

Intro to Computer Systems - Jamie Richards

by Jamie Richards

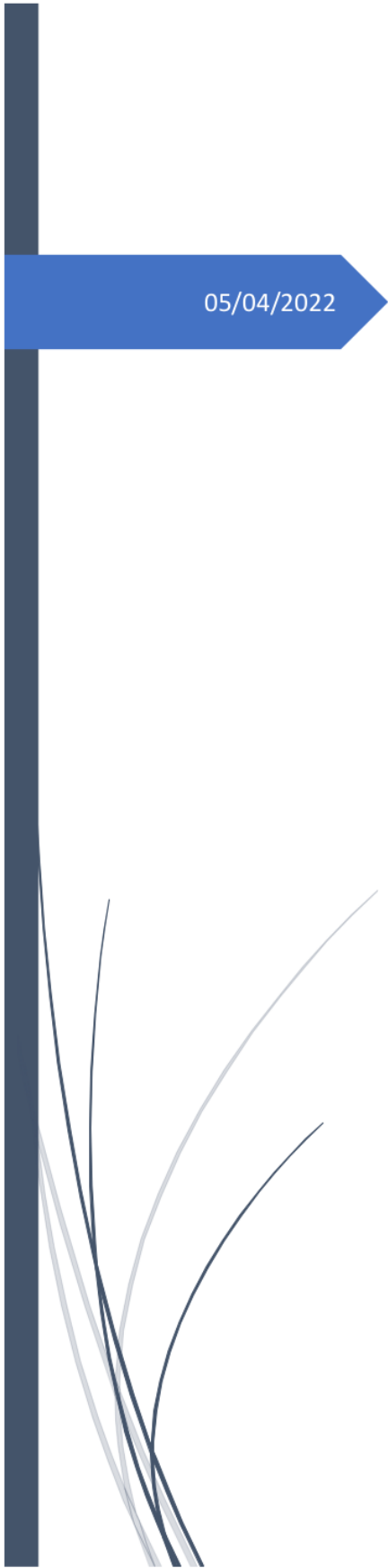
Submission date: 28-Apr-2022 06:35PM (UTC+0100)

Submission ID: 177697171

File name: 31393_Jamie_Richards_Intro_to_Computer_Systems_-_Jamie_Richards_417978_1564220434.docx
(2.76M)

Word count: 2182

Character count: 11182

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05/04/2022

Introduction to Computer Systems

Jamie Richards (0852036)

ACHA4021 – INTRODUCTION TO COMPUTER SYSTEMS

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Introduction

This report is intended to illustrate the authors understanding and knowledge of networks, this will be done by the use of modern day software and virtual machines. The core of this report will consist of instructions and screenshots.

Preparation

In order to begin setting up the first network a number of tools would be required such as a suitable computer system and software, these are described in more detail below.



Computer system

The computer system required to undergo this task would need to have a bare minimum hard drive storage space in order to maintain the virtual computers.

Software



Certain software will be needed on the computer system to allow the creation of the virtual computers. To do this a program called virtual box will be used which allows the author to create a general-purpose full virtual system.

The image to the left illustrate the logo of virtual box, it and the software itself was taken from the virtual box website. [1]

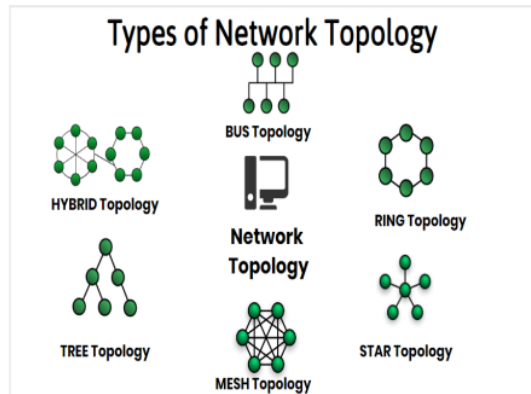


Network Configuration

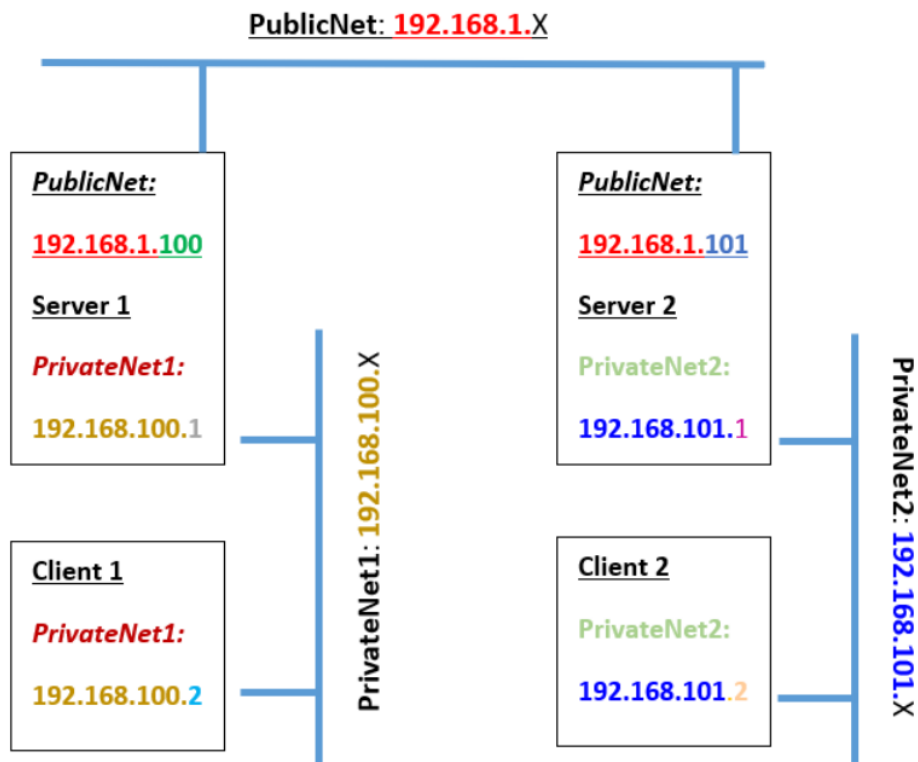
The network will be illustrated below in a topology, "A network's topology details how the devices within it connect with one another and how data moves between its nodes. It can also be defined simply as a schematic description of a network's elements' arrangement." Quoted from logical read website, the above sentence explains what a network topology is and its function. [2]



There are different types of topologies as shown from the image on the right, the image was taken from educba website and demonstrates the different types of network topology. [3]

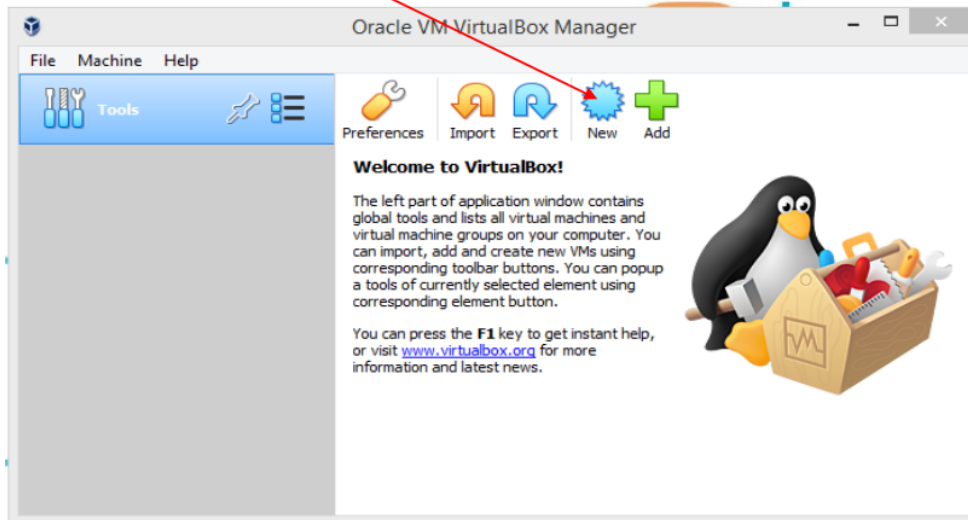


The author will be using the bus topology to demonstrate the network layout, this will display the names of the networks and IP addresses used within this exercise.

