Networking. Task1

1. **Create virtual machines connection according to figure 1:**

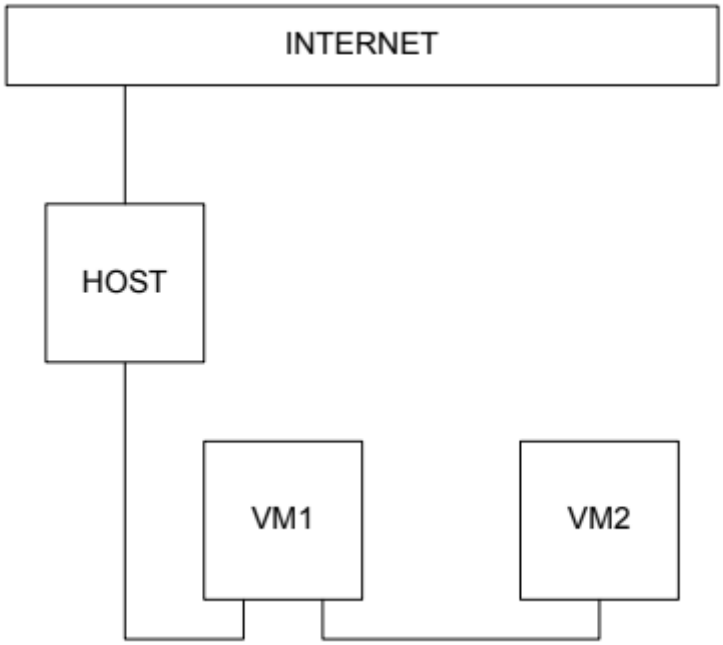
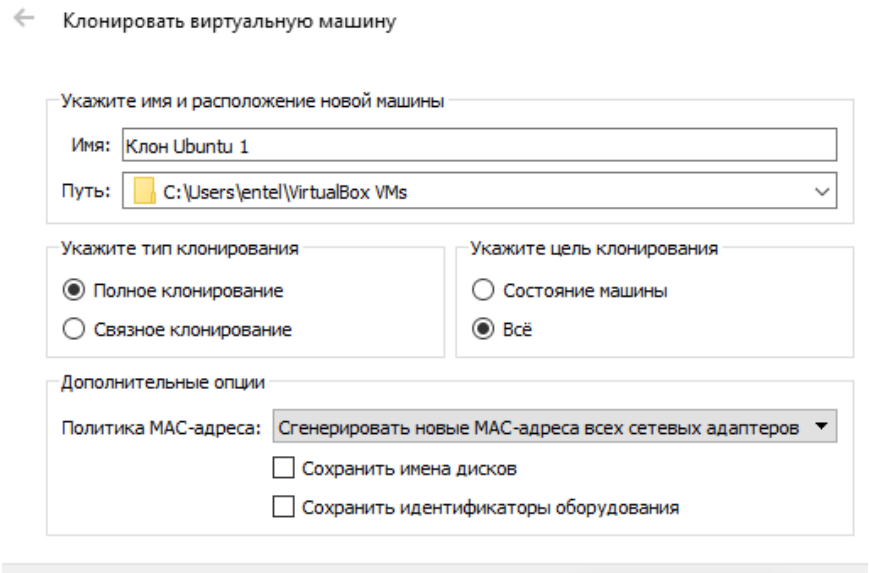
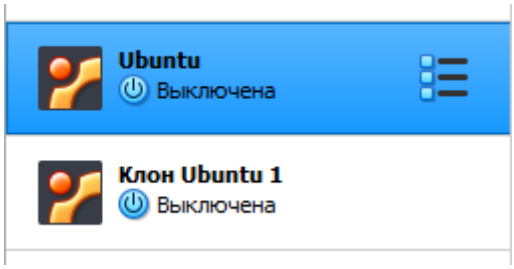


