

Задание 1

Имя устройства	IP-адрес	Шлюз по умолчанию
ISP	DHCP 172.16.4.1/28 172.16.5.1/28	DHCP
HQ-RTR	172.16.4.2/28 192.168.10.1/26 192.168.10.97/28 192.168.10.113/29 10.0.1.1/30	172.16.4.1
BR-RTR	172.16.5.2/28 192.168.10.65/27 10.0.1.2/30	172.16.5.1
HQ-SRV	192.168.10.2/26	192.168.10.1
HQ-CLI	192.168.10.98/28	192.168.10.65
BR-SRV	192.168.10.66/27	192.168.10.1

**САМОЕ ВАЖНОЕ КОГДА ДОЙДЕШЬ ДО
ПУНКТЕ МЕНЯТЬ NAMESERVER 8.8.8.8
НА АЙПИШНИКИ НЕ МЕНЯЙ НА
АЙПИШНИКИ НЕ РАБОТАЕТ НИХУЯ**

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ISP

```
mkdir etc/net/ifaces/ens19  
mkdir etc/net/ifaces/ens20
```

```
cp /etc/net/ifaces/ens18/options  
  /etc/net/ifaces/ens19/options  
cp /etc/net/ifaces/ens18/options  
  /etc/net/ifaces/ens20/options
```

```
vim /etc/net/ifaces/ens19/options режим  
редактирования INSERT
```

```
BOOTPROTO=static
```

ЧТОБЫ ПРАВИЛЬНО ВЫЙТИ НАДО
НАЖАТЬ ESC, ПОТОМ ОТДЕЛЬНО
Shift + z + z

```
vim /etc/net/ifaces/ens20/options
```

```
BOOTPROTO=static
```

```
vim /etc/net/ifaces/ens19/ipv4address
```

```
172.16.4.1/28
```

`vim /etc/net/ifaces/ens20/ipv4address`

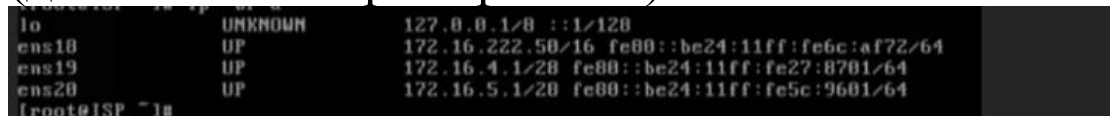
`172.16.5.1/28`

`hostnamectl hostname ISP ; exec bash`

`systemctl restart network`

`ip -br a`

(должно быть примерно так)



```
lo                UNKNOWN        127.0.0.1/8 ::1/128  
ens18             UP              172.16.222.50/16 fe80::be24:11ff:fe6c:af72/64  
ens19             UP              172.16.4.1/28  fe80::be24:11ff:fe27:8701/64  
ens20             UP              172.16.5.1/28  fe80::be24:11ff:fe5c:9601/64  
[root@ISP ~]#
```

`apt-get update`

`apt-get install -y iptables`

`iptables -t nat -j MASQUERADE -A`

`POSTROUTING -o ens18`

`iptables-save`

`vim /etc/net/sysctl.conf`

```
# This file was formerly part of /etc/sysctl.conf
### IPv4 networking options.

# IPv4 packet forwarding.
#
# This variable is special, its change resets all configuration
# parameters to their default state (RFC 1122 for hosts, RFC 1812 for
# routers).
#
net.ipv4.ip_forward = 0

# Source validation by reversed path, as specified in RFC 1812.
#
# Recommended option for single homed hosts and stub network routers.
# Could cause troubles for complicated (not loop free) networks
# running a slow unreliable protocol (sort of RIP), or using static
# routes.
#
net.ipv4.conf.default.rp_filter = 1

# If set to true, then the kernel will ignore ICMP ECHO requests sent
# to broadcast/multicast addresses, preventing the use of your system
# for "smurf" attacks.
#
-- INSERT --
```

строку `net.ipv4.ip_forward = 0` заменить 0 на 1
т.е. так
`net.ipv4.ip_forward = 1`

`systemctl restart network`

HQ-RTR

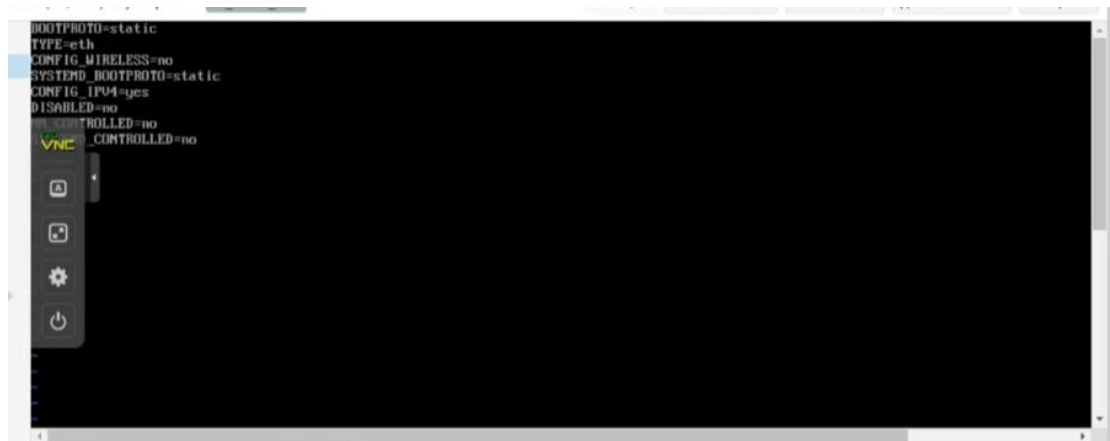
`hostnamectl hostname HQ-RTR.au-team.irpo ;`
`exec bash`

`ip -br a`

`vim /etc/net/iface/ens18/options`

Меняем `dhcp` на `static` в двух местах

как представлено на скриншоте



`vim /etc/net/ifaces/ens18/ipv4address`

`172.16.4.2/28`

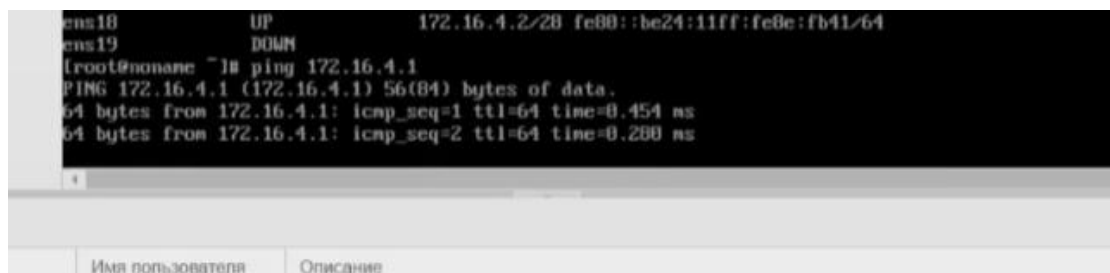
`vim /etc/net/ifaces/ens18/ipv4route`

`default via 172.16.4.1`

`systemctl restart network`

`ip -br a`

`ping 172.16.4.1` (если пингуется то заебись по типу как на скрине)



ping 8.8.8.8 (все так-же если пингуется то супер)

vim /etc/net/iface/ens18/resolv.conf

nameserver 8.8.8.8

systemctl restart network

apt-get update

apt-get install NetworkManager-tui

systemctl enable --now NetworkManager
nmtui

Edit a connection

<ADD>

IP Tunnel

Profile name: BR-RTR

Device: gre1

Mode: GRE

Parent: ens18

Local IP: 172.16.4.2

Remote IP: 172.16.5.2

Ipv4 - Manual

Addresses 10.5.5.1/30

OK

Active a connection

Включить выключить BR-RTR

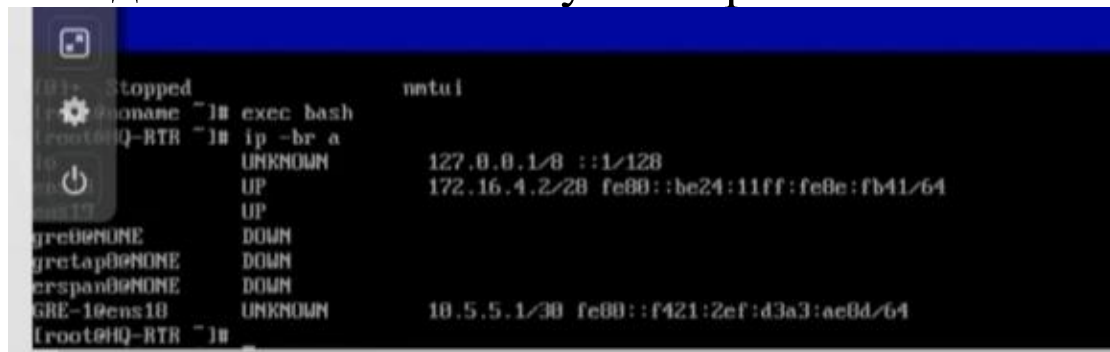
Set hostname

HQ-RTR.au-team.irpo (если по заданию будет не
au-тим.ирпо то другое соответственно писать)

```
exec bash
```

ip -br a

Там должен появиться туннель gre1



Притопали с BR-RTR сюда [1]

```
vim /etc/net/sysctl.conf
```

```
# This file was formerly part of /etc/sysctl.conf
### IPv4 networking options.

# IPv4 packet forwarding.
#
# This variable is special, its change resets all configuration
# parameters to their default state (RFC 1122 for hosts, RFC 1812 for
# routers).
#
net.ipv4.ip_forward = 0

# Source validation by reversed path, as specified in RFC 1812.
#
# Recommended option for single homed hosts and stub network routers.
# Could cause troubles for complicated (not loop free) networks
# running a slow unreliable protocol (sort of RIP), or using static
# routes.
#
net.ipv4.conf.default.rp_filter = 1

# If set to true, then the kernel will ignore ICMP ECHO requests sent
# to broadcast/multicast addresses, preventing the use of your system
# for "smurf" attacks.
#
net.ipv4.icmp_echo_ignore_broadcasts = 1
```

net.ipv4.ip_forward = 1 (0 надо поменять на 1)

iptables -t nat -j MASQUERADE -A
POSTROUTING
iptables-save

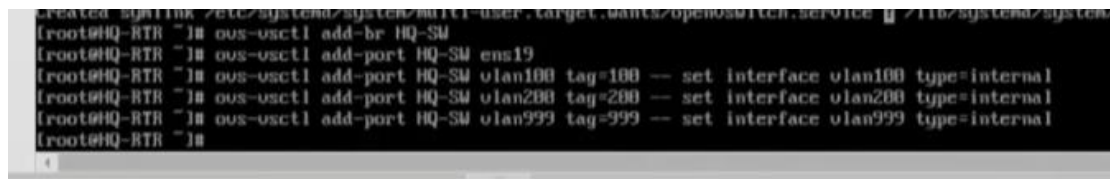
systemctl restart network
systemctl restart NetworkManager

