

Grade: 65/65 A+

Setting Up a Virtual Network with Kali Linux, Ubuntu, and Windows 11 using VirtualBox

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CSC300: Operating Systems and Architecture

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July 16, 2023

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In computer science, virtualization is a technology that allows system hardware to be shared between multiple virtual environments (Amazon, n.d.). In other words, hardware can be shared by multiple virtual machines, allowing these machines to operate simultaneously on a single physical machine. In this essay, I will provide a step-by-step guide for installing a virtual network using VirtualBox. The network will consist of three machines: Kali Linux, Ubuntu, and Windows 11, with Windows 11 being the host system. Lastly, I will describe how to network the three machines.

Virtualization Enable

To use virtualization, it needs to be enabled on the system. On a Windows 11 machine, virtualization is by default enabled. Nonetheless, to check if virtualization is enabled, launch task manager, select the performance tab, and in the bottom right portion of the page, the 'Virtualization' option should display 'Enabled' (Singh, 2021). If not, you may need to enable the Virtual Machine Platform service and you may also need to make changes to the machine's BIOS.

Steps to enable the Virtual Machine Platform service:

1. Select Start, enter Windows features, and select Turn Windows features on or off from the list of results.
2. In the Windows Features window that just opened, find Virtual Machine Platform and select it.
3. Select OK. You might need to restart your PC. (Microsoft Support, n.d.)

If changes to the machine's BIOS are needed, refer to the motherboard manufacturer's instructions. Once the Virtual Machine Platform is enabled, the next step is to install VirtualBox.

VirtualBox

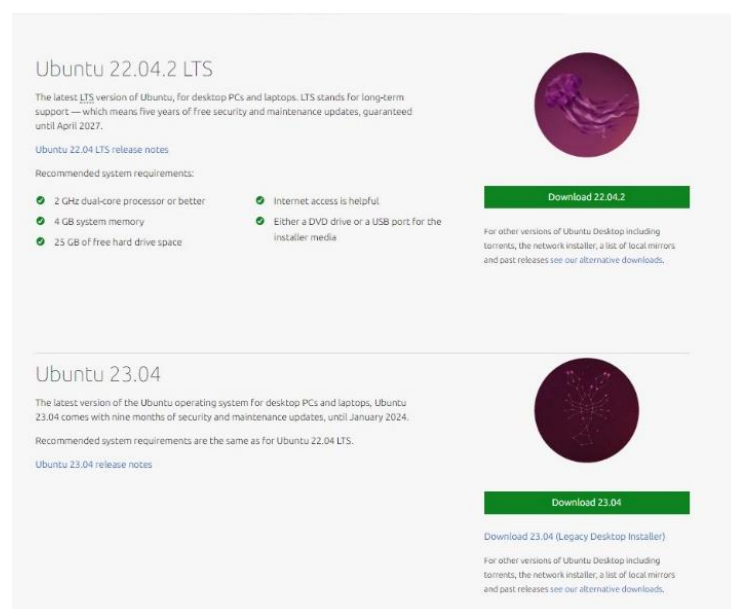
VirtualBox is an Oracle product, it is a x86 and AMD64/Intel64 virtualization product for enterprise as well as home use (“Welcome to Virtualbox.org!”, n.d.). To install VirtualBox go to ‘virtualbox.org’ and click on the ‘Download VirtualBox 7.0’ button. Then click on the ‘Windows Host’ link. This will download the VirtualBox-7.0.8-156879-Win.exe file then run the file to install VirtualBox. Once is VirtualBox installed, the next step is to install Ubuntu.

Ubuntu

Ubuntu is the most popular Linux distribution (Stratvert, 2023). To install Ubuntu on your PC, you need to download the ISO image file of Ubuntu, for that go to ‘<https://ubuntu.com/download/desktop>’. Please see Figure 1 for Ubuntu’s minimum system requirements. To install Ubuntu as a virtual machine using VirtualBox, open VirtualBox and click on the new button located at the top of the VirtualBox manager, and follow the instructions to install it. After Ubuntu is installed, the next step is to download and install Kali Linux.

Figure 1

Ubuntu System Requirements



Note. From “Download ubuntu desktop: Download,” *ubuntu.com* (<https://ubuntu.com/download/desktop>).

