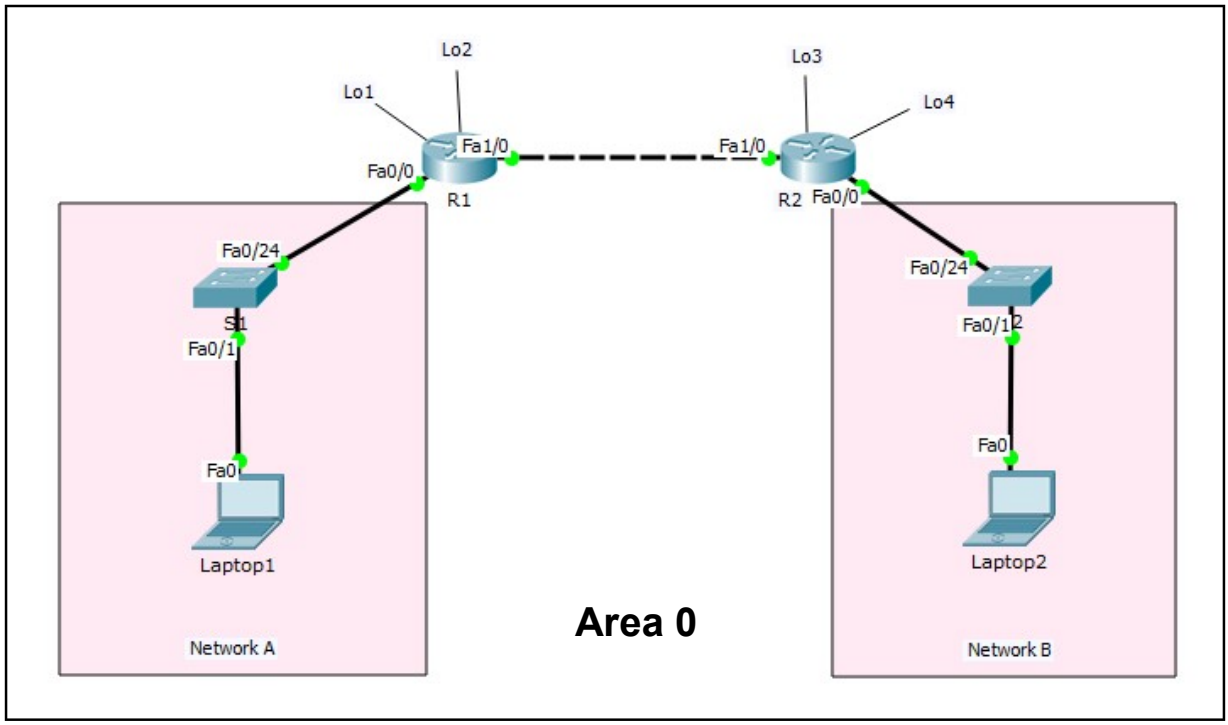
Lab 8. OSPF

Topologi



Tabel Addressing

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	Fa0/0	192.168.1.254	255.255.255.0	N/A
	Fa1/0	12.12.12.1	255.255.255.0	N/A
	Lo1	172.16.1.1	255.255.255.0	N/A
	Lo2	172.16.2.2	255.255.255.0	N/A
R2	Fa0/0	192.168.2.254	255.255.255.0	N/A
	Fa1/0	12.12.12.2	255.255.255.0	N/A
	Lo3	172.16.3.3	255.255.255.0	N/A
	Lo4	172.16.4.4	255.255.255.0	N/A
S1	N/A	VLAN 1	N/A	N/A
S2	N/A	VLAN 1	N/A	N/A
Laptop1	NIC	192.168.1.1	255.255.255.0	192.168.1.254
Laptop2	NIC	192.168.2.1	255.255.255.0	192.168.2.254

Tujuan

- Setting OSPF
- Setting router-id OSPF
- Setting passive-interface dan network type loopback OSPF