Задание 4

apt-get install openvswitch
systemctl enable --now openvswitch

ovs-vsctl add-br HQ-SW
ovs-vsctl add-port HQ-SW ens19


```
ovs-vsctl add-port HQ-SW vlan 100 tag=100 -- set
interface vlan100 type=internal
ovs-vsctl add-port HQ-SW vlan 200 tag=200 -- set
interface vlan200 type=internal
ovs-vsctl add-port HQ-SW vlan 999 tag=999 -- set
interface vlan999 type=internal
```

A terminal window screenshot showing a series of commands being executed. The commands are: 'ovs-vsctl add-br HQ-SW', 'ovs-vsctl add-port HQ-SW ens19', 'ovs-vsctl add-port HQ-SW vlan100 tag=100 -- set interface vlan100 type=internal', 'ovs-vsctl add-port HQ-SW vlan200 tag=200 -- set interface vlan200 type=internal', and 'ovs-vsctl add-port HQ-SW vlan999 tag=999 -- set interface vlan999 type=internal'. The prompt is root@HQ-RTR ~#. The terminal has a dark background with light-colored text.

```
Created symlink /etc/systemd/systemd-user.target.wants/openvswitch.service → /lib/systemd/systemd-
[root@HQ-RTR ~]# ovs-vsctl add-br HQ-SW
[root@HQ-RTR ~]# ovs-vsctl add-port HQ-SW ens19
[root@HQ-RTR ~]# ovs-vsctl add-port HQ-SW vlan100 tag=100 -- set interface vlan100 type=internal
[root@HQ-RTR ~]# ovs-vsctl add-port HQ-SW vlan200 tag=200 -- set interface vlan200 type=internal
[root@HQ-RTR ~]# ovs-vsctl add-port HQ-SW vlan999 tag=999 -- set interface vlan999 type=internal
[root@HQ-RTR ~]#
```

```
mkdir /etc/net/ifaces/vlan100
mkdir /etc/net/ifaces/vlan200
mkdir /etc/net/ifaces/vlan999
```

```
cp /etc/net/ifaces/ens18/options
/etc/net/ifaces/vlan100/options
cp /etc/net/ifaces/ens18/options
/etc/net/ifaces/vlan200/options
cp /etc/net/ifaces/ens18/options
/etc/net/ifaces/vlan999/options
```

```
echo '192.168.100.1/28' >
/etc/net/ifaces/vlan100/ipv4address
echo '192.168.200.1/28' >
/etc/net/ifaces/vlan200/ipv4address
echo '192.168.99.1/28' >
/etc/net/ifaces/vlan999/ipv4address
```

systemctl restart network

ip -br a(должно быть примерно как на картинке)

```
(root@HQ-RTR ~)# ip -br a
lo                UNKNOWN    127.0.0.1/8  ::1/128
ens18             UP          172.16.4.2/28 fe80::be24:11ff:fe8e:fb41/64
ens19             UP          fe80::fc18:bb00:810e:d696/64
gre0@NONE        DOWN
gretap@NONE       DOWN
erspan@NONE       DOWN
GRE-1@ens18       UNKNOWN    10.5.5.1/30  fe80::f421:2ef:d3a3:ac8d/64
vsw-system        DOWN
HQ-SW             DOWN
vlan100           UNKNOWN    192.168.100.1/28 fe80::cc64:57ff:fe3e:918c/64
vlan200           UNKNOWN    192.168.200.1/28 fe80::8c2e:cfff:fe2f:7a1a/64
vlan999           UNKNOWN    192.168.99.1/28  fe80::a002:93ff:fea1:8995/64
(root@HQ-RTR ~)#
```

ТУТ МЫ ВРУБАЕМ ВСЕ МАШИНЫ

HQ-SRV

HQ-CLI

BR-SRV

И переходим на BR-RTR[2]

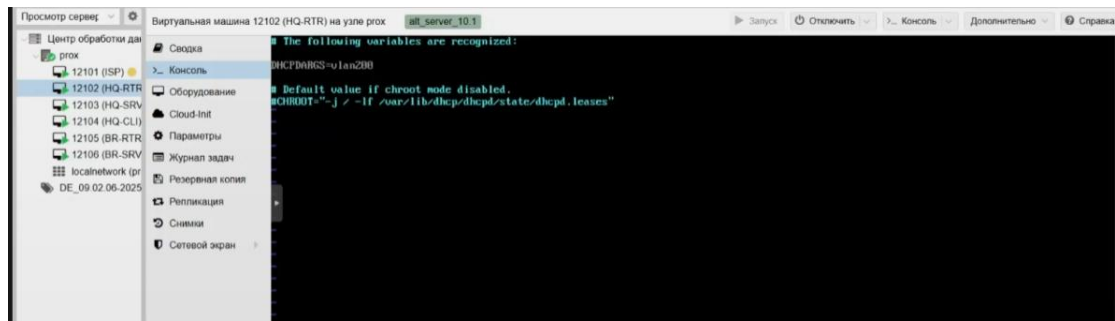
Вернулись с HQ-SRV[5]

ЗАДАНИЕ 9 (DHCP сервер)

apt-get install -y dhcp-server

vim /etc/sysconfig/dhcpd

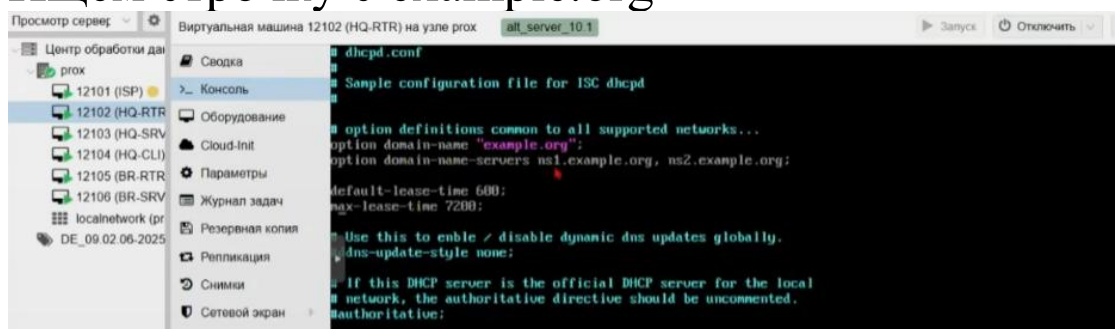
В DHCPDARGS= нужно написать vlan200



```
cp /etc/dhcp/dhcpd.conf.example  
/etc/dhcp/dhcpd.conf
```

```
vim /etc/dhcp/dhcpd.conf
```

Ищем строчку с example.org



Example.org меняем на домен au-team.irpo

в option domain-name-servers удаляем все кроме точки с запятой(или двуточие что это не вижу) и пишем вместо того что удалили 192.168.100.2

Потом спустились до #ddns-update-style none

```
option domain-name au-team.irpo ;
option domain-name-servers 192.168.100.2;

default-lease-time 600;
max-lease-time 7200;

# Use this to enable / disable dynamic dns updates globally
#ddns-update-style none;
```

Удаляем решетку перед ddns, заменяем non на interim, добавляем следующую строку

update-static-leases on;

```
zone au-team.irpo {
    primary 192.168.100.2;
}
```

(чтобы перенести скобку фигурную два раза Enter)(чтобы 50 раз не писать primary мы ставим курсор на zone в самом начале выходим из режима редактирования жмем на Y и на цифру 3, потом спускаемся под фигурную скобку и нажимаем кнопочку P, потом ещё раз стрелку вверх, типо чтобы над скопированной строкой было, и ещё раз P)((должна получится такая картина))

```
zone au-team.irpo {
    primary 192.168.100.2;
}
zone au-team.irpo {
    primary 192.168.100.2;
}
zone au-team.irpo {
    primary 192.168.100.2;
}
```

Во второй зоне стираем au-team.irpo и пишем 100.168.192.in-addr.arpa

В третьей зоне стираем au-team.irpo и пишем 200.168.192.in-addr.arpa

Дальше находим(это находится ниже)

```
subnet 10.254.239.0 netmask 255.255.255.224 {  
    # This is a very basic subnet declaration.  
    range 10.254.239.10 10.254.239.20;  
    option routers rtr-239-0-1.example.org, rtr-239-0-2.example.org;  
}
```

