

IP routing

1. Create virtual machines connection according to figure 1:

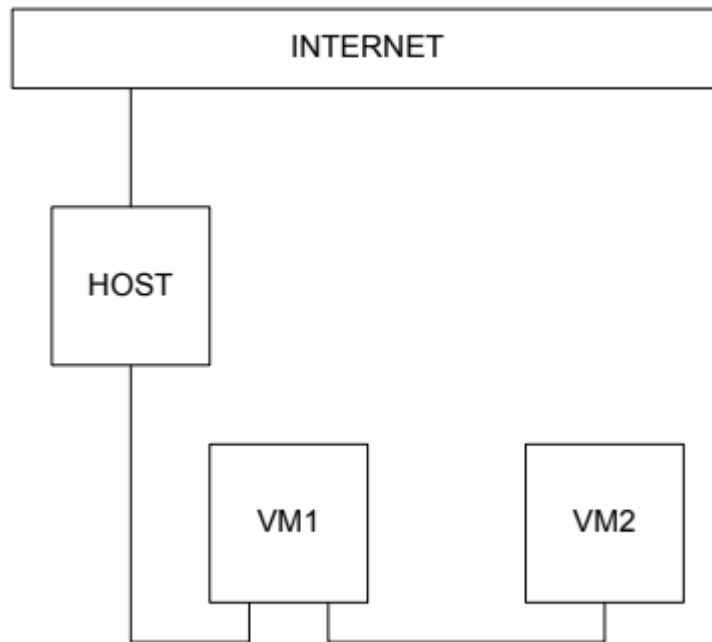
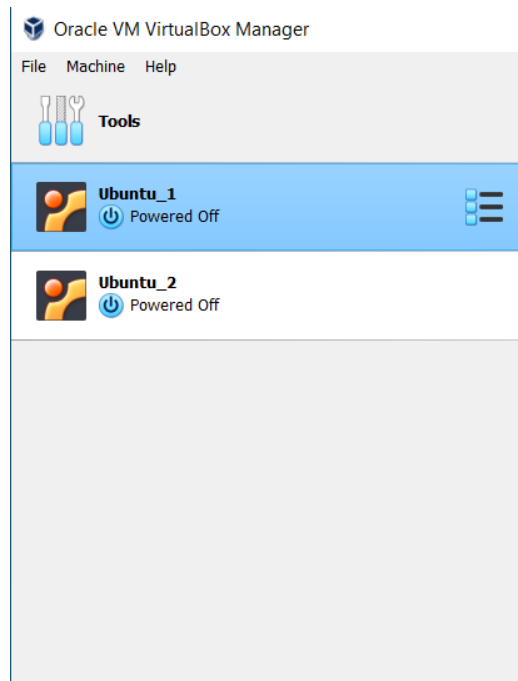