Konsep Dasar

- OSPF singkatan dari Open Shortest Path First
- OSPF merupakan routing protocol open standar yang diimplementasikan oleh berbagai macam vendor, termasuk Cisco
- Link-state protocol
- OSPF bekerja dengan menggunakan algoritma Dijkstra
- Hop count unlimited
- Metric: cost (cost=10^8 / BW)
- Administrative Distance: 110
- Classless routing protocol
- Mendukung VLSM dan CIDR
- Hanya mendukung equal cost load balancing
- Terdapat konsep area untuk memudahkan manajemen dan control traffic
- Menyediakan design hierarki dengan multiple area
- Harus memiliki satu area yang disebut sebagai area 0 atau backbone area
- Semua area selain 0 (non-backbone area) harus terhubung ke area 0
- Dari scalabilitas lebih baik dibandingkan dengan protocol distance vector
- Mendukung autentikasi
- Update melalui multicast address: 224.0.0.5
- Konvergensi cepat
- Mengirimkan hello packet setiap 10 second
- Trigger/Incrementeal updates
    - Router mengirimkan update hanya jika terjadi perubahan dan tidak mengirimkan semua routing table pada periodic update

OSPF memaintain tiga tabel

1. Neighbor table
    - Dikenal juga sebagai adjacency database
    - Menampilkan informasi directly connected router (neighbors)
    - Command: **`show ip ospf neighbor`**
2. Database table
    - Disebut juga sebagai LSDB (link state database)
    - Menampilkan semua kemungkinan informasi route menuju network dalam satu area
    - Command: **`show ip ospf database`**
3. Routing table
    - Menampilkan best route menuju network destination
    - Command: **`show ip route`**

Dua step menggunakan routing protocol dinamis secara umum:

1. Pilih routing protocol
2. Advertise directly connected network (jaringan yang terhubung langsung dengan router)

Konfigurasi OSPF

```
Router(config)# router ospf <process-id>
Router(config-router)# network <network-id> <wildcard-mask> area <area-id>
Router(config-router)# network <network-id> <wildcard-mask> area <area-id>
```

`network <Network-ID>` : untuk advertise network yang terhubung langsung dengan router (directly connected network).

`wildcard-mask` : inverse subnet-mask

Keuntungan OSPF

- Open standard
- Tidak ada batasan jumlah hop
- Loop free
- Konvergensi lebih cepat

Kerugian OSPF

- Mengkonsumsi lebih banyak resource CPU
- Kompleks dalam hal design dan implementasi
- Hanya mendukung equal load balancing
- Hanya mendukung protocol IP

Konfigurasi

Login console ke R1 atau R2 untuk mempraktikkan ***Lab 8-OSPF***.

Tampilkan routing table sebelum disetting OSPF di R1

```
R1#sh ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/24 is subnetted, 2 subnets
C 172.16.1.0 is directly connected, Loopback1
C 172.16.2.0 is directly connected, Loopback2
C 192.168.1.0/24 is directly connected, FastEthernet0/0
R1#
```

Dari output diatas, hanya terdapat directly connected network yang ditandai dengan kode C.

Tampilkan routing table sebelum disetting OSPF di R2

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/24 is subnetted, 2 subnets
C 172.16.3.0 is directly connected, Loopback0
C 172.16.4.0 is directly connected, Loopback1
C 192.168.2.0/24 is directly connected, FastEthernet0/0
R2#
```

Agar proses routing berhasil, harus disetting OSPF disemua router terlebih dulu. Setelah itu baru diverifikasi dengan tes Ping end-to-end device-nya.

Setting OSPF di R1

Command untuk mensetting OSPF.

```
R1(config)#router ospf 1
R1(config-router)#network 12.12.12.0 0.0.0.255 area 0
R1(config-router)#network 172.16.1.0 0.0.0.255 area 0
R1(config-router)#network 172.16.2.0 0.0.0.255 area 0
R1(config-router)#network 192.168.1.0 0.0.0.255 area 0
R1(config-router)#
```

Setting OSPF di R2

Command untuk mensetting OSPF.

```
R2(config)#router ospf 1
R2(config-router)#network 12.12.12.0 0.0.0.255 area 0
R2(config-router)#network 172.16.3.0 0.0.0.255 area 0
R2(config-router)#network 172.16.4.0 0.0.0.255 area 0
R2(config-router)#network 192.168.2.0 0.0.0.255 area 0
```

Verifikasi

Tampilkan routing table setelah disetting OSPF di R1

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
C 172.16.1.0/24 is directly connected, Loopback1
C 172.16.2.0/24 is directly connected, Loopback2
O 172.16.3.3/32 [110/2] via 12.12.12.2, 00:01:31, FastEthernet1/0
O 172.16.4.4/32 [110/2] via 12.12.12.2, 00:01:31, FastEthernet1/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0
O 192.168.2.0/24 [110/2] via 12.12.12.2, 00:00:40, FastEthernet1/0
R1#
```

