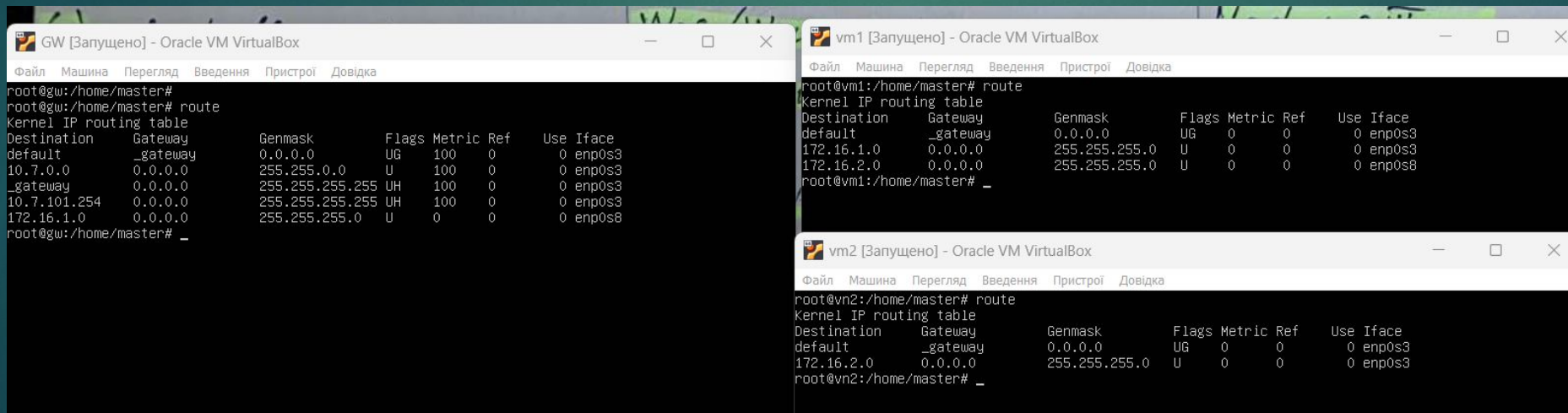


1. Create virtual machines connection according to figure 1:
2. VM2 has one interface (internal), VM1 has 2 interfaces (NAT and internal). Configure all network interfaces in order to make VM2 has an access to the Internet (iptables, forward, masquerade).