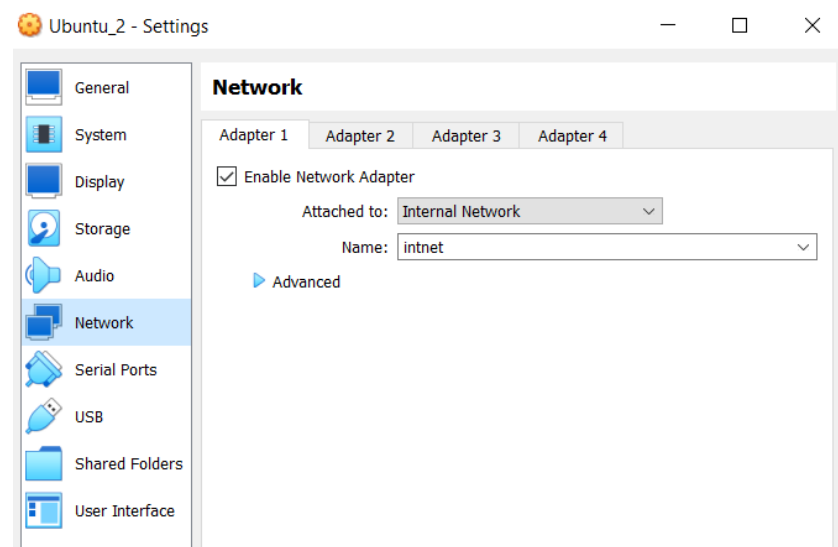
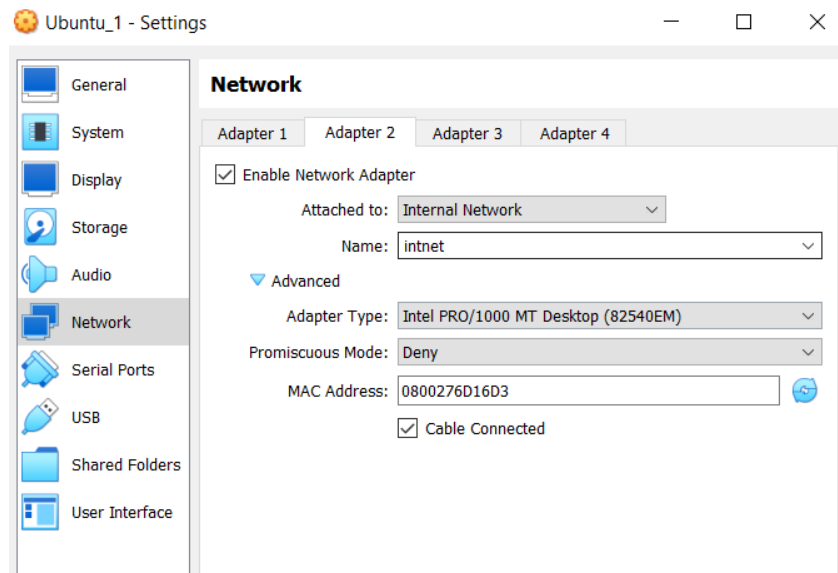
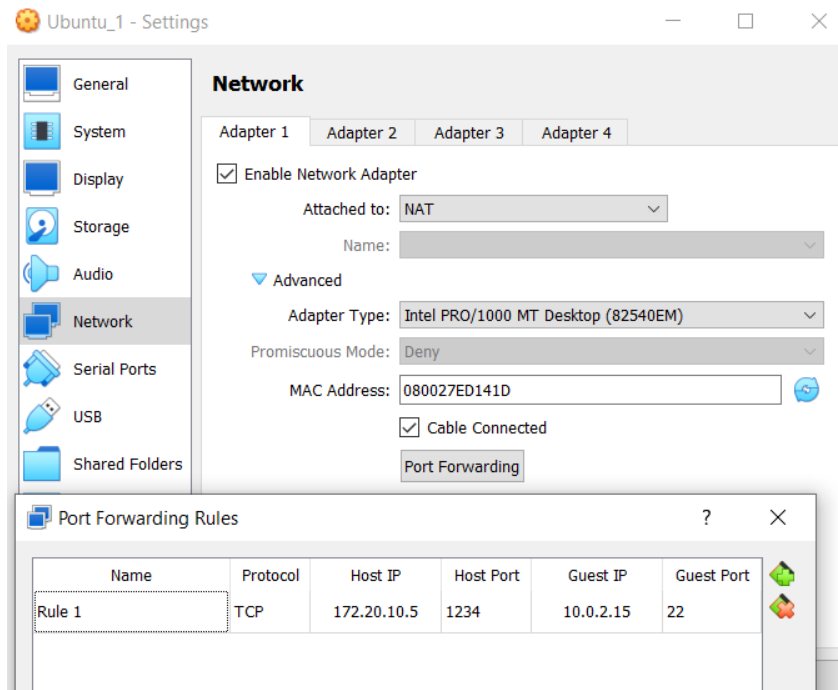


