IP routing

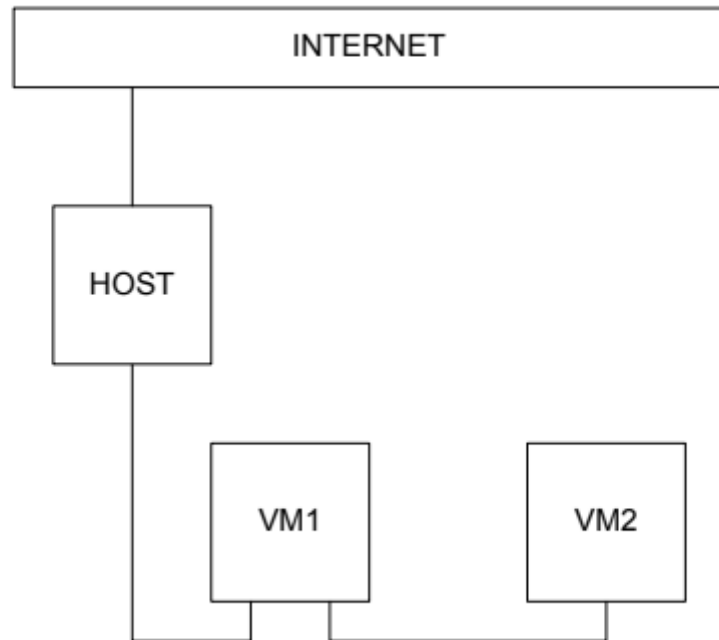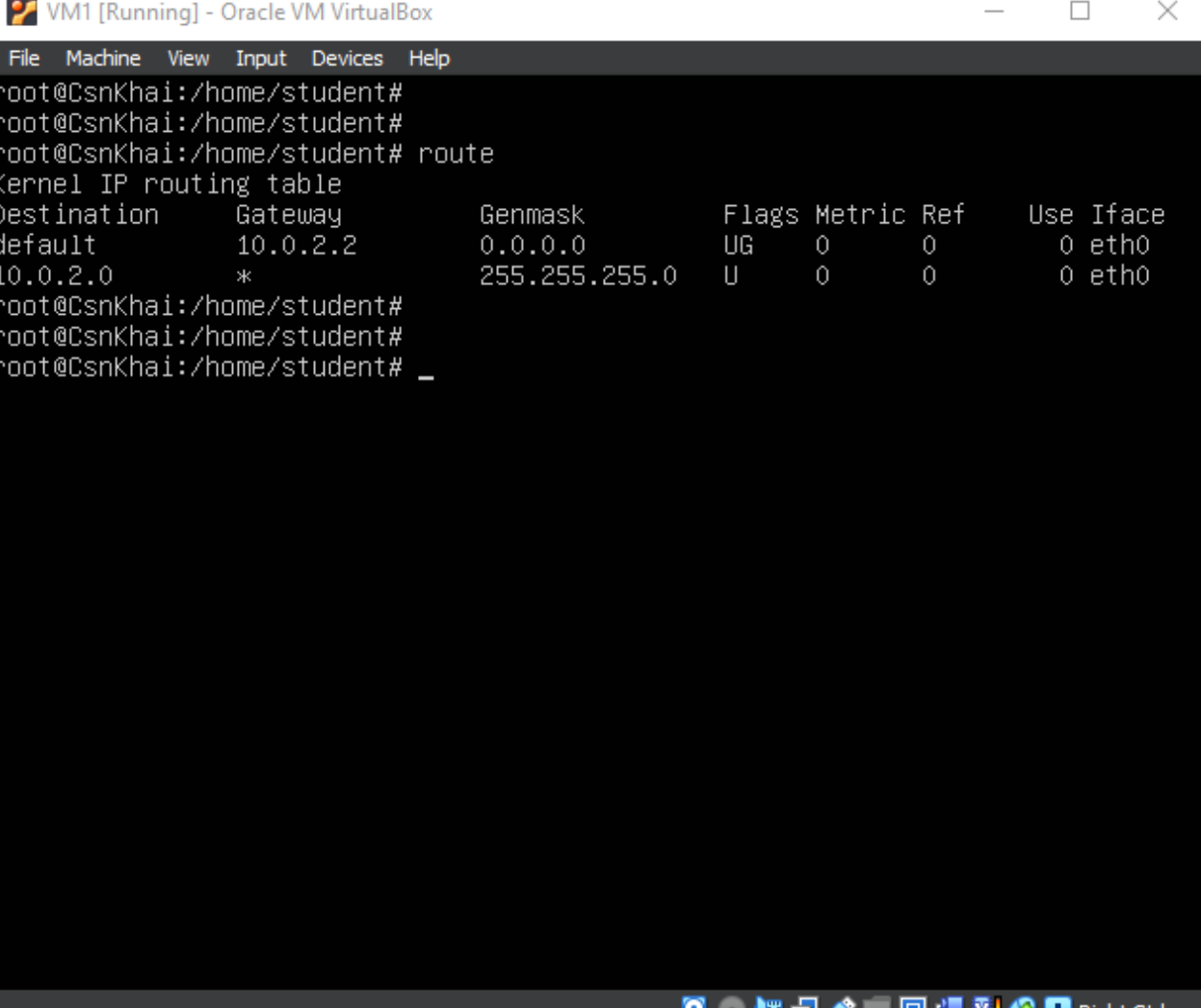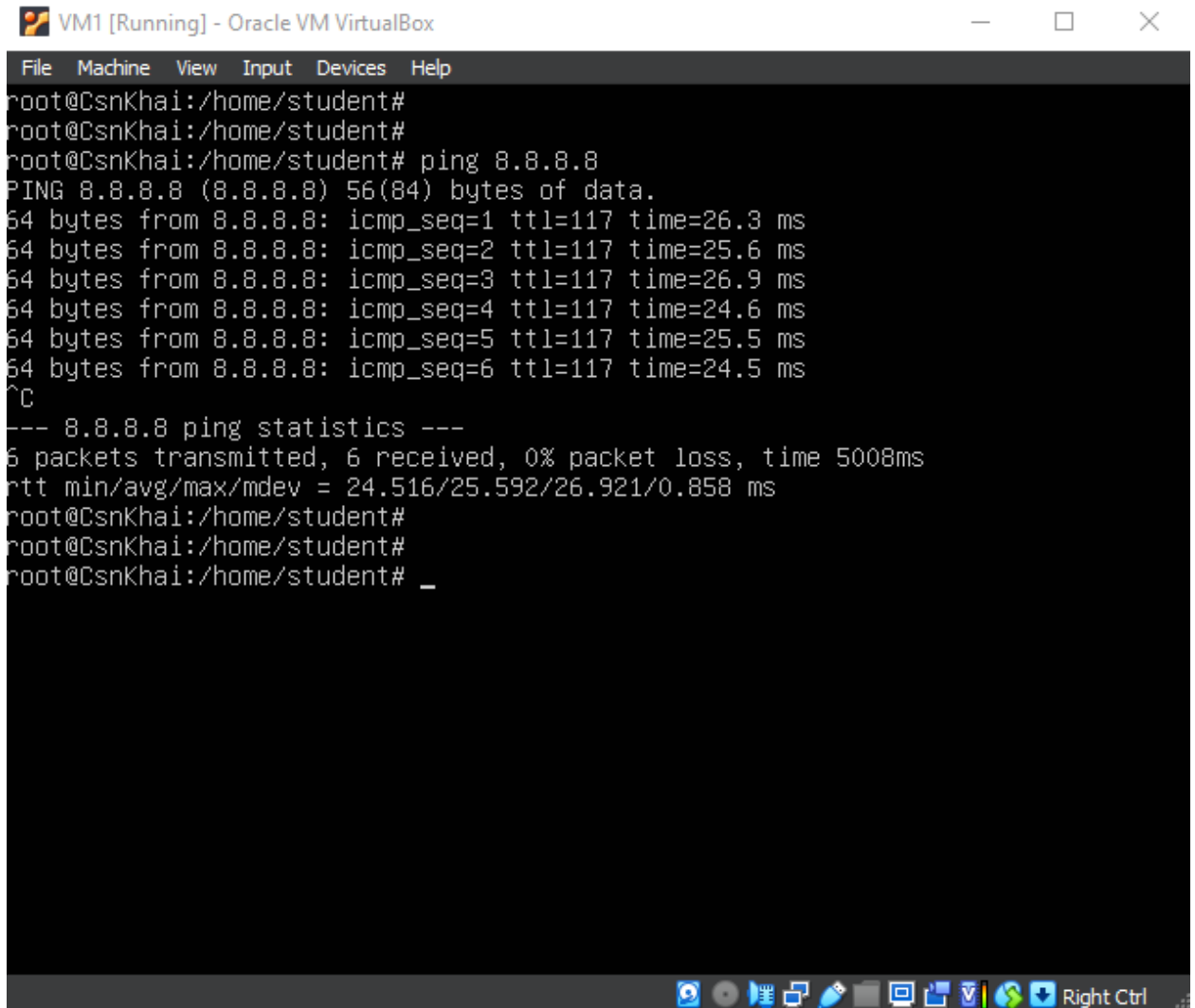1. Create virtual machines connection according to figure 1:

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.


