

Networking routing Yevhen Tereshchenko

Create Virtual Machine and test network

1. Show network interfaces

The screenshot displays three terminal windows illustrating the initial network configuration. The top-left window shows the configuration of the host's network interfaces: `wlp2s0` is configured with IP `192.168.1.87`, `vboxnet0` with IP `192.168.56.1`, and `vboxnet1` with IP `192.168.57.1`. The top-right window shows the setup of iptables rules for NAT, allowing traffic from the host to reach the VMs. The bottom window shows the configuration of the virtual machines' network interfaces. The first VM, `yevhen@yevhen-Lenovo-Ideapad-320-15ISK`, has its `vboxnet0` interface configured with IP `192.168.56.102`. The second VM, `yevhen@yevhen-VirtualBox`, has its `vboxnet0` interface configured with IP `192.168.57.3`.

```
link/ether c8:3d:d4:ef:41:5f brd ff:ff:ff:ff:ff:ff
inet 192.168.1.87/24 brd 192.168.1.255 scope global dynamic noprefroute wlp2s0
    valid_lft 82531sec preferred_lft 82531sec
inet6 fe80::5db4:d936:1da9:4873/64 scope link noprefroute
    valid_lft forever preferred_lft forever
4: vboxnet0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 0a:00:27:00:00:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.1/24 brd 192.168.56.255 scope global vboxnet0
        valid_lft forever preferred_lft forever
    inet6 fe80::808:27ff:fe00:1/64 scope link
        valid_lft forever preferred_lft forever
5: vboxnet1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 0a:00:27:00:00:01 brd ff:ff:ff:ff:ff:ff
    inet 192.168.57.1/24 brd 192.168.57.255 scope global vboxnet1
        valid_lft forever preferred_lft forever
    inet6 fe80::808:27ff:fe00:1/64 scope link
        valid_lft forever preferred_lft forever
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target prot opt source destination
Chain INPUT (policy ACCEPT)
target prot opt source destination
Chain OUTPUT (policy ACCEPT)
target prot opt source destination
Chain POSTROUTING (policy ACCEPT)
target prot opt source destination
MASQUERADE all -- anywhere anywhere
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ip route
default via 192.168.1.1 dev wlp2s0 proto dhcp metric 600
169.254.0.0/16 dev wlp2s0 scope link metric 1000
192.168.1.0/24 dev wlp2s0 proto kernel scope link src 192.168.1.87 metric 600
192.168.56.0/24 dev vboxnet0 proto kernel scope link src 192.168.56.1
192.168.57.0/24 dev vboxnet1 proto kernel scope link src 192.168.57.1
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$
```

```
yevhen@yevhen-VirtualBox:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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: enp8s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:18:79:bc brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.102/24 brd 192.168.56.255 scope global dynamic noprefroute enp8s3
        valid_lft 435sec preferred_lft 435sec
    inet6 fe80::a08:27ff:fe00:1/64 scope link noprefroute
        valid_lft forever preferred_lft forever
yevhen@yevhen-VirtualBox:~$
```

2. Show route

The screenshot displays three terminal windows showing the configuration and verification of network routes. The top-left window shows the configuration of the host's routing table, adding routes for the VMs' IP ranges. The top-right window shows the configuration of the VMs' routing tables, adding routes for the host and the other VM. The bottom window shows the verification of the routes using the `ip route` command.

```
link/ether c8:3d:d4:ef:41:5f brd ff:ff:ff:ff:ff:ff
inet 192.168.1.87/24 brd 192.168.1.255 scope global dynamic noprefroute wlp2s0
    valid_lft 82531sec preferred_lft 82531sec
inet6 fe80::5db4:d936:1da9:4873/64 scope link noprefroute
    valid_lft forever preferred_lft forever
4: vboxnet0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 0a:00:27:00:00:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.56.1/24 brd 192.168.56.255 scope global vboxnet0
        valid_lft forever preferred_lft forever
    inet6 fe80::808:27ff:fe00:1/64 scope link
        valid_lft forever preferred_lft forever
5: vboxnet1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 0a:00:27:00:00:01 brd ff:ff:ff:ff:ff:ff
    inet 192.168.57.1/24 brd 192.168.57.255 scope global vboxnet1
        valid_lft forever preferred_lft forever
    inet6 fe80::808:27ff:fe00:1/64 scope link
        valid_lft forever preferred_lft forever
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$
```

