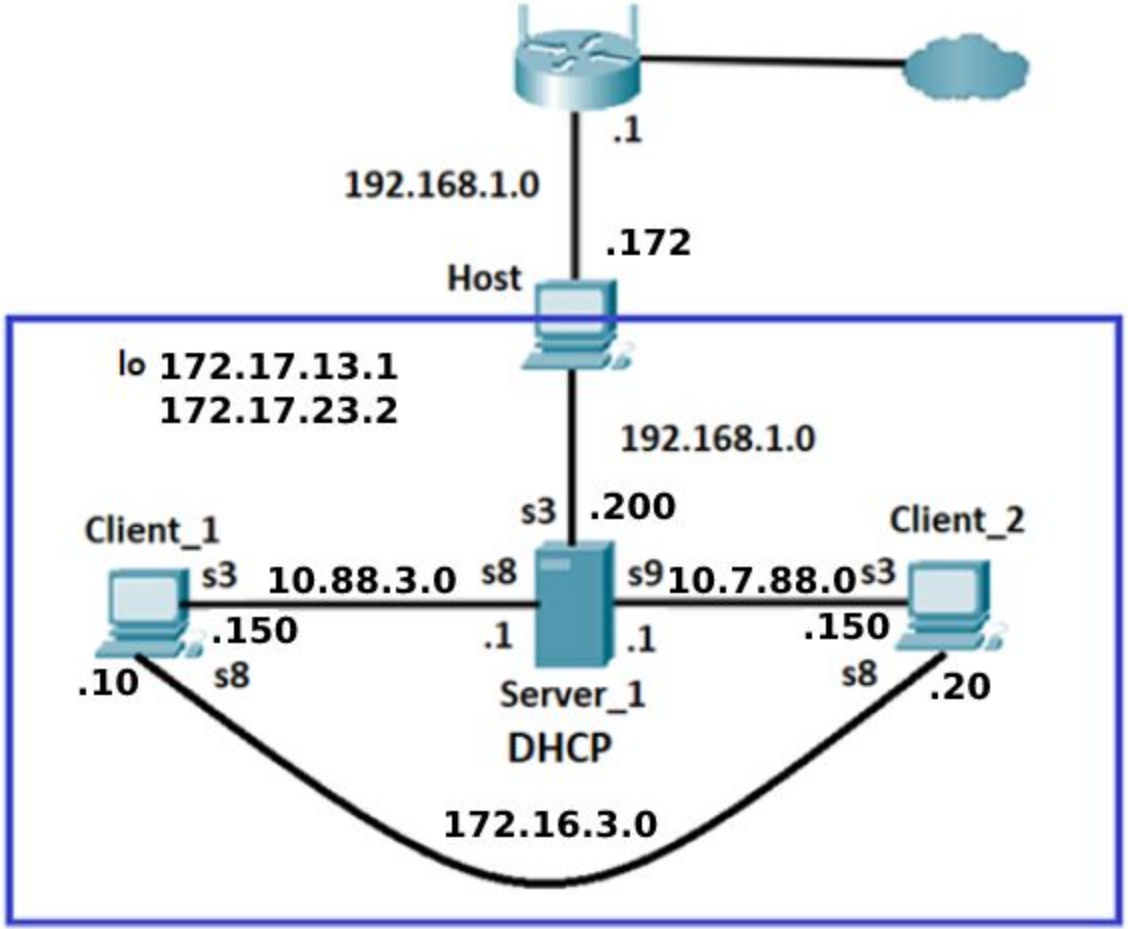
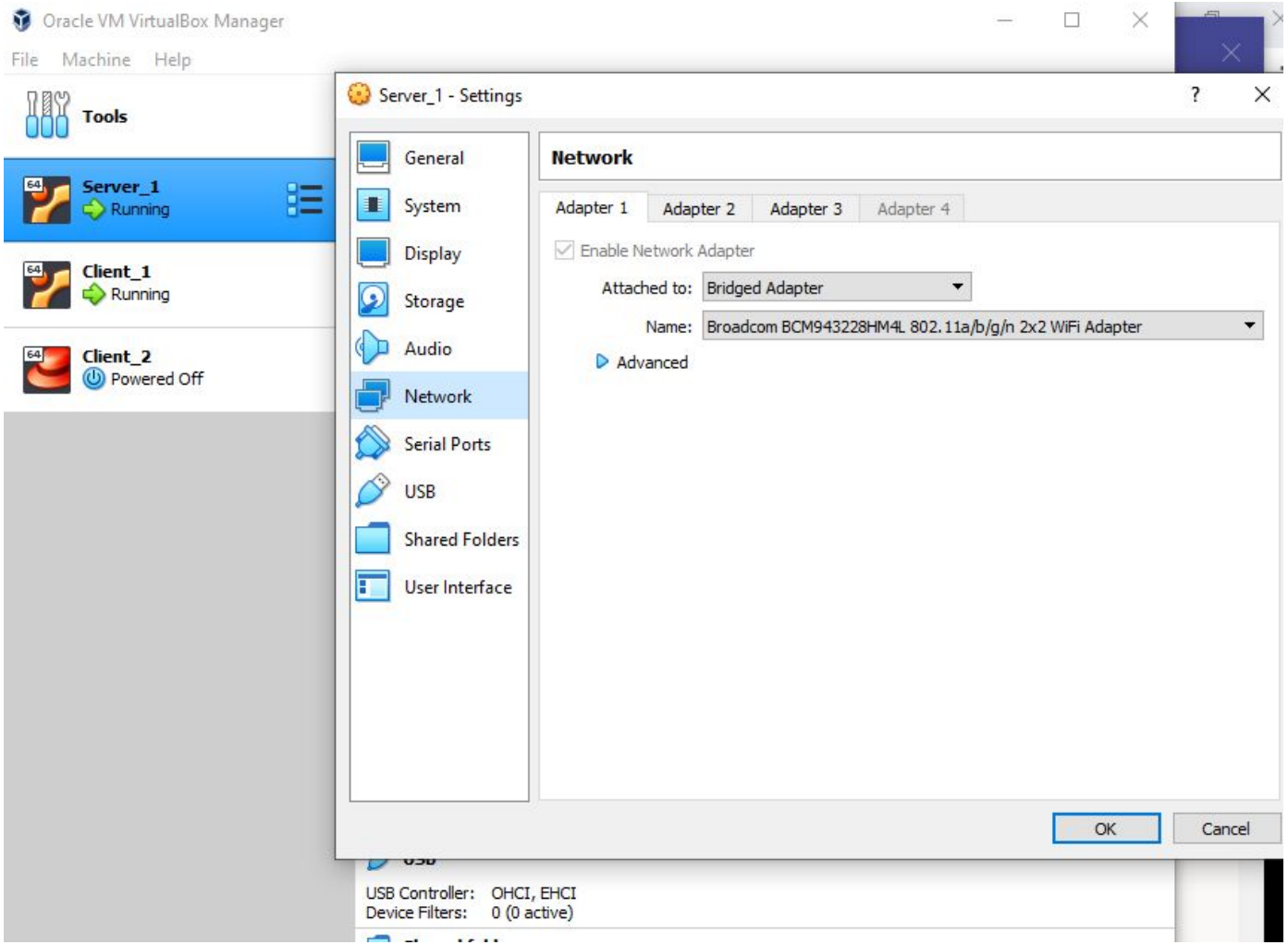
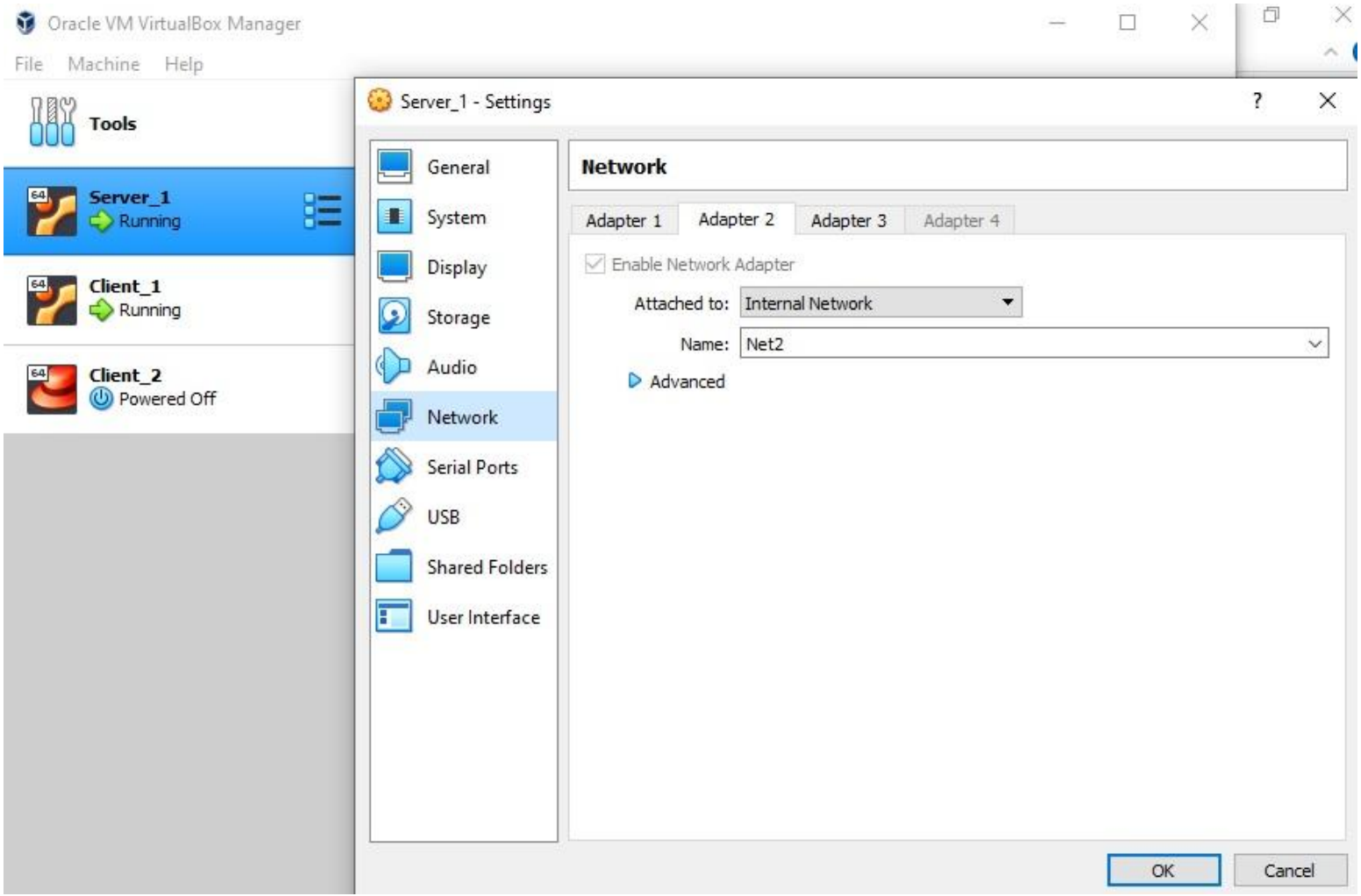
