LK – Pengelolaan IPV6

- **Syazwandy Harahap (205150300111018)**
- **Kessario Muhammad Fadhaly (205150300111015)**

Course : Administrasi Jaringan (Network Administrative)

Harap Dibaca sebelum mengerjakan !!!

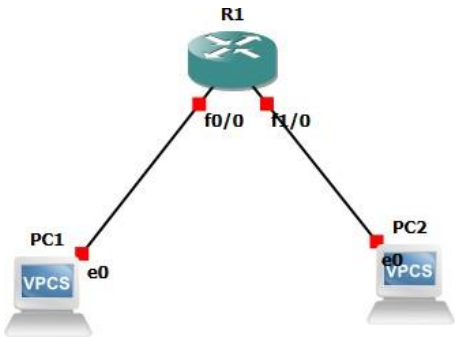
Aturan Penilaian:

1. Tugas kelompok 2 orang
2. Pada site-ID ganti dengan 4 digit terakhir NIM mahasiswa (pada contoh adalah 1a dan 2b)
3. Jika ada kesulitan kita diskusikan minggu depan

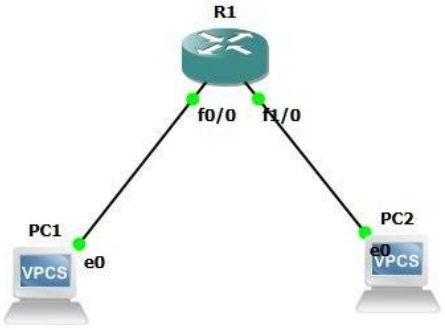
A. Menghubungkan 2 PC dengan menggunakan router R1

Langkah-langkah yang perlu dilakukan
Tugas : IPV6

1. Kamu membuat topologi jaringan seperti di atas di dalam GNS3



2. Jalankan topologi



3. Kamu membuka console pada router R1 dengan mengklik kanan Router R1 > console

```
 changed state to up
*Mar  1 00:00:02.991: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state
to administratively down
*Mar  1 00:00:03.007: %LINK-5-CHANGED: Interface FastEthernet0/1, changed state
to administratively down
*Mar  1 00:00:03.023: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state t
o up
*Mar  1 00:00:03.027: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state t
o up
*Mar  1 00:00:03.991: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to down
*Mar  1 00:00:04.007: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
*Mar  1 00:00:04.023: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to up
*Mar  1 00:00:04.027: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et2/0, changed state to up
R1#
```

4. Kamu ketikkan syntax berikut (anda dapat melihat nama interface dengan View -> show interface lable (f artinya fastethernet) gunakan tombol tab untuk auto complete.

```
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ipv6 unicast-routing
R1(config)#interface fastEthernet 1/0
R1(config-if)#ipv6 address 2002:5ef:2bc4:1015::/64 eui-64
R1(config-if)#no shutdown
R1(config-if)#ipv6 enable
R1(config-if)#exit
R1(config)#interface fastEthernet 2/0
R1(config-if)#ipv6 address 2002:5ef:2bc4:1018::/64 eui-64
R1(config-if)#no shutdown
R1(config-if)#ipv6 enable
R1(config-if)#exit
R1(config)#exit
R1#
*Mar  1 00:02:56.051: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

5. Kamu mengkonfigurasi ipv6 pada PC1

```
PC1> ip auto
GLOBAL SCOPE       : 2002:5ef:2bc4:1015:2050:79ff:fe66:6800/64
ROUTER LINK-LAYER  : c2:01:1b:64:00:10

PC1> save
Saving startup configuration to startup.vpc
.  done
```

6. Kamu mengkonfigurasi ipv6 pada PC2

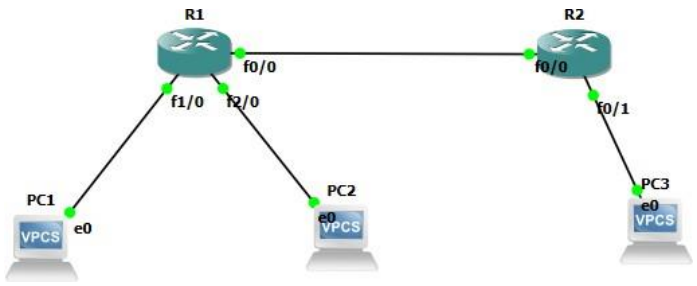
```
PC2> ip auto
GLOBAL SCOPE       : 2002:5ef:2bc4:1018:2050:79ff:fe66:6801/64
ROUTER LINK-LAYER  : c2:01:1b:64:00:20

PC2> save
Saving startup configuration to startup.vpc
.  done

PC2>
```

7. Kamu coba lakukan ping dari PC2 melalui PC1

```
PC1> ping 2002:5ef:2bc4:1018:2050:79ff:fe66:6801

2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=1 ttl=62 time=63.336 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=2 ttl=62 time=30.277 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=3 ttl=62 time=32.810 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=4 ttl=62 time=16.736 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=5 ttl=62 time=25.174 ms
```

B. Menambahkan router R2 ke dalam router R1

1. Buatlah topologi jaringan seperti dibawah ini dan kemudian jalankan topologinya



2. Setting IP pada router R1 dengan membuka console dan ketikkan sintaks seperti berikut :

```
R1#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ipv6 unicast-routing
R1(config)#interface fastEthernet 0/0
R1(config-if)#ipv6 address 2002:5ef:2bc4:3c::1/64
R1(config-if)#no shutdown
R1(config-if)#ipv6 en
*Mar  1 00:34:43.799: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:34:44.799: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#ipv6 enable
R1(config-if)#exit
R1(config)#
```

3. Kemudian juga setting IP pada router R2 seperti berikut :

```
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 unicast-routing
R2(config)#interface fastEthernet 0/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:3c::2/64
R2(config-if)#no shutdown
R2(config-if)#ipv6 ena
*Mar  1 00:04:47.943: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:04:48.943: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#ipv6 enable
R2(config-if)#exit
R2(config)#interface fastEthernet 1/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:4d::/64 eui-64
R2(config-if)#no shutdown
R2(config-if)#ipv6 enable
R2(config-if)#exi
*Mar  1 00:05:41.639: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:05:42.639: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#cop
*Mar  1 00:05:47.171: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

4. Selanjutnya adalah setting IPv6 pada PC3 dengan membuka console dan ikuti sintaks berikut :

```
PC3> ip auto
GLOBAL SCOPE      : 2002:5ef:2bc4:4d:2050:79ff:fe66:6802/64
ROUTER LINK-LAYER : c2:02:18:f8:00:10

PC3> save
Saving startup configuration to startup.vpc
.  done

PC3>
```

5. Kita lakukan tes PING ke PC3 melalui PC1

```
PC1> ping 2002:5ef:2bc4:4d:2050:79ff:fe66:6802

*2002:5ef:2bc4:1015:c001:1bff:fe64:10 icmp6_seq=1 ttl=64 time=17.919 ms (ICMP type:1, code:0, No route to destination)
*2002:5ef:2bc4:1015:c001:1bff:fe64:10 icmp6_seq=2 ttl=64 time=15.509 ms (ICMP type:1, code:0, No route to destination)
*2002:5ef:2bc4:1015:c001:1bff:fe64:10 icmp6_seq=3 ttl=64 time=3.361 ms (ICMP type:1, code:0, No route to destination)
*2002:5ef:2bc4:1015:c001:1bff:fe64:10 icmp6_seq=4 ttl=64 time=5.671 ms (ICMP type:1, code:0, No route to destination)
*2002:5ef:2bc4:1015:c001:1bff:fe64:10 icmp6_seq=5 ttl=64 time=17.067 ms (ICMP type:1, code:0, No route to destination)

PC1>
```

6. Hubungkan PC1 dan PC2 ke PC3 dengan cara sebagai berikut :

a. Setting di router R1

```
R1(config)#ipv6 route 2002:5ef:2bc4:4d::/64 2002:5ef:2bc4:3c::2
R1(config)#
```

b. Setting di router R2

```
R2(config)#ipv6 route 2002:5ef:2bc4:1015::/64 2002:5ef:2bc4:3c::1
R2(config)#ipv6 route 2002:5ef:2bc4:1018::/64 2002:5ef:2bc4:3c::1
R2(config)#
```

7. Kemudian coba tes ping ke dari setiap PC :

Ping ke PC3 melalui PC1

```
PC1> ping 2002:5ef:2bc4:4d:2050:79ff:fe66:6802

2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=1 ttl=60 time=124.200 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=2 ttl=60 time=61.659 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=3 ttl=60 time=57.511 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=4 ttl=60 time=45.262 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=5 ttl=60 time=45.886 ms
```

Ping ke PC3 melalui PC2

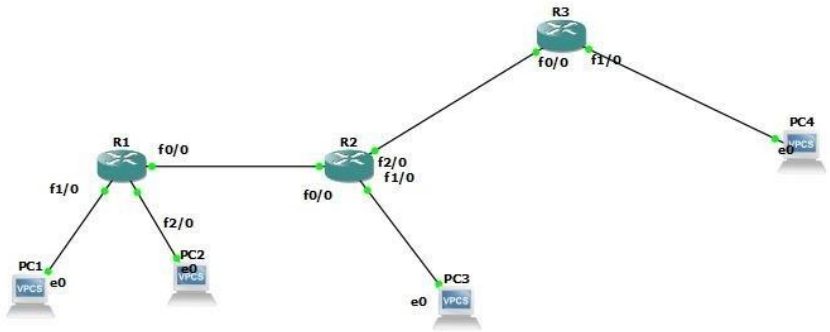
```
PC2> ping 2002:5ef:2bc4:4d:2050:79ff:fe66:6802

2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=1 ttl=60 time=30.802 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=2 ttl=60 time=29.488 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=3 ttl=60 time=46.023 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=4 ttl=60 time=44.917 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=5 ttl=60 time=51.720 ms
```

Ping ke PC1 dan PC2 melalu PC3

```
PC3> ping 2002:5ef:2bc4:1015:2050:79ff:fe66:6800

2002:5ef:2bc4:1015:2050:79ff:fe66:6800 icmp6_seq=1 ttl=60 time=60.997 ms
2002:5ef:2bc4:1015:2050:79ff:fe66:6800 icmp6_seq=2 ttl=60 time=48.180 ms
2002:5ef:2bc4:1015:2050:79ff:fe66:6800 icmp6_seq=3 ttl=60 time=46.789 ms
2002:5ef:2bc4:1015:2050:79ff:fe66:6800 icmp6_seq=4 ttl=60 time=55.619 ms
2002:5ef:2bc4:1015:2050:79ff:fe66:6800 icmp6_seq=5 ttl=60 time=46.080 ms

PC3> ping 2002:5ef:2bc4:1018:2050:79ff:fe66:6801

2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=1 ttl=60 time=67.210 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=2 ttl=60 time=63.693 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=3 ttl=60 time=41.063 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=4 ttl=60 time=44.708 ms
2002:5ef:2bc4:1018:2050:79ff:fe66:6801 icmp6_seq=5 ttl=60 time=46.950 ms

PC3>
```

C. Menambahkan router R3 ke dalam router R2

1. Buatlah topologi jaringan seperti dibawah ini dan kemudian jalankan topologinya



2. Buka console pada router R2 kemudian konfigurasikan seperti dibawah ini :

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 unicast-routing
R2(config)#int fa 2/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:1036::1/64
R2(config-if)#no shutdown
R2(config-if)#
*Mar  1 00:29:18.031: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Mar  1 00:29:19.031: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config-if)#ipv6 enable
R2(config-if)#ext
             ^
% Invalid input detected at '^' marker.

R2(config-if)#exit
R2(config)#exit
R2#
*Mar  1 00:31:26.819: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

3. Buka console pada router R3 kemudian konfigurasikan seperti dibawah ini :

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ipv6 unicast-routing
R3(config)#int fa 0/0
R3(config-if)#ipv6 address 2002:5ef:2bc4:1036::2/64
R3(config-if)#no shutdown
R3(config-if)#
*Mar  1 00:04:48.463: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:04:49.463: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#ipv6 enable
R3(config-if)#exit
R3(config)#int fa 1/0
R3(config-if)#ipv6 address 2002:5ef:2bc4:1124::/64 eui-64
R3(config-if)#no shutdown
R3(config-if)#
*Mar  1 00:06:18.783: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:06:19.783: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R3(config-if)#ipv6 enable
R3(config-if)#exit
R3(config)#exit
R3#
*Mar  1 00:06:41.659: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

4. Buka console PC1 dan konfigurasikan seperti berikut :

```
Executing the startup file


PC4> ip auto
GLOBAL SCOPE      : 2002:5ef:2bc4:1124:2050:79ff:fe66:6803/64
ROUTER LINK-LAYER : c2:03:35:98:00:10

PC4> save
Saving startup configuration to startup.vpc
.  done

PC4>
```

5. Hubungkan PC1, PC2, PC3 dan PC4 menggunakan konfigurasi seperti dibawah ini :

a. Konfigurasi router R1 :

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#ipv6 route 2002:5ef:2bc4:1036::1/64 2002:5ef:2bc4:3c::2
R1(config)#ipv6 route 2002:5ef:2bc4:1036::2/64 2002:5ef:2bc4:3c::2
R1(config)#ipv6 route 2002:5ef:2bc4:1124::/64 2002:5ef:2bc4:3c::2
R1(config)#exit
R1#
*Mar  1 00:51:42.459: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

b. Konfigurasi router R2 :

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 route 2002:5ef:2bc4:1124::/64 2002:5ef:2bc4:1036::2
R2(config)#exit
R2#
*Mar  1 00:44:41.719: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

c. Konfigurasi router R3 :

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ipv6 route 2002:5ef:2bc4:4d::/64 2002:5ef:2bc4:1036::1
R3(config)#ipv6 route 2002:5ef:2bc4:3c::/64 2002:5ef:2bc4:1036::1
R3(config)#ipv6 route 2002:5ef:2bc4:1015::/64 2002:5ef:2bc4:1036::1
R3(config)#ipv6 route 2002:5ef:2bc4:1018::/64 2002:5ef:2bc4:1036::1
R3(config)#exit
R3#conf term
*Mar  1 00:18:50.711: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

6. Melakukan tes PING dari masing-masing PC :
    - Tes Ping PC1 ke PC4

```
PC1> ping 2002:5ef:2bc4:1124:2050:79ff:fe66:6803

2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=1 ttl=58 time=187.049 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=58 time=93.733 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=58 time=92.268 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=58 time=94.355 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=58 time=93.123 ms

PC1>
```

Tes Ping PC2 ke PC4

```
PC2> ping 2002:5ef:2bc4:1124:2050:79ff:fe66:6803

2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=1 ttl=58 time=78.490 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=58 time=92.920 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=58 time=78.498 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=58 time=89.971 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=58 time=76.442 ms
```

Tes Ping PC3 ke PC4

```
PC3> ping 2002:5ef:2bc4:1124:2050:79ff:fe66:6803

2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=1 ttl=60 time=78.919 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=60 time=43.327 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=60 time=45.320 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=60 time=75.123 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=60 time=74.655 ms
```

7. Pengecekan trace pada router untuk dapat sampai ke PC yang dituju

Trace PC3 melalui router R1

```
R1#traceroute 2002:5ef:2bc4:4d:2050:79ff:fe66:6802

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:4D:2050:79FF:FE66:6802

  1 2002:5EF:2BC4:3C::2 44 msec 48 msec 56 msec
  2 2002:5EF:2BC4:4D:2050:79FF:FE66:6802 80 msec 48 msec 52 msec
```

Trace PC4 melalui router R1

```
R1#traceroute 2002:5ef:2bc4:1124:2050:79ff:fe66:6803

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1124:2050:79FF:FE66:6803

  1 2002:5EF:2BC4:3C::2 36 msec 52 msec 40 msec
  2 2002:5EF:2BC4:1036::2 68 msec 64 msec 48 msec
  3 2002:5EF:2BC4:1124:2050:79FF:FE66:6803 76 msec 84 msec 84 msec
R1#
```

Trace PC1 melalui router R2

```
R2#traceroute 2002:5ef:2bc4:1015:2050:79ff:fe66:6800

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1015:2050:79FF:FE66:6800

  1 2002:5EF:2BC4:3C::1 52 msec 48 msec 48 msec
  2 2002:5EF:2BC4:1015:2050:79FF:FE66:6800 48 msec 68 msec 68 msec
```

Trace PC2 melalui router R2

```
R2#traceroute 2002:5ef:2bc4:1018:2050:79ff:fe66:6801

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1018:2050:79FF:FE66:6801

  1 2002:5EF:2BC4:3C::1 56 msec 40 msec 32 msec
  2 2002:5EF:2BC4:1018:2050:79FF:FE66:6801 68 msec 52 msec 68 msec
```