Figure 1 – VMs connection

2. VM2 has one interface (internal), VM1 has 2 interfaces (NAT and internal). Configure all network interfaces in order to make VM2 has an access to the Internet (iptables, forward, masquerade).





```
# and how to activate them. For more information, see interfaces(5).
```

```
# The loopback network interface
```

```
auto lo
iface lo inet loopback
```

```
# NAT
```

```
auto eth0
iface eth0 inet dhcp
```

```
#internal
```

```
auto eth1
iface eth1 inet static
address 10.10.10.1
netmask 255.255.255.0
broadcast 10.10.10.255
```

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```
"/etc/network/interfaces" 17L, 350C written
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```
student@CsnKhai:~$
```

```
student@CsnKhai:~$ sudo service networking restart
stop: Job failed while stopping
start: Job is already running: networking
student@CsnKhai:~$
```

```
"/etc/network/interfaces" 17L, 350C written
```

```
student@CsnKhai:~$ sudo ifup eth1
```

```
student@CsnKhai:~$ ip a
```

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    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
```

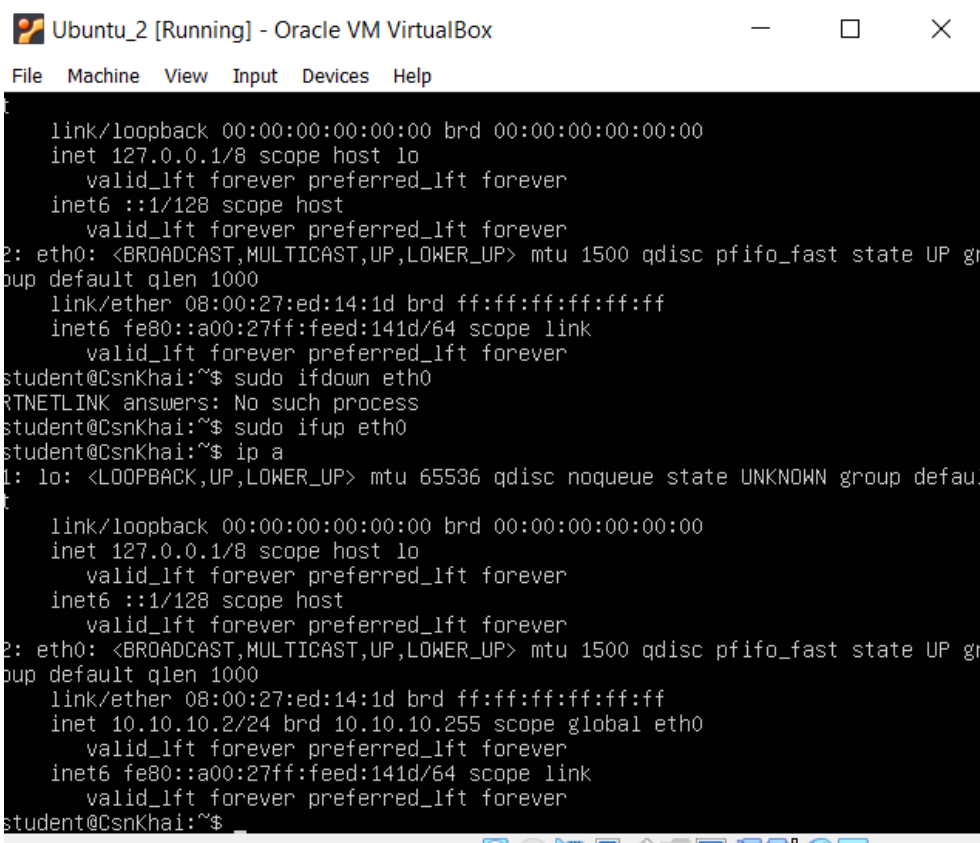
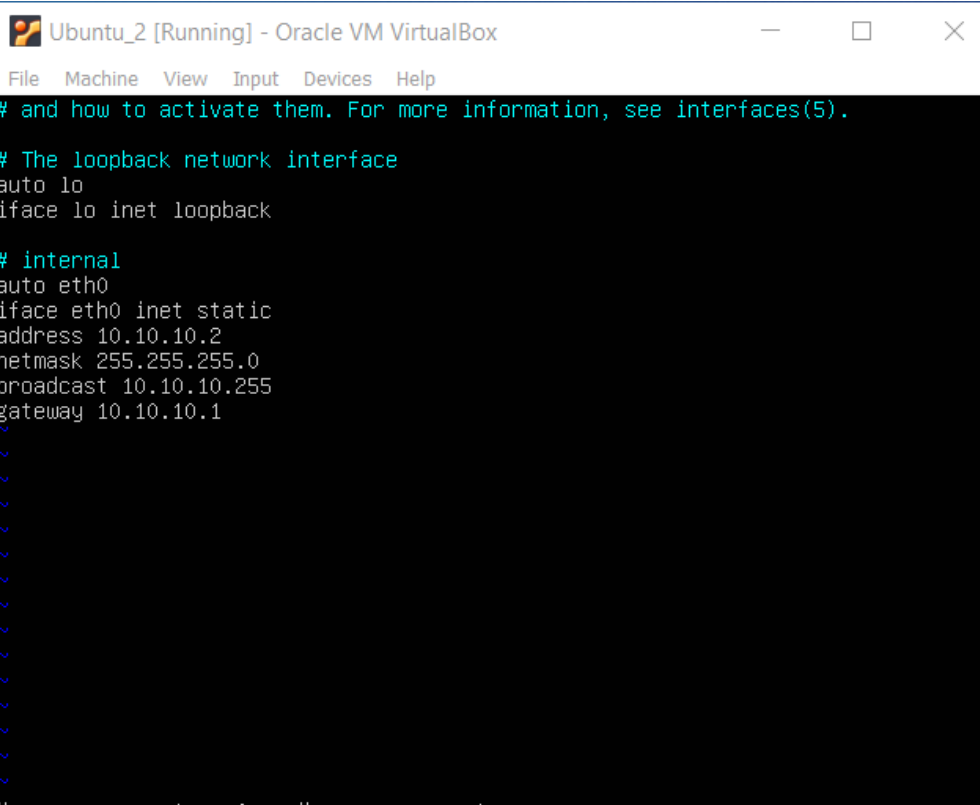
```
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:ed:14:1d brd ff:ff:ff:ff:ff:ff
```

```
    inet 10.0.2.15/24 brd 10.0.2.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:feed:141d/64 scope link
        valid_lft forever preferred_lft forever
