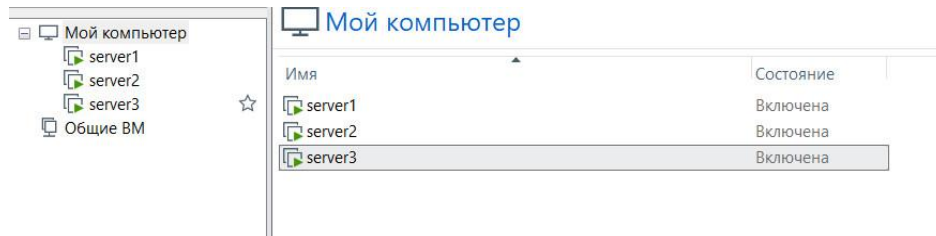


1. Собрать схему из трёх серверов. Два сервера должны иметь как минимум 3 сетевых адаптера. Один сервер должен иметь 2 сетевых адаптера.

Создаём 3 VM



Интерфейсы серверов:

Srv1 3 интерфейса

```
srv1 srv2 srv3
[root@192 ~]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:9c brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.128/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1322sec preferred_lft 1322sec
    inet6 fe80::d067:b01c:17f1:25a4/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:a6 brd ff:ff:ff:ff:ff:ff
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:b0 brd ff:ff:ff:ff:ff:ff
[root@192 ~]#
```

Srv2 3 интерфейса

```
srv1 srv2 srv3
[root@192 ~]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:37 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.129/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1390sec preferred_lft 1390sec
    inet6 fe80::fd67:8cd0:1dd9:7fe5/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:41 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::f456:30be:5791:2cbd/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:4b brd ff:ff:ff:ff:ff:ff
    inet6 fe80::c55:b456:bc3:2df0/64 scope link tentative noprefixroute
        valid_lft forever preferred_lft forever
[root@192 ~]#
```

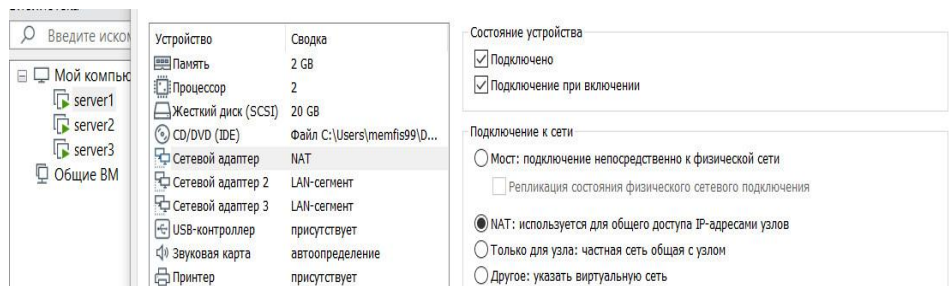
Srv3 2 интерфейса

```
[root@192 network-scripts]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 00:0c:29:89:dd:86 brd ff:ff:ff:ff:ff:ff
   inet 192.168.2.130/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
       valid_lft 1590sec preferred_lft 1590sec
   inet6 fe80::89eb:9028:302c:f52c/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 00:0c:29:89:dd:90 brd ff:ff:ff:ff:ff:ff
   inet6 fe80::b716:acd3:106f:9ca5/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@192 network-scripts]#
```

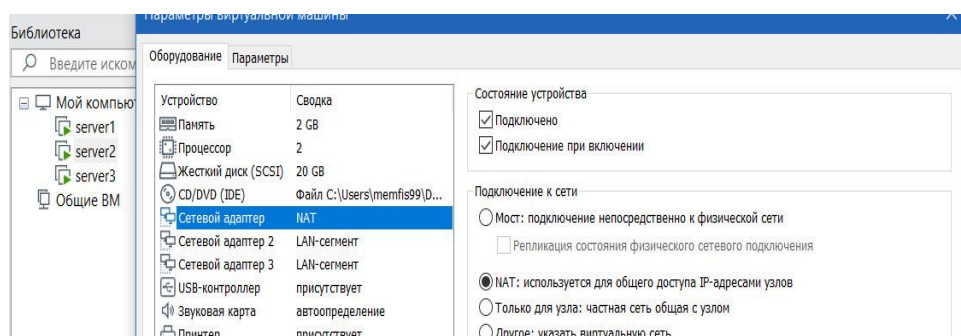
2. Первый интерфейс на каждой виртуальной машине имеет режим подключения bridge (сетевой мост) или nat для предоставления доступа в интернет и по ssh из родительской операционной системы. В этом примере используется bridge, так как есть роутер провайдера, который раздает IP-адреса.