Routing tables



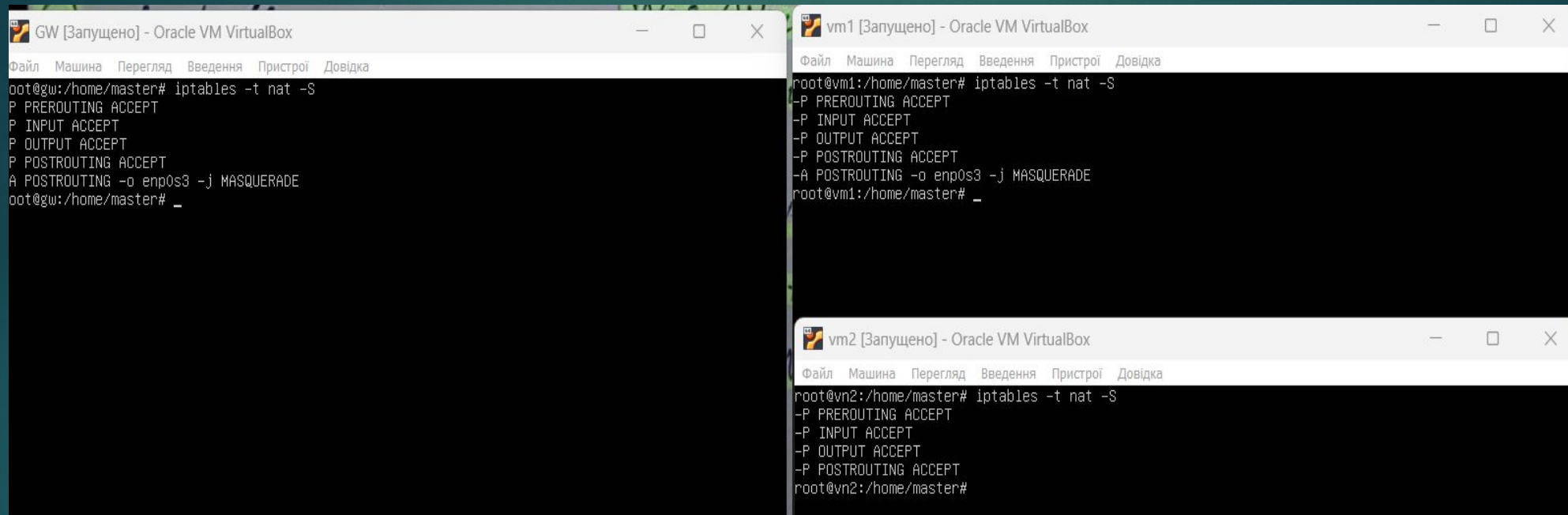
The image displays three terminal windows from Oracle VM VirtualBox, each showing the output of the 'route' command. The windows are titled 'GW [Запущено]', 'vm1 [Запущено]', and 'vm2 [Запущено]'. Each window shows the kernel IP routing table with columns for Destination, Gateway, Genmask, Flags, Metric, Ref, Use, and Iface.

```
GW [Запущено] - Oracle VM VirtualBox
root@gw:/home/master# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default _gateway 0.0.0.0 UG 100 0 0 enp0s3
10.7.0.0 0.0.0.0 255.255.0.0 U 100 0 0 enp0s3
_gateway 0.0.0.0 255.255.255.255 UH 100 0 0 enp0s3
10.7.101.254 0.0.0.0 255.255.255.255 UH 100 0 0 enp0s3
172.16.1.0 0.0.0.0 255.255.255.0 U 0 0 0 enp0s8

vm1 [Запущено] - Oracle VM VirtualBox
root@vm1:/home/master# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default _gateway 0.0.0.0 UG 0 0 0 enp0s3
172.16.1.0 0.0.0.0 255.255.255.0 U 0 0 0 enp0s3
172.16.2.0 0.0.0.0 255.255.255.0 U 0 0 0 enp0s8

vm2 [Запущено] - Oracle VM VirtualBox
root@vn2:/home/master# route
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
default _gateway 0.0.0.0 UG 0 0 0 enp0s3
172.16.2.0 0.0.0.0 255.255.255.0 U 0 0 0 enp0s3
```

IPTABLES rules:



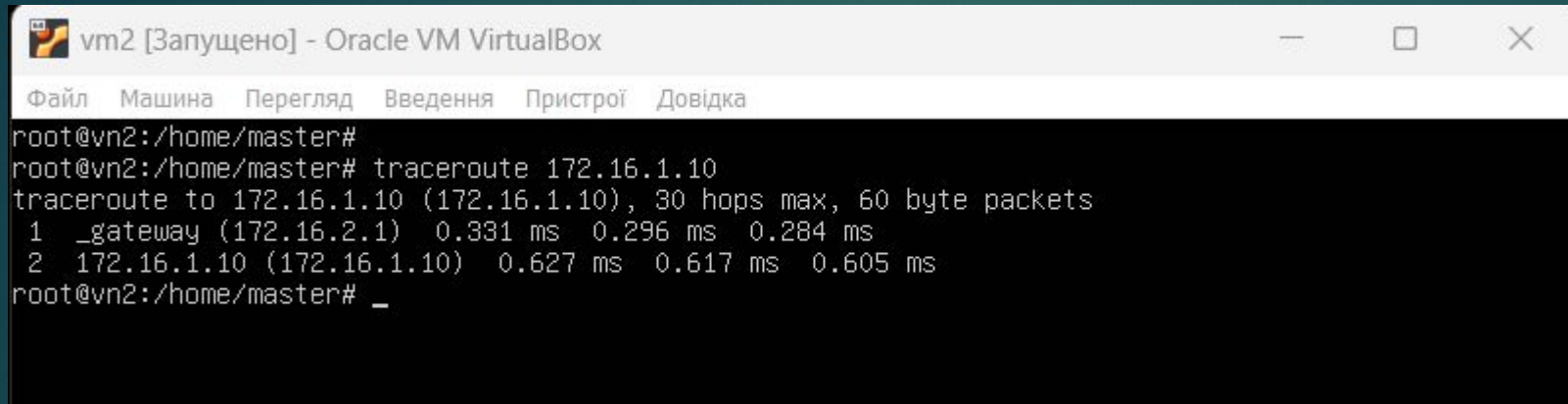
The image displays three terminal windows from Oracle VM VirtualBox, each showing the configuration of iptables rules. The windows are titled 'GW [Запущено] - Oracle VM VirtualBox', 'vm1 [Запущено] - Oracle VM VirtualBox', and 'vm2 [Запущено] - Oracle VM VirtualBox'. Each window has a menu bar with 'Файл', 'Машина', 'Перегляд', 'Введення', 'Пристрої', and 'Довідка'. The terminal output for each window is as follows:

```
oot@gw:/home/master# iptables -t nat -S
-P PREROUTING ACCEPT
-P INPUT ACCEPT
-P OUTPUT ACCEPT
-P POSTROUTING ACCEPT
-A POSTROUTING -o enp0s3 -j MASQUERADE
oot@gw:/home/master# _
```

```
root@vm1:/home/master# iptables -t nat -S
-P PREROUTING ACCEPT
-P INPUT ACCEPT
-P OUTPUT ACCEPT
-P POSTROUTING ACCEPT
-A POSTROUTING -o enp0s3 -j MASQUERADE
root@vm1:/home/master# _
```

