IP routing

1. Create virtual machines connection according to figure 1:

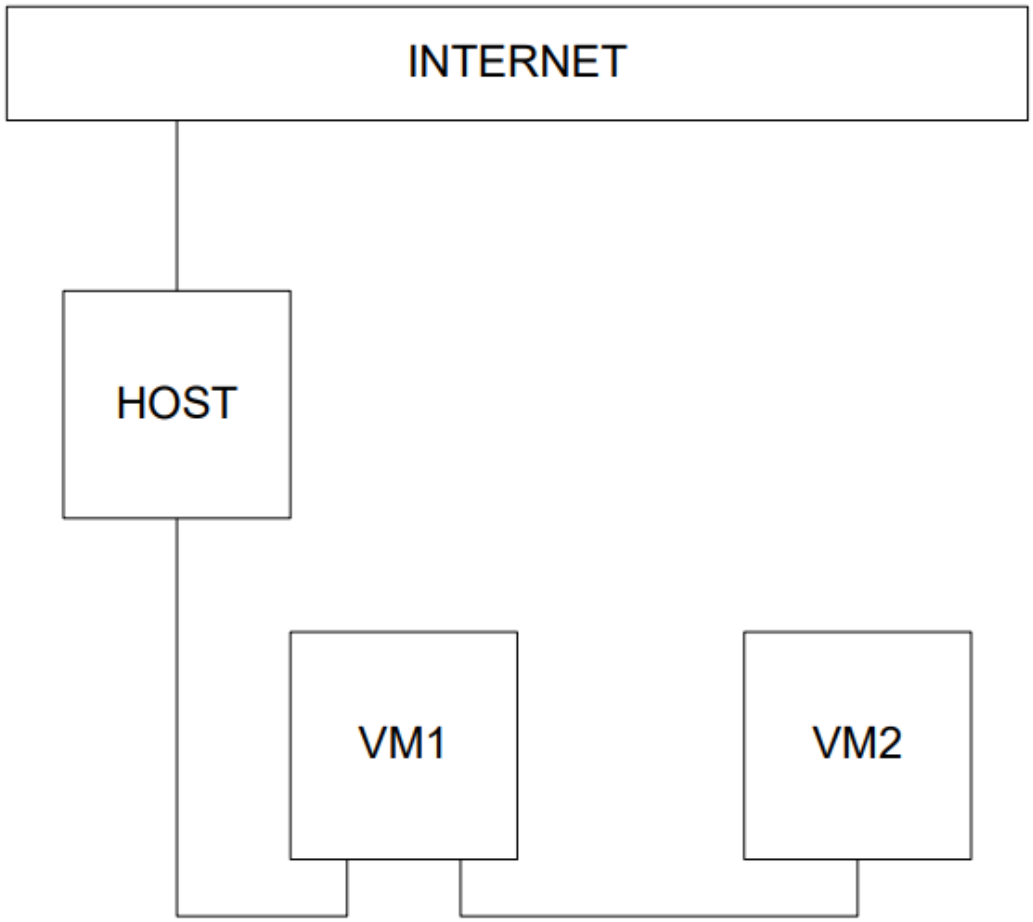
