

## IP routing

1. Create virtual machines connection according to figure 1:

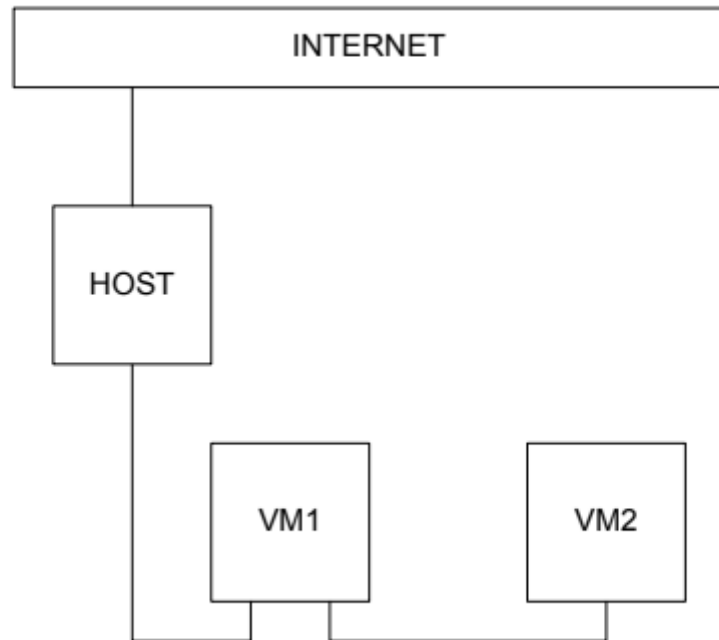
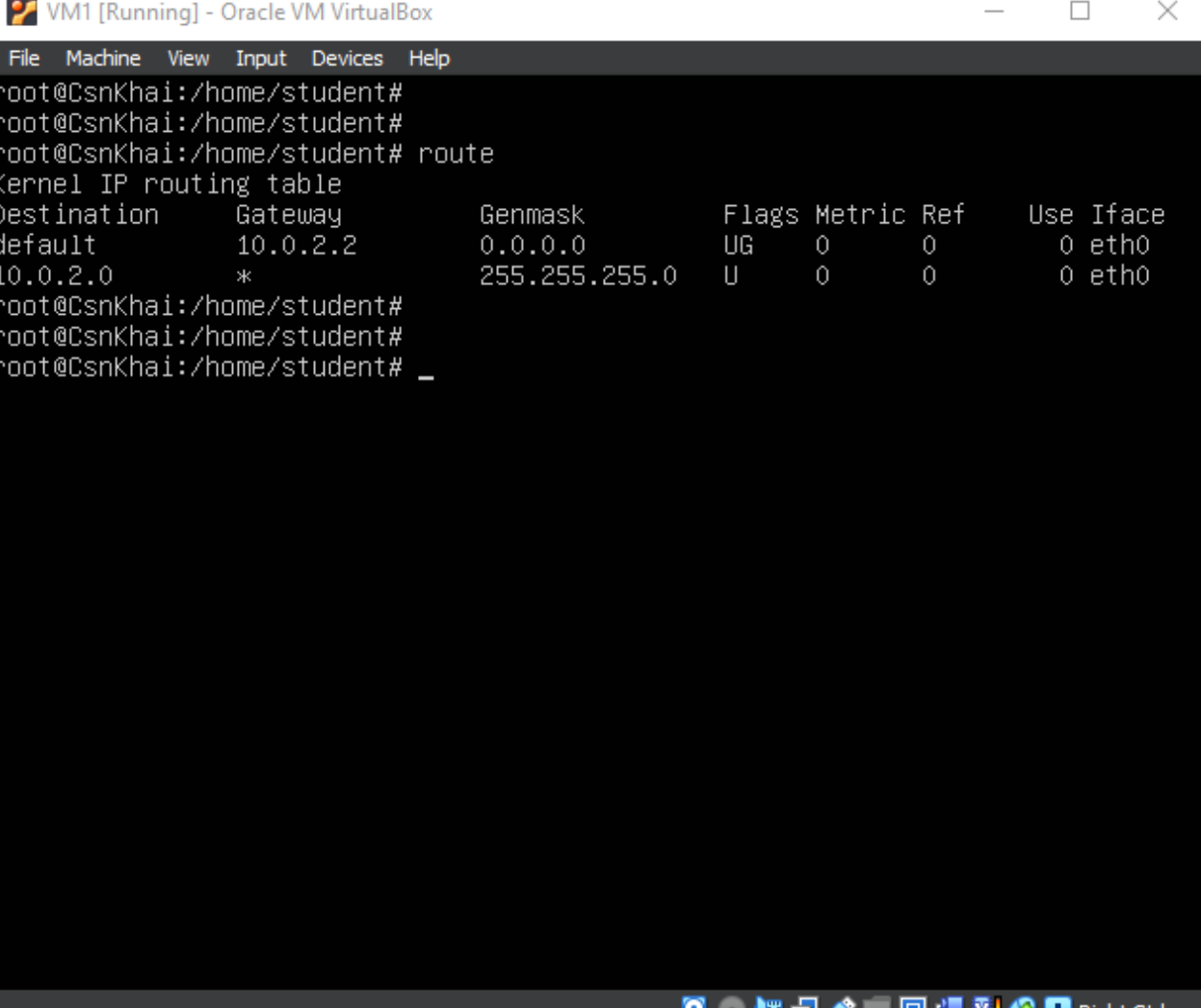


