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Daftar Isi

EVERY MORNING

YOU HAVE TWO

CHOICES: CONTINUE

TO SLEEP WITH

YOUR DREAMS,

OR WAKE UP AND

CHASE THEM.

EIGRP

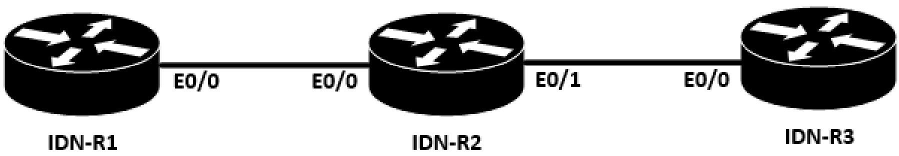
(Enhanced Interior Gateway Routing Protocol)

Lab 1. EIGRP - Konfigurasi Dasar

Tujuan Lab:

- Mempelajari konfigurasi EIGRP

Topologi Lab:



Metode Lab:

- Mengkonfigurasikan ipv4 address standar IDN di interface
- Mengadvertise ipv4 ke dalam EIGRP

Verifikasi Lab:

- Cek ipv4 routingnya
- Lakukan test ping

IDN-R1

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip address 12.12.12.1 255.255.255.0
IDN-R1(config-if)#no sh

IDN-R1(config-if)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255
```

IDN-R2

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip address 12.12.12.2 255.255.255.0
IDN-R2(config-if)#no shutdown

IDN-R2(config-if)#int e0/1
IDN-R2(config-if)#ip address 23.23.23.2 255.255.255.0
IDN-R2(config-if)#no shutdown

IDN-R2(config-if)#int lo0
IDN-R2(config-if)#ip address 2.2.2.2 255.255.255.255
```

IDN-R3

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip add 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no sh

IDN-R3(config-if)#int lo0
IDN-R3(config-if)#ip add 3.3.3.3 255.255.255.255
```

Konfigurasi EIGRP

IDN-R1

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#no auto-summary
IDN-R1(config-router)#network 12.12.12.1 0.0.0.0
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0
```

IDN-R2

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#no auto-summary
IDN-R2(config-router)#network 12.12.12.2 0.0.0.0
IDN-R2(config-router)#network 23.23.23.2 0.0.0.0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0
```

IDN-R3

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#no auto-summary
IDN-R3(config-router)#network 23.23.23.3 0.0.0.0
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
```

Cek routing table ipv4 routenya

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:02:29, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:04:53, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:09:37,
Ethernet0/0
```

Verifikasi ping

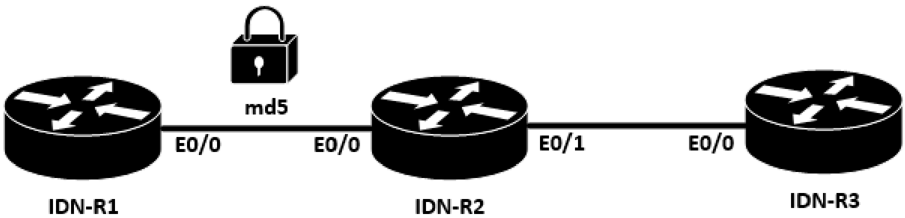
```
IDN-R1#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 2. EIGRP – Authentication

Tujuan Lab:

- Mempelajari konfigurasi Authentikasi MD5 pada EIGRP

Topologi Lab:



Metode Lab:

- Melanjutkan lab konfigurasi sebelumnya
- Membuat key-chain untuk authentikasi EIGRP
- Mengkonfigurasikan authentikasi md5 di interface

Verifikasi Lab:

- Cek authentikasi dan IPv4 routingnya
- Lakukan test ping

Pada EIGRP hanya ada MD5 authentication, tidak ada clear text authentication

```
IDN-R1(config)#key chain IDN
IDN-R1(config-keychain)#key 1
IDN-R1(config-keychain-key)#key-string cisco
```

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip authentication key-chain eigrp 1 IDN
IDN-R1(config-if)#ip authentication mode eigrp 1 md5
```

```
IDN-R2(config)#key chain IDN
IDN-R2(config-keychain)#key 1
IDN-R2(config-keychain-key)#key-string cisco
```

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip authentication key-chain eigrp 1 IDN
IDN-R2(config-if)#ip authentication mode eigrp 1 md5
```

Verifikasi

```
IDN-R1#debug eigrp packets
    (UPDATE, REQUEST, QUERY, REPLY, HELLO, UNKNOWN, PROBE, ACK,
STUB, SIAQUERY, SIAREPLY)
EIGRP Packet debugging is on
R1#
*Oct 19 01:08:14.997: EIGRP: received packet with MD5
authentication, key id = 1
*Oct 19 01:08:14.997: EIGRP: Received HELLO on Et0/0 - paklen 60 nbr
FE80::A8BB:CCFF:FE00:300
*Oct 19 01:08:14.997:   AS 1, Flags 0x0:(NULL), Seq 0/0 interfaceQ
0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
*Oct 19 01:08:15.362: EIGRP: Sending HELLO on Et0/0 - paklen 60
*Oct 19 01:08:15.362:   AS 1, Flags 0x0:(NULL), Seq 0/0 interfaceQ
0/0 iidbQ un/rely 0/0
*Oct 19 01:08:15.713: EIGRP: received packet with MD5
authentication, key id = 1
*Oct 19 01:08:15.714: EIGRP: Received HELLO on Et0/0 - paklen 60 nbr
12.12.12.2
```

Setelah dikonfigurasi, lakukan test ping kembali dan pastikan masih berhasil.

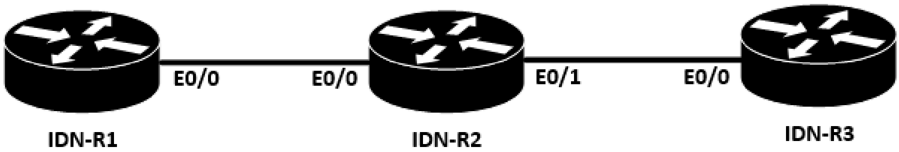
```
IDN-R1#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 3. EIGRP – Summarization

Tujuan Lab:

- Mempelajari konfigurasi summarization

Topologi Lab:



Metode Lab:

- Melanjutkan lab dan konfigurasi sebelumnya
- Membuat beberapa IPv4 loopback di IDN-R3
- Cek routing table sebelum summarization
- Konfigurasikan summarization
- Cek routing table setelah summarization

Verifikasi Lab:

- Show ip route

Dengan summarization, maka beberapa route akan dijadikan satu, untuk itu kita perlu membuat beberapa ip yang nantinya akan di summarize. Untuk IPv4 kita buat di IDN-R3

```
IDN-R3(config)#int lo1
IDN-R3(config-if)#ip address 10.0.0.1 255.255.255.255
IDN-R3(config-if)#int lo2
IDN-R3(config-if)#ip address 10.0.0.2 255.255.255.255
IDN-R3(config-if)#int lo3
IDN-R3(config-if)#ip address 10.0.0.3 255.255.255.255
IDN-R3(config-if)#int lo4
IDN-R3(config-if)#ip address 10.0.0.4 255.255.255.255
IDN-R3(config-if)#int lo5
IDN-R3(config-if)#ip address 10.0.0.5 255.255.255.255
IDN-R3(config-if)#int lo6
IDN-R3(config-if)#ip address 10.0.0.6 255.255.255.255
IDN-R3(config-if)#int lo7
IDN-R3(config-if)#ip address 10.0.0.7 255.255.255.255
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#no auto-summary
IDN-R3(config-router)#network 10.0.0.1 0.0.0.0
IDN-R3(config-router)#network 10.0.0.2 0.0.0.0
IDN-R3(config-router)#network 10.0.0.3 0.0.0.0
IDN-R3(config-router)#network 10.0.0.4 0.0.0.0
IDN-R3(config-router)#network 10.0.0.5 0.0.0.0
IDN-R3(config-router)#network 10.0.0.6 0.0.0.0
IDN-R3(config-router)#network 10.0.0.7 0.0.0.0
```

Cek routing table pada IDN-R1, pastikan menerima route dari IDN-R3

```
IDN-R1#show ip route eigrp
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:42:36, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:42:36, Ethernet0/0
      10.0.0.0/32 is subnetted, 7 subnets
D        10.0.0.1 [90/435200] via 12.12.12.2, 00:01:42, Ethernet0/0
D        10.0.0.2 [90/435200] via 12.12.12.2, 00:01:36, Ethernet0/0
D        10.0.0.3 [90/435200] via 12.12.12.2, 00:01:28, Ethernet0/0
D        10.0.0.4 [90/435200] via 12.12.12.2, 00:01:21, Ethernet0/0
D        10.0.0.5 [90/435200] via 12.12.12.2, 00:01:15, Ethernet0/0
D        10.0.0.6 [90/435200] via 12.12.12.2, 00:01:05, Ethernet0/0
D        10.0.0.7 [90/435200] via 12.12.12.2, 00:00:59, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:42:36,
Ethernet0/0
```

Konfigurasi summary IPv4 pada IDN-R3

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip summary-address eigrp 1 10.0.0.0
255.255.255.248
```

Verifikasi lagi pada routing table IDN-R1

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:59:42, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:59:42, Ethernet0/0
      10.0.0.0/29 is subnetted, 1 subnets
D        10.0.0.0 [90/435200] via 12.12.12.2, 00:00:40, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:59:42,
Ethernet0/0
```

Test ping

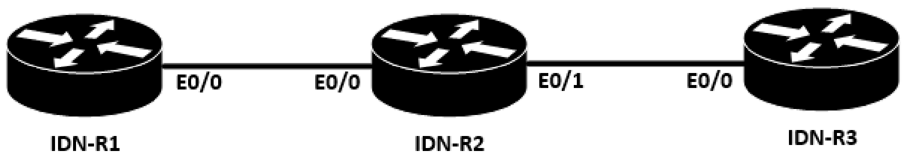
```
IDN-R1#ping 10.0.0.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R1#ping 10.0.0.7
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.0.7, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 4. EIGRP – Leak Map

Tujuan Lab:

- Mempelajari konfigurasi leak map pada EIGRP

Topologi Lab:



Metode Lab:

- Melanjutkan lab dan konfigurasi sebelumnya
- Cek routing table sebelum konfigurasi leak map
- Konfigurasikan leak map
- Cek routing table setelah konfigurasi leak map

Verifikasi Lab:

- Show ip route

Berikutnya adalah EIGRP leak map, yaitu fitur dari summary address untuk menggunakan spesifik network dikeluarkan dari summarynya.

Berikutnya konfigurasi agar network 10.0.0.2, 10.0.0.3 dan 10.0.0.7 nya dikeluarkan dari summarynya

```
IDN-R3(config)#access-list 1 permit 10.0.0.2 0.0.0.0
IDN-R3(config)#access-list 1 permit 10.0.0.3 0.0.0.0
IDN-R3(config)#access-list 1 permit 10.0.0.7 0.0.0.0

IDN-R3(config)#route-map LEAK permit 10
IDN-R3(config-route-map)#match ip address 1

IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip summary-address eigrp 1 10.0.0.0
255.255.255.248 leak-map LEAK
```

Cek lagi pada router IDN-R1 pastikan 10.0.0.2, 10.0.0.3 dan 10.0.0.7 dikeluarkan dari summarynya

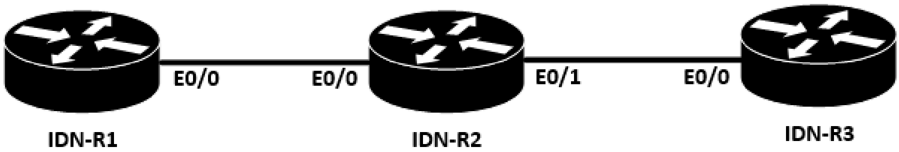
```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:36:28, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:36:28, Ethernet0/0
      10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks
D        10.0.0.0/29 [90/435200] via 12.12.12.2, 00:01:50,
Ethernet0/0
D        10.0.0.2/32 [90/435200] via 12.12.12.2, 00:00:08,
Ethernet0/0
D        10.0.0.3/32 [90/435200] via 12.12.12.2, 00:00:08,
Ethernet0/0
D        10.0.0.7/32 [90/435200] via 12.12.12.2, 00:00:08,
Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:36:28,
Ethernet0/0
```

Lab 5. EIGRP – Filtering Route Direction IN

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Kondisi awal sebelum dilakukan route filtering

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 01:32:09, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 01:31:56, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 01:32:16,
Ethernet0/0
```

Kali ini diinginkan IP loopback IDN-R2 tidak boleh terdapat dalam routing table IDN-R1, maka kita lakukan filtering route nya menggunakan distribute-list. Sebelumnya kita definisikan dulu network yang akan difilter menggunakan access-list.

```
IDN-R1(config)#access-list 1 deny 2.2.2.2
IDN-R1(config)#access-list 1 permit any

IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#distribute-list 1 in e0/0
```

Kemudian cek routing table dan pastikan IP 2.2.2.2 tidak lagi terdapat di dalam routing tablenya

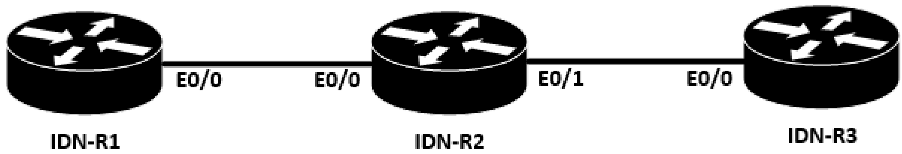
```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 01:33:44, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 01:34:04,
Ethernet0/0
```

Lab 6. EIGRP – Filtering Route Direction OUT

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Selain dikonfigurasikan di Router IDN-R1 seperti yang kita lakukan pada lab sebelumnya, bisa juga dikonfigurasikan di IDN-R2 namun dengan direction OUT

Hapus dulu konfigurasi IDN-R1

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#no distribute-list 1 in e0/0
```

Cek routing table pastikan IP 2.2.2.2 muncul kembali.

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:00:04, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 01:35:04, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
```

Kemudian konfigurasikan di IDN-R2

```
IDN-R2(config)#access-list 1 permit any
IDN-R2(config)#access-list 1 deny 2.2.2.2

IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#distribute-list 1 out e0/0
```

Cek routing tablenya

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 01:39:33, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 01:39:53,
Ethernet0/0
```

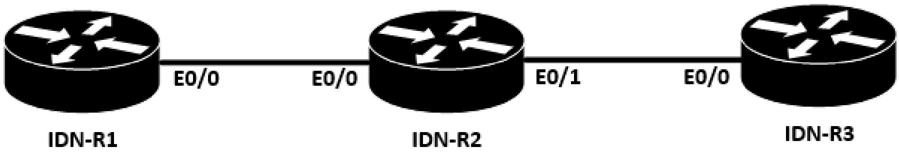
Dan hasilnya IP 2.2.2.2 sudah tidak terdapat pada routing table.

Lab 7. EIGRP – Filtering Route Modifikasi AD

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Metode filtering yang lain adalah dengan merubah nilai AD suatu route menjadi 255(unreachable).

Misalnya diinginkan IP loopback IDN-R1 tidak lagi dimunculkan dalam routing table IDN-R3, dengan diset nilai ADnya menjadi 255 sehingga route apapun yang diset ADnya menjadi 255 maka akan hilang dan tidak ada pada routing table.

Kondisi awal

```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/435200] via 23.23.23.2, 01:40:21, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 01:40:21, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 01:40:21,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Konfigurasikan ACL dan rubah AD menjadi 255

```
IDN-R3(config)#access-list 99 permit 1.1.1.1

IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#distance 255 0.0.0.0 255.255.255.255 99
```

Cek table routing IDN-R3

```
IDN-R3(config-router)#do sh ip route
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 00:00:13, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 00:00:13,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Dan IP loopback IDN-R1 sudah tidak terdapat dalam routing table.

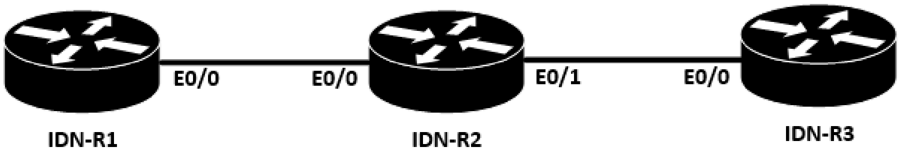
```
IDN-R3(config-router)#do sh ip route 1.1.1.1
% Network not in table
```

Lab 8. EIGRP – Filtering Route Prefix List IN

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Berikutnya adalah latihan filtering menggunakan prefix-list. Bila kita ingin memfilter berdasarkan netmasknya, missal network pada IDN-R3 dengan prefix /24 - /28 akan di blok, selain prefix tersbut akan ditampilkan.

Buatlah loopback dengan netmask yang bervariatif pada IDN-R3

```
IDN-R3(config)#int lo1
IDN-R3(config-if)#ip add 3.3.3.17 255.255.255.248
IDN-R3(config-if)#int lo2
IDN-R3(config-if)#ip add 3.3.3.33 255.255.255.240
IDN-R3(config-if)#int lo3
IDN-R3(config-if)#ip add 3.3.3.65 255.255.255.224
IDN-R3(config-if)#int lo4
IDN-R3(config-if)#ip add 3.3.3.129 255.255.255.192
```

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 5 subnets, 5 masks
D        3.3.3.3/32 [90/435200] via 12.12.12.2, 01:51:46,
Ethernet0/0
D        3.3.3.16/29 [90/435200] via 12.12.12.2, 00:01:26,
Ethernet0/0
D        3.3.3.32/28 [90/435200] via 12.12.12.2, 00:01:26,
Ethernet0/0
D        3.3.3.64/27 [90/435200] via 12.12.12.2, 00:01:26,
Ethernet0/0
D        3.3.3.128/26 [90/435200] via 12.12.12.2, 00:01:26,
Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 03:35:06,
Ethernet0/0
```

Konfigurasikan prefix-list filtering di IDN-R2

```
IDN-R2(config)#ip prefix-list eigrp_IN seq 10 deny 3.3.3.0/24 le 28
IDN-R2(config)#ip prefix-list eigrp_IN seq 20 permit 0.0.0.0/0 le 32

IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#distribute-list prefix eigrp_IN in e0/1
```

Maka semua network 3.3.3.x dengan prefix /24 - /28 akan di deny

```
IDN-R1(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D        3.3.3.3/32 [90/435200] via 12.12.12.2, 01:56:26,
Ethernet0/0
D        3.3.3.16/29 [90/435200] via 12.12.12.2, 00:06:06,
Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 03:39:46,
Ethernet0/0
```

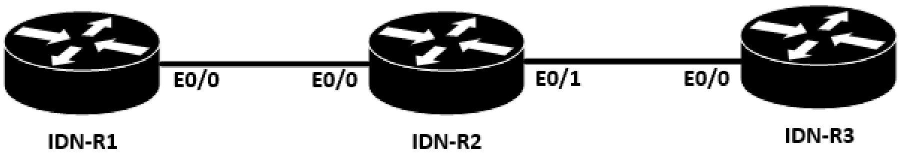
```
IDN-R2(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/409600] via 12.12.12.1, 03:41:36, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
D        3.3.3.3/32 [90/409600] via 23.23.23.3, 01:58:14,
Ethernet0/1
D        3.3.3.16/29 [90/409600] via 23.23.23.3, 00:07:54,
Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Lab 9. EIGRP – Filtering Route Prefix List OUT

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Prefixlist selain diterapkan pada input, juga bisa diterapkan pada direction output, hapus dulu prefix list in pada IDN-R2

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#no distribute-list prefix eigrp_IN in e0/1
```

Selanjutnya konfigurasikan prefix out pada IDN-R3

```
IDN-R3(config)#ip prefix-list eigrp_OUT seq 10 deny 3.3.3.0/24 ge 28
le 30
IDN-R3(config)#ip prefix-list eigrp_OUT seq 20 permit 0.0.0.0/0 le
32
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#distribute-list prefix eigrp_OUT out
```

Network 3.3.3.x yang memiliki netmask /28 - /30 akan di deny.

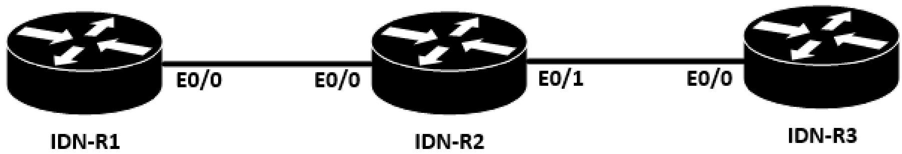
```
IDN-R2(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/409600] via 12.12.12.1, 03:56:22, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D        3.3.3.3/32 [90/409600] via 23.23.23.3, 02:13:00,
Ethernet0/1
D        3.3.3.64/27 [90/409600] via 23.23.23.3, 00:00:27,
Ethernet0/1
D        3.3.3.128/26 [90/409600] via 23.23.23.3, 00:00:27,
Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Lab 10. EIGRP – Filtering Route IP Ganjil Genap

Tujuan Lab:

- Mempelajari berbagai macam cara untuk memfilter route

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing EIGRP
- Membuat filtering route agar ip loopback IDN-R2 tidak lagi muncul dalam routing table IDN-R1
- Cek routing table

Verifikasi Lab:

- Show ip route

Selanjutnya adalah filtering dengan memanfaatkan ACL dengan hanya mengizinkan IP Genap dan IP Ganjil.

Konfigurasikan standard acl genap kemudian gunakan acl genap tersebut kedalam distribute list

```
IDN-R1(config)#access-list 88 permit 0.0.0.0 255.255.255.254

IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 10.10.10.0 0.0.0.255
IDN-R1(config-router)#distribute-list 88 out
```

Cek table routing, tidak ada ganjil pada network 10.10.10.0/29

```
IDN-R2#show ip route
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D        3.3.3.3/32 [90/409600] via 23.23.23.3, 00:12:35,
Ethernet0/1
D        3.3.3.64/27 [90/409600] via 23.23.23.3, 00:12:35,
Ethernet0/1
D        3.3.3.128/26 [90/409600] via 23.23.23.3, 00:12:35,
Ethernet0/1
      10.0.0.0/32 is subnetted, 3 subnets
D        10.10.10.2 [90/409600] via 12.12.12.1, 00:00:17,
Ethernet0/0
D        10.10.10.4 [90/409600] via 12.12.12.1, 00:00:17,
Ethernet0/0
D        10.10.10.6 [90/409600] via 12.12.12.1, 00:00:17,
Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Kemudian kita akan melakukan filtering ganjil, hapus distribute list genap dari routing, buat acl baru dengan aturan ganjil, kemudian terapkan pada distribute list

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#no distribute-list 88 out
IDN-R1(config)#access-list 99 permit 0.0.0.1 255.255.255.254
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#distribute-list 99 out
```

Cek routing table dan pastikan tidak ada route 10.10.10.0/29 genap.

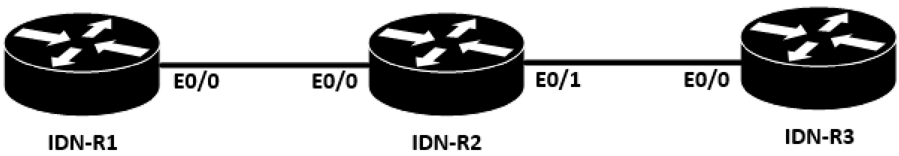
```
IDN-R2#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/409600] via 12.12.12.1, 00:03:47, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
D        3.3.3.3/32 [90/409600] via 23.23.23.3, 00:24:19,
Ethernet0/1
D        3.3.3.64/27 [90/409600] via 23.23.23.3, 00:24:19,
Ethernet0/1
D        3.3.3.128/26 [90/409600] via 23.23.23.3, 00:24:19,
Ethernet0/1
      10.0.0.0/32 is subnetted, 4 subnets
D        10.10.10.1 [90/409600] via 12.12.12.1, 00:03:47,
Ethernet0/0
D        10.10.10.3 [90/409600] via 12.12.12.1, 00:03:47,
Ethernet0/0
D        10.10.10.5 [90/409600] via 12.12.12.1, 00:03:47,
Ethernet0/0
D        10.10.10.7 [90/409600] via 12.12.12.1, 00:03:47,
Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Lab 11. EIGRP – Unicast Update

Tujuan: Lab:

- Memperlajari default routing update eigrp multicast
- Memperlajari merubah multicast update menjadi unicast

Topologi Lab:



Metode Lab:

- Bisa dengan melanjutkan lab dan konfigurasi sebelumnya
- Jalankan debug ip packet detail, cek ip destinationnya
- Rubah dari multicast menjadi unicast dengan perintah neighbor
- Jalankan debug ip packet detail lagi, cek ip destinationnya

Verifikasi Lab:

- Debug ip packet detail

Secara default EIGRP melakukan update secara multicast 224.0.0.10, pada lab kali ini kita akan merubahnya menjadi unicast update.

```
IDN-R1#debug ip packet detail
IP packet debugging is on (detailed)
IDN-R1#
*Oct 19 08:53:04.388: IP: s=12.12.12.1 (local), d=224.0.0.10
(Ethernet0/0), len 60, sending broad/multicast, proto=88
*Oct 19 08:53:04.388: IP: s=12.12.12.1 (local), d=224.0.0.10
(Ethernet0/0), len 60, sending full packet, proto=88
```

Untuk merubah menjadi unicast konfigurasikan pada IDN-R1 dan IDN-R2

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#neighbor 12.12.12.2 e0/0
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#neighbor 12.12.12.1 e0/0
```

Selanjutnya cek kembali dan pastikan updatenya sudah berubah dari multicast 224.0.0.10 menjadi unicast ip neighbornya.

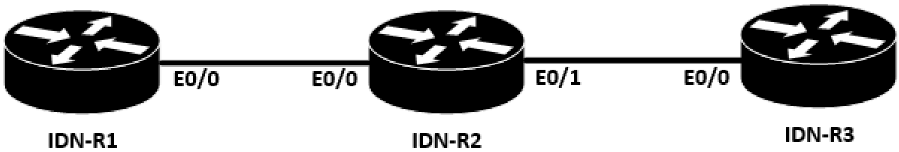
```
IDN-R1#debug ip packet detail
IP packet debugging is on (detailed)
IDN-R1#
*Oct 19 09:53:53.641: IP: s=12.12.12.1 (local), d=12.12.12.2
(Ethernet0/0), len 60, sending, proto=88
*Oct 19 09:53:53.641: IP: s=12.12.12.1 (local), d=12.12.12.2
(Ethernet0/0), len 60, sending full packet, proto=88
```

Lab 12. EIGRP – Default Route

Tujuan Lab:

- Mempelajari cara mendistribusikan default route melalui EIGRP

Topologi Lab:



Metode Lab:

- Bisa dengan melanjutkan lab dan konfigurasi sebelumnya
- Jalankan debug ip packet detail, cek ip destinationnya
- Rubah multicast menjadi unicast dengan perintah neighbor
- Jalankan debug ip packet detail lagi, cek ip detinationnya

Verifikasi Lab:

- Show ip route

Default route juga bias didistriibusikan melalui EIGRP sehingga masing-masing router tidak perlu membuat konfigurasi default route secara manual.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip summary-address eigrp 1 0.0.0.0 0.0.0.0
```

```
IDN-R1(config-if)#do sh ip route
Gateway of last resort is 0.0.0.0 to network 0.0.0.0
D*    0.0.0.0/0 is a summary, 00:00:24, Null0
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:03:04, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:01:27, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:01:42,
Ethernet0/0
```

Network tidak terdapat pada table

```
IDN-R3(config)#do sh ip route 1.1.1.1
% Network not in table
```

Test ping dan pastikan sukses

```
IDN-R3(config)#do ping 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Sebeum lanjut ke lab berikutnya hapus konfigurasi summary address

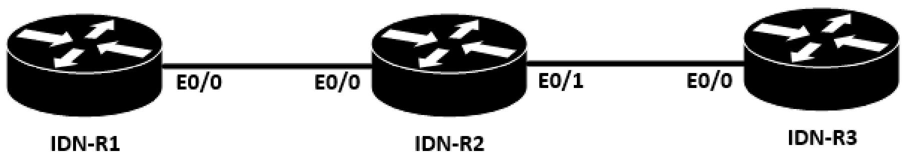
```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no ip summary-address eigrp 1 0.0.0.0 0.0.0.0
```

Lab 13. EIGRP – Redistribution RIP

Tujuan Lab:

- Mempelajari meredistribute routing protocol lain ke dalam eigrp

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router, selain di IDN-R1 boleh menggunakan network 0.0.0.0
- Pada IDN-R1 buat beberapa ip loopback yang diadvertise ke OSPF dan RIP
- Redistribute ospf, rip dan connected ke dalam EIGRP

Verifikasi Lab:

- Show ip route

Buat IP loopback yang akan diadvertise ke RIP yang kemudian diredistribute ke EIGRP

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 10.10.10.10 255.255.255.240
```

Advertise ke RIP

```
IDN-R1(config)#router rip
IDN-R1(config-router)#version 2
IDN-R1(config-router)#no auto-summary
IDN-R1(config-router)#network 10.10.10.0
```

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#redistribute rip
```

Cek routing table pada IDN-R3, network 10.10.10.0 tidak ada, karena belum diset metric

```
IDN-R3(config)#do sh ip route
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 00:11:39, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 00:11:39,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Cek K values pada interface yang akan diredistribute

```
IDN-R1(config-router)#do sh int lo1
Loopback1 is up, line protocol is up
  Hardware is Loopback
  Internet address is 10.10.10.10/28
  MTU 1514 bytes, BW 8000000 Kbit/sec, DLY 5000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation LOOPBACK, loopback not set
  Keepalive set (10 sec)
..................
```

```
IDN-R1(config-router)#redistribute rip metric ?
  <1-4294967295>  Bandwidth metric in Kbits per second

IDN-R1(config-router)#redistribute rip metric 8000000 ?
  <0-4294967295>  EIGRP delay metric, in 10 microsecond units

IDN-R1(config-router)#redistribute rip metric 8000000 500 ?
  <0-255>  EIGRP reliability metric where 255 is 100% reliable

IDN-R1(config-router)#redistribute rip metric 8000000 500 255 ?
  <1-255>  EIGRP Effective bandwidth metric (Loading) where 255 is
100% loaded

IDN-R1(config-router)#redistribute rip metric 8000000 500 255 1 ?
  <1-65535>  EIGRP MTU of the path

IDN-R1(config-router)#redistribute rip metric 8000000 500 255 1 1514
```

Abaikan nilai diatas, gunakan nilai berikut.

```
IDN-R1(config-router)#redistribute rip metric 1 1 1 1 1
```

Secara metric berbeda namun secara fungsi dan jalannya routing tidak aka nada bedanya karena sifatnya eksternal route. Yang penting metricnya harus diisi, berapapun nilainya tidak ada pengaruhnya.

Cek table routing IDN-R3

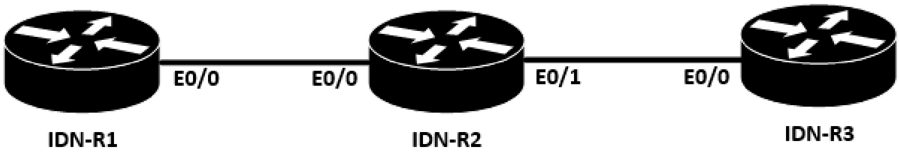
```
IDN-R3(config)#do sh ip route
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 00:18:52, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/28 is subnetted, 1 subnets
D EX     10.10.10.0 [170/2560051456] via 23.23.23.2, 00:00:18,
Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 00:18:52,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Lab 14. EIGRP – Redistribution OSPF

Tujuan Lab:

- Mempelajari meredistribute routing protocol lain ke dalam eigrp

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router, selain di IDN-R1 boleh menggunakan network 0.0.0.0
- Pada IDN-R1 buat beberapa ip loopback yang diadvertise ke OSPF dan RIP
- Redistribute ospf, rip dan connected ke dalam EIGRP

Verifikasi Lab:

- Show ip route

Berikutnya adalah kita akan meredistribute ospf ke dalam eigrp

```
IDN-R1(config)#int lo2
IDN-R1(config-if)#ip address 20.20.20.20 255.255.255.224

IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 20.20.20.20 0.0.0.31 area 0
```

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#redistribute ospf 1 metric 1 1 1 1 1
```

```
IDN-R3(config)#do sh ip route
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 00:25:00, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/28 is subnetted, 1 subnets
D EX     10.10.10.0 [170/2560051456] via 23.23.23.2, 00:06:26,
Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 00:25:00,
Ethernet0/0
      20.0.0.0/27 is subnetted, 1 subnets
D EX     20.20.20.0 [170/2560051456] via 23.23.23.2, 00:00:22,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

```
IDN-R3(config)#do ping 20.20.20.20
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 20.20.20.20, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Berikutnya kita akan latihan meredistribute suatu interface ke dalam eigrp.

```
IDN-R1(config)#int lo3
IDN-R1(config-if)#ip address 30.30.30.30 255.255.255.224
```

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#redistribute connected
```

Cek routing table IDN-R3

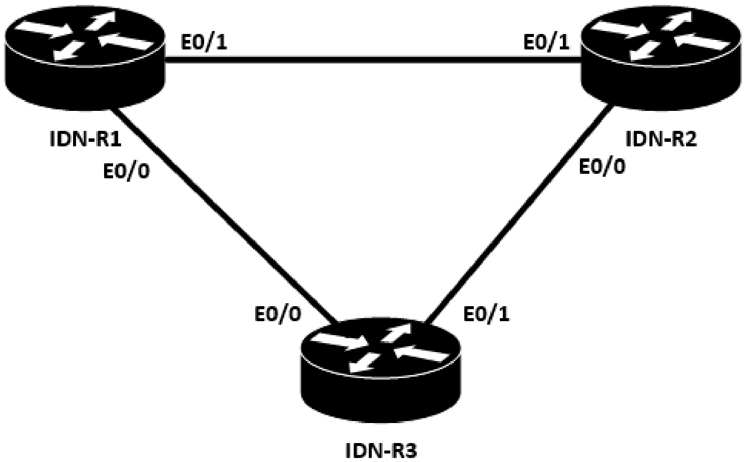
```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D EX     1.1.1.1 [170/435200] via 23.23.23.2, 00:00:56, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 23.23.23.2, 00:28:56, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/28 is subnetted, 1 subnets
D EX     10.10.10.0 [170/435200] via 23.23.23.2, 00:00:56,
Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/307200] via 23.23.23.2, 00:28:56,
Ethernet0/0
      20.0.0.0/27 is subnetted, 1 subnets
D EX     20.20.20.0 [170/435200] via 23.23.23.2, 00:00:56,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/27 is subnetted, 1 subnets
D EX     30.30.30.0 [170/435200] via 23.23.23.2, 00:00:56,
Ethernet0/0
```

Lab 15. EIGRP – Mindah Jalur (Delay)

Tujuan Lab:

- Memanipulasi jalur aar berpindah dari jalur awalnya

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router
- Cek jalur dari IDN-R1 ke IDN-R3
- Gunakan parameter delay, bandwidth, offset-list untuk memindahkan jalur melalui IDN-R2

Verifikasi Lab:

- Show ip route
- Traceroute

Ada 3 parameter yang bisa digunakan untuk memindahkan jalur routing

1. Bandwidth
2. Delay
3. Offset-list

Kondisi awal

```
IDN-R1#show ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "eigrp 1", distance 90, metric 409600, type internal
  Redistributing via eigrp 1
  Last update from 13.13.13.3 on Ethernet0/0, 00:01:29 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 13.13.13.3, 00:01:29 ago, via Ethernet0/0
      Route metric is 409600, traffic share count is 1
      Total delay is 6000 microseconds, minimum bandwidth is 10000
Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 1
```

```
IDN-R1#trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 13.13.13.3 1 msec 0 msec 1 msec
```

```
IDN-R1#sh ip eigrp topo 3.3.3.3 255.255.255.255
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 3.3.3.3/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
409600
  Descriptor Blocks:
  13.13.13.3 (Ethernet0/0), from 13.13.13.3, Send flag is 0x0
      Composite metric is (409600/128256), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 6000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 23.23.23.3
  12.12.12.2 (Ethernet0/1), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 23.23.23.3
```

Terlihat diatas bahwa delay e0/1 lebih besar dari pada e0/0, maka e0/0 dijadikan jalur utama.

Untuk merubah jalurnya kita akan memanipulasi nilai metricnya dengan merubah delay e0/0 menjadi lebih besar dari e0/1, supaya jalur e0/1 dijadikan jalur utama untuk menuju 3.3.3.3/32

```
IDN-R1(config)#int e0/0
IDN-R1(config)#delay 10000
```

```
IDN-R1(config-if)#do sh ip eigrp top 3.3.3.3 255.255.255.255
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 3.3.3.3/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
435200
  Descriptor Blocks:
  12.12.12.2 (Ethernet0/1), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 23.23.23.3
  13.13.13.3 (Ethernet0/0), from 13.13.13.3, Send flag is 0x0
      Composite metric is (2944000/128256), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 105000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 23.23.23.3
```

Terlihat diatas bahwasanya delay e0/0 menjadi lebih besar

Cek perpindahan jalur

```
IDN-R1(config-if)#do sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "eigrp 1", distance 90, metric 435200, type internal
  Redistributing via eigrp 1
  Last update from 12.12.12.2 on Ethernet0/1, 00:03:29 ago
  Routing Descriptor Blocks:
  * 12.12.12.2, from 12.12.12.2, 00:03:29 ago, via Ethernet0/1
      Route metric is 435200, traffic share count is 1
      Total delay is 7000 microseconds, minimum bandwidth is 10000
Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 2
```

Test ping

```
IDN-R1(config-if)#do ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Test traceroute

```
IDN-R1(config-if)#do trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 1 msec 0 msec
  2 23.23.23.3 1 msec 0 msec 1 msec
```

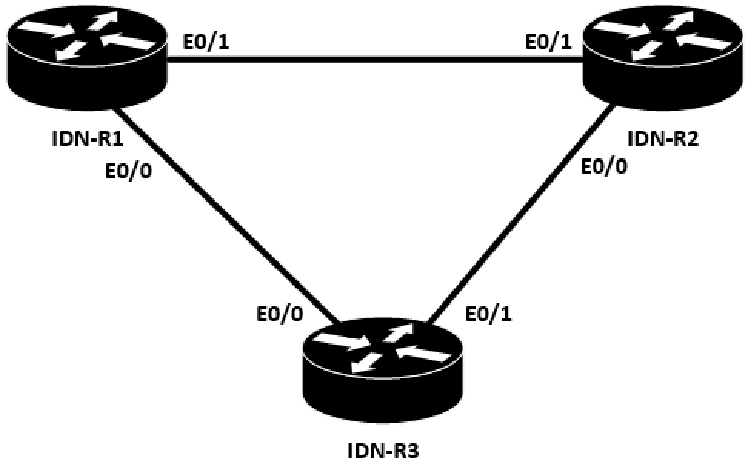
Jalur sudah berpindah lewat IDN-R2 kemudian lewat IDN-R3.

Lab 16. EIGRP – Mindah Jalur (Bandwidth)

Tujuan Lab:

- Memanipulasi jalur aar berpindah dari jalur awalnya

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router
- Cek jalur dari IDN-R1 ke IDN-R3
- Gunakan parameter delay, bandwidth, offset-list untuk memindahkan jalur melalui IDN-R2

Verifikasi Lab:

- Show ip route
- Traceroute

Selain nilai delay, bisa juga merubah nilai bandwidth yang ada pada suatu interface, bandwidth yang lebih besar akan digunakan sebagai jalur utama.

Hapus nilai delay yang tadi

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no delay 10000
```

Cek eigrp topologinya, pastikan kembali normal seperti awal.

```
IDN-R1#show ip eigrp top 3.3.3.3 255.255.255.255
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 3.3.3.3/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
409600
  Descriptor Blocks:
  13.13.13.3 (Ethernet0/0), from 13.13.13.3, Send flag is 0x0
      Composite metric is (409600/128256), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 6000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 23.23.23.3
  12.12.12.2 (Ethernet0/1), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 23.23.23.3
```

Terlihat bahwa e0/0 dan e0/1 BWnya sama, rubah BW e0/0 menjadi lebih rendah supaya e0/1 dijadikan jalur utama.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#bandwidth 5000
```

Cek perubahan bandwidth

```
IDN-R1(config-if)#do sh ip eigrp top 3.3.3.3 255.255.255.255
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 3.3.3.3/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
435200
  Descriptor Blocks:
  12.12.12.2 (Ethernet0/1), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 23.23.23.3
  13.13.13.3 (Ethernet0/0), from 13.13.13.3, Send flag is 0x0
      Composite metric is (665600/128256), route is Internal
      Vector metric:
        Minimum bandwidth is 5000 Kbit
        Total delay is 6000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 23.23.23.3
```

Cek perpindahan jalur

```
IDN-R1(config-if)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/162048] via 12.12.12.2, 00:01:45, Ethernet0/1
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:01:45, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/1
L        12.12.12.1/32 is directly connected, Ethernet0/1
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/0
L        13.13.13.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:01:45,
Ethernet0/1
```

Jalur sudah berpindah

Test traceroute

```
IDN-R1(config)#do trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 0 msec 0 msec 1 msec
  2 23.23.23.3 0 msec 1 msec 0 msec
```

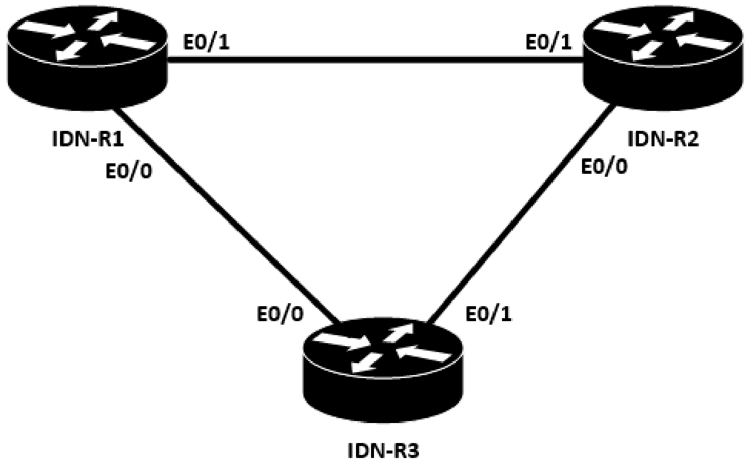
Terlihat jalur berpindah melalui IDN-R2 kemudian IDN-R3

Lab 17. EIGRP – Mindah Jalur (Offset-List)

Tujuan Lab:

- Memanipulasi jalur aar berpindah dari jalur awalnya

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router
- Cek jalur dari IDN-R1 ke IDN-R3
- Gunakan parameter delay, bandwidth, offset-list untuk memindahkan jalur melalui IDN-R2

Verifikasi Lab:

- Show ip route
- Traceroute

Yang berikutnya adalah pemindahan jalur menggunakan parameter offset-list.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no bandwidth 5000
```

Cek routing table sebelum offset list

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/162048] via 12.12.12.2, 00:01:26, Ethernet0/1
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/409600] via 13.13.13.2, 00:01:26, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/1
L        12.12.12.1/32 is directly connected, Ethernet0/1
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/0
L        13.13.13.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:01:26,
Ethernet0/1
```

Berikutnya kita terapkan offset-listnya, untuk mempengaruhi nilai delay pada interface e0/0 menjadi semakin besar

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#offset-list ?
  <0-99>       Access list of networks to apply offset (0 selects
all networks)
  <1300-1999>  Access list of networks to apply offset (extended
range)
  WORD         Access-list name

IDN-R1(config-router)#offset-list 0 ?
  in   Perform offset on incoming updates
  out  Perform offset on outgoing updates

IDN-R1(config-router)#offset-list 0 in ?
  <0-2147483647>  Offset

IDN-R1(config-router)#offset-list 0 in 2147483647 e0/0
```

Cek kembali routing tablenya pastikan sudah berpindah jalur melalui e0/1

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/162048] via 12.12.12.2, 00:02:38, Ethernet0/1
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/435200] via 12.12.12.2, 00:02:38, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/1
L        12.12.12.1/32 is directly connected, Ethernet0/1
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/0
L        13.13.13.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/307200] via 12.12.12.2, 00:02:38,
Ethernet0/1
```

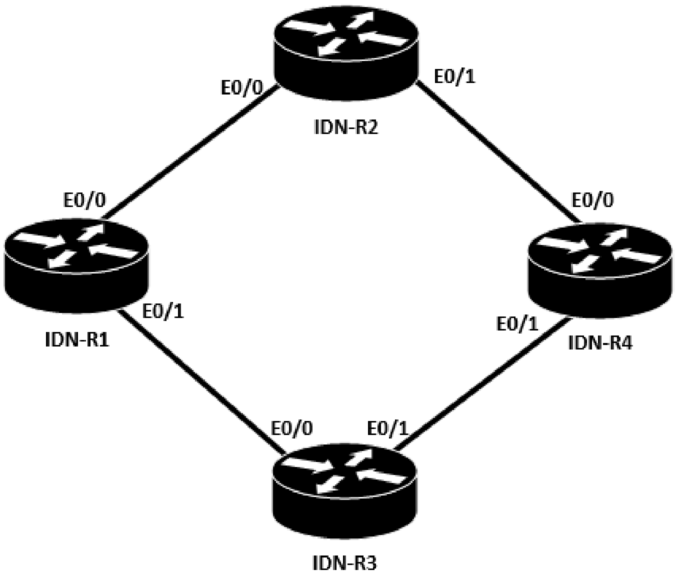
```
IDN-R1(config)#do trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 1 msec 0 msec
  2 23.23.23.3 0 msec 0 msec 0 msec
```

Lab 18. EIGRP – Equal Load Balancing

Tujuan Lab:

- Mempelajari cara agar EIGRP dapat bekerja load balance menggunakan semua link yang dimiliki, baik ketika jalurnya bernilai sama maupun berbeda.

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router
- Cek jalur dari IDN-R1 ke IDN-R3
- Gunakan parameter delay, bandwidth dan offset-list untuk memindahkan jalur melalui IDN-R2

Verifikasi Lab:

- Show ip route
- Traceroute

Konfigurasi EIGRP

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255
IDN-R1(config-router)#network 13.13.13.0 0.0.0.255
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0
IDN-R1(config-router)#no auto-summary
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255
IDN-R2(config-router)#network 24.24.24.0 0.0.0.255
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0
IDN-R2(config-router)#no auto-summary
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 13.13.13.0 0.0.0.255
IDN-R3(config-router)#network 34.34.34.0 0.0.0.255
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
IDN-R3(config-router)#no auto-summary
```

```
IDN-R4(config)#router eigrp 1
IDN-R4(config-router)#network 24.24.24.0 0.0.0.255
IDN-R4(config-router)#network 34.34.34.0 0.0.0.255
IDN-R4(config-router)#network 4.4.4.4 0.0.0.0
IDN-R4(config-router)#no auto-summary
```

Cek routing table pada IDN-R1

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:08:37, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/409600] via 13.13.13.3, 00:16:42, Ethernet0/1
      4.0.0.0/32 is subnetted, 1 subnets
D        4.4.4.4 [90/435200] via 13.13.13.3, 00:00:52, Ethernet0/1
                 [90/435200] via 12.12.12.2, 00:00:52, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
      24.0.0.0/24 is subnetted, 1 subnets
D        24.24.24.0 [90/307200] via 12.12.12.2, 00:00:54,
Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
D        34.34.34.0 [90/307200] via 13.13.13.3, 00:00:52,
Ethernet0/1
```

Seperti yang terlihat diatas, 2 jalur digunakan secara bersamaan untuk menuju 4.4.4.4/32 (Equal Cost Load Balancing) yakni via IDN-R2 (12.12.12.2) dan IDN-R3 (13.13.13.3)

```
IDN-R1(config)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "eigrp 1", distance 90, metric 435200, type internal
  Redistributing via eigrp 1
  Last update from 12.12.12.2 on Ethernet0/0, 00:06:54 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 13.13.13.3, 00:06:54 ago, via Ethernet0/1
      Route metric is 435200, traffic share count is 1
      Total delay is 7000 microseconds, minimum bandwidth is 10000
Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 2
    12.12.12.2, from 12.12.12.2, 00:06:54 ago, via Ethernet0/0
      Route metric is 435200, traffic share count is 1
      Total delay is 7000 microseconds, minimum bandwidth is 10000
Kbit
      Reliability 255/255, minimum MTU 1500 bytes
      Loading 1/255, Hops 2
```

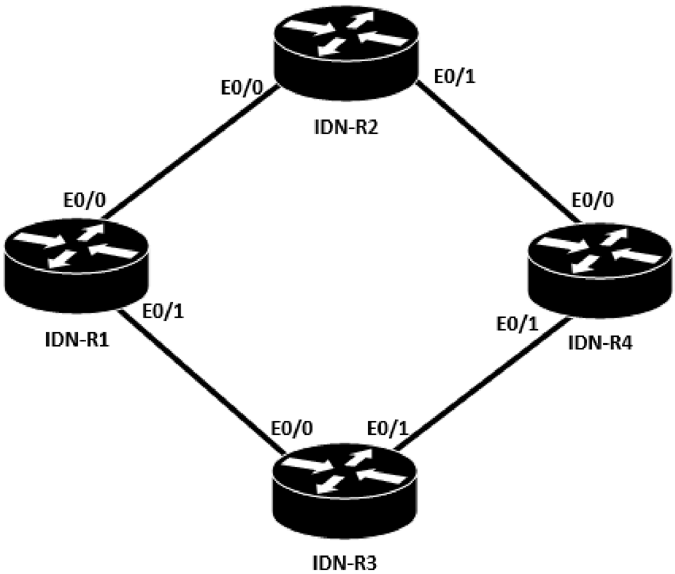
Secara default pada equal link sudah langsung load balance, namun tidak pada link yang unequal. Pada kondisi yang jalurnya nilai tidak sama, maka kita perlu konfigurasikan nilai variance terlebih dahulu baru kemudian bisa load balance.

Lab 19. EIGRP – UnEqual Load Balancing

Tujuan Lab:

- Mempelajari cara agar EIGRP dapat bekerja load balance menggunakan semua link yang dimiliki, baik ketika jalurnya bernilai sama maupun berbeda.

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp di semua router
- Cek jalur dari IDN-R1 ke IDN-R3
- Gunakan parameter delay, bandwidth dan offset-list untuk memindahkan jalur melalui IDN-R2

Verifikasi Lab:

- Show ip route
- Traceroute

Untuk menjadikan unequal, kita rubah parameter bandwidth menjadi lebih kecil pada salah satu interface, sehingga menjadi unequal nilainya.

Ubah nilai bandwidth pada e0/1 menjadi 5000 Kbit

```
IDN-R1(config)#int e0/1
IDN-R1(config-if)#bandwidth 5000
```

Kemudian cek pada tabel routing, dan di dapati hanya satu jalur yang dilewati yaitu IDN-R2

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:20:18, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/460800] via 12.12.12.2, 00:00:12, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
D        4.4.4.4 [90/435200] via 12.12.12.2, 00:00:12, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
      24.0.0.0/24 is subnetted, 1 subnets
D        24.24.24.0 [90/307200] via 12.12.12.2, 00:00:12,
Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
D        34.34.34.0 [90/332800] via 12.12.12.2, 00:00:12,
Ethernet0/0
```

Berikutnya kita cek pada eigrp topologinya yang masih menyimpan tentang jalur lain yang kita rubah bandwidthnya menjadi lebih kecil

```
IDN-R1(config)#do sh ip eigrp topo 4.4.4.4/32
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 4.4.4.4/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
435200
  Descriptor Blocks:
  12.12.12.2 (Ethernet0/0), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 4.4.4.4
  13.13.13.3 (Ethernet0/1), from 13.13.13.3, Send flag is 0x0
      Composite metric is (691200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 5000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 4.4.4.4
```

Agar EIGRP dapat load balance kuncinya ada pada konfigurasi variance. Maka untuk mencari nilai variance yang akan kita masukkan, nilai FD 691200 dibagi 435200 = 1,5 maka nilai variance yang diset adalah 2 (pembulatan harus keatas untuk nilai berapapun.)

