

1. Create virtual machines connection according to figure 1:

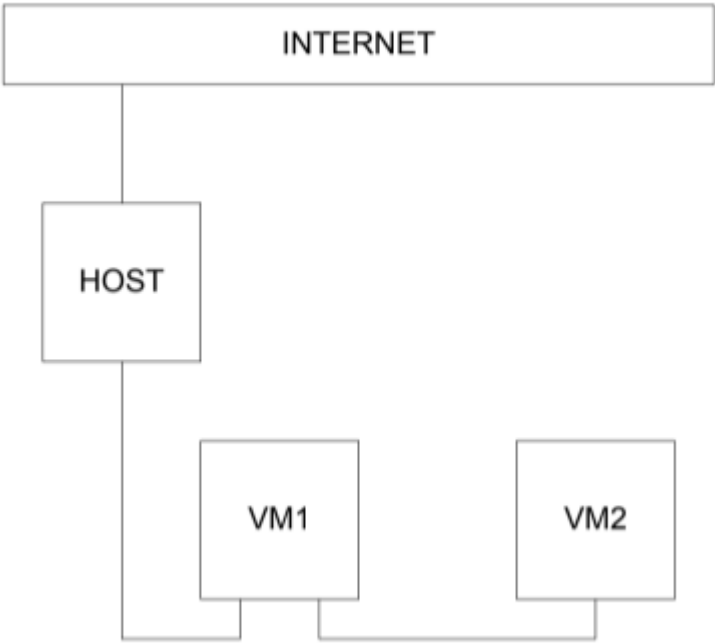
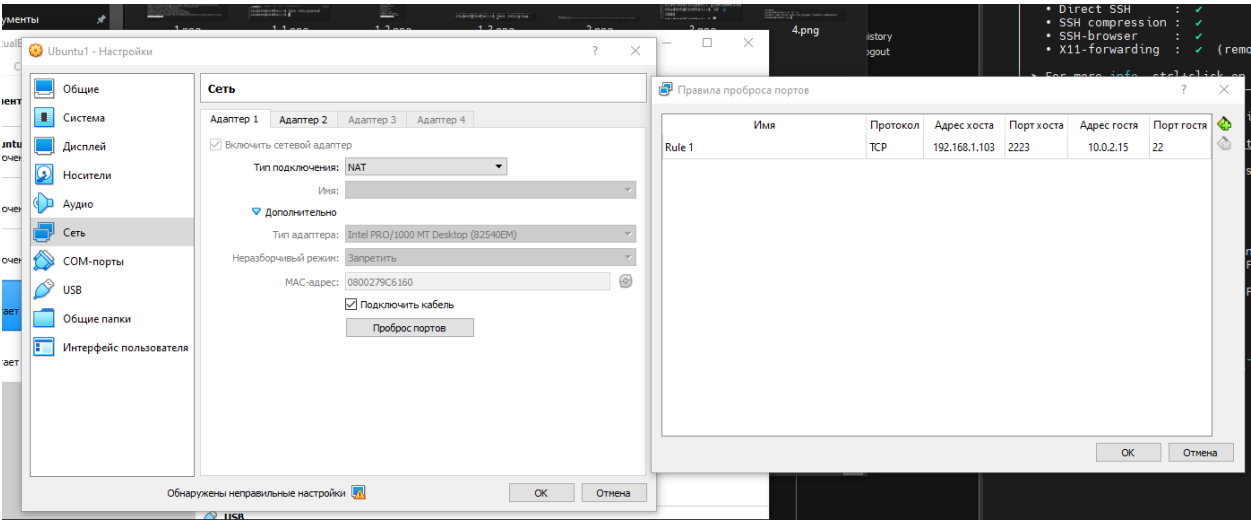