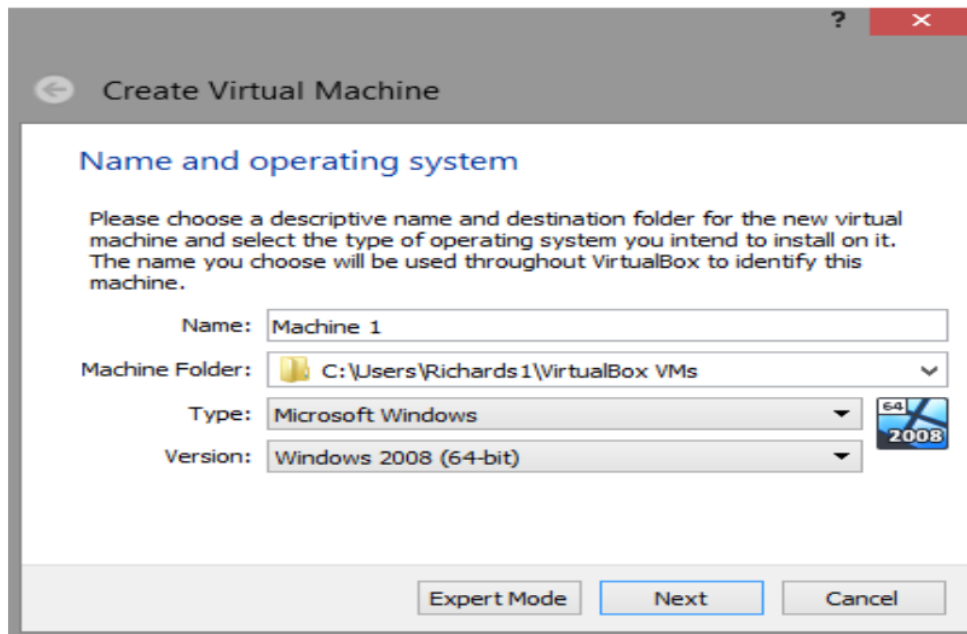


VirtualBox

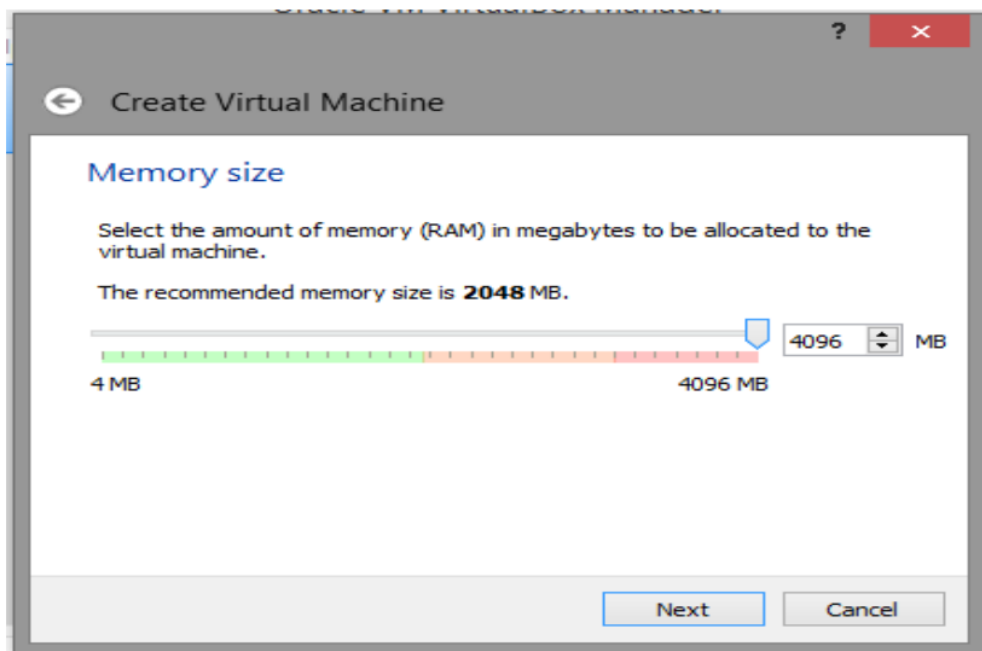
Virtual box will be used to create the virtual machines, once installed and opened the virtual box software will present the user with its welcome page, to start the user will click "New" as shown below.



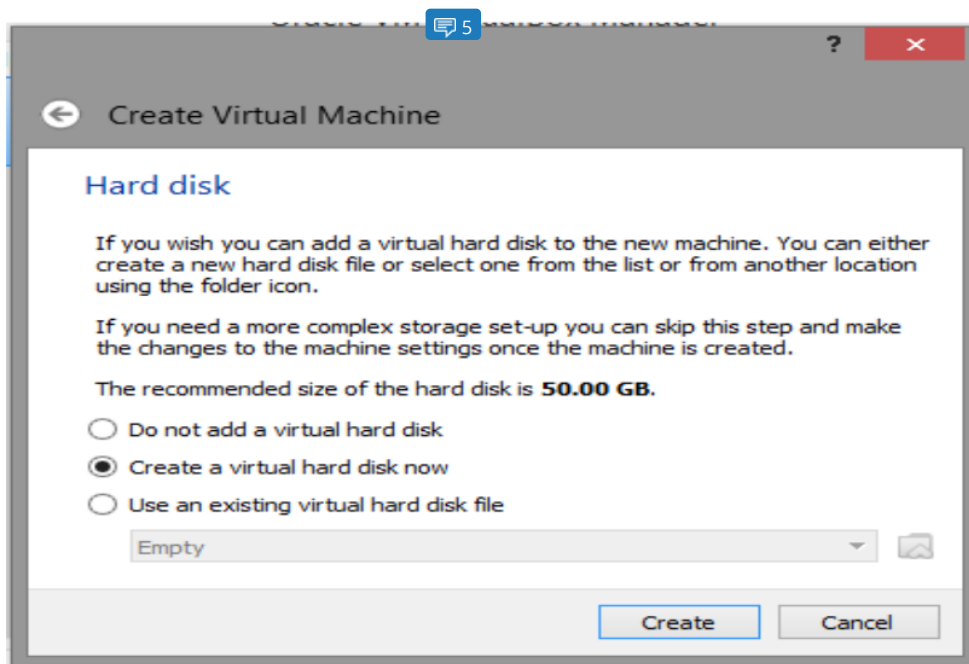
This will bring up the screen allowing the user to enter a name for the virtual machine along with selecting an operating system, for these examples Windows 2008 will be used.



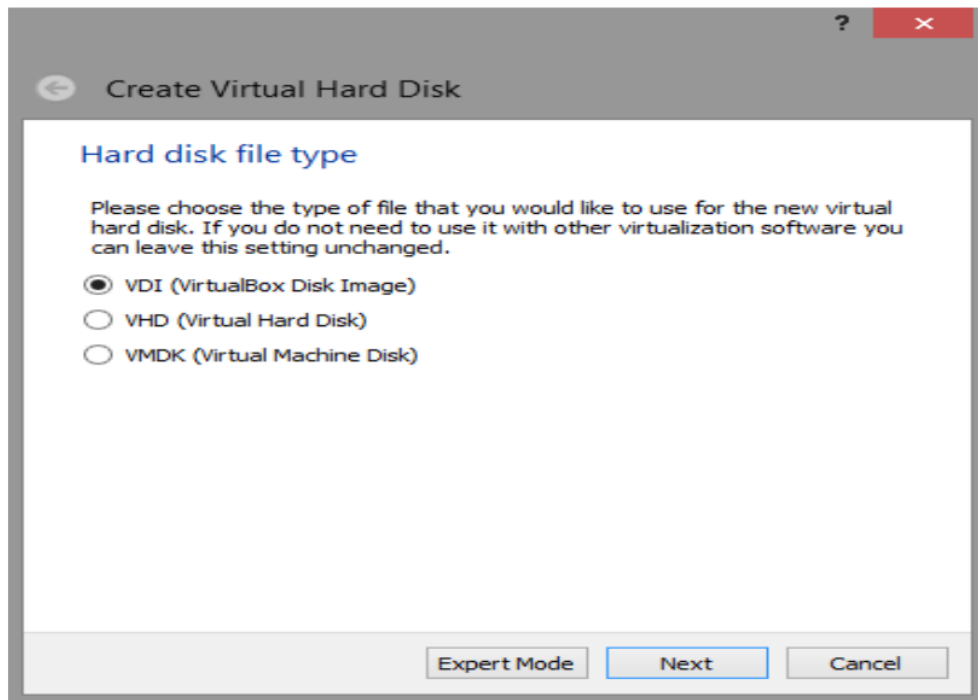
The user will choose the memory size, for these examples 4096MB will be used.



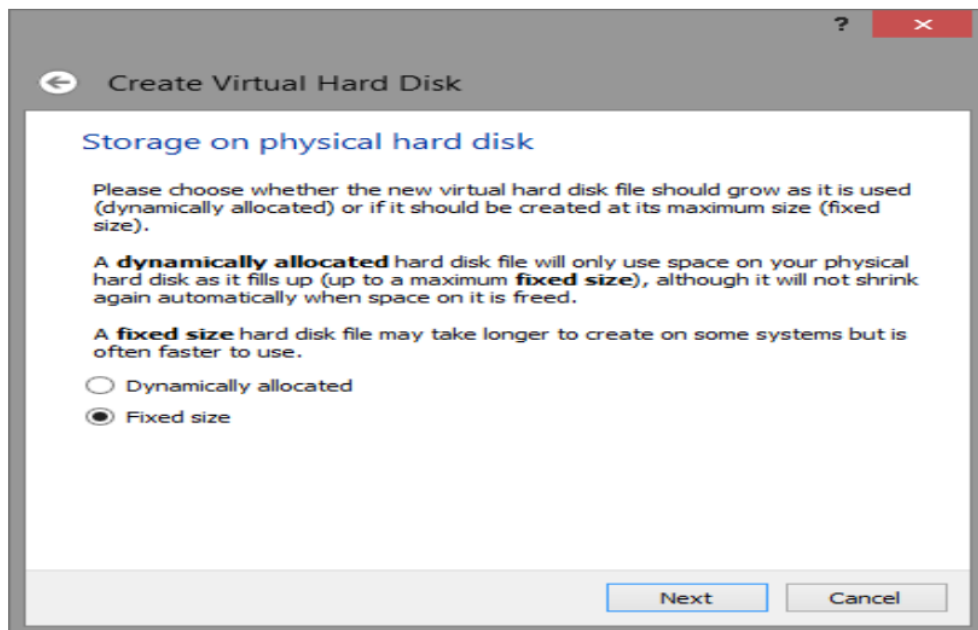
The virtual box software will ask the user is they wish to add a virtual hard disk to the virtual machine.



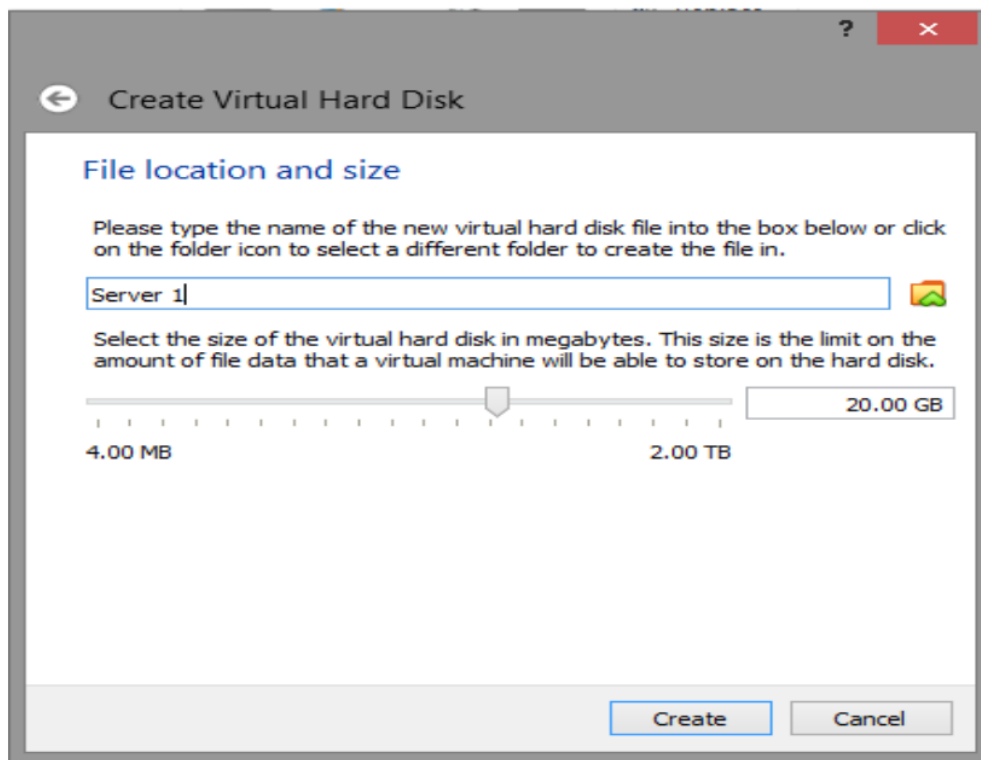
The type of hard disk will be kept as VDI.