NAT интерфейсы серверов:

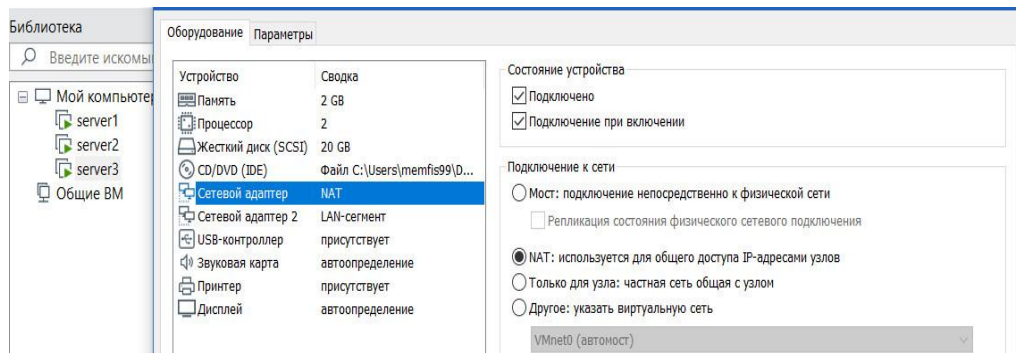
Srv1



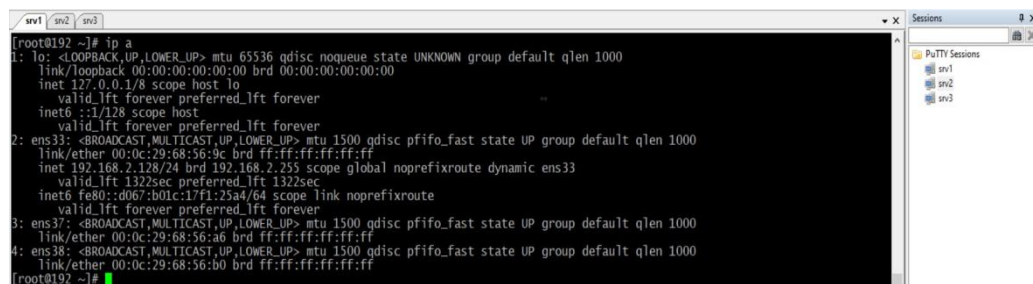
Srv2



Srv3

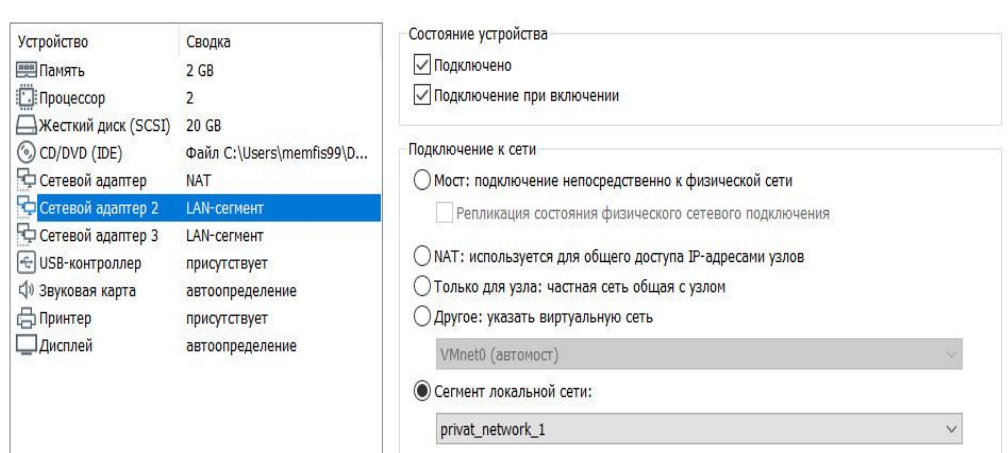


Доступ по SSH



3. Все последующие интерфейсы между серверами организуют отдельные изолированные сегменты. Режим подключения — LAN Segment. Делается это, чтобы изолировать коммуникацию между сетевыми адаптерами устройств.

