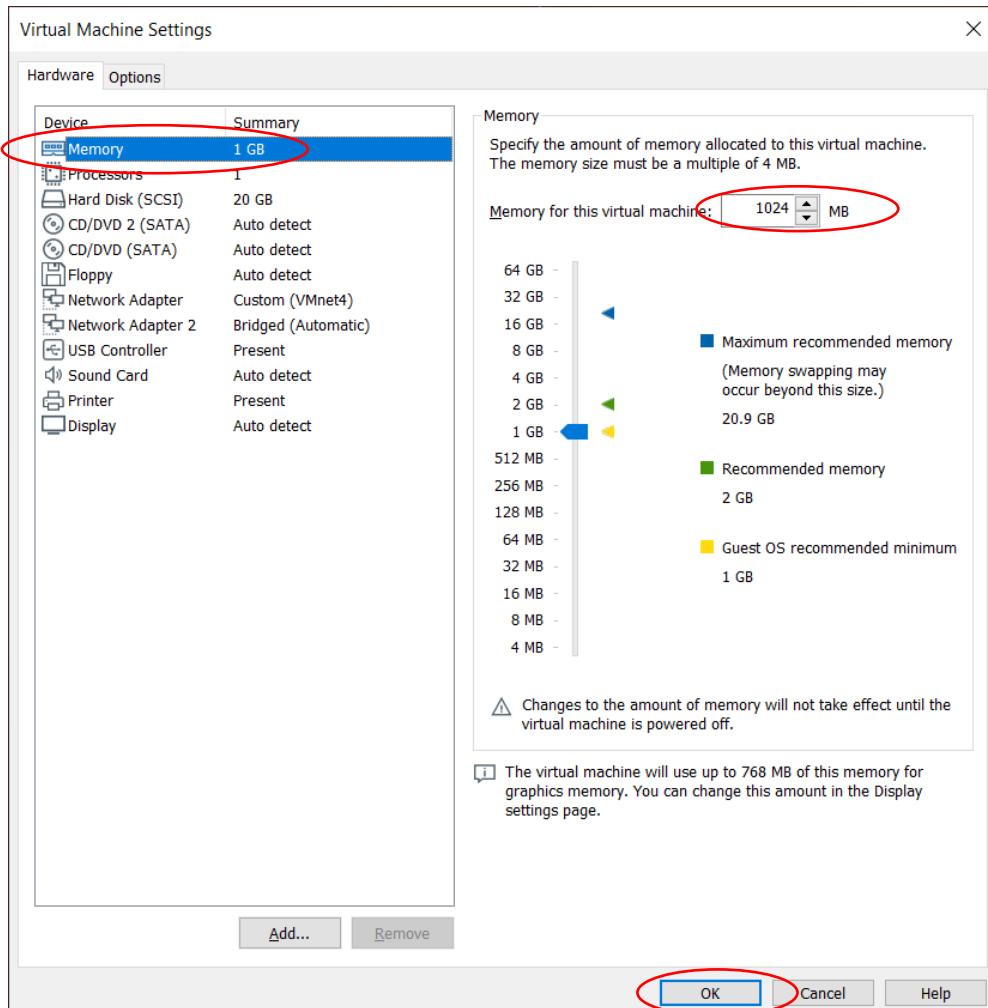
60. Close the Terminal window



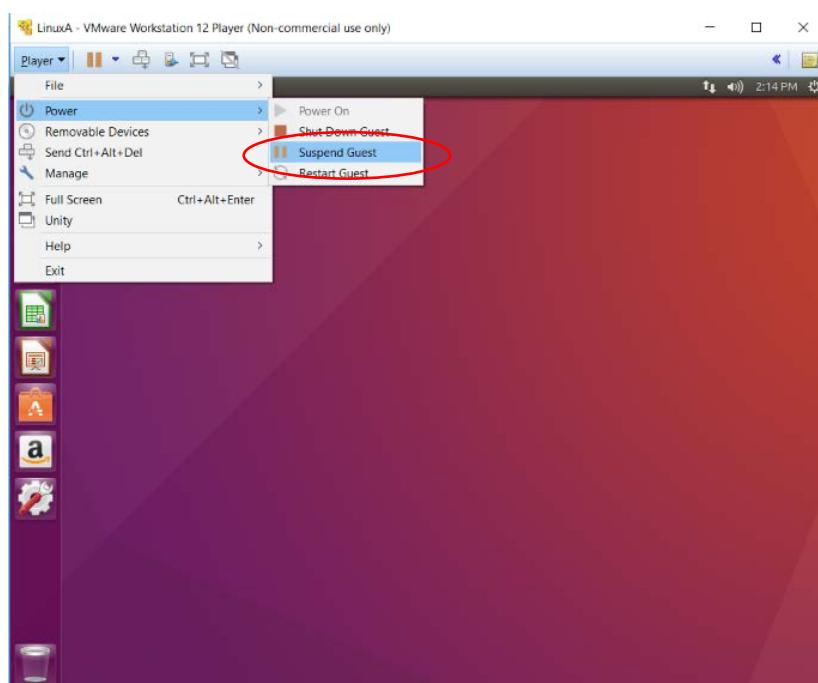
61. In VMware Workstation Player click **Player > Manage > Virtual Machine Settings...**



62. Change the Memory to **1024 MB** and click **OK**. (You can skip this step if your laptop has more than 16GB RAM).

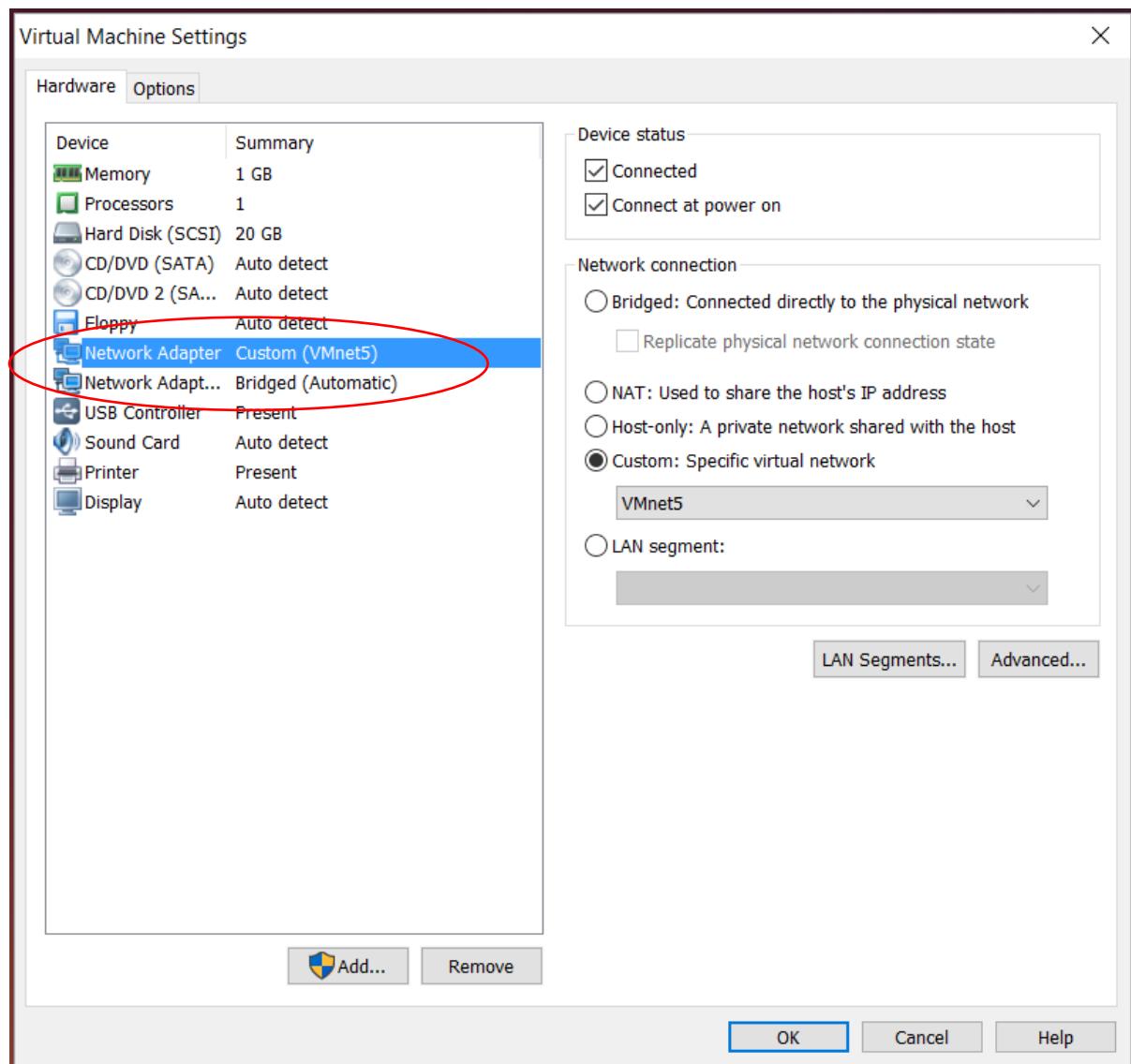


63. Click **Player > Power > Suspend Guest** to suspend the virtual machine.



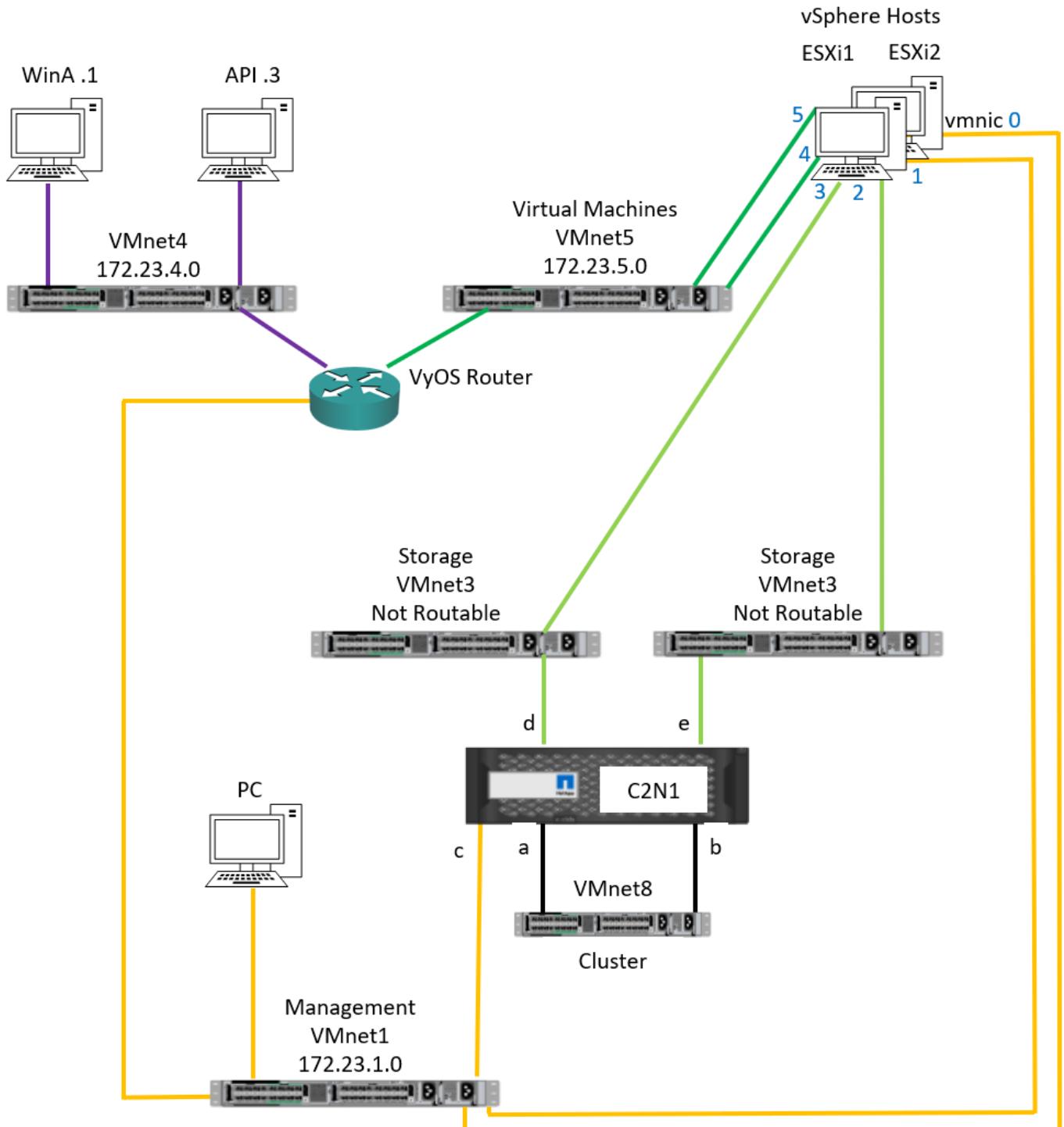
64. If you are using VMware Workstation Player you can take a clean backup of the node at this point by copying the LinuxA folder to a new location. (Use a snapshot instead if you are using VMware Workstation Pro, it will use less disk space.)
65. Repeat steps 8 to 67 to create another Linux host named **LinuxB** in folder LinuxB. Use VMnet5 as the virtual network, IP address 172.23.5.2, and the domain name flackboxB.lab

Step	Setting	Value
12	Folder Name	LinuxB
12	Virtual Machine Name	LinuxB
16	Custom Virtual Network	VMnet5
42	Address	172.23.5.2
42	Netmask	255.255.255.0
42	Gateway	172.23.5.254
42	DNS Servers	172.23.5.1
42	Search Domain	flackboxB.lab



66. Installation of the Linux hosts is now complete.

Simplified Lab Topology Diagram for 'VMware vSphere on ONTAP Storage' Labs



This is the same lab topology as shown in the main Lab Topology Diagram on page 4, with the addition of the CentOS 'API' virtual machine and simplified by removing devices not used when practicing ONTAP with VMware vSphere.

VMware ESXi1 Host and VCSA Build

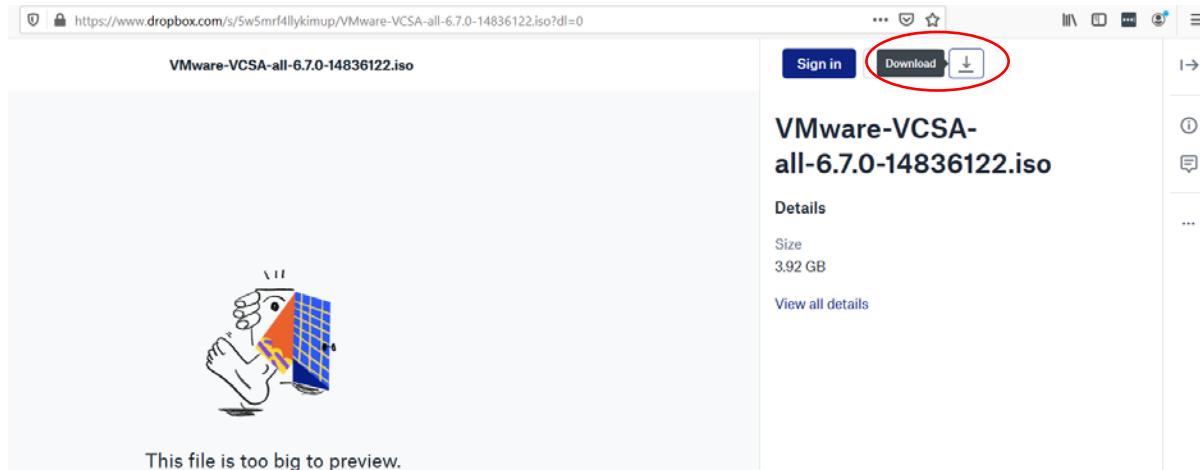
In this section you will install the VMware ESXi1 host and VCSA vCenter Server Appliance.

1. Power on the **WinA** and **VyOS** virtual machines in VMware Workstation Player.
2. VMware vSphere 7 Product Evaluation is available but version 6.7 is more reliable in this lab environment
3. Download the VMware vSphere ESXi Hypervisor 6.7 installer ISO file from
https://www.dropbox.com/scl/fi/2br3hm34dbf38zuf5jrk8/VMware-VMvisor-Installer-6.7.0.update03-14320388.x86_64.iso?rlkey=16racvu8uzonnnts23i2io1y6&dl=0



The screenshot shows a Dropbox download page for the file "VMware-VMvisor-Installer-6.7.0.update03-14320388.x86_64.iso". The file size is 314.66 MB. The "Download" button is highlighted with a red circle.

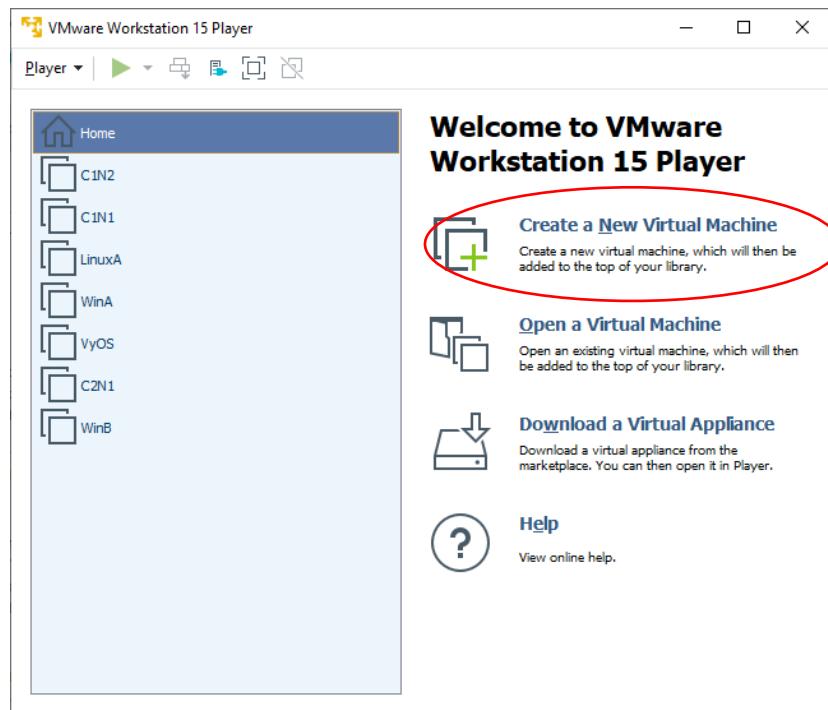
4. Download the VMware vCenter Server Appliance 6.7 installer ISO file from
<https://www.dropbox.com/scl/fi/7pcg9bwmpc95klhx1ykn1/VMware-VCSA-all-6.7.0-14836122.iso?rlkey=ksobogonk3kp398j31qfpctxth&dl=0>



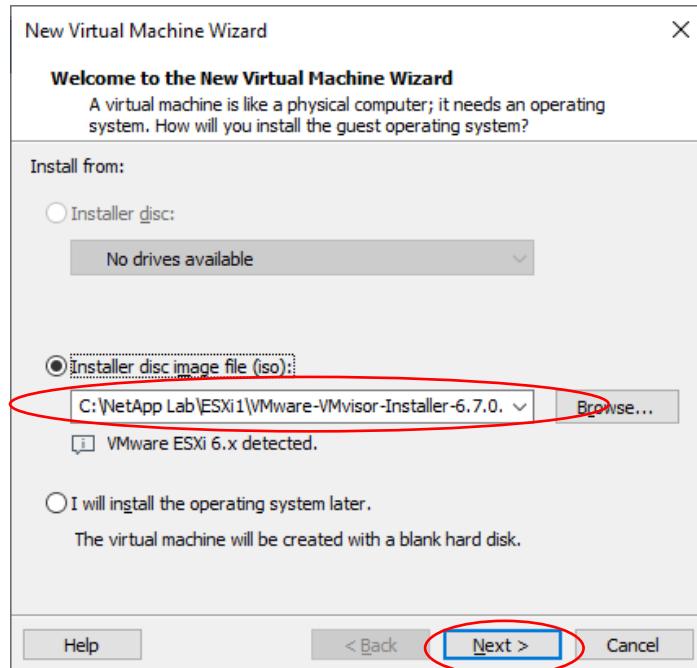
The screenshot shows a Dropbox download page for the file "VMware-VCSA-all-6.7.0-14836122.iso". The file size is 3.92 GB. The "Download" button is highlighted with a red circle. A note at the bottom left says "This file is too big to preview." There is also a cartoon hand holding a small device icon.

5. After the VMware files have completed downloading, open Windows Explorer and browse to the folder you created earlier named **NetApp Lab**.
6. In the NetApp Lab folder, make a subfolder named **ESXi1**. We will create the VMware ESXi1 host in here.
7. Find the ESXi ISO file you downloaded and move it into the **ESXi1** folder. It will have a name similar to **VMware-VMvisor-Installer-6.7.0.update02-13006603.x86_64**
8. Open VMware Player

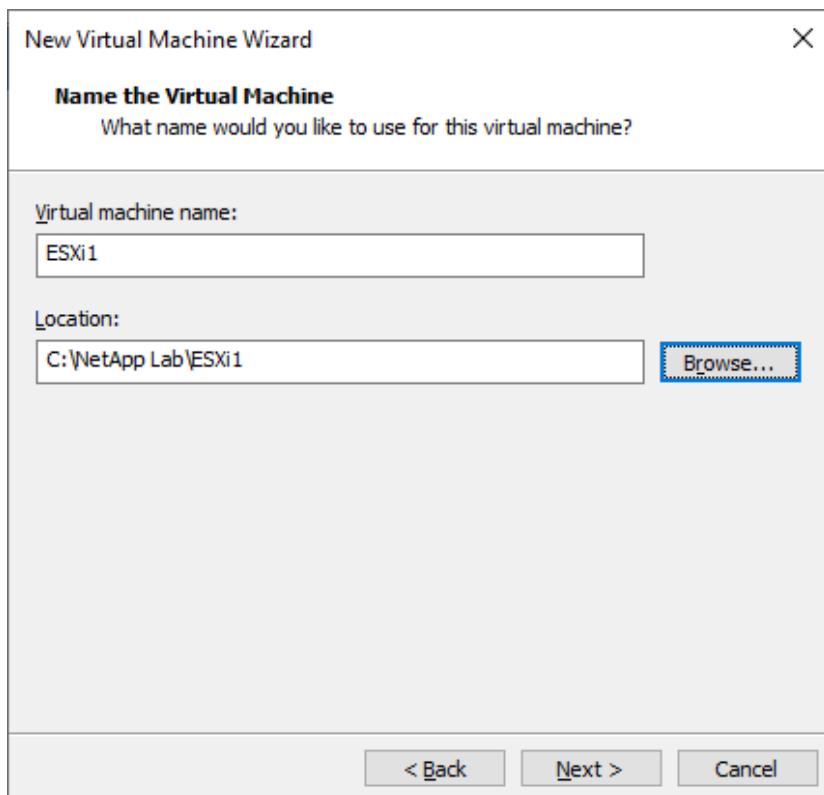
9. Click **Create a New Virtual Machine**



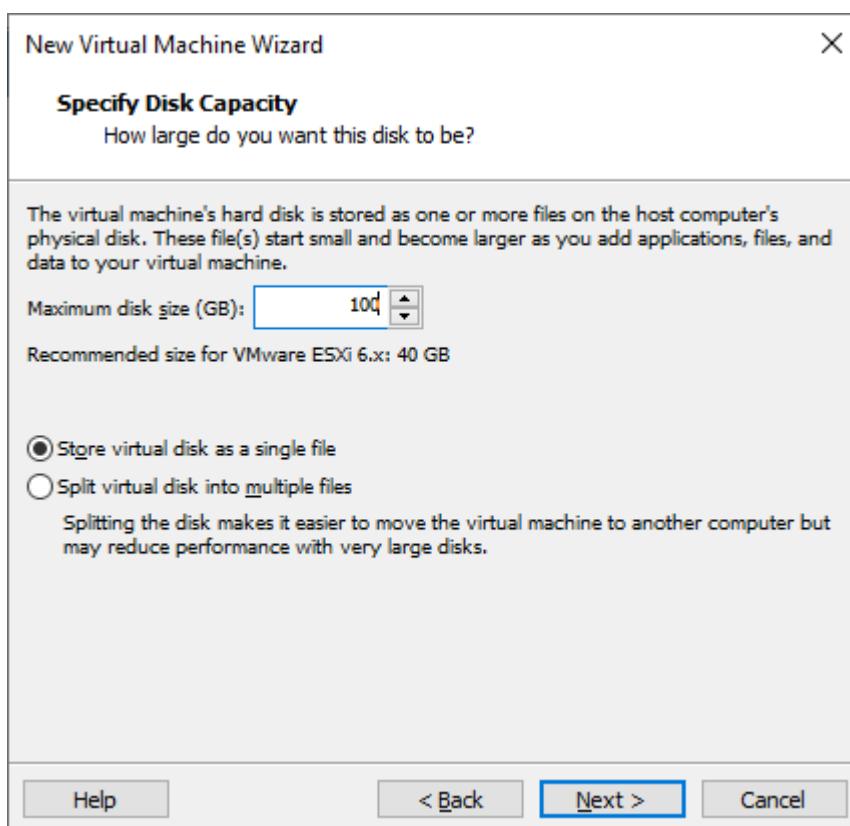
10. Select **Installer disc image file (iso)**: then **Browse** to the ESXi ISO file in the ESXi1 folder and click **Next**.



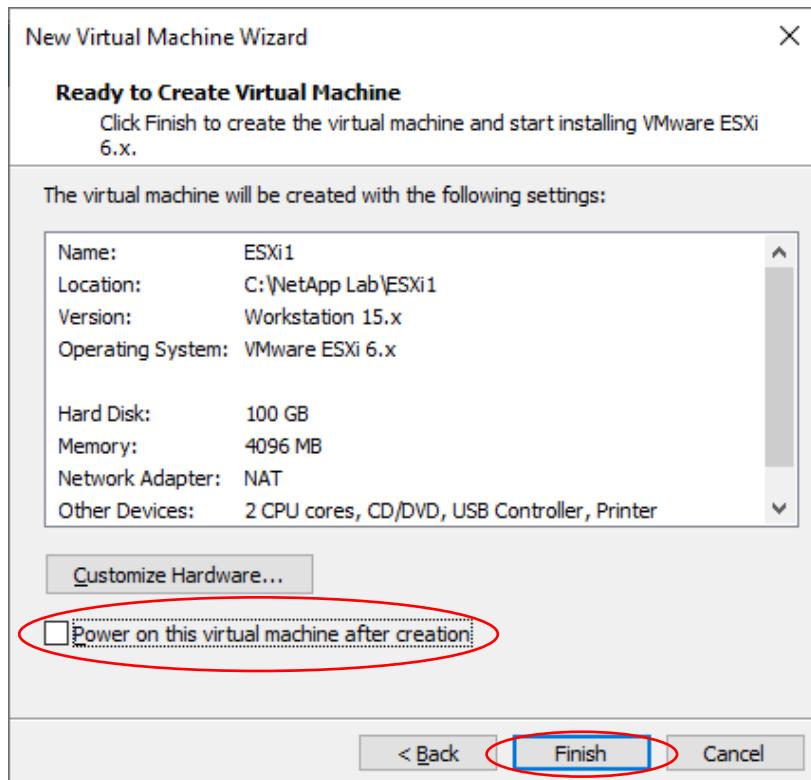
11. Name the virtual machine **ESXi1** and save it in the **NetApp Lab\ESXi1** folder



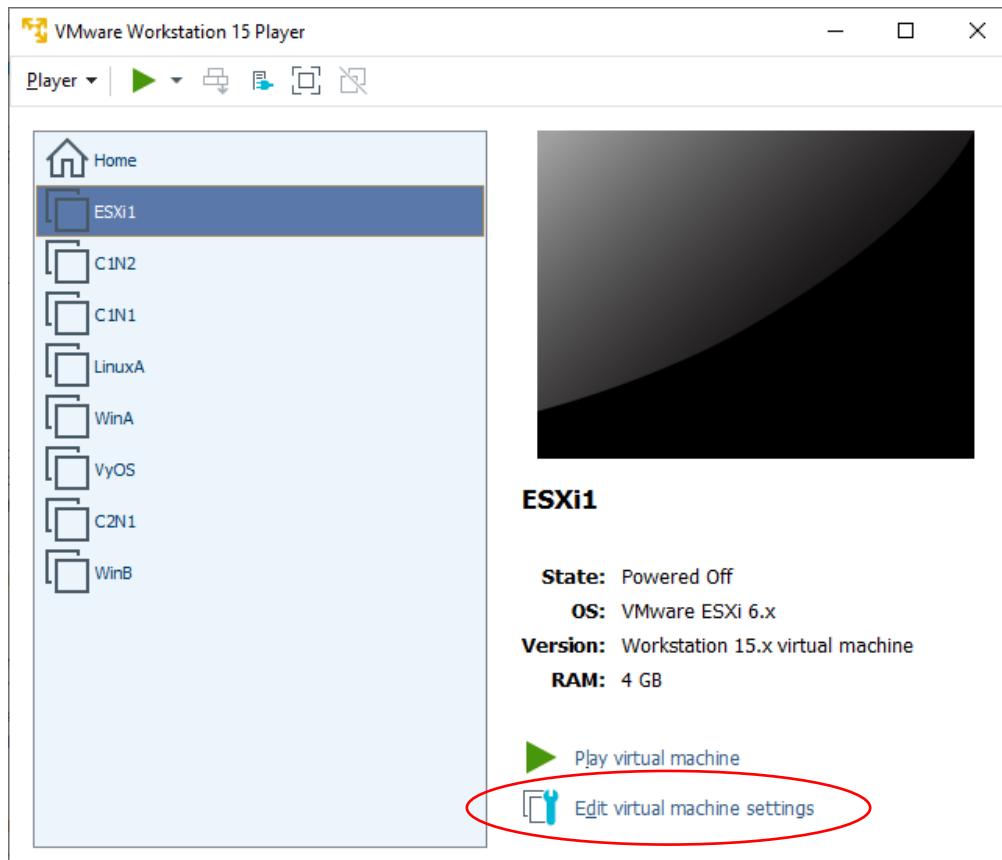
12. Make the **maximum disk size 100 GB** (*this is not the default*), select the option to **Store Virtual Disk as a single file** and click **Next**.



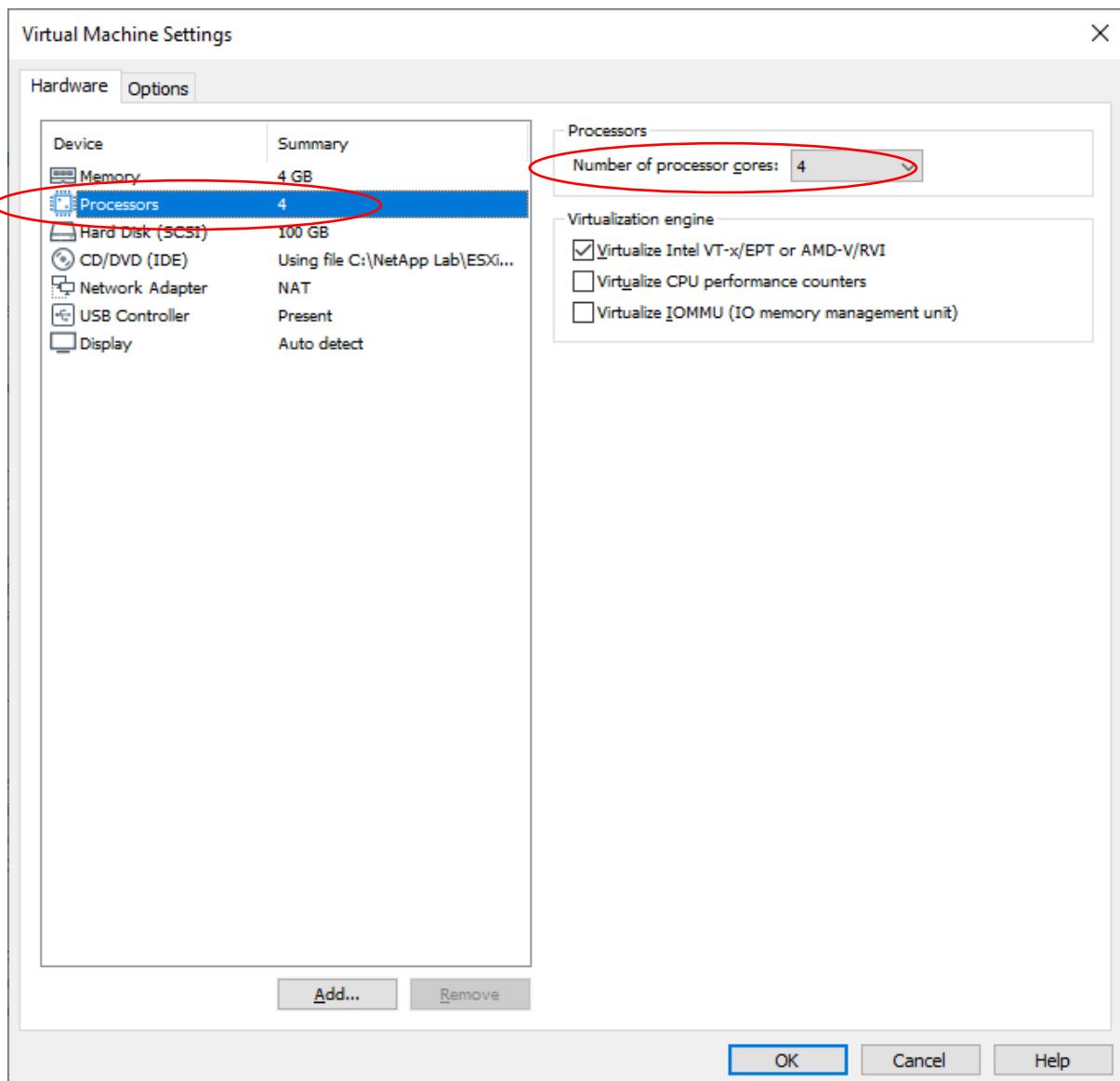
13. **Uncheck** the option to **Power on this virtual machine after creation** and click **Finish**



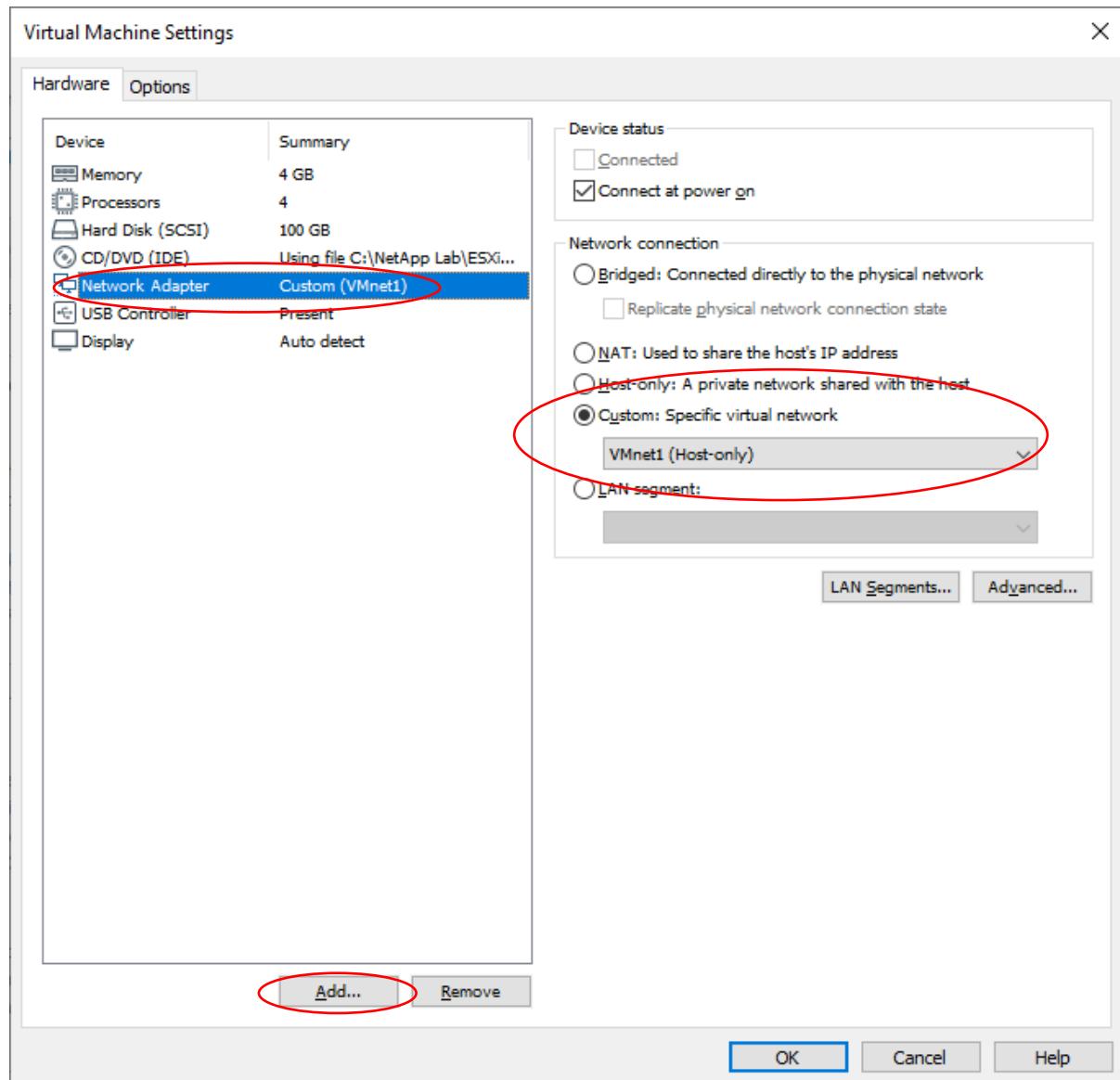
14. Click **Edit Virtual Machine Settings**



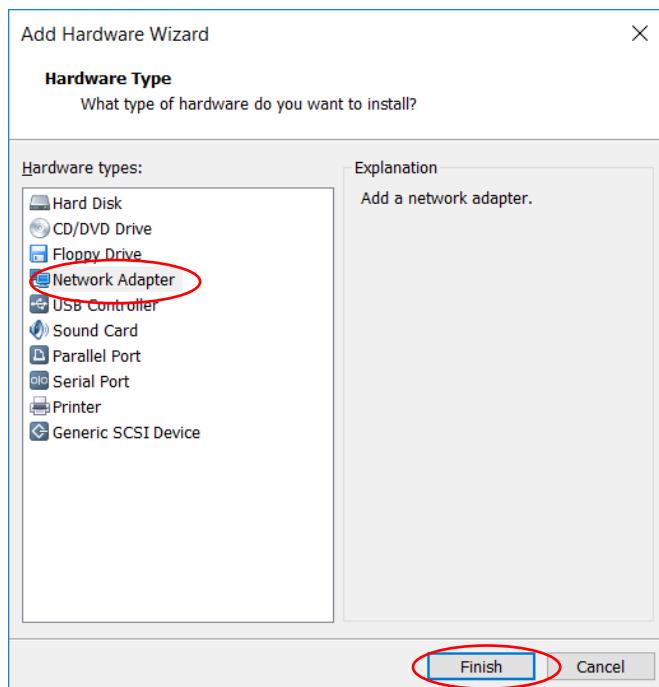
15. Click on **Processors** then set the **Number of processor cores** to 4



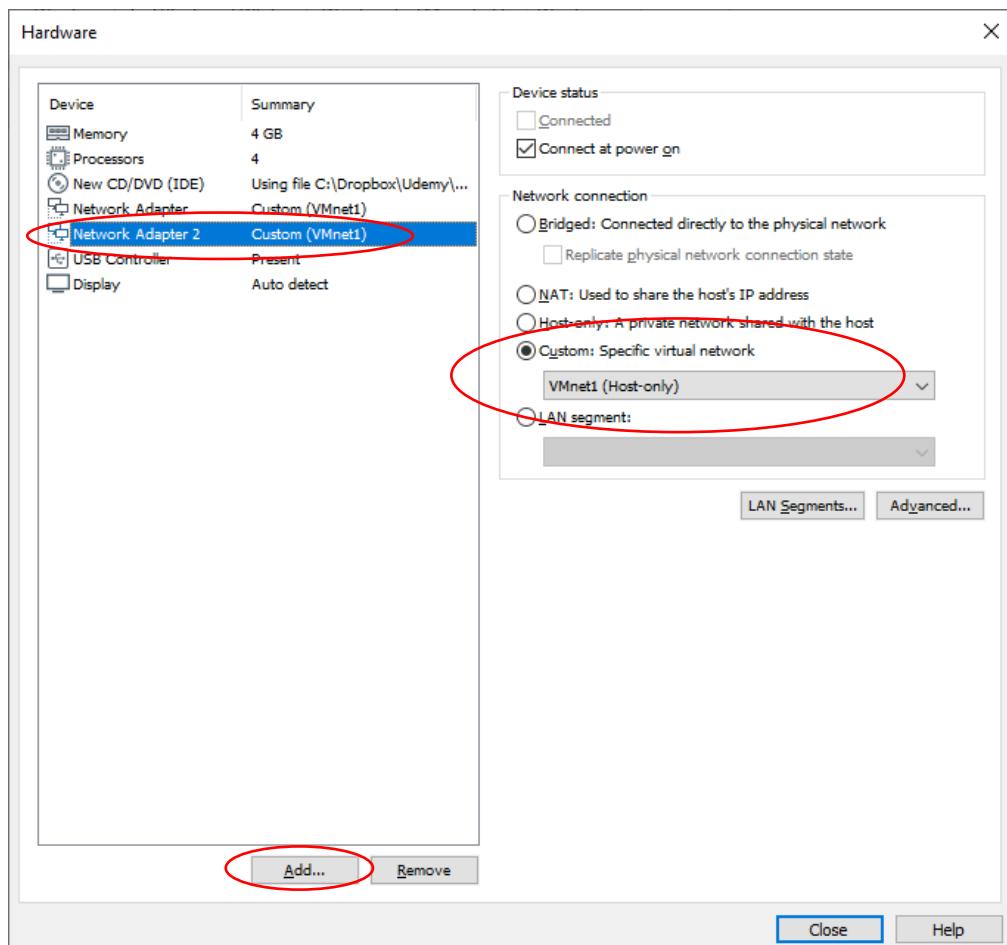
16. Click on **Network Adapter** and select **Custom** virtual network **VMnet1**, then click on the **Add** button



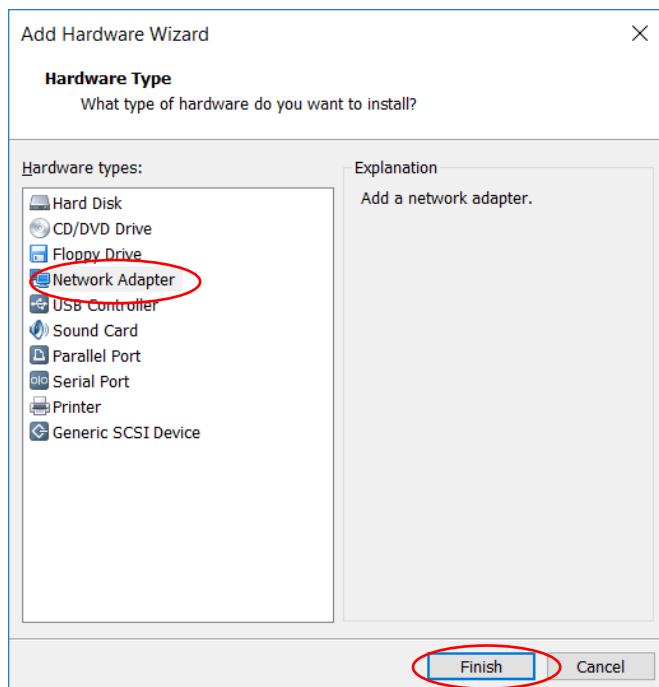
17. Choose **Network Adapter** and click **Finish**



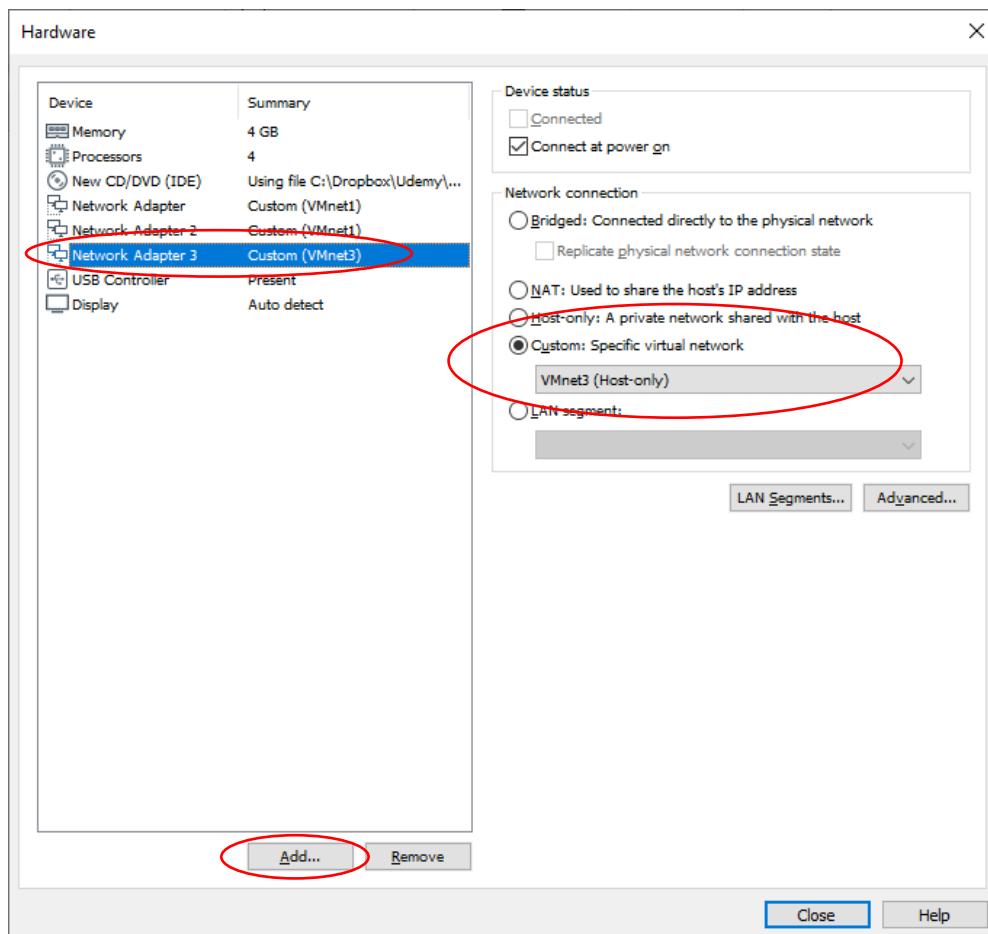
18. Select Network Adapter 2 and select **Custom** virtual network **VMnet1**, then click on the **Add** button



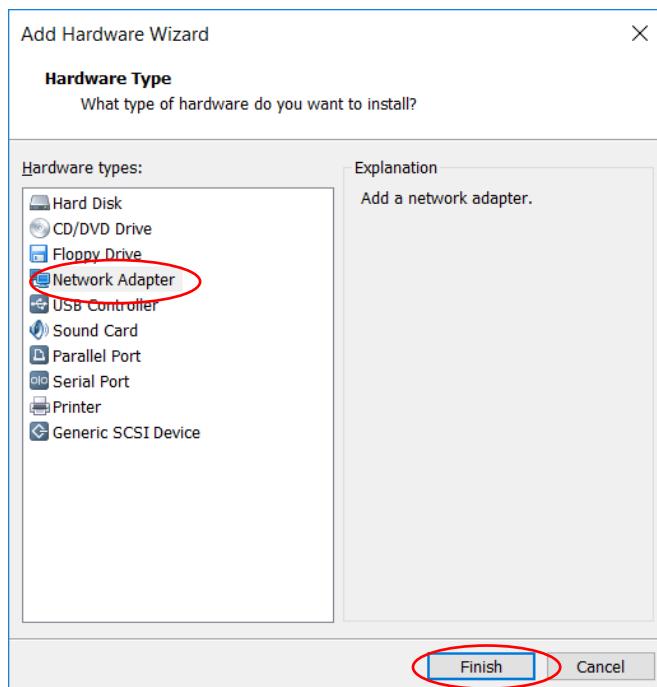
19. Choose **Network Adapter** and click **Finish**



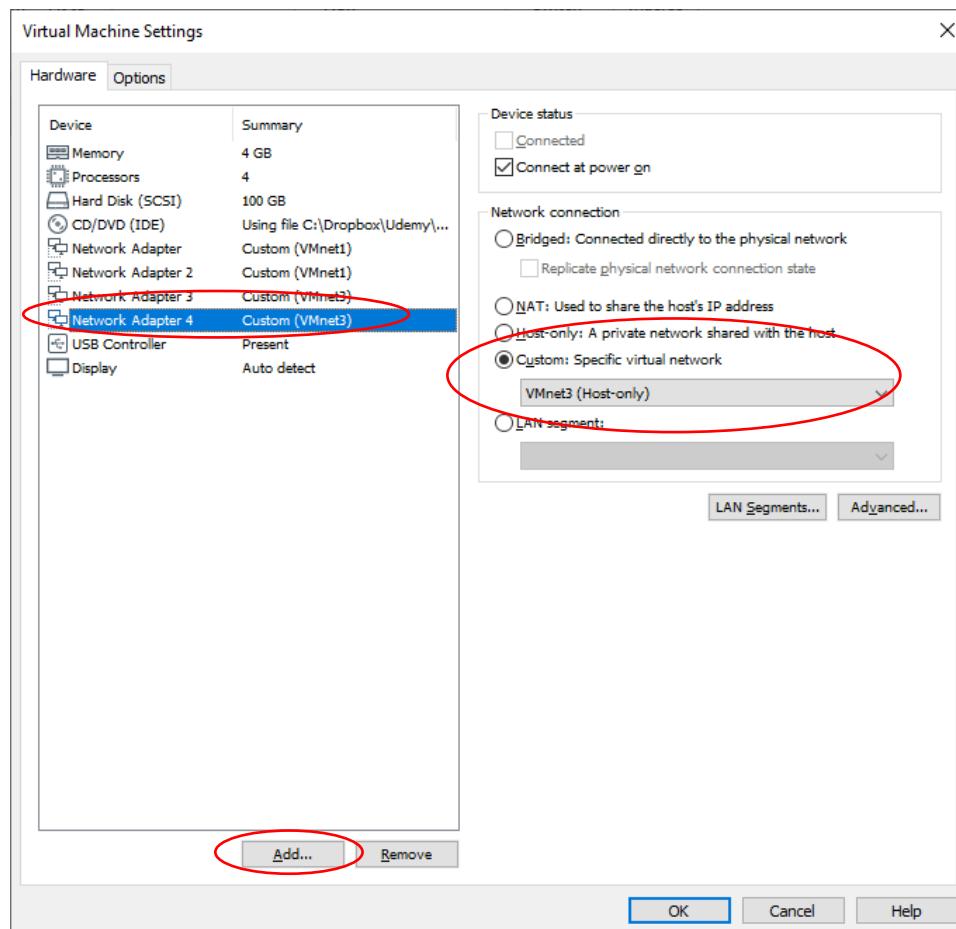
20. Select Network Adapter 3 and select **Custom** virtual network **VMnet3**, then click on the **Add** button



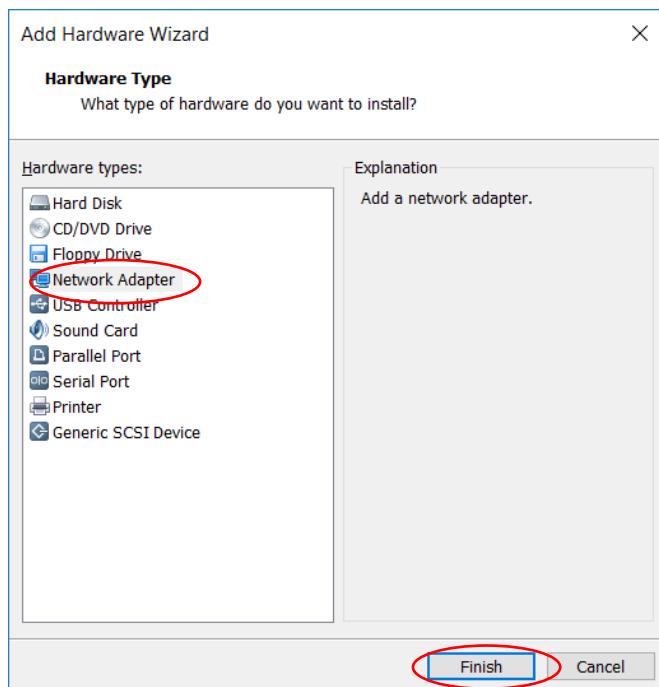
21. Choose **Network Adapter** and click **Finish**



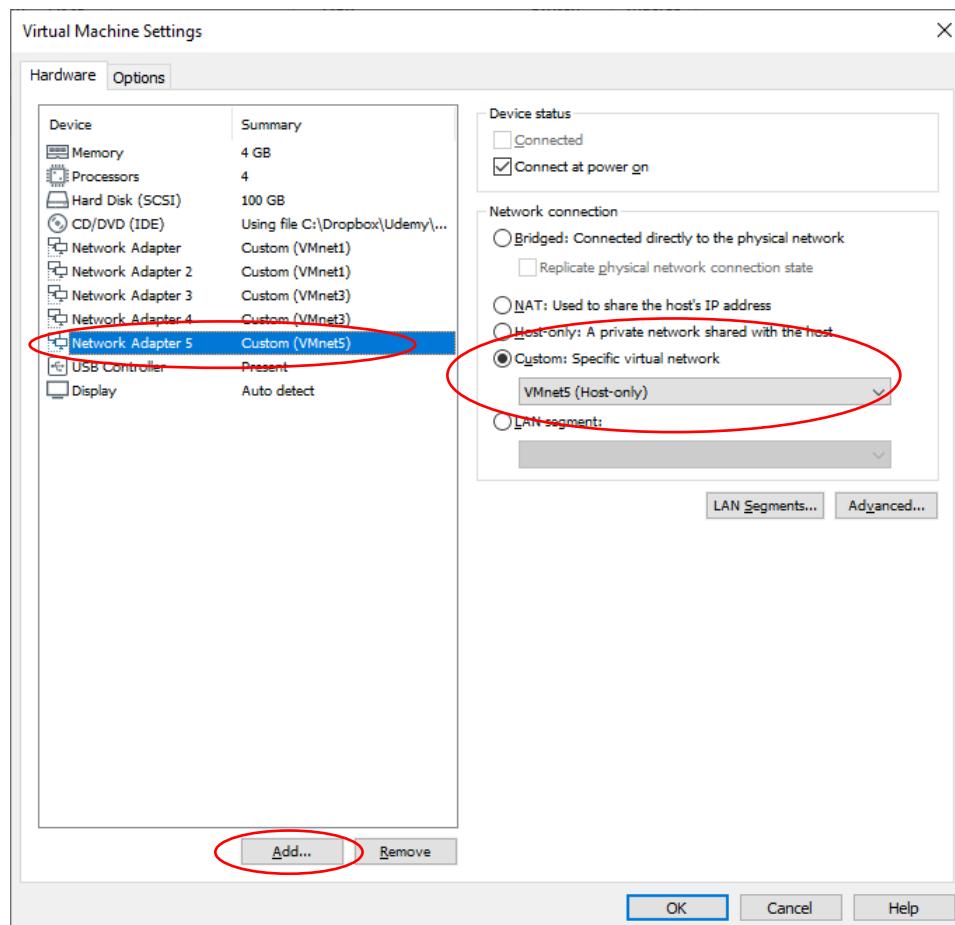
22. Select Network Adapter 4 and select **Custom** virtual network **VMnet3**, then click on the **Add** button



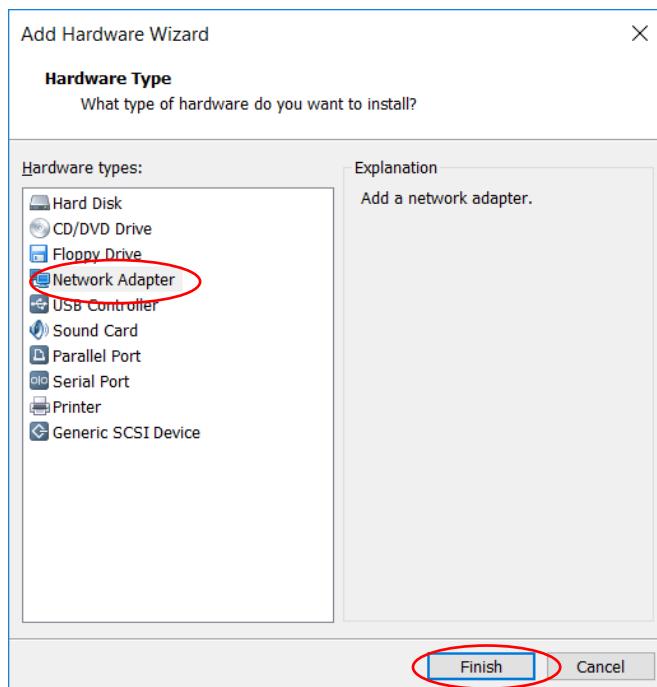
23. Choose **Network Adapter** and click **Finish**



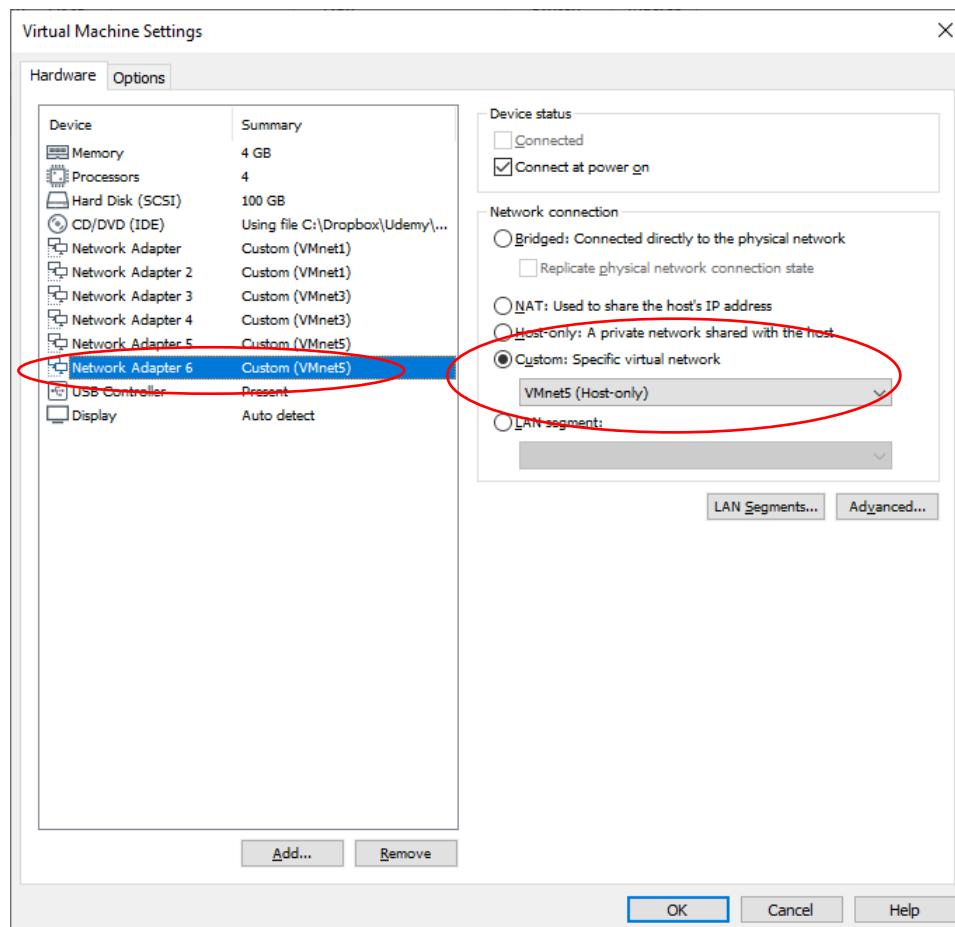
24. Select Network Adapter 5 and select **Custom** virtual network **VMnet5**, then click on the **Add** button



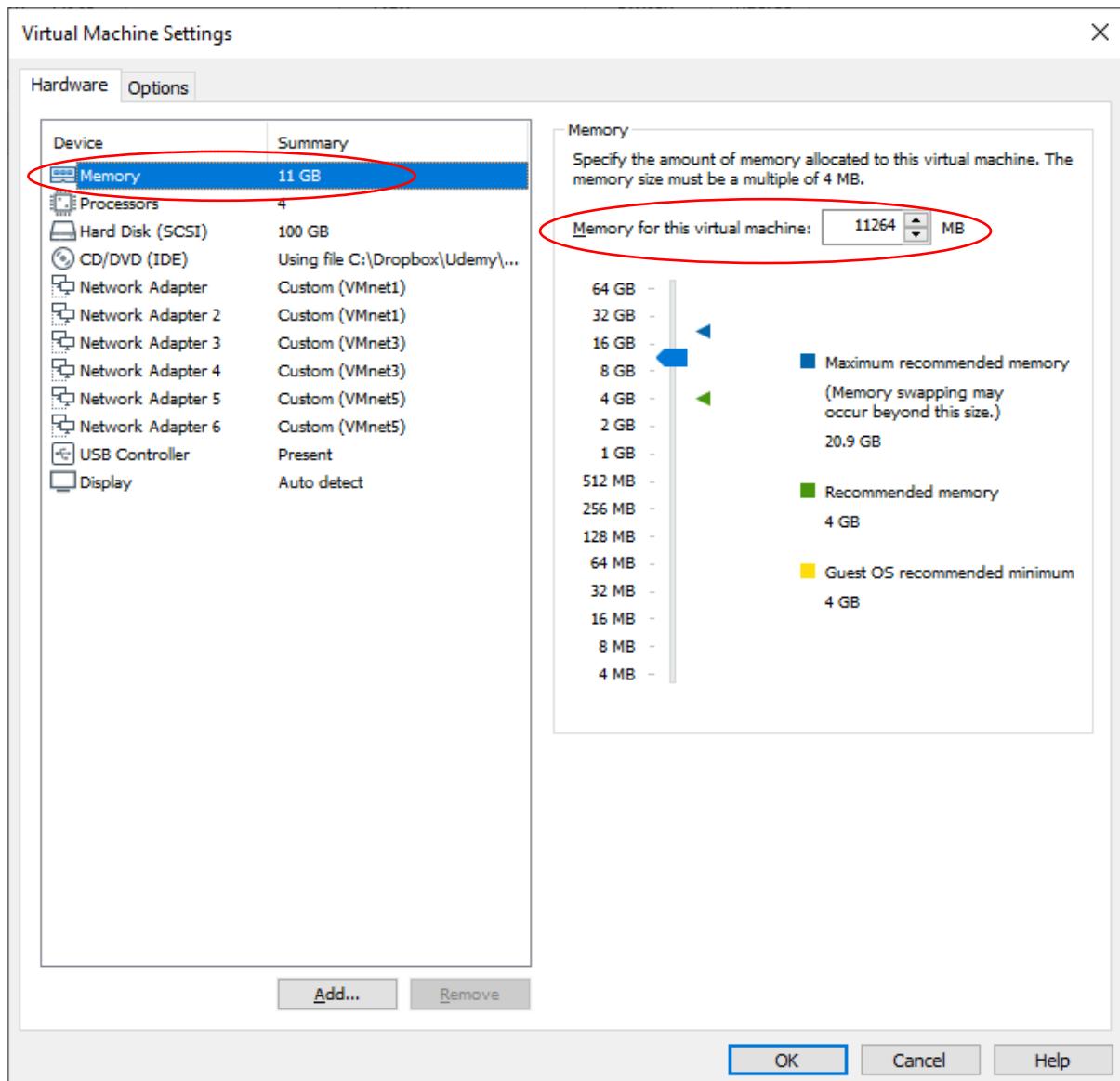
25. Choose **Network Adapter** and click **Finish**