Tampilkan routing table setelah disetting OSPF di R2

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
O 172.16.1.1/32 [110/2] via 12.12.12.1, 00:02:07, FastEthernet1/0
O 172.16.2.2/32 [110/2] via 12.12.12.1, 00:02:07, FastEthernet1/0
C 172.16.3.0/24 is directly connected, Loopback0
C 172.16.4.0/24 is directly connected, Loopback1
O 192.168.1.0/24 [110/2] via 12.12.12.1, 00:02:07, FastEthernet1/0
C 192.168.2.0/24 is directly connected, FastEthernet0/0
R2#
```

Tampilkan informasi neighbor OSPF di R1

```
R1#show ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
172.16.4.4 1 FULL/DROTHER 00:00:35 12.12.12.2 FastEthernet1/0
R1#
```

Tampilkan informasi neighbor OSPF di R2

```
R2#show ip ospf neighbor
Neighbor ID Pri State Dead Time Address Interface
172.16.2.2 1 FULL/DR 00:00:31 12.12.12.1 FastEthernet1/0
R2#
```

Tampilkan informasi routing protocol di R1

```
R1#show ip protocol

Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 172.16.2.2
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
12.12.12.0 0.0.0.255 area 0
172.16.1.0 0.0.0.255 area 0
172.16.2.0 0.0.0.255 area 0
192.168.1.0 0.0.0.255 area 0
Routing Information Sources:
Gateway Distance Last Update
172.16.2.2 110 00:07:22
172.16.4.4 110 00:06:07
Distance: (default is 110)

R1#
```

Dari informasi routing diatas, R1 menjalankan OSPF dengan proses ID 1. Ada 4 network yang diroutingkan oleh R1. Administrative distance 110. R1 memiliki router ID 172.16.2.2.

R1 memiliki neighbor `172.16.4.4` (IP Loopback R2). `172.16.4.4` merupakan router-ID R2.

Note: ulangi langkah yang sama diatas untuk menampilkan informasi neighbor dan informasi routing protocol di R2

Tampilkan informasi database OSPF di R1

```
R1#show ip ospf database
OSPF Router with ID (172.16.2.2) (Process ID 1)

Router Link States (Area 0)

Link ID ADV Router Age Seq# Checksum Link count
172.16.2.2 172.16.2.2 472 0x80000005 0x00e483 4
172.16.4.4 172.16.4.4 397 0x80000004 0x00ba9c 4

Net Link States (Area 0)
Link ID ADV Router Age Seq# Checksum
12.12.12.1 172.16.2.2 472 0x80000001 0x00720b
R1#
```

Di area 0 hanya terdapat 2 router dengan ID : `172.16.2.2` dan `172.16.4.4`.

Tes Ping dari Laptop1 ke Laptop2

```
Laptop1>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time=1ms TTL=126
Reply from 192.168.2.1: bytes=32 time=1ms TTL=126
Reply from 192.168.2.1: bytes=32 time=0ms TTL=126
Reply from 192.168.2.1: bytes=32 time=0ms TTL=126

Ping statistics for 192.168.2.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
```

Ping dari Laptop1 ke Laptop2 berhasil.

Traceroute dari Laptop1 ke Laptop2

```
Laptop1>tracert 192.168.2.1

Tracing route to 192.168.2.1 over a maximum of 30 hops:

1 1 ms 0 ms 0 ms 192.168.1.254
2 0 ms 0 ms 0 ms 12.12.12.2
3 0 ms 0 ms 0 ms 192.168.2.1

Trace complete.
```

Untuk menuju Laptop2 dari Laptop1 membutuhkan 3 hop.

Tes Ping dari Laptop2 ke Laptop1

```
Laptop2>ping 192.168.1.1

Pinging 192.168.1.1 with 32 bytes of data:

Reply from 192.168.1.1: bytes=32 time=0ms TTL=126
Reply from 192.168.1.1: bytes=32 time=1ms TTL=126
Reply from 192.168.1.1: bytes=32 time=11ms TTL=126
Reply from 192.168.1.1: bytes=32 time=0ms TTL=126

Ping statistics for 192.168.1.1:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 11ms, Average = 3ms
```

Traceroute dari Laptop2 ke Laptop1

```
Laptop2>tracert 192.168.1.1

Tracing route to 192.168.1.1 over a maximum of 30 hops:

1 1 ms 0 ms 0 ms 192.168.2.254
2 0 ms 0 ms 0 ms 12.12.12.1
3 1 ms 11 ms 11 ms 192.168.1.1

Trace complete.
```

Tampilkan routing table spesifik OSPF di R1 dan R2

```
R1#show ip route ospf
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
O 172.16.3.3 [110/2] via 12.12.12.2, 00:05:11, FastEthernet1/0
O 172.16.4.4 [110/2] via 12.12.12.2, 00:05:11, FastEthernet1/0
O 192.168.2.0 [110/2] via 12.12.12.2, 00:04:20, FastEthernet1/0
R1#
```

```
R2#show ip route ospf
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
O 172.16.1.1 [110/2] via 12.12.12.1, 00:05:05, FastEthernet1/0
O 172.16.2.2 [110/2] via 12.12.12.1, 00:05:05, FastEthernet1/0
O 192.168.1.0 [110/2] via 12.12.12.1, 00:05:05, FastEthernet1/0
R2#
```

Debug OSPF di R1

```
05:53:59: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.4.4 on FastEthernet1/0 from
LOADING to FULL, Loading Done
```

Setelah selesai setting OSPF di R2 step **Halaman 53**, di R1 maupun R2 akan muncul output **adjacent router** OSPF. Dari output debug OSPF diatas R1 memiliki neighbor 172.16.4.4. 172.16.4.4 adalah router ID dari R2. Berarti R1 dan R2 telah menjalin relationship neighbor (adjacency) sehingga routing update akan saling dikirimkan.

Setting router-id OSPF di R1

```
R1(config)#router ospf 1
R1(config-router)#router-id 111.111.111.111
R1(config-router)#Reload or use "clear ip ospf process" command, for this to
take effect
R1(config-router)#
```

Setting router-id OSPF di R2

```
R2(config)#router ospf 1
R2(config-router)#router-id 222.222.222.222
R2(config-router)#Reload or use "clear ip ospf process" command, for this to
take effect
R2(config-router)#
```

Setelah menjalankan command **router-id** diatas, jalankan command **clear ip ospf process** untuk mereset proses OSPF di R1 maupun R2, sehingga router-id OSPF akan berubah.

```
R1#clear ip ospf process
Reset ALL OSPF processes? [no]: yes

R1#
06:12:37: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.4.4 on FastEthernet1/0 from FULL
to DOWN, Neighbor Down: Adjacency forced to reset

06:12:37: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.4.4 on FastEthernet1/0 from FULL
to DOWN, Neighbor Down: Interface down or detached

R1#
06:12:41: %OSPF-5-ADJCHG: Process 1, Nbr 172.16.4.4 on FastEthernet1/0 from
LOADING to FULL, Loading Done
```

Tampilkan neighbor table OSPF di R1

```
R1#show ip ospf neighbor


Neighbor ID Pri State Dead Time Address Interface
222.222.222.222 1 FULL/DR 00:00:36 12.12.12.2 FastEthernet1/0
R1#
```

Dari output neighbor table di R1, bisa kita lihat di kolom neighbor ID terdapat 222.222.222.222, dimana 222.222.222.222 adalah router-id R2. Dengan demikian, setting router-id OSPF di R2 telah berhasil.

Note: ulangi langkah yang sama diatas untuk mereset process OSPF dan tampilkan neighbor table OSPF di R2, pastikan neighbor ID R1 111.111.111.111

Setting passive-interface OSPF di R1

```
R1(config)#router ospf 1
R1(config-router)#passive-interface fa0/0
R1(config-router)#
```

Tampilkan routing information OSPF di R1

```
R1#show ip protocols

Routing Protocol is "ospf 1"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 111.111.111.111
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
12.12.12.0 0.0.0.255 area 0
172.16.1.0 0.0.0.255 area 0
172.16.2.0 0.0.0.255 area 0
192.168.1.0 0.0.0.255 area 0
Passive Interface(s):
FastEthernet0/0
Routing Information Sources:
Gateway Distance Last Update
111.111.111.111 110 00:11:04
172.16.2.2 110 00:30:11
172.16.4.4 110 00:11:38
222.222.222.222 110 00:11:04
Distance: (default is 110)
```

Passive-interface fa0/0 telah berhasil ditambahkan di OSPF R1.

Tampilkan interface OSPF di R1

