Дз 3. Сетевой стек Linux

Блок 1. Админское

Задание 1.1 На двух ВМ создать виртуальное устройство dummy0 и настроить на нём /32 адрес из приватного диапазона

Сеть у обеих ВМ - сетевой мост.

a) Статически (файлом конфигурации в systemd-networkd/NetworkManager)

```
server@server:/etc/systemd/network$ ip addr show dummy0

p: command not found
server@server:/etc/systemd/network$ ip addr show dummy0
5: dummy0: <BROADCAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether 96:f1:69:39:a7:2d brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.1/32 scope global dummy0
       valid_lft forever preferred_lft forever
    inet6 fe80::94f1:69ff:fe39:a72d/64 scope link
       valid_lft forever preferred_lft forever
server@server:/etc/systemd/network$ _
```

```
>> sudo apt install iproute2
>> sudo modprobe dummy
>> echo "dummy" | sudo tee /etc/modules-load.d/dummy.conf
>> sudo nano /etc/systemd/network/10-dummy0.netdev
[NetDev]
Name=dummy0
Kind=dummy
>> ping 192.168.0.1
>> sudo nano /etc/systemd/network/1-dummy0.network
[Match]
Name=dummy0

[Network]
Address=192.168.0.1/32
>> sudo systemctl restart systemd-networkd
>> ip addr show dummy0
```

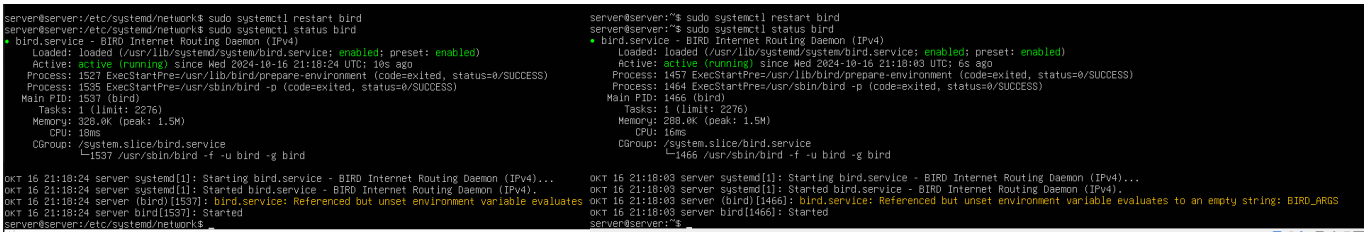
b) Динамически (командами ip. . .)

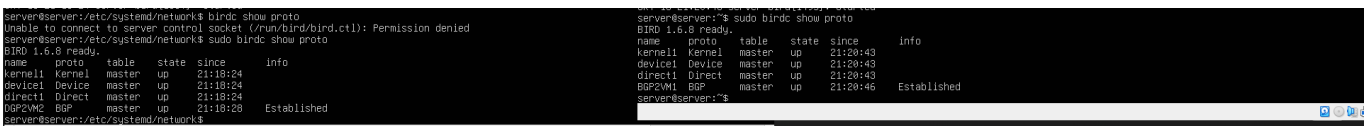
```
server@server:/$ sudo ip link add dummy0 type dummy
server@server:/$ lsmod | grep dummy
dummy                  12288  0
server@server:/$ ping 192.168.0.2
PING 192.168.0.2 (192.168.0.2) 56(84) bytes of data.
^C
--- 192.168.0.2 ping statistics ---
3 packets transmitted, 0 received, 100% packet loss, time 2066ms

server@server:/$ sudo ip addr add 192.168.0.2/32 dev dummy0
server@server:/$ sudo ip link set dummy0 up
server@server:/$ ip addr show dummy0
4: dummy0: <BROADCAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether 8e:af:2a:e3:53:9f brd ff:ff:ff:ff:ff:ff
    inet 192.168.0.2/32 scope global dummy0
       valid_lft forever preferred_lft forever
    inet6 fe80::8caf:2aff:fee3:539f/64 scope link
       valid_lft forever preferred_lft forever
server@server:/$
```

```
>> sudo apt install iproute2
>> sudo modprobe dummy
>> sudo ip link add dummy0 type dummy
>> lsmod | grep dummy
>> ping 192.168.0.2
>> sudo ip addr add 192.168.0.2/32 dev dummy0
>> sudo ip link set dummy up
>> ip addr show dummy0
```

