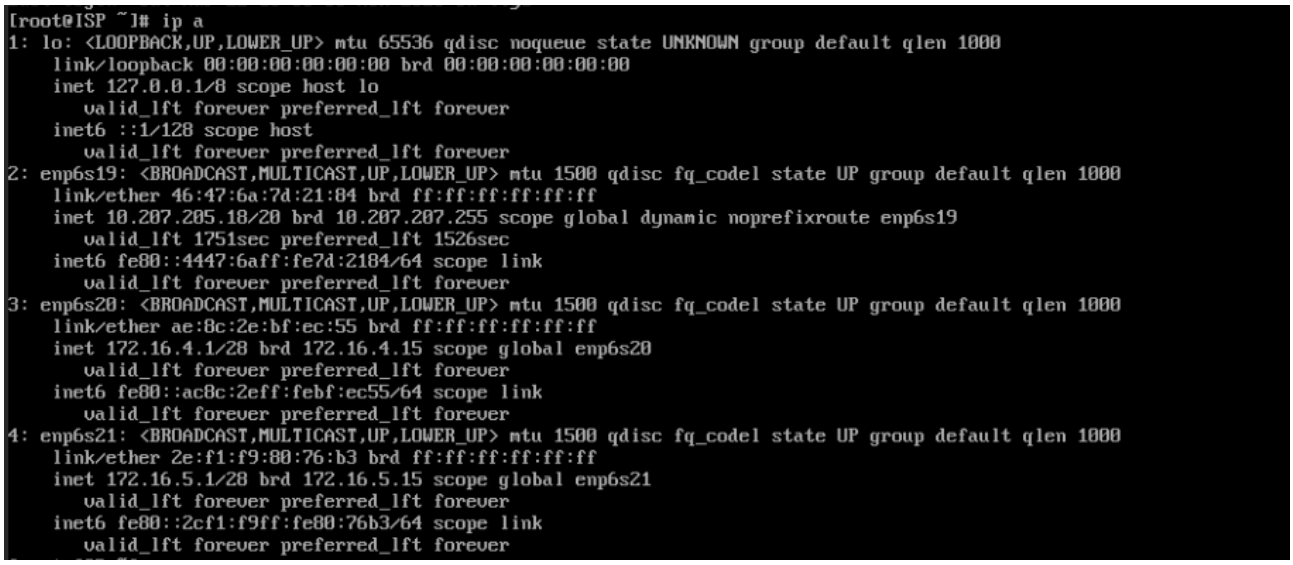
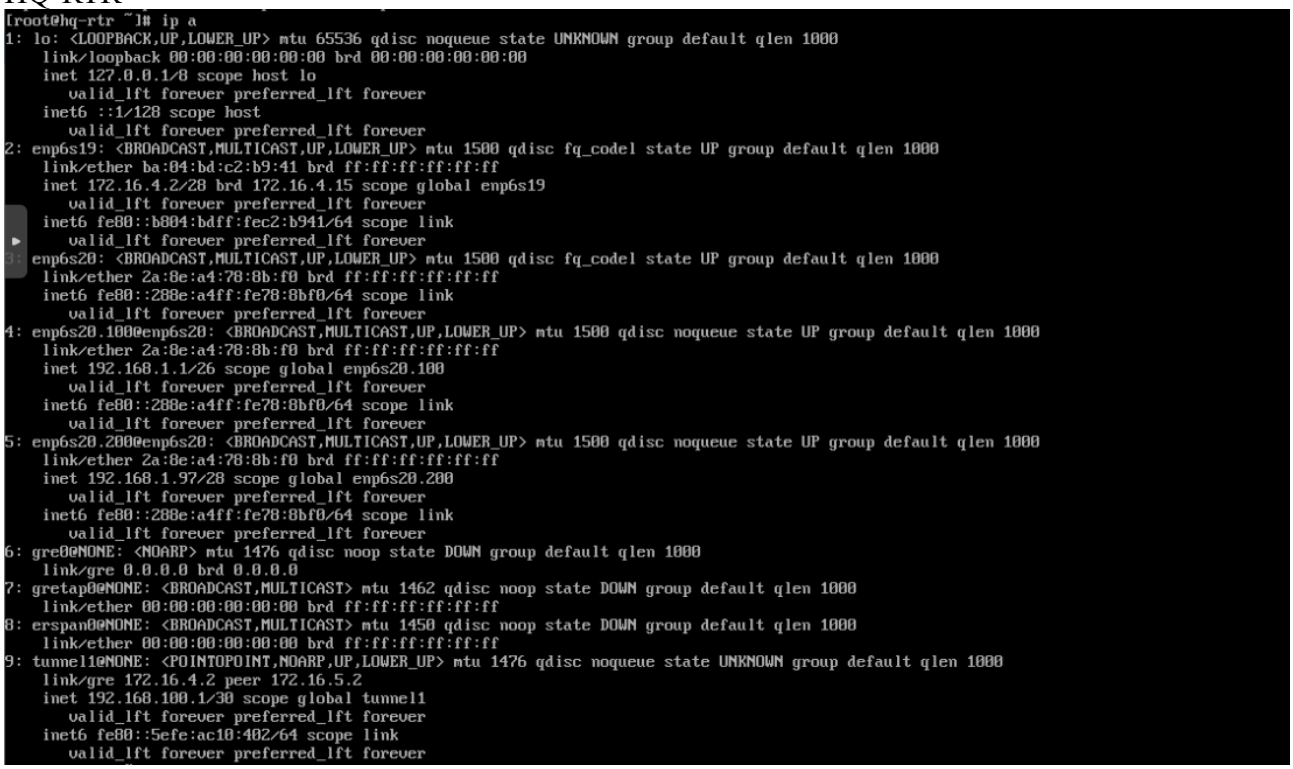
Устройство	IP-адрес	Шлюз по умолчанию
ISP	172.16.4.1/28(hq) 172.16.5.1/28(br)	
HQ-RTR	172.16.4.2/28(isp) 192.168.1.1/26(vlan100) 192.168.1.97/28(vlan200) 192.168.1.113/29(vlan999)	172.168.4.1
BR-RTR	172.16.5.2/28(isp) 192.168.1.65/27(brsrv)	172.168.5.1
HQ-SRV	192.168.1.2/28(hqrtr)	192.168.1.1
HQ-CLI	192.168.1.97/28(hqrtr)	192.168.1.97
BR-SRV	192.168.1.113/29(hqrtr)	192.168.1.65

