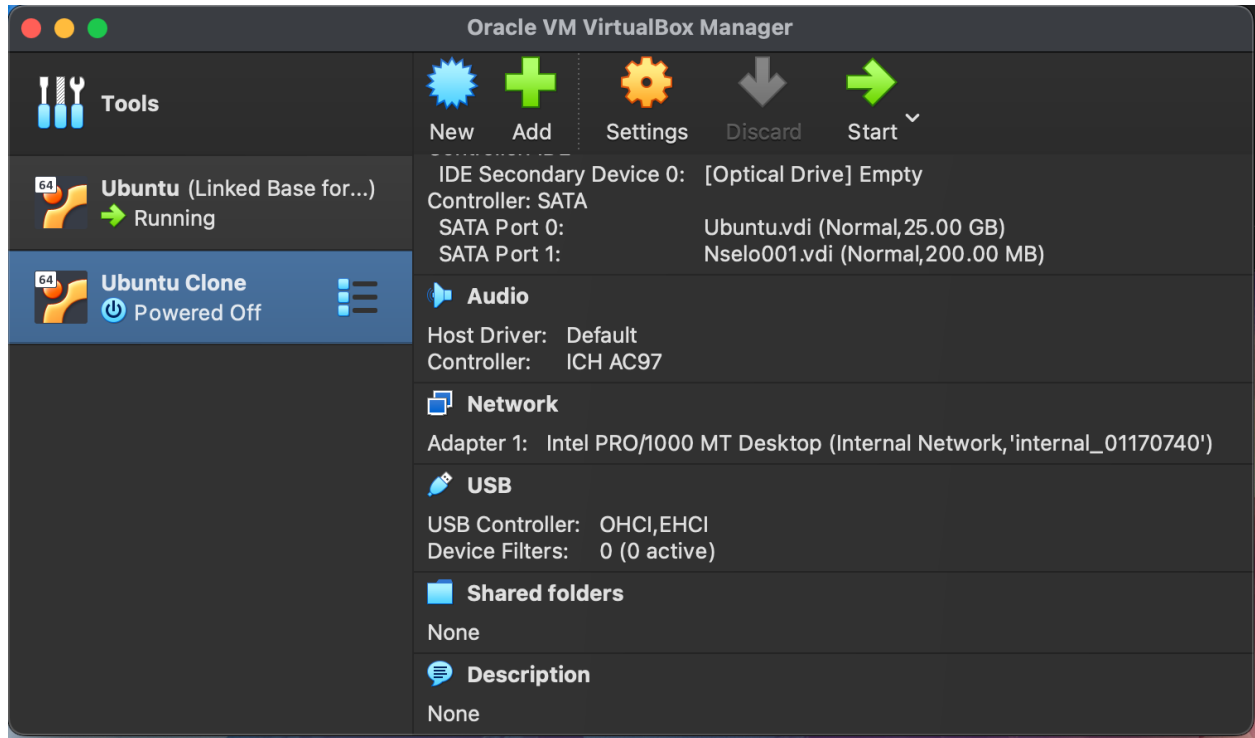


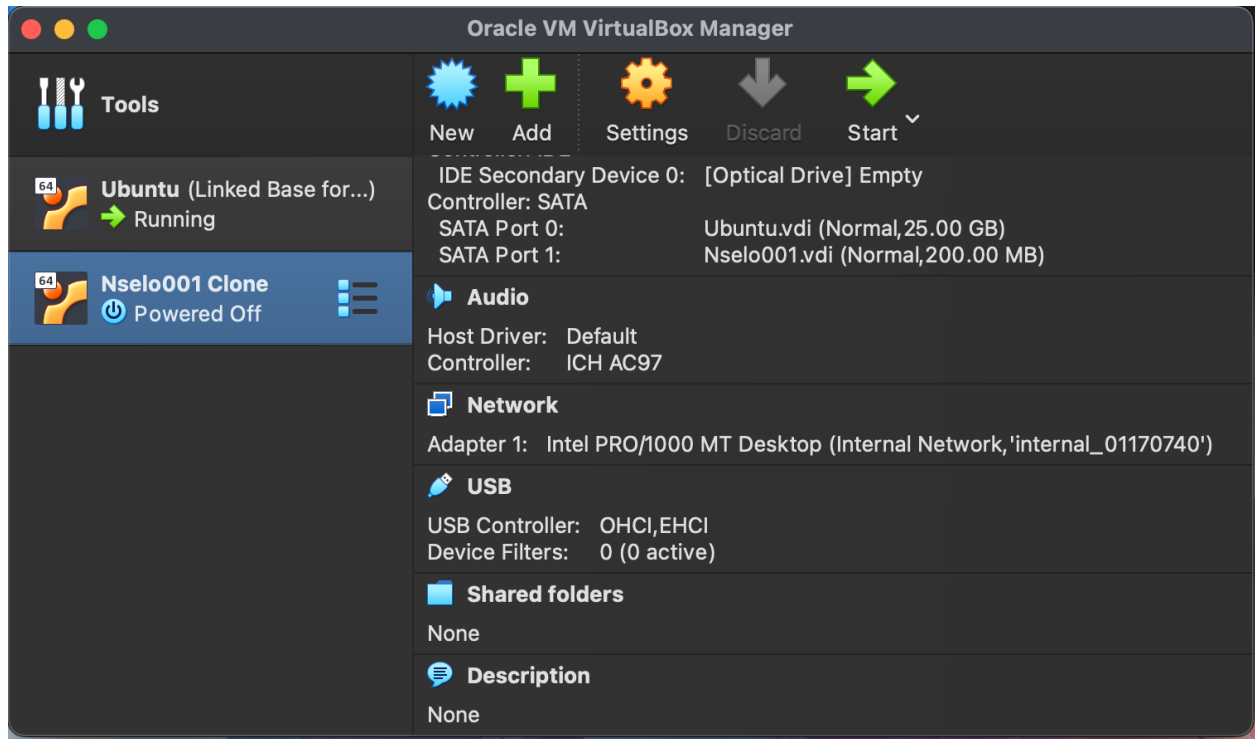
Task A –Network Configuration (60 points)

Please submit the screenshot for all the steps.