В subnet стираем 10.254.239.0 и пишем вместо этого 192.168.200.0

В netmask 255.255.255.224 меняю на 255.255.255.240

В range стираем все циферки и оставляем только range, после пишем 192.168.200.2 192.168.200.5;

В options routers мы убираем все кроме options routers, после пишем 192.168.200.1

((должно все выглядеть вот так))

```
# This declaration allows DHCP clients to get dynamic addresses  
# which we don't really recommend.  
subnet 10.254.239.32 netmask 255.255.255.224 {  
    range dynamic-bootp 10.254.239.40 10.254.239.60;  
    option broadcast-address 10.254.239.31;  
    option routers rtr-239-32-1.example.org;  
}
```

systemctl restart dhcpcd

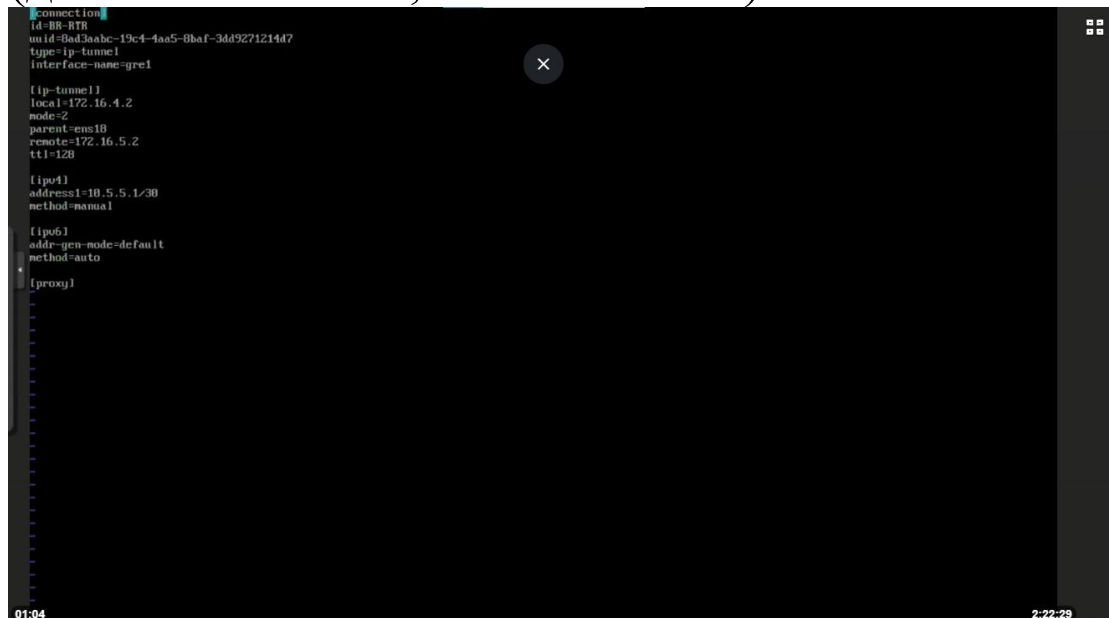
systemctl enable dhcpd

После как ввели эти команды идем на HQ-CLI[6]

Другая запись[7]

vim /etc/NetworkManager/system-connections/тут
нажимаем на ТАВ и первое что высвечивается
то нам и надо.

(должно быть так, но без ttl=128)



```
connection
id=BB-RTR
uuid=8a13aabc-19c4-4aa5-8ba1-3dd927121447
type=ip-tunnel
interface-name=gre1

[ip-tunnel]
local=172.16.4.2
mode=2
parent=encl0
remote=172.16.5.2
ttl=128

[ipv4]
address1=10.5.5.1/30
method=manual

[ipv6]
addr-gen-mode=default
method=auto

[proxy]
```

В этом файле прописываем ttl=128 как показано
на скрине

После сделать reboot

apt-get update

apt-get install -y frr

vim /etc/frr/daemons

(должно быть примерно так)

```
# Sample configurations for these daemons can be found in
# /usr/share/doc/frr/examples/.
#
# ATTENTION:
# When activating a daemon for the first time, a config file, even if it is
# empty, has to be present and be owned by the user and group "frr", else
# the daemon will not be started by /etc/init.d/frr. The permissions should
# be u=rw,g=r,o=.
# When using "vtysh" such a config file is also needed. It should be owned by
# group "frrty" and set to ug=rw,o= though. Check /etc/passwd/frr, too.
# The watchfrr, zebra and staticd daemons are always started.
#
bgpd=no
ospfd=yes
ospf6d=no
ripd=no
ripngd=no
isisd=no
pimd=no
pim6d=no
ldpd=no
nhdpd=no
tigrpd=no
babeld=no
chardpd=no
pbrd=no
bfd=no
fabricd=no
orospd=no
pathd=no
#
# If this option is set the /etc/init.d/frr script automatically loads
# the config via "vtysh -b" when the servers are started.
# Check /etc/passwd/frr if you intend to use "vtysh"!
#
vtysh_enable=yes
zebra_options="-A 127.0.0.1 -s 90000000"
```

В ospfd=no переписываю no на yes

systemctl restart frr

systemctl enable frr

ip -br a(должно быть примерно так)

```
Created symlink /etc/systemd/system/multi-user.target.wants/frr.service → /lib/systemd/
[root@HQ-RTR ~]# ip -br a
lo                UNKNOWN        127.0.0.1/8 ::1/128
ens18             UP             172.16.4.2/28 fe80::be24:11ff:fe4b:c051/64
ens19             UP             fe80::be24:11ff:fe0f:21d0/64
ovs-system        DOWN
vlan100           UNKNOWN        192.168.100.1/28 fe80::cc64:57ff:fe3e:910c/64
vlan200           UNKNOWN        192.168.200.1/28 fe80::8c2e:cfff:fe2f:7a1a/64
HQ-SW             DOWN
vlan999           UNKNOWN        192.168.99.1/28 fe80::a002:93ff:fea1:0995/64
gre0@NONE         DOWN
gretap@NONE       DOWN
erspan@NONE       DOWN
gre1@ens18        UNKNOWN        10.5.5.1/30 fe80::51bb:8adf:50c8:c573/64
[root@HQ-RTR ~]# vtysh
```

vtysh

conf t

ip forwarding

route ospf

network 10.5.5.0/30 area 0

network 192.168.100.0/28 area 0

network 192.168.200.0/28 area 0

network 192.168.99.0/28 area 0

passive-interface default

ex

int gre1

no ip ospf passive

ex

ex

wr

ex

(примерно так)

```
lroot@HQ-RTR ~]# vtysh

Hello, this is FRRouting (version 9.0.2).
Copyright 1996-2005 Kunihiro Ishiguro, et al.

HQ-RTR.au-team.irpo# conf t
HQ-RTR.au-team.irpo(config)# ip forwarding
HQ-RTR.au-team.irpo(config)# route ospf
HQ-RTR.au-team.irpo(config-router)# network 10.5.5.0/30 area 0
HQ-RTR.au-team.irpo(config-router)# network 192.168.100.0/28 area 0
HQ-RTR.au-team.irpo(config-router)# network 192.168.200.0/28 area 0
HQ-RTR.au-team.irpo(config-router)# network 192.168.99.0/28 area 0
HQ-RTR.au-team.irpo(config-router)# passive-interface default
HQ-RTR.au-team.irpo(config-router)# ex
HQ-RTR.au-team.irpo(config)# int gre1
HQ-RTR.au-team.irpo(config-if)# no ip ospf passive
HQ-RTR.au-team.irpo(config-if)# ex
HQ-RTR.au-team.irpo(config)# ex
HQ-RTR.au-team.irpo# wr
Note: this version of vtysh never writes vtysh.conf
Building Configuration...
Integrated configuration saved to /etc/frr/frr.conf
[OK]
HQ-RTR.au-team.irpo# ex
lroot@HQ-RTR ~]#
```


Идем настраивать BR-RTR до этого же момента[8]

Пришли с BR-RTR рестартать[9]

`systemctl restart frr`

`ping 10.5.5.2`

(там должно быть так примерно)

```
root@HQ-RTR ~# ping 10.5.5.2
PING 10.5.5.2 (10.5.5.2) 56(84) bytes of data:
64 bytes from 10.5.5.2: icmp_seq=1 ttl=64 time=146 ms
64 bytes from 10.5.5.2: icmp_seq=2 ttl=64 time=0.590 ms
64 bytes from 10.5.5.2: icmp_seq=3 ttl=64 time=0.384 ms
64 bytes from 10.5.5.2: icmp_seq=4 ttl=64 time=0.666 ms
64 bytes from 10.5.5.2: icmp_seq=5 ttl=64 time=0.650 ms
^C
```

`ip r`

(должно быть так)

```
root@HQ-RTR ~# ip r
default via 172.16.4.1 dev ens18
10.5.5.0/30 dev gre1 proto kernel scope link src 10.5.5.1 metric 675
172.16.4.0/28 dev ens18 proto kernel scope link src 172.16.4.2
192.168.0.0/28 nhid 68 via 10.5.5.2 dev gre1 proto ospf metric 20
192.168.99.0/28 dev vlan999 proto kernel scope link src 192.168.99.1
192.168.100.0/28 dev vlan100 proto kernel scope link src 192.168.100.1
192.168.200.0/28 dev vlan200 proto kernel scope link src 192.168.200.1
```

Проверить iptables-save

Если ничего не пишет типо маскарды не маскарды то пиздец прописываем большую команду, если все пишет команды ниже не пишем

```

```
iptables -t nat -j MASQUERADE -A
POSTROUTING
```

```
iptables-save >> /etc/sysconfig/iptables
```

```

Проверяем iptables на BR-RTR[10]