Настройка на ALT-LINUX
ISP



HQ-RTR



BR-RTR

```
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: enp6s19: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether ae:1a:9f:13:01:54 brd ff:ff:ff:ff:ff:ff
    inet 172.16.5.2/28 brd 172.16.5.15 scope global enp6s19
       valid_lft forever preferred_lft forever
    inet6 fe80::ac1a:9fff:fe13:154/64 scope link
       valid_lft forever preferred_lft forever
3: enp6s20: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 76:4b:55:f3:a6:7e brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.65/27 brd 192.168.1.95 scope global enp6s20
       valid_lft forever preferred_lft forever
    inet6 fe80::744b:55ff:fef3:a67e/64 scope link
       valid_lft forever preferred_lft forever
4: gre0@NONE: <NOARP> mtu 1476 qdisc noop state DOWN group default qlen 1000
    link/gre 0.0.0.0 brd 0.0.0.0
5: gretap0@NONE: <BROADCAST,MULTICAST> mtu 1462 qdisc noop state DOWN group default qlen 1000
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
6: erspan0@NONE: <BROADCAST,MULTICAST> mtu 1450 qdisc noop state DOWN group default qlen 1000
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
8: tunnel1@NONE: <POINTOPOINT,NOARP,UP,LOWER_UP> mtu 1476 qdisc noqueue state UNKNOWN group default qlen 1000
    link/gre 172.16.5.2 peer 172.16.4.2
    inet 192.168.100.2/30 scope global tunnel1
       valid_lft forever preferred_lft forever
    inet6 fe80::5efe:ac10:502/64 scope link
       valid_lft forever preferred_lft forever
```

Проверка NAT (BR-SRV и HQ-SRV)

```
[root@br-srv ~]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=27.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=23.3 ms
^C
--- 8.8.8.8 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 23.346/25.498/27.651/2.152 ms
```

```
[root@hq-srv bind]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=23.4 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=23.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=23.4 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 23.356/23.422/23.472/0.048 ms
```

Проверка GRE

```
[root@br-rtr ifaces]# ping 192.168.100.1
PING 192.168.100.1 (192.168.100.1) 56(84) bytes of data.
64 bytes from 192.168.100.1: icmp_seq=1 ttl=64 time=4.07 ms
64 bytes from 192.168.100.1: icmp_seq=2 ttl=64 time=1.67 ms
64 bytes from 192.168.100.1: icmp_seq=3 ttl=64 time=1.41 ms
^C
--- 192.168.100.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 1.405/2.379/4.068/1.198 ms
```

```
[root@hq-rtr ~]# ping 192.168.100.2
PING 192.168.100.2 (192.168.100.2) 56(84) bytes of data.
64 bytes from 192.168.100.2: icmp_seq=1 ttl=64 time=1.46 ms
64 bytes from 192.168.100.2: icmp_seq=2 ttl=64 time=1.55 ms
64 bytes from 192.168.100.2: icmp_seq=3 ttl=64 time=1.49 ms
^C
--- 192.168.100.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 1.459/1.501/1.551/0.037 ms
```

