OSPF

정보

             : **routing**
                    : Level 3
           : **/routing ospf**
                : [OSPF](#)
              :

                                    C

- Software Package Management
- IP Addresses and ARP
- Routes, Equal Cost Multipath Routing, Policy Routing
- Log Management

Open Shortest Path First (   )   -

                                       . OSPF

                    (   ).

                       .

              OSPF
(,   OSPF
        MTU).

        OSPF   OSPF   .
                       OSPF
                         110.

                :**/routing ospf**

distribute-default (never | if-installed-as-type-1 | if-installed-as-type-2
| always-as-type-1 | always-as-type-2; default: **never**) -
               .   ABR(

) ASBR( )
.

- **never** -
- **if-installed-as-type-1** - 1
  (
  , DHCP PPP . .)
- **if-installed-as-type-2** - 2
  (DHCP PPP
  . .)
- **always-as-type-1** - 1.
- **always-as-type-2** - 2.

metric-bgp (integer; : **20**) -
BGP .

metric-connected (integer; : **20**) -
( ).

metric-default (integer; : **1**) - .

metric-rip (integer; : **20**) -
RIP.

metric-static(integer; : **20**) - .

redistribute-bgp (as-type-1 | as-type-2 | no; : **no**) - ,
.
.

redistribute-connected(as-type-1 | as-type-2 | no; : **no**) - ,
. .

redistribute-rip (as-type-1 | as-type-2 | no; : **no**) -

RIP.

redistribute-static (as-type-1 | as-type-2 | no; : **no**) - ,

, . .,
/ip route add.

router-id(IP address; : **0.0.0.0**) - OSPF .
, OSPF IP
.

( ),
(.) AS(.
)

.

OSPF (
) .

OSPF :

- **type1** - , OSPF
.

AS

.

- **type2** - , ; **type2**

AS. **type2** AS

.

Type1 Type2 AS .
, Type1 .
/ip route **Io**.

.

10e+8/ .
:

ethernet 10

T1 64

64Kb/s 1562

OSPF
type1 **1** .

```
[admin@MikroTik] routing ospf> set redistribute-connected=as-type-1
... metric-connected=1
[admin@MikroTik] routing ospf> print
                router-id: 0.0.0.0
        distribute-default: never
    redistribute-connected: as-type-1
        redistribute-static: no
          redistribute-rip: no
          redistribute-bgp: no
            metric-default: 1
```

```
      metric-connected: 1
         metric-static: 20
            metric-rip: 20
            metric-bgp: 20
[admin@MikroTik] routing ospf>
```

: **/routing ospf area**

OSPF   .
                                    .   (
)   .   ,
                                                                                  .

                                                          .

                                                  .

                                              60 -80   .

area-id(IP address;   : 0.0.0.0) -   OSPF   .
area-id=0.0.0.0 -   .   OSPF
                                    .
                            .   (   ).
                                                              .
                                        .
                            .

authetication(none | simple | md5;   : **none**) -
                                            OSPF

- **none** -
- **simple** -
- **md5** -   md5

default-cost(integer;   : **1**) -
                                    .   .

name(name;   **""**) -   OSPF   .

stub(yes | no;   : **no**) -   (   )
                                                                                                              .

                     ,   .

                                                        CPU   .

                                                    .

                                                        OSPF   **local_10   area-id=0.0.0.15**
                                                    :

```
[admin@WiFi] routing ospf area> add area-id=0.0.10.5 name=local_10
[admin@WiFi] routing ospf area> print
Flags: X - disabled, I - invalid
 # NAME                AREA-ID       STUB DEFAULT-COST AUTHENTICATION
 0   backbone                      0.0.0.0                                          none
 1   local_10                      0.0.10.5           no    1                       none
[admin@WiFi] routing ospf area>
```


                                 : **/routing ospf network**

                                                                -   .
                                                                              (.
).   OSPF   ,
                                          (   )
                                 .

                                                    C

area(name;   : **backbone**) - OSPF
                                 .

network(IP   ;   : **20**) -   .
networks   multiple   ,
                                OSPF.