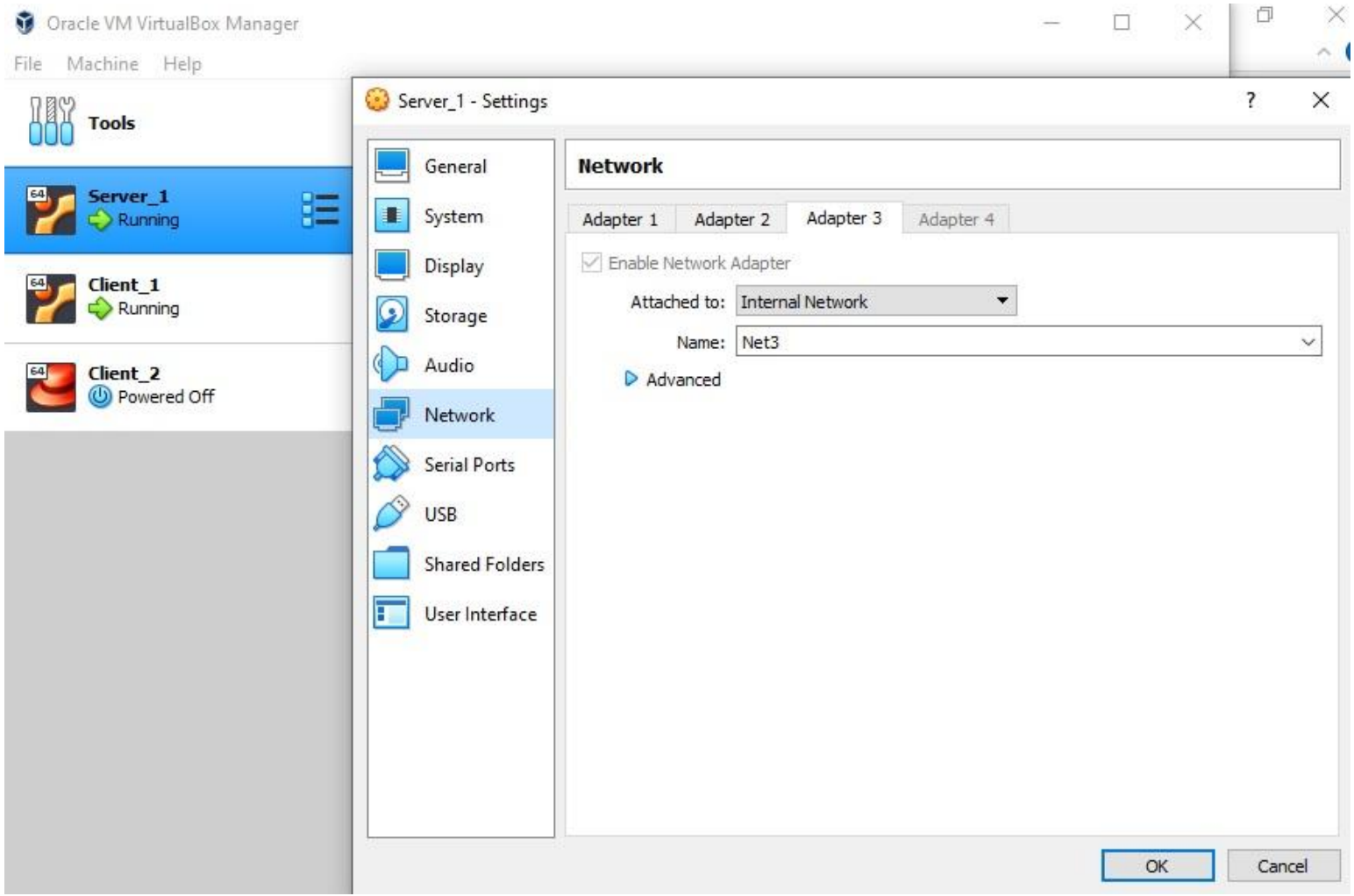
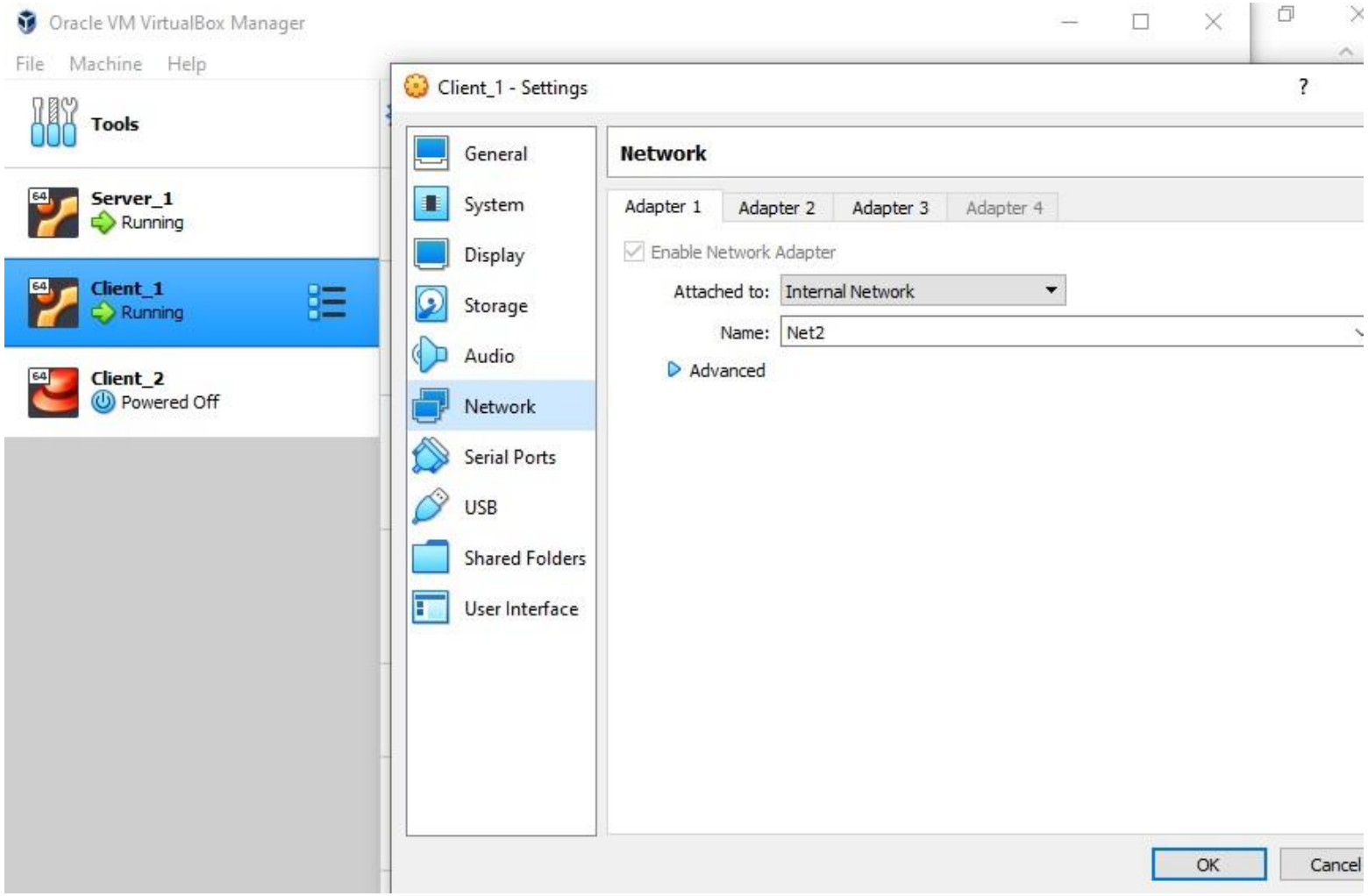
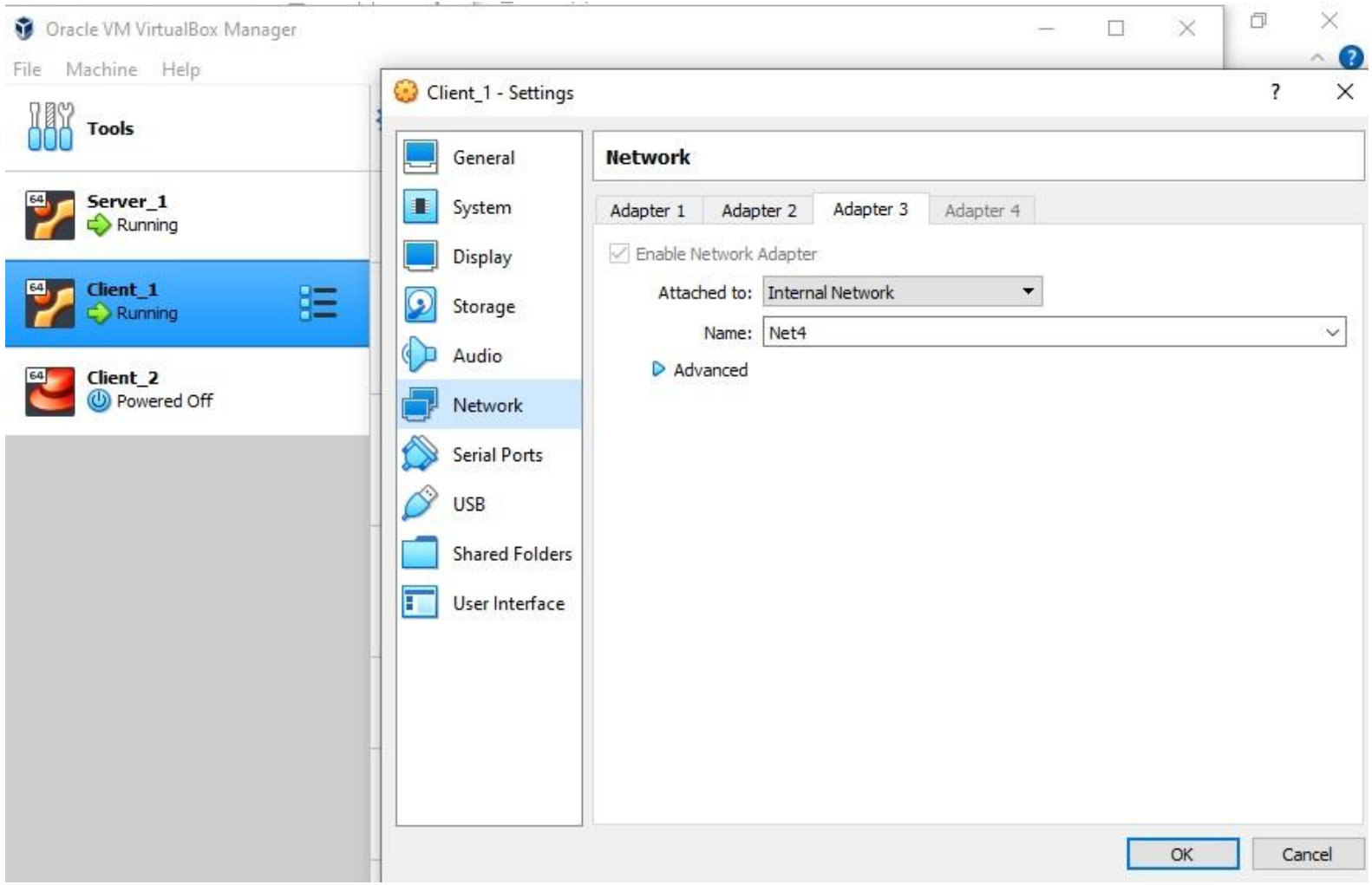