Проверка OSPF

```
hq-rtr.au-team.irpo(config-if)# do sh ip ospf neighbor

Neighbor ID     Pri State           Up Time         Dead Time Address         Interface                        RXmtL RqstL DBsmL
192.168.100.2     1 Full/-          14.184s           37.676s 192.168.100.2   tunnel1:192.168.100.1                0     0     0

br-rtr.au-team.irpo(config-if)# do sh ip ospf neighbor

Neighbor ID     Pri State           Up Time         Dead Time Address         Interface                        RXmtL RqstL DBsmL
192.168.100.1     1 Full/-          2.644s            37.349s 192.168.100.1   tunnel1:192.168.100.2                2     0     0
```

```
hq-rtr.au-team.irpo(config-if)# do sh run
Building configuration...

Current configuration:
!
frr version 9.0.2
frr defaults traditional
hostname hq-rtr.au-team.irpo
log file /var/log/frr/frr.log
no ipv6 forwarding
!
interface tunnel1
 ip ospf authentication
 ip ospf authentication-key P@asswor
 no ip ospf passive
exit
!
router ospf
 ospf router-id 192.168.100.1
 passive-interface default
 network 192.168.1.0/26 area 0
 network 192.168.1.96/28 area 0
 network 192.168.100.0/30 area 0
exit
!
```

```
br-rtr.au-team.irpo(config-if)# do sh run
Building configuration...

Current configuration:
!
frr version 9.0.2
frr defaults traditional
hostname br-rtr.au-team.irpo
log file /var/log/frr/frr.log
no ipv6 forwarding
!
interface tunnel1
 ip ospf authentication
 ip ospf authentication-key P@asswor
 no ip ospf passive
exit
!
router ospf
 ospf router-id 192.168.100.2
 passive-interface default
 network 192.168.1.64/27 area 0
 network 192.168.100.0/30 area 0
exit
!
```

SSH(HQ-SRV)

```
  GNU nano 7.2                                                 sshd_config
#       $OpenBSD: sshd_config,v 1.103 2018/04/09 20:41:22 tj Exp $

# This is the sshd server system-wide configuration file.  See
# sshd_config(5) for more information.

# This sshd was compiled with PATH=/bin:/usr/bin:/usr/local/bin

# The strategy used for options in the default sshd_config shipped with
# OpenSSH is to specify options with their default value where
# possible, but leave them commented.  Uncommented options override the
# default value.

Port 2024
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::

#HostKey /etc/openssh/ssh_host_rsa_key
#HostKey /etc/openssh/ssh_host_ecdsa_key
#HostKey /etc/openssh/ssh_host_ed25519_key

# Ciphers and keying
#RekeyLimit default none

# Logging
#SyslogFacility AUTHPRIV
#LogLevel INFO

# Authentication:

#LoginGraceTime 2m
#PermitRootLogin without-password
#StrictModes yes
MaxAuthTries 2
#MaxSessions 10

#PubkeyAuthentication yes
#PubkeyAcceptedKeyTypes ssh-ed25519-cert-v01@openssh.com,ssh-ed25519,rsa-sha2-512,rsa-sha2-256,ssh-rsa-cert-v01@openssh.com,ssh-rsa,ecdsa-sha2-nistp521-cert-v0

#AuthorizedKeysFile     /etc/openssh/authorized_keys/%u /etc/openssh/authorized_keys2/%u .ssh/authorized_keys .ssh/authorized_keys2

# no default banner path
Banner /etc/openssh/banner

# override default of no subsystems
Subsystem       sftp    /usr/lib/openssh/sftp-server

AllowUsers sshuser
```

```
[root@hq-srv openssh]# useradd -u 1010 sshuser
```

```
[root@hq-srv openssh]# passwd sshuser
```

```
  GNU nano 7.2                                                 /etc/sudoers
##
## Uncomment to enable logging of a command's output, except for
## sudoreplay and reboot.  Use sudoreplay to play back logged sessions.
## Sudo will create up to 2,176,782,336 I/O logs before recycling them.
## Set maxseq to a smaller number if you don't have unlimited disk space.
# Defaults log_output
# Defaults!/usr/bin/sudoreplay !log_output
# Defaults!/usr/local/bin/sudoreplay !log_output
# Defaults!REBOOT !log_output
# Defaults maxseq = 1000
##
## Uncomment to disable intercept and log_subcmds for debuggers and
## tracers.  Otherwise, anything that uses ptrace(2) will be unable
## to run under sudo if intercept_type is set to "trace".
# Defaults!DEBUGGERS !intercept, !log_subcmds
##
## Uncomment to disable intercept and log_subcmds for package managers.
## Some package scripts run a huge number of commands, which is made
## slower by these options and also can clutter up the logs.
# Defaults!PKGMAN !intercept, !log_subcmds

# If env_reset is disabled, sudo will NOT reset the environment
# to only contain the fixed list of variables.
# See sudoers(5) for details.
#Defaults:WHEEL_USERS !env_reset

# Preserve DISPLAY and XAUTHORITY environment variables
# for "xgrp" group members.
Defaults:XGRP_USERS env_keep += "DISPLAY XAUTHORITY"

##
## Runas alias specification
##

##
## User privilege specification
##
# root ALL=(ALL:ALL) ALL

## Uncomment to allow members of group wheel to execute any command
# WHEEL_USERS ALL=(ALL:ALL) ALL

## Same thing without a password
 sshuser ALL=(ALL:ALL) NOPASSWD: ALL
```

```
 GNU nano 7.2                                                    /etc/group
root:x:0:
bin:x:1:root
daemon:x:2:root
sys:x:3:root,bin,adm
adm:x:4:root
tty:x:5:
disk:x:6:root
lp:x:7:
mem:x:8:
kmem:x:9:
wheel:x:10:root,user,sshuser
```