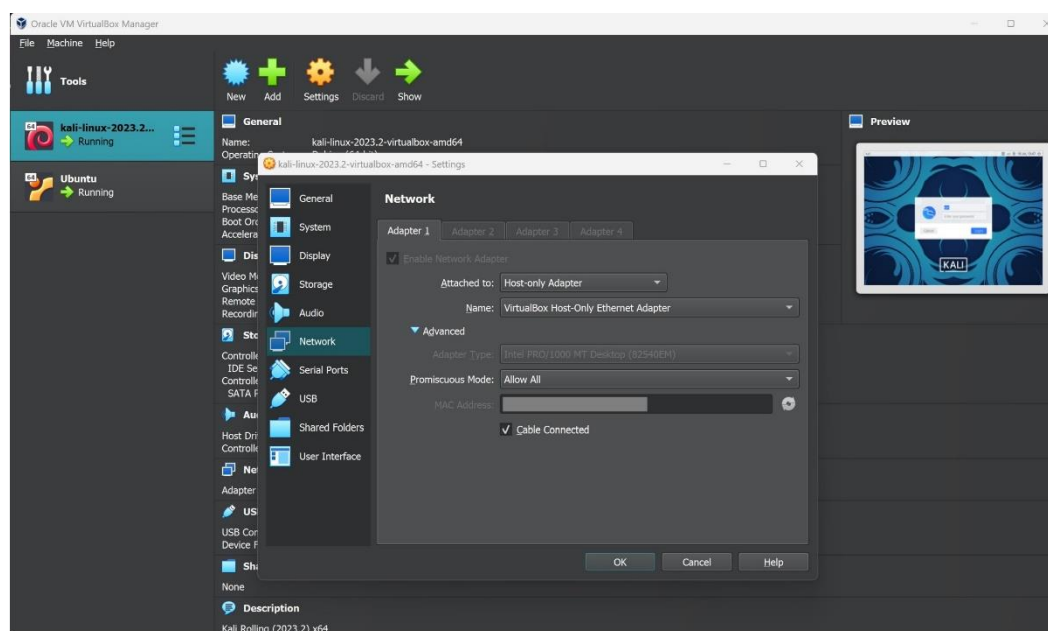
Copyright 2023 by Ubuntu.

Kali Linux

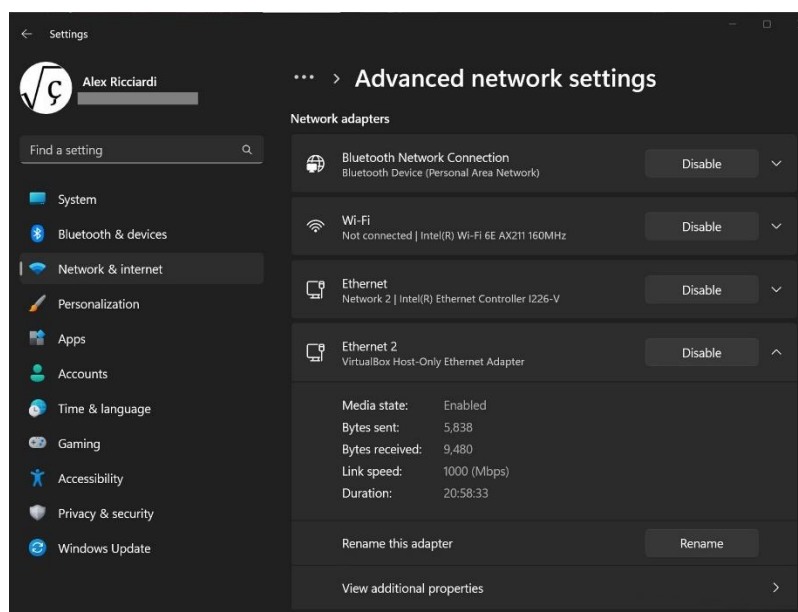
Kali is a Linux distribution based on Debian Testing. To download Kali Linux go to '<https://www.kali.org/get-kali/#kali-platforms>' and select the 'Virtual Machine' tab, or you can choose to download the ISO image, for that select the 'Installer Images' tab. The minimum system requirements for Kali are 128 MB of RAM and 2 GB of disk space (Kali Linux, 2023). However, I installed it with 2 cores, 2 GB of RAM, and 20 GB of disk space. To install Kali Linux as a virtual machine using VirtualBox, open VirtualBox and click on the new button located at the top of the VirtualBox manager and follow the instructions to install it. After Kali Linux is installed, the next step is to network the Ubuntu, Kali, and Windows 11 machines.

