1. Find Your Network Interface and IP Address

```
student@student-VMware-Virtual-Platform:~$ ip addr show
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 noprefixroute
       valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:fb:09:ea brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.253.128/24 brd 192.168.253.255 scope global dynamic noprefixroute ens33
       valid_lft 1139sec preferred_lft 1139sec
    inet6 fe80::20c:29ff:fefb:9ea/64 scope link
       valid_lft forever preferred_lft forever
student@student-VMware-Virtual-Platform:~$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.253.128  netmask 255.255.255.0  broadcast 192.168.253.255
        inet6 fe80::20c:29ff:fefb:9ea  prefixlen 64  scopeid 0x20<link>
        ether 00:0c:29:fb:09:ea  txqueuelen 1000  (Ethernet)
        RX packets 70435  bytes 89136562 (89.1 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 14370  bytes 3551782 (3.5 MB)
        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 1347  bytes 145387 (145.3 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 1347  bytes 145387 (145.3 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

student@student-VMware-Virtual-Platform:~$
```

2. Add Multiple IP Addresses to a Single Network Interface

```
student@student-VMware-Virtual-Platform:~$ sudo ip addr add 192.168.1.104/24 dev ens33
Error: ipv4: Address already assigned.
student@student-VMware-Virtual-Platform:~$ ip addr show ens33
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:fb:09:ea brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.253.128/24 brd 192.168.253.255 scope global dynamic noprefixroute ens33
       valid_lft 1542sec preferred_lft 1542sec
    inet 192.168.1.104/24 scope global ens33
       valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fefb:9ea/64 scope link
       valid_lft forever preferred_lft forever
student@student-VMware-Virtual-Platform:~$
```

3. Enable IP Forwarding and Configure Packet Filtering Using IPTables

```
student@student-VMware-Virtual-Platform:~$ sudo sysctl -w net.ipv4.ip_forward=1
net.ipv4.ip_forward = 1
student@student-VMware-Virtual-Platform:~$ sudo nano /etc/sysctl.conf
student@student-VMware-Virtual-Platform:~$ sudo sysctl -p
net.ipv4.ip_forward = 1
student@student-VMware-Virtual-Platform:~$
```

```
student@student-VMware-Virtual-Platform:~$ sudo iptables -t nat -A POSTROUTING -o ens33 -j MASQUERADE
student@student-VMware-Virtual-Platform:~$ sudo iptables -A FORWARD -s 192.168.253.128/24 -j ACCEPT
student@student-VMware-Virtual-Platform:~$ sudo iptables -L -v -n
Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain FORWARD (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 ACCEPT     0    --  *      *       192.168.253.0/24     0.0.0.0/0

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
student@student-VMware-Virtual-Platform:~$
```

4. Verify New IP Address

```
student@student-VMware-Virtual-Platform:~$ ping 192.168.253.128
PING 192.168.253.128 (192.168.253.128) 56(84) bytes of data.
64 bytes from 192.168.253.128: icmp_seq=1 ttl=64 time=0.074 ms
64 bytes from 192.168.253.128: icmp_seq=2 ttl=64 time=0.042 ms
64 bytes from 192.168.253.128: icmp_seq=3 ttl=64 time=0.047 ms
64 bytes from 192.168.253.128: icmp_seq=4 ttl=64 time=0.048 ms
64 bytes from 192.168.253.128: icmp_seq=5 ttl=64 time=0.043 ms
64 bytes from 192.168.253.128: icmp_seq=6 ttl=64 time=0.046 ms
64 bytes from 192.168.253.128: icmp_seq=7 ttl=64 time=0.048 ms
64 bytes from 192.168.253.128: icmp_seq=8 ttl=64 time=0.056 ms
64 bytes from 192.168.253.128: icmp_seq=9 ttl=64 time=0.041 ms
64 bytes from 192.168.253.128: icmp_seq=10 ttl=64 time=0.043 ms
64 bytes from 192.168.253.128: icmp_seq=11 ttl=64 time=0.025 ms
64 bytes from 192.168.253.128: icmp_seq=12 ttl=64 time=0.042 ms
64 bytes from 192.168.253.128: icmp_seq=13 ttl=64 time=0.053 ms
64 bytes from 192.168.253.128: icmp_seq=14 ttl=64 time=0.041 ms
64 bytes from 192.168.253.128: icmp_seq=15 ttl=64 time=0.044 ms
^C
--- 192.168.253.128 ping statistics ---
15 packets transmitted, 15 received, 0% packet loss, time 14340ms
rtt min/avg/max/mdev = 0.025/0.046/0.074/0.010 ms
student@student-VMware-Virtual-Platform:~$
```

5. View the Routing Table

```
student@student-VMware-Virtual-Platform:~$ netstat -rn
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
0.0.0.0         192.168.253.2   0.0.0.0         UG        0 0          0 ens33
192.168.1.0     0.0.0.0         255.255.255.0   U         0 0          0 ens33
192.168.253.0   0.0.0.0         255.255.255.0   U         0 0          0 ens33
student@student-VMware-Virtual-Platform:~$
```

6. Add and Delete Routes

```
student@student-VMware-Virtual-Platform:~$ sudo ip route add 192.168.3.0/24 via 192.168.253.2 dev ens33
student@student-VMware-Virtual-Platform:~$ ip route show
default via 192.168.253.2 dev ens33 proto dhcp src 192.168.253.128 metric 100
192.168.3.0/24 via 192.168.253.2 dev ens33
192.168.253.0/24 dev ens33 proto kernel scope link src 192.168.253.128 metric 100
student@student-VMware-Virtual-Platform:~$
```

```
student@student-VMware-Virtual-Platform:~$ sudo ip route del 192.168.3.0/24 via 192.168.253.2 dev ens33
student@student-VMware-Virtual-Platform:~$ ip route show
default via 192.168.253.2 dev ens33 proto dhcp src 192.168.253.128 metric 100
192.168.253.0/24 dev ens33 proto kernel scope link src 192.168.253.128 metric 100
student@student-VMware-Virtual-Platform:~$
```

```
student@student-VMware-Virtual-Platform:~$ sudo ip route add default via 192.168.253.2 dev ens33
student@student-VMware-Virtual-Platform:~$ ip route show
default via 192.168.253.2 dev ens33
default via 192.168.253.2 dev ens33 proto dhcp src 192.168.253.128 metric 100
192.168.253.0/24 dev ens33 proto kernel scope link src 192.168.253.128 metric 100
student@student-VMware-Virtual-Platform:~$ sudo ip route del default via 192.168.253.2 dev ens33
student@student-VMware-Virtual-Platform:~$ ip route show
default via 192.168.253.2 dev ens33 proto dhcp src 192.168.253.128 metric 100
192.168.253.0/24 dev ens33 proto kernel scope link src 192.168.253.128 metric 100
student@student-VMware-Virtual-Platform:~$
```

7. Verify Connectivity and Routing

```
student@student-VMware-Virtual-Platform:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=128 time=6.93 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=128 time=6.08 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=128 time=6.67 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=128 time=8.14 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=128 time=7.00 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=128 time=6.97 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=128 time=7.41 ms
^C
--- 8.8.8.8 ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6010ms
rtt min/avg/max/mdev = 6.076/7.027/8.140/0.588 ms
student@student-VMware-Virtual-Platform:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  _gateway (192.168.253.2)  1.285 ms  1.029 ms  0.923 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * *^C
student@student-VMware-Virtual-Platform:~$
```