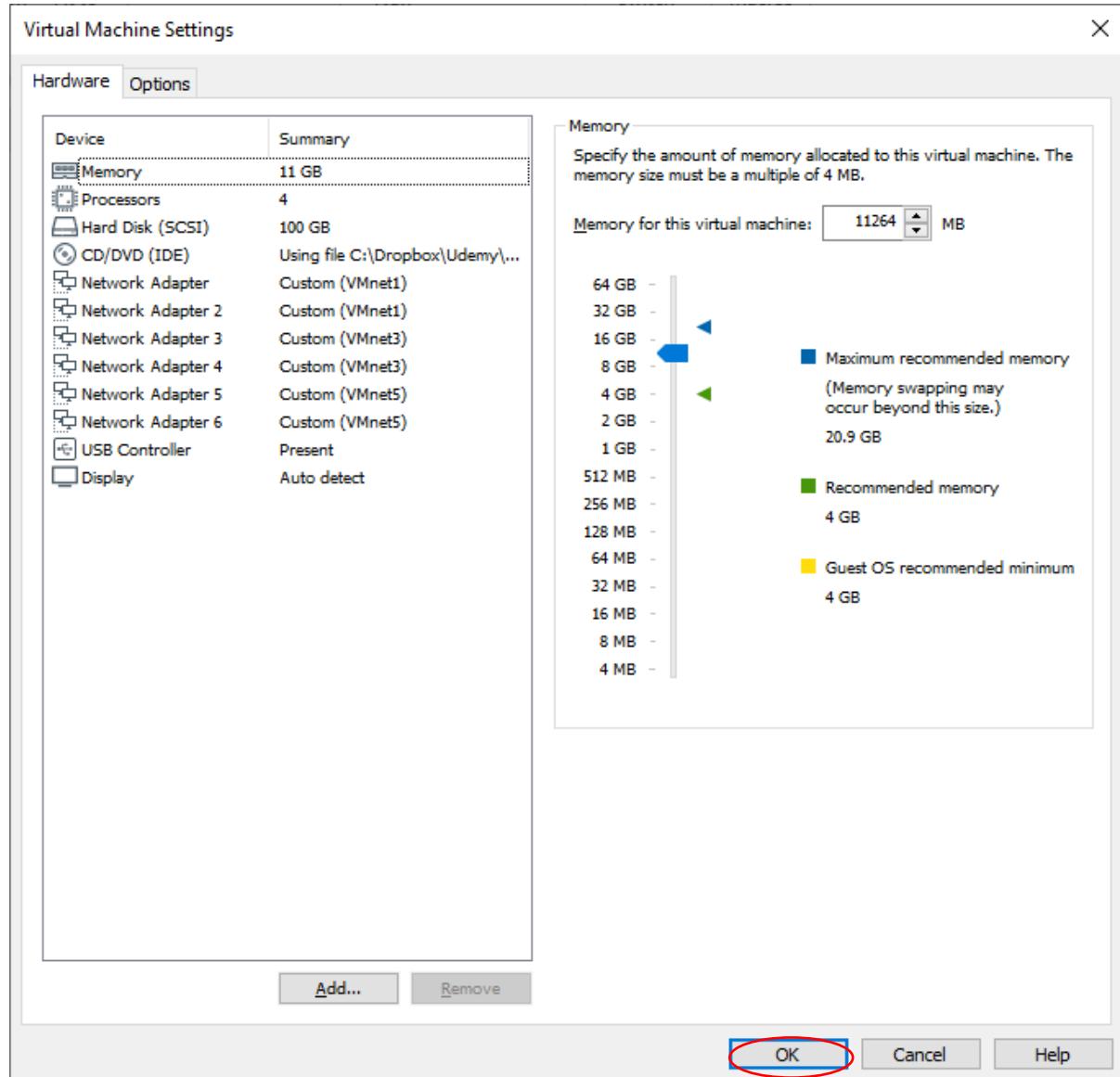
26. Select Network Adapter 6 and select **Custom** virtual network **VMnet5**



27. Click on **Memory** then set the **Memory for this virtual machine** to **11264 MB**.

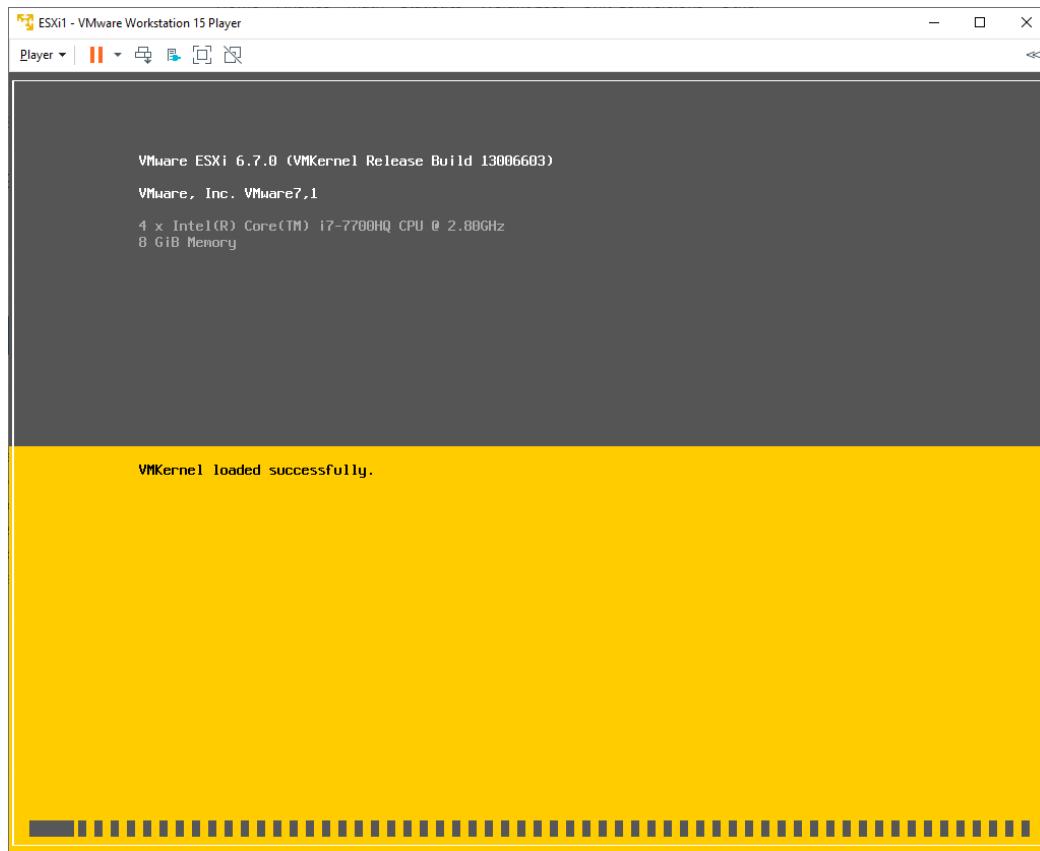


28. The Virtual Machine Settings for the Memory, Processors, Hard Disk and Network Adapters should look like the picture below. Click **OK** to close

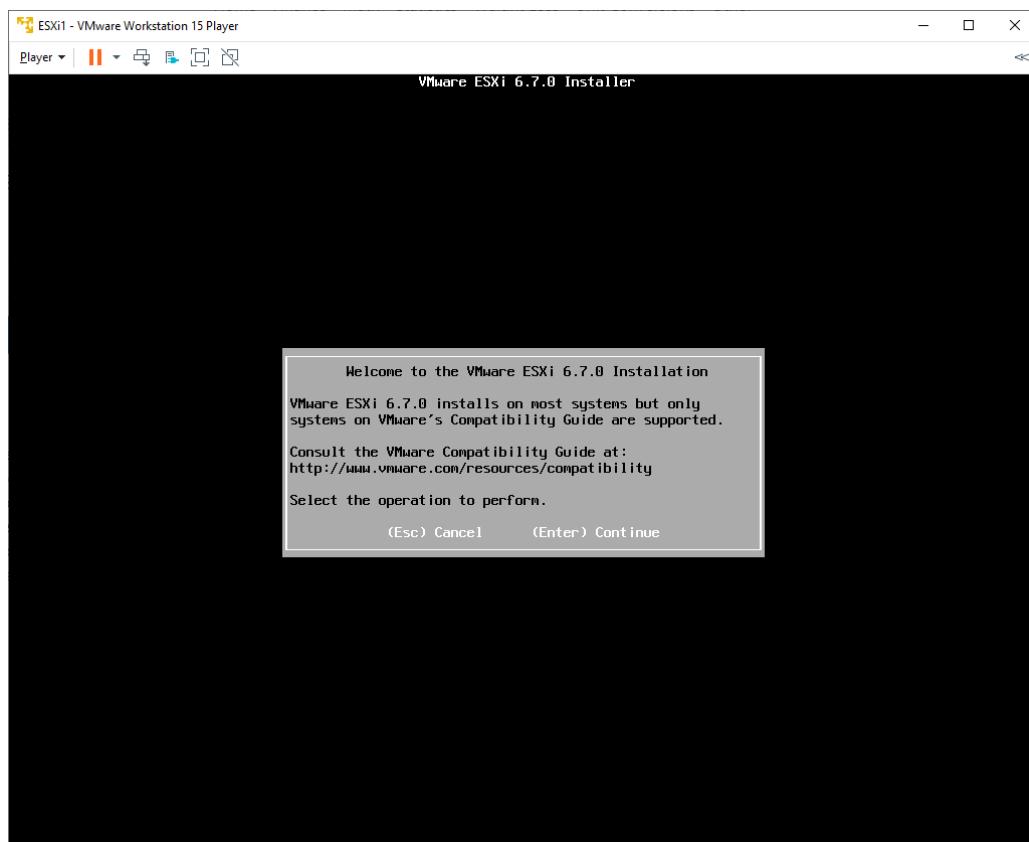


29. Click **Play Virtual Machine** to power on the ESXi1 host

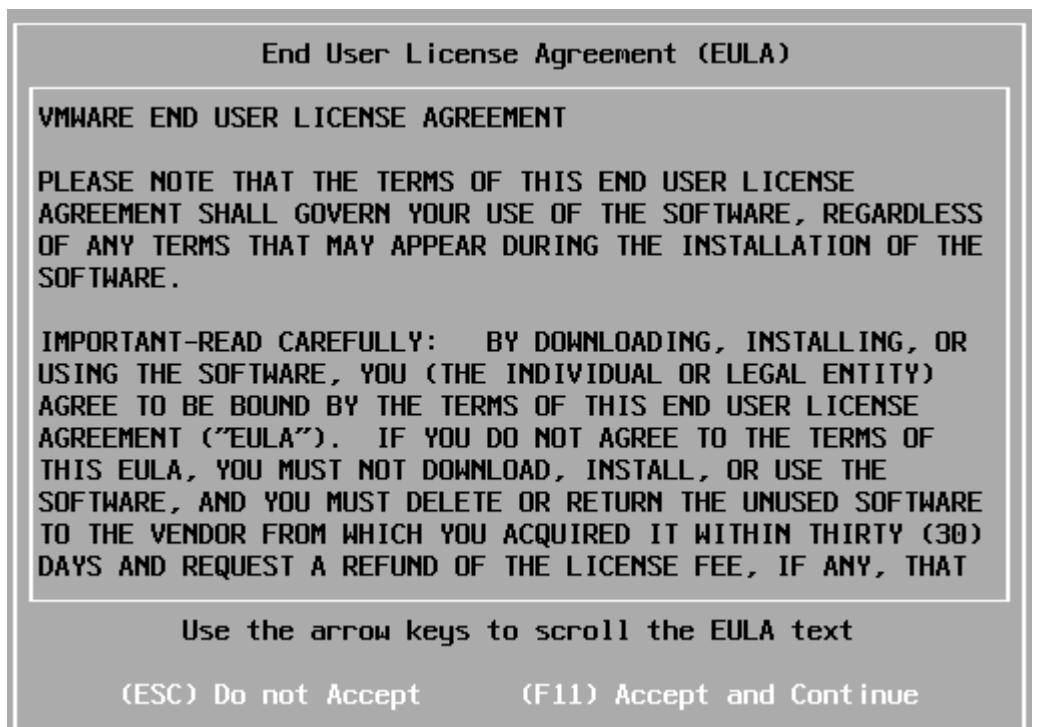
30. The host will run through the ESXi install process, this will take some time



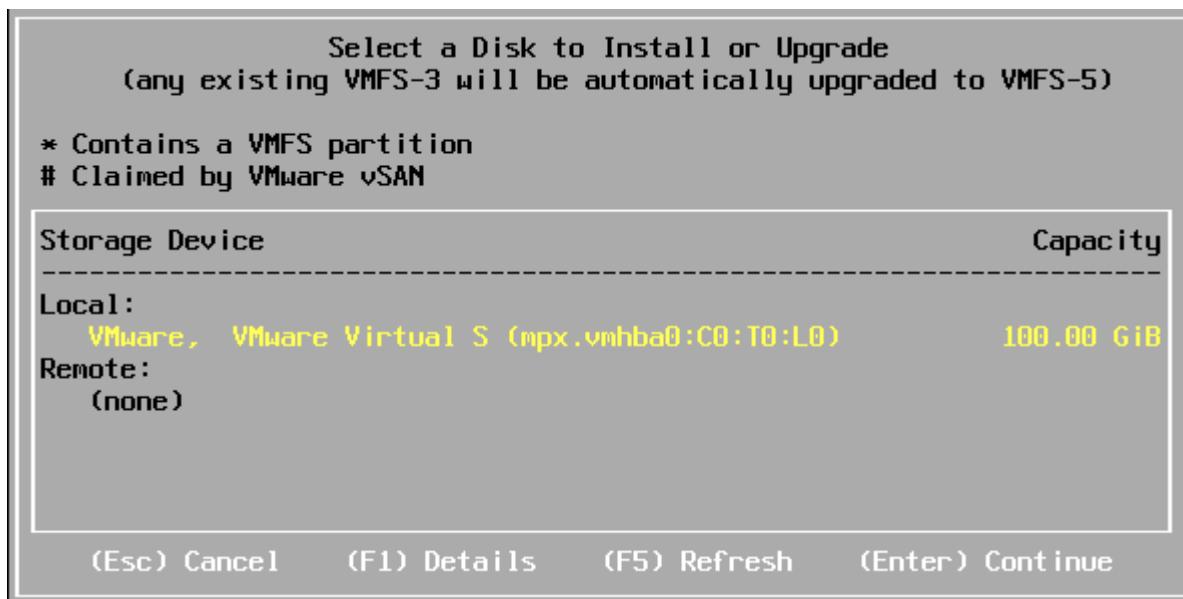
31. Click inside the VMware Workstation Player window then hit **Enter**



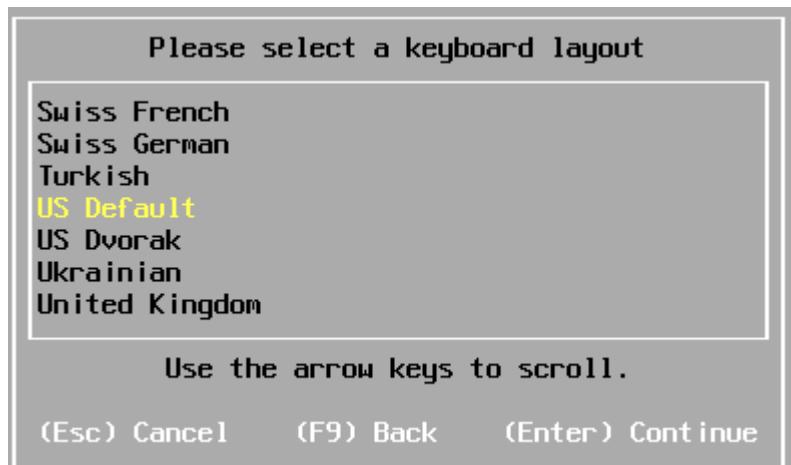
32. Hit F11 on your keyboard.



33. Hit **Enter** to select the disk to install on



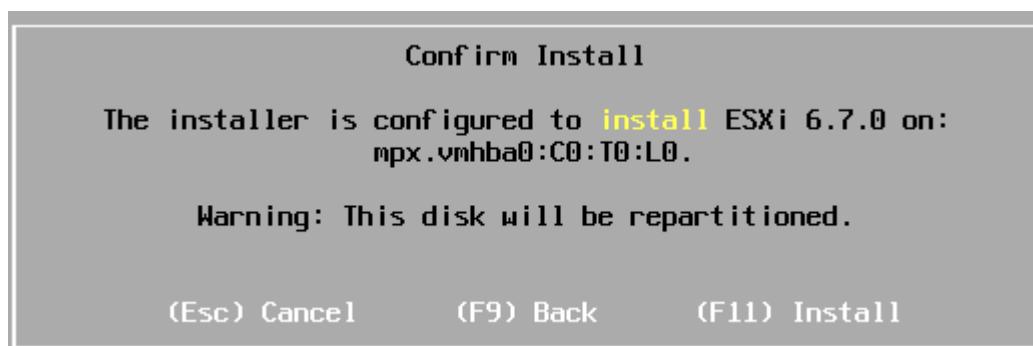
34. Use the Up and Down cursor arrows to select your keyboard layout then hit **Enter**



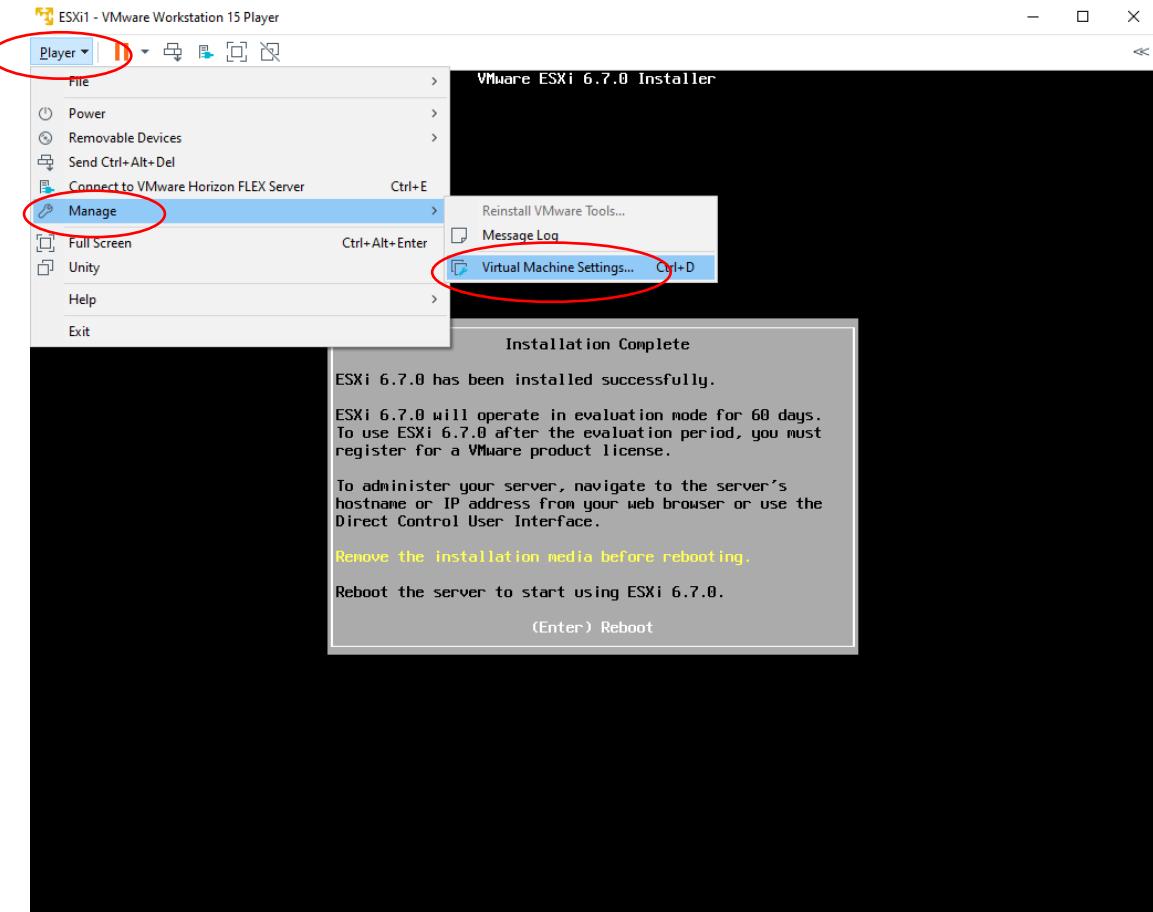
35. Enter the password **Flackbox1!** then hit **Enter** (our usual password **Flackbox1** does not meet the password complexity requirements so use **Flackbox1!** with an exclamation mark at the end).



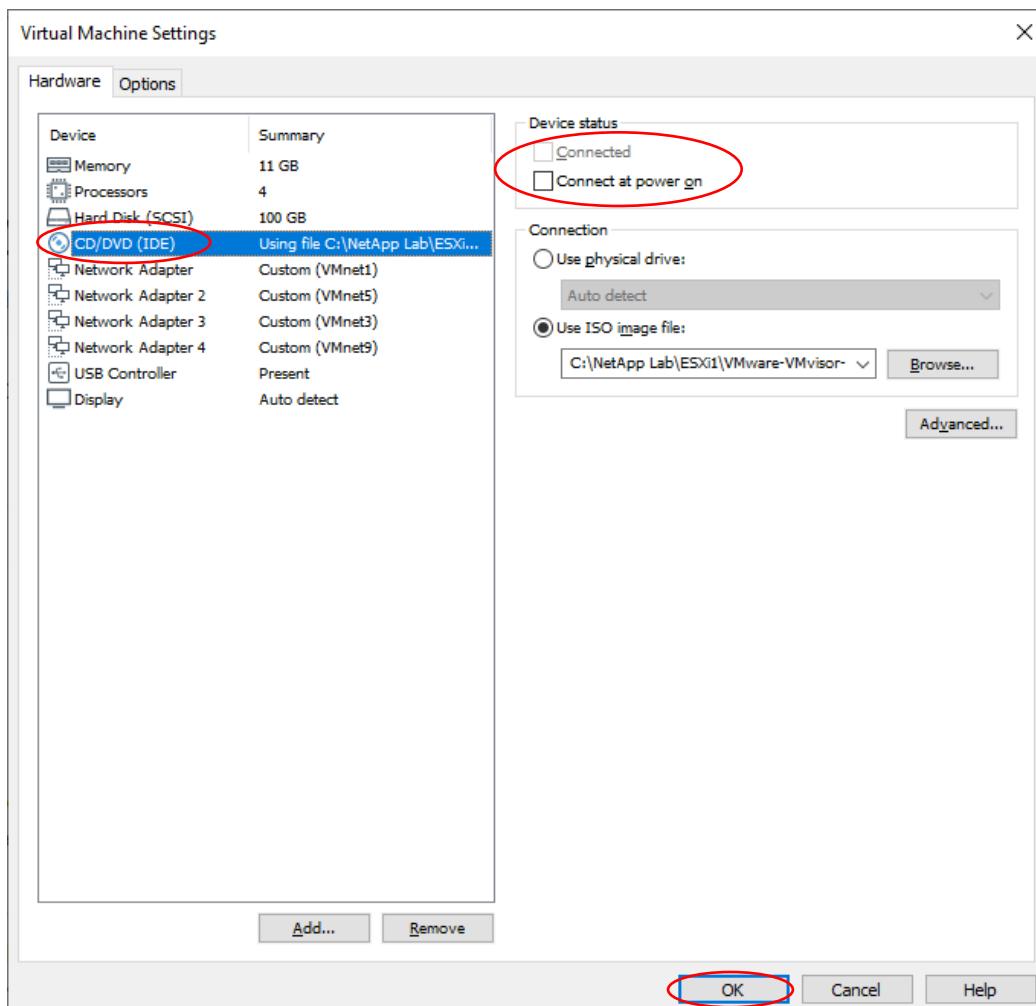
36. Hit **F11** on your keyboard to install



37. When the installation has completed, hold down the **Ctrl** and **Alt** keys on your keyboard to release the mouse, then select **Player > Manage > Virtual Machine Settings...** in VMware Workstation Player



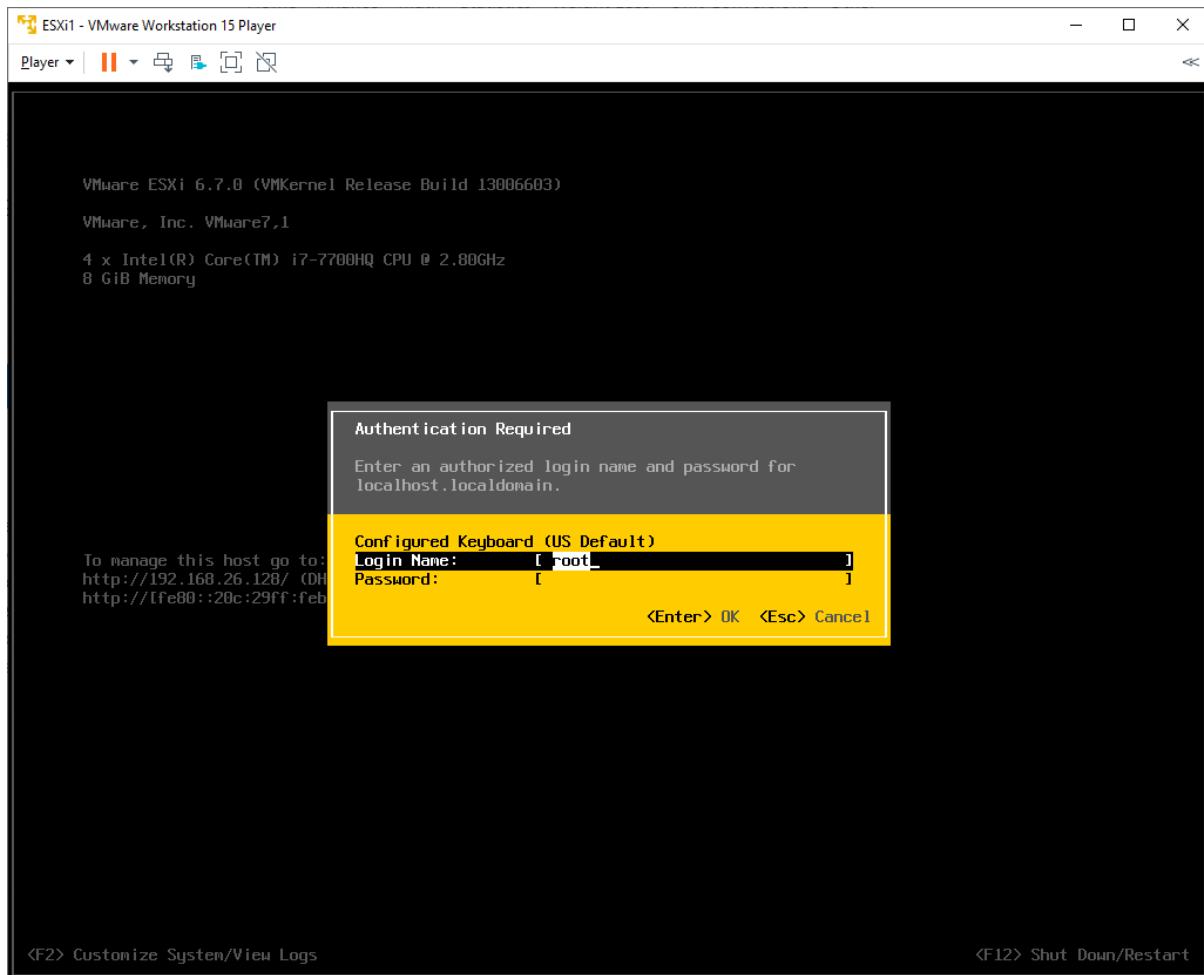
38. Select **CD/DVD (IDE)** then deselect the **Connected** and **Connect at power on** checkboxes. Click **OK**



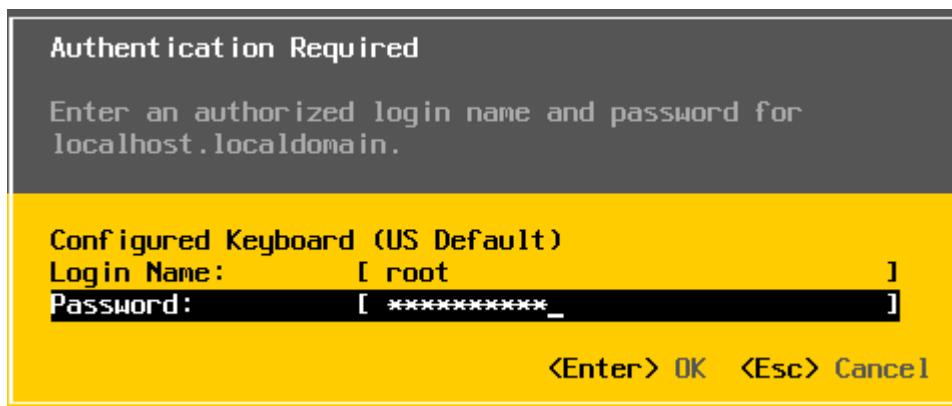
39. Click back inside the VMware Workstation Player window, then hit **Enter** to reboot.



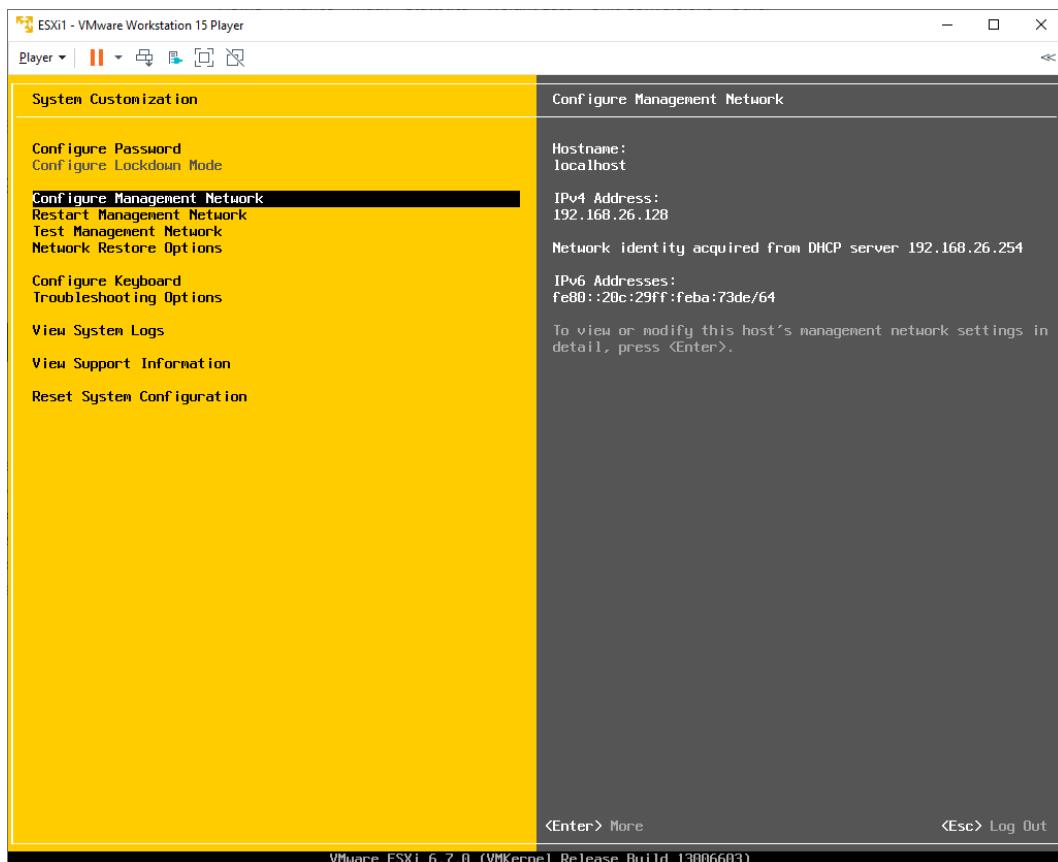
40. When the host has booted, hit **F2** to configure the settings.



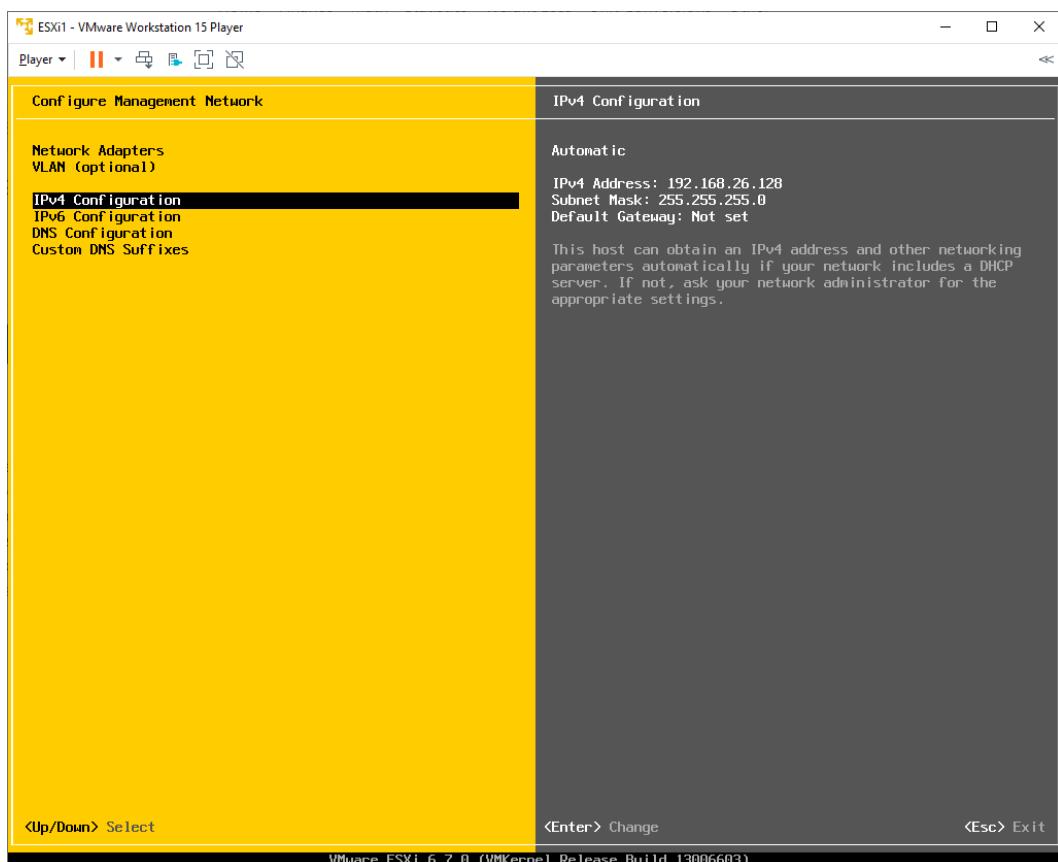
41. Use the Down arrow to get the cursor onto the **Password** line, enter the password **Flackbox1!**, then hit **Enter**



42. Use the Down arrow to select **Configure Network Management** then hit **Enter**



43. Select **IPv4 Configuration** and hit **Enter**



44. The host currently has an IP address which it obtained from the VMware Workstation DHCP service, we need to change that to the correct address. Use the Down arrow then the **Space Bar** to highlight and select **Set static IPv4 address and network configuration**

IPv4 Configuration

This host can obtain network settings automatically if your network includes a DHCP server. If it does not, the following settings must be specified:

() Disable IPv4 configuration for management network
() Use dynamic IPv4 address and network configuration
(o) Set static IPv4 address and network configuration:

IPv4 Address	[192.168.26.128]
Subnet Mask	[255.255.255.0]
Default Gateway	[0.0.0.0]

<Up/Down> Select <Space> Mark Selected <Enter> OK <Esc> Cancel

45. Configure these settings then hit **Enter**

IPv4 Address: 172.23.1.31
Subnet Mask: 255.255.255.0
Default Gateway: 172.23.1.254

IPv4 Configuration

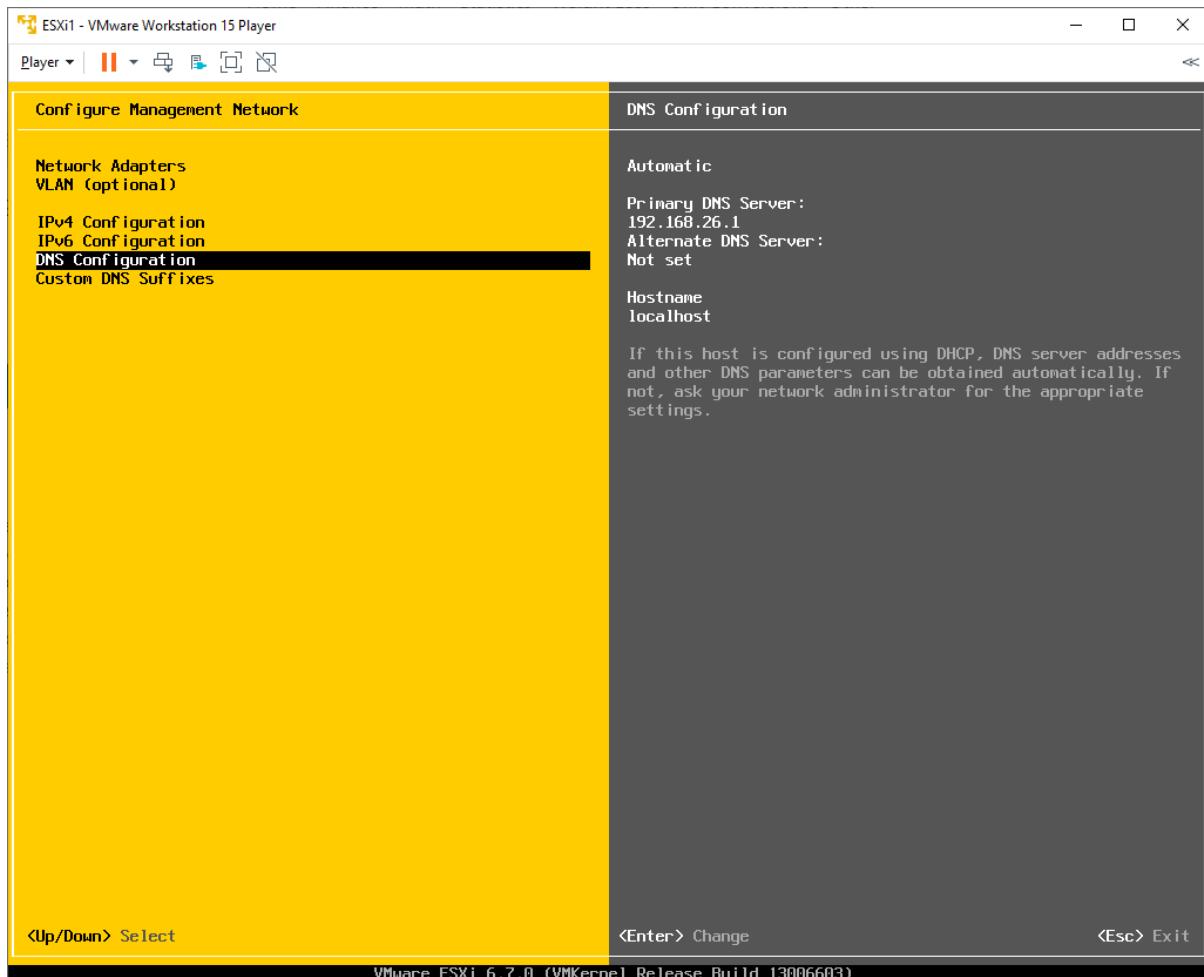
This host can obtain network settings automatically if your network includes a DHCP server. If it does not, the following settings must be specified:

() Disable IPv4 configuration for management network
() Use dynamic IPv4 address and network configuration
(o) Set static IPv4 address and network configuration:

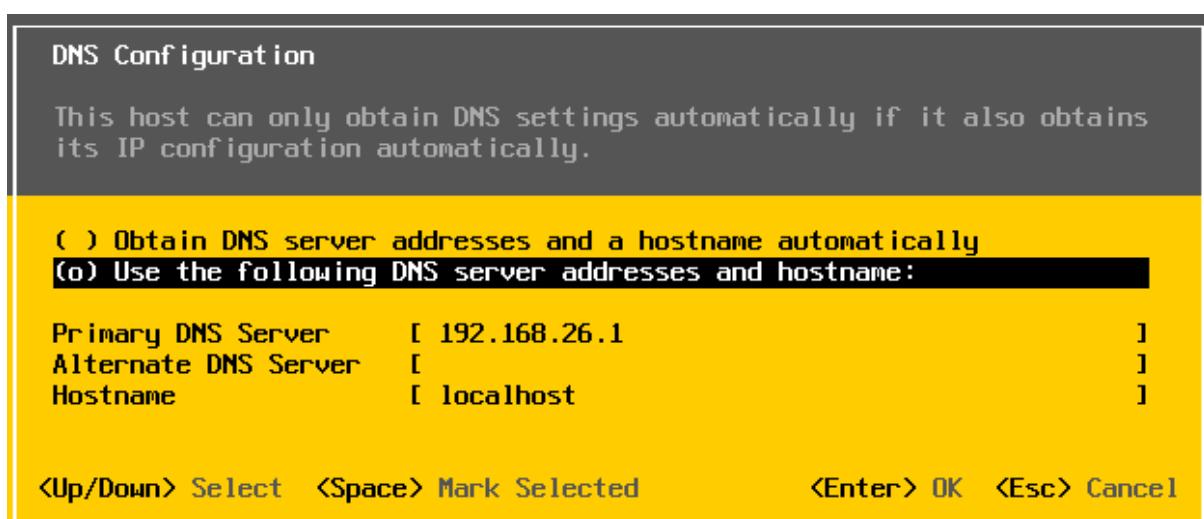
IPv4 Address	[172.23.1.31]
Subnet Mask	[255.255.255.0]
Default Gateway	[172.23.1.254]

<Up/Down> Select <Space> Mark Selected <Enter> OK <Esc> Cancel

46. Select **DNS Configuration** and hit **Enter**



47. Use the Down arrow then the **Space Bar** to highlight and select **Use the following DNS server addresses and hostname**

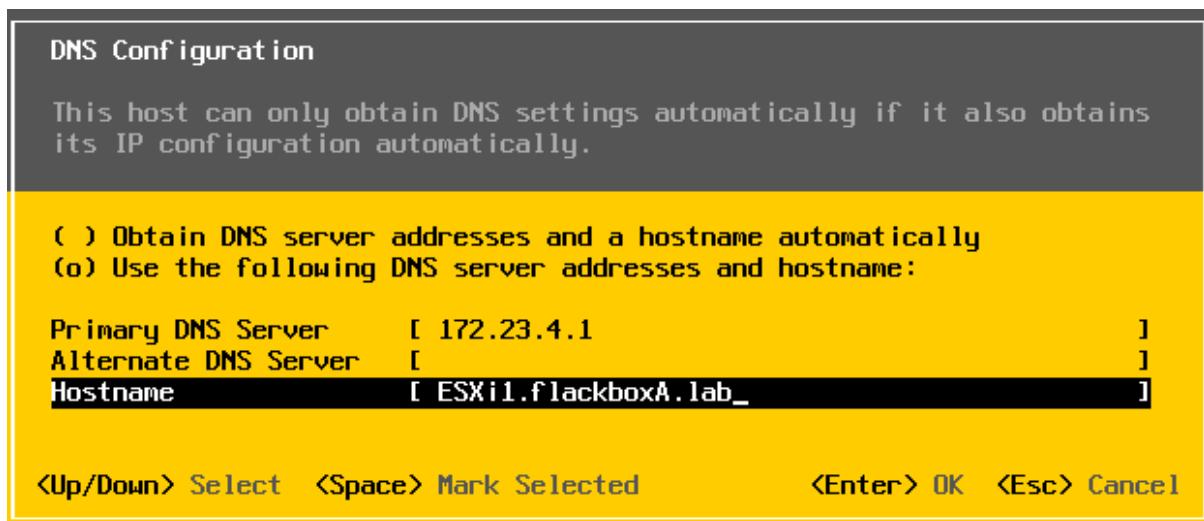


48. Configure these settings then hit **Enter**

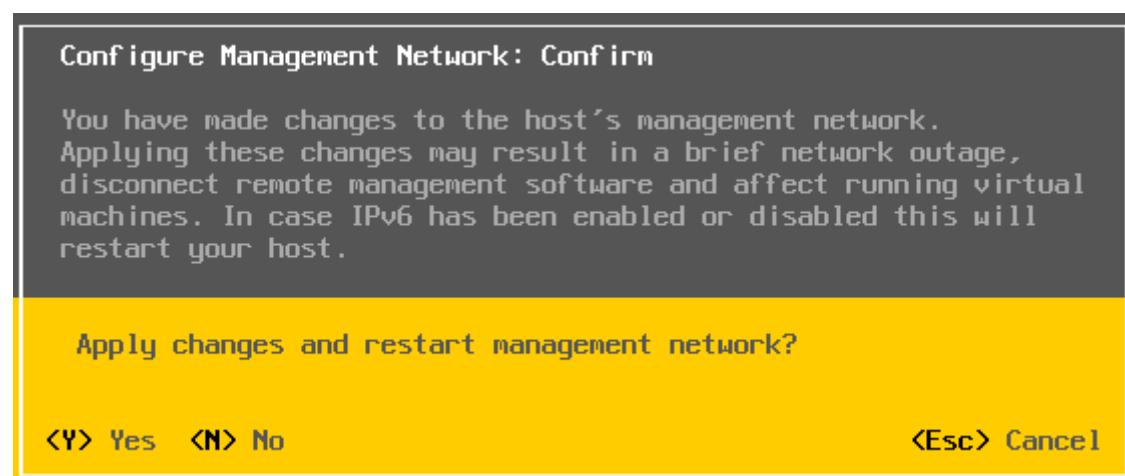
Primary DNS Server: 172.23.4.1

Alternate DNS Server: Leave blank

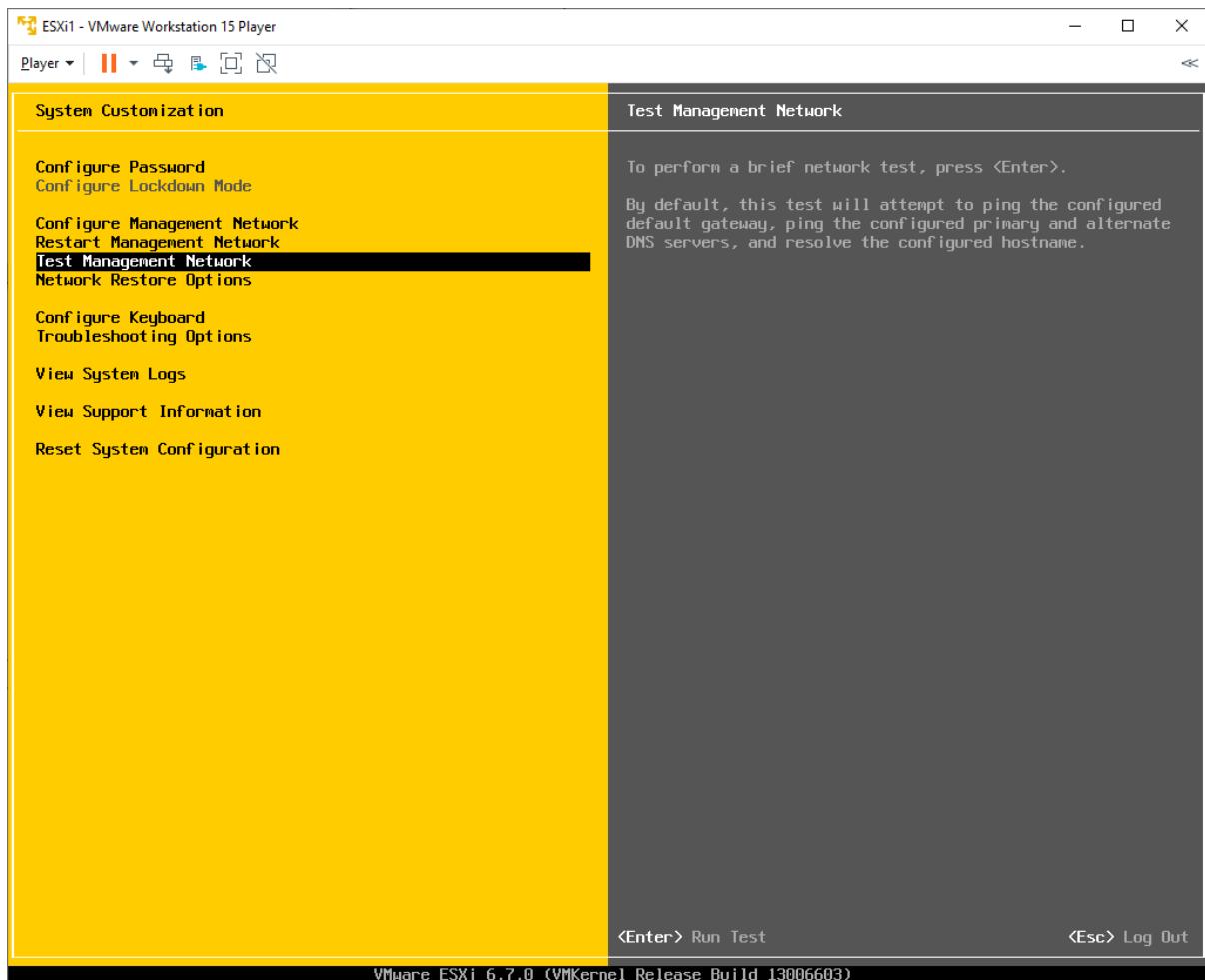
Hostname: ESXi1.flackboxA.lab



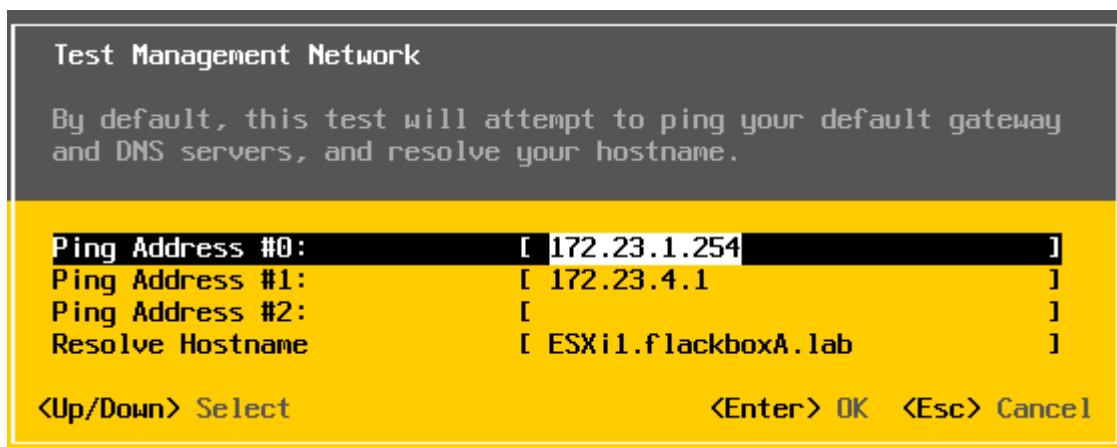
49. Hit **Escape** on your keyboard to Exit. Hit **Y** when prompted to save your changes.



50. Select **Test Management Network** and hit **Enter**



51. Hit **Enter** again to run the test



52. The tests should all complete successfully. Hit **Enter**

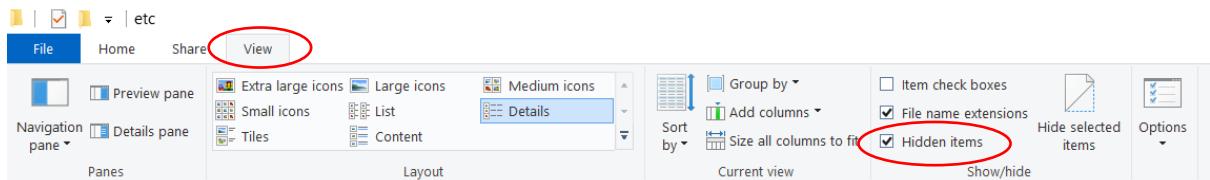
```
Testing Management Network
You may interrupt the test at any time.

Pinging address #1 (172.23.1.254).          OK.
Pinging address #2 (172.23.4.1).          OK.
Resolving hostname (ESXi1.flackboxA.lab).    OK.

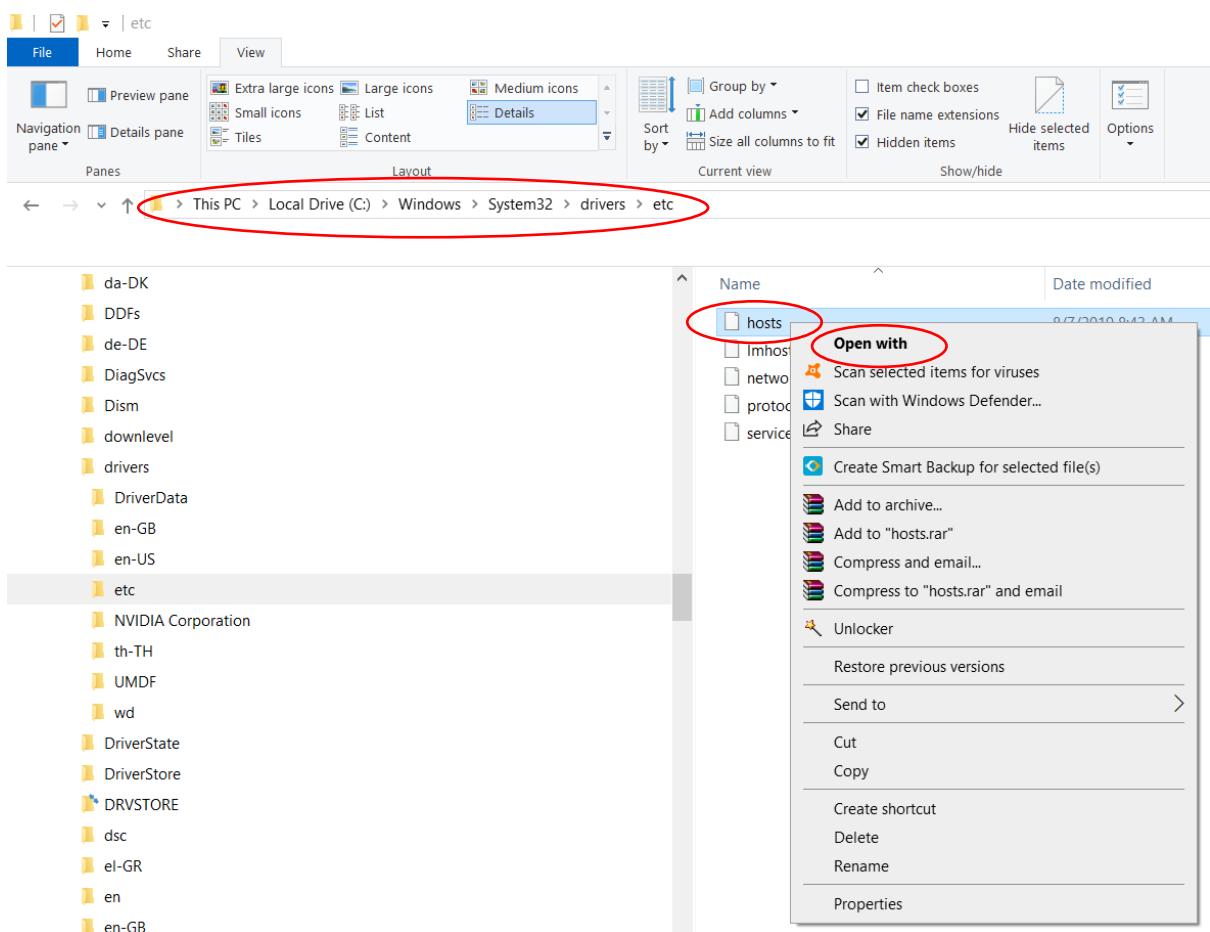
<Enter> OK
```

53. Hit **Escape** to log out. Installation of the ESXi1 host is now completed.

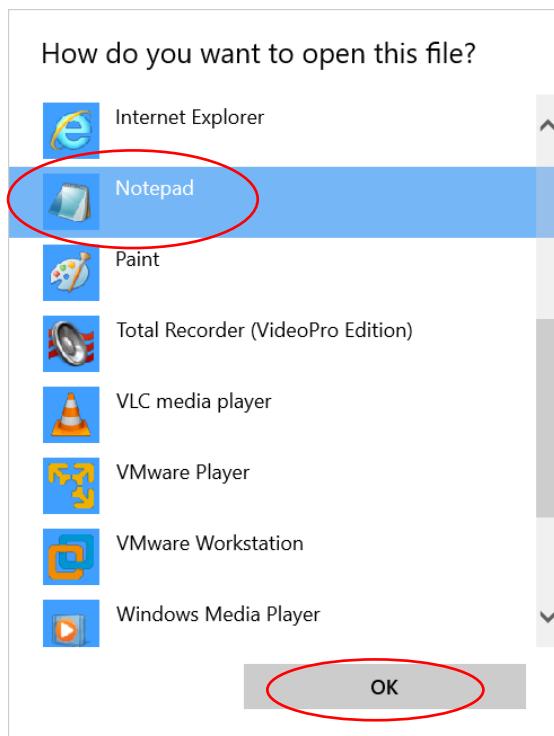
67. Installation of the VCSC vCenter Server Appliance is next.
68. You need to add an entry to the Hosts file on your laptop so that it will be able to resolve vcsa.flackboxA.lab. Open **Windows File Explorer** on your laptop.
69. Click the **View** menu and ensure **Hidden items** is checked



70. Browse to the **C:\Windows\System32\drivers\etc** folder, then right-click on the **Hosts** file and select **Open with**



71. Open the Hosts file with **Notepad**



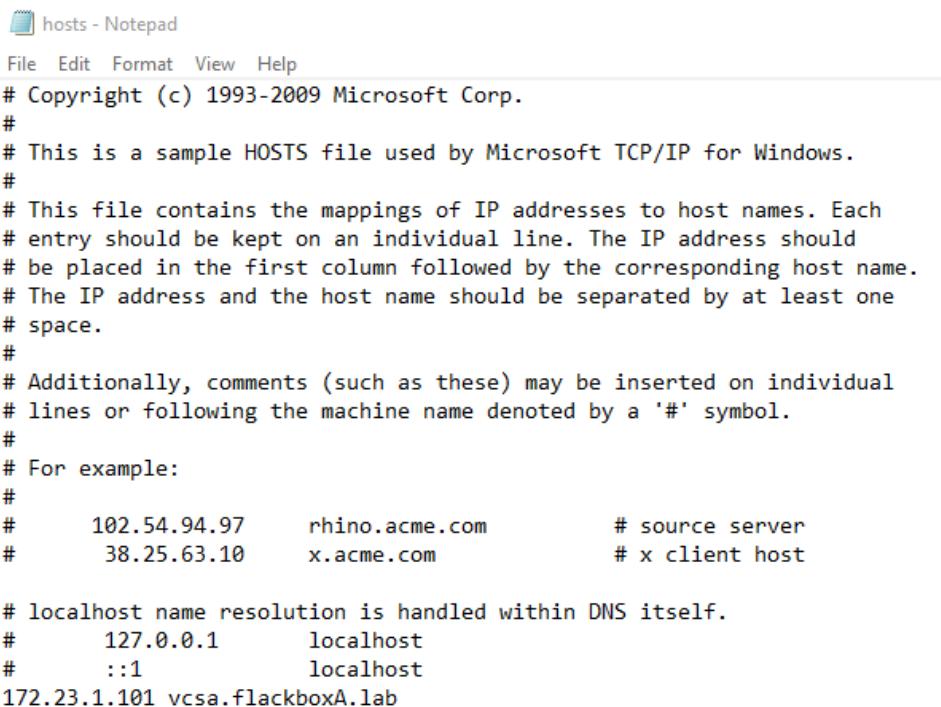
72. Add this entry at the end of the file (if you have other entries leave them as they are and add this below them):

172.23.1.101 vcsa.flackboxA.lab

```
*hosts - Notepad
File Edit Format View Help
# Copyright (c) 1993-2009 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
#      102.54.94.97    rhino.acme.com        # source server
#      38.25.63.10      x.acme.com            # x client host

# localhost name resolution is handled within DNS itself.
#      127.0.0.1        localhost
#      ::1              localhost
172.23.1.101 vcsa.flackboxA.lab
```

73. Click **File > Save** then close Notepad. Make sure you save the file with no file suffix, it must be saved as 'Hosts', not 'Hosts.txt'.
 74. Open the Hosts file in Notepad again to ensure your change was saved successfully.

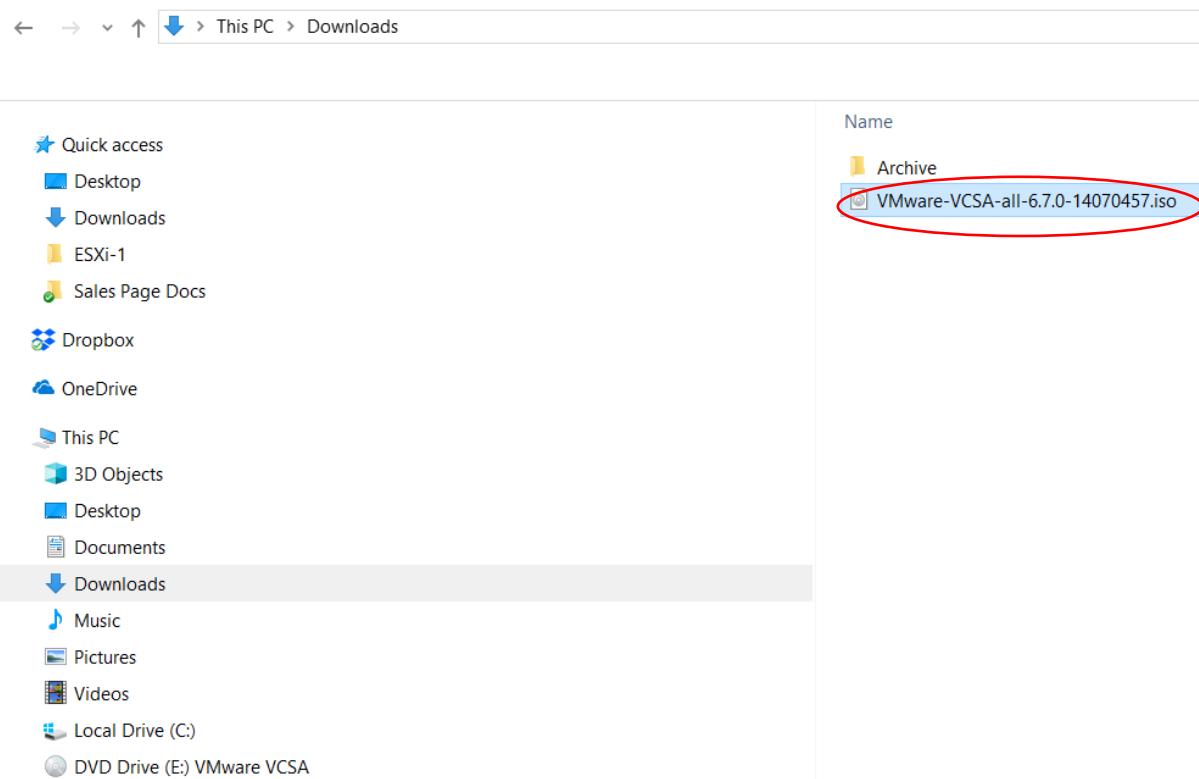


```

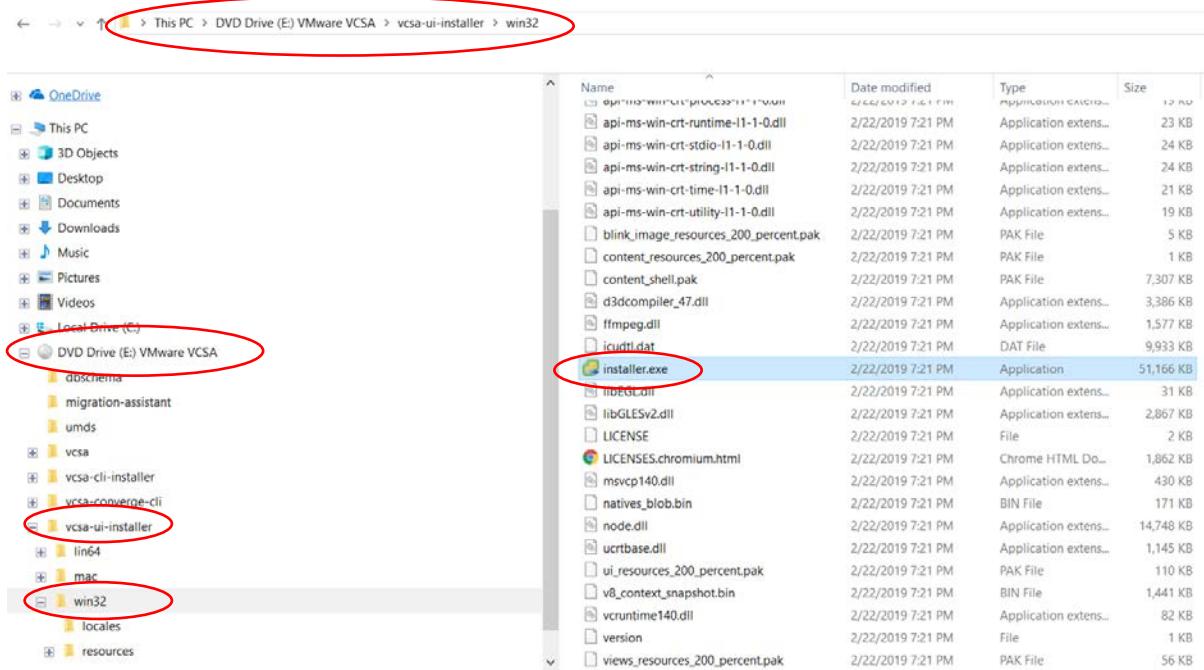
hosts - Notepad
File Edit Format View Help
# Copyright (c) 1993-2009 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
#
# For example:
#
#      102.54.94.97      rhino.acme.com      # source server
#      38.25.63.10      x.acme.com          # x client host

# localhost name resolution is handled within DNS itself.
#      127.0.0.1      localhost
#      ::1            localhost
172.23.1.101 vcsa.flackboxA.lab
  
```

75. Back in Windows File Explorer, find the VCSA ISO file you downloaded earlier. It will have a name similar to **VMware-VCSA-all-6.7.0-14070457.iso**
 54. Double-click on the file to mount it in a virtual DVD drive on your laptop



55. Browse to the \vcsa-ui-installer\win32 folder and then double-click the **Installer.exe** file to run the VCSA installation wizard



56. Click **Install**



57. Click **Next** on the Introduction page

58. Tick the checkbox to **accept the terms of the license agreement** and click **Next**

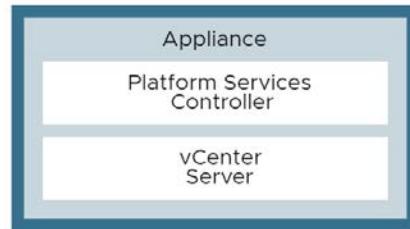
59. Accept the default **Embedded Platform Services Controller** deployment type and click **Next**

Select deployment type

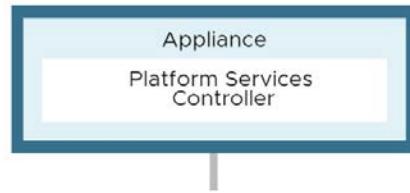
Select the deployment type you want to configure on the appliance.