Вернулись чтобы убрать 8рки[12]

```
vim /etc/net/ifaces/ens18/resolv.conf
```

```
nameserver 8.8.8.8
```

8-рки меняем

```
192.168.100.2
```

```
domain au-team.irpo
```

Переходим BR-RTR[13]

Перешли сюда [18]

```
systemctl restart network  
reboot
```

Переходим на BR-SRV[19]

Перешли сюда[21]

```
iptables -t nat -j MASQUERADE -A  
POSTROUTING  
iptables-save
```

Пишем

```
vim /etc/dhcp/dhcpd.conf
```

Должны долистать вниз до `hq-cli`

```
# A slightly different configuration for an internal subnet.  
subnet 10.5.5.0 netmask 255.255.255.224 {  
    range 10.5.5.26 10.5.5.30;  
    option domain-name-servers ns1.internal.example.org;  
    option domain-name "internal.example.org";  
    option routers 10.5.5.1;  
    option broadcast-address 10.5.5.31;  
    default-lease-time 600;  
    max-lease-time 7200;  
}  
  
# Hosts which require special configuration options can be listed in  
# host statements.  If no address is specified, the address will be  
# allocated dynamically (if possible), but the host-specific information  
# will still come from the host declaration.  
  
host passacaglia {  
    *hardware ethernet 0:8:c0:5d:bd:95;  
    filename "unix.passacaglia";  
    server-name "toccata.example.com";  
}  
  
# Fixed IP addresses can also be specified for hosts.  These addresses  
# should not also be listed as being available for dynamic assignment.  
# Hosts for which fixed IP addresses have been specified can boot using  
# BOOTP or DHCP.  Hosts for which no fixed address is specified can only  
# be booted with DHCP, unless there is an address range on the subnet  
# to which a BOOTP client is connected which has the dynamic-bootp flag  
# set.  
host hq-cli {  
    hardware ethernet bc:24:11:61:37:5c;  
    fixed-address 192.168.200.10;  
}  
  
# You can declare a class of clients and then do address allocation  
# based on that.  The example below shows a case where all clients  
# in a certain class get addresses on the 10.17.224/24 subnet, and all  
# other clients get addresses on the 10.0.29/24 subnet.  
  
class "foo" {  
    match if substring (option vendor-class-identifier, 0, 4) = "SUNW";  
}  
  
shared-network 224-29 {  
    subnet 10.17.224.0 netmask 255.255.255.0 {
```

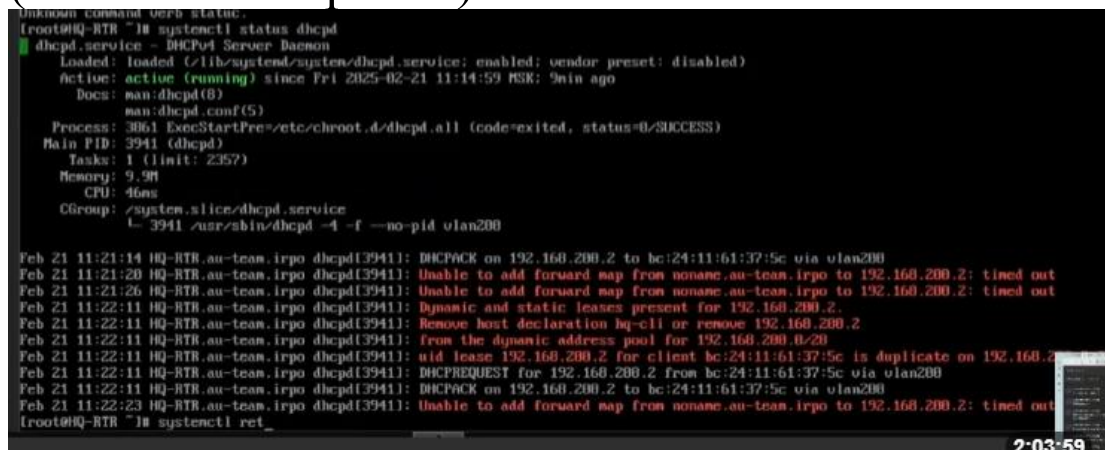
В fixed-address пишем 192.168.200.2

systemctl restart dhcpd

Переходим на HQ-CLI[22]

Перешли сюда[23]

Пишем systemctl status dhcpd
(если такая картина)



```
Unknown command verb status.
[root@HQ-RTR ~]# systemctl status dhcpd
● dhcpd.service - DHCPd Server Daemon
   Loaded: loaded (/lib/systemd/systemd/dhcpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2025-02-21 11:14:59 MSK; 9min ago
     Docs: man:dhcpd(8)
           man:dhcpd.conf(5)
   Process: 3861 ExecStartPre=/etc/chroot.d/dhcpd.all (code=exited, status=0/SUCCESS)
  Main PID: 3941 (dhcpd)
    Tasks: 1 (limit: 2357)
   Memory: 9.9M
      CPU: 46ms
   CGroup: /system.slice/dhcpd.service
           └─ 3941 /usr/sbin/dhcpd -4 -f --no-pid wlan200

Feb 21 11:21:14 HQ-RTR.au-team.irpo dhcpd[3941]: DHCPACK on 192.168.200.2 to bc:24:11:61:37:5c via wlan200
Feb 21 11:21:20 HQ-RTR.au-team.irpo dhcpd[3941]: Unable to add forward map from noname.au-team.irpo to 192.168.200.2: timed out
Feb 21 11:21:26 HQ-RTR.au-team.irpo dhcpd[3941]: Unable to add forward map from noname.au-team.irpo to 192.168.200.2: timed out
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: Dynamic and static leases present for 192.168.200.2.
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: Remove host declaration hq-cli or remove 192.168.200.2
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: from the dynamic address pool for 192.168.200.0/20
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: uid lease 192.168.200.2 for client bc:24:11:61:37:5c is duplicate on 192.168.2
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: DHCPREQUEST for 192.168.200.2 from bc:24:11:61:37:5c via wlan200
Feb 21 11:22:11 HQ-RTR.au-team.irpo dhcpd[3941]: DHCPACK on 192.168.200.2 to bc:24:11:61:37:5c via wlan200
Feb 21 11:22:23 HQ-RTR.au-team.irpo dhcpd[3941]: Unable to add forward map from noname.au-team.irpo to 192.168.200.2: timed out
[root@HQ-RTR ~]# systemctl re_
```

То пишем
systemctl restart dhcpd
Переходим на HQ-CLI[24]

BR-RTR

```
hostnamectl hostname BR-RTR.au-team.irpo ; exec  
bash
```

```
vim /etc/net/ifaces/ens18/options
```

Все так-же меняем dhcp на static

```
vim /etc/net/ifaces/ens18/ipv4address
```

```
172.16.5.2/28
```

```
vim /etc/net/ifaces/ens18/ipv4route
```

```
default via 172.16.5.1
```

```
vim /etc/net/ifaces/ens18/resolv.conf
```

```
nameserver 8.8.8.8
```

```
systemctl restart network
```

```
ip -br a
```

```
ping 8.8.8.8
```

```
ping 172.16.5.1
```

Если обе команды пинганулись все кайфы

```
apt-get update
```

```
apt-get install NetworlManager-tui
```

systemctl enable --now NetworkManager

nmtui

Edit a connection

<ADD>

IP Tunnel

Profile name: HQ-RTR

Device: gre1

Mode: GRE

Parent: ens18

Local IP: 172.16.5.2

Remote IP: 172.16.4.2

Ipv4 - Manual

Addresses 10.5.5.2/30

OK

Active a connection

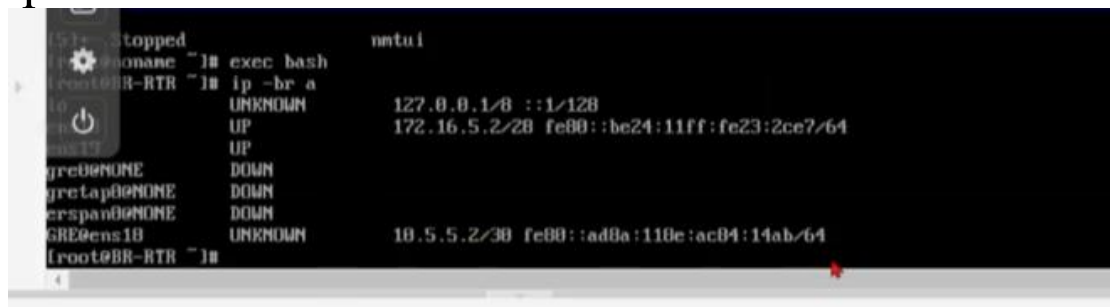
Включить выключить HQ-RTR

Set hostname

BR-RTR.au-team.irpo (если по заданию будет не ау-тим.ирпо то другое соответственно писать)

exec bash

ip -br a



ping 10.5.5.1(должно по сути пинговаться)

vim /etc/net/sysctl.conf

```
# This file was formerly part of /etc/sysctl.conf
### IPv4 networking options.

# IPv4 packet forwarding.
#
# This variable is special, its change resets all configuration
# parameters to their default state (RFC 1122 for hosts, RFC 1812 for
# routers).
#
net.ipv4.ip_forward = 0

# Source validation by reversed path, as specified in RFC 1812.
#
# Recommended option for single homed hosts and stub network routers.
# Could cause troubles for complicated (not loop free) networks
# running a slow unreliable protocol (sort of RIP), or using static
# routes.
#
net.ipv4.conf.default.rp_filter = 1

# If set to true, then the kernel will ignore ICMP ECHO requests sent
# to broadcast/multicast addresses, preventing the use of your system
# for "smurf" attacks.
#
net.ipv4.icmp_echo_ignore_broadcasts = 1
```

net.ipv4.ip_forward = 1 (0 надо поменять на 1)

iptables -t nat -j MASQUERADE -A
POSTROUTING
iptables-save

systemctl restart network
systemctl restart NetworkManager
После топаем на HQ-RTR[1]