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ sudo iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target prot opt source destination
Chain INPUT (policy ACCEPT)
target prot opt source destination
Chain OUTPUT (policy ACCEPT)
target prot opt source destination
Chain POSTROUTING (policy ACCEPT)
target prot opt source destination
MASQUERADE all -- anywhere anywhere
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ip route
default via 192.168.1.1 dev wlp2s0 proto dhcp metric 600
169.254.0.0/16 dev wlp2s0 scope link metric 1000
192.168.1.0/24 dev wlp2s0 proto kernel scope link src 192.168.1.87 metric 600
192.168.56.0/24 dev vboxnet0 proto kernel scope link src 192.168.56.1
192.168.57.0/24 dev vboxnet1 proto kernel scope link src 192.168.57.1
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$
```

```
yevhen@yevhen-VirtualBox:~$ ip route
default via 192.168.57.1 dev enp8s3 proto dhcp metric 600
169.254.0.0/16 dev enp8s3 scope link metric 1000
192.168.56.0/24 dev enp8s3 proto kernel scope link src 192.168.56.102 metric 100
192.168.57.0/24 dev enp8s3 proto kernel scope link src 192.168.57.3 metric 101
yevhen@yevhen-VirtualBox:~$
```

3. Trace from VM1 to google.com.ua

The screenshot displays the Oracle VM VirtualBox Manager interface with two virtual machines: DEBIAN VM1 and UBUNTU VM2. The DEBIAN VM1 settings are shown, including General, System, Display, and Storage. A terminal window on the DEBIAN VM1 shows the execution of the following commands:

```
yevhen@debian:~$ sudo traceroute google.com.ua
google.com.ua: Name or service not known
Cannot handle "host" cmdline arg 'google.com.ua' on position 1 (argc 1)
yevhen@debian:~$ sudo traceroute google.com.ua
traceroute to google.com.ua (216.58.208.195), 30 hops max, 60 byte packets
 1  gateway (192.168.56.102) 1.213 ms 1.050 ms 0.730 ms
 2  192.168.56.1 (192.168.56.1) 0.870 ms 1.130 ms 0.952 ms
 3  192.168.1.1 (192.168.1.1) 3.191 ms 2.634 ms 2.513 ms
 4  108.bras-dp-01.fregat.net (212.115.225.241) 10.838 ms 9.632 ms 9.513 ms
 5  10.0.11.69 (10.0.11.69) 11.948 ms 11.252 ms 10.0.11.45 (10.0.11.45) 10.959 ms
 6  212.115.254.221 (212.115.254.221) 25.342 ms 10.085 ms 9.932 ms
 7  212.115.226.198 (212.115.226.198) 14.769 ms 8.977 ms 8.896 ms
 8  108.170.248.131 (108.170.248.131) 12.629 ms 12.613 ms 12.540 ms
 9  209.85.248.105 (209.85.248.105) 22.983 ms 26.446 ms 26.370 ms
10  142.250.46.55 (142.250.46.55) 26.327 ms 26.221 ms 26.140 ms
11  216.239.35.133 (216.239.35.133) 26.080 ms 142.250.37.193 (142.250.37.193) 23.767 ms
12  142.250.224.91 (142.250.224.91) 26.803 ms 142.250.224.89 (142.250.224.89) 26.710 ms
13  142.250.224.89 (142.250.224.89) 26.595 ms 142.250.224.91 (142.250.224.91) 23.218 ms
14  par10921-in-f195.1e100.net (216.58.208.195) 26.508 ms
```

A second terminal window on the UBUNTU VM2 shows the execution of the following commands:

```
yevhen@yevhen-Lenovo-Ideapad-320-151SK:~$ sudo iptables -t nat -L
PREROUTING (policy ACCEPT)
 prot opt source destination
INPUT (policy ACCEPT)
 prot opt source destination
OUTPUT (policy ACCEPT)
 prot opt source destination
POSTROUTING (policy ACCEPT)
 prot opt source destination
RADE
all -- anywhere
yevhen@yevhen-Lenovo-Ideapad-320-151SK:~$ ip route
t via 192.168.1.1 dev wlp2s8 proto dhcp metric 600
4.0/16 dev wlp2s8 scope link metric 1000
8.1.0/24 dev wlp2s8 proto kernel scope link src 192.168.1.87 metric 600
8.56.0/24 dev vboxnet0 proto kernel scope link src 192.168.56.1
8.57.0/24 dev vboxnet0 proto kernel scope link src 192.168.57.1
yevhen@yevhen-Lenovo-Ideapad-320-151SK:~$
```

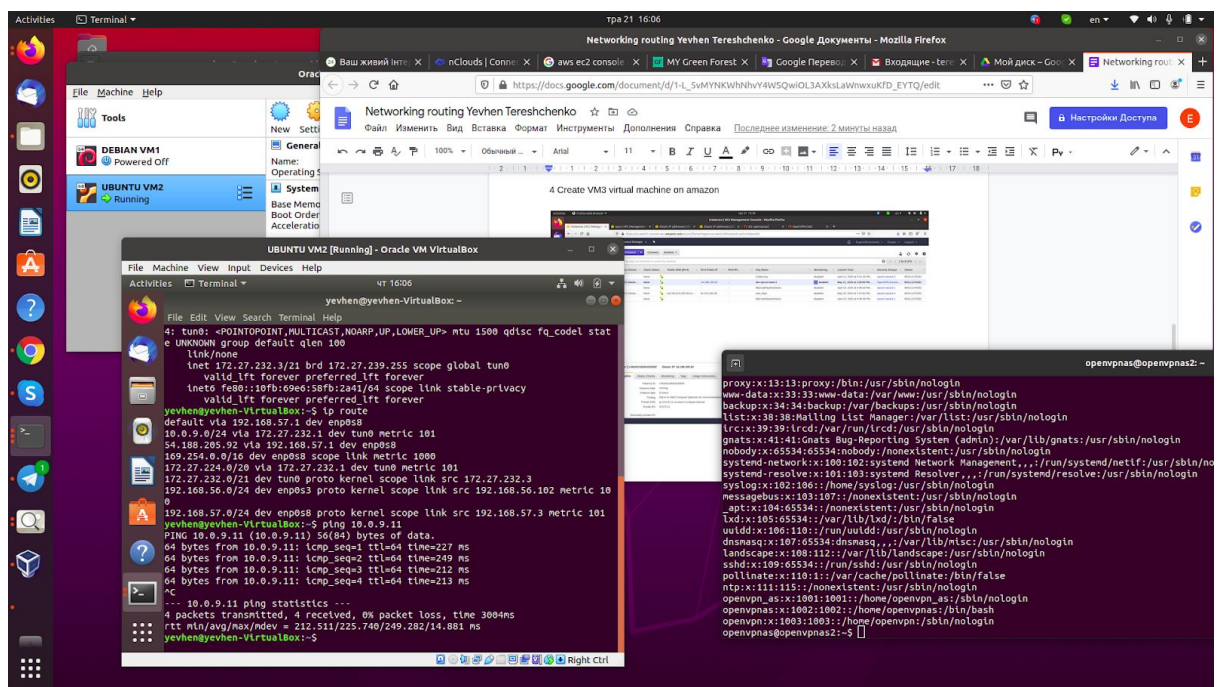
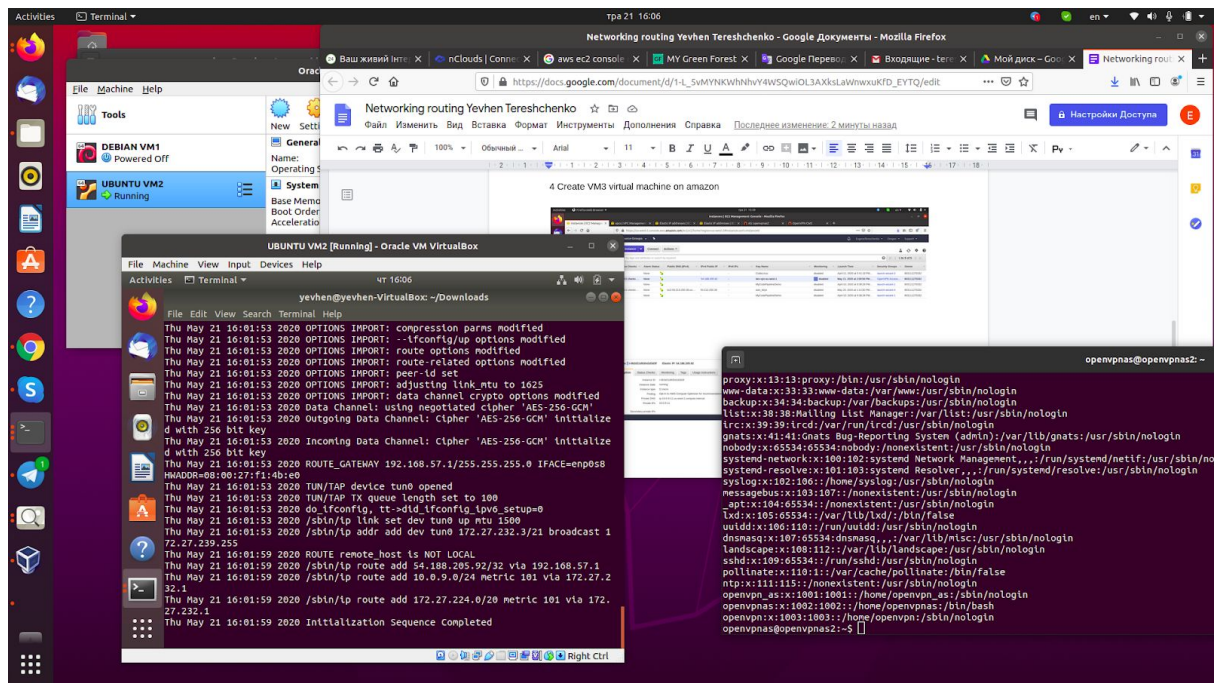
4. Create VM3 virtual machine on amazon

The screenshot displays the AWS Management Console interface. The top navigation bar shows the user is logged in as Eugene Tereshchenko in the Oregon region. The left sidebar shows the navigation menu with options like EC2 Dashboard, INSTANCES, IMAGES, ELASTIC BLOCK STORE, and NETWORK & SECURITY. The main content area shows the EC2 Dashboard with a table of instances.

Instance ID	Instance State	Instance type	Findings	Opt in to AWS Compute Optimizer for recommendations. Learn more	Private DNS	Private IPs	Secondary private IPs
i-062d21d93042d3d3f	running	m5.xlarge	Opt in to AWS Compute Optimizer for recommendations. Learn more				