Figure 1 – VMs connection

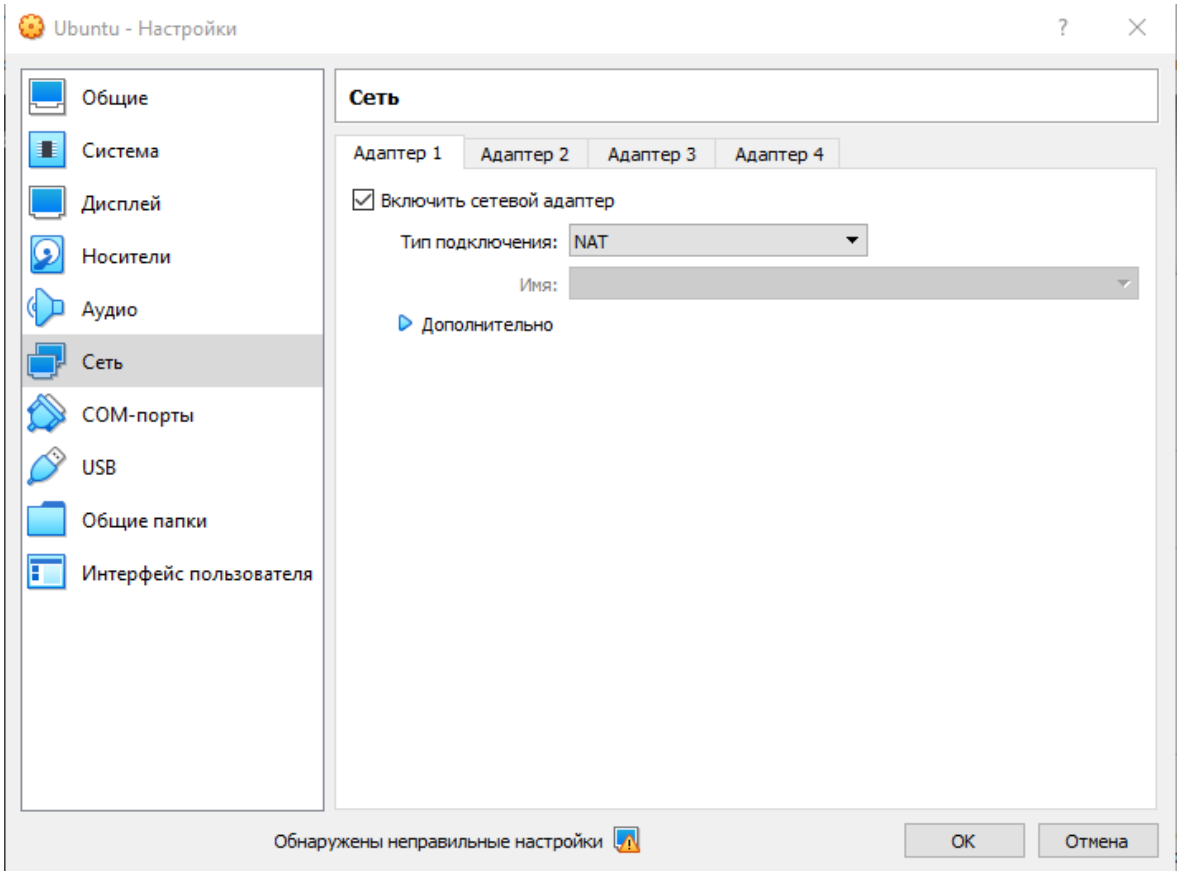
Make VM's clone:



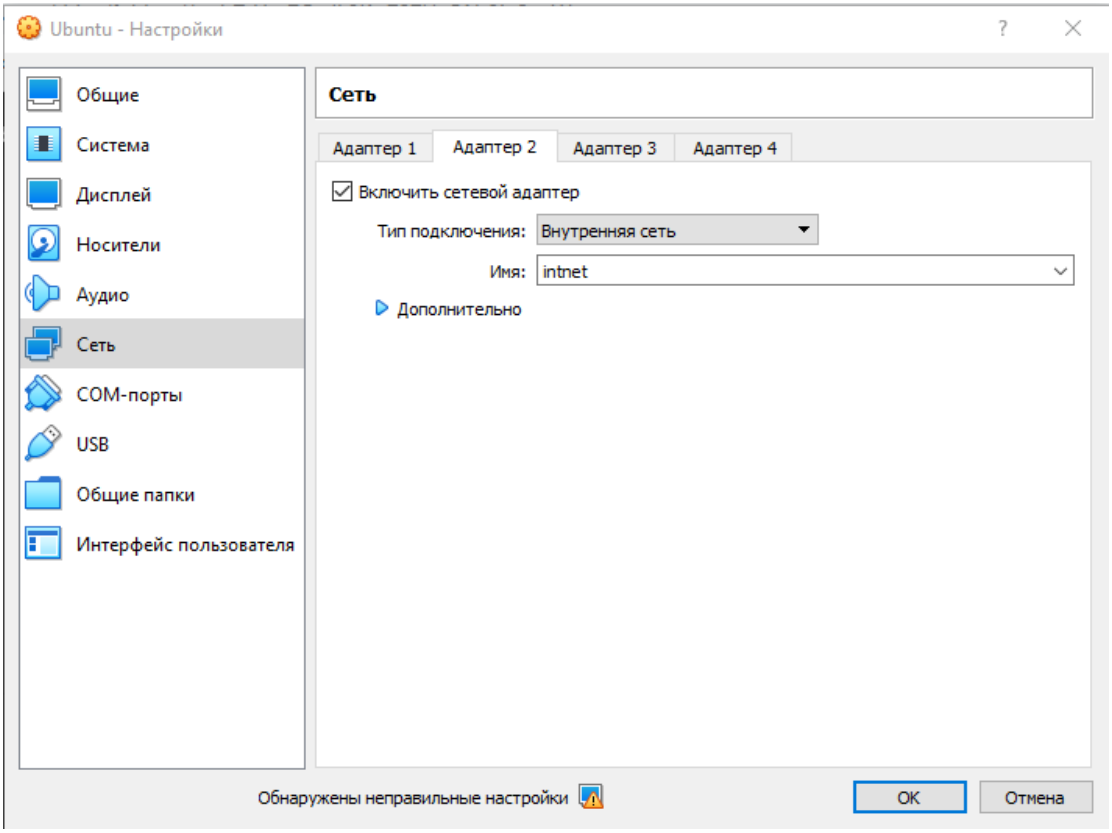


2. VM2 has one interface (internal), VM1 has 2 interfaces (NAT and internal). Configure all networkinterfaces in order to make VM2 has an access to the Internet (iptables, forward, masquerade).