For more information on deployment types, refer to the vSphere 6.7 documentation.

Embedded Platform Services Controller
 vCenter Server with an Embedded Platform Services Controller



External Platform Services Controller Deprecating soon
 Platform Services Controller
 vCenter Server (Requires External Platform Services Controller)



CANCEL BACK **NEXT**

60. Enter the ESXi host details for the **Appliance deployment target** and click **Next**

ESXi host or vCenter Server name: **172.23.1.31**

HTTPS port: **443**

User name: **root**

Password: **Flackbox1!**

Appliance deployment target

Specify the appliance deployment target settings. The target is the ESXi host or vCenter Server instance on which the appliance will be deployed.

ESXi host or vCenter Server name	172.23.1.31
HTTPS port	443
User name	root
Password

61. Click **Yes** to accept the Certificate Warning message

62. Enter these details on the **Set up appliance VM** page and click **Next**:

VM name: **VCSA**

Set root password: **Flackbox1!**

Confirm root password: **Flackbox1!**

Set up appliance VM

Specify the VM settings for the appliance to be deployed.

VM name

VCSA

Set root password

Confirm root password

63. Accept the defaults on the **Select deployment size** page and click **Next**

Select deployment size

Select the deployment size for this vCenter Server with an Embedded Platform Services Controller.

For more information on deployment sizes, refer to the vSphere 6.7 documentation.

Deployment size

Tiny

Storage size

Default

Resources required for different deployment sizes

Deployment Size	vCPUs	Memory (GB)	Storage (GB)	Hosts (up to)	VMs (up to)
Tiny	2	10	300	10	100
Small	4	16	340	100	1000
Medium	8	24	525	400	4000
Large	16	32	740	1000	10000
X-Large	24	48	1180	2000	35000

64. Tick the checkbox to **Enable Thin Disk Mode** on the Select datastore page and click **Next**

Select datastore

Select the storage location for this appliance

- Install on an existing datastore accessible from the target host

Name	Type	Capacity	Free	Provisioned
datastore1	VMFS-6	92.5 GB	91.09 GB	1.41 GB

- Enable Thin Disk Mode (i)

- Install on a new vSAN cluster containing the target host (i)

65. Configure these network settings then click **Next**

Network: VM Network

IP version: IPv4

IP assignment: static

FQDN: VCSA.flackboxA.lab

IP address: 172.23.1.101

Subnet mask or prefix length: 255.255.255.0

Default gateway: 172.23.1.254

DNS servers: 172.23.4.1

HTTP: 80

HTTPS: 443

Configure network settings

Configure network settings for this appliance

Network	VM Network
IP version	IPv4
IP assignment	static
FQDN	VCSA.flackboxA.lab
IP address	172.23.1.101
Subnet mask or prefix length	255.255.255.0
Default gateway	172.23.1.254
DNS servers	172.23.4.1
Common Ports	
HTTP	80
HTTPS	443

66. Click **Finish**

Ready to complete stage 1

Review your settings before starting the appliance deployment.

Deployment Details	
Target ESXi host	172.23.1.31
VM name	VCSA
Deployment type	vCenter Server with an Embedded Platform Services Controller
Deployment size	Tiny
Storage size	Default
Datastore Details	
Datastore, Disk mode	datastore1, thin
Network Details	
Network	VM Network
IP settings	IPv4 , static
IP address	172.23.1.101
System name	VCSA.flackboxA.lab
Subnet mask or prefix length	255.255.255.0
Default gateway	172.23.1.254
DNS servers	172.23.4.1
HTTP Port	80
HTTPS Port	443

CANCEL BACK FINISH

67. Wait for Stage 1 of the installation to complete. This can take some time.
68. Click **Continue** when the installation completes.

Install - Stage 1: Deploy vCenter Server Appliance with an Embedded Platform Services Controller

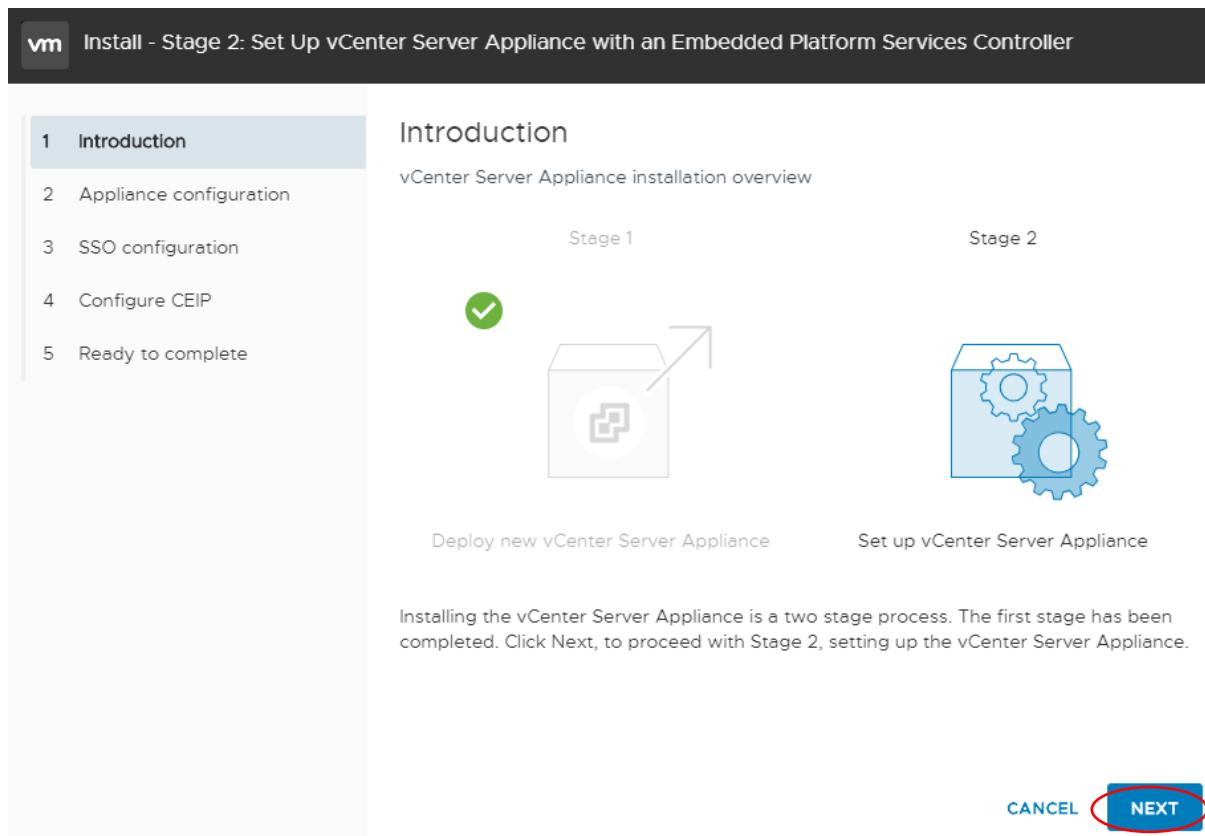
① You have successfully deployed the vCenter Server with an Embedded Platform Services Controller.

To proceed with stage 2 of the deployment process, appliance setup, click Continue.

If you exit, you can continue with the appliance setup at any time by logging in to the vCenter Server Appliance Management Interface
<https://VCSA.flackboxA.lab:5480/>

[CANCEL](#) [CLOSE](#) [CONTINUE](#) (circled)

69. Click **Next** on the Stage 2 Installation Wizard Introduction screen.



70. Accept the defaults on the **Appliance Configuration** page and click **Next**

vm Install - Stage 2: Set Up vCenter Server Appliance with an Embedded Platform Services Controller

1 Introduction

2 Appliance configuration

3 SSO configuration

4 Configure CEIP

5 Ready to complete

Appliance configuration

Time synchronization mode: Synchronize time with the ESXi host

SSH access: Disabled

i For vCenter Server High Availability (HA), enable SSH access.

CANCEL BACK NEXT

71. Click **OK** on the IP Address change warning.

IP Address change warning!



You are about to modify the IP address for this Appliance. You might lose connectivity for a few minutes. Also, you might be redirected to the following URL: <https://172.23.1.101:5480>

CANCEL OK

72. Enter these details on the **SSO configuration** page then click **Next**

Create a new SSO domain

Single Sign-On domain name: **vsphere.local** (do NOT use flackboxA.lab)

Single Sign-On user name: **administrator**

Single Sign-On password: **Flackbox1!**

Confirm password: **Flackbox1!**

vm Install - Stage 2: Set Up vCenter Server Appliance with an Embedded Platform Services Controller

1 Introduction SSO configuration

2 Appliance configuration

3 SSO configuration Create a new SSO domain

4 Configure CEIP

5 Ready to complete

Single Sign-On domain name: vsphere.local
Single Sign-On user name: administrator
Single Sign-On password:
Confirm password:

Join an existing SSO domain



CANCEL BACK **NEXT**

73. Uncheck the option to **Join the VMware's Customer Experience Program (CEIP)** then click **Next**

74. Click **Finish**

vm Install - Stage 2: Set Up vCenter Server Appliance with an Embedded Platform Services Controller

1 Introduction Ready to complete

2 Appliance configuration

3 SSO configuration

4 Configure CEIP

5 Ready to complete

Review your settings before finishing the wizard.

Network Details

Network configuration	Assign static IP address
IP version	IPv4
Host name	VCSA.flackboxA.lab
IP Address	172.23.1.101
Subnet mask	255.255.255.0
Gateway	172.23.1.254
DNS servers	172.23.4.1

Appliance Details

Time synchronization mode	Synchronize time with the ESXi host
SSH access	Disabled

SSO Details

Domain name	vsphere.local
User name	administrator

Customer Experience Improvement Program

CANCEL BACK **FINISH**

75. Click **OK** on the warning about not pausing or stopping the installation.

Warning



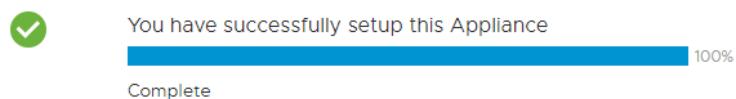
You will not be able to pause or stop the install from completing once its started. Click OK to continue, or Cancel to stop the install.



76. Wait for the installation to complete. This will take some time.

77. Click **Close** when the installation completes.

Install - Stage 2: Complete



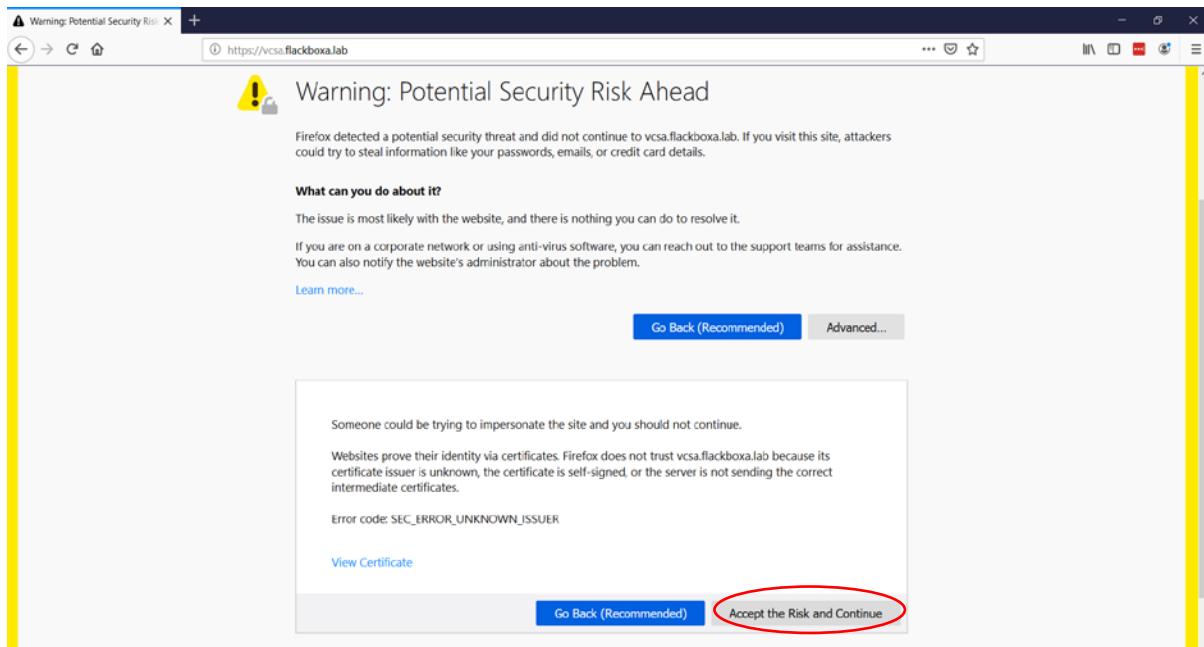
Complete

vCenter Server Appliance setup has been completed successfully. Click on the link below to get started. Press close to exit.

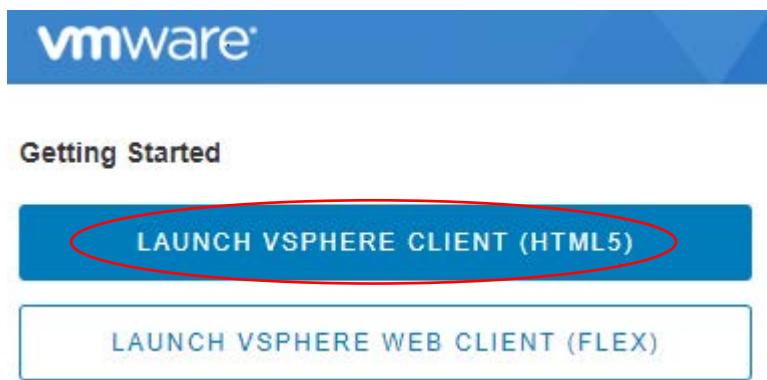
Appliance Getting Started Page <https://VCSA.flackboxa.lab:443>

CLOSE

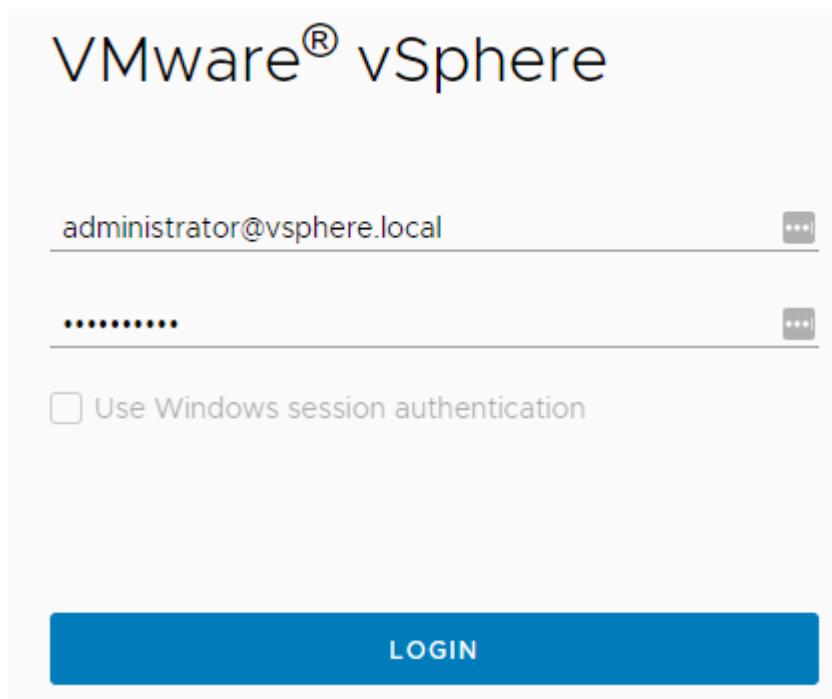
78. Open <https://vcsa.flackboxA.lab> in your web browser. Bypass any certificate warning messages in your browser.



79. Click the link to **Launch vSphere Client (HTML5)**



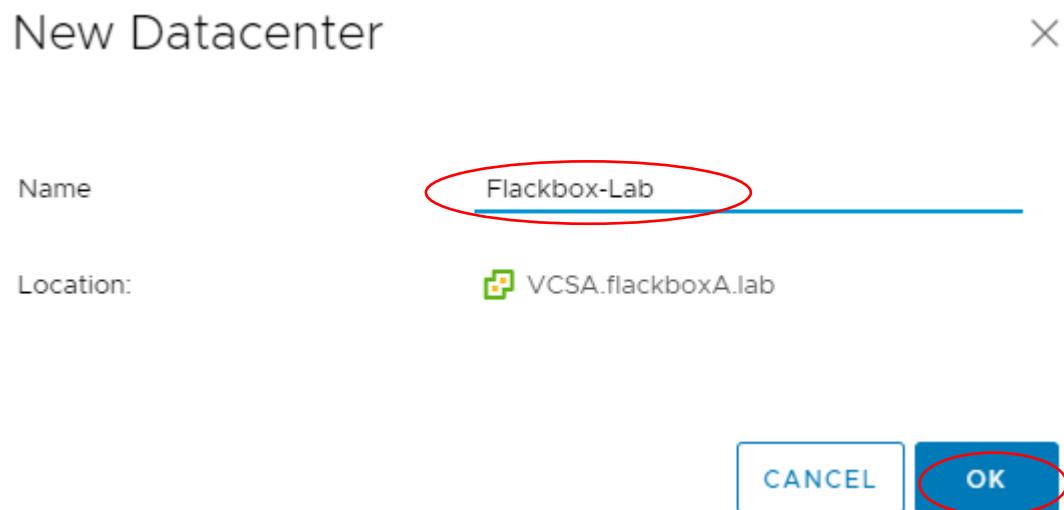
80. Login with the username **administrator@vsphere.local** and password **Flackbox1!**



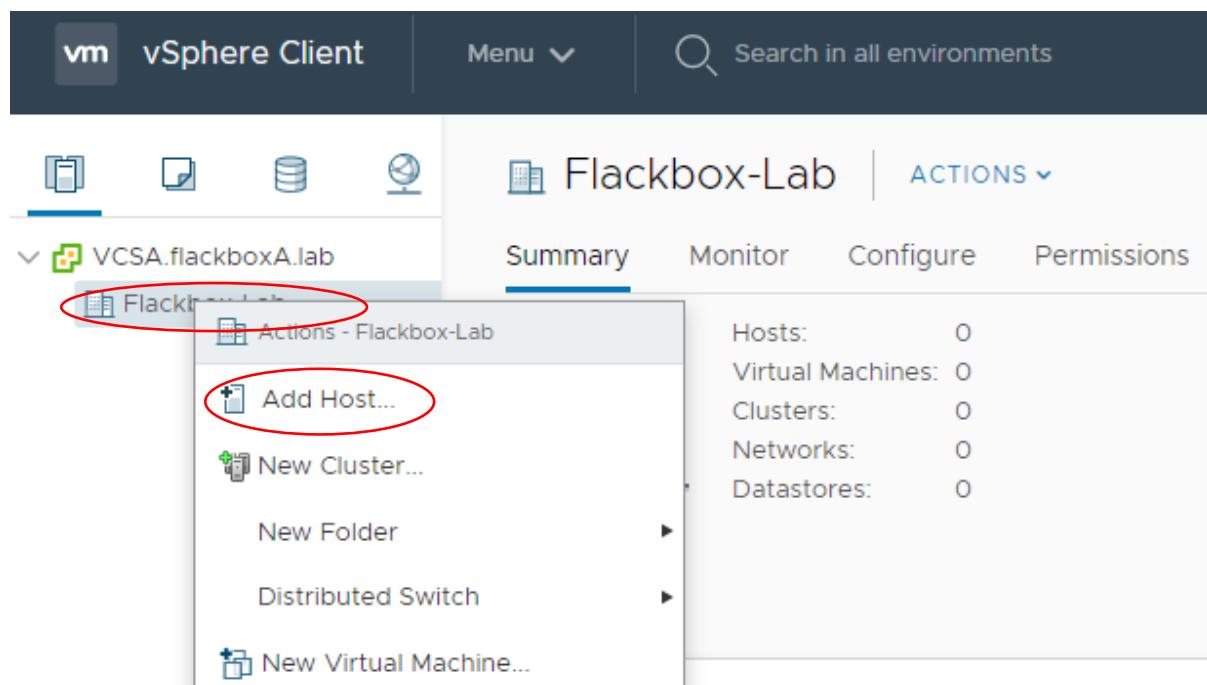
81. Right-click on **VCSA.flackboxA.lab** in the left-hand window and select **New Datacenter...**

The screenshot shows the vSphere Client interface. The top bar includes the "vSphere Client" logo, a "Menu" dropdown, and a search bar. The main area displays a datacenter named "VCSA.flackboxA.lab". A context menu is open over this item, with the "New Datacenter..." option highlighted and circled in red. Other menu items shown include "Actions - VCSA.flackboxA.lab", "New Folder", "Export System Logs...", "Assign License...", "Tags & Custom Attributes", "Add Permission...", "Alarms", and "Update Manager". The right side of the screen shows summary statistics for the datacenter: "Virtual Machines: 0" and "Hosts: 0". A yellow banner at the bottom states "Sphere Health detected new issues in your environment".

82. Name the Datacenter **Flackbox-Lab** and click **OK**



83. Expand **VCSA.flackboxA.lab** in the left hand window, then right click on the **Flackbox-Lab** datacentre and select **Add Host**



84. Enter ESXi1's IP address **172.23.1.31** then click **Next**

Add Host

1 Name and location

2 Connection settings

3 Host summary

4 Assign license

5 Lockdown mode

6 VM location

7 Ready to complete

Name and location
Enter the name or IP address of the host to add to vCenter Server.

Host name or IP address: **172.23.1.31**

Location: Flackbox-Lab

85. Enter ESXi1's credentials, User name **root** and password **Flackbox1!** then click **Next**. Click **Yes** when you see a certificate warning message.

Connection settings

Enter the host connection details

User name: **root**

Password: **.....**

86. Click **Next** on the **Host Summary** page.

Host summary

Review the summary for the host

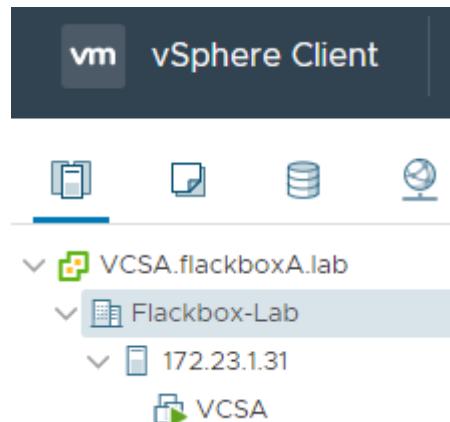
Name	172.23.1.31
Vendor	VMware, Inc.
Model	VMware7.1
Version	VMware ESXi 6.7.0 build-13006603
Virtual Machines	VCSA

87. Click **Next** on the **Assign license** page.
88. Accept the default and click **Next** on the **Lockdown mode** page.
89. Click **Next** on the **VM location** page.

90. Click **Finish** on the Ready to complete page.

Ready to complete	
Click Finish to add the host	
Name	172.23.1.31
Location	Flackbox-Lab
Version	VMware ESXi 6.7.0 build-13006603
License	Evaluation License
Networks	VM Network
Datastores	datastore1
Lockdown mode	Disabled
VM location	Flackbox-Lab

91. Expand the ESXi1 172.23.1.31 host in the left-hand window and you will see the VCSA virtual machine you are currently working on is located there.



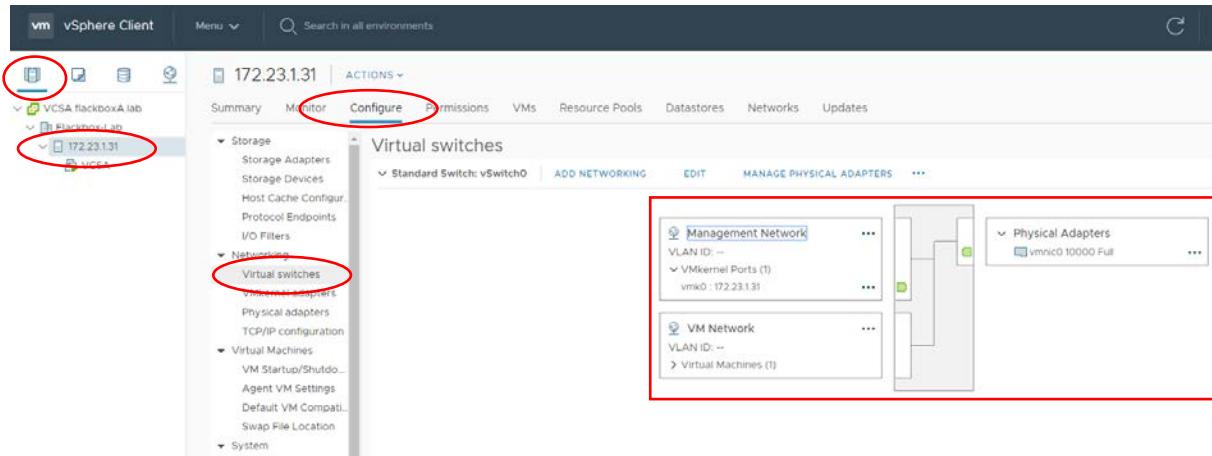
92. Click **172.23.1.31 > Configure > Virtual switches** and view the network configuration.

There is a single virtual switch configured, vSwitch0.

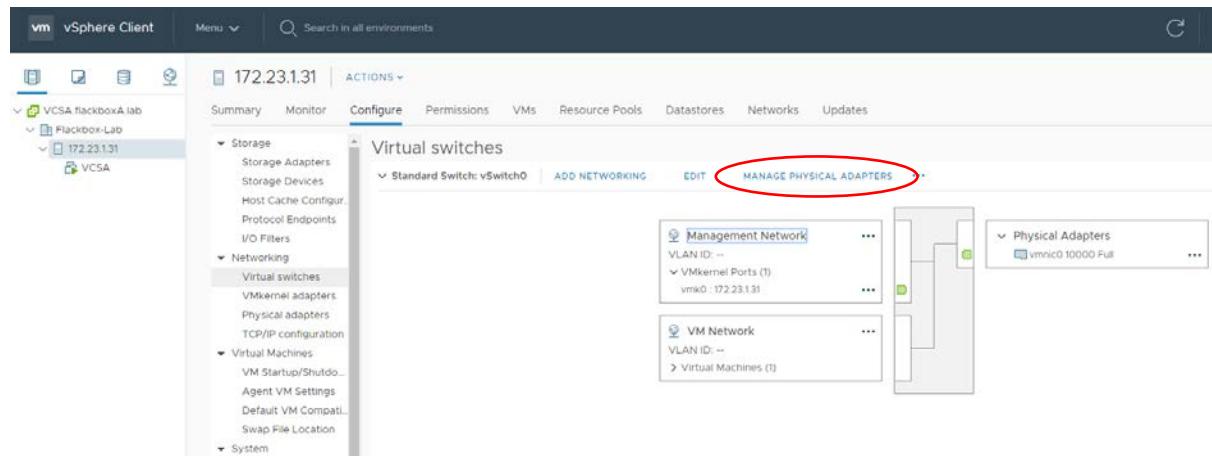
It is connected to the management network with a single uplink, vmnic0.

The management VMkernel port with IP address 172.23.1.31 and the 'VM Network' port group are connected to the switch.

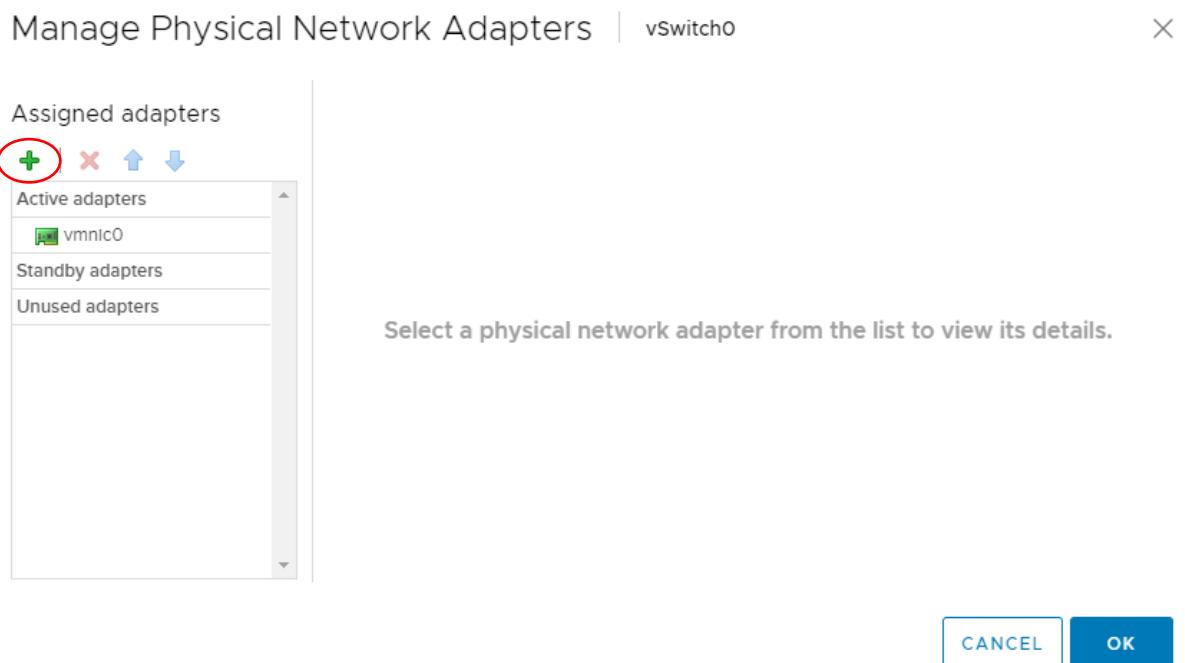
The VCSA virtual machine is in the 'VM Network' port group and has been configured with IP address 172.23.1.101



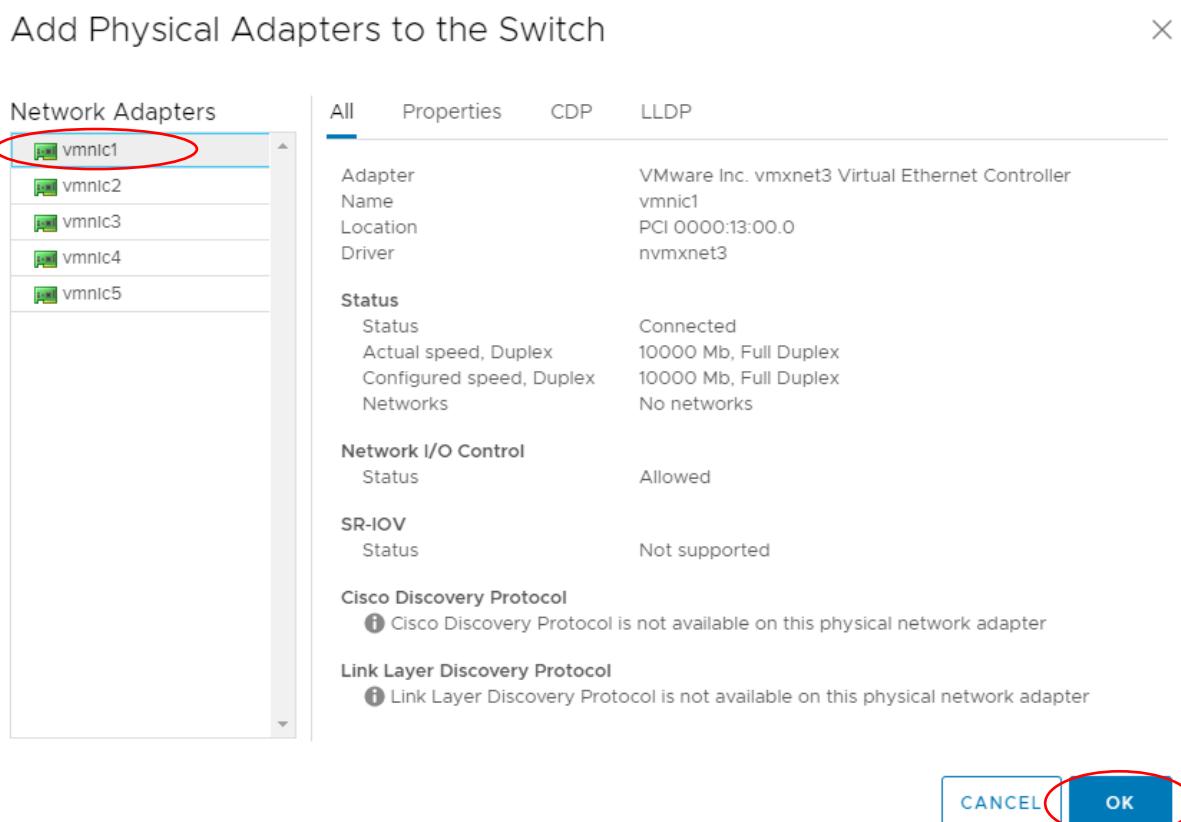
93. Click **Manage Physical Adapters**



94. Click the **Plus** symbol



95. Select **vmnic1** and click **OK**



96. Click **OK** again

Manage Physical Network Adapters | vSwitch0

Assigned adapters

All Properties CDP LLDP

Adapter	VMware Inc. vmxnet3 Virtual Ethernet Controller
Name	vmnic1
Location	PCI 0000:13:00.0
Driver	nvmxnet3
Status	
Status	Connected
Actual speed, Duplex	10000 Mb, Full Duplex
Configured speed, Duplex	10000 Mb, Full Duplex
Networks	No networks
Network I/O Control	
Status	Allowed
SR-IOV	
Status	Not supported

CANCEl OK

97. If you lose connectivity to the VCSA server then perform this step. Open the ESXi1 management interface <https://172.23.1.31> in a separate tab in your web browser. Bypass any certificate warning messages in your browser.

Warning: Potential Security Risk Ahead

Firefox detected a potential security threat and did not continue to 172.23.1.31. If you visit this site, attackers could try to steal information like your passwords, emails, or credit card details.

What can you do about it?

The issue is most likely with the website, and there is nothing you can do to resolve it.

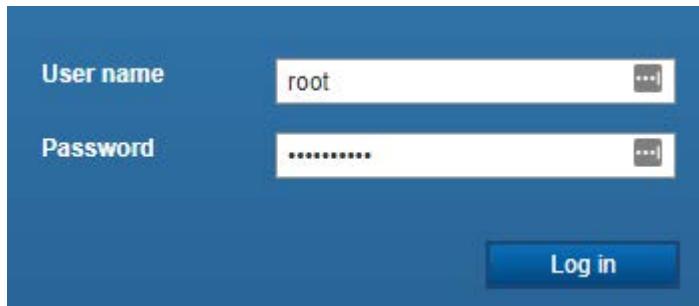
If you are on a corporate network or using anti-virus software, you can reach out to the support teams for assistance. You can also notify the website's administrator about the problem.

Learn more...

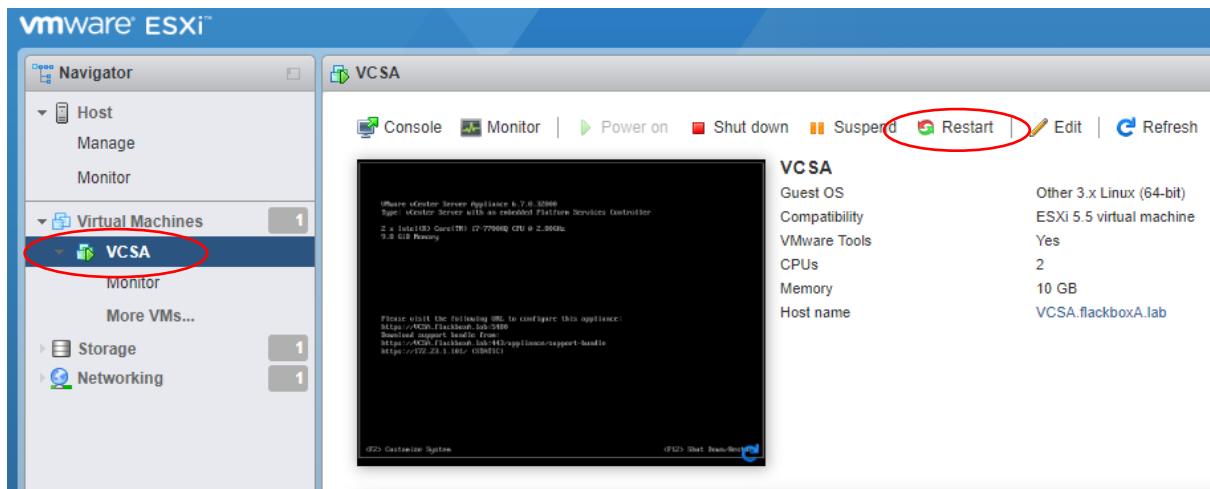
Go Back (Recommended) Advanced... Accept the Risk and Continue

Someone could be trying to impersonate the site and you should not continue.
Websites prove their identity via certificates. Firefox does not trust 172.23.1.31 because its certificate issuer is unknown, the certificate is self-signed, or the server is not sending the correct intermediate certificates.
Error code: SEC_ERROR_UNKNOWN_ISSUER
View Certificate

Log in with username **root** and password **Flackbox1!**

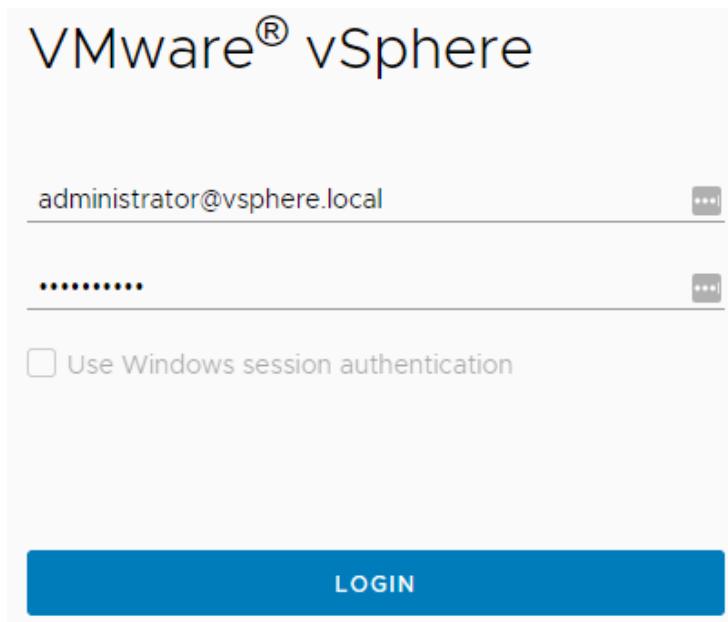


Select the **VCSA** virtual machine and **Restart**

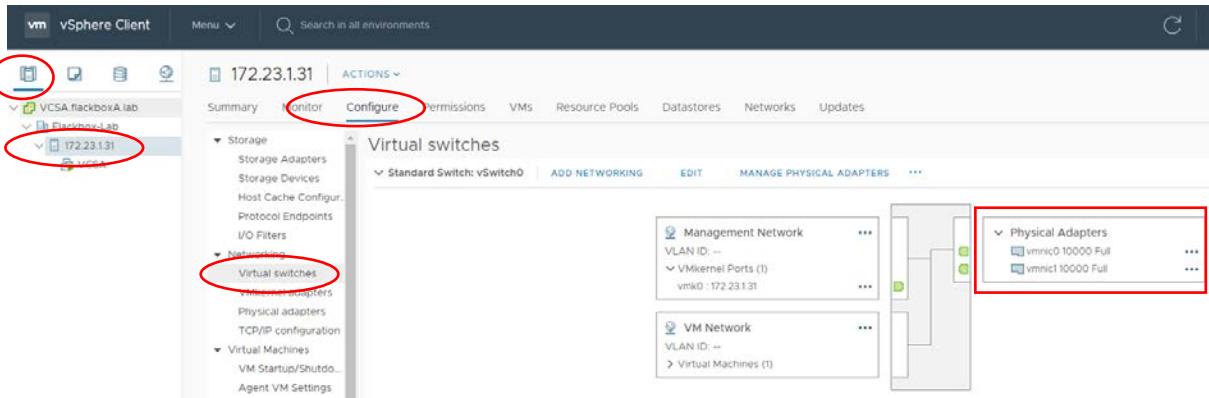


VCSA	
Guest OS	Other 3.x Linux (64-bit)
Compatibility	ESXi 5.5 virtual machine
VMware Tools	Yes
CPU	2
Memory	10 GB
Host name	VCSA.flackboxA.lab

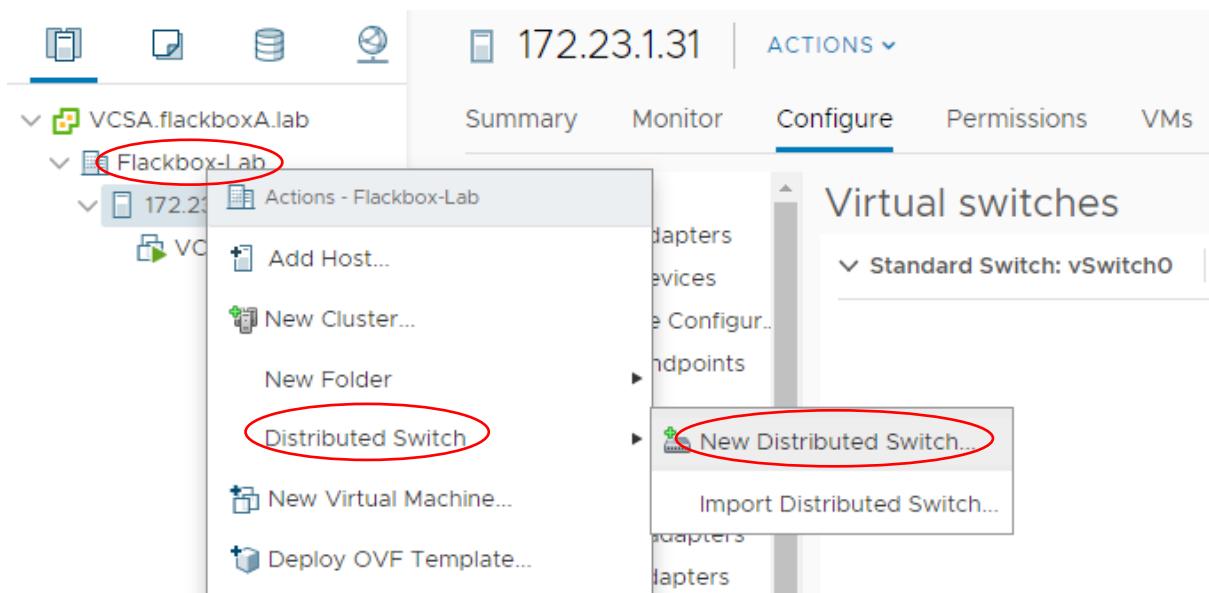
Wait a few minutes for the server to restart, then refresh the VCSA admin page in your other browser tab to be taken back to the login screen. Log in with the username **administrator@vsphere.local** and password **Flackbox1!**



98. You will see that you now have redundant uplinks to the management network using vmnic0 and vmnic1. The Lab Topology Diagram on page 4 of this guide shows a single management switch for simplicity. In a real world network vmnic0 and vmnic1 would be connected to separate, redundant switches.



99. Configure networking for the Virtual Machine network next. Right-click on **Flackbox-Lab** in the left-hand window then select **Distributed Switch > New Distributed Switch...**



100. Name the Distributed Virtual Switch **Virtual Machines DS** and click **Next**

New Distributed Switch

1 Name and location

2 Select version

3 Configure settings

4 Ready to complete

Name and location
Specify distributed switch name and location.

Name: **Virtual Machines DS**

Location: Flackbox-Lab

CANCEL BACK **NEXT**

101. Accept the default on the **Select Version** page and click **Next**

102. Use these settings on the **Configure Settings** page:

Number of uplinks: 2

Network I/O Control: Enabled

Default port group: Check 'Create a default port group'

Port group name: Virtual Machines

New Distributed Switch

✓ 1 Name and location

✓ 2 Select version

3 **Configure settings**

4 Ready to complete

Configure settings
Specify number of uplink ports, resource allocation and default port group.

Number of uplinks: 2

Network I/O Control: Enabled

Default port group: Create a default port group

Port group name: Virtual Machines

CANCEL BACK **NEXT**

103. Click **Finish**. All vSphere virtual machines you create in future should be associated with the ‘Virtual Machines’ port group you just created. The virtual machines should be configured with an IP address in the 172.23.5.0/24 IP subnet.

New Distributed Switch

✓ 1 Name and location Ready to complete
✓ 2 Select version Review your settings selections before finishing the wizard.
✓ 3 Configure settings
4 Ready to complete

Name	Virtual Machines DS
Version	6.6.0
Number of uplinks	2
Network I/O Control	Enabled
Default port group	Virtual Machines

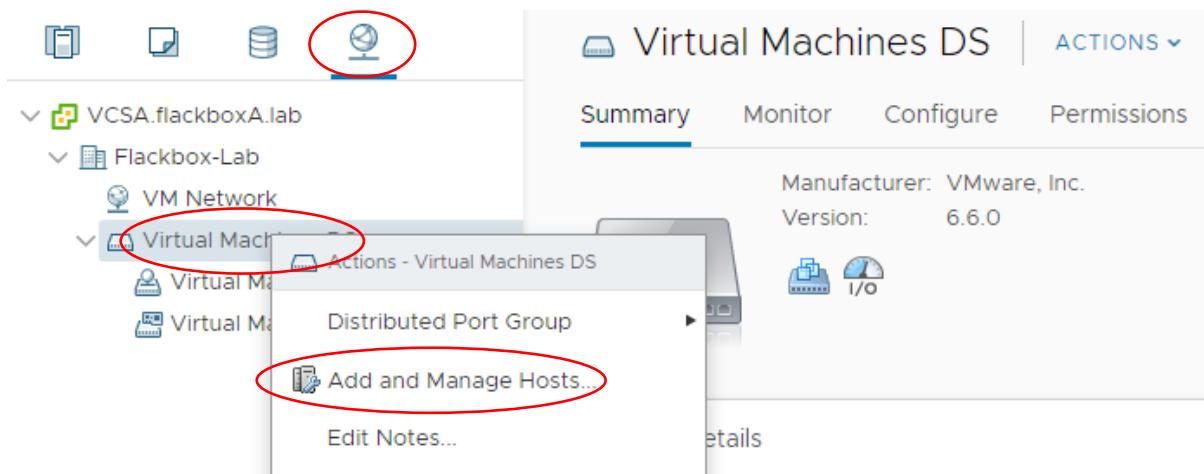
Suggested next actions

- New Distributed Port Group
- Add and Manage Hosts

These actions will be available in the Actions menu of the new distributed switch.

CANCEL BACK **FINISH**

104. Click in the Networking tab in the left-hand window, then right-click on the **Virtual Machines DS** distributed switch and select **Add and Manage Hosts...**



The screenshot shows the VMware vSphere interface. On the left, there is a navigation tree with icons for hosts, datastores, and networks. A red circle highlights the network icon. Below it, under 'Flackbox-Lab', there is a 'VM Network' and a 'Virtual Machine' folder, both with red circles around them. A context menu is open over the 'Virtual Machines DS' distributed switch, with a red circle highlighting the 'Add and Manage Hosts...' option. The main pane displays the 'Virtual Machines DS' summary, showing manufacturer: VMware, Inc., version: 6.6.0, and various status indicators like 'I/O'.

105. Choose **Add Hosts** on the Select Task page and click **Next**

Virtual Machines DS - Add and Manage Hosts

1 Select task

2 Select hosts

3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Select task
Select a task to perform on this distributed switch.

Add hosts
Add new hosts to this distributed switch.

Manage host networking
Manage networking of hosts attached to this distributed switch.

Remove hosts
Remove hosts from this distributed switch.

CANCEL **BACK** **NEXT**

106. Click on the **New hosts...** button on the Select Hosts page.

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task

2 Select hosts

3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Select hosts
Select hosts to add to this distributed switch.

+ New hosts... **X Remove**

Host	Host Status
No items to display	

CANCEL **BACK** **NEXT**

107. Tick the checkbox for **172.23.1.31** and click **OK**

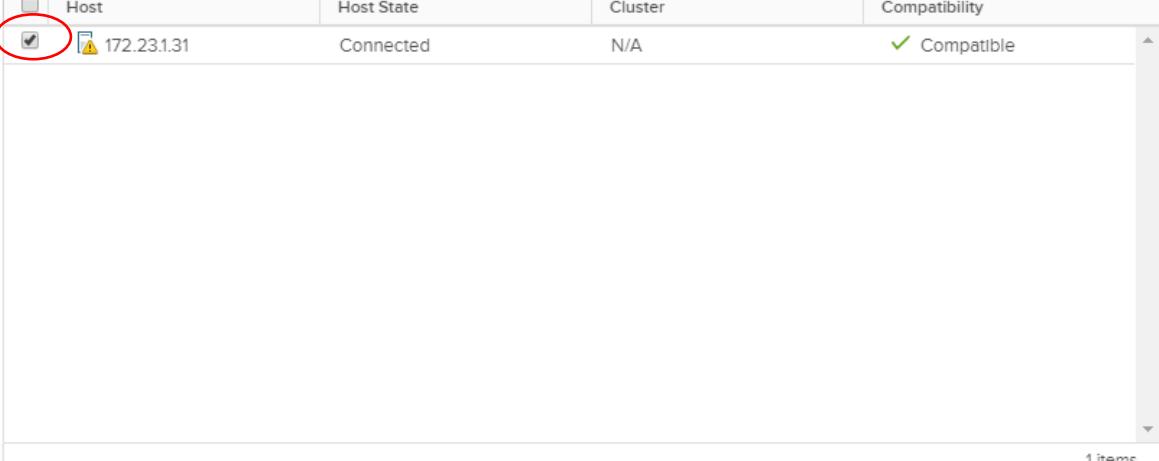
Select New Hosts | Virtual Machines DS X

SHOW INCOMPATIBLE HOSTS Filter

Host	Host State	Cluster	Compatibility
<input checked="" type="checkbox"/> 172.23.1.31	Connected	N/A	✓ Compatible

1 items

CANCEL OK



108. Click **Next**. On the Manage Physical Adapters page, highlight **vmnic4** and click **Assign uplink**

Virtual Machines DS - Add and Manage Hosts

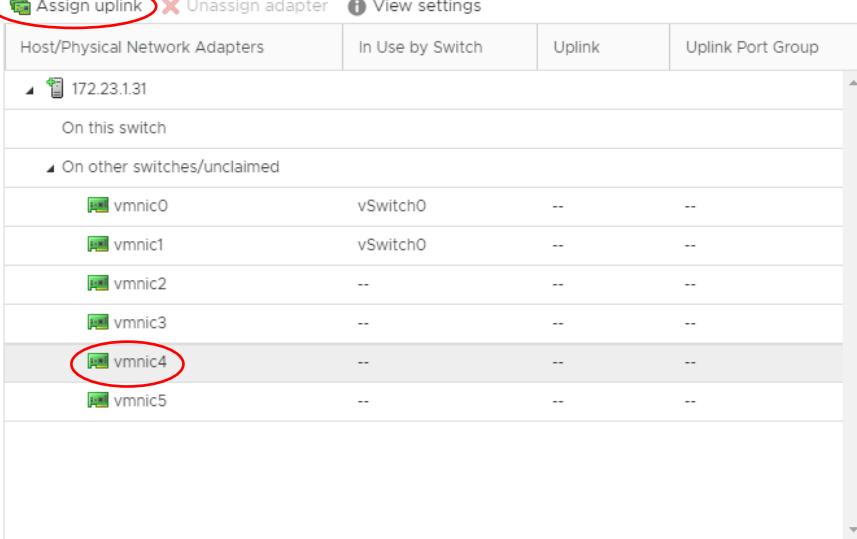
1 Select task
2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

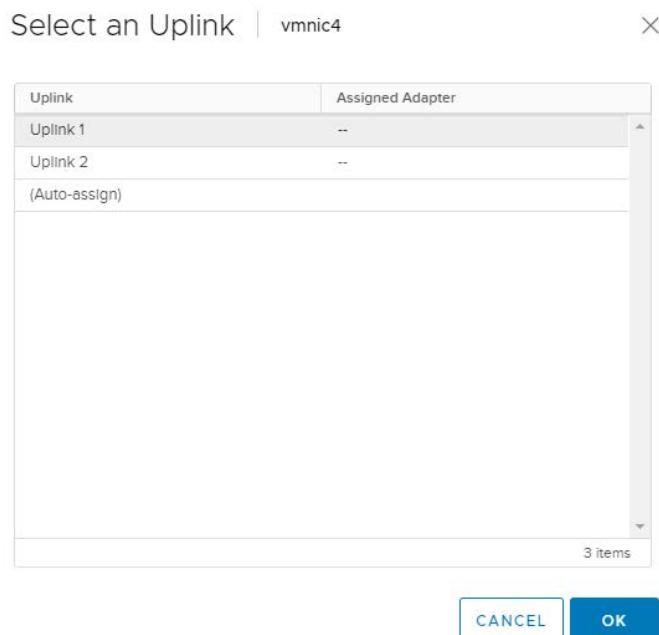
Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
On this switch			
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--
vmnic4	--	--	--
vmnic5	--	--	--

CANCEL BACK NEXT



109. Click OK



110. Highlight vmnic5 and click Assign uplink

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

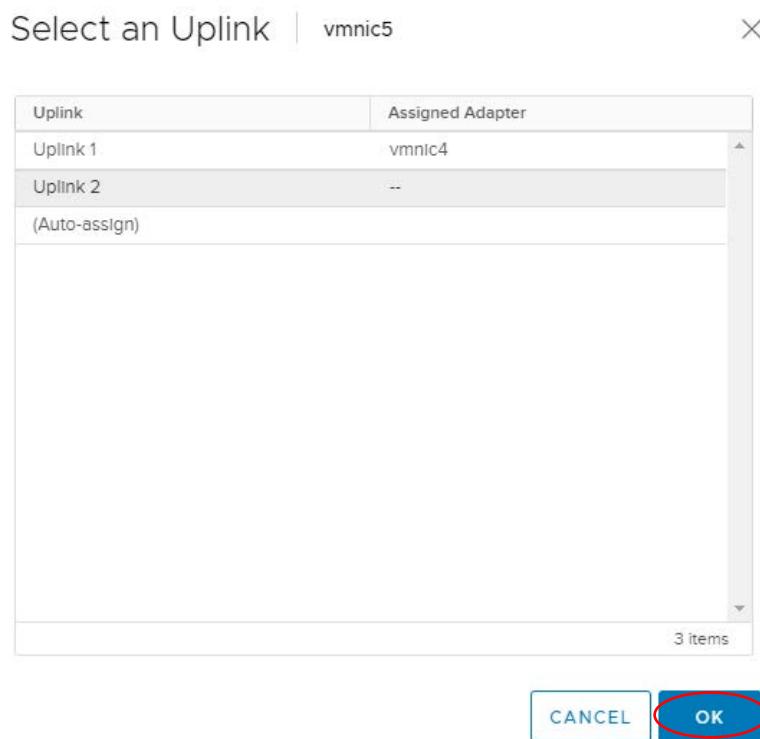
Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
On this switch			
vmnic4 (Assigned)	--	Uplink 1	Virtual Machines-...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--
vmnic5	--	--	--

CANCEL BACK NEXT

111.Click OK



112.Click Next

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

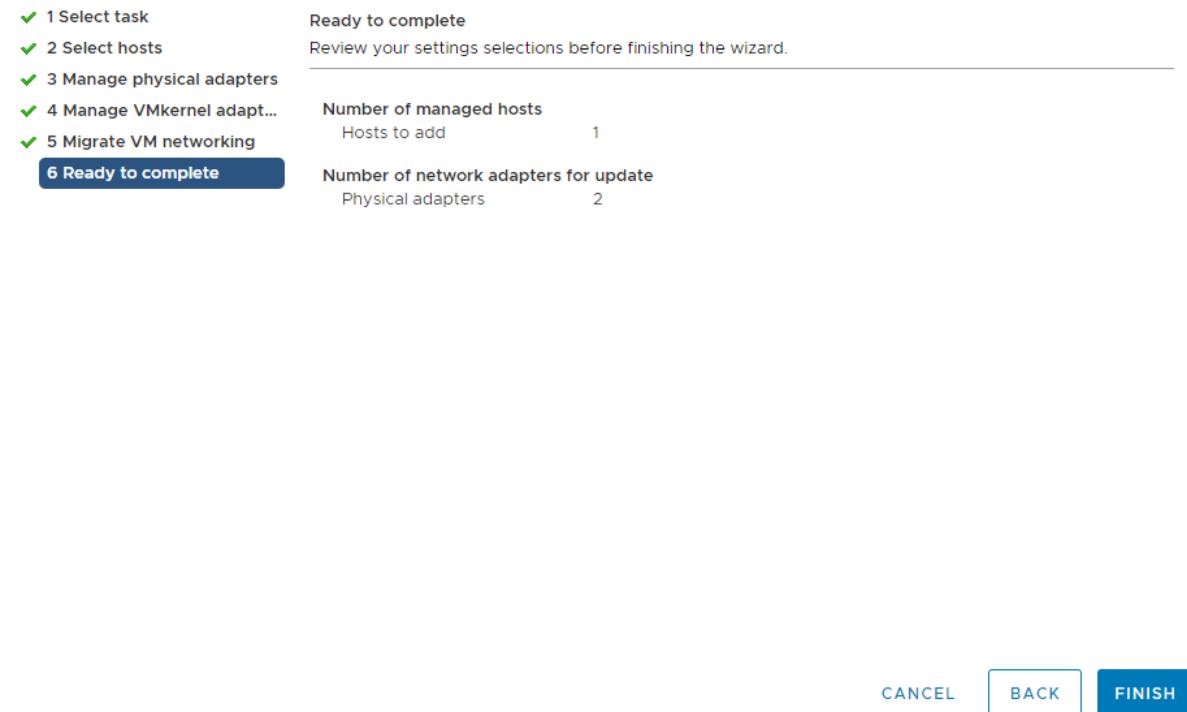
Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
On this switch			
vmnic4 (Assigned)	--	Uplink 1	Virtual Machines-...
vmnic5 (Assigned)	--	Uplink 2	Virtual Machines-...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2		--	--
vmnic3		--	--

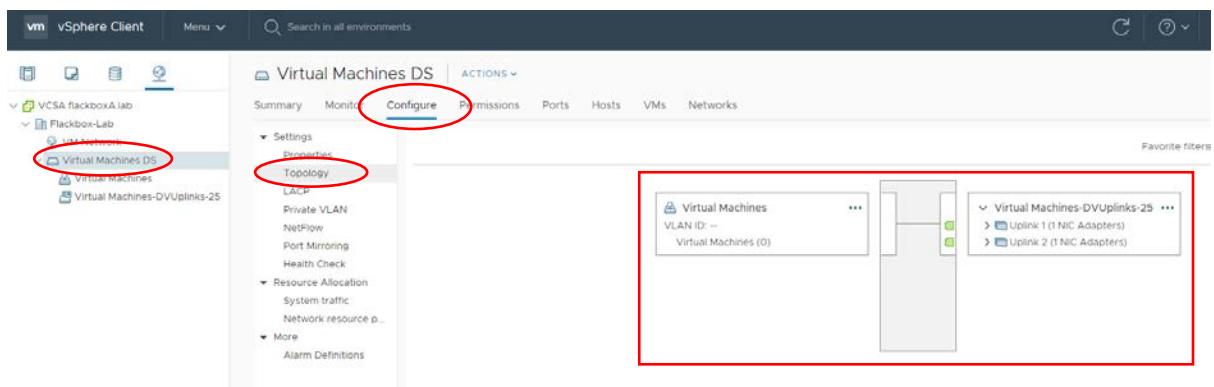
CANCEL BACK NEXT

113. Click **Next** on the Manage VMkernel adapters page
114. Click **Next** on the Migrate VM networking page
115. Click **Finish** on the Ready to Complete page

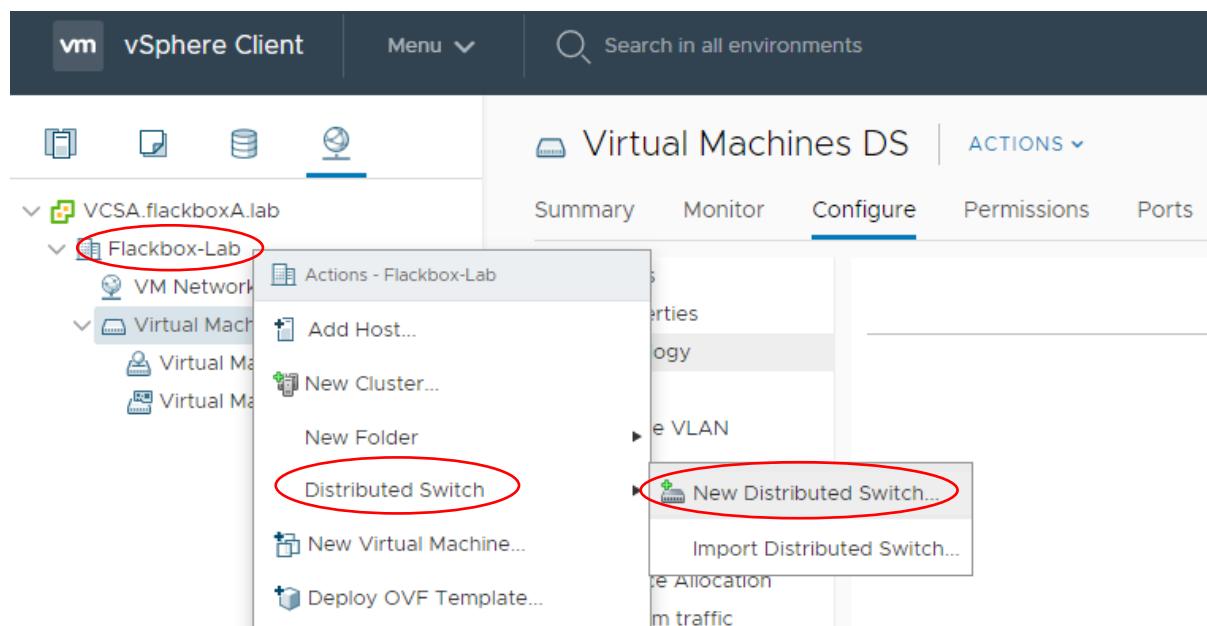
Virtual Machines DS - Add and Manage Hosts



116. With the **Virtual Machines DS** distributed switch selected in the left-hand window, click **Configure > Topology** to verify the configuration.
The Lab Topology Diagram on page 4 of this guide shows a single switch for the virtual machines network for simplicity. In a real world network vmnic4 and vmnic5 would be connected to separate, redundant switches.



117. Configure networking for the Storage network next. We'll create another dedicated distributed switch to keep the networks clearly logically separated. Right-click on **Flackbox-Lab** in the left-hand window then select **Distributed Switch > New Distributed Switch...**



118. Name the Distributed Virtual Switch **Storage DS** and click **Next**

New Distributed Switch

1 Name and location 2 Select version 3 Configure settings 4 Ready to complete

Name and location	Specify distributed switch name and location.
Name	<input type="text" value="Storage DS"/> (circled in red)
Location	Flackbox-Lab

NEXT (button circled in red) CANCEL BACK

119. Accept the default on the **Select Version** page and click **Next**

120. Use these settings on the **Configure Settings** page:

- Number of uplinks: 2
- Network I/O Control: Enabled
- Default port group: Unchecked

New Distributed Switch

✓ 1 Name and location
✓ 2 Select version
3 Configure settings
4 Ready to complete

Configure settings
Specify number of uplink ports, resource allocation and default port group.

Number of uplinks	2
Network I/O Control	Enabled
Default port group	<input type="checkbox"/> Create a default port group
Port group name	DPortGroup

CANCEL BACK **NEXT**

121. Click **Finish**.

New Distributed Switch

✓ 1 Name and location
✓ 2 Select version
✓ 3 Configure settings
4 Ready to complete

Ready to complete
Review your settings selections before finishing the wizard.