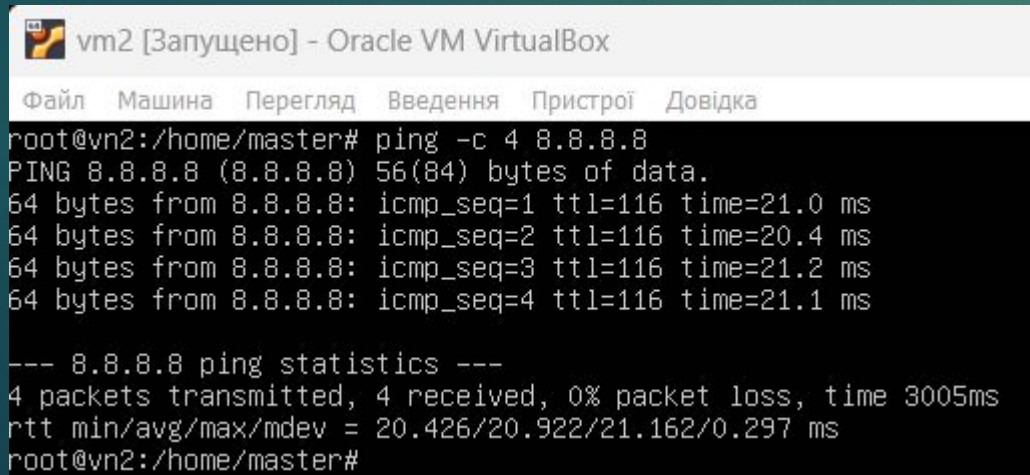
```
root@vn2:/home/master# iptables -t nat -S
-P PREROUTING ACCEPT
-P INPUT ACCEPT
-P OUTPUT ACCEPT
-P POSTROUTING ACCEPT
root@vn2:/home/master#
```

3. Check the route from VM2 to Host.



```
vm2 [Запущено] - Oracle VM VirtualBox
Файл  Машина  Перегляд  Введення  Пристрої  Довідка
root@vn2:/home/master#
root@vn2:/home/master# traceroute 172.16.1.10
traceroute to 172.16.1.10 (172.16.1.10), 30 hops max, 60 byte packets
 1  _gateway (172.16.2.1)  0.831 ms  0.296 ms  0.284 ms
 2  172.16.1.10 (172.16.1.10)  0.627 ms  0.617 ms  0.605 ms
root@vn2:/home/master# _
```

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



```
vm2 [Запущено] - Oracle VM VirtualBox
Файл  Машина  Перегляд  Введення  Пристрої  Довідка
root@vn2:/home/master# ping -c 4 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=21.0 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=20.4 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=21.2 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=116 time=21.1 ms

--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3005ms
rtt min/avg/max/mdev = 20.426/20.922/21.162/0.297 ms
root@vn2:/home/master#
```

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

```
vm2 [Запущено] - Oracle VM VirtualBox
Файл  Машина  Перегляд  Введення  Пристрої  Довідка
root@vn2:/home/master# dig -x 8.8.8.8

; <<>> DiG 9.18.1-1ubuntu1.1-Ubuntu <<>> -x 8.8.8.8
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13927
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;8.8.8.8.in-addr.arpa.      IN      PTR

;; ANSWER SECTION:
8.8.8.8.in-addr.arpa.      13667   IN      PTR      dns.google.

;; Query time: 23 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Mon Aug 21 07:06:31 UTC 2023
;; MSG SIZE  rcvd: 73

root@vn2:/home/master# _
```