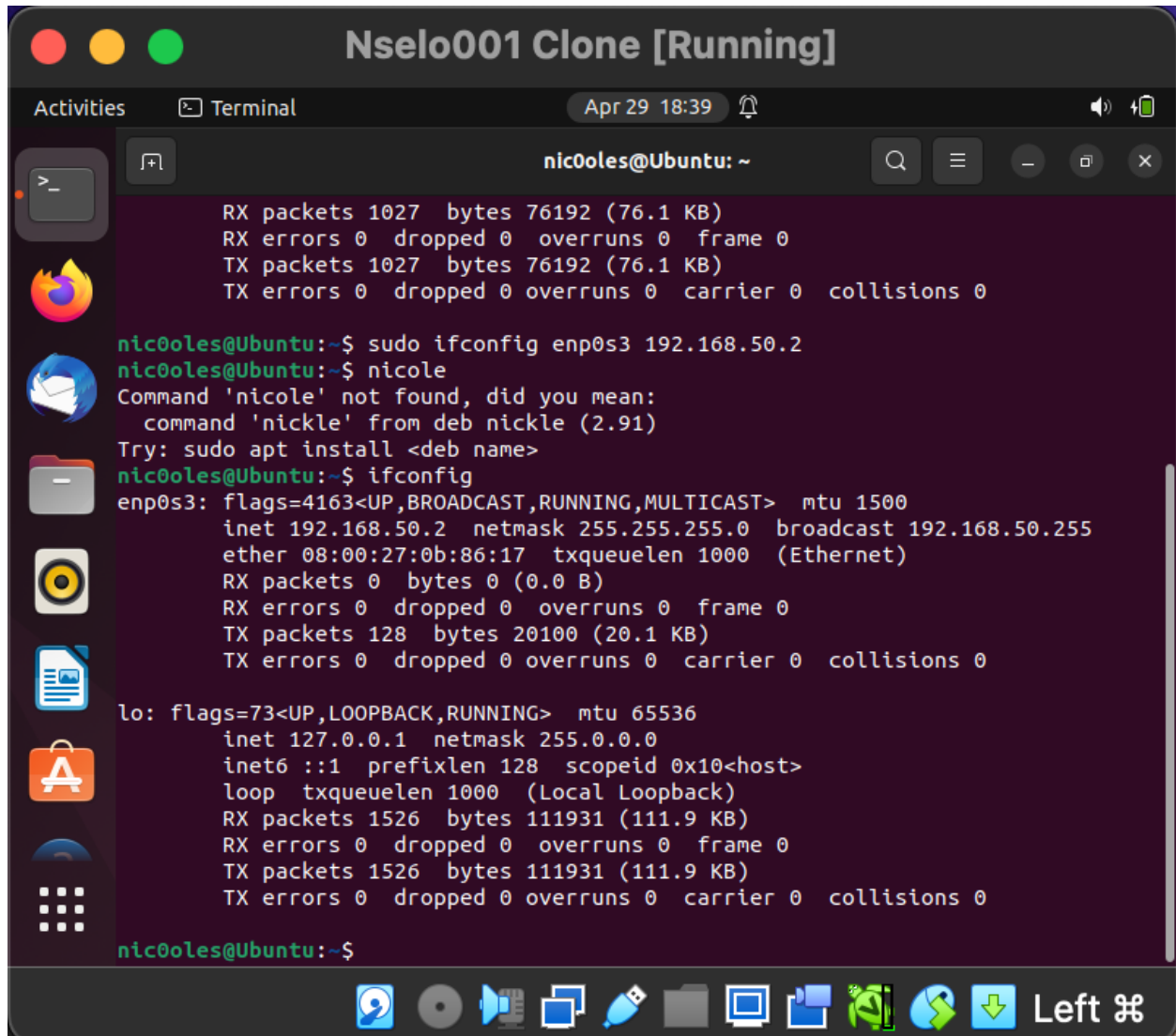
1. In the virtual box setting, connect two VMs in the same internal network, “internal_{UIN}”. Replace {UIN} with your real UIN.