.1
192.168.1.0
.172
Host
lo 172.17.13.1
172.17.23.2
192.168.1.0
s3
.200
Client_1
Client_2
s3
10.88.3.0
s8
s9
10.7.88.0
s3
.150
.1
.1
.150
.10
s8
s8
.20
Server_1
DHCP
172.16.3.0

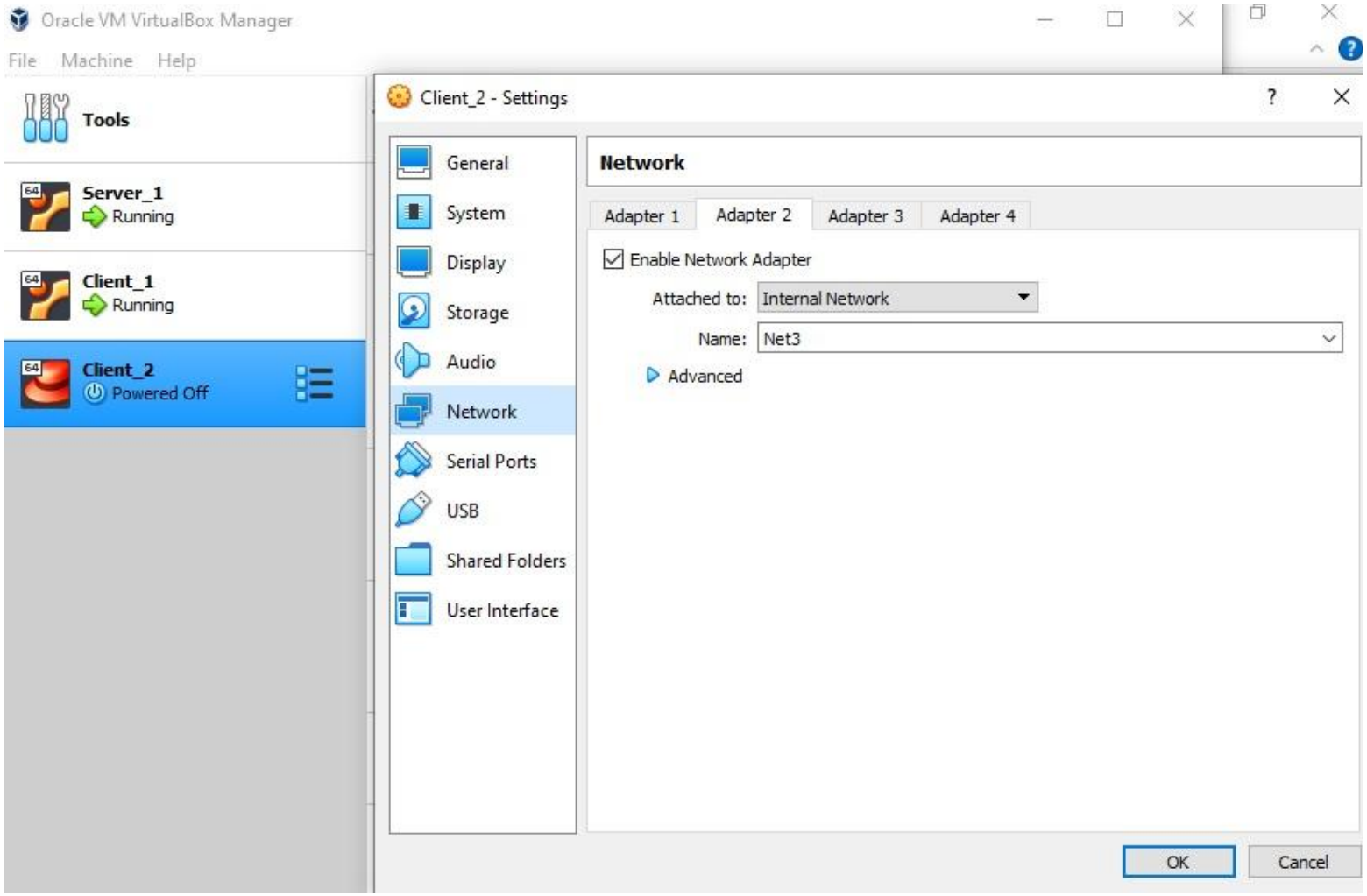

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Server_1 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Bridged Adapter
Name:
Broadcom BCM943228HM4L 802.11a/b/g/n 2x2 WiFi Adapter
Advanced
OK
Cancel
USB Controller:
OHCI, EHCI
Device Filters:
0 (0 active)