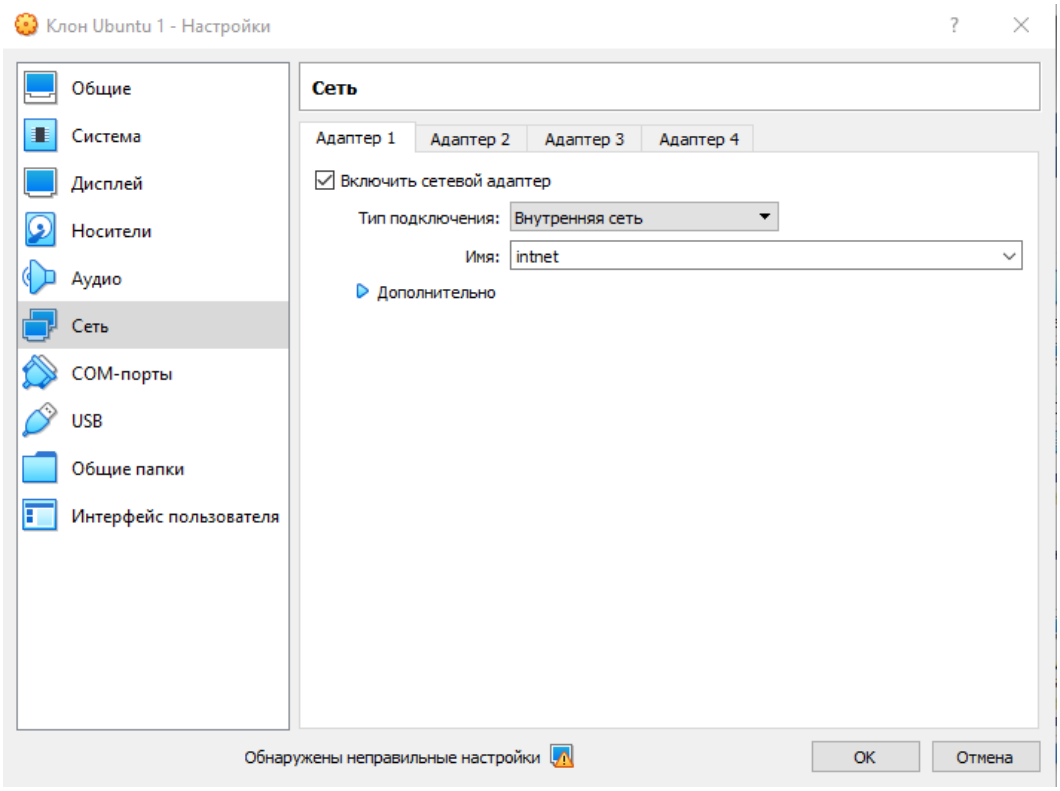
VM1's 1st interface (NAT):

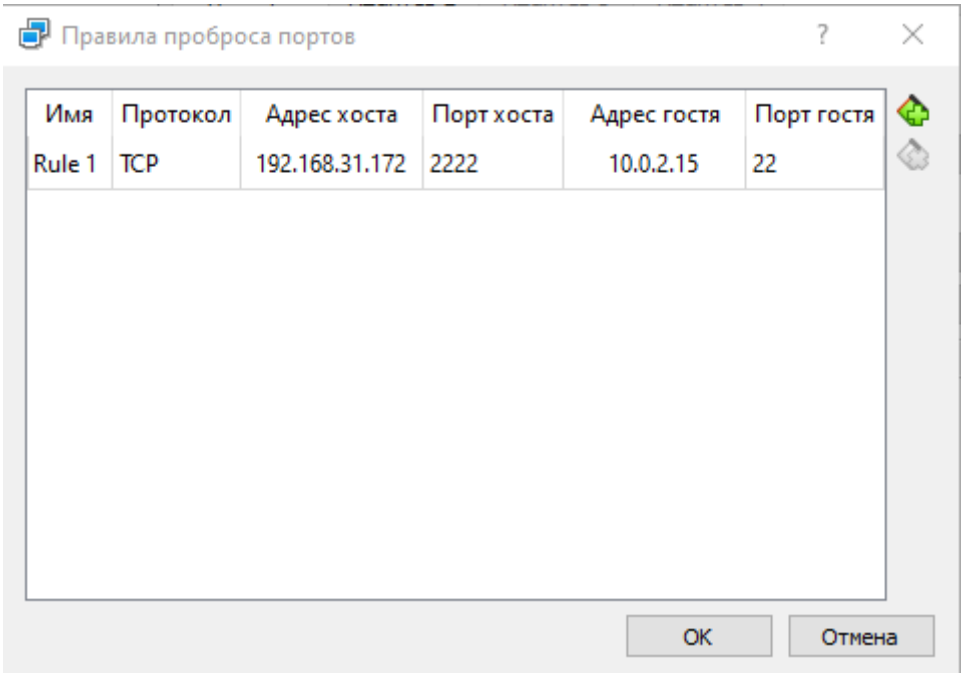


VM1's 2nd interface (internal):



VM2's interface (internal):





VM1:

```
student@CsnKhai:~$ ifconfig -a
eth0      Link encap:Ethernet  HWaddr 08:00:27:ed:14:1d
          inet addr:10.0.2.15  Bcast:10.0.2.255  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:18 errors:0 dropped:0 overruns:0 frame:0
          TX packets:28 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2178 (2.1 KB)  TX bytes:2638 (2.6 KB)

eth1      Link encap:Ethernet  HWaddr 08:00:27:6d:16:d3
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:16 errors:0 dropped:0 overruns:0 frame:0
          TX packets:16 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:1184 (1.1 KB)  TX bytes:1184 (1.1 KB)
```

There is IP on eth0, but no IP on eth1.