Trace PC4 melalui router R2

```
R2#traceroute 2002:5ef:2bc4:1124:2050:79ff:fe66:6803

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1124:2050:79FF:FE66:6803

  1 2002:5EF:2BC4:1036::2 40 msec 32 msec 36 msec
  2 2002:5EF:2BC4:1124:2050:79FF:FE66:6803 48 msec 48 msec 52 msec
R2#
```

Trace PC1 melalui router R3

```
R3#traceroute 2002:5ef:2bc4:1015:2050:79ff:fe66:6800

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1015:2050:79FF:FE66:6800

  1 2002:5EF:2BC4:1036::1 52 msec 36 msec 52 msec
  2 2002:5EF:2BC4:3C::1 64 msec 80 msec 68 msec
  3 2002:5EF:2BC4:1015:2050:79FF:FE66:6800 80 msec 84 msec 72 msec
```

Trace PC2 melalui router R3

```
R3#traceroute 2002:5ef:2bc4:1018:2050:79ff:fe66:6801

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1018:2050:79FF:FE66:6801

  1 2002:5EF:2BC4:1036::1 40 msec 40 msec 36 msec
  2 2002:5EF:2BC4:3C::1 48 msec 48 msec 68 msec
  3 2002:5EF:2BC4:1018:2050:79FF:FE66:6801 84 msec 64 msec 68 msec
```

Trace PC3 melalui router R3

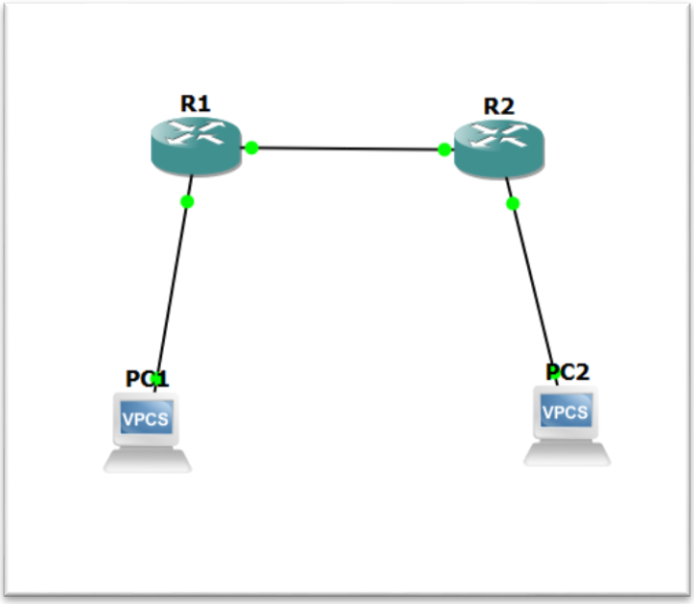
```
R3#traceroute 2002:5ef:2bc4:4d:2050:79ff:fe66:6802

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:4D:2050:79FF:FE66:6802

  1 2002:5EF:2BC4:1036::1 52 msec 48 msec 32 msec
  2 2002:5EF:2BC4:4D:2050:79FF:FE66:6802 52 msec 52 msec 56 msec
R3#
```

LK – Static Routing

Nama : Syazwandy Harahap (205150300111018)

Course : Administrasi Jaringan (Network Administrative)

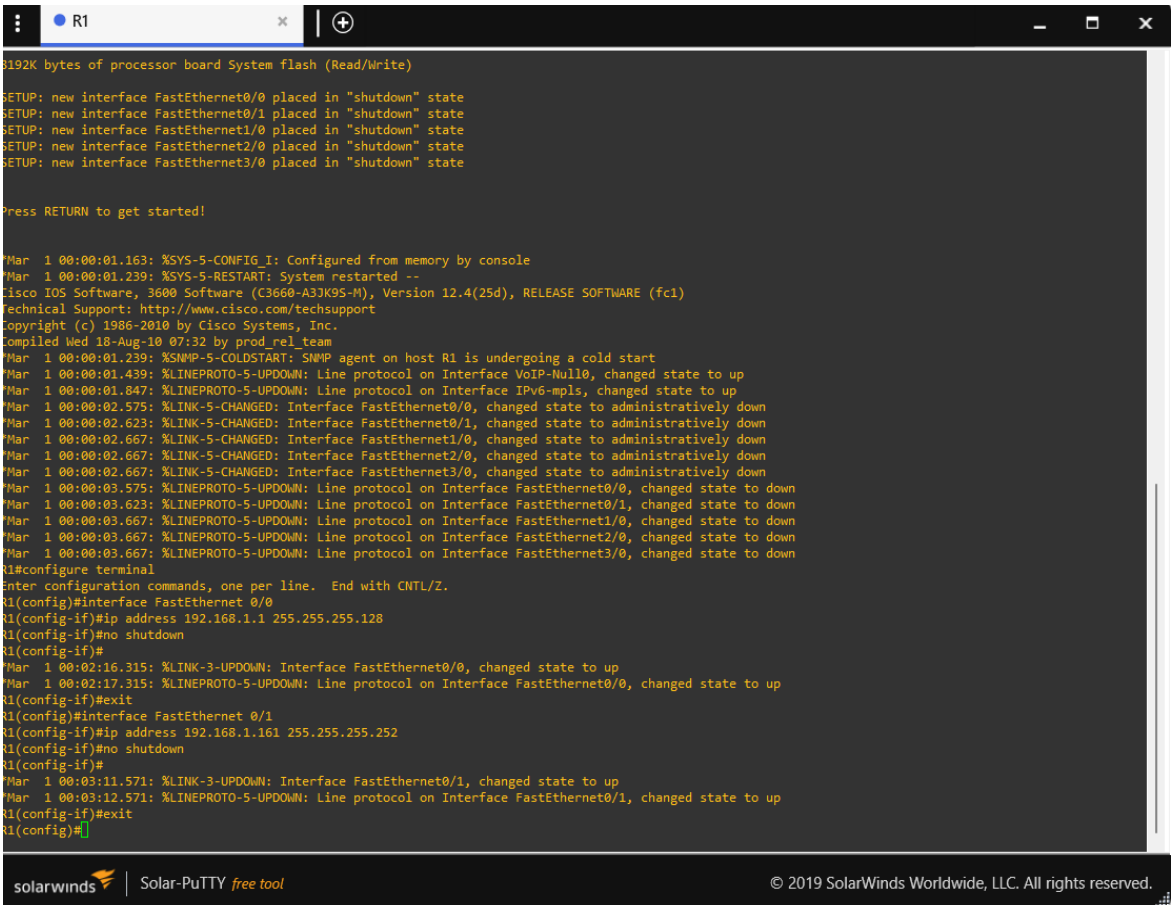
- Tambahkan dua router Cisco 3600 ke layar kerja Anda. Anda dapat mencarinya dengan mengeklik "Devices" di panel kiri dan memilih "Router" dalam kategori "Routers". Kemudian, seret dua router ke layar kerja. Router A= R1, Router B = R2
  Terdapat 3 network:
  192.168.1.0/25 tempat PC1
  192.168.1.128/27 tempat PC2
  192.168.1.160/30 antar router



- Langkah 2: Konfigurasi Router A
  - Klik dua kali pada router pertama untuk membuka jendela konfigurasi.
  - Nyalakan router dengan mengklik tombol "Start".
  - Klik kanan pada router dan pilih "Console" untuk membuka konsolnya.
- Konfigurasikan alamat IP untuk antarmuka yang menghadap ke jaringan A (192.168.1.0/25) dan antarmuka yang menghadap ke router B (192.168.1.160/30) dengan perintah berikut:
  Setelah Anda masuk ke konsol, masukkan mode konfigurasi dengan perintah berikut:

```
R1#configure terminal
R1(config)#inteface FastEthernet 0/0
R1(config-if)#configure terminal
```

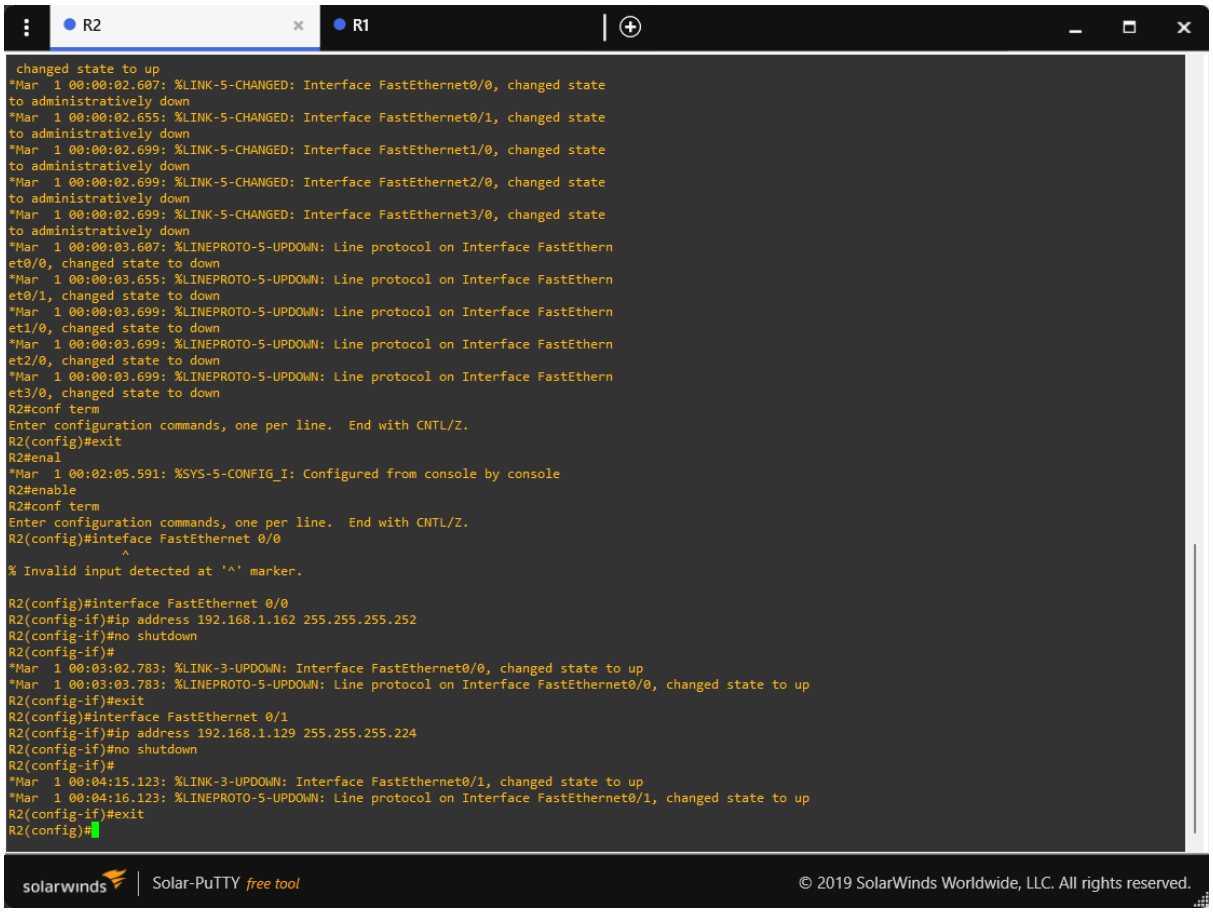
```
R1(config-if)#ip address 192.168.1.1 255.255.255.128
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface FastEthernet 0/1
R1(config-if)# ip address 192.168.1.161 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit
```



- Langkah 3: Konfigurasi Router B
    - Klik dua kali pada router kedua (Router B) untuk membuka jendela konfigurasi.
    - Nyalakan router dengan mengklik tombol "Start".
    - Klik kanan pada router dan pilih "Console" untuk membuka konsolnya.
    - Setelah Anda masuk ke konsol, masukkan mode konfigurasi dengan perintah berikut:
- Konfigurasikan alamat IP untuk antarmuka yang menghadap ke router A (192.168.1.160/30) dan antarmuka yang menghadap ke jaringan B (192.168.1.128/27) dengan perintah berikut:

```
R2#enable
R2#conf term
R2(config)#interface FastEthernet 0/0
R2(config-if)#ip address 192.168.1.162 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface FastEthernet 0/1
R2(config-if)#ip address 192.168.1.129 255.255.255.224
```

```
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#
```

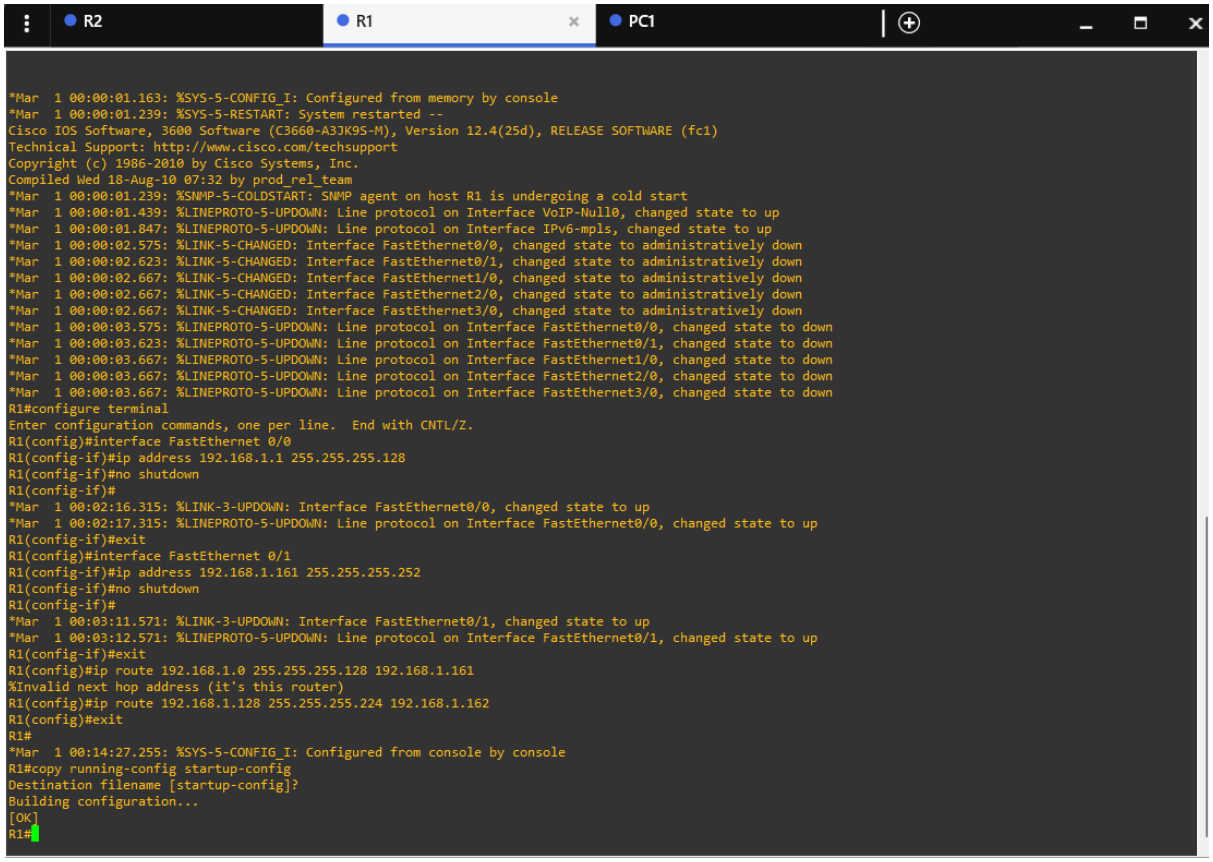


Langkah 4: Konfigurasi Routing Statis

Anda perlu menambahkan entri routing statis pada kedua router agar mereka tahu cara mencapai jaringan satu sama lain.