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

Why epam.com?)))

```
vm2 [Запущено] - Oracle VM VirtualBox
Файл  Машина  Перегляд  Введення  Пристрої  Довідка
root@vn2:/home/master# dig epam.com A

; <<>> DiG 9.18.1-1ubuntu1.1-Ubuntu <<>> epam.com A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13353
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

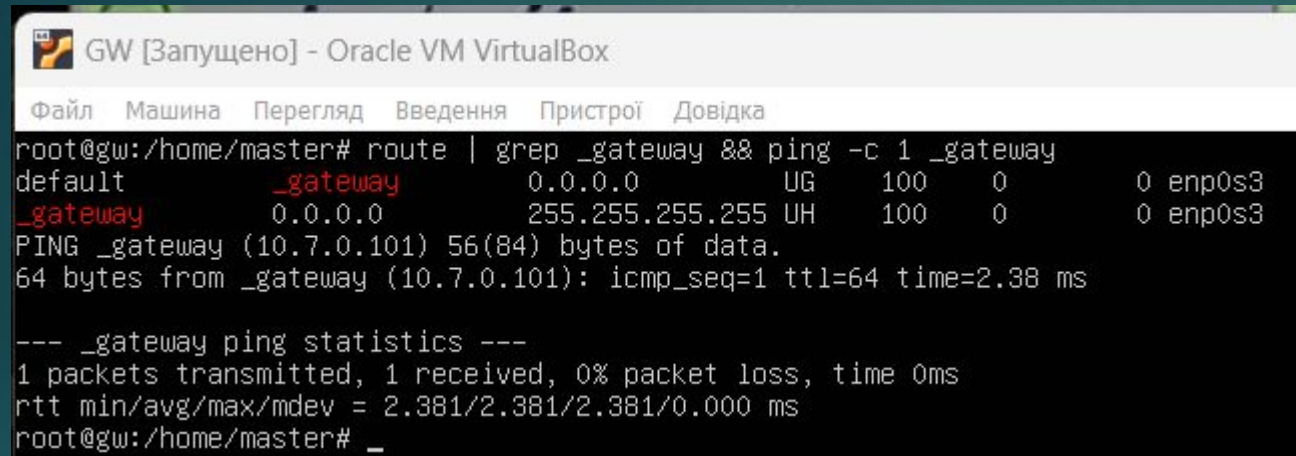
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;epam.com.                IN      A

;; ANSWER SECTION:
epam.com.                  3600    IN      A      3.214.134.159

;; Query time: 56 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Mon Aug 21 07:08:09 UTC 2023
;; MSG SIZE rcvd: 53

root@vn2:/home/master# _
```