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#variance 2
```

Cek routing table

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:04:08, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/665600] via 13.13.13.3, 00:04:08, Ethernet0/1
                 [90/460800] via 12.12.12.2, 00:04:08, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
D        4.4.4.4 [90/691200] via 13.13.13.3, 00:04:08, Ethernet0/1
                 [90/435200] via 12.12.12.2, 00:04:08, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
      24.0.0.0/24 is subnetted, 1 subnets
D        24.24.24.0 [90/307200] via 12.12.12.2, 00:04:08,
Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
D        34.34.34.0 [90/563200] via 13.13.13.3, 00:04:08,
Ethernet0/1
                    [90/332800] via 12.12.12.2, 00:04:08,
Ethernet0/0
```

Kembali muncul dua jalur lagi via e0/0 dan e0/1

```
IDN-R1#show ip eigrp topo 4.4.4.4/32
EIGRP-IPv4 Topology Entry for AS(1)/ID(13.13.13.1) for 4.4.4.4/32
  State is Passive, Query origin flag is 1, 2 Successor(s), FD is
435200
  Descriptor Blocks:
  12.12.12.2 (Ethernet0/0), from 12.12.12.2, Send flag is 0x0
      Composite metric is (435200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 4.4.4.4
  13.13.13.3 (Ethernet0/1), from 13.13.13.3, Send flag is 0x0
      Composite metric is (691200/409600), route is Internal
      Vector metric:
        Minimum bandwidth is 5000 Kbit
        Total delay is 7000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 4.4.4.4
```

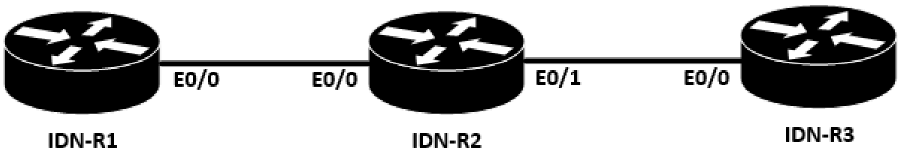
Seperti yang terlihat sekarang 2 jalur digunakan secara bersamaan, namun dengan pembagian setiap 2 paket dikirimkan melalui link utama, maka berikutnya 1 paket akan dikirimkan ke link kedua.

Lab 20. EIGRP – Stub Default

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Pertama- tama konfigurasikan lab sedemikian rupa

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip add 1.1.1.1 255.255.255.255
```

```
IDN-R1(config)#router rip
IDN-R1(config-router)#version 2
IDN-R1(config-router)#no auto-summary
IDN-R1(config-router)#network 12.12.12.0
```

```
IDN-R2(config)#int lo0
IDN-R2(config-if)#ip add 2.2.0.1 255.255.255.255
IDN-R2(config-if)#int lo1
IDN-R2(config-if)#ip add 2.2.1.1 255.255.255.255
IDN-R2(config-if)#int lo2
IDN-R2(config-if)#ip add 2.2.2.1 255.255.255.255
IDN-R2(config-if)#int lo3
IDN-R2(config-if)#ip add 2.2.3.1 255.255.255.255
IDN-R2(config-if)#int lo4
IDN-R2(config-if)#ip add 2.2.4.1 255.255.255.255
IDN-R2(config-if)#int lo5
IDN-R2(config-if)#ip add 2.2.5.1 255.255.255.255
IDN-R2(config-if)#int lo6
IDN-R2(config-if)#ip add 2.2.6.1 255.255.255.255
IDN-R2(config-if)#int lo7
IDN-R2(config-if)#ip add 2.2.7.1 255.255.255.255
```

```
IDN-R2(config)#router rip
IDN-R2(config-router)#version 2
IDN-R2(config-router)#no auto-summary
IDN-R2(config-router)#network 12.12.12.0
```

```
IDN-R2(config)#ip route 1.1.1.1 255.255.255.255 e0/0
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 2.2.0.0 0.0.7.255
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255
IDN-R2(config-router)#no auto-summary
IDN-R2(config-router)#redistribute static
IDN-R2(config-router)#redistribute rip metric 1 1 1 1 1
```

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip summary-address eigrp 1 2.2.0.0 255.255.248.0
```

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip add 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no shutdown
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
IDN-R3(config-router)#no auto-summary
```

```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D EX     1.1.1.1 [170/307200] via 23.23.23.2, 00:20:20, Ethernet0/0
      2.0.0.0/21 is subnetted, 1 subnets
D        2.2.0.0 [90/409600] via 23.23.23.2, 00:23:14, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D EX     12.12.12.0 [170/2560025856] via 23.23.23.2, 00:20:45,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Selanjutnya kita konfigurasikan stub pada IDN-R2

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub
```

Verifikasi tabel IDN-R3

```
IDN-R3(config)#do sh ip route
      2.0.0.0/21 is subnetted, 1 subnets
D        2.2.0.0 [90/409600] via 23.23.23.2, 00:00:14, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Secara defaultnya ketika dikonfigurasikan stub maka yang ditampilkan hanya 2 tipe route dari perpektif IDN-R2, yaitu Connected dan Summary.

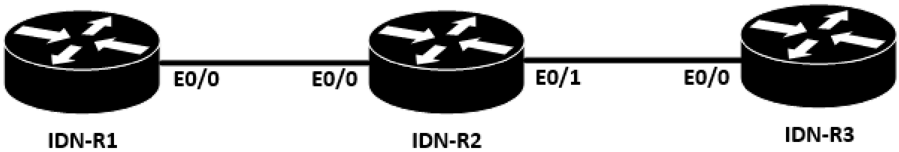
Selain dua tipe tersebut tidak akan tampil secara default.

Lab 21. EIGRP – Stub Connected

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Konfigurasikan stub connected

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub connected
```

Verifikasi stub connected

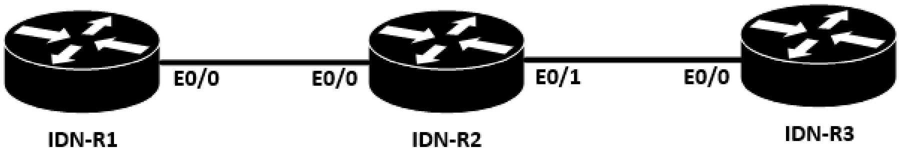
```
IDN-R3(config-router)#do sh ip route
      2.0.0.0/32 is subnetted, 8 subnets
D        2.2.0.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.1.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.2.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.3.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.4.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.5.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.6.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
D        2.2.7.1 [90/409600] via 23.23.23.2, 00:00:04, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```
Terlihat bahwa hanya connected route yang diadvertise

Lab 22. EIGRP – Stub Summary

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Konfigurasikan stub summary

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub summary
```

Verifikasi stub summary

```
IDN-R3(config-router)#do sh ip route
      2.0.0.0/21 is subnetted, 1 subnets
D        2.2.0.0 [90/409600] via 23.23.23.2, 00:00:05, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

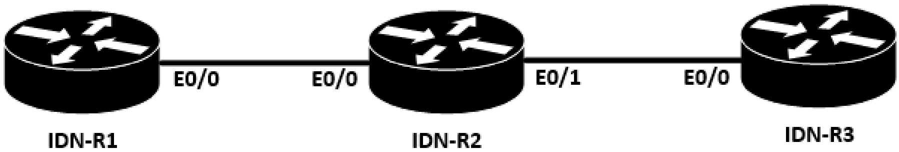
Terlihat bahwa hanya summary route yang akan diadvertise

Lab 23. EIGRP – Stub Static

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Konfigurasikan stub static

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub static
```

Verifikasi stub static

```
IDN-R3(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D EX     1.1.1.1 [170/307200] via 23.23.23.2, 00:00:17, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

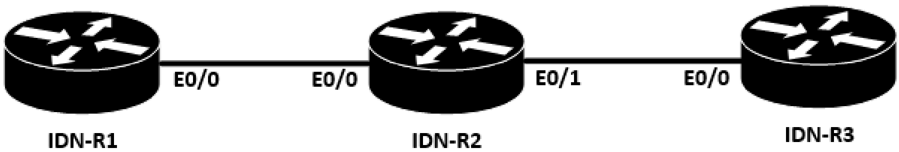
Terlihat bahwa route yang dilakukan secara static akan diadvertise melalui external route (redistribution)

Lab 24. EIGRP – Stub Redistribute

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Konfigurasikan stub redistributed

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub redistributed
```

Verifikasi stub redistributed

```
IDN-R3(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
D EX     1.1.1.1 [170/307200] via 23.23.23.2, 00:00:15, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D EX     12.12.12.0 [170/2560025856] via 23.23.23.2, 00:00:15,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

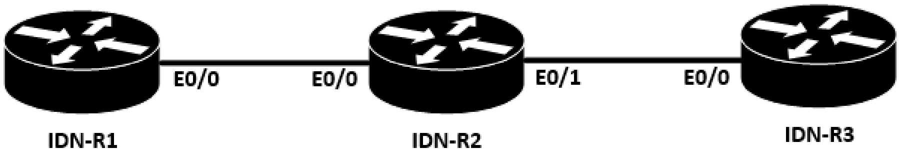
Terlihat bahwa hanya redistributed route yang diadvertise.

Lab 25. EIGRP – Stub Recive Only

Tujuan Lab:

- Memperlajari bagaimana eigrp stub bekerja

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan eigrp pada IDN-R2 dan IDN-R3
- Konfigurasikan rip pada IDN-R2 dan IDN-R1
- Konfigurasikan eigrp summary address
- Konfigurasi stub (connected,summary,static,redistribute,receive-only)

Verifikasi lab:

- Show ip route

Konfigurasikan stub receive-only

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#eigrp stub receive-only
```

Verifikasi stub receive-only

```
IDN-R3(config-router)#do sh ip route
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Terlihat bahwa IDN-R3 tidak mengetahui route eigrp manapun, karena IDN-R2 bersifat hanya menerima advertise namun IDN-R2 tidak akan melakukan advertise menuju neighbornya. Maka dari itu tidak ada route eigrp pada router neighbor.

Verifikasi tabel route pada IDN-R2

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
S        1.1.1.1 is directly connected, Ethernet0/0
      2.0.0.0/8 is variably subnetted, 9 subnets, 2 masks
D        2.2.0.0/21 is a summary, 00:34:17, Null0
C        2.2.0.1/32 is directly connected, Loopback0
C        2.2.1.1/32 is directly connected, Loopback1
C        2.2.2.1/32 is directly connected, Loopback2
C        2.2.3.1/32 is directly connected, Loopback3
C        2.2.4.1/32 is directly connected, Loopback4
C        2.2.5.1/32 is directly connected, Loopback5
C        2.2.6.1/32 is directly connected, Loopback6
C        2.2.7.1/32 is directly connected, Loopback7
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/409600] via 23.23.23.3, 00:01:01, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

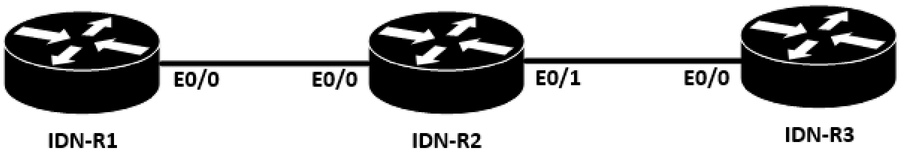
Terlihat bahwa router stub mengetahui semua informasi untuk menuju semua network yang ada, dan router ini hanya menerima advertise dan tidak akan melakukan advertise menuju neighbornya

Lab 26. EIGRP – Konfigurasi Multi AF

Tujuan Lab:

- Mempelajari fitur Multi Address Family (Named Mode)

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip addressing standar IDN
- Konfigurasika eigrp address-family

Verifikasi Lab:

- Show ip route
- traceroute

```
IDN-R1(config)#router eigrp IDN
IDN-R1(config-router)#address-family ipv4 unicast aut
IDN-R1(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R1(config-router-af)#network 12.12.12.0 0.0.0.255
IDN-R1(config-router-af)#network 1.1.1.1 0.0.0.0
```

```
IDN-R2(config)#router eigrp IDN
IDN-R2(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R2(config-router-af)#network 12.12.12.0 0.0.0.255
IDN-R2(config-router-af)#network 23.23.23.0 0.0.0.255
IDN-R2(config-router-af)#network 2.2.2.2 0.0.0.0
```

```
IDN-R3(config)#router eigrp IDN
IDN-R3(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R3(config-router-af)#network 23.23.23.0 0.0.0.255
IDN-R3(config-router-af)#network 3.3.3.3 0.0.0.0
```

Verifikasi pada tabel routing

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/1024640] via 12.12.12.2, 00:04:22, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/1536640] via 12.12.12.2, 00:01:53, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D        23.23.23.0 [90/1536000] via 12.12.12.2, 00:04:29,
Ethernet0/0
```

```
IDN-R2#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/1024640] via 12.12.12.1, 00:05:04, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
D        3.3.3.3 [90/1024640] via 23.23.23.3, 00:02:23, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

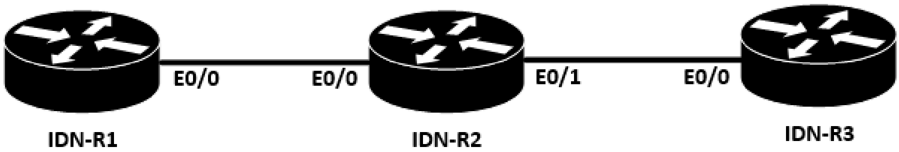
```
IDN-R3#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
D        1.1.1.1 [90/1536640] via 23.23.23.2, 00:02:33, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/1024640] via 23.23.23.2, 00:02:33, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
D        12.12.12.0 [90/1536000] via 23.23.23.2, 00:02:33,
Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Lab 27. EIGRP – Multi AF (Metric K6)

Tujuan Lab:

- Mempelajari fitur Multi Address Family (Named Mode)

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip addressing standar IDN
- Konfigurasika eigrp address-family
- Mengaktifkan metric K6

Verifikasi Lab:

- Show ip route
- traceroute

Pada EIGRP multi AF ada tambahan nilai metric yaitu K6, parameter K6 ini berisikan 2 hal, yaitu Total jitter dan energy. Yang lebih rendah yang akan dipilih. Defaultnya K6 itu bernilai 0 atau tidak digunakan. Penggunaannya adalah jika menggunakan interface dengan bandwidth diatas 1Gbps.

```
IDN-R1#show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "eigrp 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP-IPv4 VR(IDN) Address-Family Protocol for AS(1)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0 K6=0
    Metric rib-scale 128
..................
```

Untuk mengaktifkannya lakukan konfigurasi berikut pada setiap router, karena bila satu router saja K values akan mismatch dengan router lainnya.

```
IDN-R1(config)#router eigrp IDN
IDN-R1(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R1(config-router-af)#metric weights ?
  <0-8>  Type Of Address (Only TOS 0 supported)
IDN-R1(config-router-af)#metric weights 0 ?
  <0-255>  K1
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 ?
  <0-255>  K2
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 0 ?
  <0-255>  K3
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 0 1 ?
  <0-255>  K4
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 0 1 0 ?
  <0-255>  K5
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 0 1 0 0 ?
  <0-255>  K6
  <cr>
IDN-R1(config-router-af)#metric weights 0 1 0 1 0 0 1
```

```
IDN-R2(config)#router eigrp IDN
IDN-R2(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R2(config-router-af)#metric weights 0 1 0 1 0 0 1
```

```
IDN-R3(config)#router eigrp IDN
IDN-R3(config-router)#address-family ipv4 unicast autonomous-system
1
IDN-R3(config-router-af)#metric weights 0 1 0 1 0 0 1
```

```
IDN-R1(config-router-af)#do sh ip pro
*** IP Routing is NSF aware ***

Routing Protocol is "application"
  Sending updates every 0 seconds
  Invalid after 0 seconds, hold down 0, flushed after 0
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Maximum path: 32
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 4)

Routing Protocol is "eigrp 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Default networks flagged in outgoing updates
  Default networks accepted from incoming updates
  EIGRP-IPv4 VR(IDN) Address-Family Protocol for AS(1)
    Metric weight K1=1, K2=0, K3=1, K4=0, K5=0 K6=1
..................
```

Berikutnya pada EIGRP multi-AF ini delaynya tidak menggunakan satuan microseconds lagi, namun lebih detail lagi yakni picoseconds untuk kebutuhan interface yang mendukung bandwidth yang sangat tinggi.

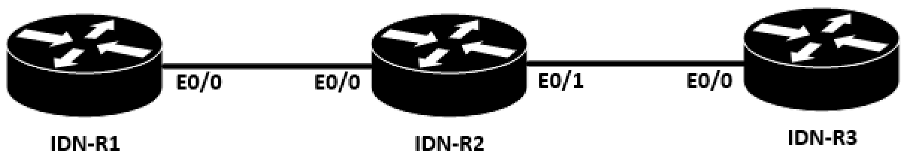
```
IDN-R1(config-router-af)#do show eigrp address-family ipv4 1
topology 3.3.3.3/32
EIGRP-IPv4 VR(IDN) Topology Entry for AS(1)/ID(1.1.1.1) for
3.3.3.3/32
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is
196689920, RIB is 1536640
  Descriptor Blocks:
  12.12.12.2 (Ethernet0/0), from 12.12.12.2, Send flag is 0x0
      Composite metric is (196689920/131153920), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 2001250000 picoseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 2
        Originating router is 3.3.3.3
```

Lab 28. EIGRP – Multi AF (SHA Authentication)

Tujuan Lab:

- Mempelajari fitur Multi Address Family (Named Mode)

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip addressing standar IDN
- Konfigurasika eigrp address-family
- Mengaktifkan metric K6
- Mengkonfigurasikan authenntikasi hmac-SHA

Verifikasi Lab:

- Show ip route
- traceroute

Selanjutnya adalah authentikasi SHA pada EIGRP menggunakan multi-af, Named mode ini mensupport 2 authentikasi yaitu md5 dan SHA-256

```
IDN-R1(config-router-af)#af-interface e0/0
IDN-R1(config-router-af-interface)#authentication mode hmac-sha-256
CISCO
```

```
IDN-R2(config-router-af)#af-interface e0/0
IDN-R2(config-router-af-interface)#authentication mode hmac-sha-256
CISCO

IDN-R2(config-router-af)#af-interface e0/1
IDN-R2(config-router-af-interface)#authentication mode hmac-sha-256
CISCO
```

```
IDN-R3(config-router-af)#af-interface e0/0
IDN-R3(config-router-af-interface)#authentication mode hmac-sha-256
CISCO
```

Verifikasi Authentikasi

```
IDN-R1#show ip eigrp 1 interfaces detail e0/0
EIGRP-IPv4 VR(IDN) Address-Family Interfaces for AS(1)
                              Xmit Queue   PeerQ        Mean
Pacing Time   Multicast    Pending
Interface              Peers  Un/Reliable  Un/Reliable  SRTT
Un/Reliable   Flow Timer   Routes
Et0/0                   1        0/0       0/0           8
0/2           50           0
  Hello-interval is 5, Hold-time is 15
  Split-horizon is enabled
  Next xmit serial <none>
  Packetized sent/expedited: 14/0
  Hello's sent/expedited: 357/6
  Un/reliable mcasts: 0/14  Un/reliable ucasts: 19/10
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 0
  Retransmissions sent: 4  Out-of-sequence rcvd: 1
  Topology-ids on interface - 0
  Authentication mode is HMAC-SHA-256, key-chain is not set
```

Debug eigrp packet untuk melihat proses authentikasi

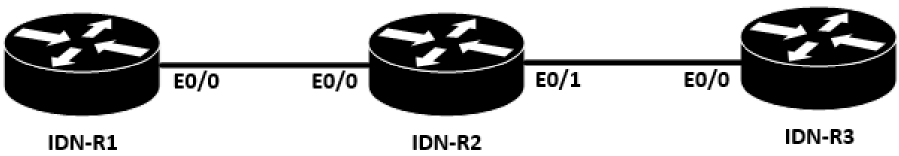
```
IDN-R1#debug eigrp packets
    (UPDATE, REQUEST, QUERY, REPLY, HELLO, UNKNOWN, PROBE, ACK,
STUB, SIAQUERY, SIAREPLY)
EIGRP Packet debugging is on
IDN-R1#
*Oct 20 12:30:35.842: EIGRP: received packet with HMAC-SHA-256
authentication
*Oct 20 12:30:35.842: EIGRP: Received HELLO on Et0/0 - paklen 76 nbr
12.12.12.2
*Oct 20 12:30:35.842:   AS 1, Flags 0x0:(NULL), Seq 0/0 interfaceQ
0/0 iidbQ un/rely 0/0 peerQ un/rely 0/0
```

Lab 29. EIGRP – Passive Interface

Tujuan Lab:

- Konfigurasi eigrp passive interface
- memahami cara kerja passive interface

Topologi Lab:



Metode Lab:

- Menggunakan topologi sebelumnya
- Advertise ip address pada interface e0/1
- Debugging hello packet

Verifikasi lab:

- Debug eigrp packets hello

Konfigurasikan ip address pada e0/1

```
IDN-R1(config)#int e0/1
IDN-R1(config-if)#ip address 192.168.10.1 255.255.255.0
```

Advertise network dengan eigrp

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 192.168.10.0 0.0.0.255
```

Debug paket hello

```
IDN-R1#debug eigrp packets hello
    (HELLO)
EIGRP Packet debugging is on
IDN-R1#
*Oct 20 10:27:29.487: EIGRP: Sending HELLO on Et0/1 - paklen 20
```

Konfigurasikan passive interface

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#passive-interface e0/1
```

Verifikasi:

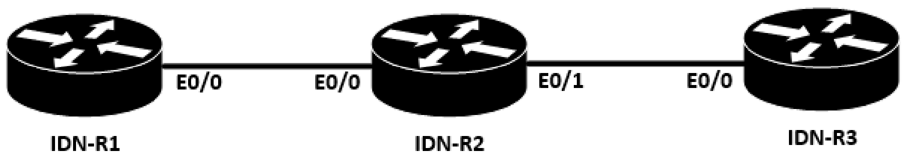
Pastikan hello packet tidak keluar mengarah ke e0/1 lagi.

Lab 30. EIGRP – Timers

Tujuan Lab:

- Mempelajari eigrp timers

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN lab sebelumnya
- Konfigurasikan IP address standar IDN
- Konfigurasikan routing EIGRP
- Rubah hello-interval
- Rubah hold-time

Verifikasi:

- Show ip eigrp interface detail

Cek timers eigrp default

```
IDN-R1#show ip eigrp interfaces detail e0/0
EIGRP-IPv4 Interfaces for AS(1)
                              Xmit Queue   PeerQ        Mean
Pacing Time   Multicast    Pending
Interface               Peers  Un/Reliable  Un/Reliable  SRTT
Un/Reliable   Flow Timer   Routes
Et0/0                    1        0/0        0/0           4
0/2           50           0
  Hello-interval is 5, Hold-time is 15
  Split-horizon is enabled
  Next xmit serial <none>
  Packetized sent/expedited: 28/2
  Hello's sent/expedited: 522/2
  Un/reliable mcasts: 0/19  Un/reliable ucasts: 24/10
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 1
  Retransmissions sent: 3  Out-of-sequence rcvd: 3
  Topology-ids on interface - 0
  Authentication mode is not set
```

Secara default EIGRP memiliki default timer hello 5 detik dan Hold time 15 detik, dalam setiap konfigurasi disarankan menggunakan aturan hold time 3x lebih besar dari hello interval.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip hello-interval eigrp 1 10
IDN-R1(config-if)#ip hold-time eigrp 1 30
```

Verifikasi hello-inteval dan hold time yang dirubah tadi

```
IDN-R1(config-if)#do sh ip eigrp inter detail e0/0
EIGRP-IPv4 Interfaces for AS(1)
                              Xmit Queue   PeerQ        Mean
Pacing Time   Multicast    Pending
Interface              Peers  Un/Reliable  Un/Reliable  SRTT
Un/Reliable   Flow Timer   Routes
Et0/0                    1        0/0       0/0           4
0/2           50           0
  Hello-interval is 10, Hold-time is 30
  Split-horizon is enabled
  Next xmit serial <none>
  Packetized sent/expedited: 28/2
  Hello's sent/expedited: 540/2
  Un/reliable mcasts: 0/19  Un/reliable ucasts: 24/10
  Mcast exceptions: 0  CR packets: 0  ACKs suppressed: 1
  Retransmissions sent: 3  Out-of-sequence rcvd: 3
  Topology-ids on interface - 0
  Authentication mode is not set
```

"The best way to predict the future is to create it."

– PETER DRUCKER

OSPF

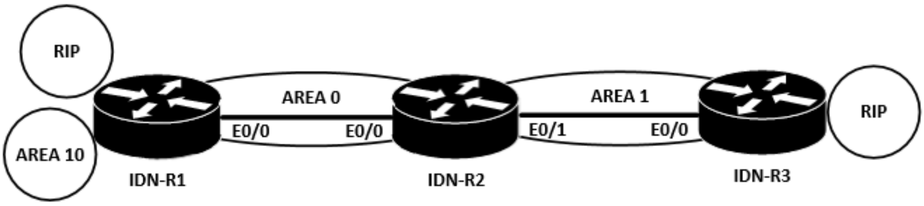
(Open Shortest Path First)

Lab 1. OSPF – Konfigurasi Dasar dan Area

Tujuan Lab:

- Mempelajari berbagai tipe area pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3

Verifikasi Lab:

- Show ip route
- show ip ospf database

IDN-R1

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip address 12.12.12.1 255.255.255.0
IDN-R1(config-if)#no shutdown
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255

IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 10.10.10.1 255.255.255.255
IDN-R1(config)#int lo2
IDN-R1(config-if)#ip address 10.10.10.2 255.255.255.255
IDN-R1(config)#int lo3
IDN-R1(config-if)#ip address 10.10.10.3 255.255.255.255
IDN-R1(config)#int lo4
IDN-R1(config-if)#ip address 10.10.10.4 255.255.255.255
```

Pada router IDN-R1 buat loopback 1 dan 2 akan di masukkan kedalam ospf area 10, sedangkan loopback 3 dan 4 akan dimasukkan kedalam rip dan kemudian diredistribute ke dalam OSPF.

IDN-R2

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip address 12.12.12.2 255.255.255.0
IDN-R2(config-if)#no shutdown

IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip address 23.23.23.2 255.255.255.0
IDN-R2(config-if)#no shutdown

IDN-R2(config)#int lo0
IDN-R2(config-if)#ip address 2.2.2.2 255.255.255.255
IDN-R2(config-if)#no shutdown
```

IDN-R3

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip address 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no shutdown

IDN-R3(config)#int lo0
IDN-R3(config-if)#ip address 3.3.3.3 255.255.255.255

IDN-R3(config)#int lo1
IDN-R3(config-if)#ip address 30.30.30.1 255.255.255.255
IDN-R3(config)#int lo2
IDN-R3(config-if)#ip address 30.30.30.2 255.255.255.255
```

Konfigurasi OSPF

IDN-R1

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip ospf 1 area 0

IDN-R1(config)#int range lo1-2
IDN-R1(config-if-range)#ip ospf 1 area 10

IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip ospf 1 area 0

IDN-R1(config-if)#router rip
IDN-R1(config-router)#version 2
IDN-R1(config-router)#no auto-summary
IDN-R1(config-router)#network 10.10.10.0

IDN-R1(config)#router ospf 1
IDN-R1(config-router)#router-id 1.1.1.1
IDN-R1(config-router)#redistribute rip subnets

IDN-R1#clear ip ospf process
```

IDN-R2

```
IDN-R2(config)#int lo0
IDN-R2(config-if)#ip ospf 2 area 1

IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip ospf 2 area 0

IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip ospf 2 area 1
```

```
IDN-R3(config)#int lo0
IDN-R3(config-if)#ip ospf 3 area 1
IDN-R3(config-if)#ex

IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip ospf 3 area 1

IDN-R3(config)#router rip
IDN-R3(config-router)#version 2
IDN-R3(config-router)#no auto-summary
IDN-R3(config-router)#network 30.30.30.0

IDN-R3(config)#router ospf 3
IDN-R3(config-router)#router-id 3.3.3.3
IDN-R3(config-router)#redistribute rip subnets

IDN-R3#clear ip ospf process
```

Cek table routing IDN-R1

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O IA     2.2.2.2 [110/11] via 12.12.12.2, 00:00:30, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/21] via 12.12.12.2, 00:00:30, Ethernet0/0
      10.0.0.0/32 is subnetted, 4 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
C        10.10.10.4 is directly connected, Loopback4
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O IA     23.23.23.0 [110/20] via 12.12.12.2, 00:00:30, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
O E2     30.30.30.1 [110/20] via 12.12.12.2, 00:00:30, Ethernet0/0
O E2     30.30.30.2 [110/20] via 12.12.12.2, 00:00:30, Ethernet0/0
```

Cek table routing IDN-R2

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:32, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:42, Ethernet0/1
      10.0.0.0/32 is subnetted, 4 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:32, Ethernet0/0
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:00:32, Ethernet0/0
O E2     10.10.10.3 [110/20] via 12.12.12.1, 00:00:32, Ethernet0/0
O E2     10.10.10.4 [110/20] via 12.12.12.1, 00:00:32, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
      30.0.0.0/32 is subnetted, 2 subnets
O E2     30.30.30.1 [110/20] via 23.23.23.3, 00:00:42, Ethernet0/1
O E2     30.30.30.2 [110/20] via 23.23.23.3, 00:00:42, Ethernet0/1
```

```
IDN-R2(config)#do sh ipv6 route
O   1::1/128 [110/10]
     via FE80::A8BB:CCFF:FE00:100, Ethernet0/0
LC  2::2/128 [0/0]
     via Loopback0, receive
O   3::3/128 [110/10]
     via FE80::A8BB:CCFF:FE00:300, Ethernet0/1
OI  10::1/128 [110/10]
     via FE80::A8BB:CCFF:FE00:100, Ethernet0/0
OI  10::2/128 [110/10]
     via FE80::A8BB:CCFF:FE00:100, Ethernet0/0
OE2 10::3/128 [110/20]
     via FE80::A8BB:CCFF:FE00:100, Ethernet0/0
OE2 10::4/128 [110/20]
     via FE80::A8BB:CCFF:FE00:100, Ethernet0/0
C   12::/64 [0/0]
     via Ethernet0/0, directly connected
L   12::2/128 [0/0]
     via Ethernet0/0, receive
C   23::/64 [0/0]
     via Ethernet0/1, directly connected
L   23::2/128 [0/0]
     via Ethernet0/1, receive
OE2 30::1/128 [110/20]
     via FE80::A8BB:CCFF:FE00:300, Ethernet0/1
OE2 30::2/128 [110/20]
     via FE80::A8BB:CCFF:FE00:300, Ethernet0/1
L   FF00::/8 [0/0]
     via Null0, receive
```

Cek table routing IDN-R3

```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O IA     1.1.1.1 [110/21] via 23.23.23.2, 00:00:39, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:00:49, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 4 subnets
O IA     10.10.10.1 [110/21] via 23.23.23.2, 00:00:39, Ethernet0/0
O IA     10.10.10.2 [110/21] via 23.23.23.2, 00:00:39, Ethernet0/0
O E2     10.10.10.3 [110/20] via 23.23.23.2, 00:00:34, Ethernet0/0
O E2     10.10.10.4 [110/20] via 23.23.23.2, 00:00:34, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O IA     12.12.12.0 [110/20] via 23.23.23.2, 00:00:39, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
C        30.30.30.1 is directly connected, Loopback1
C        30.30.30.2 is directly connected, Loopback2
```

Cek ospf database

```
IDN-R1#show ip ospf database
               OSPF Router with ID (1.1.1.1) (Process ID 1)
                  Router Link States (Area 0) -------------> LSA 1
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         179         0x8000000C 0x00C1F1 2
2.2.2.2         2.2.2.2         140         0x80000006 0x00F1D5 1
                  Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         140         0x80000001 0x0014EB
                  Summary Net Link States (Area 0) -------------> LSA 3
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         180         0x80000001 0x00FA31
3.3.3.3         2.2.2.2         144         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         174         0x80000001 0x000217
10.10.10.2      1.1.1.1         174         0x80000001 0x00F720
23.23.23.0      2.2.2.2         180         0x80000001 0x007273
                Summary ASB Link States (Area 0)  ---------> LSA 4
Link ID         ADV Router      Age         Seq#       Checksum
3.3.3.3         2.2.2.2         144         0x80000001 0x001905
                Router Link States (Area 10)  -------------> LSA 1
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         179         0x8000000B 0x00A626 2
                Summary Net Link States (Area 10)  ---------> LSA3
Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         1.1.1.1         174         0x80000001 0x0047EC
2.2.2.2         1.1.1.1         138         0x80000001 0x007DA8
3.3.3.3         1.1.1.1         138         0x80000001 0x00B364
12.12.12.0      1.1.1.1         138         0x80000001 0x001EEC
23.23.23.0      1.1.1.1         138         0x80000001 0x00F4EA
                Summary ASB Link States (Area 10) ---------> LSA 4
Link ID         ADV Router      Age         Seq#       Checksum
3.3.3.3         1.1.1.1         138         0x80000001 0x009B7C
                Type-5 AS External Link States    -----------> LSA 5
Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         179         0x80000001 0x004239 0
10.10.10.4      1.1.1.1         179         0x80000001 0x003842 0
30.30.30.1      3.3.3.3         208         0x80000001 0x0047F1 0
30.30.30.2      3.3.3.3         208         0x80000001 0x003DFA 0
```

```
IDN-R2#show ip ospf database
                OSPF Router with ID (2.2.2.2) (Process ID 2)
                 Router Link States (Area 0)  ------------> LSA 1
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         263         0x8000000C 0x00C1F1 2
2.2.2.2         2.2.2.2         222         0x80000006 0x00F1D5 1
                 Net Link States (Area 0)  ------------> LSA 2
Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         222         0x80000001 0x0014EB
                 Summary Net Link States (Area 0) ------------> LSA 3
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         262         0x80000001 0x00FA31
3.3.3.3         2.2.2.2         225         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         258         0x80000001 0x000217
10.10.10.2      1.1.1.1         258         0x80000001 0x00F720
23.23.23.0      2.2.2.2         262         0x80000001 0x007273
                Summary ASB Link States (Area 0)  ------------> LSA 4
Link ID         ADV Router      Age         Seq#       Checksum
3.3.3.3         2.2.2.2         225         0x80000001 0x001905
                Router Link States (Area 1)   ------------> LSA 1
Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         230         0x80000008 0x007BED 2
3.3.3.3         3.3.3.3         231         0x80000008 0x006EEC 2
                Net Link States (Area 1)    ------------> LSA 2
Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         231         0x80000001 0x00B21F
                Summary Net Link States (Area 1) ------------> LSA 3
Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         215         0x80000001 0x008D98
10.10.10.1      2.2.2.2         215         0x80000001 0x0048C2
10.10.10.2      2.2.2.2         215         0x80000001 0x003ECB
12.12.12.0      2.2.2.2         215         0x80000001 0x00FF07
                Summary ASB Link States (Area 1)  ------------> LSA 4
Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         215         0x80000001 0x0075B0
                Type-5 AS External Link States  ------------> LSA 5
Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         262         0x80000001 0x004239 0
10.10.10.4      1.1.1.1         262         0x80000001 0x003842 0
30.30.30.1      3.3.3.3         289         0x80000001 0x0047F1 0
30.30.30.2      3.3.3.3         289         0x80000001 0x003DFA 0
```

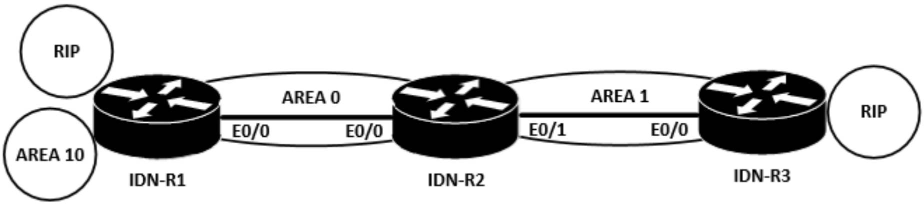
```
IDN-R3#show ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

                Router Link States (Area 0) ------------> LSA 1

Link ID         ADV Router      Age         Seq#       Checksum Link
count
3.3.3.3         3.3.3.3         345         0x80000008 0x00B071 0

                Router Link States (Area 1) ------------> LSA 1

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         287         0x80000008 0x007BED 2
3.3.3.3         3.3.3.3         286         0x80000008 0x006EEC 2

                Net Link States (Area 1) ------------> LSA 2

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         286         0x80000001 0x00B21F

                Summary Net Link States (Area 1) ------------> LSA 3

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         272         0x80000001 0x008D98
10.10.10.1      2.2.2.2         272         0x80000001 0x0048C2
10.10.10.2      2.2.2.2         272         0x80000001 0x003ECB
12.12.12.0      2.2.2.2         272         0x80000001 0x00FF07

                 Summary ASB Link States (Area 1) ------------> LSA 4

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         272         0x80000001 0x0075B0

                 Type-5 AS External Link States ------------> LSA 5

Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         318         0x80000001 0x004239 0
10.10.10.4      1.1.1.1         318         0x80000001 0x003842 0
30.30.30.1      3.3.3.3         344         0x80000001 0x0047F1 0
30.30.30.2      3.3.3.3         344         0x80000001 0x003DFA 0
```

Lab 2. OSPF – Redistribute Metric-Type 1

Tujuan Lab:

- Mempelajari berbagai tipe redistribute pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3

Verifikasi Lab:

- Show ip route
- show ip ospf database

Rubah metric menjadi type 1

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#redistribute rip subnets metric-type 1
```

Cek table IDN-R3

```
IDN-R2#show ip route | i O E
O E1     10.10.10.3 [110/30] via 12.12.12.1, 00:00:30, Ethernet0/0
O E1     10.10.10.4 [110/30] via 12.12.12.1, 00:00:30, Ethernet0/0
O E2     30.30.30.1 [110/20] via 23.23.23.3, 00:08:15, Ethernet0/1
O E2     30.30.30.2 [110/20] via 23.23.23.3, 00:08:15, Ethernet0/1
```

```
IDN-R3#show ip route | i O E
O E1     10.10.10.3 [110/40] via 23.23.23.2, 00:01:34, Ethernet0/0
O E1     10.10.10.4 [110/40] via 23.23.23.2, 00:01:34, Ethernet0/0
```

Nilai metricnya berubah pada IDN-R2 menjadi 30 sedangkan pada IDN-R3 metric berubah menjadi 40, type 2 nilai metricnya akan tetap menjadi 20 Dengan konfigurasi diatas maka semua route akan menjadi type 1 semua. akan tetapi kalua ingin sebagian saja yang dijadikan tipe 1 maka bisa menggunakan route-map berikut

```
IDN-R3(config)#route-map TIPE1 10
IDN-R3(config-route-map)#match interface lo1
IDN-R3(config-route-map)#set metric-type type-1

IDN-R3(config)#route-map TIPE1 20
IDN-R3(config-route-map)#match interface lo2
IDN-R3(config-route-map)#set metric-type type-2

IDN-R3(config)#router ospf 3
IDN-R3(config-router)#redistribute rip subnets route-map TIPE1
```

Pada bagian match bisa menggunakan interface maupun menggunakan ip address-acl.

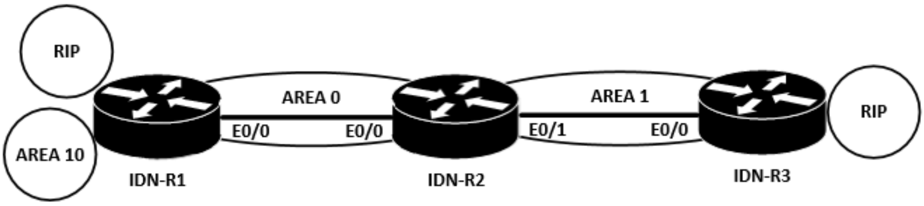
```
IDN-R2#sh ip route | i 30.30.30
O E1     30.30.30.1 [110/30] via 23.23.23.3, 00:06:35, Ethernet0/1
O E2     30.30.30.2 [110/20] via 23.23.23.3, 00:03:19, Ethernet0/1
```

Lab 3. OSPF – Stub Area

Tujuan Lab:

- Mempelajari berbagai tipe area pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3
- Rubah area 1 menjadi stub area

Verifikasi Lab:

- Show ip route
- show ip ospf database

Berikutnya kita akan mengkonfigurasikan area 1 sebagai stub

Stub artinya ujung, merupakan router atau area yang paling ujung atau sisi paling akhir ospf

- Semua external route LSA Tipe 5 (network dari routing protocol lain yang diredistribute ke dalam OSPF) tidak diperkenankan masuk kedalam area stub.

- Sebagai gantinya digunakan default route untuk menuju ke network tersebut
- Hal ini akan mengurangi kinerja CPU & memori router, mengurangi jumlah routing table.
- Dikonfigurasikan di semua router yang ada dalam stub area

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 1 stub
```

```
IDN-R3#router ospf 3
IDN-R3(config-router)#area 1 stub
```

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O IA     2.2.2.2 [110/11] via 12.12.12.2, 00:17:37, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/21] via 12.12.12.2, 00:04:37, Ethernet0/0
      10.0.0.0/32 is subnetted, 4 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
C        10.10.10.4 is directly connected, Loopback4
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O IA     23.23.23.0 [110/20] via 12.12.12.2, 00:04:37, Ethernet0/0
```

Setelah dikonfigurasikan menjadi stub maka tidak ada lagi route external (LSA 5) yang berasal dari IDN-R3

```
IDN-R1#show ip ospf database

            OSPF Router with ID (1.1.1.1) (Process ID 1)

               Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1182        0x80000003 0x00D3E8 2
2.2.2.2         2.2.2.2         1183        0x80000002 0x00F9D1 1

               Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1183        0x80000001 0x0014EB

               Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         1212        0x80000001 0x00FA31
3.3.3.3         2.2.2.2         398         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         1212        0x80000001 0x000217
10.10.10.2      1.1.1.1         1212        0x80000001 0x00F720
23.23.23.0      2.2.2.2         398         0x80000001 0x007273

                Router Link States (Area 10)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1222        0x80000002 0x00C411 2

                Summary Net Link States (Area 10)

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         1.1.1.1         1212        0x80000001 0x0047EC
2.2.2.2         1.1.1.1         1177        0x80000001 0x007DA8
3.3.3.3         1.1.1.1         397         0x80000001 0x00B364
12.12.12.0      1.1.1.1         1226        0x80000001 0x001EEC
23.23.23.0      1.1.1.1         397         0x80000001 0x00F4EA

                Type-5 AS External Link States

Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         1226        0x80000001 0x00BE3D 0
10.10.10.4      1.1.1.1         1226        0x80000001 0x00B446 0
```

Pada ospf databasenya tidak ada lagi network 30.30.30.1 dan 30.30.30.2 sedangkan network 10.10.10.3 dan 10.10.10.4 adalah network router IDN-R1 (directly connected) yang dimaskkan kedalam rip kemudian rdiredistribute ke dalam ospf

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:14:14, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:09:12, Ethernet0/1
      10.0.0.0/32 is subnetted, 4 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:14:14, Ethernet0/0
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:14:14, Ethernet0/0
O E1     10.10.10.3 [110/30] via 12.12.12.1, 00:14:14, Ethernet0/0
O E1     10.10.10.4 [110/30] via 12.12.12.1, 00:14:14, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Disisi routing table IDN-R2 hanya menerima external route dari IDN-R1 saja tidak ada external route yang berasal dari IDN-R3

```
IDN-R2(config)#do sh ip ospf database
            OSPF Router with ID (2.2.2.2) (Process ID 2)
               Router Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1375        0x80000003 0x00D3E8 2
2.2.2.2         2.2.2.2         1374        0x80000002 0x00F9D1 1
               Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1374        0x80000001 0x0014EB
               Summary Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         1404        0x80000001 0x00FA31
3.3.3.3         2.2.2.2         589         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         1404        0x80000001 0x000217
10.10.10.2      1.1.1.1         1404        0x80000001 0x00F720
23.23.23.0      2.2.2.2         589         0x80000001 0x007273
                Router Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         603         0x80000005 0x009FCE 2
3.3.3.3         3.3.3.3         604         0x80000005 0x008CD5 2
                Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         600         0x80000003 0x00CC05
                Summary Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
0.0.0.0         2.2.2.2         892         0x80000001 0x0075C0
1.1.1.1         2.2.2.2         892         0x80000002 0x00A97D
10.10.10.1      2.2.2.2         892         0x80000002 0x0064A7
10.10.10.2      2.2.2.2         892         0x80000002 0x005AB0
12.12.12.0      2.2.2.2         892         0x80000002 0x001CEB
                Type-5 AS External Link States
Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         1418        0x80000001 0x00BE3D 0
10.10.10.4      1.1.1.1         1418        0x80000001 0x00B446 0
```

Disisi ospf database IDN-R2 hanya ada tipe 5 yang berasal dari IDN-R1 saja.