```
R1#show ip ospf interface

FastEthernet1/0 is up, line protocol is up
Internet address is 12.12.12.1/24, Area 0
Process ID 1, Router ID 111.111.111.111, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 222.222.222.222, Interface address 12.12.12.2
Backup Designated Router (ID) 111.111.111.111, Interface address 12.12.12.1
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 222.222.222.222 (Designated Router)
```

```
Suppress hello for 0 neighbor(s)

Loopback1 is up, line protocol is up
Internet address is 172.16.1.1/24, Area 0
Process ID 1, Router ID 111.111.111.111, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

Loopback2 is up, line protocol is up
Internet address is 172.16.2.2/24, Area 0
Process ID 1, Router ID 111.111.111.111, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

FastEthernet0/0 is up, line protocol is up
Internet address is 192.168.1.254/24, Area 0
Process ID 1, Router ID 111.111.111.111, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State WAITING, Priority 1
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
No Hellos (Passive interface)
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

Passive-interface OSPF memiliki kemiripan dengan EIGRP. Dengan mengaktifkan **passive-interface** di interface OSPF, maka akan menghentikan pengiriman paket hello sehingga akan mencegah router membentuk relationship neighbor antar router, akibatnya router akan berhenti melakukan update routing outgoing dan incoming (tidak dapat mengirimkan update routing dan tidak dapat dikirimi update routing).

OSPF dan EIGRP sama-sama menggunakan paket hello sebelum membentuk relationship antar router. Perhatikan informasi interface OSPF Fa0/0 dan Fa1/0 R1 diatas. Fa0/0 sudah diaktifkan command **passive-interface** sehingga tidak ada lagi paket hello. Beda dengan Fa1/0 yang ada keterangan **Hello due in**..

```
FastEthernet0/0 is up, line protocol is up
No Hellos (Passive interface)

FastEthernet1/0 is up, line protocol is up
Hello due in 00:00:07
```

Karena Network A dan Network B merupakan jaringan LAN dimana tidak membutuhkan relationship neighbor antar router OSPF sehingga tidak jadi masalah ketika interface Fa0/0 diaktifkan command **passive-interface**-nya. Lain halnya dengan interface Fa1/0 ketika diaktifkan command `passive-interface`, maka akan menimbulkan masalah yaitu R1 tidak dapat membentuk relationship dengan R2, sehingga OSPF tidak dapat berjalan normal.

OSPF secara default memiliki hello interval = 10 second, dan dead interval = 40 second.

Interface Loopback di OSPF

Perhatikan sekali lagi output routing table di R1 dan R2. Apakah ada masalah dengan interface loopback?

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
C 172.16.1.0/24 is directly connected, Loopback1
C 172.16.2.0/24 is directly connected, Loopback2
O 172.16.3.3/32 [110/2] via 12.12.12.2, 00:38:50, FastEthernet1/0
O 172.16.4.4/32 [110/2] via 12.12.12.2, 00:38:50, FastEthernet1/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0
O 192.168.2.0/24 [110/2] via 12.12.12.2, 00:38:50, FastEthernet1/0
```

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/16 is variably subnetted, 4 subnets, 2 masks
O 172.16.1.1/32 [110/2] via 12.12.12.1, 00:41:42, FastEthernet1/0
O 172.16.2.2/32 [110/2] via 12.12.12.1, 00:41:42, FastEthernet1/0
C 172.16.3.0/24 is directly connected, Loopback3
C 172.16.4.0/24 is directly connected, Loopback4
O 192.168.1.0/24 [110/2] via 12.12.12.1, 00:41:42, FastEthernet1/0
C 192.168.2.0/24 is directly connected, FastEthernet0/0
R2#
```

Dari output **`show ip ospf interface`** **Halaman 60** dan **`show ip route`** **Halaman 61** kita bisa lihat bahwa loopback yang sebelumnya kita buat untuk tujuan imitasi subnet atau testing menjadi sebuah network sendiri di R1 maupun di R2 berubah menjadi stub host dengan prefix /32 dan network type LOOPBACK.

```
Loopback1 is up, line protocol is up
.
Process ID 1, Router ID 111.111.111.111, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

Loopback2 is up, line protocol is up
.
Process ID 1, Router ID 111.111.111.111, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

Loopback3 is up, line protocol is up
.
Process ID 1, Router ID 222.222.222.222, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

Loopback4 is up, line protocol is up
.
Process ID 1, Router ID 222.222.222.222, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host

O 172.16.3.3/32 [110/2] via 12.12.12.2, 00:38:50, FastEthernet1/0
O 172.16.4.4/32 [110/2] via 12.12.12.2, 00:38:50, FastEthernet1/0

O 172.16.1.1/32 [110/2] via 12.12.12.1, 00:41:42, FastEthernet1/0
O 172.16.2.2/32 [110/2] via 12.12.12.1, 00:41:42, FastEthernet1/0
```

Semua loopback, yaitu Loopback1, Loopback2, Loopback3, Loopback4 menjadi stub host dengan network type LOOPBACK. Stub host memang tampil di routing table dengan prefix /32, akan tetapi tidak dapat digunakan untuk forwarding.