2. Change the hostname of the Client VM to "{MIDASname}-Client." Replace {MIDAS name} with your real MIDAS name. Don't forget to reboot your client VM to reflect the change in hostname.



3. Configure the temporary IP address on the Gateway Ubuntu, as shown in Figure 1.



```
Nselo001 Clone [Running]
Activities Terminal Apr 29 18:39 nic0oles@Ubuntu: ~
RX packets 1027 bytes 76192 (76.1 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 1027 bytes 76192 (76.1 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

nic0oles@Ubuntu:~$ sudo ifconfig enp0s3 192.168.50.2
nic0oles@Ubuntu:~$ nicole
Command 'nicole' not found, did you mean:
  command 'nickle' from deb nickle (2.91)
Try: sudo apt install <deb name>
nic0oles@Ubuntu:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.50.2 netmask 255.255.255.0 broadcast 192.168.50.255
    ether 08:00:27:0b:86:17 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 128 bytes 20100 (20.1 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 1526 bytes 111931 (111.9 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 1526 bytes 111931 (111.9 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

nic0oles@Ubuntu:~$
```

Ubuntu (Linked Base for Ubuntu and Ubuntu Clon...

Activities Terminal Apr 29 18:44

nic0oles@Ubuntu: ~

```
[sudo] password for nic0oles:
nic0oles@Ubuntu:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.50.1 netmask 255.255.255.0 broadcast 192.168.50.255
    inet6 fe80::a841:f6f:1412:270c prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:dd:28:10 txqueuelen 1000 (Ethernet)
    RX packets 28 bytes 4909 (4.9 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 109 bytes 12932 (12.9 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

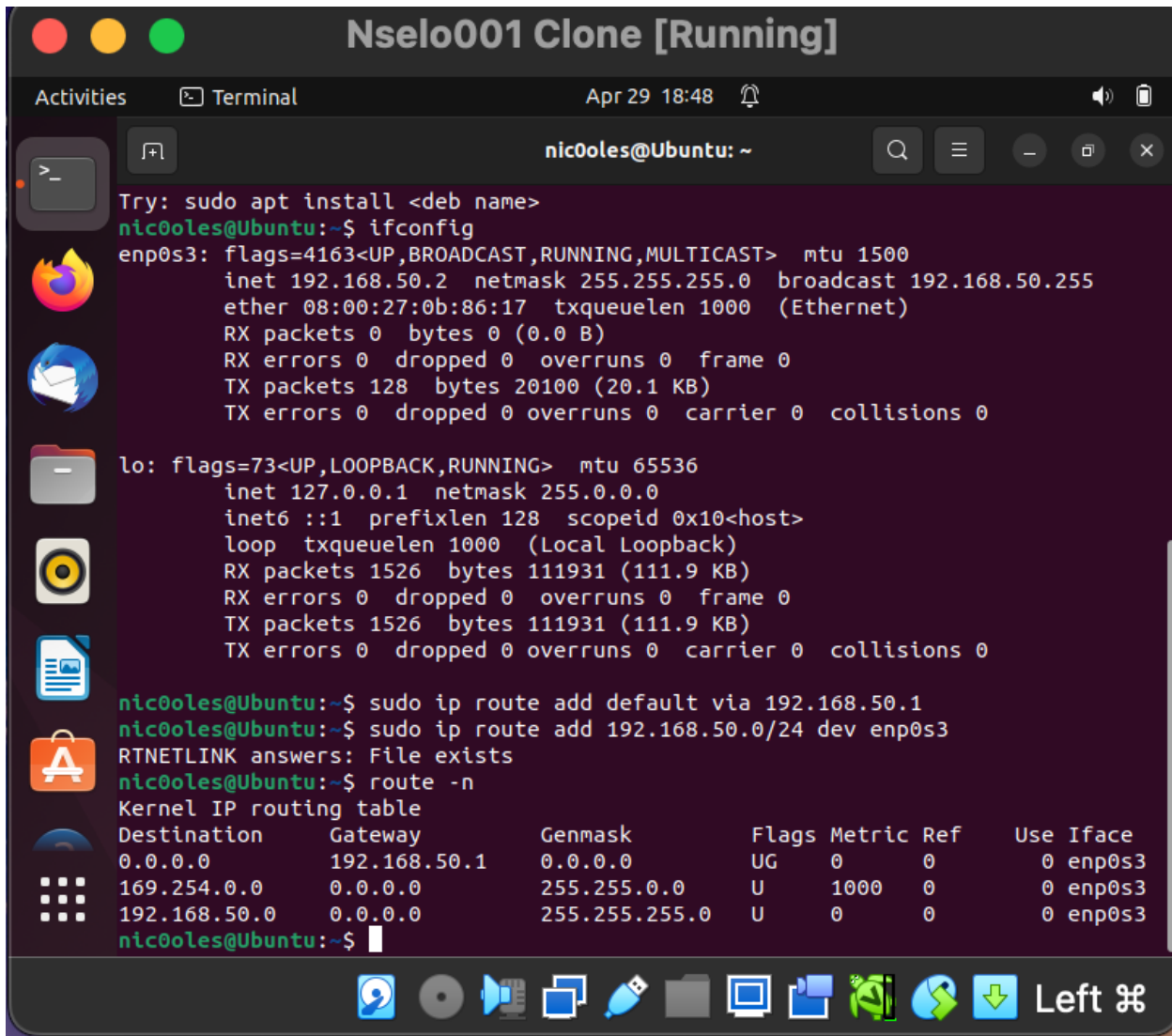
enp0s8: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::cdd2:fa8f:f851:7a27 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:83:86:ef txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 78 bytes 12099 (12.0 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 172 bytes 18742 (18.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 172 bytes 18742 (18.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

nic0oles@Ubuntu:~$
```

Left ⌘

4. Configure the temporary IP address, routing table, and DNS server on Client VM as shown in Figure 1.



The screenshot shows a terminal window titled "Nselo001 Clone [Running]" with a dark theme. The terminal displays the following commands and output:

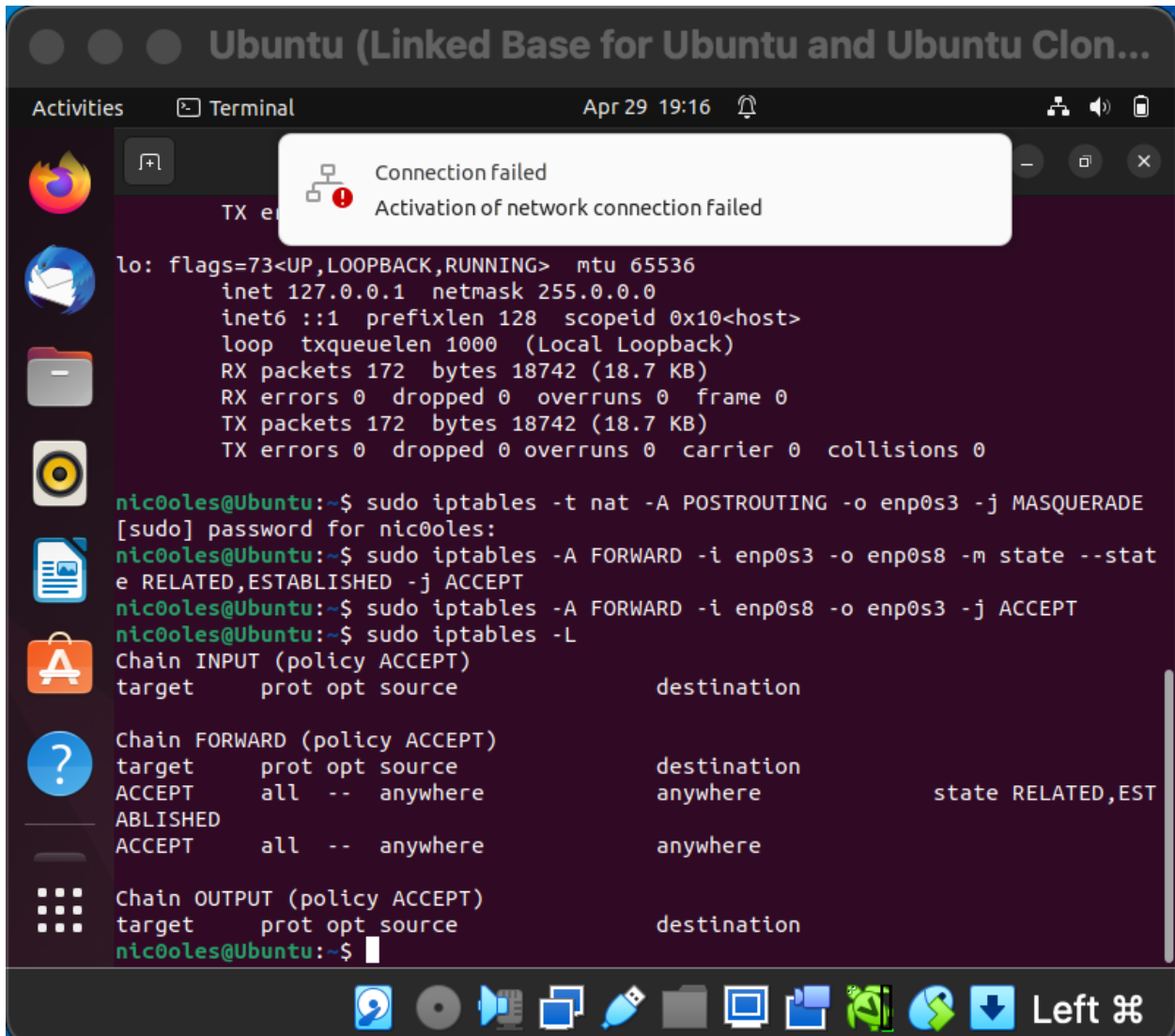
```
Try: sudo apt install <deb name>
nic0oles@Ubuntu:~$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.50.2  netmask 255.255.255.0  broadcast 192.168.50.255
        ether 08:00:27:0b:86:17  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 128  bytes 20100 (20.1 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop txqueuelen 1000  (Local Loopback)
        RX packets 1526  bytes 111931 (111.9 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1526  bytes 111931 (111.9 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

nic0oles@Ubuntu:~$ sudo ip route add default via 192.168.50.1
nic0oles@Ubuntu:~$ sudo ip route add 192.168.50.0/24 dev enp0s3
RTNETLINK answers: File exists
nic0oles@Ubuntu:~$ route -n
Kernel IP routing table
Destination    Gateway         Genmask         Flags Metric Ref    Use Iface
0.0.0.0        192.168.50.1   0.0.0.0         UG    0      0      0 enp0s3
169.254.0.0    0.0.0.0        255.255.0.0     U     1000   0      0 enp0s3
192.168.50.0   0.0.0.0        255.255.255.0   U      0      0      0 enp0s3
nic0oles@Ubuntu:~$
```

The terminal window includes a sidebar with application icons (Activities, Terminal, Firefox, Mail, Files, Music, Documents, Applications) and a top bar with window controls and system status (Apr 29 18:48). The bottom dock contains various system icons and the text "Left ⌘".

5. Configure gateway Ubuntu to enable IP forwarding (to forward the traffic) (also NATconfiguration)



Ubuntu (Linked Base for Ubuntu and Ubuntu Clon...