```
VM1 [Running] - Oracle VM VirtualBox                               —    □    ×

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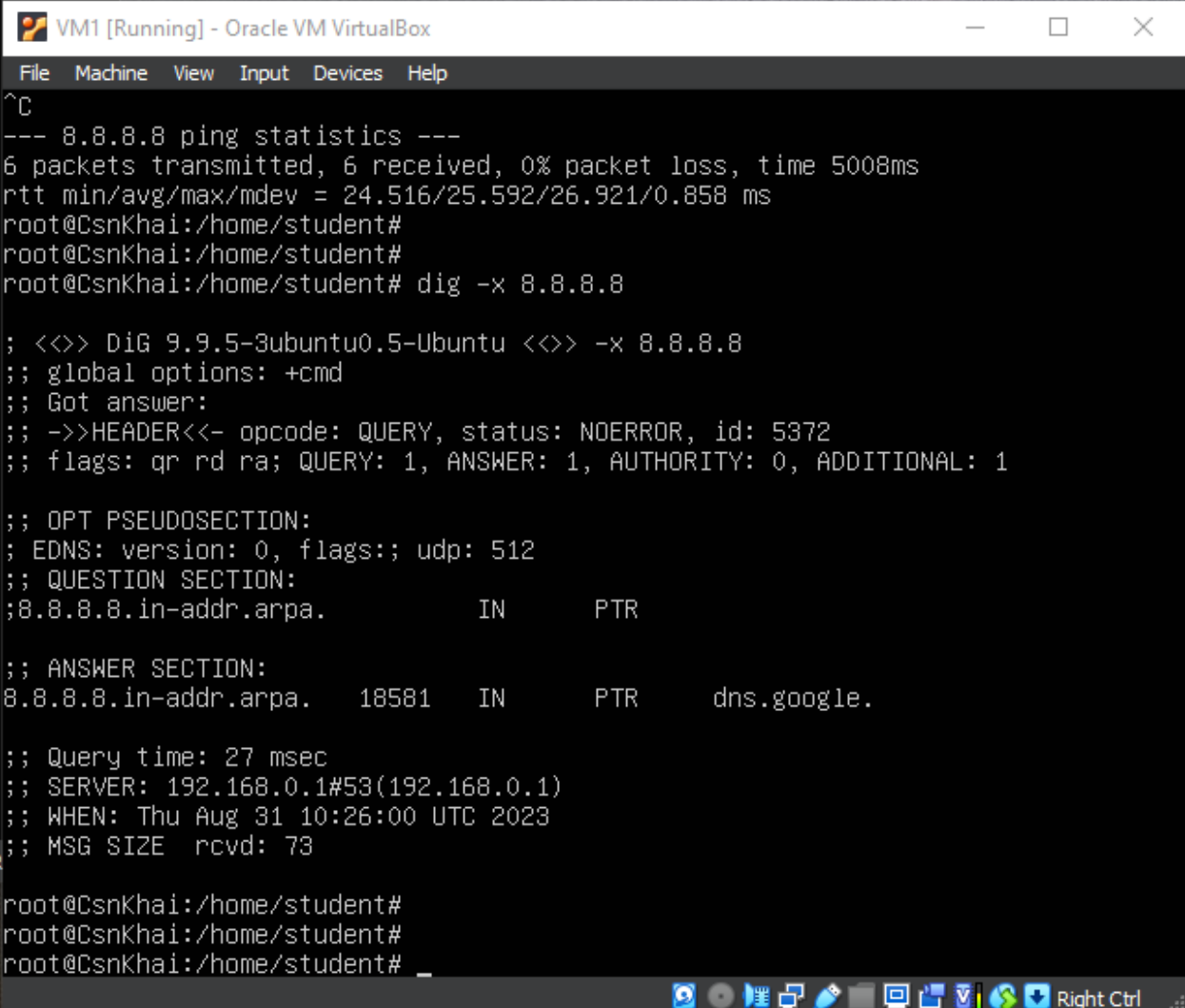