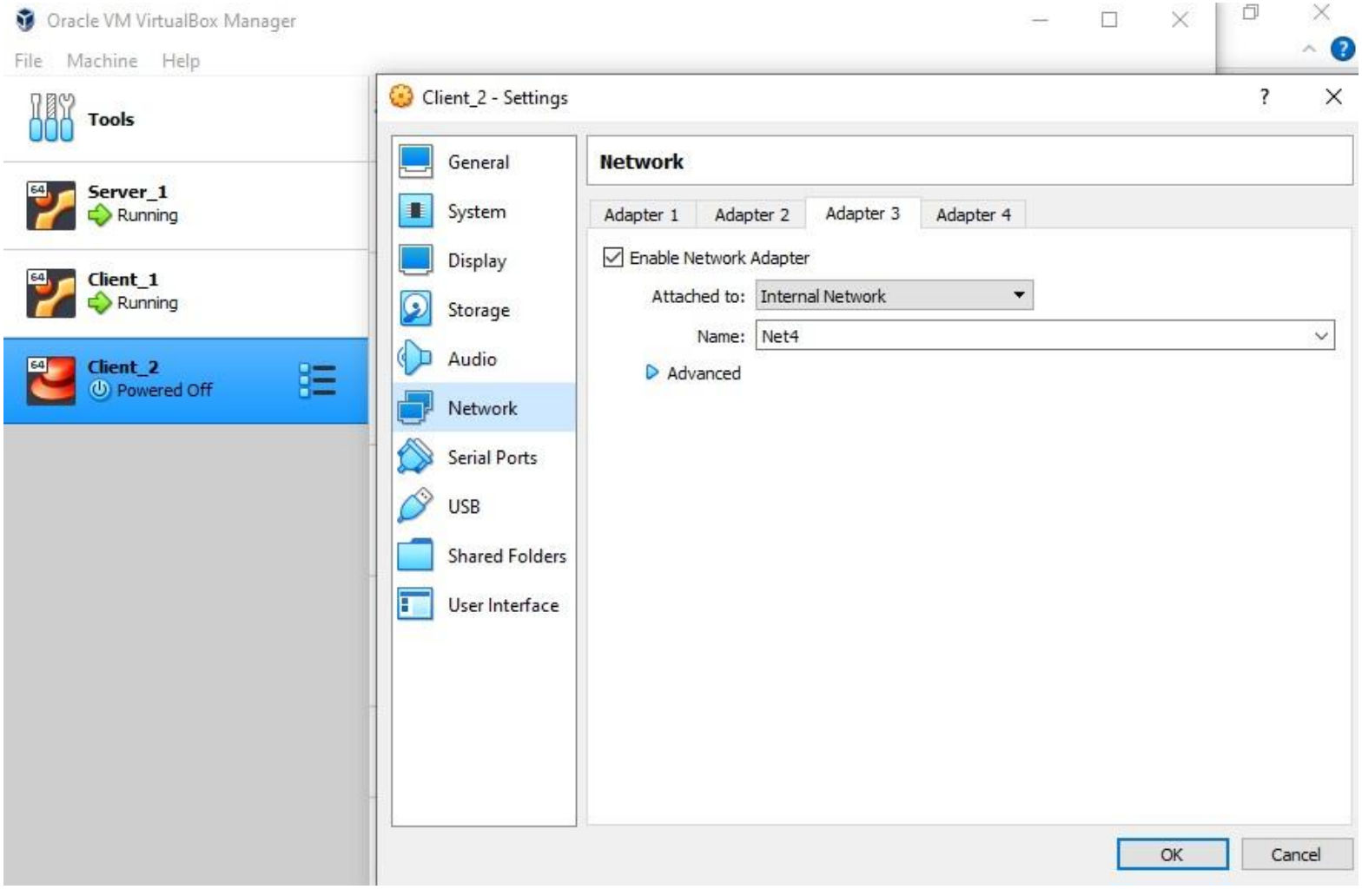

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Server_1 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net2
Advanced
OK
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Server_1 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net3
Advanced
OK
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Client_1 - Settings
?
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net2
Advanced
OK
Cancel

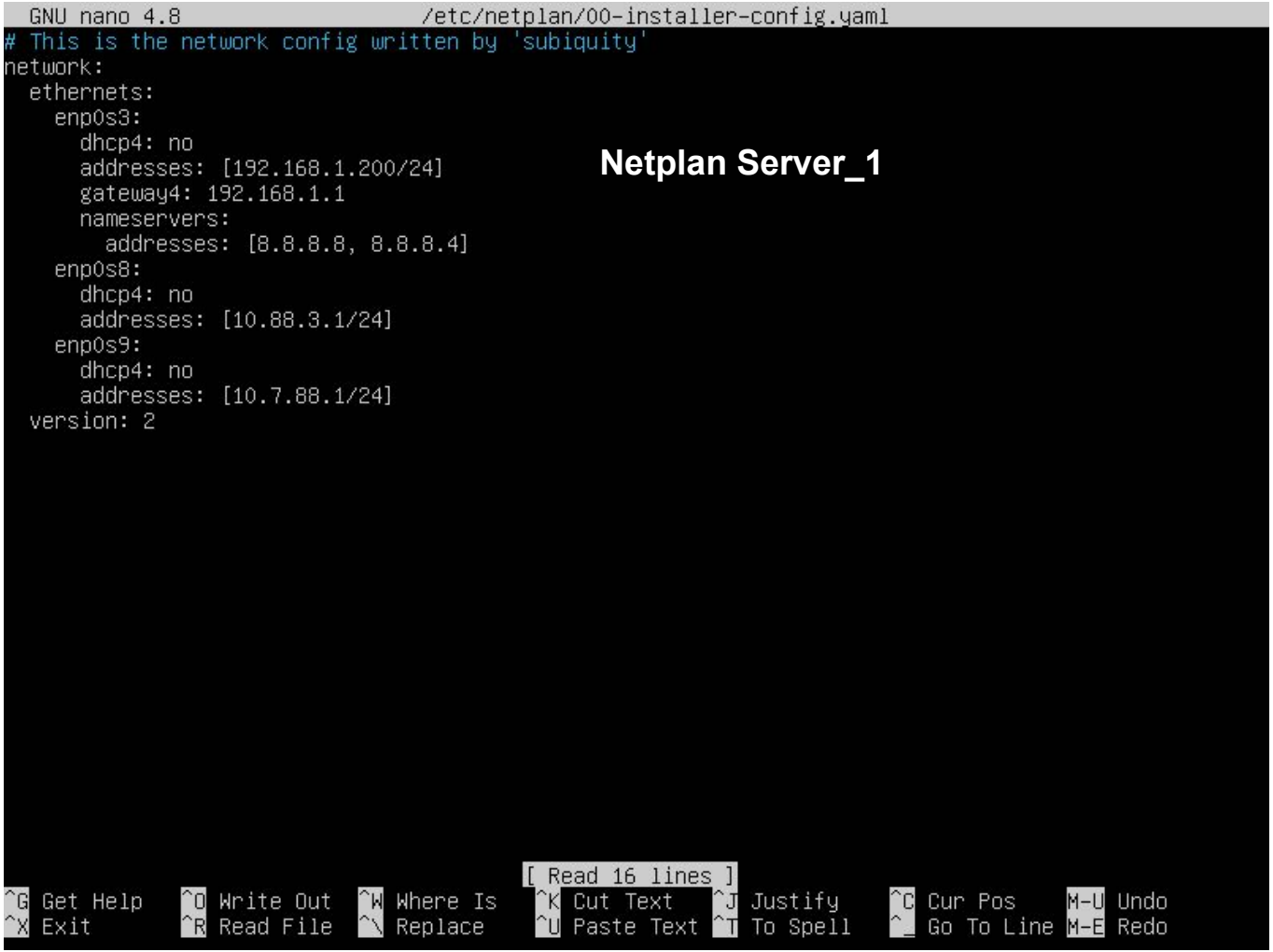

Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Client_1 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net4
Advanced
OK
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Client_2 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net3
Advanced
OK
Cancel


Oracle VM VirtualBox Manager
File
Machine
Help
Tools
Server_1
Running
Client_1
Running
Client_2
Powered Off
Client_2 - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
User Interface
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to:
Internal Network
Name:
Net4
Advanced
OK
Cancel

```
Do you want to keep these settings?


Press ENTER before the timeout to accept the new configuration


Changes will revert in 105 seconds
Configuration accepted.
anton_nevero@antonnevero:/etc/netplan$ ip addr
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 127.0.0.1/8 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 fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:5a:d2:0c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.200/24 brd 192.168.1.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe5a:d20c/64 scope link
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:d7:2c:e4 brd ff:ff:ff:ff:ff:ff
    inet 10.88.3.0/24 brd 10.88.3.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fed7:2ce4/64 scope link
       valid_lft forever preferred_lft forever
4: enp0s9: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:db:c7:d0 brd ff:ff:ff:ff:ff:ff
    inet 10.7.88.0/24 brd 10.7.88.255 scope global enp0s9
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fedb:c7d0/64 scope link
       valid_lft forever preferred_lft forever
anton_nevero@antonnevero:/etc/netplan$
```