The details for the instance i-062d21d93042d3d3f are shown below the table. The instance is running on the m5.xlarge instance type. The public DNS is 54.188.205.92. The public IP is 54.188.205.92. The elastic IP is 54.188.205.92. The availability zone is us-west-2a. The security groups are OpenVPN Access Server 2-7-5-AutogenByAWSMP- view inbound rules, view outbound rules. The scheduled events are No scheduled events.

5. Show vpn connection from VM2 to VM3



6. Allow only ssh and icmp packets

The screenshot shows a terminal window with the following commands and output:

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ssh yevhen@192.168.57.3
yevhen@192.168.57.3's password:

yevhen@yevhen-VirtualBox:~$ sudo iptables -L --line-numbers
Chain INPUT (policy DROP)
num target prot opt source destination
1 ACCEPT icmp -- anywhere anywhere
2 ACCEPT tcp -- anywhere anywhere
3 DROP icmp -- anywhere anywhere

Chain FORWARD (policy ACCEPT)
num target prot opt source destination

Chain OUTPUT (policy ACCEPT)
num target prot opt source destination
yevhen@yevhen-VirtualBox:~$ sudo iptables -D INPUT 3
yevhen@yevhen-VirtualBox:~$ sudo iptables -L --line-numbers
Chain INPUT (policy DROP)
num target prot opt source destination
1 ACCEPT icmp -- anywhere anywhere
2 ACCEPT tcp -- anywhere anywhere

Chain FORWARD (policy ACCEPT)
num target prot opt source destination

Chain OUTPUT (policy ACCEPT)
num target prot opt source destination
yevhen@yevhen-VirtualBox:~$ sudo iptables -D INPUT 1
yevhen@yevhen-VirtualBox:~$ sudo iptables -A INPUT -p icmp -s 0.0.0.0/0 -d 0.0.0.0/0 -j ACCEPT
yevhen@yevhen-VirtualBox:~$
```