                                                                                                                              -
                                 .   **/32**.

OSPF   10.10.1.0/24,
:

```
[admin@MikroTik] routing ospf network> add area=backbone network=10.10.1.0/24
[admin@MikroTik] routing ospf network> print
Flags: X - disabled
  #  NETWORK          AREA
  0  10.10.1.0/24        backbone
[admin@MikroTik] routing ospf>
```

:/routing ospf interface

OSPF   .

authentication-key (text;   : **""**) -

.

cost(integer: 1..65535;   : **1**) -
.

dead-interval(time;   :**40s**) -
.
hello.   .

hello-interval (time;   **10s**) -   hello
.   ,   .
,   .

interface(name;   : **all**) -   OSPF

• **all** -   ,

priority(integer: 0..255;   :**1**) -   .
(   )   .
,
.

retransmit-interval(time;   : **5s**) -
.

(LSA)   ,   LSA
.

LSA.   :   5
-        10   .

transmit-delay(time;   : **1s**) -

.

ether2

Hello   5   ,   :

```
[admin@MikroTik] routing ospf> interface add interface=ether2 hello-
interval=5s
[admin@MikroTik] routing ospf> interface print
  0 interface=ether2 cost=1 priority=1 authentication-key=""
    retransmit-interval=5s transmit-delay=1s hello-interval=5s
    dead-interval=40s
[admin@MikroTik] routing ospf>
```

: **/routing ospf virtual-link**

RFC   OSPF   .
,   .
.
,
.
.
,
-        .

neighbor-id(IP address;   : **0.0.0.0**) router-id   .

transit-area(name;   : **(unknown)**)) -   ,

(   )   .

10.0.0.201   ex,

:

```
[admin@MikroTik] routing ospf virtual-link> add neighbor-id=10.0.0.201
... transit-area=ex
[admin@MikroTik] routing ospf virtual-link> print
Flags: X - disabled, I - invalid
  # NEIGHBOR-ID    TRANSIT-AREA
  0   10.0.0.201        ex
[admin@MikroTik] routing ospf virtual-link>
```

.

: /routing ospf neigbor

OSPF   ,

.

address(read-only: IP   ) -   IP   .

backup-dr-id(read-only: IP   ) -
.

db-summaries(read-only: integer) -
.

dr-id(read-only: IP   ) -   .

ls-request(read-only: integer) -

ls-retransmits(read-only: integer) -   .

priority(read-only: integer) -
Hello

router-id(read-only: IP   ) - **router-id**

state(read-only: Down | Attempt | Init | 2-Way | ExStart | Exchange | Loading | Full) - co
:

- **Down** -
- **Attempt** -   Hello
- **Init** -   Hello

- **2-Way** -   ,

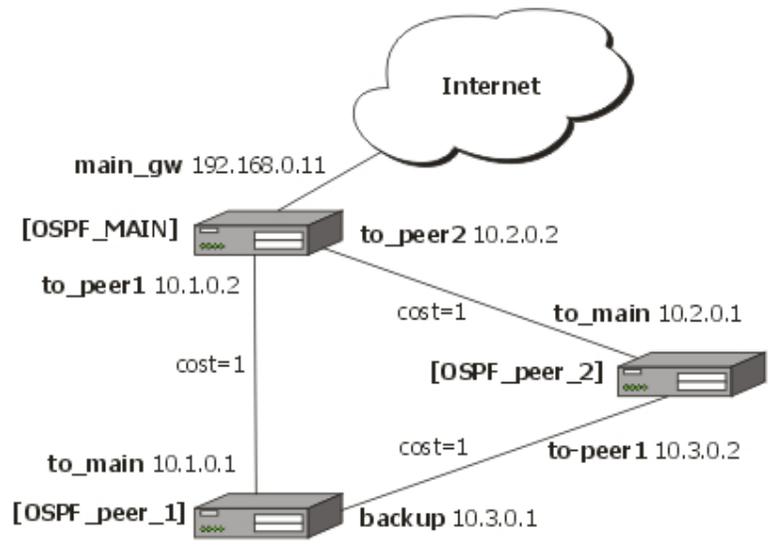- **ExStart** - DR (   )   BDR(
)   ,
                                                                                              .