Lan-segment добавлены к серверам

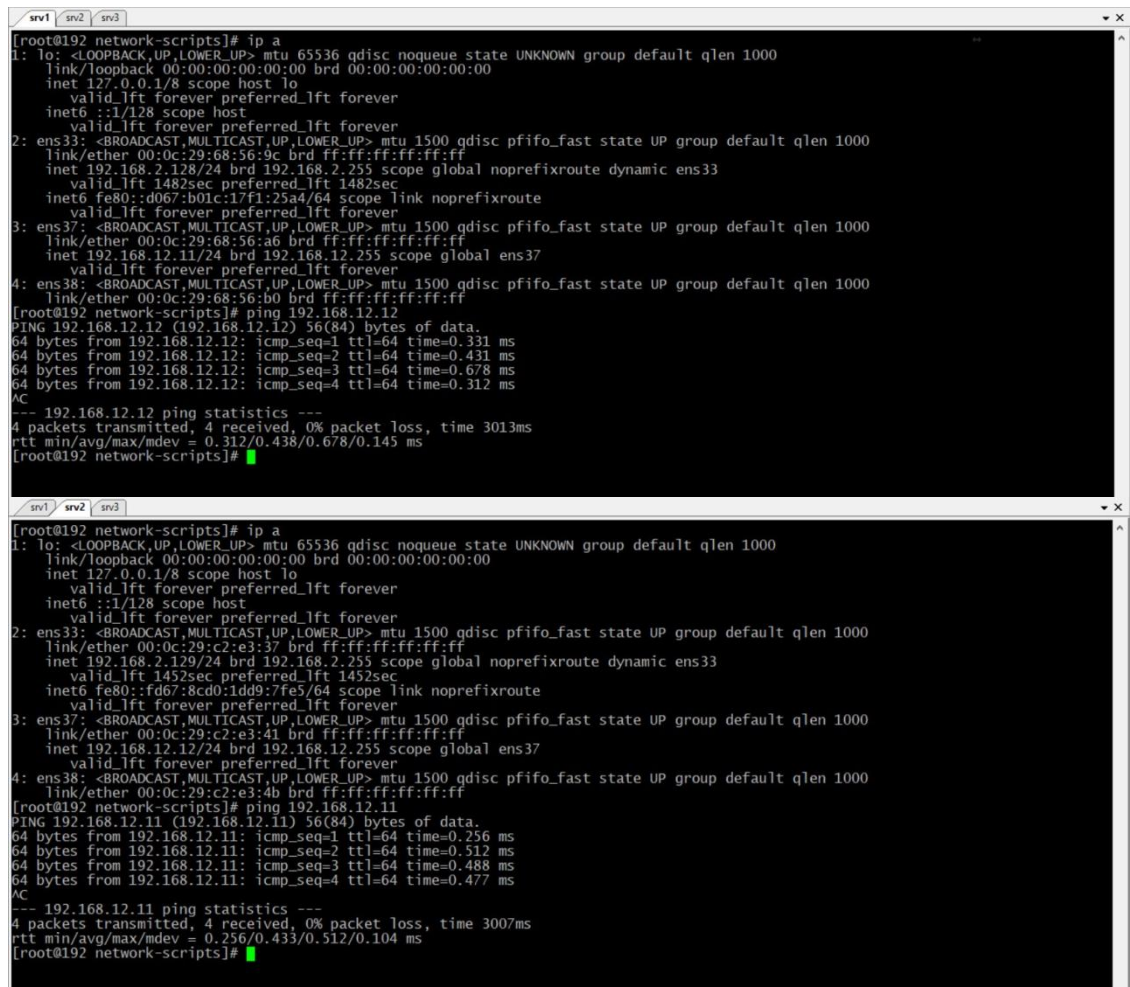


4. Настроить любой из интерфейсов между server1 и server2. Назначить на него адреса из подсети 192.168.12.0/24. Второй интерфейс между ними остается отключенным и в этом задании не участвует.