Pada Router A:

```
R1#conf term
R1(config)# ip route 192.168.1.128 255.255.255.224 192.168.1.162
R1(config)#exit
R1#copy running-config startup-config /lalu klik enter
```



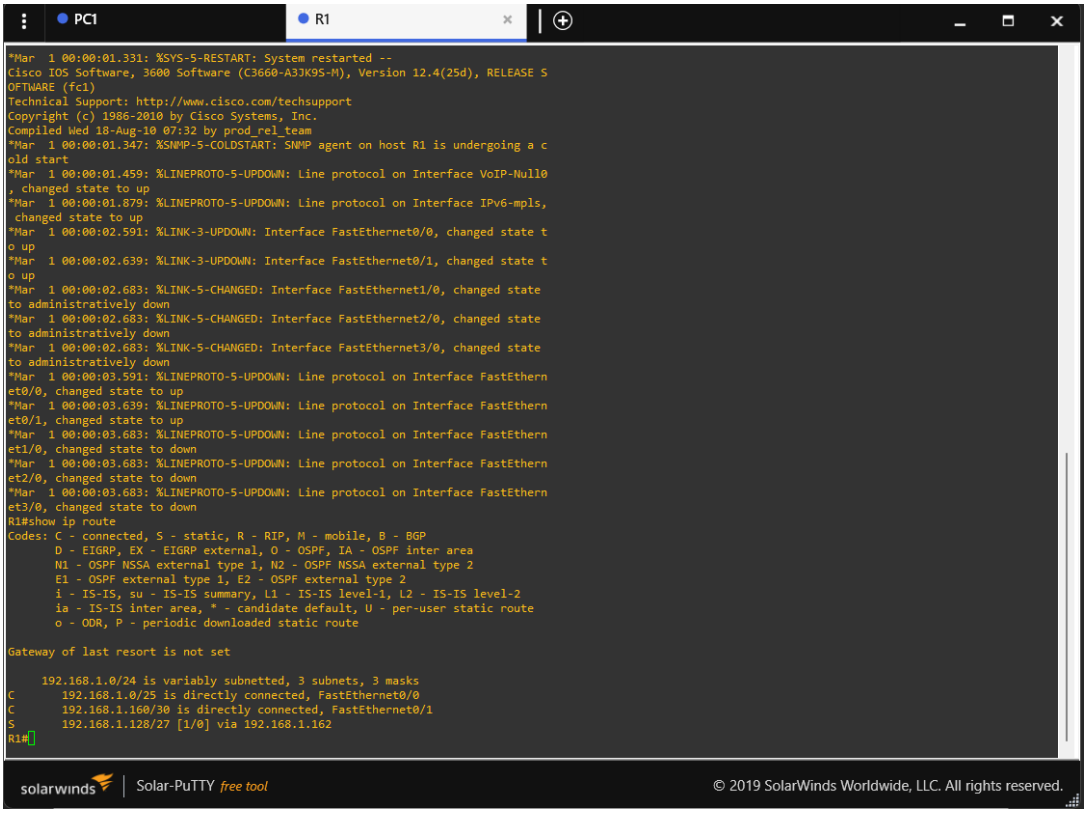
Pada Router B:

```
R2#conf term
R2(config)#ip route 192.168.1.0 255.255.255.128 192.168.1.161
R2(config)#exit
R2# copy running-config startup-config /lalu klik enter
```

Langkah 5: Verifikasi Koneksi (R1/Router A)

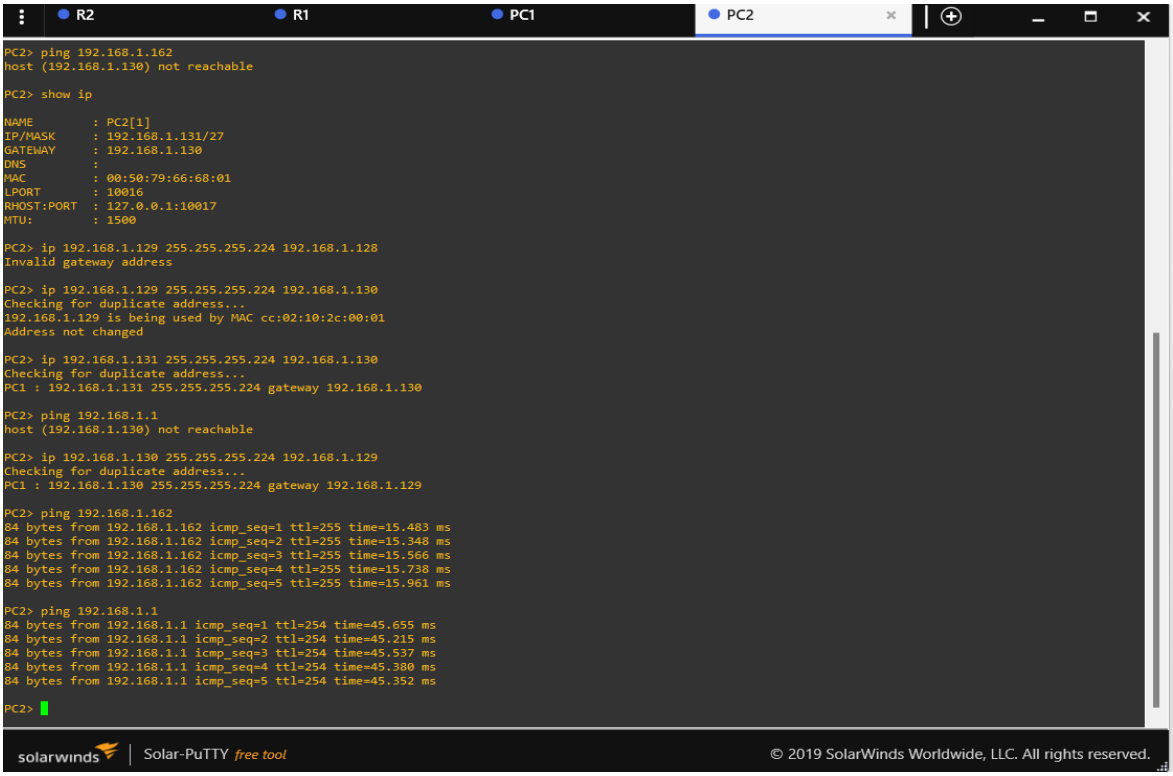
Anda dapat menguji koneksi dengan melakukan ping dari satu router ke router lainnya. Misalnya, dari Router A, coba ping alamat IP Router B (192.168.1.162) dan sebaliknya.

Check table routing pada router A,



Langkah 5: Verifikasi Koneksi (R2/Router B)

Langkah yang serupa dilakukan dari jaringan B melalui Router B dan PC2. Pada jaringan 192.168.1.129 sebagai gateway yang akan berkomunikasi dengan 192.168.1.1 pada PC1 jaringan A untuk PC2.



Check table routing pada router B,


PC1
R1
R2
PC2
*Mar 1 00:00:01.335: %SYS-5-RESTART: System restarted --
Cisco IOS Software, 3600 Software (C3660-A3JK9S-M), Version 12.4(25d), RELEASE S
OFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Wed 18-Aug-10 07:32 by prod_rel_team
*Mar 1 00:00:01.347: %SNMP-5-COLDSTART: SNMP agent on host R2 is undergoing a c
old start
*Mar 1 00:00:01.455: %LINEPROTO-5-UPDOWN: Line protocol on Interface VoIP-Null0
, changed state to up
*Mar 1 00:00:01.879: %LINEPROTO-5-UPDOWN: Line protocol on Interface IPv6-mpls,
changed state to up
*Mar 1 00:00:02.591: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state t
o up
*Mar 1 00:00:02.639: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state t
o up
*Mar 1 00:00:02.683: %LINK-5-CHANGED: Interface FastEthernet1/0, changed state
to administratively down
*Mar 1 00:00:02.683: %LINK-5-CHANGED: Interface FastEthernet2/0, changed state
to administratively down
*Mar 1 00:00:02.683: %LINK-5-CHANGED: Interface FastEthernet3/0, changed state
to administratively down
*Mar 1 00:00:03.591: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to up
*Mar 1 00:00:03.639: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to up
*Mar 1 00:00:03.683: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to down
*Mar 1 00:00:03.683: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et2/0, changed state to down
*Mar 1 00:00:03.683: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et3/0, changed state to down
R2#show ip route
Codes: C - connected, S - static, 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
i - IS-IS, su - IS-IS summary, 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
192.168.1.0/24 is variably subnetted, 3 subnets, 3 masks
S 192.168.1.0/25 [1/0] via 192.168.1.161
C 192.168.1.160/30 is directly connected, FastEthernet0/0
C 192.168.1.128/27 is directly connected, FastEthernet0/1
R2#
solarwinds
Solar-PuTTY free tool
© 2019 SolarWinds Worldwide, LLC. All rights reserved.

LK: OSPF (Open Shortest Path First)

Nama : Syazwandy Harahap (205150300111018)

Course : Administrasi Jaringan (Network Administrative)

Pendahuluan

Konfigurasi dasar OSPF

R3#**configure terminal**
R3(config)#**router ospf 11**
R3(config-router)#**network 192.82.3.0 0.0.0.255 area 11**
R3(config-router)#**network 192.82.5.0 0.0.0.255 area 11**
R3(config-router)#**network 192.82.6.0 0.0.0.255 area 11**
R3(config-router)#**exit**
R3(config)#**exit**
R3#

Pengertian

Open Shortest Path First (OSPF) adalah salah satu protokol routing interior yang digunakan untuk mengatur perpindahan paket data di dalam jaringan komputer. OSPF adalah protokol open-standard yang dikembangkan oleh Internet Engineering Task Force (IETF) dan digunakan untuk mengatur lalu lintas IP dalam jaringan yang menggunakan model OSI (Open Systems Interconnection). Berikut adalah penjelasan tentang OSPF, termasuk jenis pesan, cara menemukan tetangga router, dan konsep Designated Router (DR) dan Backup Designated Router (BDR):

Jenis Pesan OSPF:

1. Hello Packets: Pesan Hello digunakan untuk menemukan tetangga OSPF. Router mengirimkan Hello Packets secara periodik ke alamat multicast OSPF yang khusus. Pesan Hello ini membantu router untuk menentukan apakah tetangga OSPF masih aktif.
2. Link-State Advertisement (LSA): Pesan LSA digunakan untuk berbagi informasi topologi jaringan antara router-OSPF. Terdapat beberapa jenis LSA yang berbeda, seperti LSA tipe-1 untuk router, LSA tipe-2 untuk network, LSA tipe-3 untuk summary routes, dan lainnya.

Cara Menemukan Tetangga Router:

1. Router OSPF menggunakan pesan Hello untuk menemukan tetangga mereka di jaringan. Ketika router menyala atau saat OSPF diaktifkan, mereka mulai mengirimkan Hello

Packets ke alamat multicast OSPF. Router lain yang mendengar Hello Packets ini akan membalas jika mereka ingin menjadi tetangga.

2. Untuk menjadi tetangga, dua router harus memiliki parameter OSPF yang sesuai, seperti area ID, subnet mask, hello timer, dead timer, dan nomor router ID yang unik.
3. Ketika kedua router berhasil saling mengenali melalui Hello Packets, mereka menjadi tetangga OSPF dan mulai berbagi informasi topologi melalui pesan LSA.

Designated Router (DR) dan Backup Designated Router (BDR):

1. Dalam jaringan OSPF yang cukup besar, jumlah pesan Hello yang dikirim oleh setiap router dapat menjadi overhead yang tinggi. Untuk mengatasi masalah ini, OSPF menggunakan konsep DR dan BDR.
2. DR adalah router yang bertanggung jawab untuk mengirimkan pesan Hello ke semua tetangganya di segmen jaringan. BDR adalah cadangan DR yang akan menggantikan DR jika DR gagal.
3. DR dan BDR dipilih berdasarkan prioritas OSPF yang ditetapkan pada setiap router di segmen. Router dengan prioritas tertinggi menjadi DR, sedangkan router dengan prioritas kedua tertinggi menjadi BDR. Jika ada router dengan prioritas yang sama, maka router dengan Router ID terbesar akan menjadi DR.
4. DR dan BDR mengurangi jumlah pesan Hello yang dikirimkan di segmen jaringan, mengurangi overhead dan meningkatkan efisiensi komunikasi OSPF.

Dengan OSPF, jaringan dapat mengatur lalu lintas IP secara dinamis berdasarkan topologi jaringan dan menjaga database topologi yang akurat di setiap router. Hal ini membuat OSPF menjadi salah satu protokol routing yang sangat digunakan dalam jaringan yang besar dan kompleks.

Kelebihan

- Tidak menghasilkan routing loop
- Mendukung penggunaan beberapa metrik sekaligus
- Dapat menghasilkan banyak jalur ke sebuah tujuan
- Membagi jaringan yang besar mejadi beberapa area.
- Waktu yang diperlukan untuk konvergen lebih cepat

Kekurangan

- Membutuhkan basis data yang besar
- Lebih rumit

Cara kerja OSPF

Gambaran dari cara kerja OSPF :

1. Setiap router membuat Link State Packet (LSP)

2. Kemudian LSP didistribusikan ke semua neighbour menggunakan Link State Advertisement (LSA) type 1 dan menentukan DR dan BDR dalam 1 Area.
3. Masing-masing router menghitung jalur terpendek (Shortest Path) ke semua neighbour berdasarkan cost routing.
4. Jika ada perbedaan atau perubahan tabel routing, router akan mengirimkan LSP ke DR dan BDR melalui alamat multicast 224.0.0.6
5. LSP akan didistribusikan oleh DR ke router neighbour lain dalam 1 area sehingga semua router neighbour akan melakukan perhitungan ulang jalur terpendek.

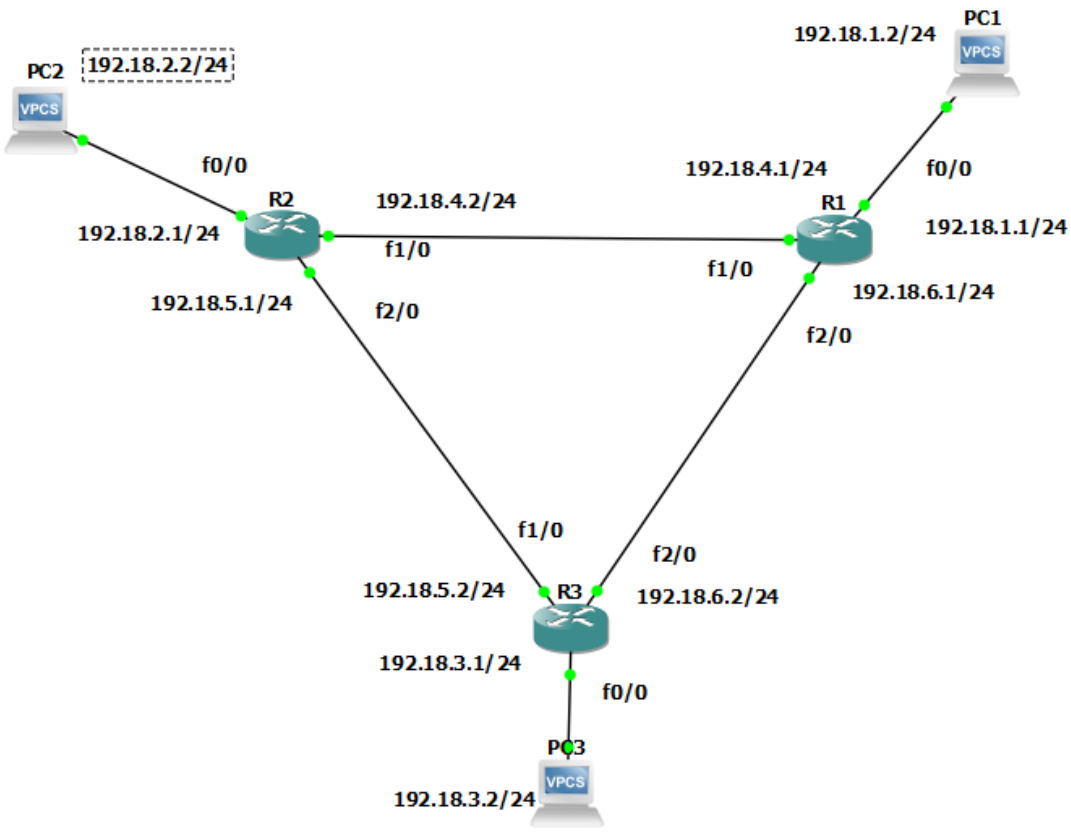
Latihan

Aturan wajib:

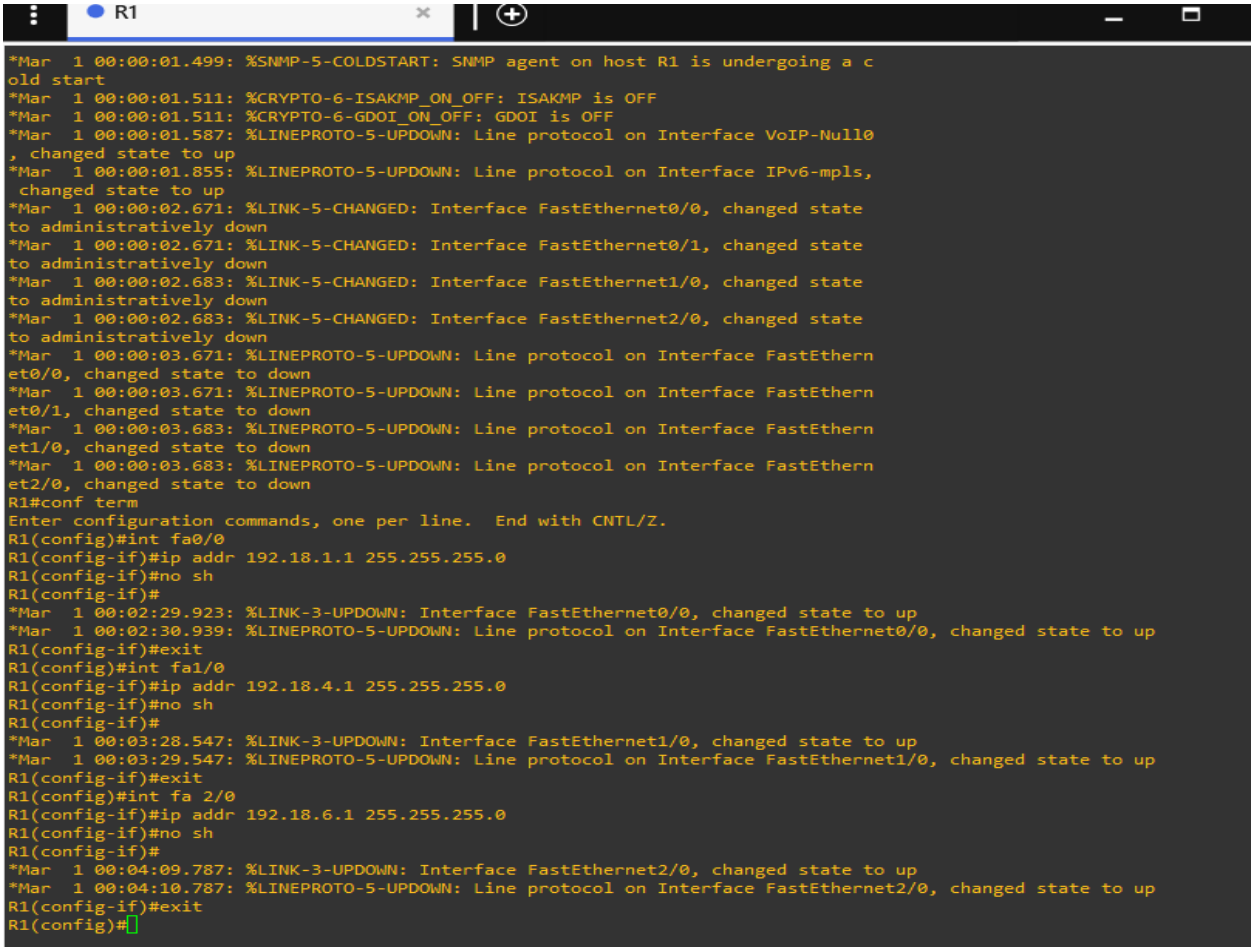
1. Pada topologi dibawah ini menggunakan network 192.**82**.X.X, ganti 82 dengan 2 digit NIM terakhir mhs.

2. Update screenshot dan dapat memberikan penjelasan lebih detail setiap konfigurasinya

1. Topologi jaringan dan alokasi IP



2. Konfigurasi IP pada masing-masing interface
   - R1



- R2

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int fa 0/0
R2(config-if)#ip addr 192.18.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:03:57.255: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:03:58.255: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ip addr 192.18.4.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:04:29.851: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:04:30.851: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 2/0
R2(config-if)#ip addr 192.18.5.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:05:13.183: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Mar  1 00:05:14.183: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config-if)#exit
R2(config)#
```

- R3

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int fa 0/0
R3(config-if)#ip addr 192.18.3.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:05:26.003: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:05:27.003: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#exit
R3(config)#int fa 1/0
R3(config-if)#ip addr 192.18.5.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:06:09.763: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:06:10.763: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R3(config-if)#exit
R3(config)#int fa 2/0
R3(config-if)#ip addr 192.18.6.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:06:51.255: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Mar  1 00:06:52.255: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R3(config-if)#exit
R3(config)#
```

Simpan konfigurasi pada masing-masing router dengan sintaks berikut ini :

Copy running-config startup-config (enter) Destination filename [startup-config] ? (enter) Building configuration [OK]

- R3

```
*Mar  1 00:06:51.255: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed st
*Mar  1 00:06:52.255: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastE
R3(config-if)#exit
R3(config)#copy running-config startup-coonfig
             ^
% Invalid input detected at '^' marker.

R3(config)#exit
R3#
*Mar  1 00:09:16.975: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

- R2

```
*Mar  1 00:05:13.183: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state
*Mar  1 00:05:14.183: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEther
R2(config-if)#exit
R2(config)#exit
R2#
*Mar  1 00:11:34.211: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

- R1

```
R1(config-if)#
*Mar  1 00:04:09.787: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed stat
*Mar  1 00:04:10.787: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
R1(config-if)#exit
R1(config)#exit
R1#co
*Mar  1 00:15:25.355: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

Setting IP pada masing-masing PC

- IP PC1

```
PC1> ip 192.18.1.2 255.255.255.0 192.18.1.1
Checking for duplicate address...
PC1 : 192.18.1.2 255.255.255.0 gateway 192.18.1.1

PC1> save
Saving startup configuration to startup.vpc
.  done

PC1>
```

- IP PC2

```
PC2> ip 192.18.2.2 255.255.255.0 192.18.2.1
Checking for duplicate address...
PC1 : 192.18.2.2 255.255.255.0 gateway 192.18.2.1

PC2> save
Saving startup configuration to startup.vpc
.  done

PC2>
```

- IP PC3

```
PC3> ip 192.18.3.2 255.255.255.0 192.18.3.1
Checking for duplicate address...
PC1 : 192.18.3.2 255.255.255.0 gateway 192.18.3.1

PC3> save
Saving startup configuration to startup.vpc
.  done

PC3>
```

3. Konfigurasi OSPF, yaitu konfigurasi network id, wildcard dan area

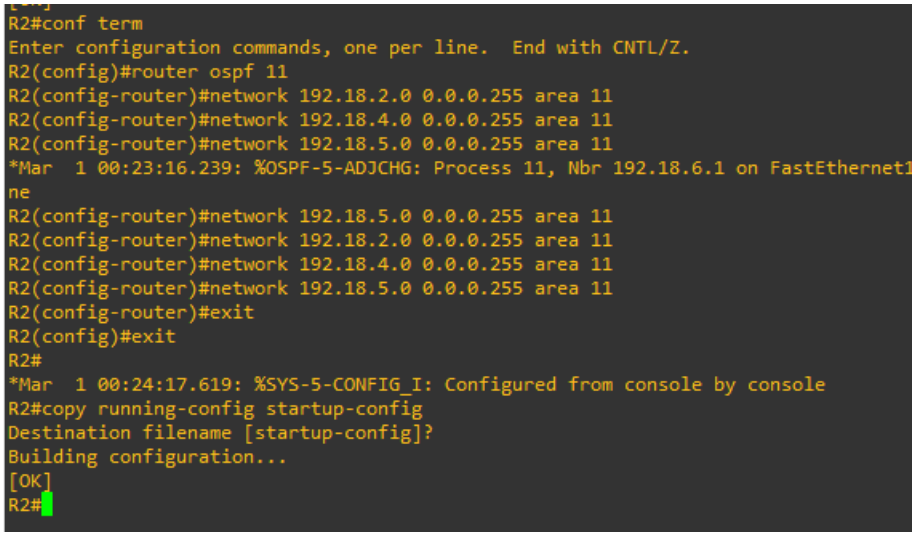
   Konfigruasi pada R1

```
R1#configure terminal
R1(config)#router ospf 11
R1(config-router)#network 192.82.1.0 0.0.0.255 area 11
R1(config-router)#network 192.82.4.0 0.0.0.255 area 11
R1(config-router)#network 192.82.6.0 0.0.0.255 area 11
R1(config-router)#exit
R1(config)#exit
R1#
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R1#
```

```
[OK]
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 11
R1(config-router)#network 192.18.1.0 0.0.0.255 area 11
R1(config-router)#network 192.18.4.0 0.0.0.255 area 11
R1(config-router)#network 192.18.6.0 0.0.0.255 area 11
R1(config-router)#exit
R1(config)#exit
R1#
*Mar  1 00:23:44.599: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

Konfigurasi pada R2

```
R3#configure terminal
R3(config)#router ospf 11
R3(config-router)#network 192.82.2.0 0.0.0.255 area 11
R3(config-router)#network 192.82.4.0 0.0.0.255 area 11
R3(config-router)#network 192.82.5.0 0.0.0.255 area 11
R3(config-router)#exit
R3(config)#exit
R3#
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R2#
```



Konfigurasi pada R3

```
R3#configure terminal
R3(config)#router ospf
R3(config-router)#network 192.82.3.0 0.0.0.255 area 11
R3(config-router)#network 192.82.5.0 0.0.0.255 area 11
R3(config-router)#network 192.82.6.0 0.0.0.255 area 11
R3(config-router)#exit
R3(config)#exit
R3#
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
```

```
[OK]
R3#
```

```
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 11
R3(config-router)#network 192.18.3.0 0.0.0.255 area 11
R3(config-router)#network 192.18.5.0 0.0.0.255 area 11
R3(config-router)#network 192.18.6.0 0.0.0.255 area 11
*Mar  1 00:24:14.811: %OSPF-5-ADJCHG: Process 11, Nbr 192.18.5.1 on FastEther
ne
R3(config-router)#network 192.18.6.0 0.0.0.255 area 11
R3(config-router)#network 192.18.6.0 0.0.0.255 area 11
*Mar  1 00:24:21.031: %OSPF-5-ADJCHG: Process 11, Nbr 192.18.6.1 on FastEther
ne
R3(config-router)#network 192.18.3.0 0.0.0.255 area 11
R3(config-router)#network 192.18.6.0 0.0.0.255 area 11
R3(config-router)#network 192.18.5.0 0.0.0.255 area 11
R3(config-router)#exit
R3(config)#exit
R3#
*Mar  1 00:24:57.047: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

4. Pembuktian konfigurasi berhasil dengan PING
   - Dari PC1

```
PC1> ping 192.18.2.2
192.18.2.2 icmp_seq=1 timeout
84 bytes from 192.18.2.2 icmp_seq=2 ttl=62 time=47.225 ms
84 bytes from 192.18.2.2 icmp_seq=3 ttl=62 time=60.684 ms
84 bytes from 192.18.2.2 icmp_seq=4 ttl=62 time=47.047 ms
84 bytes from 192.18.2.2 icmp_seq=5 ttl=62 time=47.472 ms

PC1> ping 192.18.3.2
192.18.3.2 icmp_seq=1 timeout
84 bytes from 192.18.3.2 icmp_seq=2 ttl=62 time=61.318 ms
84 bytes from 192.18.3.2 icmp_seq=3 ttl=62 time=60.472 ms
84 bytes from 192.18.3.2 icmp_seq=4 ttl=62 time=60.775 ms
84 bytes from 192.18.3.2 icmp_seq=5 ttl=62 time=60.580 ms

PC1> ping 192.18.3.2
84 bytes from 192.18.3.2 icmp_seq=1 ttl=62 time=60.516 ms
84 bytes from 192.18.3.2 icmp_seq=2 ttl=62 time=44.741 ms
84 bytes from 192.18.3.2 icmp_seq=3 ttl=62 time=47.133 ms
84 bytes from 192.18.3.2 icmp_seq=4 ttl=62 time=60.730 ms
84 bytes from 192.18.3.2 icmp_seq=5 ttl=62 time=61.127 ms

PC1> ping 192.18.2.2
84 bytes from 192.18.2.2 icmp_seq=1 ttl=62 time=61.524 ms
84 bytes from 192.18.2.2 icmp_seq=2 ttl=62 time=60.546 ms
84 bytes from 192.18.2.2 icmp_seq=3 ttl=62 time=62.513 ms
84 bytes from 192.18.2.2 icmp_seq=4 ttl=62 time=61.458 ms
84 bytes from 192.18.2.2 icmp_seq=5 ttl=62 time=60.979 ms

PC1>
```

- Dari PC2

```
PC2> ping 192.18.1.2
192.18.1.2 icmp_seq=1 timeout
192.18.1.2 icmp_seq=2 timeout
84 bytes from 192.18.1.2 icmp_seq=3 ttl=62 time=62.326 ms
84 bytes from 192.18.1.2 icmp_seq=4 ttl=62 time=48.050 ms
84 bytes from 192.18.1.2 icmp_seq=5 ttl=62 time=61.877 ms

PC2> ping 192.18.1.2
84 bytes from 192.18.1.2 icmp_seq=1 ttl=62 time=49.511 ms
84 bytes from 192.18.1.2 icmp_seq=2 ttl=62 time=47.103 ms
84 bytes from 192.18.1.2 icmp_seq=3 ttl=62 time=61.858 ms
84 bytes from 192.18.1.2 icmp_seq=4 ttl=62 time=47.404 ms
84 bytes from 192.18.1.2 icmp_seq=5 ttl=62 time=60.433 ms

PC2> ping 192.18.3.2
192.18.3.2 icmp_seq=1 timeout
192.18.3.2 icmp_seq=2 timeout
84 bytes from 192.18.3.2 icmp_seq=3 ttl=62 time=60.527 ms
84 bytes from 192.18.3.2 icmp_seq=4 ttl=62 time=48.187 ms
84 bytes from 192.18.3.2 icmp_seq=5 ttl=62 time=60.684 ms

PC2> ping 192.18.3.2
84 bytes from 192.18.3.2 icmp_seq=1 ttl=62 time=47.752 ms
84 bytes from 192.18.3.2 icmp_seq=2 ttl=62 time=44.038 ms
84 bytes from 192.18.3.2 icmp_seq=3 ttl=62 time=61.512 ms
84 bytes from 192.18.3.2 icmp_seq=4 ttl=62 time=46.669 ms
84 bytes from 192.18.3.2 icmp_seq=5 ttl=62 time=58.573 ms

PC2>
```

- Dari PC3

```
PC3> ping 192.18.1.2
84 bytes from 192.18.1.2 icmp_seq=1 ttl=62 time=61.367 ms
84 bytes from 192.18.1.2 icmp_seq=2 ttl=62 time=59.792 ms
84 bytes from 192.18.1.2 icmp_seq=3 ttl=62 time=47.374 ms
84 bytes from 192.18.1.2 icmp_seq=4 ttl=62 time=45.469 ms
84 bytes from 192.18.1.2 icmp_seq=5 ttl=62 time=43.155 ms

PC3> ping 192.18.2.2
192.18.2.2 icmp_seq=1 timeout
192.18.2.2 icmp_seq=2 timeout
84 bytes from 192.18.2.2 icmp_seq=3 ttl=62 time=60.825 ms
84 bytes from 192.18.2.2 icmp_seq=4 ttl=62 time=47.776 ms
84 bytes from 192.18.2.2 icmp_seq=5 ttl=62 time=44.761 ms

PC3> ping 192.18.2.2
84 bytes from 192.18.2.2 icmp_seq=1 ttl=62 time=48.761 ms
84 bytes from 192.18.2.2 icmp_seq=2 ttl=62 time=60.748 ms
84 bytes from 192.18.2.2 icmp_seq=3 ttl=62 time=60.020 ms
84 bytes from 192.18.2.2 icmp_seq=4 ttl=62 time=46.463 ms
84 bytes from 192.18.2.2 icmp_seq=5 ttl=62 time=47.653 ms

PC3>
```

5. Menampilkan IP route di setiap router
   - R1

```
R1#show ip route ospf
O    192.18.5.0/24 [110/2] via 192.18.6.2, 00:06:59, FastEthernet2/0
                   [110/2] via 192.18.4.2, 00:09:40, FastEthernet1/0
O    192.18.2.0/24 [110/11] via 192.18.4.2, 00:09:58, FastEthernet1/0
O    192.18.3.0/24 [110/11] via 192.18.6.2, 00:06:59, FastEthernet2/0
R1#
```

   - R2

```
R2#show ip route ospf
O    192.18.6.0/24 [110/2] via 192.18.5.2, 00:08:08, FastEthernet2/0
                   [110/2] via 192.18.4.1, 00:11:01, FastEthernet1/0
O    192.18.1.0/24 [110/11] via 192.18.4.1, 00:11:01, FastEthernet1/0
O    192.18.3.0/24 [110/11] via 192.18.5.2, 00:08:18, FastEthernet2/0
R2#
```

   - R3

```
R3#show ip route ospf
O    192.18.4.0/24 [110/2] via 192.18.6.1, 00:08:55, FastEthernet2/0
                   [110/2] via 192.18.5.1, 00:09:05, FastEthernet1/0
O    192.18.1.0/24 [110/11] via 192.18.6.1, 00:08:55, FastEthernet2/0
O    192.18.2.0/24 [110/11] via 192.18.5.1, 00:09:05, FastEthernet1/0
R3#
```

6. Menampilkan traceroute dari router ke setiap PC
   - R1