- **Exchange** -

- **Loading** -
- **Full** -   .

                    Hello,

state-changes(read-only: integer) -

OSPF   :

```
admin@MikroTik] routing ospf> neighbor print
 router-id=10.0.0.204 address=10.0.0.204 priority=1 state="2-Way"
    state-changes=0 ls-retransmits=0 ls-requests=0 db-summaries=0
    dr-id=0.0.0.0 backup-dr-id=0.0.0.0

[admin@MikroTik] routing ospf>
```


OSPF

                                                                    OSPF -Main   OSPF-
peer-1   .   OSPF-
peer-2.   ,   OSPF   ,
                                        ,   OSPF   .

                                                    :

1.   OSPF   ID=0.0.0.1,

Internet

main_gw 192.168.0.11

[OSPF_MAIN]   to_peer2 10.2.0.2

to_peer1 10.1.0.2

cost=1   to_main 10.2.0.1

[OSPF_peer_2]

cost=1

cost=1   to-peer1 10.3.0.2

to_main 10.1.0.1

[OSPF_peer_1]   backup 10.3.0.1

2.   OSPF   .
        peer1   peer2   OSPF   .
main_gw   OSPF

3.   OSPF-peer-1   OSPF-peer-2
         ,   OSPF.

                                     .

```
[admin@OSPF_MAIN] interface> print
Flags: X - disabled, D - dynamic, R - running
  #   NAME                    TYPE          RX-RATE   TX-RATE   MTU
  0   R main_gw                             ether                   0
          0         1500
  1   R to_peer_1                           ether                   0
          0         1500
  2   R to_peer_2                           ether                   0
          0         1500
```

                    ip   ,

```
[admin@OSPF_MAIN] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
  #   ADDRESS           NETWORK        BROADCAST        INTERFACE
  0   192.168.0.11/24       192.168.0.0        192.168.0.255      main_gw
  1   10.1.0.2/24           10.1.0.0           10.1.0.255
to_peer_1
  2   10.2.0.2/24           10.2.0.0           10.2.0.255
to_peer_2
```

                              distribute-default   if-installed-as-type-2,

redistribute-connected as-type-1 redistribute-static as-type-2.
Metric-connected, metric-static, metric-rip, metric-bgp   .

```
[admin@OSPF_MAIN] routing ospf> print
                      router-id: 0.0.0.0
              distribute-default: if-installed-as-type-2
          redistribute-connected: as-type-1
             redistribute-static: as-type-2
                redistribute-rip: no
                redistribute-bgp: no
                  metric-default: 1
                metric-connected: 0
                   metric-static: 0
                      metric-rip: 0
                      metric-bgp: 0
```

OSPF   local_10   area -id 0.0.0.1:

```
[admin@OSPF_MAIN] routing ospf area> print
Flags: X - disabled, I - invalid
  #  NAME                     AREA-ID          STUB DEFAULT-COST
AUTHENTICATION
  0   backbone                               0.0.0.0
        none
  1   local_10                               0.0.0.1              no        1
        none
```

area local_10   OSPF   :

```
[admin@OSPF_MAIN] routing ospf network> print
Flags: X - disabled, I - invalid
  #  NETWORK           AREA
  0    10.1.0.0/24           local_10
  1    10.2.0.0/24           local_10
```

.

OSPF_peer_1.

OSPF_peer_1:

```
[admin@OSPF_peer_1] interface> print
Flags: X - disabled, D - dynamic, R - running
  #  NAME                  TYPE        RX-RATE  TX-RATE   MTU
  0   R backup                          ether                       0
          0        1500
  1   R to_main                         ether                       0
          0        1500
```