На srv1 настроен интерфейс ens37 с адресом 192.168.12.11

На srv2 настроен интерфейс ens37 с адресом 192.168.12.12

Проверяем пингуем с srv1 srv2 и наоборот



```
[root@192 network-scripts]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:9c brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.128/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1482sec preferred_lft 1482sec
    inet6 fe80::d067:b01c:17f1:25a4/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:a6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.12.11/24 brd 192.168.12.255 scope global ens37
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:b0 brd ff:ff:ff:ff:ff:ff
[root@192 network-scripts]# ping 192.168.12.12
PING 192.168.12.12 (192.168.12.12) 56(84) bytes of data.
64 bytes from 192.168.12.12: icmp_seq=1 ttl=64 time=0.331 ms
64 bytes from 192.168.12.12: icmp_seq=2 ttl=64 time=0.431 ms
64 bytes from 192.168.12.12: icmp_seq=3 ttl=64 time=0.678 ms
64 bytes from 192.168.12.12: icmp_seq=4 ttl=64 time=0.312 ms
^C
--- 192.168.12.12 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3013ms
rtt min/avg/max/mdev = 0.312/0.438/0.678/0.145 ms
[root@192 network-scripts]#

[srv1] [srv2] [srv3]
[root@192 network-scripts]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:37 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.129/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1452sec preferred_lft 1452sec
    inet6 fe80::fd67:8cd0:1dd9:7fe5/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:41 brd ff:ff:ff:ff:ff:ff
    inet 192.168.12.12/24 brd 192.168.12.255 scope global ens37
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:4b brd ff:ff:ff:ff:ff:ff
[root@192 network-scripts]# ping 192.168.12.11
PING 192.168.12.11 (192.168.12.11) 56(84) bytes of data.
64 bytes from 192.168.12.11: icmp_seq=1 ttl=64 time=0.256 ms
64 bytes from 192.168.12.11: icmp_seq=2 ttl=64 time=0.512 ms
64 bytes from 192.168.12.11: icmp_seq=3 ttl=64 time=0.488 ms
64 bytes from 192.168.12.11: icmp_seq=4 ttl=64 time=0.477 ms
^C
--- 192.168.12.11 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3007ms
rtt min/avg/max/mdev = 0.256/0.433/0.512/0.104 ms
[root@192 network-scripts]#
```

Работает.

5. Настроить подсеть между server2 и server3 с адресами из подсети 192.168.23.0/24.

На srv2 настроен интерфейс ens38 с адресом 192.168.23.12

На srv3 настроен интерфейс ens37 с адресом 192.168.23.13

Проверяем пингуем с srv2 srv3 и наоборот

```

[root@192 network-scripts]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:37 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.129/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1239sec preferred_lft 1239sec
    inet6 fe80::fd67:8cd0:1dd9:7fe5/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:41 brd ff:ff:ff:ff:ff:ff
    inet 192.168.12.12/24 brd 192.168.12.255 scope global ens37
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:4b brd ff:ff:ff:ff:ff:ff
    inet 192.168.23.12/24 brd 192.168.23.255 scope global ens38
        valid_lft forever preferred_lft forever
[root@192 network-scripts]# ping 192.168.23.13
PING 192.168.23.13 (192.168.23.13) 56(84) bytes of data.
64 bytes from 192.168.23.13: icmp_seq=1 ttl=64 time=0.519 ms
64 bytes from 192.168.23.13: icmp_seq=2 ttl=64 time=0.351 ms
64 bytes from 192.168.23.13: icmp_seq=3 ttl=64 time=0.444 ms
64 bytes from 192.168.23.13: icmp_seq=4 ttl=64 time=0.559 ms
^C
--- 192.168.23.13 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3001ms
rtt min/avg/max/mdev = 0.351/0.468/0.559/0.080 ms
[root@192 network-scripts]#

[root@192 network-scripts]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:89:dd:86 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.130/24 brd 192.168.2.255 scope global noprefixroute dynamic ens33
        valid_lft 1419sec preferred_lft 1419sec
    inet6 fe80::89eb:9028:302c:f52c/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:89:dd:90 brd ff:ff:ff:ff:ff:ff
    inet 192.168.23.13/24 brd 192.168.23.255 scope global ens37
        valid_lft forever preferred_lft forever
[root@192 network-scripts]# ping 192.168.23.12
PING 192.168.23.12 (192.168.23.12) 56(84) bytes of data.
64 bytes from 192.168.23.12: icmp_seq=1 ttl=64 time=0.338 ms
64 bytes from 192.168.23.12: icmp_seq=2 ttl=64 time=0.596 ms
64 bytes from 192.168.23.12: icmp_seq=3 ttl=64 time=0.476 ms
64 bytes from 192.168.23.12: icmp_seq=4 ttl=64 time=0.521 ms
^C
--- 192.168.23.12 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3023ms
rtt min/avg/max/mdev = 0.338/0.482/0.596/0.097 ms
[root@192 network-scripts]#
```

6. На каждом из серверов поднять dummy0-интерфейс и назначить на него ip-адрес 1.1.1.1/32, 2.2.2.2/32, 3.3.3.3/32 соответственно.