```

```
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:6d:16:d3 brd ff:ff:ff:ff:ff:ff
```

```
    inet 10.10.10.1/24 brd 10.10.10.255 scope global eth1
        valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe6d:16d3/64 scope link
        valid_lft forever preferred_lft forever
```

```
student@CsnKhai:~$
```



```
#
# /etc/sysctl.conf - Configuration file for setting system variables
# See /etc/sysctl.d/ for additional system variables.
# See sysctl.conf (5) for information.
#

#kernel.domainname = example.com

# Uncomment the following to stop low-level messages on console
#kernel.printk = 3 4 1 3

#####3
# Functions previously found in netbase
#

# Uncomment the next two lines to enable Spoof protection (reverse-path filter)
# Turn on Source Address Verification in all interfaces to
# prevent some spoofing attacks
#net.ipv4.conf.default.rp_filter=1
#net.ipv4.conf.all.rp_filter=1

# Uncomment the next line to enable TCP/IP SYN cookies
# See http://lwn.net/Articles/277146/
# Note: This may impact IPv6 TCP sessions too
#net.ipv4.tcp_syncookies=1

# Uncomment the next line to enable packet forwarding for IPv4
net.ipv4.ip_forward=1
```

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Top

```
student@CsnKhai:~$ sudo sysctl -p
net.ipv4.ip_forward = 1
student@CsnKhai:~$
```

```
net.ipv4.ip_forward = 1
student@CsnKhai:~$ sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
student@CsnKhai:~$
```