```
IDN-R3(config)#do sh ip route
Gateway of last resort is 23.23.23.2 to network 0.0.0.0

O*IA  0.0.0.0/0 [110/11] via 23.23.23.2, 00:11:22, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
O IA     1.1.1.1 [110/21] via 23.23.23.2, 00:11:22, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:11:22, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 2 subnets
O IA     10.10.10.1 [110/21] via 23.23.23.2, 00:11:22, Ethernet0/0
O IA     10.10.10.2 [110/21] via 23.23.23.2, 00:11:22, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O IA     12.12.12.0 [110/20] via 23.23.23.2, 00:11:22, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
C        30.30.30.1 is directly connected, Loopback1
C        30.30.30.2 is directly connected, Loopback2
```

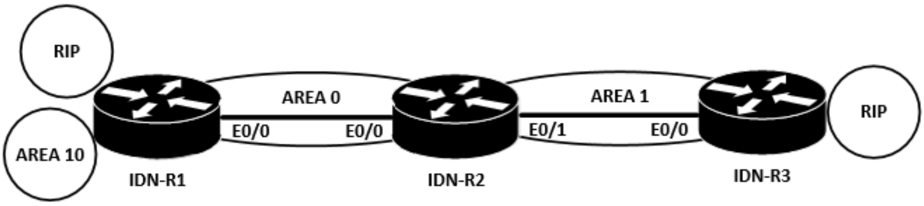
Di sisi IDN-R3 tidak ada route external apapun Karena pada stub area lsa tipe 5 tidak diperkenankan masuk. kemudian pada stub area akan terbentuk default route secara otomatis dengan tanda O* IA

Lab 4. OSPF – Totally Stub Area

Tujuan Lab:

- Mempelajari berbagai tipe area pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3
- Rubah area 1 menjadi totally stub area

Verifikasi Lab:

- Show ip route
- show ip ospf database

Berikutnya yang akan kita coba adalah totally stub area

OSPF totally stub area

- Lebih sadis dari stub area, Karena totally akan benar-benar membatasi route
- Bukan hanya external route yang dibatasi, bahkan internal route dari OSPF area lain juga tidak dimasukkan dalam routing table

- konfigurasi hanya dilakukan pada router ABRnya saja, tidak di semua router dalam stub area.
- Router R2 merupakan ABR (Area Border Router) yang menghubungkan Area0 dan Stub Area 1

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no area 1 stub
IDN-R2(config-router)#area 1 stub no-summary
```

```
IDN-R3(config)#do sh ip route

Gateway of last resort is 23.23.23.2 to network 0.0.0.0

O*IA  0.0.0.0/0 [110/11] via 23.23.23.2, 00:05:16, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:24:37, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
C        30.30.30.1 is directly connected, Loopback1
C        30.30.30.2 is directly connected, Loopback2
```

Tidak ada lagi O IA Hanya ada O dan default route O*IA saja

```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

               Router Link States (Area 1) ---------→ LSA 1

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         206         0x80000006 0x009DCF 2
3.3.3.3         3.3.3.3         239         0x80000006 0x008AD6 2

               Net Link States (Area 1)  ---------→ LSA 2

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         239         0x80000004 0x00CA06

               Summary Net Link States (Area 1)  ---------→ LSA 3

Link ID         ADV Router      Age         Seq#       Checksum
0.0.0.0         2.2.2.2         1000        0x80000003 0x0071C2
```

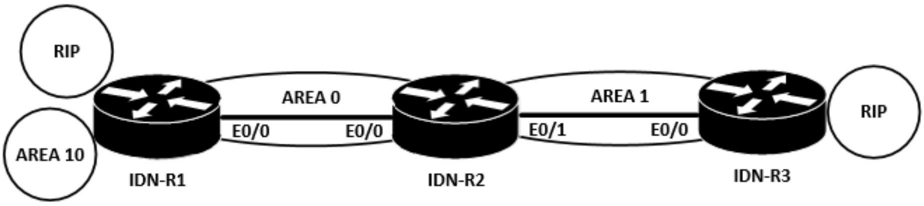
Dalam ospf database, semua LSA tipe 3 kecuali default route dihapus, sehingga yang sebelumnya link berikut masih ada, sekarang sudah tidak lagi terdapat dalam OSPF databasenya.

Lab 5. OSPF – Not So Stubby Area

Tujuan Lab:

- Mempelajari berbagai tipe area pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3
- Rubah area 1 menjadi NSSA area

Verifikasi Lab:

- Show ip route
- show ip ospf database

Area berikutnya yang akan kita pelajari adalah NSSA, OSPF Not So Stubby Area

- Seperti stub area tapi masih bisa diatur, nego2 dikit
- Kalau pada stub dan totally stub area, maka external router benar2 tidak diterima ataupun dikirimkan, nah bila diinginkan pada area stub masih bisa mengirim external route maka solusinya ya menggunakan NSSA

- Namun External route ini tidak sebagai LSA tipe 5, melaiinkan dalam bentuk LSA tipe 7, Karena memang LSA tipe 3,4,5 benar2 dibatasi pada stub area. jadi alternatifnya menggunakan LSA tipe 7
- Dan bila diinginkan internal route ospf dari area lain masih bisa diterima, maka solusinya juga menggunakan NSSA
- Dikonfigurasikan pada semua router pada area stub

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no area 1 stub no-summary
IDN-R2(config-router)#area 1 nssa
% OSPF: Area is configured as stub area already
IDN-R2(config-router)#no area 1 stub
IDN-R2(config-router)#area 1 nssa
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#no area 1 stub
IDN-R3(config-router)#area 1 nssa
```

Cek table routingnya

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O IA     2.2.2.2 [110/11] via 12.12.12.2, 00:57:29, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/21] via 12.12.12.2, 00:00:04, Ethernet0/0
      10.0.0.0/32 is subnetted, 4 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
C        10.10.10.4 is directly connected, Loopback4
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
O E1     30.30.30.1 [110/41] via 12.12.12.2, 00:00:03, Ethernet0/0
O E2     30.30.30.2 [110/20] via 12.12.12.2, 00:00:03, Ethernet0/0
```

Terlihat dengan NSSA maka external area dari IDN-R3 bisa sampai ke IDN-R1

```
IDN-R1(config)#do sh ip ospf database
            OSPF Router with ID (1.1.1.1) (Process ID 1)
               Router Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1851        0x80000004 0x00D1E9 2
2.2.2.2         2.2.2.2         606         0x80000004 0x00FBCB 1
               Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1871        0x80000002 0x0012EC
               Summary Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         1871        0x80000002 0x00F832
3.3.3.3         2.2.2.2         373         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         1851        0x80000002 0x00FF18
10.10.10.2      1.1.1.1         1851        0x80000002 0x00F521
23.23.23.0      2.2.2.2         367         0x80000004 0x006C76
                Router Link States (Area 10)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1851        0x80000003 0x00C212 2
               Summary Net Link States (Area 10)
Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         1.1.1.1         1851        0x80000002 0x0045ED
2.2.2.2         1.1.1.1         1851        0x80000002 0x007BA9
3.3.3.3         1.1.1.1         372         0x80000001 0x00B364
12.12.12.0      1.1.1.1         1851        0x80000002 0x001CED
23.23.23.0      1.1.1.1         367         0x80000001 0x00F4EA
               Summary ASB Link States (Area 10)
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         1.1.1.1         600         0x80000001 0x0065C0
               Type-5 AS External Link States
Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         1851        0x80000002 0x00BC3E 0
10.10.10.4      1.1.1.1         1851        0x80000002 0x00B247 0
30.30.30.1      2.2.2.2         372         0x80000001 0x007839 0
30.30.30.2      2.2.2.2         372         0x80000001 0x00F13E 0
```

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:10:44, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:06:49, Ethernet0/1
      10.0.0.0/32 is subnetted, 4 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:10:44, Ethernet0/0
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:10:44, Ethernet0/0
O E1     10.10.10.3 [110/30] via 12.12.12.1, 00:10:44, Ethernet0/0
O E1     10.10.10.4 [110/30] via 12.12.12.1, 00:10:44, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
      30.0.0.0/32 is subnetted, 2 subnets
O N1     30.30.30.1 [110/31] via 23.23.23.3, 00:06:49, Ethernet0/1
O N2     30.30.30.2 [110/20] via 23.23.23.3, 00:06:49, Ethernet0/1
```

```
IDN-R2(config)#do sh ip ospf database
                OSPF Router with ID (2.2.2.2) (Process ID 2)
                    Router Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1938        0x80000004 0x00D1E9 2
2.2.2.2         2.2.2.2         691         0x80000004 0x00FBCB 1
                    Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1956        0x80000002 0x0012EC
                    Summary Net Link States (Area 0)
Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         2.2.2.2         1956        0x80000002 0x00F832
3.3.3.3         2.2.2.2         458         0x80000001 0x0031EC
10.10.10.1      1.1.1.1         1938        0x80000002 0x00FF18
10.10.10.2      1.1.1.1         1938        0x80000002 0x00F521
23.23.23.0      2.2.2.2         453         0x80000004 0x006C76
                    Router Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         472         0x80000009 0x00253B 2
3.3.3.3         3.3.3.3         472         0x80000009 0x001242 2
                    Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         469         0x80000006 0x004E78
                    Summary Net Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         692         0x80000003 0x002FEE
10.10.10.1      2.2.2.2         692         0x80000003 0x00E919
10.10.10.2      2.2.2.2         692         0x80000003 0x00DF22
12.12.12.0      2.2.2.2         692         0x80000003 0x00A15D
                    Type-7 AS External Link States (Area 1)
Link ID         ADV Router      Age         Seq#       Checksum Tag
30.30.30.1      3.3.3.3         477         0x80000001 0x00C5DD 0
30.30.30.2      3.3.3.3         477         0x80000001 0x003FE2 0
                    Type-5 AS External Link States
Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.3      1.1.1.1         1938        0x80000002 0x00BC3E 0
10.10.10.4      1.1.1.1         1938        0x80000002 0x00B247 0
30.30.30.1      2.2.2.2         457         0x80000001 0x007839 0
30.30.30.2      2.2.2.2         457         0x80000001 0x00F13E 0
```

```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

                Router Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         527         0x80000009 0x00253B 2
3.3.3.3         3.3.3.3         525         0x80000009 0x001242 2

                Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         522         0x80000006 0x004E78

                Summary Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         2.2.2.2         747         0x80000003 0x002FEE
10.10.10.1      2.2.2.2         747         0x80000003 0x00E919
10.10.10.2      2.2.2.2         747         0x80000003 0x00DF22
12.12.12.0      2.2.2.2         747         0x80000003 0x00A15D

                Type-7 AS External Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Tag
30.30.30.1      3.3.3.3         530         0x80000001 0x00C5DD 0
30.30.30.2      3.3.3.3         530         0x80000001 0x003FE2 0
```

Namun demikian pada NSSA default route tidak terbentuk secara otomatis sehingga akan mengalami masalah ketika mau ping ke ip yang tidak ada dalam routing table.

```
IDN-R3(config)#do ping 10.10.10.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Maka kemudian kita tambahkan konfigurasi di ABR nya perintah default-information originate

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 1 nssa default-information-originate
```

```
IDN-R3(config)#do sh ip route

Gateway of last resort is 23.23.23.2 to network 0.0.0.0

O*N2  0.0.0.0/0 [110/1] via 23.23.23.2, 00:00:24, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
O IA     1.1.1.1 [110/21] via 23.23.23.2, 00:11:09, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:11:09, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 2 subnets
O IA     10.10.10.1 [110/21] via 23.23.23.2, 00:11:09, Ethernet0/0
O IA     10.10.10.2 [110/21] via 23.23.23.2, 00:11:09, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O IA     12.12.12.0 [110/20] via 23.23.23.2, 00:11:09, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
C        30.30.30.1 is directly connected, Loopback1
C        30.30.30.2 is directly connected, Loopback2
```

Perhatikan bahwa default routenya muncul sebagai N2

Lakukan test ping

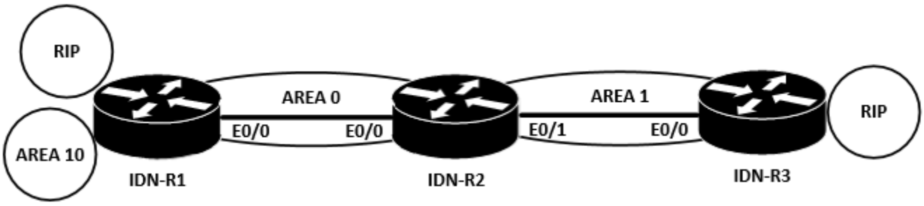
```
IDN-R3(config)#do ping 10.10.10.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 6. OSPF – Totally Not So Stubby Area

Tujuan Lab:

- Mempelajari berbagai tipe area pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Mengkonfigurasikan ipv4 address standar IDN di interface
- Konfigurasikan ospf pada semua router mengacu pada topologi diatas
- Lakukan redistribute rip ke ospf pada IDN-R1 dan IDN-R3
- Rubah area 1 menjadi totally NSSA Area

Verifikasi Lab:

- Show ip route
- show ip ospf database

Berikutnya yang akan kita labkan adalah area totally NSSA

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 1 nssa no-summary
```

```
IDN-R3(config)#do sh ip route
Gateway of last resort is 23.23.23.2 to network 0.0.0.0

O*IA  0.0.0.0/0 [110/11] via 23.23.23.2, 00:00:25, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:13:38, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      30.0.0.0/32 is subnetted, 2 subnets
C        30.30.30.1 is directly connected, Loopback1
C        30.30.30.2 is directly connected, Loopback2
```

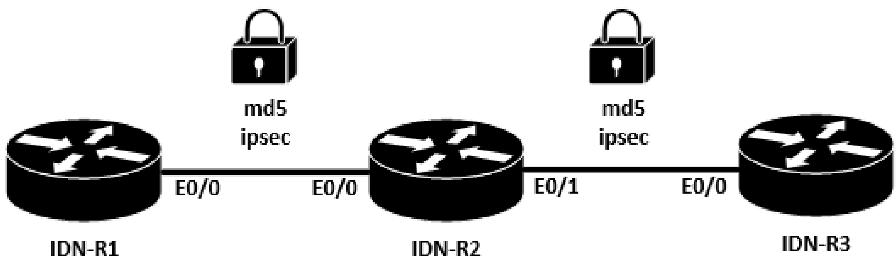
```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

               Router Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         926         0x80000009 0x00253B 2
3.3.3.3         3.3.3.3         923         0x80000009 0x001242 2

               Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.3      3.3.3.3         920         0x80000006 0x004E78

               Summary Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
0.0.0.0         2.2.2.2         126         0x80000001 0x00FC31

               Type-7 AS External Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Tag
0.0.0.0         2.2.2.2         275         0x80000001 0x00D0D8 0
30.30.30.1      3.3.3.3         929         0x80000001 0x00C5DD 0
30.30.30.2      3.3.3.3         929         0x80000001 0x003FE2 0
```

Lab 7. OSPF – Authentication

Tujuan Lab:

- Mempelajari konfigurasi Authentikasi pada ospf dan ospfv3

Topologi Lab:



Metode Lab:

- Melanjutkan lab konfigurasi sebelumnya
- Mengkonfigurasikan authentikasi md5 per interface
- Konfigurasikan authentikasi per area pada area 1

Verifikasi Lab:

- Show crypto ipsec policy
- Lakukan test ping

Pada authentikasi kita akan menggunakan md5 dan ipsec, OSPF juga support clear text authentication.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip ospf authentication message-digest
IDN-R1(config-if)#ip ospf message-digest-key 1 md5 IDN
IDN-R1(config-if)#ipv6 ospf authentication ipsec spi 1000 md5
123456789abcdef123456789abcdef
```

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip ospf authentication message-digest
IDN-R2(config-if)#ip ospf message-digest-key 1 md5 IDN
IDN-R2(config-if)#ipv6 ospf authentication ipsec spi 1000 md5
123456789abcdef123456789abcdef
```

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip ospf authentication message-digest
IDN-R2(config-if)#ip ospf message-digest-key 2 md5 IDN
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 1 authentication message-digest
```

```
IDN-R2(config)#ipv6 router ospf 2
IDN-R2(config-rtr)#area 1 authentication ipsec spi 2000 md5
abcdef1234567890abcdef1234567890
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#area 1 authentication message-digest
```

```
IDN-R3(config)#ipv6 router ospf 3
IDN-R3(config-rtr)#area 1 authentication ipsec spi 2000 md5
abcdef1234567890abcdef1234567890
```

```
IDN-R1#show ipv6 ospf int e0/0
Ethernet0/0 is up, line protocol is up
  Link Local Address FE80::A8BB:CCFF:FE00:100, Interface ID 3
  Area 0, Process ID 1, Instance ID 0, Router ID 1.1.1.1
  Network Type BROADCAST, Cost: 10
  MD5 authentication SPI 1000, secure socket UP (errors: 0)
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 2.2.2.2, local address
FE80::A8BB:CCFF:FE00:200
  Backup Designated router (ID) 1.1.1.1, local address
FE80::A8BB:CCFF:FE00:100
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
    Hello due in 00:00:04
  Graceful restart helper support enabled
  Index 1/2/2, flood queue length 0
  Next 0x0(0)/0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 4
  Last flood scan time is 0 msec, maximum is 1 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 2.2.2.2  (Designated Router)
  Suppress hello for 0 neighbor(s)
```

Verifikasi ipsec

```
IDN-R1#show crypto ipsec policy
Crypto IPsec client security policy data

Policy name:      OSPFv3-1000
Policy refcount:  1
Inbound  AH SPI:  1000 (0x3E8)
Outbound AH SPI:  1000 (0x3E8)
Inbound  AH Key:  1234567890ABCDEF1234567890ABCDEF
Outbound AH Key:  1234567890ABCDEF1234567890ABCDEF
Transform set:    ah-md5-hmac
```

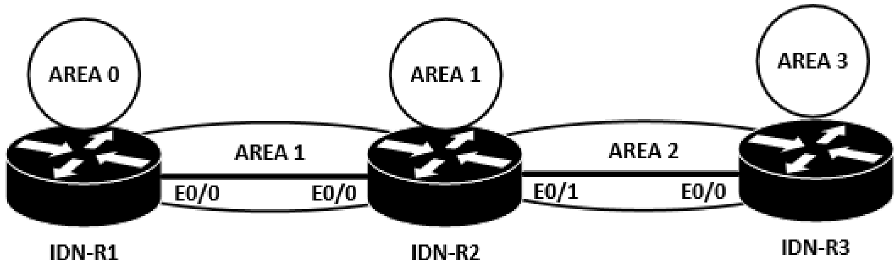
```
IDN-R1#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 8. OSPF – Virtual Link

Tujuan Lab:

- Mempelajari standard area yang tidak tersambung dengan area 0

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- Konfigurasikan ospf area mengacu pada topologi diatas
- Konfigurasikan virtual link untuk area 2
- Konfigurasikan virtual link untuk area 3

Verifikasi Lab:

- Show ip route
- Show ip ospf virtual link

Konfigurasikan ospf

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 1
IDN-R1(config-router)#router-id 1.1.1.1
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 1
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 1
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 2
IDN-R2(config-router)#router-id 2.2.2.2
```

```
IDN-R3(config-if)#router ospf 3
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 3
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 2
IDN-R3(config-router)#router-id 3.3.3.3
```

Cek routing tablenya dan akn didapati tidak semua loopback ada dalam routing tablenya

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:15:06, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
```

```
IDN-R2#show ip route

      1.0.0.0/32 is subnetted, 1 subnets
O IA     1.1.1.1 [110/11] via 12.12.12.1, 00:15:29, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

```
IDN-R3#show ip route
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Pada OSPF, bila diinginkan menggunakan area lain selain area 0, maka area tersebut harus terhubung dengan area 0. Bila ternyata kondisinya ada area yang tidak tersambung dengan area 0, maka hasilnya akan seperti diatas dimana routing tablenya tidaklah lengkap Karena tidak mau untuk saling berbagi informasi routing tablenya.

Pada topologi diatas, hanya IDN-R1 yang tersambung dengan area 0, sedangkan IDN-R2 dan IDN-R3 tidak, jika kita tampilkan ospf databasenya, maka hanya IDN-R1 yang menampilkan informasi tentang area 0, lainnya tidak.

```
IDN-R1#show ip ospf database

            OSPF Router with ID (1.1.1.1) (Process ID 1)

               Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1416        0x80000002 0x00D152 1

               Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
2.2.2.2         1.1.1.1         1347        0x80000001 0x007DA8
12.12.12.0      1.1.1.1         1410        0x80000001 0x001EEC

               Router Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1352        0x80000002 0x00389C 1
2.2.2.2         2.2.2.2         1353        0x80000003 0x00BAF7 2

               Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1353        0x80000001 0x0014EB

                Summary Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         1.1.1.1         1416        0x80000001 0x0047EC
```

```
IDN-R2#show ip ospf database

            OSPF Router with ID (2.2.2.2) (Process ID 2)

               Router Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         1570        0x80000002 0x00389C 1
2.2.2.2         2.2.2.2         1569        0x80000003 0x00BAF7 2

               Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1569        0x80000001 0x0014EB

               Summary Net Link States (Area 1)

Link ID         ADV Router      Age         Seq#       Checksum
1.1.1.1         1.1.1.1         1633        0x80000001 0x0047EC

               Router Link States (Area 2)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         1543        0x80000002 0x008DFC 1
3.3.3.3         3.3.3.3         1544        0x80000002 0x004F32 1

               Net Link States (Area 2)

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.2      2.2.2.2         1543        0x80000001 0x00EAEB
```

```
IDN-R3#show ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

               Router Link States (Area 2)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
2.2.2.2         2.2.2.2         1564        0x80000002 0x008DFC 1
3.3.3.3         3.3.3.3         1563        0x80000002 0x004F32 1

               Net Link States (Area 2)

Link ID         ADV Router      Age         Seq#       Checksum
23.23.23.2      2.2.2.2         1564        0x80000001 0x00EAEB

               Router Link States (Area 3)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
3.3.3.3         3.3.3.3         1578        0x80000001 0x007C91 1
```

Maka agar area 2 dapat terhubung langsung dengan area 0, berikut kita konfigurasikan virtual linknya pada IDN-R2 ke IDN-R1 dan IDN-R3 ke IDN-R2, virtual link ini dikonfigurasikan dua sisi.

Untuk IDN-R2 dimana terdapat area 2 didalamnya yang tidak terhubung langsung dengan area 0, konfigurasi virtual link dibuat melalui area 1 yang merupakan area transitnya.

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 1 virtual-link 1.1.1.1
```

Dengan konfigurasi tersebut, kalua kita lihat di R1 akan muncul message seperti berikut, maka konfigurasikan virtual link di sisi IDN-R1

```
IDN-R1(config)#
*Oct 23 15:09:50.786: %OSPF-4-ERRRCV: Received invalid packet:
mismatched area ID from backbone area from 12.12.12.2, Ethernet0/0
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#area 1 virtual-link 2.2.2.2
```

Cek table routing

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:46:46, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O IA     23.23.23.0 [110/20] via 12.12.12.2, 00:04:23, Ethernet0/0
```

Kita lihat network area 2 yaitu 23.23.23.0 sudah masuk ke dalam routing table, namun network area 3 tampaknya belum muncul.

Berikutnya kita konfigurasikan virtual link pada IDN-R3 dimana terdapat area 3 didalamnya untuk terhubung ke area 0, area 2 digunakan sebagai area transitnya

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#area 2 virtual-link 2.2.2.2
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#area 2 virtual-link 3.3.3.3
```

Cek routing table

```
IDN-R1#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:58:00, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/21] via 12.12.12.2, 00:05:18, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O IA     23.23.23.0 [110/20] via 12.12.12.2, 00:15:37, Ethernet0/0
```

Kita bisa melihat pada IDN-R1 sudah mengenali semua network pada Area 1, Area 2 dan Area 3

```
IDN-R2#show ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:17:53, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/11] via 23.23.23.3, 00:07:34, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

```
IDN-R3#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:09:27, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O IA     2.2.2.2 [110/11] via 23.23.23.2, 00:09:27, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
O IA     12.12.12.0 [110/20] via 23.23.23.2, 00:09:27, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

```
IDN-R3#ping 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R3#ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R3#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/4/5 ms
```

Cek status virtuallinknya pastikan UP

```
IDN-R3#show ip ospf virtual-links
Virtual Link OSPF_VL0 to router 2.2.2.2 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 2, via interface Ethernet0/0
 Topology-MTID    Cost    Disabled     Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
    Hello due in 00:00:02
    Adjacency State FULL (Hello suppressed)
    Index 1/1/2, retransmission queue length 0, number of
retransmission 0
    First 0x0(0)/0x0(0)/0x0(0) Next 0x0(0)/0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

```
IDN-R2#show ip ospf virtual-links
Virtual Link OSPF_VL1 to router 3.3.3.3 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 2, via interface Ethernet0/1
 Topology-MTID    Cost    Disabled     Shutdown      Topology Name
        0           10        no           no            Base
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
    Hello due in 00:00:03
    Adjacency State FULL (Hello suppressed)
    Index 1/2/4, retransmission queue length 0, number of
retransmission 0
    First 0x0(0)/0x0(0)/0x0(0) Next 0x0(0)/0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
Virtual Link OSPF_VL0 to router 1.1.1.1 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 1, via interface Ethernet0/0
 Topology-MTID    Cost    Disabled     Shutdown      Topology Name
        0           10        no           no            Base
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
    Hello due in 00:00:05
    Adjacency State FULL (Hello suppressed)
    Index 1/1/3, retransmission queue length 0, number of
retransmission 1
    First 0x0(0)/0x0(0)/0x0(0) Next 0x0(0)/0x0(0)/0x0(0)
    Last retransmission scan length is 1, maximum is 1
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

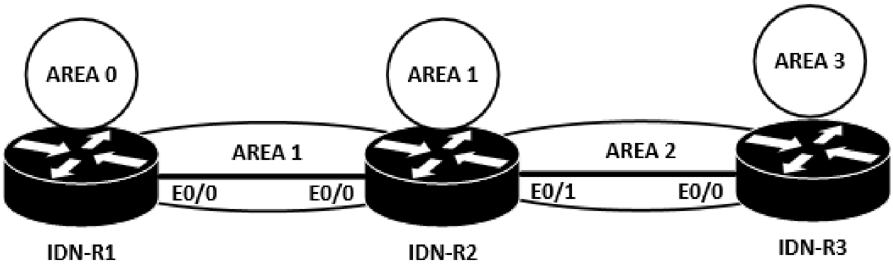
```
IDN-R1#show ip ospf virtual-links
Virtual Link OSPF_VL0 to router 2.2.2.2 is up
  Run as demand circuit
  DoNotAge LSA allowed.
  Transit area 1, via interface Ethernet0/0
 Topology-MTID    Cost    Disabled     Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State POINT_TO_POINT,
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
    Hello due in 00:00:01
    Adjacency State FULL (Hello suppressed)
    Index 1/1/2, retransmission queue length 0, number of
retransmission 0
    First 0x0(0)/0x0(0)/0x0(0) Next 0x0(0)/0x0(0)/0x0(0)
    Last retransmission scan length is 0, maximum is 0
    Last retransmission scan time is 0 msec, maximum is 0 msec
```

Lab 9. OSPF – Gre Tunnel

Tujuan Lab:

- Mempelajari standard area yang tidak tersambung dengan area 0

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- Konfigurasikan ospf area mengacu pada topologi diatas
- Konfigurasikan GRE tunnel untuk area 2
- Konfigurasikan GRE tunnel untuk area 3

Verifikasi Lab:

- Show ip route

Selain menggunakan virtual link, kita juga bisa menghubungakan area yang tidak terhubung langsung dengan area 0 dengan cara mengkonfigurasi GRE Tunnel.

Hapus semua virtual link yang sudah dibuat

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no area 1 virtual-link 2.2.2.2
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no area 1 virtual-link 1.1.1.1
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#no area 2 virtual-link 2.2.2.2
```

Konfigurasikan GRE-Tunnelnya

```
IDN-R1(config)#int tun12
IDN-R1(config-if)#ip address 21.21.21.1 255.255.255.0
IDN-R1(config-if)#tunnel source 12.12.12.1
IDN-R1(config-if)#tunnel destination 12.12.12.2
IDN-R2(config-if)#ip ospf 1 area 0
```

```
IDN-R2(config)#int tun12
IDN-R2(config-if)#ip address 21.21.21.2 255.255.255.0
IDN-R2(config-if)#tunnel source 12.12.12.2
IDN-R2(config-if)#tunnel destination 12.12.12.1
IDN-R2(config-if)#ip ospf 2 area 0
```

```
IDN-R2(config)#int tun23
IDN-R2(config-if)#ip address 32.32.32.2 255.255.255.0
IDN-R2(config-if)#tunnel source 23.23.23.2
IDN-R2(config-if)#tunnel destination 23.23.23.3
IDN-R2(config-if)#ip ospf 2 area 0
```

```
IDN-R3(config)#int tun23
IDN-R3(config-if)#ip address 32.32.32.3 255.255.255.0
IDN-R3(config-if)#tunnel source 23.23.23.3
IDN-R3(config-if)#tunnel destination 23.23.23.2
IDN-R3(config-if)#ip ospf 3 area 0
```

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 01:02:00, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/2001] via 21.21.21.2, 00:01:36, Tunnel12
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      21.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        21.21.21.0/24 is directly connected, Tunnel12
L        21.21.21.1/32 is directly connected, Tunnel12
      23.0.0.0/24 is subnetted, 1 subnets
O IA     23.23.23.0 [110/1010] via 21.21.21.2, 00:01:36, Tunnel12
      32.0.0.0/24 is subnetted, 1 subnets
O        32.32.32.0 [110/2000] via 21.21.21.2, 00:01:36, Tunnel12
```

```
IDN-R2(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/1001] via 21.21.21.1, 00:01:44, Tunnel12
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O IA     3.3.3.3 [110/1001] via 32.32.32.3, 00:02:17, Tunnel23
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      21.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        21.21.21.0/24 is directly connected, Tunnel12
L        21.21.21.2/32 is directly connected, Tunnel12
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
      32.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        32.32.32.0/24 is directly connected, Tunnel23
L        32.32.32.2/32 is directly connected, Tunnel23
```

```
IDN-R3(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/2001] via 32.32.32.2, 00:01:44, Tunnel23
      2.0.0.0/32 is subnetted, 1 subnets
O IA     2.2.2.2 [110/1001] via 32.32.32.2, 00:02:27, Tunnel23
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
O IA     12.12.12.0 [110/1010] via 32.32.32.2, 00:02:27, Tunnel23
      21.0.0.0/24 is subnetted, 1 subnets
O        21.21.21.0 [110/2000] via 32.32.32.2, 00:01:54, Tunnel23
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      32.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        32.32.32.0/24 is directly connected, Tunnel23
L        32.32.32.3/32 is directly connected, Tunnel23
```

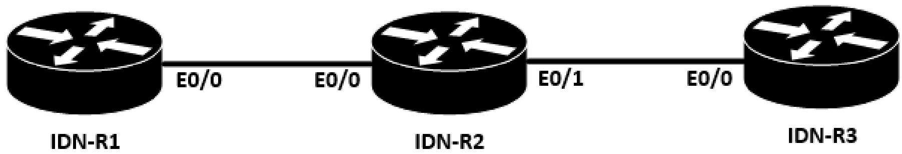
```
IDN-R1(config)#do ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R1(config)#do ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 10. OSPF – Filtering Route Access List

Tujuan Lab:

- Mempelajari cara memfilter suatu route dari routing tablenya menggunakan access list

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing ospf
- Membuat ip loopback di IDN-R1 yang akan difilter nantinya
- Gunakan ACL
- Bandingkan routing table dengan ospf database

Verifikasi Lab:

- Show ip route
- Show ip ospf database

Ada beberapa cara untuk melakukan filtering route, salah satunay adalah dengan menggunakan access list + distribute list yang akan kita labkan berikut

Buat ip loopback pada iDN-R1

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255
IDN-R1(config-if)#int lo1
IDN-R1(config-if)#ip address 10.10.10.1 255.255.255.255
IDN-R1(config-if)#int lo2
IDN-R1(config-if)#ip address 10.10.10.2 255.255.255.255
IDN-R1(config-if)#int lo3
IDN-R1(config-if)#ip address 10.10.10.3 255.255.255.255
IDN-R1(config-if)#int lo4
IDN-R1(config-if)#ip address 10.10.10.4 255.255.255.255
IDN-R1(config-if)#int lo5
IDN-R1(config-if)#ip address 10.10.10.5 255.255.255.255
IDN-R1(config-if)#int lo6
IDN-R1(config-if)#ip address 10.10.10.6 255.255.255.255
```

Konfigurasikan OSPF pada setiap router

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#router-id 1.1.1.1
IDN-R1(config-router)#network 10.10.10.0 0.0.0.255 area 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#router-id 2.2.2.2
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#router-id 3.3.3.3
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
```

Cek table routing

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:05, Ethernet0/1
      10.0.0.0/32 is subnetted, 6 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.3 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.4 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.5 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Konfigurasikan filtering distribute list yang hanya mengizinkan IP genap yang dapat lewat.

```
IDN-R2(config)#access-list 1 permit 0.0.0.0 255.255.255.254
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#distribute-list 1 in
```

Cek table routing

```
IDN-R2(config-router)#do sh ip route
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 3 subnets
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:00:04, Ethernet0/0
O IA     10.10.10.4 [110/11] via 12.12.12.1, 00:00:04, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:04, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

```
IDN-R3(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:14:08, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 6 subnets
O IA     10.10.10.1 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
O IA     10.10.10.2 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
O IA     10.10.10.3 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
O IA     10.10.10.4 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
O IA     10.10.10.5 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
O IA     10.10.10.6 [110/21] via 23.23.23.2, 00:03:18, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:03:18, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Tidak terpengaruh dengan adanya filtering pada router R2 karena ospf mengacu pada OSPF database, sekarang kita cek OSPF database disisi IDN-R2 dan IDN-R3

```
IDN-R2(config)#do sh ip ospf database

            OSPF Router with ID (2.2.2.2) (Process ID 2)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         394         0x80000004 0x00CBF1 2
2.2.2.2         2.2.2.2         353         0x80000006 0x00A265 3
3.3.3.3         3.3.3.3         1009        0x80000002 0x005E06 2

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         353         0x80000001 0x0014EB
23.23.23.2      2.2.2.2         1008        0x80000001 0x00EAEB

                Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
10.10.10.1      1.1.1.1         384         0x80000001 0x000217
10.10.10.2      1.1.1.1         384         0x80000001 0x00F720
10.10.10.3      1.1.1.1         384         0x80000001 0x00ED29
10.10.10.4      1.1.1.1         384         0x80000001 0x00E332
10.10.10.5      1.1.1.1         384         0x80000001 0x00D93B
10.10.10.6      1.1.1.1         384         0x80000001 0x00CF44
```

```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

               Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         617         0x80000004 0x00CBF1 2
2.2.2.2         2.2.2.2         576         0x80000006 0x00A265 3
3.3.3.3         3.3.3.3         1230        0x80000002 0x005E06 2

               Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         576         0x80000001 0x0014EB
23.23.23.2      2.2.2.2         1231        0x80000001 0x00EAEB

               Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
10.10.10.1      1.1.1.1         607         0x80000001 0x000217
10.10.10.2      1.1.1.1         607         0x80000001 0x00F720
10.10.10.3      1.1.1.1         607         0x80000001 0x00ED29
10.10.10.4      1.1.1.1         607         0x80000001 0x00E332
10.10.10.5      1.1.1.1         607         0x80000001 0x00D93B
10.10.10.6      1.1.1.1         607         0x80000001 0x00CF44
```

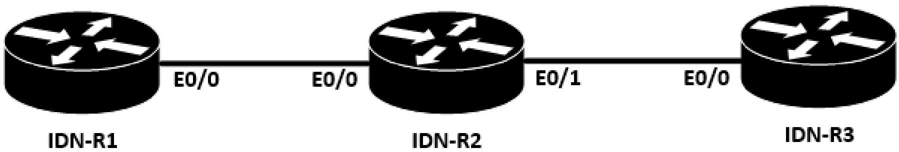
Terlihat di sisi IDN-R3 ospf databasenya sama dengan IDN-R2 sehingga filtering yang dilakukan di sisi IDN-R2 hanya mempengaruhi routing tablenya IDN-R2 saja, tidak di IDN-R3 karena pada router IDN-R3 mengacu pada ospf database yang dimilikinya. Semua router ospf yang berada pada area yang sama akan memiliki nilai ospf database yang sama.

Lab 11. OSPF – Filtering Route Administrative Distance

Tujuan Lab:

- Mempelajari cara memfilter suatu route dari routing tablenya menggunakan AD

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing ospf
- Membuat ip loopback di IDN-R1 yang akan difilter nantinya
- Gunakan ACL
- Bandingkan routing table dengan ospf database

Verifikasi Lab:

- Show ip route
- Show ip ospf database

Latihan filtering berikutnya adalah dengan menggunakan AD, yaitu dengan merubah nilai AD suatu route yang ingin kita hapus dengan merubah nilainya menjadi 255.

Hapus konfigurasi filtering sebelumnya

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no distribute-list 1 in
```

Cek routing table

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:05, Ethernet0/1
      10.0.0.0/32 is subnetted, 6 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.2 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.3 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.4 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.5 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:05, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Konfigurasikan filtering AD

```
IDN-R2(config)#access-list 2 permit 10.10.10.2
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#distance 255 0.0.0.0 255.255.255.255 2
```

Cek routing table lagi dan pastikan 10.10.10.2 tidak lagi terdapat dalam routing tablenya

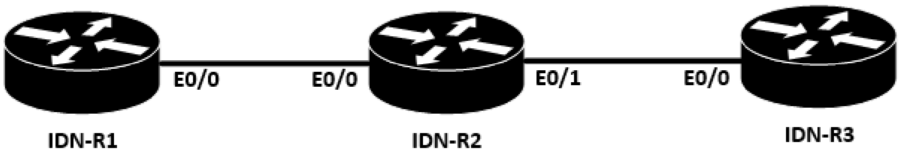
```
IDN-R2(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:16, Ethernet0/1
      10.0.0.0/32 is subnetted, 5 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.3 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.4 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.5 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Lab 12. OSPF – Filtering Route Prefix List

Tujuan Lab:

- Mempelajari cara memfilter suatu route dari routing tablenya menggunakan Prefix-list

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing ospf
- Membuat ip loopback di IDN-R1 yang akan difilter nantinya
- Gunakan ACL
- Bandingkan routing table dengan ospf database

Verifikasi Lab:

- Show ip route
- Show ip ospf database

Latihan Filtering berikutnya adalah menggunakan prefix-list, jika sebelumnya kita menghilangkan 10.10.10.2 maka kita akan mencoba menghilangkan 10.10.10.4

Cek terlebih dahulu kondisi sebelum filtering

```
IDN-R2(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:16, Ethernet0/1
      10.0.0.0/32 is subnetted, 5 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.3 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.4 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.5 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:16, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Selanjutnya kita konfigurasikan prefix-list filternya

```
IDN-R2(config)#ip prefix-list IDN seq 10 deny 10.10.10.4/32
IDN-R2(config)#ip prefix-list IDN seq 20 permit 0.0.0.0/0 le 32
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#distribute-list prefix IDN in
```

Kemudian kita lihat routing tablenya IDN-R2 lagi dan pastikan 10.10.10.4/32 sudah tidak ada

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:00:11, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:00:11, Ethernet0/1
      10.0.0.0/32 is subnetted, 4 subnets
O IA     10.10.10.1 [110/11] via 12.12.12.1, 00:00:11, Ethernet0/0
O IA     10.10.10.3 [110/11] via 12.12.12.1, 00:00:11, Ethernet0/0
O IA     10.10.10.5 [110/11] via 12.12.12.1, 00:00:11, Ethernet0/0
O IA     10.10.10.6 [110/11] via 12.12.12.1, 00:00:11, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Diatas bisa kita lihat bahwa tidak ada prefix 10.10.10.1/32 pada routing table IDN-R3

Sekarang kita cek pada databasenya

```
IDN-R2(config)#do sh ip ospf database

            OSPF Router with ID (2.2.2.2) (Process ID 2)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         992         0x80000004 0x00CBF1 2
2.2.2.2         2.2.2.2         951         0x80000006 0x00A265 3
3.3.3.3         3.3.3.3         1607        0x80000002 0x005E06 2

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         951         0x80000001 0x0014EB
23.23.23.2      2.2.2.2         1606        0x80000001 0x00EAEB

                Summary Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
10.10.10.1      1.1.1.1         983         0x80000001 0x000217
10.10.10.2      1.1.1.1         983         0x80000001 0x00F720
10.10.10.3      1.1.1.1         983         0x80000001 0x00ED29
10.10.10.4      1.1.1.1         983         0x80000001 0x00E332
10.10.10.5      1.1.1.1         983         0x80000001 0x00D93B
10.10.10.6      1.1.1.1         983         0x80000001 0x00CF44
```

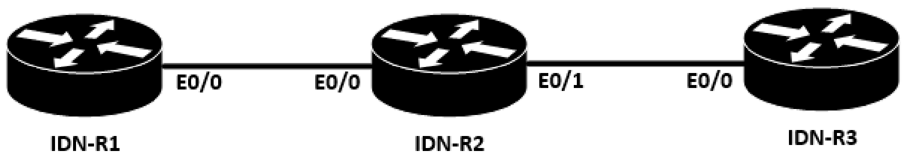
Kita bisa melihat bahwa pada database ospf nya masih ada 10.10.10.4/32

Lab 13. OSPF – Filtering External Route

Tujuan Lab:

- Mempelajari cara memfilter suatu route dari routing tablenya menggunakan access list, AD, Prefix-list

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN
- Konfigurasi IP address standar IDN
- Konfigurasi routing ospf
- Membuat ip loopback di IDN-R1 yang akan difilter nantinya
- Gunakan ACL
- Bandingkan routing table dengan ospf database

Verifikasi Lab:

- Show ip route
- Show ip ospf database

Latihan Filtering berikutnya kita akan membatasi jumlah eksternal route yang diredistribute kedalam ospf. Untuk itu beberapa ip loopback pada IDN-R1 akan kita jadikan sebagai external route. Hapus konfigurasi filtering yang sebelumnya.