IP   :

```
[admin@OSPF_peer_1] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
  #  ADDRESS           NETWORK        BROADCAST       INTERFACE
  0  10.1.0.1/24               10.1.0.0            10.1.0.255
to_main
  1  10.3.0.1/24               10.3.0.0            10.3.0.255        backup
```

redistribute-connected as-type-1. Metric-connected, metric-static, metric-rip, metric-bgp .

```
[admin@OSPF_peer_1] routing ospf> print
                       router-id: 0.0.0.0
               distribute-default: never
           redistribute-connected: as-type-1
              redistribute-static: no
                 redistribute-rip: no
                 redistribute-bgp: no
                   metric-default: 1
                 metric-connected: 0
                    metric-static: 0
                       metric-rip: 0
                       metric-bgp: 0
```

```
[admin@OSPF_peer_1] routing ospf area> print
Flags: X - disabled, I - invalid
  #  NAME                 AREA-ID        STUB DEFAULT-COST
AUTHENTICATION
  0  backbone                            0.0.0.0
     none
  1  local_10                            0.0.0.1            no        1
     none
```

local_10:

```
[admin@OSPF_peer_1] routing ospf network> print
Flags: X - disabled, I - invalid
  #  NETWORK        AREA
  0  10.3.0.0/24         local_10
  1  10.1.0.0/24         local_10
```
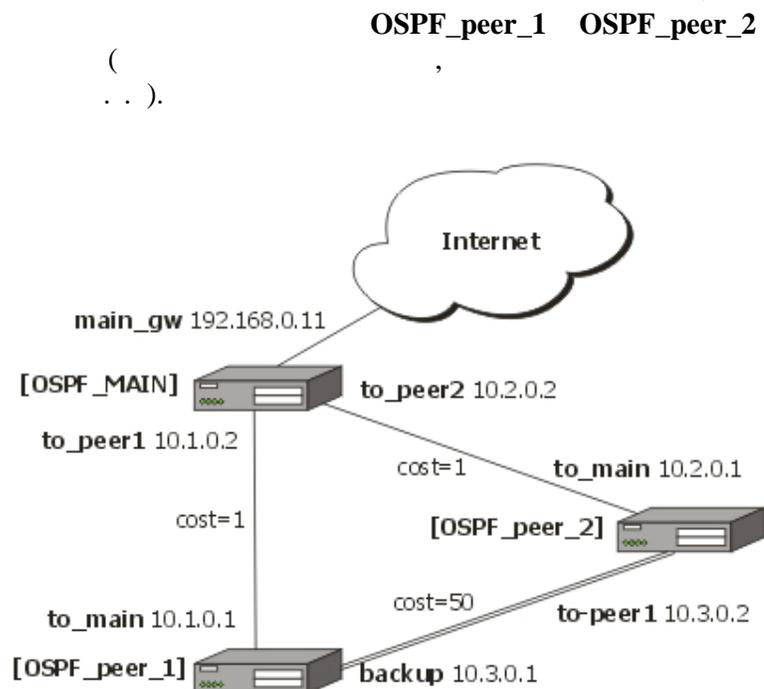
, **OSPF_peer2**.   :

```
[admin@OSPF_peer_2] interface> print
Flags: X - disabled, D - dynamic, R - running
  #  NAME               TYPE        RX-RATE    TX-RATE    MTU
```

```
 0   R to_main                                              ether                    0
         0          1500
 1   R to_peer_1                                            ether                    0
         0          1500
```

IP   :

```
[admin@OSPF_peer_2] ip address> print
Flags: X - disabled, I - invalid, D - dynamic
  #  ADDRESS              NETWORK         BROADCAST          INTERFACE
  0   10.2.0.1/24                    10.2.0.0              10.2.0.255
to_main
  1   10.3.0.2/24                    10.3.0.0              10.3.0.255
to_peer_1
```

:

```
[admin@OSPF_peer_2] routing ospf area> print
Flags: X - disabled, I - invalid
  #  NAME                 AREA-ID          STUB DEFAULT-COST
AUTHENTICATION
  0   backbone                              0.0.0.0
         none
  1   local_10                              0.0.0.1              no         1
         none
```

:

```
[admin@OSPF_peer_2] routing ospf network> print
Flags: X - disabled, I - invalid
  #  NETWORK          AREA
  0   10.2.0.0/24          local_10
  1   10.3.0.0/24          local_10
```