Activities Terminal Apr 29 19:16

Connection failed
Activation of network connection failed

```
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 172 bytes 18742 (18.7 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 172 bytes 18742 (18.7 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

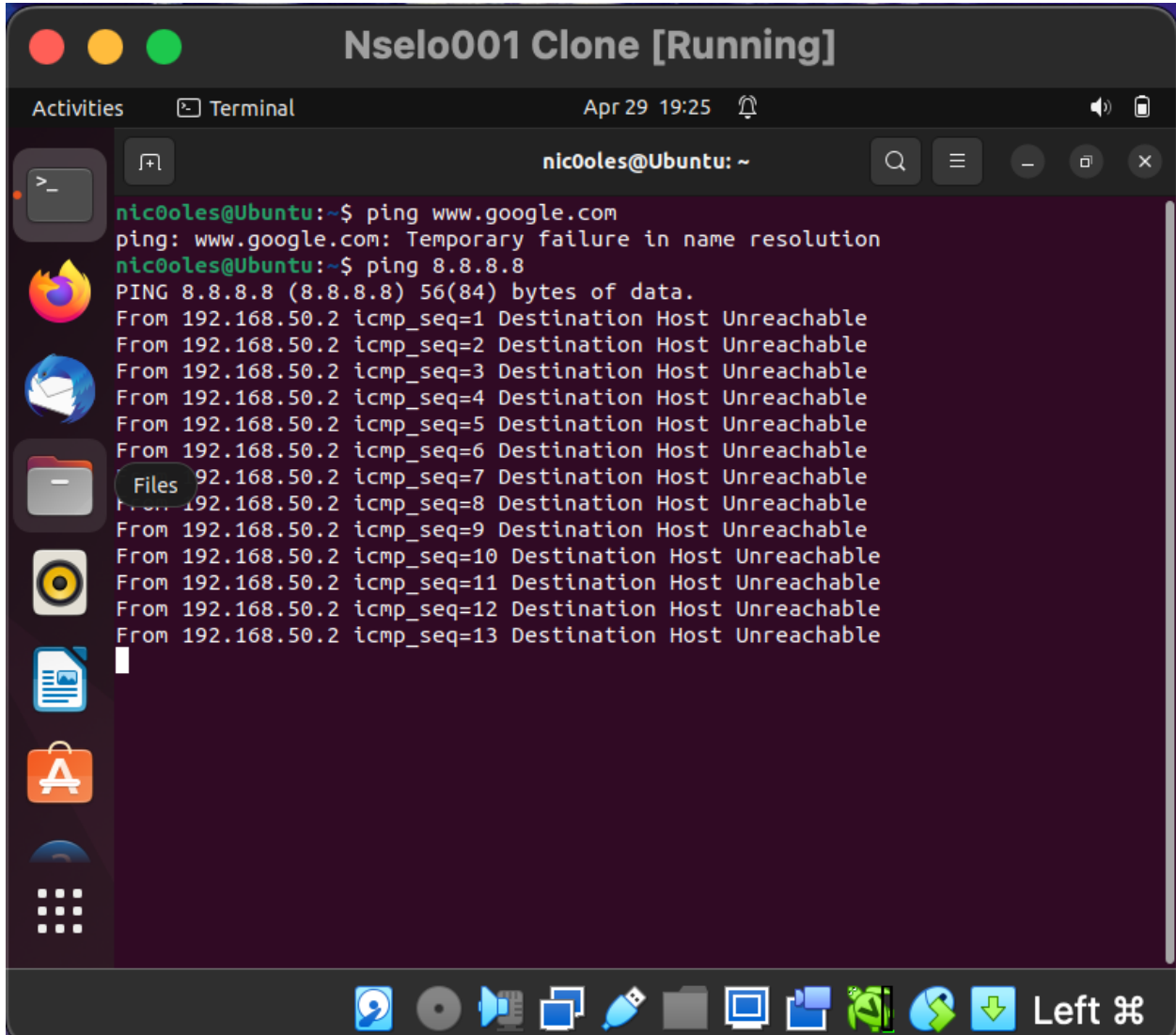
nic0oles@Ubuntu:~$ sudo iptables -t nat -A POSTROUTING -o enp0s3 -j MASQUERADE
[sudo] password for nic0oles:
nic0oles@Ubuntu:~$ sudo iptables -A FORWARD -i enp0s3 -o enp0s8 -m state --stat
e RELATED,ESTABLISHED -j ACCEPT
nic0oles@Ubuntu:~$ sudo iptables -A FORWARD -i enp0s8 -o enp0s3 -j ACCEPT
nic0oles@Ubuntu:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain FORWARD (policy ACCEPT)
target     prot opt source                destination
ACCEPT     all  --  anywhere               anywhere             state RELATED,EST
ABLISHED
ACCEPT     all  --  anywhere               anywhere

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination
nic0oles@Ubuntu:~$
```