ПОСЛЕ ВКЛЮЧЕНИЯ ВСЕХ МАШИНОК
ПРИТОПАЛИ СЮДА[2]

ip -br a
(видим примерно такую картину)

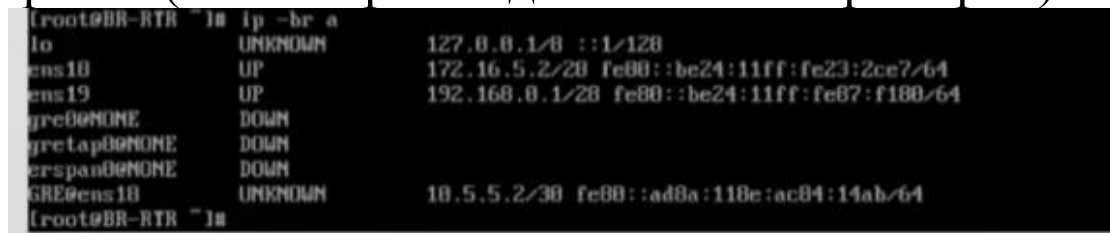
```
(root@HQ-RTR ~)# ip -br a
lo                UNKNOWN        127.0.0.1/8 ::1/128
ens18             UP                172.16.5.2/28 fe80::be24:11ff:fe23:2ce7/64
ens19             UP
gre0@NONE        DOWN
gretap@NONE       DOWN
erspan@NONE       DOWN
GRE@ens18         UNKNOWN        10.5.5.2/30 fe80::ad8a:118e:ac84:14ab/64
(root@HQ-RTR ~)#
```



```
mkdir /etc/net/ifaces/ens19
cp /etc/net/ifaces/ens18/options
  /etc/net/ifaces/ens19/options
```

```
echo '192.1628.0.1/28' >
/etc/net/ifaces/ens19/ipv4address
```

```
systemctl restart network
ip -br a(такая картина должна быть примерно)
```



```
root@BR-RTR ~# ip -br a
lo                UNKNOWN      127.0.0.1/8 ::1/128
ens18             UP           172.16.5.2/28 fe80::be24:11ff:fe23:2ce7/64
ens19             UP           192.168.0.1/28 fe80::be24:11ff:fe87:f180/64
gre0@NONE        DOWN
gre1ap@NONE       DOWN
erspan@NONE       DOWN
GRE@ens18         UNKNOWN      18.5.5.2/30 fe80::ad8a:118e:ac84:14ab/64
root@BR-RTR ~#
```

ТОПАЕМ НА BR-SRV[3]

Притопали с HQ-RTR[8]

```
apt-get update
apt-get install -y frr
```

```
vim /etc/frr/daemons
(меняем ospfd с no на yes)
```

```

# When activating a daemon for the first time, a config file, even if it is
# empty, has to be present *and* be owned by the user and group "frr", else
# the daemon will not be started by /etc/init.d/frr. The permissions should
# be u=rw,g=r,o=.
# When using "vtysh" such a config file is also needed. It should be owned by
# group "frrty" and set to ug=rw,o= though. Check /etc/passwd/frr, too.
#
# The watchfrr, zebra and staticd daemons are always started.
#
bgpd=no
ospfd=no
ospf6d=no
ripd=no
ripngd=no
isisd=no
pimd=no
pin6d=no
ldpd=no
nhrpd=no
eigrpd=no
babeld=no
sharpd=no
pbrd=no
bfd=no
fabricd=no
vrrpd=no
pathd=no

#
# If this option is set the /etc/init.d/frr script automatically loads
# the config via "vtysh -b" when the servers are started.
# Check /etc/passwd/frr if you intend to use "vtysh"!
#

```

systemctl restart frr
systemctl enable frr
ip -br a(должно быть примерно так)

```

[root@BR-RTR ~]# ip -br a
lo                UNKNOWN    127.0.0.1/8 ::1/128
ens18             UP         172.16.5.2/28 fe80::be24:11ff:fe12:163c/64
ens19            UP         192.168.0.1/28 fe80::be24:11ff:fee6:268f/64
gre0@NONE        DOWN
gretap0@NONE     DOWN
erspan0@NONE     DOWN
gre1@ens18       UNKNOWN    10.5.5.2/30 fe80::e763:7bd1:8639:e2fe/64

```

vtysh

conf t

ip forwarding

route ospf

network 10.5.5.0/30 area 0

network 192.168.0.0/28 area 0

passive-interface default

ex

int gre1

no ip ospf passive

```
ex
ex
wr
ex
```

```
systemctl restart frr
```

Топаем на HQ-RTR и делаем тоже рестарт[9]

Проверяем iptables на BR-RTR[10]

Если ничего не пишет типо маскарады не
маскарады то пиздец прописываем большую
команду, если все пишет команды ниже не
пишем

```
'''
```

```
iptables -t nat -j MASQUERADE -A  
POSTROUTING
```

```
iptables-save >> /etc/sysconfig/iptables
```

```
'''
```

Проверяем iptables на BR-RTR[10]

Переходим на HQ-SRV[11]

Перешли на BR-RTR[13]

```
vim /etc/net/ifaces/ens18/resolv.conf  
nameserver 192.168.100.2  
domain au-team.irpo
```

Переходим на BR-SRV[14]

Перешли сюда[17]

```
systemctl restart network  
reboot
```

Переходим на HQ-RTR[18]

Пришли сюда[20]

У нас не пингуется а значит скорее всего слетели iptables

Проверяем iptables-save если ничего нет пишем длинную команду

```
iptables -t nat -j MASQUERADE -A  
POSTROUTING  
iptables-save >> /etc/sysconfig/iptables
```

Дальше топаем на HQ-RTR[21]

BR-SRV

vim /etc/net/ifaces/ens18/options
dhcp на static меняем

vim /etc/net/ifaces/ens18/ipv4address
192.168.0.2/28

vim /etc/net/ifaces/ens18/ipv4route
default via 192.168.0.1
vim /etc/net/ifaces/ens18/resolv.conf

nameserver 8.8.8.8

systemctl restart network
ip -br a (должно быть примерно так)



```
(root@noname ~)# ip -br a
lo                UNKNOWN      127.0.0.1/8  ::1/128
ens18             UP                192.168.0.2/28  fe80::be24:11ff:fe01:3d7b:64
```

hostnamectl hostname BR-SRV.au-team.irpo ; exec
bash

ДАЛЬШЕ ПЕРЕХОДИМ НА HQ-SRV[4]

Перешли на BR-SRV[14]

`vim /etc/net/iface/ens18/resolv.conf`

`nameserver 192.168.200.2`
`domain au-team.irpo`

Переходим на HQ-CLI[15]

Перешли сюда[16]

Делаем `systemctl restart network`
Потом пытаемся пингануть
`ping HQ-RTR`
Если не проходит пинг делаем ребут
`Reboot`

Дальше переходим на BR-RTR[17]

Перешли сюда[19]

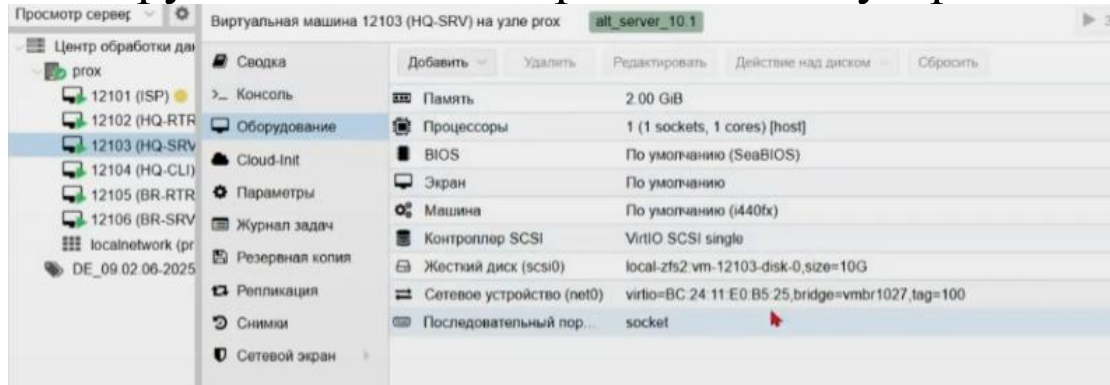
`ping hq-srv`

Если не пингуется идем на BR-RTR[20]

HQ-SRV

```
hostnamectl hostname HQ-SRV.au-team.irpo ;  
exec bash
```

В оборудовании посмотрели сетевое устройство



```
tag=100
```

Значит в `ipaddress` будем использовать
192.168.100

```
vim /etc/net/ifaces/ens18/options
```

dhcp на static меняем

```
vim /etc/net/ifaces/ens18/ipv4address
```

```
192.168.100.2/28
```

```
vim /etc/net/ifaces/ens18/ipv4route
```

```
default via 192.168.100.1
```

```
vim /etc/net/ifaces/ens18/resolv.conf
```

```
nameserver 8.8.8.8
```

systemctl restart network

ip -br a (должно быть примерно так)

```
(root@HQ-SRV ~)# ip -br a
lo                UNKNOWN      127.0.0.1/8      ::1/128
ens18             UP            192.168.100.2/28  fe80::be24:11ff:fee0:b525/64
(root@HQ-SRV ~)# ping 192.168.100.1
```

ping 192.168.100.1 (должно пинговаться)