```
R1#traceroute 192.18.2.2

Type escape sequence to abort.
Tracing the route to 192.18.2.2

  1 192.18.4.2 16 msec 28 msec 36 msec
  2  *
    192.18.2.2 64 msec 36 msec
R1#traceroute 192.18.2.2

Type escape sequence to abort.
Tracing the route to 192.18.2.2

  1 192.18.4.2 24 msec 32 msec 28 msec
  2 192.18.2.2 32 msec 60 msec 60 msec
R1#traceroute 192.18.3.2

Type escape sequence to abort.
Tracing the route to 192.18.3.2

  1 192.18.6.2 20 msec 28 msec 32 msec
  2  *
    192.18.3.2 84 msec 32 msec
R1#traceroute 192.18.3.2

Type escape sequence to abort.
Tracing the route to 192.18.3.2

  1 192.18.6.2 44 msec 28 msec 24 msec
  2 192.18.3.2 44 msec 32 msec 60 msec
R1#
```

- R2

```
R2#traceroute 192.18.1.2

Type escape sequence to abort.
Tracing the route to 192.18.1.2

  1 192.18.4.1 20 msec 28 msec 32 msec
  2  *
    192.18.1.2 72 msec 8 msec
R2#traceroute 192.18.1.2

Type escape sequence to abort.
Tracing the route to 192.18.1.2

  1 192.18.4.1 28 msec 28 msec 36 msec
  2 192.18.1.2 32 msec 28 msec 32 msec
R2#traceroute 192.18.3.2

Type escape sequence to abort.
Tracing the route to 192.18.3.2

  1 192.18.5.2 48 msec 24 msec 28 msec
  2 192.18.3.2 24 msec 52 msec 52 msec
R2#
```

- R3

```
R3#traceroute 192.18.1.2

Type escape sequence to abort.
Tracing the route to 192.18.1.2

  1 192.18.6.1 24 msec 32 msec 32 msec
  2 192.18.1.2 56 msec 32 msec 28 msec
R3#traceroute 192.18.2.2

Type escape sequence to abort.
Tracing the route to 192.18.2.2

  1 192.18.5.1 40 msec 32 msec 32 msec
  2  *
    192.18.2.2 60 msec 0 msec
R3#traceroute 192.18.2.2

Type escape sequence to abort.
Tracing the route to 192.18.2.2

  1 192.18.5.1 44 msec 24 msec 32 msec
  2 192.18.2.2 56 msec 32 msec 56 msec
R3#
```

Soal!!!!

1. Tunjukkan DR dan BDRnya! Dan pada router yang mana?

Router DR pada Router 3 ditunjukkan berada pada 192.18.6.1 (R1) dan 192.18.5.1 (R2)

```
R3#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.18.6.1        1   FULL/DR         00:00:36    192.18.6.1      FastEthernet2/0
192.18.5.1        1   FULL/DR         00:00:37    192.18.5.1      FastEthernet1/0
R3#
```

Sedangkan pada Router 1 BDR ada pada ip 192.18.6.2(R3) dan 192.18.4.2(R2)

```
R1#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.18.6.2        1   FULL/BDR        00:00:38    192.18.6.2      FastEthernet2/0
192.18.5.1        1   FULL/BDR        00:00:32    192.18.4.2      FastEthernet1/0
R1#
```

Dan untuk Router 2 terdapat BDR pada ip 192.18.5.2(R3) dan DR pada ip 192.18.4.1(R1)

```
R2#show ip ospf neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface
192.18.6.2        1   FULL/BDR        00:00:37    192.18.5.2      FastEthernet2/0
192.18.6.1        1   FULL/DR         00:00:32    192.18.4.1      FastEthernet1/0
R2#
```

2. Tunjukkan cost dari network PC1 ke network PC 2? Berikan screenshot dan jelaskan screenshot tersebut!

Cost dari network PC1 ke network PC2 adalah cost = 11 (dilihat pada Route metric is 11).

```
  Suppress hello for 0 neighbor(s)
R1#
R1#show ip route ospf 11
O    192.18.5.0/24 [110/2] via 192.18.6.2, 01:10:50, FastEthernet2/0
                   [110/2] via 192.18.4.2, 01:13:30, FastEthernet1/0
O    192.18.2.0/24 [110/11] via 192.18.4.2, 01:13:49, FastEthernet1/0
O    192.18.3.0/24 [110/11] via 192.18.6.2, 01:10:50, FastEthernet2/0
R1#show ip route 192.18.2.0
Routing entry for 192.18.2.0/24
  Known via "ospf 11", distance 110, metric 11, type intra area
  Last update from 192.18.4.2 on FastEthernet1/0, 01:15:41 ago
  Routing Descriptor Blocks:
  * 192.18.4.2, from 192.18.5.1, 01:15:41 ago, via FastEthernet1/0
      Route metric is 11, traffic share count is 1

R1#
```

LK: Multi Area OSPF

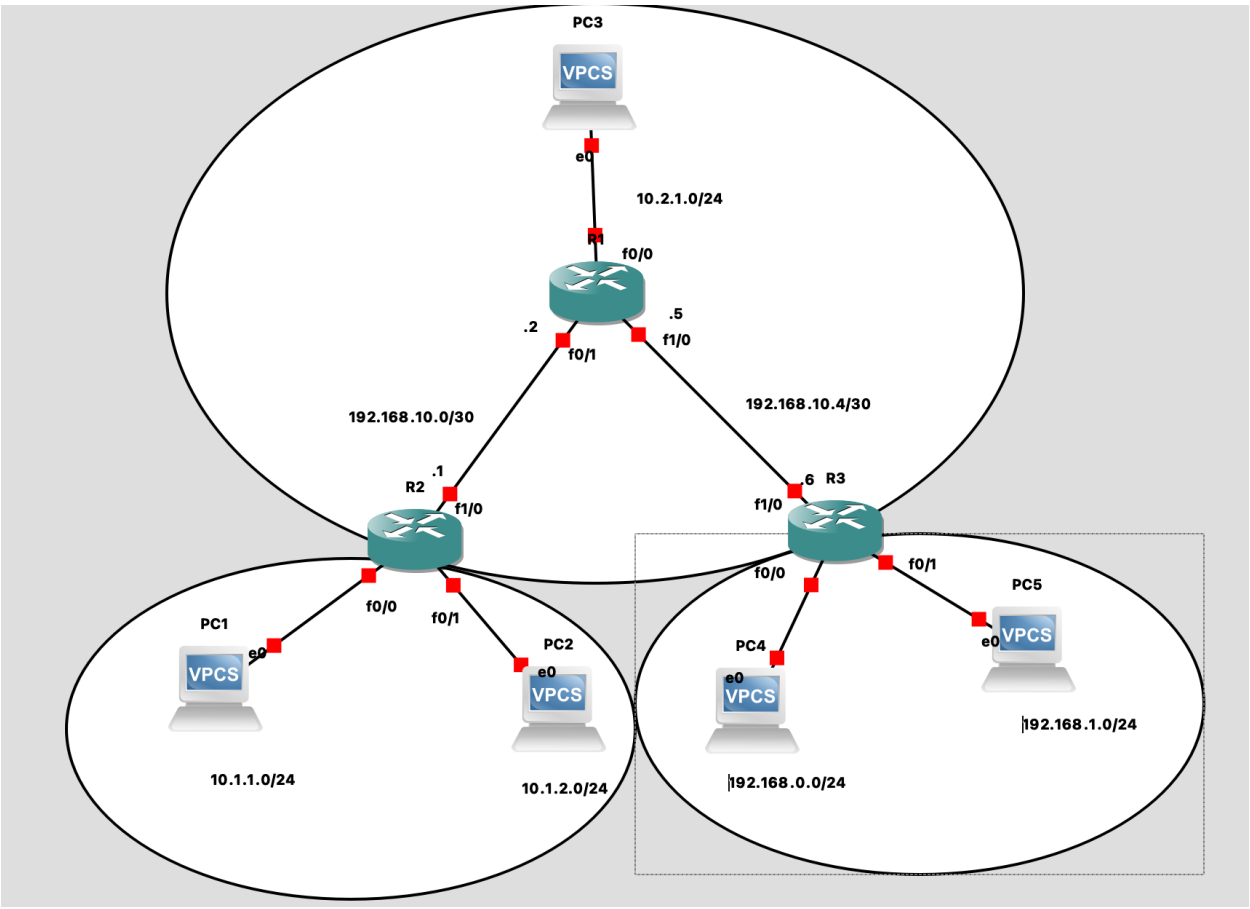
Nama : Syazwandy Harahap (205150300111018)

Course : Administrasi Jaringan (Network Administrative)

Deskripsi LK

1. Dikerjakan per mahasiswa
2. Pada IP antar router 192.168.**10**.X, ganti 10 dengan 2 digit NIM terakhir

Desain jaringan



* Nama interface router sesuai dengan desain tiap mahasiswa
* Lingkaran merepresentasikan area pada OSPF

Soal

1. Koneksikan seluruh jaringan dengan konfigurasi multi area OSPF **(30 point)**
2. Pada R3 (pada gambar, menyesuaikan desain masing2) tunjukkan network yang berada pada area OSPF yang sama dengan R3, dan network yang berasal dari area lain!
3. Manakah yang merupakan ABR dan tunjukan dengan screenshot routing tablenya!
4. Apakah ada DR dan BDR pada network tersebut? Jelaskan!
5. Jika anda adalah sebagai network administrator dan dihadapkan pilihan untuk menggunakan OSPF atau IS-IS pada jaringan intra AS, manakah protocol yang akan anda pilih? Berikan alasan dan referensinya (website resmi/whitepaper/rfc)
6. Buat tabel perbandingan untuk kedua protokol tersebut!

1.

R1

```
et2/0, changed state to down
R1#enable
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fa0/0
R1(config-if)#ip addr 10.2.1.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Mar  1 00:01:54.927: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:01:55.927: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#int fa0/1
R1(config-if)#ip addr 192.168.18.2 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Mar  1 00:02:48.835: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar  1 00:02:49.835: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R1(config-if)#exit
R1(config)#int fa1/0
R1(config-if)#ip addr 192.168.18.5 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Mar  1 00:03:40.599: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:03:41.599: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#exit
R1#
*Mar  1 00:03:50.103: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

R2

```
et2/0, changed state to down
R2#enable
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int fa0/0
R2(config-if)#ip addr 10.1.1.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:03:46.923: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:03:47.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#int fa0/1
R2(config-if)#ip addr 10.1.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:06:17.171: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar  1 00:06:18.171: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R2(config-if)#exit
R2(config)#int fa1/0
R2(config-if)#ip addr 192.168.18.1 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:07:47.495: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:07:48.495: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#exit
R2#
*Mar  1 00:08:25.347: %SYS-5-CONFIG_I: Configured from console by console
R2#xopy running-config startup-config
    ^
% Invalid input detected at '^' marker.

R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

R3

```
et2/0, changed state to down
R3#enable
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int fa1/0
R3(config-if)#ip addr 192.168.18.6 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:08:39.187: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:08:40.199: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R3(config-if)#exit
R3(config)#int fa0/0
R3(config-if)#ip addr 192.168.0.1 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:09:24.467: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:09:25.467: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#exit
R3(config)#int fa0/1
R3(config-if)#ip addr 192.168.1.1 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:10:11.899: %LINK-3-UPDOWN: Interface FastEthernet0/1, changed state to up
*Mar  1 00:10:12.899: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
R3(config-if)#exit
R3(config)#exit
R3#
*Mar  1 00:11:11.371: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

PC1

```
PC1> ip 10.1.1.2 255.255.255.0 10.1.1.1
Checking for duplicate address...
PC1 : 10.1.1.2 255.255.255.0 gateway 10.1.1.1

PC1> save
Saving startup configuration to startup.vpc
.  done

PC1> ping 10.1.2.2
10.1.2.2 icmp_seq=1 timeout
84 bytes from 10.1.2.2 icmp_seq=2 ttl=63 time=30.059 ms
84 bytes from 10.1.2.2 icmp_seq=3 ttl=63 time=30.771 ms
84 bytes from 10.1.2.2 icmp_seq=4 ttl=63 time=30.083 ms
84 bytes from 10.1.2.2 icmp_seq=5 ttl=63 time=29.742 ms

PC1>
```

PC2

```
PC2> ip 10.1.2.2 255.255.255.0 10.1.2.1
Checking for duplicate address...
PC1 : 10.1.2.2 255.255.255.0 gateway 10.1.2.1

PC2> save
Saving startup configuration to startup.vpc
.  done

PC2>
```

PC3

```
PC3> ip 10.2.1.2 255.255.255.0 10.2.1.1
Checking for duplicate address...
PC1 : 10.2.1.2 255.255.255.0 gateway 10.2.1.1

PC3> save
Saving startup configuration to startup.vpc
.  done

PC3>
```

PC4

```
PC4> ip 192.168.0.2 255.255.255.252 192.168.0.1
Checking for duplicate address...
PC1 : 192.168.0.2 255.255.255.252 gateway 192.168.0.1

PC4> save
Saving startup configuration to startup.vpc
.  done
```

PC5

```
PC5> ip 192.168.1.2 255.255.255.252 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.252 gateway 192.168.1.1

PC5> save
Saving startup configuration to startup.vpc
.  done
```

Pengaturan OSPF

R1

```
*Mar  1 01:01:57.855: %OSPF-5-ADJCHG: Process 11, Nbr 192.168.18.6 on FastEthernet1/0 from
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router ospf 11
R1(config-router)#network 10.2.1.0 0.0.0.255 area 0
R1(config-router)#
*Mar  1 01:10:11.507: %OSPF-6-AREACHG: 10.2.1.0/24 changed from area 11 to area 0
R1(config-router)#network 192.168.18.4 0.0.0.3 area 0
R1(config-router)#network 192.168.18.0 0.0.0.3 area 0
R1(config-router)#end
R1#
*Mar  1 01:10:40.311: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

R2

```
astEthernet1/0
R2(config-router)#network 192.168.18.0 0.0.0.3 area 0
R2(config-router)#
*Mar  1 00:56:30.971: %OSPF-6-AREACHG: 192.168.18.0/30 changed from area 11 to area 0
R2(config-router)#
*Mar  1 00:56:31.123: %OSPF-5-ADJCHG: Process 11, Nbr 192.168.18.5 on FastEthernet1/0 from LOADING to FULL, Loading Done
R2(config-router)#network 10.1.2.0 0.0.0.255 area 1
R2(config-router)#
*Mar  1 00:57:46.239: %OSPF-6-AREACHG: 10.1.2.0/24 changed from area 11 to area 1
R2(config-router)#network 10.1.1.0 0.0.0.255 area 1
R2(config-router)#
*Mar  1 00:57:56.159: %OSPF-6-AREACHG: 10.1.1.0/24 changed from area 11 to area 1
R2(config-router)#
```

R3

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router ospf 11
R3(config-router)#network 192.168.0.0 0.0.0.3 area 2
R3(config-router)#network 192.168.1.0 0.0.0.3 area 2
R3(config-router)#network 192.168.18.4 0.0.0.3 area 0
R3(config-router)#end
R3#
*Mar  1 00:59:18.379: %SYS-5-CONFIG_I: Configured from console by console
R3#
```

2.

Network 192.168.0.0 dan 192.168.1.0 berada pda area yang sama dengan R3 yaitu area 2, dan network 192.168.18.4 berada pada area lain (area 0)

```
*Mar  1 00:59:18.379: %SYS-5-CONFIG_I: Configured from console by console
R3#show ip protocols
Routing Protocol is "ospf 11"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.18.6
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.168.0.0 0.0.0.3 area 2
    192.168.1.0 0.0.0.3 area 2
    192.168.18.4 0.0.0.3 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.18.1         110      00:12:15
    192.168.18.5         110      00:12:15
  Distance: (default is 110)

R3#
```

3.