Подняли

```
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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:37 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.129/24 brd 192.168.2.255 scope global ens33
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fec2:e337/64 scope link
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:41 brd ff:ff:ff:ff:ff:ff
    inet 192.168.12.12/24 brd 192.168.12.255 scope global ens37
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fec2:e341/64 scope link
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:c2:e3:4b brd ff:ff:ff:ff:ff:ff
    inet 192.168.23.12/24 brd 192.168.23.255 scope global ens38
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fec2:e34b/64 scope link
        valid_lft forever preferred_lft forever
5: dummy0: <BROADCAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether da:c2:bd:aa:95:30 brd ff:ff:ff:ff:ff:ff
    inet 2.2.2.2/32 brd 2.2.2.2 scope global dummy0
        valid_lft forever preferred_lft forever
    inet6 fe80::d8c2:bdff:feaa:9530/64 scope link
        valid_lft forever preferred_lft forever
```

```
➤ Using username "root".
➤ root@192.168.2.128's password:
Last login: Mon Jun 21 16:23:56 2021 from 192.168.2.1
[root@192 ~]# 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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:9c brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.128/24 brd 192.168.2.255 scope global ens33
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fe68:569c/64 scope link
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:a6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.12.11/24 brd 192.168.12.255 scope global ens37
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fe68:56a6/64 scope link
        valid_lft forever preferred_lft forever
4: ens38: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:68:56:b0 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::916c:222f:f1fd:c5d7/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
5: dummy0: <BROADCAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether 96:86:11:aa:73:e0 brd ff:ff:ff:ff:ff:ff
    inet 1.1.1.1/32 brd 1.1.1.1 scope global dummy0
        valid_lft forever preferred_lft forever
    inet6 fe80::9486:11ff:feaa:73e0/64 scope link
        valid_lft forever preferred_lft forever
```

```
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: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:89:dd:86 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.130/24 brd 192.168.2.255 scope global ens33
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fe89:dd86/64 scope link
        valid_lft forever preferred_lft forever
3: ens37: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0c:29:89:dd:90 brd ff:ff:ff:ff:ff:ff
    inet 192.168.23.13/24 brd 192.168.23.255 scope global ens37
        valid_lft forever preferred_lft forever
    inet6 fe80::20c:29ff:fe89:dd90/64 scope link
        valid_lft forever preferred_lft forever
4: dummy0: <BROADCAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether be:27:40:5c:a9:1e brd ff:ff:ff:ff:ff:ff
    inet 3.3.3.3/32 brd 3.3.3.3 scope global dummy0
        valid_lft forever preferred_lft forever
    inet6 fe80::bc27:40ff:fe5c:a91e/64 scope link
        valid_lft forever preferred_lft forever
```

7. На серверах установить пакет frr и настроить на роутерах ospf, добавив подсети 192.168.12.0/24, 192.168.23.0/24, 1.1.1.1/32, 2.2.2.2/32, 3.3.3.3/32 в area 0.

Установил frr

```
Installed:
  frr.x86_64 0:7.5.1-01.e17                                frr-pythontools.x86_64 0:7.5.1-01.e17
Dependency Installed:
  c-ares.x86_64 0:1.10.0-3.e17                                libtirpc.x86_64 0:0.2.4-0.16.e17      libyang1.x86_64 0:1.0.184-0
  python3.x86_64 0:3.6.8-18.e17                              python3-libs.x86_64 0:3.6.8-18.e17    python3-pip.noarch 0:9.0.3-8.e17
  python3-setuptools.noarch 0:39.2.0-10.e17
Complete!
```

Добавили сети в OSPF

```
192.168.2.129# show running-config
Building configuration...

Current configuration:
!
frr version 7.5.1
frr defaults traditional
hostname 192.168.2.129
no ip forwarding
no ipv6 forwarding
!
router ospf
 network 2.2.2.0/24 area 0
 network 192.168.12.0/24 area 0
 network 192.168.23.0/24 area 0
!
line vty
!
end
```

```
192.168.2.128# show running-config
Building configuration...

Current configuration:
!
frr version 7.5.1
frr defaults traditional
hostname 192.168.2.128
no ip forwarding
no ipv6 forwarding
!
router ospf
 network 1.1.1.1/32 area 0
 network 192.168.12.0/24 area 0
!
line vty
!
end
```

```
192.168.2.130# show running-config
Building configuration...

Current configuration:
!
frr version 7.5.1
frr defaults traditional
hostname 192.168.2.130
no ip forwarding
no ipv6 forwarding
!
router ospf
 network 3.3.3.3/32 area 0
 network 192.168.23.0/24 area 0
!
line vty
!
end
```


8. Убедиться, что маршрутизация работает, и с server1 вы должны пинговать 3.3.3.3 адрес на server3. Убедитесь, что нужный тип трафика разрешен в firewalld и что трафик не улетает в интернет при помощи traceroute.