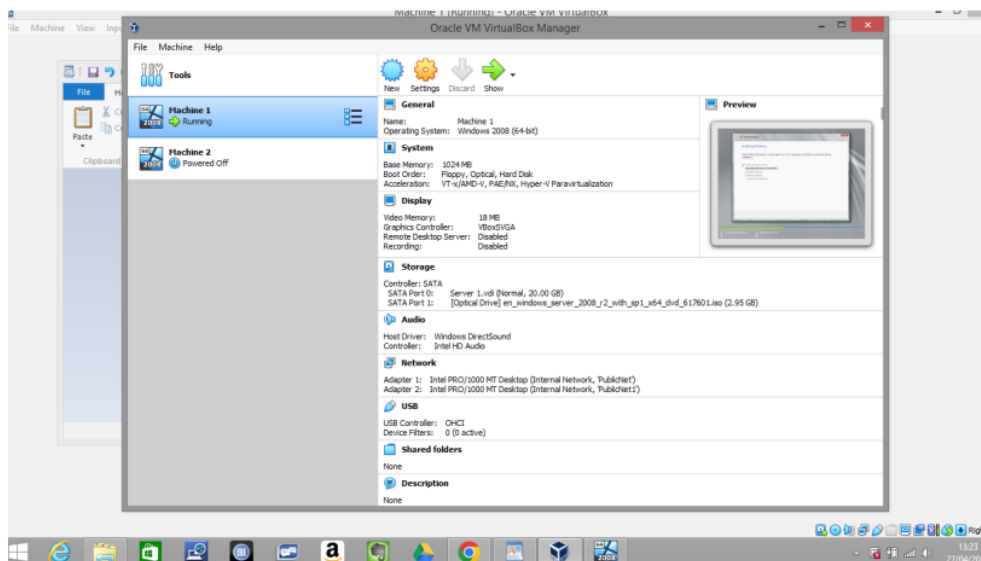
The next window gives the user two options for the storage on the hard disk, the user will choose fixed size.



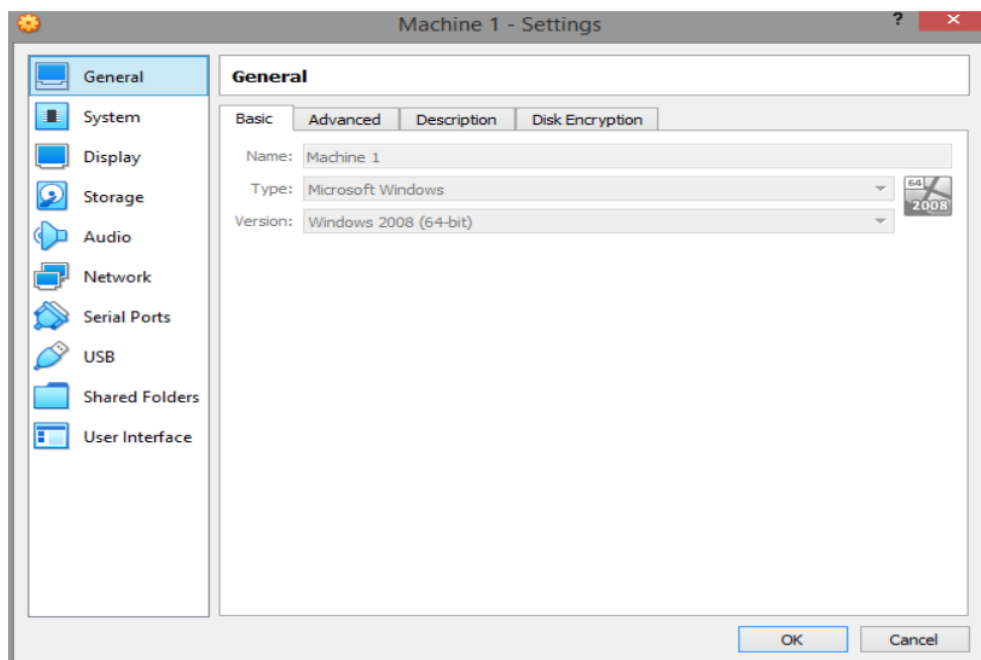
Finally the user will choose a name for the virtual hard disk and the size, the user will name this Server 1 and use 20GB.



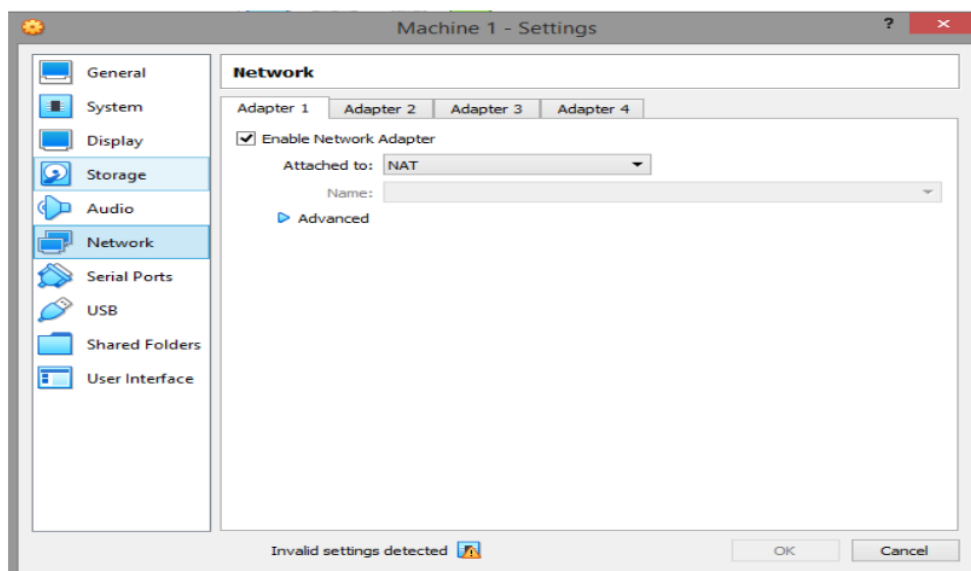
These steps are followed again by the user to create Machine 2 as shown below.



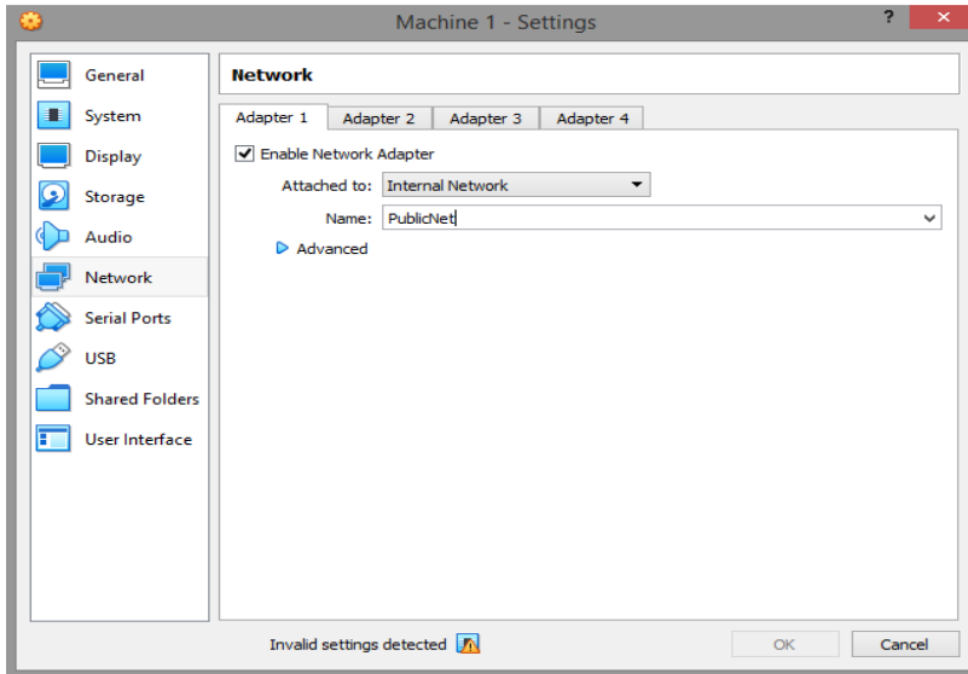
Next the user will right click on Machine 1 and click setting, bringing up the following window.



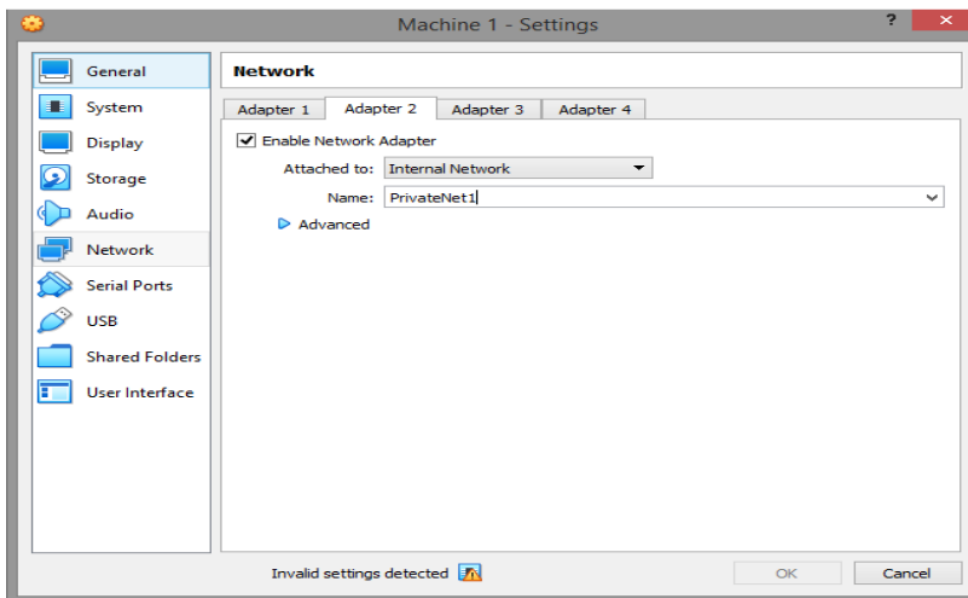
From here, clicking on the network tab, the user is presented with the following window, here after clicking the box to enable a network adapter, the user has a drop down menu to choose from, the one that will need to be selected is "Internal Network".