R3 dan R2 merupakan ABR karen R3 terhubung pada area 0 dan 2 sementara R2 terhubung ke area 1 dan area 0


```
*Mar  1 00:59:18.379: %SYS-5-CONFIG_I: Configured from console by console
R3#show ip protocols
Routing Protocol is "ospf 11"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.18.6
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    192.168.0.0 0.0.0.3 area 2
    192.168.1.0 0.0.0.3 area 2
    192.168.18.4 0.0.0.3 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.18.1         110      00:12:15
    192.168.18.5         110      00:12:15
  Distance: (default is 110)

R3#
```

```
R2#show ip protocols
Routing Protocol is "ospf 11"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 192.168.18.1
  It is an area border router
  Number of areas in this router is 2. 2 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.1.1.0 0.0.0.255 area 1
    10.1.2.0 0.0.0.255 area 1
    192.168.18.0 0.0.0.3 area 0
 Reference bandwidth unit is 100 mbps
  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.18.6         110      00:31:31
    192.168.18.5         110      00:34:07
  Distance: (default is 110)

R2#
```

4.
Pada R2, DR ada pada IP 10.1.1.1/24 dan 10.1.2.1/24 sedangkan untuk BDR terdapat pada IP 192.168.18.1/30.

```
R2#show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Fa1/0        11    0               192.168.18.1/30    1     BDR   1/1
Fa0/0        11    1               10.1.1.1/24        10    DR    0/0
Fa0/1        11    1               10.1.2.1/24        10    DR    0/0
R2#
```

Pada R3, DR terdapat pada 192.168.1.1/30 dan 192.168.0.1/30 sedangkan untuk BDR terdapat pada IP 192.168.18.6/30

```
R3#show ip ospf interface brief
Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Fa1/0        11    0               192.168.18.6/30    1     BDR   1/1
Fa0/1        11    2               192.168.1.1/30     10    DR    0/0
Fa0/0        11    2               192.168.0.1/30     10    DR    0/0
R3#
```

5.
Sebagai administrator jaringan, keputusan antara OSPF (Open Shortest Path First) dan IS-IS (Intermediate System to Intermediate System) untuk jaringan intra-AS dapat bergantung pada berbagai faktor, seperti kebutuhan jaringan spesifik dan preferensi perusahaan. Berikut adalah beberapa faktor umum yang perlu dipertimbangkan, bersama dengan referensi yang bermanfaat.

Protokol Open Shortest Path First (OSPF) menawarkan keuntungan konfigurasi dan pemeliharaan yang mudah.

- OSPF umumnya dianggap lebih mudah untuk dikonfigurasi dan dikelola, khususnya dalam jaringan yang rumit. Informasi ini dapat ditemukan di RFC 2328 - OSPF Versi 2. Ini juga menyediakan dukungan untuk berbagai jenis jaringan.

- OSPF mampu mendukung berbagai jenis jaringan seperti jaringan Ethernet, Frame Relay, dan IP. Informasi ini dapat ditemukan di RFC 1247 - OSPF Versi 2 MIB.

- OSPF menawarkan ekstensibilitas yang baik, yang memungkinkan penyesuaian dan pengembangan lebih lanjut, sebagaimana disebutkan dalam RFC 2740 - OSPF untuk IPv6. Selain itu, IS-IS (Intermediate System to Intermediate System) dikenal dengan skalabilitasnya.

IS-IS dikenal karena kinerjanya yang unggul dalam skenario jaringan besar dan skalabilitasnya yang luar biasa. Referensi: RFC 1195 - Pemanfaatan OSI IS-IS untuk Routing di TCP/IP dan Lingkungan Ganda.

- IS-IS dirancang khusus untuk mendukung berbagai protokol jaringan seperti IP, IPv6, dan IPX, sebagaimana tercantum dalam RFC 5305 - IS-IS Extensions for Traffic Engineering. Selain itu, perlu dicatat bahwa IS-IS menekankan konvergensi yang cepat.

- IS-IS terkenal karena kemampuannya mencapai konvergensi cepat dalam topologi jaringan dinamis, sebagaimana tercantum dalam RFC 6232 - Purge Originator Identification TLV untuk IS-IS. Penting untuk dicatat bahwa ini berlaku khusus untuk lingkungan spesifik vendor.

Perlu dipertimbangkan apakah vendor perangkat jaringan yang digunakan memiliki dukungan OSPF atau IS-IS yang lebih baik. Pemilihan protokol juga dapat dipengaruhi oleh karakteristik jaringan, termasuk jumlah router, kecepatan, dan jenis teknologi yang digunakan.

Pilihannya juga mungkin dipengaruhi oleh kebijakan perusahaan dan preferensi internal. Disarankan untuk menguraikan secara menyeluruh persyaratan dan tujuan spesifik jaringan Anda sebelum mengambil keputusan, dan selalu berkonsultasi dengan dokumentasi resmi yang sesuai dan standar IETF (Internet Engineering Task Force).

6.
Berikut Tabel Perbandingan keduan protocol tersebut,

Kriteria	OSPF	IS-IS
Jarak Administratif	110	115
Standar	RFC 2328 (OSPFv2)	ISO 10589, RFC 1195
Skalabilitas	Mendukung berbagai jenis jaringan, termasuk Ethernet, Frame Relay, dan jaringan IP (Kurang skalabilitas berbanding IS-IS)	Mendukung juga berbagai jenis jaringan dan protokol, termasuk IP, IPv6, dan IPX. (Lebih skalabilitas berbanding OSPF)

Kemudahan Konfigurasi	Lebih mudah dikonfigurasi dan dikelola, terutama dalam jaringan yang kompleks.	Dapat dianggap lebih rumit, tetapi dikenal skalabilitasnya yang baik.
Link Virtual	Ada	Tidak ada
Pemilihan DR/BDR	OSPF memilih DR dan BDR pada broadcast network	ISIS memilih satu DIS pada broadcast network
Identifikasi	OSPF menggunakan router id untuk mengetahui router pada suatu jaringan	ISIS menggunakan System ID untuk mengetahui router pada suatu jaringan

Referensi : https://ipwithease-com.translate.goog/ospf-vs-isis/?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=tc

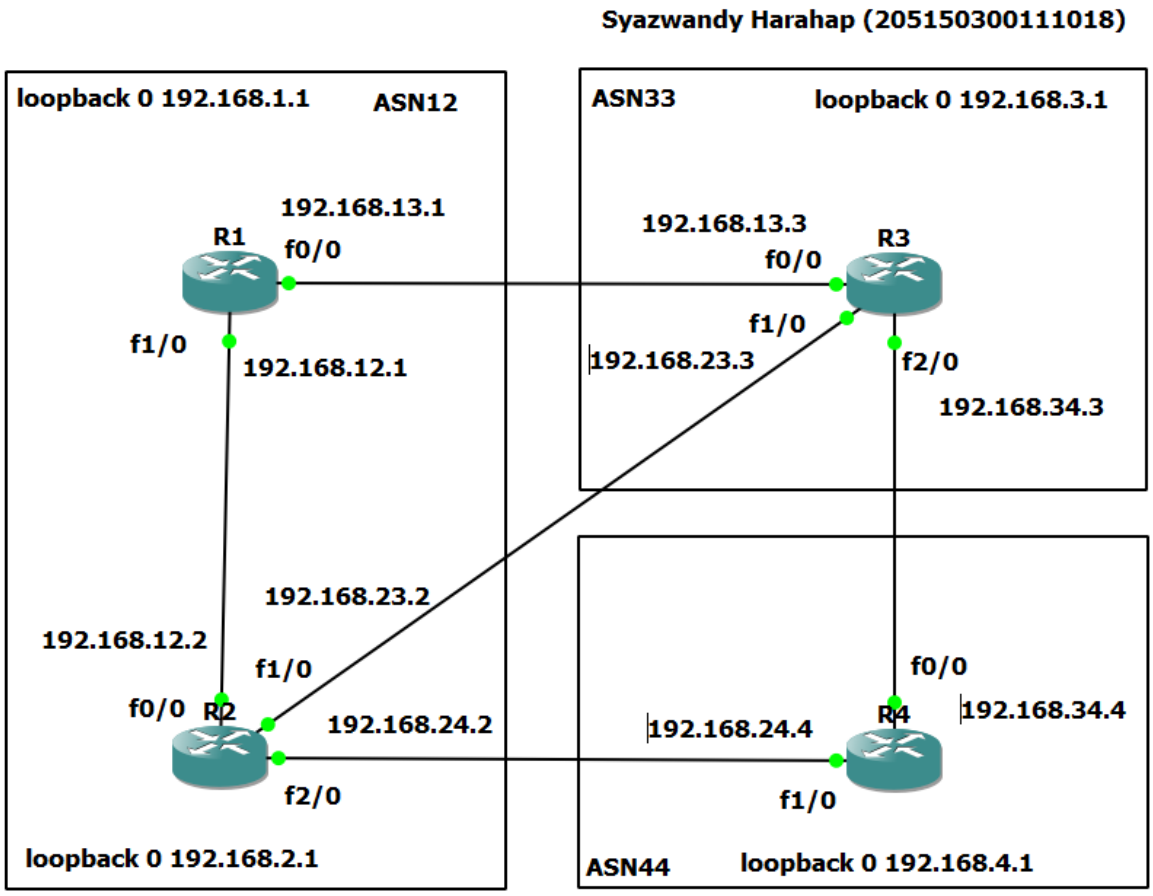
LK: BGP

Nama : Syazwandy Harahap (205150300111018)

Course : Administrasi Jaringan (Network Administrative)

Dokumentasi Percobaan

A. Mengkonfigurasikan BGP
   1. Buatlah topologi jaringan seperti dibawah ini menggunakan GNS3



2. Konfigurasikanlah IP di setiap interface router sesuai dengan topologi yang telah dibuat
   - R1

```
*Mar  1 00:00:03.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
*Mar  1 00:00:03.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to down
*Mar  1 00:00:03.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et2/0, changed state to down
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#exit
R1#ern
*Mar  1 00:01:51.171: %SYS-5-CONFIG_I: Configured from console by console
R1#erenable
Translating "erenable"

Translating "erenable"

% Unknown command or computer name, or unable to find computer address
R1#enable
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface loopback 0
R1(config-if)#
*Mar  1 00:03:38.891: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R1(config-if)#ip addr 192.168.1.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#int fa0/0
R1(config-if)#ip addr 192.168.13.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#
*Mar  1 00:05:57.211: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:05:58.211: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config)#int fa1/0
R1(config-if)#ip addr 192.168.12.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Mar  1 00:06:39.339: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:06:40.339: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#exit
R1#co
*Mar  1 00:07:16.215: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

- R2

```
 changed state to up
*Mar  1 00:00:02.723: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state
to administratively down
*Mar  1 00:00:02.723: %LINK-5-CHANGED: Interface FastEthernet0/1, changed state
to administratively down
*Mar  1 00:00:02.739: %LINK-5-CHANGED: Interface FastEthernet1/0, changed state
to administratively down
*Mar  1 00:00:02.739: %LINK-5-CHANGED: Interface FastEthernet2/0, changed state
to administratively down
*Mar  1 00:00:03.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to down
*Mar  1 00:00:03.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
*Mar  1 00:00:03.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to down
*Mar  1 00:00:03.739: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et2/0, changed state to down
R2#enable
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface loopback 0
R2(config-if)#
*Mar  1 00:05:11.123: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R2(config-if)#ip addr 192.168.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#int fa0/0
R2(config-if)#ip addr 192.168.12.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:07:05.099: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:07:06.099: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#int fa1/0
R2(config-if)#ip addr 192.168.23.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:07:38.447: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:07:39.447: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#int fa2/0
R2(config-if)#ip addr 192.168.24.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:08:14.959: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Mar  1 00:08:15.959: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config-if)#exit
R2(config)#
```

- R3

```
*Mar  1 00:00:02.755: %LINK-5-CHANGED: Interface FastEthernet2/0, changed state
to administratively down
*Mar  1 00:00:03.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to down
*Mar  1 00:00:03.723: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
*Mar  1 00:00:03.755: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et1/0, changed state to down
*Mar  1 00:00:03.755: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et2/0, changed state to down
R3#enable
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface loopback 0
R3(config-if)#
*Mar  1 00:07:51.755: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R3(config-if)#ip addr 192.168.3.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#int fa0/0
R3(config-if)#ip addr 192.168.13.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:09:34.775: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:09:35.775: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#exit
R3(config)#int fa1/0
R3(config-if)#ip addr 192.168.23.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:10:06.243: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:10:07.243: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R3(config-if)#exit
R3(config)#int fa2/0
R3(config-if)#ip addr 192.168.34.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:10:41.439: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
*Mar  1 00:10:42.439: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R3(config-if)#exit
R3(config)#exit
R3#cop
*Mar  1 00:11:01.787: %SYS-5-CONFIG_I: Configured from console by console
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

- R4

```
R4#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#interface loopback 0
R4(config-if)#
*Mar  1 00:12:13.871: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to up
R4(config-if)#ip addr 192.168.4.1 255.255.255.0
R4(config-if)#no sh
R4(config-if)#exit
R4(config)#int fa0/0
R4(config-if)#ip addr 192.168.34.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Mar  1 00:15:47.639: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:15:48.639: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
R4(config-if)#exit
R4(config)#int fa1/0
R4(config-if)#ip addr 192.168.24.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Mar  1 00:16:24.703: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:16:25.703: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to
R4(config-if)#exit
R4(config)#exit
R4#
*Mar  1 00:16:34.743: %SYS-5-CONFIG_I: Configured from console by console
R4#
```

3. Konfigurasikanlah BGP di setiap router

- R1

```
R1(config)#router bgp 12
R1(config-router)#network 192.168.2.0 mask 255.255.255.0
R1(config-router)#neighbor 192.168.12.1 remote-as 12
% Cannot configure the local system as neighbor
R1(config-router)#network 192.168.1.0 mask 255.255.255.0
R1(config-router)#neighbor 192.168.12.2 remote-as 12
R1(config-router)#neighbor 192.168.12.2 next-hop-self
R1(config-router)#neighbor 192.168.12.2 soft-reconfiguration inbound
R1(config-router)#neighbor 192.168.13.3 remote-as 33
R1(config-router)#neighbor 192.168.13.3 soft-reconfiguration inbound
R1(config-router)#exit
R1(config)#exit
R1#
*Mar  1 00:31:18.699: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

- R2

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router bgp 12
R2(config-router)#network 192.168.2.0 mask 255.2555.255.0
                                            ^
% Invalid input detected at '^' marker.

R2(config-router)#network 192.168.2.0 mask 255.255.255.0
R2(config-router)#neighbor 192.168.12.1 remote-as 12
R2(config-router)#neighbor 192.168.12.1 remote-as
*Mar  1 00:29:50.911: %BGP-5-ADJCHANGE: neighbor 192.168.12.1 Up
R2(config-router)#neighbor 192.168.12.1 next-hop-self
R2(config-router)#neighbor 192.168.12.1 soft-reconfiguration inbound
R2(config-router)#neighbor 192.168.23.3 remote-as 33
R2(config-router)#neighbor 192.168.23.3 soft-reconfiguration inbound
R2(config-router)#neighbor 192.168.24.4 remote-as 44
R2(config-router)#neighbor 192.168.24.4 soft-reconfiguration inbound
R2(config-router)#exit
R2(config)#exit
R2#
*Mar  1 00:33:08.767: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

- R3

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#router bgp 33
R3(config-router)#network 192.168.3.0 mask 255.255.255.0
R3(config-router)#neighbor 192.168.13.1 remote-as 12
R3(config-router)#neighbor 192.168.13.1 soft-
*Mar  1 00:32:06.947: %BGP-5-ADJCHANGE: neighbor 192.168.13.1 Up
R3(config-router)#neighbor 192.168.13.1 soft-reconfiguration inbound
R3(config-router)#neighbor 192.168.23.2 remote-as 12
R3(config-router)#neighbor 192.168.23.2 soft-refon
*Mar  1 00:33:08.187: %BGP-5-ADJCHANGE: neighbor 192.168.23.2 Up
R3(config-router)#neighbor 192.168.23.2 soft-reconfiguration inbound
R3(config-router)#neighbor 192.168.34.4 remote-as 44
R3(config-router)#neighbor 192.168.34.4 soft-reconfiguration inbound
R3(config-router)#exit
R3(config)#exit
R3#
```

- R4

```
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#router bgp 44
R4(config-router)#network 192.168.4.0 nmask 255.255.255.0
                                      ^
% Invalid input detected at '^' marker.

R4(config-router)#network 192.168.4.0 mask 255.255.255.0
R4(config-router)#neighbor 192.168.24.2 remote-as 12
R4(config-router)#soft-reconfiguration inbound
*Mar  1 00:37:11.435: %BGP-5-ADJCHANGE: neighbor 192.168.24.2 Up
R4(config-router)#neighbor 192.168.24.2 soft-reconfiguration inbound
R4(config-router)#neighbor 192.168.34.3 remote-as 33
R4(config-router)#neighbor 192.168.34.3 soft-rencfiguration inbound
*Mar  1 00:38:10.523: %BGP-5-ADJCHANGE: neighbor 192.168.34.3 Up
R4(config-router)#neighbor 192.168.34.3 soft-reconfiguration inbound
R4(config-router)#exit
R4(config)#exit
R4#copy running-config startup-config
```