Name	Storage DS
Version	6.6.0
Number of uplinks	2
Network I/O Control	Enabled

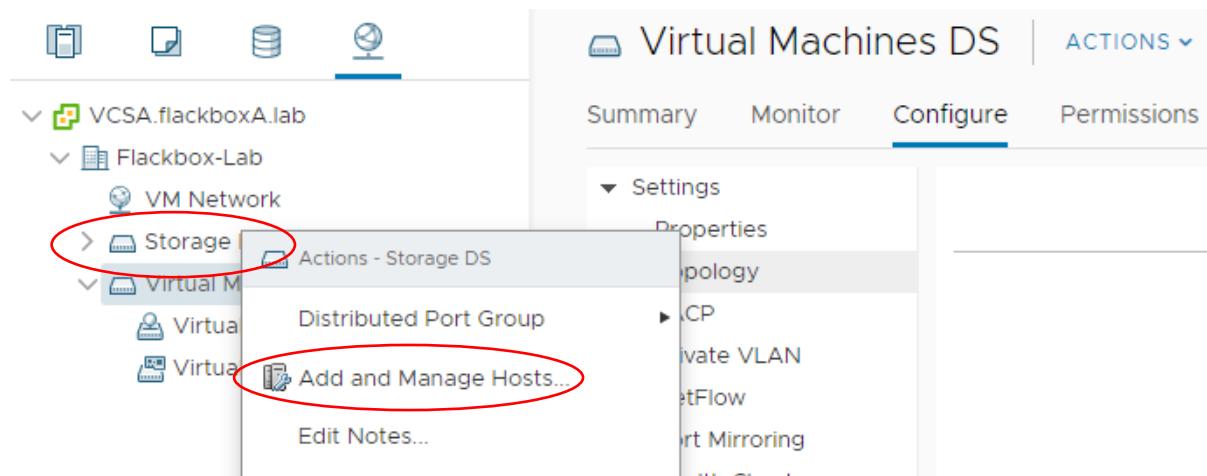
Suggested next actions

-  New Distributed Port Group
-  Add and Manage Hosts

These actions will be available in the Actions menu of the new distributed switch.

CANCEL BACK **FINISH**

122. Right-click on the **Storage DS** distributed switch in the left-hand window and select **Add and Manage Hosts...**



123. Choose **Add Hosts** on the Select Task page and click **Next**

Storage DS - Add and Manage Hosts

1 Select task

2 Select hosts

3 Manage physical adapters

4 Manage VMkernel adapt...

5 Migrate VM networking

6 Ready to complete

Select task

Select a task to perform on this distributed switch.

Add hosts

Add new hosts to this distributed switch.

Manage host networking

Manage networking of hosts attached to this distributed switch.

Remove hosts

Remove hosts from this distributed switch.

CANCEL

BACK

NEXT

124. Click on the **New hosts...** button on the Select Hosts page.

Storage DS - Add and Manage Hosts

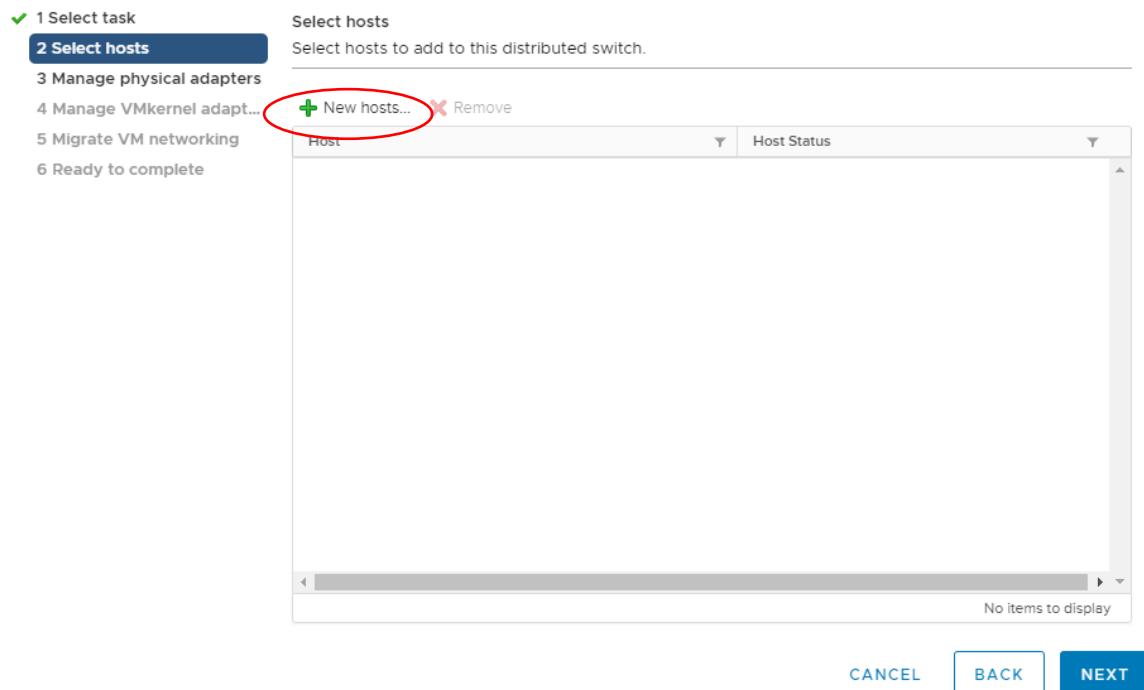
✓ 1 Select task
2 **Select hosts**
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Select hosts
Select hosts to add to this distributed switch.

+ New hosts... X Remove

Host	Host Status
No items to display	

CANCEL BACK NEXT



125. Tick the checkbox for **172.23.1.31** and click **OK**

Select New Hosts | Storage DS X

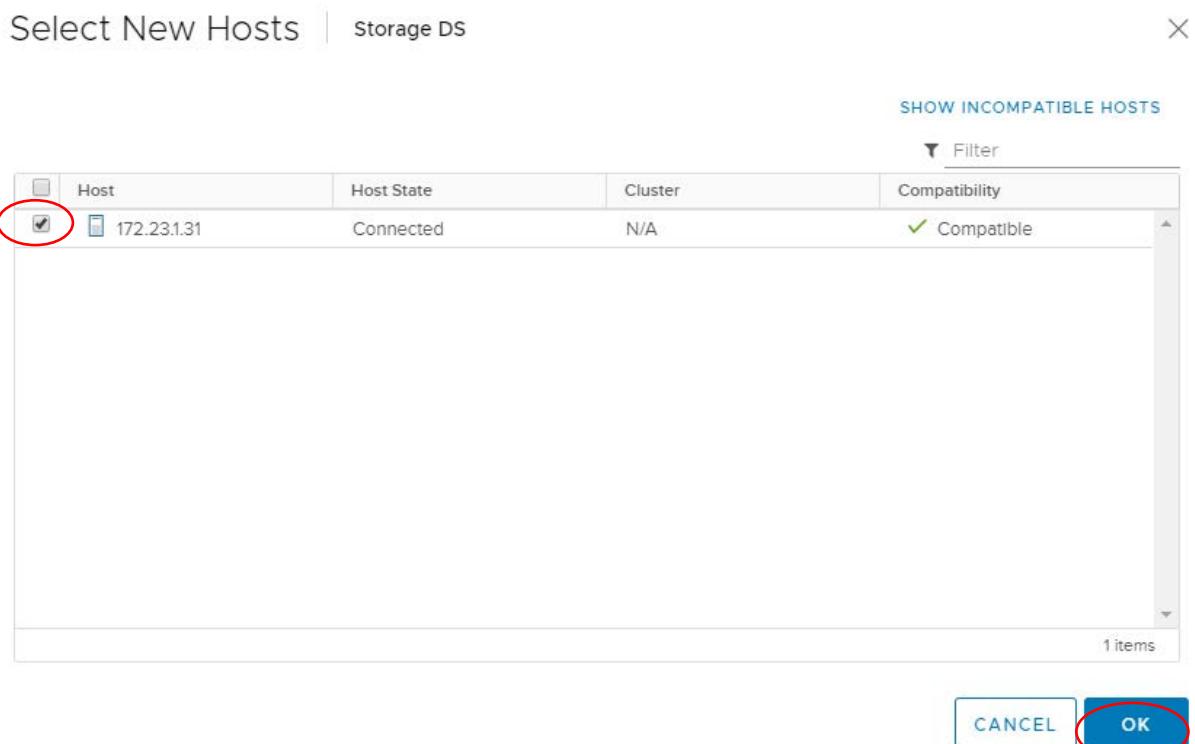
SHOW INCOMPATIBLE HOSTS

Filter

	Host	Host State	Cluster	Compatibility
<input checked="" type="checkbox"/>	172.23.1.31	Connected	N/A	✓ Compatible

1 items

CANCEL OK



126. Click **Next**. On the Manage Physical Adapters page, highlight **vmnic2** and click **Assign uplink**

Storage DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
On this switch			
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL **BACK** **NEXT**

127. Click **OK**

Select an Uplink | **vmnic2** X

Uplink	Assigned Adapter
Uplink 1	--
Uplink 2	--
(Auto-assign)	

CANCEL **OK**

128. Highlight **vmnic3** and click **Assign uplink**

Storage DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
On this switch			
vmnic2 (Assigned)	--	Uplink 1	Storage DS-DVU...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic3	--	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL BACK NEXT

129. Click **OK**

Select an Uplink | vmnic3 X

Uplink	Assigned Adapter
Uplink 1	vmnic2
Uplink 2	--
(Auto-assign)	

CANCEL OK

130. Click **Next**

Storage DS - Add and Manage Hosts

- ✓ 1 Select task
- ✓ 2 Select hosts
- 3 Manage physical adapters**
- 4 Manage VMkernel adapt...
- 5 Migrate VM networking
- 6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.31			
▲ On this switch			
vmnic2 (Assigned)	--	Uplink 1	Storage DS-DVU...
vmnic3 (Assigned)	--	Uplink 2	Storage DS-DVU...
▲ On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL **BACK** **NEXT** (circled)

131. Click **Next** on the Manage VMkernel adapters page

132. Click **Next** on the Migrate VM networking page

133. Click **Finish** on the Ready to Complete page

Storage DS - Add and Manage Hosts

- ✓ 1 Select task
- ✓ 2 Select hosts
- ✓ 3 Manage physical adapters
- ✓ 4 Manage VMkernel adapt...
- ✓ 5 Migrate VM networking
- 6 Ready to complete**

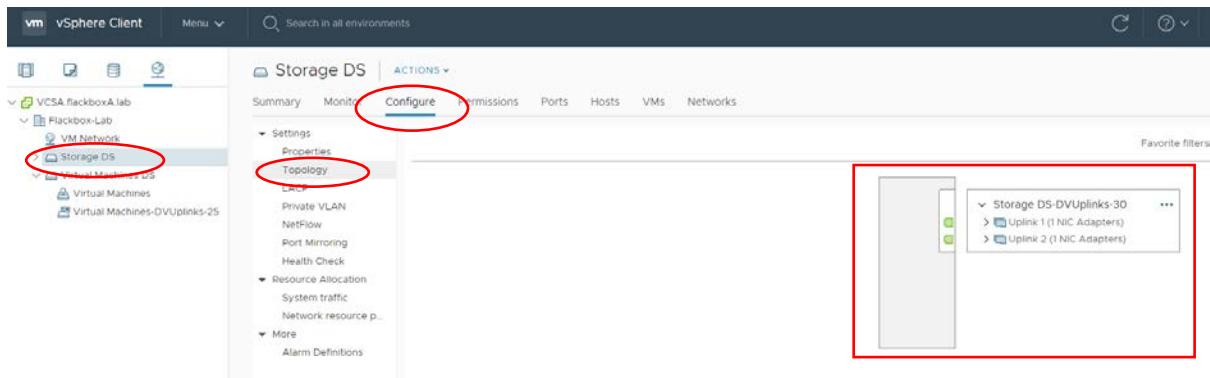
Ready to complete
Review your settings selections before finishing the wizard.

Number of managed hosts
Hosts to add 1

Number of network adapters for update
Physical adapters 2

CANCEL **BACK** **FINISH** (circled)

134. With the **Storage DS** distributed switch selected in the left-hand window, click **Configure > Topology** to verify the configuration.

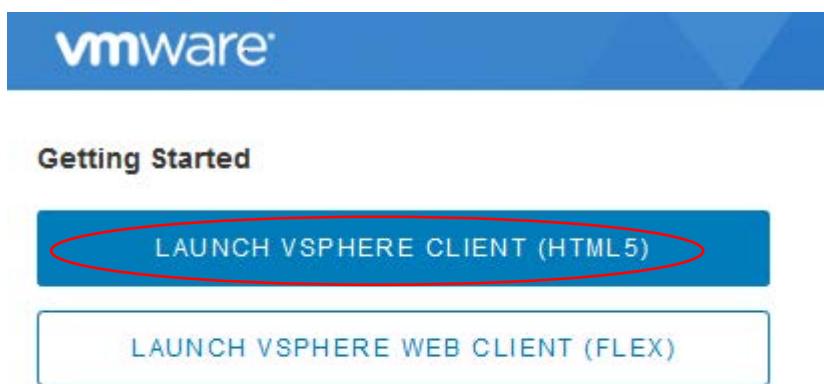


All iSCSI and NFS storage VMkernel ports you create in future should be associated with this distributed switch.

The storage network is not routable (it is not connected to the router) so any IP address range can be used, as long as it matches on both the ESXi1 host and the storage system. For example, you could configure the storage VMkernel ports on the ESXi1 host and the LIFs on the storage system both in the 172.23.50.0/24 IP subnet. The Lab Topology Diagram on page 4 of this guide shows a single switch for the storage network for simplicity. In a real world network vmnic2 and vmnic3 would be connected to separate, redundant switches.

135. We will reduce the amount of RAM required by VCSA and the ESXi1 host by disabling unneeded services next. (Note that the services start automatically on startup, so you can repeat these steps if you reboot the server to shut them down again.)

Open <https://vcsa.flackboxa.lab/> in a browser window and select **Launch vSphere Client (HTML5)**



Getting Started

LAUNCH VS SPHERE CLIENT (HTML5)

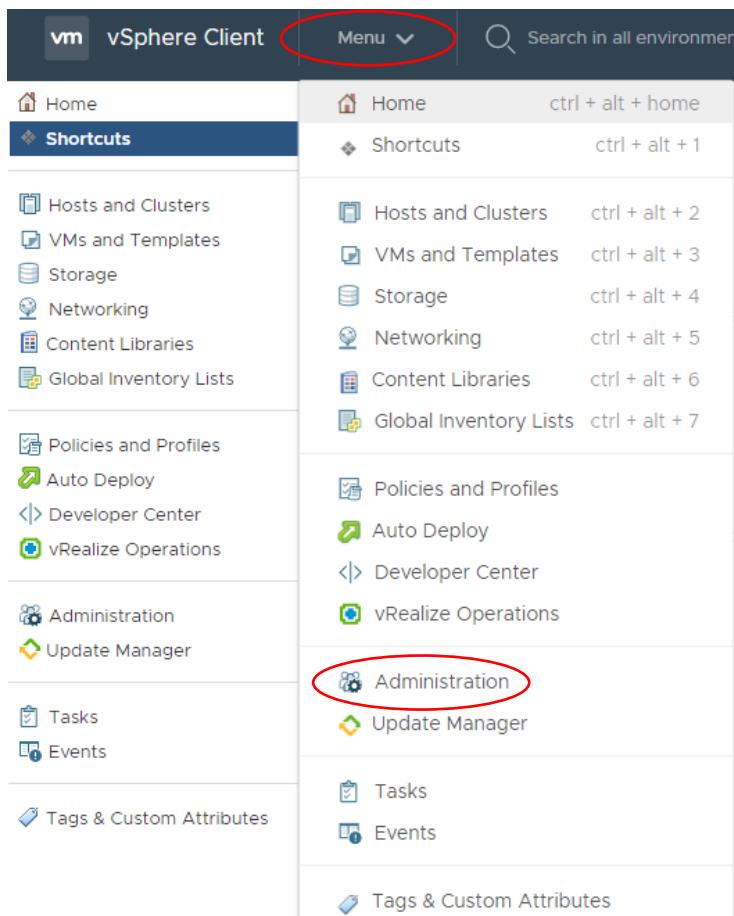
LAUNCH VS SPHERE WEB CLIENT (FLEX)

Documentation

[VMware vSphere Documentation Center](#)

[Functionality Updates for the vSphere Client \(HTML5\)](#)

136. Click **Menu > Administration**



137. Click **Deployment > System Configuration** then select and expand the checkbox for VCSA.flackboxA.lab and click **Login**

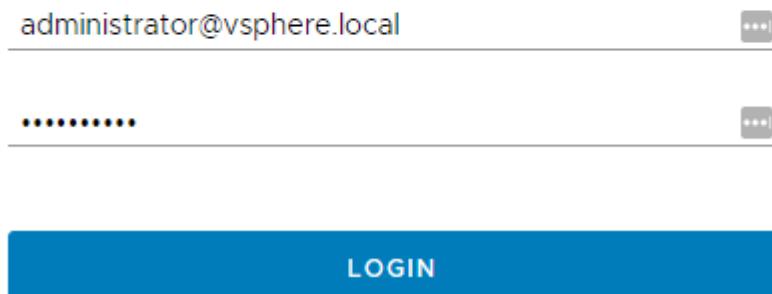
The screenshot shows the vSphere Client interface. The top navigation bar includes a 'vm' icon, the text 'vSphere Client', a 'Menu' dropdown, and a search bar. The left sidebar has sections: 'Access Control', 'Licensing', 'Solutions', 'Deployment' (selected), and 'System Configuration' (highlighted with a red circle). The right panel is titled 'System Configuration' and contains tabs for 'EXPORT SUPPORT BUNDLE', 'REBOOT NODE', and 'CONVERGE TO EMBEDDED'. It shows a 'Node' section with a table:

Node	Value
Node	VCSA.flackboxA.lab
Version	6.7.0.32000
Replication partner	No replication partner
Appliance management	<input type="button" value="LOGIN"/>

Two red circles highlight the checkboxes in the 'Node' section and the 'LOGIN' button.

138. Login with the username **administrator@vsphere.local** and password **Flackbox1!**

VMware Appliance Management



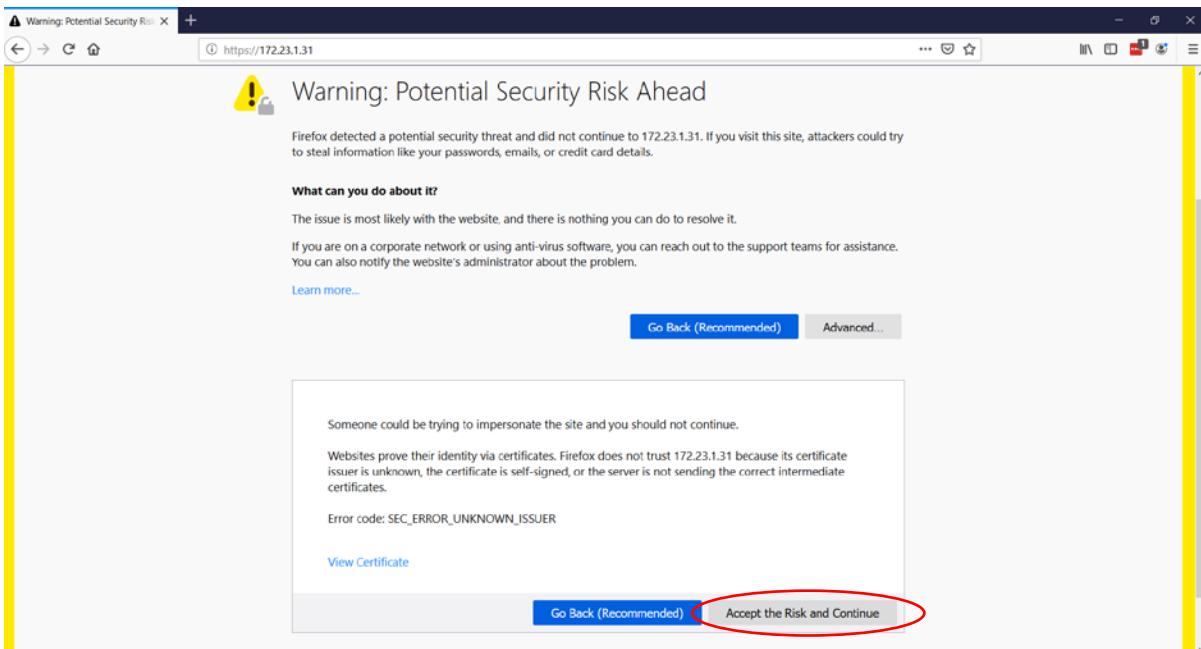
139. Click on **Services** then select the **VMware Performance Charts Service** and **Stop** it

The screenshot shows the 'Services' page of the VMware Appliance Management interface. The 'Services' tab is highlighted with a red circle. In the top right corner of the service list, there is a 'STOP' button highlighted with a red circle. The service list table includes columns for Name, Startup Type, Health, and State. The 'VMware Performance Charts Service' is listed as 'Automatic' with a status of 'Healthy' and 'Started'. Other services listed include 'Appliance Management Service', 'Auto Deploy', 'Component Manager', etc.

Name	Startup Type	Health	State
Appliance Management Service	Automatic	Healthy	Started
Auto Deploy	Manual		Stopped
Component Manager	Automatic	Healthy	Started
Content Library Service	Automatic	Healthy	Started
ImageBuilder Service	Manual		Stopped
License Service	Automatic	Healthy	Started
Service Control Agent	Automatic	Healthy	Started
vAPI Endpoint	Automatic	Healthy with warnings	Started
VMware Analytics Service	Automatic	Healthy	Started
VMware Appliance Monitoring Service	Automatic	Healthy	Started
VMware Certificate Management Service	Automatic	Healthy	Started
VMware ESX Agent Manager	Automatic	Healthy	Started
VMware HTTP Reverse Proxy	Automatic	Healthy	Started
VMware Message Bus Configuration Service	Manual		Stopped
VMware Performance Charts Service	Automatic	Healthy	Started
VMware Postgres	Automatic	Healthy	Started

140. Repeat to also **Stop** the VMware vSphere Update Manager, VMware vSphere Web Client, and vSAN Health Service.

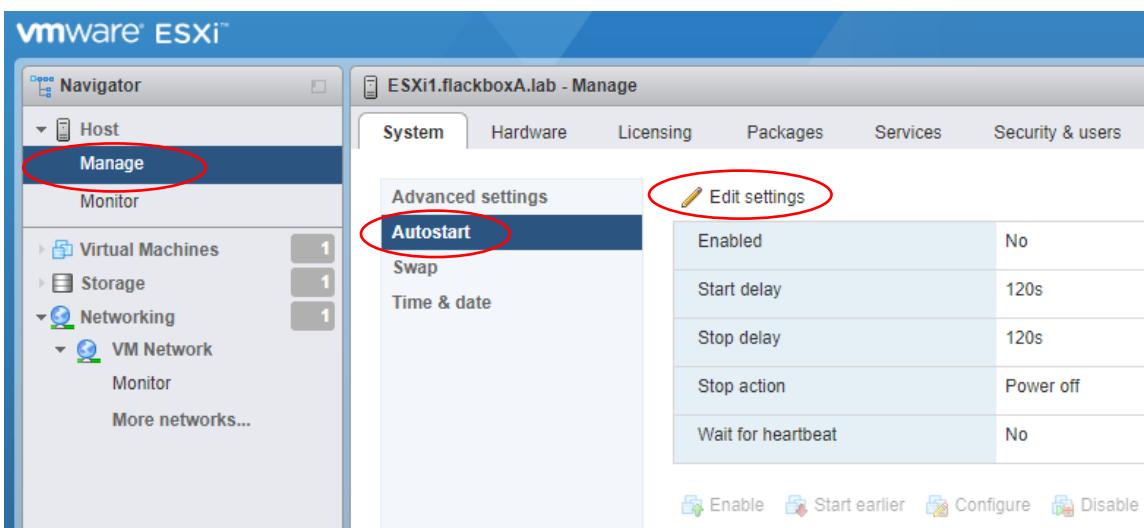
141. Configure the VCSA virtual machine to autostart next. Open the ESXi1 management interface <https://172.23.1.31> in a separate tab in your web browser. Bypass any certificate warning messages in your browser.



142. Log in with username **root** and password **Flackbox1!**



143. Click **Manage** then **Autostart** and **Edit settings**



144. Configure these settings then click **Save**:

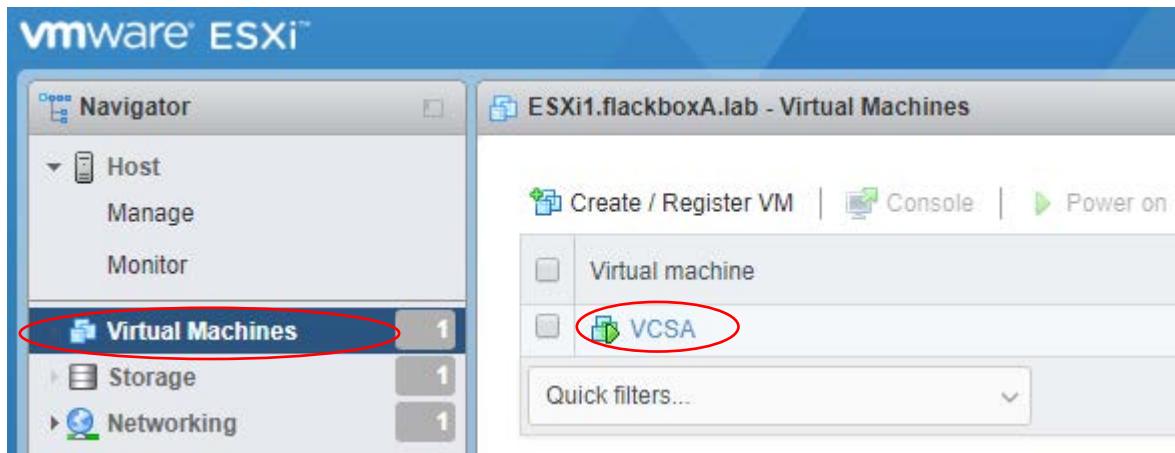
Enabled: Yes
Start delay: **10 seconds**
Stop delay: **120 seconds**
Stop action: **Shut down**
Wait for heartbeat: No

Change autostart configuration

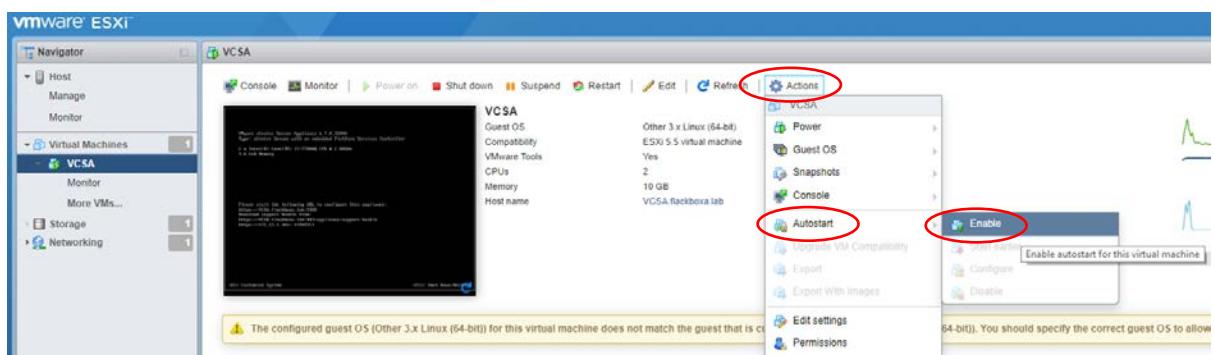
Enabled	<input checked="" type="radio"/> Yes <input type="radio"/> No
Start delay	10 seconds
Stop delay	120 seconds
Stop action	Shut down
Wait for heartbeat	<input type="radio"/> Yes <input checked="" type="radio"/> No

Save **Cancel**

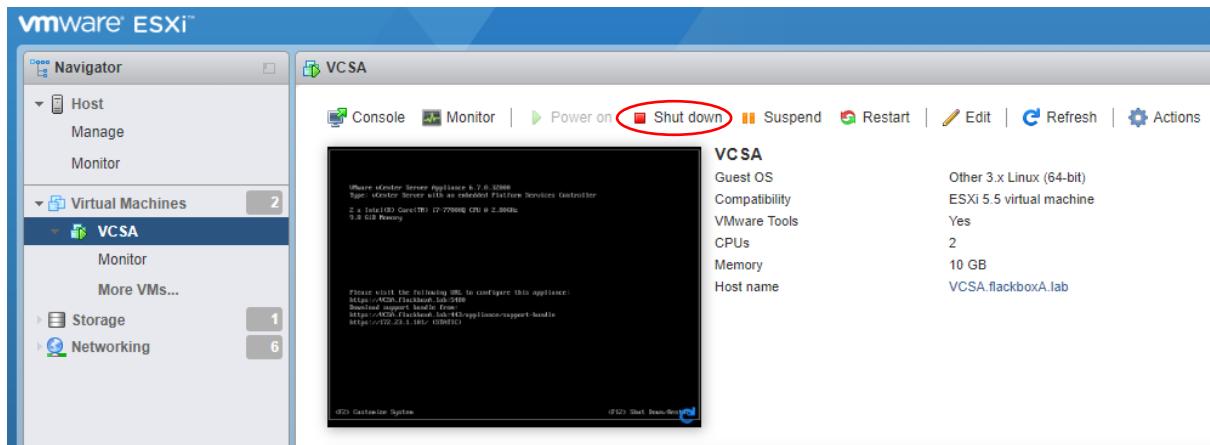
145. Click **Virtual Machines** then click **VCSA**



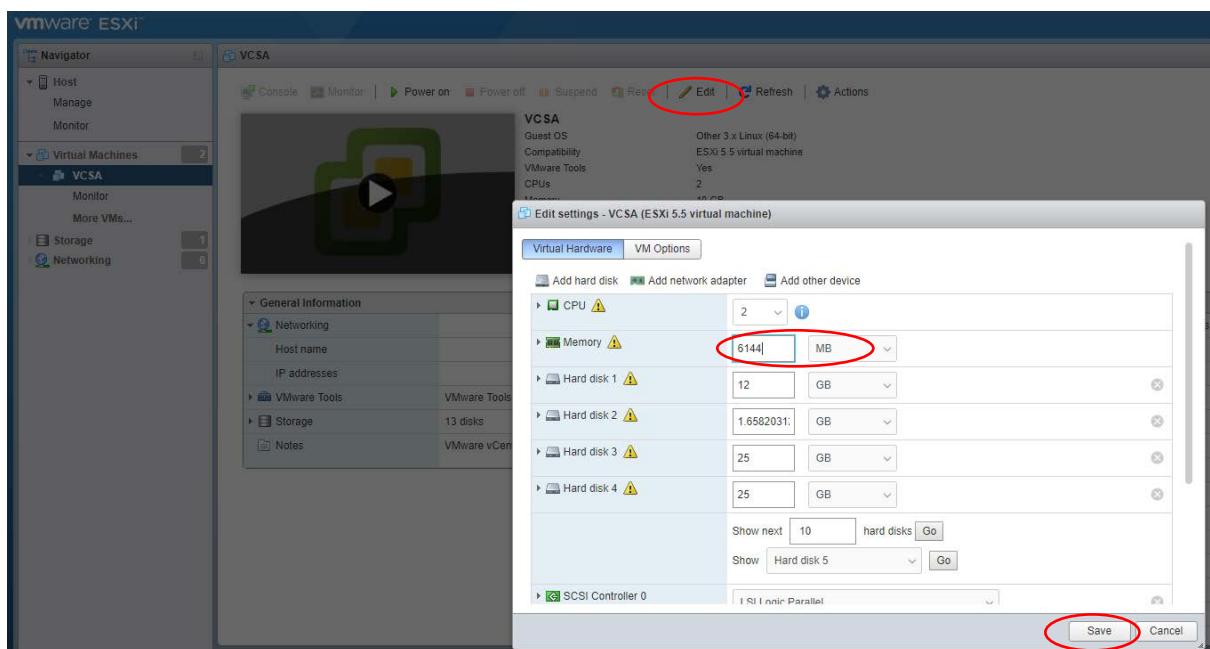
146. Click **Actions > Autostart > Enable**



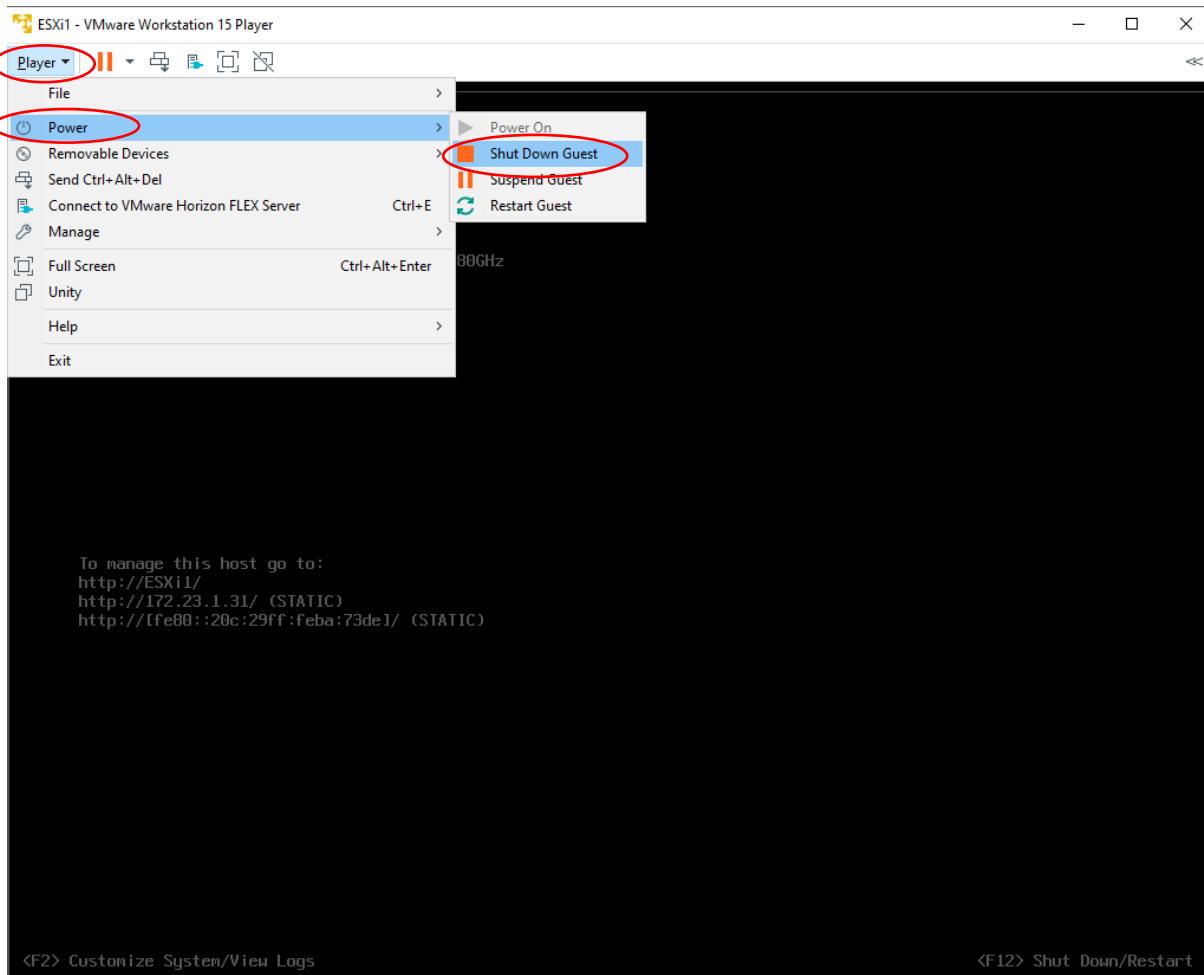
147. Click **Shut Down** to shut down the VCSA virtual machine.



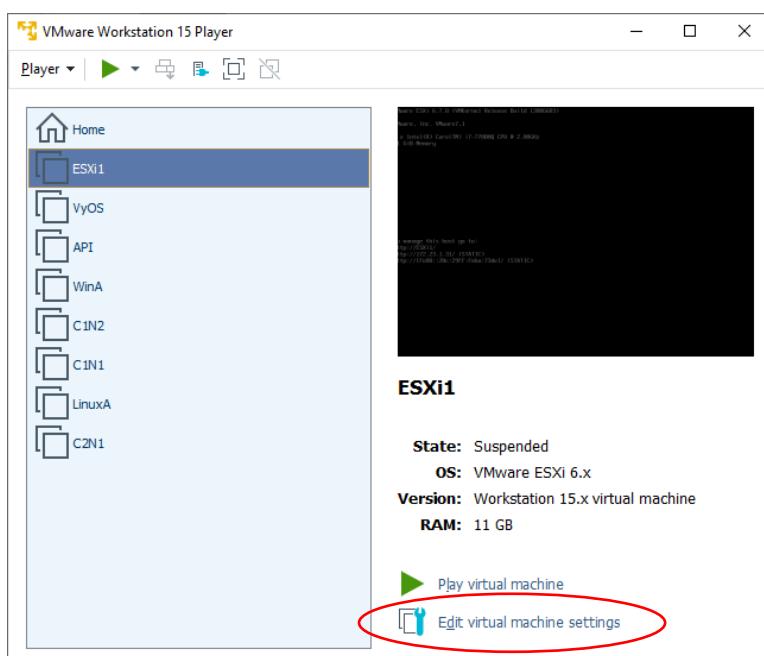
148. Click **Edit** then set the **Memory** to **6144 MB** and click **Save**



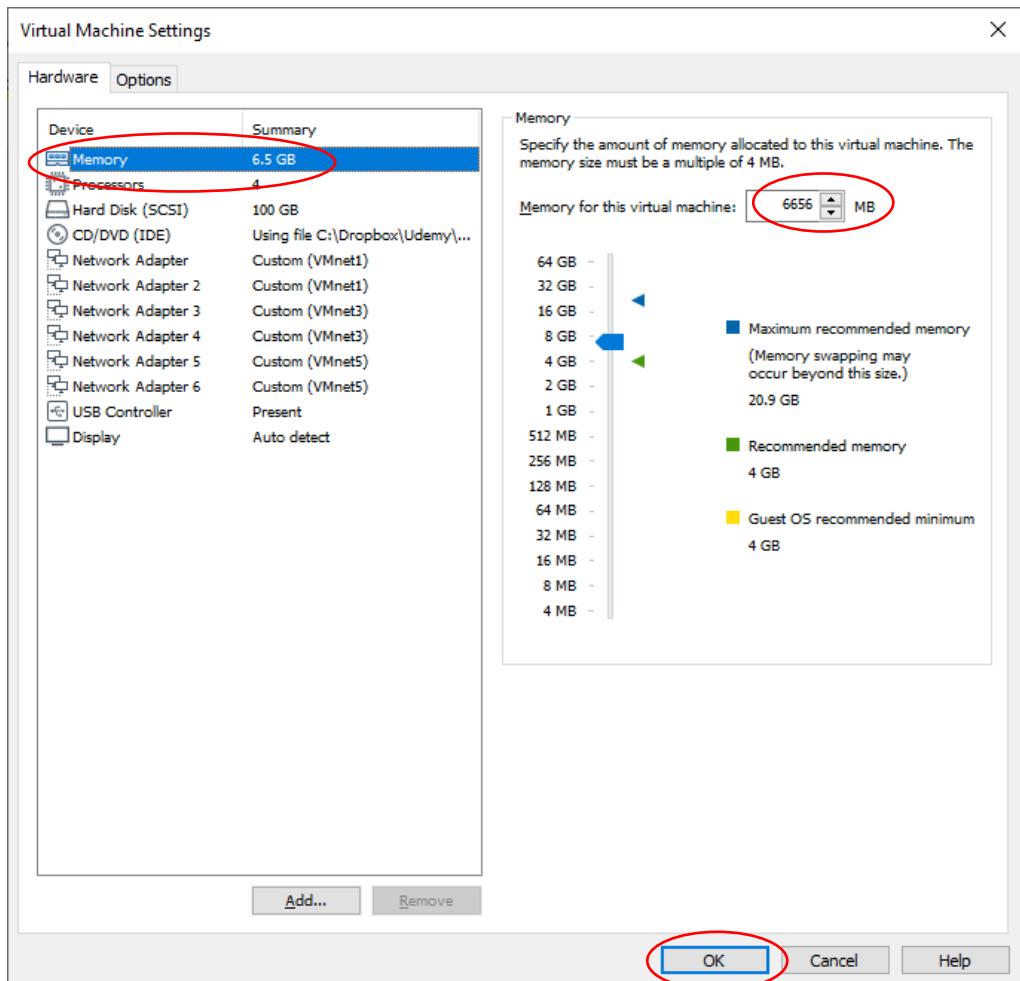
149. Click **Player > Power > Shut Down Guest** in VMware Workstation Player to shut down the ESXi1 virtual machine.



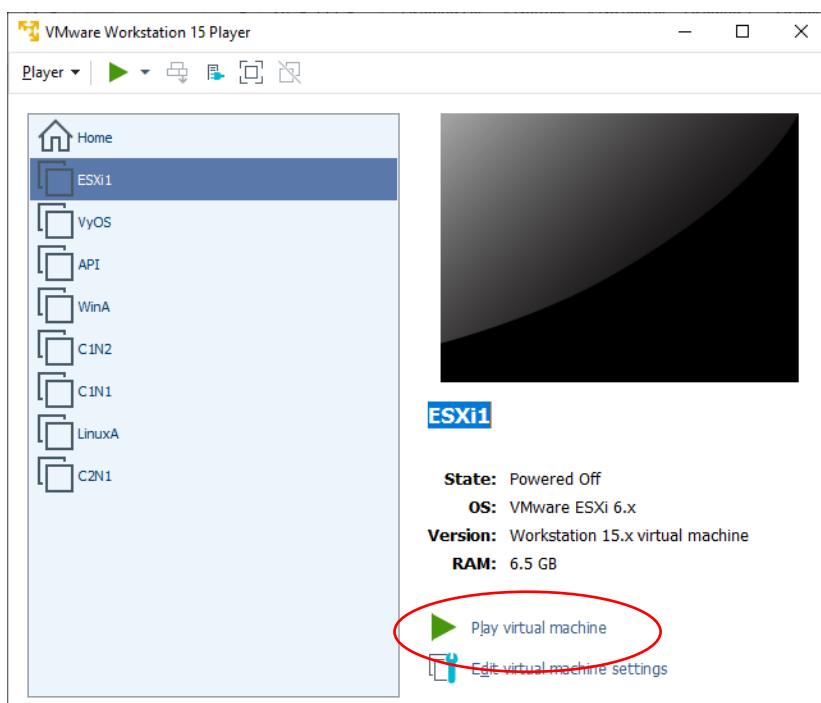
150. Open a new instance of VMware Workstation Player, select **ESXi1** then click **Edit Virtual Machine Settings**



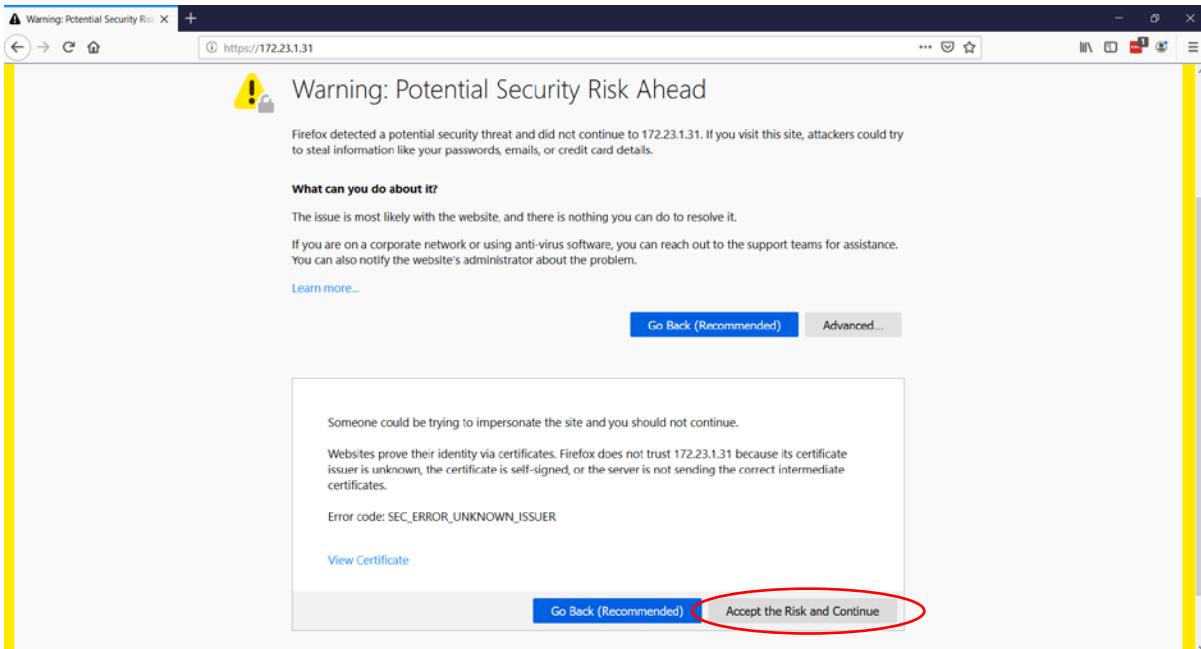
151. Set the **Memory** to **6656 MB** then click **OK**



152. Click **Play Virtual Machine** then wait a few minutes to allow ESXi1 and the VCSA virtual machine to boot up



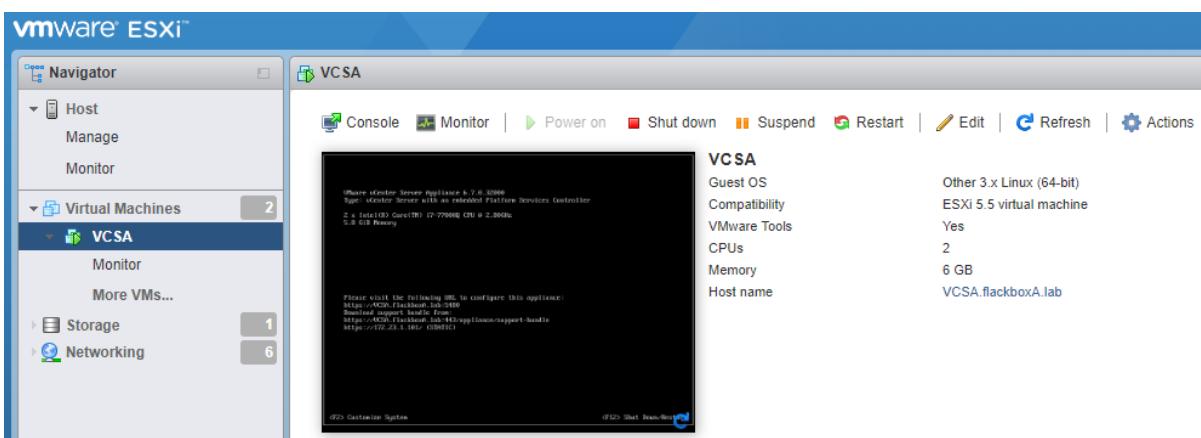
153. Check the VCSA virtual machine has started next. Open the ESXi1 management interface <https://172.23.1.31> in your web browser. Bypass any certificate warning messages in your browser.



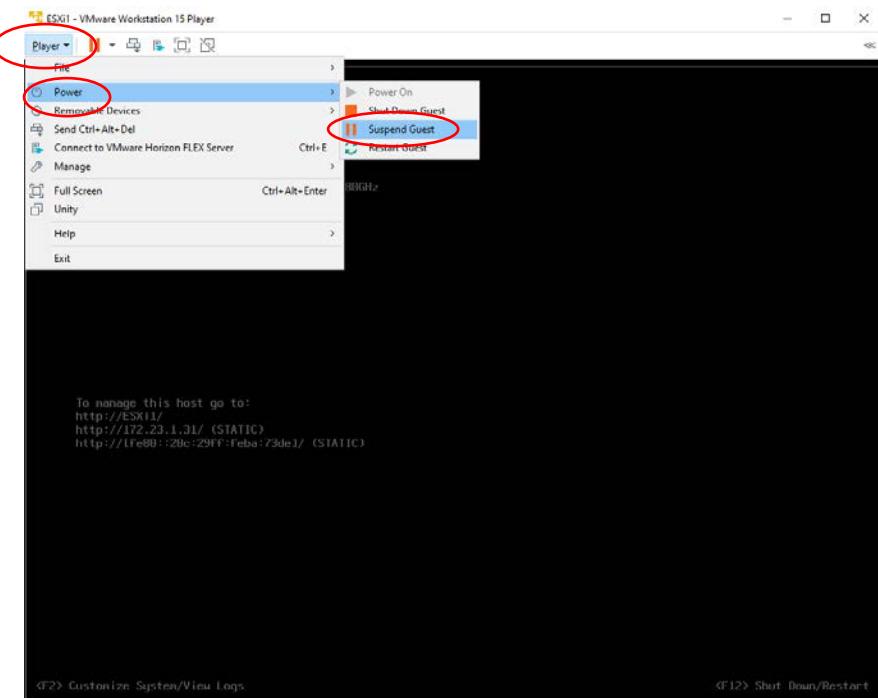
154. Log in with username **root** and password **Flackbox1!**



155. Click on **Virtual Machines > VCSA** to check it has started. Start the virtual machine if it is not started already.



156. Setup of the ESXi1 host and VCSA is now complete. In VMware Workstation Player click **Player > Power > Suspend Guest**



157. Do not take a snapshot of ESXi1 until the installation of ESXi2 in the next section is completed.

Optional: VMware ESXi2 Host Build for NetApp VSC

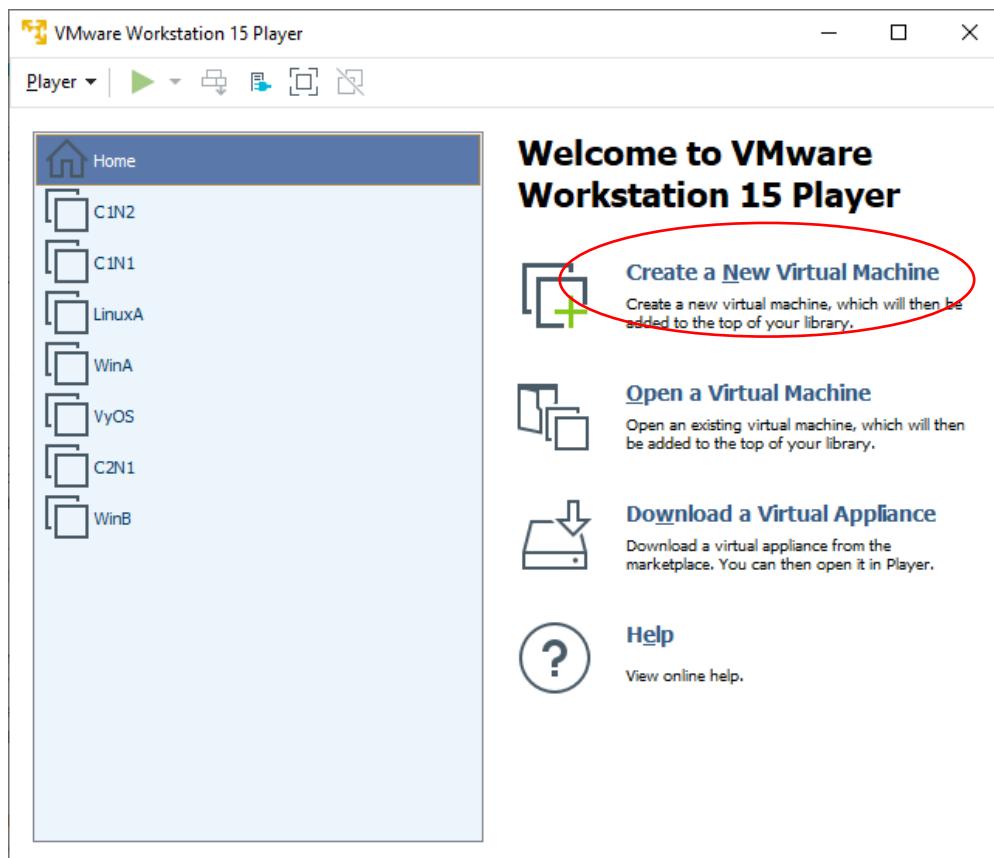
The NetApp VSC Virtual Storage Console vSphere plug-in is recommended for managing NetApp storage for VMware vSphere. You can configure NetApp storage for VMware without it, but it is best practice to use it.

NetApp VSC must *not* be installed on the same ESXi host as VCSA VMware vCenter Server Appliance, so we need to build another ESXi host for it to run on.

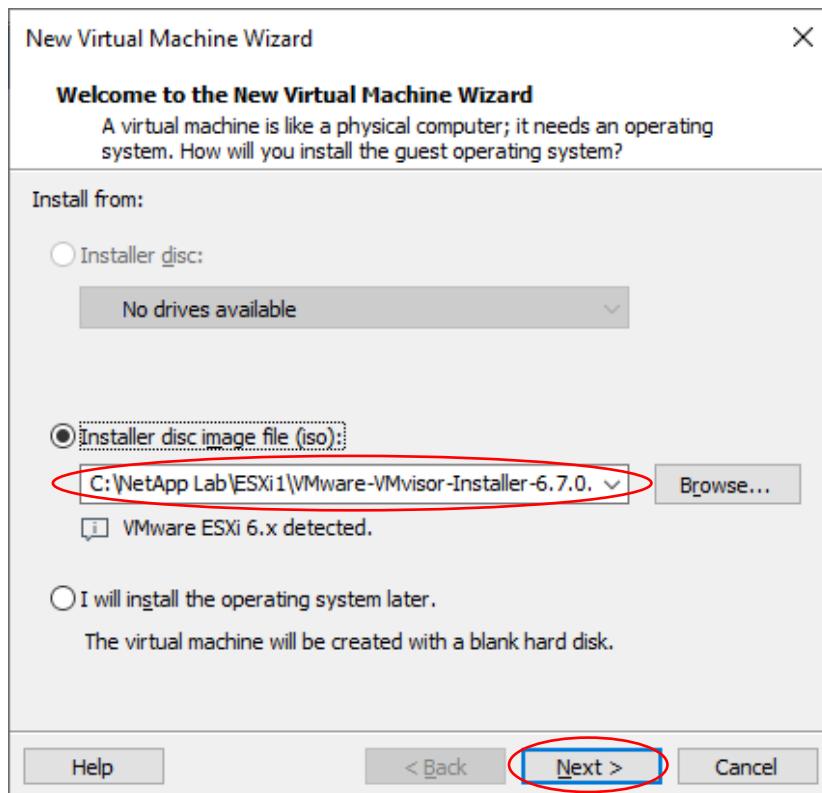
You will build the ESXi2 host in this section. You can download the NetApp VSC plug-in from the NetApp website and install it on ESXi2 after completing this section.

A minimum of 24 GB RAM is recommended in your PC if you are going to use NetApp VSC in the lab. If you only have 16 GB RAM in your PC then skip this section and the following CentOS API Host Installation section. You can still configure traditional datastores on ONTAP storage for the VMware host ESXi1 without using VSC.

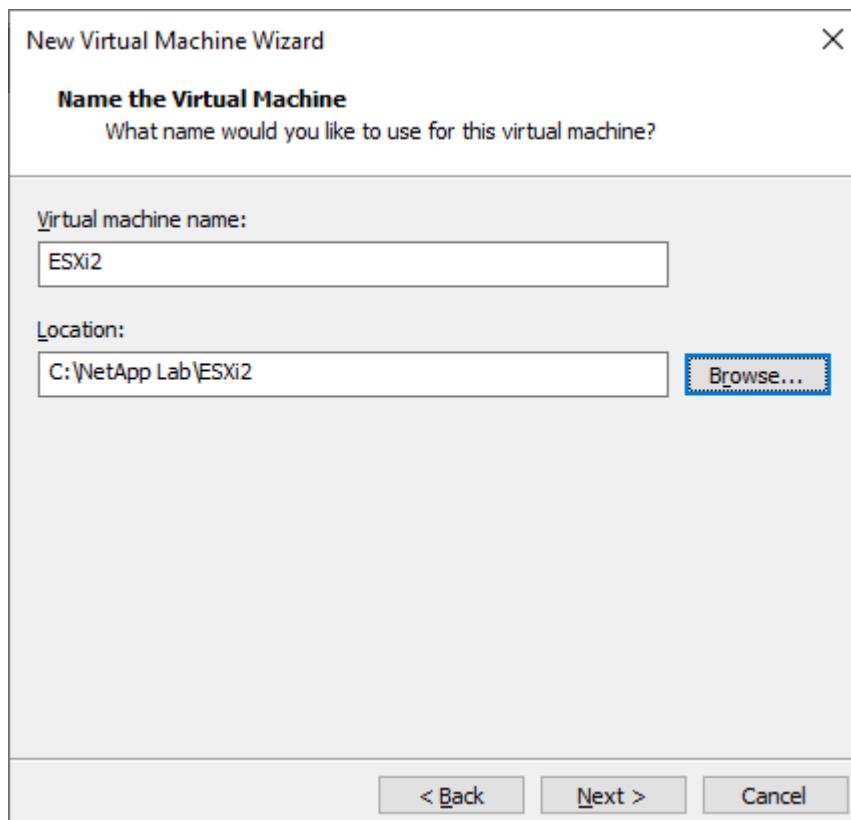
1. Power on the **ESXi1**, **WinA** and **VyOS** virtual machines in VMware Workstation Player.
2. Browse to the folder you created earlier named **NetApp Lab**.
3. In the NetApp Lab folder, make a subfolder named **ESXi2**. We will create the VMware ESXi2 host in here.
4. Open VMware Player
5. Click **Create a New Virtual Machine**



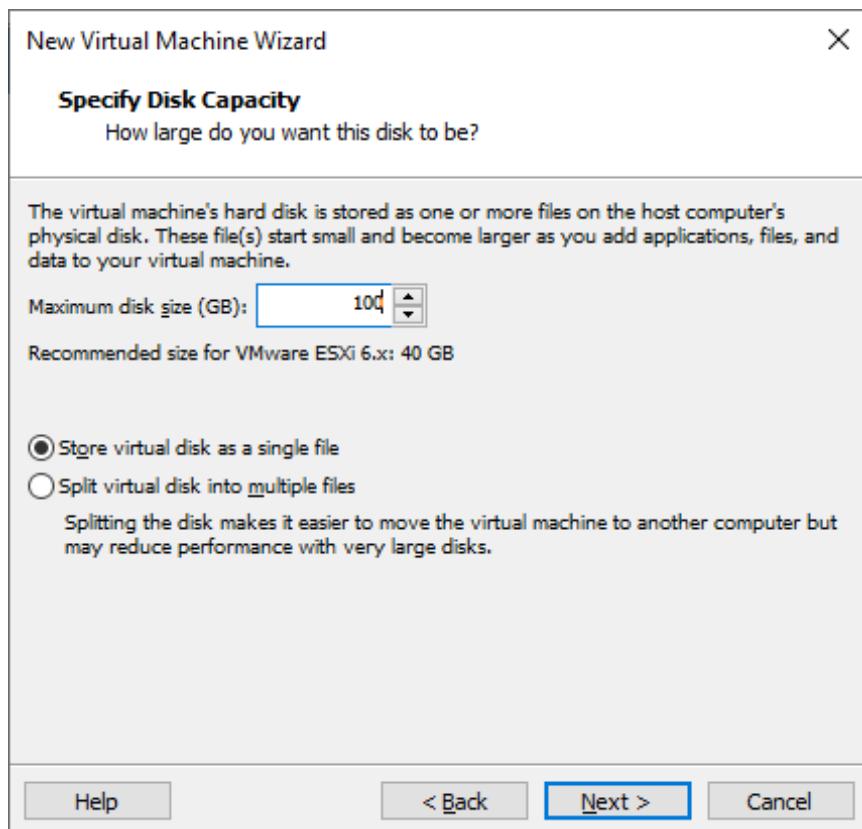
6. Select **Installer disc image file (iso)**: then **Browse** to the ESXi ISO file in the ESXi1 folder and click **Next**.



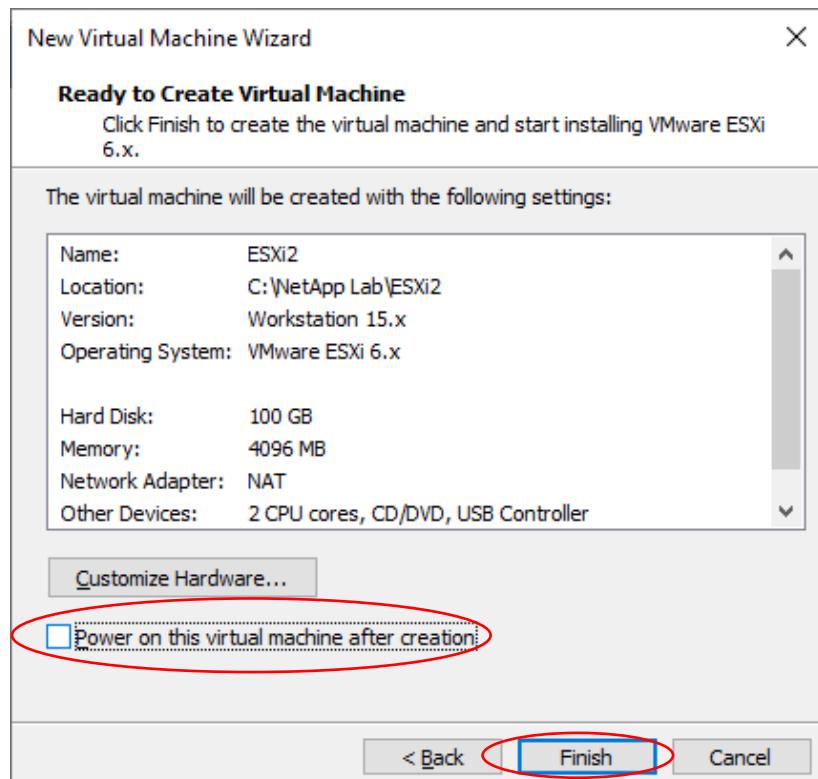
7. Name the virtual machine **ESXi2** and save it in the **NetApp Lab\ESXi2** folder



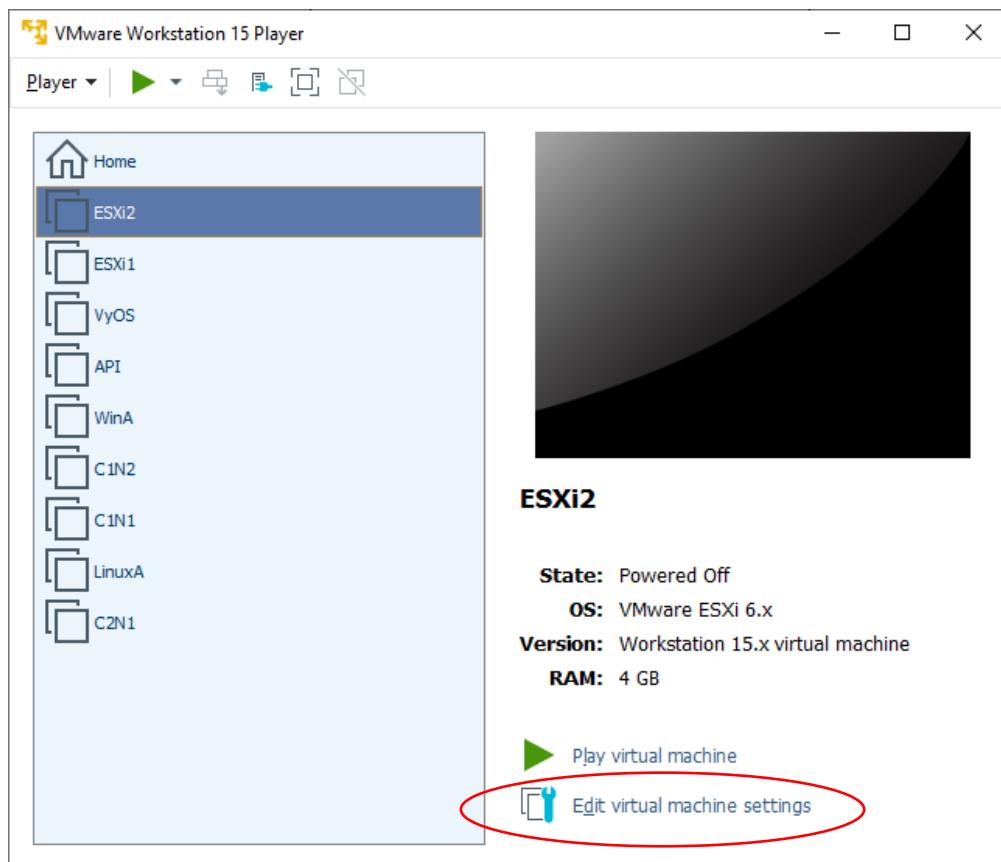
8. Make the **maximum disk size 100 GB** (*this is not the default*), select the option to **Store Virtual Disk as a single file** and click **Next**.