Agar semua loopback dapat di advertise oleh OSPF sebagai network dengan prefix aslinya yaitu /24, caranya dengan mengubah network type loopback menjadi point-to-point.

Ubah Network Type Interface Loopback OSPF di R1 dan R2

```
R1(config)#interface lo1
R1(config-if)#ip ospf network point-to-point
R1(config-if)#
R1(config-if)#interface lo2
R1(config-if)#ip ospf network point-to-point
R1(config-if)#
```

```
R2(config)#interface lo3
R2(config-if)#ip ospf network point-to-point
R2(config-if)#
R2(config-if)#interface lo4
R2(config-if)#ip ospf network point-to-point
R2(config-if)#
```

Tampilkan routing table OSPF terupdate di R1 dan R2

```
R1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/24 is subnetted, 4 subnets
C 172.16.1.0 is directly connected, Loopback1
C 172.16.2.0 is directly connected, Loopback2
O 172.16.3.0 [110/2] via 12.12.12.2, 00:01:00, FastEthernet1/0
O 172.16.4.0 [110/2] via 12.12.12.2, 00:00:50, FastEthernet1/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0
O 192.168.2.0/24 [110/2] via 12.12.12.2, 01:17:07, FastEthernet1/0
R1#
```

```
R2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

12.0.0.0/24 is subnetted, 1 subnets
C 12.12.12.0 is directly connected, FastEthernet1/0
172.16.0.0/24 is subnetted, 4 subnets
O 172.16.1.0 [110/2] via 12.12.12.1, 00:04:33, FastEthernet1/0
O 172.16.2.0 [110/2] via 12.12.12.1, 00:04:23, FastEthernet1/0
C 172.16.3.0 is directly connected, Loopback3
C 172.16.4.0 is directly connected, Loopback4
O 192.168.1.0/24 [110/2] via 12.12.12.1, 01:18:04, FastEthernet1/0
C 192.168.2.0/24 is directly connected, FastEthernet0/0
```

Dari output diatas, semua loopback telah diadvertise sebagai network dengan prefix /24. Selanjutnya kita akan tes Ping dari Loopback1 di R1 ke Loopback3 di R2.

Tes Ping dari Loopback1 di R1 ke Loopback3 di R2

Untuk mencoba tes Ping dari Loopback, gunakan extended-ping di router.

```
R1#ping
Protocol [ip]: ip
Target IP address: 172.16.3.3
Repeat count [5]: [ENTER]
Datagram size [100]: [ENTER]
Timeout in seconds [2]: [ENTER]
Extended commands [n]: y
Source address or interface: loopback1
Type of service [0]: [ENTER]
Set DF bit in IP header? [no]: [ENTER]
Validate reply data? [no]: [ENTER]
Data pattern [0xABCD]: [ENTER]
Loose, Strict, Record, Timestamp, Verbose[none]:
Sweep range of sizes [n]: [ENTER]
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.3.3, timeout is 2 seconds:
Packet sent with a source address of 172.16.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms
```

Note: ulangi langkah yang sama diatas untuk tes Ping dari Loopback4 di R2 ke Loopback2 di R1.

Review

1. Jelaskan bagaimana mekanisme pemilihan router-id OSPF?
2. Apa yang terjadi jika router memiliki router-id yang sama dengan router yang lain dalam satu area yang sama?
3. Untuk membentuk relationship neighbor antar router di OSPF, apa sajakah kriteria yang diperlukan ? Isi **Ya** atau **Tidak** table dibawah ini.

Requirement	OSPF
Status interface harus UP UP	
Interface harus berada pada subnet yang sama	
Harus lolos autentikasi (jika disetting autentikasinya)	
Harus menggunakan ASN yang sama disettingan command **router ospf**	
Hello dan hold/dead timers harus sama	
IP MTU harus sama	
Router ID harus unik	
K-values harus sama	
Harus berada dalam area yang sama	