Проверка SSH с BR-RTR

```
[root@br-rtr ~]# ssh -p 2024 sshuser@192.168.1.2
Autorized access only
sshuser@192.168.1.2's password:
Last login: Wed Mar 26 14:17:21 2025 from 192.168.100.2
[sshuser@hq-srv ~]$
```

DHCP для HQ-CLI

```
 GNU nano 7.2                                                /etc/sysconfig/dhcpd
# The following variables are recognized:

DHCPDARGS=enp6s20.200

# Default value if chroot mode disabled.
#CHROOT="-j / -lf /var/lib/dhcp/dhcpd/state/dhcpd.leases"
```

```
 GNU nano 7.2                                                /etc/dhcp/dhcpd.conf
# See dhcpd.conf(5) for further configuration

ddns-update-style none;

subnet 192.168.1.96 netmask 255.255.255.240 {
        option routers                  192.168.1.97;
        option subnet-mask              255.255.255.240;


#       option nis-domain               "domain.org";
        option domain-name              "lupa";
        option domain-name-servers      192.168.1.97;

        range dynamic-bootp 192.168.1.98 192.168.1.105;
        default-lease-time 21600;
        max-lease-time 43200;
}
host hq-cli. {
        hardware ethernet ca:1a:8d:f2:b9:19;
        fixed-address 192.168.1.98;
}
```

Проверка

```
[root@hq-cli ~]# ip r
default via 192.168.1.97 dev enp6s19
default via 192.168.1.97 dev enp6s19 proto dhcp src 192.168.1.98 metric 1002
192.168.1.96/28 dev enp6s19 proto dhcp scope link src 192.168.1.98 metric 1002
```

DNS

```
 GNU nano 7.2                                                /etc/bind/options.conf
options {
        version "unknown";
        directory "/etc/bind/zone";
        /*
         * ALT Linux: this requires write permission to /session/
         */
        // session-keyfile "/session/session.key";
        pid-file "";
        dump-file "/var/run/named_dump.db";
        statistics-file "/var/run/named.stats";
        recursing-file "/var/run/recursing";

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

        /*
         * For the localhost configuration, uncomment the listen-on directive
         * below.
         */
        //listen-on { any; };

        /*
         * If the forward directive is set to "only", the server will only
         * query the forwarders.
         */
        //forward first;
        forwarders { 8.8.8.8; };
        include "/etc/bind/resolvconf-options.conf";

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

```
 GNU nano 7.2                                                /etc/bind/local.conf
include "/etc/bind/rfc1912.conf";

// Consider adding the 1918 zones here,
// if they are not used in your organization.
//      include "/etc/bind/rfc1918.conf";

// Add other zones here
include "/etc/bind/resolvconf-zones.conf";

zone "lupa" {
        type master;
        file "lupa.db";
};

zone "16.172.in-addr.arpa" {
        type master;
        file "16.172.addr";
};

zone "1.168.192.in-addr.arpa" {
        type master;
        file "1.168.192.addr";
};
```

```
 GNU nano 7.2                                                /etc/bind/zone/lupa.db
$TTL    1D
@       IN      SOA     lupa. root.lupa. (
                                2024092400      ; serial
                                12H             ; refresh
                                1H              ; retry
                                1W              ; expire
                                1H              ; ncache
                        )
        IN      NS      lupa.
        IN      A       127.0.0.1
isp     IN      A       172.16.4.1
isp     IN      A       172.16.5.1
hq-rtr  IN      A       172.16.4.2
hr-rtr  IN      A       192.168.1.1
hq-rtr  IN      A       192.168.1.97
hq-rtr  IN      A       192.168.1.113
hq-srv  IN      A       192.168.1.2
hq-cli  IN      A       192.168.1.98
br-rtr  IN      A       172.16.5.2
br-rtr  IN      A       192.168.1.65
br-srv  IN      A       192.168.1.66
```

```
 GNU nano 7.2                                              /etc/bind/zone/16.172.addr
$TTL    1D
@       IN      SOA     lupa. root.lupa. (
                                2024092400      ; serial
                                12H             ; refresh
                                1H              ; retry
                                1W              ; expire
                                1H              ; ncache
                        )
        IN      NS      lupa.
1.4     IN      PTR     isp.
1.5     IN      PTR     isp.
2.4     IN      PTR     hq-rtr.
2.5     IN      PTR     br-rtr.
```

```
 GNU nano 7.2                                                    /etc/bind/zone/1.168.192.addr
$TTL    1D
@       IN      SOA     lupa. root.lupa. (
                                2024092400      ; serial
                                12H             ; refresh
                                1H              ; retry
                                1W              ; expire
                                1H              ; ncache
                        )
        IN      NS      lupa.
1       IN      PTR     hq-rtr.
97      IN      PTR     hq-rtr.
113     IN      PTR     hq-rtr.
2       IN      PTR     hq-srv.
98      IN      PTR     hq-cli.
65      IN      PTR     br-rtr.
66      IN      PTR     br-srv.
```

Проверка