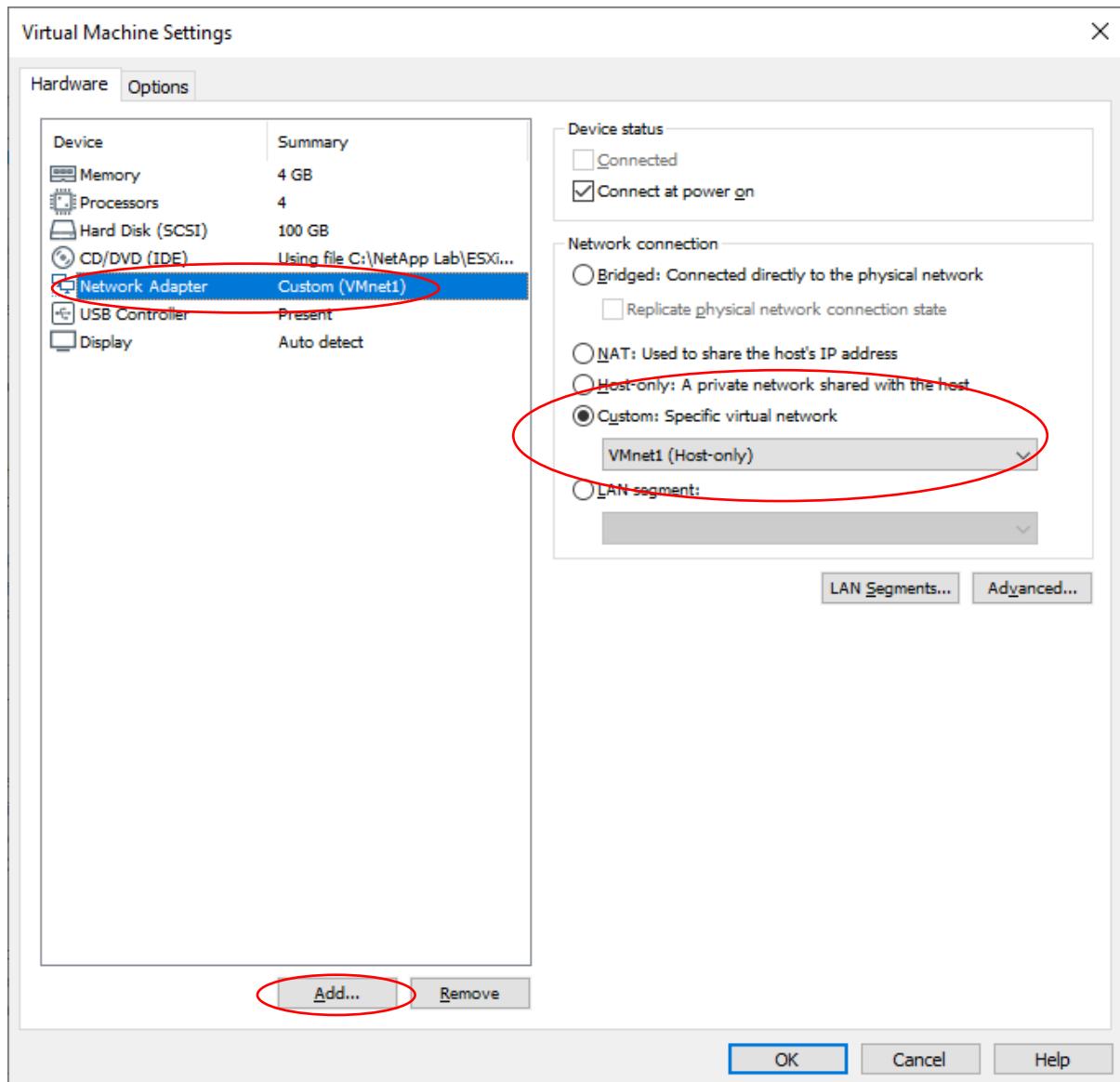
9. **Uncheck** the option to **Power on this virtual machine after creation** and click **Finish**



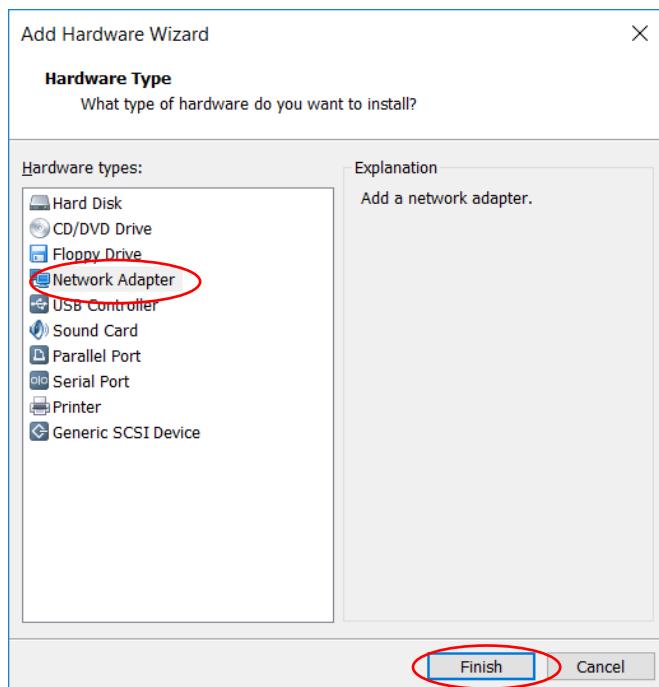
10. Click **Edit Virtual Machine Settings**



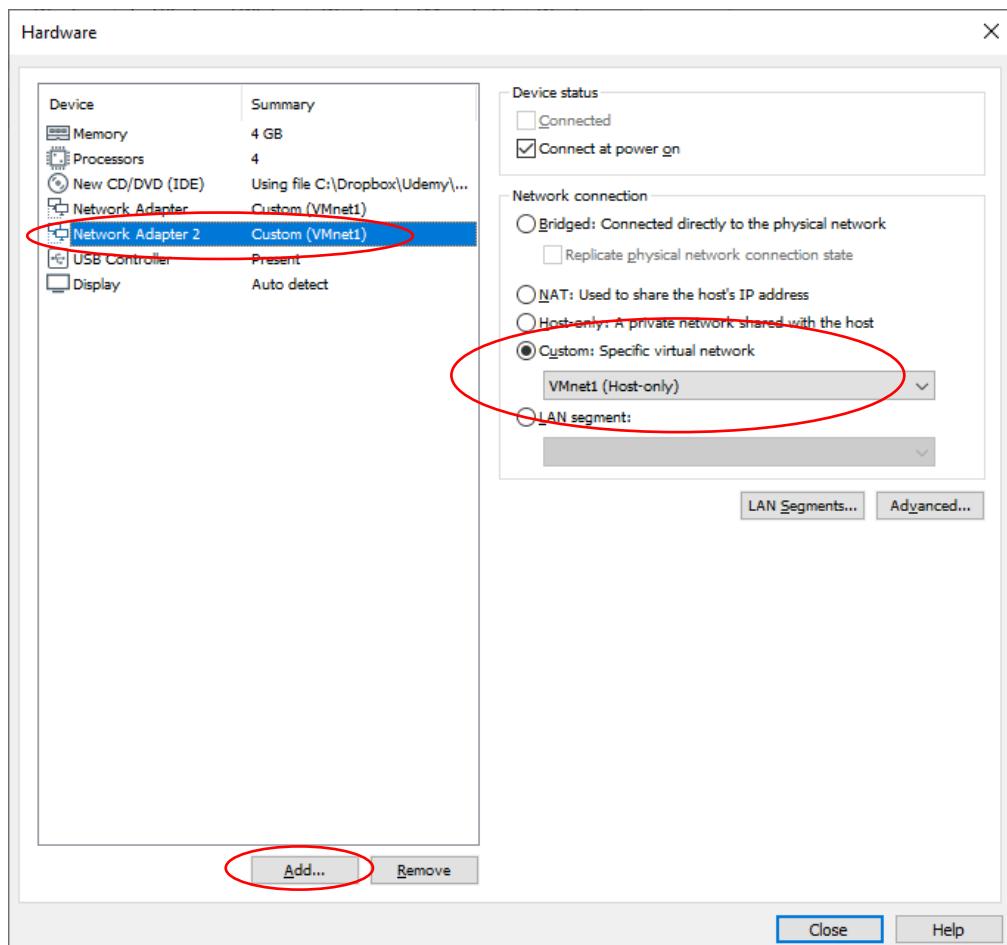
11. Click on **Network Adapter** and select **Custom** virtual network **VMnet1**, then click on the **Add** button



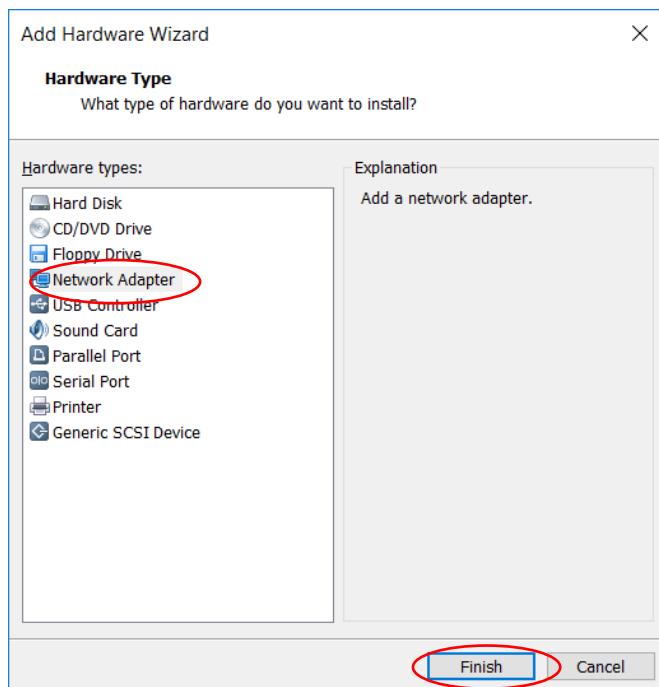
12. Choose **Network Adapter** and click **Finish**



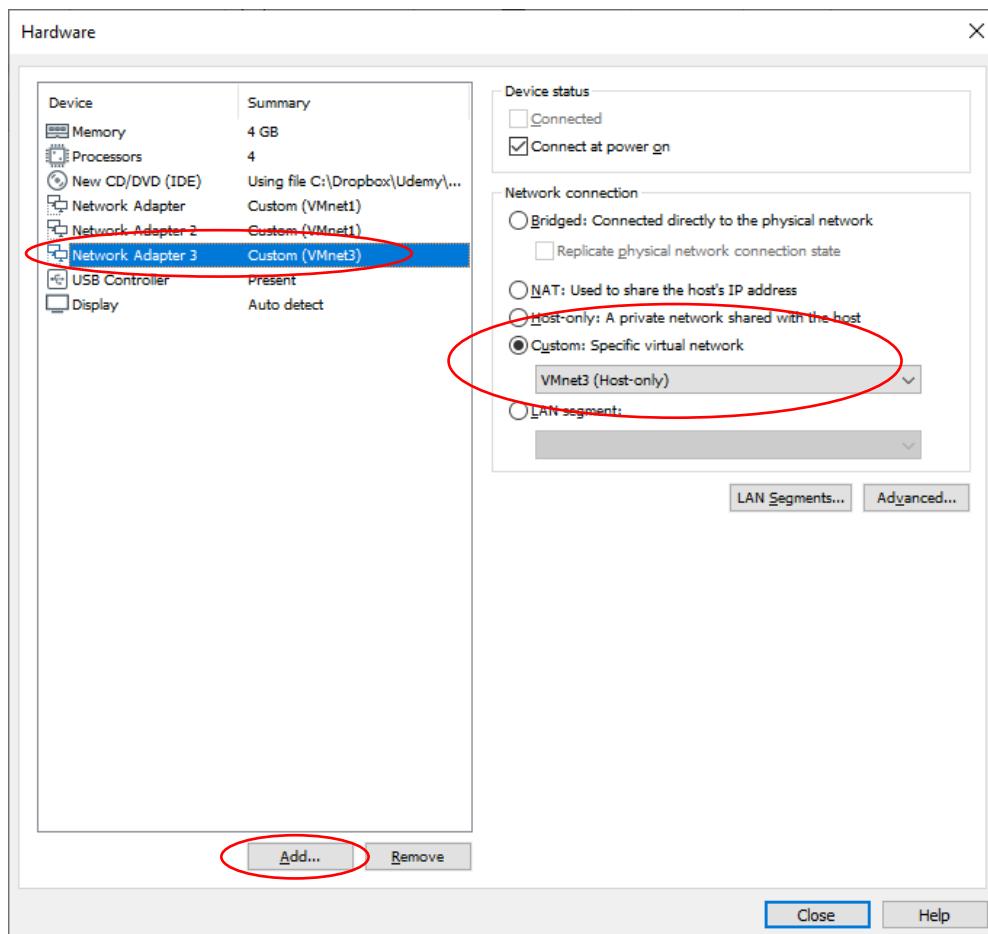
13. Select Network Adapter 2 and select **Custom** virtual network **VMnet1**, then click on the **Add** button



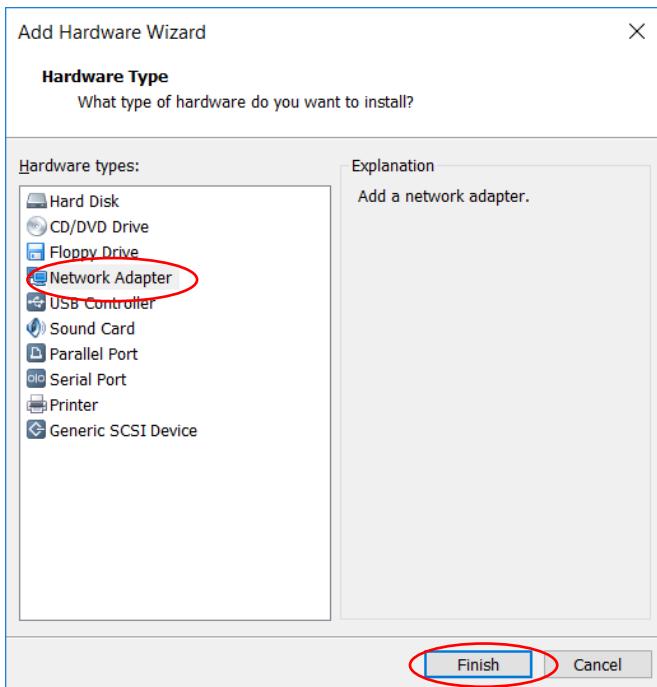
14. Choose **Network Adapter** and click **Finish**



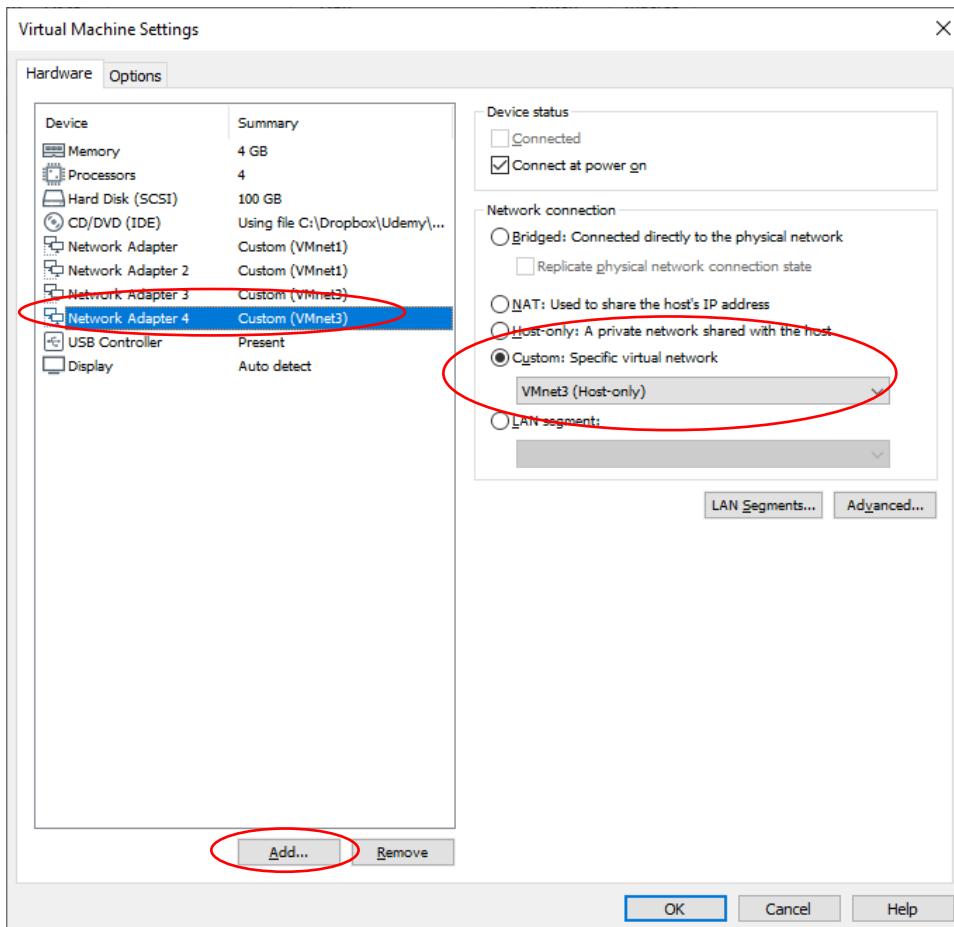
15. Select Network Adapter 3 and select **Custom** virtual network **VMnet3**, then click on the **Add** button



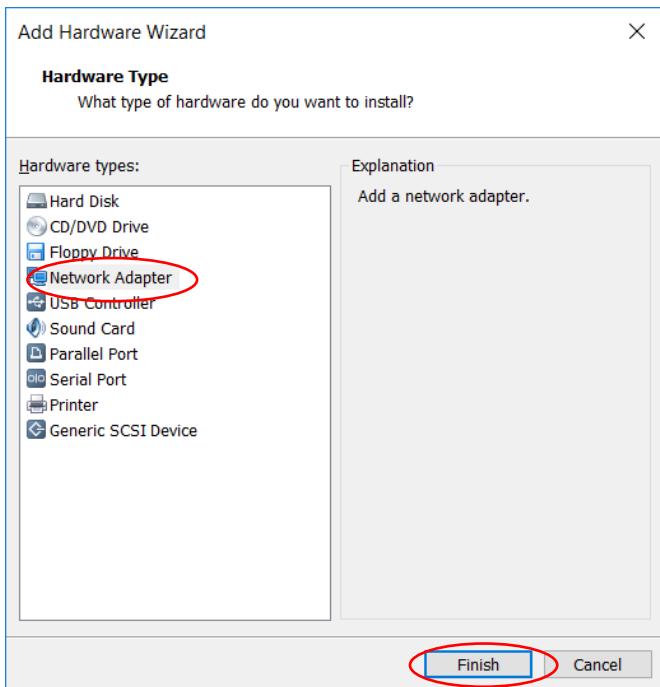
16. Choose **Network Adapter** and click **Finish**



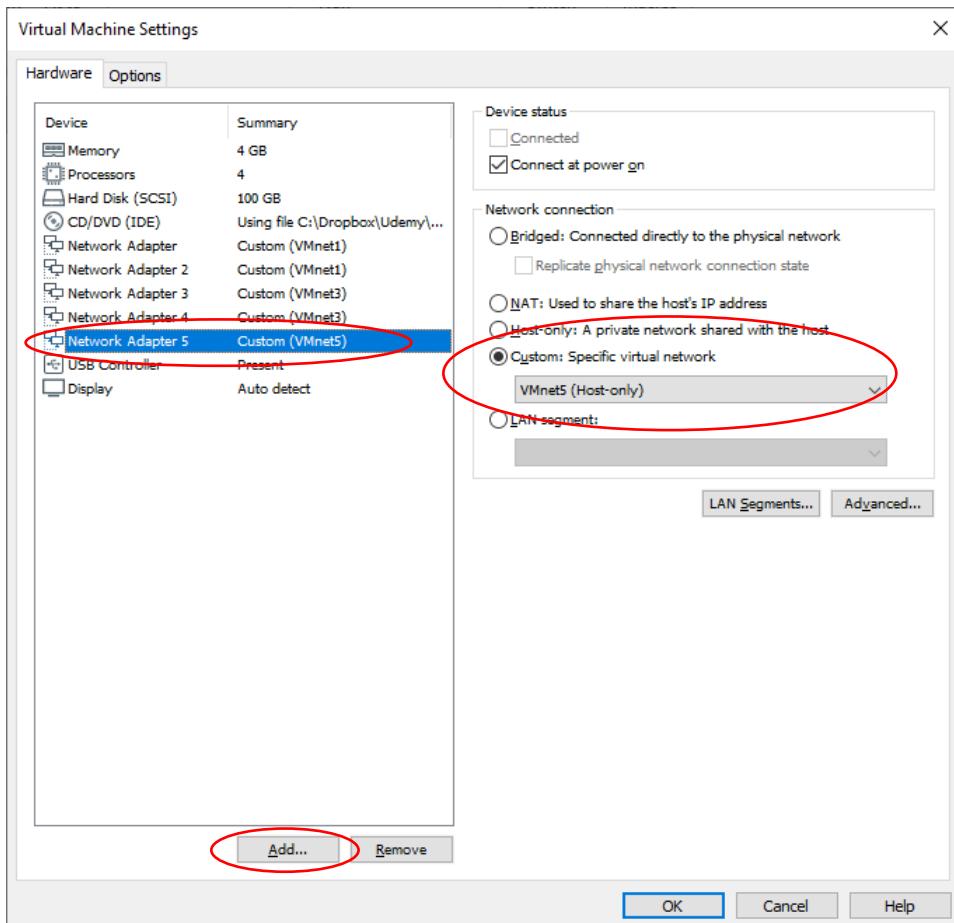
17. Select Network Adapter 4 and select **Custom** virtual network **VMnet3**, then click on the **Add** button



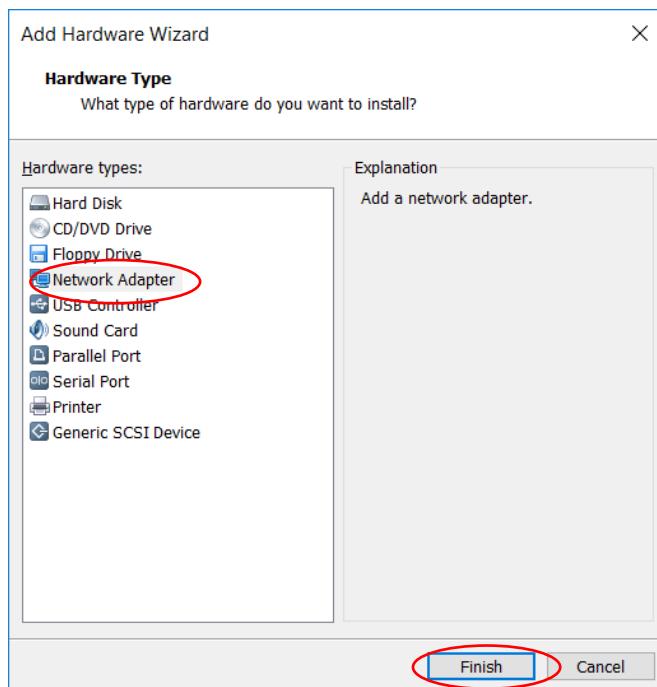
18. Choose **Network Adapter** and click **Finish**



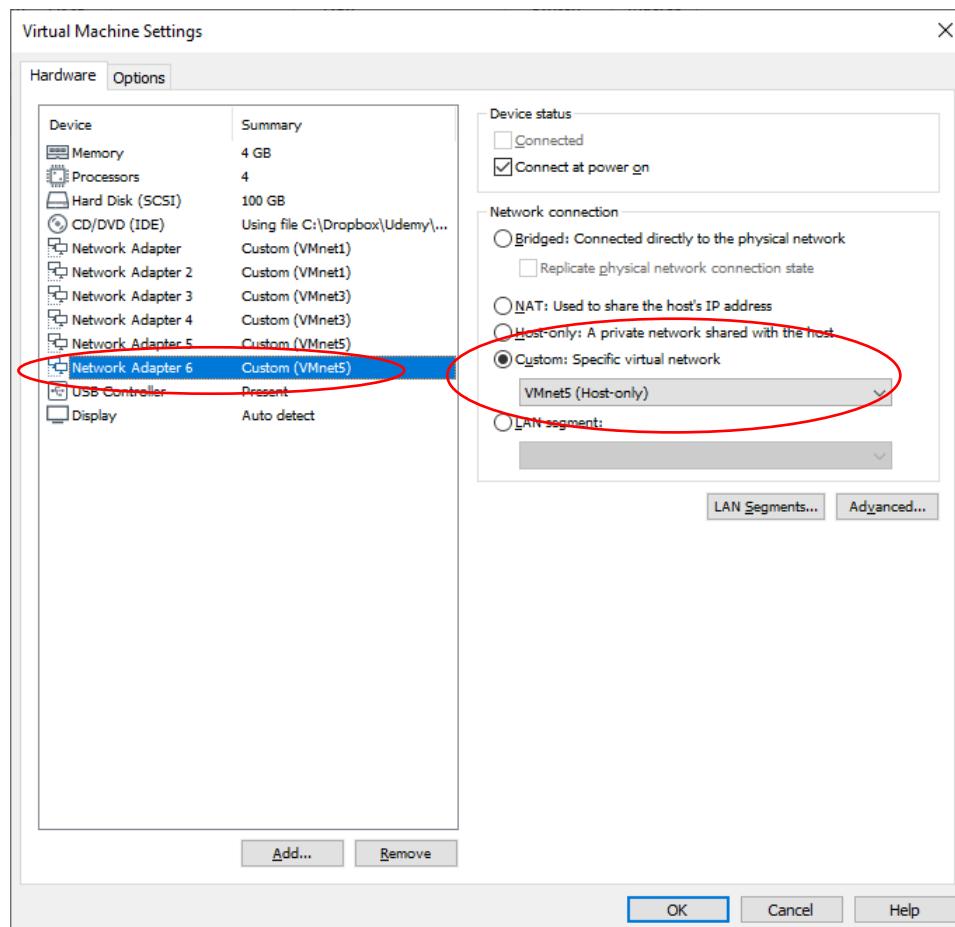
19. Select Network Adapter 5 and select **Custom** virtual network **VMnet5**, then click on the **Add** button



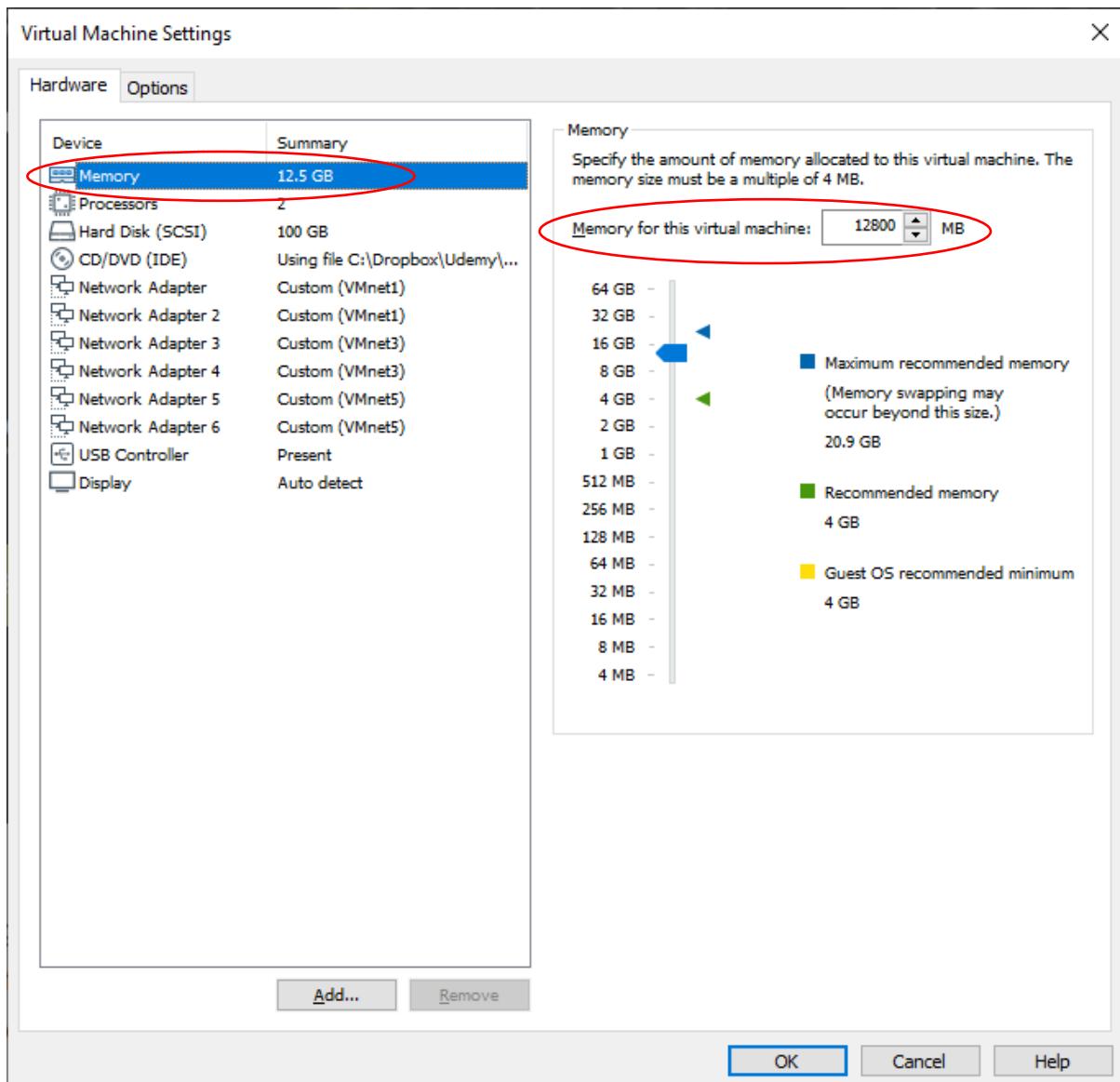
20. Choose **Network Adapter** and click **Finish**



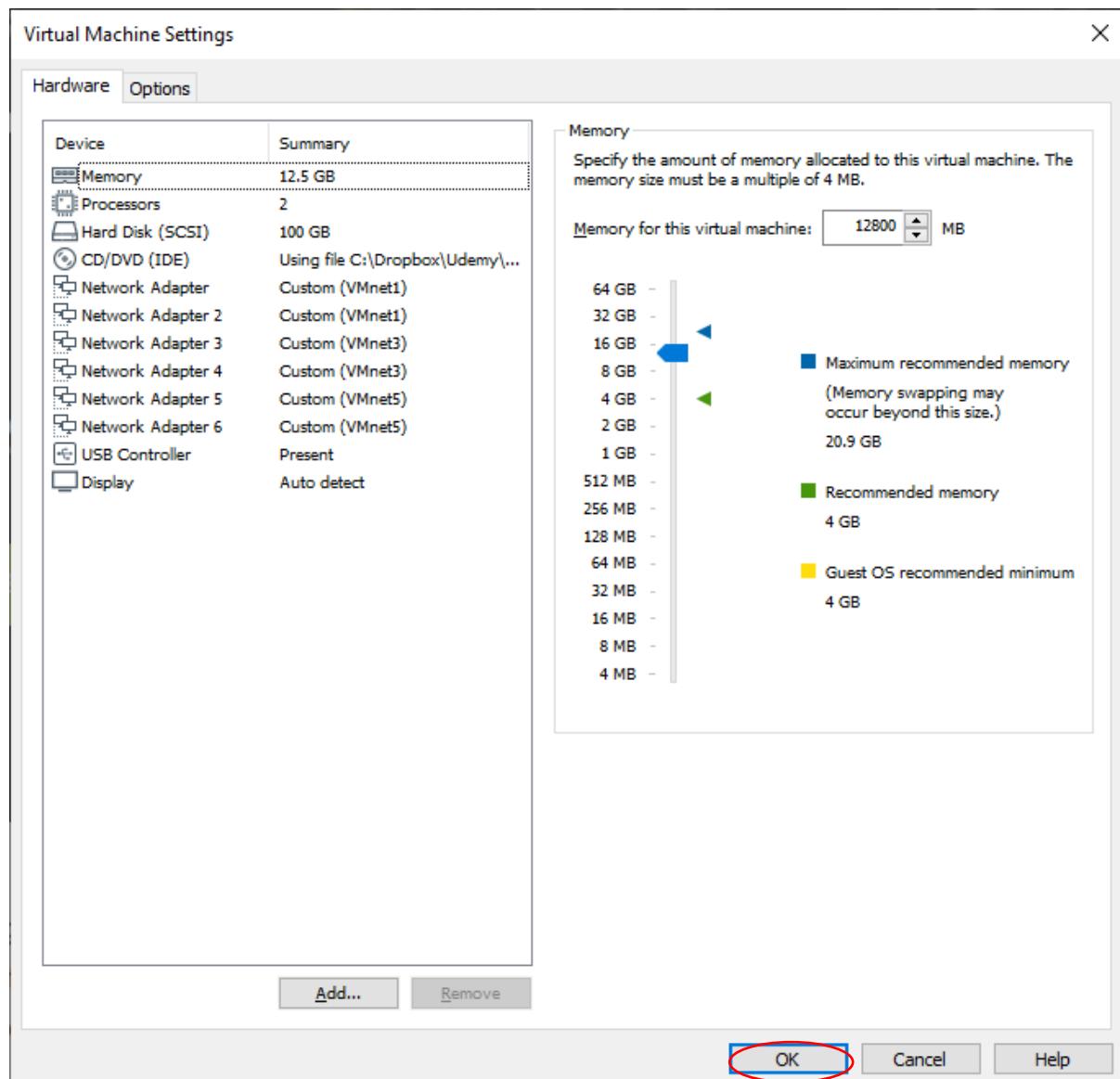
21. Select Network Adapter 6 and select **Custom** virtual network **VMnet5**



22. Click on **Memory** then set the **Memory for this virtual machine** to **12800 MB**.

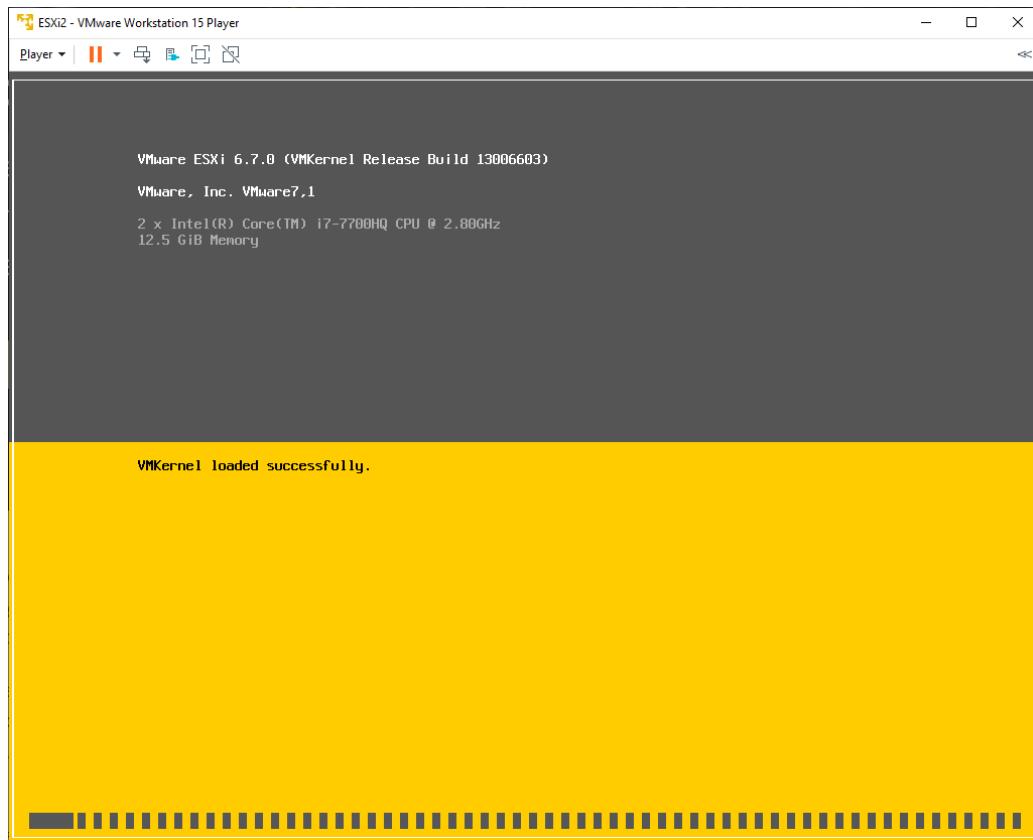


23. The Virtual Machine Settings for the Memory, Processors, Hard Disk and Network Adapters should look like the picture below. Make sure the right Network Adapter is in the right VMnet network. Click **OK** to close

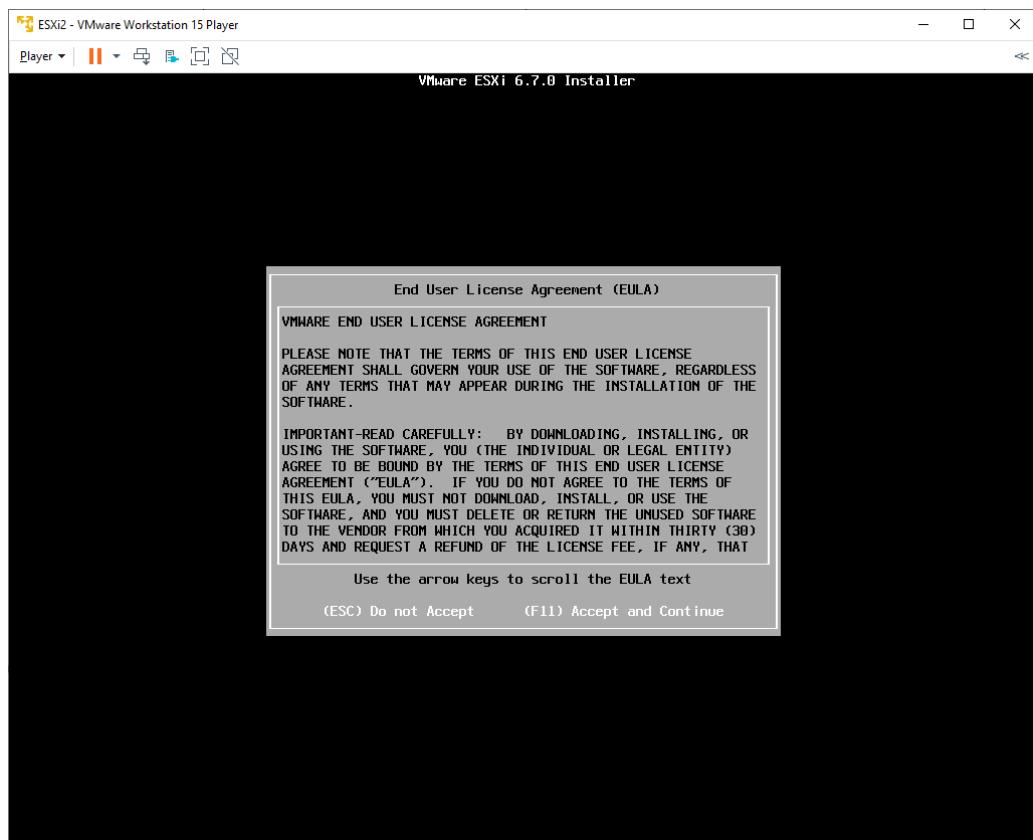


24. Click **Play Virtual Machine** to power on the ESXi2 host

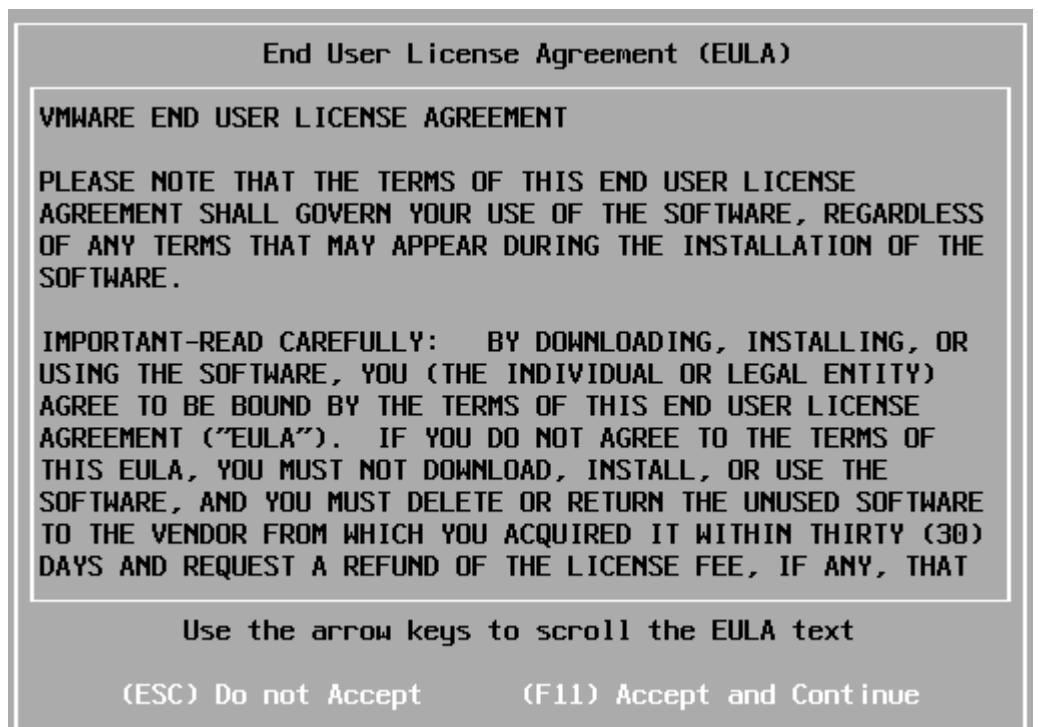
25. The host will run through the ESXi install process, this will take some time



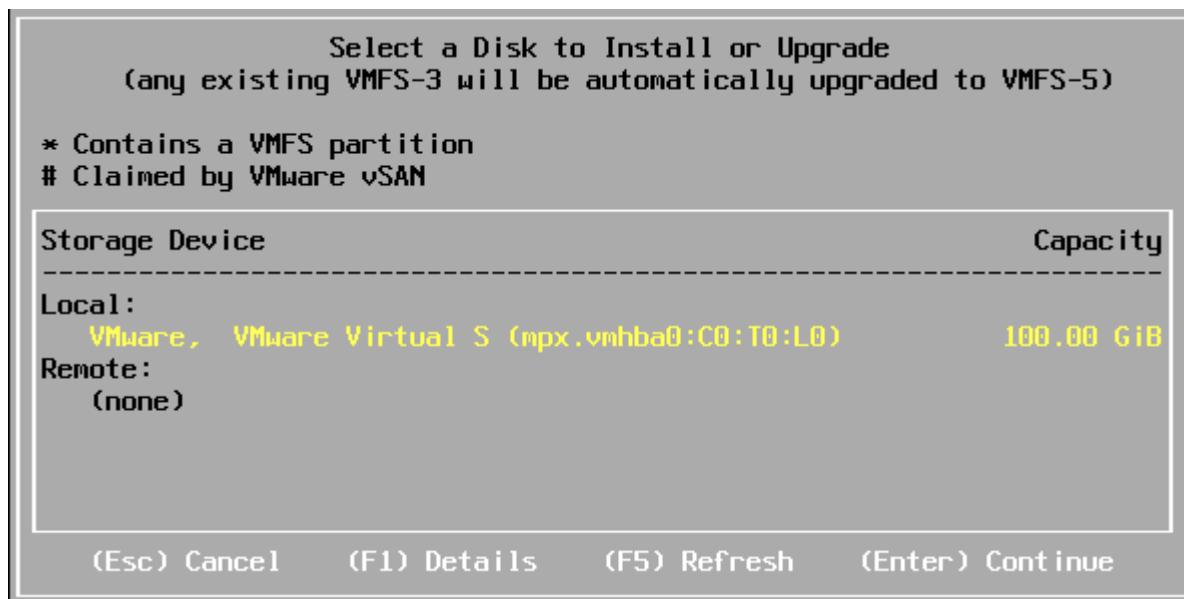
26. Click inside the VMware Workstation Player window then hit **Enter**



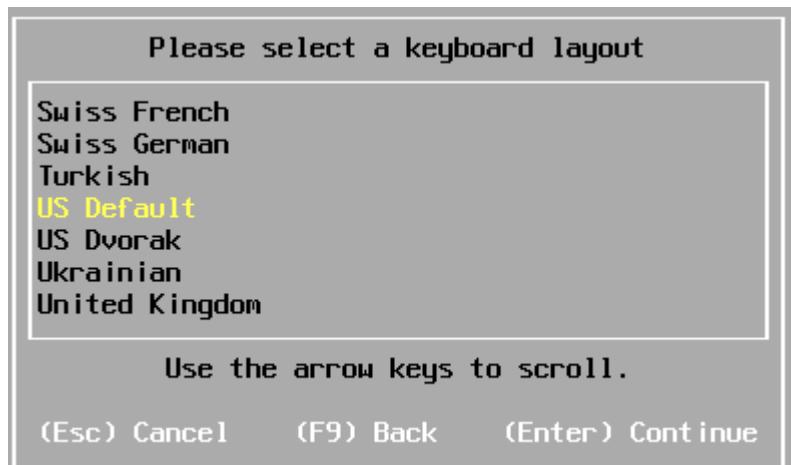
27. Hit F11 on your keyboard.



28. Hit **Enter** to select the disk to install on



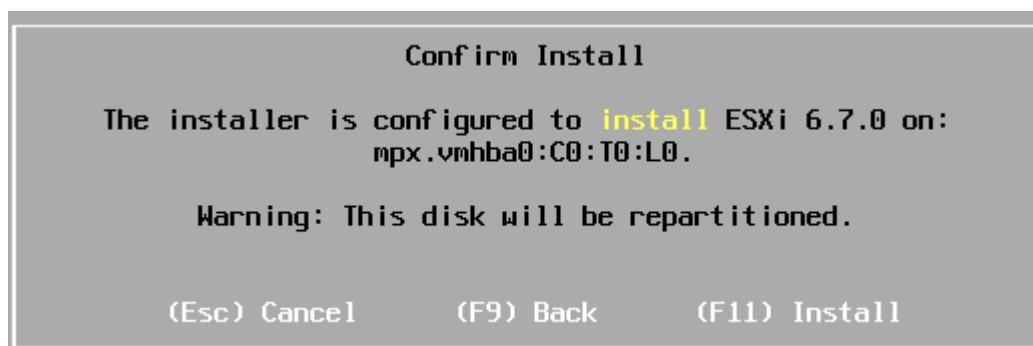
29. Use the Up and Down cursor arrows to select your keyboard layout then hit **Enter**



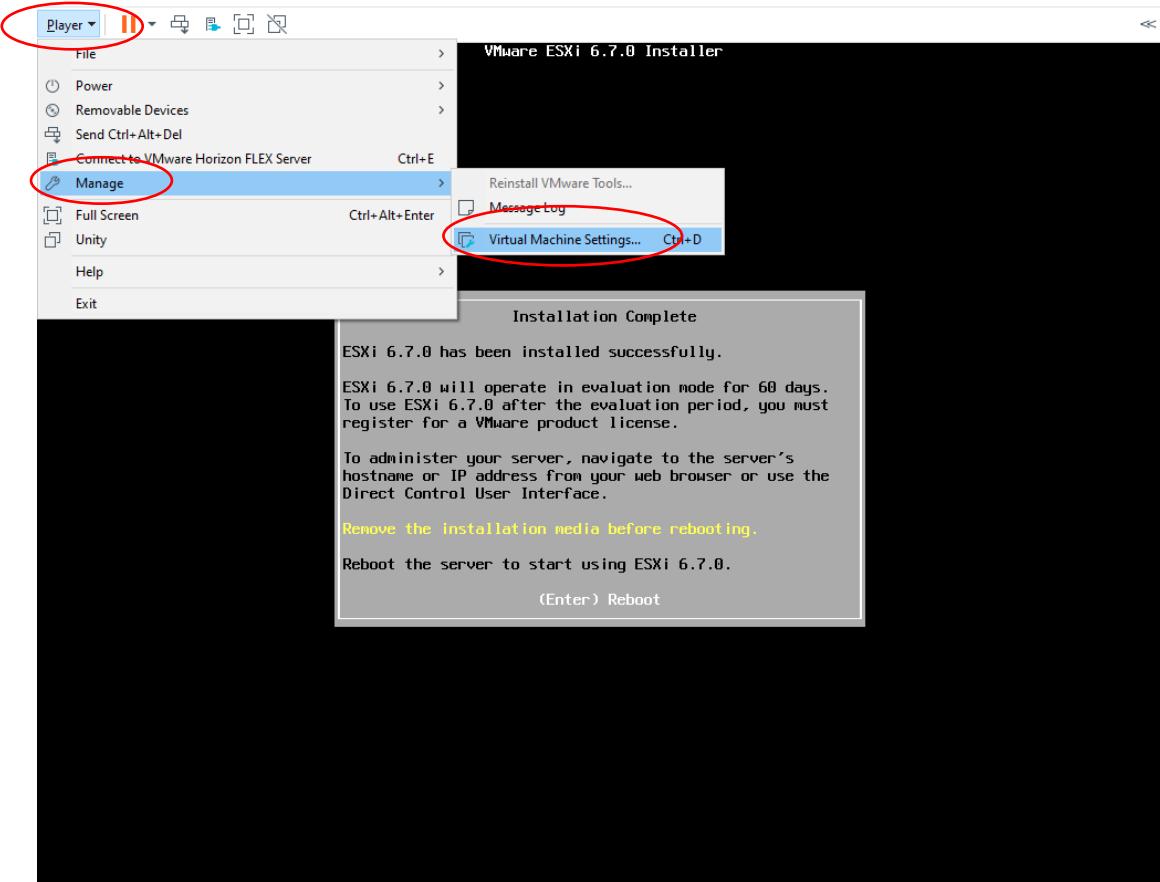
30. Enter the password **Flackbox1!** then hit **Enter** (our usual password **Flackbox1** does not meet the password complexity requirements so use **Flackbox1!** with an exclamation mark at the end).



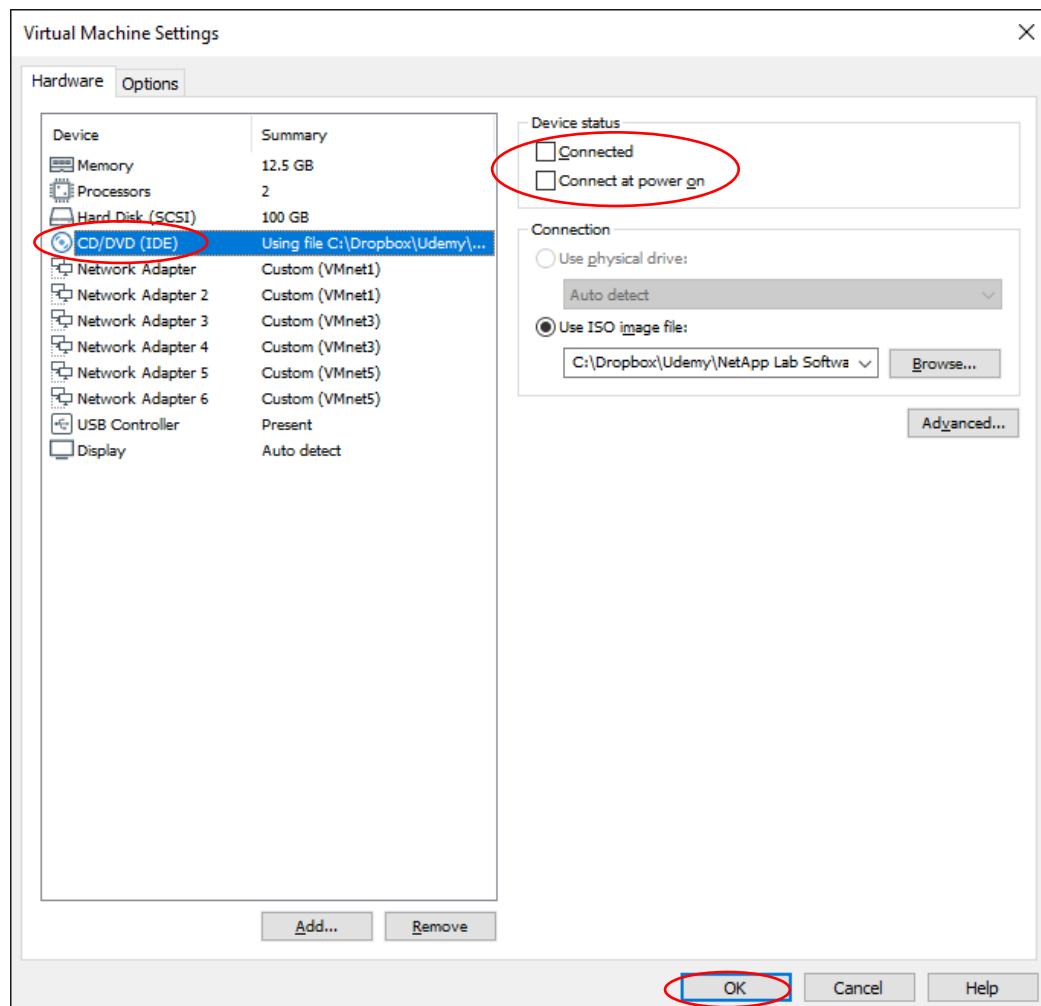
31. Hit **F11** on your keyboard to install



32. When the installation has completed, hold down the **Ctrl** and **Alt** keys on your keyboard to release the mouse, then select **Player > Manage > Virtual Machine Settings...** in VMware Workstation Player



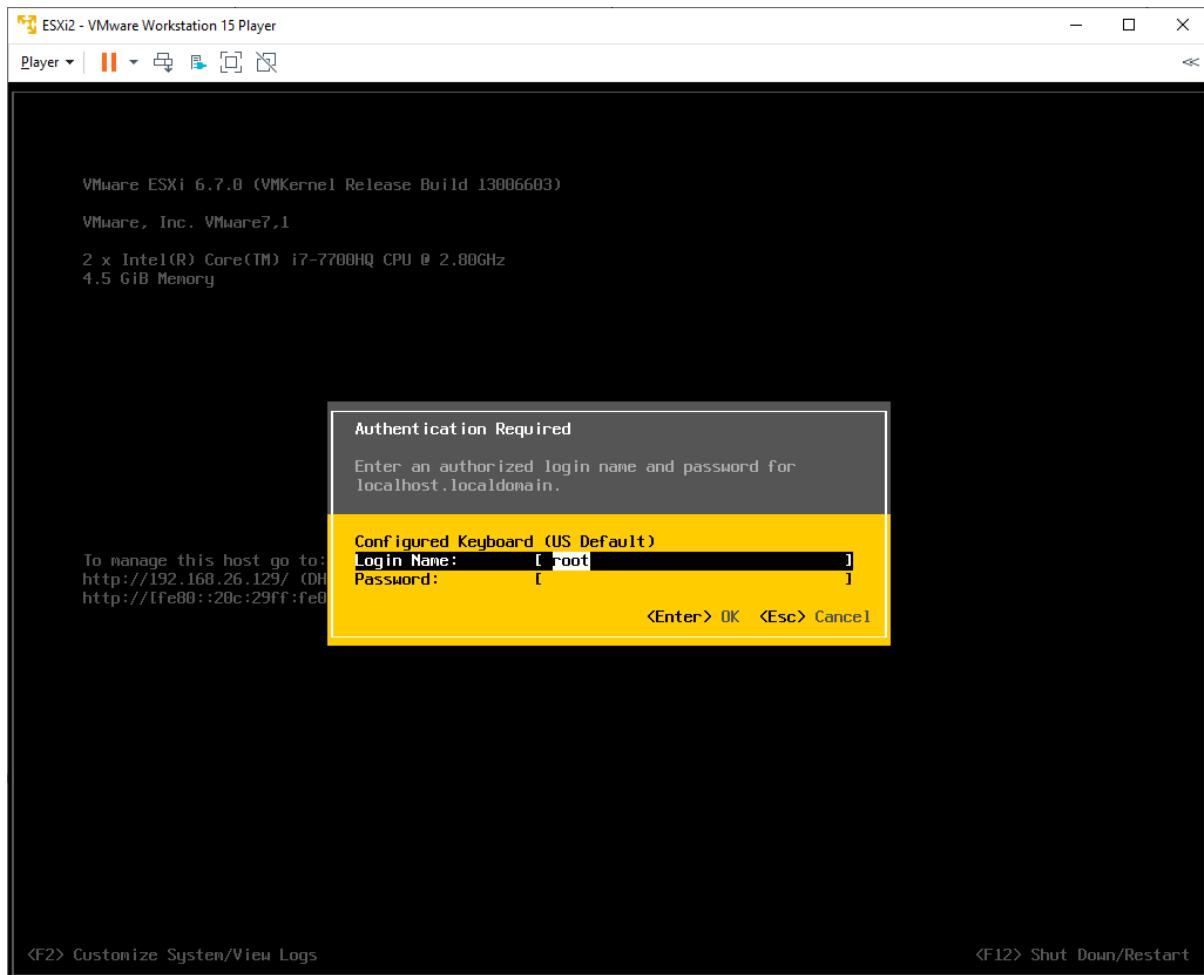
33. Select **CD/DVD (IDE)** then deselect the **Connected** and **Connect at power on** checkboxes. Click **OK**



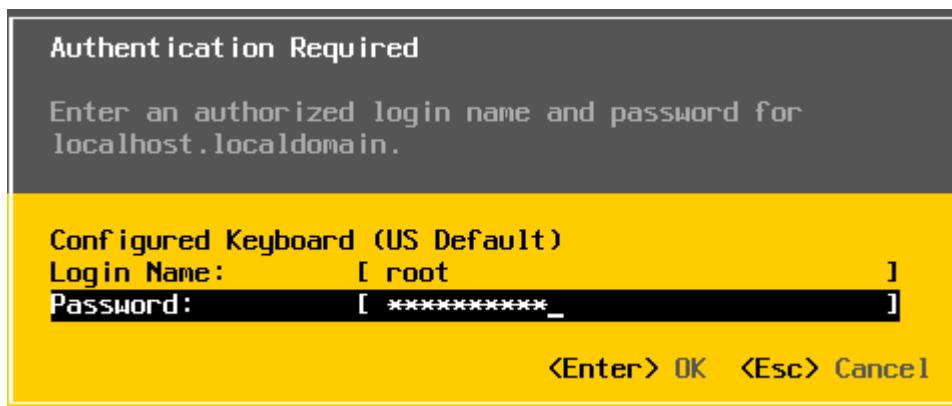
34. Click back inside the VMware Workstation Player window, then hit **Enter** to reboot.



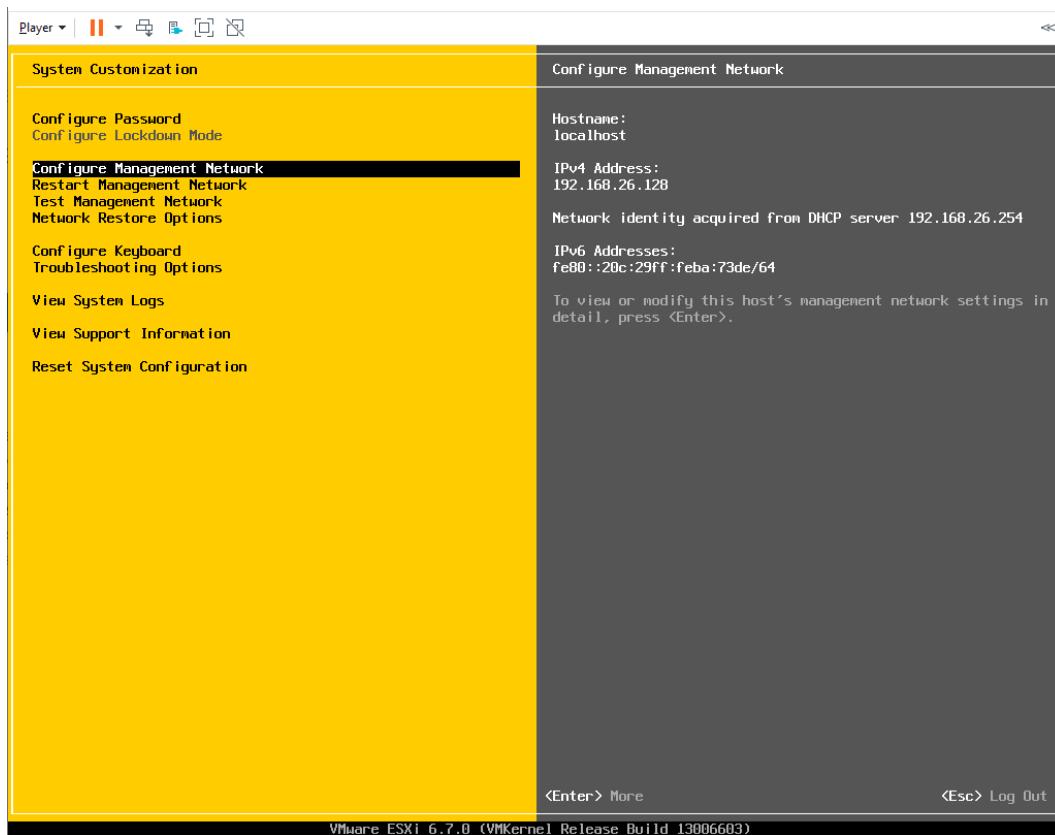
35. When the host has booted, hit **F2** to configure the settings.



