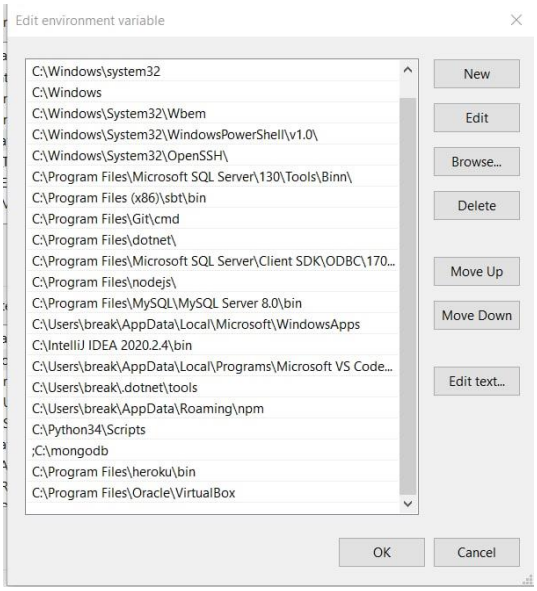
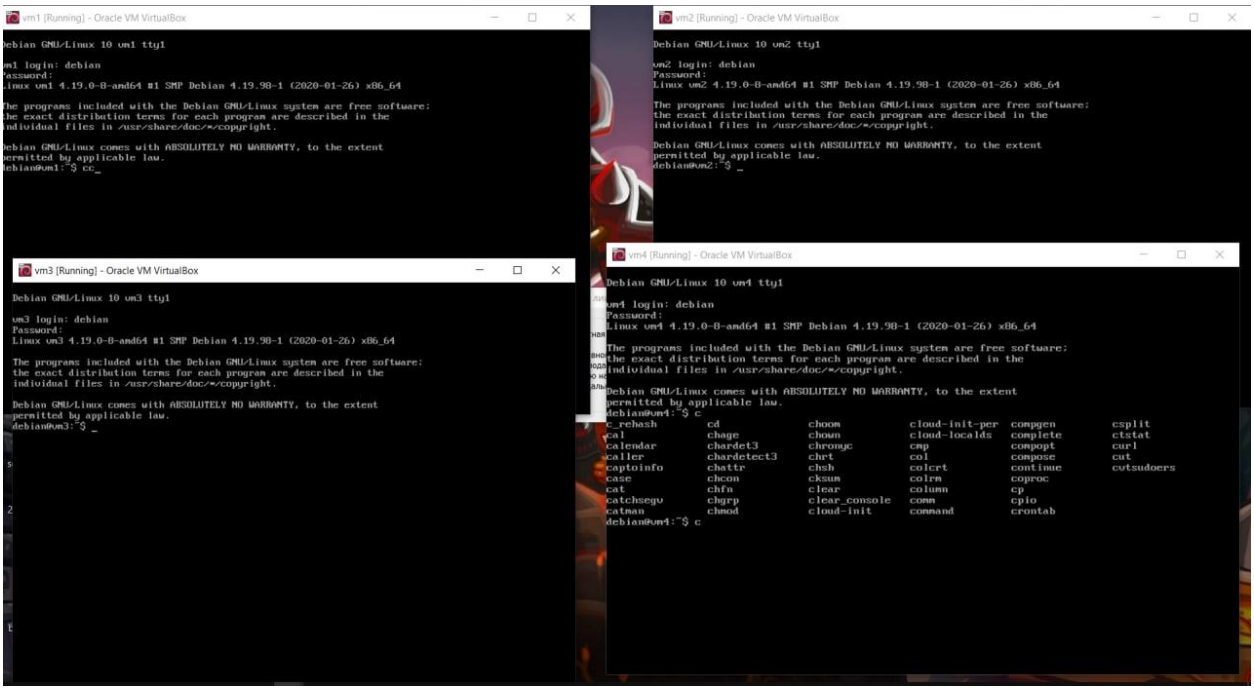
2.1 Lab environment configuration