**ip Server_1**




**Netplan Server_1**

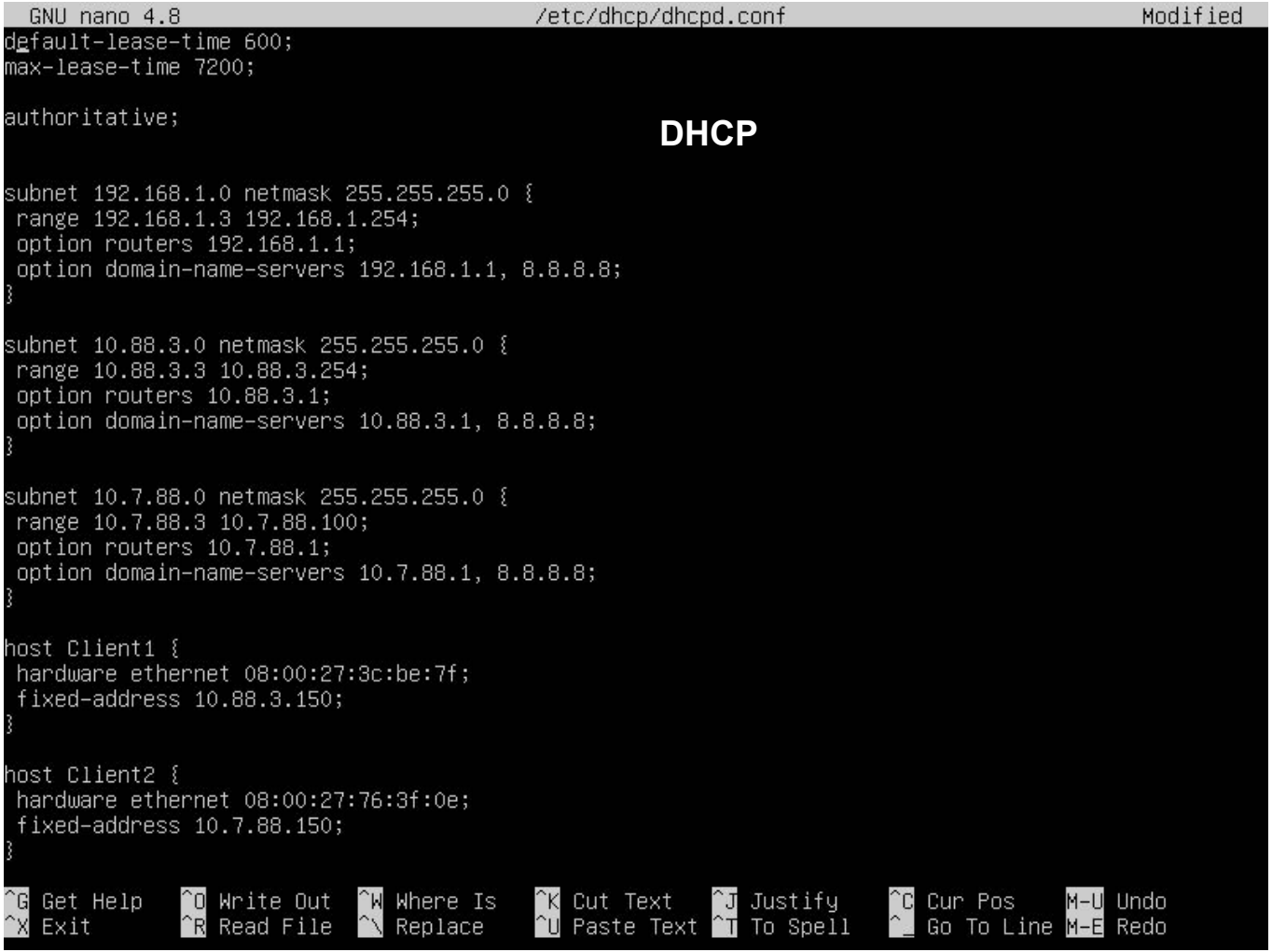
**ip Client_1**

```
anton_nevero@antonnevero:~$ sudo netplan try
Do you want to keep these settings?


Press ENTER before the timeout to accept the new configuration


Changes will revert in 120 seconds
Configuration accepted.
anton_nevero@antonnevero:~$ 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 127.0.0.1/8 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 fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:3c:be:7f brd ff:ff:ff:ff:ff:ff
    inet 10.88.3.150/24 brd 10.88.3.255 scope global dynamic enp0s3
       valid_lft 597sec preferred_lft 597sec
    inet6 fe80::a00:27ff:fe3c:be7f/64 scope link
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:c6:9c:54 brd ff:ff:ff:ff:ff:ff
    inet 172.16.3.10/24 brd 172.16.3.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fec6:9c54/64 scope link
       valid_lft forever preferred_lft forever
anton_nevero@antonnevero:~$
```


Client_2 enp0s3

## Client_2 enp0s8 static

```
TYPE="Ethernet"
PROXY_METHOD="none"
BROWSER_ONLY="no"
BOOTPROTO=none
DEFROUTE="yes"
IPV4_FAILURE_FATAL="no"
IPV6INIT="yes"
IPV6_AUTOCONF="yes"
IPV6_DEFROUTE="yes"
IPV6_FAILURE_FATAL="no"
IPV6_ADDR_GEN_MODE="stable-privacy"
NAME="enp0s8"
UUID="e61cb1e0-26d8-45af-9658-fa1c29020686"
DEVICE="enp0s8"
ONBOOT="yes"
IPADDR0=172.16.3.20
PREFIX0=24
DNS1=8.8.8.8
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
"/etc/sysconfig/network-scripts/ifcfg-enp0s8" 18L, 354C
```


GNU nano 4.8 /etc/dhcp/dhcpd.conf Modified
default-lease-time 600;
max-lease-time 7200;
authoritative;
subnet 192.168.1.0 netmask 255.255.255.0 {
range 192.168.1.3 192.168.1.254;
option routers 192.168.1.1;
option domain-name-servers 192.168.1.1, 8.8.8.8;
}
subnet 10.88.3.0 netmask 255.255.255.0 {
range 10.88.3.3 10.88.3.254;
option routers 10.88.3.1;
option domain-name-servers 10.88.3.1, 8.8.8.8;
}
subnet 10.7.88.0 netmask 255.255.255.0 {
range 10.7.88.3 10.7.88.100;
option routers 10.7.88.1;
option domain-name-servers 10.7.88.1, 8.8.8.8;
}
host Client1 {
hardware ethernet 08:00:27:3c:be:7f;
fixed-address 10.88.3.150;
}
host Client2 {
hardware ethernet 08:00:27:76:3f:0e;
fixed-address 10.7.88.150;
}
^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos M-U Undo
^X Exit ^R Read File ^\ Replace ^U Paste Text ^T To Spell ^_ Go To Line M-E Redo