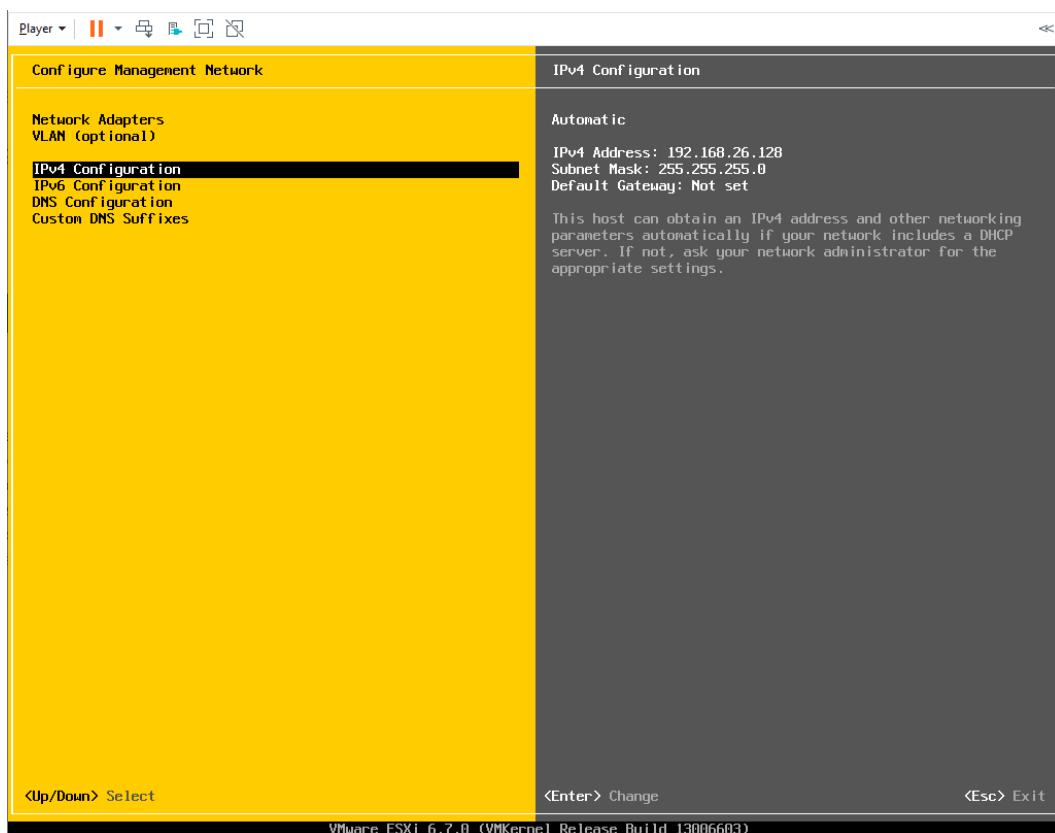
36. Use the Down arrow to get the cursor onto the **Password** line, enter the password **Flackbox1!**, then hit **Enter**



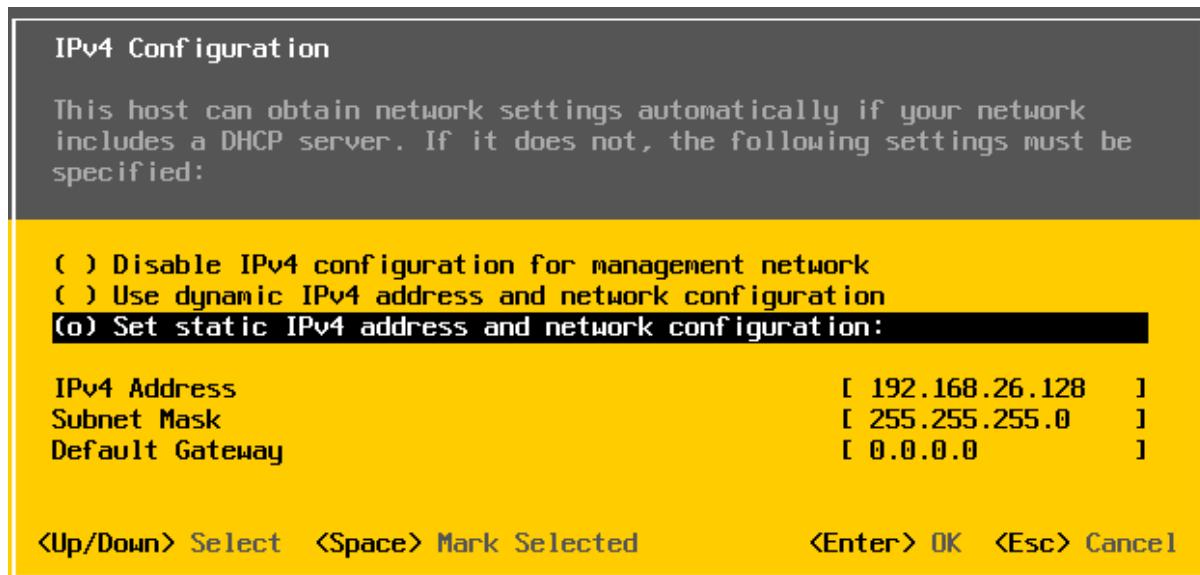
37. Use the Down arrow to select **Configure Network Management** then hit **Enter**



38. Select **IPv4 Configuration** and hit **Enter**

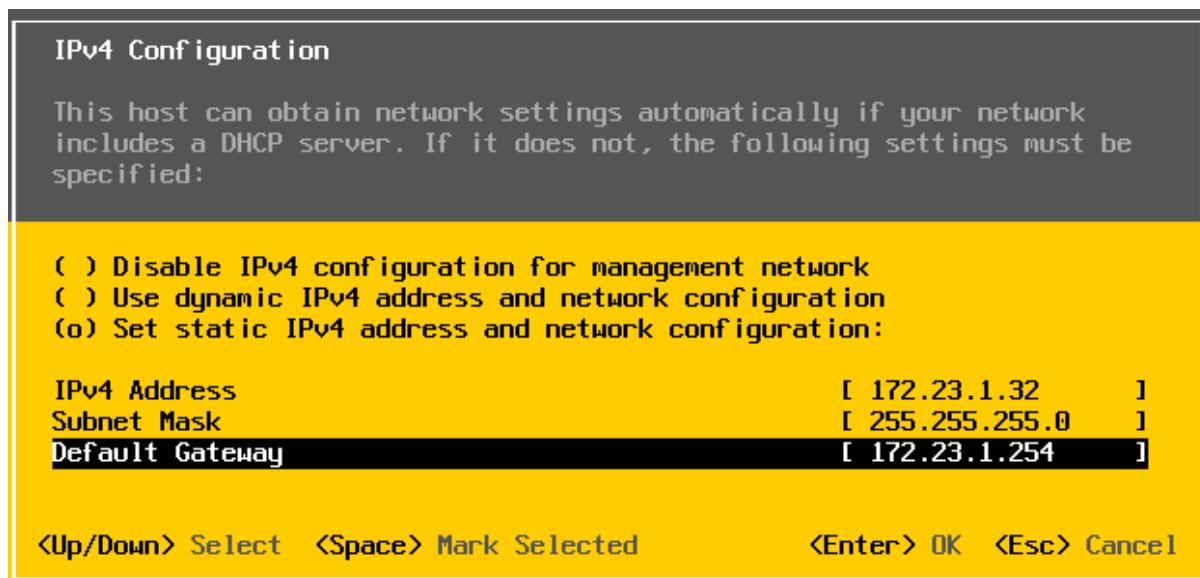


39. The host currently has an IP address which it obtained from the VMware Workstation DHCP service, we need to change that to the correct address. Use the Down arrow then the **Space Bar** to highlight and select **Set static IPv4 address and network configuration**

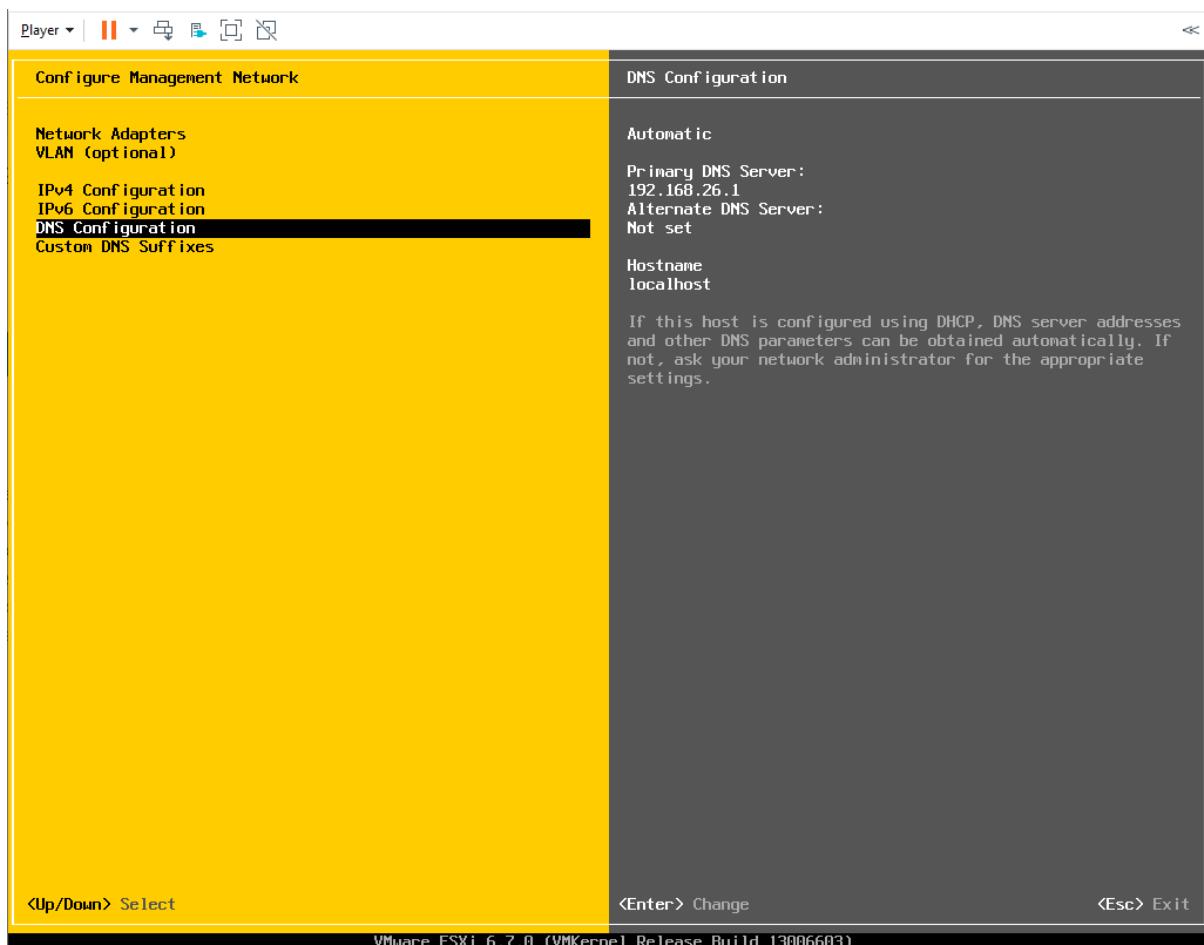


40. Configure these settings then hit **Enter**

IPv4 Address: 172.23.1.32
Subnet Mask: 255.255.255.0
Default Gateway: 172.23.1.254



41. Select **DNS Configuration** and hit **Enter**



42. Use the Down arrow then the **Space Bar** to highlight and select **Use the following DNS server addresses and hostname**

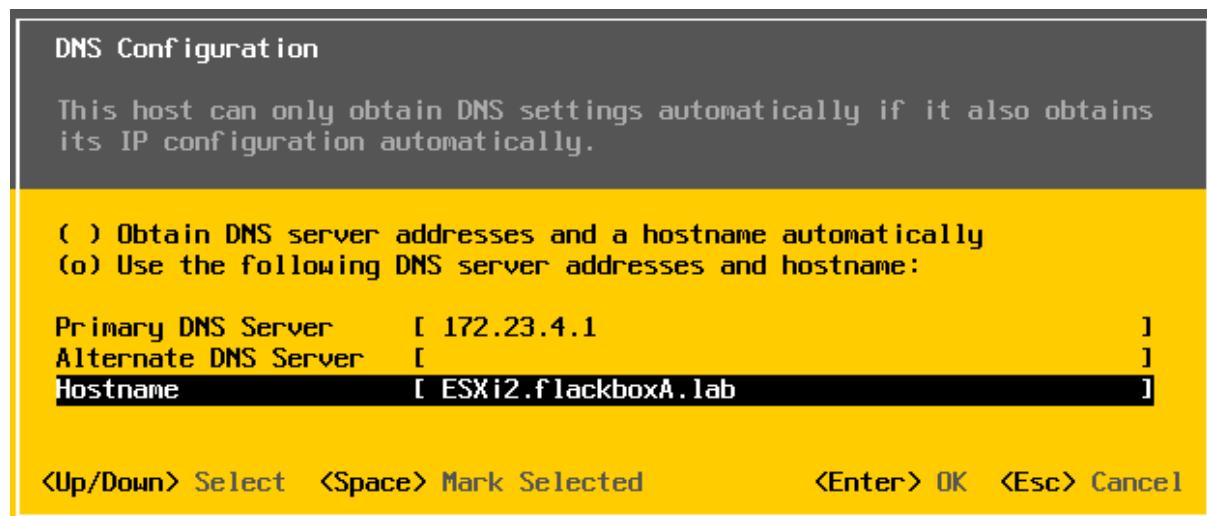


43. Configure these settings then hit **Enter**

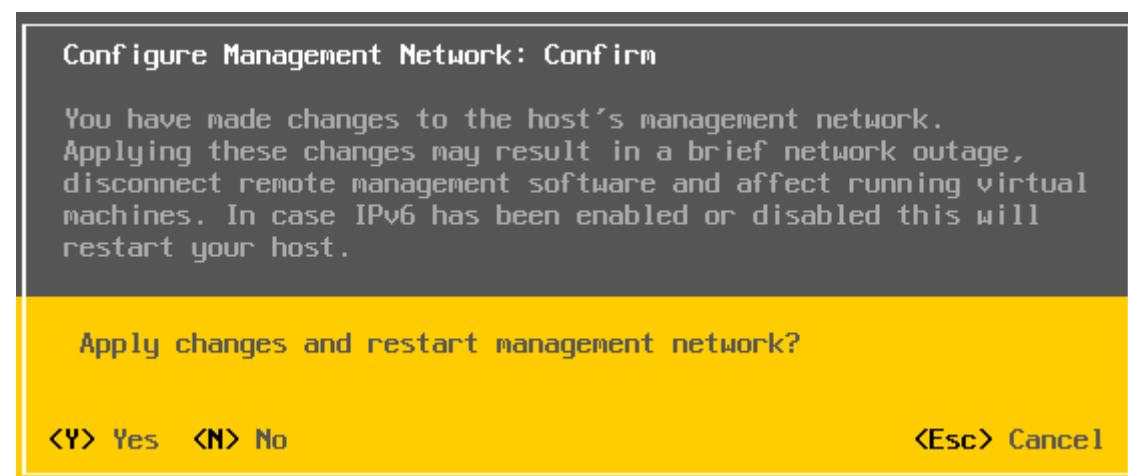
Primary DNS Server: 172.23.4.1

Alternate DNS Server: Leave blank

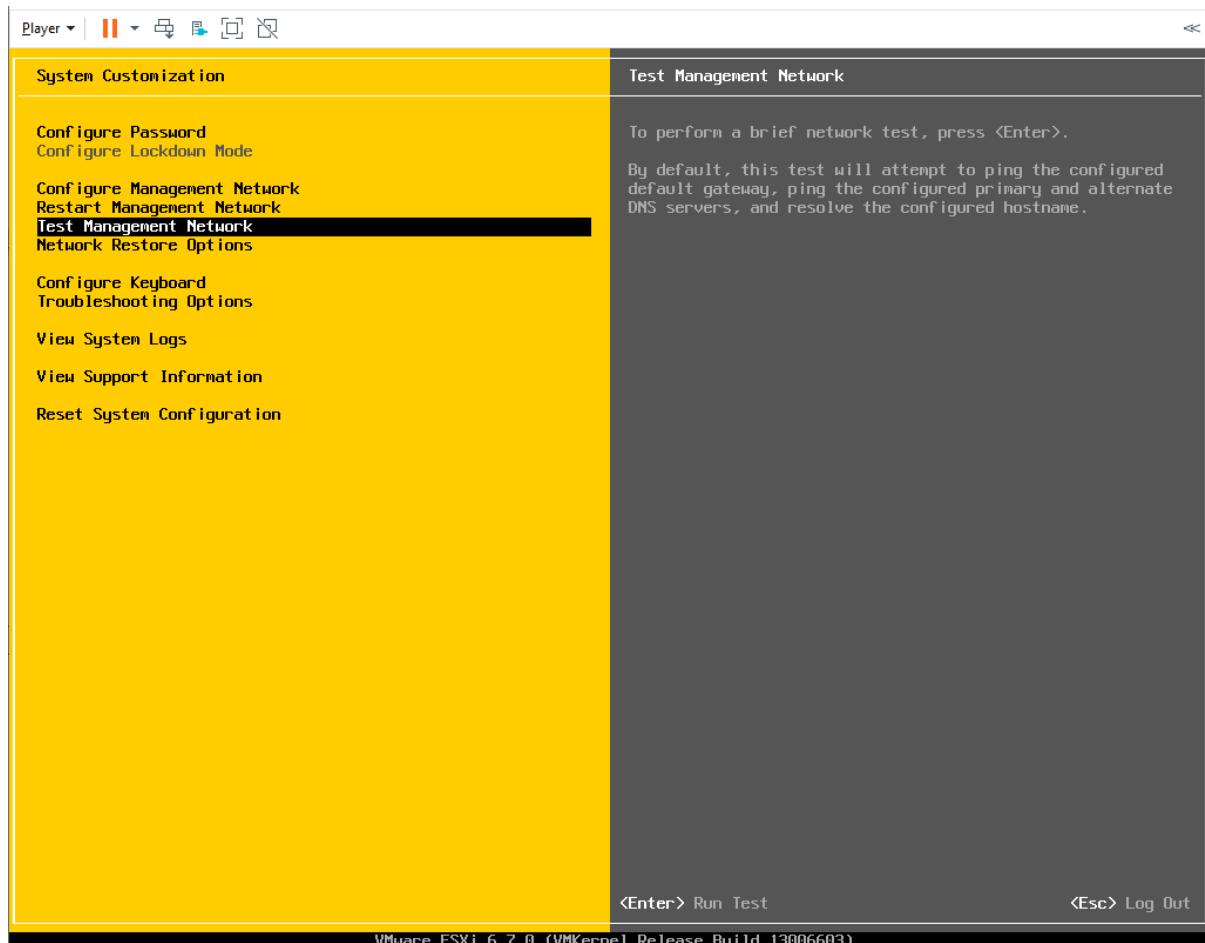
Hostname: ESXi2.flackboxA.lab



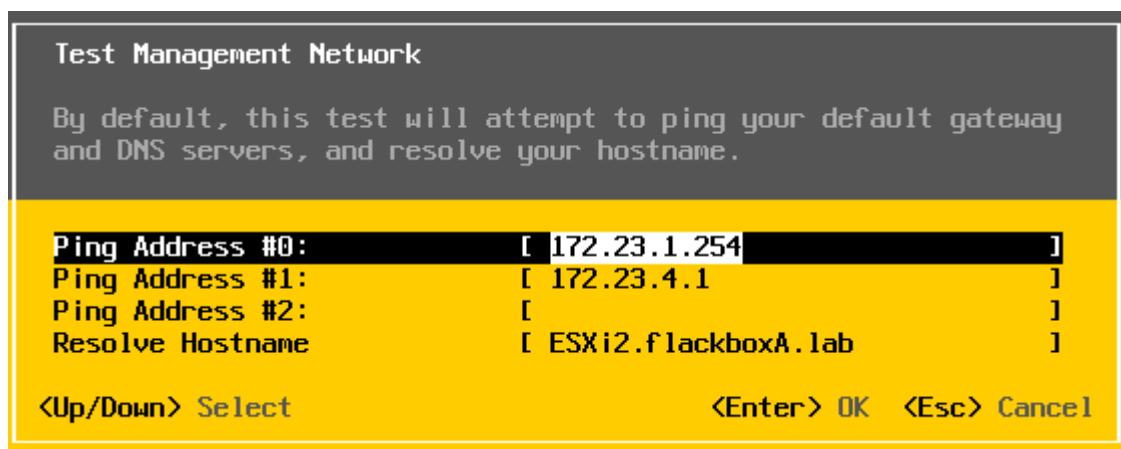
44. Hit **Escape** on your keyboard to Exit. Hit **Y** when prompted to save your changes.



45. Select **Test Management Network** and hit **Enter**



46. Hit **Enter** again to run the test

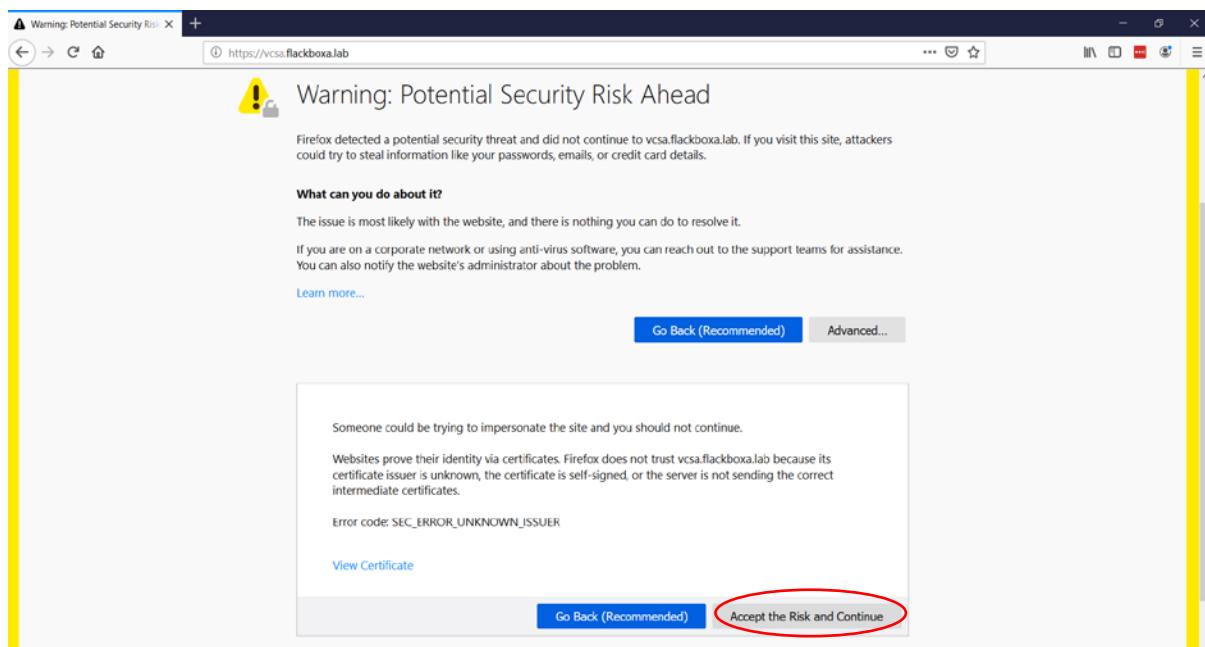


47. The tests should all complete successfully. Hit **Enter**



48. Hit **Escape** to log out. Installation of the ESXi2 host is now completed.

49. Open <https://vcsa.flackboxA.lab> in your web browser. Bypass any certificate warning messages in your browser.



50. Click the link to **Launch vSphere Client (HTML5)**

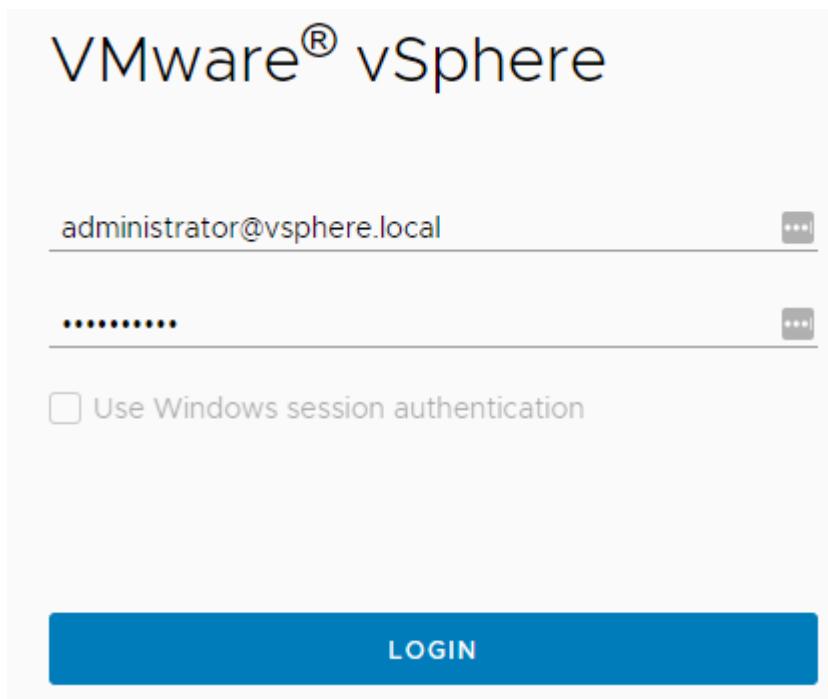


Getting Started

LAUNCH VSPHERE CLIENT (HTML5)

LAUNCH VSPHERE WEB CLIENT (FLEX)

51. Login with the username **administrator@vsphere.local** and password **Flackbox1!**



52. Expand **VCSA.flackboxA.lab** in the left hand window, then right click on the **Flackbox-Lab** datacentre and select **Add Host**

The screenshot shows the vSphere Client interface. At the top, it says "vSphere Client" and has a "Menu" dropdown and a search bar. The left sidebar shows a tree view with "VCSA.flackboxA.lab" expanded, and "Flackbox-Lab" selected. A context menu is open over "Flackbox-Lab", with the "Add Host..." option highlighted and circled in red. The main pane shows the "Flackbox-Lab" datacenter details with tabs for Networks, Distributed Switches, and Distributed P.

53. Enter ESXi2's IP address **172.23.1.32** then click **Next**

Add Host

1 Name and location

2 Connection settings	Name and location Enter the name or IP address of the host to add to vCenter Server.
3 Host summary	
4 Assign license	Host name or IP address: 172.23.1.32
5 Lockdown mode	Location:
6 VM location	 Flackbox-Lab
7 Ready to complete	

54. Enter ESXi2's credentials, User name **root** and password **Flackbox1!** then click **Next**. Click **Yes** when you see a certificate warning message.

Connection settings

Enter the host connection details

User name:	root	
Password:	

55. Click **Next** on the **Host Summary** page.

Host summary

Review the summary for the host

Name	172.23.1.32
Vendor	VMware, Inc.
Model	VMware7,1
Version	VMware ESXi 6.7.0 build-13006603
Virtual Machines	

56. Click **Next** on the **Assign license** page.

57. Accept the default and click **Next** on the **Lockdown mode** page.

58. Click **Next** on the **VM location** page.

59. Click **Finish** on the **Ready to complete** page.

Ready to complete
Click Finish to add the host

Name	172.23.1.32
Location	Flackbox-Lab
Version	VMware ESXi 6.7.0 build-13006603
License	Evaluation License
Networks	VM Network
Datastores	datastore1
Lockdown mode	Disabled
VM location	Flackbox-Lab

60. Click **172.23.1.32 > Configure > Virtual switches** and view the network configuration.

There is a single virtual switch configured, vSwitch0.

It is connected to the management network with a single uplink, vmnic0.

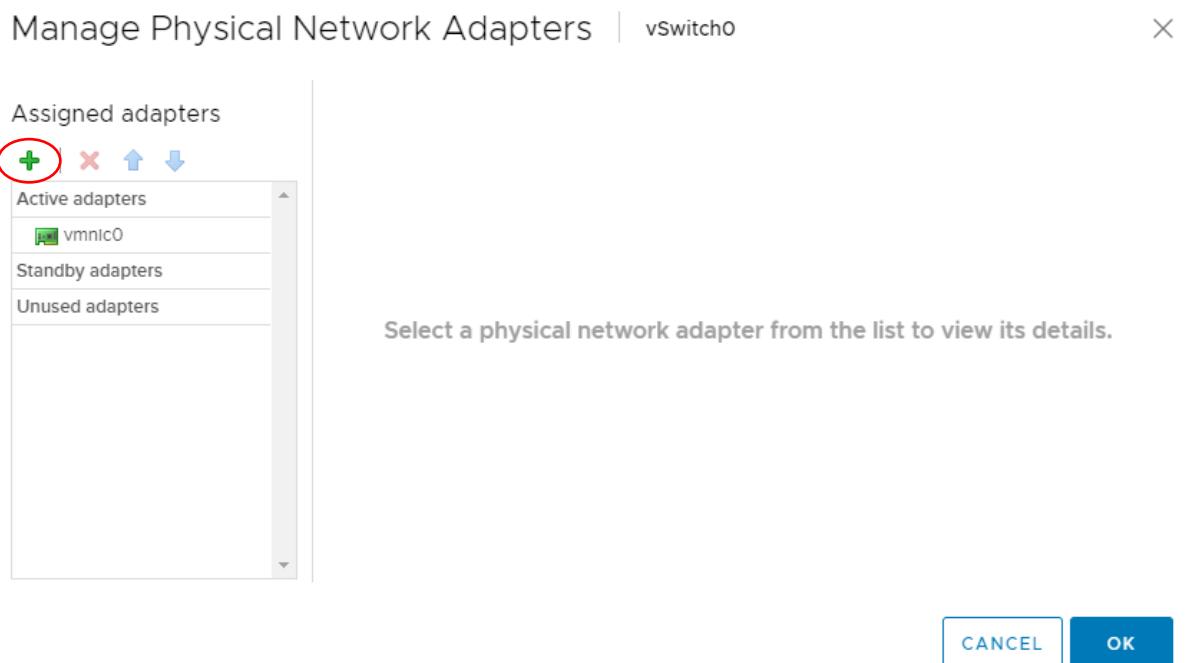
The management VMkernel port with IP address 172.23.1.32 and the 'VM Network' port group are connected to the switch.

The screenshot shows the vSphere Client interface for host 172.23.1.32. The left sidebar shows the host tree with 'Flackbox-Lab' selected. The main pane shows the 'Configure' tab selected. Under 'Networking', the 'Virtual switches' section is highlighted. A red circle highlights the 'Management Network' port group, which is connected to the 'vmk0' VMkernel port. Another red circle highlights the 'VM Network' port group, which is connected to the 'Virtual Machines' section. A large red box highlights the 'Physical Adapters' section, which contains the 'vmnic0' adapter.

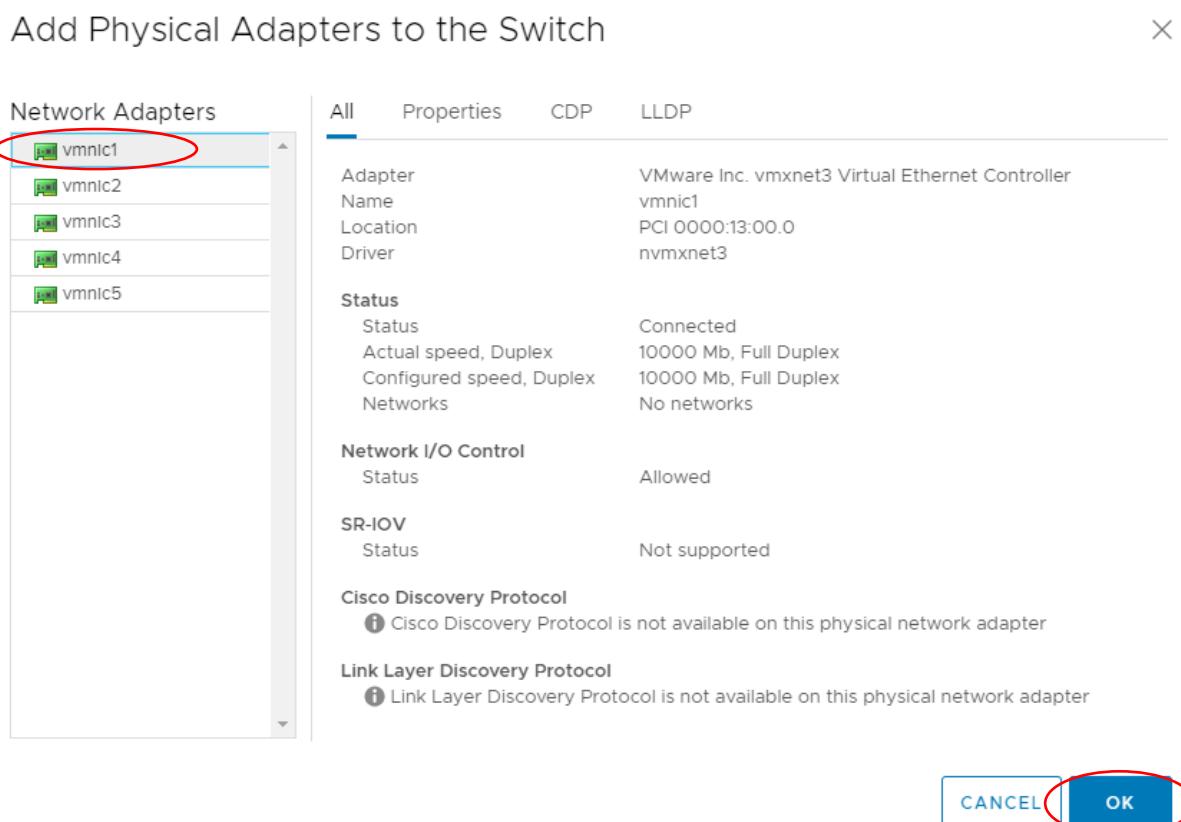
61. Click **Manage Physical Adapters**

The screenshot shows the vSphere Client interface for host 172.23.1.32. The left sidebar shows the host tree with 'Flackbox-Lab' selected. The main pane shows the 'Configure' tab selected. Under 'Networking', the 'Virtual switches' section is highlighted. A red circle highlights the 'Physical Adapters' section, which contains the 'vmnic0' adapter.

62. Click the **Plus** symbol



63. Select **vmnic1** and click **OK**



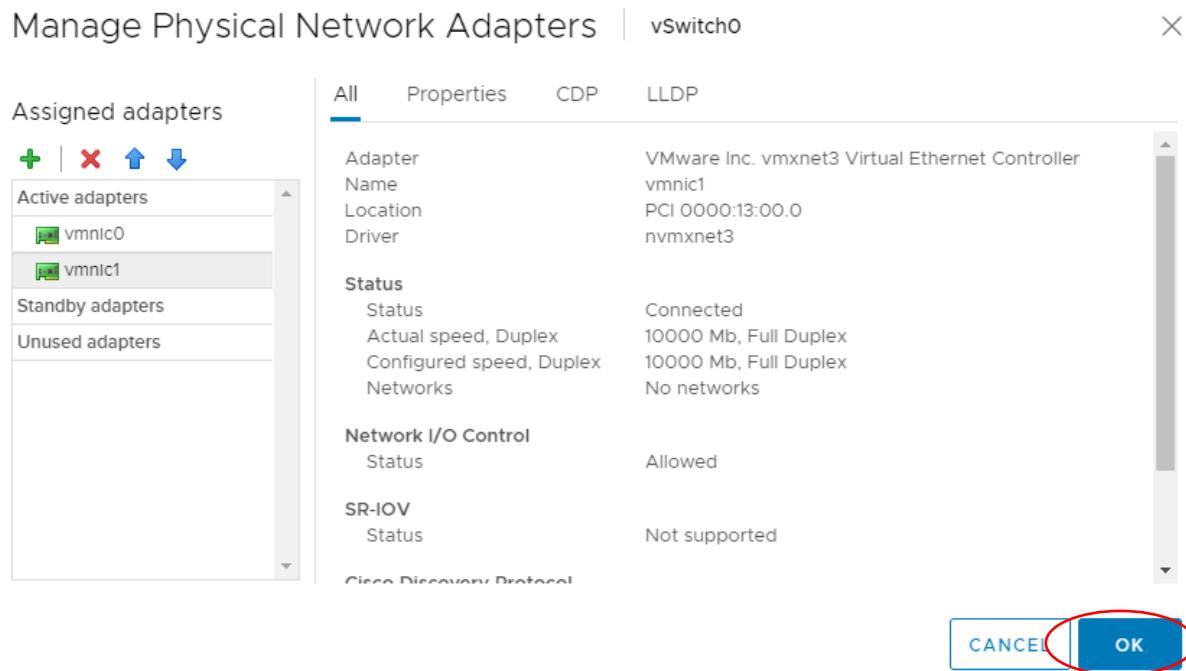
64. Click **OK** again

Manage Physical Network Adapters | vSwitch0

Assigned adapters

Adapter	VMware Inc. vmxnet3 Virtual Ethernet Controller
Name	vmnic1
Location	PCI 0000:13:00.0
Driver	nvmxnet3
Status	
Status	Connected
Actual speed, Duplex	10000 Mb, Full Duplex
Configured speed, Duplex	10000 Mb, Full Duplex
Networks	No networks
Network I/O Control	
Status	Allowed
SR-IOV	
Status	Not supported
Cisco Discovery Protocol	

CANCEL OK



65. You will see that you now have redundant uplinks to the management network using vmnic0 and vmnic1. The Lab Topology Diagram on page 4 of this guide shows a single management switch for simplicity. In a real world network vmnic0 and vmnic1 would be connected to separate, redundant switches.

vSphere Client | Search in all environments

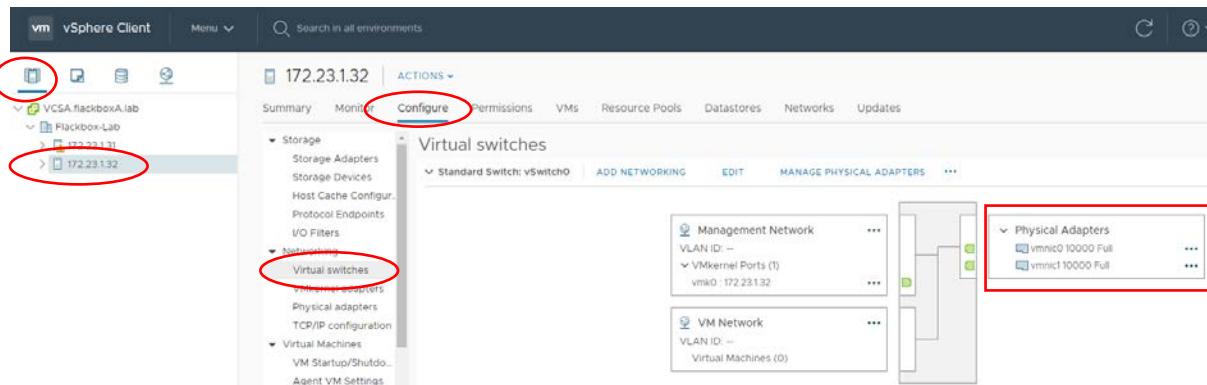
172.23.1.32 | ACTIONS ▾

VMCSA.flackboxA.lab | Configure

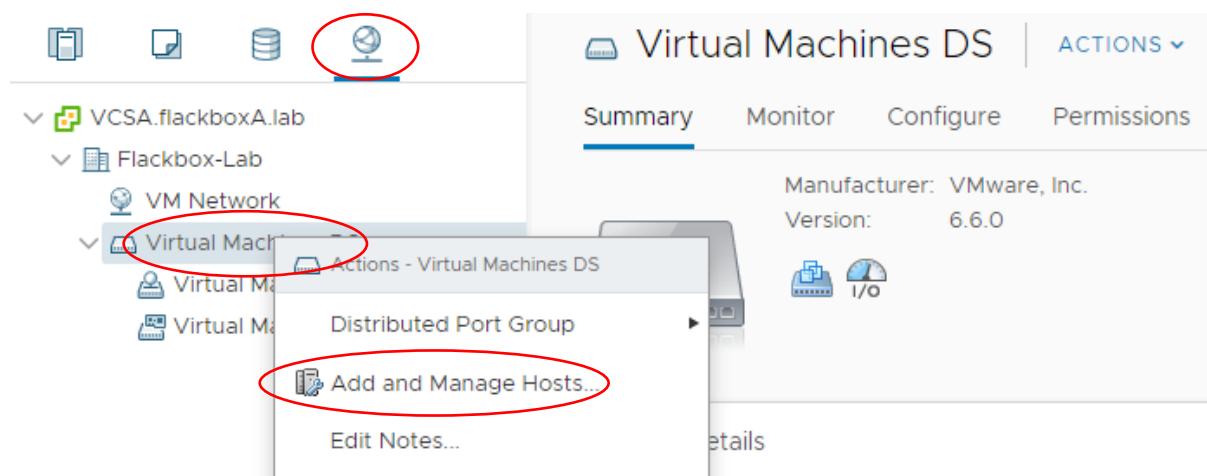
Virtual switches

Standard Switch: vSwitch0 | ADD NETWORKING | EDIT | MANAGE PHYSICAL ADAPTERS

Physical Adapters: vmnic0 10000 Full, vmnic1 10000 Full



66. Click in the Networking tab in the left-hand window, then right-click on the **Virtual Machines DS** distributed switch and select **Add and Manage Hosts...**



67. Choose **Add Hosts** on the Select Task page and click **Next**

Virtual Machines DS - Add and Manage Hosts

1 Select task 2 Select hosts 3 Manage physical adapters 4 Manage VMkernel adapt... 5 Migrate VM networking 6 Ready to complete

Select task
Select a task to perform on this distributed switch.

Add hosts
Add new hosts to this distributed switch.

Manage host networking
Manage networking of hosts attached to this distributed switch.

Remove hosts
Remove hosts from this distributed switch.

CANCEL BACK NEXT

68. Click on the **New hosts...** button on the Select Hosts page.

Virtual Machines DS - Add and Manage Hosts

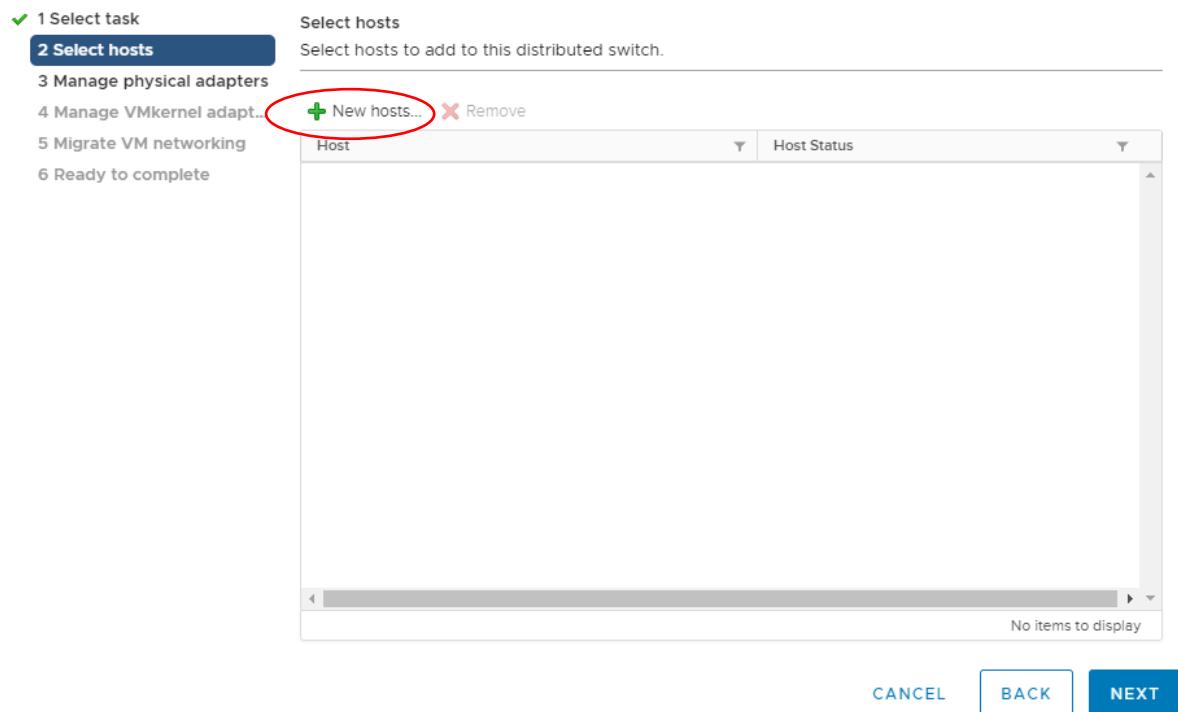
✓ 1 Select task
2 **Select hosts**
3 Manage physical adapters
4 Manage VMkernel adapt.
5 Migrate VM networking
6 Ready to complete

Select hosts
Select hosts to add to this distributed switch.

+ New hosts... X Remove

Host	Host Status
No items to display	

CANCEL BACK NEXT



69. Tick the checkbox for **172.23.1.32** and click **OK**

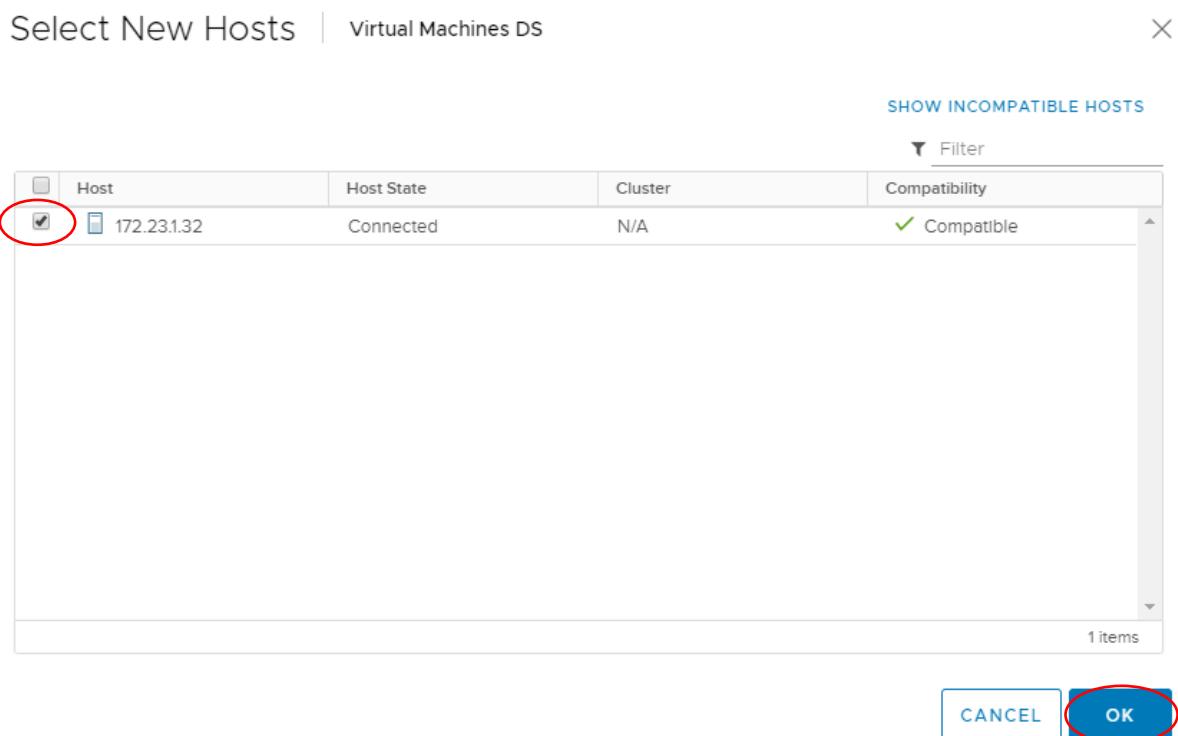
Select New Hosts | Virtual Machines DS X

SHOW INCOMPATIBLE HOSTS Filter

Host	Host State	Cluster	Compatibility
<input checked="" type="checkbox"/> 172.23.1.32	Connected	N/A	✓ Compatible

1 items

CANCEL OK



70. Click **Next**. On the Manage Physical Adapters page, highlight **vmnic4** and click **Assign uplink**

Virtual Machines DS - Add and Manage Hosts

The screenshot shows the 'Manage physical adapters' interface. On the left, a sidebar lists steps: 1 Select task, 2 Select hosts, 3 Manage physical adapters (highlighted in blue), 4 Manage VMkernel adapt..., 5 Migrate VM networking, and 6 Ready to complete. The main area has a header 'Manage physical adapters' and a sub-header 'Add or remove physical network adapters to this distributed switch.' Below this is a table with columns: Host/Physical Network Adapters, In Use by Switch, Uplink, and Uplink Port Group. The table shows several adapters: vmnic0, vmnic1, vmnic2, vmnic3, vmnic4 (highlighted with a red circle), and vmnic5. The 'Assign uplink' button is located at the top of the table area, also highlighted with a red circle.

71. Click **OK**

The screenshot shows a 'Select an Uplink' dialog box. At the top, it says 'Select an Uplink | vmnic4' and has a close button 'X'. Below is a table with two columns: 'Uplink' and 'Assigned Adapter'. It lists three items: 'Uplink 1' and 'Uplink 2' (both with '--' assigned) and '(Auto-assign)'. At the bottom are 'CANCEL' and 'OK' buttons.

Uplink	Assigned Adapter
Uplink 1	--
Uplink 2	--
(Auto-assign)	

72. Highlight **vmnic5** and click **Assign uplink**

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.32			
On this switch			
vmnic4 (Assigned)	--	Uplink 1	Virtual Machines-...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--
vmnic5	--	--	--

CANCEL **BACK** **NEXT**

73. Click **OK**

Select an Uplink | vmnic5 ×

Uplink	Assigned Adapter
Uplink 1	vmnic4
Uplink 2	--
(Auto-assign)	

3 items

CANCEL **OK**

74. Click **Next**

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.32			
On this switch			
vmnic4 (Assigned)	--	Uplink 1	Virtual Machines-...
vmnic5 (Assigned)	--	Uplink 2	Virtual Machines-...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--

CANCEL BACK **NEXT**

75. Click **Next** on the Manage VMkernel adapters page

76. Click **Next** on the Migrate VM networking page

77. Click Finish on the Ready to Complete page

Virtual Machines DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
✓ 3 Manage physical adapters
✓ 4 Manage VMkernel adapt...
✓ 5 Migrate VM networking
6 Ready to complete

Ready to complete
Review your settings selections before finishing the wizard.

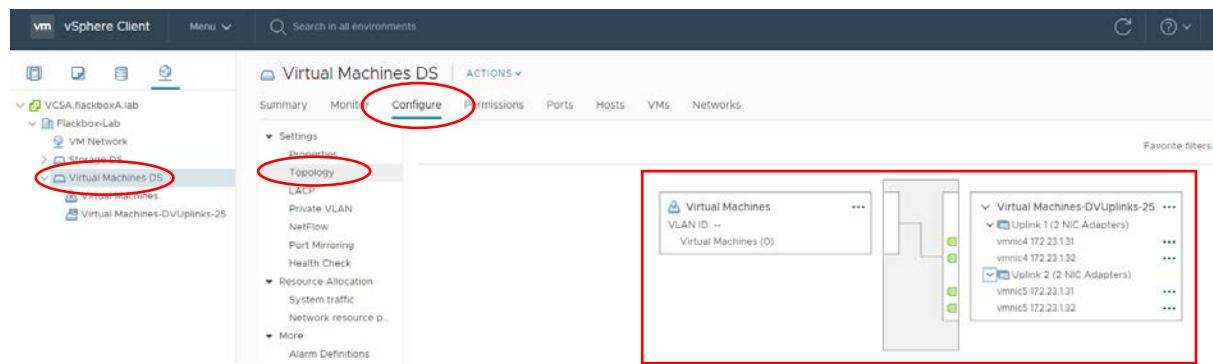
Number of managed hosts
Hosts to add 1

Number of network adapters for update
Physical adapters 2

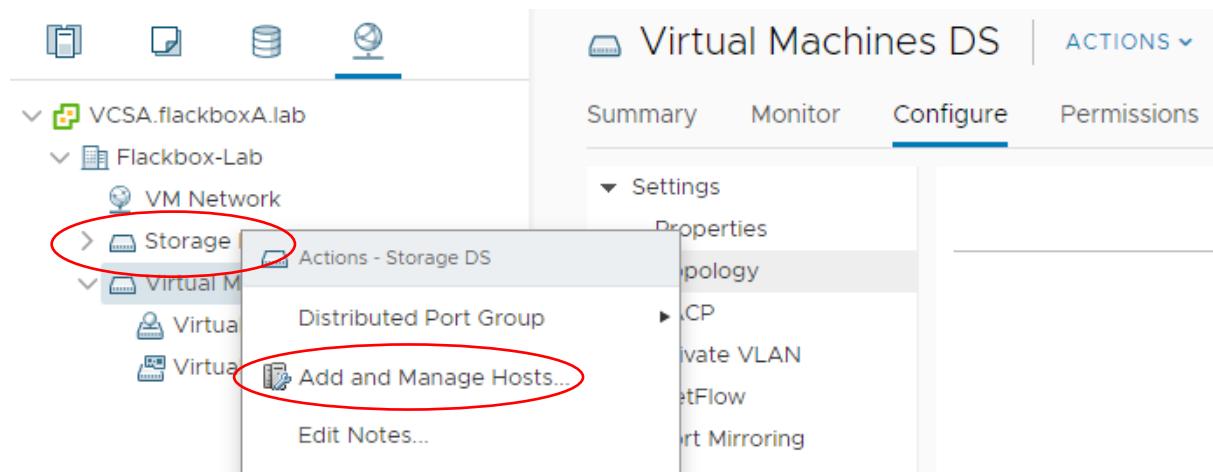
CANCEL BACK **FINISH**

78. With the **Virtual Machines DS** distributed switch selected in the left-hand window, click **Configure > Topology** to verify the configuration.

The Lab Topology Diagram on page 4 of this guide shows a single switch for the virtual machines network for simplicity. In a real world network vmnic4 and vmnic5 would be connected to separate, redundant switches.



79. Right-click on the **Storage DS** distributed switch in the left-hand window and select **Add and Manage Hosts...**.



80. Choose **Add Hosts** on the Select Task page and click **Next**

Storage DS - Add and Manage Hosts

1 Select task

2 Select hosts

3 Manage physical adapters

4 Manage VMkernel adapt...

5 Migrate VM networking

6 Ready to complete

Select task
Select a task to perform on this distributed switch.

Add hosts
Add new hosts to this distributed switch.

Manage host networking
Manage networking of hosts attached to this distributed switch.

Remove hosts
Remove hosts from this distributed switch.

CANCEL **BACK** **NEXT**

81. Click on the **New hosts...** button on the Select Hosts page.

Storage DS - Add and Manage Hosts

✓ 1 Select task

2 Select hosts

3 Manage physical adapters

4 Manage VMkernel adapt...

5 Migrate VM networking

6 Ready to complete

Select hosts
Select hosts to add to this distributed switch.

+ New hosts... **Remove**

Host	Host Status
No items to display	

CANCEL **BACK** **NEXT**

82. Tick the checkbox for **172.23.1.32** and click **OK**

Select New Hosts | Storage DS X

SHOW INCOMPATIBLE HOSTS Filter

Host	Host State	Cluster	Compatibility
<input checked="" type="checkbox"/> 172.23.1.32	Connected	N/A	✓ Compatible

1 items

CANCEL OK

83. Click **Next**. On the Manage Physical Adapters page, highlight **vmnic2** and click **Assign uplink**

Storage DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters NEXT

4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

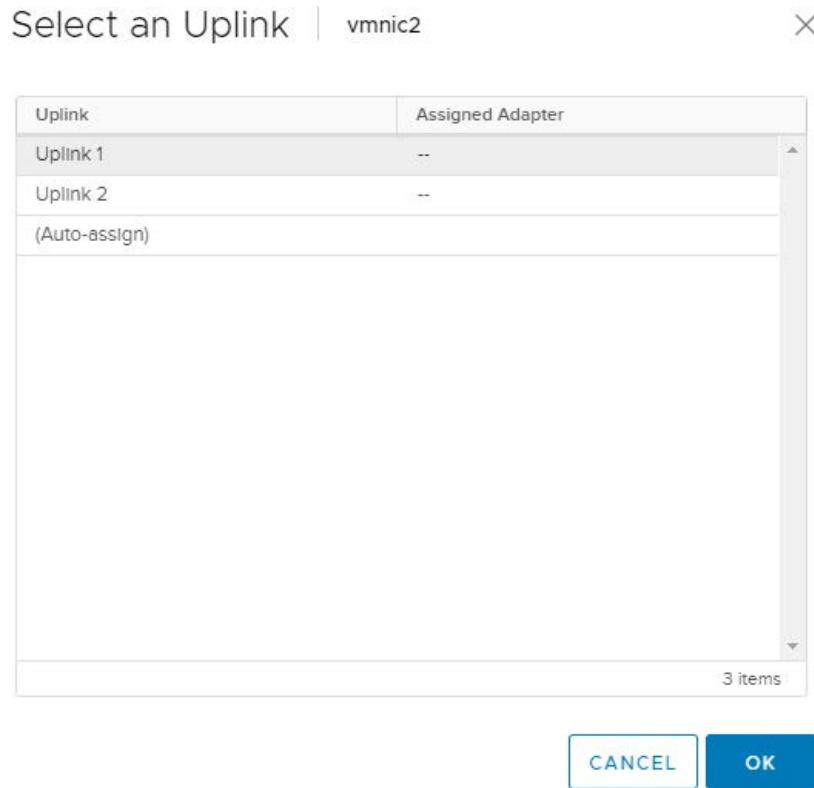
Manage physical adapters
Add or remove physical network adapters to this distributed switch.

Assign uplink Unassign adapter View settings

Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.32			
On this switch			
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic2	--	--	--
vmnic3	--	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL BACK NEXT

84. Click **OK**



85. Highlight **vmnic3** and click **Assign uplink**

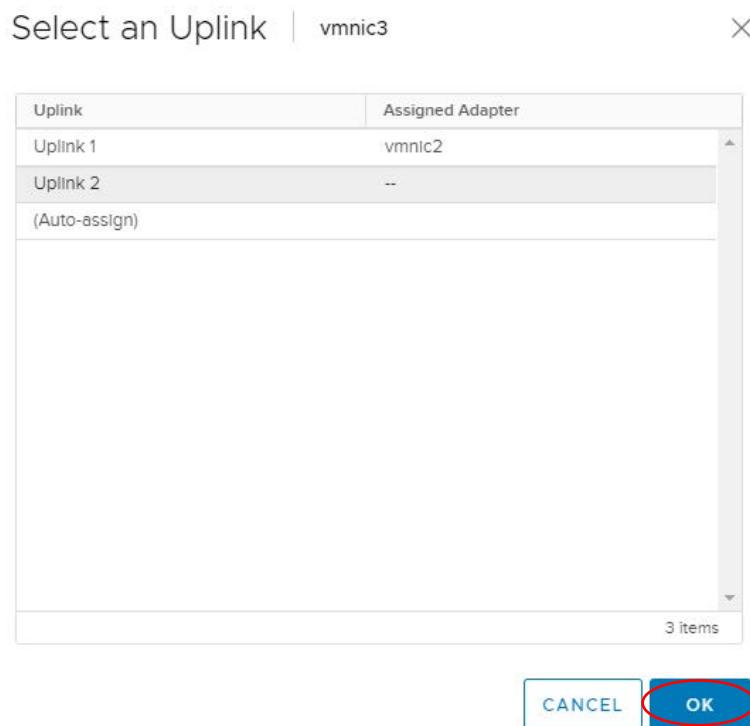
Storage DS - Add and Manage Hosts

- ✓ 1 Select task
- ✓ 2 Select hosts
- 3 Manage physical adapters**
- 4 Manage VMkernel adapt...
- 5 Migrate VM networking
- 6 Ready to complete

Manage physical adapters			
Add or remove physical network adapters to this distributed switch.			
Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.32			
On this switch			
vmnic2 (Assigned)	--	Uplink 1	Storage DS-DVU...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic3	--	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL BACK **NEXT**

86. Click **OK**



87. Click **Next**

Storage DS - Add and Manage Hosts

✓ 1 Select task
✓ 2 Select hosts
3 Manage physical adapters
4 Manage VMkernel adapt...
5 Migrate VM networking
6 Ready to complete

Manage physical adapters
Add or remove physical network adapters to this distributed switch.

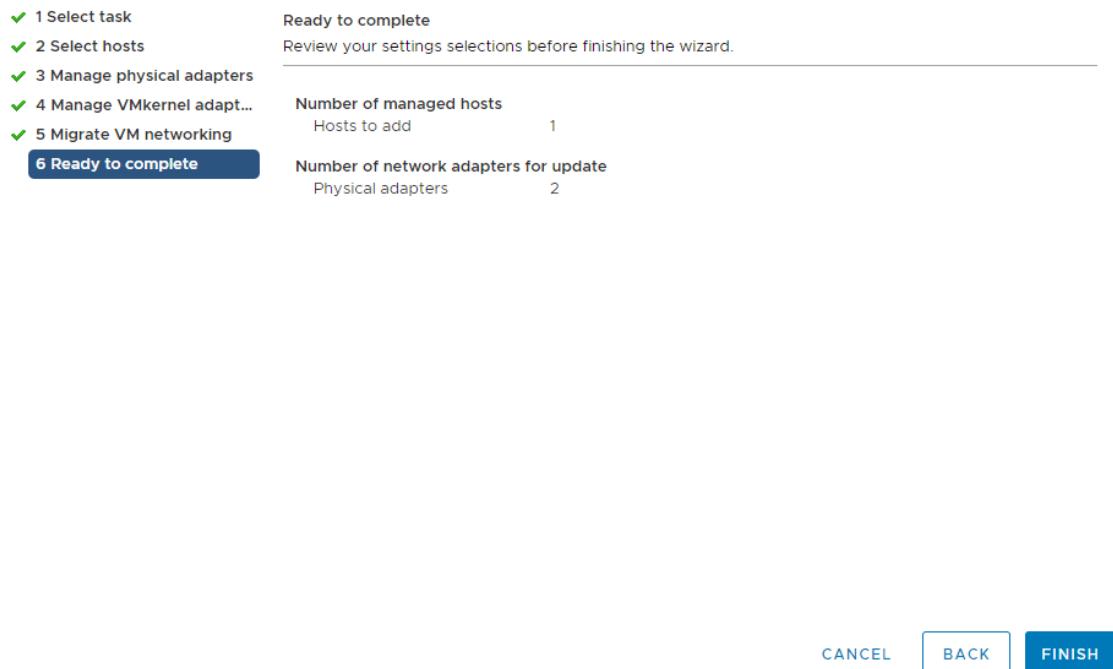
Host/Physical Network Adapters	In Use by Switch	Uplink	Uplink Port Group
172.23.1.32			
On this switch			
vmnic2 (Assigned)	--	Uplink 1	Storage DS-DVU...
vmnic3 (Assigned)	--	Uplink 2	Storage DS-DVU...
On other switches/unclaimed			
vmnic0	vSwitch0	--	--
vmnic1	vSwitch0	--	--
vmnic4	Virtual Machines DS	--	--
vmnic5	Virtual Machines DS	--	--

CANCEL BACK **NEXT**

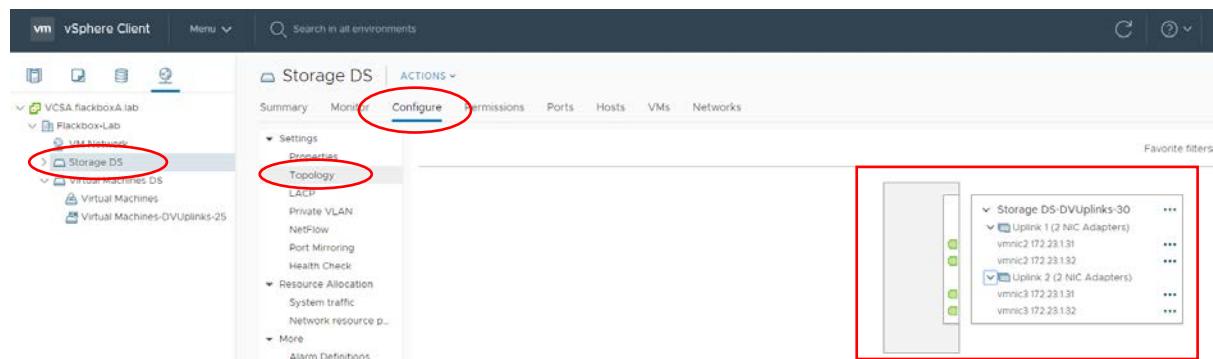
88. Click **Next** on the Manage VMkernel adapters page
89. Click **Next** on the Migrate VM networking page

90. Click Finish on the Ready to Complete page

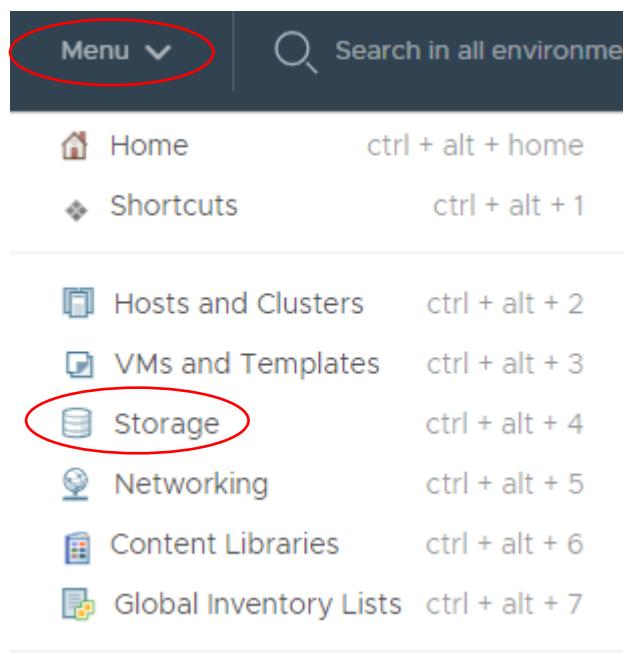
Storage DS - Add and Manage Hosts



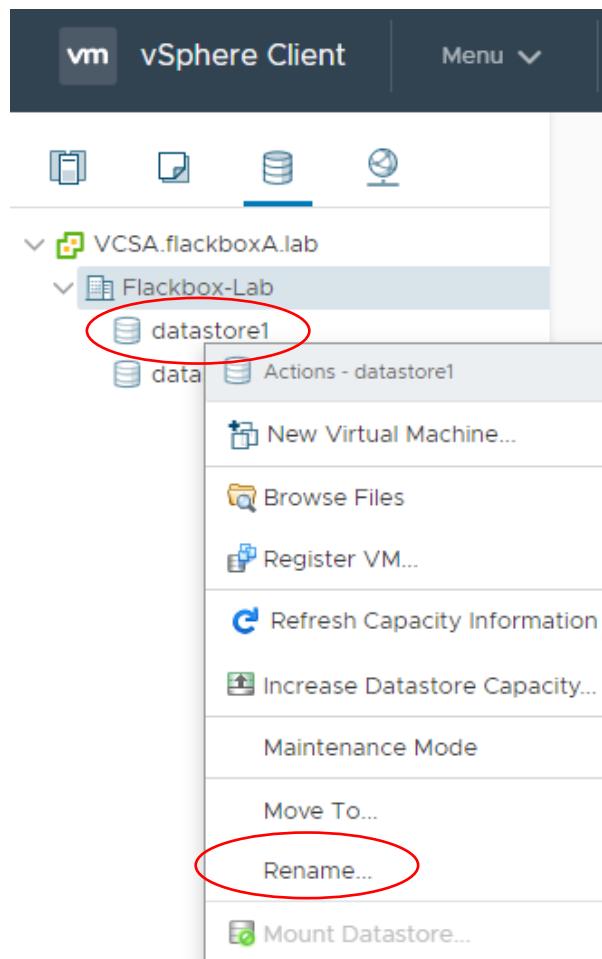
91. With the **Storage DS** distributed switch selected in the left-hand window, click **Configure > Topology** to verify the configuration.