Задание 1.2 Настроить маршрутизацию между /32

a) bird + BGP



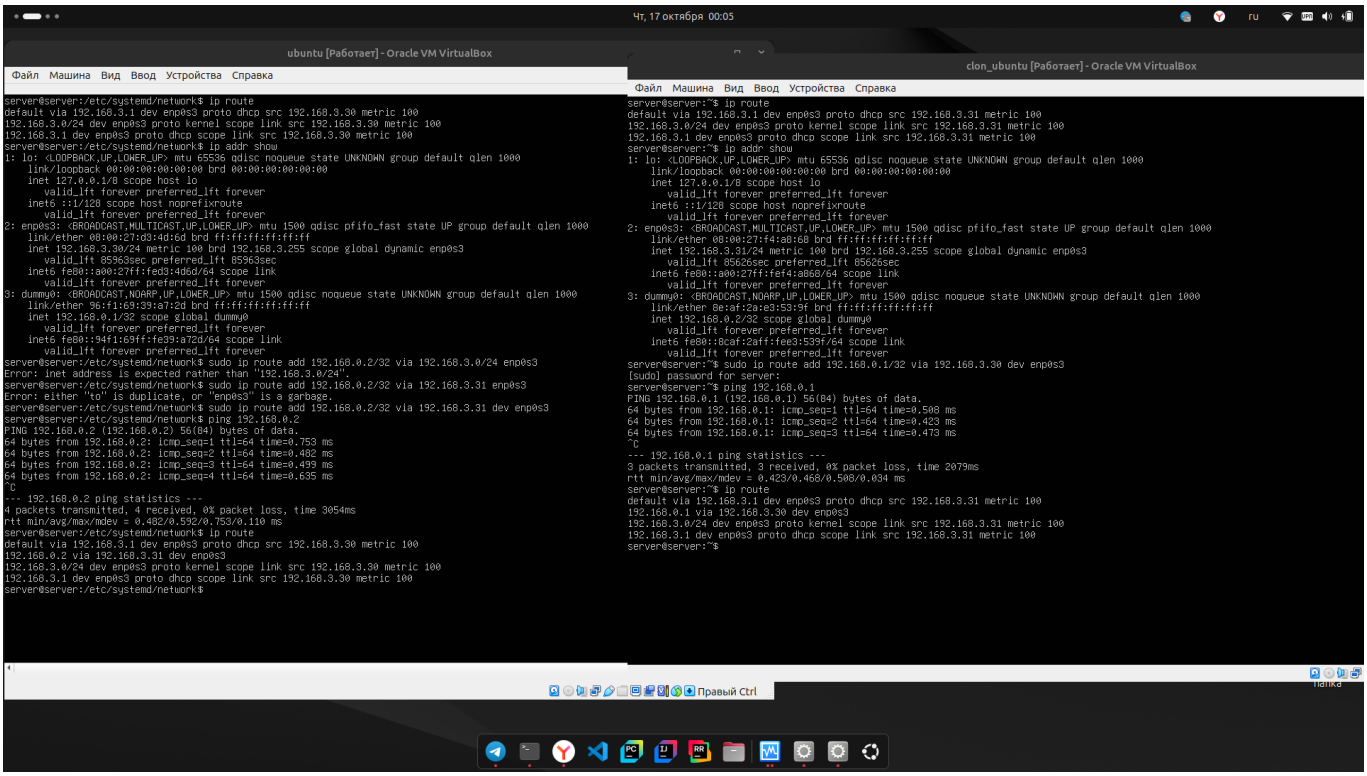


```
bird> show route
192.168.3.0/24     dev enp0s3 [direct1 21:18:24] * (240)
                   via 192.168.3.31 on enp0s3 [DGP2VM2 21:20:46] (100) [AS65002i]
192.168.0.1/32     dev dummy0 [direct1 21:18:24] * (240)
192.168.0.2/32     via 192.168.3.31 on enp0s3 [DGP2VM2 21:20:46] * (100) [AS65002i]
bird> ip r
No such command. Press `?' for help.
bird>
server@server:/etc/systemd/network$ ip r
default via 192.168.3.1 dev enp0s3 proto dhcp src 192.168.3.30 metric 100
192.168.0.2 via 192.168.3.31 dev enp0s3 proto bird
192.168.3.0/24 dev enp0s3 proto kernel scope link src 192.168.3.30 metric 100
192.168.3.1 dev enp0s3 proto dhcp scope link src 192.168.3.30 metric 100
server@server:/etc/systemd/network$ sudo systemctl stop bird
server@server:/etc/systemd/network$ ip r
default via 192.168.3.1 dev enp0s3 proto dhcp src 192.168.3.30 metric 100
192.168.3.0/24 dev enp0s3 proto kernel scope link src 192.168.3.30 metric 100
192.168.3.1 dev enp0s3 proto dhcp scope link src 192.168.3.30 metric 100
server@server:/etc/systemd/network$ ping 192.168.0.2
PING 192.168.0.2 (192.168.0.2) 56(84) bytes of data.
^C
--- 192.168.0.2 ping statistics ---
4 packets transmitted, 0 received, 100% packet loss, time 3086ms

server@server:/etc/systemd/network$
```

```
#VM1
>> sudo nano /etc/bird/bird.conf
router id 192.168.3.30;

protocol kernel {
    persist;
    scan time 20;
    export all;
}

protocol device {
    scan time 10;
}

protocol direct {
    interface "enp0s3", "dummy0";
}

protocol bgp BGP_to_VM2 {
    local as 65001;
    neighbor 192.168.3.31 as 65002;
    import all;
    export all;
    next hop self;
}

>> sudo systemctl restart bird
>> sudo systemctl status bird
>> sudo birdc show proto
>> sudo birdc show route
```

```
>> ip r
>> ping 192.168.0.2
>> sudo systemctl stop bird
>> ping 192.168.0.2

#VM2
>> sudo nano /etc/bird/bird.conf
router id 192.168.3.31;

protocol kernel {
    persist;
    scan time 20;
    export all;
}

protocol device {
    scan time 10;
}

protocol direct {
    interface "enp0s3", "dummy0";
}

protocol bgp BGP_to_VM1 {
    local as 65002;
    neighbor 192.168.3.30 as 65001;
    import all;
    export all;
    next hop self;
}
>> sudo systemctl restart bird
>> sudo systemctl status bird
>> sudo birdc show proto
>> sudo birdc show route
>> ip r
>> ping 192.168.0.1
>> sudo systemctl stop bird
>> ping 192.168.0.1
```

b) Статические маршруты




```
#VM1
>> sudo ip route add 192.168.0.2/32 via 192.168.3.31 dev enp0s3
>> ping 192.168.0.2

#VM2
>> sudo ip route add 192.168.0.1/32 via 192.168.3.30 dev enp0s3
>> ping 192.168.0.1
```

Блок 2. Программистское

Написать программу для DNS резолва (A/AAAA записи) через произвольный DNS сервер. Сетевое взаимодействие организовать через RAW сокет (SOCK RAW). Сформировать UDP пакет, отправить и получить ответ.