Left ⌘

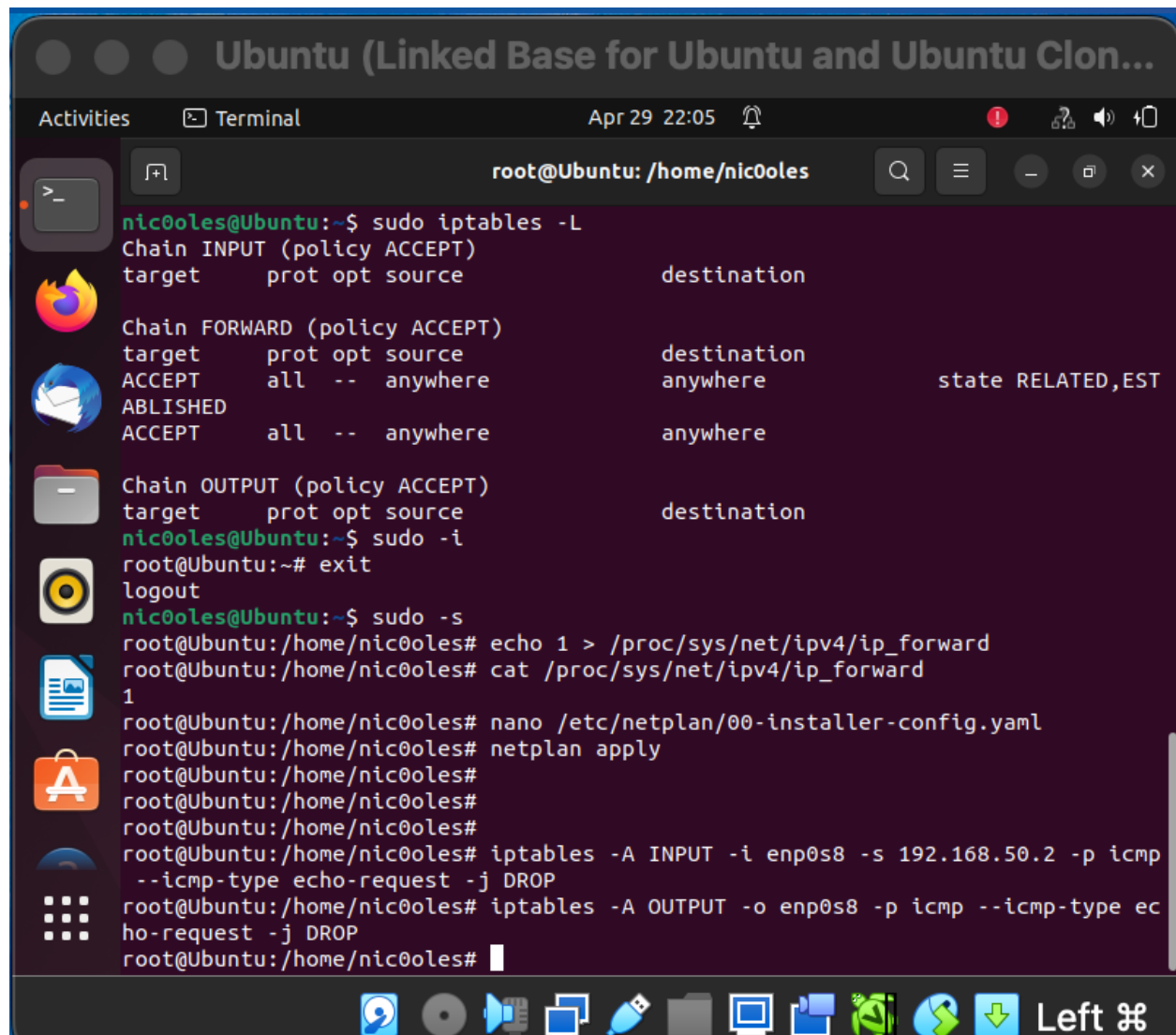
6. Test your ping connection to 8.8.8.8 and www.google.com in the client VM, respectively.



```
Nselo001 Clone [Running]
Activities Terminal Apr 29 19:25
nic0oles@Ubuntu: ~
nic0oles@Ubuntu:~$ ping www.google.com
ping: www.google.com: Temporary failure in name resolution
nic0oles@Ubuntu:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
From 192.168.50.2 icmp_seq=1 Destination Host Unreachable
From 192.168.50.2 icmp_seq=2 Destination Host Unreachable
From 192.168.50.2 icmp_seq=3 Destination Host Unreachable
From 192.168.50.2 icmp_seq=4 Destination Host Unreachable
From 192.168.50.2 icmp_seq=5 Destination Host Unreachable
From 192.168.50.2 icmp_seq=6 Destination Host Unreachable
From 192.168.50.2 icmp_seq=7 Destination Host Unreachable
From 192.168.50.2 icmp_seq=8 Destination Host Unreachable
From 192.168.50.2 icmp_seq=9 Destination Host Unreachable
From 192.168.50.2 icmp_seq=10 Destination Host Unreachable
From 192.168.50.2 icmp_seq=11 Destination Host Unreachable
From 192.168.50.2 icmp_seq=12 Destination Host Unreachable
From 192.168.50.2 icmp_seq=13 Destination Host Unreachable
```