```
[root@br-srv openssh]# hostinfo hq-rtr
 address: 192.168.1.113
hostname: hq-rtr.lupa
 aliases:

 address: 192.168.1.97
hostname: hq-rtr.lupa
 aliases:

 address: 172.16.4.2
hostname: hq-rtr.lupa
 aliases:

[root@br-srv openssh]# hostinfo hq-rtr
 address: 172.16.4.2
hostname: hq-rtr.lupa
 aliases:

 address: 192.168.1.113
hostname: hq-rtr.lupa
 aliases:

 address: 192.168.1.97
hostname: hq-rtr.lupa
 aliases:
```

OPENVSWITCH

```
       valid_lft forever preferred_lft forever
2: enp6s19: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master ovs-system state UP group default qlen 1000
    link/ether 4a:93:29:33:7e:0e brd ff:ff:ff:ff:ff:ff
    inet6 fe80::4893:29ff:fe33:7e0e/64 scope link
       valid_lft forever preferred_lft forever
3: enp6s20: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master ovs-system state UP group default qlen 1000
    link/ether 3e:70:ef:ce:45:d0 brd ff:ff:ff:ff:ff:ff
    inet6 fe80::3c70:efff:fece:45d0/64 scope link
       valid_lft forever preferred_lft forever
4: enp6s21: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master ovs-system state UP group default qlen 1000
    link/ether be:99:db:3c:f6:dc brd ff:ff:ff:ff:ff:ff
    inet6 fe80::bc99:dbff:fe3c:f6dc/64 scope link
       valid_lft forever preferred_lft forever
5: ovs-system: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether c2:5a:a7:e7:29:68 brd ff:ff:ff:ff:ff:ff
6: hq-sw: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether ca:a3:ef:00:fb:46 brd ff:ff:ff:ff:ff:ff
7: mgmt0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether fe:3f:71:7e:2e:4d brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.114/29 brd 192.168.1.119 scope global mgmt0
       valid_lft forever preferred_lft forever
    inet6 fe80::fc3f:71ff:fe7e:2e4d/64 scope link
       valid_lft forever preferred_lft forever
[root@hq-sw ~]# ovs
ovs-appctl    ovs-docker    ovs-dpctl     ovs-ofctl     ovs-pki       ovs-vsctl     ovs-vswitchd  ovsdb-client  ovsdb-server  ovsdb-tool
[root@hq-sw ~]# ovs-vsctl show
34aba730-1041-4691-91eb-f37c028815a9
    Bridge hq-sw
        Port enp6s19
            trunks: [100, 200, 999]
            Interface enp6s19
        Port mgmt0
            tag: 999
            Interface mgmt0
                type: internal
        Port enp6s20
            tag: 100
            Interface enp6s20
        Port enp6s21
            tag: 200
            Interface enp6s21
        Port hq-sw
            Interface hq-sw
                type: internal
    ovs_version: "2.17.11"
```

Настройка на CISCO
ISP

```
!
interface GigabitEthernet1
 ip address dhcp
 ip nat outside
 negotiation auto
 no mop enabled
 no mop sysid
!
interface GigabitEthernet2
 ip address 172.16.4.1 255.255.255.240
 ip nat inside
 negotiation auto
 no mop enabled
 no mop sysid
!
interface GigabitEthernet3
 ip address 172.16.5.1 255.255.255.240
 ip nat inside
 negotiation auto
 no mop enabled
 no mop sysid
!
```

```
ip nat inside source list NAT interface GigabitEthernet1 overload
ip ssh version 2
!
ip access-list standard NAT
 10 permit 172.16.4.0 0.0.0.15
 20 permit 172.16.5.0 0.0.0.15
```

HQ-RTR

```
ip domain name au-team.irpo
ip dhcp excluded-address 192.168.1.97
!
ip dhcp pool CLI
 network 192.168.1.96 255.255.255.240
 default-router 192.168.1.97
 dns-server 192.168.1.2
 domain-name au-team.irpo
!
ip dhcp pool CLI1
 host 192.168.1.98 255.255.255.240
 hardware-address ca1a.8df2.b919
!
```

```
interface Tunnel1
 ip address 192.168.100.1 255.255.255.252
 ip ospf authentication
 ip ospf authentication-key P@asswor
 tunnel source GigabitEthernet1
 tunnel destination 172.16.5.2
!
interface GigabitEthernet1
 ip address 172.16.4.2 255.255.255.240
 ip nat outside
 negotiation auto
 no mop enabled
 no mop sysid
!
interface GigabitEthernet2
 no ip address
 negotiation auto
 no mop enabled
 no mop sysid
!
interface GigabitEthernet2.100
 encapsulation dot1Q 100
 ip address 192.168.1.1 255.255.255.192
 ip nat inside
!
interface GigabitEthernet2.200
 encapsulation dot1Q 200
 ip address 192.168.1.97 255.255.255.240
 ip nat inside
!
interface GigabitEthernet2.999
 encapsulation dot1Q 999
 ip address 192.168.1.113 255.255.255.248
!
```