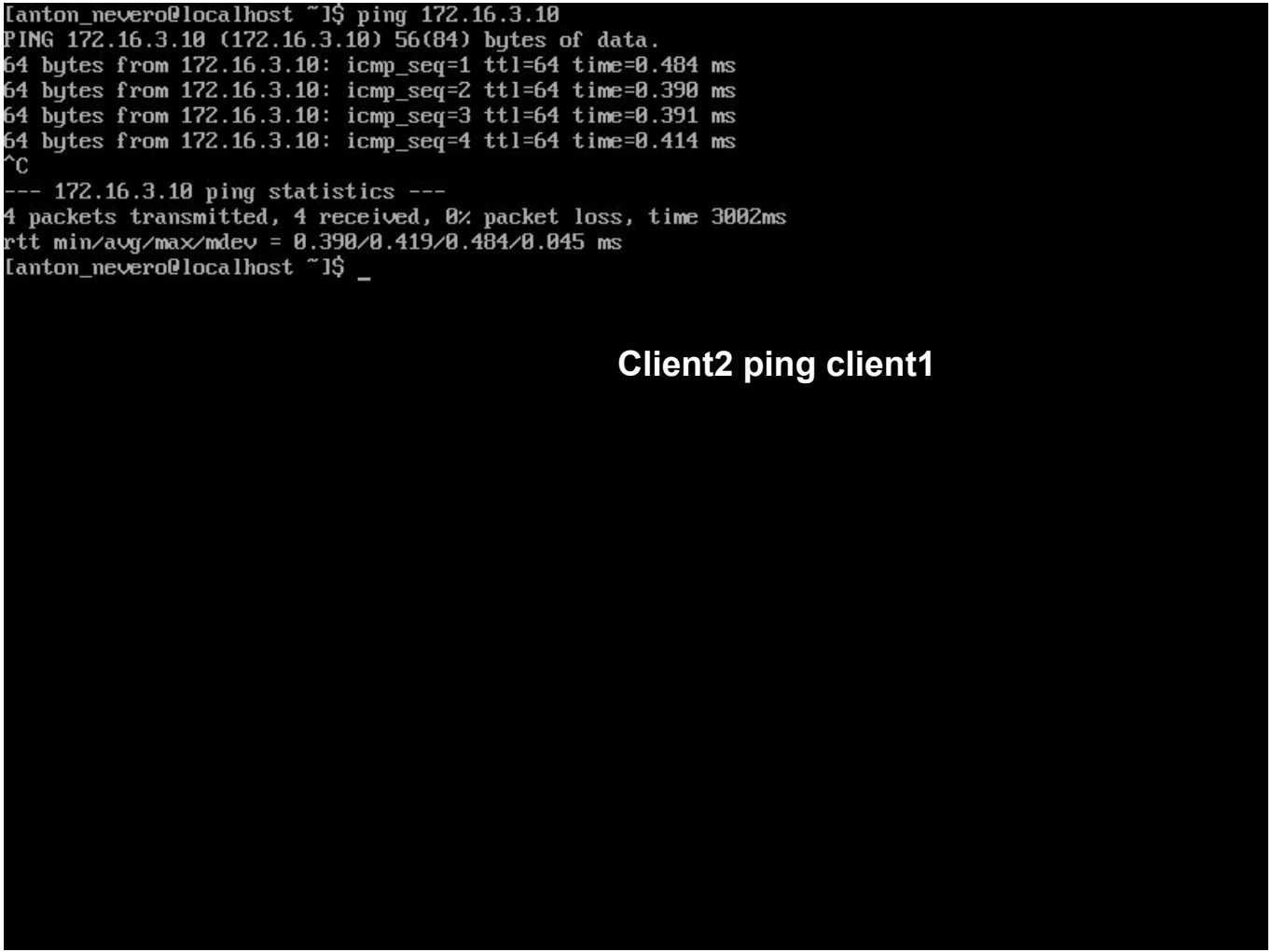
# DHCP

```
anton_nevero@antonnevero:~$ ping 10.88.3.150
PING 10.88.3.150 (10.88.3.150) 56(84) bytes of data.
64 bytes from 10.88.3.150: icmp_seq=1 ttl=64 time=0.441 ms
64 bytes from 10.88.3.150: icmp_seq=2 ttl=64 time=0.356 ms
64 bytes from 10.88.3.150: icmp_seq=3 ttl=64 time=0.539 ms
64 bytes from 10.88.3.150: icmp_seq=4 ttl=64 time=0.416 ms
^C
--- 10.88.3.150 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3053ms
rtt min/avg/max/mdev = 0.356/0.438/0.539/0.065 ms
anton_nevero@antonnevero:~$
```

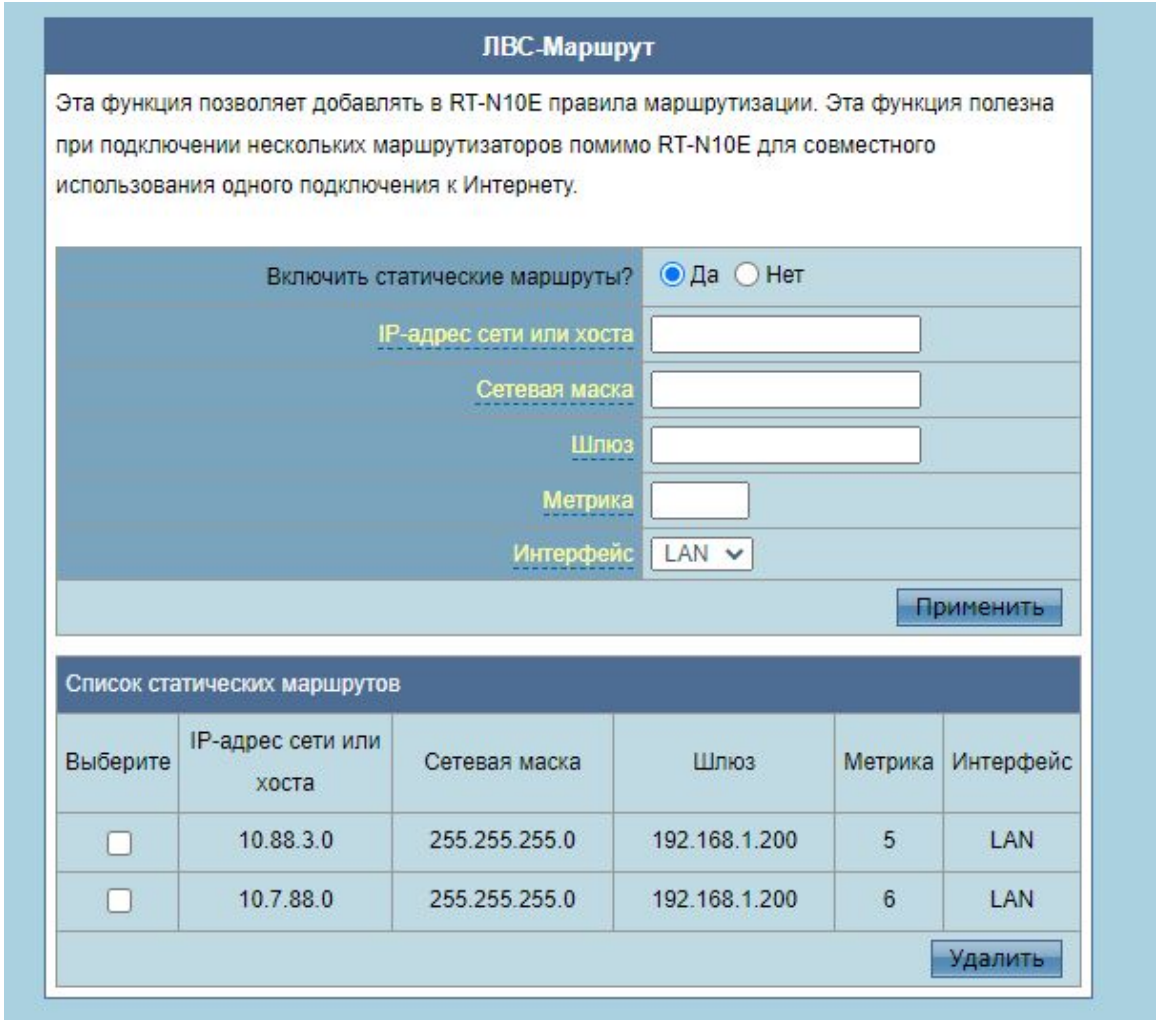
**Server1 ping Client1**


anton_nevero@antonnevero:~$ ping 10.7.88.150
PING 10.7.88.150 (10.7.88.150) 56(84) bytes of data.
64 bytes from 10.7.88.150: icmp_seq=1 ttl=64 time=0.421 ms
64 bytes from 10.7.88.150: icmp_seq=2 ttl=64 time=0.484 ms
64 bytes from 10.7.88.150: icmp_seq=3 ttl=64 time=0.446 ms
64 bytes from 10.7.88.150: icmp_seq=4 ttl=64 time=0.469 ms
^C
--- 10.7.88.150 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3060ms
rtt min/avg/max/mdev = 0.421/0.455/0.484/0.023 ms
anton_nevero@antonnevero:~$ _
Server1 ping client2


**Client1 ping client2**


[anton_nevero@localhost ~]$ ping 172.16.3.10
PING 172.16.3.10 (172.16.3.10) 56(84) bytes of data.
64 bytes from 172.16.3.10: icmp_seq=1 ttl=64 time=0.484 ms
64 bytes from 172.16.3.10: icmp_seq=2 ttl=64 time=0.390 ms
64 bytes from 172.16.3.10: icmp_seq=3 ttl=64 time=0.391 ms
64 bytes from 172.16.3.10: icmp_seq=4 ttl=64 time=0.414 ms
^C
--- 172.16.3.10 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3002ms
rtt min/avg/max/mdev = 0.390/0.419/0.484/0.045 ms
[anton_nevero@localhost ~]$ _
Client2 ping client1

**Static routes for net2 and net3**



```
anton_nevero@antonnevero:~$ 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 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet 172.17.13.1/24 brd 172.17.13.255 scope global lo
       valid_lft forever preferred_lft forever
    inet 172.17.23.1/24 brd 172.17.23.255 scope global 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 fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:3c:be:7f brd ff:ff:ff:ff:ff:ff
    inet 10.88.3.150/24 brd 10.88.3.255 scope global dynamic enp0s3
       valid_lft 335sec preferred_lft 335sec
    inet6 fe80::a00:27ff:fe3c:be7f/64 scope link
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 100
0
    link/ether 08:00:27:c6:9c:54 brd ff:ff:ff:ff:ff:ff
    inet 172.16.3.10/24 brd 172.16.3.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fec6:9c54/64 scope link
       valid_lft forever preferred_lft forever
anton_nevero@antonnevero:~$
```