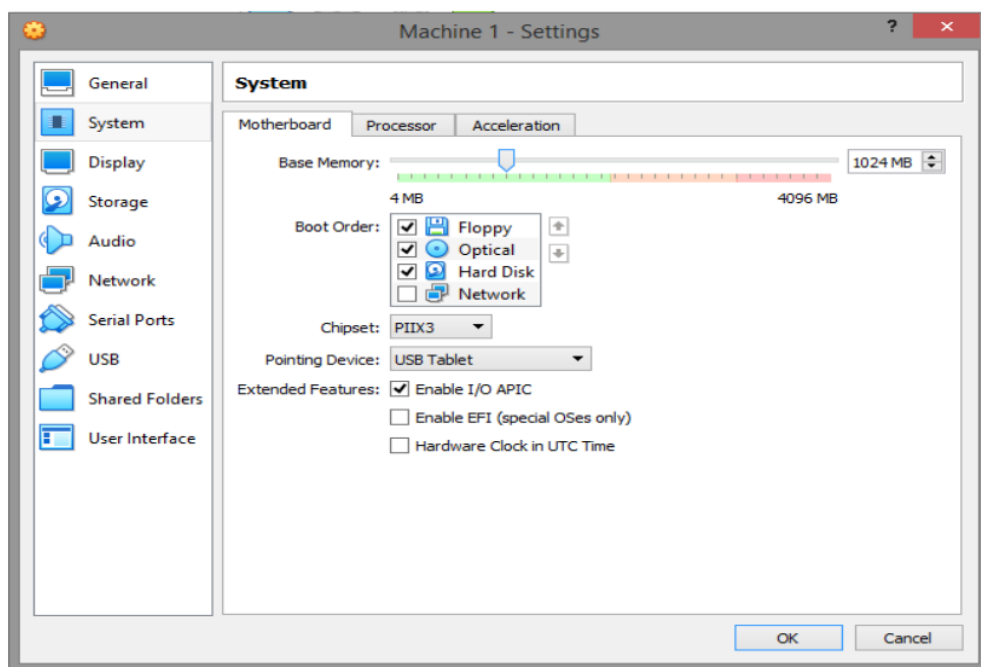
After this a name can be inputted for the network and as shown in the topology diagram previously this name will be PublicNet.



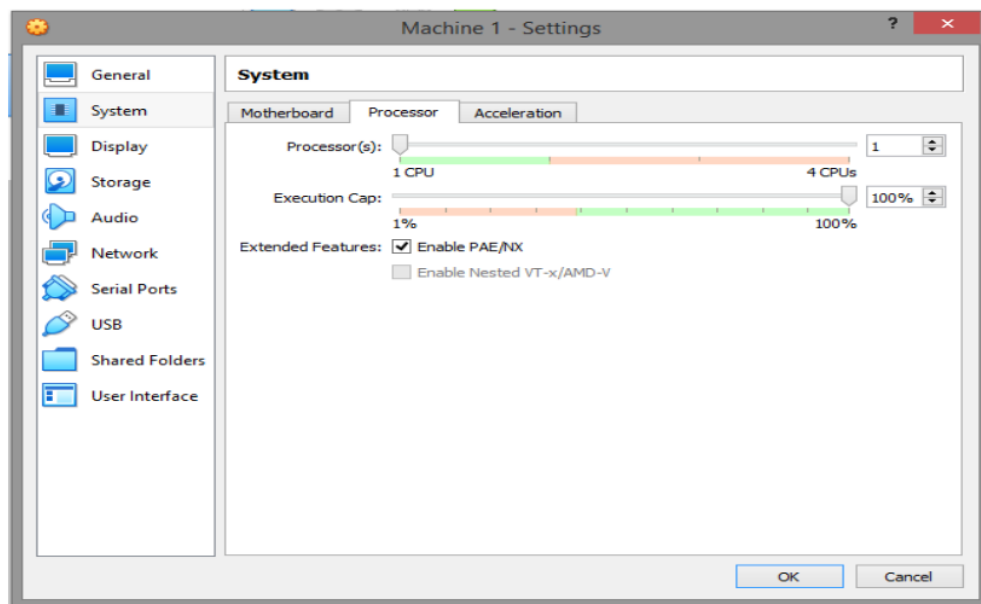
The same options are available in the Adapter 2 tab.



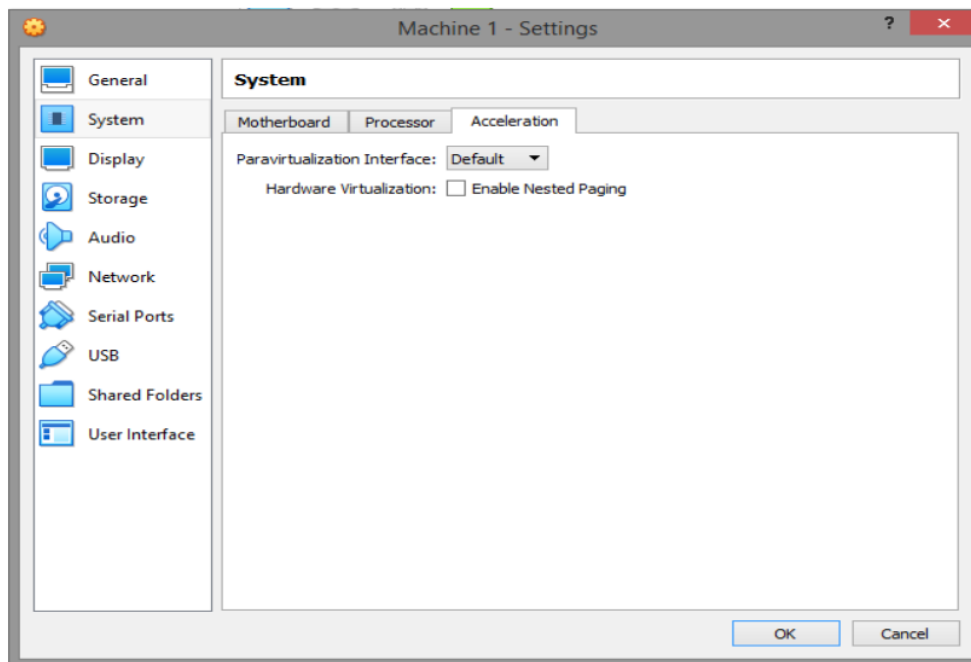
The next tab needing amendments will be the system tab, here the user will have three separate areas to adjust.



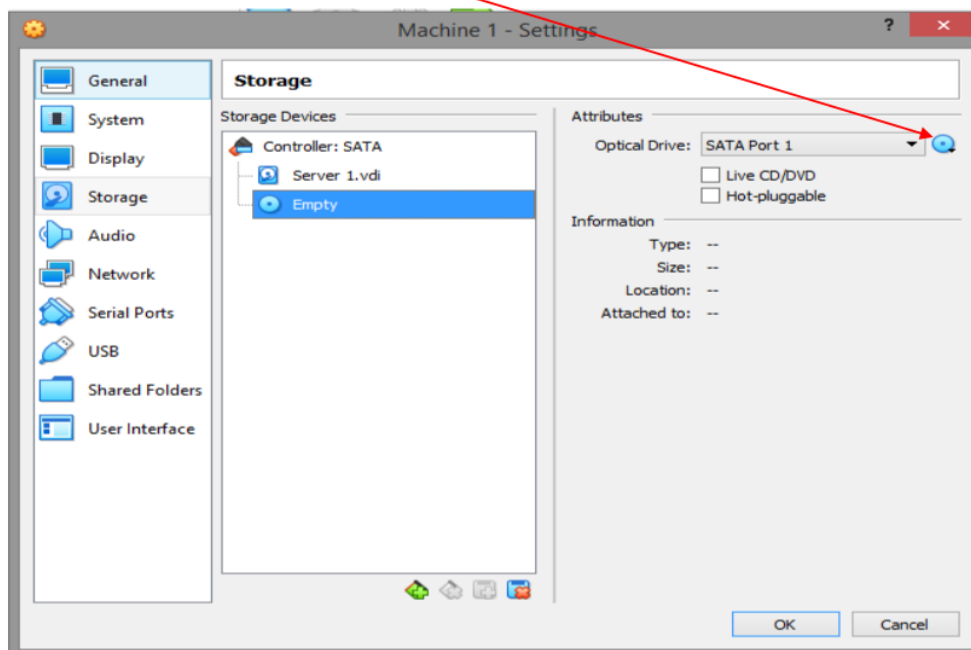
The processor will have the feature "enable APE/NX" ticked.



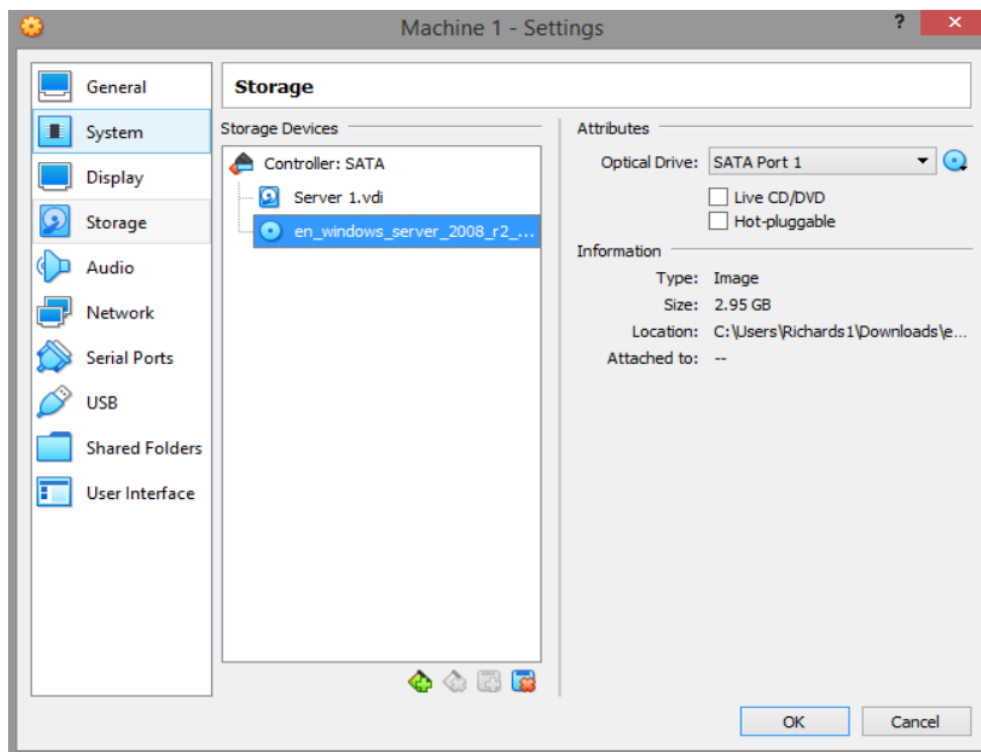
Finally in acceleration the nested paging will be unticked.