```
router ospf 1
 router-id 192.168.100.1
 passive-interface default
 no passive-interface Tunnel1
 network 192.168.1.0 0.0.0.63 area 0
 network 192.168.1.96 0.0.0.15 area 0
 network 192.168.100.0 0.0.0.3 area 0
!
ip forward-protocol nd
ip http server
ip http authentication local
ip http secure-server
!
ip nat inside source list NAT interface GigabitEthernet1 overload
ip route 0.0.0.0 0.0.0.0 172.16.4.1
ip ssh version 2
!
ip access-list standard NAT
 10 permit 192.168.1.0 0.0.0.63
 20 permit 192.168.1.96 0.0.0.15
```

BR-RTR

```
interface Tunnel1
 ip address 192.168.100.2 255.255.255.252
 ip ospf authentication
 ip ospf authentication-key P@asswor
 tunnel source GigabitEthernet1
 tunnel destination 172.16.4.2
!
interface GigabitEthernet1
 ip address 172.16.5.2 255.255.255.240
 ip nat outside
 negotiation auto
 no mop enabled
 no mop sysid
!
interface GigabitEthernet2
 ip address 192.168.1.65 255.255.255.224
 ip nat inside
 negotiation auto
 no mop enabled
 no mop sysid
```

```
router ospf 1
 router-id 192.168.100.2
 passive-interface default
 --More--
*Mar 26 12:45:00.014: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.100.1 on Tunnel1 f
om FULL to DOWN, Neighbor Down: Dead tim no passive-interface Tunnel1
 network 192.168.1.64 0.0.0.31 area 0
 network 192.168.100.0 0.0.0.3 area 0
!
ip forward-protocol nd
ip http server
ip http authentication local
ip http secure-server
!
ip nat inside source list NAT interface GigabitEthernet1 overload
ip route 0.0.0.0 0.0.0.0 172.16.5.1
ip ssh version 2
!
ip access-list standard NAT
 10 permit 192.168.1.64 0.0.0.31
!
```

Проверка NAT

```
br-rtr(config)#do ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 26/28/34 ms
br-rtr(config)#_
```

Проверка OSPF

```
br-rtr(config)#do sh ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.100.1     0   FULL/  -        00:00:31    192.168.100.1   Tunnel1
br-rtr(config)#_
hq-rtr.au-team.irpo#sh ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.100.2     0   FULL/  -        00:00:31    192.168.100.2   Tunnel1
```

Проверка GRE

```
hq-rtr.au-team.irpo#ping 192.168.100.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/6/9 ms
br-rtr#ping 192.168.100.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.100.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 2/3/5 ms
```

Настройка на ELTEX
ISP

```
interface gigabitethernet 1/0/3
  ip firewall disable
  ip address dhcp
exit
interface gigabitethernet 1/0/4
  ip firewall disable
  ip address 172.16.4.1/28
exit
interface gigabitethernet 1/0/5
  ip firewall disable
  ip address 172.16.5.1/28
exit
security passwords default-expired
nat source
  ruleset NAT
    to interface gigabitethernet 1/0/3
    rule 1
      action source-nat interface
      enable
    exit
  exit
exit
```

HQ-RTR

```
router ospf 1
  router-id 192.168.100.1
  area 0.0.0.0
    network 192.168.100.0/30
    network 192.168.1.0/26
    network 192.168.1.96/28
    enable
  exit
  enable
exit

interface gigabitethernet 1/0/3
  ip firewall disable
exit
interface gigabitethernet 1/0/3.100
  ip firewall disable
  ip address 192.168.1.1/26
  ip ospf instance 1
  ip ospf
exit
```

```
interface gigabitethernet 1/0/3.200
  ip firewall disable
  ip address 192.168.1.97/28
  ip ospf instance 1
  ip ospf
exit
interface gigabitethernet 1/0/3.999
  ip firewall disable
  ip address 192.168.1.113/29
  ip ospf instance 1
  ip ospf
exit
interface gigabitethernet 1/0/4
  ip address 172.16.4.2/28
exit
tunnel gre 1
  ttl 32
  mtu 1426
  ip firewall disable
  local interface gigabitethernet 1/0/4
  remote address 172.16.5.2
  ip address 192.168.100.1/30
  ip ospf instance 1
  ip ospf
  enable
exit

security passwords default-expired
nat source
  ruleset NAT
    to interface gigabitethernet 1/0/4
    rule 1
      action source-nat interface
      enable
    exit
  exit
exit
```