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no distribute-list prefix IDN in
IDN-R2(config-router)#no distance 255 0.0.0.0 255.255.255.255 2
```

Konfigurasikan redistribute, hapus network yg diadvertise kemudian redistribute.

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no network 10.10.10.0 0.0.0.255 area 1
IDN-R1(config-router)#redistribute connected subnets
```

Cek routing table IDN-R2

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:01:19, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:01:19, Ethernet0/1
      10.0.0.0/32 is subnetted, 6 subnets
O E2     10.10.10.1 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
O E2     10.10.10.2 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
O E2     10.10.10.3 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
O E2     10.10.10.4 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
O E2     10.10.10.5 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
O E2     10.10.10.6 [110/20] via 12.12.12.1, 00:01:19, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

Sudah muncul sebagai external route

Sekearang kita akan membatasi jumlah prefix menjadi 3

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#redistribute maximum-prefix 3 60
IDN-R1(config-router)#
*Oct 24 02:36:14.700: %IPRT-4-REDIST_THR_PFX: Redistribution prefix
threshold has been reached "ospf 1" - 1 prefixes
*Oct 24 02:36:14.700: %IPRT-4-REDIST_MAX_PFX: Redistribution prefix
limit has been reached "ospf 1" - 3 prefixes
```

Sekarang kita lihat di sisi IDN-R2 dan IDN-R3

```
IDN-R2(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:02:59, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:02:59, Ethernet0/1
      10.0.0.0/32 is subnetted, 3 subnets
O E2     10.10.10.1 [110/20] via 12.12.12.1, 00:00:00, Ethernet0/0
O E2     10.10.10.2 [110/20] via 12.12.12.1, 00:00:00, Ethernet0/0
O E2     10.10.10.3 [110/20] via 12.12.12.1, 00:00:00, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

```
IDN-R2(config)#do sh ip ospf database

            OSPF Router with ID (2.2.2.2) (Process ID 2)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         658         0x80000006 0x00CAEF 2
2.2.2.2         2.2.2.2         1922        0x80000006 0x00A265 3
3.3.3.3         3.3.3.3         653         0x80000003 0x005C07 2

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         1922        0x80000001 0x0014EB
23.23.23.2      2.2.2.2         659         0x80000002 0x00E8EC

                Type-5 AS External Link States

Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.1      1.1.1.1         69          0x80000001 0x005627 0
10.10.10.2      1.1.1.1         69          0x80000001 0x004C30 0
10.10.10.3      1.1.1.1         69          0x80000001 0x004239 0
```

```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:33:19, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:44:09, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 3 subnets
O E2     10.10.10.1 [110/20] via 23.23.23.2, 00:02:29, Ethernet0/0
O E2     10.10.10.2 [110/20] via 23.23.23.2, 00:02:29, Ethernet0/0
O E2     10.10.10.3 [110/20] via 23.23.23.2, 00:02:29, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:33:19, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

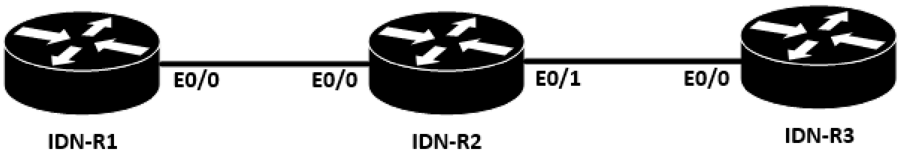
```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

                Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         784         0x80000006 0x00CAEF 2
2.2.2.2         2.2.2.2         38          0x80000007 0x00A066 3
3.3.3.3         3.3.3.3         777         0x80000003 0x005C07 2

                Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.2      2.2.2.2         38          0x80000002 0x0012EC
23.23.23.2      2.2.2.2         786         0x80000002 0x00E8EC

                Type-5 AS External Link States

Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.1      1.1.1.1         195         0x80000001 0x005627 0
10.10.10.2      1.1.1.1         195         0x80000001 0x004C30 0
10.10.10.3      1.1.1.1         195         0x80000001 0x004239 0
```

Lab 14. OSPF – Summarization Area Range

Tujuan: Lab:

- Memperlajari summarization internal route dan external route

Topologi Lab:



Metode Lab:

- Bisa dengan melanjutkan lab dan konfigurasi sebelumnya
- Summary ABR Internal route → command "area xx range"
- Summary ASBR External route → command "summary-address"

Verifikasi Lab:

- Show ip route

Pertama kita akan belajar OSPF internal route summarization dulu dengan perintah area range, hapus dulu konfigurasi redistribute sebelumnya kemudian advertise ke ospf

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no redistribute connected subnets
IDN-R1(config-router)#no redistribute maximum-prefix 3
IDN-R1(config-router)#network 10.10.10.0 0.0.0.255 area 1
```

```
IDN-R3#sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:02:51, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:02:51, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 6 subnets
O IA     10.10.10.1 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
O IA     10.10.10.2 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
O IA     10.10.10.3 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
O IA     10.10.10.4 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
O IA     10.10.10.5 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
O IA     10.10.10.6 [110/21] via 23.23.23.2, 00:02:00, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:02:51, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Konfigurasi summary

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#area 1 range 10.10.10.0 255.255.255.248
```

Cek routing table

```
IDN-R3#show ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:04:28, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:04:28, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/29 is subnetted, 1 subnets
O IA     10.10.10.0 [110/21] via 23.23.23.2, 00:00:18, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:04:28, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Sudah ter summary

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:00:58, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 00:00:58, Ethernet0/0
      10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O        10.10.10.0/29 is a summary, 00:00:58, Null0
C        10.10.10.1/32 is directly connected, Loopback1
C        10.10.10.2/32 is directly connected, Loopback2
C        10.10.10.3/32 is directly connected, Loopback3
C        10.10.10.4/32 is directly connected, Loopback4
C        10.10.10.5/32 is directly connected, Loopback5
C        10.10.10.6/32 is directly connected, Loopback6
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 00:00:58, Ethernet0/0
```

Pada OSPF, discard route akan otomatis muncul bila summary route dikonfigurasikan. Hal tersebut untuk menghindari terjadinya adanya forwarding loop. Bila ingin dihapuskan, maka konfigurasikan berikut.

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no discard-route internal
```

```
IDN-R1(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:05:23, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 00:05:23, Ethernet0/0
      10.0.0.0/32 is subnetted, 6 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
C        10.10.10.4 is directly connected, Loopback4
C        10.10.10.5 is directly connected, Loopback5
C        10.10.10.6 is directly connected, Loopback6
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 00:05:23, Ethernet0/0
```

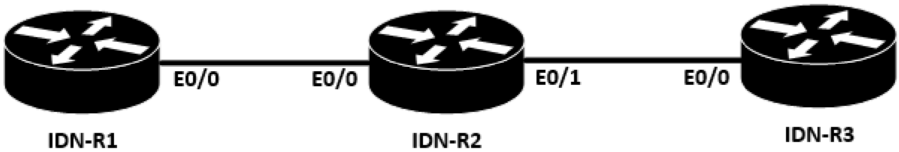
Dan discard route null0 pun sudah dihapuskan.

Lab 15. OSPF – Summarization Summary Address

Tujuan: Lab:

- Memperlajari summarization internal route dan external route

Topologi Lab:



Metode Lab:

- Bisa dengan melanjutkan lab dan konfigurasi sebelumnya
- Summary ABR Internal route → command "area xx range"
- Summary ASBR External route → command "summary-address"

Verifikasi Lab:

- Show ip route

Berikutnya untuk OSPF external route summarization konfigurasikan berikut

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no network 10.10.10.0 0.0.0.255 area 1

IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 10.10.10.0 0.0.0.7
IDN-R1(config-router)#no auto-summary

IDN-R1(config)#router ospf 1
IDN-R1(config-router)#redistribute eigrp 1 subnets
```

Cek routing table IDN-R3

```
IDN-R3#show ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:18:36, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:18:36, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 6 subnets
O E2     10.10.10.1 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
O E2     10.10.10.2 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
O E2     10.10.10.3 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
O E2     10.10.10.4 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
O E2     10.10.10.5 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
O E2     10.10.10.6 [110/20] via 23.23.23.2, 00:01:14, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:18:36, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Konfigurasikan External Route Summarization di IDN-R1

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#summary-address 10.10.10.0 255.255.255.248
```

Cek lagi di IDN-R3

```
IDN-R3#show ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:21:08, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:21:08, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/29 is subnetted, 1 subnets
O E2     10.10.10.0 [110/20] via 23.23.23.2, 00:00:59, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:21:08, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Cek table routing IDN-R1

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:17:47, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 00:17:47, Ethernet0/0
      10.0.0.0/8 is variably subnetted, 7 subnets, 2 masks
O        10.10.10.0/29 is a summary, 00:05:09, Null0
C        10.10.10.1/32 is directly connected, Loopback1
C        10.10.10.2/32 is directly connected, Loopback2
C        10.10.10.3/32 is directly connected, Loopback3
C        10.10.10.4/32 is directly connected, Loopback4
C        10.10.10.5/32 is directly connected, Loopback5
C        10.10.10.6/32 is directly connected, Loopback6
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 00:17:47, Ethernet0/0
```

Untuk menghapusnya konfigurasikan

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no discard-route external
```

```
IDN-R1(config-router)#do sho ip route

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:00:31, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 00:00:31, Ethernet0/0
      10.0.0.0/32 is subnetted, 6 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
C        10.10.10.4 is directly connected, Loopback4
C        10.10.10.5 is directly connected, Loopback5
C        10.10.10.6 is directly connected, Loopback6
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 00:00:31, Ethernet0/0
```

Test ping

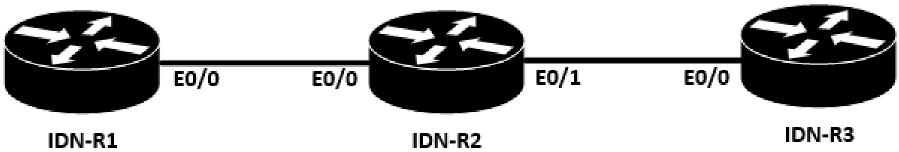
```
IDN-R3#ping 10.10.10.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R3#ping 10.10.10.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R3#ping 10.10.10.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

IDN-R3#ping 10.10.10.4
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 16. OSPF – Default Route

Tujuan Lab:

- Mempelajari cara mendistribusikan default route melalui OSPF

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- IDN-R1 dan IDN-R2 adalah router kantor kita
- IDN-R3 adalah routernya ISP
- Konfigurasikan OSPSF area 0 pada router IDN-R1 dan IDN-R2
- Konfigurasikan OSPF area 0 pada router IDN-R1 dan IDN-R2
- Dari router kantor ke router ISP gunakan default route

Verifikasi Lab:

- Show ip route
- Show ip ospf interface

Konfigurasikan OSPF

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
```

Tambahkan loopback yang tidak akan diadvertise ke ospf, ip loopback ini tidak akan masuk routing table Karena sebagi uji coba default route.

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 10.10.10.1 255.255.255.255
IDN-R1(config-if)#int lo2
IDN-R1(config-if)#ip address 10.10.10.2 255.255.255.255
IDN-R1(config)#int lo3
IDN-R1(config-if)#ip address 10.10.10.3 255.255.255.255
```

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#default-information originate always
```

Perintah default information originate always digunakan untuk mendistribusikan default route kedadlam ospf. Keyword always digunakan bila tidak ada baris perintah static default route (ip route x.x.x.x)

```
IDN-R2(config)#do sh ip route
Gateway of last resort is 12.12.12.1 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 12.12.12.1, 00:00:29, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:05:20, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 00:04:48, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

```
IDN-R2(config)#do ping 10.10.10.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
IDN-R3(config)#do sh ip route
Gateway of last resort is 23.23.23.2 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 23.23.23.2, 00:01:20, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:05:39, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:05:39, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:05:39, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

```
IDN-R3(config)#do sh ip route 10.10.10.2
% Network not in table
```

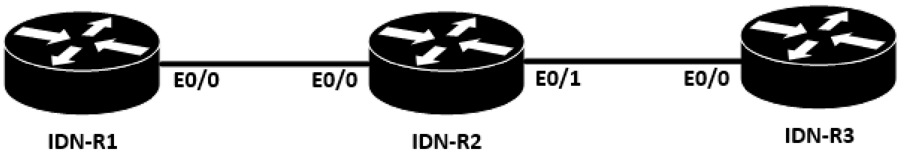
```
IDN-R3(config)#do ping 10.10.10.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.10.10.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 17. OSPF – Conditional Default Route

Tujuan Lab:

- Mempelajari cara mendistribusikan default route melalui OSPF

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- IDN-R1 dan IDN-R2 adalah router kantor kita
- IDN-R3 adalah routernya ISP
- Konfigurasikan OSPSF area 0 pada router IDN-R1 dan IDN-R2
- Konfigurasikan OSPF area 0 pada router IDN-R1 dan IDN-R2
- Dari router kantor ke router ISP gunakan default route
- Jika link dari IDN-R2 ke ISP(IDN-R3) putus, maka IDN-R2 tidak mengirimkan default route ke IDN-R1

Verifikasi Lab:

- Show ip route
- Show ip ospf interface

Latihan default route berikutnya kita akan mengkonfigurasikan conditional default route, dimana IDN-R2 akan mengadvertise default route ke IDN-R1 bilamana link kearah ISP aktif. Namun jika linknya terputus maka IDN-R2 tidak akan mengirimkan default route ke IDN-R1.

Hapus default route pada IDN-R1

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#no default-information originate always
```

Konfigurasikan default route

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#no network 23.23.23.0 0.0.0.255 area 0

IDN-R2(config)#ip route 0.0.0.0 0.0.0.0 23.23.23.3
```

```
IDN-R3(config)#router ospf 2
IDN-R3(config-router)#no network 23.23.23.0 0.0.0.255 area 0

IDN-R3(config)#ip route 0.0.0.0 0.0.0.0 23.23.23.2
```

Konfigurasikan route-map sebagai rule conditional default route

```
IDN-R2(config)#access-list 1 permit 23.23.23.0 0.0.0.255

IDN-R2(config)#route-map OSPF_defroute permit 10
IDN-R2(config-route-map)#match ip address 1

IDN-R2(config)#router ospf 2
IDN-R2(config-router)#default-information originate route-map
OSPF_defroute
```

Pastikan di sisi IDN-R1 mendapatkan default route

```
IDN-R1(config)#do sh ip route
Gateway of last resort is 12.12.12.2 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 12.12.12.2, 00:05:44, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 02:12:13, Ethernet0/0
      10.0.0.0/32 is subnetted, 3 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
```

Shutdown interface e0/1 pada IDN-R2

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#shutdown
```

Cek di sisi IDN-R1 pastikan sudah tidak ada default routenya

```
IDN-R1(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 02:05:52, Ethernet0/0
      10.0.0.0/32 is subnetted, 3 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
```

Aktifkan interface kembali yan gmenuju kea rah IDN-R3 (ISP)

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#no shutdown
```

Cek lagi IDN-R1

```
IDN-R1(config)#do sh ip route
Gateway of last resort is 12.12.12.2 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 12.12.12.2, 00:05:44, Ethernet0/0
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 02:12:13, Ethernet0/0
      10.0.0.0/32 is subnetted, 3 subnets
C        10.10.10.1 is directly connected, Loopback1
C        10.10.10.2 is directly connected, Loopback2
C        10.10.10.3 is directly connected, Loopback3
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
```

Lakukan test ping

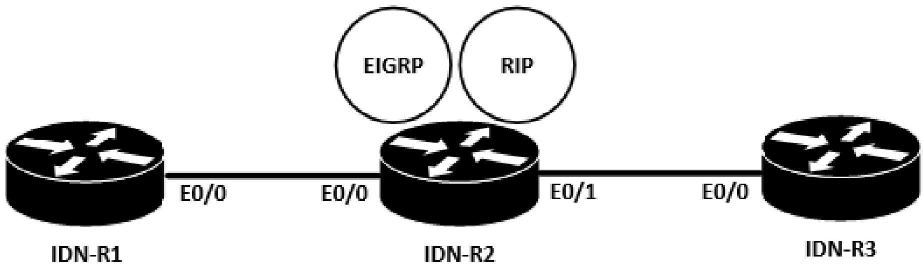
```
IDN-R1(config)#do ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 18. OSPF – Redistribution

Tujuan Lab:

- Mempelajari meredistribute routing protocol lain ke dalam ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi standar IDN
- Konfigurasikan ip address standar IDN
- Buat ip loopback pada IDN-R2 yang akan diadvertise dan redistribute
- Redistribute eigrp ke ospf
- Redistribute rip ke ospf
- Redistribute connected
- Redistribute static

Verifikasi Lab:

- Show ip route
- Show ip ospf database

Konfigurasikan single area ospf pada semua router

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#router-id 1.1.1.1
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#router-id 2.2.2.2
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#router-id 3.3.3.3
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
```

Tambahkan loopback pada IDN-R1 untuk di tuju dengan static

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 10.10.10.1 255.255.255.255
```

Tambahkan loopback pada IDN-R2

```
IDN-R2(config)#int lo1
IDN-R2(config-if)#ip address 20.20.20.1 255.255.255.255
IDN-R2(config-if)#int lo2
IDN-R2(config-if)#ip address 20.20.20.2 255.255.255.255
IDN-R2(config-if)#int lo3
IDN-R2(config-if)#ip address 20.20.20.3 255.255.255.255
```

Advertise network 20.20.20.1 ke eigrp

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 20.20.20.1 0.0.0.0
IDN-R2(config-router)#no auto-summary
```

Advertise network 20.20.20.0 ke ripv2

```
IDN-R2(config)#router rip
IDN-R2(config-router)#version 2
IDN-R2(config-router)#network 20.20.20.0
IDN-R2(config-router)#no auto-summary
```

Buat static routing menuju llopback IDN-R1

```
IDN-R2(config)#ip route 10.10.10.1 255.255.255.255 12.12.12.1
```

Redistribute eigrp, rip, static,dan connected

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#redistribute eigrp 1 subnets
IDN-R2(config-router)#redistribute rip subnets
IDN-R2(config-router)#redistribute static subnets
IDN-R2(config-router)#redistribute connected subnets
```

Cek tabel routingnya

```
IDN-R3(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 00:01:12, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 00:01:12, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 1 subnets
O E2     10.10.10.1 [110/20] via 23.23.23.2, 00:01:12, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 00:01:12, Ethernet0/0
      20.0.0.0/32 is subnetted, 3 subnets
O E2     20.20.20.1 [110/20] via 23.23.23.2, 00:01:12, Ethernet0/0
O E2     20.20.20.2 [110/20] via 23.23.23.2, 00:01:12, Ethernet0/0
O E2     20.20.20.3 [110/20] via 23.23.23.2, 00:01:12, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Cek database ospf

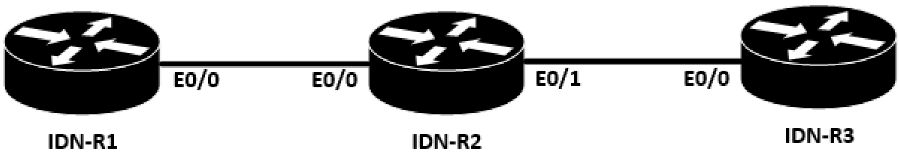
```
IDN-R3(config)#do sh ip ospf database

            OSPF Router with ID (3.3.3.3) (Process ID 3)

               Router Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum Link
count
1.1.1.1         1.1.1.1         137         0x80000004 0x00B20D 2
2.2.2.2         2.2.2.2         176         0x80000007 0x009A6A 3
3.3.3.3         3.3.3.3         135         0x80000004 0x0070F0 2

               Net Link States (Area 0)

Link ID         ADV Router      Age         Seq#       Checksum
12.12.12.1      1.1.1.1         137         0x80000001 0x004CB8
23.23.23.3      3.3.3.3         135         0x80000001 0x00B21F

               Type-5 AS External Link States

Link ID         ADV Router      Age         Seq#       Checksum Tag
10.10.10.1      2.2.2.2         175         0x80000001 0x00F75C 0
20.20.20.1      2.2.2.2         175         0x80000001 0x00CE8C 0
20.20.20.2      2.2.2.2         175         0x80000001 0x00C495 0
20.20.20.3      2.2.2.2         175         0x80000001 0x00BA9E 0
```

Lab 19. OSPF – Timers

Tujuan Lab:

- Mempelajari cara merubah ospf timers

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan ospf single area pada setiap router
- Rubah hello timer
- Rubah dead timer

Verifikasi Lab:

- Show ip ospf interface

Konfigurasikan ospf

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
```

Cek hello timer dan dead interval secara defulat pada ospf interface

```
IDN-R1#show ip ospf int e0/0
Ethernet0/0 is up, line protocol is up
  Internet Address 12.12.12.1/24, Area 0, Attached via Network
Statement
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 12.12.12.2
  Backup Designated router (ID) 1.1.1.1, Interface address
12.12.12.1
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit
5
```

Rubah hello interval

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip ospf hello-interval 20
```

Ketika hello intervak di rubah yang terjadi adalah dead time juga ikut berubah menjadi 4x nilai hellonya namun tidak berlaku sebaliknya.

Cek kembali ospf timernya

```
IDN-R1(config-if)#do show ip ospf int e0/0
Ethernet0/0 is up, line protocol is up
  Internet Address 12.12.12.1/24, Area 0, Attached via Network
Statement
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 12.12.12.2
  Backup Designated router (ID) 1.1.1.1, Interface address
12.12.12.1
  Timer intervals configured, Hello 20, Dead 80, Wait 80, Retransmit
5
```

Akan muncul seperti berikut

```
*Oct 24 06:49:27.836: %OSPF-5-ADJCHG: Process 1, Nbr 2.2.2.2 on
Ethernet0/0 from FULL to DOWN, Neighbor Down: Dead timer expired
```

Rubah hello timer pada IDN-R2 e0/0

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip ospf hello-interval 20
```

Dan adjacency kembali terjadi, hello timer pada ospf syaratnya HARUS sama.

```
*Oct 24 06:50:33.026: %OSPF-5-ADJCHG: Process 2, Nbr 1.1.1.1 on
Ethernet0/0 from LOADING to FULL, Loading Done
```

Cek ospf timer pada IDN-R2 e0/0

```
IDN-R2(config-if)#do show ip ospf int e0/0
Ethernet0/0 is up, line protocol is up
  Internet Address 12.12.12.2/24, Area 0, Attached via Network
Statement
  Process ID 2, Router ID 2.2.2.2, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 2.2.2.2, Interface address 12.12.12.2
  Backup Designated router (ID) 1.1.1.1, Interface address
12.12.12.1
  Timer intervals configured, Hello 20, Dead 80, Wait 80, Retransmit
5
```

Rubah dead interval menjadi 30 detik

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip ospf dead-interval 30
```

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip ospf dead-interval 30
```

Cek apakah akan otomatis berubah jika dead timer dirubah

```
IDN-R2(config-if)#do show ip ospf int e0/1
Ethernet0/1 is up, line protocol is up
  Internet Address 23.23.23.2/24, Area 0, Attached via
Network Statement
  Process ID 2, Router ID 2.2.2.2, Network Type BROADCAST,
Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology
Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State BDR, Priority 1
  Designated Router (ID) 3.3.3.3, Interface address
23.23.23.3
  Backup Designated router (ID) 2.2.2.2, Interface address
23.23.23.2
  Flush timer for old DR LSA due in 00:01:28
  Timer intervals configured, Hello 10, Dead 30, Wait 30,
Retransmit 5
```

```
IDN-R3(config-if)#do show ip ospf int e0/0
Ethernet0/0 is up, line protocol is up
  Internet Address 23.23.23.3/24, Area 0, Attached via Network
Statement
  Process ID 3, Router ID 3.3.3.3, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 3.3.3.3, Interface address 23.23.23.3
  Backup Designated router (ID) 2.2.2.2, Interface address
23.23.23.2
  Timer intervals configured, Hello 10, Dead 30, Wait 30, Retransmit
5
```

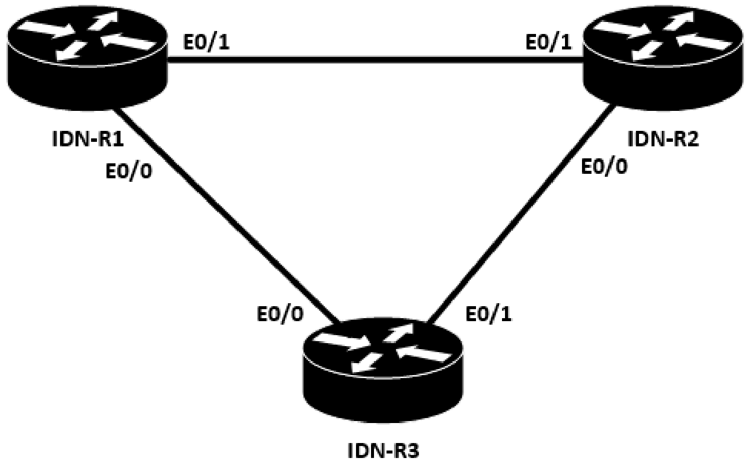
Jika dead timer dirubah, hello interval tidak akan menyesuaikan nilainya dengan dead intervalnya.

Lab 20. OSPF – Mindah Jalur Bandwidth

Tujuan Lab:

- Memperlajari perpindahan jalur pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan ospf single area
- Shutdown interface
- Rubah bandwidth

Verifikasi Lab:

- Show ip route
- Traceroute

Konfigurasi OSPF single area

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 0.0.0.0 255.255.255.255 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 0.0.0.0 255.255.255.255 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#network 0.0.0.0 255.255.255.255 area 0
```

Test traceroute

```
IDN-R1(config)#do trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 13.13.13.3 1 msec 0 msec 0 msec
```

Terlihat bahwa jalur menggunakan IDN-R3

```
IDN-R1(config)#do show ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "ospf 1", distance 110, metric 11, type intra area
  Last update from 13.13.13.3 on Ethernet0/0, 00:10:59 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 13.13.13.3, 00:10:59 ago, via Ethernet0/0
      Route metric is 11, traffic share count is 1
```

Metric sebelas didapatkan dari nilai link IDN-R1 ke IDN-R3 (10) ditambah nilai cost loopback (1) jadi total cost 11

Shutdown interface agar berpindah jalurnya.

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#shutdown
```

Cek ip route menuju 3.3.3.3

```
IDN-R1(config-if)#do sh ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "ospf 1", distance 110, metric 21, type intra area
  Last update from 12.12.12.2 on Ethernet0/1, 00:00:25 ago
  Routing Descriptor Blocks:
  * 12.12.12.2, from 13.13.13.3, 00:00:25 ago, via Ethernet0/1
      Route metric is 21, traffic share count is 1
```

Terlihat jalur sekarang melewati IDN-R2 terlebih dahulu.

Hidupkan kembali interfacenya

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no shutdown
```

Cek ip route menuju 3.3.3.3 kembali menggunakan IDN-R3

```
IDN-R1(config)#do show ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "ospf 1", distance 110, metric 11, type intra area
  Last update from 13.13.13.3 on Ethernet0/0, 00:01:15 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 13.13.13.3, 00:01:15 ago, via Ethernet0/0
      Route metric is 11, traffic share count is 1
```

Adapun cara lain perpindahan jalur yaitu dengan manipulasi nilai bandwidth pada interface,

```
IDN-R1(config)#do sh int e0/0
Ethernet0/0 is up, line protocol is up
  Hardware is AmdP2, address is aabb.cc00.0100 (bia aabb.cc00.0100)
  Internet address is 13.13.13.1/24
  MTU 1500 bytes, BW 10000 Kbit/sec, DLY 1000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
```

Jadikan interface e0/0 menjadi lebih rendah bandwidthnya, sehingga jalur e0/1 lebih diutamakan

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#bandwidth 3000
```

Cek ip route menuju 3.3.3.3

```
IDN-R1(config-if)#do show ip route 3.3.3.3
Routing entry for 3.3.3.3/32
  Known via "ospf 1", distance 110, metric 21, type intra area
  Last update from 12.12.12.2 on Ethernet0/1, 00:00:04 ago
  Routing Descriptor Blocks:
  * 12.12.12.2, from 13.13.13.3, 00:00:04 ago, via Ethernet0/1
      Route metric is 21, traffic share count is 1
```

Test trace route untuk memastikan bahwa jalur sudah berpindah.

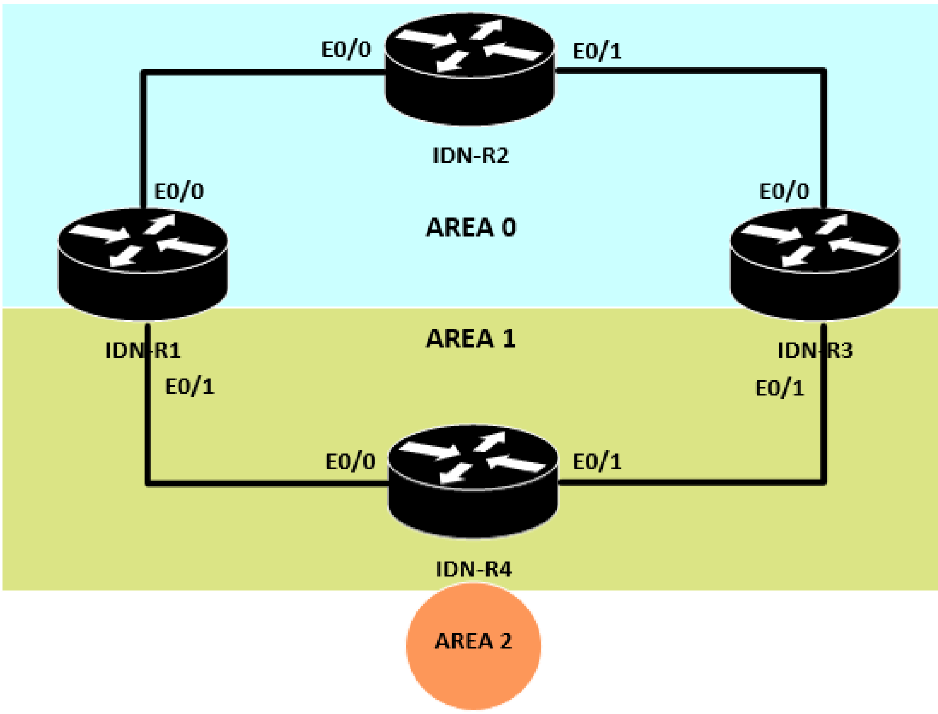
```
IDN-R1(config-if)#do trace 3.3.3.3
Type escape sequence to abort.
Tracing the route to 3.3.3.3
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 1 msec 0 msec
  2 23.23.23.3 1 msec 0 msec 1 msec
```

Lab 21. OSPF – Mindah Jalur Cost

Tujuan Lab:

- Memperlajari perpindahan jalur pada ospf

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas
- Konfigurasikan ip address standar IDN
- Konfigurasikan ospf virtual link di R1 dan R4
- Rubah cost pada R3

Verifikasi Lab:

- Show ip route

Konfigurasi addressing
R1

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255

IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip address 12.12.12.1 255.255.255.0
IDN-R1(config-if)#no shutdown

IDN-R1(config)#int e0/1
IDN-R1(config-if)#ip address 14.14.14.1 255.255.255.0
IDN-R1(config-if)#no shutdown
```

R2

```
IDN-R2(config)#int lo0
IDN-R2(config-if)#ip add 2.2.2.2 255.255.255.255

IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip address 12.12.12.2 255.255.255.0
IDN-R2(config-if)#no shutdown

IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip add 23.23.23.2 255.255.255.0
IDN-R2(config-if)#no shutdown
```

R3

```
IDN-R3(config)#int lo0
IDN-R3(config-if)#ip add 3.3.3.3 255.255.255.0

IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip add 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no shutdown

IDN-R3(config)#int e0/1
IDN-R3(config-if)#ip add 34.34.34.3 255.255.255.0
IDN-R3(config-if)#no shutdown
```

R4

```
IDN-R4(config)#int lo0
IDN-R4(config-if)#ip add 4.4.4.4 255.255.255.255

IDN-R4(config)#int e0/0
IDN-R4(config-if)#ip add 14.14.14.4 255.255.255.0
IDN-R4(config-if)#no shutdown

IDN-R4(config)#int e0/1
IDN-R4(config-if)#ip add 34.34.34.4 255.255.255.0
IDN-R4(config-if)#no shutdown
```

Konfigurasikan ospf dan virtual-link

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#router-id 1.1.1.1
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 14.14.14.0 0.0.0.255 area 1
IDN-R1(config-router)#area 1 virtual-link 4.4.4.4
```

Konfigurasi ospf R2

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#router-id 2.2.2.2
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
```

Konfigurasi ospf R3

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#router-id 3.3.3.3
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#network 34.34.34.0 0.0.0.255 area 1
```

Konfigurasi ospf dan virtual link R4

```
IDN-R4(config)#router ospf 4
IDN-R4(config-router)#router-id 4.4.4.4
IDN-R4(config-router)#network 4.4.4.4 0.0.0.0 area 2
IDN-R4(config-router)#network 14.14.14.0 0.0.0.255 area 1
IDN-R4(config-router)#network 34.34.34.0 0.0.0.255 area 1
IDN-R4(config-router)#area 1 virtual-link 1.1.1.1
```

Cek tabel routing pada R4 pastikan routenya sudah lengkap

```
IDN-R4(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 14.14.14.1, 00:00:26, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/21] via 34.34.34.3, 00:00:26, Ethernet0/1
                 [110/21] via 14.14.14.1, 00:00:26, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 34.34.34.3, 00:00:26, Ethernet0/1
      4.0.0.0/32 is subnetted, 1 subnets
C        4.4.4.4 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 14.14.14.1, 00:00:26, Ethernet0/0
      14.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        14.14.14.0/24 is directly connected, Ethernet0/0
L        14.14.14.4/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 34.34.34.3, 00:00:26, Ethernet0/1
      34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        34.34.34.0/24 is directly connected, Ethernet0/1
L        34.34.34.4/32 is directly connected, Ethernet0/1
```

Diatas bisa kita lihat bahwa R4 memiliki dua jalur untuk menuju network 2.2.2.2/32 pada R2. Kita akan mengubah cost pada R3 sehingga nanti jalur yang digunakan hanya melalui R3

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip ospf cost 1
```

Setelah merubah costnya, tentu menjadi lebih kecil dan akan dipilih sebagai jalur terbaik, sekarang kita cek pada R4 apakah masih menggunakan 2 link atau tidak.

```
IDN-R4(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 14.14.14.1, 00:04:33, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/12] via 34.34.34.3, 00:00:05, Ethernet0/1
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 34.34.34.3, 00:00:05, Ethernet0/1
      4.0.0.0/32 is subnetted, 1 subnets
C        4.4.4.4 is directly connected, Loopback0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 14.14.14.1, 00:04:33, Ethernet0/0
      14.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        14.14.14.0/24 is directly connected, Ethernet0/0
L        14.14.14.4/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/11] via 34.34.34.3, 00:00:05, Ethernet0/1
      34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        34.34.34.0/24 is directly connected, Ethernet0/1
L        34.34.34.4/32 is directly connected, Ethernet0/1
```

Skrg jalur untuk menuju 2.2.2.2/32 hanya melalui R3.

MISTAKES
HAVE THE
POWER TO
TURN YOU
INTO
SOMETHING
BETTER THAN
YOU WERE
BEFORE.

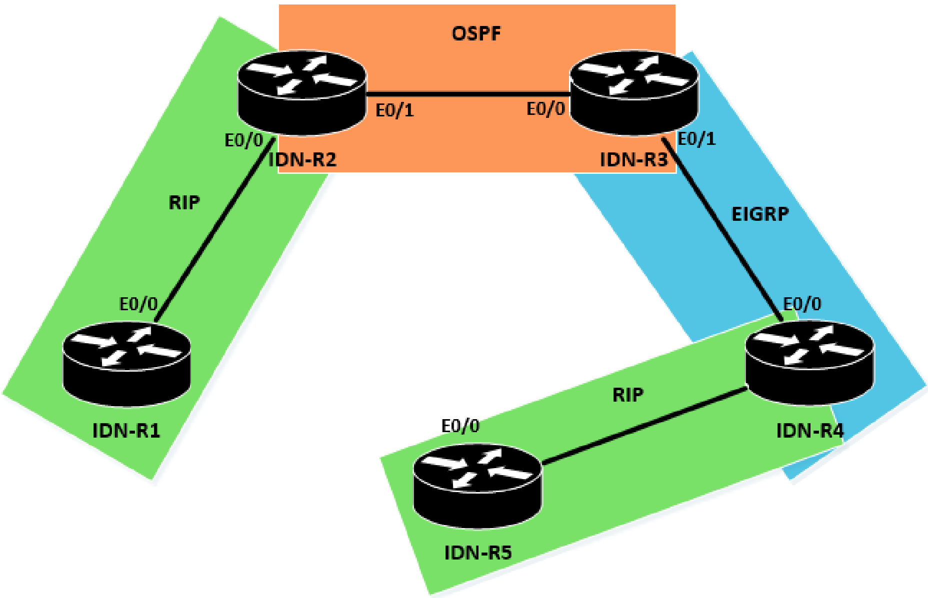
Mutual Redistribution

Lab 1. Mutual Redistribution

Tujuan Lab:

- Mempelajari redistribution pada IGP (RIP,OSPF,EIGRP)

Topologi Lab:



Metode Lab:

- Gunakan topologi lab diatas dengan addressing standar IDN
- R1 RIP
- R2 RIP dan OSPF
- R3 OSPF dan EIGRP
- R4 EIGRP dan RIP

Verifikasi Lab:

- Show ip route
- ping test

- Traceroute

Konfigurasikan seperti berikut:

```
IDN-R1(config)#router rip
IDN-R1(config-router)#version 2
IDN-R1(config-router)#network 12.12.12.0
IDN-R1(config-router)#no auto-summary
```

```
IDN-R2(config)#router rip
IDN-R2(config-router)#version 2
IDN-R2(config-router)#network 12.12.12.0
IDN-R2(config-router)#no auto-summary
IDN-R2(config-router)#redistribute ospf 1 metric 1
```

```
IDN-R2(config)#router ospf 1
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R2(config-router)#redistribute rip subnets
```

```
IDN-R3(config)#router ospf 1
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255 area 0
IDN-R3(config-router)#redistribute eigrp 1 subnets
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 34.34.34.0 0.0.0.255
IDN-R3(config-router)#no auto-summary
IDN-R3(config-router)#redistribute ospf 1 metric 1 1 1 1 1
```

```
IDN-R4(config)#router eigrp 1
IDN-R4(config-router)#network 34.34.34.0 0.0.0.255
IDN-R4(config-router)#no auto-summary
IDN-R4(config-router)#redistribute rip metric 1 1 1 1 1
```

```
IDN-R4(config)#router rip
IDN-R4(config-router)#version 2
IDN-R4(config-router)#network 45.45.45.0
IDN-R4(config-router)#no auto-summary
IDN-R4(config-router)#redistribute eigrp 1 metric 1
```

```
IDN-R5(config)#router rip
IDN-R5(config-router)#version 2
IDN-R5(config-router)#network 45.45.45.0
IDN-R5(config-router)#no auto-summary
```

Verifikasi Routing table

```
IDN-R1#show ip route

      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
R        23.23.23.0 [120/1] via 12.12.12.2, 00:00:17, Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
R        34.34.34.0 [120/1] via 12.12.12.2, 00:00:17, Ethernet0/0
      45.0.0.0/24 is subnetted, 1 subnets
R        45.45.45.0 [120/1] via 12.12.12.2, 00:00:17, Ethernet0/0
```

```
IDN-R2#show ip route

      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
      34.0.0.0/24 is subnetted, 1 subnets
O E2     34.34.34.0 [110/20] via 23.23.23.3, 00:11:14, Ethernet0/1
      45.0.0.0/24 is subnetted, 1 subnets
O E2     45.45.45.0 [110/20] via 23.23.23.3, 00:05:47, Ethernet0/1
```

```
IDN-R3#show ip route

      12.0.0.0/24 is subnetted, 1 subnets
O E2     12.12.12.0 [110/20] via 23.23.23.2, 00:12:25, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
      34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        34.34.34.0/24 is directly connected, Ethernet0/1
L        34.34.34.3/32 is directly connected, Ethernet0/1
      45.0.0.0/24 is subnetted, 1 subnets
D EX     45.45.45.0 [170/2560025856] via 34.34.34.4, 00:05:55,
Ethernet0/1
```

```
IDN-R4#show ip route

      12.0.0.0/24 is subnetted, 1 subnets
D EX     12.12.12.0 [170/2560025856] via 34.34.34.3, 00:08:45,
Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
D EX     23.23.23.0 [170/2560025856] via 34.34.34.3, 00:08:45,
Ethernet0/0
      34.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        34.34.34.0/24 is directly connected, Ethernet0/0
L        34.34.34.4/32 is directly connected, Ethernet0/0
      45.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        45.45.45.0/24 is directly connected, Ethernet0/1
L        45.45.45.4/32 is directly connected, Ethernet0/1
```

```
IDN-R5#show ip route

      12.0.0.0/24 is subnetted, 1 subnets
R        12.12.12.0 [120/1] via 45.45.45.4, 00:00:13, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
R        23.23.23.0 [120/1] via 45.45.45.4, 00:00:13, Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
R        34.34.34.0 [120/1] via 45.45.45.4, 00:00:13, Ethernet0/0
      45.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        45.45.45.0/24 is directly connected, Ethernet0/0
L        45.45.45.5/32 is directly connected, Ethernet0/0
```

Test ping dan trace route

```
IDN-R5#ping 12.12.12.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 12.12.12.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

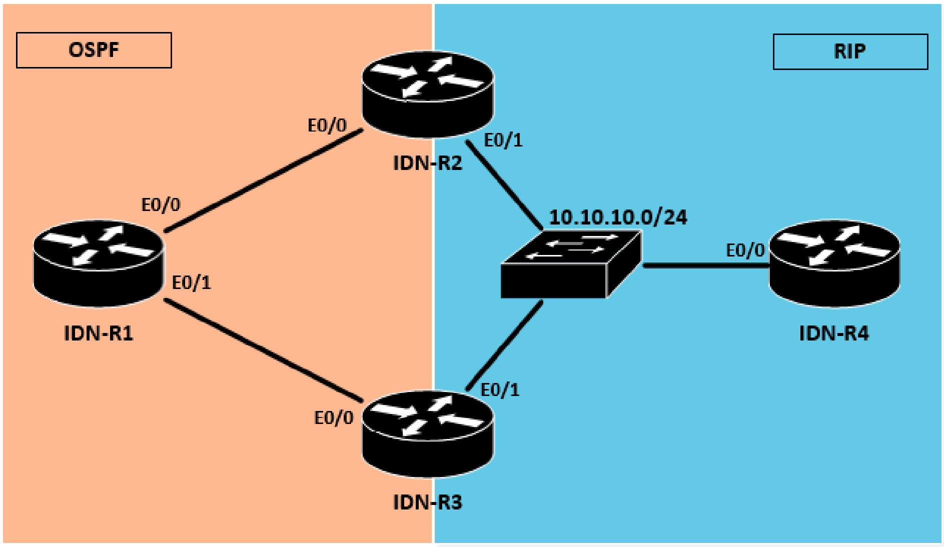
```
IDN-R5#traceroute 12.12.12.1
Type escape sequence to abort.
Tracing the route to 12.12.12.1
VRF info: (vrf in name/id, vrf out name/id)
  1 45.45.45.4 1 msec 0 msec 0 msec
  2 34.34.34.3 1 msec 0 msec 1 msec
  3 23.23.23.2 0 msec 0 msec 1 msec
  4 12.12.12.1 0 msec 1 msec 0 msec
```

Lab 2. Mutual Redistribution – 2 Titik

Tujuan Lab:

- Mempelajari redistribution 2 titik distribusi

Topologi Lab:



Metode Lab:

- Routing OSPF pada R1,R2 dan R3
- Routing RIP pada R2,R3 dan R4
- R2 dan R3 berperan sebagai redistributor nya

Verifikasi Lab:

- Show ip route
- Traceroute
- Ping

Konfigurasi seperti berikut

```
IDN-R1(config)#router ospf 10
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 13.13.13.0 0.0.0.255 area 0
```

```
IDN-R2(config)#router ospf 10
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0

IDN-R2(config)#router rip
IDN-R2(config-router)#version 2
IDN-R2(config-router)#network 10.10.10.0
IDN-R2(config-router)#no auto-summary
```

```
IDN-R3(config)#router ospf 10
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
IDN-R3(config-router)#network 13.13.13.0 0.0.0.255 area 0

IDN-R3(config)#router rip
IDN-R3(config-router)#version 2
IDN-R3(config-router)#network 10.10.10.0
IDN-R3(config-router)#no auto-summary
```

```
IDN-R4(config)#router rip
IDN-R4(config-router)#version 2
IDN-R4(config-router)#network 10.10.10.0
IDN-R4(config-router)#network 4.4.4.4
IDN-R4(config-router)#no auto-summary
```

Konfigurasi Redistribution

```
IDN-R2(config)#router ospf 10
IDN-R2(config-router)#redistribute rip subnets

IDN-R2(config)#router rip
IDN-R2(config-router)#redistribute ospf 10 metric 1
```

```
IDN-R3(config)#router ospf 10
IDN-R3(config-router)#redistribute rip subnets

IDN-R3(config)#router rip
IDN-R3(config-router)#redistribute ospf 10 metric 1
```

```
IDN-R1(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:10:53, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 13.13.13.3, 00:08:57, Ethernet0/1
      4.0.0.0/32 is subnetted, 1 subnets
O E2     4.4.4.4 [110/20] via 12.12.12.2, 00:00:43, Ethernet0/0
      10.0.0.0/24 is subnetted, 1 subnets
O E2     10.10.10.0 [110/20] via 12.12.12.2, 00:06:17, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
```

```
IDN-R2(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 00:11:05, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.1, 00:08:59, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
R        4.4.4.4 [120/1] via 10.10.10.4, 00:00:06, Ethernet0/1
      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.10.10.0/24 is directly connected, Ethernet0/1
L        10.10.10.2/32 is directly connected, Ethernet0/1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      13.0.0.0/24 is subnetted, 1 subnets
O        13.13.13.0 [110/20] via 12.12.12.1, 00:11:05, Ethernet0/0
```

```
IDN-R3(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 13.13.13.1, 00:09:26, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/21] via 13.13.13.1, 00:09:26, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      4.0.0.0/32 is subnetted, 1 subnets
O E2     4.4.4.4 [110/20] via 13.13.13.1, 00:01:09, Ethernet0/0
      10.0.0.0/24 is subnetted, 1 subnets
O E2     10.10.10.0 [110/20] via 13.13.13.1, 00:06:43, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 13.13.13.1, 00:09:26, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/0
L        13.13.13.3/32 is directly connected, Ethernet0/0
```

```
IDN-R4(config)#do sh ip route

      1.0.0.0/32 is subnetted, 1 subnets
R        1.1.1.1 [120/1] via 10.10.10.2, 00:00:04, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
R        2.2.2.2 [120/1] via 10.10.10.2, 00:00:04, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
R        3.3.3.3 [120/1] via 10.10.10.2, 00:00:04, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
C        4.4.4.4 is directly connected, Loopback0
      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.10.10.0/24 is directly connected, Ethernet0/0
L        10.10.10.4/32 is directly connected, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
R        12.12.12.0 [120/1] via 10.10.10.2, 00:00:04, Ethernet0/0
      13.0.0.0/24 is subnetted, 1 subnets
R        13.13.13.0 [120/1] via 10.10.10.2, 00:00:04, Ethernet0/0
```

Trace dari R3 untuk menuju ke 4.4.4.4 lebih memilih melalui R1 dikarenakan AD ospf (110) lebih kecil dari RIP (120)

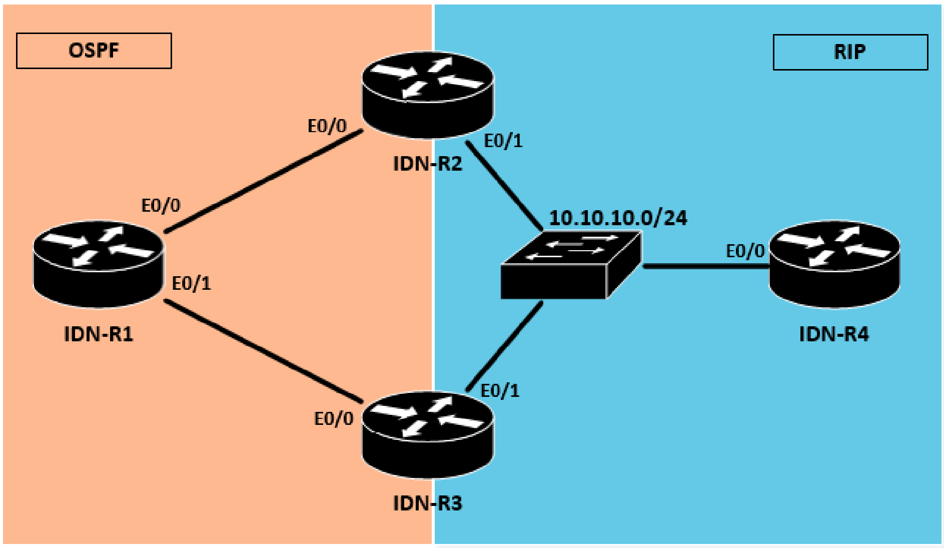
```
IDN-R3(config-router)#do trace 4.4.4.4
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 13.13.13.1 0 msec 5 msec 6 msec
  2 12.12.12.2 0 msec 2 msec 0 msec
  3 10.10.10.4 1 msec 1 msec 2 msec
```

Lab 3. Mutual Redistribution – Route Tagging

Tujuan Lab:

- Mempelajari route tagging

Topologi Lab:



Metode Lab:

- Konfigurasikan OSPF dan RIP
- R2 dan R3 meredistribusi dua titik tersebut
- RIP di tag sebagai 120
- OSPF di tag sebagai 110

Verifikasi Lab:

- Show ip route

Kali ini cara untuk mencegah terjadinya loop adalah dengan memberi tanda berupa suatu angka terhadap route yang diredistribute. Berdasarkan tanda berupa angka tersebut, maka akan dikenali mana route asli dan mana route hasil redistribute.

Route yang memiliki tanda angkan nantinya agar tidak terjadi loop maka akan dicegah untuk diredistribute yakni dengan di deny terlebih dahulu agar tidak dikirim ulang kembali.

Konfigurasikan seperti berikut

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 13.13.13.0 0.0.0.255 area 0
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
IDN-R2(config-router)#network 12.12.12.0 0.0.0.0 area 0
```

```
IDN-R3(config)#router ospf 3
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0 area 0
IDN-R3(config-router)#network 13.13.13.0 0.0.0.255 area 0
```

```
IDN-R2(config)#router rip
IDN-R2(config-router)#version 2
IDN-R2(config-router)#network 10.10.10.0
IDN-R2(config-router)#no auto-summary
```

Verifikasi

```
IDN-R3(config)#router rip
IDN-R3(config-router)#version 2
IDN-R3(config-router)#network 10.10.10.0
IDN-R3(config-router)#no auto-summary
```

```
IDN-R4(config)#router rip
IDN-R4(config-router)#version 2
IDN-R4(config-router)#network 10.10.10.0
IDN-R4(config-router)#no auto-summary
```

Untuk menghindari routing loop, selain dengan merubah nilai AD, bisa juga dilakukan dengan menandai route atau melakukan route atau melakukan route taggin pada network yang diredistribute. Konfigurasi di setiap titik redistribusi.