,   ,   ,
           ,   :

```
[admin@OSPF_MAIN] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
  #    DST-ADDRESS         G GATEWAY          DISTANCE INTERFACE
  0 Io 192.168.0.0/24           110
  1 DC 192.168.0.0/24       r 0.0.0.0                 0         main_gw
  2 Do 10.3.0.0/24          r 10.2.0.1              110         to_peer_2
                            r 10.1.0.1                          to_peer_1
  3 Io 10.2.0.0/24          110
  4 DC 10.2.0.0/24          r 0.0.0.0                 0         to_peer_2
  5 Io 10.1.0.0/24          110
  6 DC 10.1.0.0/24          r 0.0.0.0                 0         to_peer_1
```

```
[admin@OSPF_peer_1] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
 # DST-ADDRESS G GATEWAY DISTANCE INTERFACE
 0 Do 192.168.0.0/24 r 10.1.0.2 110 to_main
 1 Io 10.3.0.0/24 110
 2 DC 10.3.0.0/24 r 0.0.0.0 0 backup
 3 Do 10.2.0.0/24 r 10.1.0.2 110 to_main
 r 10.3.0.2 backup
 4 Io 10.1.0.0/24 110
 5 DC 10.1.0.0/24 r 0.0.0.0 0 to_main
```

```
[admin@OSPF_peer_2] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
 #    DST-ADDRESS          G GATEWAY          DISTANCE INTERFACE
 0 Do 192.168.0.0/24          r 10.2.0.2                 110      to_main
 1 Io 10.3.0.0/24               110
 2 DC 10.3.0.0/24             r 0.0.0.0                   0        to_peer_1
 3 Io 10.2.0.0/24             110
 4 DC 10.2.0.0/24             r 0.0.0.0                   0        to_main
 5 Do 10.1.0.0/24             r 10.3.0.1                  110      to_peer_1
                              r 10.2.0.2                           to_main
```

.

OSPF_peer_1   OSPF_peer_2

(,
. .).

OSPF_peer_2   50.   ,
                 :

```
[admin@OSPF_peer_1] routing ospf interface> add interface=backup cost=50
[admin@OSPF_peer_1] routing ospf interface> print
  0 interface=backup cost=50 priority=1 authentication-key=""
 retransmit-interval=5s transmit-delay=1s hello-interval=10s
dead-interval=40s

[admin@OSPF_peer_2] routing ospf interface> add interface=to_peer_1 cost=50
[admin@OSPF_peer_2] routing ospf interface> print
  0 interface=to_peer_1 cost=50 priority=1 authentication-key=""
 retransmit-interval=5s transmit-delay=1s hello-interval=10s
    dead-interval=40s
```

                                                                      multi
              10.3.0.0/24   **OSPF_MAIN**

OSPF_MAIN

```
[admin@OSPF_MAIN] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
  #    DST-ADDRESS        G GATEWAY          DISTANCE INTERFACE
  0 Io 192.168.0.0/24          110
  1 DC 192.168.0.0/24        r 0.0.0.0               0       main_gw
  2 Do 10.3.0.0/24           r 10.2.0.1             110     to_peer_2
                             r 10.1.0.1                     to_peer_1
  3 Io 10.2.0.0/24           110
  4 DC 10.2.0.0/24           r 0.0.0.0               0      to_peer_2
  5 Io 10.1.0.0/24           110
  6 DC 10.1.0.0/24           r 0.0.0.0               0      to_peer_1
```

OSPF_peer_1

```
[admin@OSPF_peer_1] > ip route pr
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
  #    DST-ADDRESS        G GATEWAY          DISTANCE INTERFACE
  0 Do 192.168.0.0/24       r 10.1.0.2             110      to_main
  1 Io 10.3.0.0/24          110
  2 DC 10.3.0.0/24          r 0.0.0.0               0       backup

  3 Do 10.2.0.0/24          r 10.1.0.2             110      to_main
  4 Io 10.1.0.0/24          110
  5 DC 10.1.0.0/24          r 0.0.0.0               0       to_main
```