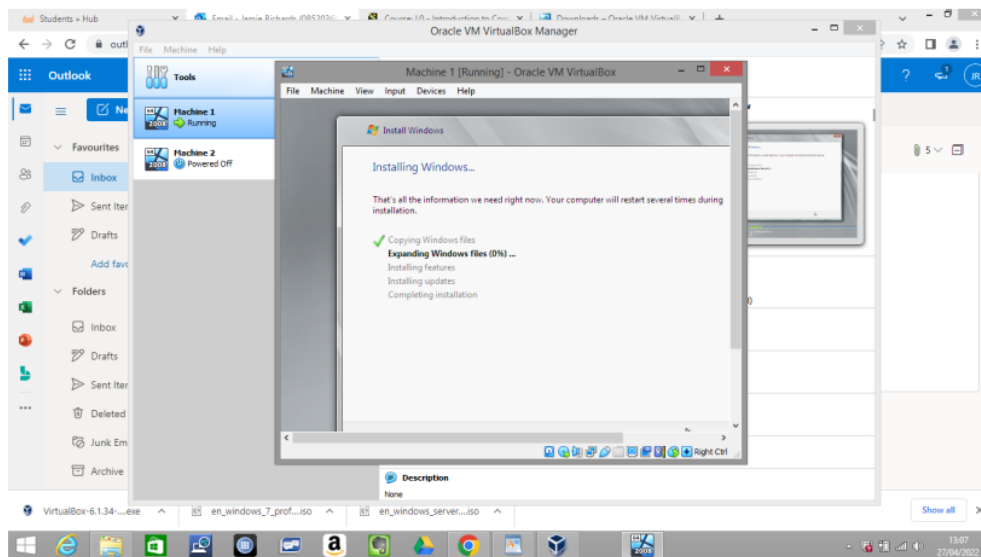
Clicking OK saves the changes, however the user will need to go back into settings, then clicking storage. The user will need to upload a copy of windows 2008 by clicking the disk icon shown below.



The screenshot below shows the windows server ISO is now ready to be run.

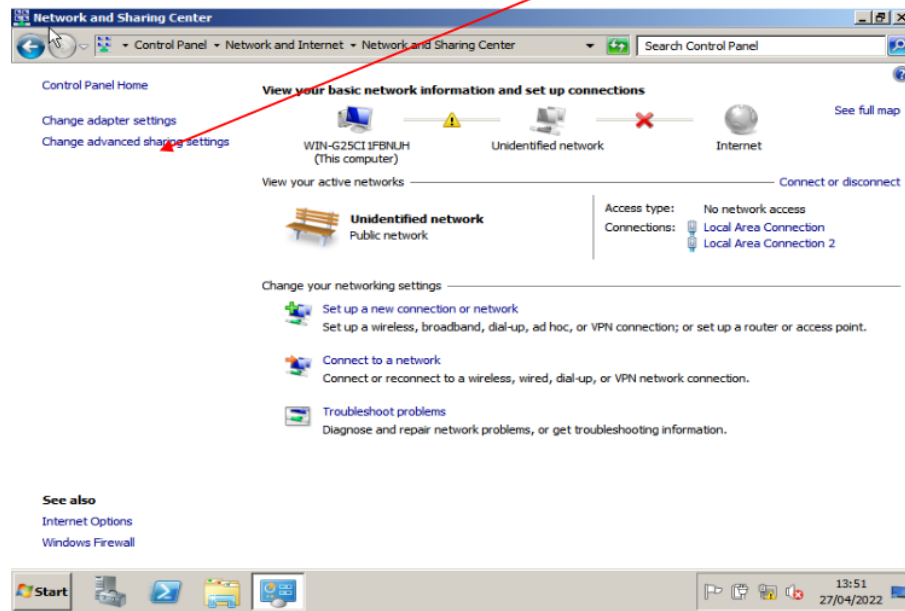


Clicking okay and returning to the virtual box, the user will then start Machine 1, allowing virtual box to install Windows 2008 for the first time.

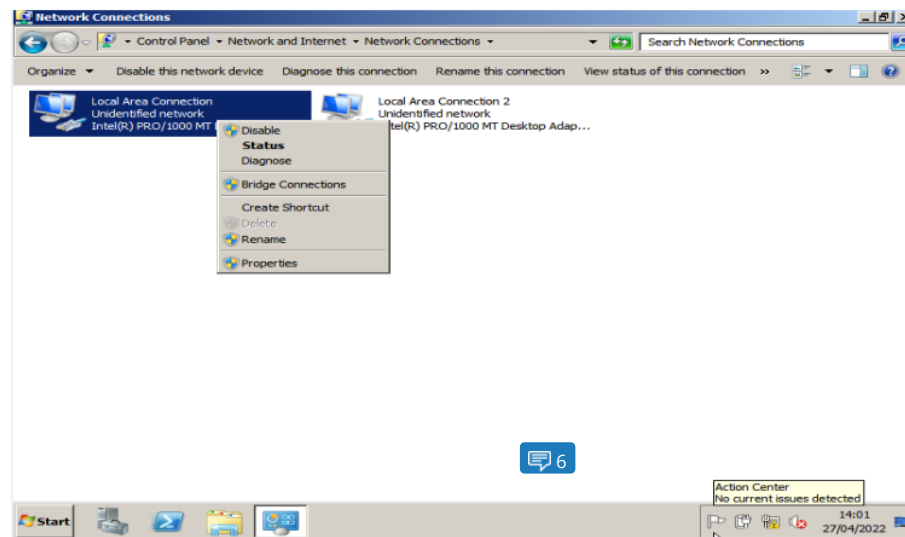


Networking

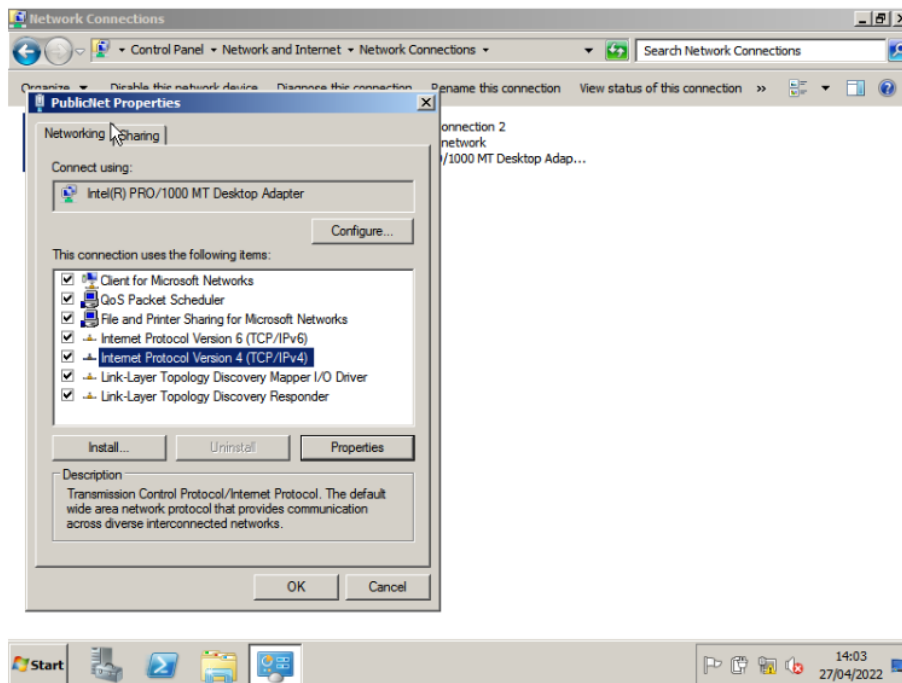
With the installation finished the user now will arrange the network settings on the server, within network and sharing center an option on the left of the screen called change adapter settings will need to be clicked.



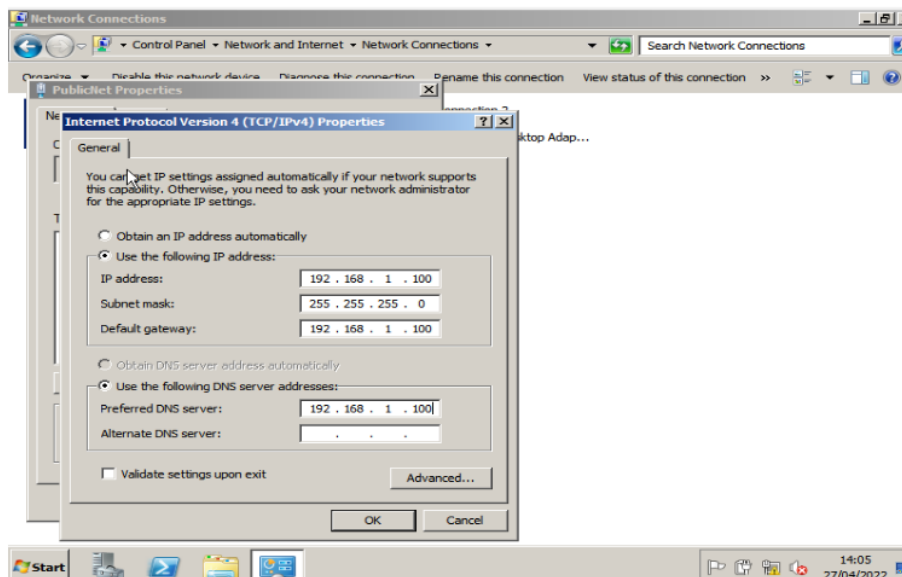
In this window two adapters should be present, the first one will be renamed PublicNet as per the topology.



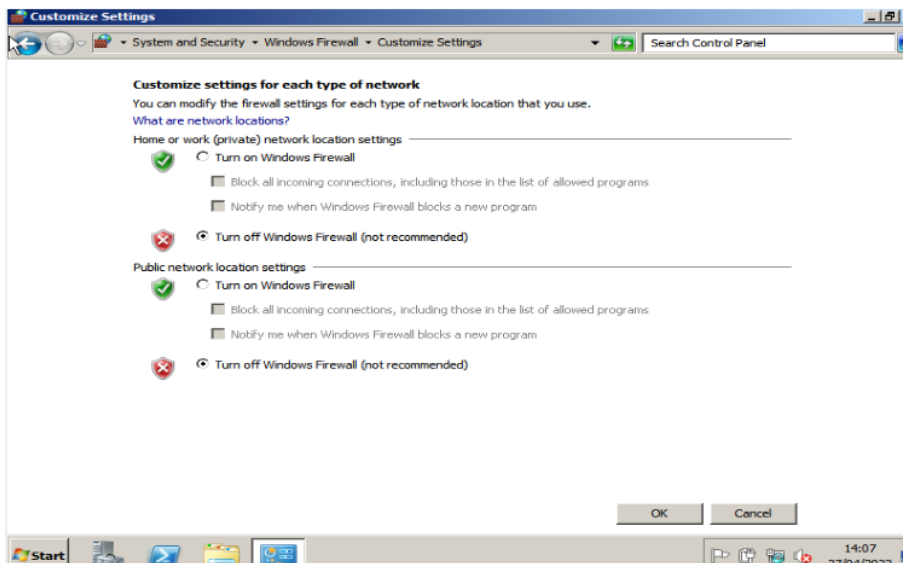
Right clicking the adapter and choosing properties brings up a further window.