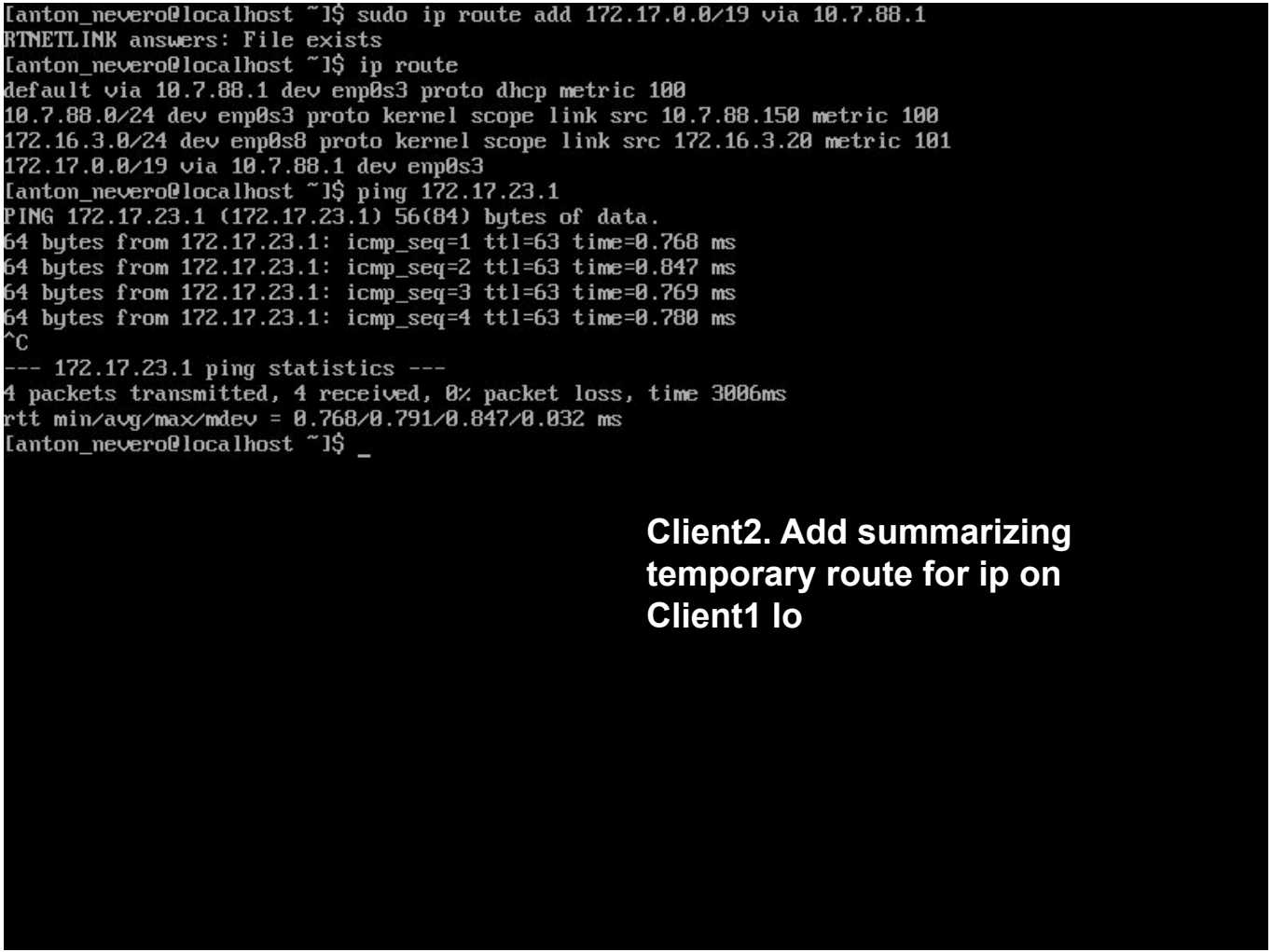
**Add ip for lo**

```
[anton_nevero@localhost ~]$ traceroute 172.17.13.1
traceroute to 172.17.13.1 (172.17.13.1), 30 hops max, 60 byte packets
 1  gateway (10.7.88.1)  0.423 ms  0.338 ms  0.320 ms
 2  172.17.13.1 (172.17.13.1)  0.879 ms  0.836 ms  0.879 ms
[anton_nevero@localhost ~]$
```

**Ping from Client2 to Client1 lo via Server1**

```
[anton_nevero@localhost ~]$ traceroute 172.17.23.1
traceroute to 172.17.23.1 (172.17.23.1), 30 hops max, 60 byte packets
 1  172.17.23.1 (172.17.23.1)  0.480 ms  0.396 ms  0.388 ms
[anton_nevero@localhost ~]$
```

**Ping from Client 2 to Client1 lo**




**Client2. Add summarizing temporary route for ip on Client1 lo**

```
[anton_nevero@localhost network-scripts]$ cat route-enp0s3
ADDRESS0=172.17.0.0
NETMASK0=255.255.224.0
GATEWAY0=10.7.88.1
[anton_nevero@localhost network-scripts]$ ip route
default via 10.7.88.1 dev enp0s3 proto dhcp metric 100
10.7.88.0/24 dev enp0s3 proto kernel scope link src 10.7.88.150 metric 100
172.16.3.0/24 dev enp0s8 proto kernel scope link src 172.16.3.20 metric 101
[anton_nevero@localhost network-scripts]$ ping 172.17.23.1
PING 172.17.23.1 (172.17.23.1) 56(84) bytes of data.
64 bytes from 172.17.23.1: icmp_seq=1 ttl=63 time=0.893 ms
64 bytes from 172.17.23.1: icmp_seq=2 ttl=63 time=0.749 ms
64 bytes from 172.17.23.1: icmp_seq=3 ttl=63 time=0.800 ms
64 bytes from 172.17.23.1: icmp_seq=4 ttl=63 time=0.802 ms
^C
--- 172.17.23.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3003ms
rtt min/avg/max/mdev = 0.749/0.811/0.893/0.051 ms
[anton_nevero@localhost network-scripts]$
```

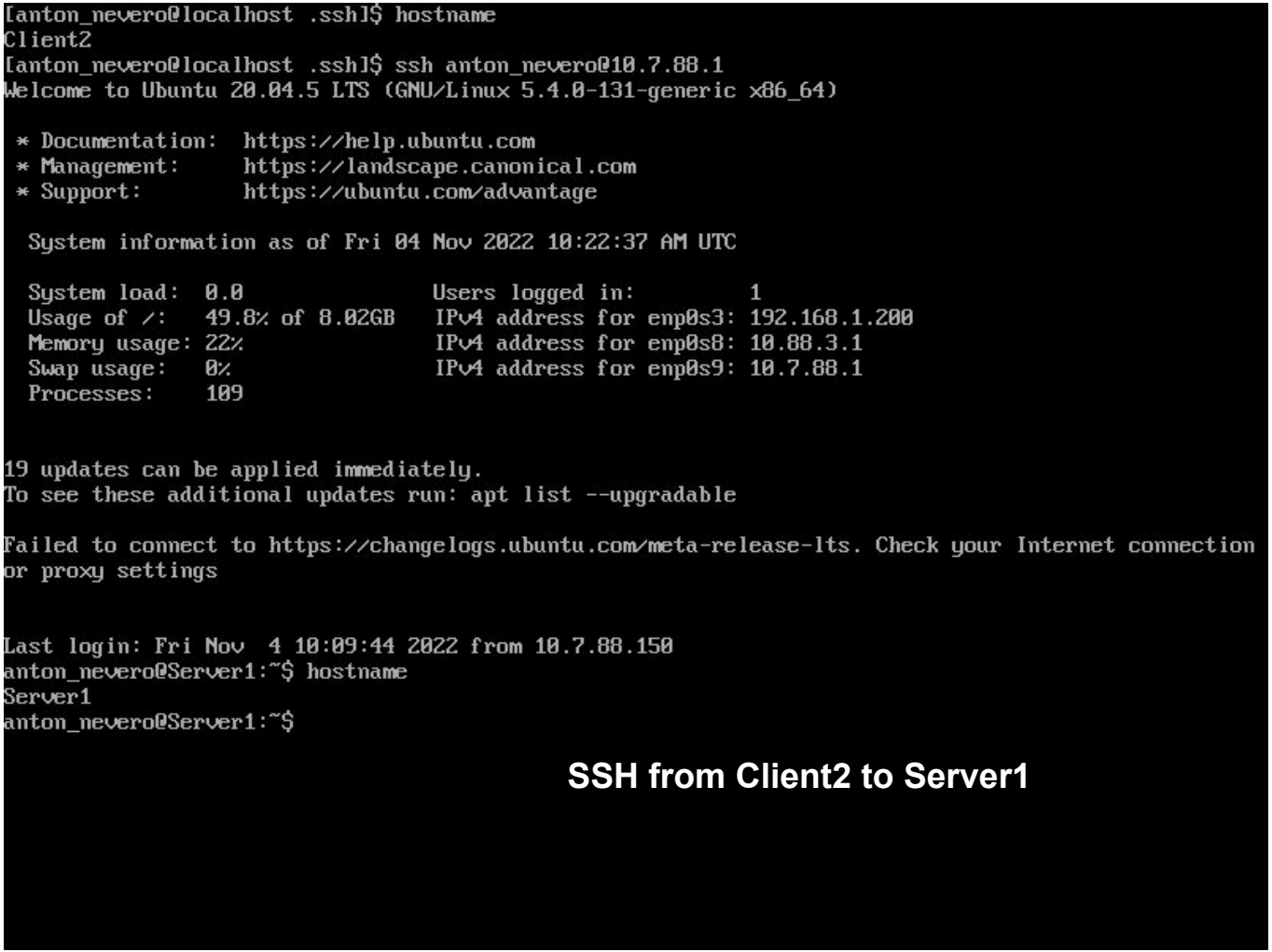
**Client2. Add summarizing permanent route for ip on Client1 lo**