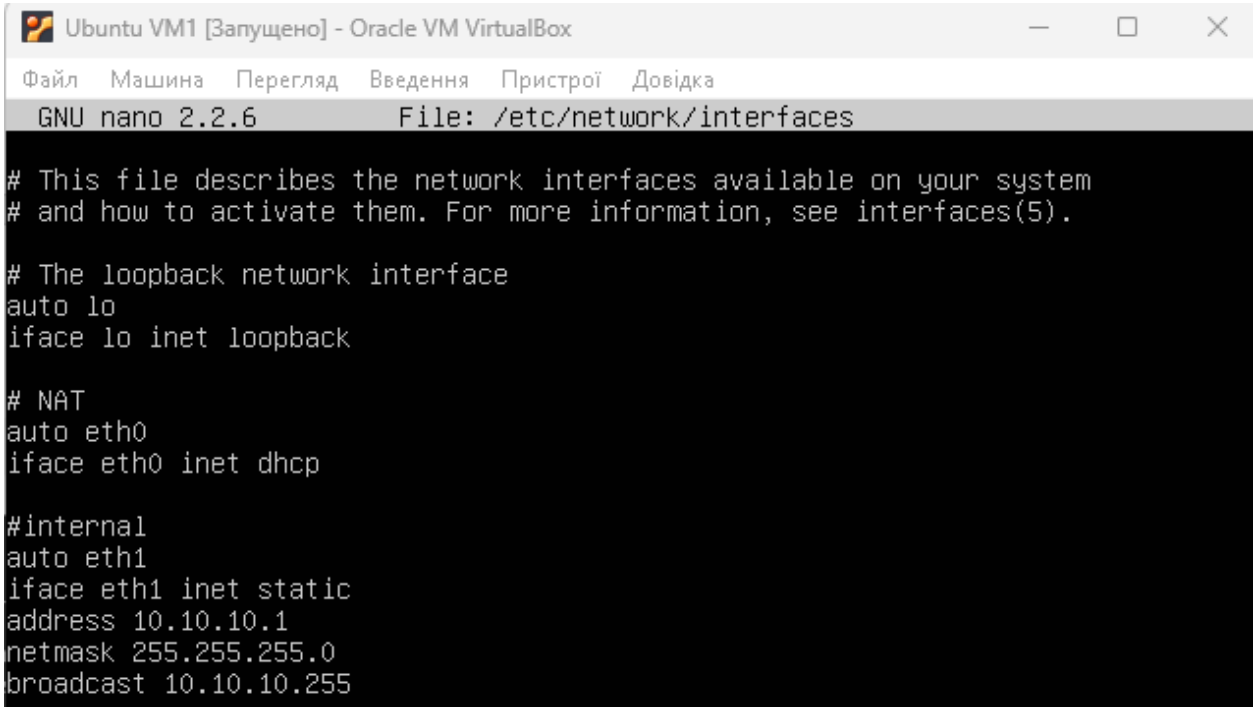
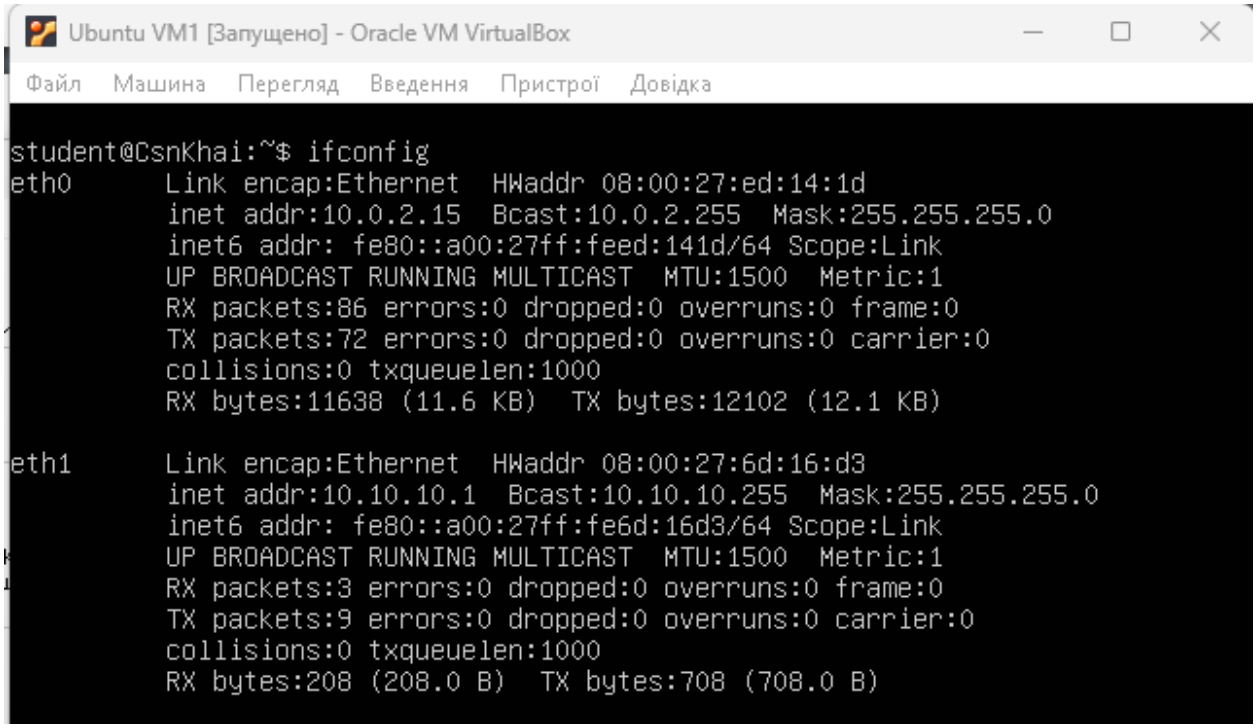