Включаем везде firewall и добавляем везде правило для OSPF

firewall-cmd --add-protocol=ospf --permanent --zone=public

При необходимости нужно добавить сетевые интерфейсы в зону управления public.

```
sn2  srv1  srv3
[root@192 network-scripts]# systemctl status firewalld
● firewalld.service - firewalld - dynamic firewall daemon
   Loaded: loaded (/usr/lib/systemd/system/firewalld.service; disabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-06-22 05:26:21 EDT; 15min ago
     Docs: man:firewalld(1)
   Main PID: 4111 (firewalld)
   CGroup: /system.slice/firewalld.service
           └─4111 /usr/bin/python2 -Es /usr/sbin/firewalld --nofork --nopid

Jun 22 05:26:21 192.168.2.128 systemd[1]: Starting firewalld - dynamic firewall daemon...
Jun 22 05:26:21 192.168.2.128 systemd[1]: Started firewalld - dynamic firewall daemon.
Jun 22 05:26:21 192.168.2.128 firewalld[4111]: WARNING: AllowZoneDrifting is enabled. This is considered an insecure confi...t now.
Hint: Some lines were ellipsized, use -l to show in full.
[root@192 network-scripts]# ping 3.3.3.3
PING 3.3.3.3 (3.3.3.3) 56(84) bytes of data:
64 bytes from 3.3.3.3: icmp_seq=1 ttl=63 time=0.775 ms
64 bytes from 3.3.3.3: icmp_seq=2 ttl=63 time=1.10 ms
64 bytes from 3.3.3.3: icmp_seq=3 ttl=63 time=1.11 ms
64 bytes from 3.3.3.3: icmp_seq=4 ttl=63 time=0.718 ms
64 bytes from 3.3.3.3: icmp_seq=5 ttl=63 time=1.21 ms
64 bytes from 3.3.3.3: icmp_seq=6 ttl=63 time=1.11 ms
^C
--- 3.3.3.3 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5024ms
rtt min/avg/max/mdev = 0.718/1.007/1.212/0.188 ms
[root@192 network-scripts]#
```

Работает

Проверяем traceroute

```
traceroute to 3.3.3.3 (3.3.3.3), 30 hops max, 60 byte packets
 1  192.168.12.12 (192.168.12.12)  0.449 ms  0.323 ms  0.281 ms
 2  192.168.12.12 (192.168.12.12)  0.238 ms !X  0.200 ms !X  0.230 ms !X
```

Вылетает через правильный интерфейс.

9. На server3 создайте 2 папки nfs_1 и nfs_2, добавьте их в export.

Добавляем в экспорт

```
exports  [----] 27 L: [ 1+ 0 1/ 3] *(27 / 96b) 0040 0x028 [*][X]
/var/nfs_2 192.168.12.11/24(rw,sync,all_squash)
/var/nfs_1 192.168.12.11/24(rw,sync,all_squash)
```

10. Убедитесь, что только server1 может их примонтировать.

Монтируем

```
[root@192 network-scripts]# mount -t nfs4 3.3.3.3:/var/nfs_1/ /mnt/nfs-share_1/
[root@192 network-scripts]# mount -t nfs4 3.3.3.3:/var/nfs_1/ /mnt/nfs-share_1/
mount.nfs4: /mnt/nfs-share_1 is busy or already mounted
[root@192 network-scripts]# mount -t nfs4 3.3.3.3:/var/nfs_2/ /mnt/nfs-share_2/
[root@192 network-scripts]# mount -t nfs4 3.3.3.3:/var/nfs_2/ /mnt/nfs-share_2/
mount.nfs4: /mnt/nfs-share_2 is busy or already mounted
```


Проверяем mount

```
[root@192 sysconfig]# mount | grep nfs4
3.3.3.3:/var/nfs_1 on /mnt/nfs-share_1 type nfs4 (rw,relatime,vers=4.1,rsize=262144,wsz=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.12.11,local_lock=none,addr=3.3.3.3)
3.3.3.3:/var/nfs_2 on /mnt/nfs-share_2 type nfs4 (rw,relatime,vers=4.1,rsize=262144,wsz=262144,namlen=255,hard,proto=tcp,timeo=600,retrans=2,sec=sys,clientaddr=192.168.12.11,local_lock=none,addr=3.3.3.3)
[root@192 sysconfig]#
```