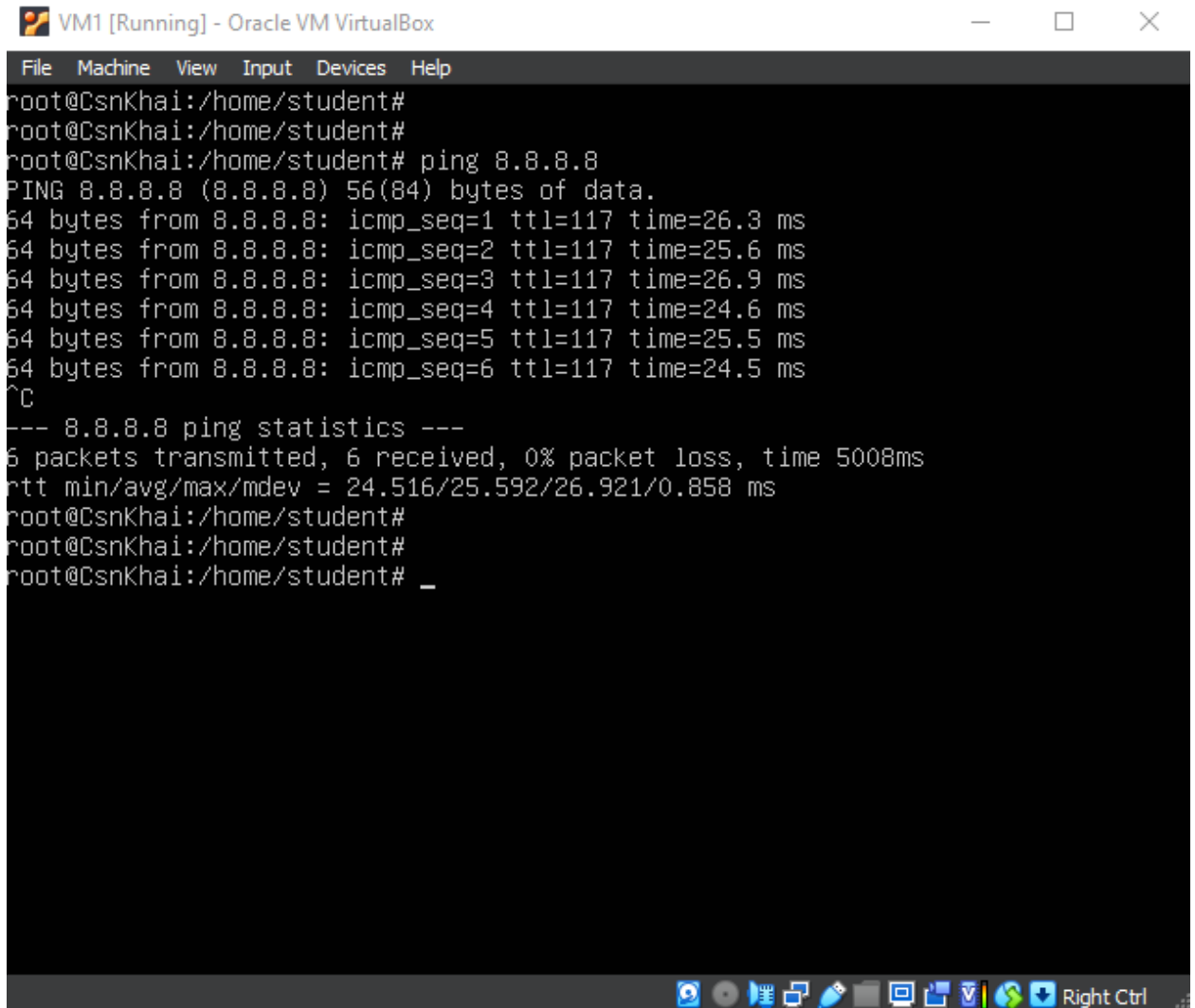
Figure 1 – VMs connection

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



```
File Machine View Input Devices Help