Networking the Machines

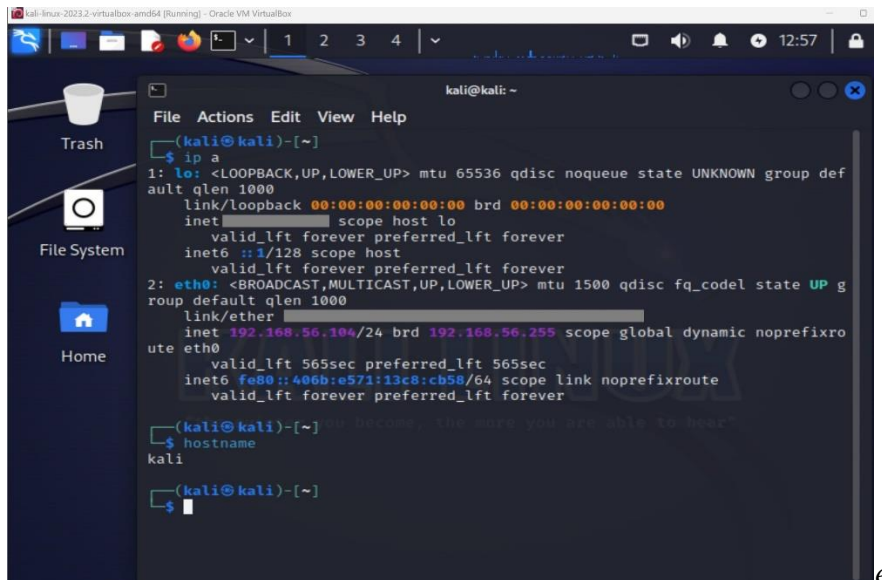
By default, VirtualBox sets the network translation to Network address translation (NAT) and creates a virtual router (Network Ninja, 2022). This configuration creates an individual network for each virtual machine. As a result, the machines cannot ping each other. One solution is to set the network translation on both virtual machines to 'Host-only Adapter' and the 'Promiscuous Mode' to 'Allow All', see Figure 2 for more information. Additionally, VirtualBox creates a network where the host and the virtual machines are all connected but are physically cut off from the rest of the network. Furthermore, Figure 3 shows the network name to be Ethernet 2. The Ethernet 2 IP addresses and hostnames for each machine are shown in Figures 4, 5, 6, and 7. Figures 8, 9, and 10 show the machine pinging each other. This shows that all the machines are all connected to same network and can communicate.

Figure 2*Host-only Adapter*

Note. Kali Linux, Host-only Adapter setting.

Figure 3*Ethernet 2*

Note. VirtualBox created network.

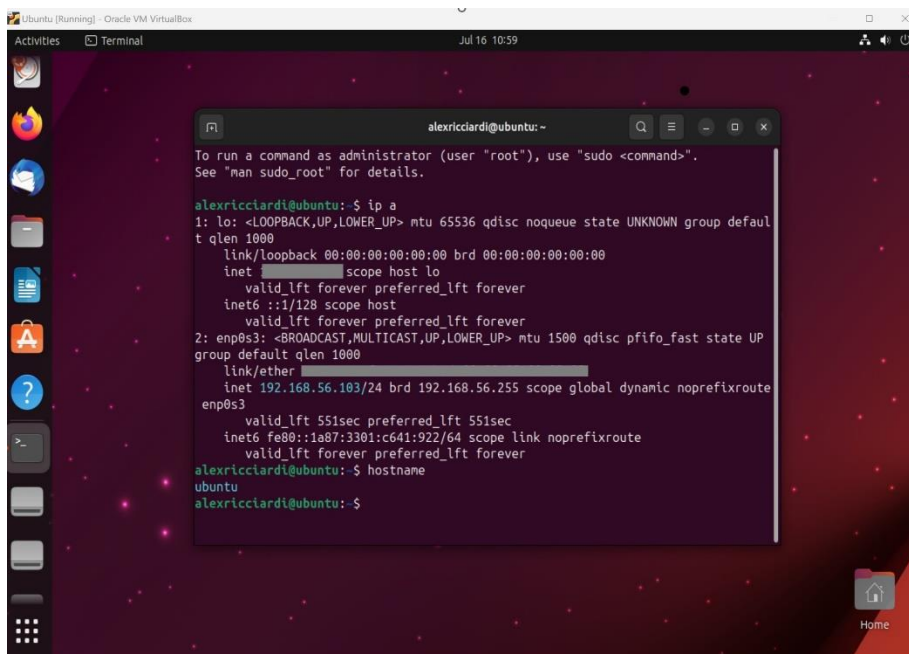
Figure 4*Kali Linux IP Address and Hostname*


```

kali@kali: ~
File Actions Edit View Help
(kali@kali)-[~]
$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group def
  ault qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP g
  roup default qlen 1000
    link/ether 08:00:27:00:00:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.104/24 brd 192.168.56.255 scope global dynamic noprefixro
      ute eth0
        valid_lft 565sec preferred_lft 565sec
    inet6 fe80::406b:e571:13c8:cb58/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
(kali@kali)-[~]
$ hostname
kali
(kali@kali)-[~]
$