Lakukan deny terlebih dahulu terhadap route hasil redistribute yang akan diredistribute kembali. Misal route dari ospf yang diredistribute ke rip dikasih tanda 110 nah kemudian suatu ketika dari rip akan diredistribute ke ospf, maka route hasil dari ospf yang sebelumnya memiliki tanda 110 akan di deny dulu untuk mencegah dikirim balik ulang ke ospf lagi.

```
IDN-R2(config)#route-map RIP-to-OSPF deny 10
IDN-R2(config-route-map)#match tag 110

IDN-R2(config)#route-map RIP-to-OSPF permit 20
IDN-R2(config-route-map)#set tag 120

IDN-R2(config)#router ospf 2
IDN-R2(config-router)#redistribute rip subnets route-map RIP-to-OSPF


IDN-R2(config)#route-map OSPF-to-RIP deny 10
IDN-R2(config-route-map)#match tag 120

IDN-R2(config)#route-map OSPF-to-RIP permit 20
IDN-R2(config-route-map)#set tag 110

IDN-R2(config)#router rip
IDN-R2(config-router)#redistribute ospf 2 metric 1 route-map OSPF-
to-RIP
```

Pada R2 terdapat 2 redistribution

1. RIP yang diredistribusikan ke OSPF
    a. Route dengan tag 110 akan di deny dulu (agar route dari RIP tidak diredistribusikan ke RIP kembali)
    b. Route dari RIP yang diredistribusikan ke OSPF diset tag 120
2. OSPF yang diredistribusikan ke RIP
    a. Route dengan tag 120 akan di deny dulu (agar route dari OSPF tidak diredistribusikan ke OSPF kembali)
    b. Route dari OSPF yang diredistribusikan ke RIP diset tag 110

```
IDN-R3(config)#route-map RIP-to-OSPF deny 10
IDN-R3(config-route-map)#match tag 110

IDN-R3(config)#route-map RIP-to-OSPF permit 20
IDN-R3(config-route-map)#set tag 120

IDN-R3(config)#router ospf 3
IDN-R3(config-router)#redistribute rip subnets route-map RIP-to-OSPF

IDN-R3(config)#route-map OSPF-to-RIP deny 10
IDN-R3(config-route-map)#match tag 120

IDN-R3(config)#route-map OSPF-to-RIP permit 20
IDN-R3(config-route-map)#set tag 110

IDN-R3(config)#router rip
IDN-R3(config-router)#redistribute ospf 3 metric 1 route-map OSPF-
to-RIP
```

```
IDN-R1(config)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "ospf 1", distance 110, metric 20
  Tag 120, type extern 2, forward metric 10
  Last update from 13.13.13.3 on Ethernet0/1, 00:08:56 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 3.3.3.3, 00:08:56 ago, via Ethernet0/1
      Route metric is 20, traffic share count is 1
      Route tag 120
```

Tag tersebut menandakan bahwa network tersebut berasal dari area RIP. Pada router R2 dan R3 yang menjadi titik resdistribusi, network tersebut. Tidak akan diredistribute kembali ke dalam area dimana network tersebut berasal. Network tersebut sudah ditandai dan berdasarkan penanda tersebut, diberlakukan aturan untuk tidak diredistribute kembali sehingga tidak terjadi routing loop.

Lakukan ping serta traceroute kembali seperti lab sebelumnya dan pastikan tidak terjadi loop.

BGP

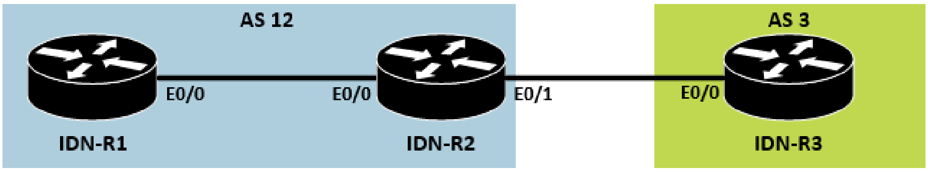
(Border Gateway Protocol)

LAB 1. iBGP Peering

Tujuan Lab:

- Mempelajari peering bgp (physical)

Topologi Lab:



Metode Lab:

- Gunakan topologi lab standar IDN diatas
- Mengkonfigurasikan ipv4 dan ipv6 address standar IDN di interface
- Konfigurasikan peering menggunakan interface fisik
- Buat interface loopback untuk diadvertise ke BGP gunakan ip standar IDN
- IDN-R3 tidak dikonfigurasi, digunakan untuk lab selanjutnya

Verifikasi Lab:

- Show ip route
- Pastikan BGP adjacency terbentuk dengan mengetik show ip bgp summary
- Pastikan ada route yang diadvertise ke BGP, show ip bgp
- Pastikan route yang diadvertise ke BGP masuk dalam routing tabelnya, ketik show ip route bgp
- Pastikan IP loopback IDN-R1 dan IDN-R2 bisa saling ping

Peering BGP bisa menggunakan IP interface physical ataupun loopback, umumnya pada iBGP menggunakan IP loopback, berikut kita belajar melakukan konfigurasi iBGP

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 12
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 12
```

Verifikasi neighbor bgp

```
IDN-R1(config)#do show ip bgp summary
BGP router identifier 12.12.12.1, local AS number 12
BGP table version is 1, main routing table version 1

Neighbor        V      AS MsgRcvd MsgSent    TblVer   InQ OutQ Up/Down
State/PfxRcd
12.12.12.2      4      12       6       6         1     0     0 00:02:22
0
```

Pastikan pada bagian prefix harus terdapat nilainya walaupun 0. Apabila masih bernilai active atau idle artinya BGP belum adjacency. Periksa kembali apakah udah benar konfigurasi bgpnya, pastikan IP peeringnya bisa diping.

Selanjutnya kita akan coba lakukan adverise interface loopback ke BGP

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255
```

```
IDN-R2(config)#int lo0
IDN-R2(config-if)#ip address 2.2.2.2 255.255.255.255
```

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

Verifikasi network yang diadvertise

```
IDN-R1(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>i 2.2.2.2/32       12.12.12.2               0    100      0 i
```

```
IDN-R2(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 1.1.1.1/32       12.12.12.1               0    100      0 i
 *>  2.2.2.2/32       0.0.0.0                  0         32768 i
```

* = Valid

\> = Best

i = Pada kolom network menunjukan route berasal dari iBGP

i = Pada kolom path menunjukkan origin

Network = Route yang diadvertise kedalam bgp

Next hop = Menunjukkan ip next-hop untuk menuju ke suatu route

Metric = Menunjukkan nilai metric Inter-AS atau nilai atribut MED, defaultnya 0

LocPrf = Menunjukkan nilai atribut local preference yang digunakan untuk pemilihan jalur, nilai defaultnya 100, yang lebih tinggi yang dipilih. DC nilainya 0

Weight = Nilai default pada router itu sendiri 32768. Nilai defaultnya 0. Tertinggi dipilih

Path = Menunjukkan dari mana suatu route berasal (Melalui AS)

Verifikasi tabel routing

```
IDN-R1(config)#do show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
B        2.2.2.2 [200/0] via 12.12.12.2, 00:01:11
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
```

```
IDN-R2(config)#do show ip route
      1.0.0.0/32 is subnetted, 1 subnets
B        1.1.1.1 [200/0] via 12.12.12.1, 00:01:29
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.2/32 is directly connected, Ethernet0/0
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/1
L        23.23.23.2/32 is directly connected, Ethernet0/1
```

verifikasi ping

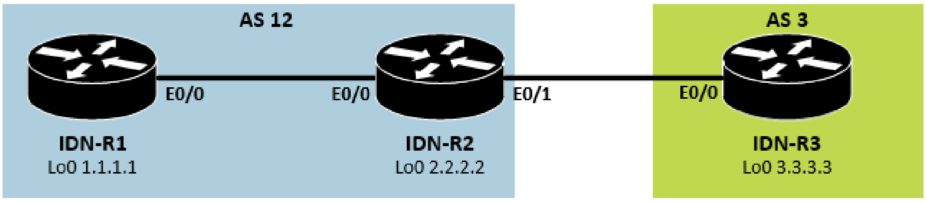
```
IDN-R1(config)#do ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 2. iBGP Peering Loopback

Tujuan Lab:

- Mempelajari konfigurasi peering loopback

Topologi Lab:



Metode Lab:

- Melanjutkan lab konfigurasi sebelumnya
- Mengkonfigurasikan IGP routing agar loopback reachable
- Buat IP loopback untuk diadvertise

Verifikasi Lab:

- Pastikan BGP adjacency terbentuk dengan mengetik show ip bgp summary
- Pastikan ada route yang diadvertise ke BGP, dan masuk dalam routing tablenya
- Pastikan loopback R1 dan R2 bisa saling ping
- Show ip route bgp

Berikutnya kita akan belajar melakukan peering menggunakan ip loopback. Sebelum melakukan BGP peers, pastikan IP loopback harus reachable (bisa di ping)

Masih melanjutkan konfigurasi sebelumnya, namun hapus dulu konfigurasi BGP sebelumnya.

```
IDN-R1(config)#no router bgp 12
```

```
IDN-R2(config)#no router bgp 12
```

Agar loopback bisa reachable lakukan routing IGP, kita menggunakan eigrp

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0
```

Verifikasi pastikan ip loopback reachable

```
IDN-R1(config)#do ping 2.2.2.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Konfigurasikan BGP peernya dengan menambahkan update-source loopback 0, bila tidak ditambahkan, maka yang digunakan updatenya adalah ip interface physical sehingga bgp adjacency akan bermasalah.

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#neighbor 2.2.2.2 remote-as 12
IDN-R1(config-router)#neighbor 2.2.2.2 update-source lo0
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 1.1.1.1 remote-as 12
IDN-R2(config-router)#neighbor 1.1.1.1 update-source lo0
```

Pastikan BGP adjacency sudah UP

```
IDN-R1(config-router)#do show ip bgp summary
BGP router identifier 1.1.1.1, local AS number 12
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
2.2.2.2         4           12       5       5        1    0    0
00:01:37        0
```

Pastikan pada bagian Prefix bernilai 0 dan perhatikan juga ip neighbornya bukan lagi ip physical melainkan ip loopbacknya

Selanjutnya buat ip loopback baru untuk diadvertise ke BGP dan kemudian advertise network ke BGP

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 11.11.11.11 255.255.255.255
```

```
IDN-R2(config)#int lo1
IDN-R2(config-if)#ip address 22.22.22.22 255.255.255.255
```

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#network 11.11.11.11 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#network 22.22.22.22 mask 255.255.255.255
```

Pastikan route tersebut sudah diadvetise sehingga nilai Prefix menjadi 1

```
IDN-R1(config-router)#do show ip bgp summ

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
2.2.2.2         4           12      17      17        4    0    0
00:11:44        1
```

Cek routing tablenya, pastikan bgp route sudah ada didalamnya

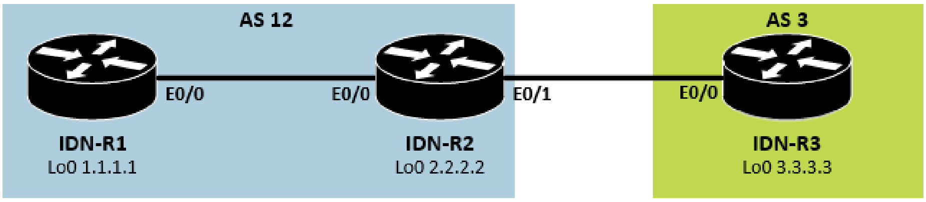
```
IDN-R1(config-router)#do show ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:14:16, Ethernet0/0
      11.0.0.0/32 is subnetted, 1 subnets
C        11.11.11.11 is directly connected, Loopback1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      22.0.0.0/32 is subnetted, 1 subnets
B        22.22.22.22 [200/0] via 2.2.2.2, 00:02:45
```

Lab 3. eBGP Peering

Tujuan Lab:

- Mempelajari bagaimana mengkonfigurasikan peers BGP external antara R2(AS12) dan R3(AS3)

Topologi Lab:



Metode Lab:

- Masih melanjutkan topologi dan konfigurasi sebelumnya
- Konfigurasikan pengalamatan IP antara R2 dan R3
- Konfigurasikan eBGP peers antara R2 dan R3
- Buat IP loopback di R3 untuk diadvertise ke BGP

Verifikasi Lab:

- Pastikan BGP adjacency terbentuk dengan mengetik show ip bgp summary
- Pastikan ada route yang diadvertise ke BGPP masuk dalam routing tablenya, ketik show ip route bgp
- Pastikan IP loopback R1 dan R2 bisa saling diping oleh keduanya.

Berikutnya kita akan belajar konfigurasi eBGP peers, yakni antara R2 dan R3. Kali ini menggunakan ip physical sebagai bgp peersnya.

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 12
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Verifikasi bgp peers

```
IDN-R3(config-router)#do sh ip bgp summary
BGP router identifier 23.23.23.3, local AS number 3
BGP table version is 3, main routing table version 3
2 network entries using 288 bytes of memory
2 path entries using 160 bytes of memory
2/2 BGP path/bestpath attribute entries using 304 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 776 total bytes of memory
BGP activity 2/0 prefixes, 2/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
23.23.23.2      4           12       7       5        3    0    0
00:01:19        2
```

Terlihat sudah ada 2 route

```
IDN-R3(config-router)#do sh ip bgp
BGP table version is 4, local router ID is 23.23.23.3
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  3.3.3.3/32       0.0.0.0                  0         32768 i
 *>  11.11.11.11/32   23.23.23.2                             0 12 i
 *>  22.22.22.22/32   23.23.23.2               0             0 12 i
```

Lakukan test ping

```
IDN-R3(config-router)#do ping 11.11.11.11
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 11.11.11.11, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

Loh belum bisa, coba cek R1

```
IDN-R1(config)#do sh ip bgp
BGP table version is 4, local router ID is 11.11.11.11
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 * i 3.3.3.3/32       23.23.23.3               0    100      0 3 i
 *>  11.11.11.11/32   0.0.0.0                  0         32768 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
```

Terlihat bahwasanya route BGP dari R3 3.3.3.3 tidak ada tanda > (best). Hal tersebut dikarenakan IP next hopnya 23.23.23.3 tidak reachable dari sisi R1. Yang menyebabkan ketika paket icmp dikirim dan sampai ke R1, R1 tidak tahu untuk mengembalikan paket icmp tersebut.

Cek routing table R1

```
IDN-R1(config)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
D        2.2.2.2 [90/409600] via 12.12.12.2, 00:15:14, Ethernet0/0
      11.0.0.0/32 is subnetted, 1 subnets
C        11.11.11.11 is directly connected, Loopback1
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      22.0.0.0/32 is subnetted, 1 subnets
B        22.22.22.22 [200/0] via 2.2.2.2, 00:14:08
```

Terlihat tidak satupun route yang berasal dari R3 baik itu interface loopback maupun physical terutama IP 23.23.23.3 yang menjadi next-hop menuju ke 3.3.3.3

Ada beberapa cara yang bisa dilakukan, salah satunya adalah mengadvertise network 23.23.23.0 ke BGP pada R2

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#network 23.23.23.0 mask 255.255.255.0
```

Cek lagi di R1

```
IDN-R1#show ip bgp
BGP table version is 6, local router ID is 11.11.11.11
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 3.3.3.3/32       23.23.23.3               0    100      0 3 i
 *>  11.11.11.11/32   0.0.0.0                  0         32768 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
 *>i 23.23.23.0/24    2.2.2.2                  0    100      0 i
```

Terlihat muncul route 23.23.23.0 serta pada route 3.3.3.3 sudah muncul tanda > best yang dikarenakan nexthopnya sudah reachable.

Selanjutnya lakukan test ping kembali dari R3

```
IDN-R3(config-router)#do ping 11.11.11.11
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 11.11.11.11, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Dan hasilnya reply, sekarang coba cek ping dari R1

```
IDN-R1#ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

RTO, sekarang gunakan source yang ipnya sudah diketahui R3

Cek dulu IPnya R1 yang dikenali oelh R3 apa saja

```
IDN-R3(config)#do show ip route
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      11.0.0.0/32 is subnetted, 1 subnets
B        11.11.11.11 [20/0] via 23.23.23.2, 00:20:11
      22.0.0.0/32 is subnetted, 1 subnets
B        22.22.22.22 [20/0] via 23.23.23.2, 00:20:11
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Ternyata disisi R3 hanya IP 11.11.11.11 yang dikenali, maka gunakan sebagai source-nya.

```
IDN-R1#ping 3.3.3.3 source 11.11.11.11
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 11.11.11.11
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Dan di test hasilnya reply, sebelumnya RTO Karena tidak menambahkan source yang dikenali R3, maka yang digunakan sourcenya adalah ip physicalnya yakni 12.12.12.1 yang mana tidak ada dalam routing tablenya R3.

Cara yang sama bisa dilakukan yakni mengadvertise network 12.12.12.0 ke BGP pada R1

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#network 12.12.12.0 mask 255.255.255.0
```

Cek di R3 terlebih dahulu, pastikan network 12.12.12.0 sudah dikenali

```
IDN-R3(config)#do show ip route bgp

      11.0.0.0/32 is subnetted, 1 subnets
B        11.11.11.11 [20/0] via 23.23.23.2, 00:26:45
      12.0.0.0/24 is subnetted, 1 subnets
B        12.12.12.0 [20/0] via 23.23.23.2, 00:02:23
      22.0.0.0/32 is subnetted, 1 subnets
B        22.22.22.22 [20/0] via 23.23.23.2, 00:26:45
```

Lakukan tes ping dari R1 tanpa menggunakan source

```
IDN-R1(config)#do ping 3.3.3.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/20
```

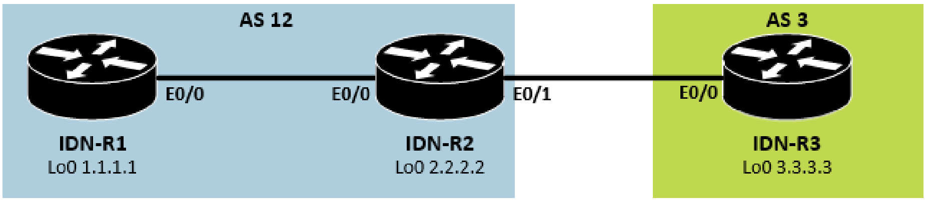
Hasilnya reply.

Lab 4. eBGP Peering Loopback

Tujuan Lab:

- Mempelajari bagaimana mengkonfigurasi peers bgp external antara R2 dan R3 menggunakan interface loopback

Topologi Lab:



Metode Lab:

- Masih melanjutkan topologi dan konfigurasi sebelumnya
- Advertise IP loopback
- Hapus konfigurasi eBGP peers antara R2 dan R3 sebelumnya
- Konfigurasikan eBGP peers antara R2 dan R3 menggunakan loopback
- Buat IP loopback baru untuk diadvertise

Verifikasi Lab:

- Pastikan BGP adjacency terbentuk dengan verifikasi show ip bgp summary
- Pastikan ada route yang diadvertise ke BGP masuk dalam routing table
- Pastikan route yang diadvertise ke BGP masuk dalam routing tabelnya, ketik show ip route bgp
- Pastikan IP loopback bisa saling ping

Selain menggunakan interface physical sebagai neighbor peers eBGP kita bisa juga menggunakan ip loopback nya. Namun demikian ini sifatnya hanya di lab saja, tidak digunakan untuk real lapangan.

Hapus peering sebelumnya

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#no neighbor 23.23.23.3 remote-as 3
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#no neighbor 23.23.23.2 remote-as 12
```

Agar loopback reachable gunakan routing IGP(RIP,OSPF,EIGRP,dll.) atau static route, tapi kita kali ini menggunakan EIGRP sebagai routing IGPnya

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
```

Perlu untuk diperhatikan bahwasanya menggunakan dynamic routing pada eBGP adalah suatu hal yang tidak mungkin dilakukan di kenyataan dilapangan terkait dengan policy di tiap-tiap company. Namun pada lab ini sifatnya hanya pembelajaran.

Konfigurasikan BGP

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 3.3.3.3 remote-as 3
IDN-R2(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R2(config-router)#neighbor 3.3.3.3 ebgp-multihop 2
```

```
IDN-R3(config)#no router bgp 3
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 2.2.2.2 remote-as 12
IDN-R3(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R3(config-router)#neighbor 2.2.2.2 ebgp-multihop 2
IDN-R3(config-router)#network 33.33.33.33 mask 255.255.255.255
```

Selain menambahkan update-source, kita juga harus menambahkan keyword ebgp-multihop hal tersebut mengingat pada ebgp syaratnya musti directly connected sedangkan pada penggunaan loopback, maka tidak lagi directly connected interfacenya.

Buat IP loopback dan advertise ke BGP

```
IDN-R3(config)#int lo1
IDN-R3(config-if)#ip address 33.33.33.33 255.255.255.255
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#network 33.33.33.33 mask 255.255.255.255
```

Verifikasi bgp summary

```
IDN-R1(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  11.11.11.11/32   0.0.0.0                  0         32768 i
 *>  12.12.12.0/24    0.0.0.0                  0         32768 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
 r>i 23.23.23.0/24    2.2.2.2                  0    100      0 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 3 i
```

Test ping pada network yang diadvertise

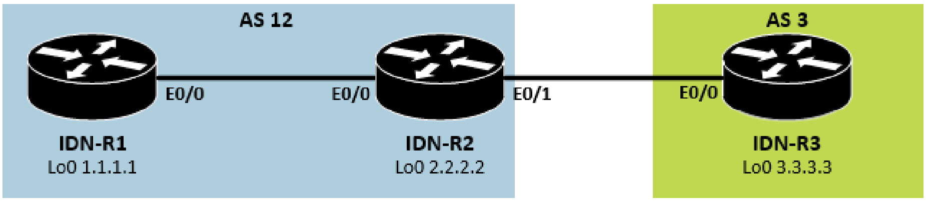
```
IDN-R1(config)#do ping 33.33.33.33
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 33.33.33.33, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 5. BGP Next-Hop-Self

Tujuan: Lab:

- Mempelajari next-hop pada BGP
- Mempelajari mengapa next-hop-self perlu dikonfig
- Mengetahui bahwa route yang diadvertise pada BGP dan tampil dalam perintah show ip bgp tidak semuanya akan tampil dalam routing table (show ip route) dikarenakan ip next-hopnya unreachable

Topologi Lab:



Metode Lab:

- Hapus konfigurasi IGP dan BGP lab sebelumnya tanpa menghapus pengalamatan ip yang digunakan
- Konfigurasikan iBGP peers antara R1 dan R2
- Konfigurasikan eBGP peers antara R2 dan R3
- Advertise masing-masing IP loopback ke BGP
- Tanpa next-hop-self, maka dari R1 tidak akan bisa ping ke R3

Verifikasi Lab:

- Pastikan BGP adjacency terbentuk dengan mengetik show ip bgp summary
- Pastikan ada route yang diadvertise ke BGP, ketik show ip bgp
- Periksa nilai next-hop yang ada pada show ip bgp baik sebelum dan setelah di konfig

Hapus konfigurasi BGP dan EIGRP di semua router.

```
IDN-R1(config)#no router eigrp 1
IDN-R1(config)#no router bgp 12
```

```
IDN-R2(config)#no router eigrp 1
IDN-R2(config)#no router bgp 12
```

```
IDN-R3(config)#no router eigrp 1
IDN-R3(config)#no router bgp 3
```

Konfigurasikan BGP peers ke interface physical

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 12
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 12
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 12
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Cek di sisi R1

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 * i 3.3.3.3/32       23.23.23.3               0    100      0 3 i
```

Tidak ada tanda > best pada route 3.3.3.3 yang dikarenakan next-hop-nya tidak reachable. Salah satu solusinya yakni menjadikan R2 sebagai next-hop R1 untuk menuju ke R3.

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 12.12.12.1 next-hop-self
```

Cek lagi di sisi R1

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 3.3.3.3/32       12.12.12.2               0    100      0 3 i
```

Perhatikan bahwasanya ip next-hopnya sudah berbah dari R3 menjadi R2 sehingga bisa diping dari R1

```
IDN-R1(config-router)#do sh ip route bgp
      3.0.0.0/32 is subnetted, 1 subnets
B        3.3.3.3 [200/0] via 12.12.12.2, 00:01:44
```

Sudah muncul di routing table R1. Namun walaupun demikian tetap saja R3 tidak bisa diping dari R1, Karena walau R1 punya routing table ke R3, namun tidak dengan R3 yang tidak memiliki route sama sekali terhadap R1.

Untuk itu lakukan advertise salah satu ip R1 ke BGP untuk dijadikan sebagai source saat ping ke R3

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

Verifikasi setelah diadvertise

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>i 3.3.3.3/32       12.12.12.2               0    100      0 3 i
```

Nexthop 0.0.0.0 yang artinya local router itu sendiri.

Test ping ke R3 lo0 dari R1 lo0

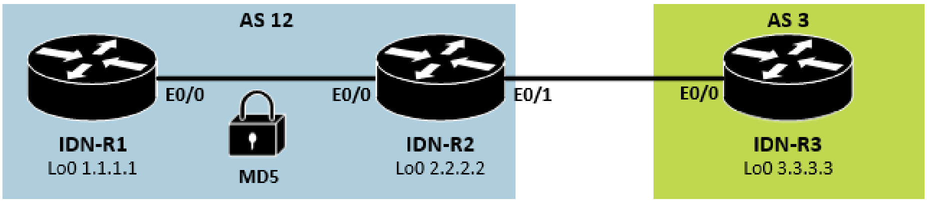
```
IDN-R1(config-router)#do ping 3.3.3.3 source 1.1.1.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 1.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 6. BGP Authentication

Tujuan Lab:

- Mempelajari authentikasi pada BGP
- Pada BGP hanya ada authentikasi MD5, tidak ada clear text

Topologi Lab:



Metode Lab:

- Melanjutkan lab sebelumnya
- Konfigurasikan authentikasi antara router R1 dan R2

Verifikasi Lab:

- Pastikan BGP adjacency masih terbentuk dengan mengetik show ip bgp summary

Konfigurasikan BGP

```
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#neighbor 12.12.12.2 password 0 IDN
```

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 12.12.12.1 password 0 IDN
```

Clear BGP untuk adjacency ulang

```
IDN-R1(config-router)#do clear ip bgp *
```

```
IDN-R2(config-router)#do clear ip bgp *
```

Verifikasi authentikasi

```
IDN-R1(config-router)#do sh ip bgp nei 12.12.12.2 | i
Established|md5
  BGP state = Established, up for 00:01:54
Option Flags: nagle, path mtu capable, md5
```

Verifikasi neighbor

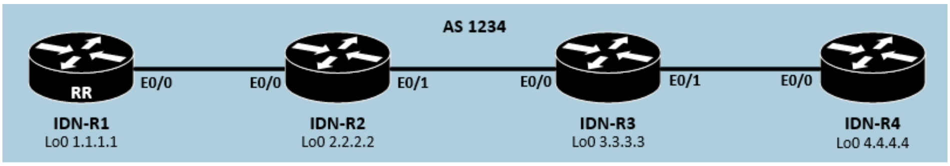
```
IDN-R1(config-router)#do show ip bgp summ
BGP router identifier 11.11.11.11, local AS number 12
BGP table version is 5, main routing table version 5
2 network entries using 288 bytes of memory
2 path entries using 160 bytes of memory
2/2 BGP path/bestpath attribute entries using 304 bytes of memory
1 BGP AS-PATH entries using 24 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 776 total bytes of memory
BGP activity 4/2 prefixes, 5/3 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
12.12.12.2      4           12       9       9        5    0    0
00:04:27        1
```

Lab 7. BGP Route Reflector

Tujuan Lab:

- Mempelajari issue yang ada pada internal BGP
- Mengetahui solusi untuk issue tsb (Full mesh peers, Route Reflector)
- Mempelajari konfigurasi BGP route reflector

Topologi Lab:



Metode Lab:

- Konfigurasikan topologi diatas dengan IP standar IDN
- Advertise semua IP ke dalam IGP RIP
- R1 dijadikan sebagai RRnya
- Router lainnya dijadikan RR client
- R1 sebagai RR melakukan BGP peers ke semua router
- Semua router, neighbor peernya cukup ke RR saja
- Buat ip loopback baru yang diadvertise ke BGP

Verifikasi Lab:

- Pastikan IP loopback baru yang diadvertise ke BGP bisa diping oleh semua router.

Pada iBGP, peernya harus full mesh artinya

- R1 neighbor peers ke R2,R3,R4
- R2 neighbor peers ke R1,R3,R4
- R3 neighbor peers ke R1,R2,R4
- R4 neighbor peers ke R1,R2,R3

Permasalahannya adalah apabila ada router baru, maka selain router tersebut menjadi route reflector. Pada lab kali ini R1 akan dijadikan sebagai route-reflector server. Maka RR akan melakukan peers ke semua router, dan semua router peersnya cukup ke RR saja.

Konfigurasikan addressing IDN

```
IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255

IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip address 12.12.12.1 255.255.255.0
IDN-R1(config-if)#no sh
```

```
IDN-R2(config)#int lo0
IDN-R2(config-if)#ip address 2.2.2.2 255.255.255.255

IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip address 12.12.12.2 255.255.255.0
IDN-R2(config-if)#no sh

IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip address 23.23.23.2 255.255.255.0
IDN-R2(config-if)#no shutdown
```

```
IDN-R3(config)#int lo0
IDN-R3(config-if)#ip address 3.3.3.3 255.255.255.255

IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip address 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no shutdown

IDN-R3(config)#int e0/1
IDN-R3(config-if)#ip address 34.34.34.3 255.255.255.0
IDN-R3(config-if)#no shutdown
```

```
IDN-R4(config)#int lo0
IDN-R4(config-if)#ip address 4.4.4.4 255.255.255.255

IDN-R4(config)#int e0/0
IDN-R4(config-if)#ip address 34.34.34.4 255.255.255.0
IDN-R4(config-if)#no shutdown
```

Konfigurasikan EIGRP

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255
IDN-R3(config-router)#network 34.34.34.0 0.0.0.255
```

```
IDN-R4(config)#router eigrp 1
IDN-R4(config-router)#network 4.4.4.4 0.0.0.0
IDN-R4(config-router)#network 34.34.34.0 0.0.0.255
```

Konfigurasikan route reflector pada R1

```
IDN-R1(config)#router bgp 1234
IDN-R1(config-router)#neighbor 2.2.2.2 remote-as 1234
IDN-R1(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R1(config-router)#neighbor 2.2.2.2 route-reflector-client
IDN-R1(config-router)#neighbor 3.3.3.3 remote-as 1234
IDN-R1(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R1(config-router)#neighbor 3.3.3.3 route-reflector-client
IDN-R1(config-router)#neighbor 4.4.4.4 remote-as 1234
IDN-R1(config-router)#neighbor 4.4.4.4 update-source lo0
IDN-R1(config-router)#neighbor 4.4.4.4 route-reflector-client
```

Konfigurasi peering router R2,R3 dan R4 ke Route Reflector (RR)

```
IDN-R2(config)#router bgp 1234
IDN-R2(config-router)#neighbor 1.1.1.1 remote-as 1234
IDN-R2(config-router)#neighbor 1.1.1.1 update-source lo0
```

```
IDN-R3(config)#router bgp 1234
IDN-R3(config-router)#neighbor 1.1.1.1 remote-as 1234
IDN-R3(config-router)#neighbor 1.1.1.1 update-source lo0
```

```
IDN-R4(config)#router bgp 1234
IDN-R4(config-router)#neighbor 1.1.1.1 remote-as 1234
IDN-R4(config-router)#neighbor 1.1.1.1 update-source lo0
```

Pastikan neighbor sudah masuk semua

```
IDN-R1(config)#do show ip bgp summary
BGP router identifier 1.1.1.1, local AS number 1234
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
2.2.2.2         4         1234       6       6        1    0    0 00:02:38
0
3.3.3.3         4         1234       4       4        1    0    0 00:01:48
0
4.4.4.4         4         1234       5       3        1    0    0 00:01:08
0
```

Buat interface loopback di R4 dan advertise ke BGP

```
IDN-R4(config)#int lo1
IDN-R4(config-if)#ip address 44.44.44.44 255.255.255.255

IDN-R4(config)#router bgp 1234
IDN-R4(config-router)#network 44.44.44.44 mask 255.255.255.255
```

Cek di R2 mengenai route yang diadvertise oleh R4 ke BGP tersebut

```
IDN-R2(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 44.44.44.44/32   4.4.4.4                  0    100      0 i
```

Lakukan tes ping dari semua router dan pastikan mendapatkan reply.

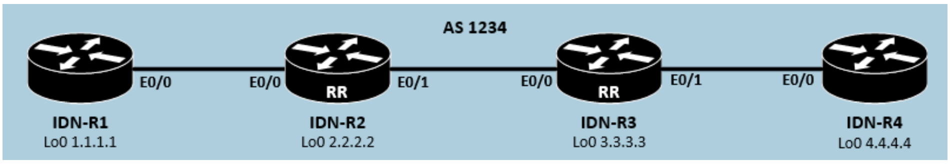
```
IDN-R2(config)#do ping 44.44.44.44
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 44.44.44.44, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

Lab 8. BGP Redundant Route Reflector

Tujuan Lab:

- Mengetahui Issue yang ada pada Internal BGP
- Mempelajari konfigurasi BGP Redundant Route Reflector

Topologi Lab:



Metode Lab:

- Masih menggunakan topologi lab sebelumnya
- R2 dan R3 dijadikan sebagai Route Reflector
- R1 dan R4 dijadikan sebagai Route Reflector Client
- R2 dan R3 peering peering ke semua client
- Semua router, neighbor peernya cukup ke RR saja
- Buat ip loopback baru untuk diadvertise ke BGP

Verifikasi Lab:

- Pastikan IP loopback baru yang diadvertise ke BGP bisa diping oleh semua router.
- Cek redundansi dengan menshutdown session BGP antara RR R3 dengan client R4

Pencegahan loop untuk kedua Clsuter-ID dan originator-ID bekerja dalam cara yang sangat mirip dan sederhana:

- Jika sebuah router BGP menerima rute dari iBGP tetangga dan di dalam update yang diterimanya mendeteksi keberadaan Router-ID sendiri di atribut Originator-ID nya. Maka router tersebut akan menolak update itu.
- Jika sebuah router BGP menerima rute dari tetangga iBGP yang dikonfigurasikan sebagai router reflector dan di dalam update yang diterimanya mendeteksi keberadaan Cluster-ID sendiri di atribut Cluster-list-nya, maka router tersebut akan menolak update itu.

Hapus konfigurasi BGP sebelumnya di semua router.

```
IDN-R1(config)#no router bgp 1234
```

```
IDN-R2(config)#no router bgp 1234
```

```
IDN-R3(config)#no router bgp 1234
```

```
IDN-R4(config)#no router bgp 1234
```

Konfigurasikan loopback pada R1 dan R4 untuk diadvertise nanti

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 11.11.11.11 255.255.255.255
```

```
IDN-R4(config)#int lo1
IDN-R4(config-if)#ip address 44.44.44.44 255.255.255.255
```

Konfigurasikan peering menuju RR pada R1

```
IDN-R1(config)#router bgp 1234
IDN-R1(config-router)#neighbor 2.2.2.2 remote-as 1234
IDN-R1(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R1(config-router)#neighbor 3.3.3.3 remote-as 1234
IDN-R1(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R1(config-router)#network 11.11.11.11 mask 255.255.255.255
```

Konfigurasikan route-reflector di R2

```
IDN-R2(config)#router bgp 1234
IDN-R2(config-router)#neighbor 1.1.1.1 remote-as 1234
IDN-R2(config-router)#neighbor 1.1.1.1 update-source lo0
IDN-R2(config-router)#neighbor 1.1.1.1 route-reflector-client
IDN-R2(config-router)#neighbor 3.3.3.3 remote-as 1234
IDN-R2(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R2(config-router)#neighbor 4.4.4.4 remote-as 1234
IDN-R2(config-router)#neighbor 4.4.4.4 update-source lo0
IDN-R2(config-router)#neighbor 4.4.4.4 route-reflector-client
```

Konfigurasikan route-reflector di R3

```
IDN-R3(config)#router bgp 1234
IDN-R3(config-router)#neighbor 1.1.1.1 remote-as 1234
IDN-R3(config-router)#neighbor 1.1.1.1 update-source lo0
IDN-R3(config-router)#neighbor 1.1.1.1 route-reflector-client
IDN-R3(config-router)#neighbor 2.2.2.2 remote-as 1234
IDN-R3(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R3(config-router)#neighbor 4.4.4.4 remote-as 1234
IDN-R3(config-router)#neighbor 4.4.4.4 update-source lo0
IDN-R3(config-router)#neighbor 4.4.4.4 route-reflector-client
```

Konfigurasikan peering menuju RR di R4

```
IDN-R4(config-router)#router bgp 1234
IDN-R4(config-router)#neighbor 2.2.2.2 remote-as 1234
IDN-R4(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R4(config-router)#neighbor 3.3.3.3 remote-as 1234
IDN-R4(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R4(config-router)#network 44.44.44.44 mask 255.255.255.255
```

Cek apakah konfigurasi kita diatas berhasil

```
IDN-R2(config)#do show ip bgp summ
BGP router identifier 2.2.2.2, local AS number 1234
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
1.1.1.1         4         1234      30      29        1    0    0
00:23:23        0
```

```
IDN-R3(config)#do sh ip bgp summ
BGP router identifier 3.3.3.3, local AS number 1234
BGP table version is 1, main routing table version 1

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
1.1.1.1         4         1234      21      24        1    0    0
00:18:00        0
```

Di AS 1234 memiliki 2 route reflector RR, masing-masing RR memiliki client sendiri-sendiri. Ketika satu RR menerima update dari salah satu clientnya, maka ia akan mengadvertise prefix it uke RR yang lain, kemudian RR yang lain itu akan mengadvertise ke client sehingga dapat menyebabkan routing loop.

Ada beberapa tambahan atribut optional non-transitive yang bisa digunakan ketika RR dikonfigurasikan, yaitu originator-id, cluster-id dan cluster-list.

- Originator-id : atribut ini dibuat oleh RR, yang merupakan router-id dari router, asal suatu prefix tujuannya untuk mencegah routing loop, lihat penjelasan sebelumnya.
- Cluster-id : RR dan client-nya secara kolektif disebut cluster, masing-masing cluster diidentifikasi secara unik, dan cluster-id biasanya adalh router-id dari RR kecuali dikonfigurasi khusus
- Cluster-list : attribute ini seperti atribut AS-PATH, dimana dia menyimpan track beberapa cluster-id seperti AS-PATH menyimpan track dari AS-Number. Ketika RR mengadvertise prefix ke non-client maka ia akan menambahkan cluster-id ke cluster-list prefix itu. Jika RR menerima update dan melihat adanya cluster-id sendiri di cluster-listnya maka update itu akan diabaikan

Sekarang perhatikan output dari show ip bgp 44.44.44.44/32 pada R1

```
IDN-R1(config-router)#do show ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 10
Paths: (2 available, best #1, table default)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    4.4.4.4 (metric 460800) from 2.2.2.2 (2.2.2.2)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      Originator: 44.44.44.44, Cluster list: 2.2.2.2
      rx pathid: 0, tx pathid: 0x0
  Refresh Epoch 1
  Local
    4.4.4.4 (metric 460800) from 3.3.3.3 (3.3.3.3)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 44.44.44.44, Cluster list: 3.3.3.3
      rx pathid: 0, tx pathid: 0
```

R1 sekarang memiliki dua Salinan rute. Satu route diterima dari R2 dan yang lainnya dari R3. Router tidak butuh dua rute, namun router menerima keduanya. Hal ini juga menarik untuk melihat apa yang terjadi pada R2.

```
IDN-R2(config-router)#do sh ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 13
Paths: (2 available, best #2, table default)
  Advertised to update-groups:
     3          5
  Refresh Epoch 1
  Local
    4.4.4.4 (metric 435200) from 3.3.3.3 (3.3.3.3)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 44.44.44.44, Cluster list: 3.3.3.3
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 1
  Local, (Received from a RR-client)
    4.4.4.4 (metric 435200) from 4.4.4.4 (44.44.44.44)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
```

R2 juga memiliki 2 route, dan memilih bestnya adalah route yang berasal dari neighbornya, yang kemudian R2 akan mengadvertise ke R3

```
IDN-R3(config-router)#do sh ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 13
Paths: (2 available, best #2, table default)
  Advertised to update-groups:
     5          6
  Refresh Epoch 1
  Local
    4.4.4.4 (metric 409600) from 2.2.2.2 (2.2.2.2)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 44.44.44.44, Cluster list: 2.2.2.2
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 2
  Local, (Received from a RR-client)
    4.4.4.4 (metric 409600) from 4.4.4.4 (44.44.44.44)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
```

Berdasarkan keterangan sebelumnya, bahwa setelah menerima route ini, R3 akan mengadvertise ke clientnya, apa yang akan terjadi di R4 sebagai asal muasal route 44.44.44.44/32?

```
IDN-R4(config-router)#do show ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 7
Paths: (1 available, best #1, table default)
  Advertised to update-groups:
     1
  Refresh Epoch 1
  Local
    0.0.0.0 from 0.0.0.0 (44.44.44.44)
      Origin IGP, metric 0, localpref 100, weight 32768, valid,
sourced, local, best
      rx pathid: 0, tx pathid: 0x0
```

R4 tampak seakan tidak memiliki route 44.44.44.44/32 yang sifatnya kiriman dari router lain pada tabel BGPnya, hanya local saja. Akan tetapi bukan berarti R3 tidak mengadvertise 44.44.44.44/32 ke R4. Kita akan melakukan clear ip bgp session antara R3 dan R4 dan melakukan debug ip bgp ipv4 unicast update pada R4.

Lakukan debugging

```
IDN-R4#debug ip bgp ipv4 unicast update in
BGP updates debugging is on (inbound) for address family: IPv4
```

Clear ip bgp

```
IDN-R4#clear ip bgp 3.3.3.3
IDN-R4#
*Nov 21 15:36:17.084: %BGP-3-NOTIFICATION: sent to neighbor 3.3.3.3
6/4 (Administrative Reset) 0 bytes
IDN-R4#
*Nov 21 15:36:17.090: %BGP-5-ADJCHANGE: neighbor 3.3.3.3 Down User
reset
*Nov 21 15:36:17.090: %BGP_SESSION-5-ADJCHANGE: neighbor 3.3.3.3
IPv4 Unicast topology base removed from session  User reset
*Nov 21 15:36:18.071: %BGP-5-ADJCHANGE: neighbor 3.3.3.3 Up
*Nov 21 15:36:18.073: BGP(0): (base) 2.2.2.2 send UPDATE (format)
44.44.44.44/32, next 4.4.4.4, metric 0, path Local
*Nov 21 15:36:18.077: BGP: nbr_topo global 3.3.3.3 IPv4 Unicast:base
(0xF6064CD8:1) rcvd Refresh Start-of-RIB
*Nov 21 15:36:18.077: BGP: nbr_topo global 3.3.3.3 IPv4 Unicast:base
(0xF6064CD8:1) refresh_epoch is 2
*Nov 21 15:36:18.077: BGP: 3.3.3.3 Local router is the Originator;
Discard update
*Nov 21 15:36:18.077: BGP(0): 3.3.3.3 rcv UPDATE w/ attr: nexthop
3.3.3.3, origin i, localpref 100, metric 0, originator 4.4.4.4,
clusterlist 3.3.3.3 2.2.2.2, merged path , AS_PATH , community ,
extended community , SSA attribute
*Nov 21 15:36:18.077: BGPSSA ssacount is 0
*Nov 21 15:36:18.077: BGP(0): 3.3.3.3 rcv UPDATE about
44.44.44.44/32 -- DENIED due to: ORIGINATOR is us;
```

Terlihat diatas bahwa R3 berusaha, meng-advertise rute 44.44.44.44 ke R4, tapi di reject dengan pertimbangan originator-id.