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# _
```

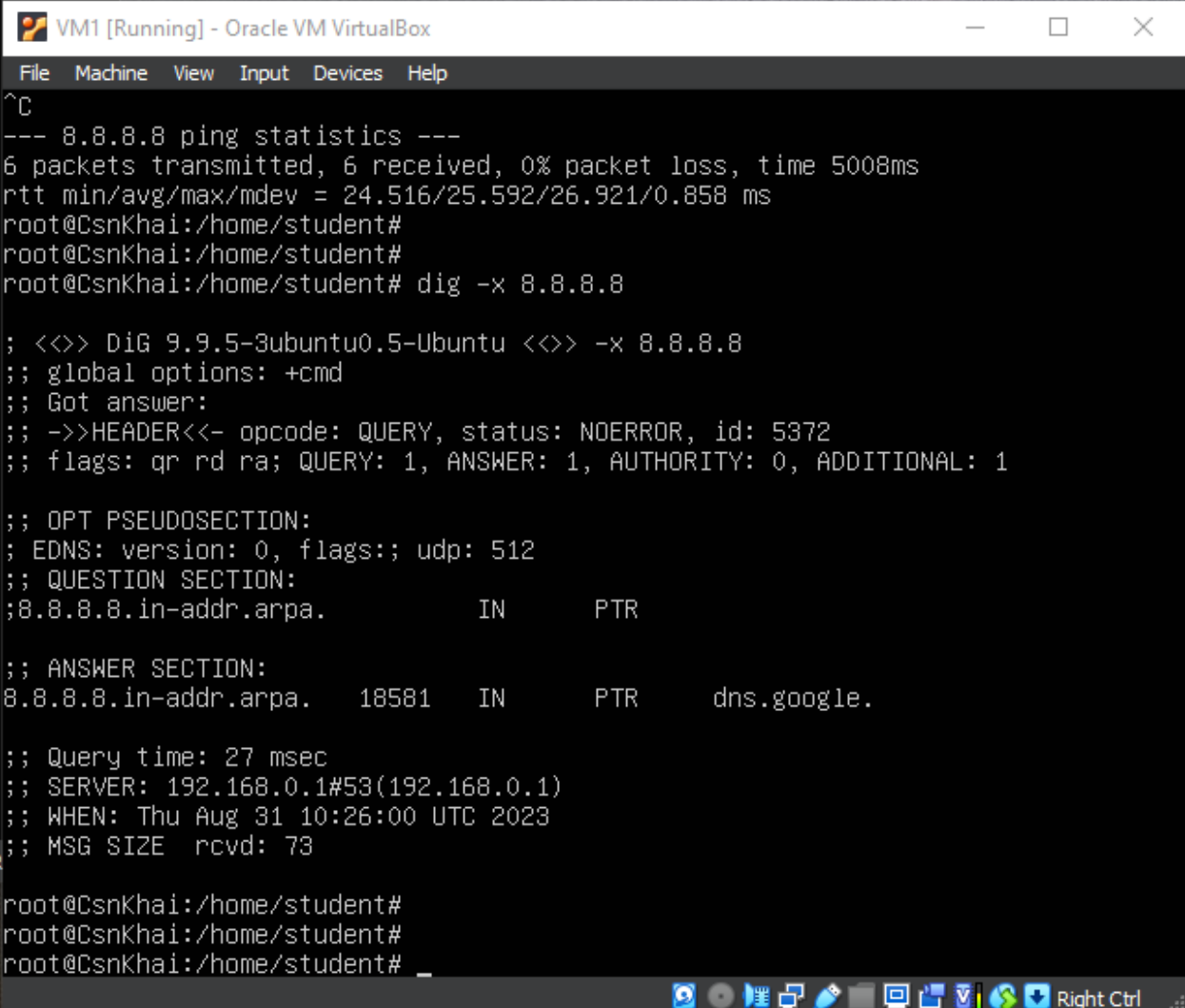
4. Check the access to the Internet, (just ping, for example, 8.8.8.8).