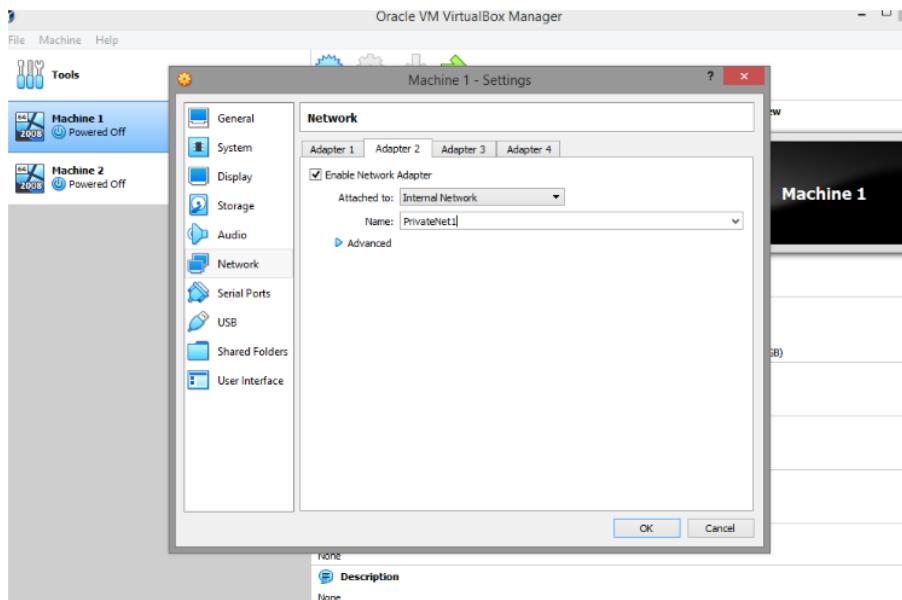
Choosing the appropriate one (TCP/Pv4) and clicking properties allows the user to enter their desired IP address.



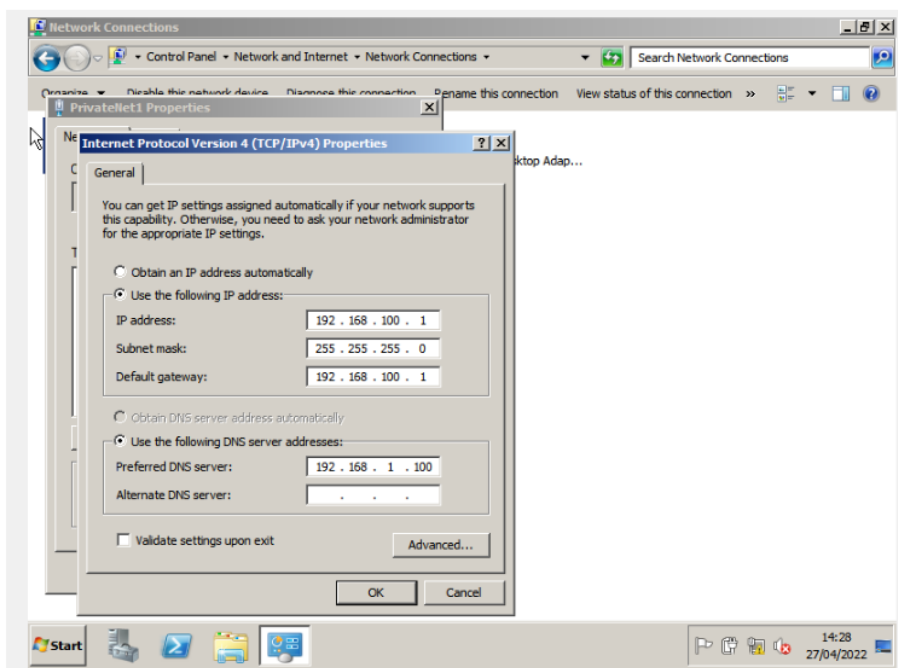
Next firewalls will be turned off to ensure nothing gets blocked when altering network settings and testing further in this report.



Within Virtual Box welcome screen clicking settings allows the user to alter the network adapter 2 and naming it PrivateNet1.

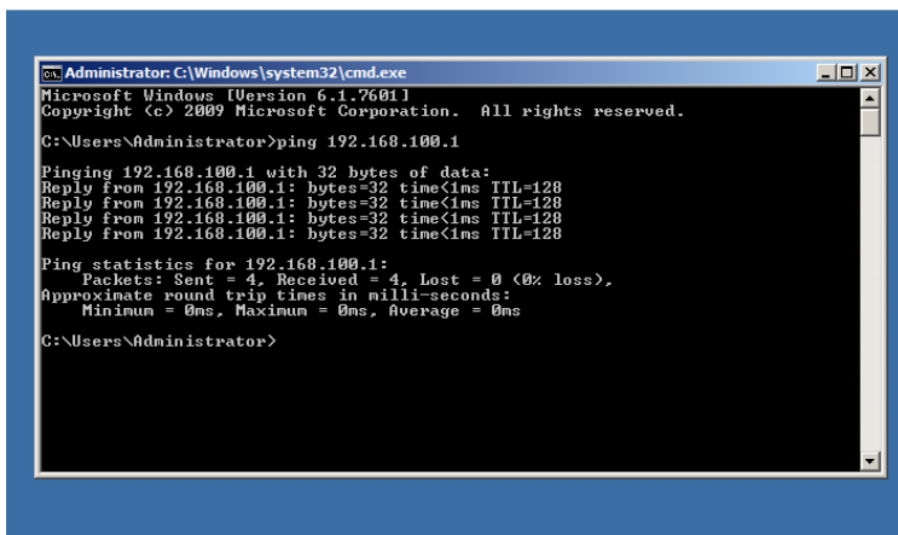


Following the same steps the user can then amend the IP address on this adapter.



Once these steps are repeated for each machine and client, the connections can be tested using the command cmd as shown in the following screenshots, the main thing the user is looking for here is a reply from the IP address entered.

Machine 1 to PrivateNet 1



Machine 2 to PrivateNet 2

```
C:\Users\Administrator>cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>ping 192.168.101.1

Pinging 192.168.101.1 with 32 bytes of data:
Reply from 192.168.101.1: bytes=32 time<1ms TTL=128
Reply from 192.168.101.1: bytes=32 time<1ms TTL=128
Reply from 192.168.101.1: bytes=32 time<1ms TTL=128
Reply from 192.168.101.1: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.101.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\Administrator>
```

Client 1 to PrivateNet1



```
C:\Users\Administrator>cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>ping 192.168.100.2

Pinging 192.168.100.2 with 32 bytes of data:
Reply from 192.168.100.2: bytes=32 time<1ms TTL=128
Reply from 192.168.100.2: bytes=32 time<1ms TTL=128
Reply from 192.168.100.2: bytes=32 time<1ms TTL=128
Reply from 192.168.100.2: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.100.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\Administrator>
```

Client 2 to PrivateNet2

```
C:\Users\Administrator>cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Administrator>ping 192.168.101.2

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

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

C:\Users\Administrator>
```

Hypervisor programs

“There are two types of hypervisors:

- Type 1 hypervisor: hypervisors run directly on the system hardware – A “bare metal” embedded hypervisor,
- Type 2 hypervisor: hypervisors run on a host operating system that provides virtualization services, such as I/O device support and memory management.”

The statement above quoted from the vapour apps website, defines two types of hypervisors. [4]

Essentially a hypervisor program is a piece of software that allows a user to create virtual machines, hypervisor has been also known as a virtual machine monitor.

The hypervisor program used in this report was virtual box which is a type 2 hypervisor.



One could argue a big advantage of this type 2 software is that the program holds a straightforward management system, the user doesn't need to install vast amounts of different bundles of software to maintain a virtual machine. The possibility of simply loading in the operating system to conduct your intent then loading another to evaluate the differences makes this type of hypervisor gain more attractiveness.

On the other hand like most things has type 2 has its disadvantages, the main being the issue with the operating system only allowing the user to run one or the other such as windows, if for some reason the operating system fails or has an error the virtual machine is fundamentally useless, unusable.

Utility and Application Program Software

The author will now look into utilising utility and application software on an operating system and explain what they do.

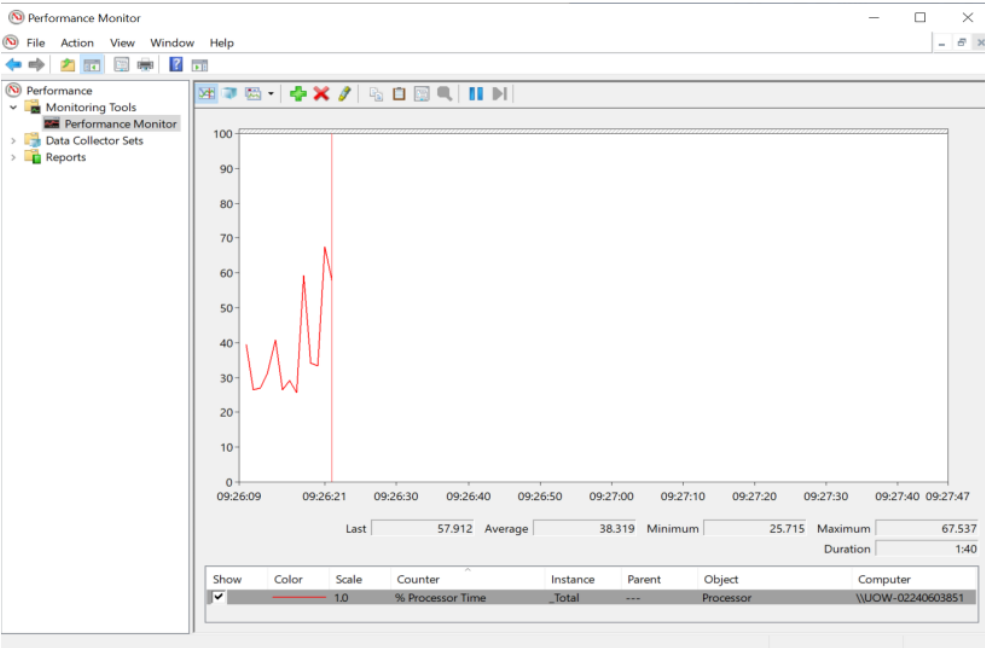
Application software as the name suggests is where the user applies third party software to perform different desired tasks, dependant on the software's purpose. Most commonly gaming, which requires the use of an application program, allowing the operating system to be given the required software to run that game.

Utility software allows a user to manipulate and adjust the computers infrastructure while also optimising, often coming built in with the operating system and accessed through the control panel or system settings. A common use for a utility program would be to back up or restore data however the author will look into performance monitor, computer management and system configuration utility programs below.