Jika kita mengimplementasikan redundant route-reflector, kita akan terbebas dari adanya looping, hanya saja route yang kita terima adalah double (ada 2 RR di AS 1234), sehingga resource router akan terpakai lebih besar.

Untuk menyelesaikan masalah ini, kita maka semua RR kita daftarkan ke dalam cluster redundancy yang sama. Sehingga kita perlu membuat cluster-id yang sama. By default, cluster-id ini adalah router-ID ini adalah router ID. Kita kan mengubah cluster-id dengan nilai yang sama seperti subnet yang digunakan antara R2 dan R3 kemudian reset semua BGP peeringnya.

```
IDN-R2(config)#router bgp 1234
IDN-R2(config-router)#bgp cluster-id 23.23.23.0
```

```
IDN-R3(config)#router bgp 1234
IDN-R3(config-router)#bgp cluster-id 23.23.23.0
```

Lihat efeknya

```
IDN-R1(config)#do sh ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 10
Paths: (2 available, best #1, table default)
  Not advertised to any peer
  Refresh Epoch 3
  Local
    4.4.4.4 (metric 460800) from 2.2.2.2 (2.2.2.2)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      Originator: 44.44.44.44, Cluster list: 23.23.23.0
      rx pathid: 0, tx pathid: 0x0
  Refresh Epoch 3
  Local
    4.4.4.4 (metric 460800) from 3.3.3.3 (3.3.3.3)
      Origin IGP, metric 0, localpref 100, valid, internal
      Originator: 44.44.44.44, Cluster list: 23.23.23.0
      rx pathid: 0, tx pathid: 0
```

Terlihat pada R1 masih tampil 2 route, dengan cluster-id yang sama.

```
IDN-R2(config-router)#do sh ip bgp 44.44.44.44
BGP routing table entry for 44.44.44.44/32, version 13
Paths: (1 available, best #1, table default)
  Advertised to update-groups:
     3          5
  Refresh Epoch 2
  Local, (Received from a RR-client)
    4.4.4.4 (metric 435200) from 4.4.4.4 (44.44.44.44)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
```

Berbeda dengan R2, hanya ada 1 route dari router R4 langusng. Kita debug lagi.

```
IDN-R2(config)#do debug ip bgp ipv4 unicast updates in
BGP updates debugging is on (inbound) for address family: IPv4
Unicast
IDN-R2(config)#do clear ip bgp 3.3.3.3
IDN-R2(config)#
*Nov 21 16:10:33.970: %BGP-3-NOTIFICATION: sent to neighbor 3.3.3.3
6/4 (Administrative Reset) 0 bytes
*Nov 21 16:10:33.976: %BGP-5-ADJCHANGE: neighbor 3.3.3.3 Down User
reset
*Nov 21 16:10:33.976: %BGP_SESSION-5-ADJCHANGE: neighbor 3.3.3.3
IPv4 Unicast topology base removed from session  User reset
*Nov 21 16:10:34.638: %BGP-5-ADJCHANGE: neighbor 3.3.3.3 Up
*Nov 21 16:10:34.640: BGP(0): (base) 3.3.3.3 send UPDATE (format)
11.11.11.11/32, next 1.1.1.1, metric 0, path Local
*Nov 21 16:10:34.640: BGP(0): (base) 3.3.3.3 send UPDATE (format)
44.44.44.44/32, next 4.4.4.4, metric 0, path Local
*Nov 21 16:10:34.640: BGP: 3.3.3.3 RR in same cluster. Reflected
update dropped
*Nov 21 16:10:34.641: BGP(0): 3.3.3.3 rcv UPDATE w/ attr: nexthop
4.4.4.4, origin i, localpref 100, metric 0, originator 44.44.44.44,
clusterlist 23.23.23.0, merged path , AS_PATH , community , extended
community , SSA attribute
*Nov 21 16:10:34.641: BGPSSA ssacount is 0
*Nov 21 16:10:34.641: BGP(0): 3.3.3.3 rcv UPDATE about
44.44.44.44/32 -- DENIED due to:
reflected from the same cluster;
```

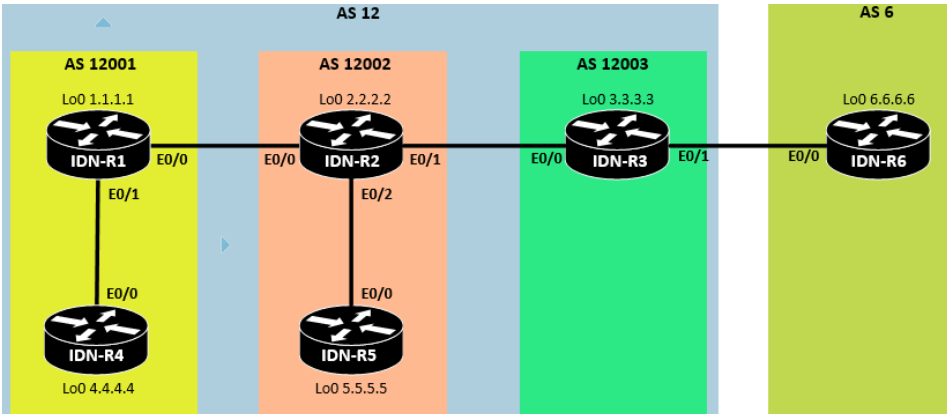
Route yang diterima oleh RR dari RR lain dengan cluster-id sama akan ditolak, sehingga route-nya semakin simple sehingga resource semakin efisien.

Lab 9. BGP Confederation

Tujuan Lab:

- Mengetahui solusi untuk konfigurasi full mesh yang ada pada iBGP, yakni dengan dikonfigurasi dalam BGP confederation
- Dengan BGP Confederation, maka dibuat beberapa sub-AS didalam AS12 sehingga seolah-olah seperti eBGP Karena pada eBGP tidak memerlukan full mesh

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas dengan pengalamatan IP standar IDN
- Buat BGP peers dengan menggunakan IP physicalnya
- Gunakan nilai sub-ASnya sebagai nilai AS pada konfigurasi router BGP xx nya
- Nilai main AS nya digunakan sebagai BGP identifiernya
- R1 (AS 12001) memiliki BGP Confederation peers ke AS 12002
- R2 (AS 12002) memiliki BGP Confederation peers ke AS 12001 dan 12003
- R3 (AS 12003) memiliki BGP Confederation peers ke AS 12002 + eBGP AS 6
- Semua router R(1-5) dianggap oleh router R6, semuanya sebagai AS 12

Verifikasi Lab:

- Pastikan semua IP loopback bisa diping oleh semua router.

Konfigurasikan addressing standar IDN

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#ip address 12.12.12.1 255.255.255.0
IDN-R1(config-if)#no sh

IDN-R1(config)#int e0/1
IDN-R1(config-if)#ip address 14.14.14.1 255.255.255.0
IDN-R1(config-if)#no sh

IDN-R1(config)#int lo0
IDN-R1(config-if)#ip address 1.1.1.1 255.255.255.255
```

```
IDN-R2(config)#int e0/0
IDN-R2(config-if)#ip address 12.12.12.2 255.255.255.0
IDN-R2(config-if)#no sh

IDN-R2(config)#int e0/1
IDN-R2(config-if)#ip address 23.23.23.2 255.255.255.0
IDN-R2(config-if)#no sh

IDN-R2(config)#int e0/2
IDN-R2(config-if)#ip address 25.25.25.2 255.255.255.0
IDN-R2(config-if)#no sh

IDN-R2(config)#int lo0
IDN-R2(config-if)#ip address 2.2.2.2 255.255.255.255
```

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#ip address 23.23.23.3 255.255.255.0
IDN-R3(config-if)#no sh

IDN-R3(config)#int e0/1
IDN-R3(config-if)#ip address 36.36.36.3 255.255.255.0
IDN-R3(config-if)#no sh

IDN-R3(config)#int lo0
IDN-R3(config-if)#ip address 3.3.3.3 255.255.255.255
```

```
IDN-R4(config)#int e0/0
IDN-R4(config-if)#ip address 14.14.14.4 255.255.255.0
IDN-R4(config-if)#no sh

IDN-R4(config)#int lo0
IDN-R4(config-if)#ip address 4.4.4.4 255.255.255.255
```

```
IDN-R5(config)#int e0/0
IDN-R5(config-if)#ip address 25.25.25.5 255.255.255.0
IDN-R5(config-if)#no sh

IDN-R5(config)#int lo0
IDN-R5(config-if)#ip address 5.5.5.5 255.255.255.255
```

```
IDN-R6(config)#int e0/0
IDN-R6(config-if)#ip address 36.36.36.6 255.255.255.0
IDN-R6(config-if)#no sh

IDN-R6(config)#int lo0
IDN-R6(config-if)#ip address 6.6.6.6 255.255.255.255
```

Konfigurasi bgp confederation pada R1

```
IDN-R1(config)#router bgp 12001
IDN-R1(config-router)#bgp confederation identifier 12
IDN-R1(config-router)#bgp confederation peers 12002
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 12002
IDN-R1(config-router)#neighbor 14.14.14.4 remote-as 12001
IDN-R1(config-router)#neighbor 14.14.14.4 next-hop-self
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
IDN-R1(config-router)#network 12.12.12.0 mask 255.255.255.0
IDN-R1(config-router)#network 14.14.14.0 mask 255.255.255.0
```

Konfigurasi bgp confederation pada R2

```
IDN-R2(config)#router bgp 12002
IDN-R2(config-router)#bgp confederation identifier 12
IDN-R2(config-router)#bgp confederation peers 12001 12003
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 12001
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 12003
IDN-R2(config-router)#neighbor 25.25.25.5 remote-as 12002
IDN-R2(config-router)#neighbor 25.25.25.5 next-hop-self
IDN-R2(config-router)#network 12.12.12.0 mask 255.255.255.0
IDN-R2(config-router)#network 23.23.23.0 mask 255.255.255.0
IDN-R2(config-router)#network 25.25.25.0 mask 255.255.255.0
```

Konfigurasi bgp confederation pada R3

```
IDN-R3(config)#router bgp 12003
IDN-R3(config-router)#bgp confederation identifier 12
IDN-R3(config-router)#bgp confederation peers 12002
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 12002
IDN-R3(config-router)#neighbor 36.36.36.6 remote-as 6
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
IDN-R3(config-router)#network 23.23.23.0 mask 255.255.255.0
IDN-R3(config-router)#network 36.36.36.0 mask 255.255.255.0
```

Konfigurasi bgp confederation pada R4

```
IDN-R4(config)#router bgp 12001
IDN-R4(config-router)#bgp confederation identifier 12
IDN-R4(config-router)#neighbor 14.14.14.1 remote-as 12001
IDN-R4(config-router)#network 4.4.4.4 mask 255.255.255.255
IDN-R4(config-router)#network 14.14.14.0 mask 255.255.255.0
```

Konfigurasi bgp confederation pada R5

```
IDN-R5(config)#router bgp 12002
IDN-R5(config-router)#bgp confederation identifier 12
IDN-R5(config-router)#neighbor 25.25.25.2 remote-as 12002
IDN-R5(config-router)#network 5.5.5.5 mask 255.255.255.255
IDN-R5(config-router)#network 25.25.25.0 mask 255.255.255.0
```

Konfigurasi bgp confederation pada R6

```
IDN-R6(config)#router bgp 6
IDN-R6(config-router)#neighbor 36.36.36.3 remote-as 12
IDN-R6(config-router)#network 6.6.6.6 mask 255.255.255.255
IDN-R6(config-router)#network 36.36.36.0 mask 255.255.255.0
```

Cek show ip bgp

```
IDN-R1(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0    100      0 (12002) i
 *>  3.3.3.3/32       23.23.23.3               0    100      0 (12002 12003) i
 *>i 4.4.4.4/32       14.14.14.4               0    100      0 i
 *>  5.5.5.5/32       25.25.25.5               0    100      0 (12002) i
 *>  6.6.6.6/32       36.36.36.6               0    100      0 (12002 12003) 6
 *   12.12.12.0/24    12.12.12.2               0    100      0 (12002) i
 *>                   0.0.0.0                  0         32768 i
 * i 14.14.14.0/24    14.14.14.4               0    100      0 i
 *>                   0.0.0.0                  0         32768 i
 *>  23.23.23.0/24    12.12.12.2               0    100      0 (12002) i
 *>  25.25.25.0/24    12.12.12.2               0    100      0 (12002) i
 *>  36.36.36.0/24    23.23.23.3               0    100      0 (12002 12003) i
```

Kita lihat dari R1 network yang diadvertise oleh R6 pathnya dianggap hanya satu AS saja, sedangkan AS yang di lewatinya dianggap satu group confederation (AS 12002 dan AS 12003)

```
IDN-R6(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       36.36.36.3                             0 12 i
 *>  2.2.2.2/32       36.36.36.3                             0 12 i
 *>  3.3.3.3/32       36.36.36.3               0             0 12 i
 *>  4.4.4.4/32       36.36.36.3                             0 12 i
 *>  5.5.5.5/32       36.36.36.3                             0 12 i
 *>  6.6.6.6/32       0.0.0.0                  0         32768 i
 *>  12.12.12.0/24    36.36.36.3                             0 12 i
 *>  14.14.14.0/24    36.36.36.3                             0 12 i
 *>  23.23.23.0/24    36.36.36.3               0             0 12 i
 *>  25.25.25.0/24    36.36.36.3                             0 12 i
 *>  36.36.36.0/24    0.0.0.0                  0         32768 i
 *                    36.36.36.3               0             0 12 i
```

Dari sisi R6 hanya tampak AS-path nya hanya “12” saja, dan AS yang melakukan confederation tidak kelihatan AS aslinya.

Test ping dan traceroute dari R1

```
IDN-R1#ping 6.6.6.6
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 6.6.6.6, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

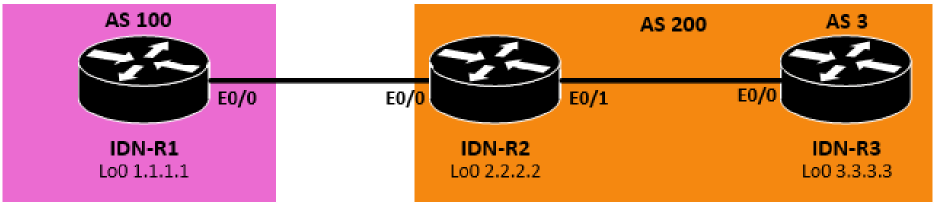
```
IDN-R1#traceroute 6.6.6.6
Type escape sequence to abort.
Tracing the route to 6.6.6.6
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 0 msec 1 msec 0 msec
  2 23.23.23.3 [AS 12002] 1 msec 0 msec 1 msec
  3 36.36.36.6 [AS 12003] 0 msec 1 msec 0 msec
```

Lab 10. BGP Attribute – Origin

Tujuan Lab:

- Tiap routing protocol memeiliki nilai metric, rip metric nya adalah hop count, ospf adalah cost, eigrp adalah bandwidth dan delay
- BGP memiliki nilai metric yang banyak, biasa disebut BGP atribut
- Origin adalah salah satu BGP attribute yang akan kita pelajari kali ini

Topologi Lab:



Metode Lab:

- Gunakan pengalamatan alamat IP standar IDN
- Konfigurasikan iBGP peers dengan IP Phisical antara R2 dan R3
- Konfigurasikan eBGP peers dengan IP Physical antar R1 dan R2
- Advertise masing-masing IP loopbacknya ke BGP
- Pada R2 buat static route ke salah satu ip loopback di R3, selanjutnya lakukan redistribute static ke BGP
- Pada R3 buat beberapa IP loopback yang kemudian diadvertise ke RIP dan selanjutnya diredistribute ke BGP

Verifikasi Lab:

- Gunakan show ip bgp, cek pada bagian path
- Perhatikan tanda i dan ? yang ada pada bagian tersebut.

Konfigurasikan BGP

```
IDN-R1(config)#router bgp 100
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 200
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

Konfigurasikan Static route

```
IDN-R2(config)#ip route 30.30.30.30 255.255.255.255 23.23.23.3
```

Konfigurasi BGP dan redistribute static

```
IDN-R2(config)#router bgp 200
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 100
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 200
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
IDN-R2(config-router)#redistribute static
```

Buat ip loopback

```
IDN-R3(config)#int lo1
IDN-R3(config-if)#ip address 30.30.30.30 255.255.255.255

IDN-R3(config)#int lo2
IDN-R3(config-if)#ip address 33.33.33.33 255.255.255.255
```

Advertise ip loopback 2 ke rip

```
IDN-R3(config)#router rip
IDN-R3(config-router)#version 2
IDN-R3(config-router)#network 33.33.33.33
IDN-R3(config-router)#no auto-summary
```

Konfigurasi BGP dan redistribute rip ke BGP

```
IDN-R3(config)#router bgp 200
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 200
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
IDN-R3(config-router)#redistribute rip
```

Verifikasi pada R1, show ip bgp

```
IDN-R1(config)#do show ip bgp
BGP table version is 8, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0             0 200 i
 *>  3.3.3.3/32       12.12.12.2                             0 200 i
 *>  30.30.30.30/32   12.12.12.2               0             0 200 ?
 *>  33.33.33.33/32   12.12.12.2                             0 200 ?
```

i = Route yang berasal dari BGP (eBGP/iBGP) yang diadvertise melalui perintah network x.x.x.x mask y.y.y.y

e = Route yang berasal dari protocol EGP (saat ini sudah tidak ada protocol tsb)

? = Route yang berasal dari protocol lain (Static/RIP/OSPF/EIGRP) yang diredistribute kedalam BGP

R1 untuk menuju network 2.2.2.2 dan 3.3.3.3 adalah via “200 i” yang artinya Next AS Path nya adalah AS 200 dan nilai origin dari routenya adalah i

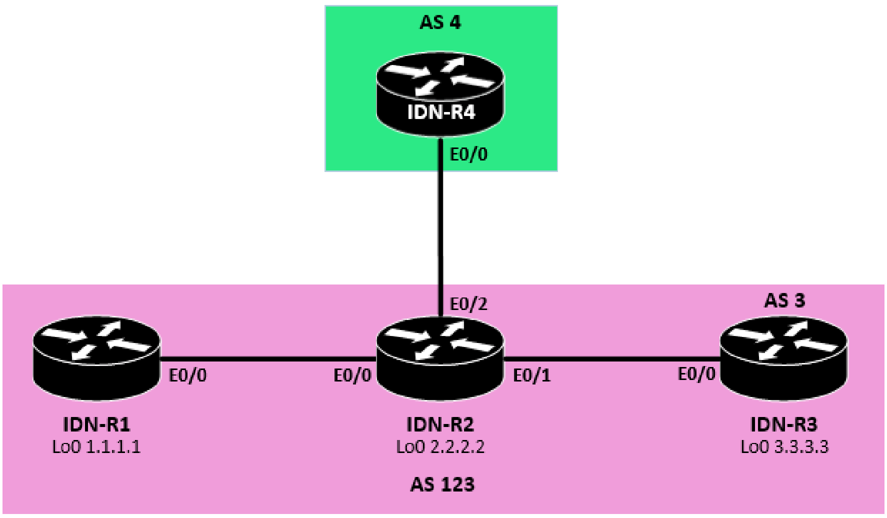
R1 untuk menuju network 30.30.30.30/32 dan 33.33.33.33/32 adalah via “200 ?” yang artinya Next AS-Path nya adalah AS 200 dan nilai origin dari routenya adalah ”?”

Lab 11. BGP Attribute – Community No-Export

Tujuan Lab:

- Mempelajari salah satu attribute pada BGPP yakni community.
- Atribut community terbagi menjadi 4 yakni no-export, no-advertise, internet dan local-as
- Mempelajari BGP community Policy

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas, alamat IP standar IDN
- Gunakan EIGRP pada R1, R2 dan R3 agar ip loopback0 nya reachable dari ketiga router tersebut.
- Konfigurasikan iBGP peers dengan IP loopback antara R1, R2 dan R3, dimana R2 dijadikan sebagai RR nya.
- Buat IP loopback1 kemudian advertise ke BGP
- Konfigurasikan eBGP peers dengan IP Physical antara R2 dan R4

Verifikasi Lab:

- Konfigurasikan no-export di R1, cek BGP route di R4 baik sebelum maupun sesudah no-export dikonfigurasikan

Buat IP loopback

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 11.11.11.11 255.255.255.255
```

```
IDN-R2(config-if)#int lo1
IDN-R2(config-if)#ip address 22.22.22.22 255.255.255.255
```

```
IDN-R3(config)#int lo1
IDN-R3(config-if)#ip address 33.33.33.33 255.255.255.255
```

Konfigurasi eigrp pada router R1,R2 dan R3

```
IDN-R1(config)#router eigrp 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0
IDN-R1(config-router)#no auto-summary
```

```
IDN-R2(config)#router eigrp 1
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255
IDN-R2(config-router)#network 23.23.23.0 0.0.0.255
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0
IDN-R2(config-router)#no auto-summary
```

```
IDN-R3(config)#router eigrp 1
IDN-R3(config-router)#network 23.23.23.0 0.0.0.255
IDN-R3(config-router)#network 3.3.3.3 0.0.0.0
IDN-R3(config-router)#no auto-summary
```

Konfigurasikan BGP pada R1,R2 dan R3

```
IDN-R1(config)#router bgp 123
IDN-R1(config-router)#neighbor 2.2.2.2 remote-as 123
IDN-R1(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R1(config-router)#network 11.11.11.11 mask 255.255.255.255
```

Konfigurasi R2 menjadi RR

```
IDN-R2(config)#router bgp 123
IDN-R2(config-router)#neighbor 24.24.24.4 remote-as 4
IDN-R2(config-router)#neighbor 1.1.1.1 remote-as 123
IDN-R2(config-router)#neighbor 1.1.1.1 update-source lo0
IDN-R2(config-router)#neighbor 1.1.1.1 next-hop-self
IDN-R2(config-router)#neighbor 1.1.1.1 route-reflector-client
IDN-R2(config-router)#neighbor 3.3.3.3 remote-as 123
IDN-R2(config-router)#neighbor 3.3.3.3 update-source lo0
IDN-R2(config-router)#neighbor 3.3.3.3 next-hop-self
IDN-R2(config-router)#neighbor 3.3.3.3 route-reflector-client
IDN-R2(config-router)#network 22.22.22.22 mask 255.255.255.255
```

```
IDN-R3(config)#router bgp 123
IDN-R3(config-router)#neighbor 2.2.2.2 remote-as 123
IDN-R3(config-router)#neighbor 2.2.2.2 update-source lo0
IDN-R3(config-router)#network 33.33.33.33 mask 255.255.255.255
```

Konfigurasi BGP pada R4

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#neighbor 24.24.24.2 remote-as 123
IDN-R4(config-router)#network 4.4.4.4 mask 255.255.255.255
```

Cek BGP router di R1 dan R4 pastikan semua route nya lengkap

```
IDN-R1(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 4.4.4.4/32       2.2.2.2                  0    100      0 4 i
 *>  11.11.11.11/32   0.0.0.0                  0         32768 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
```

```
IDN-R4(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       0.0.0.0                  0         32768 i
 *>  11.11.11.11/32   24.24.24.2                             0 123 i
 *>  22.22.22.22/32   24.24.24.2               0             0 123 i
 *>  33.33.33.33/32   24.24.24.2                             0 123 i
```

Set community “no-export” di R1 (no-export : tidak diadvertise ke eBGP)

```
IDN-R1(config)#access-list 1 permit host 11.11.11.11
IDN-R1(config)#route-map no-export
IDN-R1(config-route-map)#match ip address 1
IDN-R1(config-route-map)#set community no-export

IDN-R1(config)#router bgp 123
IDN-R1(config-router)#neighbor 2.2.2.2 route-map no-export out
IDN-R1(config-router)#neighbor 2.2.2.2 send-community
```

Cek BGP route di R4 pastikan network 11.11.11.11/32 sudah tidak ada, namun pada R3 ada.

```
IDN-R3(config)#do show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 4.4.4.4/32       2.2.2.2                  0    100      0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
 *>  33.33.33.33/32   0.0.0.0                  0         32768 i
```

```
IDN-R4(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       0.0.0.0                  0         32768 i
 *>  22.22.22.22/32   24.24.24.2               0             0 123 i
 *>  33.33.33.33/32   24.24.24.2                             0 123 i
```

Terlihat network 11.11.11.11 sudah tidak diadvertise ke eBGP

Cek pada sisi R2

```
IDN-R2(config)#do show ip bgp 11.11.11.11
BGP routing table entry for 11.11.11.11/32, version 7
Paths: (1 available, best #1, table default, not advertised to EBGP
peer)
  Advertised to update-groups:
     1
  Refresh Epoch 1
  Local, (Received from a RR-client)
    1.1.1.1 (metric 409600) from 1.1.1.1 (11.11.11.11)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      Community: no-export
      rx pathid: 0, tx pathid: 0x0
```

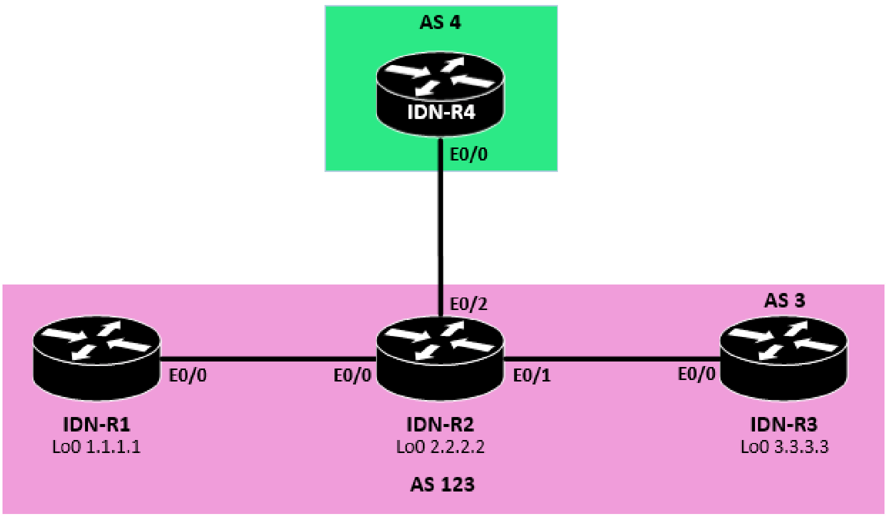
network 11.11.11.11 dinyatakan tidak akan diadvertise menuju eBGP

Lab 12. BGP Attribute – Community No-Advertise

Tujuan Lab:

- Mempelajari salah satu attribute pada BGPP yakni community.
- Atribut community terbagi menjadi 4 yakni no-export, no-advertise, internet dan local-as
- Mempelajari BGP community Policy

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas, alamat IP standar IDN
- Gunakan EIGRP pada R1, R2 dan R3 agar ip loopback0 nya reachable dari ketiga router tersebut.
- Konfigurasikan iBGP peers dengan IP loopback antara R1, R2 dan R3, dimana R2 dijadikan sebagai RR nya.
- Buat IP loopback1 kemudian advertise ke BGP
- Konfigurasikan eBGP peers dengan IP Physical antara R2 dan R4

Verifikasi Lab:

- Konfigurasikan no-advertise di R3, cek BGP route di R1 dan R4 baik sebelum maupun sesudah no-export dikonfigurasikan

Lab berikutnya kita akan set Community menjadi “no-advertise” di R3 (no-advertise: tidak diadvertise ke iBGP maupun eBGP)

```
IDN-R3(config)#access-list 1 permit host 33.33.33.33
IDN-R3(config)#route-map no-advertise
IDN-R3(config-route-map)#match ip address 1
IDN-R3(config-route-map)#set community no-advertise

IDN-R3(config)#router bgp 123
IDN-R3(config-router)#neighbor 2.2.2.2 route-map no-advertise out
IDN-R3(config-router)#neighbor 2.2.2.2 send-community
```

Cek bgp route di R1 dan R4 pastikan network 33.33.33.33 sudah tidak muncul lagi

```
IDN-R1(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 4.4.4.4/32       2.2.2.2                  0    100      0 4 i
 *>  11.11.11.11/32   0.0.0.0                  0         32768 i
 *>i 22.22.22.22/32   2.2.2.2                  0    100      0 i
```

```
IDN-R4(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       0.0.0.0                  0         32768 i
 *>  22.22.22.22/32   24.24.24.2               0             0 123 i
```

Terlihat R4 tidak menerima advertisement tentang network 33.33.33.33

```
IDN-R2(config)#do show ip bgp 33.33.33.33
BGP routing table entry for 33.33.33.33/32, version 8
Paths: (1 available, best #1, table default, not advertised to any
peer)
  Not advertised to any peer
  Refresh Epoch 1
  Local, (Received from a RR-client)
    3.3.3.3 (metric 409600) from 3.3.3.3 (33.33.33.33)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      Community: no-advertise
      rx pathid: 0, tx pathid: 0x0
```

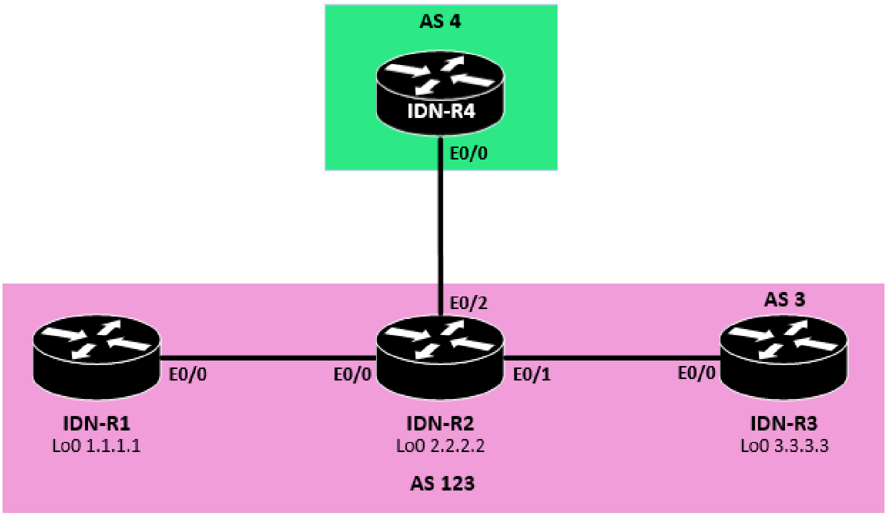
R2 menyatakan bahwa tidak akan melakukan advertise tentang network 33.33.33.33 kemanapun

Lab 13. BGP Attribute – Community Local AS

Tujuan Lab:

- Mempelajari salah satu attribute pada BGPP yakni community.
- Atribut community terbagi menjadi 4 yakni no-export, no-advertise, internet dan local-as
- Mempelajari BGP community Policy

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas, alamat IP standar IDN
- Gunakan EIGRP pada R1, R2 dan R3 agar ip loopback0 nya reachable dari ketiga router tersebut.
- Konfigurasikan iBGP peers dengan IP loopback antara R1, R2 dan R3, dimana R2 dijadikan sebagai RR nya.
- Buat IP loopback1 kemudian advertise ke BGP
- Konfigurasikan eBGP peers dengan IP Physical antara R2 dan R4

Verifikasi Lab:

- Buat BGP Confederation antara R1, R2 dan R3, Konfigurasikan local-as di R1, cek BGP route di R2 dan R3.

Lab berikutnya kita akan set community menjadi “local-as” di R1 (diadvertise di confederation BGP saja).

Artinya konfigurasi iBGP (R1,R2 & R3) harus dirubah dari route reflector menjadi confederation

```
IDN-R1(config)#access-list 2 permit 11.11.11.11
IDN-R1(config)#route-map local-as
IDN-R1(config-route-map)#match ip address 1
IDN-R1(config-route-map)#set community local-as
```

Konfigurasikan BGP ulang sebagai berikut

```
IDN-R1(config)#no router bgp 123
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#bgp confederation identifier 123
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 12
IDN-R1(config-router)#neighbor 12.12.12.2 route-map local-as out
IDN-R1(config-router)#neighbor 12.12.12.2 send-community
IDN-R1(config-router)#network 11.11.11.11 mask 255.255.255.255
```

```
IDN-R2(config)#no router bgp 123
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#bgp confederation identifier 123
IDN-R2(config-router)#bgp confederation peers 3
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 12
IDN-R2(config-router)#neighbor 12.12.12.1 next-hop-self
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#neighbor 23.23.23.3 next-hop-self
IDN-R2(config-router)#neighbor 24.24.24.4 remote-as 4
IDN-R2(config-router)#network 22.22.22.22 mask 255.255.255.255
```

```
IDN-R3(config)#no router bgp 123
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#bgp confederation identifier 123
IDN-R3(config-router)#bgp confederation peers 12
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 12
IDN-R3(config-router)#network 33.33.33.33 mask 255.255.255.255
```

Cek bgp route di R2

```
IDN-R2(config-router)#do sh ip bgp
BGP table version is 7, local router ID is 22.22.22.22
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   12.12.12.1               0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>  33.33.33.33/32   23.23.23.3               0    100      0 (3) i
```

Dan pastikan R3 tidak mempunyai informasi network 11.11.11.11/32 sudah tidak muncul lagi

```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       23.23.23.2               0    100      0 (12) 4 i
 *>  22.22.22.22/32   23.23.23.2               0    100      0 (12) i
 *>  33.33.33.33/32   0.0.0.0                  0         32768 i
```

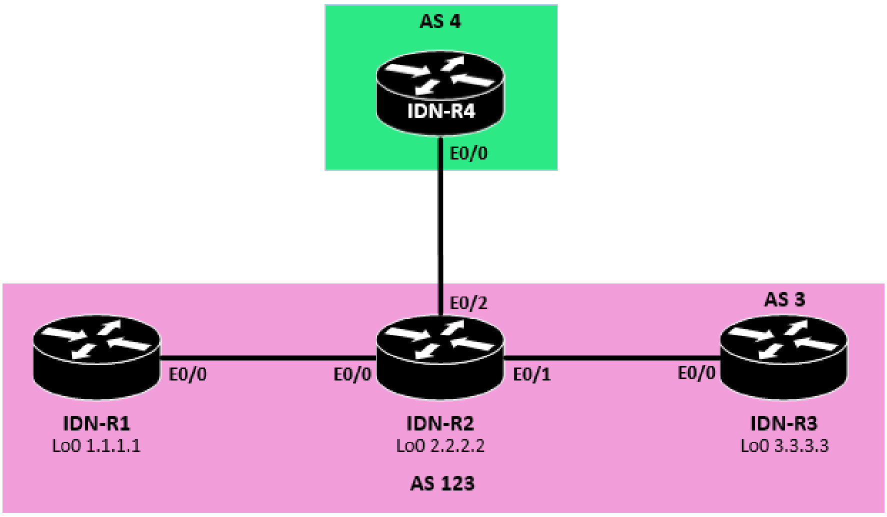
```
IDN-R2(config-router)#do sh ip bgp 11.11.11.11
BGP routing table entry for 11.11.11.11/32, version 2
Paths: (1 available, best #1, table default, not advertised outside
local AS)
  Not advertised to any peer
  Refresh Epoch 1
  Local
    12.12.12.1 from 12.12.12.1 (11.11.11.11)
      Origin IGP, metric 0, localpref 100, valid, confed-internal,
best
      Community: local-AS
      rx pathid: 0, tx pathid: 0x0
```

Lab 14. BGP Peers Group

Tujuan Lab:

- Bila suatu router memiliki banyak peers, kita bisa menggabungkan peersnya kedalam suatu group, sehingga option update-source lo0, remote-as, route-reflector-client, dll tidak perlu diketik berulang-ulang

Topologi Lab:



Metode Lab:

- Melanjutkan topologi dan konfigurasi sebelumnya
- Hapus konfigurasi BGP 12 gantikan dengan BGP 123
- Konfigurasikan peers group nya

Verifikasi Lab:

- Pastikan bgp adjacency nya tetap terbentuk
- Pastikan ip loopback yang diadvertise ke BGP bisa diping semua router.

Konfigurasikan BGP peers group

```
IDN-R1(config)#no router bgp 12
IDN-R1(config)#router bgp 123
IDN-R1(config-router)#neighbor internal peer-group
IDN-R1(config-router)#neighbor internal remote-as 123
IDN-R1(config-router)#neighbor internal update-source lo0
IDN-R1(config-router)#neighbor 2.2.2.2 peer-group internal
IDN-R1(config-router)#neighbor 3.3.3.3 peer-group internal
IDN-R1(config-router)#network 11.11.11.11 mask 255.255.255.255
```

```
IDN-R2(config)#no router bgp 12
IDN-R2(config)#router bgp 123
IDN-R2(config-router)#neighbor internal peer-group
IDN-R2(config-router)#neighbor internal remote-as 123
IDN-R2(config-router)#neighbor internal update-source lo0
IDN-R2(config-router)#neighbor 1.1.1.1 peer-group internal
IDN-R2(config-router)#neighbor 3.3.3.3 peer-group internal
IDN-R2(config-router)#neighbor 24.24.24.4 remote-as 4
IDN-R2(config-router)#network 22.22.22.22 mask 255.255.255.255
```

```
IDN-R3(config)#no router bgp 3
IDN-R3(config)#router bgp 123
IDN-R3(config-router)#neighbor internal peer-group
IDN-R3(config-router)#neighbor internal remote-as 123
IDN-R3(config-router)#neighbor internal update-source lo0
IDN-R3(config-router)#neighbor 2.2.2.2 peer-group internal
IDN-R3(config-router)#neighbor 1.1.1.1 peer-group internal
IDN-R3(config-router)#network 33.33.33.33 mask 255.255.255.255
```

Cek bgp route di semua router, pastikan semua IP merupakan best route

```
IDN-R2(config)#do sh ip bgp
BGP table version is 9, local router ID is 22.22.22.22
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
```

```
IDN-R2(config)#do sh ip bgp peer-group internal
BGP peer-group is internal,  remote AS 123
  BGP version 4
  Neighbor sessions:
    0 active, is not multisession capable (disabled)
  Do log neighbor state changes (via global configuration)
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast
  BGP neighbor is internal, peer-group internal, members:
  1.1.1.1 3.3.3.3
  Index 0, Advertise bit 0
  Update messages formatted 0, replicated 0
  Number of NLRIs in the update sent: max 0, min 0
```

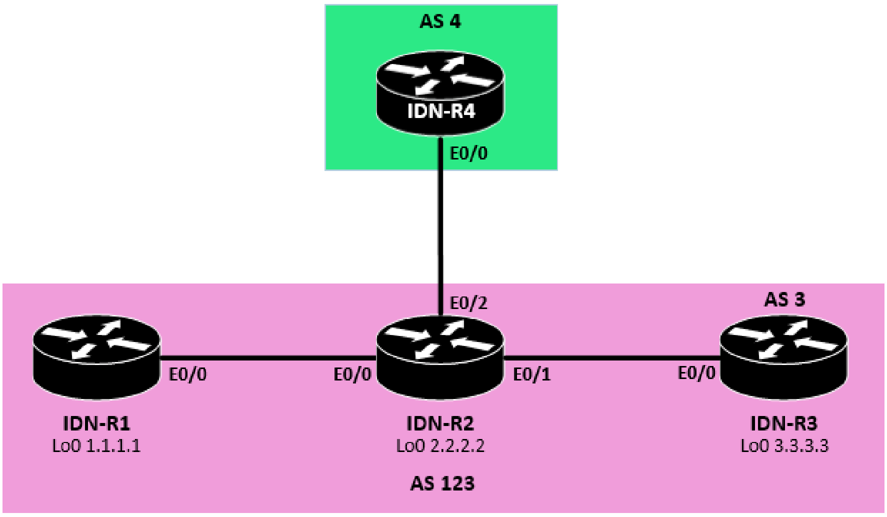
Output “show ip bgp peer-group INTERNAL” memunculkan alamat IP setiap anggota peer-group. Keuntungan utama penggunaan peer-group yaitu bisa mengurangi pekerjaan konfigurasi serupa/berulang di router.

Lab 15. BGP Attribute – Atomic Aggregate

Tujuan Lab:

- Atribute BGP ini akan ada bila dikonfigurasikan summarization, maka lab kali ini kita akan belajar mensummarization suatu route pada BGP

Topologi Lab:



Metode Lab:

- Melanjutkan topologi dan konfigurasi sebelumnya
- Buat beberapa IP loopback di R4, kemudian advertise ke BGP
- Lakukan summarization untuk ip loopback tersebut

Verifikasi Lab:

- Pastikan BGP adjacency nya tetap terbentuk
- Pastikan ip loopback yang diadvertise ke BGP bisa diping semua router.

Tambahkan beberapa ip loopback di R4 yang nantinya akan di aggregate

```
IDN-R4(config)#int lo1
IDN-R4(config-if)#ip address 40.40.1.1 255.255.255.255
IDN-R4(config-if)#int lo2
IDN-R4(config-if)#ip address 40.40.2.1 255.255.255.255
IDN-R4(config-if)#int lo3
IDN-R4(config-if)#ip address 40.40.3.1 255.255.255.255
IDN-R4(config-if)#int lo4
IDN-R4(config-if)#ip address 40.40.4.1 255.255.255.255
IDN-R4(config-if)#int lo5
IDN-R4(config-if)#ip address 40.40.5.1 255.255.255.255
IDN-R4(config-if)#int lo6
IDN-R4(config-if)#ip address 40.40.6.1 255.255.255.255
```

Advertise ke BGP

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#network 40.40.1.1 mask 255.255.255.255
IDN-R4(config-router)#network 40.40.2.1 mask 255.255.255.255
IDN-R4(config-router)#network 40.40.3.1 mask 255.255.255.255
IDN-R4(config-router)#network 40.40.4.1 mask 255.255.255.255
IDN-R4(config-router)#network 40.40.5.1 mask 255.255.255.255
IDN-R4(config-router)#network 40.40.6.1 mask 255.255.255.255
```

Cek BGP route di R1, akan muncul banyak route network 40.x.x.x

```
IDN-R2(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
 *>  40.40.1.1/32     24.24.24.4               0             0 4 i
 *>  40.40.2.1/32     24.24.24.4               0             0 4 i
 *>  40.40.3.1/32     24.24.24.4               0             0 4 i
 *>  40.40.4.1/32     24.24.24.4               0             0 4 i
 *>  40.40.5.1/32     24.24.24.4               0             0 4 i
 *>  40.40.6.1/32     24.24.24.4               0             0 4 i
```

Lakukan aggregation di R4

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#aggregate-address 40.40.0.0 255.255.248.0
```

Clear bgp

```
IDN-R2(config)#do clear ip bgp * soft
```

Cek kembali BGP route di R1, pastikan muncul route summarizationnya

```
IDN-R2(config)#do sh ip bgp
BGP table version is 14, local router ID is 22.22.22.22
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
 *>  40.40.0.0/21     24.24.24.4               0             0 4 i
 *>  40.40.1.1/32     24.24.24.4               0             0 4 i
 *>  40.40.2.1/32     24.24.24.4               0             0 4 i
 *>  40.40.3.1/32     24.24.24.4               0             0 4 i
 *>  40.40.4.1/32     24.24.24.4               0             0 4 i
 *>  40.40.5.1/32     24.24.24.4               0             0 4 i
 *>  40.40.6.1/32     24.24.24.4               0             0 4 i
```

Pada BGP route yang disummarization, route aslinya tetap tidak hilang, hanya nambah 1 route hasil summarisasi saja

```
IDN-R2(config)#do sh ip bgp 40.40.0.0
BGP routing table entry for 40.40.0.0/21, version 14
Paths: (1 available, best #1, table default)
  Advertised to update-groups:
     2
  Refresh Epoch 2
  4, (aggregated by 4 4.4.4.4)
    24.24.24.4 from 24.24.24.4 (4.4.4.4)
      Origin IGP, metric 0, localpref 100, valid, external, atomic-
aggregate, best
      rx pathid: 0, tx pathid: 0x0
```

Lakukan Aggregate single route di R4, agar hanya muncul 1 route summarisasi saja

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#aggregate-address 40.40.0.0 255.255.248.0
summary-only
```

Cek kembali BGP route di R1

```
IDN-R2(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
 *>  40.40.0.0/21     24.24.24.4               0             0 4 i
```

Hasilnya hanya muncul 1 route summarization saja

Berikutnya bila yang ingin di summarisasikan hanya beberapa route saja, tidak semua yang dalam satu blok subnet, maka konfigurasikan aggregate suppress map berikut.