11. Убедитесь, что после перезагрузки server1 все еще может писать и читать файлы в примонтированных папках

Настраиваем автоматическое монтирование шары при перезагрузке системы, добавляя запись в конец файла /etc/fstab:

```
fstab [----] 97 L: [ 1+12 13/ 13] *(663 / 666b) 0048 0x030 [*] [X] ^
#
# /etc/fstab
# Created by anaconda on Mon Jun 21 09:21:59 2021
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/centos-root / xfs defaults 0 0
UUID=230399bf-5637-4f14-914a-9b1f072cade4 /boot xfs defaults 0 0
/dev/mapper/centos-swap swap swap defaults 0 0
3.3.3.3:/var/nfs_1/ /mnt/nfs-share_1/ nfs auto,noatime,nolock,bg,nfsvers=3,intr,tcp,actimeo=1800 0 0
3.3.3.3:/var/nfs_2/ /mnt/nfs-share_2/ nfs auto,noatime,nolock,bg,nfsvers=3,intr,tcp,actimeo=1800 0 0
```

Ребутаем сервер проверяем

```
Using username "root".
root@192.168.2.128's password:
Last login: Tue Jun 22 13:10:14 2021
[root@192 ~]# mcedit /etc/fstab

[root@192 ~]# df -kh
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        898M   0  898M   0% /dev
tmpfs           910M   0   910M   0% /dev/shm
tmpfs           910M  9.6M   901M   2% /run
tmpfs           910M   0   910M   0% /sys/fs/cgroup
/dev/mapper/centos-root 17G   1.5G   16G   9% /
/dev/sdal       1014M  151M   864M  15% /boot
3.3.3.3:/var/nfs_1/ 17G   1.5G   16G   9% /mnt/nfs-share_1
3.3.3.3:/var/nfs_2/ 17G   1.5G   16G   9% /mnt/nfs-share_2
tmpfs          182M   0   182M   0% /run/user/0
[root@192 ~]#
```

В шаре nfs_1 был создан файл test.txt, проверяем что файл на месте и в качестве теста создаём файл в шаре nfs_2

```
[root@192 nfs-share_2]# ls /mnt/nfs-share_1
test.txt
[root@192 nfs-share_2]# touch test2.txt
[root@192 nfs-share_2]# ls
test2.txt
[root@192 nfs-share_2]#
```

10. На server3 создайте iSCSI target размером 2GB и примонтируйте этот LUN на server1. Создайте там файловую систему xfs. Убедитесь, что диск будет активным после перезагрузки.

Создаём блочное устройство в iscsi target

```
/> ls
o- backstores ..... [Storage objects: 0]
o- block ..... [Storage objects: 0]
o- fileio ..... [Storage objects: 0]
o- pscsi ..... [Storage objects: 0]
o- ramdisk ..... [Storage objects: 0]
o- iscsi ..... [Targets: 0]
o- loopback ..... [Targets: 0]
/ > cd backstores/
/backstores> cd block
/backstores/block>
/backstores/block> create name=test_2g dev=sdb
could not open sdb
/backstores/block> create name=test_2g dev=/sdb
could not open /sdb
/backstores/block> create name=test_2g dev=/dev/sdb
created block storage object test_2g using /dev/sdb.
/backstores/block> ls
o- block ..... [Storage objects: 1]
o- test_2g ..... [/dev/sdb (2.0GiB) write-thru deactivated]
o- alua ..... [ALUA Groups: 1]
o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
/backstores/block>
```

Создаём iscsi target

```
/> cd iscsi
/iscsi> create wwn=iqn.2021-06.test.2g
Created target iqn.2021-06.test.2g.
Created TPG 1.
Global pref auto_add_default_portal=true
Created default portal listening on all IPs (0.0.0.0), port 3260.
/iscsi> ls
o- iscsi ..... [Targets: 1]
o- iqn.2021-06.test.2g ..... [TPGs: 1]
o- tpg1 ..... [no-gen-acls, no-auth]
o- acls ..... [ACLs: 0]
o- luns ..... [LUNS: 0]
o- portals ..... [Portals: 1]
o- 0.0.0.0:3260 ..... [OK]
/iscsi>
```