VM2:

```
student@CsnKhai:~$ ifconfig -a
eth0      Link encap:Ethernet  HWaddr 08:00:27:31:6b:aa
          inet6 addr: fe80::a00:27ff:fe31:6baa/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:21 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:5094 (5.0 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:32 errors:0 dropped:0 overruns:0 frame:0
          TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:2480 (2.4 KB)  TX bytes:2480 (2.4 KB)
```

There is no IP setted up on eth0.

So we go to */etc/network/interfaces* :

```
student@CsnKhai:~$ sudo nano /etc/network/interfaces
```

Change this file and reboot or sudo ifdown eth1 && sudo ifup eth1.

```
  GNU nano 2.2.6        File: /etc/network/interfaces                Modified

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp

auto eth1
iface eth1 inet static
address 192.168.1.10
network 192.168.1.0
gateway 192.168.1.1
netmask 255.255.255.0

File Name to Write: /etc/network/interfaces
```

Here is the result:

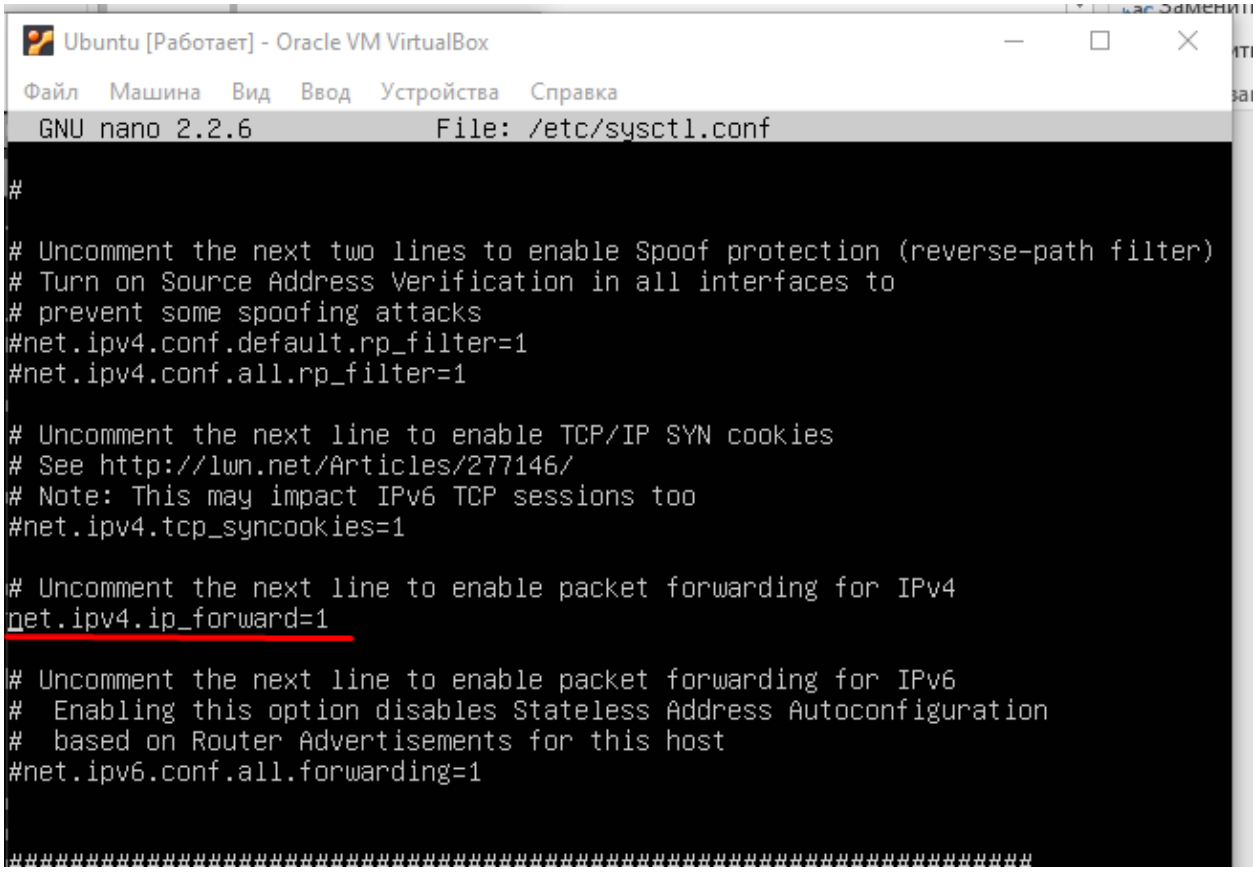
```
student@CsnKhai:~$ ifconfig -a
eth0      Link encap:Ethernet  HWaddr 08:00:27:ed:14:1d
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:feed:141d/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:1180 (1.1 KB)  TX bytes:1332 (1.3 KB)

eth1      Link encap:Ethernet  HWaddr 08:00:27:6d:16:d3
          inet addr:192.168.1.10  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe6d:16d3/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:15 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:1068 (1.0 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:36 errors:0 dropped:0 overruns:0 frame:0
          TX packets:36 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:2720 (2.7 KB)  TX bytes:2720 (2.7 KB)
```