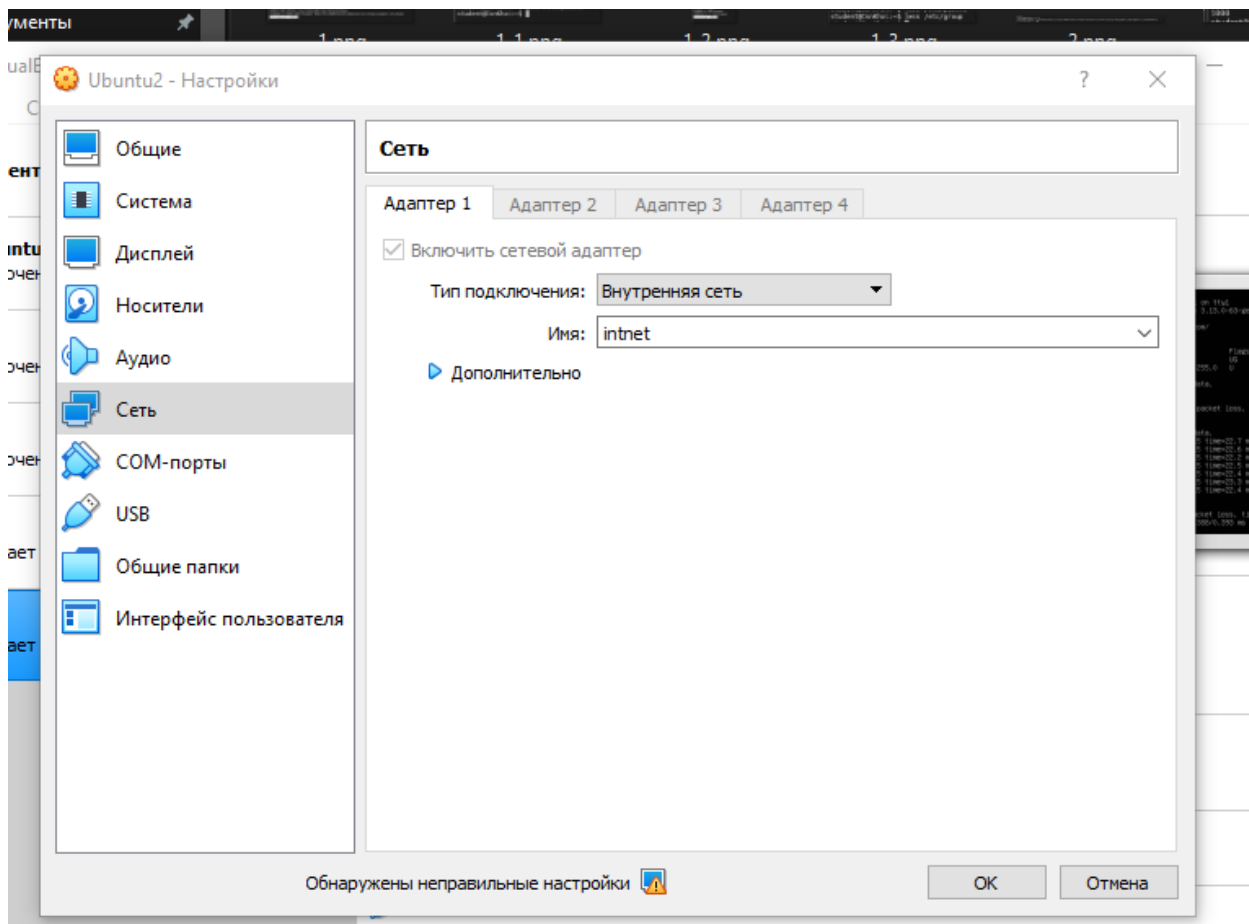
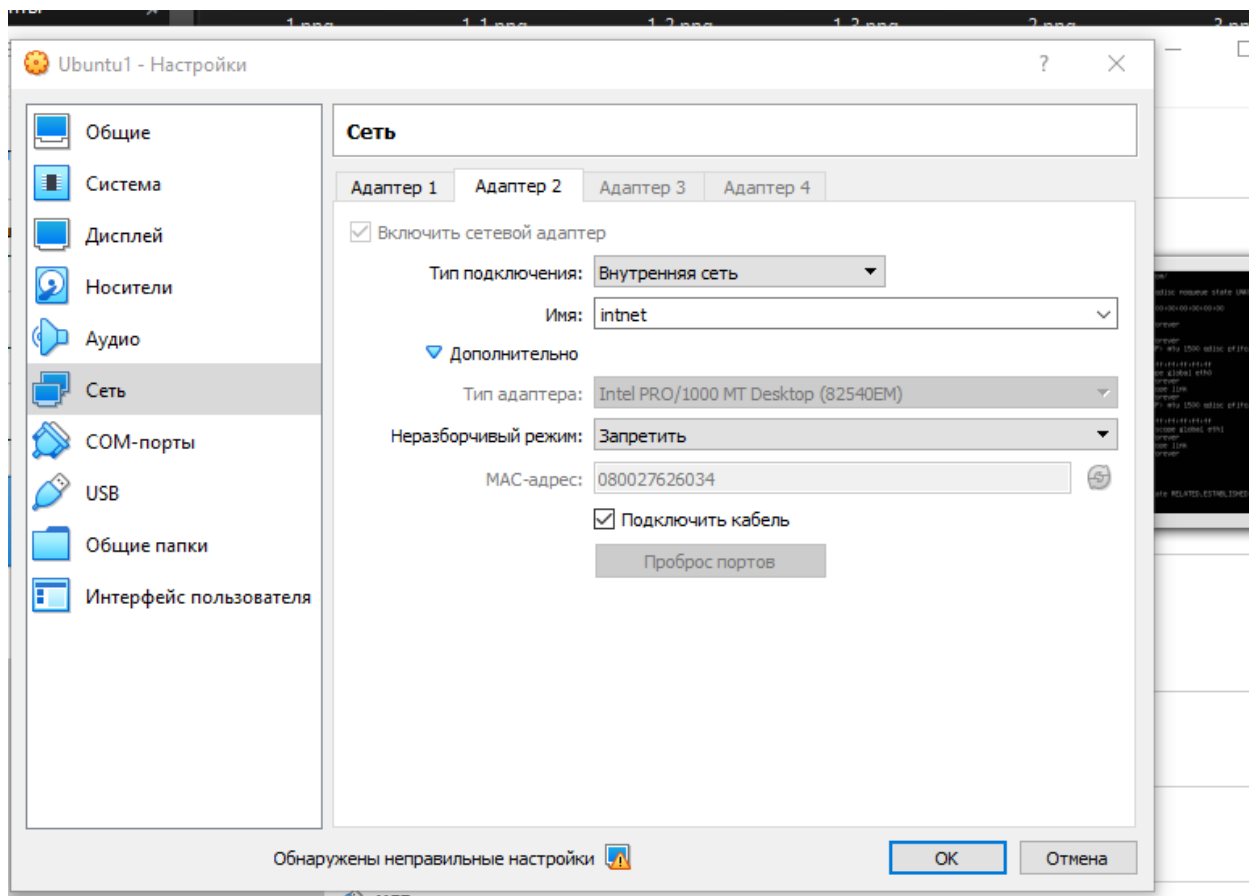