ВОЗВРАЩАЕМСЯ НА HQ-RTR[5]

Перешли на HQ-SRV[11]

apt-get update

apt-get install -y bind

vim /var/lib/bind/etc/options.conf

(должно быть так)

```
options {
    version "unknown";
    directory "/etc/bind/zone";
    dump-file "/var/run/named/named_dump.db";
    statistics-file "/var/run/named/named.stats";
    recursing-file "/var/run/named/named.recursing";
    secroots-file "/var/run/named/named.secroots";

    // disables the use of a PID file
    pid-file none;

    /*
     * Oftenly used directives are listed below.
     */

    listen-on { 127.0.0.1; };
    listen-on-v6 { ::1; };

    /*
     * If the forward directive is set to "only", the server will only
     * query the forwarders.
     */
    //forward only;
    //forwarders { };

    /*
     * Specifies which hosts are allowed to ask ordinary questions.
     */
    //allow-query { localnets; };

    /*
     * This lets "allow-query" be used to specify the default zone access
     * level rather than having to have every zone override the global
     * value. "allow-query-cache" can be set at both the options and view
     * levels. If "allow-query-cache" is not set then "allow-recursion" is
     * used if set, otherwise "allow-query" is used if set unless
     * "recursion no;" is set in which case "none;" is used, otherwise the
     * default (localhost; localnets;) is used.
     */
    //allow-query-cache { localnets; };

    /*
     * Specifies which hosts are allowed to make recursive queries
     * through this server. If not specified, the default is to allow
     * recursive queries from all hosts. Note that disallowing recursive
     * queries for a host does not prevent the host from retrieving data
     * that is already in the server's cache.
     */
    //allow-recursion { localnets; };
}
```

listen-on стираем айпи пишем any

listen-on-v6 стираем ::1 и пишем none

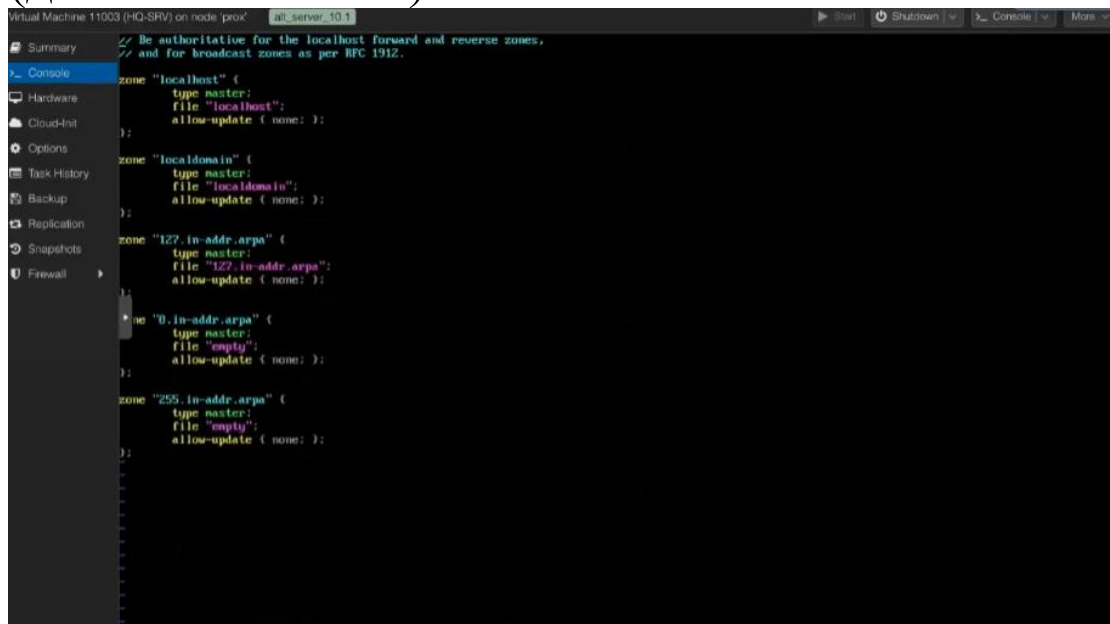
Спускаемся до forwarders убираем два слеша
И в скобках пишем 8.8.8.8; (точка с запятой
обязательно)

Спускаемся до allow-query, в скобках пишем
any

Спускаемся до allow-recursion, в скобках пишем
any и на конце ;

Выходим из файла

`vim /var/lib/bind/etc/rfc1912.conf`
(должно быть так)



```
Virtual Machine 11003 (HQ-SRV) on node 'prox'  all_server_10.1  Start  Shutdown  Console  More
Summary
Console
Hardware
Cloud-Init
Options
Task History
Backup
Replication
Snapshots
Firewall

// Be authoritative for the localhost forward and reverse zones,
// and for broadcast zones as per RFC 1912.

zone "localhost" {
    type master;
    file "localhost";
    allow-update { none; };
};

zone "localdomain" {
    type master;
    file "localdomain";
    allow-update { none; };
};

zone "127.in-addr.arpa" {
    type master;
    file "127.in-addr.arpa";
    allow-update { none; };
};

*ne "0.in-addr.arpa" {
    type master;
    file "empty";
    allow-update { none; };
};

zone "255.in-addr.arpa" {
    type master;
    file "empty";
    allow-update { none; };
};
```

Стираем в первой zone, localhost и пишем

au-team.irpo

В file стираем localhost и пишем au-team.db

allow-update { any; }

allow-transfer { any; }

Zone localdomain полностью убираем

Чтобы быстро стриять надо нажимать два раза D, но нужно выйти из режима редактирования

Zone 127,

В этой зоне 127 стираем остальное оставляем

И пишем 100.168.192 вместо 127

В file 127 меняем на 100

В allow-update меняем none на any

В zone 0 стираем 0 остальное оставляем и пишем 200.168.192

В file ставим просто 200

В allow-update вместо none пишем any

Zone 255 просто удаляем

cd /var/lib/bind/etc/zone

ls(должно быть примерно так)

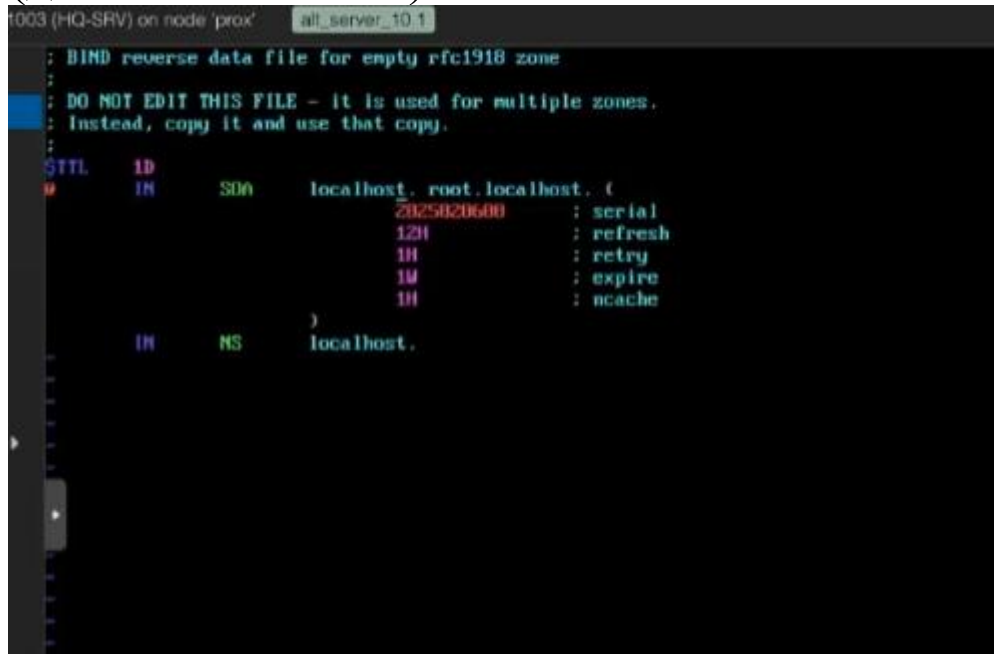


```
"/var/lib/bind/etc/rfc1912.conf" 22L, 438B written
[root@HQ-SRU ~]# cd /var/lib/bind/etc/zone
[root@HQ-SRU zone]# ls
127.in-addr.arpa empty localdomain localhost slave
[root@HQ-SRU zone]#
```

cp empty au.team.db

vim au.team.db

(должно быть так)



```
1003 (HQ-SRV) on node 'prox'  all_server_10.1
: BIND reverse data file for empty rfc1918 zone
:
: DO NOT EDIT THIS FILE - it is used for multiple zones.
: Instead, copy it and use that copy.
:
$TTL      1D
IN        SOA      localhost. root.localhost. (
                                2025020600 : serial
                                12H         : refresh
                                1H         : retry
                                1W         : expire
                                1H         : ncache
                                )
IN        NS       localhost.
```

Стираем localhost и пишем hq-srv.au-team.irpo

Так-же стираем localhost в конце и пишем
au-team.irpo

Переходим ниже NS localhost

Стираем localhost пишем hq-srv.au-team.irpo

Переходим на некст строку через ентер

Пишем

IN (ТАВ типо табулируем)

A (еще раз табулируем)

192.168.100.2

Ентер

Пишем с самого начала строки
hq-rtr (табулируем)
IN(табулируем)
A(табулируем)
192.168.100.1

Пишем с самого начала строки
br-rtr (табулируем)
IN(табулируем)
A(табулируем)
192.168.0.1

Пишем с самого начала строки
hq-srv (табулируем)
IN(табулируем)
A(табулируем)
192.168.100.2