```
ip dhcp-server
ip dhcp-server pool LANCLI
  network 192.168.1.96/28
  domain-name au-team.irpo
  address-range 192.168.1.98-192.168.1.105
  address 192.168.1.98 mac-address ca:1a:8d:f2:b9:19
  default-router 192.168.1.97
  dns-server 192.168.1.2
exit

ip route 0.0.0.0/0 172.16.4.1

ip ssh server

clock timezone gmt +3
```

BR-RTR

```
router ospf 1
  router-id 192.168.100.2
  area 0.0.0.0
    network 192.168.100.0/30
    network 192.168.1.64/27
    enable
  exit
  enable
exit

interface gigabitethernet 1/0/3
  ip firewall disable
  ip address 172.16.5.2/28
exit
interface gigabitethernet 1/0/4
  ip firewall disable
  ip address 192.168.1.65/27
  ip ospf instance 1
  ip ospf
exit
tunnel gre 1
  ttl 32
  mtu 1426
  ip firewall disable
  local interface gigabitethernet 1/0/3
  remote address 172.16.4.2
  ip address 192.168.100.2/30
  ip ospf instance 1
  ip ospf
  enable
exit
```

```
security passwords default-expired
nat source
  ruleset NAT
    to interface gigabitethernet 1/0/3
    rule 1
      action source-nat interface
      enable
    exit
  exit
exit

ip route 0.0.0.0/0 172.16.5.1
```

Проверка NAT

```
[root@hq-srv ~]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=26.1 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=26.2 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=25.2 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 25.213/25.842/26.218/0.447 ms
[root@hq-srv ~]#
```

```
^C[root@br-srv ~]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=26.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=30.1 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=24.8 ms
^C
--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2004ms
rtt min/avg/max/mdev = 24.830/27.185/30.064/2.168 ms
[root@br-srv ~]#
```

Проверка OSPF

```
[root@br-srv ~]# ping 192.168.1.2
PING 192.168.1.2 (192.168.1.2) 56(84) bytes of data.
64 bytes from 192.168.1.2: icmp_seq=1 ttl=62 time=8.06 ms
64 bytes from 192.168.1.2: icmp_seq=2 ttl=62 time=7.76 ms
^C
--- 192.168.1.2 ping statistics ---
3 packets transmitted, 2 received, 33.3333% packet loss, time 2004ms
rtt min/avg/max/mdev = 7.760/7.912/8.064/0.152 ms
[root@br-srv ~]#
```

```
BR-RTR(config-if-gi)# do sh ip ospf neighbors
Router ID        Pri  State          DTime  Interface          Router IP
---------        ---  -----          -----  -----------------  ---------
192.168.100.1    128  Full/BDR       00:30  gre 1              192.168.100.1
```

```
HQ-RTR(config)# do sh ip ospf neighbors
Router ID        Pri  State          DTime  Interface          Router IP
---------        ---  -----          -----  -----------------  ---------
192.168.100.2    128  Full/DR        00:38  gre 1              192.168.100.2
```

Проверка GRE

```
BR-RTR(config)# do ping 192.168.100.1
PING 192.168.100.1 (192.168.100.1) 56 bytes of data.
!!!!!
--- 192.168.100.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4010ms
rtt min/avg/max/mdev = 4.758/7.307/10.204/2.203 ms
HQ-RTR(config)# do ping 192.168.100.2
PING 192.168.100.2 (192.168.100.2) 56 bytes of data.
!!!!!
--- 192.168.100.2 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4008ms
rtt min/avg/max/mdev = 4.021/5.127/7.056/1.284 ms
HQ-RTR(config)#
```

Проверка DHCP

```
[root@hq-cli ~]# ip r
default via 192.168.1.97 dev enp6s19
default via 192.168.1.97 dev enp6s19 proto dhcp src 192.168.1.98 metric 1002
192.168.1.96/28 dev enp6s19 proto dhcp scope link src 192.168.1.98 metric 1002
```

Настройка на ECOROUTER

ISP

```
ip route 0.0.0.0/0 10.207.192.1
!
line con 0
line vty 0 39
!
port ge0
 mtu 9728
 service-instance INT
  encapsulation untagged
!
port ge1
 mtu 9728
 service-instance HQSER
  encapsulation untagged
!
port ge2
 mtu 9728
 service-instance BR
  encapsulation untagged
!
```

```
interface HQ
 ip mtu 1500
 connect port ge1 service-instance HQSER
 ip nat inside
 ip address 172.16.4.1/28
!
interface INT
 ip mtu 1500
 connect port ge0 service-instance INT
 ip nat outside
 ip address 10.207.201.6/20
!
interface BR
 ip mtu 1500
 connect port ge2 service-instance BR
 ip nat inside
 ip address 172.16.5.1/28
!
ip nat pool local 172.16.4.1-172.16.4.14,172.16.5.1-172.16.5.14
!
ip nat source dynamic inside-to-outside pool local overload interface INT
!
```

HQ-RTR

```
ip pool DHCP_POOL 1
 range 192.168.1.98-192.168.1.105
!
dhcp-server 1
 lease 86400
 domain-name lupa
 dns 192.168.1.2
 gateway 192.168.1.97
 domain-search lupa
 mask 255.255.255.240
 static ip 192.168.1.106
  chaddr ca1a.8df2.b919
 pool DHCP_POOL 1
!
```