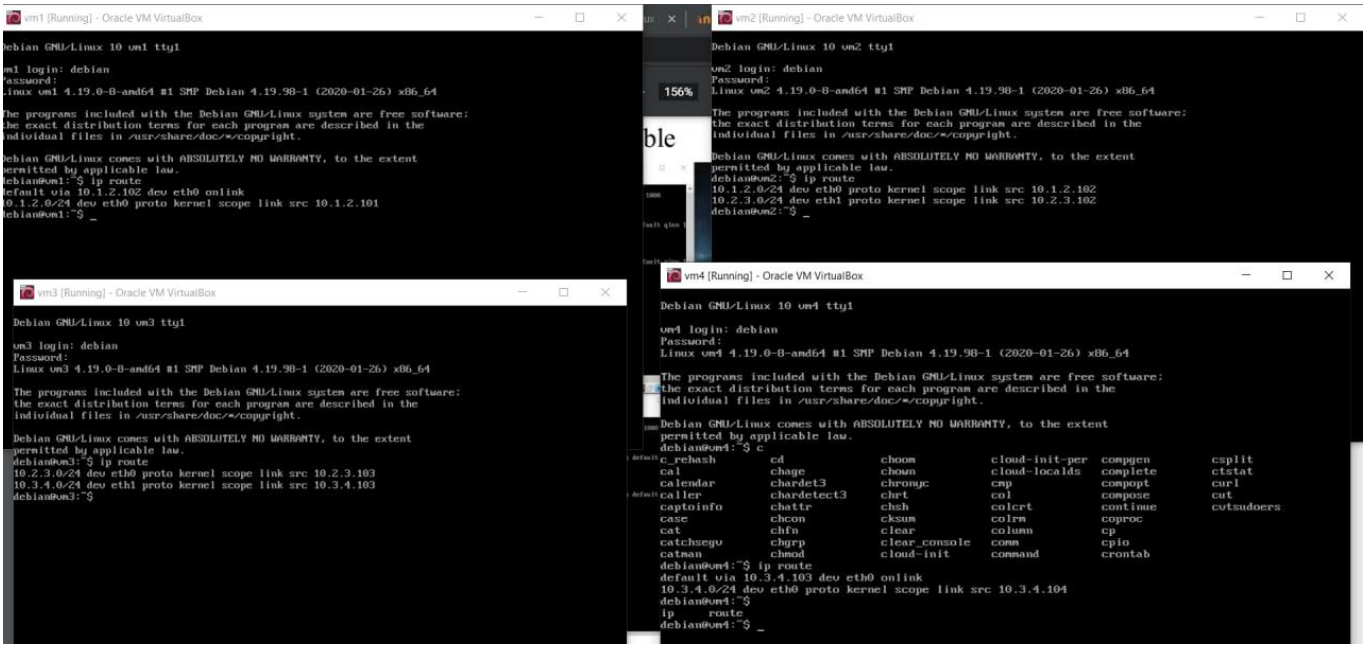


2.2 Starting lab

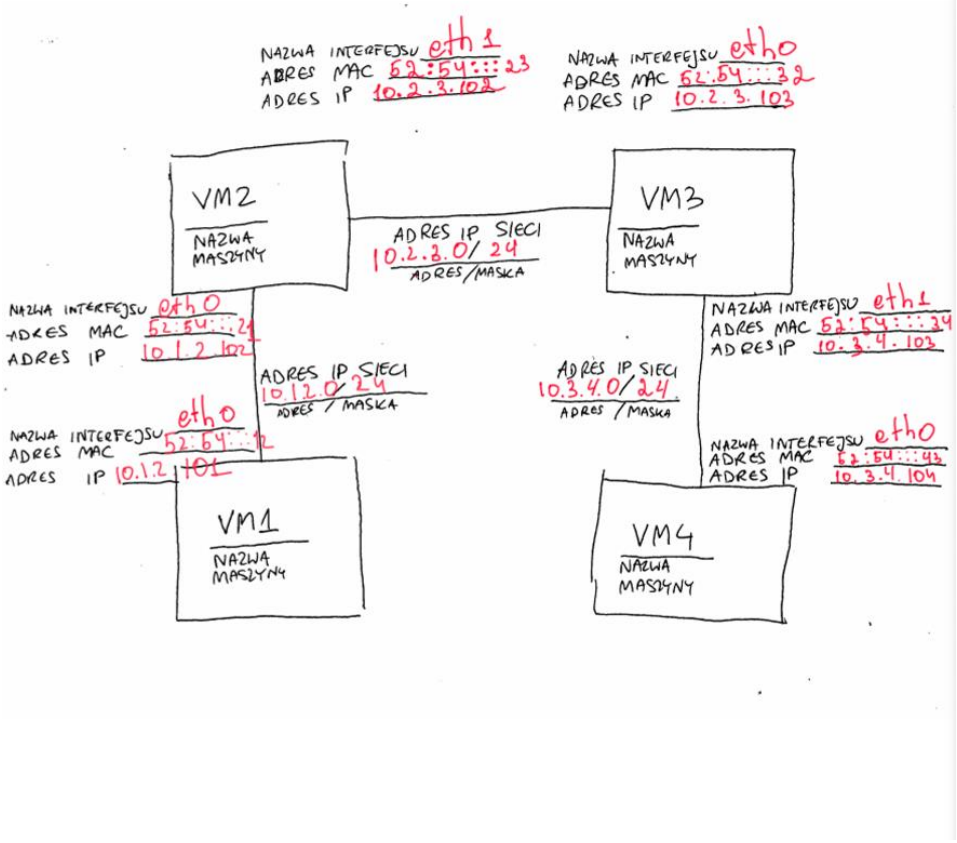


2.3 Getting used with lab configuration

1.



2.