4. Check the access to the Internet, (just ping, for example, 8.8.8.8).

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# _
```

Right Ctrl

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


```
VM1 [Running] - Oracle VM VirtualBox                        —    □    ✕

File   Machine   View   Input   Devices   Help
^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# _
```
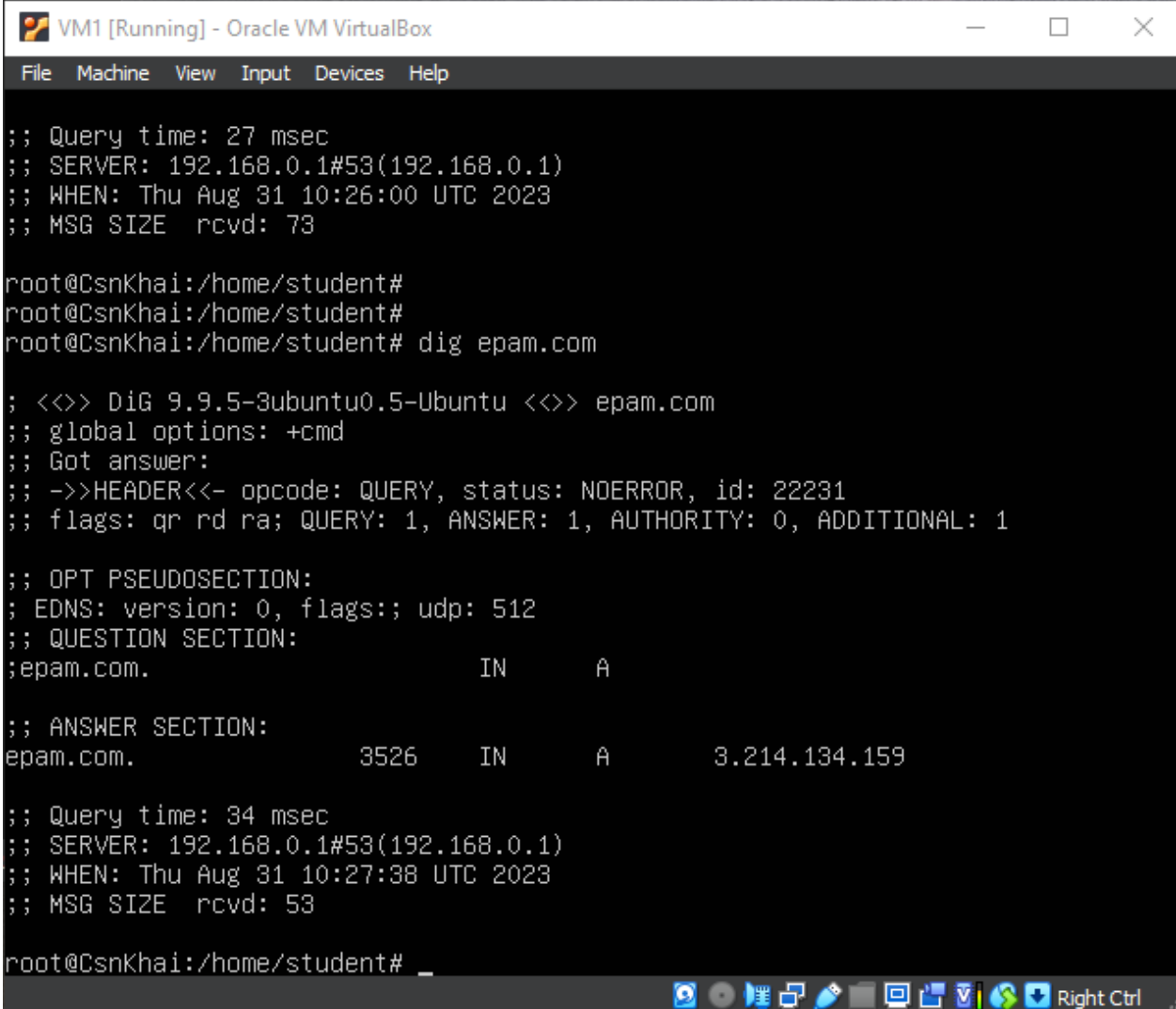
6. Determine, which IP address belongs to resource epam.com.

VM1 [Running] - Oracle VM VirtualBox

File   Machine   View   Input   Devices   Help