Task B –Firewall Configuration (40 points)

1. Configure the iptables on the gateway Ubuntu to block all the inbound ICMP packets from the Client VM.
2. Configure the iptables on the gateway Ubuntu to block all the outbound ICMP packets that originated from the gateway Ubuntu itself.

A screenshot of a terminal window titled "Ubuntu (Linked Base for Ubuntu and Ubuntu Clon...". The terminal shows a user named nic0oles at the prompt. The user runs "sudo iptables -L" which displays the current iptables rules for INPUT, FORWARD, and OUTPUT chains. Then, the user runs "sudo -i" to become root. In root, they run "echo 1 > /proc/sys/net/ipv4/ip_forward" and "cat /proc/sys/net/ipv4/ip_forward" to verify IP forwarding is enabled. Next, they use "nano" to edit "/etc/netplan/00-installer-config.yaml" and run "netplan apply". Finally, they configure iptables to block ICMP: "iptables -A INPUT -i enp0s8 -s 192.168.50.2 -p icmp --icmp-type echo-request -j DROP" and "iptables -A OUTPUT -o enp0s8 -p icmp --icmp-type echo-request -j DROP". The terminal ends with the root prompt.

```
nic0oles@Ubuntu:~$ sudo iptables -L
Chain INPUT (policy ACCEPT)
target     prot opt source                destination

Chain FORWARD (policy ACCEPT)
target     prot opt source                destination
ACCEPT     all  --  anywhere             anywhere             state RELATED,ESTABLISHED
ACCEPT     all  --  anywhere             anywhere

Chain OUTPUT (policy ACCEPT)
target     prot opt source                destination
nic0oles@Ubuntu:~$ sudo -i
root@Ubuntu:~# exit
logout
nic0oles@Ubuntu:~$ sudo -s
root@Ubuntu:/home/nic0oles# echo 1 > /proc/sys/net/ipv4/ip_forward
root@Ubuntu:/home/nic0oles# cat /proc/sys/net/ipv4/ip_forward
1
root@Ubuntu:/home/nic0oles# nano /etc/netplan/00-installer-config.yaml
root@Ubuntu:/home/nic0oles# netplan apply
root@Ubuntu:/home/nic0oles#
root@Ubuntu:/home/nic0oles#
root@Ubuntu:/home/nic0oles#
root@Ubuntu:/home/nic0oles# iptables -A INPUT -i enp0s8 -s 192.168.50.2 -p icmp
--icmp-type echo-request -j DROP
root@Ubuntu:/home/nic0oles# iptables -A OUTPUT -o enp0s8 -p icmp --icmp-type echo-request -j DROP
root@Ubuntu:/home/nic0oles#
```

Extra credit:

Set the permanent IP address on the Client Ubuntu based on the above network topology.