The right side of the terminal shows the output of the `ss` command, displaying a list of connections from 192.168.57.3 to 192.168.57.1, all of which are ICMP packets.

The screenshot shows a terminal window with the following commands and output:

```
yevhen@yevhen-Lenovo-Ideapad-320-15ISK:~$ ssh yevhen@192.168.57.3
yevhen@192.168.57.3's password:
Connection closed by 192.168.57.3 port 22
yevhen@yevhen-VirtualBox:~$ ssh yevhen@192.168.57.3
yevhen@192.168.57.3's password:
Welcome to Ubuntu 18.04.4 LTS (GNU/Linux 5.3.0-51-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

 * Canonical Livepatch is available for installation.
   - Reduce system reboots and improve kernel security. Activate at:
     https://ubuntu.com/livepatch

176 packages can be updated.
134 updates are security updates.

Your Hardware Enablement Stack (HWE) is supported until April 2023.
Last login: Thu May 21 17:10:15 2020 from 192.168.57.1
yevhen@yevhen-VirtualBox:~$

yevhen@yevhen-VirtualBox:~$ sudo iptables -D INPUT 2
yevhen@yevhen-VirtualBox:~$ sudo iptables -A INPUT -p icmp -s 0.0.0.0/0 -d 0.0.0.0/0 -j ACCEPT
yevhen@yevhen-VirtualBox:~$ sudo iptables -D INPUT 1
yevhen@yevhen-VirtualBox:~$ sudo iptables -L --line-numbers
Chain INPUT (policy DROP)
num target prot opt source destination
1 ACCEPT icmp -- anywhere anywhere

Chain FORWARD (policy ACCEPT)
num target prot opt source destination

Chain OUTPUT (policy ACCEPT)
num target prot opt source destination
yevhen@yevhen-VirtualBox:~$ sudo iptables -A INPUT -p tcp -n tcp --dport 22 -j ACCEPT
yevhen@yevhen-VirtualBox:~$ sudo iptables -L --line-numbers
Chain INPUT (policy DROP)
num target prot opt source destination
1 ACCEPT icmp -- anywhere anywhere
2 ACCEPT tcp -- anywhere anywhere

Chain FORWARD (policy ACCEPT)
num target prot opt source destination

Chain OUTPUT (policy ACCEPT)
num target prot opt source destination
yevhen@yevhen-VirtualBox:~$
```

The right side of the terminal shows the output of the `ss` command, displaying a list of connections from 192.168.57.3 to 192.168.57.1, all of which are ICMP packets.