OSPF_peer_2

```
[admin@OSPF_peer_2] > ip route print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
  #    DST-ADDRESS        G GATEWAY          DISTANCE INTERFACE
  0 Do 192.168.0.0/24       r 10.2.0.2                110       to_main
```

```
   1 Io 10.3.0.0/24                110
   2 DC 10.3.0.0/24             r 0.0.0.0                    0          to_peer_1
   3 Io 10.2.0.0/24                110
   4 DC 10.2.0.0/24             r 0.0.0.0                    0          to_main
   5 Do 10.1.0.0/24             r 10.2.0.2                 110          to_main
```
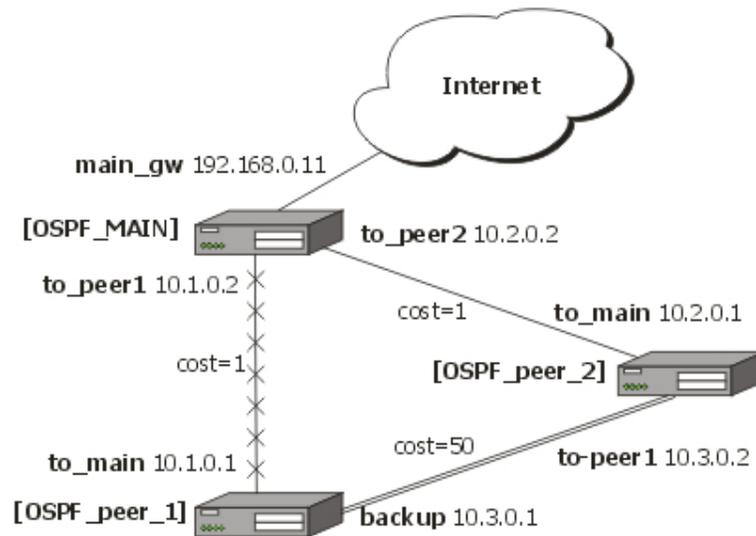
OSPF_MAIN   OSPF_peer_1   ,

:

OSPF   :

OSPF_MAIN

```
[admin@OSPF_MAIN] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
  #    DST-ADDRESS          G GATEWAY            DISTANCE INTERFACE
  0 Io 192.168.0.0/24             110
  1 DC 192.168.0.0/24          r 0.0.0.0                    0          main_gw
  2 Do 10.3.0.0/24             r 10.2.0.1                 110          to_peer_2
  3 Io 10.2.0.0/24                110
  4 DC 10.2.0.0/24             r 0.0.0.0                    0          to_peer_2
  5 Io 10.1.0.0/24                110
  6 DC 10.1.0.0/24             r 0.0.0.0                    0          to_peer_1
```

OSPF_peer_1

```
[admin@OSPF_peer_1] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
```

```
#    DST-ADDRESS          G GATEWAY            DISTANCE INTERFACE
0 Do 192.168.0.0/24       r 10.3.0.2                    110        backup
1 Io 192.168.0.0/24         110
2 DC 10.3.0.0/24          r 0.0.0.0                     0          backup
3 Do 10.2.0.0/24          r 10.3.0.2                    110        backup
4 Io 10.1.0.0/24          110
5 DC 10.1.0.0/24          r 0.0.0.0                     0          to_main
```

OSPF_peer_2

```
[admin@OSPF_peer_2] ip route> print
Flags: X - disabled, I - invalid, D - dynamic, J - rejected,
C - connect, S - static, r - rip, o - ospf, b - bgp
#    DST-ADDRESS          G GATEWAY            DISTANCE INTERFACE
0 Do 192.168.0.0/24       r 10.2.0.2                    110        to_main
1 Io 10.3.0.0/24          110
2 DC 10.3.0.0/24          r 0.0.0.0                     0          to_peer_1
3 Io 10.2.0.0/24          110
4 DC 10.2.0.0/24          r 0.0.0.0                     0          to_main
5 Do 10.1.0.0/24          r 10.2.0.2                    110        to_main
```

40   (hello-
interval).   ,   ,
.