Пишем с самого начала строки
hq-cli (табулируем)
IN(табулируем)
A(табулируем)
192.168.200.2

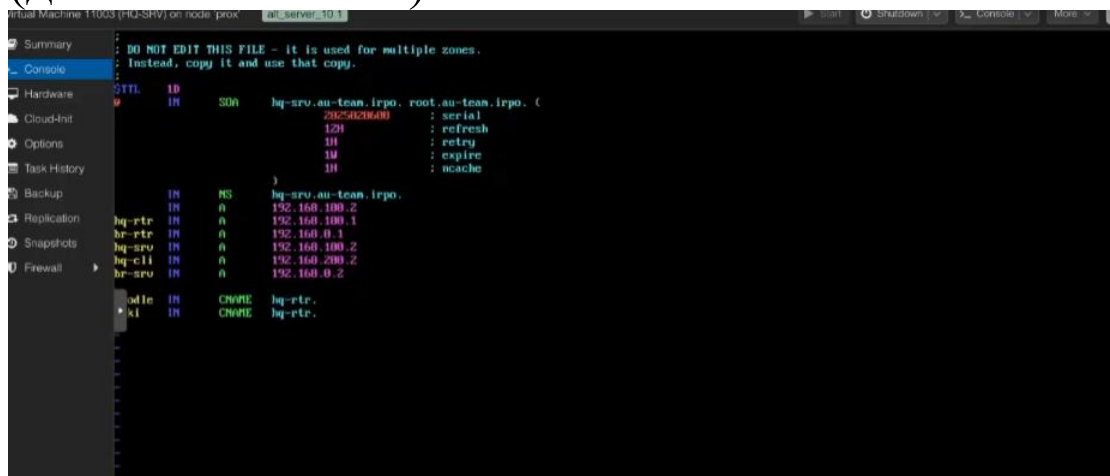
Пишем с самого начала строки
br-rtr (табулируем)
IN(табулируем)

A(табулируем)
192.168.0.2

ДВА РАЗА ЕНТЕР

moodle(табулируем)
IN(табулируем)
CNAME(табулируем)
hq-rtr.

wiki(табулируем)
IN(табулируем)
CNAME(табулируем)
hq-rtr.
(должно быть так)

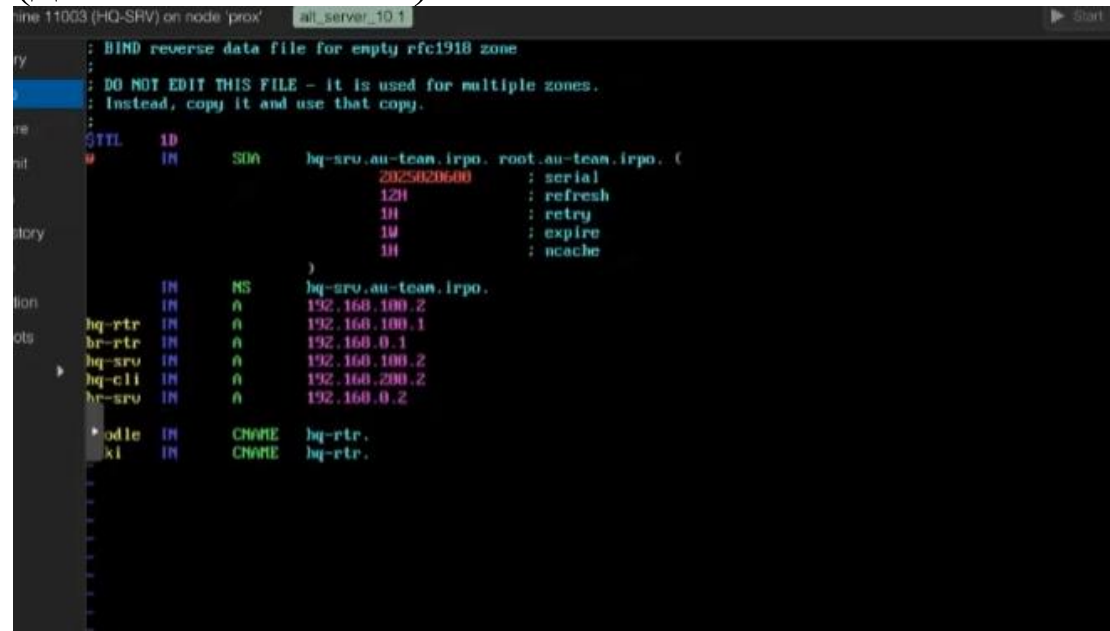


cp au.team.db 100.168.192.in-addr.arpa

cp au.team.db 200.168.192.in-addr.arpa

vim 100.168.192.in-addr.arpa

(должно быть так)



```
;; BIND reverse data file for empty rfc1918 zone
;; DO NOT EDIT THIS FILE - it is used for multiple zones.
;; Instead, copy it and use that copy.

$TTL 1D
IN SOA hq-srv.au-team.irpo. root.au-team.irpo. (
    2025020600 ; serial
    12H ; refresh
    1H ; retry
    1W ; expire
    1H ; ncache
)
IN NS hq-srv.au-team.irpo.
IN A 192.168.100.2
hq-rtr IN A 192.168.100.1
br-rtr IN A 192.168.0.1
hq-srv IN A 192.168.100.2
hq-ctrl IN A 192.168.200.2
br-srv IN A 192.168.0.2
node IN CNAME hq-rtr.
xl IN CNAME hq-rtr.
```

Удаляем все и ниже начиная с hq-rtr IN A и т.д.

В начале строки пишем

1(табуляция)

IN(табуляция)

PTR(табуляция)

hq-rtr.au-team.irpo.

В начале строки пишем

2(табуляция)

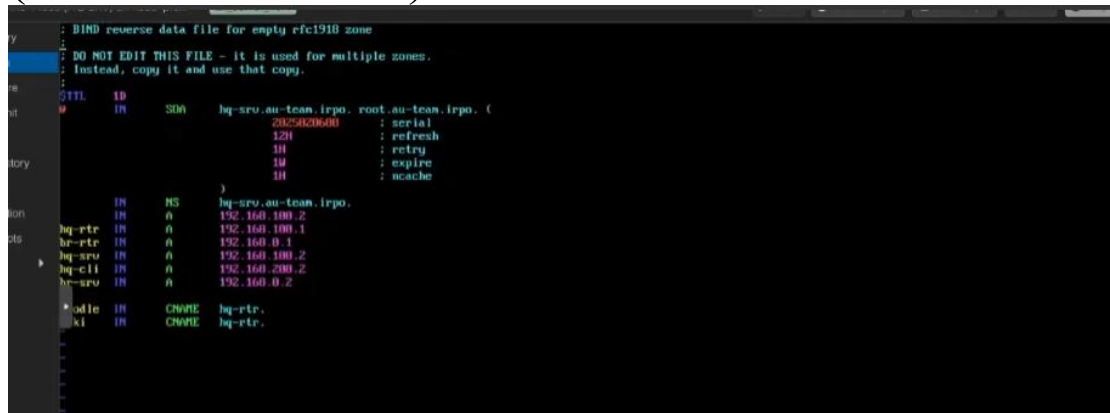
IN(табуляция)

PTR(табуляция)

hq-srv.au-team.irpo.

Выходим из файла

vim 200.168.192.in-addr.arpa
(должно быть так)



```
;; BIND reverse data file for empty rfc1918 zone
;; DO NOT EDIT THIS FILE - it is used for multiple zones.
;; Instead, copy it and use that copy.

$TTL      1D
$ORIGIN    .
$SOA       hq-srv.au-team.irpo. root.au-team.irpo. (
; serial
; refresh
; retry
; expire
; cache
)
$NS        hq-srv.au-team.irpo.
$PTR       192.168.192.2
hq-rtr     IN      PTR      hq-rtr.au-team.irpo.
hq-srv     IN      PTR      hq-srv.au-team.irpo.
hq-cli     IN      PTR      hq-cli.au-team.irpo.
hq-srv     IN      PTR      hq-srv.au-team.irpo.
$CNAME     hq-rtr     IN      CNAME    hq-rtr.
$CNAME     hq-cli     IN      CNAME    hq-cli.
```

Удаляем все и ниже начиная с hq-rtr IN А и т.д.

В начале строки пишем
1(табуляция)
IN(табуляция)
PTR(табуляция)
hq-rtr.au-team.irpo.

В начале строки пишем
2(табуляция)
IN(табуляция)
PTR(табуляция)
hq-cli.au-team.irpo.