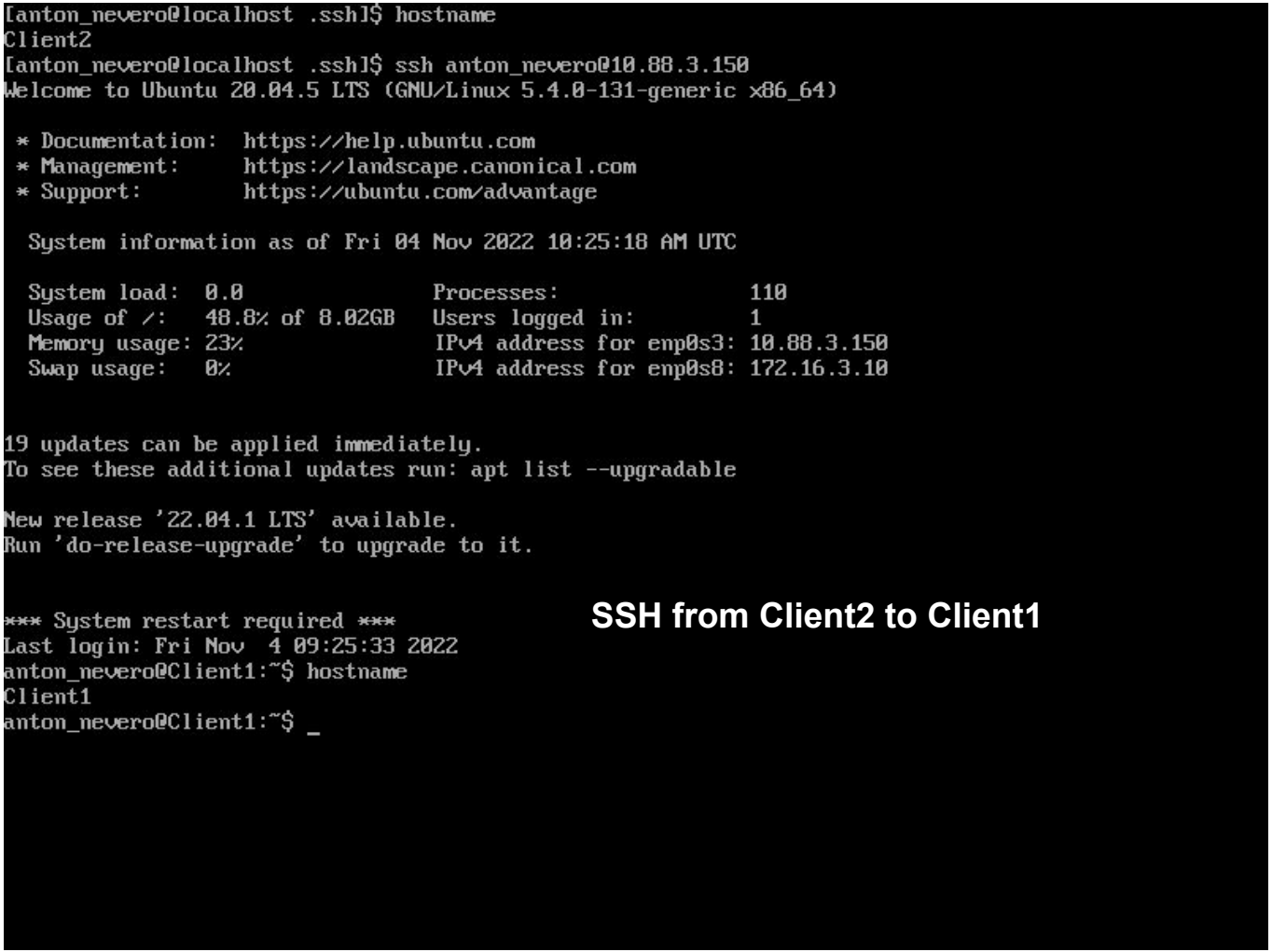
```
anton_nevero@antonnevero:~$ cat /etc/netplan/00-installer-config.yaml
# This is the network config written by 'subiquity'
network:
  ethernets:
    enp0s3:
      dhcp4: no
      addresses: [192.168.1.200/24]
      gateway4: 192.168.1.1
    enp0s8:
      dhcp4: no
      addresses: [10.88.3.1/24]
      routes:
        - to: 172.17.0.0/19
          via: 10.88.3.150
          metric: 50
    enp0s9:
      dhcp4: no
      addresses: [10.7.88.1/24]
  version: 2
anton_nevero@antonnevero:~$ _
```

**Permanent routing on Server1**

```
anton_nevero@antonnevero:~/.ssh$ hostname
Client1
anton_nevero@antonnevero:~/.ssh$ ssh anton_nevero@10.7.88.150
Last login: Fri Nov  4 12:05:30 2022 from 10.88.3.150
[anton_nevero@Client2 ~]$ hostname
Client2
[anton_nevero@Client2 ~]$
```

**SSH from Client1 to Client2**


[anton_nevero@localhost .ssh]$ hostname
Client2
[anton_nevero@localhost .ssh]$ ssh anton_nevero@10.7.88.1
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage
System information as of Fri 04 Nov 2022 10:22:37 AM UTC
System load: 0.0
Usage of /: 49.8% of 8.02GB
Memory usage: 22%
Swap usage: 0%
Processes: 109
Users logged in: 1
IPv4 address for enp0s3: 192.168.1.200
IPv4 address for enp0s8: 10.88.3.1
IPv4 address for enp0s9: 10.7.88.1
19 updates can be applied immediately.
To see these additional updates run: apt list --upgradable
Failed to connect to https://changelogs.ubuntu.com/meta-release-lts. Check your Internet connection or proxy settings
Last login: Fri Nov 4 10:09:44 2022 from 10.7.88.150
anton_nevero@Server1:~$ hostname
Server1
anton_nevero@Server1:~$
SSH from Client2 to Server1


[anton_nevero@localhost .ssh]$ hostname
Client2
[anton_nevero@localhost .ssh]$ ssh anton_nevero@10.88.3.150
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-131-generic x86_64)
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage
System information as of Fri 04 Nov 2022 10:25:18 AM UTC
System load: 0.0
Usage of /: 48.8% of 8.02GB
Memory usage: 23%
Swap usage: 0%
Processes: 110
Users logged in: 1
IPv4 address for enp0s3: 10.88.3.150
IPv4 address for enp0s8: 172.16.3.10
19 updates can be applied immediately.
To see these additional updates run: apt list --upgradable
New release '22.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.
*** System restart required ***
Last login: Fri Nov 4 09:25:33 2022
anton_nevero@Client1:~$ hostname
Client1
anton_nevero@Client1:~$ _
SSH from Client2 to Client1

```
anton_nevero@antonnevero:~$ sudo iptables -L
sudo: unable to resolve host antonnevero: Temporary failure in name resolution
Chain INPUT (policy ACCEPT)
target     prot opt source               destination
ACCEPT     all  --  anywhere             anywhere             state RELATED,ESTABLISHED
ACCEPT     tcp  --  10.88.3.0/24         anywhere             tcp dpt:ssh
DROP       all  --  anywhere             anywhere

Chain FORWARD (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination
anton_nevero@antonnevero:~$ _
```

**Firewall. Allow SSH from Client1 and deny other**

```
anton_nevero@antonnevero:~$ sudo iptables -t nat -L
sudo: unable to resolve host antonnevero: Temporary failure in name resolution
Chain PREROUTING (policy ACCEPT)
target     prot opt source               destination

Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source               destination
SNAT       all  --  10.88.3.0/24         anywhere             to:192.168.1.200
MASQUERADE  all  --  anywhere             anywhere
anton_nevero@antonnevero:~$
```

**NAT for 10.88.3.0/24 and masquerade testing**