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

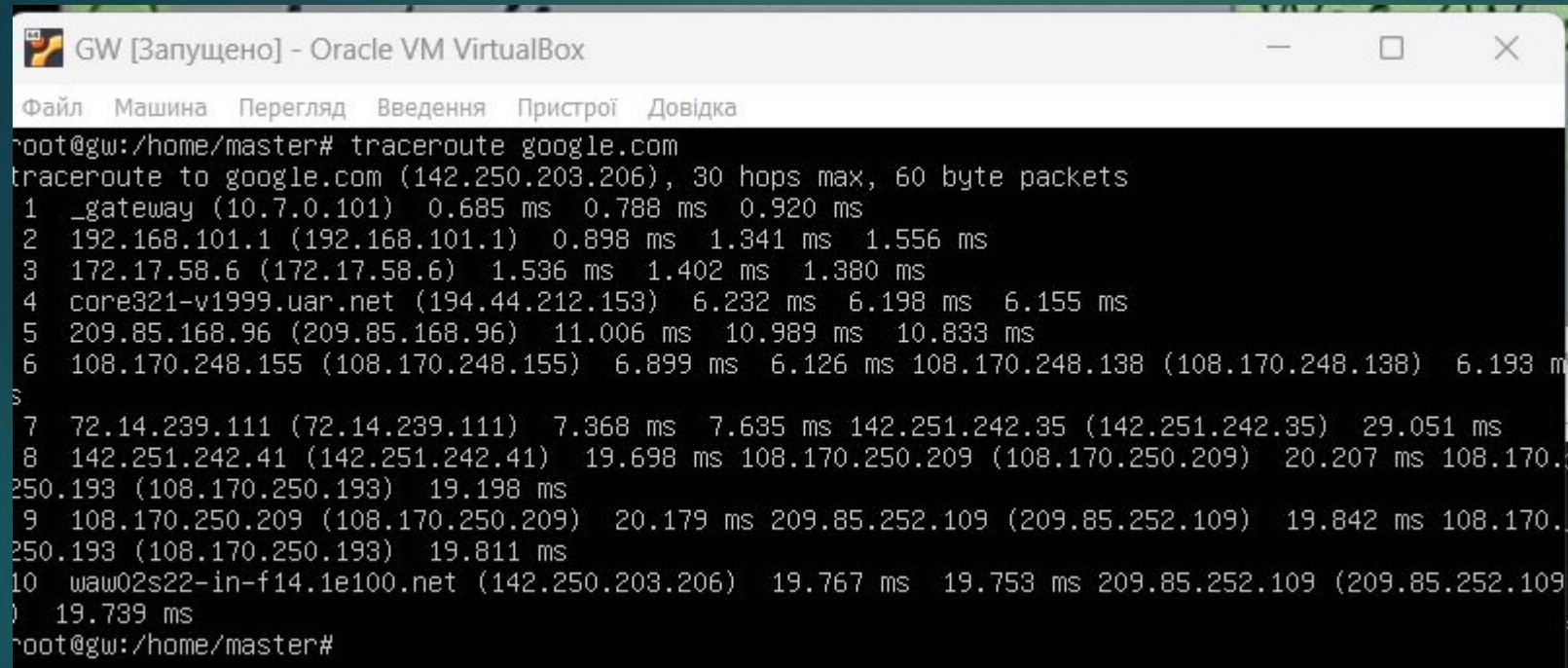


```
GW [Запущено] - Oracle VM VirtualBox
Файл  Машина  Перегляд  Введення  Пристрої  Довідка
root@gw:/home/master# route | grep _gateway && ping -c 1 _gateway
default         _gateway        0.0.0.0          UG    100    0        0 enp0s3
_gateway        0.0.0.0          255.255.255.255 UH    100    0        0 enp0s3
PING _gateway (10.7.0.101) 56(84) bytes of data.
64 bytes from _gateway (10.7.0.101): icmp_seq=1 ttl=64 time=2.38 ms

--- _gateway ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 2.381/2.381/2.381/0.000 ms
root@gw:/home/master# _
```

In my case is a default gw of my network: 10.7.0.101.

8. Trace the route to google.com.



The screenshot shows a terminal window titled "GW [Запущено] - Oracle VM VirtualBox". The terminal output displays the command `tracert google.com` and its results. The output shows the path from the local gateway to google.com, including IP addresses and round-trip times for each hop.

```
root@gw:/home/master# tracert google.com
tracert to google.com (142.250.203.206), 30 hops max, 60 byte packets
 1  _gateway (10.7.0.101)  0.685 ms  0.788 ms  0.920 ms
 2  192.168.101.1 (192.168.101.1)  0.898 ms  1.341 ms  1.556 ms
 3  172.17.58.6 (172.17.58.6)  1.536 ms  1.402 ms  1.380 ms
 4  core321-v1999.uar.net (194.44.212.153)  6.232 ms  6.198 ms  6.155 ms
 5  209.85.168.96 (209.85.168.96)  11.006 ms  10.989 ms  10.833 ms
 6  108.170.248.155 (108.170.248.155)  6.899 ms  6.126 ms  108.170.248.138 (108.170.248.138)  6.193 ms
 7  72.14.239.111 (72.14.239.111)  7.368 ms  7.635 ms  142.251.242.35 (142.251.242.35)  29.051 ms
 8  142.251.242.41 (142.251.242.41)  19.698 ms  108.170.250.209 (108.170.250.209)  20.207 ms  108.170.250.193 (108.170.250.193)  19.198 ms
 9  108.170.250.209 (108.170.250.209)  20.179 ms  209.85.252.109 (209.85.252.109)  19.842 ms  108.170.250.193 (108.170.250.193)  19.811 ms
10  waw02s22-in-f14.1e100.net (142.250.203.206)  19.767 ms  19.753 ms  209.85.252.109 (209.85.252.109)  19.739 ms
root@gw:/home/master#
```