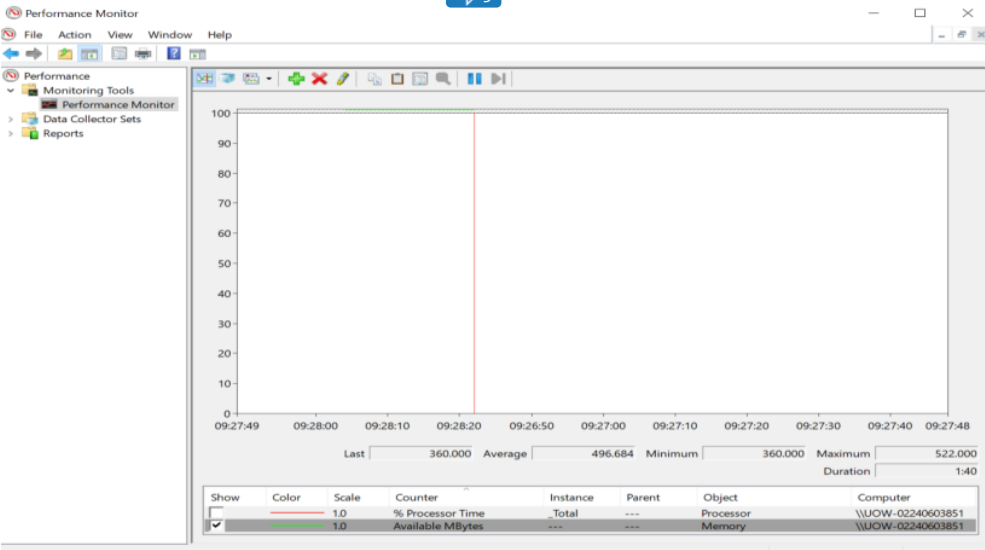
Performance monitor is used to monitor the systems different usual activities such as memory usage or processing speed, often used to determine a cause of an issue locally.

The performance monitor application can be found in the windows administrative tools folder and when opened the user can observe a number of selected counters relating to the system performance.

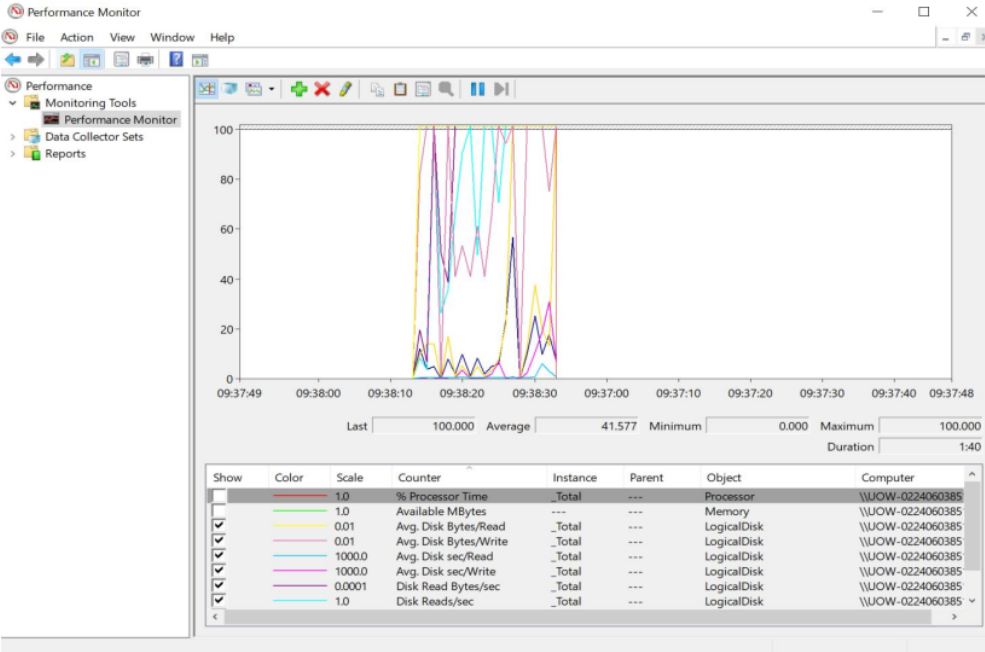
The below image shows the processor time of the system being used by the author and its CPU usage.



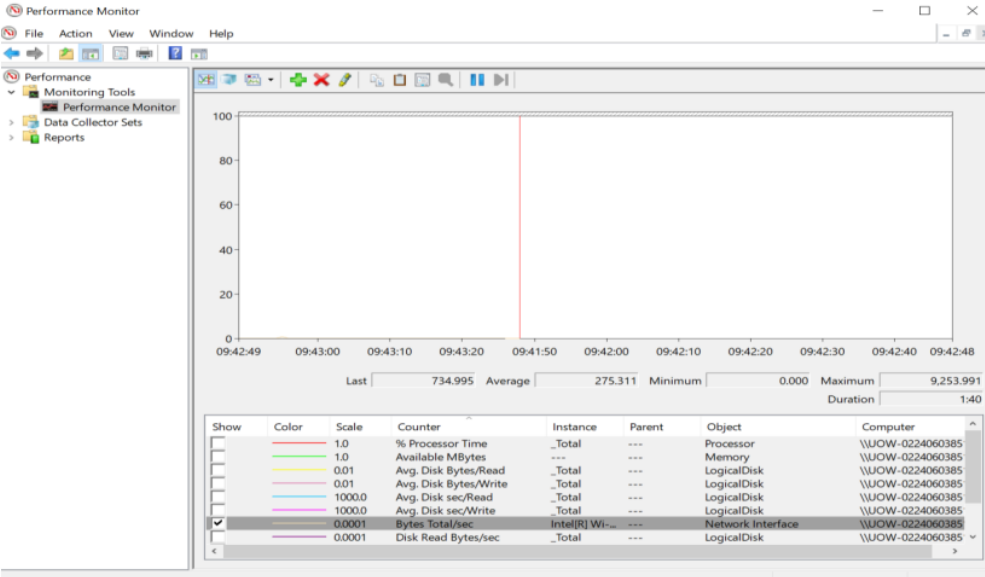
The next screenshot below shows the memory and its available storage space, further selections allows a user to see how much memory is being used.



Below is the local disk input and output processes.

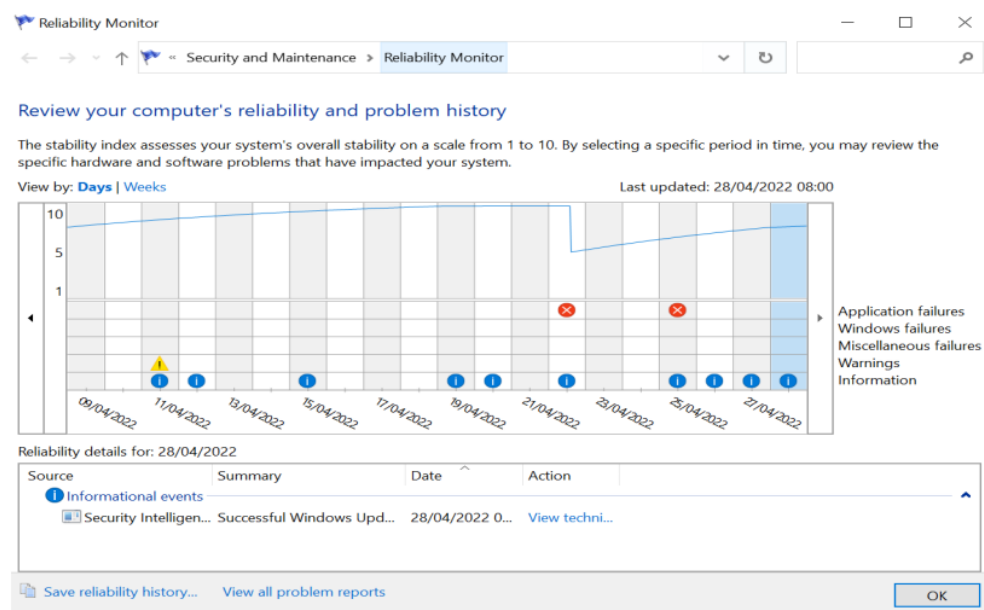


Finally below shows the network settings, in particular latency and bytes per second.



Reliability Monitor found in the performance monitor itself allows the user to measure events that has happened on a computer, making this a very useful tool especially when a user needs to access whether the system they are using is reliable.

To access the reliability monitor the user would need to right click on the “Monitoring tools” folder within the performance monitor window and click “view system reliability”, this brings up a new window giving the viewer detailed information about the computers reliability in a score of 1 to 10, screenshot below.



Computer management is a vital utility program allowing users to access settings within the windows operating system, the program itself consists of system tools, applications and storage.

Such actions like backing up the system and adding new users to the computer can be found within this utility program, further more within system tools the user can download and update the computers drives and software.

System configuration also known as MSCONFIG is an extremely useful tool when the user needs to address an speed issues when starting up a system, by entering this utility program the user can amend the programs they want to run when the system boots on.

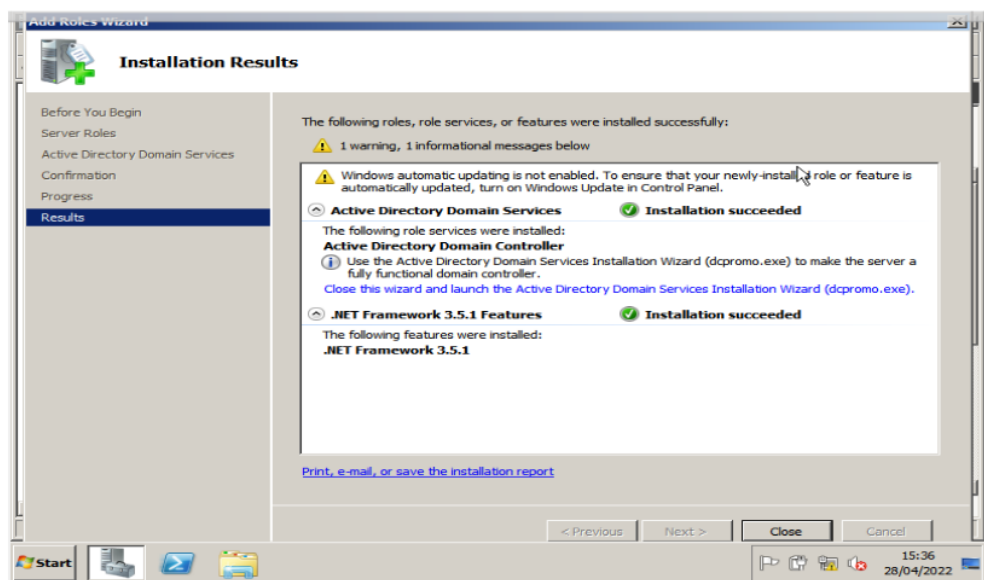
Finally in this section of the report the author will discuss monitoring tools and its importance, uses. A monitoring tool is used to locate a problem or determine if there is one or not, by incessant observations on a monitoring tool a user can identify and resolve issues on a computer before they become too big or unfixable.