Do the same for eth0 on VM2:

```
  GNU nano 2.2.6         File: /etc/network/interfaces                  Modified

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet static
address 192.168.1.11
network 192.168.1.0
gateway 192.168.1.1
netmask 255.255.255.0
broadcast 192.168.1.255

File Name to Write: /etc/network/interfaces
```

```
student@CsnKhai:~$ ifconfig -a
eth0      Link encap:Ethernet  HWaddr 08:00:27:31:6b:aa
          inet addr:192.168.1.11  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe31:6baa/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:648 (648.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:32 errors:0 dropped:0 overruns:0 frame:0
          TX packets:32 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:2368 (2.3 KB)  TX bytes:2368 (2.3 KB)
```

Now we go to */etc/sysctl.conf* file to configure forwarding:




```
student@CsnKhai:~$ sudo iptables -S
[sudo] password for student:
-P INPUT ACCEPT
-P FORWARD ACCEPT
-P OUTPUT ACCEPT
student@CsnKhai:~$ sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
```

So here is the internet connection on VM2 with internal network:

```
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=116 time=24.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=23.8 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=24.5 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 23.862/24.337/24.646/0.385 ms
```

SAVING

Save iptables configuration to iptables.rules:

```
student@CsnKhai:~$ sudo su
root@CsnKhai:/home/student# iptables-save > /etc/network/iptables.rules
```

Now we can use a pre-up command in */etc/network/interfaces*:

```
  GNU nano 2.2.6         File: /etc/network/interfaces

# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp
pre-up iptables-restore < /etc/network/iptables.rules

auto eth1
iface eth1 inet static
address 192.168.1.10
broadcast 192.168.1.255
netmask 255.255.255.0
```

Now It’s possible to reboot machine with saved iptables.