The screenshot shows a terminal window titled "VM1 [Running] - Oracle VM VirtualBox". The terminal is running a Linux system with the prompt "root@CsnKhai:/home/student#". The user has entered the command "ping 8.8.8.8". The output shows six successful ping requests to 8.8.8.8, each with a response time between 24.5 ms and 26.9 ms. The statistics show 6 packets transmitted, 6 received, and 0% packet loss. The terminal window has a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". The bottom of the window shows a taskbar with various icons and the text "Right Ctrl".

```
VM1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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=26.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=117 time=25.6 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=117 time=26.9 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=117 time=24.6 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=117 time=25.5 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=117 time=24.5 ms
^C
--- 8.8.8.8 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5008ms
rtt min/avg/max/mdev = 24.516/25.592/26.921/0.858 ms
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# _
```

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



The screenshot shows a VirtualBox window titled "VM1 [Running] - Oracle VM VirtualBox". The terminal window inside shows the following commands and output:

```
^C
--- 8.8.8.8 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5008ms
rtt min/avg/max/mdev = 24.516/25.592/26.921/0.858 ms
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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: 5372
;; 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

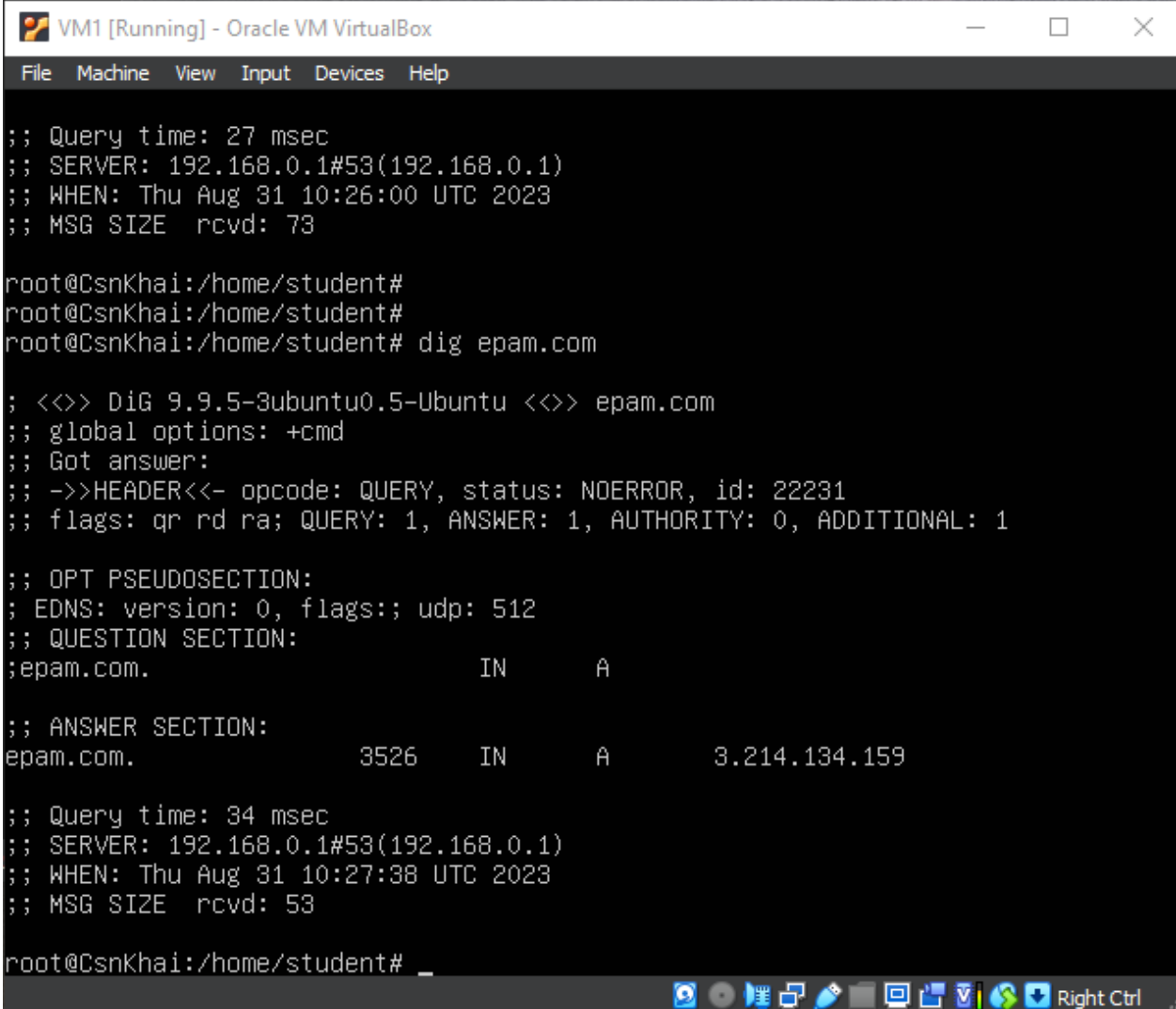
;; ANSWER SECTION:
8.8.8.8.in-addr.arpa.    18581   IN      PTR      dns.google.

;; Query time: 27 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Thu Aug 31 10:26:00 UTC 2023
;; MSG SIZE  rcvd: 73

root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# _
```

The bottom of the window shows a taskbar with various application icons and a "Right Ctrl" label.