Often monitoring tools come with a cost where companies design a monitoring tool available to download to the public at a subscription monthly or one off cost, majority of the time these come with a free trial. An example of one such tool called paessler prtng, which is designed specifically for monitoring networks. This monitoring tool

allows the user to monitor network devices, servers and even certain applications, their website claims to have its own auto discovery feature which will alert the user of any network failure or issues. [5]

Domain

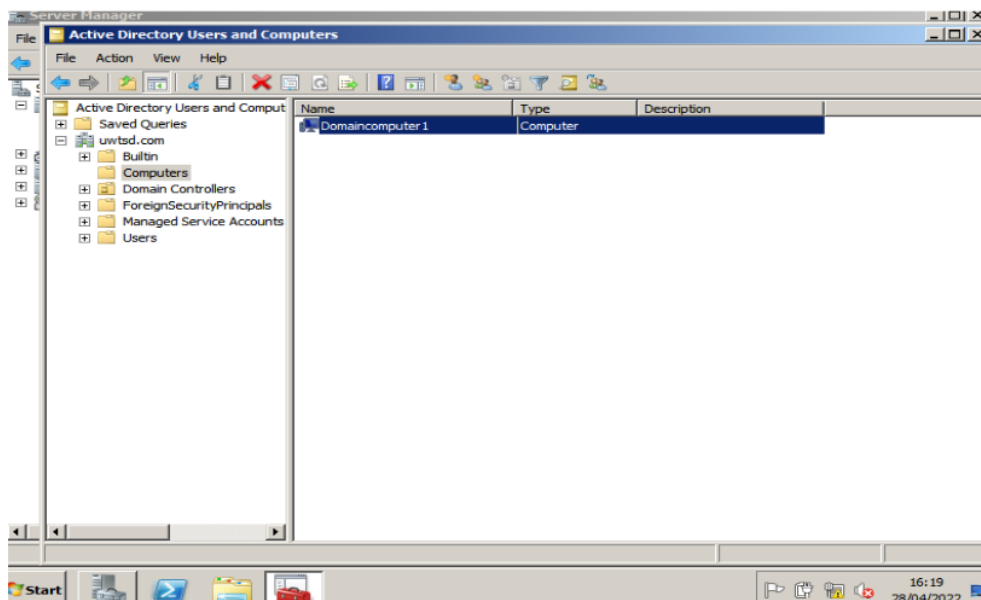
The author will now set up a server as a domain controller, to do this using the author firstly installs an active directory domain service which is needed to safeguard the login account, a screenshot of this complete is shown below.



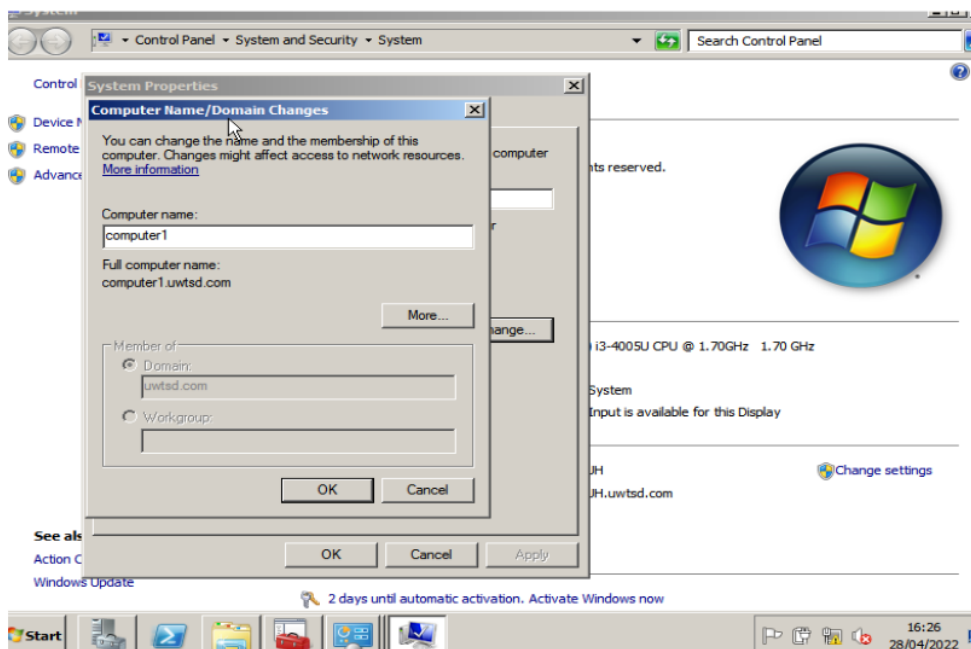
Using the same service manager window, the author will create an active directory domain named UWTSD, after resetting the system the author can then log in to this domain.



With this complete the author can then access the active directory users and computers window enabling the option to create things like client computers and objects. For instance the below screenshot shows a new computer which has been created called Domaincomputer1.



From here the author can connect the new computer to the domain allowing other users access as shown below.



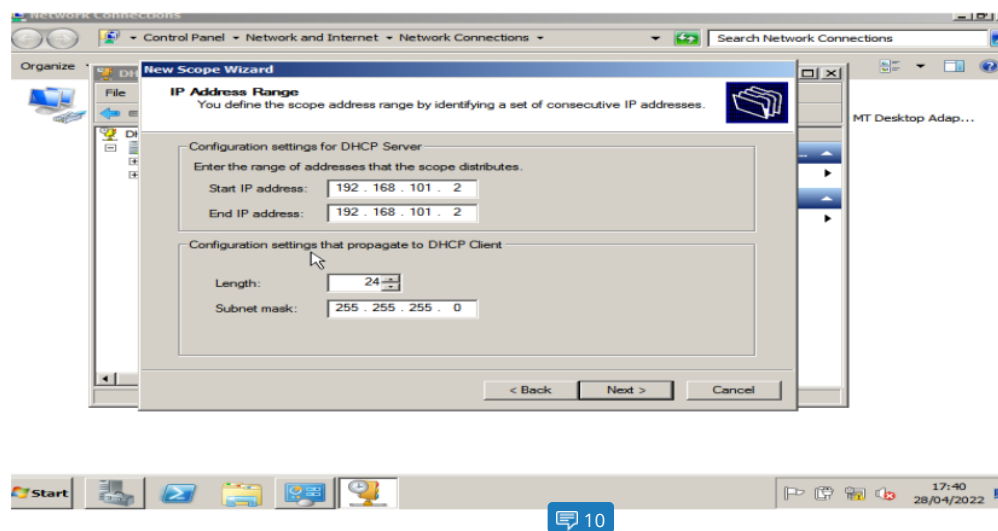
An active directory is used to store information about the network and makes its contents easily accessible for a user.

A domain is a group of devices or users sharing different data with each other via a network, a domain controller is responsible for allowing the host user access to the domains resources being in charge so to speak.

A tree in the context of domains is essential like an hierarchical that share a constant namespace. Where as a forest is a group of trees without sharing the same namespace.

DHCP

Before evaluating this report the author will create a DHCP server and acquire a IP automatically, using sever manager the author will install the relevant feature to allow a DHCP to allocate itself a static IP address. Followed by adding a scope as shown below.



After following the rest of the steps the author can test the DHCP by using the cmd command and entering ipconfig, below is a screenshots of the results.

```

Administrator: C:\Windows\system32\cmd.exe
C:\Users\Administrator>ipconfig/all

Windows IP Configuration

Host Name . . . . . : computer1
Primary Dns Suffix . . . . . : uvtst.com
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : uvtst.com

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . : 
Description . . . . . : Intel(R) PRO/1000 MT Desktop Adapter #3
Physical Address. . . . . : 08-00-27-1D-6D-17
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::4499:53a2:37c3:dd83%15(Preferred)
IPv4 Address. . . . . : 192.168.100.2(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.1.100
DHCPv6 Iid . . . . . : 359625079
DHCPv6 Client DUID. . . . . : 00-01-00-01-29-Fa-F1-70-08-00-27-65-43-5A

DNS Servers . . . . . : ::1
                       127.0.0.1
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter PrivateNet1:

Connection-specific DNS Suffix . : 
Description . . . . . : Intel(R) PRO/1000 MT Desktop Adapter #2
Physical Address. . . . . : 08-00-27-0B-0A-2B
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::254:129:64:1(Preferred)
IPv4 Address. . . . . : 169.254.129.64(Preferred)
Subnet Mask . . . . . : 255.255.0.0
Default Gateway . . . . . : 0.0.0.0
DNS Servers . . . . . : ::1
                       127.0.0.1
NetBIOS over Tcpip. . . . . : Enabled
  
```

Evaluation

To conclude the virtual box program is a very powerful tool which allows a lot of flexibility for the user to play with, the different virtual machines each with numerous network adapters makes this program a must use when setting up network interfaces.

References

[unknown, "VirtualBox," [Online]. Available: <https://www.virtualbox.org/>. [Accessed 22 04 2022].

1  11

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[S. Contributor, "All about network topology," 24 11 2021. [Online]. Available:

2 <https://logicalread.com/network-topology/#what-is-network-topology>. [Accessed 22 04 2022].

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[unknown, "Overview of types of network topology," [Online]. Available:

3 <https://www.educba.com/types-of-network-topology/>. [Accessed 22 04 2022].

]

[VapourApps, "What is Hypervisor and what types of hypervisors are there," 13 May 2016.

4 [Online]. Available: <https://vapour-apps.com/what-is-hypervisor/>. [Accessed 28 04 2022].

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[P. AG. [Online]. Available:

5 [https://www.paessler.com/prtg?utm_campaign=WebgainsAffiliate&utm_content=1287125&utm](https://www.paessler.com/prtg?utm_campaign=WebgainsAffiliate&utm_content=1287125&utm_medium=affiliate&utm_source=Webgains&wgexpiry=1658913583&wgregion=us&wgu=264775_1287125_16511375834476_35542b2a4d)

6 [_medium=affiliate&utm_source=Webgains&wgexpiry=1658913583&wgregion=us&wgu=264775_1287125_16511375834476_35542b2a4d](https://www.paessler.com/prtg?utm_campaign=WebgainsAffiliate&utm_content=1287125&utm_medium=affiliate&utm_source=Webgains&wgexpiry=1658913583&wgregion=us&wgu=264775_1287125_16511375834476_35542b2a4d). [Accessed 28 04 2022].

Intro to Computer Systems - Jamie Richards

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FINAL GRADE

GENERAL COMMENTS

Instructor

75/100

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Comment 1

well-organised document

PAGE 3



Comment 2

well-written introduction



Comment 3

careful of referencing convention. this belongs as part of the sentence



Comment 4

good explanation

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Comment 5

ell organised evidence here

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Comment 7

vidence of key diagnostics tools

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evidence of good research here

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emonstration of appropriate use of utility programs

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Comment 10

excellent work shown in setting up the systems



Comment 11

reference convention