4. Cobalah melakukan tes PING antar router

- R1 ke R2, R3, R4

```
R1#ping 192.168.2.1 source 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/44 ms
R1#ping 192.168.3.1 source 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 24/30/36 ms
R1#ping 192.168.4.1 source 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.4.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 40/55/76 ms
R1#
```

- R2 ke R3, R4

```
R2#ping 192.168.3.1 source 192.168.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.2.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 12/40/64 ms
R2#ping 192.168.4.1 source 192.168.2.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.4.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.2.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/28/36 ms
R2#
```

- R3 ke R14

```
R3#ping 192.168.4.1 source 192.168.3.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.4.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.3.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/28/36 ms
R3#
```

- R4 ke R1, R2, R3

```
R4#ping 192.168.1.1 source 192.168.4.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.4.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 36/56/64 ms
R4#ping 192.168.2.1 source 192.168.4.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.4.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 20/31/40 ms
R4#ping 192.168.3.1 source 192.168.4.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.3.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.4.1
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/28/36 ms
R4#
```

5. Cobalah melakukan traceroute antar router
   - R1 ke R2

```
Success rate is 100 percent (5/5), round-trip m
R1#traceroute 192.168.2.1 source 192.168.1.1

Type escape sequence to abort.
Tracing the route to 192.168.2.1

  1 192.168.12.2 20 msec 32 msec 32 msec
R1#
```

   - R1 ke R3

```
R1#traceroute 192.168.3.1 source 192.168.1.1

Type escape sequence to abort.
Tracing the route to 192.168.3.1

  1 192.168.13.3 24 msec 36 msec 24 msec
R1#
```

   - R2 ke R1

```
R2#traceroute 192.168.1.1 source 192.168.2.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 192.168.12.1 32 msec 32 msec 28 msec
R2#
```

- R2 ke R3

```
R2#traceroute 192.168.3.1 source 192.168.2.1

Type escape sequence to abort.
Tracing the route to 192.168.3.1

  1 192.168.23.3 36 msec 28 msec 60 msec
R2#
```

- R3 ke R1

```
R3#traceroute 192.168.1.1 source 192.168.3.1

Type escape sequence to abort.
Tracing the route to 192.168.1.1

  1 192.168.13.1 28 msec 32 msec 28 msec
R3#
```

- R3 ke R4

```
R3#traceroute 192.168.4.1 source 192.168.3.1

Type escape sequence to abort.
Tracing the route to 192.168.4.1

  1 192.168.34.4 20 msec 28 msec 36 msec
R3#
```

- R4 ke R2

```
R4#traceroute 192.168.2.1 source 192.168.4.1

Type escape sequence to abort.
Tracing the route to 192.168.2.1

  1 192.168.24.2 12 msec 28 msec 32 msec
R4#
```

6. Tampilkanlaah IP route BGP di setiap router
   - Router R1

```
R1#show ip bgp
BGP table version is 5, local router ID is 192.168.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      0.0.0.0                  0         32768 i
*>i192.168.2.0      192.168.12.2             0    100      0 i
* i192.168.3.0      192.168.12.2             0    100      0 33 i
*>                  192.168.13.3             0             0 33 i
*  192.168.4.0      192.168.13.3                           0 33 44 i
*>i                 192.168.12.2             0    100      0 44 i
R1#
```

   - Router R2

```
R2#show ip bgp
BGP table version is 6, local router ID is 192.168.2.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>i192.168.1.0      192.168.12.1             0    100      0 i
*> 192.168.2.0      0.0.0.0                  0         32768 i
*  192.168.3.0      192.168.24.4                           0 44 33 i
*>                  192.168.23.3             0             0 33 i
* i                 192.168.12.1             0    100      0 33 i
*  192.168.4.0      192.168.23.3                           0 33 44 i
*>                  192.168.24.4             0             0 44 i
R2#
```

   - Router R3

```
R3#show ip bgp
BGP table version is 6, local router ID is 192.168.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  192.168.1.0      192.168.34.4                           0 44 12 i
*                   192.168.23.2                           0 12 i
*>                  192.168.13.1             0             0 12 i
*  192.168.2.0      192.168.34.4                           0 44 12 i
*                   192.168.23.2             0             0 12 i
*>                  192.168.13.1                           0 12 i
*> 192.168.3.0      0.0.0.0                  0         32768 i
*> 192.168.4.0      192.168.34.4             0             0 44 i
*                   192.168.23.2                           0 12 44 i
*                   192.168.13.1                           0 12 44 i
R3#
```

   - Router R4

```
R4#show ip bgp
BGP table version is 6, local router ID is 192.168.4.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  192.168.1.0      192.168.34.3                           0 33 12 i
*>                  192.168.24.2                           0 12 i
*  192.168.2.0      192.168.34.3                           0 33 12 i
*>                  192.168.24.2             0             0 12 i
*> 192.168.3.0      192.168.34.3             0             0 33 i
*                   192.168.24.2                           0 12 33 i
*> 192.168.4.0      0.0.0.0                  0         32768 i
R4#
```

7. Konfigurasikanlah PREPEND di R1
   Konfigurasi ini beguna untuk memanipulasi jalur yang diiklankan ke tetangga BGP. Prepend ini dilakukan dengan menambahkan pengulangan ASN (Autonomous System Number) ke jalur BGP yang diiklankan. Pada konfigurasi ini jalur yang diiklankan adalah 192.168.13.3 pada ASN12.

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#route-map PREPEND permit 10
R1(config-route-map)#set as-path prepend 12 12
R1(config-route-map)#router bgp 12
R1(config-router)#neighbor 192.168.13.3 route-map PREPEND out
R1(config-router)#exit
R1(config)#
```

8. Konfigurasikanlah LOKAL PREFERENCE di R2
   Konfigurasi ini berguna untuk memberikan penilaian prioritas pada rute yang diiklankan ke router BGP tetangga. Router tetangga nya yaitu 192.168.23.3 pada ASN12.

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#route-map LOKAL permit 10
R2(config-route-map)#set local-preference 300
R2(config-route-map)#router bgp 12
R2(config-router)#neighbor 192.168.23.3 route-map LOKAL in
R2(config-router)#exit
R2(config)#exit
R2#
*Mar  1 01:01:23.607: %SYS-5-CONFIG_I: Configured from console by console
```

9. Tampilkanlah IP route di setiap router setelah konfigurasi PREPEND dam LOCAL PREFERENCE

   Terlihat perbedaan dimana nilai LocPrf berubah dengan ditambahnya local preference dan preprend pada R1 dan R2

   - Router R1

```
R1#show ip bgp
BGP table version is 7, local router ID is 192.168.1.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*> 192.168.1.0      0.0.0.0                  0         32768 i
*>i192.168.2.0      192.168.12.2             0    100      0 i
*>i192.168.3.0      192.168.12.2             0    300      0 33 i
*                   192.168.13.3             0             0 33 i
*  192.168.4.0      192.168.13.3                           0 33 44 i
*>i                 192.168.12.2             0    300      0 33 44 i
R1#
```

   - Router R2

```
R2#show ip bgp
BGP table version is 8, local router ID is 192.168.2.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*>i192.168.1.0      192.168.12.1             0    100      0 i
*> 192.168.2.0      0.0.0.0                  0         32768 i
*  192.168.3.0      192.168.24.4                           0 44 33 i
*>                  192.168.23.3             0    300      0 33 i
*> 192.168.4.0      192.168.23.3                  300      0 33 44 i
*                   192.168.24.4             0             0 44 i
R2#
```

   - Router R3

```
R3#show ip bgp
BGP table version is 8, local router ID is 192.168.3.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  192.168.1.0      192.168.34.4                           0 44 12 i
*>                  192.168.23.2                           0 12 i
*                   192.168.13.1             0             0 12 12 12 i
*  192.168.2.0      192.168.34.4                           0 44 12 i
*>                  192.168.23.2             0             0 12 i
*                   192.168.13.1                           0 12 12 12 i
*> 192.168.3.0      0.0.0.0                  0         32768 i
*> 192.168.4.0      192.168.34.4             0             0 44 i
R3#
```

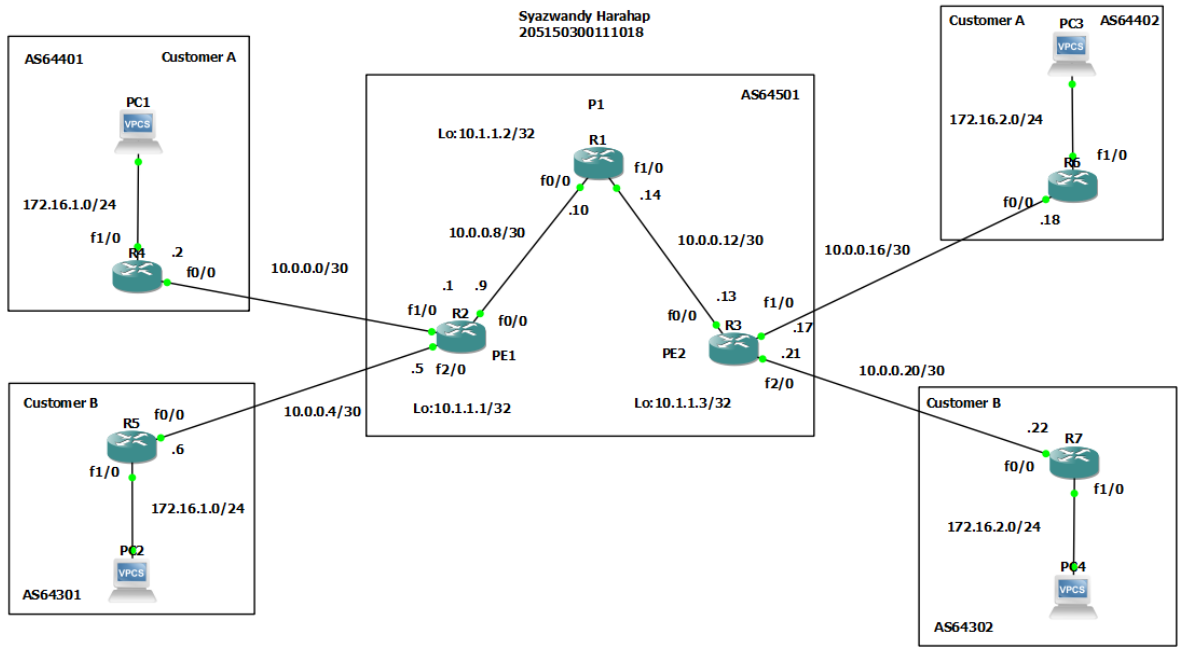
- Router R4

```
R4#show ip bgp
BGP table version is 6, local router ID is 192.168.4.1
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale
Origin codes: i - IGP, e - EGP, ? - incomplete

   Network          Next Hop            Metric LocPrf Weight Path
*  192.168.1.0      192.168.34.3                           0 33 12 i
*>                  192.168.24.2                           0 12 i
*  192.168.2.0      192.168.34.3                           0 33 12 i
*>                  192.168.24.2             0             0 12 i
*> 192.168.3.0      192.168.34.3             0             0 33 i
*                   192.168.24.2                           0 12 33 i
*> 192.168.4.0      0.0.0.0                  0         32768 i
R4#
```

LK - BGP/MPLS/VPN

Nama : Syazwandy Harahap (205150300111018)

Course : Administrasi Jaringan (Network Administrative)



AS 64501 merupakan provider bagi customerA dan CustomerB, masing-masing customer sama-sama memiliki ip 172.16.1.0/24 dan 172.16.2.0/24.

1. Mengkonfigurasi dan mengkoneksi router2 provider dengan intra AS routing menggunakan EIGRP:
R2

```
R2(config)#router eigrp 65401
R2(config-router)#network 10.0.0.8 0.0.0.3
R2(config-router)#network 10.0.0.12 0.0.0.3
R2(config-router)#exit
R2(config)#interface lo0
R2(config-if)#
*Mar  1 00:13:02.811: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopbac
R2(config-if)#ip addr 10.1.1.1 255.255.255.255
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#router eigrp 65401
R2(config-router)#network 10.0.0.8 0.0.0.3
R2(config-router)#exit
R2(config)#router eigrp 64501
R2(config-router)#network 10.0.0.8 0.0.0.3
R2(config-router)#network 10.1.1.1 0.0.0.0
R2(config-router)#exit
R2(config)#int fa0/0
R2(config-if)#ip addr 10.0.0.9 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:25:56.579: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed stat
*Mar  1 00:25:57.579: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEth
R2(config-if)#exit
```

```
R2(config)#int fa2/0
R2(config-if)#ip addr 10.0.0.5 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Mar  1 00:29:46.167: %LINK-3-UPDOWN: Interface FastEthe
*Mar  1 00:29:47.167: %LINEPROTO-5-UPDOWN: Line protocol
R2(config-if)#exit
R2(config)#int fa1/0
R2(config-if)#ip addr 10.0.0.1 255.255.255.252
R2(config-if)#no sh
R2(config-if)#exit
```

R1

```
R1(config)#int lo0
R1(config-if)#
*Mar  1 00:18:20.891: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
R1(config-if)#ip addr 10.1.1.2 255.255.255.255
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#router eigrp 64501
R1(config-router)#network 10.0.0.8 0.0.0.3
R1(config-router)#network 10.0.0.12 0.0.0.3
R1(config-router)#network 10.1.1.2 0.0.0.0
R1(config-router)#exit
R1(config)#int fa0/0
R1(config-if)#ip addr 10.0.0.7 255.255.255.252
Bad mask /30 for address 10.0.0.7
R1(config-if)#ip addr 10.0.0.10 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Mar  1 00:34:35.655: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 64501: Neighbor 10.0.0.9 (Fa
jacency
R1(config-if)#
*Mar  1 00:34:36.431: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to
*Mar  1 00:34:37.431: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEtherne
R1(config-if)#exit
*Mar  1 00:34:39.151: %LDP-5-NBRCHG: LDP Neighbor 10.1.1.1:0 (1) is UP
R1(config-if)#exit
R1(config)#int fa1/0
R1(config-if)#ip addr 10.0.0.14 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
```

R3

```
R3(config)#int lo0
R3(config-if)#
*Mar  1 00:21:09.763: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0, changed state to
R3(config-if)#ip addr 10.1.1.3 255.255.255.255
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#router eigrp 64501
R3(config-router)#network 10.0.0.12 0.0.0.3
R3(config-router)#network 10.1.1.3 0.0.0.0
R3(config-router)#exit
R3(config)#int fa0/0
R3(config-if)#ip addr 10.0.0.14 255.255.255.252
R3(config-if)#ip addr 10.0.0.13 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:37:38.475: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar  1 00:37:39.475: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed sta
R3(config-if)#
*Mar  1 00:38:06.627: %DUAL-5-NBRCHANGE: IP-EIGRP(0) 64501: Neighbor 10.0.0.14 (FastEthernet0/0) i
djacency
R3(config-if)#
*Mar  1 00:38:08.811: %LDP-5-NBRCHG: LDP Neighbor 10.1.1.2:0 (1) is UP
R3(config-if)#exit
R3(config)#int fa1/0
R3(config-if)#ip addr 10.0.0.15 255.255.255.252
Bad mask /30 for address 10.0.0.15
R3(config-if)#ip addr 10.0.0.17 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
*Mar  1 00:40:02.239: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
*Mar  1 00:40:03.239: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed sta
R3(config-if)#exit
R3(config)#int fa2/0
R3(config-if)#ip addr 10.0.0.21 255.255.255.252
R3(config-if)#no sh
R3(config-if)#
```

2. Konfigurasi adjacency eBGP antara router CE dan PE. Nomor AS BGP di setiap situs pelanggan harus unik dan berbeda dari ASN penyedia. Sebagai contoh, nomor AS BGP pelanggan A adalah 64401 di situs 1 dan ASN 64402 di situs 2. Kita juga melakukan *broadcast* subnet pelanggan masing-masing dari CE ke router PE dengan perintah jaringan berikut:

R4 (Customer A)

```
R4(config)#int fa0/0
R4(config-if)#ip addr 10.0.0.2 255.255.255.252
R4(config-if)#no sh
R4(config-if)#
*Mar  1 00:46:07.251: %LINK-3-UPDOWN: Interface FastEthernet0/0, change
*Mar  1 00:46:08.251: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
R4(config-if)#exit
R4(config)#exit
R4#
*Mar  1 00:46:21.435: %SYS-5-CONFIG_I: Configured from console by conso
R4#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R4(config)#int fa1/0
R4(config-if)#
*Mar  1 00:46:33.447: %BGP-5-ADJCHANGE: neighbor 10.0.0.1 Up
R4(config-if)#ip addr 172.16.1.0 255.255.255.0
Bad mask /24 for address 172.16.1.0
R4(config-if)#ip addr 172.16.1.1 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Mar  1 00:48:23.003: %LINK-3-UPDOWN: Interface FastEthernet1/0, change
*Mar  1 00:48:24.003: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
R4(config-if)#exit
R4(config)#router bgp 64401
R4(config-router)#neighbor 10.0.0.1 remote-as 64501
R4(config-router)#network 172.16.1.0 mask 255.255.255.0
R4(config-router)#exit
```