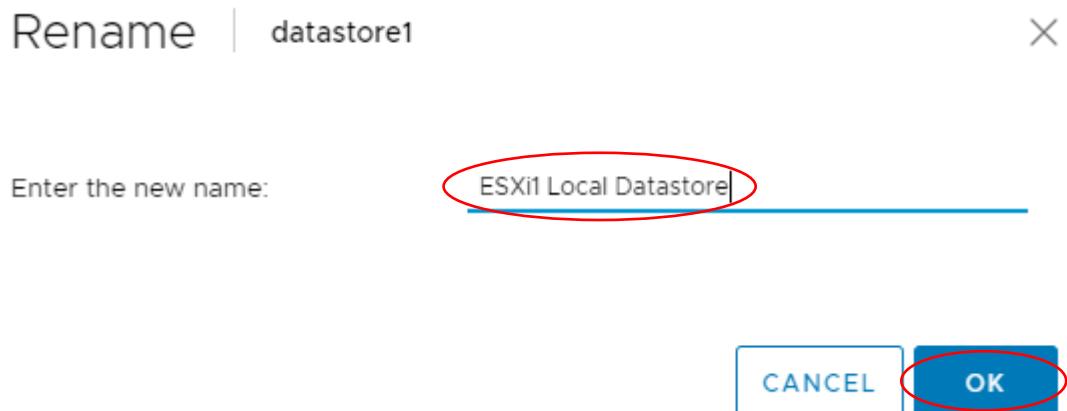
92. Click **Menu > Storage**



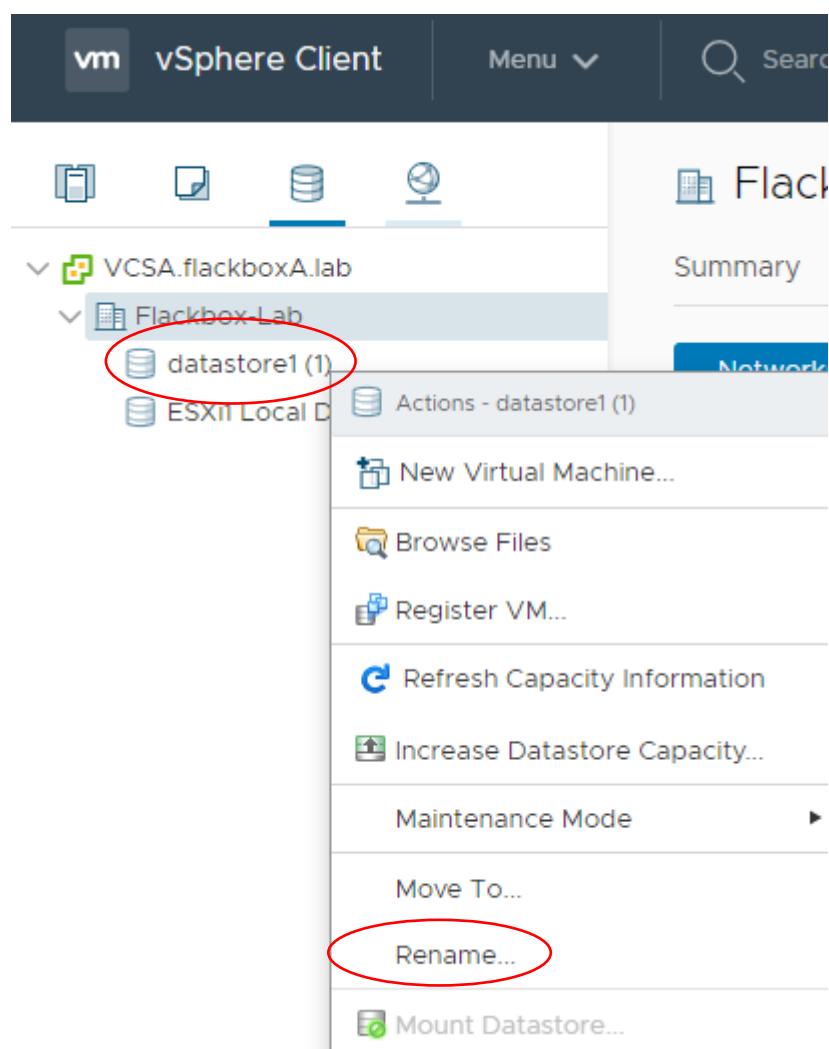
93. Expand **Flackbox-Lab** then right-click on **datastore1** and select **Rename**



94. **datastore1** uses the local disk in the ESXi1 host. Rename it to the more descriptive name of **ESXi1 Local Datastore** then click **OK**



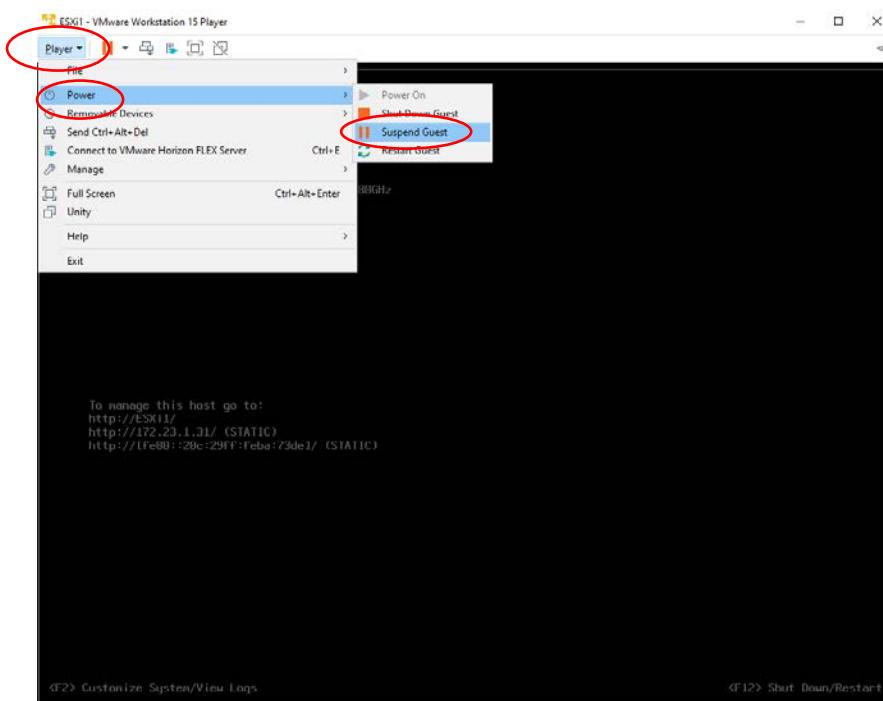
95. Right-click on **datastore1(1)** and select **Rename**



96. **datastore1(1)** uses the local disk in the ESXi2 host. Rename it to the more descriptive name of **ESXi2 Local Datastore** then click **OK**



97. Setup of the ESXi2 host is now complete. In VMware Workstation Player click **Player > Power > Suspend Guest**



98. If you are using VMware Workstation Pro take a snapshot of both ESXi1 and ESXi2 now, name the snapshots 'Base'. If you are using VMware Workstation Player then copy the 'ESXi1' and 'ESXi2' folders from the 'NetApp Lab' folder to the 'NetApp Lab Backup' folder.

Optional: CentOS ‘API’ Host Installation for OnCommand API Services

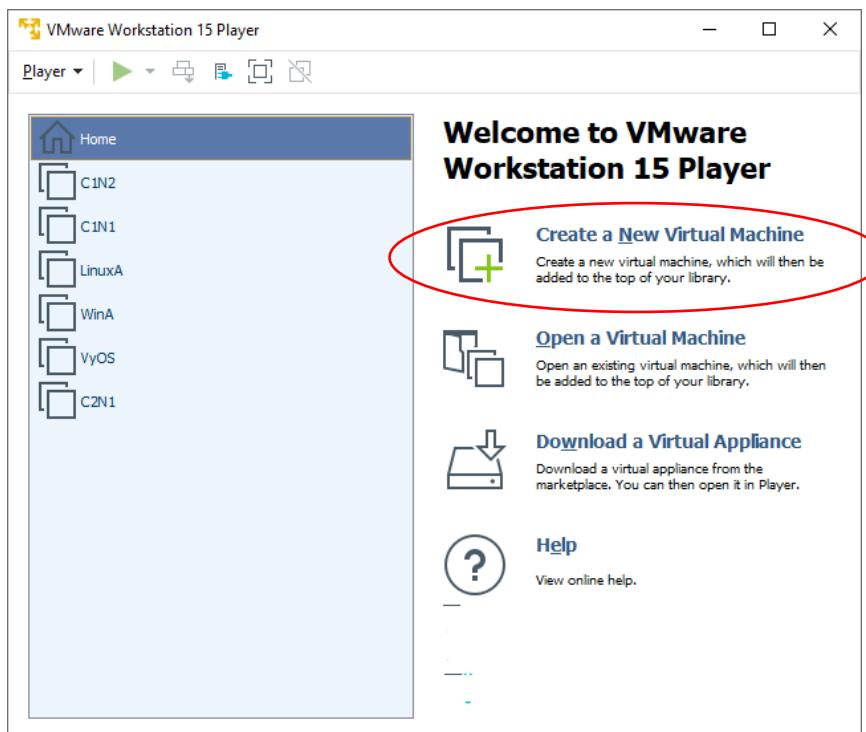
You can configure VMware VVol datastores on ONTAP storage using NetApp VSC, without a need to also install OnCommand API Services. In order to view the VSC Vvol Dashboard and reports however, OnCommand API Services must also be installed on a separate Red Hat or CentOS Linux host.

You will build the CentOS host in this section. You can download OnCommand API Services from the NetApp website and install it here after completing this section.

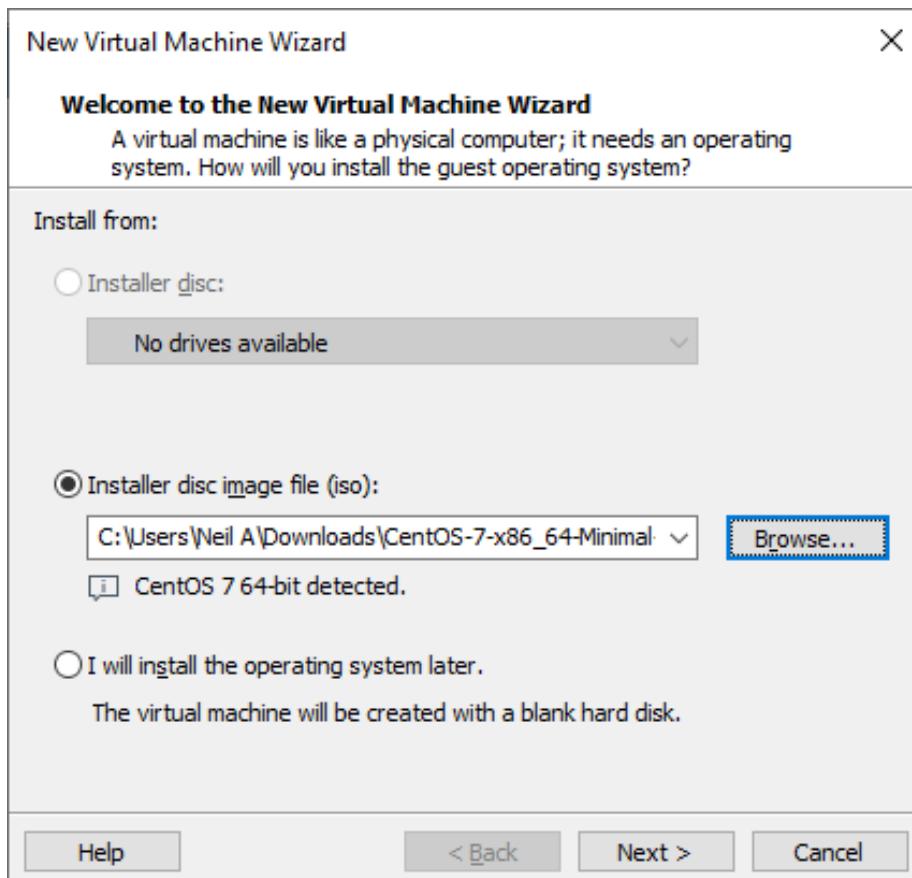
You only need to complete this section if you are going to configure VMware vSphere VVols in NetApp VSC **and** you want to see the VVol Dashboard and reports.

1. In the NetApp Lab folder, make a subfolder named **API**. We will create the CentOS Linux host in here.
2. Open <http://old-releases.ubuntu.com/releases/18.04.2/ubuntu-18.04.2-desktop-amd64.iso> in a web browser to download the CentOS Minimal ISO installation software.

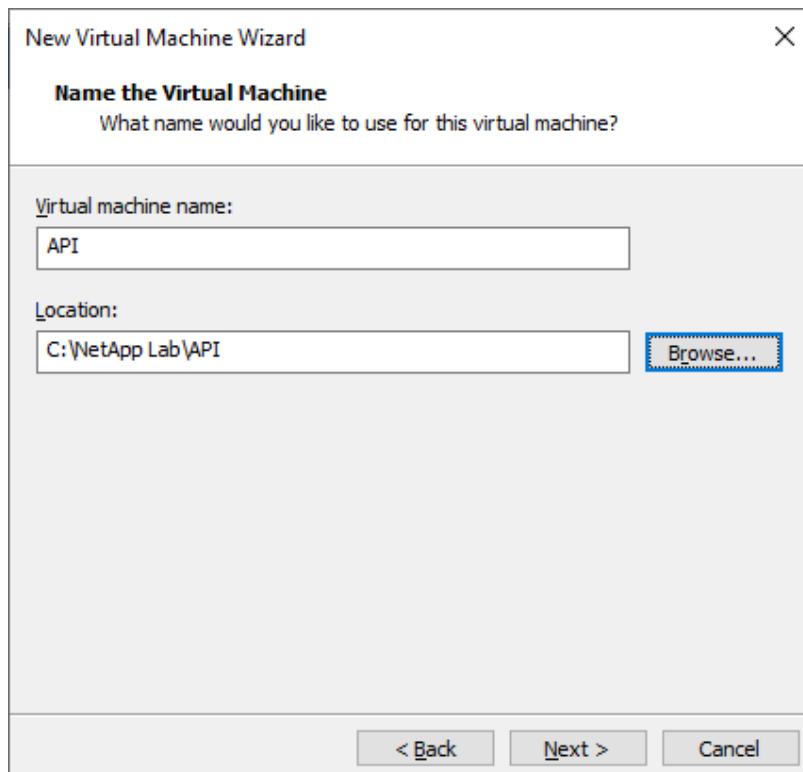
3. Open VMware Workstation Player and click **Create a New Virtual Machine**



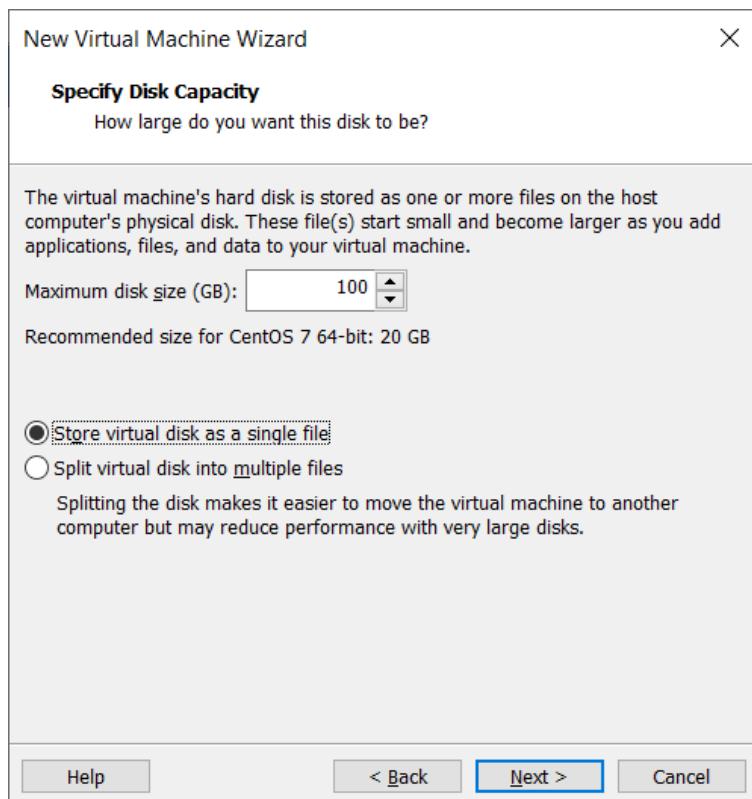
4. Click **Browse...** and select the CentOS ISO file you just downloaded then click **Next**.



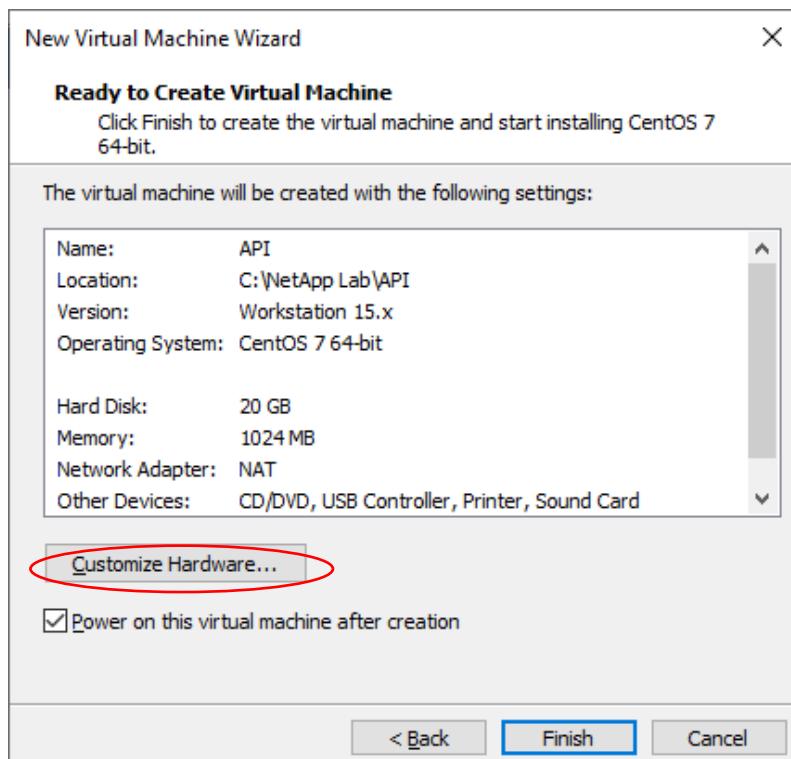
5. Name the virtual machine **API** and save it in the **C:\NetApp Lab\API** folder



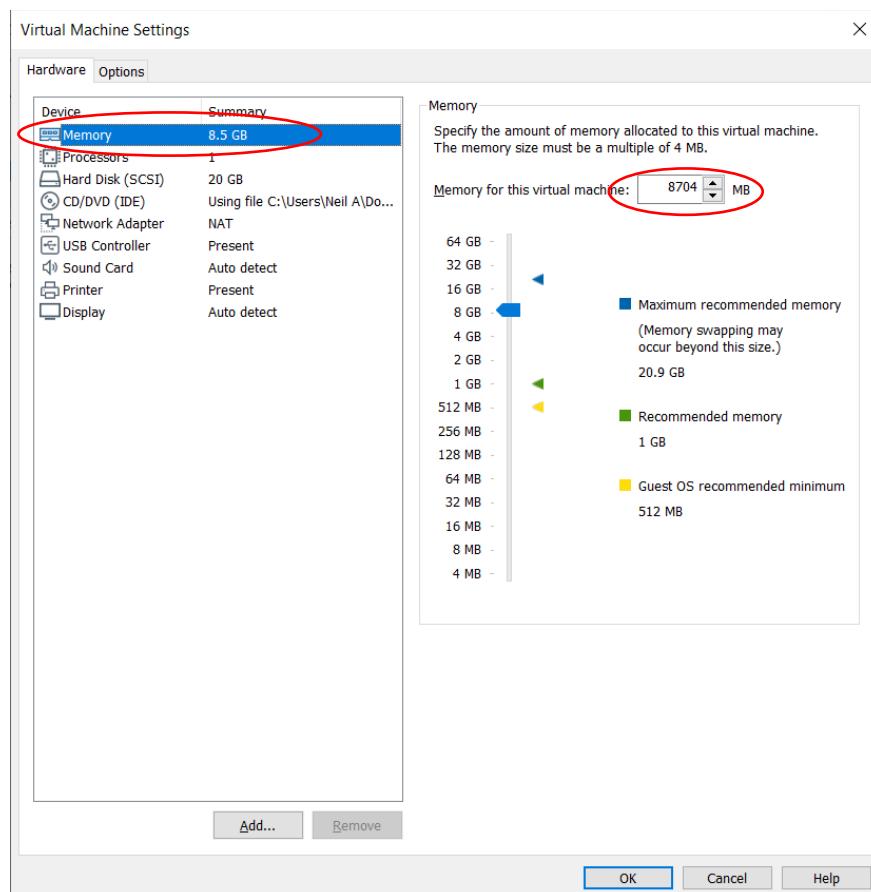
6. Set the **maximum disk size** to **100 GB** and **Store virtual disk as a single file**.



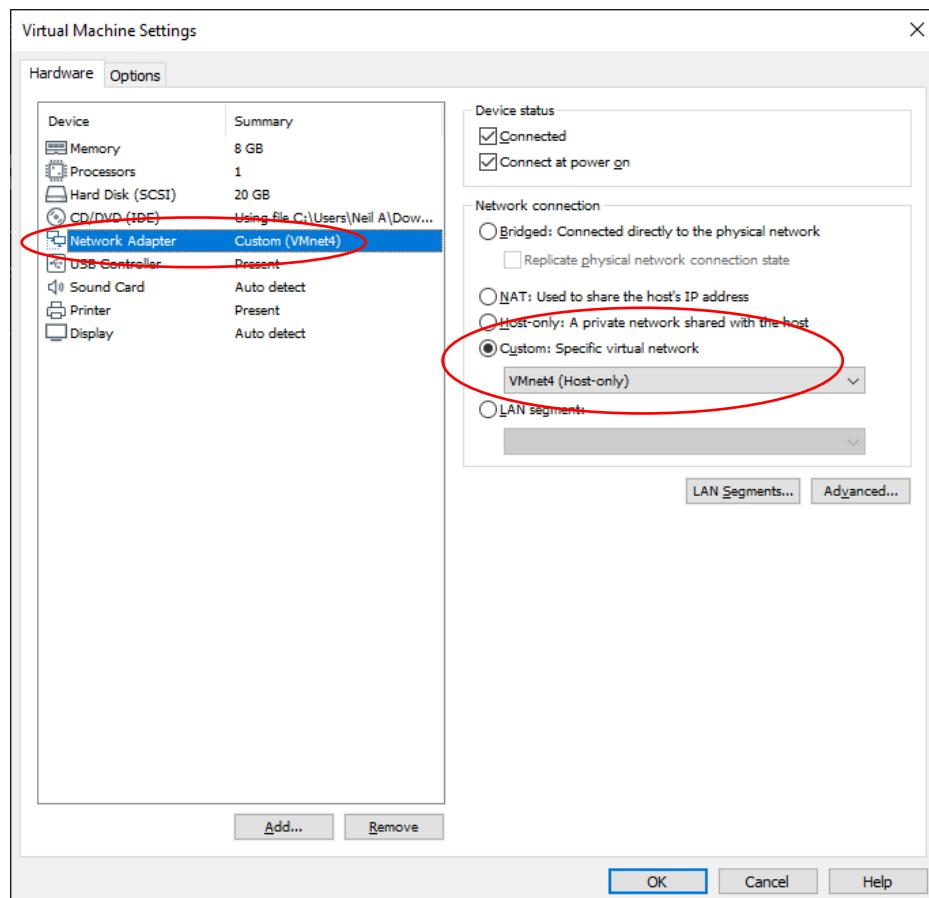
7. Click **Customize Hardware...**



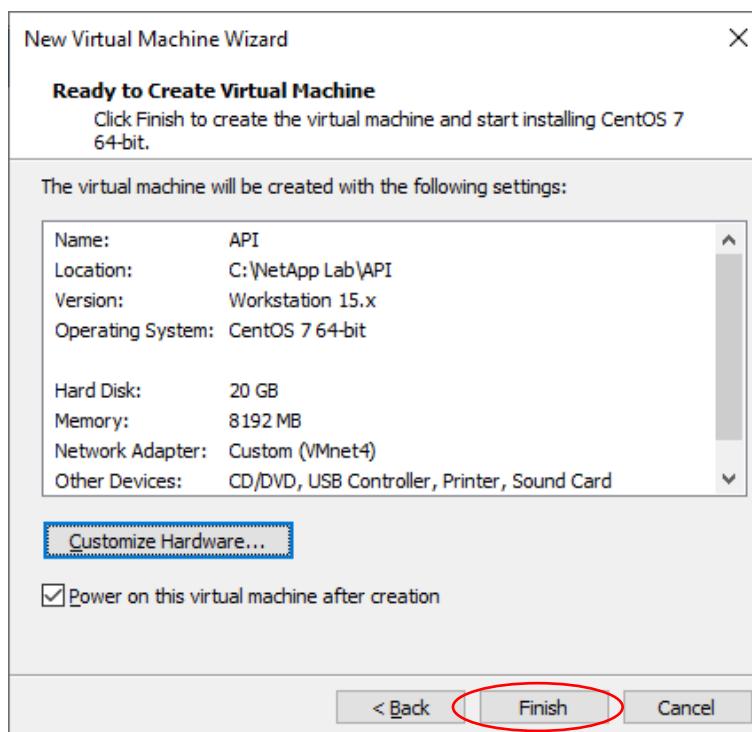
8. Set the Memory to 8704 MB



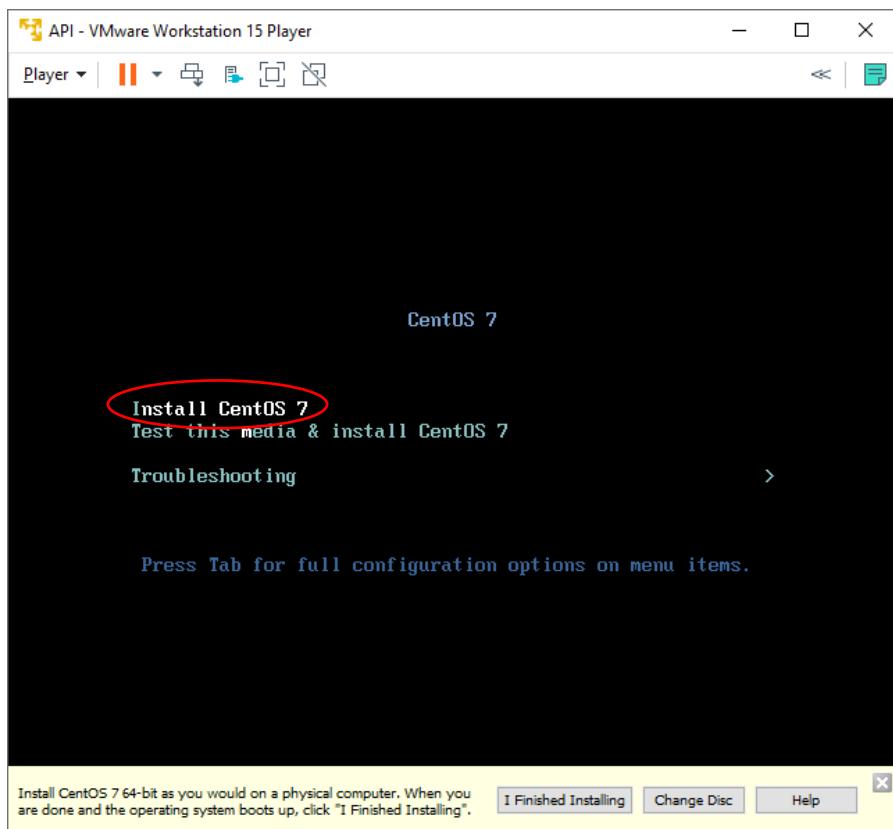
9. Select the Network Adapter and place it in the **Custom: VMnet4** network



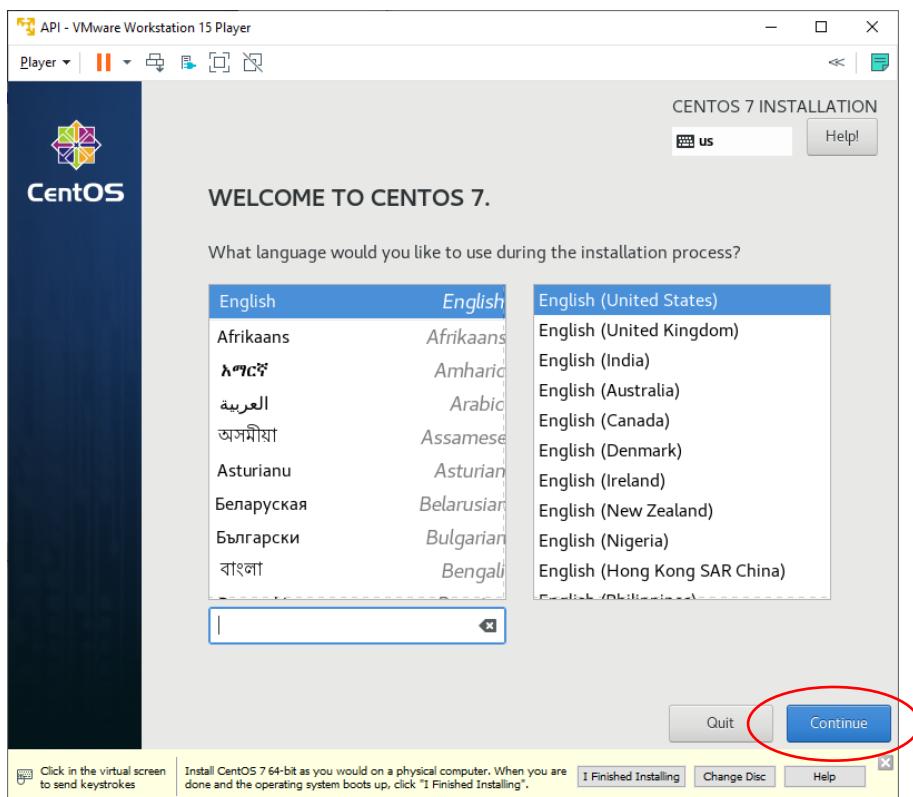
10. Click **Close** then **Finish** to power on the virtual machine



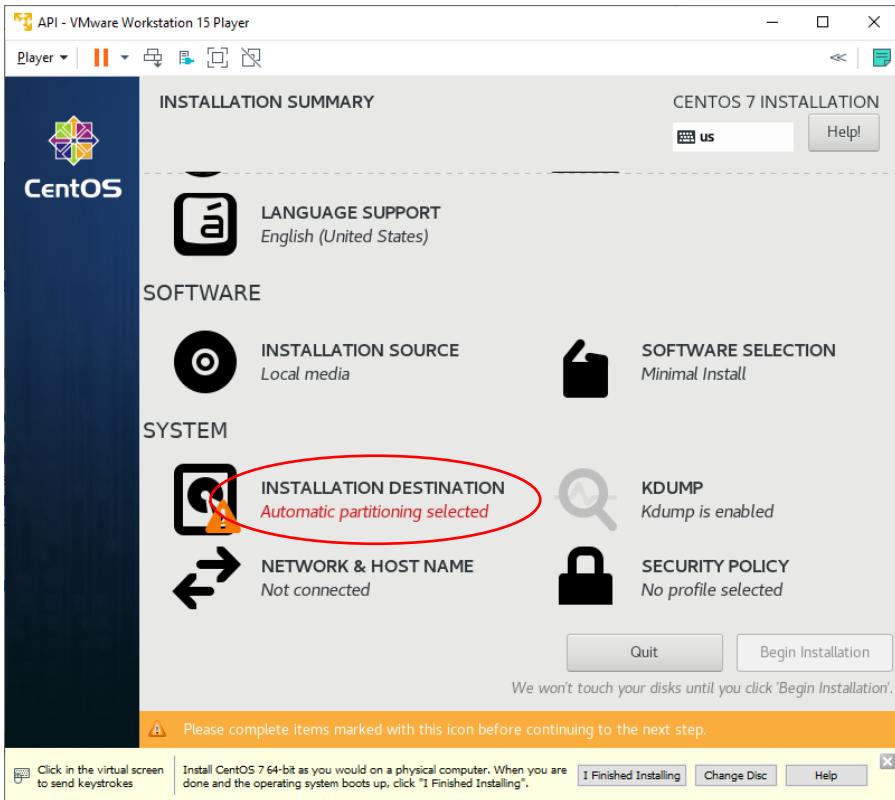
11. Click inside the VMware window and hit the up arrow on your keyboard to select **Install CentOS 7** then **Enter** to begin the installation



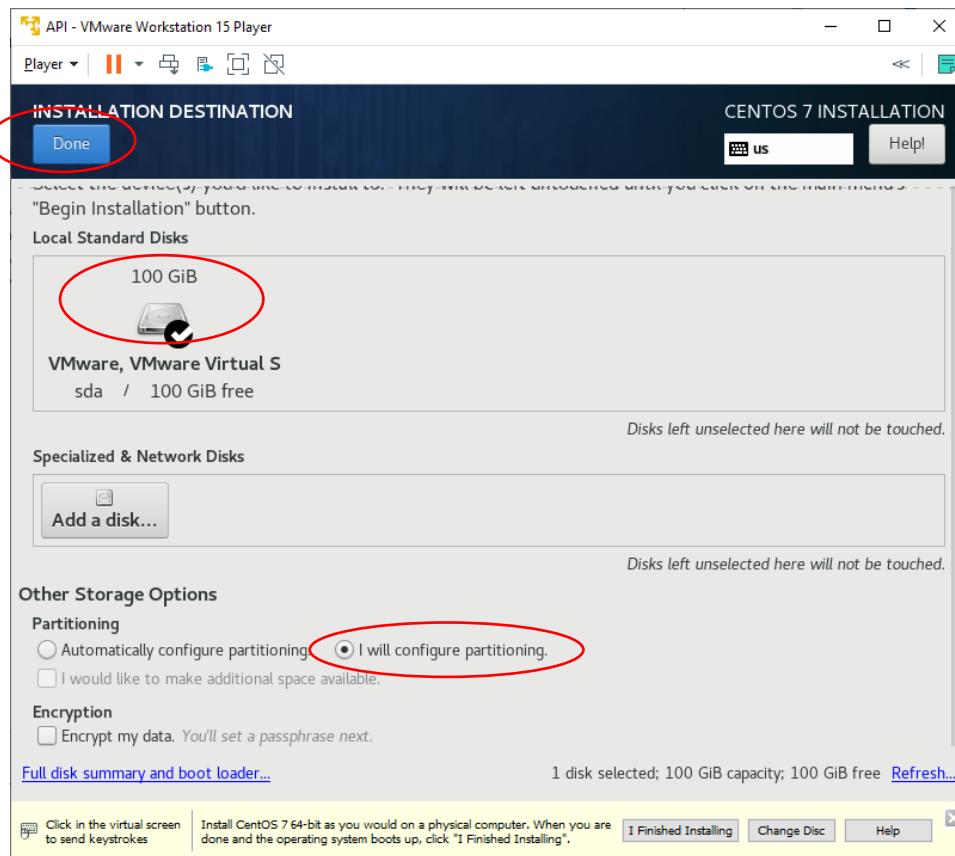
12. Select your language when prompted and **Continue**



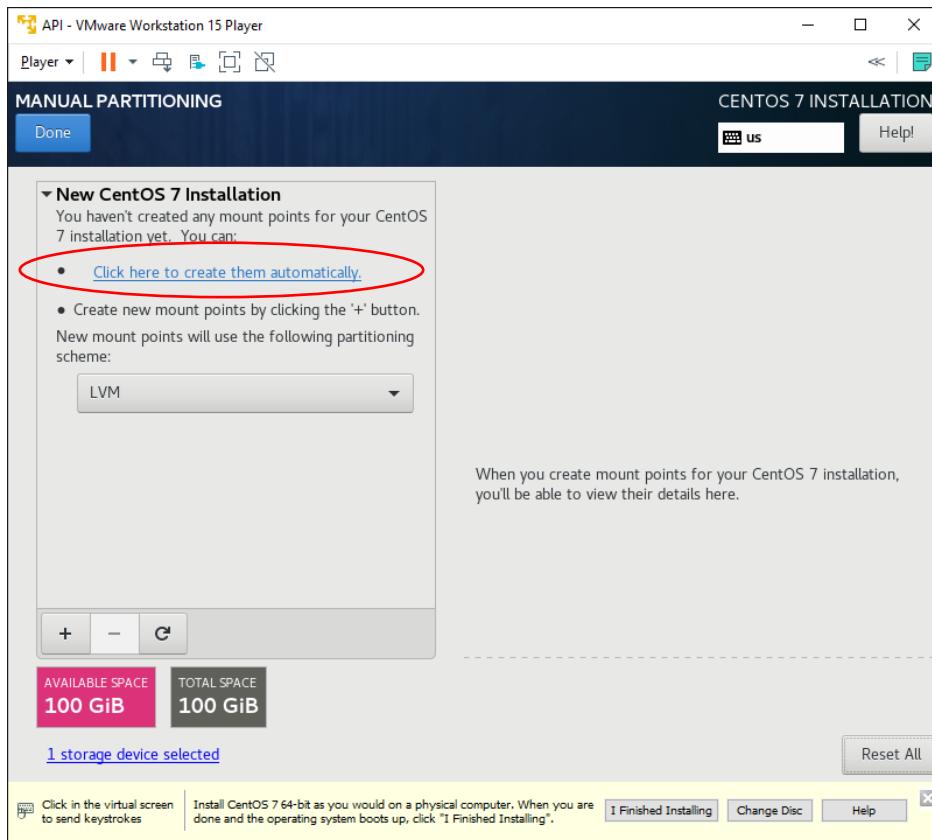
13. Scroll down and click Installation Destination



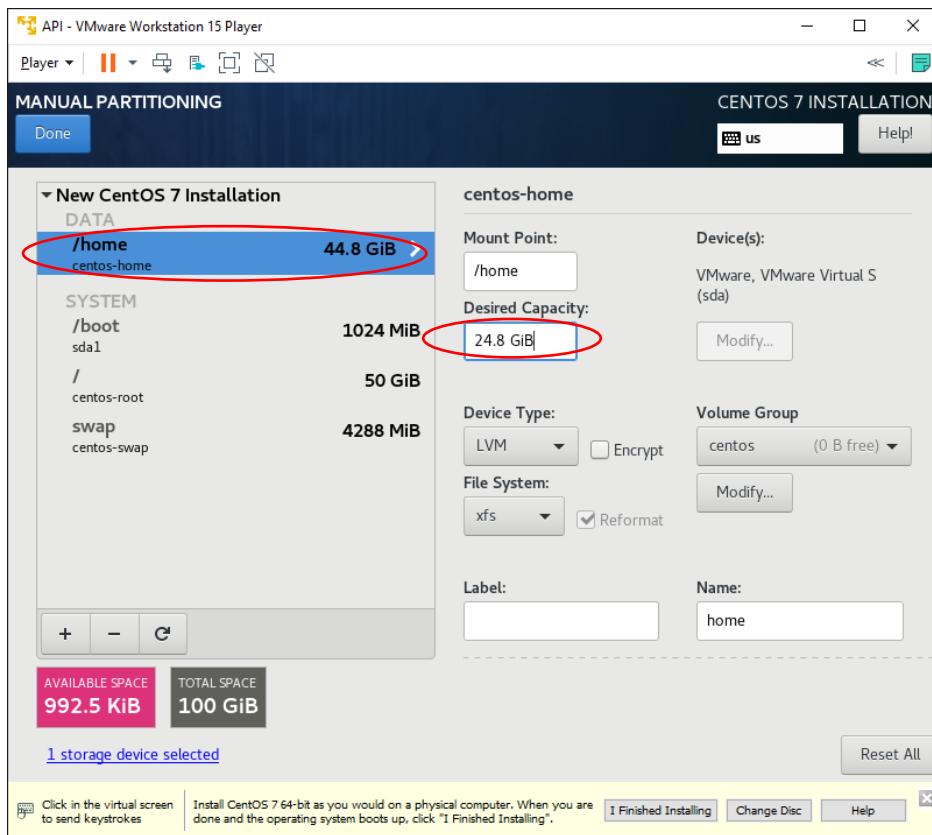
14. Double-click on the 100 GiB disk to select it, select I will configure partitioning then Done



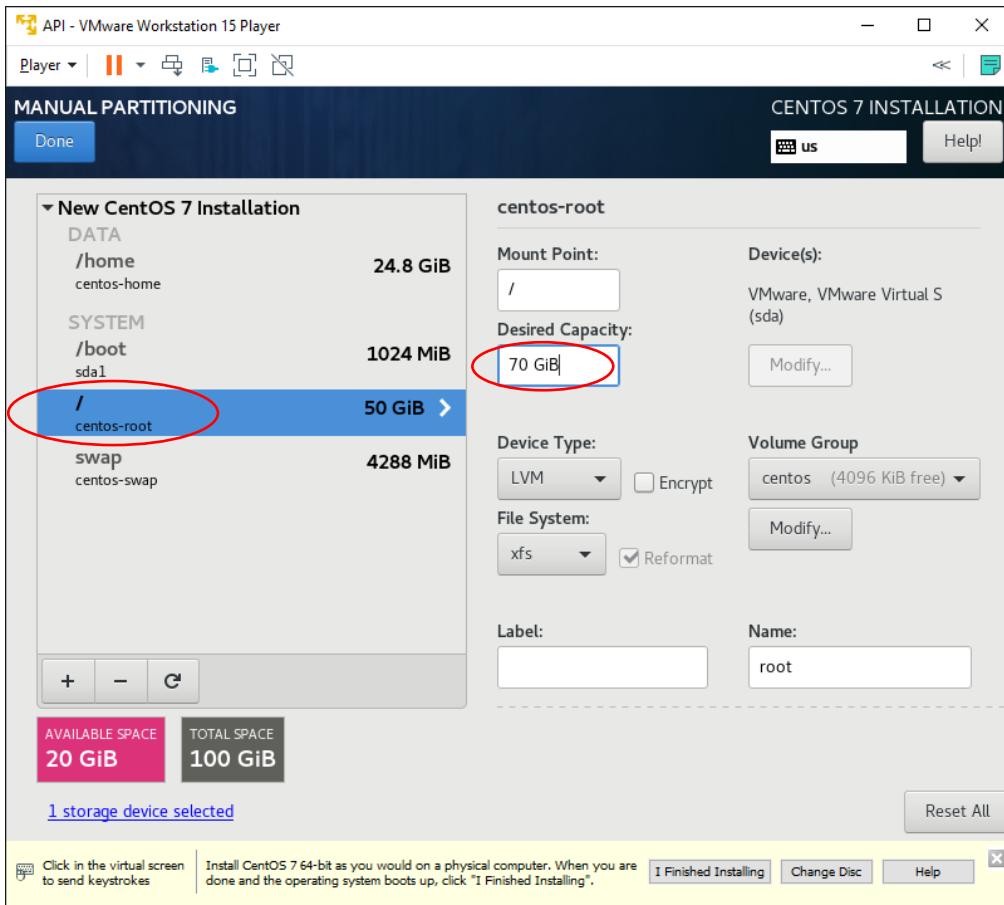
15. Click **Click here to create them automatically**



16. Select the **/home** partition and change the **Desired Capacity** to **24.8 GiB**



17. Select the **/ centos-root** partition and change the **Desired Capacity** to **70 GiB** then click **Done**

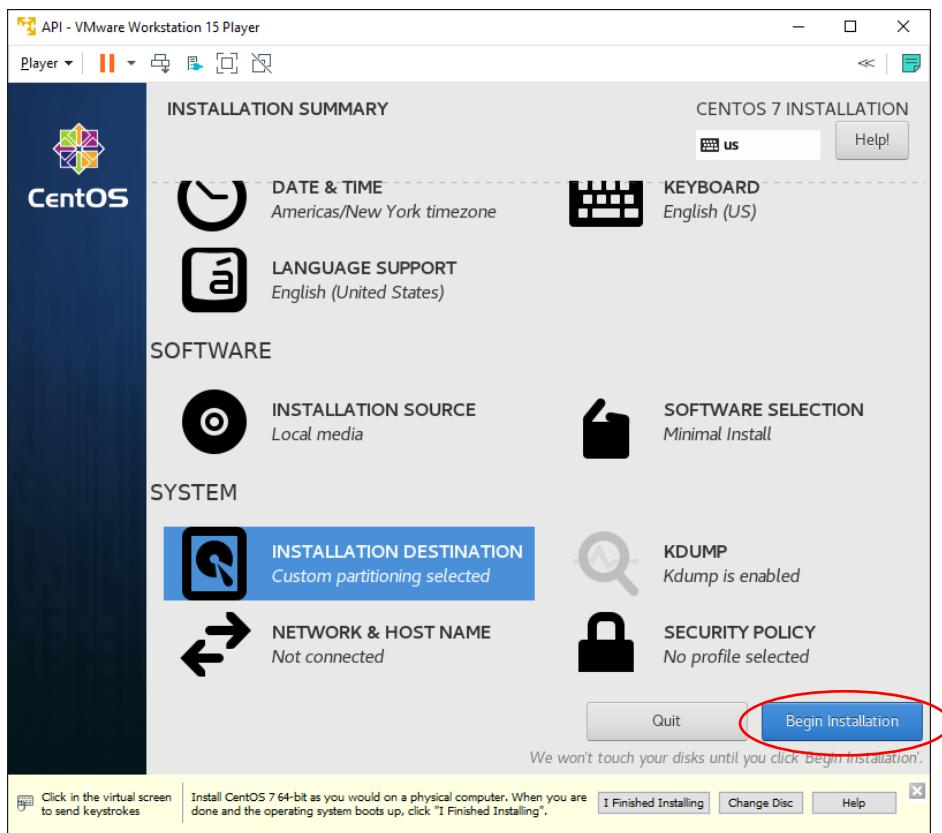


18. Click **Accept Changes**

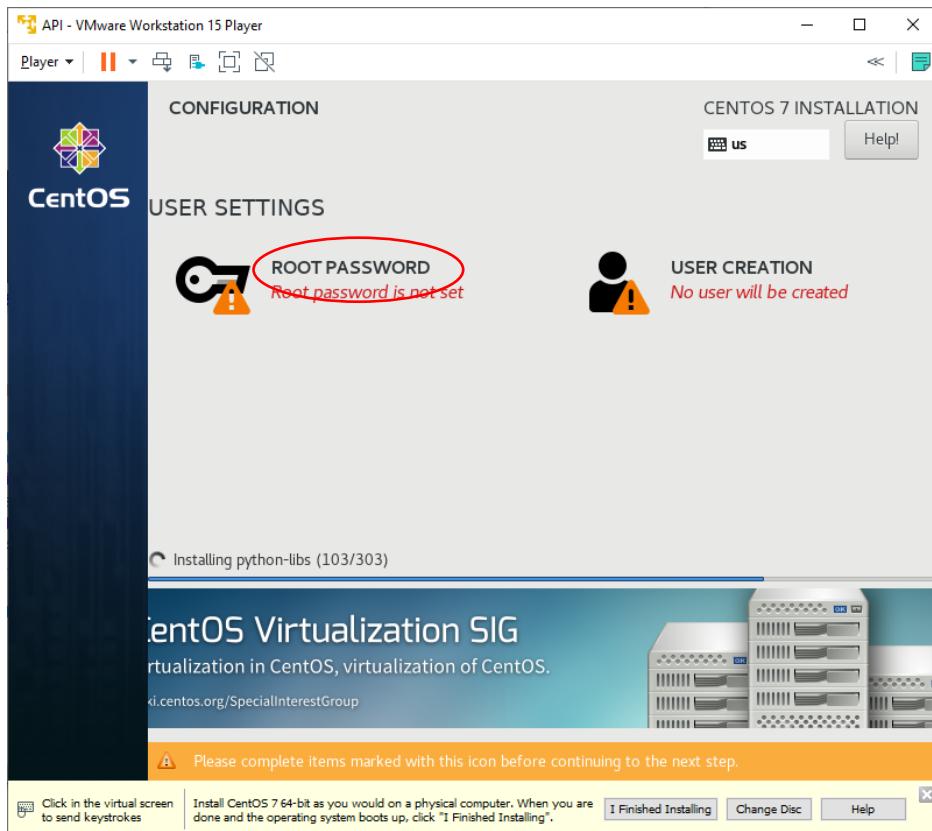
SUMMARY OF CHANGES				
Order	Action	Type	Device Name	Mount point
1	Destroy Format	Unknown	sda	
2	Create Format	partition table (MSDOS)	sda	
3	Create Device	partition	sda1	
4	Create Format	xfs	sda1	/boot
5	Create Device	partition	sda2	
6	Create Format	physical volume (LVM)	sda2	
7	Create Device	lvmvg	centos	
8	Create Device	lvmlv	centos-swap	
9	Create Format	swap	centos-swap	
10	Create Device	lvmlv	centos-home	
11	Create Format	xfs	centos-home	/home
12	Create Device	lvmlv	centos-root	

[Cancel & Return to Custom Partitioning](#) Accept Changes

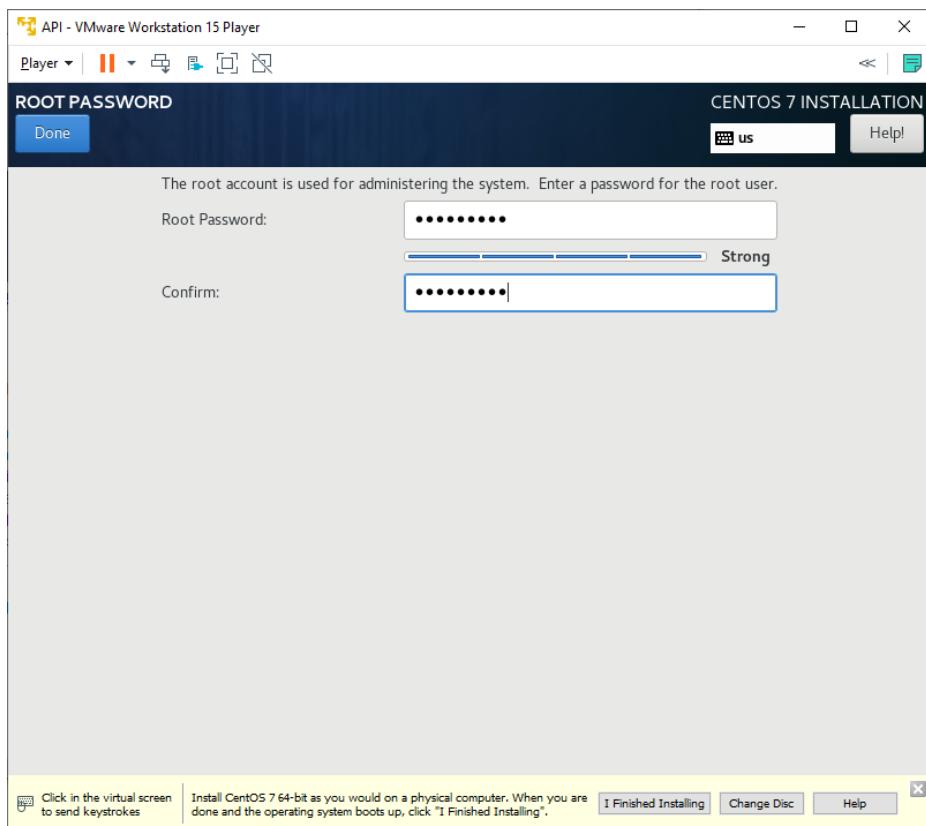
19. Click Begin Installation



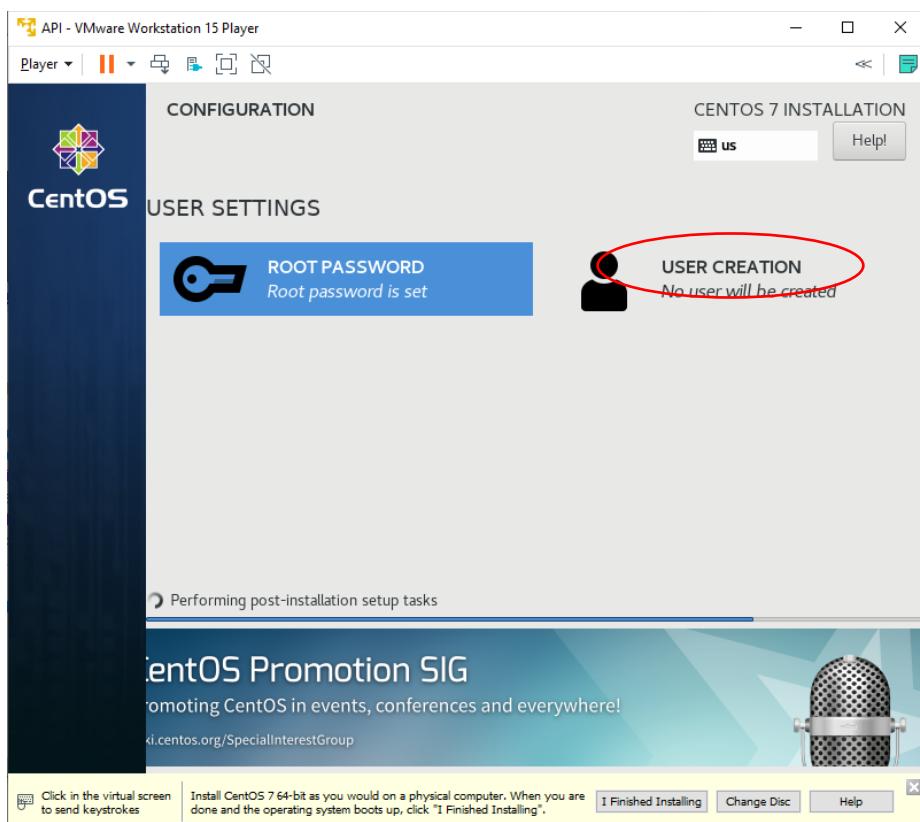
20. Click Root Password



21. Set a root password of **Flackbox1** then click **Done**



22. Click **User Creation**



23. Create a user with these details then click **Done** twice

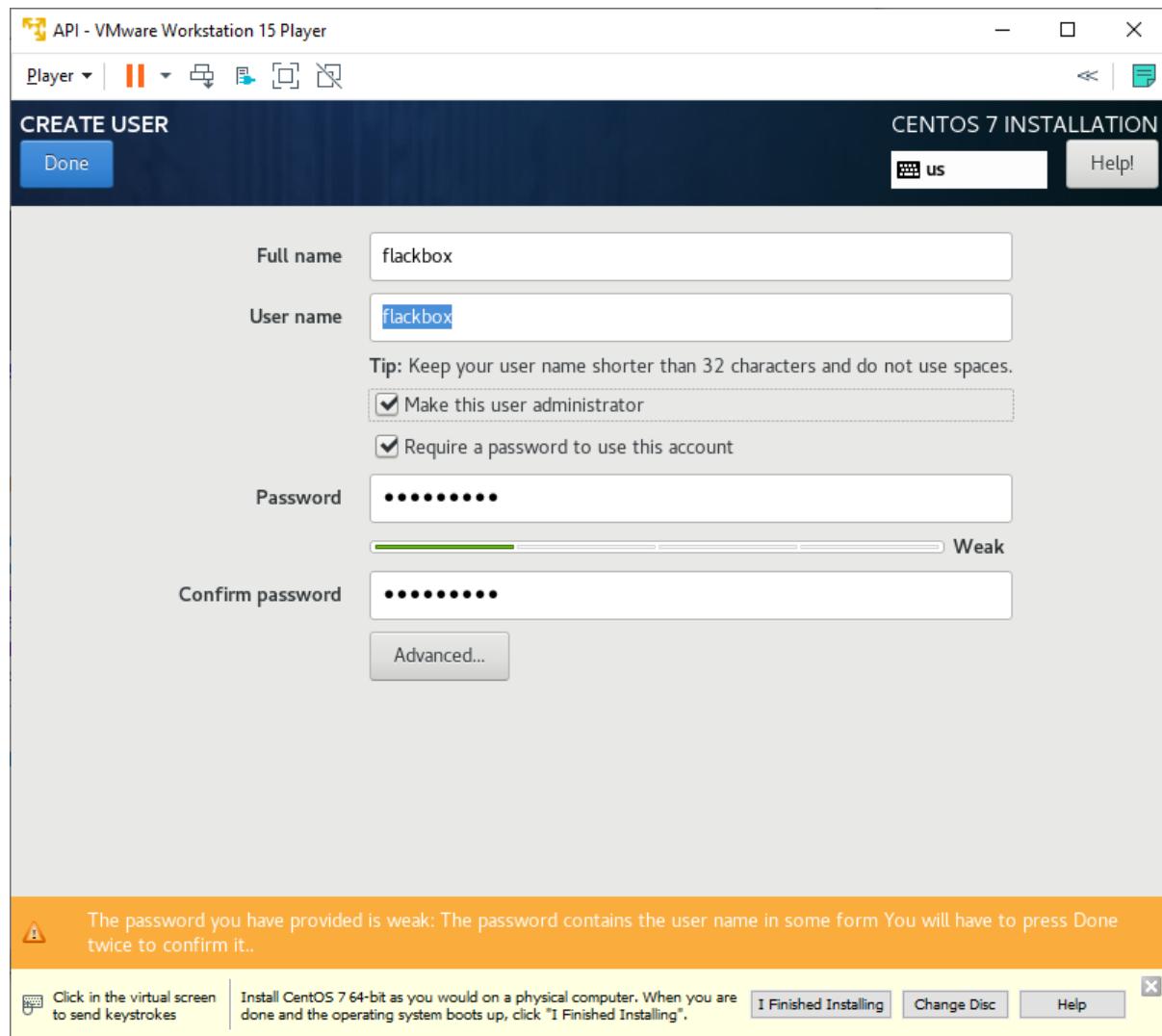
Full name: flackbox

User name: flackbox

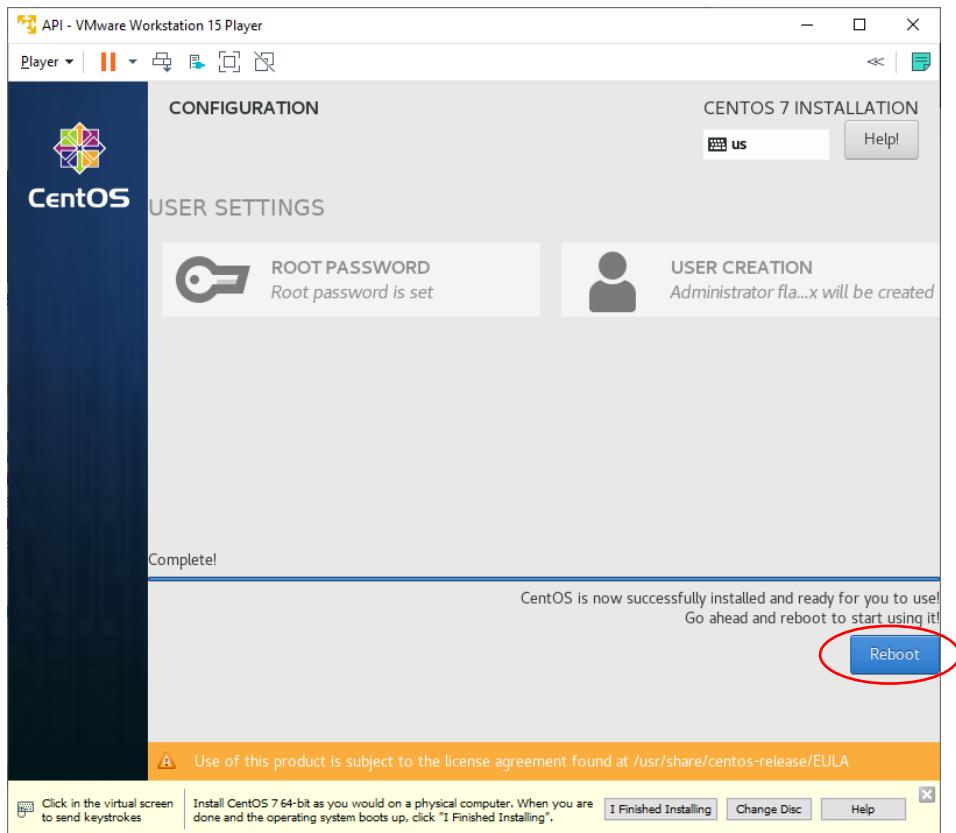
Make this user administrator: checked

Require a password to use this account: checked

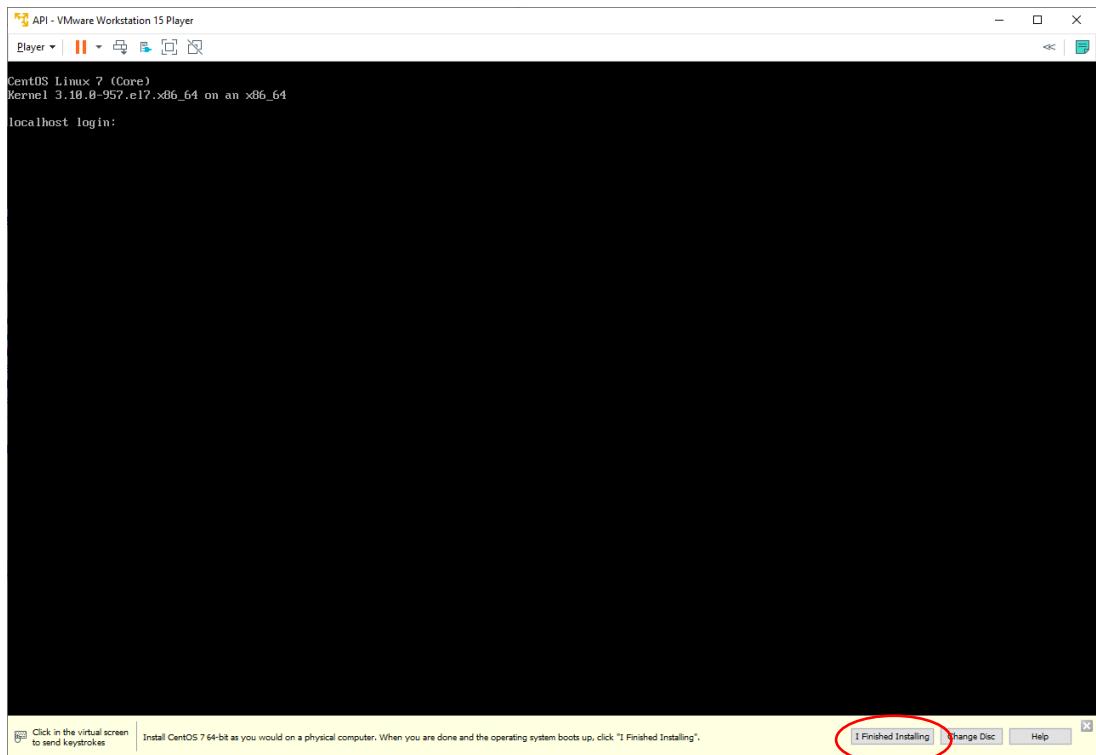
Password: Flackbox1



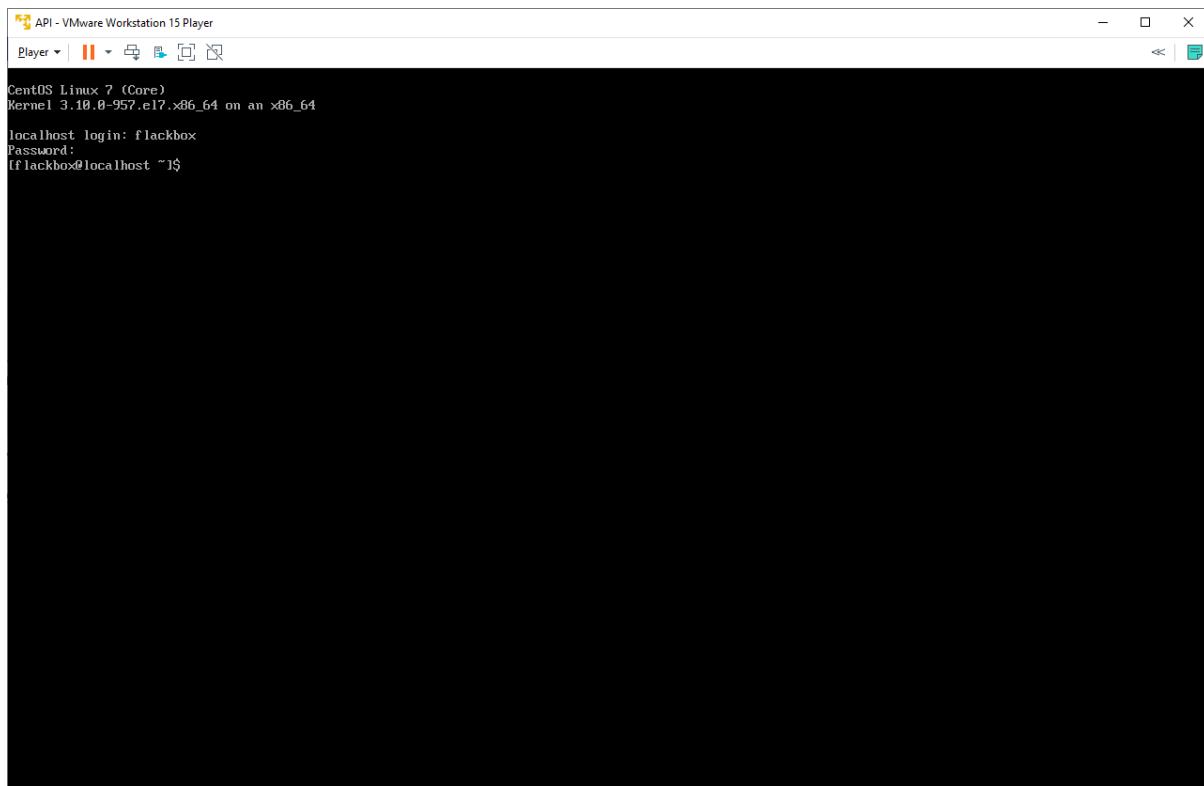
24. Click **Reboot when the installation completes**



25. If you see the prompt at the bottom of the VMware Workstation Player window, click **I Finished Installing**



26. Log in to the CentOS host using username **flackbox** and password **Flackbox1**



27. Use the **sudo su -** command to run the following commands as root. Enter the password **Flackbox1** when prompted.

```
[flackbox@localhost ~]$ sudo su -
We trust you have received the usual lecture from the local System
Administrator. It usually boils down to these three things:
#1) Respect the privacy of others.
#2) Think before you type.
#3) With great power comes great responsibility.

[sudo] password for flackbox:
[root@localhost ~]# _
```

28. Check which network interfaces are available with the **nmcli -p dev** command

```
[root@localhost ~]# nmcli -p dev
=====
Status of devices
=====
DEVICE  TYPE      STATE        CONNECTION
-----
ens33   ethernet  disconnected  --
lo      loopback  unmanaged   --
[root@localhost ~]#
```

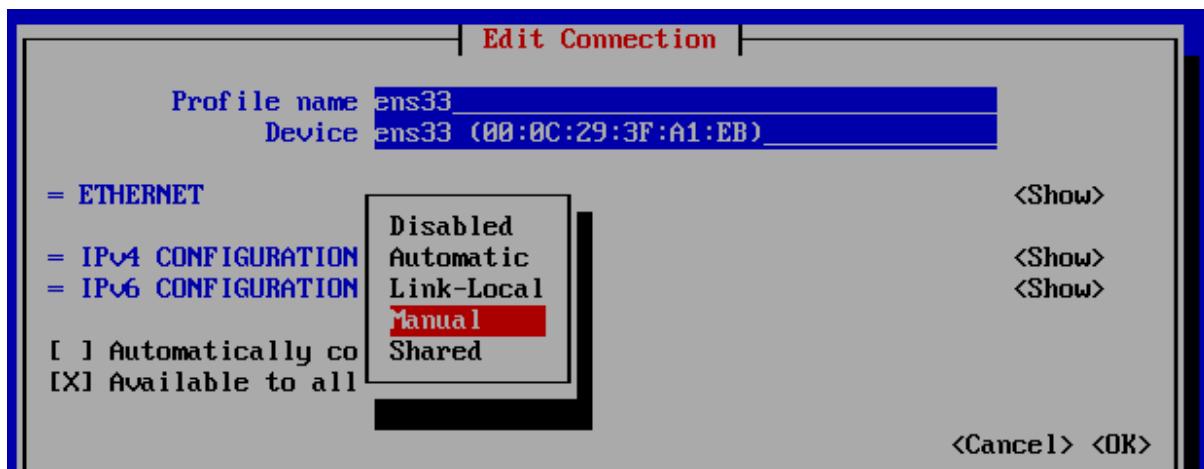
29. Use the **nmtui edit ens33** command to configure the ethernet interface with these settings:

IP address: 172.23.4.3/24
Default gateway: 172.23.4.254
DNS server: 172.23.4.1
Search domain: flackboxA.lab

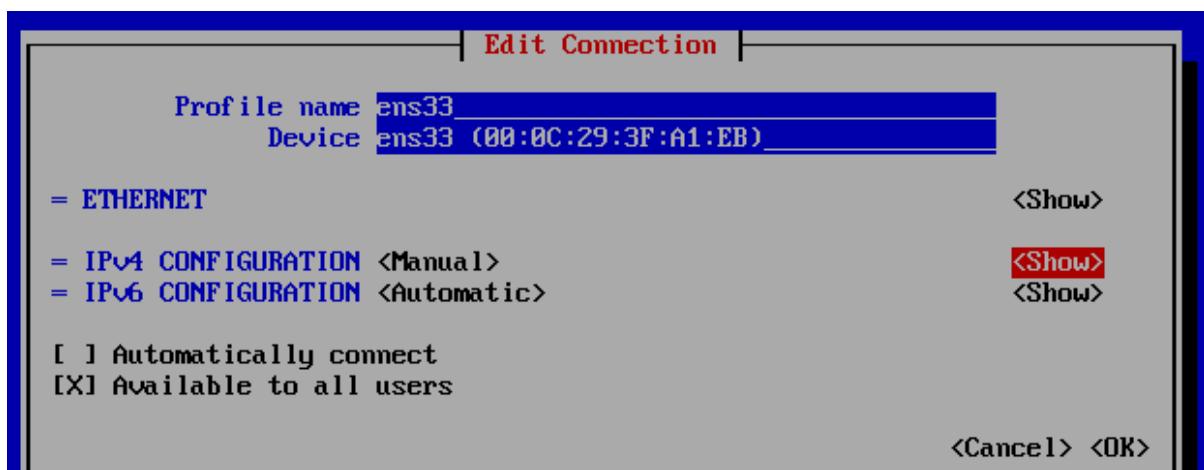
Run the NMTUI application to edit the Ethernet interface with the command **nmtui edit ens33**.

```
[root@localhost ~]# nmtui edit ens33
```

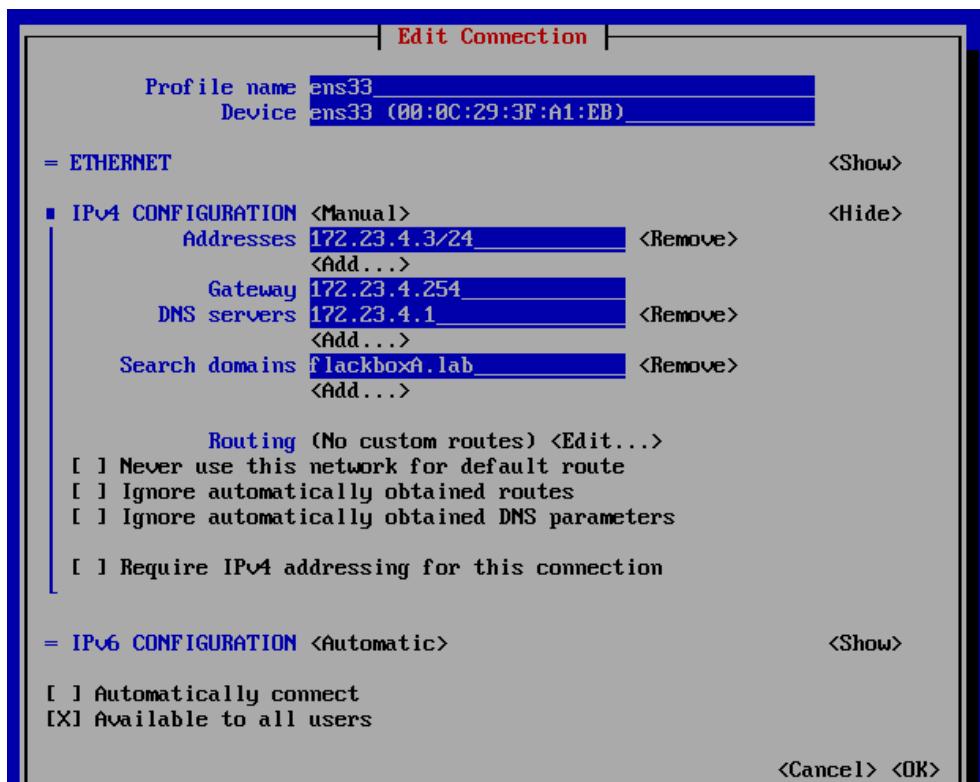
Use the down arrow on your keyboard to select **IPv4 CONFIGURATION** and set it to **Manual**



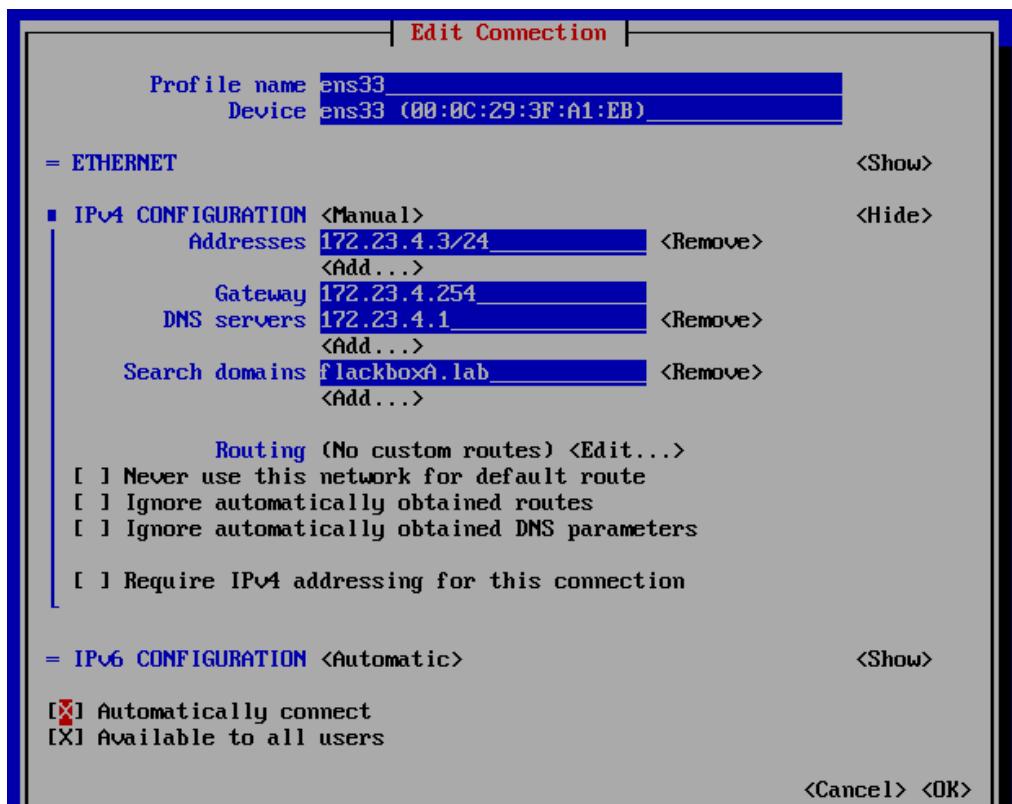
Use the down arrow again to highlight **Show** for the IPv4 configuration and hit **Enter**



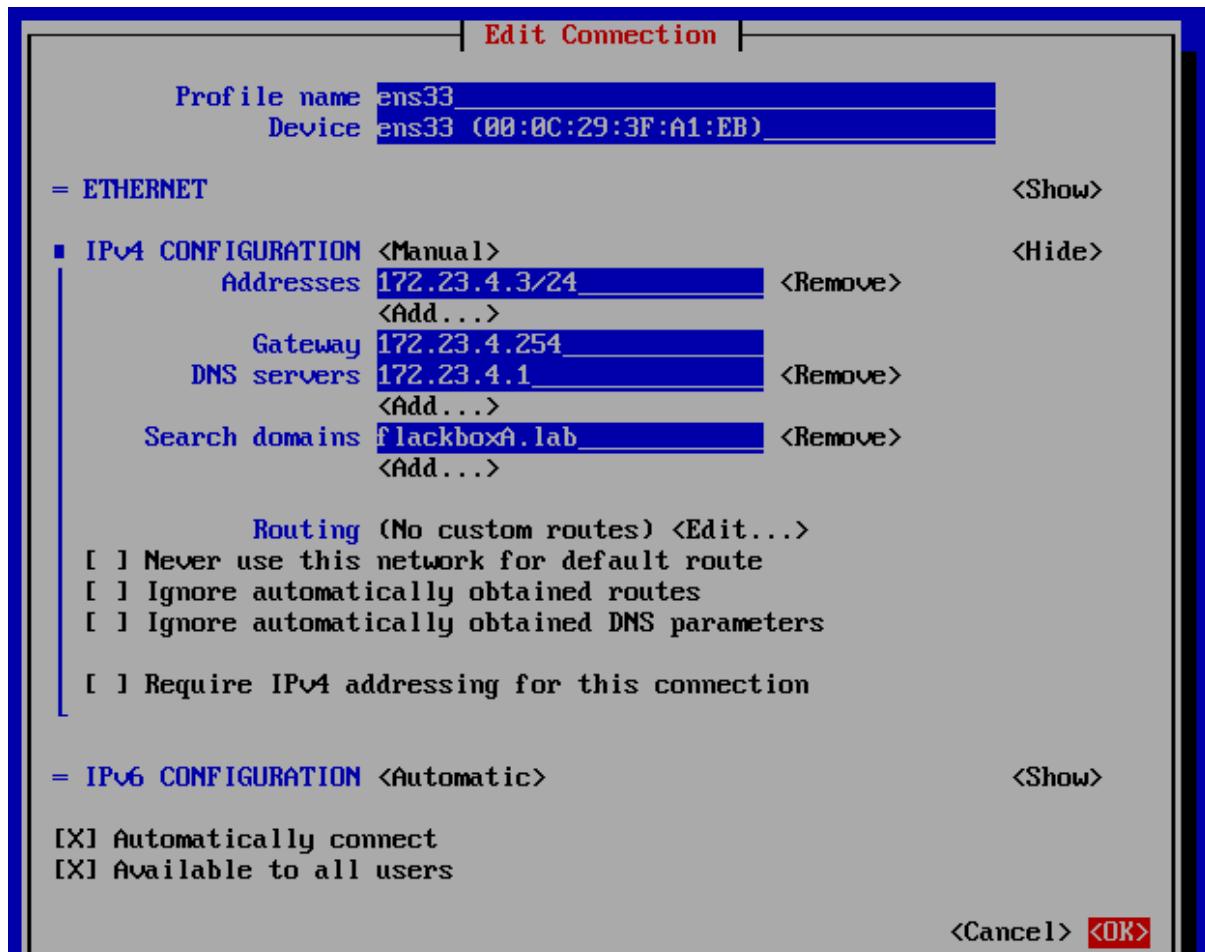
Add the IPv4 details shown in the screenshot below. Use the down arrow and Enter keys on the keyboard to select **Add** and enter the information.



Use the down arrow and **Spacebar** on your keyboard to check the **Automatically connect** option



Highlight **OK** and hit Enter



The CentOS host is now installed and configured.

SuperPutty Install

In this section you will install Putty and SuperPutty.

1. Open the Putty downloads page at <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html> in your browser
2. Click on the link to download the Putty installer msi file

Package files

You probably want one of these. They include versions of all the PuTTY utilities.

(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

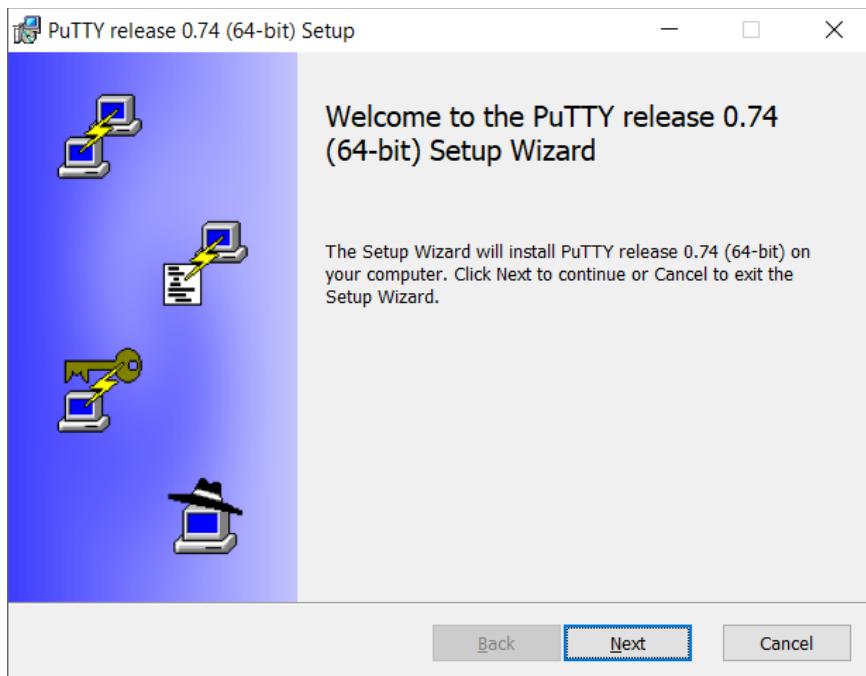
MSI ("Windows Installer")

32-bit:	putty-0.74-installer.msi	(or by FTP)	(signature)
64-bit:	putty-64bit-0.74-installer.msi	(or by FTP)	(signature)

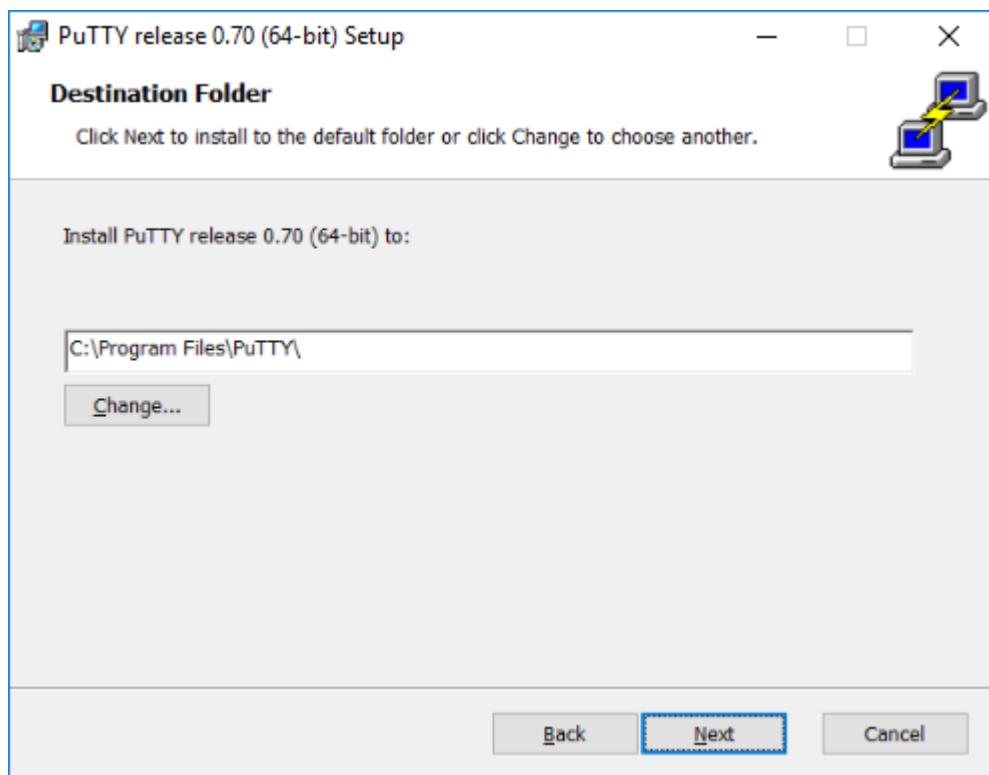
Unix source archive

.tar.gz:	putty-0.74.tar.gz	(or by FTP)	(signature)
----------	-----------------------------------	------------------------------	-------------------------------

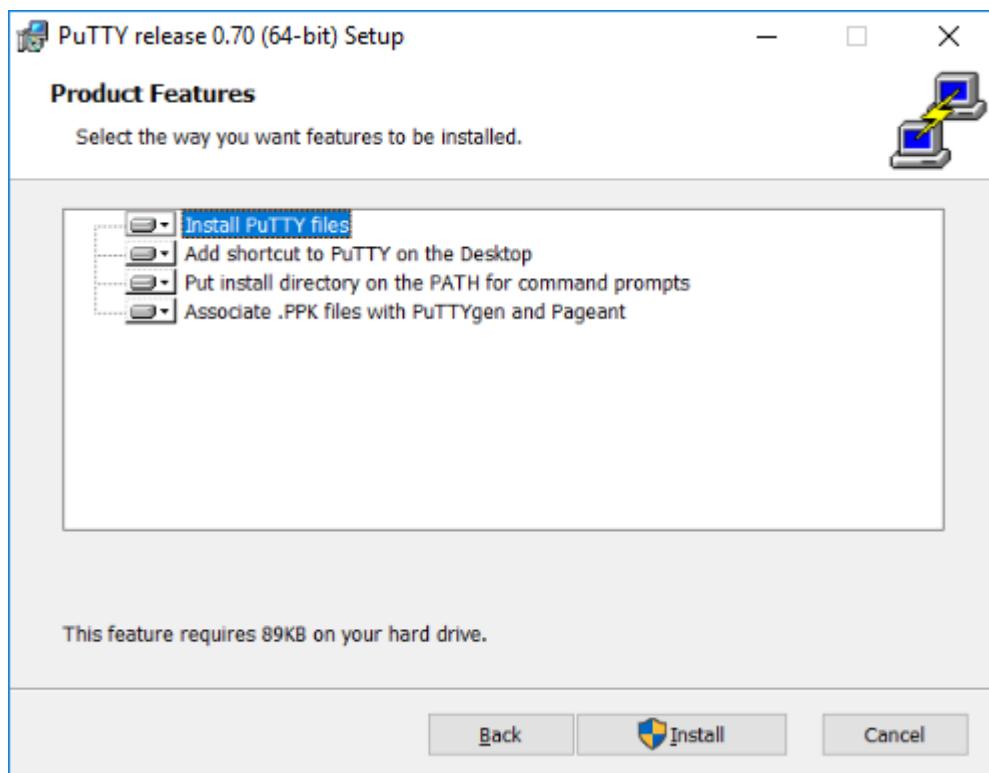
3. Run the installer and click **Next**



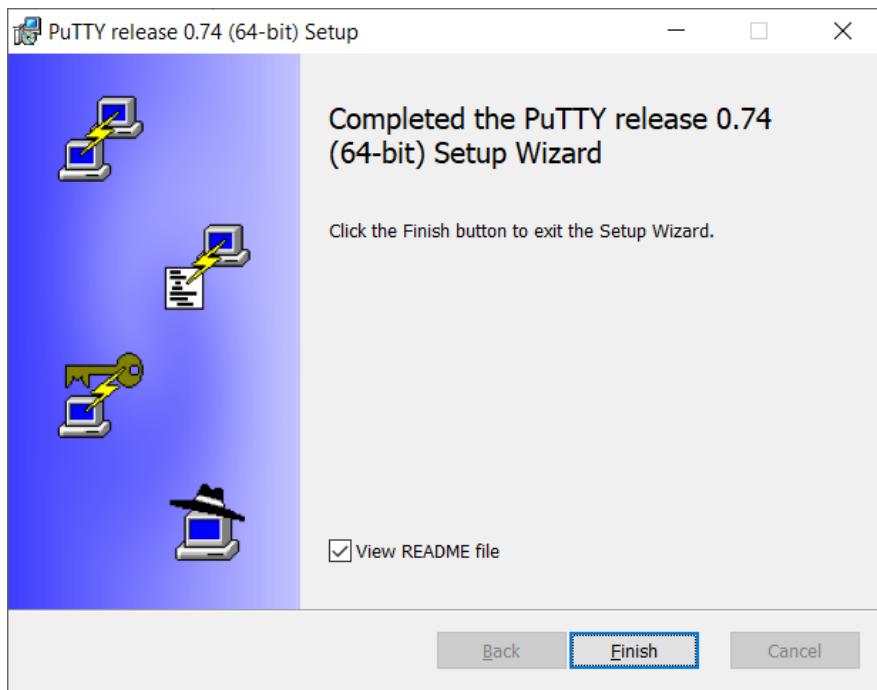
4. Click **Next** to accept the default destination folder



5. Click **Install**

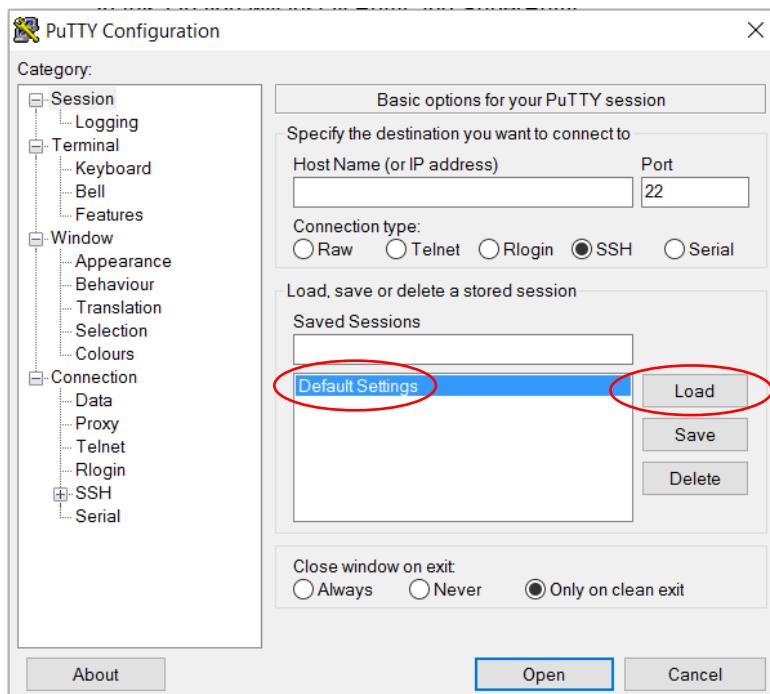


6. Uncheck the **View README file** checkbox and click **Finish**

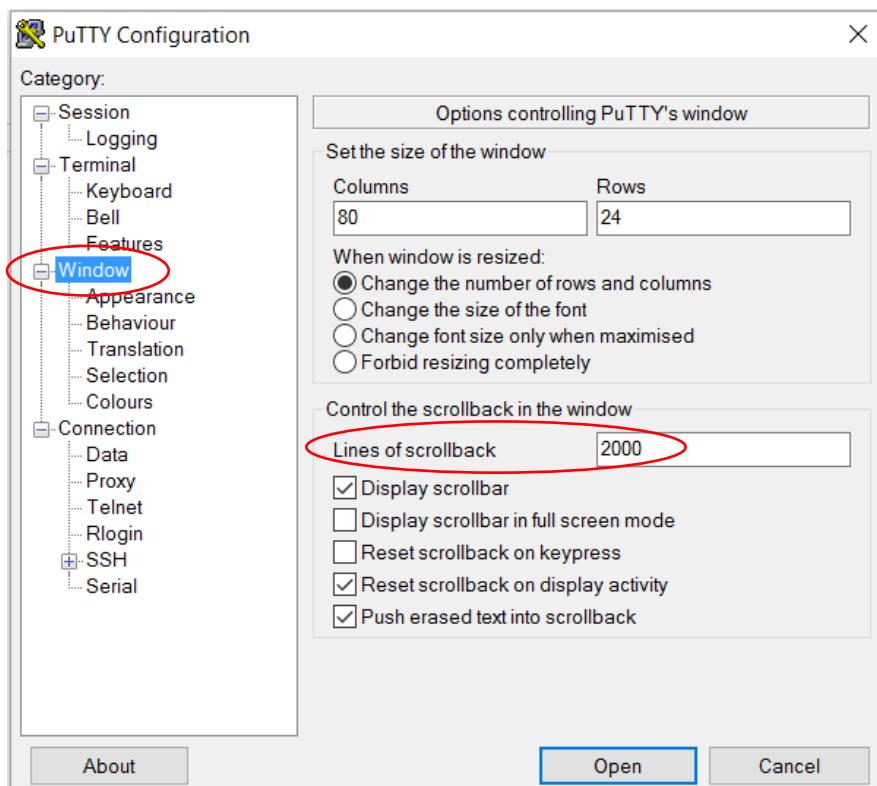


7. Run Putty from the shortcut on your desktop

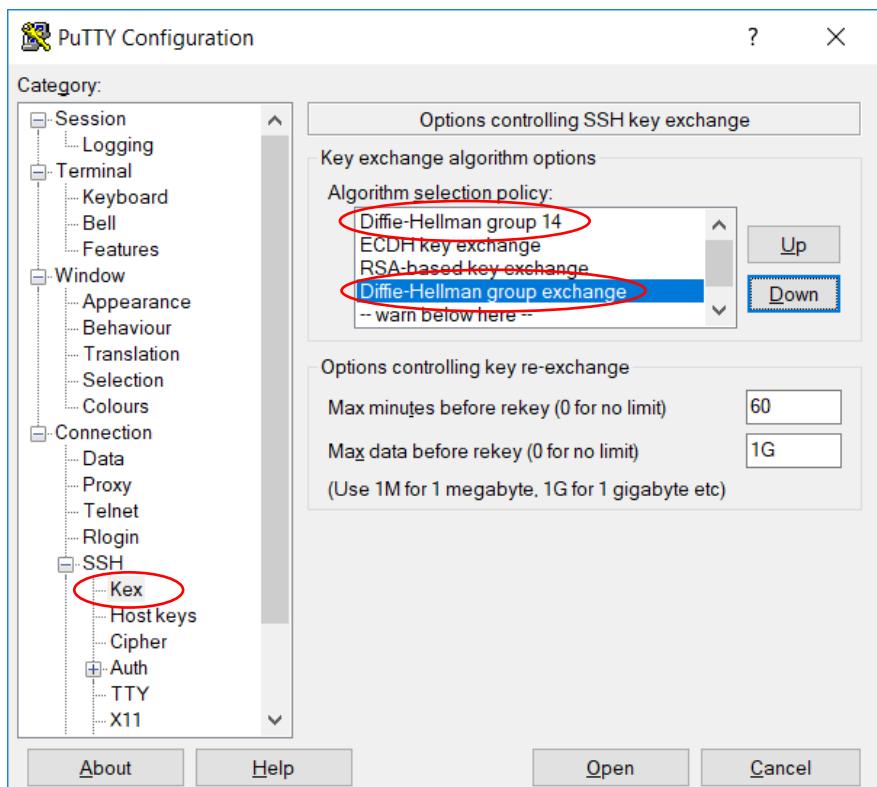
8. Click on **Default Settings** and **Load**



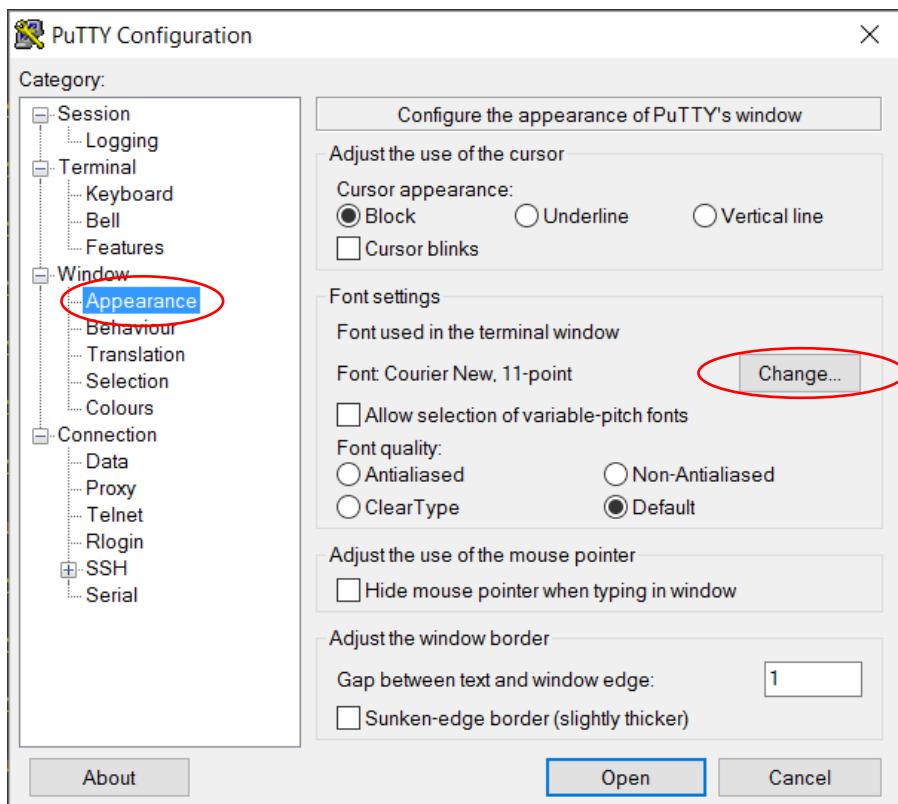
9. Click **Window** and set **Lines of Scrollback** to 2000



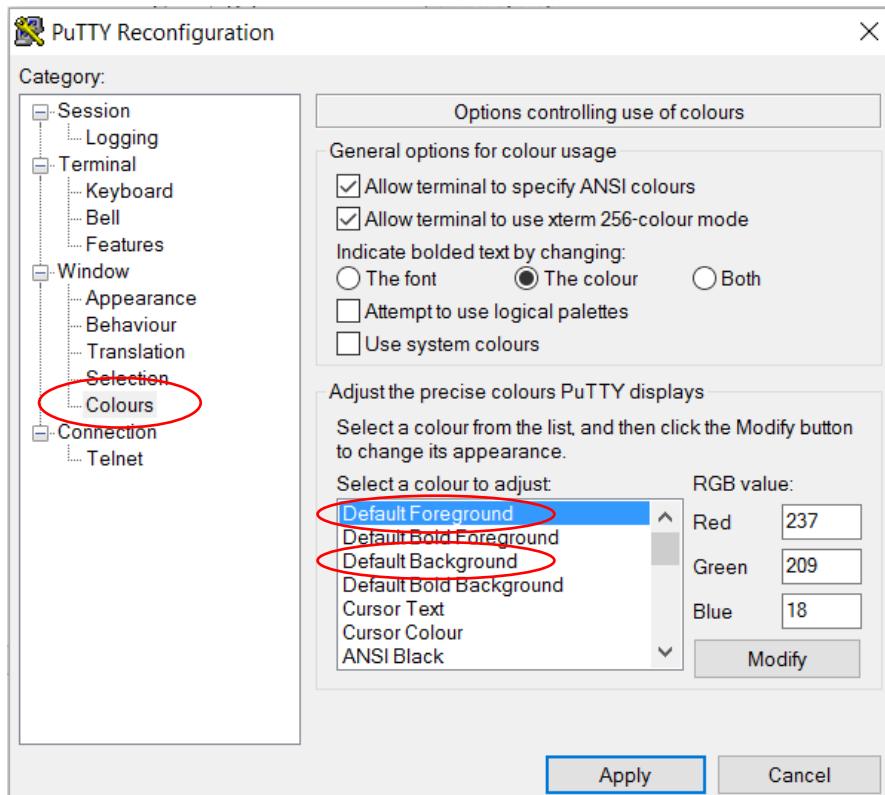
10. Expand **Connection** and **SSH** and click on **Kex**. Move **Diffie-Hellman Group 14** to the top of the list and **Diffie-Hellman group exchange** to one place above -- warn below here --



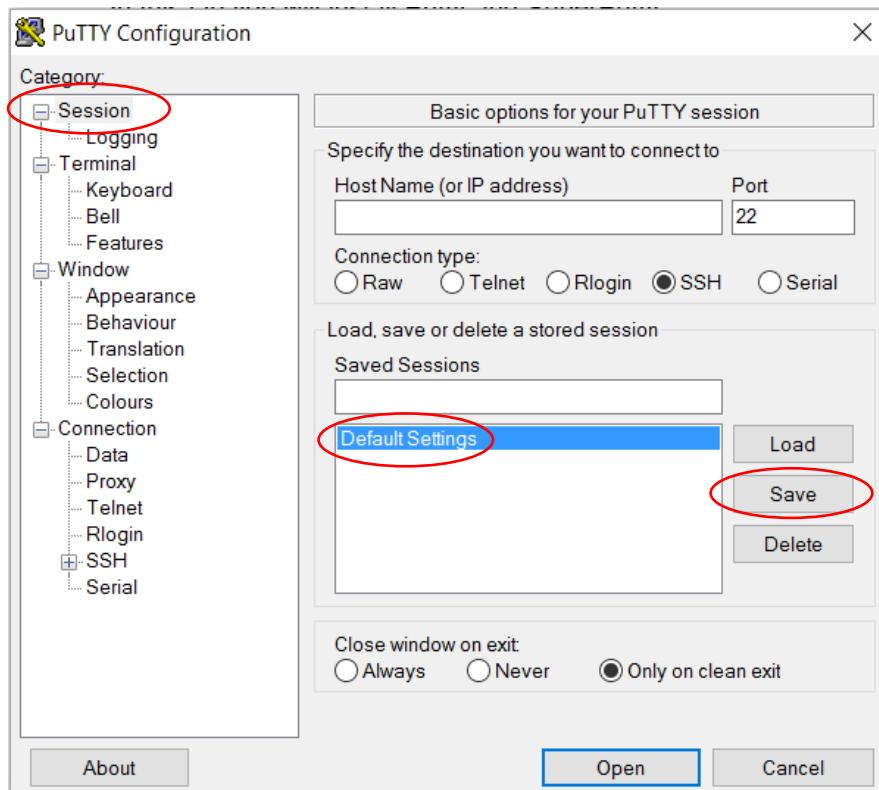
11. Click on **Appearance** and **Change** if you want to change the font size or style.



12. Click on **Colours** and edit the **Default Foreground** and **Default Background** if you want to change the colour scheme.



13. Click on **Session** then **Default Settings** and **Save** to save your changes

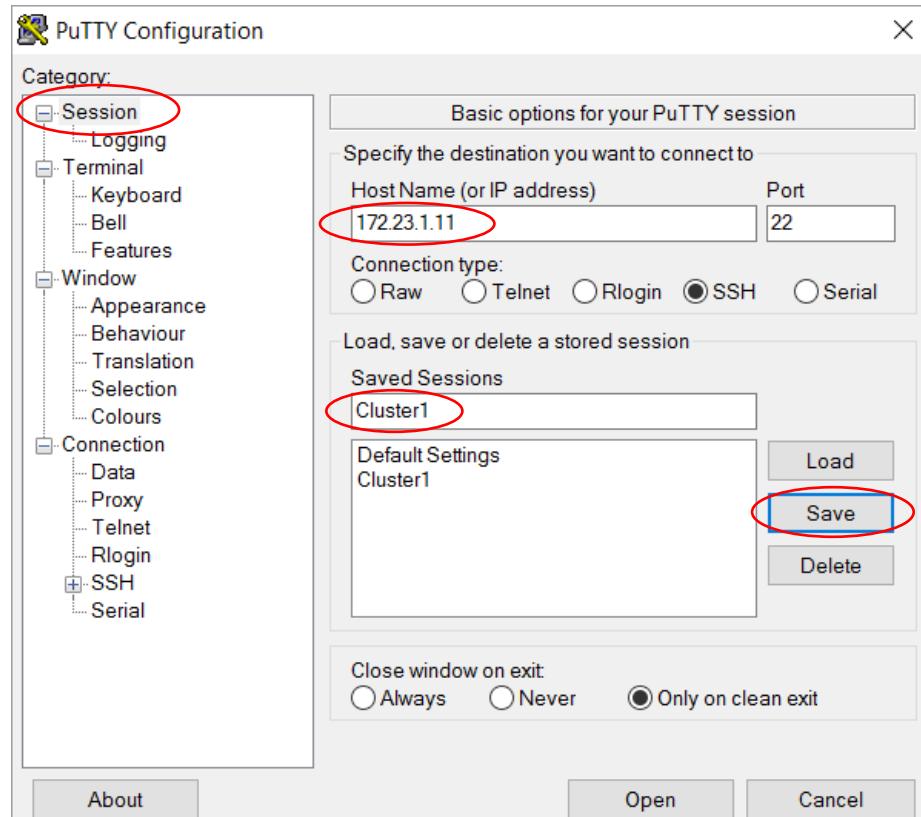


14. Configure a shortcut for the Cluster 1 Management address.
On the Session page, enter the information below.

Host Name (or IP address): **172.23.1.11**

Saved Sessions: **Cluster1**

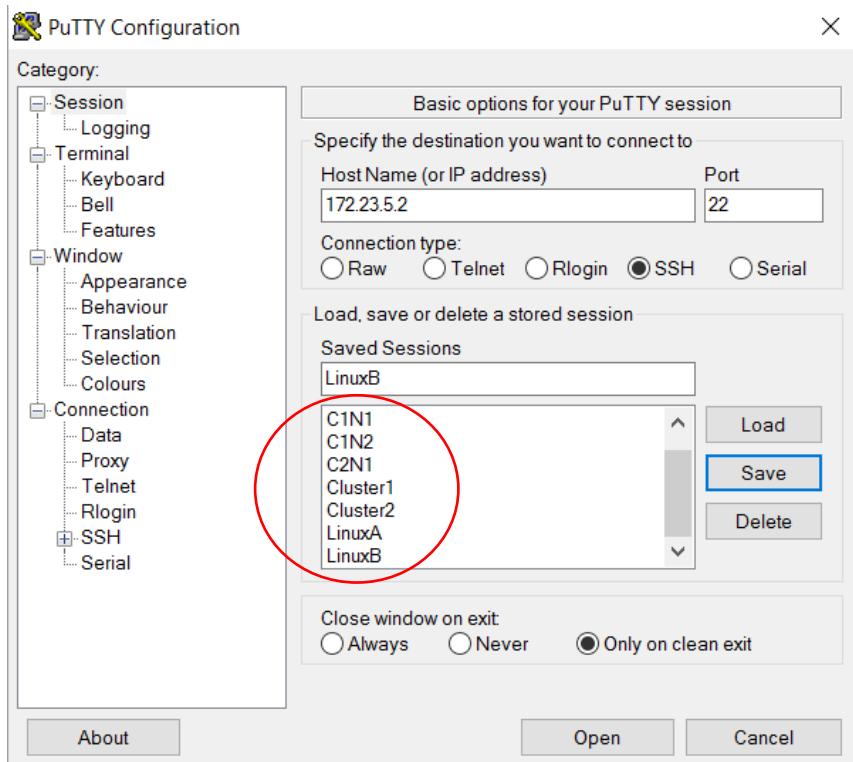
Click **Save**



15. Repeat to create six more shortcuts for the other hosts in the lab. Use the information from the table below.

Host Name (or IP address)	Saved Session
172.23.1.12	C1N1
172.23.1.13	C1N2
172.23.1.21	Cluster2
172.23.1.22	C2N1
172.23.4.2	LinuxA
172.23.5.2	LinuxB

16. Your Saved Sessions should look like the picture below when you have finished creating the shortcuts.



17. Next we'll install SuperPutty which allows us to open SSH sessions to the lab virtual machines as multiple tabs in the same window. This is more convenient than opening multiple separate Putty windows.
18. Open the GitHub SuperPutty download page at <https://github.com/jimradford/superputty/releases> in your browser
19. In the Download section, click on the link to download the SuperPutty installation zip file

Stable SuperPuTTY 1.4.0.9 Release

 jimradford released this on Oct 4, 2018 · 17 commits to master since this release

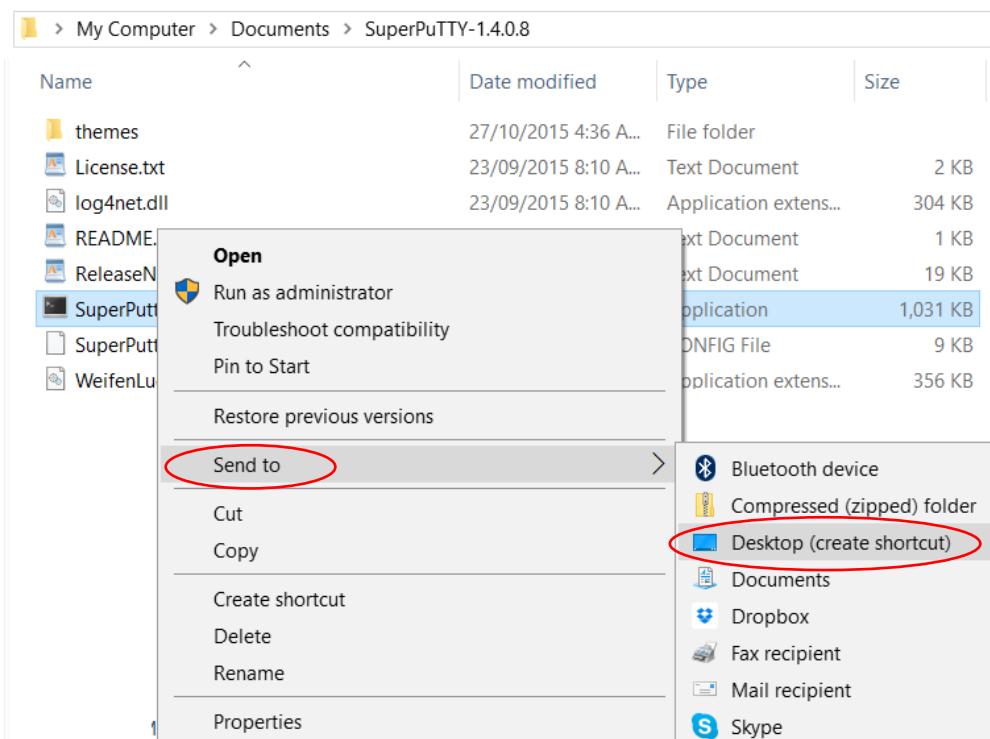
▼ Assets 4

 SuperPuTTY-1.4.0.9.zip	561 KB
 SuperPuttySetup-1.4.0.9.msi	1.79 MB
 Source code (zip)	
 Source code (tar.gz)	

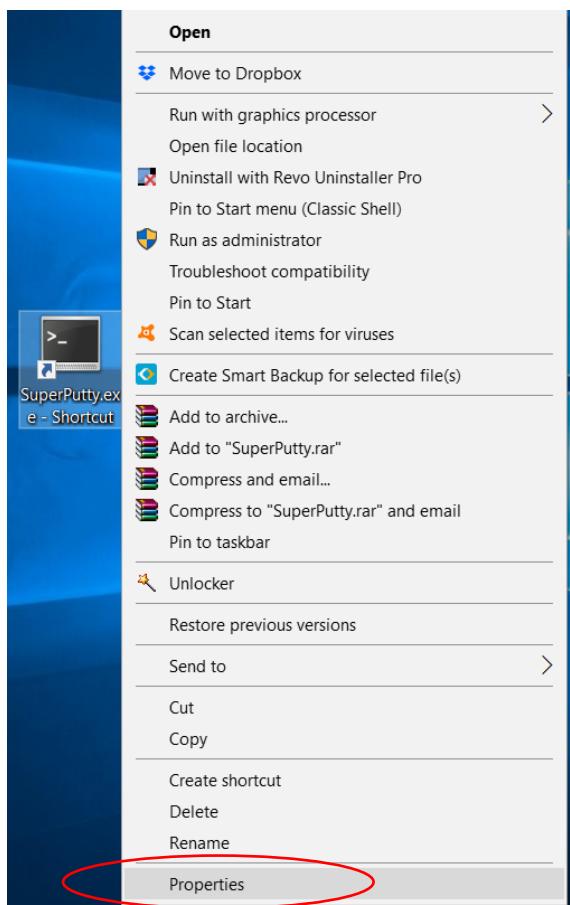
20. Extract the SuperPutty folder from the zip file to your Documents folder

Name	Date modified	Type	Size
SuperPUTTY-1.4.0.9	10/24/2018 5:03 AM	File folder	

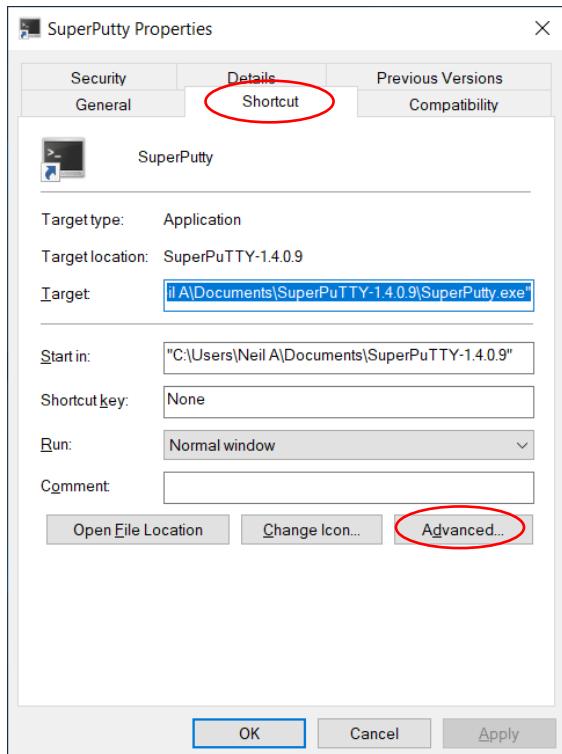
21. Open the SuperPutty folder, right-click on **superputty.exe** and make a desktop shortcut to it.



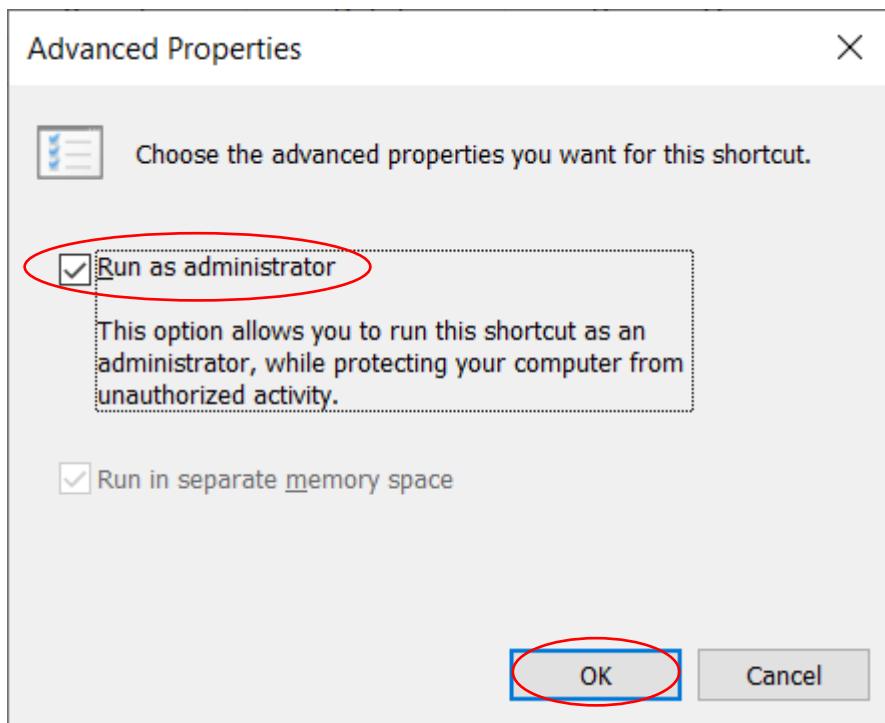
22. Right-click on the SuperPutty shortcut on your desktop and select **Properties**



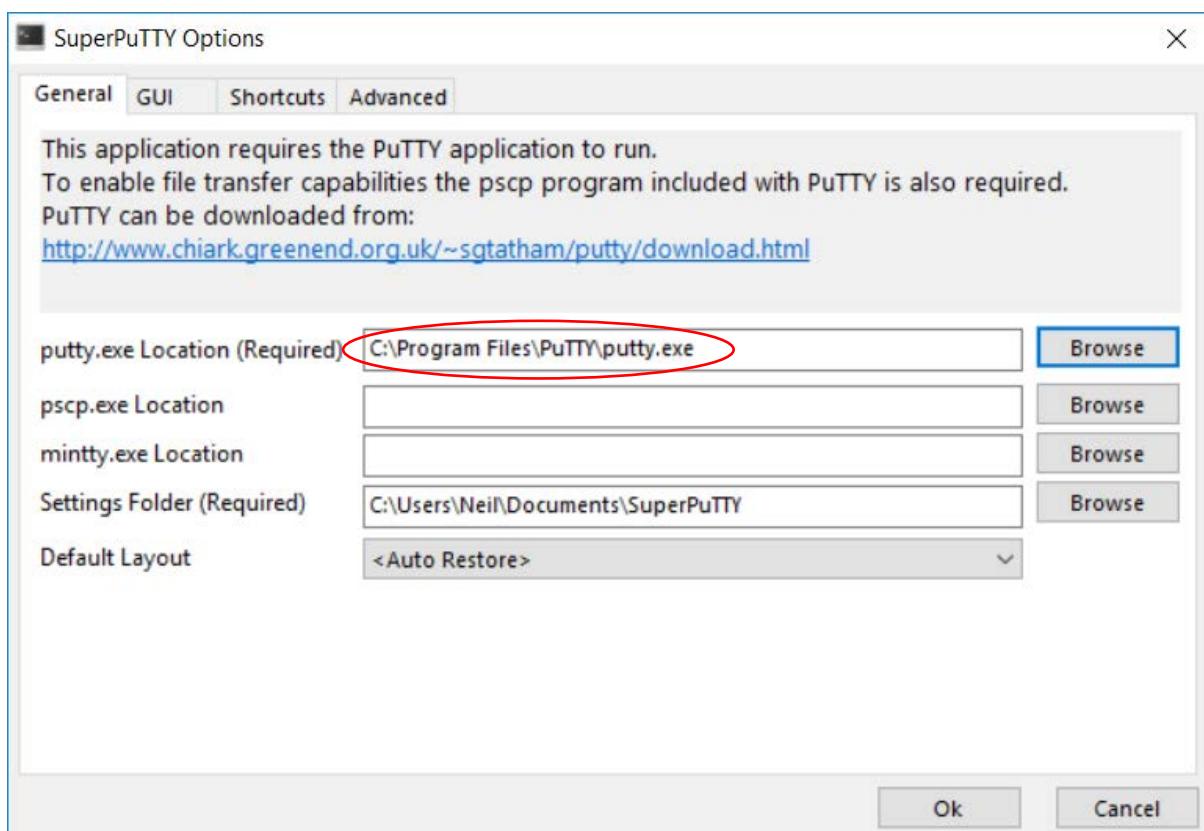
23. Click on the Shortcut tab then Advanced



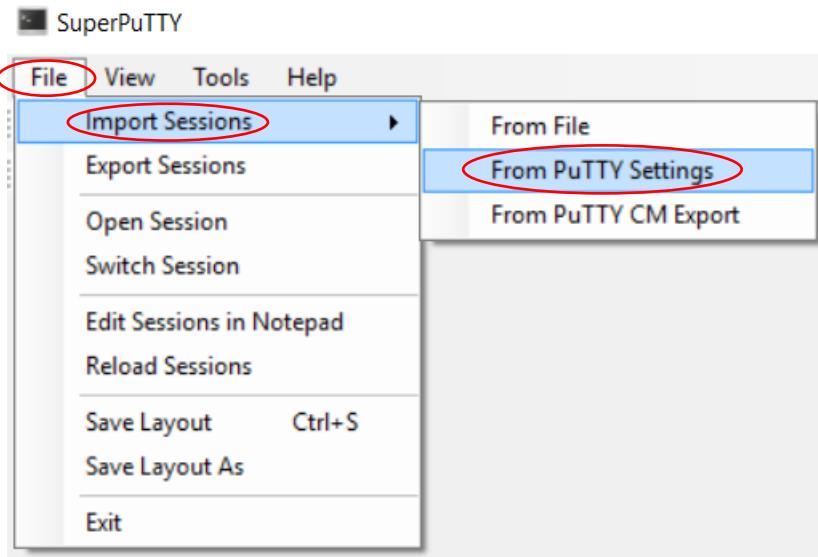
24. Click the **Run as administrator** checkbox then **OK** and **OK** again to close the shortcut Properties window



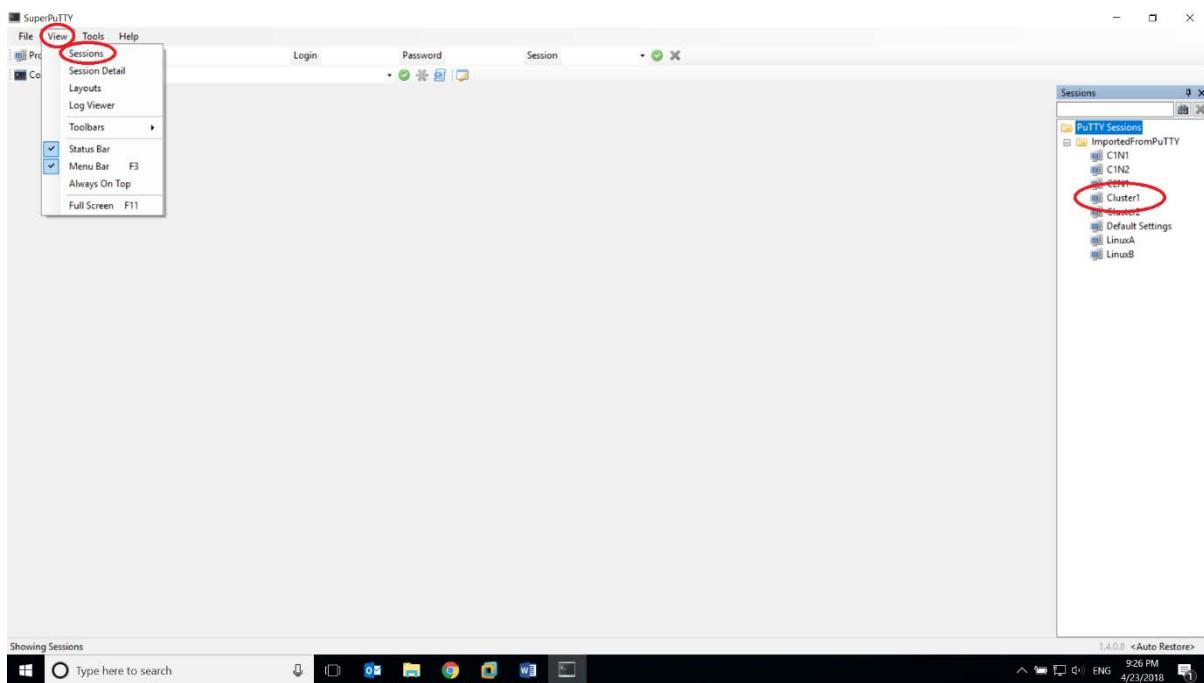
25. Run **superputty.exe** from the desktop shortcut. The SuperPutty options window will open. Enter the path to the putty.exe location in your Program Files folder and click **OK**. You can leave the pscp.exe and mintty.exe locations blank.



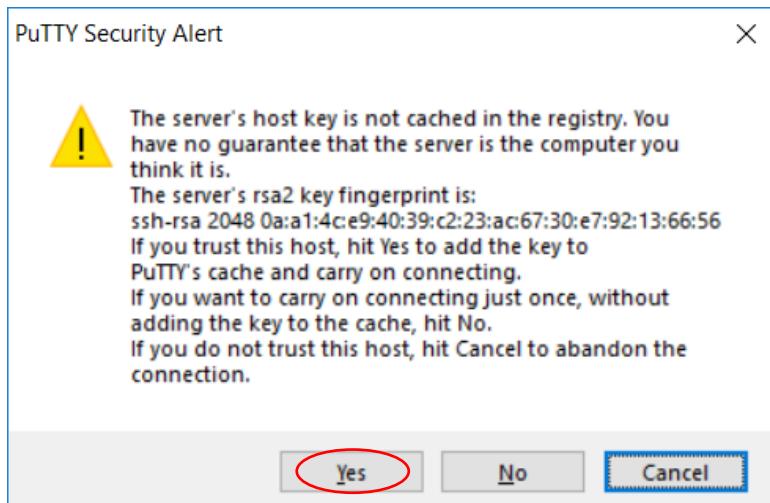
26. The SuperPutty main window will open. Click **File > Import Sessions > From PuTTY Settings** to import your Putty sessions. Click **Yes** when asked if you want to copy all sessions.



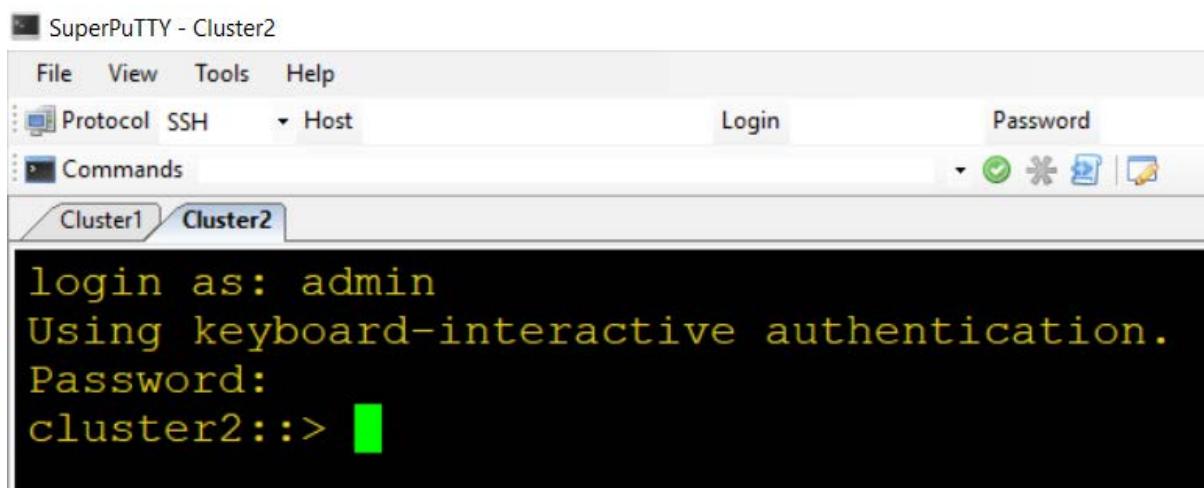
27. Expand the Session window to see your saved sessions. If you cannot see the session window then click on **View** and then **Sessions**. You can double-click on sessions to open them up in multiple tabs in SuperPutty.



28. Check that you can open the Putty sessions to NetApp Cluster 1 and Cluster 2 (make sure the NetApp virtual machines are running first). Click **Yes** to add the host keys to Putty's cache.



29. Log in with username **admin** and password **Flackbox1** on both clusters.



30. If the Putty session cannot connect, a common problem is that the cluster management logical interface is not on its home port. Enter **network interface show** in the VMware window to check.

```
cluster1::> network interface show
UserServer   Logical      Status      Network          Current       Current       Is
           Interface    Admin/Oper   Address/Mask   Node         Port        Home
-----+-----+-----+-----+-----+-----+-----+-----+
Cluster
  cluster1-01_clus1      up/up      169.254.142.33/16  cluster1-01  e0a      true
  cluster1-01_clus2      up/up      169.254.210.190/16 cluster1-01  e0b      true
  cluster1-02_clus1      up/up      169.254.53.193/16  cluster1-02  e0a      true
  cluster1-02_clus2      up/up      169.254.31.98/16   cluster1-02  e0b      true
cluster1
  cluster1-01_mgmt1      up/up      172.23.1.12/24     cluster1-01  e0c      true
  cluster1-02_mgmt1      up/up      172.23.1.13/24     cluster1-02  e0c      true
  cluster_mgmt      up/up      172.23.1.11/24     cluster1-01  e0d      false
7 entries were displayed.
```

31. If the cluster_mgmt LIF reports **false** for **Is Home** then run the **network interface revert -vserver *** command to revert it back to its home port. Connectivity should now be restored.

```
cluster1::> network interface revert -vserver *
1 entry was acted on.
```

```
cluster1::> network interface show
UserServer   Logical      Status      Network          Current       Current       Is
           Interface    Admin/Oper   Address/Mask   Node         Port        Home
-----+-----+-----+-----+-----+-----+-----+-----+
Cluster
  cluster1-01_clus1      up/up      169.254.142.33/16  cluster1-01  e0a      true
  cluster1-01_clus2      up/up      169.254.210.190/16 cluster1-01  e0b      true
  cluster1-02_clus1      up/up      169.254.53.193/16  cluster1-02  e0a      true
  cluster1-02_clus2      up/up      169.254.31.98/16   cluster1-02  e0b      true
cluster1
  cluster1-01_mgmt1      up/up      172.23.1.12/24     cluster1-01  e0c      true
  cluster1-02_mgmt1      up/up      172.23.1.13/24     cluster1-02  e0c      true
  cluster_mgmt      up/up      172.23.1.11/24     cluster1-01  e0c      true
7 entries were displayed.
```

32. Installation of Putty and SuperPutty is now complete.
 33. Run SuperPutty from the shortcut on your desktop when you want to connect to the virtual machines.
 34. The lab build is now complete.

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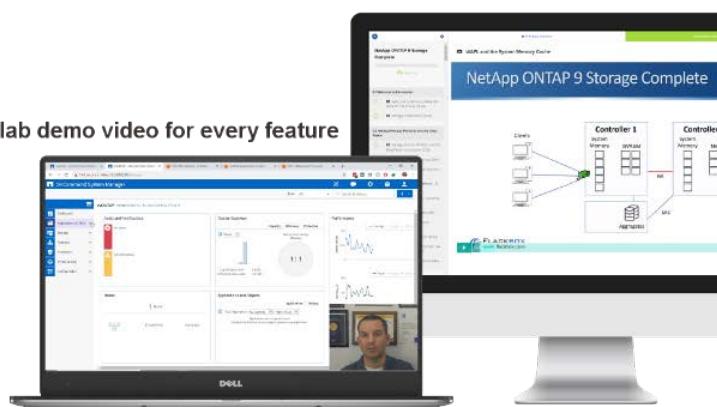
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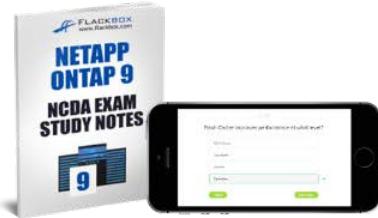
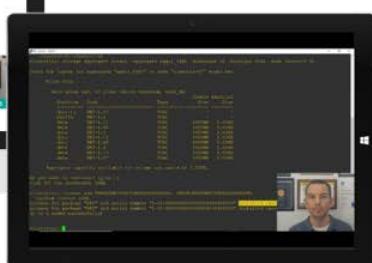
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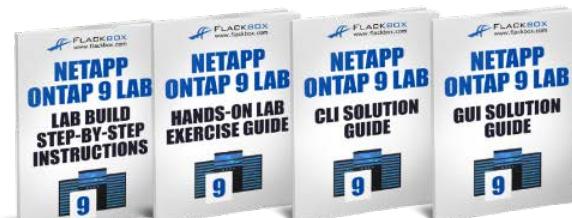
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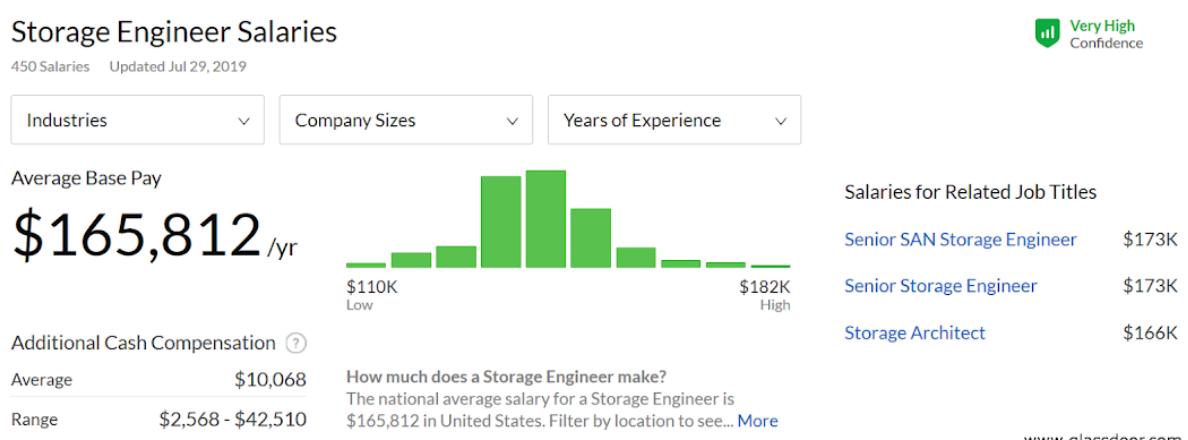
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