```

Note. Kali Linux virtual machine IP address is 192.168.56.104 and its hostname is kali.

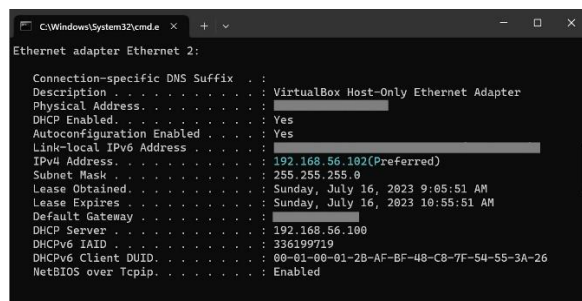
Figure 5*Ubuntu IP Address and Hostname*


```

alexricciardi@ubuntu: ~
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
alexricciardi@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
  qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP
  group default qlen 1000
    link/ether 82:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.103/24 brd 192.168.56.255 scope global dynamic noprefixroute
      enp0s3
        valid_lft 551sec preferred_lft 551sec
    inet6 fe80::1a87:3301:c641:922/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
alexricciardi@ubuntu:~$ hostname
ubuntu
alexricciardi@ubuntu:~$

```

Note. Ubuntu virtual machine IP address is 192.168.56.103 and its hostname is ubuntu.

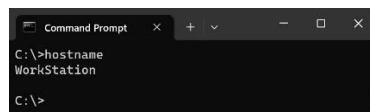
Figure 6*Windows 11 IP Address*


```

C:\Windows\System32\cmd.exe
Ethernet adapter Ethernet 2:

    Connection-specific DNS Suffix . . . : 
    Description . . . . . : VirtualBox Host-Only Ethernet Adapter
    Physical Address. . . . . : 
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes
    Link-local IPv6 Address . . . . . : 
    IPv4 Address. . . . . : 192.168.56.102(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Lease Obtained. . . . . : Sunday, July 16, 2023 9:05:51 AM
    Lease Expires . . . . . : Sunday, July 16, 2023 10:55:51 AM
    Default Gateway . . . . . : 
    DHCP Server . . . . . : 192.168.56.100
    DHCPv6 IAID . . . . . : 336199719
    DHCPv6 Client DUID. . . . . : 00-01-00-01-2B-AF-BF-48-C8-7F-54-55-3A-26
    NetBIOS over Tcpip. . . . . : Enabled
  
```

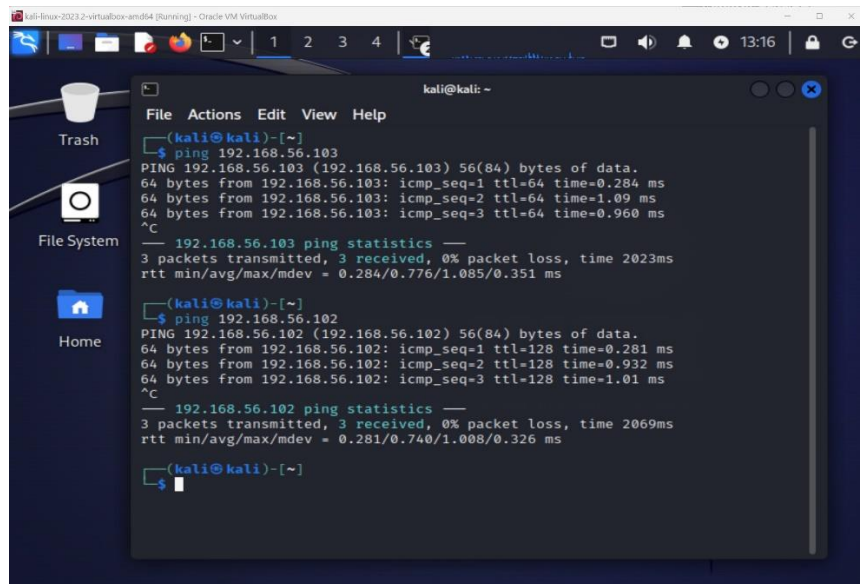
Note. Windows 11 machine IP address is 192.168.56.104.