3. **Check the route from VM2 to Host.**

```
student@CsnKhai:~$ traceroute 192.168.31.172
traceroute to 192.168.31.172 (192.168.31.172), 30 hops max, 60 byte packets
 1  192.168.1.10 (192.168.1.10)  0.134 ms  0.111 ms  0.102 ms
 2  10.0.2.2 (10.0.2.2)  1.778 ms  1.773 ms  1.768 ms
 3  10.0.2.2 (10.0.2.2)  1.764 ms  1.756 ms  2.907 ms
student@CsnKhai:~$
```

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

Ping from VM1:

```
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=24.1 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=117 time=23.6 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=117 time=22.9 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=117 time=23.2 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3006ms
rtt min/avg/max/mdev = 22.912/23.495/24.121/0.477 ms
```

Ping from VM2:

```
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=116 time=89.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=126 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=24.4 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=24.5 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=116 time=54.6 ms
^C
--- 8.8.8.8 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 24.440/63.972/126.516/39.424 ms
```

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

$ host 8.8.8.8

```
student@CsnKhai:~$ host 8.8.8.8
8.8.8.8.in-addr.arpa domain name pointer dns.google.
```

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

$ nslookup epam.com

```
student@CsnKhai:~$ nslookup epam.com
Server:         192.168.31.1
Address:        192.168.31.1#53

Non-authoritative answer:
Name:   epam.com
Address: 3.214.134.159
```

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

```
C:\Program Files>route PRINT
===========================================================================
Список интерфейсов
 19...54 48 10 a7 54 85 ......Realtek PCIe FE Family Controller
  8...0a 00 27 00 00 08 ......VirtualBox Host-Only Ethernet Adapter
  3...fe 01 7c 52 99 f3 ......Microsoft Wi-Fi Direct Virtual Adapter
 12...0e 01 7c 52 99 f3 ......Microsoft Wi-Fi Direct Virtual Adapter #2
 14...fc 01 7c 52 99 f3 ......Qualcomm QCA9377 802.11ac Wireless Adapter
  5...fc 01 7c 52 99 f4 ......Bluetooth Device (Personal Area Network)
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 таблица маршрута
===========================================================================
Активные маршруты:
Сетевой адрес           Маска сети      Адрес шлюза       Интерфейс  Метрика
          0.0.0.0          0.0.0.0    192.168.31.1   192.168.31.172     35
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    331
     192.168.31.0    255.255.255.0         On-link    192.168.31.172    291
   192.168.31.172  255.255.255.255         On-link    192.168.31.172    291
   192.168.31.255  255.255.255.255         On-link    192.168.31.172    291
     192.168.56.0    255.255.255.0         On-link      192.168.56.1    281
     192.168.56.1  255.255.255.255         On-link      192.168.56.1    281
   192.168.56.255  255.255.255.255         On-link      192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link      192.168.56.1    281
        224.0.0.0        240.0.0.0         On-link    192.168.31.172    291
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link      192.168.56.1    281
  255.255.255.255  255.255.255.255         On-link    192.168.31.172    291
===========================================================================
Постоянные маршруты:
  Отсутствует
```

8. Trace the route to google.com

```
student@CsnKhai:~$ traceroute google.com
traceroute to google.com (172.217.19.110), 30 hops max, 60 byte packets
 1  10.0.2.2 (10.0.2.2)  0.316 ms  0.270 ms  0.245 ms
 2  * * *
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  * * *
 9  * * *
10  * * *
11  * * *
12  * * *
13  * * *
14  * * *
15  * * *
16  * * *
17  * * *
```

```
D:\WORK\SS>tracert www.google.com

Трассировка маршрута к www.google.com [172.217.20.4]
с максимальным числом прыжков 30:

  1     2 ms     2 ms     1 ms  XiaoQiang [192.168.31.1]
  2     7 ms     3 ms     2 ms  172.19.56.254
  3     5 ms    13 ms     3 ms  10.21.0.21
  4     3 ms     3 ms     3 ms  10.121.121.121
  5     9 ms     9 ms     9 ms  142.250.164.150
  6    11 ms    13 ms     9 ms  108.170.248.138
  7    10 ms     9 ms    12 ms  72.14.239.111
  8    23 ms    22 ms    22 ms  142.251.224.76
  9    23 ms    22 ms    22 ms  74.125.242.241
 10    22 ms    23 ms    23 ms  216.239.35.251
 11    22 ms    23 ms    22 ms  bud02s28-in-f4.1e100.net [172.217.20.4]

Трассировка завершена.
```