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



The screenshot shows a terminal window titled "VM1 [Running] - Oracle VM VirtualBox". The terminal output shows a series of commands and their results. The first command is a query to 192.168.0.1#53, which returns a message size of 73. The second command is a dig query for epam.com, which returns a message size of 53. The output of the dig query shows the following details:

```
;; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> epam.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 22231
;; 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

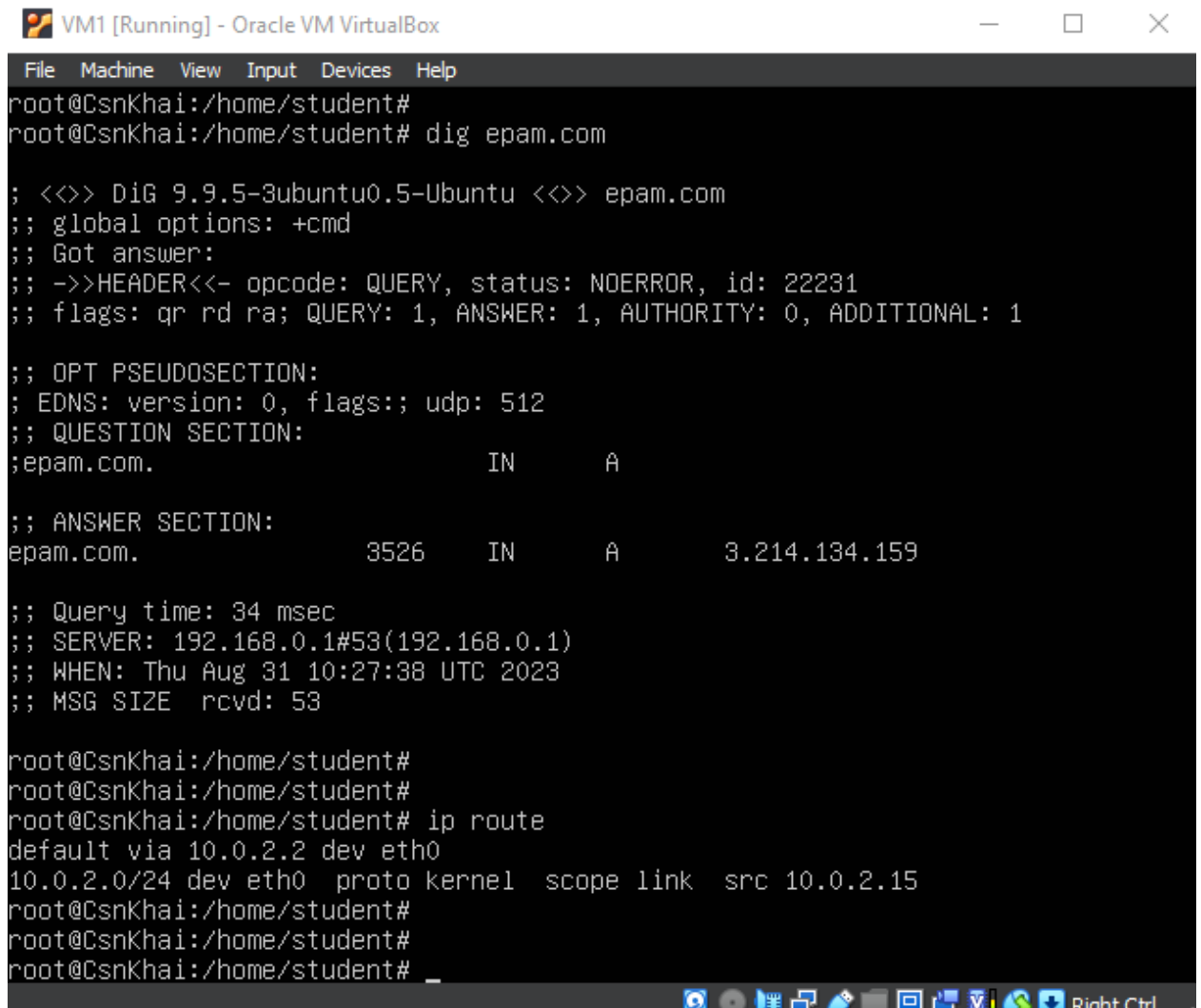
;; ANSWER SECTION:
epam.com.                 3526    IN      A      3.214.134.159

;; Query time: 34 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Thu Aug 31 10:27:38 UTC 2023
;; MSG SIZE  rcvd: 53

root@CsnKhai:/home/student# _
```

The terminal window also shows a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". The bottom of the window shows a taskbar with various icons and a "Right Ctrl" button.

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



The screenshot shows a terminal window titled "VM1 [Running] - Oracle VM VirtualBox". The terminal output is as follows:

```
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# dig epam.com

; <<>> DiG 9.9.5-3ubuntu0.5-Ubuntu <<>> epam.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 22231
;; 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.                 3526    IN      A      3.214.134.159

;; Query time: 34 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Thu Aug 31 10:27:38 UTC 2023
;; MSG SIZE rcvd: 53

root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# _
```

The terminal window has a menu bar with "File", "Machine", "View", "Input", "Devices", and "Help". The bottom status bar shows various icons and the text "Right Ctrl".

8. Trace the route to google.com.

```
VM1 [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
;; 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.                 3526    IN      A      3.214.134.159
;; Query time: 34 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Thu Aug 31 10:27:38 UTC 2023
;; MSG SIZE rcvd: 53

root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# 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)  0.371 ms  0.349 ms  0.309 ms

^C
root@CsnKhai:/home/student#
root@CsnKhai:/home/student#
root@CsnKhai:/home/student# _
```