```
;; 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# 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# _
```
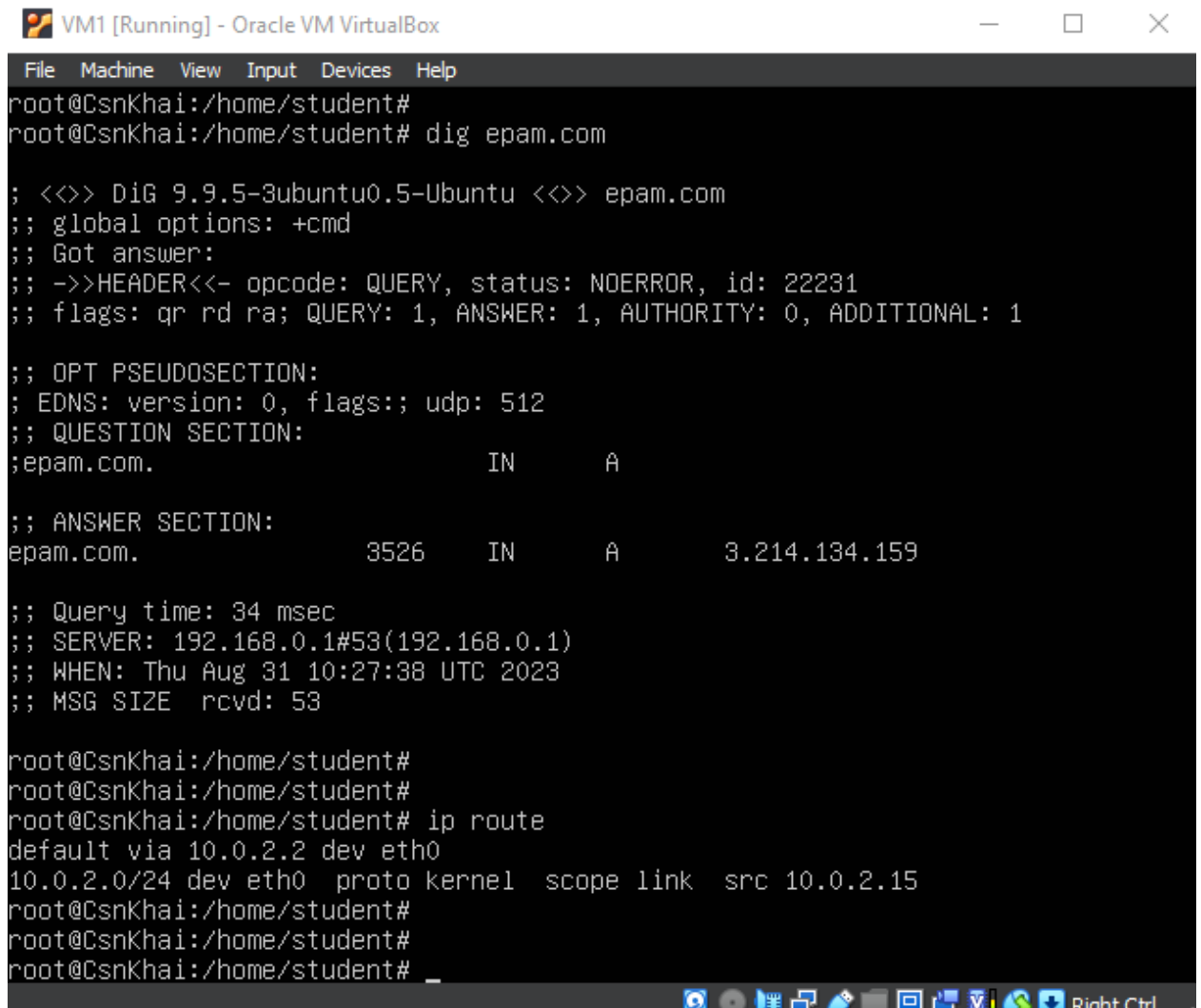
Right Ctrl

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


```
VM1 [Running] - Oracle VM VirtualBox                    —   □   ×

File  Machine  View  Input  Devices  Help
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# _
                                                    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# _
```

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