Figure 7*Windows 11 Hostname*


```

Command Prompt
C:\>hostname
WorkStation
C:\>
  
```

Note. Windows 11 machine hostname is Workstation.

Figure 8*Kali Linux Pings*


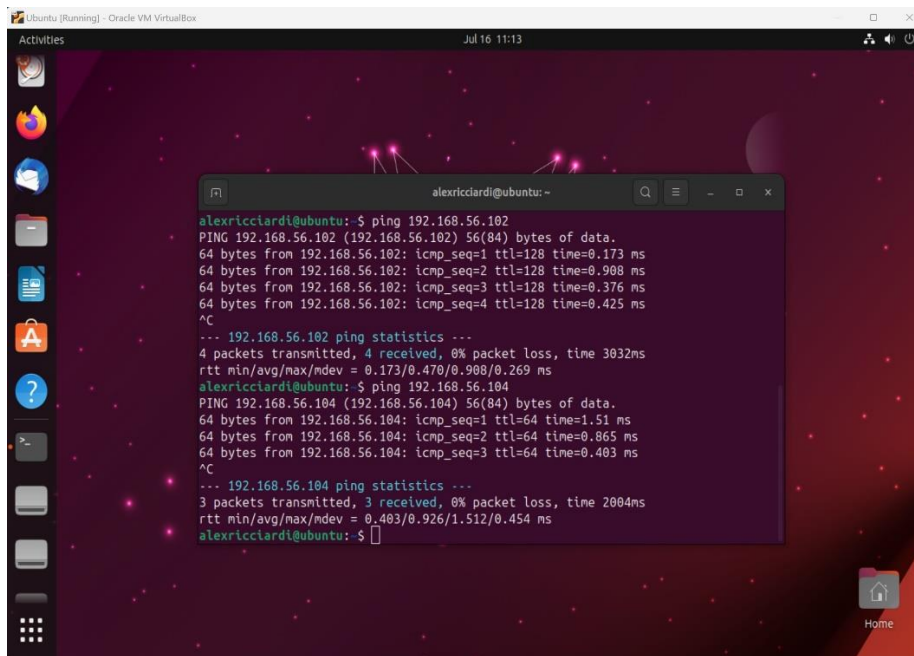
```

kali@kali: ~
File Actions Edit View Help
$ ping 192.168.56.103
PING 192.168.56.103 (192.168.56.103) 56(84) bytes of data:
64 bytes from 192.168.56.103: icmp_seq=1 ttl=64 time=0.284 ms
64 bytes from 192.168.56.103: icmp_seq=2 ttl=64 time=1.09 ms
64 bytes from 192.168.56.103: icmp_seq=3 ttl=64 time=0.960 ms
^C
--- 192.168.56.103 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2023ms
rtt min/avg/max/mdev = 0.284/0.776/1.085/0.351 ms

$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data:
64 bytes from 192.168.56.102: icmp_seq=1 ttl=128 time=0.281 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=128 time=0.932 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=128 time=1.01 ms
^C
--- 192.168.56.102 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2069ms
rtt min/avg/max/mdev = 0.281/0.740/1.088/0.326 ms

$
  