3.

```
debian@vm2:~$ ip route
10.1.2.0/24 dev eth0 proto kernel scope link src 10.1.2.102
10.2.3.0/24 dev eth1 proto kernel scope link src 10.2.3.102
```

4.
```
debian@vm2:~$ ping 10.1.2.101
PING 10.1.2.101 (10.1.2.101) 56(84) bytes of data.
64 bytes from 10.1.2.101: icmp_seq=1 ttl=64 time=0.364 ms
64 bytes from 10.1.2.101: icmp_seq=2 ttl=64 time=0.415 ms
64 bytes from 10.1.2.101: icmp_seq=3 ttl=64 time=0.316 ms
64 bytes from 10.1.2.101: icmp_seq=4 ttl=64 time=0.240 ms
^C
--- 10.1.2.101 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 66ms
rtt min/avg/max/mdev = 0.240/0.333/0.415/0.068 ms
debian@vm2:~$ ping 10.2.3.103
PING 10.2.3.103 (10.2.3.103) 56(84) bytes of data.
64 bytes from 10.2.3.103: icmp_seq=1 ttl=64 time=0.472 ms
64 bytes from 10.2.3.103: icmp_seq=2 ttl=64 time=0.382 ms
64 bytes from 10.2.3.103: icmp_seq=3 ttl=64 time=0.346 ms
64 bytes from 10.2.3.103: icmp_seq=4 ttl=64 time=0.448 ms
^C
--- 10.2.3.103 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 78ms
rtt min/avg/max/mdev = 0.346/0.412/0.472/0.050 ms
```

5.
```
debian@vm2:~$ traceroute 10.1.2.101
traceroute to 10.1.2.101 (10.1.2.101), 30 hops max, 60 byte packets
 1  10.1.2.101 (10.1.2.101)  0.301 ms  0.268 ms  0.361 ms
```

6.
```
debian@vm2:~$ ping 10.1.2.58
PING 10.1.2.58 (10.1.2.58) 56(84) bytes of data.
From 10.1.2.102 icmp_seq=1 Destination Host Unreachable
From 10.1.2.102 icmp_seq=2 Destination Host Unreachable
From 10.1.2.102 icmp_seq=3 Destination Host Unreachable
^C
--- 10.1.2.58 ping statistics ---
5 packets transmitted, 0 received, +3 errors, 100% packet loss, time 98ms
pipe 4
debian@vm2:~$ traceroute 10.1.2.58
traceroute to 10.1.2.58 (10.1.2.58), 30 hops max, 60 byte packets
 1  10.1.2.102 (10.1.2.102)  3067.129 ms !H  3067.031 ms !H  3067.018 ms !H
debian@vm2:~$ _
```

7.
```
debian@vm2:~$ ping 2.2.2.2
connect: Network is unreachable
```

```
debian@vm2:~$ traceroute 2.2.2.2
traceroute to 2.2.2.2 (2.2.2.2), 30 hops max, 60 byte packets
connect: Network is unreachable
```

8.

```
debian@vm1:~$ ip route
default via 10.1.2.102 dev eth0 onlink
10.1.2.0/24 dev eth0 proto kernel scope link src 10.1.2.101
```

9.

```
debian@vm1:~$ ping 10.1.2.102
PING 10.1.2.102 (10.1.2.102) 56(84) bytes of data.
64 bytes from 10.1.2.102: icmp_seq=1 ttl=64 time=0.320 ms
64 bytes from 10.1.2.102: icmp_seq=2 ttl=64 time=0.423 ms
64 bytes from 10.1.2.102: icmp_seq=3 ttl=64 time=0.456 ms
64 bytes from 10.1.2.102: icmp_seq=4 ttl=64 time=0.322 ms
^C
--- 10.1.2.102 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 65ms
rtt min/avg/max/mdev = 0.320/0.380/0.456/0.061 ms
debian@vm1:~$ traceroute 10.1.2.102
traceroute to 10.1.2.102 (10.1.2.102), 30 hops max, 60 byte packets
 1  10.1.2.102 (10.1.2.102)  0.372 ms  0.341 ms  0.326 ms
debian@vm1:~$ _
```

10.

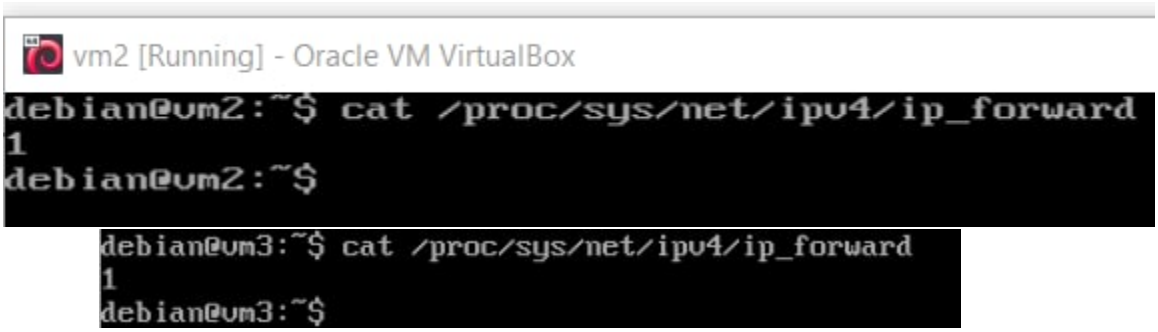
```
debian@vm1:~$ ping 10.1.2.58
PING 10.1.2.58 (10.1.2.58) 56(84) bytes of data.
From 10.1.2.101 icmp_seq=1 Destination Host Unreachable
From 10.1.2.101 icmp_seq=2 Destination Host Unreachable
From 10.1.2.101 icmp_seq=3 Destination Host Unreachable
From 10.1.2.101 icmp_seq=4 Destination Host Unreachable
From 10.1.2.101 icmp_seq=5 Destination Host Unreachable
From 10.1.2.101 icmp_seq=6 Destination Host Unreachable
^C
--- 10.1.2.58 ping statistics ---
7 packets transmitted, 0 received, +6 errors, 100% packet loss, time 148ms
pipe 4
debian@vm1:~$ traceroute 10.1.2.58
traceroute to 10.1.2.58 (10.1.2.58), 30 hops max, 60 byte packets
 1  vm1 (10.1.2.101)  3057.371 ms !H  3057.316 ms !H  3057.302 ms !H
debian@vm1:~$ _
```