Figure 1 – VMs connection

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).





Ubuntu1 [Работает] - Oracle VM VirtualBox

GNU nano 2.2.6File: /etc/network/interfaces

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

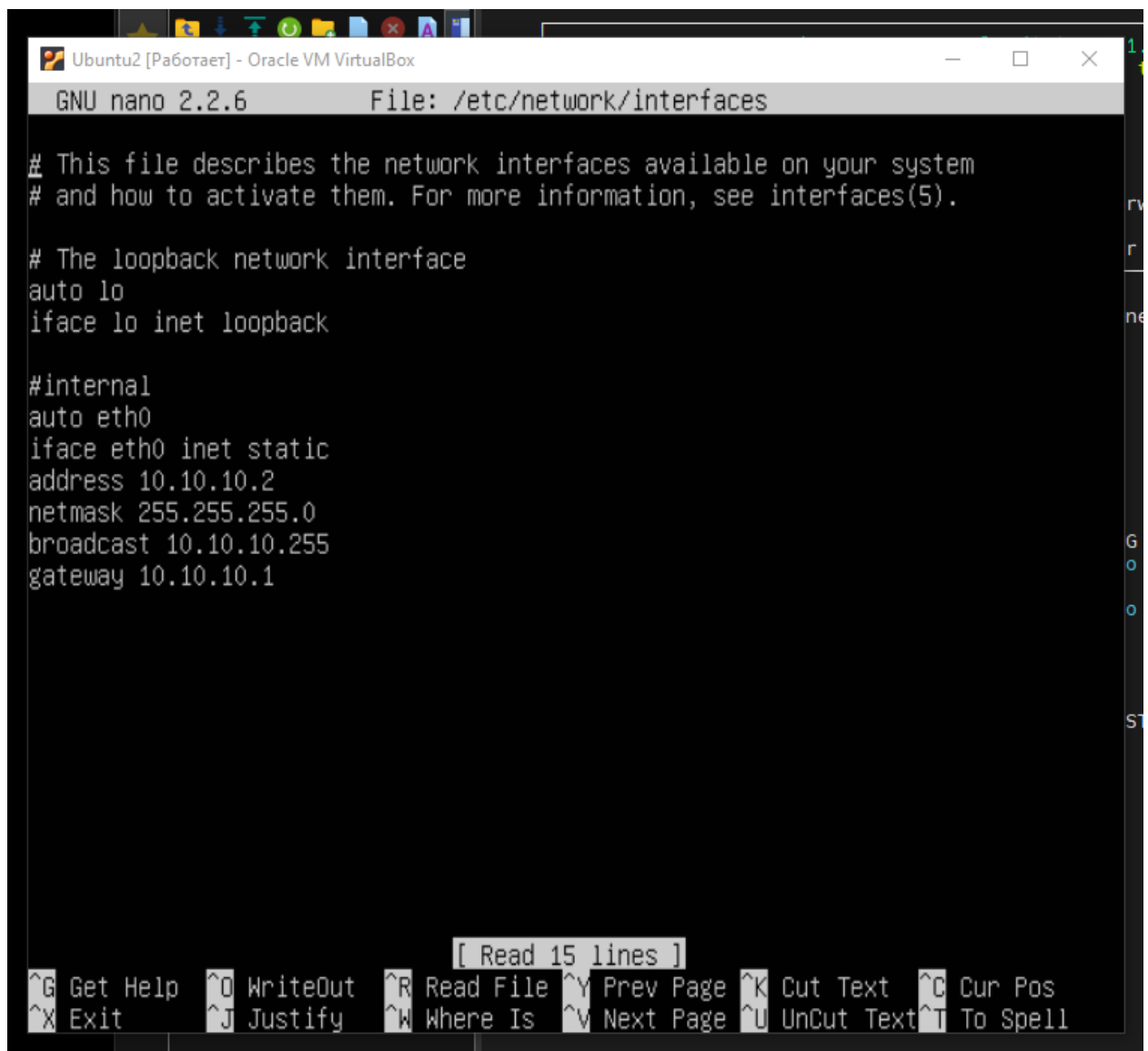
# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
iface eth0 inet dhcp

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

[Read 18 lines]

^G Get Help	^O WriteOut	^R Read File	^Y Prev Page	^K Cut Text	^C Cur Pos
^X Exit	^J Justify	^W Where Is	^V Next Page	^U UnCut Text	^T To Spell



The image shows a terminal window titled "Ubuntu2 [Пафотаер] - Oracle VM VirtualBox". Inside the terminal, the GNU nano 2.2.6 text editor is open, editing the file /etc/network/interfaces. The editor's content includes comments about network interfaces and configuration for 'lo' and 'eth0'. The 'lo' interface is configured as a loopback. The 'eth0' interface is configured as a static IP with address 10.10.10.2, netmask 255.255.255.0, broadcast 10.10.10.255, and gateway 10.10.10.1. At the bottom of the terminal, a status bar displays various nano editor commands and their shortcuts, such as ^G Get Help, ^O WriteOut, ^R Read File, ^Y Prev Page, ^K Cut Text, ^C Cur Pos, ^X Exit, ^J Justify, ^W Where Is, ^V Next Page, ^U UnCut Text, and ^T To Spell. A message "[Read 15 lines]" is also visible above the status bar.

```
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

#internal
auto eth0
iface eth0 inet static
address 10.10.10.2
netmask 255.255.255.0
broadcast 10.10.10.255
gateway 10.10.10.1

[ Read 15 lines ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text ^T To Spell
```

```
netns | 12tp | tcp_metrics | token }
OPTIONS := { -V[ersion] | -s[tatistics] | -d[etails] | -r[esolve] |
             -f[amily] { inet | inet6 | ipx | dnet | bridge | link } |
             -4 | -6 | -I | -D | -B | -O |
             -l[oops] { maximum-addr-flush-attempts } |
             -o[neline] | -t[imestamp] | -b[atch] [filename] |
             -rc[vbuf] [size]}

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 08:00:27:9c:61:60 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:fe9c:6160/64 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 08:00:27:62:60:34 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:fe62:6034/64 scope link
        valid_lft forever preferred_lft forever
student@CsnKhai:~$ _
```

```
gateway 10.10.10.1
```