```
router ospf 1
 passive-interface default
 no passive-interface tunnel.0
 network 192.168.1.0/26 area 0.0.0.0
 network 192.168.1.96/28 area 0.0.0.0
 network 192.168.1.112/29 area 0.0.0.0
 network 192.168.100.0/30 area 0.0.0.0
!
ip route 0.0.0.0/0 172.16.4.1
!
line con 0
line vty 0 39
!
port ge0
 mtu 9728
 service-instance ISP
  encapsulation untagged
!
port ge1
 mtu 9728
 service-instance HQVLAN
  encapsulation dot1q 100
  rewrite pop 1
 service-instance HQVLAN200
  encapsulation dot1q 200
  rewrite pop 1
 service-instance HQVLAN999
  encapsulation dot1q 999
  rewrite pop 1
 service-instance VLAN
  no encapsulation
!
```

```
interface tunnel.0
 ip mtu 1426
 ip address 192.168.100.1/30
 ip tunnel 172.16.4.2 172.16.5.2 mode gre
 ip ospf authentication
 ip ospf authentication-key 0x21965554a4989433
!
```

```
interface ISP
 ip mtu 1500
 connect port ge0 service-instance ISP
 ip nat outside
 ip address 172.16.4.2/28
!
interface VLAN
 ip mtu 1500
 connect port ge1 service-instance HQVLAN
 ip nat inside
 ip address 192.168.1.1/26
!
interface VLAN200
 ip mtu 1500
 connect port ge1 service-instance HQVLAN200
 dhcp-server 1
 ip nat inside
 ip address 192.168.1.97/28
!
interface VLAN999
 ip mtu 1500
 connect port ge1 service-instance HQVLAN999
 ip nat inside
 ip address 192.168.1.113/29
```

```
ip nat pool local1 192.168.1.1-192.168.1.62,192.168.1.97-192.168.1.111,192.168.
!
ip nat source dynamic inside-to-outside pool local1 overload interface ISP
!
```

BR-RTR

```
router ospf 1
 passive-interface default
 no passive-interface tunnel.0
 network 192.168.1.64/27 area 0.0.0.0
 network 192.168.100.0/30 area 0.0.0.0
!
ip route 0.0.0.0/0 172.16.5.1
!
line con 0
line vty 0 39
!
port ge0
 mtu 9728
 service-instance ISP
  encapsulation untagged
!
port ge1
 mtu 9728
 service-instance HQSRV
  encapsulation untagged
```

```
interface tunnel.0
 ip mtu 1426
 ip address 192.168.100.2/30
 ip tunnel 172.16.5.2 172.16.4.2 mode gre
 ip ospf authentication
 ip ospf authentication-key 0x21965554a4989433
!
interface ISP
 ip mtu 1500
 connect port ge0 service-instance ISP
 ip nat outside
 ip address 172.16.5.2/28
!
interface SRV
 ip mtu 1500
 connect port ge1 service-instance HQSRV
 ip nat inside
 ip address 192.168.1.65/27
!
ip nat pool local2 192.168.1.65-192.168.1.95
!
ip nat source dynamic inside-to-outside pool local2 overload interface ISP
!
```

Проверка NAT

```
[root@hq-srv ~]# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=102 time=59.3 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=102 time=65.8 ms
^C
--- 8.8.8.8 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 59.338/62.545/65.752/3.207 ms
```

Проверка GRE

```
br-rtr.au-team.irpo(config-router)#do ping 192.168.100.1
PING 192.168.100.1 (192.168.100.1) 56(84) bytes of data.
64 bytes from 192.168.100.1: icmp_seq=1 ttl=64 time=45.8 ms
64 bytes from 192.168.100.1: icmp_seq=2 ttl=64 time=35.3 ms

--- 192.168.100.1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1002ms
rtt min/avg/max/mdev = 35.322/40.554/45.786/5.232 ms
hq-rtr.au-team.irpo(config-router)#do ping 192.168.100.2
PING 192.168.100.2 (192.168.100.2) 56(84) bytes of data.
64 bytes from 192.168.100.2: icmp_seq=1 ttl=64 time=47.8 ms
64 bytes from 192.168.100.2: icmp_seq=2 ttl=64 time=77.0 ms

--- 192.168.100.2 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1003ms
rtt min/avg/max/mdev = 47.847/62.417/76.988/14.570 ms
```

Проверка OSPF

```
hq-rtr.au-team.irpo(config-router)#do sh ip ospf neighbor

Total number of full neighbors: 1
OSPF process 1 VRF(default):
Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.100.2     1   Full/DR         00:00:40    192.168.100.2   tunnel.0
```

```
br-rtr.au-team.irpo(config-router)#do sh ip ospf neighbor

Total number of full neighbors: 1
OSPF process 1 VRF(default):
Neighbor ID     Pri   State           Dead Time   Address         Interface
192.168.100.1     1   Full/Backup     00:00:36    192.168.100.1   tunnel.0
```

Проверка DHCP

```
[root@hq-cli ~]# ip r
default via 192.168.1.97 dev enp6s19
default via 192.168.1.97 dev enp6s19 proto dhcp src 192.168.1.106 metric 1002
192.168.1.96/28 dev enp6s19 proto dhcp scope link src 192.168.1.106 metric 1002
```