11.

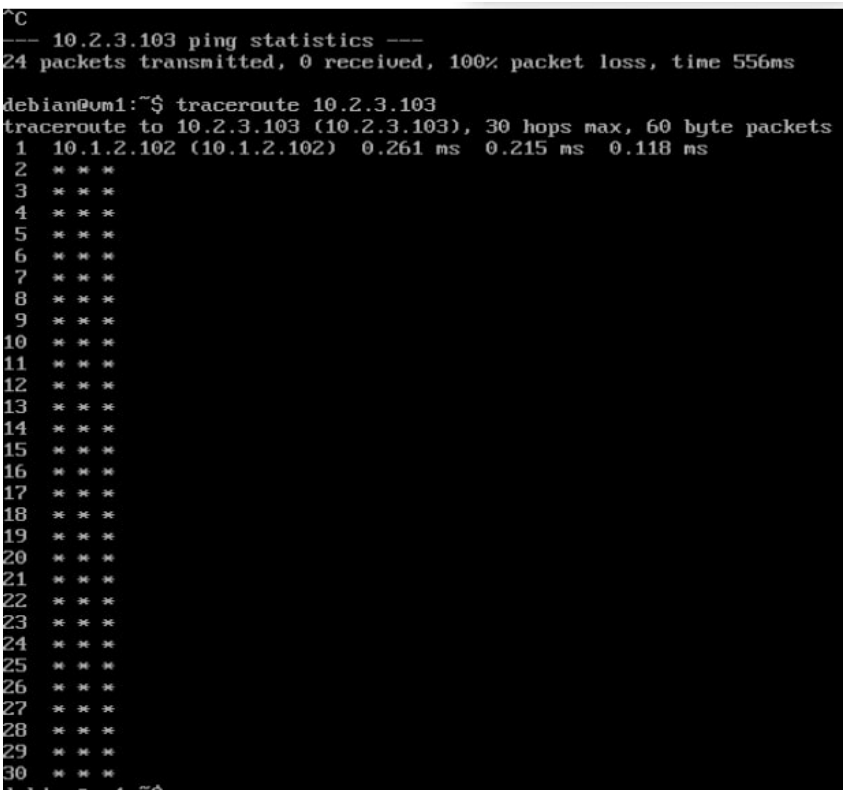
```
debian@vm1:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
From 10.1.2.102 icmp_seq=1 Destination Net Unreachable
From 10.1.2.102 icmp_seq=2 Destination Net Unreachable
From 10.1.2.102 icmp_seq=3 Destination Net Unreachable
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 4

debian@vm1:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  10.1.2.102 (10.1.2.102)  0.283 ms !N  0.240 ms !N *
```

2.4 Routing configuration

1.



2.



VM 1 and VM 3 configuration

```
debian@vm3:~$ sudo -i
root@vm3:~# ip route add 10.1.2/24 via 10.2.3.102
root@vm3:~# ip route
10.1.2.0/24 via 10.2.3.102 dev eth0
10.2.3.0/24 dev eth0 proto kernel scope link src 10.2.3.103
10.3.4.0/24 dev eth1 proto kernel scope link src 10.3.4.103
root@vm3:~# ping 10.1.2.101
PING 10.1.2.101 (10.1.2.101) 56(84) bytes of data.
64 bytes from 10.1.2.101: icmp_seq=1 ttl=63 time=0.740 ms
64 bytes from 10.1.2.101: icmp_seq=2 ttl=63 time=0.578 ms
64 bytes from 10.1.2.101: icmp_seq=3 ttl=63 time=0.777 ms
64 bytes from 10.1.2.101: icmp_seq=4 ttl=63 time=0.478 ms
^C
--- 10.1.2.101 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 6ms
rtt min/avg/max/mdev = 0.478/0.643/0.777/0.122 ms
root@vm3:~# traceroute 10.1.2.101
traceroute to 10.1.2.101 (10.1.2.101), 30 hops max, 60 byte packets
 1  10.2.3.102 (10.2.3.102)  0.322 ms  0.293 ms  0.278 ms
 2  10.1.2.101 (10.1.2.101)  0.927 ms  0.925 ms  0.916 ms
```

```
debian@vm1:~$ sudo -i
root@vm1:~# ping 10.2.3.103
PING 10.2.3.103 (10.2.3.103) 56(84) bytes of data.
64 bytes from 10.2.3.103: icmp_seq=1 ttl=63 time=0.682 ms
64 bytes from 10.2.3.103: icmp_seq=2 ttl=63 time=0.523 ms
64 bytes from 10.2.3.103: icmp_seq=3 ttl=63 time=0.514 ms
^C
--- 10.2.3.103 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 38ms
rtt min/avg/max/mdev = 0.514/0.573/0.682/0.077 ms
root@vm1:~# traceroute 10.2.3.103
traceroute to 10.2.3.103 (10.2.3.103), 30 hops max, 60 byte packets
 1  10.1.2.102 (10.1.2.102)  0.330 ms  0.145 ms  0.183 ms
 2  10.2.3.103 (10.2.3.103)  0.428 ms  0.411 ms  0.379 ms
root@vm1:~# _
```