[Read 15 lines]

```
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 08:00:27:36:43:ed brd ff:ff:ff:ff:ff:ff
```

```
    inet 10.10.10.2/24 brd 10.10.10.255 scope global eth0
```

```
        valid_lft forever preferred_lft forever
```

```
    inet6 fe80::a00:27ff:fe36:43ed/64 scope link
```

```
        valid_lft forever preferred_lft forever
```

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

```
s Games Settings Macros Help
Sessions View Split MultiExec Tunneling Packages Settings Help X server Exit

10. 192.168.1.103 (student)

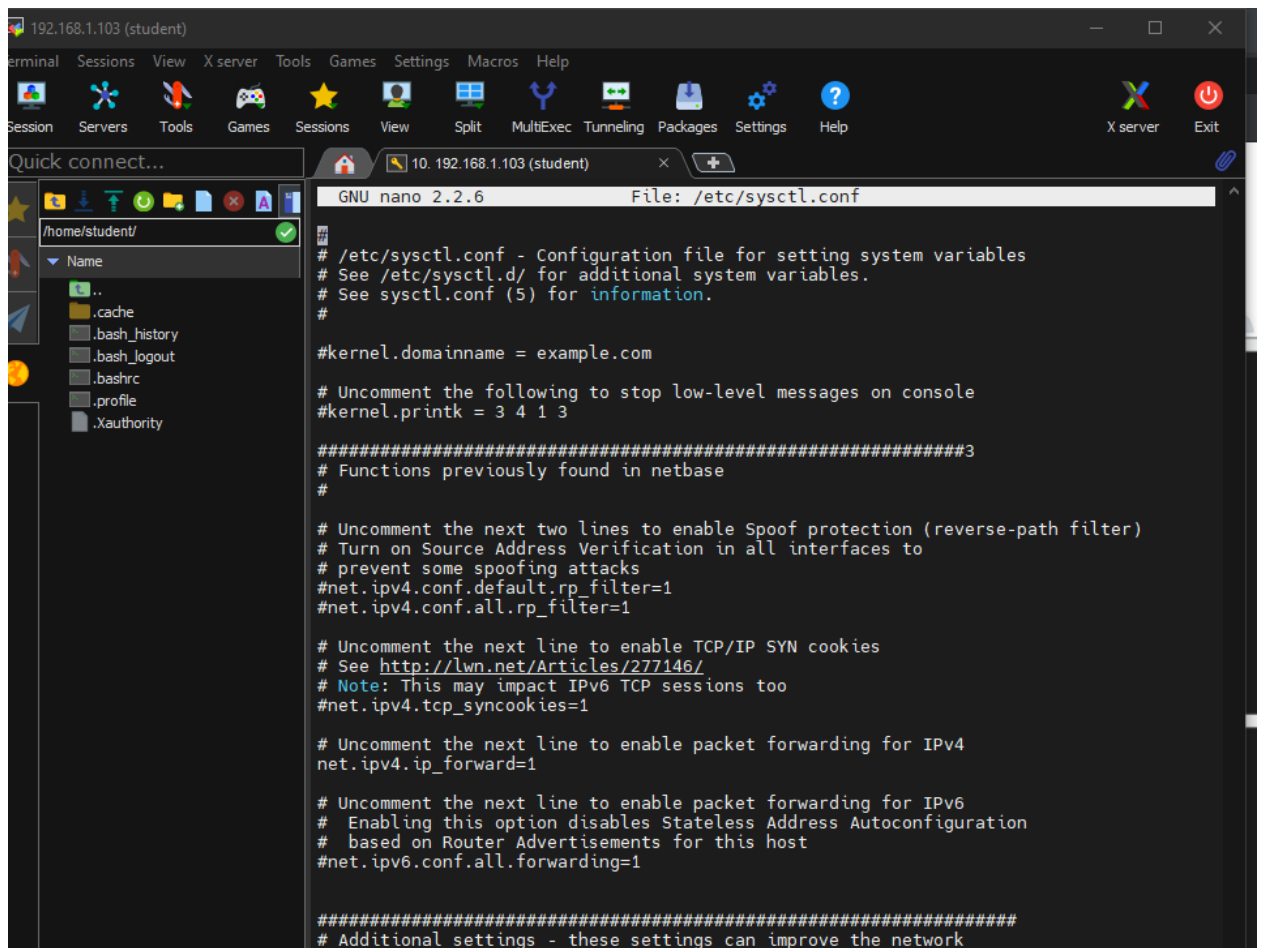
• MobaXterm Personal Edition v21.5 •
(SSh client, X server and network tools)

> SSh session to student@192.168.1.103
• Direct SSh : ✓
• SSh compression : ✓
• SSh-browser : ✓
• X11-forwarding : ✓ (remote display is forwarded through SSh)

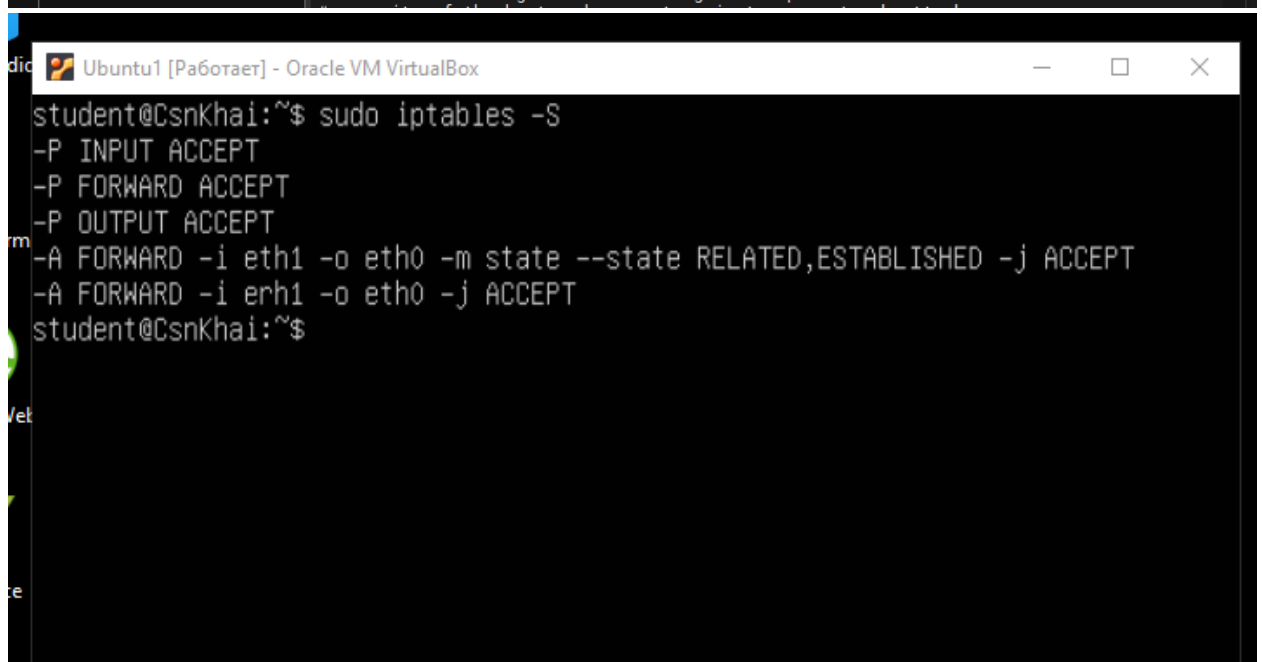
> For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 14.04.3 LTS (GNU/Linux 3.13.0-63-generic i686)

* Documentation: https://help.ubuntu.com/
Last login: Sat Dec 25 14:06:50 2021 from 10.0.2.2
student@CsnKhai:~$ sudo nano /etc/sysctl.conf
[sudo] password for student:
student@CsnKhai:~$ sudo iptables -S
-P INPUT ACCEPT
-P FORWARD ACCEPT
-P OUTPUT ACCEPT
student@CsnKhai:~$ sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
student@CsnKhai:~$ sudo iptables -A FORWARD -i eth1 -o eth0 -m state --state RELATED,ESTABLISHED -j ACCEPT
student@CsnKhai:~$ sudo iptables -A FORWARD -i eth1 -o eth0 -j ACCEPT
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
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 08:00:27:9c:61:60 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:fe9c:6160/64 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 08:00:27:62:60:34 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:fe62:6034/64 scope link
        valid_lft forever preferred_lft forever
student@CsnKhai:~$
```



```
GNU nano 2.2.6 File: /etc/sysctl.conf
# /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
#####
# 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
#
# Uncomment the next line to enable packet forwarding for IPv6
# Enabling this option disables Stateless Address Autoconfiguration
# based on Router Advertisements for this host
#net.ipv6.conf.all.forwarding=1
#####
# Additional settings - these settings can improve the network
```