Выходим из файла

cd ..

```
rndc-confgen > /var/lib/bind/etc/rndc.key  
sed -i '6,$d' rndc.key
```

```
chgrp -R named zone/
```

```
named-checkconf -z
```

Если ошибка по типу такой

```
options.conf - 30k, 2301k written  
(root@HQ-SRU etc) named-checkconf  
(root@HQ-SRU etc) named-checkconf -z  
zone au-team.irpo/IN: loading from master file au-team.db failed: file not found  
zone au-team.irpo/IN: not loaded due to errors.  
_default/au-team.irpo/IN: file not found  
zone 100.160.192.in-addr.arpa/IN: loading from master file 100.in-addr.arpa failed: file not found  
zone 100.160.192.in-addr.arpa/IN: not loaded due to errors.  
_default/100.160.192.in-addr.arpa/IN: file not found  
zone 200.160.192.in-addr.arpa/IN: loading from master file 200.in-addr.arpa failed: file not found  
zone 200.160.192.in-addr.arpa/IN: not loaded due to errors.  
_default/200.160.192.in-addr.arpa/IN: file not found  
(root@HQ-SRU etc) #
```

Пишем ls zone/

По сути должна быть такая картина

```
bind bind.keys local.conf named.conf options.conf options.conf rfc1912.conf rfc1912.conf rfc1918.conf rndc.conf  
(root@HQ-SRU etc) ls zone/  
100.160.192.in-addr.arpa 127.in-addr.arpa 200.160.192.in-addr.arpa au.team.db localdomain slave  
100.160.192.in-addr.arpa 200.160.192.in-addr.arpa au.team.db empty localhost  
(root@HQ-SRU etc) #
```

Пишем

```
mv zone/au.team.db zone/au-team.db
```

```
rm -f zone/au.team.db
```

Дальше пишем

```
named-checkconf
```

```
named-checkconf -z
```

По сути должно быть так


```

zone 200.168.192.in-addr.arpa/IN: not loaded due to errors.
default/200.168.192.in-addr.arpa/IN: file not found
[root@HQ-SRV etc]# named-checkconf
[root@HQ-SRV etc]# named-checkconf -z
zone au-team.irpa/IN: loaded serial 2025020600
zone 100.168.192.in-addr.arpa/IN: loading from master file 100.in-addr.arpa failed: file not found
zone 100.168.192.in-addr.arpa/IN: not loaded due to errors.
default/100.168.192.in-addr.arpa/IN: file not found
zone 200.168.192.in-addr.arpa/IN: loading from master file 200.in-addr.arpa failed: file not found
zone 200.168.192.in-addr.arpa/IN: not loaded due to errors.
default/200.168.192.in-addr.arpa/IN: file not found
[root@HQ-SRV etc]#

```

Если все так то идем дальше

Пишем

```
mv zone /100.168.192.in-addr.arpa zone/100.in-addr.arpa
```

```
mv zone /200.168.192.in-addr.arpa zone/200.in-addr.arpa
```

named-checkconf

named-checkconf -z

Должно получится так

```

[root@HQ-SRV etc]# named-checkconf
[root@HQ-SRV etc]# named-checkconf -z
zone au-team.irpa/IN: loaded serial 2025020600
zone 100.168.192.in-addr.arpa/IN: loaded serial 2025020600
zone 200.168.192.in-addr.arpa/IN: loaded serial 2025020600
[root@HQ-SRV etc]#

```

systemctl enable --now bind

Пишем дальше

cd

vim /etc/net/iface/ens18/resolv.conf

nameserver 8.8.8.8

(убираем 8.8.8.8)

Вместо 8 пишем

192.168.100.2

Добавляем строку в этом же файле

domain au-team.irpo

Выходим из файла

systemctl restart network

ping hq-srv

```
/etc/net/iface/ens18/resolv.conf" 2L, 45B written
[root@HQ-SRV ~]# systemctl restart network
[root@HQ-SRV ~]# ping hq-srv
ping: hq-srv: Temporary failure in name resolution
[root@HQ-SRV ~]#
```

если так-же как на скриншоте то делаем
reboot

Как ребутинется пишем

ping hq-srv

(должно быть так)

```
hq-srv login: root
Password:
Last login: Mon Feb 17 16:00:22 MSK 2025 on tty1
[root@HQ-SRV ~]# ping hq-srv
PING hq-srv.au-team.irpo (192.168.100.2) 56(84) bytes of data:
64 bytes from hq-srv.au-team.irpo (192.168.100.2): icmp_seq=1 ttl=64 time=0.010 ms
64 bytes from hq-srv.au-team.irpo (192.168.100.2): icmp_seq=2 ttl=64 time=0.025 ms
64 bytes from hq-srv.au-team.irpo (192.168.100.2): icmp_seq=3 ttl=64 time=0.017 ms
^C
--- hq-srv.au-team.irpo ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
```

Проверяем ping ya.ru

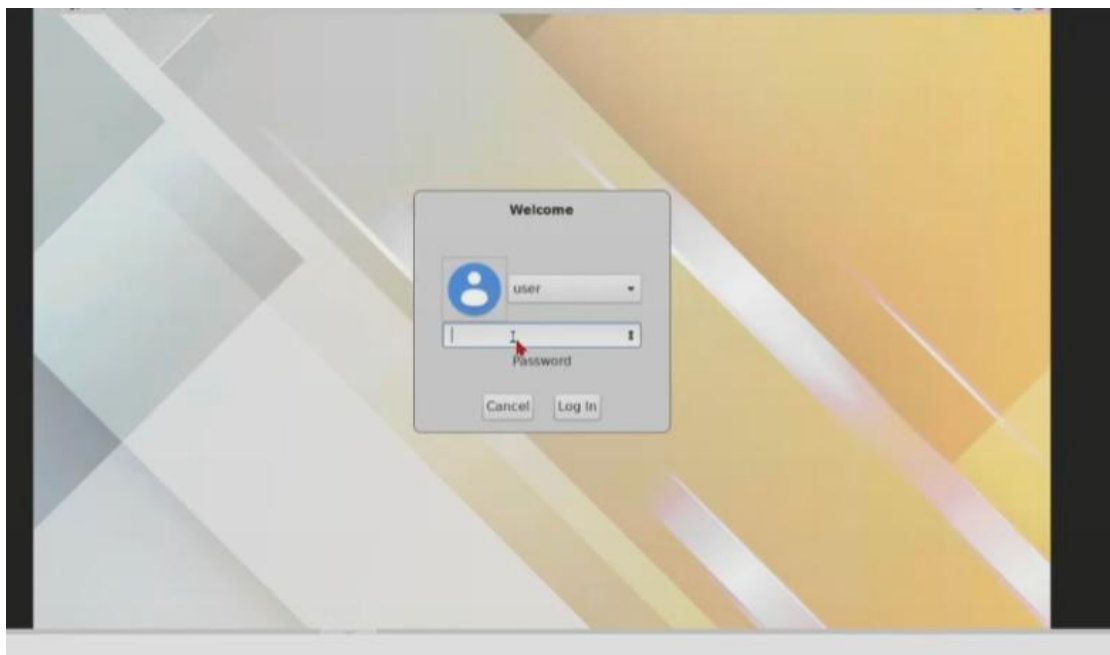
(должен работать)

```
^C
--- hq-srv.au-team.irpo ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/ndev = 0.010/0.017/0.025/0.006 ms
[root@HQ-SRV ~]# ping ya.ru
PING ya.ru (77.88.55.242) 56(84) bytes of data:
64 bytes from ya.ru (77.88.55.242): icmp_seq=1 ttl=50 time=15.1 ms
64 bytes from ya.ru (77.88.55.242): icmp_seq=2 ttl=50 time=15.2 ms
```

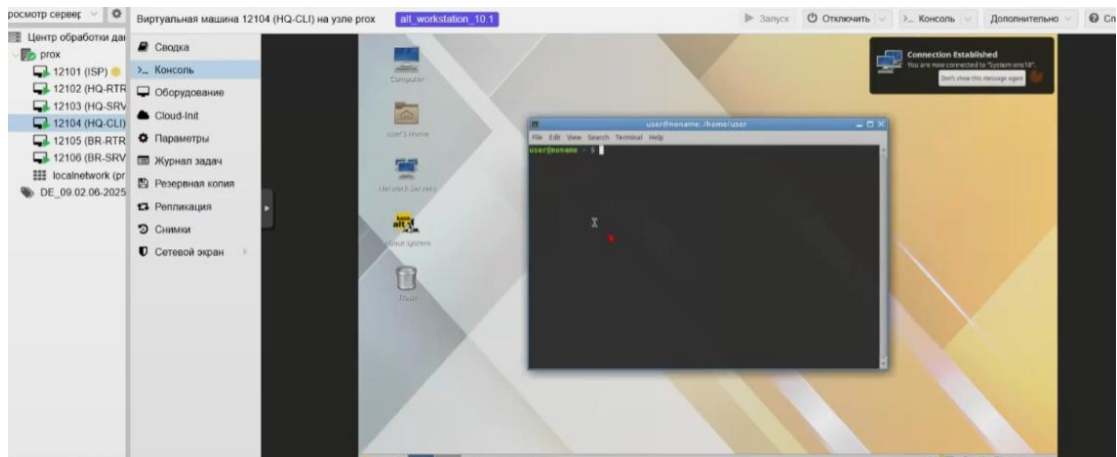
На всех машинках нужно вместо 8-рок указать то что нужно начнем с HQ-RTR[12]

HQ-CLI

Пришли на HQ-CLI[6]



Пароль resu



Открыв терминал пишем

`ip -br a`(должно быть так)



Продолжение следует...[7]

Перешли на HQ-CLI[15]

Сразу же переходим на BR-SRV[16]

Перешли сюда[22]

В терминале пишем
`systemctl restart network`
`systemctl restart NetworkManager`

Дальше пытаемся `ping hq-srv`

Если не пингуется то смотрим дальше

`ls /etc/net/ifaces/ens18`

(если такая картина)



```
default ens18 lo unknown
user@noname ~$ ls /etc/net/ifaces/ens18/
ipv4address options
user@noname ~$
```

То нам надо удалить `ipv4address`

`rm /etc/net/ifaces/ens18/ipv4address`

Дальше на вопрос пишем `y`

Если не удалось типо пермишон денайд

То пишем дальше

`su -`

Пароль `resu`

Если `resu` не подходит то пишем `toor`

`rm /etc/net/ifaces/ens18/ipv4address`

`systemctl restart network`

`systemctl restart NetworkManager`

Пытаемся `ping hq-srv`

Если не пингуется ребутаем HQ-CLI

Переходим на HQ-RTR[23]

Перешли сюда[24]

```
systemctl restart network
```

```
systemctl restart NetworkManager
```

Пробуем пингануть HQ-RTR

Если не пингуется делаем дальше