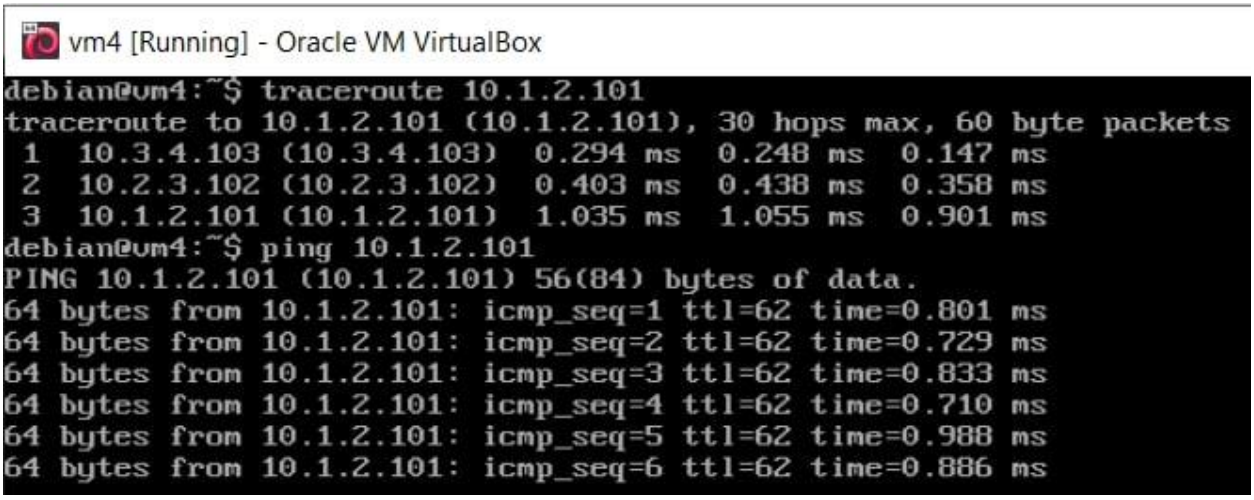
VM2 and VM4 configuration

```
debian@vm2:~$ sudo -i
root@vm2:~# ip route add 10.3.4/24 via 10.2.3.103
root@vm2:~# ip route
10.1.2.0/24 dev eth0 proto kernel scope link src 10.1.2.102
10.2.3.0/24 dev eth1 proto kernel scope link src 10.2.3.102
10.3.4.0/24 via 10.2.3.103 dev eth1
root@vm2:~# ping 10.3.4.104
PING 10.3.4.104 (10.3.4.104) 56(84) bytes of data.
64 bytes from 10.3.4.104: icmp_seq=1 ttl=63 time=0.869 ms
64 bytes from 10.3.4.104: icmp_seq=2 ttl=63 time=0.462 ms
64 bytes from 10.3.4.104: icmp_seq=3 ttl=63 time=0.530 ms
^C
--- 10.3.4.104 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 52ms
rtt min/avg/max/mdev = 0.462/0.620/0.869/0.179 ms
root@vm2:~# traceroute 10.3.4.104
traceroute to 10.3.4.104 (10.3.4.104), 30 hops max, 60 byte packets
 1  10.2.3.103 (10.2.3.103)  0.301 ms  0.253 ms  0.230 ms
 2  10.3.4.104 (10.3.4.104)  0.437 ms  0.313 ms  0.418 ms
```

```
debian@vm4:~$ ping 10.1.2.102
PING 10.1.2.102 (10.1.2.102) 56(84) bytes of data.
64 bytes from 10.1.2.102: icmp_seq=1 ttl=63 time=0.507 ms
64 bytes from 10.1.2.102: icmp_seq=2 ttl=63 time=0.536 ms
64 bytes from 10.1.2.102: icmp_seq=3 ttl=63 time=0.901 ms
^C
--- 10.1.2.102 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 42ms
rtt min/avg/max/mdev = 0.507/0.648/0.901/0.179 ms
debian@vm4:~$ traceroute 10.1.2.102
traceroute to 10.1.2.102 (10.1.2.102), 30 hops max, 60 byte packets
 1  10.3.4.103 (10.3.4.103)  0.304 ms  0.256 ms  0.105 ms
 2  10.1.2.102 (10.1.2.102)  0.587 ms  0.491 ms  0.393 ms
```