```
IDN-R4(config)#access-list 1 permit host 40.40.2.1
IDN-R4(config)#access-list 1 permit host 40.40.3.1
IDN-R4(config)#access-list 1 permit host 40.40.4.1
IDN-R4(config)#access-list 1 deny any
IDN-R4(config)#route-map block
IDN-R4(config-route-map)#match ip address 1
```

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#aggregate-address 40.40.0.0 255.255.248.0
suppress-map block
```

Muncul S (suppress map) pada bgp route nya

```
IDN-R4(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       0.0.0.0                  0         32768 i
 *>  11.11.11.11/32   24.24.24.2                             0 123 i
 *>  22.22.22.22/32   24.24.24.2               0             0 123 i
 *>  33.33.33.33/32   24.24.24.2                             0 123 i
 *>  40.40.0.0/21     0.0.0.0                            32768 i
 *>  40.40.1.1/32     0.0.0.0                  0         32768 i
 s>  40.40.2.1/32     0.0.0.0                  0         32768 i
 s>  40.40.3.1/32     0.0.0.0                  0         32768 i
 s>  40.40.4.1/32     0.0.0.0                  0         32768 i
 *>  40.40.5.1/32     0.0.0.0                  0         32768 i
 *>  40.40.6.1/32     0.0.0.0                  0         32768 i
```

Cek kembali BGP route di R1, summarisasi hanya yang di suppress map saja

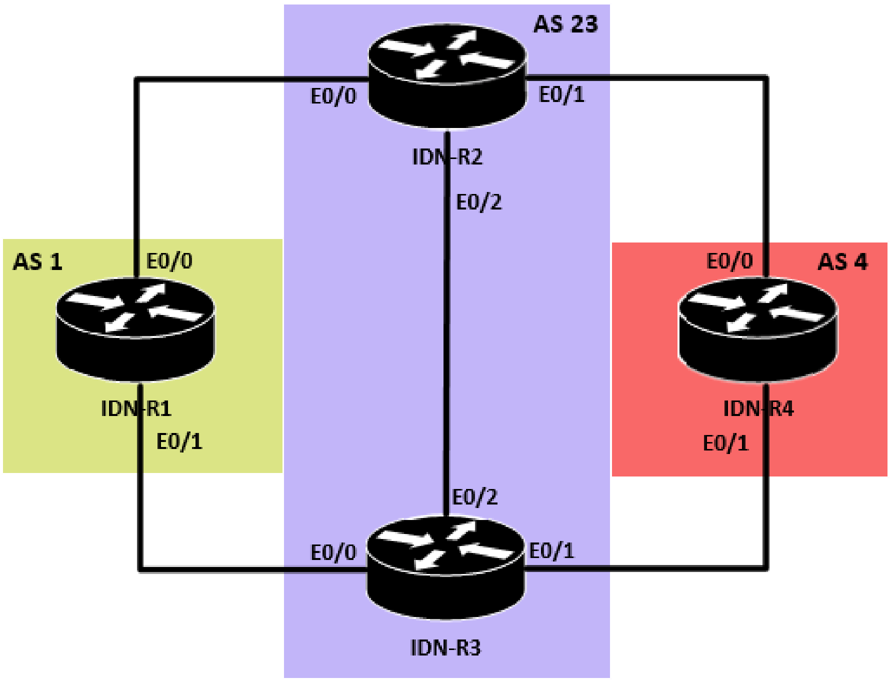
```
IDN-R2(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  4.4.4.4/32       24.24.24.4               0             0 4 i
 *>i 11.11.11.11/32   1.1.1.1                  0    100      0 i
 *>  22.22.22.22/32   0.0.0.0                  0         32768 i
 *>i 33.33.33.33/32   3.3.3.3                  0    100      0 i
 *>  40.40.0.0/21     24.24.24.4               0             0 4 i
 *>  40.40.1.1/32     24.24.24.4               0             0 4 i
 *>  40.40.5.1/32     24.24.24.4               0             0 4 i
 *>  40.40.6.1/32     24.24.24.4               0             0 4 i
```

Lab 16. BGP Multihoming – 2 ISP Sama

Tujuan Lab:

- Memperlajari BGP redundancy
- Mempelajari BGP Load balancing
- Mempelajari Atribute Weight, Local Preference, MED, AS-PATH

Topologi Lab:



Metode Lab:

- Gunakan pengalamatan IP standar IDN
- R1 adalah router kantor kita
- R2 dan R3 adalah di sisi service provider
- R4 adalah router yang dijadikan tujuan
- Berdasarkan topologinya, kantor kita memiliki 2 link upstream, misalnya satunya di hongkong (R2) sedangkan satunya ngambil dari singapore (R3)
- R1 eBGP peers ke R2 dan R3
- R2 dan R3 iBGP Peers, serta eBGP peers ke R4
- Konfigurasikan Weight MED dan AS-Path

Verifikasi Lab:

- Pastikan traffic dari R1 bisa ke R4 dan sebaliknya dengan berbagai macam metode melewatkan traffic yang berbeda-beda

BGP multihoming terdapat dua tipe:

1. BGP dengan dua link ke ISP yang sama (AS number ISPnya sama)
    a. Main-backup mode
    b. Load sharing mode
2. BGP dengan dua link ke ISP yang berbeda (AS number ISP nya berbeda)
    a. Main-backup mode
    b. Load Sharing mode

Konfigurasikan BGP pada router seperti berikut

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 23
IDN-R1(config-router)#neighbor 13.13.13.3 remote-as 23
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 23
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 23
IDN-R2(config-router)#neighbor 24.24.24.4 remote-as 4
```

```
IDN-R3(config)#router bgp 23
IDN-R3(config-router)#neighbor 13.13.13.1 remote-as 1
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 23
IDN-R3(config-router)#neighbor 34.34.34.4 remote-as 4
```

```
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#neighbor 24.24.24.2 remote-as 23
IDN-R4(config-router)#neighbor 34.34.34.3 remote-as 23
IDN-R4(config-router)#network 4.4.4.4 mask 255.255.255.255
```

Cek route bgp di R1

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *   4.4.4.4/32       13.13.13.3                             0 23 4 i
 *>                   12.12.12.2                             0 23 4 i
```

Terlihat best nya (>) melalui 12.12.12.2

Cek routing table

```
IDN-R1(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 12.12.12.2, 00:01:26
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
```

Kesimpulannya walau sudah menggunakan 2 link namun tetap saja hanya 1 link yang digunakan BGP sebagai defaultnya.

Untuk memastikan bahwa kedua linknya berfungsi dengan baik, jangan sampai ketika main link nya down dan berpindah ke backupnya, malah backupnya tidak jalan. Karena hal tersebut sepertinya banyak terjadi dilapangan, sudah redundancy namun tidak berjalan dengan baik ketika fail over terjadi

Shutdown interface

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#shutdown
```

Cek route bgp

```
IDN-R1(config-if)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  4.4.4.4/32       13.13.13.3                             0 23 4 i
```

```
IDN-R1(config-if)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 13.13.13.3, 00:00:56
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
```

Terlihat bahwa sekarang jalur berpindah menjadi melalui R3 13.13.13.3

Hidupkan interface nya kembali

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no shutdown
```

Kemudian cek kembali route bgp nya

```
IDN-R1(config-if)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *   4.4.4.4/32       12.12.12.2                             0 23 4 i
 *>                   13.13.13.3                             0 23 4 i
```

```
IDN-R1(config)#do sh ip route bgp
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 13.13.13.3, 00:04:27
```

Menarik, ternyata tidak mau otomatis pindah ke R2 (Main Link) lagi

Untuk memastikan agar link ke R2 menjadi Main link, BGP default. Tidak bisa melakukannya, maka kita konfigurasikan attribute weight atau bisa juga local prefference

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 route-map weight in
IDN-R1(config-router)#route-map weight
IDN-R1(config-route-map)#set weight 100
IDN-R1(config-route-map)#do clear ip bgp * soft
```

Selain wight, kita juga bisa menggunakan local preference, perbedaannya kalua pada weight pengaruhnya hanya pada 1 router yang dikonfigurasikan weight, sedangkan kalau menggunakan local preference pengaruhnya ke semua router dalam internal BGP

Berikut pemilihan route BGP berdasarkan atributnya, mulain dari atas dulu, kalua nilai atributnya sama, kemudian menurun ke attribute bawahnya

- Weight, yang lebih tinggi yang dipilih (Cisco Proprietary)
- Local Preference yang lebih tinggi yang dipilih (iBGP)
- Locally Originated, route berasal dari internal BGP
- AS-Path, jalur AS terpendek yang lebih dipilih
- Origin (IGP > EGP > ?) route yang berasal dari eBGP dan iBGP lebih dipilih daripada route yang berasal dari EGP ataupun IGP yang diredistribute ke BGP
- MED, nilai metric yang paling rendah yang lebih dipilih

Cek route bgp kembali setelah di konfigurasi weight

```
IDN-R1(config-route-map)#do show ip bgp
     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  4.4.4.4/32       12.12.12.2                           100 23 4 i
 *                    13.13.13.3                             0 23 4 i
```

Terlihat R2 dipilih sebagai jalur bestnya

```
IDN-R1(config-route-map)#do sh ip route bgp
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 12.12.12.2, 00:01:53
```

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#shutdown
```

```
IDN-R1(config-if)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  4.4.4.4/32       13.13.13.3                             0 23 4 i
```

Ketika link arah R2 mati, kemudian failover menggunakan backupnya (R3)

Sekarang kita tes kembali dengan mengaktifkan interface arah R2

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#no shutdown
```

Cek BGP route nya, dan terlihat Best Next hopnya adalah kembali ke main linknya R2

```
IDN-R1(config-if)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  4.4.4.4/32       12.12.12.2                           100 23 4 i
 *                    13.13.13.3                             0 23 4 i
```

```
IDN-R1(config-if)#do sh ip route bgp
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 12.12.12.2, 00:00:20
```

Sekarang jalur kembali menggunakan main linknya kembali yakni melalui R2.

Selain mengatur trafic keluar, kita juga bisa mengatur traffic yang masuk ke network kita.

Konfigurasikan di R1, agar traffic menuju ke network internal kita, datangnya melalui R3 yang diset nilai metric nya lebih rendah (100) dibanding R2 (110)

```
IDN-R1(config)#access-list 1 permit 1.1.1.1

IDN-R1(config)#route-map R2MED permit 10
IDN-R1(config-route-map)#match ip address 1
IDN-R1(config-route-map)#set metric 110

IDN-R1(config)#route-map R3MED permit 10
IDN-R1(config-route-map)#match ip address 1
IDN-R1(config-route-map)#set metric 100

IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 route-map R2MED out
IDN-R1(config-router)#neighbor 13.13.13.3 route-map R3MED out
```

```
IDN-R2(config-router)#network 23.23.23.0 mask 255.255.255.0
```

Verifikasi dari R3 ke network internal kita R1 (1.1.1.1)

```
IDN-R3(config-router)#do sh ip route 1.1.1.1
Routing entry for 1.1.1.1/32
  Known via "bgp 23", distance 20, metric 100
  Tag 1, type external
  Last update from 13.13.13.1 00:07:37 ago
  Routing Descriptor Blocks:
  * 13.13.13.1, from 13.13.13.1, 00:07:37 ago
      Route metric is 100, traffic share count is 1
      AS Hops 1
      Route tag 1
      MPLS label: none
```

```
IDN-R2(config-router)#do sh ip bgp 1.1.1.1
BGP routing table entry for 1.1.1.1/32, version 7
Paths: (2 available, best #1, table default)
  Advertised to update-groups:
     1
  Refresh Epoch 1
  1
    13.13.13.1 from 23.23.23.3 (3.3.3.3)
      Origin IGP, metric 100, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
  Refresh Epoch 2
  1
    12.12.12.1 from 12.12.12.1 (1.1.1.1)
      Origin IGP, metric 110, localpref 100, valid, external
      rx pathid: 0, tx pathid: 0
```

Bahkan dari router R2 sekalipun untuk menuju ke R1 harus melalui R3 terlebih dahulu.
Seperti yang terlihat diatas, maka dari R2 (AS 23) untuk menuju ke R1(AS1) akan melalui R3 terlebih dahulu.

Cek trace route

```
IDN-R2(config)#do traceroute 1.1.1.1
Type escape sequence to abort.
Tracing the route to 1.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 23.23.23.3 0 msec 0 msec 0 msec
  2 13.13.13.1 1 msec 0 msec 1 msec
```

Selain menggunakan attribute MED, kita juga bisa menggunakan attribute AS-Path
Hapus dulu konfigurasi MED sebelumnya.

Kemudian kita konfigurasikan AS-path, yakni dengan mengulang ulang nilai AS 1 agar seolah olah jalurnya lebih panjang sehingga tidak dipilih

```
IDN-R1(config)#route-map as-prepend
IDN-R1(config-route-map)#set as-path prepend 1 1 1

IDN-R1(config)#router bgp 1
IDN-R1(config-router)#no neighbor 12.12.12.2 route-map R2MED out
IDN-R1(config-router)#no neighbor 13.13.13.3 route-map R3MED out
IDN-R1(config-router)#neighbor 12.12.12.2 route-map as-prepend out
```

Verifikasi bgp route nya dan terlihat pathnya

```
IDN-R2(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 1.1.1.1/32       13.13.13                 0    100      0 1 i
 *                    12.12.12.1               0             0 1 1 1 1 i
 * i 4.4.4.4/32       34.34.34.4               0    100      0 4 i
 *>                   24.24.24.4               0             0 4 i
 *>i 13.13.13.0/24    23.23.23.3               0    100      0 i
 *>  23.23.23.0/24    0.0.0.0                  0         32768 i
```

```
IDN-R2(config)#do sh ip bgp 1.1.1.1
BGP routing table entry for 1.1.1.1/32, version 11
Paths: (2 available, best #1, table default)
  Advertised to update-groups:
     1
  Refresh Epoch 1
  1
    13.13.13.1 from 23.23.23.3 (3.3.3.3)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      rx pathid: 0, tx pathid: 0x0
  Refresh Epoch 2
  1 1 1 1
    12.12.12.1 from 12.12.12.1 (1.1.1.1)
      Origin IGP, metric 0, localpref 100, valid, external
      rx pathid: 0, tx pathid: 0
```

Test traceroute

```
IDN-R2(config)#do traceroute 1.1.1.1
Type escape sequence to abort.
Tracing the route to 1.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 23.23.23.3 1 msec 1 msec 0 msec
  2 13.13.13.1 1 msec 0 msec 0 msec
```

```
IDN-R4#show ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *   1.1.1.1/32       24.24.24.2                             0 23 1 i
 *>                   34.34.34.3                             0 23 1 i
 *>  4.4.4.4/32       0.0.0.0                  0         32768 i
 *   13.13.13.0/24    24.24.24.2                             0 23 i
 *>                   34.34.34.3               0             0 23 i
 *   23.23.23.0/24    34.34.34.3                             0 23 i
 *>                   24.24.24.2               0             0 23 i
```

```
IDN-R4(config)#do trace 1.1.1.1 source lo0
Type escape sequence to abort.
Tracing the route to 1.1.1.1
VRF info: (vrf in name/id, vrf out name/id)
  1 34.34.34.3 0 msec 1 msec 0 msec
  2 13.13.13.1 [AS 23] 1 msec 1 msec 0 msec
```

Selain menggunakan weight dan AS-Path, kita bisa menggunakan local preference untuk menentukan jalur upstream mana yang kita kehendaki.

Hapus dulu konfigurasi AS-Path. Kemudian kita konfigurasikan local preference-nya

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#no neighbor 12.12.12.2 route-map as-prepend
out
IDN-R1(config-router)#no neighbor 12.12.12.2 route-map weight in
```

Kita cek kondisi route semula seperti ini

```
IDN-R1(config)#do sh ip bgp 4.4.4.4
BGP routing table entry for 4.4.4.4/32, version 14
Paths: (2 available, best #2, table default)
  Advertised to update-groups:
     4
  Refresh Epoch 6
  23 4
    12.12.12.2 from 12.12.12.2 (2.2.2.2)
      Origin IGP, localpref 100, valid, external
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 6
  23 4
    13.13.13.3 from 13.13.13.3 (3.3.3.3)
      Origin IGP, localpref 100, valid, external, best
      rx pathid: 0, tx pathid: 0x0
```

```
IDN-R1(config)#do traceroute 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 13.13.13.3 [AS 23] 1 msec 0 msec 0 msec
  2 34.34.34.4 0 msec 1 msec 0 msec
```

Kita konfigurasikan local preference

```
IDN-R1(config)#route-map localpref
IDN-R1(config-route-map)#set local-preference 200

IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 route-map localpref in
```

Cek hasil konfigurasi, dan bandingkan dengan hasil sebelumnya:

```
IDN-R1(config-router)#do sh ip bgp 4.4.4.4
BGP routing table entry for 4.4.4.4/32, version 2
Paths: (2 available, best #2, table default)
  Advertised to update-groups:
     6
  Refresh Epoch 2
  23 4
    13.13.13.3 from 13.13.13.3 (3.3.3.3)
      Origin IGP, localpref 100, valid, external
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 2
  23 4
    12.12.12.2 from 12.12.12.2 (2.2.2.2)
      Origin IGP, localpref 200, valid, external, best
      rx pathid: 0, tx pathid: 0x0
```

```
IDN-R1(config-router)#do trace 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 0 msec 1 msec 0 msec
  2 24.24.24.4 1 msec 0 msec 1 msec
```

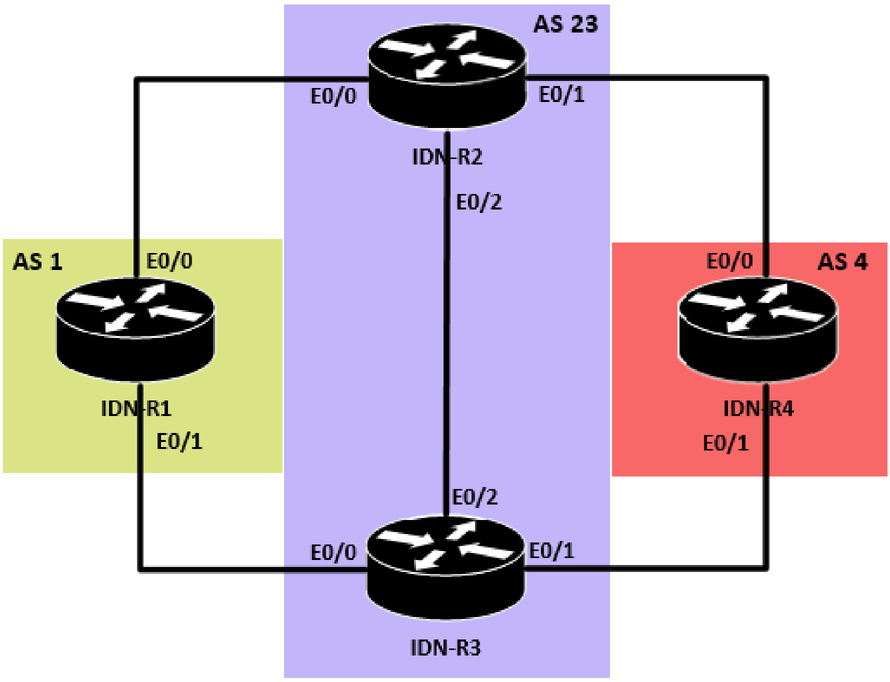
Tampak sekarang dari R1 menuju R4 melewati R2 karena memiliki local preference yang lebih tinggi.

Lab 17. BGP Multihoming – 2 ISP Sama – Load Balancing

Tujuan Lab:

- Mempelajari BGP load balancing
- Mempelajari BGP maximum path
- Mempelajari BGP unequal load balancing

Topologi Lab:



Metode Lab:

- Masih melanjutkan konfigurasi sebelumnya
- Hapus konfigurasi AS-Path yang digunakan lab sebelumnya
- Konfigurasikan BGP Maximum Path

Verifikasi Lab:

- Pastikan traffic dari R1 bisa ke R4 berjalan secara load sharing

BGP secara default hanya akan menggunakan 1 jalur saja. Untuk dapat menggunakan lebih dari satu jalur perlu diset maximum path terlebih dahulu.

Kemudian kita juga bisa menggunakan opsi dmzlink-bw agar bisa melakukan equal dan unequal loadbalancing. Fitur ini akan bekerja dengan prasyarat:

- Prefix harus memiliki attribute yang sama : weight, local preference, origin, MED
- Prefix harus dipelajari melalui iBGP dan eBGP
- Memiliki metric IGP yang sama menuju next-hop router

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#maximum-path ?
  <1-32>  Number of paths
  eibgp   Both eBGP and iBGP paths as multipath
  ibgp    iBGP-multipath

IDN-R1(config-router)#maximum-path 2
IDN-R1(config-router)#do clear ip bgp *
```

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *   4.4.4.4/32       12.12.12.2                             0 23 4 i
 *>                   13.13.13.3                             0 23 4 i
```

Tanda (>) hanya menunjuj ke jalur R3 saja

Namun cek pada tampilan show ip route, muncul 2 jalur yang digunakan

```
IDN-R1(config-router)#do sh ip route bgp
      4.0.0.0/32 is subnetted, 1 subnets
B        4.4.4.4 [20/0] via 13.13.13.3, 00:00:12
                 [20/0] via 12.12.12.2, 00:00:12
```

Hasil traceroute juga melewati 2 jalur

```
IDN-R1(config-router)#do trace 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 0 msec
    13.13.13.3 5 msec
    12.12.12.2 0 msec
  2 34.34.34.4 6 msec
    24.24.24.4 5 msec
    34.34.34.4 5 msec
```

Berikutnya jika link yang dimiliki unequal, misal kedua link memiliki kapasitas bandwidth yang berbeda, maka harus dikonfigurasikan dmzlink-bw.

Kita konfigurasikan dulu bandwidth yang berbeda pada interface dan selanjutnya mengkonfigurasikan dmzlink-bw pada konfigurasi router bgp dan neighbor

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#bandwidth 1024

IDN-R1(config)#int e0/1
IDN-R1(config-if)#bandwidth 4096
```

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#bgp dmzlink-bw
IDN-R1(config-router)#neighbor 12.12.12.2 dmzlink-bw
IDN-R1(config-router)#neighbor 13.13.13.3 dmzlink-bw
IDN-R1(config-router)#do clear ip bgp *
```

```
IDN-R1(config-router)#do sh ip bgp 4.4.4.4
BGP routing table entry for 4.4.4.4/32, version 2
Paths: (2 available, best #2, table default)
Multipath: eBGP
  Advertised to update-groups:
     3
  Refresh Epoch 2
  23 4
    13.13.13.3 from 13.13.13.3 (3.3.3.3)
      Origin IGP, localpref 100, valid, external, multipath(oldest)
      DMZ-Link Bw 512 kbytes
      rx pathid: 0, tx pathid: 0
  Refresh Epoch 2
  23 4
    12.12.12.2 from 12.12.12.2 (2.2.2.2)
      Origin IGP, localpref 100, valid, external, multipath, best
      DMZ-Link Bw 128 kbytes
      rx pathid: 0, tx pathid: 0x0
```

Lakukan ping dari R1 ke R4 untuk menambah paket yang terkirim kemudian cek ip route ke 4.4.4.4 dari R1

```
IDN-R1(config-router)#do ping 4.4.4.4 source lo0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 4.4.4.4, timeout is 2 seconds:
Packet sent with a source address of 1.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/6 ms
```

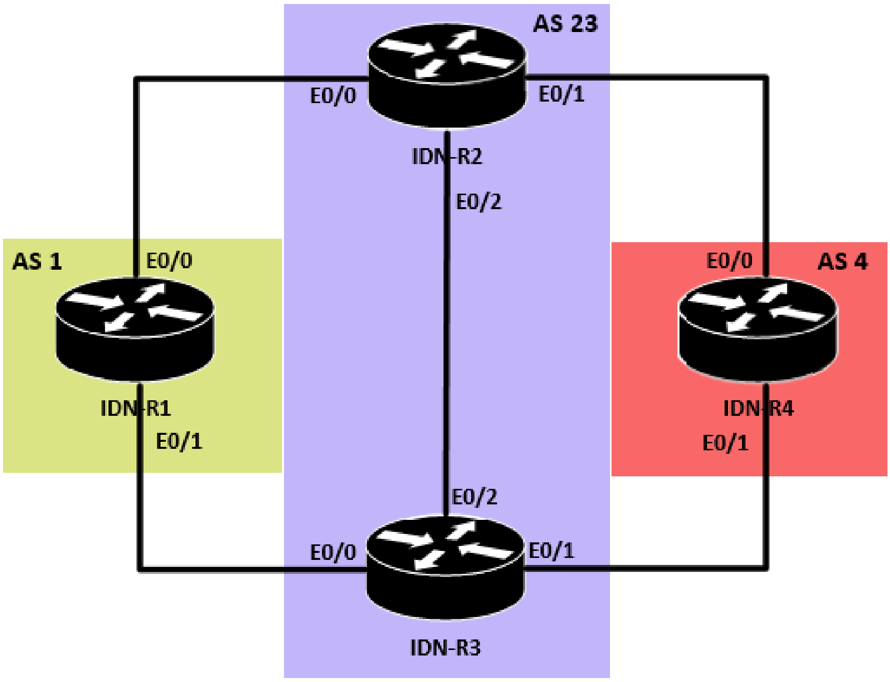
```
IDN-R1(config-router)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "bgp 1", distance 20, metric 0
  Tag 23, type external
  Last update from 12.12.12.2 00:01:15 ago
  Routing Descriptor Blocks:
  * 13.13.13.3, from 13.13.13.3, 00:01:15 ago
      Route metric is 0, traffic share count is 80
      AS Hops 2
      Route tag 23
      MPLS label: none
    12.12.12.2, from 12.12.12.2, 00:01:15 ago
      Route metric is 0, traffic share count is 19
      AS Hops 2
      Route tag 23
      MPLS label: none
```

Lab 18. BGP Multihoming – 2 ISP Berbeda

Tujuan Lab:

- Mempelajari BGP load balancing
- Mempelajari BGP maximum path

Topologi Lab:



Metode Lab:

- Masih melanjutkan konfigurasi sebelumnya
- Hapus konfigurasi AS-Path yang digunakan lab sebelumnya
- Konfigurasikan BGP maximum path

Verifikasi Lab:

- Pastikan traffic dari R1 bisa ke R4 berjalan secara load sharing.

Hapus konfigurasi sebelumnya, kemudian konfigurasikan:

```
IDN-R1(config)#no router bgp 1
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#neighbor 13.13.13.3 remote-as 3
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
IDN-R1(config-router)#maximum-paths 2
```

```
IDN-R2(config)#no router bgp 23
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#neighbor 24.24.24.4 remote-as 4
```

```
IDN-R3(config)#no router bgp 23
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 13.13.13.1 remote-as 1
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#neighbor 34.34.34.4 remote-as 4
```

```
IDN-R4(config)#no router bgp 4
IDN-R4(config)#router bgp 4
IDN-R4(config-router)#neighbor 24.24.24.2 remote-as 2
IDN-R4(config-router)#neighbor 34.34.34.3 remote-as 3
IDN-R4(config-router)#network 4.4.4.4 mask 255.255.255.255
```

Hasilnya pada BGP route di R1, muncul 2 jalur next hop menuju 4.4.4.4, namun tidak load balancing

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *   4.4.4.4/32       13.13.13.3                             0 3 4 i
 *>                   12.12.12.2                             0 2 4 i
```

```
IDN-R1(config-router)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "bgp 1", distance 20, metric 0
  Tag 2, type external
  Last update from 12.12.12.2 00:03:12 ago
  Routing Descriptor Blocks:
  * 12.12.12.2, from 12.12.12.2, 00:03:12 ago
      Route metric is 0, traffic share count is 1
      AS Hops 2
      Route tag 2
      MPLS label: none
```

```
IDN-R1(config)#do trace 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 1 msec 0 msec
  2 24.24.24.4 1 msec 0 msec 1 msec
```

Terlihat diatas bahwa walau sudah dikonfigurasikan maximum-path 2 namun tetap saja tidak load sharing, melainkan hanya berfungsi sebagai main backup saja.

Agar dapat load sharing melalui 2 IDP berbeda gunakan perintah bgp bestpath as-path multipath-relax yang jika digunakan (?) tanda tanya perintah tersebut tidak muncul namun kalu diketikan perintah tersebut akan dijalankan tidak valid.

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#bgp bestpath as-path multipath-relax
IDN-R1(config-router)#do clear ip bgp *
```

```
IDN-R1(config-router)#do sh ip bgp
BGP table version is 3, local router ID is 1.1.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i
- internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f
RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
```

Cek di IDN-R1 sudah muncul via 2 jalur

```
IDN-R1(config-router)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "bgp 1", distance 20, metric 0
  Tag 2, type external
  Last update from 13.13.13.3 00:19:26 ago
  Routing Descriptor Blocks:
    13.13.13.3, from 13.13.13.3, 00:19:26 ago
      Route metric is 0, traffic share count is 1
      AS Hops 2
      Route tag 2
      MPLS label: none
  * 12.12.12.2, from 12.12.12.2, 00:19:26 ago
      Route metric is 0, traffic share count is 1
      AS Hops 2
      Route tag 2
      MPLS label: none
```

Kalau ditraceroute juga sudah via 2 jalur tersebut

```
IDN-R1(config-router)#do traceroute 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 0 msec
    13.13.13.3 0 msec
    12.12.12.2 1 msec
  2 34.34.34.4 0 msec
    24.24.24.4 0 msec
    34.34.34.4 1 msec
```

Ok sekarang sudah load-sharing, permasalahan berikutnya adalah seandainya bandwidth antara kedua link tersebut adalah berbeda, maka bagaiman proses sharing antar kedua link tersebut

```
IDN-R1(config)#int e0/0
IDN-R1(config-if)#bandwidth 100

IDN-R1(config)#int e0/1
IDN-R1(config-if)#bandwidth 200
```

```
IDN-R1(config-router)#do sh ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "bgp 1", distance 20, metric 0
  Tag 2, type external
  Last update from 13.13.13.3 00:19:26 ago
  Routing Descriptor Blocks:
    13.13.13.3, from 13.13.13.3, 00:19:26 ago
      Route metric is 0, traffic share count is 1
      AS Hops 2
      Route tag 2
      MPLS label: none
  * 12.12.12.2, from 12.12.12.2, 00:19:26 ago
      Route metric is 0, traffic share count is 1
      AS Hops 2
      Route tag 2
      MPLS label: none
```

Ternyata masih 1:1 padahal bandwidthnya berbeda tentunya hal tersebut akan memunculkan permasalahan, terutama bila link satu dengan link lainnya bandwidthnya terpaut jauh.

Untuk itu konfigurasikan berikut

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#bgp dmzlink-bw
IDN-R1(config-router)#neighbor 12.12.12.2 dmzlink-bw
IDN-R1(config-router)#neighbor 13.13.13.3 dmzlink-bw
```

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  4.4.4.4/32       12.12.12.2                             0 2 4 i
 *m                   13.13.13.3                             0 3 4 i
```

```
IDN-R1(config)#do sh ip cef 4.4.4.4 internal
4.4.4.4/32, epoch 0, flags [rnolbl, rlbls], RIB[B], refcnt 5, per-
destination sharing
  sources: RIB
  feature space:
    IPRM: 0x00018000
  ifnums:
    Ethernet0/0(3): 12.12.12.2
    Ethernet0/1(4): 13.13.13.3
  path list F321E8FC, 3 locks, per-destination, flags 0x269 [shble,
rif, rcrsv, hwcn, bgp]
    path F5D590F4, share 23/23, type recursive, for IPv4
      recursive via 12.12.12.2[IPv4:Default], fib F4DD5BEC, 1
terminal fib, v4:Default:12.12.12.2/32
      path list F321E9EC, 2 locks, per-destination, flags 0x49
[shble, rif, hwcn]
          path F5D59294, share 1/1, type adjacency prefix, for IPv4
            attached to Ethernet0/0, IP adj out of Ethernet0/0, addr
12.12.12.2 F44AA7C0
    path F5D5915C, share 48/48, type recursive, for IPv4
      recursive via 13.13.13.3[IPv4:Default], fib F4DD5B68, 1
terminal fib, v4:Default:13.13.13.3/32
      path list F321E99C, 2 locks, per-destination, flags 0x49
[shble, rif, hwcn]
          path F5D5922C, share 1/1, type adjacency prefix, for IPv4
            attached to Ethernet0/1, IP adj out of Ethernet0/1, addr
13.13.13.3 F44AA690
  output chain:
    loadinfo F3A547A8, per-session, 2 choices, flags 0003, 5 locks
      flags [Per-session, for-rx-IPv4]
      16 hash buckets
        < 0 > IP adj out of Ethernet0/0, addr 12.12.12.2 F44AA7C0
        < 1 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        < 2 > IP adj out of Ethernet0/0, addr 12.12.12.2 F44AA7C0
        < 3 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        < 4 > IP adj out of Ethernet0/0, addr 12.12.12.2 F44AA7C0
        < 5 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        < 6 > IP adj out of Ethernet0/0, addr 12.12.12.2 F44AA7C0
        < 7 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        < 8 > IP adj out of Ethernet0/0, addr 12.12.12.2 F44AA7C0
        < 9 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <10 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <11 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <12 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <13 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <14 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
        <15 > IP adj out of Ethernet0/1, addr 13.13.13.3 F44AA690
```

Seperti yang terlihat, sekarang load sharingnya sudah dalam perbandingan yang baik e0/1 lebih sering dipilih untuk mengirimkan traffic sehingga kedua link tersebut bisa di gunakan sesuai kemampuannya.

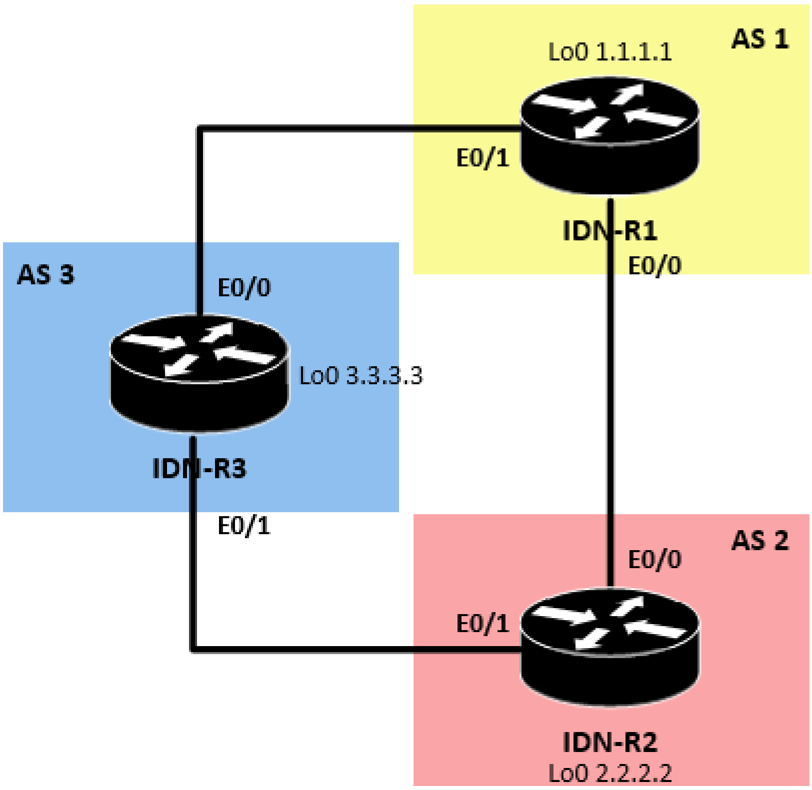
```
IDN-R1(config)#do trace 4.4.4.4 source lo0
Type escape sequence to abort.
Tracing the route to 4.4.4.4
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 0 msec 1 msec
  2 24.24.24.4 0 msec 0 msec 1 msec
```

Lab 19. BGP Backdoor

Tujuan Lab:

- Mempelajari BGP backdoor, dimana router akan lebih memilih route IGP dibandingkan BGP
- BGP memiliki AD 20 sedangkan OSPF 110

Topologi Lab:



Pada kondisi diatas, yang diinginkan link utamanya adalah melalui OSPF, dan kemudian melalui BGP sebagai link backupnya. Namun demikian kondisi defaultnya Karena AD BGP lebih rendah dari OSPF sehingga malah jalurnya lewat BGP. Untuk itu kita perlu konfigurasikan BGP backdoor.

Metode Lab:

- Gunakan pengalamatan IP standar IDN untuk topologi diatas
- R1-R3 dan R2-R3 menggunakan routing protocol BGP, sedangkan R1-R2 menggunakan OSPF

- Konfigurasikan BGP backdoor agar router R1 menuju R2 lebih memilih OSPF daripada BGP

Verifikasi Lab:

- Pastikan traffic dari R1 ke R2, melalui route ospf.

Konfigurasikan seperti berikut

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 13.13.13.3 remote-as 3
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 13.13.13.1 remote-as 1
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

```
IDN-R1(config)#router ospf 1
IDN-R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R1(config-router)#network 1.1.1.1 0.0.0.0 area 0
```

```
IDN-R2(config)#router ospf 2
IDN-R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
IDN-R2(config-router)#network 2.2.2.2 0.0.0.0 area 0
```

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255 backdoor
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255 backdoor
```

Cek hasil konfigurasi

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       13.13.13.3                             0 3 2 i
 *>  3.3.3.3/32       13.13.13.3               0             0 3 i
```

Dari R1 menuju ke R2 melalui jalur BGP (lewat R3)

```
IDN-R1(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
B        2.2.2.2 [20/0] via 13.13.13.3, 00:14:17
      3.0.0.0/32 is subnetted, 1 subnets
B        3.3.3.3 [20/0] via 13.13.13.3, 00:28:00
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
```

```
IDN-R1(config-router)#do trace 2.2.2.2 source lo0
Type escape sequence to abort.
Tracing the route to 2.2.2.2
VRF info: (vrf in name/id, vrf out name/id)
  1 13.13.13.3 1 msec 0 msec 0 msec
  2 23.23.23.2 1 msec 0 msec 1 msec
```

Terlihat diatas bahwa dari R1 menuju loopback R2 melewati R3 dulu, lebih memilih BGP (AD 20)

Konfigurasikan bgp backdoor pada R1 dan R2

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255 backdoor
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255 backdoor
```

Cek hasil konfigurasi

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 r>  2.2.2.2/32       13.13.13.3                             0 3 2 i
 *>  3.3.3.3/32       13.13.13.3               0             0 3 i
```

```
IDN-R1(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:03:07, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
B        3.3.3.3 [20/0] via 13.13.13.3, 00:39:27
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      13.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        13.13.13.0/24 is directly connected, Ethernet0/1
L        13.13.13.1/32 is directly connected, Ethernet0/1
```

Terlihat diatas sekarang langsung ke R2 (melalui OSPF) bukan lewat R3 (BGP)

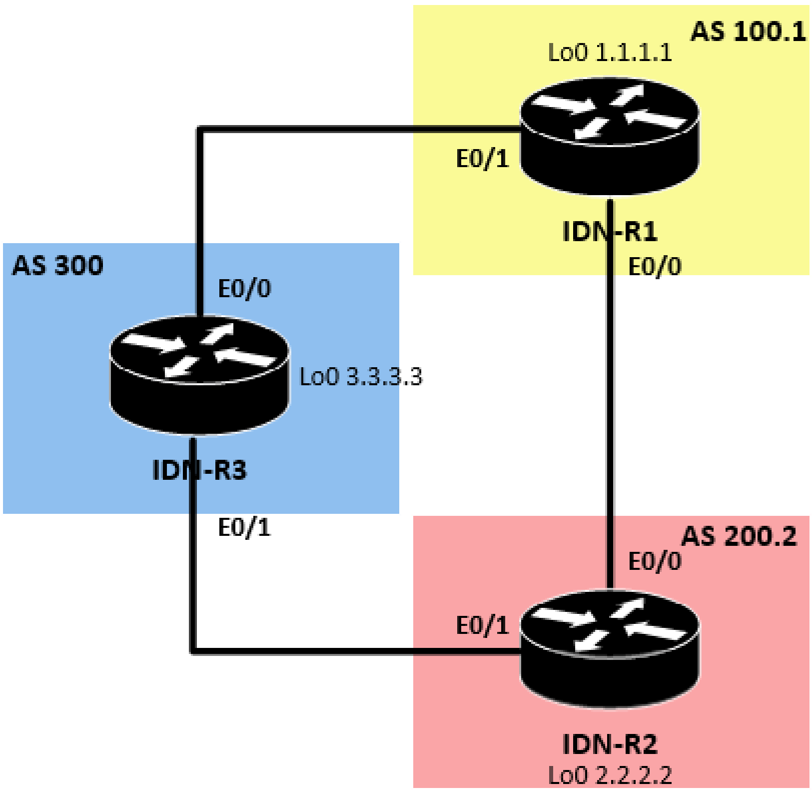
```
IDN-R1(config-router)#do trace 2.2.2.2 source lo0
Type escape sequence to abort.
Tracing the route to 2.2.2.2
VRF info: (vrf in name/id, vrf out name/id)
  1 12.12.12.2 1 msec 0 msec 0 msec
```

Lab 20. BGP AS Number 32 Bit

Tujuan Lab:

- Mempelajari konfigurasi BGP menggunakan ASNumber 32 bit
- Mengantisipasi semakin menipisnya jumlah ASn yang tersedia, maka seperti halnya dirumuskannya IPv6, dirumuskan pula ASN 32 bit.
- Memperlajari interkoneksi router 32 bit dengan 16 bit

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas dengan addressing standar IDN
- R1 dan R2 menggunakan ASN 32 bit
- R3 menggunakan ASN 16 bit
- Konfigurasi BGP di semua router

Verifikasi Lab:

- Pastikan semua IP loopback bisa saling ping

32 bit ASN extend the pool:

- 0-65535 diperluas menjadi 0-4294967295
- Representation range 65536-4294967295
    - Kebanyakan operator menyukai format tradisional
    - Hanya Sedikit yang menggunakan notasi dot (X,Y)
        - AS dot untuk 65535-4294967295, contoh 2.4
        - AS dot+ untuk 0-4294967295, contoh 0.64513

Berikut konfigurasi

```
IDN-R1(config)#router bgp 100.1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 200.2
IDN-R1(config-router)#neighbor 13.13.13.3 remote-as 300
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 200.2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 100.1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 300
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

Konfigurasi R3 menggunakan ASN 16 bit

```
IDN-R3(config)#router bgp 300
IDN-R3(config-router)#neighbor 13.13.13.1 remote-as 100.1
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 200.2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Cek neighbor

```
IDN-R1(config-router)#do sh ip bgp summ
BGP router identifier 1.1.1.1, local AS number 6553601
BGP table version is 3, main routing table version 3
2 network entries using 288 bytes of memory
3 path entries using 240 bytes of memory
3/2 BGP path/bestpath attribute entries using 456 bytes of memory
2 BGP AS-PATH entries using 48 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 1032 total bytes of memory
BGP activity 2/0 prefixes, 3/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ
Up/Down  State/PfxRcd
12.12.12.2      4     13107202       5       6        3    0    0
00:01:20        1
13.13.13.3      4     19660803       5       8        3    0    0
00:00:49
```

Test ping

```
IDN-R1(config)#do ping 2.2.2.2 source lo0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
Packet sent with a source address of 1.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/5 ms
```

```
IDN-R1(config)#do ping 3.3.3.3 source lo0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 3.3.3.3, timeout is 2 seconds:
Packet sent with a source address of 1.1.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/5 ms
```

```
IDN-R3(config)#do ping 1.1.1.1 source lo0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 1.1.1.1, timeout is 2 seconds:
Packet sent with a source address of 3.3.3.3
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/3/5 ms
```

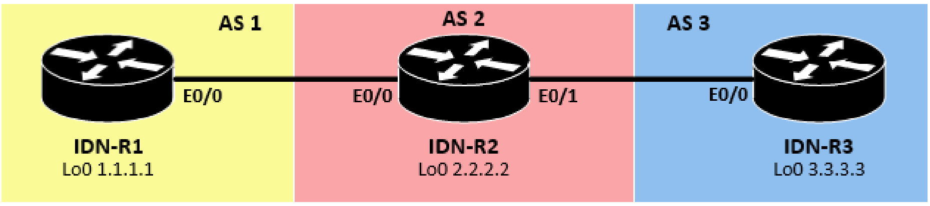
```
IDN-R3(config)#do ping 2.2.2.2 source lo0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2.2.2.2, timeout is 2 seconds:
Packet sent with a source address of 3.3.3.3
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 5/5/6 ms
```

Lab 21. BGP Filtering

Tujuan Lab:

- Mempelajari filtering route pada BGP

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas addressing standar IDN
- Konfigurasikan eBGP di setiap router menggunakan interface physical
- Buat beberapa loopback di R1 yang nantinya akan diadvertise kedalam BGP
- Filtering dilakukan dengan mengkonfigurasikan access-list dan route-map di R2

Verifikasi Lab:

- Gunakan perintah show ip route dan show ip bgp di R3 sebelum dan sesudah mengkonfigurasi access-list

Konfigurasikan seperti berikut

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Buat IP loopback

```
IDN-R1(config)#int lo1
IDN-R1(config-if)#ip address 10.10.10.1 255.255.255.255
IDN-R1(config-if)#int lo2
IDN-R1(config-if)#ip address 10.10.10.2 255.255.255.255
IDN-R1(config-if)#int lo3
IDN-R1(config-if)#ip address 10.10.10.3 255.255.255.255
IDN-R1(config-if)#int lo4
IDN-R1(config-if)#ip address 10.10.10.4 255.255.255.255
IDN-R1(config-if)#int lo5
IDN-R1(config-if)#ip address 10.10.10.5 255.255.255.255
IDN-R1(config-if)#int lo6
IDN-R1(config-if)#ip address 10.10.10.6 255.255.255.255
```

Advertise IP loopback

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#network 10.10.10.1 mask 255.255.255.255
IDN-R1(config-router)#network 10.10.10.2 mask 255.255.255.255
IDN-R1(config-router)#network 10.10.10.3 mask 255.255.255.255
IDN-R1(config-router)#network 10.10.10.4 mask 255.255.255.255
IDN-R1(config-router)#network 10.10.10.5 mask 255.255.255.255
IDN-R1(config-router)#network 10.10.10.6 mask 255.255.255.255
```

Cek hasilnya pada R3

```
IDN-R3(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
B        1.1.1.1 [20/0] via 23.23.23.2, 00:05:20
      2.0.0.0/32 is subnetted, 1 subnets
B        2.2.2.2 [20/0] via 23.23.23.2, 00:05:20
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 6 subnets
B        10.10.10.1 [20/0] via 23.23.23.2, 00:01:09
B        10.10.10.2 [20/0] via 23.23.23.2, 00:00:39
B        10.10.10.3 [20/0] via 23.23.23.2, 00:00:39
B        10.10.10.4 [20/0] via 23.23.23.2, 00:00:39
B        10.10.10.5 [20/0] via 23.23.23.2, 00:00:08
B        10.10.10.6 [20/0] via 23.23.23.2, 00:00:08
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

Bisa kita lihat, semua IP sudah masuk ke dalam route R3, sekarang kita konfigurasikan bgp filtering route dengan access-list dan route-map di R2

```
IDN-R2(config)#access-list 1 deny 10.10.10.0 0.0.0.254
IDN-R2(config)#access-list 1 permit any
5
IDN-R2(config)#route-map filter_genap
IDN-R2(config-route-map)#match ip address 1
IDN-R2(config-router)#neighbor 23.23.23.3 route-map filter_genap out
```

Untuk verifikasi, kita cek lagi ip route/ip bgp di R3.

```
IDN-R2(config-router)#do clear ip bgp * soft
```

```
IDN-R3(config-router)#do sh ip route
      1.0.0.0/32 is subnetted, 1 subnets
B        1.1.1.1 [20/0] via 23.23.23.2, 00:09:36
      2.0.0.0/32 is subnetted, 1 subnets
B        2.2.2.2 [20/0] via 23.23.23.2, 00:09:36
      3.0.0.0/32 is subnetted, 1 subnets
C        3.3.3.3 is directly connected, Loopback0
      10.0.0.0/32 is subnetted, 3 subnets
B        10.10.10.1 [20/0] via 23.23.23.2, 00:05:25
B        10.10.10.3 [20/0] via 23.23.23.2, 00:04:55
B        10.10.10.5 [20/0] via 23.23.23.2, 00:04:24
      23.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        23.23.23.0/24 is directly connected, Ethernet0/0
L        23.23.23.3/32 is directly connected, Ethernet0/0
```

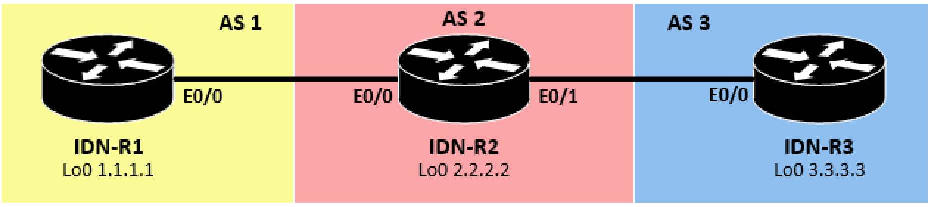
Hasilnya setelah IP yang genap kita deny, maka ip ganjil saja yang muncul seperti tampilan diatas.