We need to install iptables-persistent and run the following command to make iptables rules persistent.

```
root@CsnKhai:/home/student# iptables-save > /etc/iptables/rules.v4
```

3. Check the route from VM2 to Host.

```
student@CsnKhai:~$ sudo route
[sudo] password for student:
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default 10.10.10.1 0.0.0.0 UG 0 0 0 eth0
10.10.10.0 * 255.255.255.0 U 0 0 0 eth0
student@CsnKhai:~$
```

4. Check the access to the Internet, (just ping, for example, 8.8.8.8).

```
Ubuntu_2 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
6 packets transmitted, 6 received, 0% packet loss, time 5010ms
rtt min/avg/max/mdev = 27.195/34.890/41.240/4.772 ms
student@CsnKhai:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 0 received, 100% packet loss, time 3018ms

student@CsnKhai:~$ ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
^C
--- 8.8.8.8 ping statistics ---
7 packets transmitted, 0 received, 100% packet loss, time 6034ms

student@CsnKhai:~$ 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=117 time=42.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=117 time=84.8 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=117 time=69.5 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=117 time=49.5 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=117 time=25.9 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=117 time=74.2 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=117 time=165 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=117 time=169 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=117 time=53.5 ms
^C
--- 8.8.8.8 ping statistics ---
9 packets transmitted, 9 received, 0% packet loss, time 8012ms
rtt min/avg/max/mdev = 25.917/81.651/169.357/48.642 ms
student@CsnKhai:~$
```

5. Determine, which resource has an IP address 8.8.8.8.

```
student@CsnKhai:~$ dig -x 8.8.8.8

; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> -x 8.8.8.8
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 11502
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 2

;; QUESTION SECTION:
;8.8.8.8.in-addr.arpa.      IN      PTR

;; ANSWER SECTION:
8.8.8.8.in-addr.arpa.     86400   IN      PTR      dns.google.

;; ADDITIONAL SECTION:
dns.google.               54024   IN      A        8.8.8.8
dns.google.               54024   IN      A        8.8.4.4

;; Query time: 266 msec
;; SERVER: 192.168.19.1#53(192.168.19.1)
;; WHEN: Sat Aug 19 20:38:35 UTC 2023
;; MSG SIZE rcvd: 94

student@CsnKhai:~$
```

6. Determine, which IP address belongs to resource epam.com.

```

student@CsnKhai:~$ dig A epam.com

; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> A epam.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 60395
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;epam.com.                IN      A

;; ANSWER SECTION:
epam.com.                 3600    IN      A      3.214.134.159

;; Query time: 167 msec
;; SERVER: 192.168.19.1#53(192.168.19.1)
;; WHEN: Sat Aug 19 20:39:59 UTC 2023
;; MSG SIZE rcvd: 42

student@CsnKhai:~$

```

7. Determine the default gateway for your HOST and display routing table.

```

student@CsnKhai:~$ ip route
default via 10.0.2.2 dev eth0

```

```

student@CsnKhai:~$ route
Kernel IP routing table

```

| Destination | Gateway | Genmask | Flags | Metric | Ref | Use | Iface |
|-------------|----------|---------------|-------|--------|-----|-----|-------|
| default | 10.0.2.2 | 0.0.0.0 | UG | 0 | 0 | 0 | eth0 |
| 10.0.2.0 | * | 255.255.255.0 | U | 0 | 0 | 0 | eth0 |
| 10.10.10.0 | * | 255.255.255.0 | U | 0 | 0 | 0 | eth1 |

```

student@CsnKhai:~$

```

8. Trace the route to google.com.

```
student@CsnKhai:~$ traceroute google.com
traceroute to google.com (192.178.25.174), 30 hops max, 60 byte packets
 1  10.0.2.2 (10.0.2.2)  0.848 ms  0.762 ms  0.804 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
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30  * * *
student@CsnKhai:~$ _
```