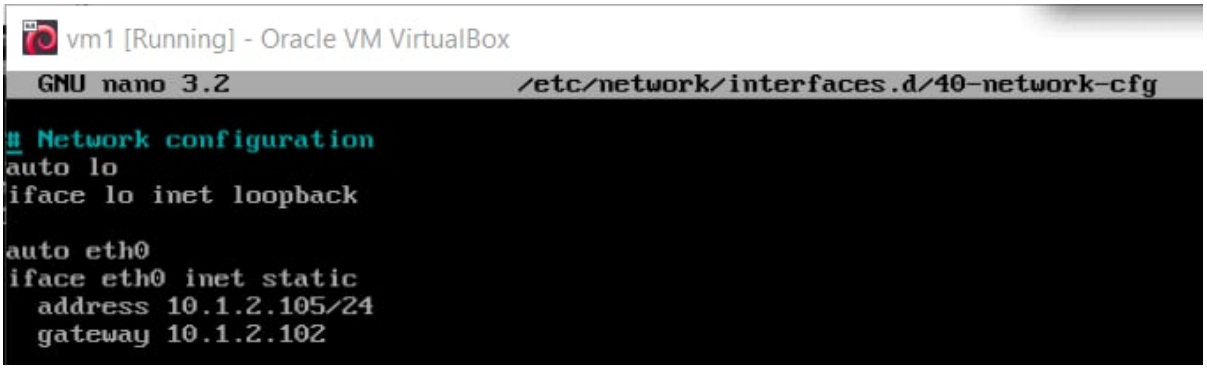
VM1 to VM4

```
root@vm1:~# ping 10.3.4.104
PING 10.3.4.104 (10.3.4.104) 56(84) bytes of data.
64 bytes from 10.3.4.104: icmp_seq=1 ttl=62 time=0.802 ms
64 bytes from 10.3.4.104: icmp_seq=2 ttl=62 time=1.03 ms
64 bytes from 10.3.4.104: icmp_seq=3 ttl=62 time=1.09 ms
^C
--- 10.3.4.104 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 9ms
rtt min/avg/max/mdev = 0.802/0.974/1.093/0.124 ms
root@vm1:~# traceroute 10.3.4.104
traceroute to 10.3.4.104 (10.3.4.104), 30 hops max, 60 byte packets
 1  10.1.2.102 (10.1.2.102)  0.282 ms  0.235 ms  0.149 ms
 2  10.2.3.103 (10.2.3.103)  0.474 ms  0.439 ms  0.544 ms
 3  10.3.4.104 (10.3.4.104)  2.621 ms  2.398 ms  2.258 ms
```