Figure 1 – VMs connection

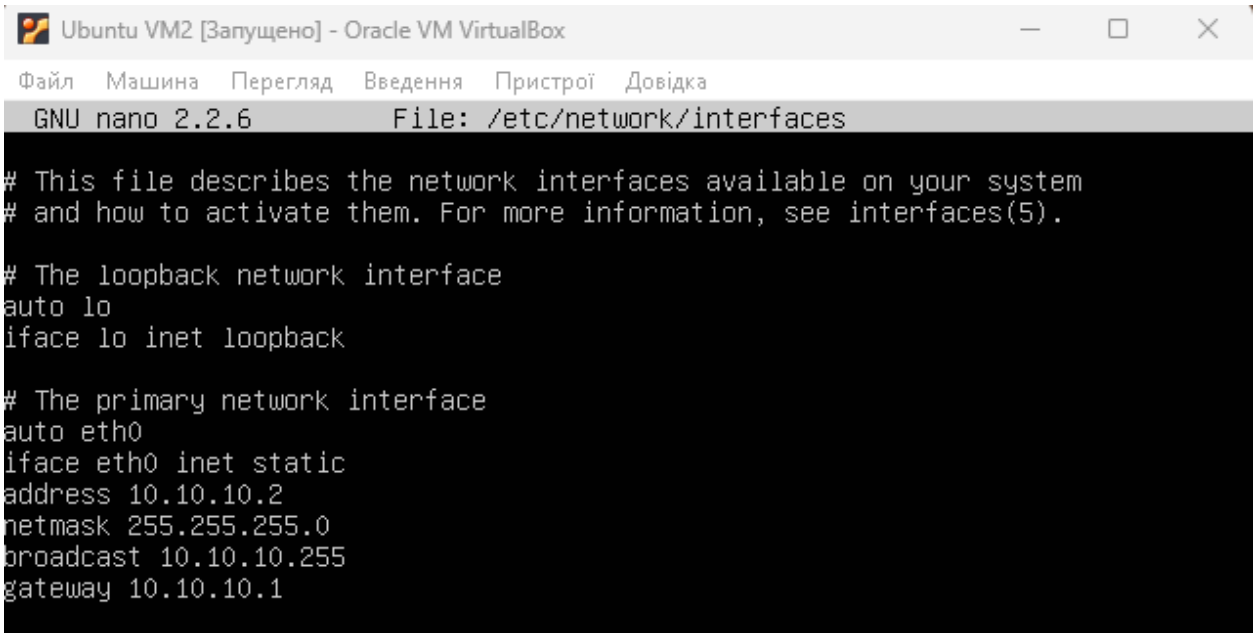
2. VM2 has one interface (internal), VM1 has 2 interfaces (NAT and internal). Configure all network interfaces in order to make VM2 has an access to the Internet (iptables, forward, masquerade).

Configure network on WM1





Configure network on WM2




```
student@CsnKhai:~$ ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:ed:14:1d
          inet addr:10.10.10.2  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:feed:141d/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1 errors:0 dropped:0 overruns:0 frame:0
          TX packets:17 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:60 (60.0 B)  TX bytes:1364 (1.3 KB)
```

Uncomment the line in /etc/sysctl.conf

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

Configure iptables

```
student@CsnKhai:~$ sudo iptables -S
-P INPUT ACCEPT
-P FORWARD ACCEPT
-P OUTPUT ACCEPT
-A FORWARD -i eth1 -o eth0 -m state --state RELATED,ESTABLISHED -j ACCEPT
-A FORWARD -i eth1 -o eth0 -j ACCEPT
```

3. Check the route from VM2 to Host.

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

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

```
student@CsnKhai:~$ ping -c 8 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=116 time=24.5 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=25.3 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=24.7 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=23.7 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=116 time=24.8 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=116 time=24.5 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=116 time=24.2 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=116 time=24.2 ms

--- 8.8.8.8 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7012ms
rtt min/avg/max/mdev = 23.781/24.548/25.351/0.444 ms
```

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: 26857
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;8.8.8.8.in-addr.arpa.          IN      PTR

;; ANSWER SECTION:
8.8.8.8.in-addr.arpa.   266     IN      PTR     dns.google.
```

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

```
student@CsnKhai:~$ dig epam.com

; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> epam.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 39175
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;epam.com.                      IN      A

;; ANSWER SECTION:
epam.com.               300     IN      A       3.214.134.159

;; Query time: 14 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Sun Aug 20 06:57:05 UTC 2023
;; MSG SIZE  rcvd: 53
```

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

```
student@CsnKhai:~$ ip route
default via 10.0.2.2 dev eth0
10.0.2.0/24 dev eth0  proto kernel  scope link  src 10.0.2.15
10.10.10.0/24 dev eth1  proto kernel  scope link  src 10.10.10.1
```

8. Trace the route to google.com.

```
student@CsnKhai:~$ traceroute google.com
traceroute to google.com (216.58.209.14), 30 hops max, 60 byte packets
 1  10.0.2.2 (10.0.2.2)  0.086 ms  0.073 ms  0.067 ms
 2  10.0.2.2 (10.0.2.2)  1.685 ms  1.677 ms  1.602 ms
```