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

3. Check the route from VM2 to Host.


```
Ubuntu2 [Работаer] - Oracle VM VirtualBox
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=115 time=22.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=21.9 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=115 time=22.2 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=115 time=22.5 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 21.934/22.336/22.619/0.320 ms
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
student@CsnKhai:~$ traceroute 192.168.1.103
traceroute to 192.168.1.103 (192.168.1.103), 30 hops max, 60 byte packets
 1  10.10.10.1 (10.10.10.1)  0.355 ms  0.338 ms  0.328 ms
 2  10.0.2.2 (10.0.2.2)      1.489 ms  1.480 ms  1.472 ms
 3  10.0.2.2 (10.0.2.2)      2.809 ms  2.597 ms  2.583 ms
student@CsnKhai:~$
```

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

```
Ubuntu2 [Работаer] - Oracle VM VirtualBox
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=115 time=22.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=21.9 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=115 time=22.2 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=115 time=22.5 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 21.934/22.336/22.619/0.320 ms
student@CsnKhai:~$
```

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

```
АЙН РАЗМЕТКА СТРАНИЦЫ ССЫЛКИ РАССЫЛКИ РЕЦЕНЗИРОВАНИЕ ВИД
Ubuntu2 [Работает] - Oracle VM VirtualBox
GNU nano 2.2.6 File: /etc/hosts
127.0.0.1 localhost
127.0.1.1 CsnKhai
8.8.8.8 google.com
# The following lines are desirable for IPv6 capable hosts
::1 localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

```
АЙН РАЗМЕТКА СТРАНИЦЫ ССЫЛКИ РАССЫЛКИ РЕЦЕНЗИРОВАНИЕ ВИД
Ubuntu2 [Работает] - Oracle VM VirtualBox
student@CsnKhai:~$ ping google.com
PING google.com (8.8.8.8) 56(84) bytes of data.
64 bytes from google.com (8.8.8.8): icmp_seq=1 ttl=115 time=22.1 ms
64 bytes from google.com (8.8.8.8): icmp_seq=2 ttl=115 time=22.1 ms
64 bytes from google.com (8.8.8.8): icmp_seq=3 ttl=115 time=22.6 ms
```

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: 27821
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;epam.com. IN A
;; ANSWER SECTION:
epam.com. 577 IN A 3.214.134.159
;; Query time: 9 msec
;; SERVER: 192.168.1.1#53(192.168.1.1)
;; WHEN: Sat Dec 25 14:39:55 UTC 2021
;; MSG SIZE rcvd: 53
```

```
student@CsnKhai:~$ nslookup epam.com
Server:          192.168.1.1
Address:         192.168.1.1#53

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

student@CsnKhai:~$ _
```

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

```
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:~$ traceroute 10.0.2.2
traceroute to 10.0.2.2 (10.0.2.2), 30 hops max, 60 byte packets
 1 10.10.10.1 (10.10.10.1) 0.244 ms 0.303 ms 0.294 ms
 2 10.0.2.2 (10.0.2.2) 2.732 ms 2.638 ms 2.624 ms
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
student@CsnKhai:~$
```

8. Trace the route to google.com.

```
student@CsnKhai:~$ traceroute google.com
traceroute to google.com (8.8.8.8), 30 hops max, 60 byte packets
 1 10.10.10.1 (10.10.10.1) 0.333 ms 0.456 ms 0.451 ms
 2 10.0.2.2 (10.0.2.2) 0.770 ms 0.767 ms 0.780 ms
 3 * * *
 4 * * *
 5 * * *
 6 * * *
 7 * * *
 8 *^C
student@CsnKhai:~$
```

```
student@CsnKhai:~$ traceroute 8.8.8.8
traceroute to 8.8.8.8 (8.8.8.8), 30 hops max, 60 byte packets
 1  10.10.10.1 (10.10.10.1)  0.373 ms  0.356 ms  0.716 ms
 2  10.0.2.2 (10.0.2.2)  0.715 ms  0.710 ms  0.705 ms
 3  * * *
 4  * * *
 5  * * *
 6  * * *
 7  * * *
 8  *^C
student@CsnKhai:~$ _
```