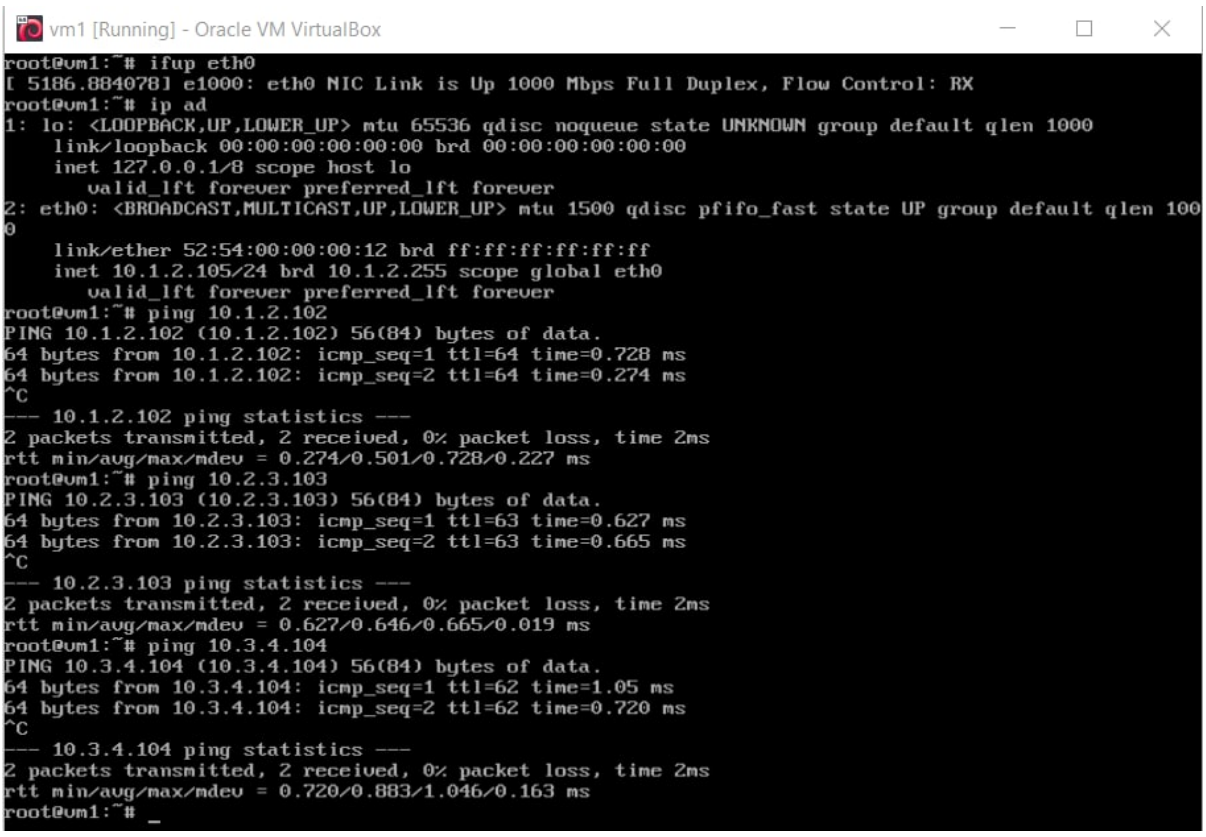

vm4 [Running] - Oracle VM VirtualBox
debian@vm4:~$ traceroute 10.1.2.101
traceroute to 10.1.2.101 (10.1.2.101), 30 hops max, 60 byte packets
 1 10.3.4.103 (10.3.4.103) 0.294 ms 0.248 ms 0.147 ms
 2 10.2.3.102 (10.2.3.102) 0.403 ms 0.438 ms 0.358 ms
 3 10.1.2.101 (10.1.2.101) 1.035 ms 1.055 ms 0.901 ms
debian@vm4:~$ ping 10.1.2.101
PING 10.1.2.101 (10.1.2.101) 56(84) bytes of data.
64 bytes from 10.1.2.101: icmp_seq=1 ttl=62 time=0.801 ms
64 bytes from 10.1.2.101: icmp_seq=2 ttl=62 time=0.729 ms
64 bytes from 10.1.2.101: icmp_seq=3 ttl=62 time=0.833 ms
64 bytes from 10.1.2.101: icmp_seq=4 ttl=62 time=0.710 ms
64 bytes from 10.1.2.101: icmp_seq=5 ttl=62 time=0.988 ms
64 bytes from 10.1.2.101: icmp_seq=6 ttl=62 time=0.886 ms

2.5 Configuration of network interfaces

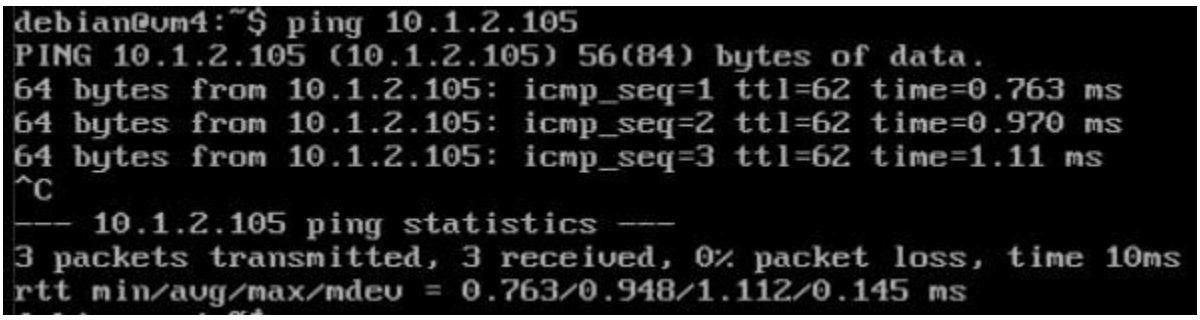
1.