Lab 22. BGP Conditional Default Route

Tujuan Lab:

- Mempelajari metode mengadvertise default route ke dalam BGP dengan suatu kondisi tertentu yang diinginkan, yakni hanya jika link R2-R3 UP

Topologi Lab:



Metode Lab:

- Buat topologi seperti diatas dan addressing standard IDN
- Konfigurasikan eBGP peers menggunakan interface physicalnya
- Buat IP loopback di IDN-R1 dan IDN-R2 untuk diadvertise ke BGP
- Konfigurasikan BGP conditional advertise di IDN-R2

Verifikasi Lab:

- Ce kip bgp di R3 sebelum dan sesudah konfigurasi bgp conditional advertise, gunakan perintah show ip bgp

Buat peer antara R2 dan R3

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
```

Advertise default route ke R1 hanya pada kondisi link R2-R3 nya berstatus UP

```
IDN-R2(config)#ip prefix-list LINK_R2-R3 seq 10 permit 23.23.23.0/24

IDN-R2(config)#route-map defroute
IDN-R2(config-route-map)#match ip address prefix-list defroute
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 default-originate route-
```

Verifikasi

```
IDN-R1(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  0.0.0.0          12.12.12.2                             0 2 i
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0             0 2 i
```

Seperti terlihat diatas terdapat default route yyang diberikan oleh R2 (12.12.12.2)

Sekarang kita shutdown link R2 – R3

```
IDN-R3(config)#int e0/0
IDN-R3(config-if)#shutdown
```

```
IDN-R2(config)#int e0/1
IDN-R2(config-if)#shutdown
```

Setelah R2-R3 di shutdown, pastikan R1 tidak mendapat adefault route lagi.

```
IDN-R1(config)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0             0 2 i
```

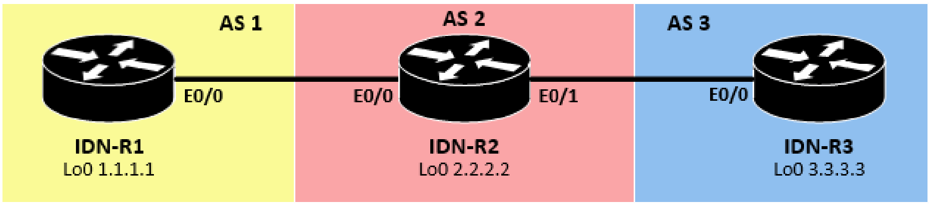
Aktifkan kembali interface dan pastikan mendapat default routenya lagi.

Lab 23. BGP Local AS

Tujuan Lab:

- Mempelajari BGP local-as

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas addressing standar IDN
- Konfigurasikan ip address standar idn
- Konfigurasikan ebgp peer interface fisik sesuai AS nya masing-masing
- Selanjutnya ISP-R1 dan ISP-R2 merger,sehingga menjadi AS-12 untuk kedua router tersebut
- Router ISP-R3 tidak menginginkan perubahan peer neighbor dari remote-as 2 menjadi remote-as 12
- Konfigurasikan local-as

Verifikasi Lab:

- Pastikan setelah AS1 dan AS2 merger menjadi AS12, AS3 tetap dapat berkomunikasi dan saling bertukar routing update dengan route pada bgp AS 12.

Konfigurarikan seperti berikut

```
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#router bgp 3
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Verifikasi neighbor

```
IDN-R1(config-router)#do sh ip bgp summary

Neighbor     V       AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
12.12.12.2   4         2       5       5        2    0    0 00:01:20
1
```

```
IDN-R2(config-router)#do sh ip bgp summary

Neighbor     V         AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
12.12.12.1   4         1       6       6        3    0    0 00:02:32
1
23.23.23.3   4         3       4       7        3    0    0 00:00:12
0
```

```
IDN-R3(config-router)#do sh ip bgp summ

Neighbor    V       AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
23.23.23.2  4        2       7       4        3    0    0 00:00:42
2
```

Selanjutnya R1 dan R2 merger sehingga ASnya menjadi AS 12

```
IDN-R1(config)#no router bgp 1
IDN-R1(config)#router bgp 12
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 12
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#no router bgp 2
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 12
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 3
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

Pada R2 konfigurasikan local-as 2 terhadap R3

```
IDN-R2(config)#router bgp 12
IDN-R2(config-router)#neighbor 23.23.23.3 local-as 2
```

Cek di sisi R1, masih ada AS-Path 2 disitu, mestinya AS 2 hanya untuk R3 saja

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>i 2.2.2.2/32       12.12.12.2               0    100      0 i
 * i 3.3.3.3/32       23.23.23.3               0    100      0 2 3 i
```

Cek pada R2 juga masih sama, terdapat AS-Path 2 nya

```
IDN-R2(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 1.1.1.1/32       12.12.12.1               0    100      0 i
 *>  2.2.2.2/32       0.0.0.0                  0         32768 i
 *>  3.3.3.3/32       23.23.23.3               0             0 2 3 i
```

```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop           Metric LocPrf Weight Path
 *>  1.1.1.1/32       23.23.23.2                             0 2 12 i
 *>  2.2.2.2/32       23.23.23.2              0              0 2 12 i
 *>  3.3.3.3/32       0.0.0.0                 0          32768 i
```

Meski BGP nya sudah UP, hanya saja AS 2 masih terlihat dan masih diadvertise kemana-mana. Untuk itu konfigurasikan no prepend berikut

```
IDN-R2(config-router)#neighbor 23.23.23.3 local-as 2 no-prepend
```

Hasilnya AS 2 sudah tidak lagi ada di R1 dan R2 hanya ada di IDN-R3 saja

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>i 2.2.2.2/32       12.12.12.2               0    100      0 i
 * i 3.3.3.3/32       23.23.23.3               0    100      0 3 i
```

```
IDN-R2(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>i 1.1.1.1/32       12.12.12.1               0    100      0 i
 *>  2.2.2.2/32       0.0.0.0                  0         32768 i
 *>  3.3.3.3/32       23.23.23.3               0             0 3 i
```

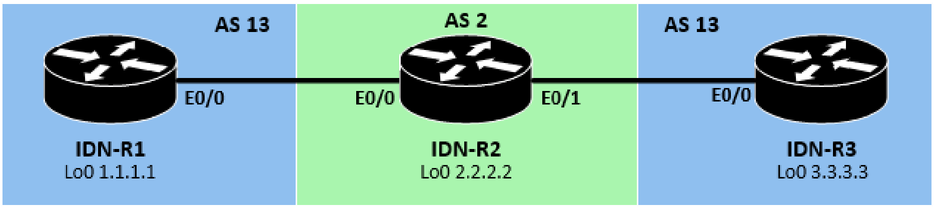
```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       23.23.23.2                             0 2 12 i
 *>  2.2.2.2/32       23.23.23.2               0             0 2 12 i
 *>  3.3.3.3/32        0.0.0.0                 0         32768 i
```

Lab 24. BGP Allowas-In

Tujuan Lab:

- Mempelajari BGP allowas-in, yaitu metode agar BGP mau menerima route eBGP yang sama ASnya
- Secara default BGP akan mereject prefix yang di dalam as-pathnya ada AS sendiri, hal tersebut, dilakukan oleh BGP untuk menghindari routing-loop

Topologi Lab:



Metode Lab:

- Gunakan topologi sebelumnya, dimana skenarionya AS 13 – AS 2 – AS 13
- Secara default R2 akan mereject route dari R3 karena memiliki AS yang sama.
- Konfigurasikan Allowas-in agar R1 menerima prefix dari R3, begitu sebaliknya

Verifikasi Lab:

- Pastikan R1 menerima prefix dari R3, begitu juga sebaliknya

Konfigurasikan seperti berikut

```
IDN-R1(config)#no router bgp 12
IDN-R1(config)#router bgp 13
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#no router bgp 12
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 13
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 13
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#no router bgp 3
IDN-R3(config)#router bgp 13
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Cek bgp neighbor disetiap routernya

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0             0 2 i
```

```
IDN-R2(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       12.12.12.1               0             0 13 i
 *>  2.2.2.2/32       0.0.0.0                  0         32768 i
 *>  3.3.3.3/32       23.23.23.3               0             0 13 i
```

```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  2.2.2.2/32       23.23.23.2               0             0 2 i
 *>  3.3.3.3/32       0.0.0.0                  0         32768 i
```

Bisa kita lihat di R1 tidak memiliki network loopback R3 dan demikian juga sebaliknya. Hal ini dikarenakan BGP akan mereject suatu network dengan AS yang sama yang diadvetise oleh eBGP lain. Untuk itu, salah satu solusinya adalah dengan mengkonfigurasi allowas-in di router yang AS numbernya sama

```
IDN-R1(config-router)#do debug ip bgp update
BGP updates debugging is on for address family: IPv4 Unicast
IDN-R1(config-router)#
*Nov  3 19:46:24.344: BGP: nbr_topo global 12.12.12.2 IPv4
Unicast:base (0xF6047450:1) rcvd Refresh Start-of-RIB
*Nov  3 19:46:24.344: BGP: nbr_topo global 12.12.12.2 IPv4
Unicast:base (0xF6047450:1) refresh_epoch is 2
*Nov  3 19:46:24.346: BGP(0): 12.12.12.2 rcv UPDATE w/ attr: nexthop
12.12.12.2, origin i, originator 0.0.0.0, merged path 2 13, AS_PATH
, community , extended community , SSA attribute
*Nov  3 19:46:24.346: BGPSSA ssacount is 0
*Nov  3 19:46:24.346: BGP(0): 12.12.12.2 rcv UPDATE about 3.3.3.3/32
-- DENIED due to: AS-PATH contains our own AS;
*Nov  3 19:46:24.346: BGP(0): 12.12.12.2 rcv UPDATE w/ attr: nexthop
12.12.12.2, origin i, originator 0.0.0.0
IDN-R1(config-router)#, merged path 2 13, AS_PATH , community ,
extended community , SSA attribute
*Nov  3 19:46:24.346: BGPSSA ssacount is 0
*Nov  3 19:46:24.346: BGP(0): 12.12.12.2 rcv UPDATE about 1.1.1.1/32
-- DENIED due to: AS-PATH contains our own AS;
```

```
IDN-R1(config)#router bgp 13
IDN-R1(config-router)#neighbor 12.12.12.2 allowas-in
```

```
IDN-R3(config)#router bgp 13
IDN-R3(config-router)#neighbor 23.23.23.2 allowas-in
```

Tunggu beberapa saat, lalu cek lagi ip bgp di kedua router tersebut. Pastikan semua ip loopback R1 muncul di R3 dan dimikian juga sebaliknya.

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *   1.1.1.1/32       12.12.12.2                             0 2 13 i
 *>                   0.0.0.0                  0         32768 i
 *>  2.2.2.2/32       12.12.12.2               0             0 2 i
 *>  3.3.3.3/32       12.12.12.2                             0 2 13 i
```

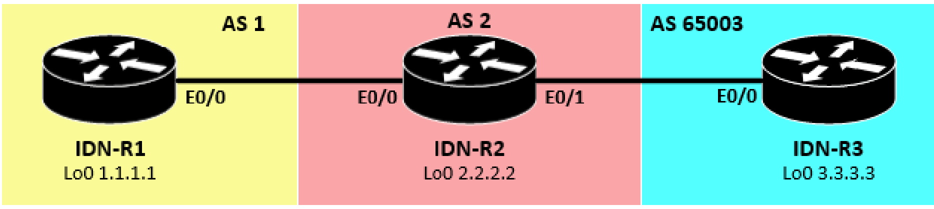
```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       23.23.23.2                             0 2 13 i
 *>  2.2.2.2/32       23.23.23.2               0             0 2 i
 *   3.3.3.3/32       23.23.23.2                             0 2 13 i
 *>                   0.0.0.0                  0         32768 i
```

Lab 25. BGP Remove-Private-AS

Tujuan Lab:

- Mempelajari BGP remove-private-as, yaitu metode agar AS private kita tidak diadvertise ke Provider.
- AS2 merupakan ISP nya R3 yang memiliki private AS 65503

Topologi Lab:



Metode Lab:

- Gunakan topologi diatas gunakan standar IDN
- Konfigurasikan eBGP peers antara IDN-R1 dengan IDN-R2 menggunakan interface physicalnya
- Buat BGP di R3 dengan AS number private
- Buat IP loopback di semua router untuk diadvertise ke BGP
- Konfigurasikan remove-private-as IDN-R2

Verifikasi Lab:

- Pastikan private AS R3 tidak teradvertise via eBGP

Alokasi AS Private:
16 bit : 64512 – 65534
32 bit : 4200000000 - 4294967295

Konfigurasikan seperti berikut

```
IDN-R1(config)#no router bgp 13
IDN-R1(config)#router bgp 1
IDN-R1(config-router)#neighbor 12.12.12.2 remote-as 2
IDN-R1(config-router)#network 1.1.1.1 mask 255.255.255.255
```

```
IDN-R2(config)#no router bgp 2
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remote-as 1
IDN-R2(config-router)#neighbor 23.23.23.3 remote-as 64567
IDN-R2(config-router)#network 2.2.2.2 mask 255.255.255.255
```

```
IDN-R3(config)#no router bgp 13
IDN-R3(config)#router bgp 64567
IDN-R3(config-router)#neighbor 23.23.23.2 remote-as 2
IDN-R3(config-router)#network 3.3.3.3 mask 255.255.255.255
```

Cek ip bgp di R1 dalam kondisi semula

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop         Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0               0         32768 i
 *>  2.2.2.2/32       12.12.12.2            0             0 2 i
 *>  3.3.3.3/32       12.12.12.2                          0 2 64567 i
```

terlihat bahwasanya Private AS 65003 dari R3 teradvertise sampai ke public AS bahkan hingga ke R1

Berikutnya kita akan konfigurasikana agar private as tersebut tidak diadvertise kedalam public as yakni dengan mengkonfigurasikan remove-private as pada router yang memiliki peer ke IDN-R1

```
IDN-R2(config)#router bgp 2
IDN-R2(config-router)#neighbor 12.12.12.1 remove-private-as
```

Tunggu beberapa saat, lalu kita cek kembali di IDN-R1 hasilnya

```
IDN-R1(config-router)#do sh ip bgp

     Network          Next Hop             Metric LocPrf Weight Path
 *>  1.1.1.1/32       0.0.0.0                   0         32768 i
 *>  2.2.2.2/32       12.12.12.2                0             0 2 i
 *>  3.3.3.3/32       12.12.12.2                              0 2 i
```

Sekarang private AS 65003 tidak ikut terbawa ke public AS lagi.

Cek di R3

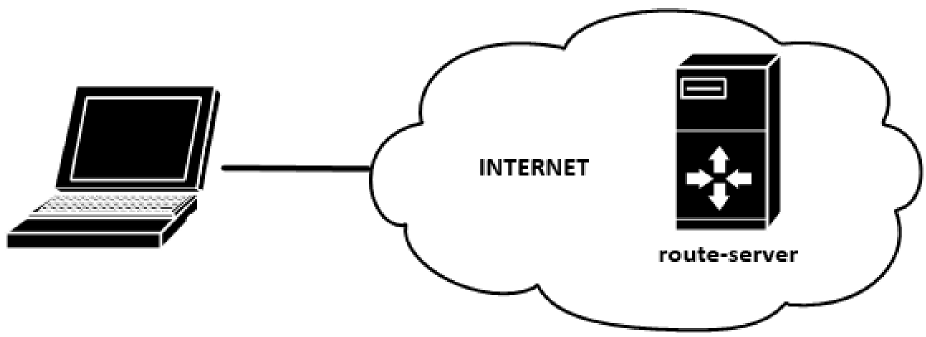
```
IDN-R3(config-router)#do sh ip bgp

     Network          Next Hop            Metric LocPrf Weight Path
 *>  1.1.1.1/32       23.23.23.2                             0 2 1 i
 *>  2.2.2.2/32       23.23.23.2               0             0 2 i
 *>  3.3.3.3/32       0.0.0.0                  0         32768 i
```

Lab 26. BGP Regular Expression

Tujuan Lab:

- Mengenal penggunaan BGP regex untuk keperluan mencari/memfilter suatu route yang diinginkan

Topologi Lab:



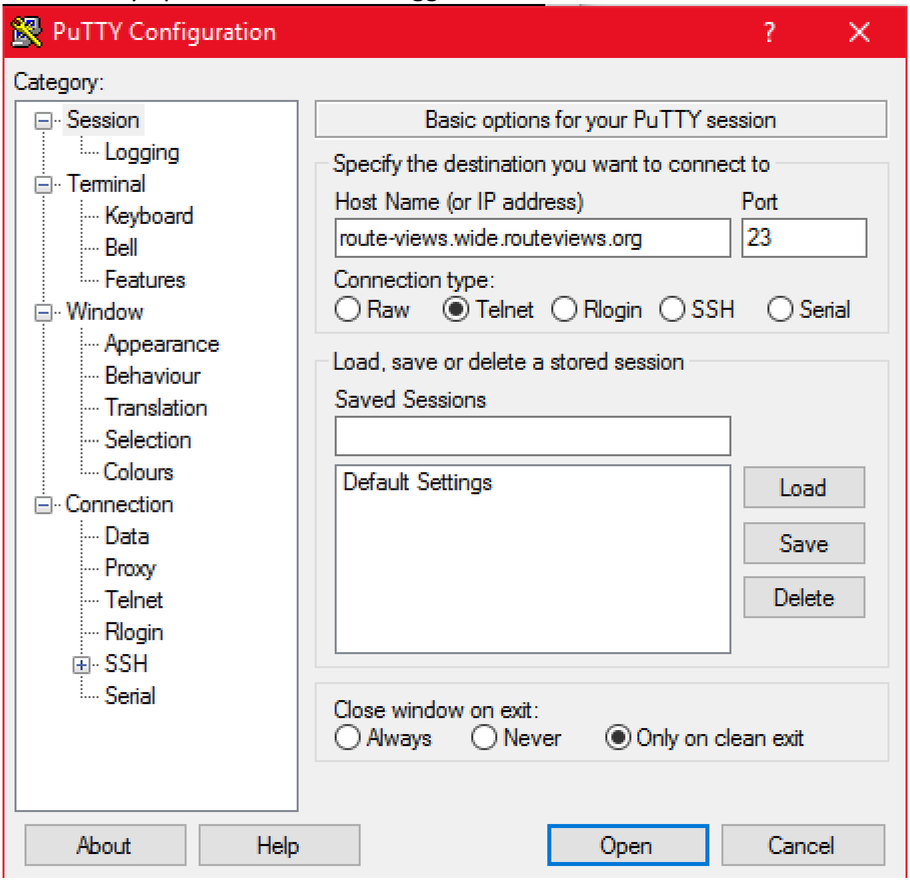
Metode Lab:

- Buka web BGP looking glasses
- Telnet ke salah satu IP server di BGP looking glasses
- Gunakan putty sebagai telnet client
- Cek route server bisa dari sini http://routeserver.org/

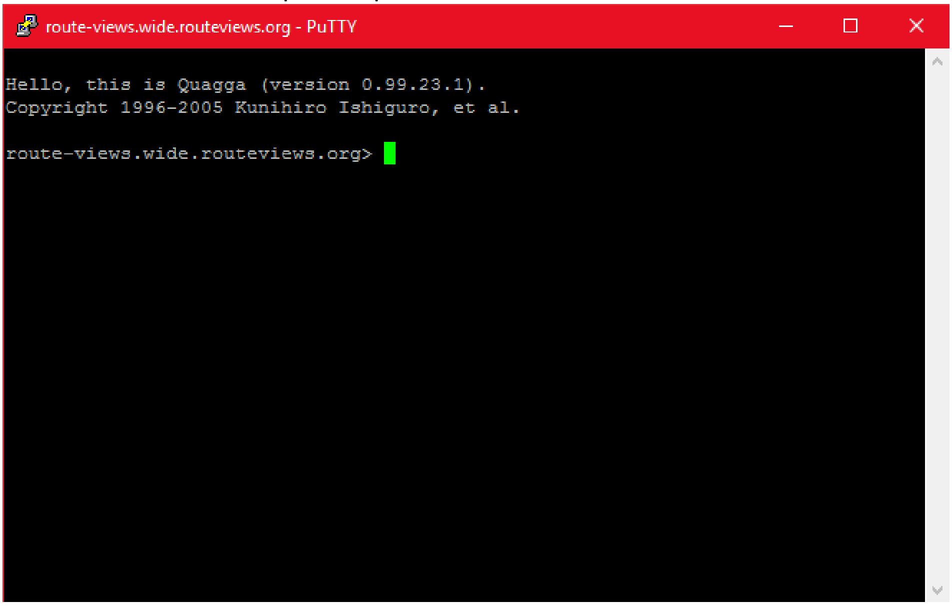
Verifikasi Lab:

- Gunakan command show ip bgp dan regex untuk menampilkan route yang kita inginkan.

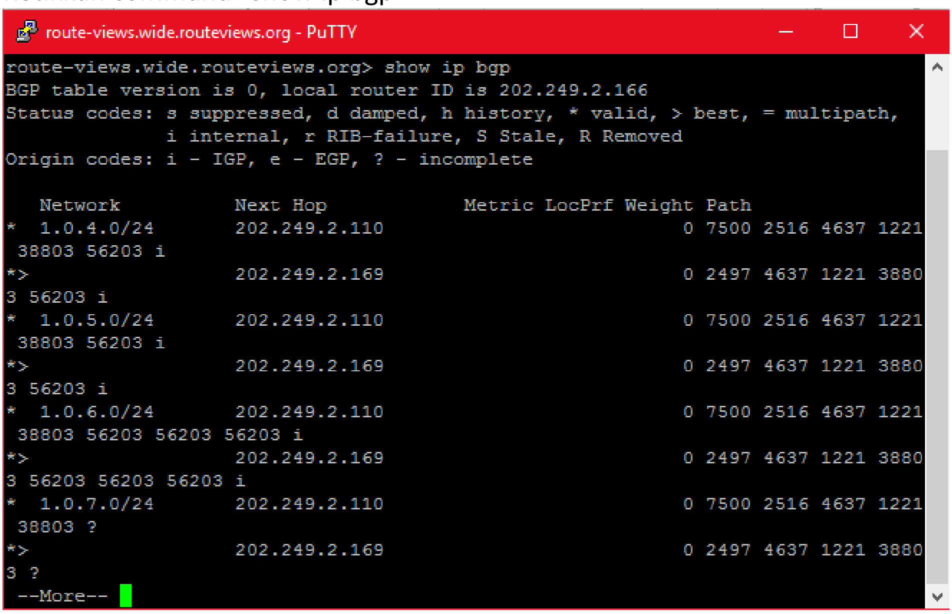
Pilih servernya pada lab ini kita menggunakan route-views.wide.routeviews.org



Maka akan muncul tampilan seperti ini setelah masuk telnet



Ketikkan command “show ip bgp”



Gunakan regexp untuk menampilkan route yang hanya dari AS 2497

Dengan command “show ip bgp ^2497$”

route-views.wide.routeviews.org - PuTTY

```
route-views.wide.routeviews.org> show ip bgp regexp ^2497$
BGP table version is 0, local router ID is 202.249.2.166
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 49.239.64.0/18   202.249.2.169                          0 2497 i
*> 58.138.0.0/17    202.249.2.169                          0 2497 i
*> 58.138.128.0/18  202.249.2.169                          0 2497 i
*> 61.211.96.0/19   202.249.2.169                          0 2497 i
*> 101.128.128.0/17 202.249.2.169                          0 2497 i
*> 103.2.56.0/24    202.249.2.169                          0 2497 i
*> 113.197.128.0/17 202.249.2.169                          0 2497 i
*> 116.118.192.0/20 202.249.2.169                          0 2497 i
*> 118.151.0.0/17   202.249.2.169                          0 2497 i
*> 118.151.128.0/18 202.249.2.169                          0 2497 i
*> 119.10.192.0/18  202.249.2.169                          0 2497 i
*> 121.50.160.0/21  202.249.2.169                          0 2497 i
*> 121.102.0.0/16   202.249.2.169                          0 2497 i
*> 121.200.200.0/21 202.249.2.169                          0 2497 i
*> 124.41.0.0/17    202.249.2.169                          0 2497 i
*> 124.41.128.0/18  202.249.2.169                          0 2497 i
 --More--
```

Terlihat hanya AS 2497 yang terlihat

Selanjutnya gunakan untuk menampilkan route yang berasal dari AS 2497 serta route laindi belakangnya

Dengan command “show ip bgp regexp ^680_

route-views.wide.routeviews.org - PuTTY

```
route-views.wide.routeviews.org> show ip bgp regexp ^2497_
BGP table version is 0, local router ID is 202.249.2.166
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 1.0.4.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 i
*> 1.0.5.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 i
*> 1.0.6.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 56203 56203 i
*> 1.0.7.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 ?
*  1.0.64.0/18      202.249.2.169                          0 2497 7670 7670 7670
 18144 i
*> 1.0.128.0/17     202.249.2.169                          0 2497 38040 9737 i
*> 1.0.128.0/18     202.249.2.169                          0 2497 38040 9737 i
*> 1.0.128.0/19     202.249.2.169                          0 2497 38040 9737 i
*> 1.0.128.0/24     202.249.2.169                          0 2497 38040 23969 ?
*> 1.0.129.0/24     202.249.2.169                          0 2497 38040 23969 ?
*> 1.0.130.0/24     202.249.2.169                          0 2497 38040 23969 ?
 --More--
```

Terlihat AS-path berlanjut dengan AS yang lain setelah AS 2497

Selanjutnya gunakan regexp untuk menampilkan route yg berasal dalam AS 2497
Dengan command _2497$

route-views.wide.routeviews.org - PuTTY

```
route-views.wide.routeviews.org> show ip bgp regexp _2497$
BGP table version is 0, local router ID is 202.249.2.166
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  49.239.64.0/18   202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*  58.138.0.0/17    202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*  58.138.128.0/18  202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*  61.211.96.0/19   202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*  101.128.128.0/17 202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*> 103.2.56.0/24    202.249.2.169                          0 2497 i
*                   202.249.2.169                          0 7500 2497 i
*  113.197.128.0/17 202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
*  116.118.192.0/20 202.249.2.169                          0 7500 2497 i
*>                  202.249.2.169                          0 2497 i
 --More--
```

Selanjutnya regexp untuk menampilkan route AS 2497 ditengah tengah AS Path
Dengan command “show ip bgp regexp _2497_”

route-views.wide.routeviews.org - PuTTY

```
route-views.wide.routeviews.org> show ip bgp regexp _2497_
BGP table version is 0, local router ID is 202.249.2.166
Status codes: s suppressed, d damped, h history, * valid, > best, = multipath,
              i internal, r RIB-failure, S Stale, R Removed
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 1.0.4.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 i
*> 1.0.5.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 i
*> 1.0.6.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 56203 56203 56203 i
*> 1.0.7.0/24       202.249.2.169                          0 2497 4637 1221 3880
3 ?
*  1.0.64.0/18      202.249.2.169                          0 2497 7670 7670 7670
 18144 i
*  1.0.128.0/17     202.249.2.169                          0 7500 2497 38040 973
7 i
*>                  202.249.2.169                          0 2497 38040 9737 i
*> 1.0.128.0/18     202.249.2.169                          0 2497 38040 9737 i
*                   202.249.2.169                          0 7500 2497 38040 973
7 i
 --More--
```

BE THANKFUL FOR THE HARD TIMES, FOR THEY HAVE MADE YOU

MPLS

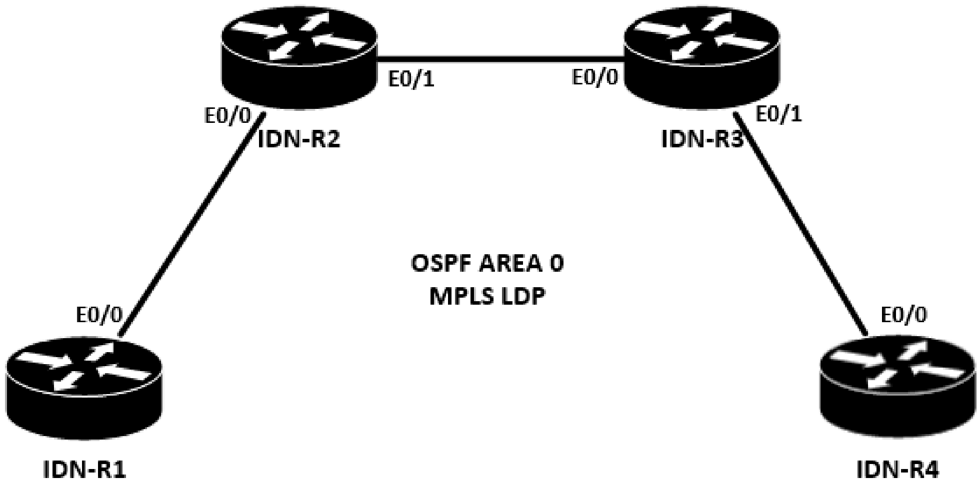
(Multiprotocol Label Switching)

Lab 1. LDP Dasar

Tujuan Lab

- Mempelajari bagaimana mengkonfigurasi LDP dasar
- Mempelajari cara modifikasi LDP timer

Topology Lab:



Metode Lab :

- Gunakan topologi diatas, konfigurasi pengalamatan IP sesuai standard IDN
- Konfigurasi IGP menggunakan OSPF, loopback0 sebagai router-id—nya
- Konfigurasi MPLS label distribution menggunakan LDP pada semua link backto-back antar router
- Jadikan interface loopback0 sebagai MPLS LDP router-id

Verifikasi Lab :

- Pastikan semua ip loopback0 dan ip PTP sudah teradvertise via OSPF
- Pastikan efek dari perubahan LDP timer

Berikut konfigurasinya :

Router IDN-R1

```
interface Loopback0
 ip address 1.1.1.1 255.255.255.255
!
interface Ethernet0/0
 ip address 12.12.12.1 255.255.255.0
!
router ospf 1
 network 1.1.1.1 0.0.0.0 area 0
 network 12.12.12.0 0.0.0.255 area 0
```

Router IDN-R2

```
interface Loopback0
 ip address 2.2.2.2 255.255.255.255
!
interface Ethernet0/0
 ip address 12.12.12.2 255.255.255.0
!
interface Ethernet0/1
 ip address 23.23.23.2 255.255.255.0
!
router ospf 1
 network 2.2.2.2 0.0.0.0 area 0
 network 12.12.12.0 0.0.0.255 area 0
 network 23.23.23.0 0.0.0.255 area 0
```

Router IDN-R3

```
interface Loopback0
 ip address 3.3.3.3 255.255.255.255
!
interface Ethernet0/0
 ip address 23.23.23.3 255.255.255.0
!
interface Ethernet0/1
 ip address 34.34.34.3 255.255.255.0
!
router ospf 1
 network 3.3.3.3 0.0.0.0 area 0
 network 23.23.23.0 0.0.0.255 area 0
 network 34.34.34.0 0.0.0.255 area 0
```

Router IDN-R4

```
interface Loopback0
 ip address 4.4.4.4 255.255.255.255
!
interface Ethernet0/0
 ip address 34.34.34.4 255.255.255.0
!
router ospf 1
 network 4.4.4.4 0.0.0.0 area 0
 network 34.34.34.0 0.0.0.255 area 0
```

Verifikasi

```
IDN-R1#sh ip route ospf
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 05:12:35, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 05:07:24, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
O        4.4.4.4 [110/31] via 12.12.12.2, 05:00:33, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 05:11:01, Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
O        34.34.34.0 [110/30] via 12.12.12.2, 05:00:33, Ethernet0/0
```

```
IDN-R2#sh ip route ospf
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/11] via 12.12.12.1, 05:14:03, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 23.23.23.3, 05:09:00, Ethernet0/1
      4.0.0.0/32 is subnetted, 1 subnets
O        4.4.4.4 [110/21] via 23.23.23.3, 05:01:59, Ethernet0/1
      34.0.0.0/24 is subnetted, 1 subnets
O        34.34.34.0 [110/20] via 23.23.23.3, 05:01:59, Ethernet0/1
```

```
IDN-R3#sh ip route ospf
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/21] via 23.23.23.2, 05:19:47, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 23.23.23.2, 05:19:47, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
O        4.4.4.4 [110/11] via 34.34.34.4, 05:12:56, Ethernet0/1
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/20] via 23.23.23.2, 05:19:47, Ethernet0/0
```

```
IDN-R4#sh ip route ospf
      1.0.0.0/32 is subnetted, 1 subnets
O        1.1.1.1 [110/31] via 34.34.34.3, 05:17:13, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/21] via 34.34.34.3, 05:17:13, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/11] via 34.34.34.3, 05:17:13, Ethernet0/0
      12.0.0.0/24 is subnetted, 1 subnets
O        12.12.12.0 [110/30] via 34.34.34.3, 05:17:13, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 34.34.34.3, 05:17:13, Ethernet0/0
```

Protocol yang berfungsi membuat dan mendistribusikan label ada 2 yaitu LDP dan TDP, TDP (Tag Distribution Protocol) merupakan proprietary cisco namun sudah tidak digunakan lagi. Sekarang router cisco sendiri defaultnya menggunakan ldp.

Perintah “mpls label protocol LDP” apabila dikonfigurasikan di global config mode akan menjadikan semua interface menggunakan LDP sebagai Label distribution protocolnya.

Semua LSR (Label Switch Router) yang menjalankan LDP akan diberikan router-id layaknya OSPF, EIGRP atau BGP, dimana defaultnya akan didasarkan pada IP tertinggi loopback yang ada, jika tidak ada akan menggunakan IP aktif yang tertinggi. Atau bisa juga kita define sendiri menggunakan perintah “mpls ldp router-id”. Sebaiknya, LDP router-id kita konfigurasikan sendiri agar *transport address* mpls-nya stabil.

Perlu diketahui bahwa LDP mengadvertise LDP router-id sebagai transport *transport address* pada LDP discover hello message, yang dikirim dari interface (serupa dengan BGP update source). Oleh karena itu, Anda harus memastikan bahwa router-id itu bisa dijangkau dari router lain dan muncul di table routingnya melalui rute IGP.

Perintah “mpls ip” berfungsi mengaktifkan MPLS forwarding IPv4 paket melalui jalur routingnya.

Konfigurasi mpls ldp di semua router :

```
IDN-R1,R2,R3,R4(config)#mpls label protocol ldp

IDN-R1,R2,R3,R4(config)#mpls ldp router-id loopback 0 force
```

Aktifkan range label pada setiap router :

Pengaktifan range label ini hanya untuk mempermudah kita mempelajari ldp, di real-nya gak perlu kita aktifkan.

```
IDN-R1(config)#mpls label range 100 199
IDN-R2(config)#mpls label range 200 299
IDN-R3(config)#mpls label range 300 399
IDN-R4(config)#mpls label range 400 499
```

Aktifkan MPLS pada setiap interface:

```
IDN-R1(config)#interface ethernet 0/0
IDN-R1(config-if)#mpls ip
```

```
IDN-R2(config)#interface ethernet 0/0
IDN-R2(config-if)#mpls ip
IDN-R2(config)#interface ethernet 0/1
IDN-R2(config-if)#mpls ip
```

```
IDN-R3(config)#interface ethernet 0/0
IDN-R3(config-if)#mpls ip
IDN-R3(config)#interface ethernet 0/1
IDN-R3(config-if)#mpls ip
```

```
IDN-R4(config)#interface ethernet 0/0
IDN-R4(config-if)#mpls ip
```

Cek mpls interface nya

```
IDN-R1(config-if)#do show mpls interfaces
Interface              IP            Tunnel   BGP Static Operational
Ethernet0/0            Yes (ldp)     No       No  No     Yes
```

```
IDN-R2(config-if)#do show mpls interfaces
Interface              IP            Tunnel   BGP Static Operational
Ethernet0/0            Yes (ldp)     No       No  No     Yes
Ethernet0/1            Yes (ldp)     No       No  No     Yes
```

```
IDN-R3(config-if)#do show mpls interfaces
Interface              IP            Tunnel   BGP Static Operational
Ethernet0/0            Yes (ldp)     No       No  No      Yes
Ethernet0/1            Yes (ldp)     No       No  No      Yes
```

```
IDN-R4(config-if)#do show mpls interfaces
Interface              IP            Tunnel   BGP Static Operational
Ethernet0/0            Yes (ldp)     No       No  No      Yes
```

Setelah LSR dikonfigurasikan, maka ia akan melakukan discovery ke semua neighbornya. Discovery ini menggunakan *hello message* via protocol UDP dengan IP 224.0.0.2 port 646 baik source dan destination. Setiap hello message dikirim setiap 5 detik dan hold timer setiap 15 detik.

```
IDN-R1#debug ip packet detail
IP packet debugging is on (detailed)
*Nov 21 18:00:37.301: IP: s=12.12.12.2 (Ethernet0/0), d=224.0.0.5,
len 80, rcvd 0, proto=89
*Nov 21 18:00:40.843:     UDP src=646, dst=646, Logical MN
local(14), rtype 0, forus FALSE, sendself FALSE, mtu 0, fwdchk FALSE
```

Ketika router local menemukan neighbor, anda akan menemukan consol message seperti ini, kita ambil dari R1 :

```
*Nov 21 18:06:52.898: %LDP-5-NBRCHG: LDP Neighbor 2.2.2.2:0 (2) is
```

Penjelasan : LDP menggunakan kuantiti 6 Byte, dimana 4 Byte untuk LDP-ID atau LDP router-id (2.2.2.2), dan 2 byte berikutnya (:0) menunjukkan label space. Ada 2 jenis label space yaitu platform-wide dan per-interface. Untuk *platform-wide* 2 byte terakhirnya selalu bernilai “0” kalau selain “0” maka itu adalah per-interface label space. Pada per-interface label space, paket diforward berdasar interface dan labelnya. Di dalam frame MPLS, label spacenya akan selalu platform-wide dengan nilai 0.

```
IDN-R1#show mpls ldp neighbor
    Peer LDP Ident: 2.2.2.2:0; Local LDP Ident 1.1.1.1:0
        TCP connection: 2.2.2.2.63337 - 1.1.1.1.646
        State: Oper; Msgs sent/rcvd: 10/10; Downstream
        Up time: 00:00:35
        LDP discovery sources:
          Ethernet0/0, Src IP addr: 12.12.12.2
        Addresses bound to peer LDP Ident:
          12.12.12.2      2.2.2.2         23.23.23.2
```

Pada baris kedua output *show mpls ldp neighbor* koneksi TCP diperlihatkan, remote menggunakan nilai port yang tinggi, sedang router local menggunakan port 646.

Kita cek di peer-nya R1 yaitu R2 :

```
IDN-R2#show mpls ldp neighbor 1.1.1.1
    Peer LDP Ident: 1.1.1.1:0; Local LDP Ident 2.2.2.2:0
        TCP connection: 1.1.1.1.646 - 2.2.2.2.63337
        State: Oper; Msgs sent/rcvd: 33/33; Downstream
        Up time: 00:20:59
        LDP discovery sources:
          Ethernet0/0, Src IP addr: 12.12.12.1
        Addresses bound to peer LDP Ident:
          12.12.12.1      1.1.1.1
```

Cek juga di R3

```
IDN-R3#show mpls ldp ne
IDN-R3#show mpls ldp neighbor
    Peer LDP Ident: 4.4.4.4:0; Local LDP Ident 3.3.3.3:0
        TCP connection: 4.4.4.4.24781 - 3.3.3.3.646
        State: Oper; Msgs sent/rcvd: 37/37; Downstream
        Up time: 00:24:13
        LDP discovery sources:
          Ethernet0/1, Src IP addr: 34.34.34.4
        Addresses bound to peer LDP Ident:
          34.34.34.4      4.4.4.4
    Peer LDP Ident: 2.2.2.2:0; Local LDP Ident 3.3.3.3:0
        TCP connection: 2.2.2.2.646 - 3.3.3.3.36965
        State: Oper; Msgs sent/rcvd: 37/38; Downstream
        Up time: 00:24:03
        LDP discovery sources:
          Ethernet0/0, Src IP addr: 23.23.23.2
        Addresses bound to peer LDP Ident:
          12.12.12.2      2.2.2.2         23.23.23.2
```

Untuk melihat discovery hello dan hold time nya :

```
IDN-R1#show mpls ldp discovery detail
 Local LDP Identifier:
    1.1.1.1:0
    Discovery Sources:
    Interfaces:
        Ethernet0/0 (ldp): xmit/recv
            Enabled: Interface config
            Hello interval: 5000 ms; Transport IP addr: 1.1.1.1
            LDP Id: 2.2.2.2:0
              Src IP addr: 12.12.12.2; Transport IP addr: 2.2.2.2
              Hold time: 15 sec; Proposed local/peer: 15/15 sec
              Reachable via 2.2.2.2/32
              Password: not required, none, in use
            Clients: IPv4, mLDP
```

Untuk melihat bagaimana label degenerate dan dipertukarkan dan apa yang digunakan setiap hopnya :

```
IDN-R1#show ip route | b Ga
Gateway of last resort is not set

      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      2.0.0.0/32 is subnetted, 1 subnets
O        2.2.2.2 [110/11] via 12.12.12.2, 00:28:57, Ethernet0/0
      3.0.0.0/32 is subnetted, 1 subnets
O        3.3.3.3 [110/21] via 12.12.12.2, 00:28:57, Ethernet0/0
      4.0.0.0/32 is subnetted, 1 subnets
O        4.4.4.4 [110/31] via 12.12.12.2, 00:28:57, Ethernet0/0
      12.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        12.12.12.0/24 is directly connected, Ethernet0/0
L        12.12.12.1/32 is directly connected, Ethernet0/0
      23.0.0.0/24 is subnetted, 1 subnets
O        23.23.23.0 [110/20] via 12.12.12.2, 00:28:57, Ethernet0/0
      34.0.0.0/24 is subnetted, 1 subnets
O        34.34.34.0 [110/30] via 12.12.12.2, 00:28:57, Ethernet0/0
```

Catat bahwa di R1 terdapat 5 prefix ospf dan 2 prefix yang directly connected, total 7 prefix

```
IDN-R1#show mpls ldp bi
IDN-R1#show mpls ldp bindings
  lib entry: 1.1.1.1/32, rev 5
        local binding:  label: imp-null
        remote binding: lsr: 2.2.2.2:0, label: 204
  lib entry: 2.2.2.2/32, rev 11
        local binding:  label: 103
        remote binding: lsr: 2.2.2.2:0, label: imp-null
  lib entry: 3.3.3.3/32, rev 9
        local binding:  label: 102
        remote binding: lsr: 2.2.2.2:0, label: 203
  lib entry: 4.4.4.4/32, rev 7
        local binding:  label: 101
        remote binding: lsr: 2.2.2.2:0, label: 202
  lib entry: 12.12.12.0/24, rev 3
        local binding:  label: imp-null
        remote binding: lsr: 2.2.2.2:0, label: imp-null
  lib entry: 23.23.23.0/24, rev 15
        local binding:  label: 105
        remote binding: lsr: 2.2.2.2:0, label: imp-null
  lib entry: 34.34.34.0/24, rev 13
        local binding:  label: 104
        remote binding: lsr: 2.2.2.2:0, label: 205
```

Router akan memberikan 7 label, satu label per prefix. Artinya router akan memberikan satu label setiap prefix di dalam routing tabelnya.

Perintah “show” berikut akan menampilkan label yang diberikan R1 untuk prefix 4.4.4.4/32

Perintah “show” berikut akan menampilkan LIB untuk prefix 4.4.4.4/32 di R1:

```
IDN-R1#show mpls forwarding-table 4.4.4.4
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next
Hop
Label      Label      or Tunnel Id     Switched      interface
```

Ketika R1 memforward trafik menuju 4.4.4.4/32 yang memiliki label 104 maka kemudian R1 akan mengganti labelnya dulu dengan label 203 dan kemudian mengirimkan trafik ini keluar melalui fa0/0 ke nexthop 12.12.12.2

```
IDN-R1#show ip cef 4.4.4.4 detail
4.4.4.4/32, epoch 0
  local label info: global/101
  nexthop 12.12.12.2 Ethernet0/0 label 202
```

Isi tabel FIB juga terdiri atas informasi label lokal dan akan mengganti dengan label 203 pada jalur keluar via interface fa0/0. Jika harus menerima paket yang tidak berlabel dari peer yang berikutnya dari network tujuan, informasi LFIB dan FIB harus saling crosscek dan memberikan info label atau paket tidak akan dikirim dengan benar atau tidak dikiirm sama sekali.

```
IDN-R2#show mpls forwarding-table 4.4.4.4
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next
Hop
Label      Label      or Tunnel Id     Switched      interface
202        302        4.4.4.4/32       0             Et0/1
23.23.23.3
```

```
IDN-R3#show mpls forwarding-table 4.4.4.4
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next
Hop
Label      Label      or Tunnel Id     Switched      interface
302        Pop Label  4.4.4.4/32       0             Et0/1
34.34.34.4
```

Pada kolom ***Outgoing tag or VC*** ada 3 jenis output yang akan muncul

- Untagged : Label dari Paket yang diterima dengan top label sebagaimana tertera pada *local tag,* semua label akan dihapus dan LSR akan memforward paketnya sebagai paket IP, biasa kita sebut ***Label to IP forwarding***
- Pop tag : Label dari Paket yang diterima dengan top label sebagaimana tertera pada *local tag* akan dihapus (Pop satu label) dan memforward paket sebagai paket berLabel atau paket IP, jadi bisa menjadi ***Label to IP forwarding*** atau ***Label to label forwarding***
- “Angka (Label)” : Label dari Paket yang diterima dengan top label sebagaimana tertera pada *local tag* akan diganti dengan “angka (label)” dan memforward ke interface yang tercantum pada kolom *outgoing interface*

```
IDN-R4#show mpls forwarding-table 4.4.4.4
Local      Outgoing   Prefix           Bytes Label   Outgoing   Next 
Hop
Label      Label      or Tunnel Id     Switched      interface
None       No Label   4.4.4.4/32       0
```

```
IDN-R4#show ip route 4.4.4.4
Routing entry for 4.4.4.4/32
  Known via "connected", distance 0, metric 0 (connected, via 
interface)
  Routing Descriptor Blocks:
  * directly connected, via Loopback0
```