Создаём Lun

```
o- iscsi ..... [Targets: 1]
o- iqn.2021-06.test.2g ..... [TPGs: 1]
o- tpg1 ..... [no-gen-acls, no-auth]
o- acls ..... [ACLs: 0]
o- luns ..... [LUNS: 0]
o- portals ..... [Portals: 1]
o- 0.0.0.0:3260 ..... [OK]
/iscsi> cd iqn.2021-06.test.2g/tpg1/luns
/iscsi/iqn.2021-06.test.2g/tpg1/luns> create /backstores/block/test_2g
Created LUN 0.
/iscsi/iqn.2021-06.test.2g/tpg1/luns> ls
o- luns ..... [LUNS: 1]
o- lun0 ..... [block/test_2g (/dev/sdb) (default_tg_pt_gp)]
/iscsi/iqn.2021-06.test.2g/tpg1/luns> cd
```

Презентуем lun нашему iscsi инициатору.

```
o- tpg1 ..... [no-gen-acls, no-auth]
o- acls ..... [ACLs: 1]
o- iqn.1994-05.com.redhat:5716fee7ccac ..... [Mapped LUNS: 1]
o- mapped_lun0 ..... [lun0 block/test_2g (rw)]
o- luns ..... [LUNS: 1]
o- lun0 ..... [block/test_2g (/dev/sdb) (default_tg_pt_gp)]
o- portals ..... [Portals: 1]
o- 0.0.0.0:3260 ..... [OK]
/iscsi/iqn.2021-06.test.2g/tpg1>
```

Разрешаем в firewall srv2 хождение трафика между ens37 и ens38

firewall-cmd --direct --permanent --add-rule ipv4 filter FORWARD 0 -i ens37 -o ens38 -j ACCEPT

проверяем доступность lun

```
[root@192 ~]# iscsiadm --mode discoverydb --type sendtargets --portal 3.3.3.3 --discover 3.3.3.3:3260,1 iqn.2021-06.test.2g
```

Подключаемся к lun

```
iscsiadm --mode node --targetname iqn.2021-06.test.2g --portal 3.3.3.3:3260 --login
```

Создаём раздел на диске sdb через fdisk и проверяем

```
[root@192 ~]# lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda          8:0    0   20G  0 disk
├─sda1       8:1    0    1G  0 part /boot
├─sda2       8:2    0   19G  0 part
│   └─centos-root 253:0    0   17G  0 lvm  /
│       └─centos-swap 253:1    0    2G  0 lvm  [SWAP]
└─sdb        8:16    0    2G  0 disk
   └─sdb1     8:17    0    2G  0 part
sr0         11:0    1   4.4G  0 rom
```

Меняем настройки iscsi.conf для автозагрузки

```
/etc/iscsi/iscsid.conf 2793/12603 22% ^
# node.startup = automatic
#
# To manually startup the session set to "manual". The default is automatic.
node.startup = automatic
#
# For "automatic" startup nodes, setting this to "Yes" will try logins on each
# available iface until one succeeds, and then stop. The default "No" will try
# logins on all available ifaces simultaneously.
node.leading_login = Yes
```

Создаём файловую систему и раздел через fdisk

Для автоматического монтирования создаём файл точки монтирования в /etc/systemd/system/

```
[root@localhost system]# ls -l | grep share
-rw-r--r--. 1 root root 149 Jun 23 06:53 share.mount
[root@localhost system]# cat share.mount
[Unit]
Description=Mount iscsi storage

[Mount]
What=/dev/sdb1
Where=/share
Type=xfs
Options=defaults

[Install]
WantedBy=multi-user.target[root@localhost system]#
```

Добавляем файл монтирования в автозагрузку

```
systemctl enable share.mount
```

Ребутаем проверяем что всё работает

```
[root@localhost /]# ls /share
123.txt 321.txt
[root@localhost /]# touch /share/test.txt
[root@localhost /]# ls /share
123.txt 321.txt test.txt
[root@localhost /]# df -kh
Filesystem      Size  Used Avail Use% Mounted on
devtmpfs        898M   0 898M   0% /dev
tmpfs           910M   0 910M   0% /dev/shm
tmpfs           910M  9.6M 901M   2% /run
tmpfs           910M   0 910M   0% /sys/fs/cgroup
/dev/mapper/centos-root 17G  1.5G  16G   9% /
/dev/sda1       1014M 151M  864M  15% /boot
3.3.3.3:/var/nfs_2/  17G  1.5G  16G   9% /mnt/nfs-share_2
3.3.3.3:/var/nfs_1/  17G  1.5G  16G   9% /mnt/nfs-share_1
/dev/sdb1        2.0G   33M  2.0G   2% /share
tmpfs           182M   0 182M   0% /run/user/0
[root@localhost /]#
```