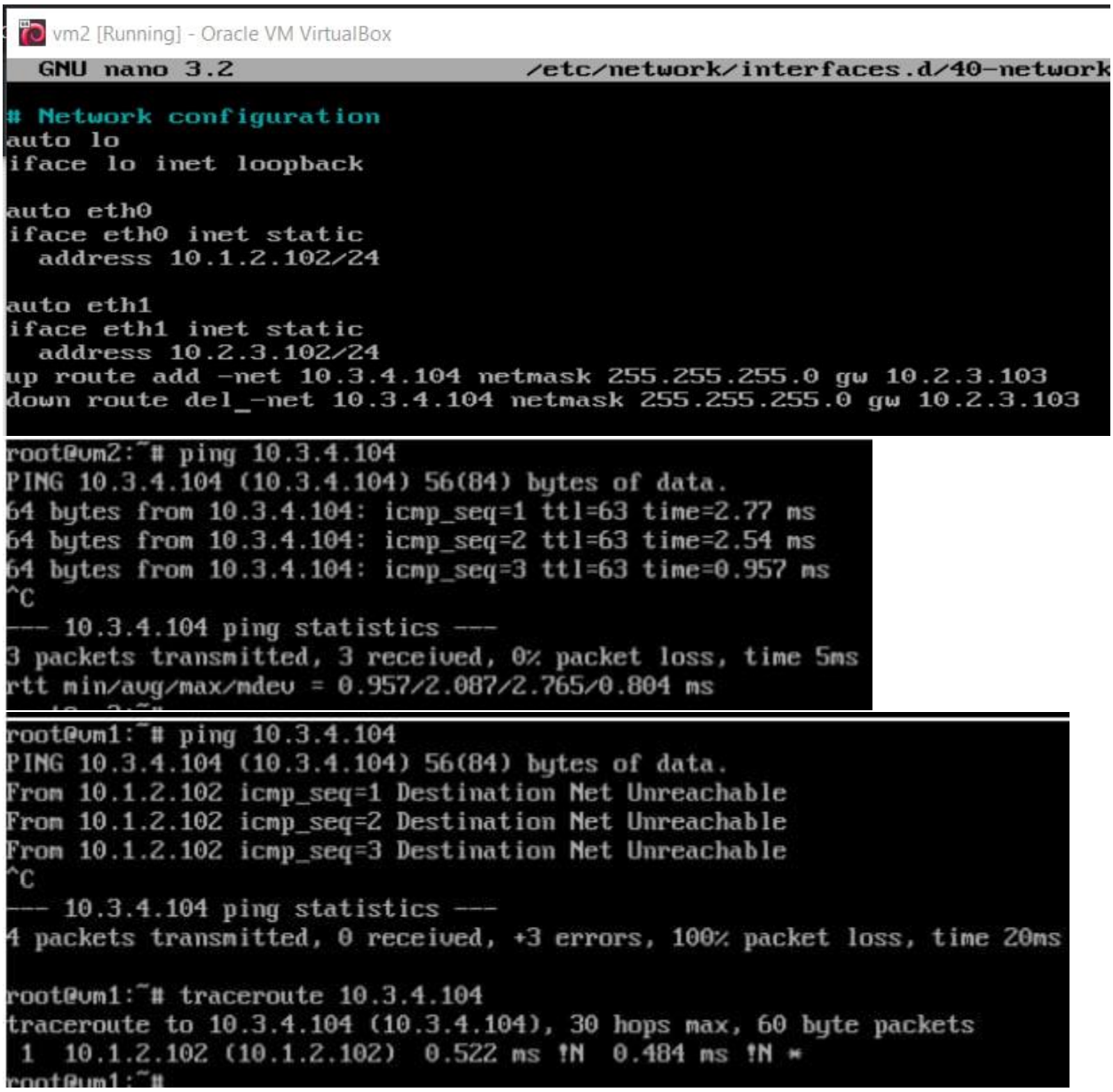
Testing



Vm4 ping to 10.1.2.105



VM2 configuration


vm2 [Running] - Oracle VM VirtualBox
GNU nano 3.2 /etc/network/interfaces.d/40-network
Network configuration
auto lo
iface lo inet loopback
auto eth0
iface eth0 inet static
address 10.1.2.102/24
auto eth1
iface eth1 inet static
address 10.2.3.102/24
up route add -net 10.3.4.104 netmask 255.255.255.0 gw 10.2.3.103
down route del -net 10.3.4.104 netmask 255.255.255.0 gw 10.2.3.103
root@vm2:~# ping 10.3.4.104
PING 10.3.4.104 (10.3.4.104) 56(84) bytes of data.
64 bytes from 10.3.4.104: icmp_seq=1 ttl=63 time=2.77 ms
64 bytes from 10.3.4.104: icmp_seq=2 ttl=63 time=2.54 ms
64 bytes from 10.3.4.104: icmp_seq=3 ttl=63 time=0.957 ms
^C
--- 10.3.4.104 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 5ms
rtt min/avg/max/mdev = 0.957/2.087/2.765/0.804 ms
root@vm1:~# ping 10.3.4.104
PING 10.3.4.104 (10.3.4.104) 56(84) bytes of data.
From 10.1.2.102 icmp_seq=1 Destination Net Unreachable
From 10.1.2.102 icmp_seq=2 Destination Net Unreachable
From 10.1.2.102 icmp_seq=3 Destination Net Unreachable
^C
--- 10.3.4.104 ping statistics ---
4 packets transmitted, 0 received, +3 errors, 100% packet loss, time 20ms
root@vm1:~# traceroute 10.3.4.104
traceroute to 10.3.4.104 (10.3.4.104), 30 hops max, 60 byte packets
1 10.1.2.102 (10.1.2.102) 0.522 ms !N 0.484 ms !N *
root@vm1:~#

Reboot:

Debian GNU/Linux 10 vm2 tty1
vm2 login: debian
Password:
Last login: Thu May 6 10:51:51 CEST 2021 on tty1
Linux vm2 4.19.0-8-amd64 #1 SMP Debian 4.19.98-1 (2020-01-26) x86_64
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
debian@vm2:~$ sudo -i
root@vm2:~# ping 10.3.4.104
connect: Network is unreachable