```

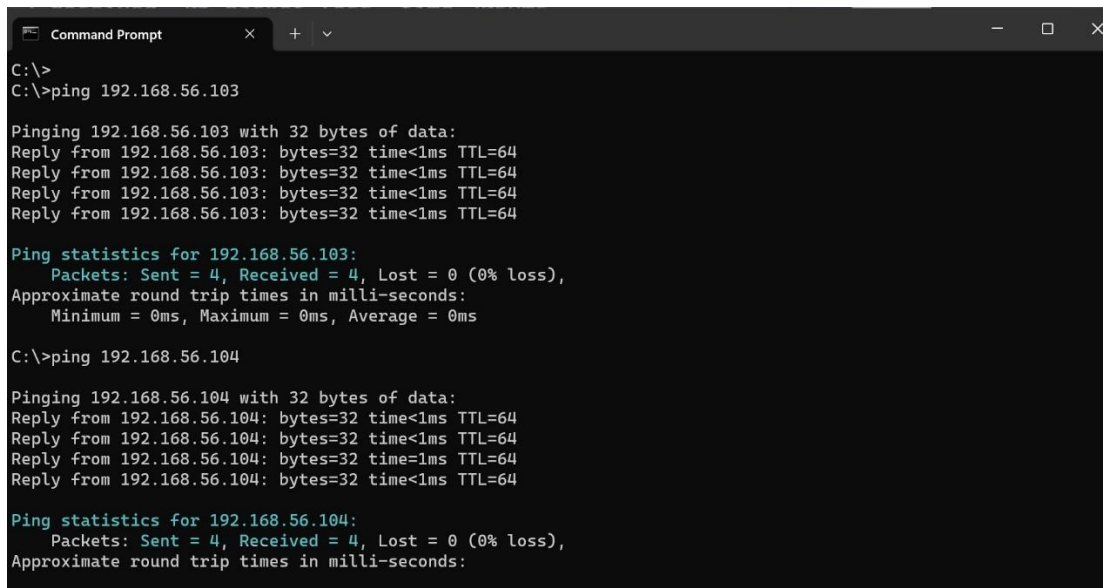
Note. The pings were successful.

Figure 9*Ubuntu Pings*


The screenshot shows an Ubuntu desktop with a dark purple background. A terminal window is open, displaying the results of two ping commands. The first command is 'ping 192.168.56.102', which shows four successful replies with varying round-trip times (0.173 ms to 0.908 ms) and a summary of 4 packets transmitted with 0% loss. The second command is 'ping 192.168.56.104', showing three successful replies with round-trip times (1.51 ms to 0.403 ms) and a summary of 3 packets transmitted with 0% loss.

```
alexricciardi@ubuntu:~$ ping 192.168.56.102
PING 192.168.56.102 (192.168.56.102) 56(84) bytes of data:
64 bytes from 192.168.56.102: icmp_seq=1 ttl=128 time=0.173 ms
64 bytes from 192.168.56.102: icmp_seq=2 ttl=128 time=0.908 ms
64 bytes from 192.168.56.102: icmp_seq=3 ttl=128 time=0.376 ms
64 bytes from 192.168.56.102: icmp_seq=4 ttl=128 time=0.425 ms
^C
--- 192.168.56.102 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3032ms
rtt min/avg/max/mdev = 0.173/0.470/0.908/0.269 ms
alexricciardi@ubuntu:~$ ping 192.168.56.104
PING 192.168.56.104 (192.168.56.104) 56(84) bytes of data:
64 bytes from 192.168.56.104: icmp_seq=1 ttl=64 time=1.51 ms
64 bytes from 192.168.56.104: icmp_seq=2 ttl=64 time=0.865 ms
64 bytes from 192.168.56.104: icmp_seq=3 ttl=64 time=0.403 ms
^C
--- 192.168.56.104 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 0.403/0.926/1.512/0.454 ms
alexricciardi@ubuntu:~$
```

Note. The pings were successful.

Figure 10*Windows 11 Pings*


The screenshot shows a Windows 11 Command Prompt window. It displays the results of two ping commands. The first command is 'ping 192.168.56.103', which shows four successful replies with round-trip times less than 1ms and a TTL of 64. The second command is 'ping 192.168.56.104', also showing four successful replies with round-trip times less than 1ms and a TTL of 64. Both commands include a summary of ping statistics showing 4 packets sent, 4 received, and 0% loss.

```
C:\>ping 192.168.56.103

Pinging 192.168.56.103 with 32 bytes of data:
Reply from 192.168.56.103: bytes=32 time<1ms TTL=64
Reply from 192.168.56.103: bytes=32 time<1ms TTL=64
Reply from 192.168.56.103: bytes=32 time<1ms TTL=64
Reply from 192.168.56.103: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.56.103:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.56.104

Pinging 192.168.56.104 with 32 bytes of data:
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64
Reply from 192.168.56.104: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.56.104:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
```

Note. The pings were successful.

Conclusion

To summarize, virtualization is a technology that allows a physical system to be shared between several virtual machines. In this essay, I described a step-by-step guide for installing a three-machine virtual network using VirtualBox. The three machines were Kali Linux, Ubuntu, and Windows 11, with Windows 11 being the host system. Furthermore, I discussed the steps to enable virtualization, install VirtualBox, and set up a Kali Linux and an Ubuntu virtual machine. Lastly, I explained how to network the machines together using VirtualBox's network settings and ensured that the machines pinged each other.

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