R5 (Customer B)

```
R5(config)#router bgp 64301
R5(config-router)#neighbor 10.0.0.5 remote-as 64501
R5(config-router)#network 172.16.1.0 mask 255.255.255.0
R5(config-router)#exit
R5(config)#int fa0/0
R5(config-if)#ip addr 10.0.0.6 255.255.255.252
R5(config-if)#no sh
R5(config-if)#
*Mar  1 01:05:20.063: %LINK-3-UPDOWN: Interface FastEthernet0/0, change
*Mar  1 01:05:21.063: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
R5(config-if)#exit
R5(config)#int fa1/0
R5(config-if)#ip addr 172.16.1.1 255.255.255.
*Mar  1 01:05:38.247: %BGP-5-ADJCHANGE: neighbor 10.0.0.5 Up
R5(config-if)#ip addr 172.16.1.1 255.255.255.0
R5(config-if)#no sh
R5(config-if)#
*Mar  1 01:10:05.983: %LINK-3-UPDOWN: Interface FastEthernet1/0, change
*Mar  1 01:10:06.983: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
R5(config-if)#exit
R5(config)#exit
```

R6 (Customer A)

```
R6(config)#router bgp 64402
R6(config-router)#neighbor 10.0.0.17 remote-as 64501
R6(config-router)#network 172.16.2.0 mask 255.255.255.0
R6(config-router)#exit
R6(config)#int fa0/0
R6(config-if)#ip addr 10.0.0.18 255.255.255.252
R6(config-if)#no sh
R6(config-if)#
*Mar  1 00:54:30.399: %LINK-3-UPDOWN: Interface FastEthernet0/0, char
*Mar  1 00:54:31.399: %LINEPROTO-5-UPDOWN: Line protocol on Interface
R6(config-if)#exit
R6(config)#int fa1/0
R6(config-if)#ip addr 172.16.2.1 255.255.255
*Mar  1 00:55:02.247: %BGP-5-ADJCHANGE: neighbor 10.0.0.17 Up
R6(config-if)#ip addr 172.16.2.1 255.255.255.0
R6(config-if)#no sh
R6(config-if)#
*Mar  1 00:55:24.487: %LINK-3-UPDOWN: Interface FastEthernet1/0, char
*Mar  1 00:55:25.487: %LINEPROTO-5-UPDOWN: Line protocol on Interface
R6(config-if)#exit
```

R7 (Customer B)

```
R7(config)#router bgp 64302
R7(config-router)#neighbor 10.0.0.21 remote-as 64501
R7(config-router)#network 172.16.2.0 mask 255.255.255.0
R7(config-router)#exit
R7(config)#int fa0/0
R7(config-if)#ip addr 10.0.0.22 255.255.255.252
R7(config-if)#n sh
R7(config-if)#no sh
R7(config-if)#
*Mar  1 01:12:42.807: %LINK-3-UPDOWN: Interface FastEthernet0/
*Mar  1 01:12:43.807: %LINEPROTO-5-UPDOWN: Line protocol on In
R7(config-if)#exit
R7(config)#int fa1/0
R7(config-if)#
*Mar  1 01:12:52.371: %BGP-5-ADJCHANGE: neighbor 10.0.0.21 Up
R7(config-if)#int fa1/0
R7(config-if)#ip addr 172.16.2.1 255.255.255.0
R7(config-if)#no sh
```

3. Konfigurasi MP-BGP pada Router PE Multiprotocol BGP dijelaskan dalam RFC 4760. Ini mendefinisikan ekstensi terhadap BGP-4 untuk memungkinkannya membawa informasi routing untuk beberapa protokol Layer Jaringan (misalnya, IPv6, L3VPN). Oleh karena itu, kita akan mengonfigurasi MP-BGP untuk mendistribusikan IP prefix pelanggan. Sebuah router yang mendukung fitur tsb dapat

beroperasi bersama dengan router yang tidak mendukungnya. Jaringan iBGP terbentuk antara router PE, menggunakan ASN 64501. Tidak ada konfigurasi BGP pada router P:

R2

```
R2(config)#router bgp 64501
R2(config-router)#neighbor 10.1.1.3 remote-as 64501
R2(config-router)#neighbor 10.1.1.3 update-source lo0
R2(config-router)#address-family vpnv
*Mar  1 01:16:26.023: %BGP-5-ADJCHANGE: neighbor 10.1.1.3 Up
R2(config-router)#address-family vpnv4
R2(config-router-af)#neighbor 10.1.1.3 activate
R2(config-router-af)#exit
```

Catatan: Perintah neighbor 10.1.1.3 send-community extended dikonfigurasi secara otomatis di bawah bagian address-family vpnv4

R3

```
R3(config)#router bgp 64501
R3(config-router)#neighbor 10.1.1.1 remote-as 64501
R3(config-router)#neighbor 10.1.1.1 update-source lo0
R3(config-router)#address-family vpnv4
R3(config-router-af)#neigbor 10.1.1.1 activate
                     ^
% Invalid input detected at '^' marker.

R3(config-router-af)#neighbor 10.1.1.1 activate
R3(config-router-af)#exit
```

4. Aktifkan MPLS pada Router PE dan P Kita perlu mengaktifkan MPLS dalam jaringan penyedia. Data pelanggan kemudian dialihkan dalam jaringan MPLS berdasarkan label luar (LSP). Kita akan mengaktifkan MPLS pada router P penyedia dan pada router PE:

R2

```
R2(config)#interface f0/0
R2(config-if)#mpls ip
R2(config-if)#
```

R1

```
R1(config)#int fa0/0
R1(config-if)#mpls ip
R1(config-if)#int fa1/0
R1(config-if)#mpls ip
R1(config-if)#
```

R3

```
R3(config-router)#exit
R3(config)#int fa0/0
R3(config-if)#mpls ip
R3(config-if)#
```

5. Buat dan assign VRF

Tabel forwarding pelanggan dipisahkan dengan menggunakan konsep tabel routing dan forwarding VPN (VRF) pada router PE. Satu VRF dikonfigurasi pada router PE untuk setiap pelanggan.

Antarmuka PE router yang menghubungkan router CE ke jaringan MPLS penyedia kemudian dialokasikan ke VRF pelanggan. Route distinguisher ditambahkan pada router PE untuk prefix

pelanggan agar dapat membedakan prefix dan mask yang sama dalam VRF yang berbeda. Sebagai contoh, router PE1 mengumumkan prefix RD1:172.16.10/24 dan RD2:172.16.1.0/24 bersama dengan label VPN ke router PE2 dalam pesan pembaruan BGP. RD digunakan untuk membedakan prefix dan tidak memiliki dampak pada cara rute diinstal ke dalam VRF.
Route target adalah atribut komunitas yang diperluas yang digunakan untuk impor/ekspor rute VPN. Sebagai contoh, sebuah awalan VPN 172.16.1.0/24 yang dikirim dari PE1 ke PE2 dalam pesan pembaruan MP-BGP dan membawa route-target 64501:1 diimpor ke dalam VRF Pelanggan A pada PE2:

R2

```
R2(config)#ip vrf CustomerA
R2(config-vrf)#rd 64501:1
R2(config-vrf)#route-target both 64501:1
R2(config-vrf)#exit
R2(config)#ip vrf CustomerB
R2(config-vrf)#rd 64501:2
R2(config-vrf)#route-target both 64501:2
R2(config-vrf)#
```

Menetapkan antarmuka L3 ke dalam VRF pelanggan:

R2

```
R2(config)#int fa1/0
R2(config-if)#ip vrf forwarding CustomerA
R2(config-if)#ip add 10.0.0.1 255.255.255.252
R2(config-if)#exit
R2(config)#int fa2/0
R2(config-if)#ip vrf forwarding CustomerB
R2(config-if)#ip add 10.0.0.5 255.255.255.252
```

R3

```
R3(config)#ip vrf CustomerA
R3(config-vrf)#rd 64501:1
R3(config-vrf)#route-target both 64501:1
R3(config-vrf)#ip vrf CustomerB
R3(config-vrf)#rd 64501:2
R3(config-vrf)#route-target both 64501:2
R3(config-if)#int fa2/0
R3(config-if)#ip vrf forwarding CustomerB
R3(config-if)#ip add 10.0.0.21 255.255.255.252
R3(config-if)#exit
R3(config)#int fa1/0
R3(config-if)#ip vrf forwarding CustomerA
R3(config-if)#ip add 10.0.0.17 255.255.255.252
R3(config-if)#exit
R3(config)#
```

6. Konfigurasi eBGP ke Pelanggan pada Router PE

Sejauh ini, kita telah mengonfigurasi eBGP pada router pelanggan. Namun, kita juga perlu menentukan tetangga BGP untuk router PE di bawah bagian address-family ipv4 vrf, agar dapat menjalin adjasensi BGP dengan router CE:

R2

```
R2(config)#router bgp 64501
R2(config-router)#address-family ipv4 vrf CustomerA
R2(config-router-af)#neighbor 10.0.0.2 remote-as 64401
R2(config-router-af)#exit
R2(config-router)#address-family ipv4 vrf CustomerB
R2(config-router-af)#neighbor 10.0.0.6 remote-as 64301
R2(config-router-af)#exit
```

R3

```
R3(config)#router bgp 64501
R3(config-router)#address-family ipv4 vrf CustomerA
R3(config-router-af)#neighbor 10.0.0.18 remote-as 64402
R3(config-router-af)#exit
R3(config-router)#address-family ipv4 vrf CustomerB
R3(config-router-af)#neighbor 10.0.0.22 remote-as 64302
R3(config-router-af)#exit
R3(config-router)#
```

Trace dari customerA PC1 ke PC3

```
PC1> ip 172.16.1.2 255.255.255.0 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.2 255.255.255.0 gateway 172.16.1.1

PC1> trace 172.16.2.1
trace to 172.16.2.1, 8 hops max, press Ctrl+C to stop
 1   172.16.1.1   15.320 ms  14.229 ms  14.844 ms
 2   10.0.0.1   45.472 ms  45.959 ms  46.436 ms
 3   10.0.0.10   136.941 ms  135.826 ms  136.752 ms
 4   10.0.0.17   106.498 ms  107.157 ms  105.174 ms
 5   *10.0.0.18   134.837 ms (ICMP type:3, code:3, Destination port unreachable)
```

Trace dari customerB PC2 ke PC4

```
PC2> ip 172.16.1.2 255.255.255.0 172.16.1.1
Checking for duplicate address...
PC1 : 172.16.1.2 255.255.255.0 gateway 172.16.1.1

PC2> trace 172.16.2.1
trace to 172.16.2.1, 8 hops max, press Ctrl+C to stop
 1   172.16.1.1   15.547 ms  15.497 ms  15.364 ms
 2   10.0.0.5   46.195 ms  45.708 ms  46.447 ms
 3   10.0.0.10   136.742 ms  136.133 ms  135.585 ms
 4   10.0.0.21   106.898 ms  107.570 ms  107.720 ms
 5   *10.0.0.22   137.347 ms (ICMP type:3, code:3, Destination port unreachable)
```

MPLS table R3

```
R3#show mpls forwarding-table
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Pop tag     10.1.1.2/32      0          Fa0/0       10.0.0.14
17     Pop tag     10.0.0.8/30      0          Fa0/0       10.0.0.14
18     16          10.1.1.1/32      0          Fa0/0       10.0.0.14
19     Untagged    172.16.2.0/24[V] 876        Fa1/0       10.0.0.18
20     Untagged    172.16.2.0/24[V] 876        Fa2/0       10.0.0.22
```

Virtual Fwd Table R3

```
R3#show ip route vrf CustomerA | b Gateway
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 2 subnets
B       172.16.1.0 [200/0] via 10.1.1.1, 00:39:02
B       172.16.2.0 [20/0] via 10.0.0.18, 01:00:13
     10.0.0.0/30 is subnetted, 1 subnets
C       10.0.0.16 is directly connected, FastEthernet1/0
R3#
```

TUGAS

1. Ganti Intra AS routing dengan IS-IS routing

R1

Konfigurasi IS-IS routing dari AS routing

```
R1(config)#no router eigrp 64501
R1(config)#no router eigrp 64501
R1(config)#router isis
R1(config-router)#net 49.A001.0000.0000.C001.00
R1(config-router)#is-type level-1-only
                                    ^
% Invalid input detected at '^' marker.

R1(config-router)#is-type level-1-only
                                    ^
% Invalid input detected at '^' marker.

R1(config-router)#is-type level-1
R1(config-router)#exit
R1(config)#int fa0/0
R1(config-if)#ip router isis
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#int fa1/0
R1(config-if)#ip router isis
R1(config-if)#no sh
R1(config-if)#exit
R1(config)#exit
R1#
*Mar  1 03:43:30.115: %SYS-5-CONFIG_I: Configured from console by console
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int lo0
R1(config-if)#ip router isis
R1(config-if)#exit
```

Verifikasi IS-IS routing

```
R1#show isis neighbor

System Id      Type Interface   IP Address      State Holdtime Circuit Id
R3             L1   Fa1/0       10.0.0.13       UP    9        R3.01
R2             L1   Fa0/0       10.0.0.9        UP    7        R2.01
R1#show isis database

IS-IS Level-1 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
R1.00-00            * 0x00000008   0xFB21        733               0/0/0
R2.00-00              0x00000007   0x7D63        705               0/0/0
R2.01-00              0x00000002   0x917C        851               0/0/0
R3.00-00              0x00000007   0x02B3        565               0/0/0
R3.01-00              0x00000002   0x9774        940               0/0/0
R1#
```

R2

Konfigurasi IS-IS routing dari AS routing

```
R2(config)#router isis
R2(config-router)#net 49.A001.0000.0000.C002.00
R2(config-router)#is-type level-1-2
R2(config-router)#exit
R2(config)#int fa
*Mar  1 03:18:18.827: %LDP-5-NBRCHG: LDP Neighbor 10.
R2(config)#int fa
*Mar  1 03:18:27.083: %BGP-5-ADJCHANGE: neighbor 10.1
R2(config)#int fa
*Mar  1 03:18:27.083: %BGP-3-NOTIFICATION: sent to ne
R2(config)#int fa0/0
R2(config-if)#ip router isis
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#int fa1/0
R2(config-if)#ip router isis
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#int fa2/0
R2(config-if)#ip router isis
R2(config-if)#no sh
R2(config-if)#exit
R2(config)#exit
```

```
Enter configuration commands, one per line.  End with C
R2(config)#int lo0
R2(config-if)#ip router isis
R2(config-if)#exit
R2(config)#exit
```

Verifikasi IS-IS routing

```
R2#show isis neighbor

System Id      Type Interface   IP Address      State Holdtime Circuit Id
R1             L1   Fa0/0       10.0.0.10       UP    29       R2.01
R2#show isis database

IS-IS Level-1 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
R1.00-00              0x00000008   0xFB21        738               0/0/0
R2.00-00            * 0x00000007   0x7D63        714               0/0/0
R2.01-00            * 0x00000002   0x917C        861               0/0/0
R3.00-00              0x00000007   0x02B3        570               0/0/0
R3.01-00              0x00000002   0x9774        945               0/0/0
IS-IS Level-2 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
R2.00-00            * 0x0000000A   0xF6D9        742               0/0/0
R2#
```

R3

```
R3(config)#int fa0/0
R3(config-if)#ip router isis
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#int fa1/0
R3(config-if)#ip router isis
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#int fa2/0
R3(config-if)#ip router isis
R3(config-if)#no sh
R3(config-if)#exit
R3(config)#exit
R3#
*Mar  1 03:43:36.243: %SYS-5-CONFIG_I: Configured from console b
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#coonf term
     ^
% Invalid input detected at '^' marker.

R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#int lo0
R3(config-if)#ip router isis
R3(config-if)#exit
R3(config)#exit
```

```
R3#show isis neighbor

System Id      Type Interface   IP Address      State Holdtime Circuit Id
R1             L1   Fa0/0       10.0.0.14       UP    22       R3.01
R3#show isis database

IS-IS Level-1 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
R1.00-00              0x00000008   0xFB21        747               0/0/0
R2.00-00              0x00000007   0x7D63        719               0/0/0
R2.01-00              0x00000002   0x917C        865               0/0/0
R3.00-00            * 0x00000007   0x02B3        583               0/0/0
R3.01-00            * 0x00000002   0x9774        958               0/0/0
IS-IS Level-2 Link State Database:
LSPID                 LSP Seq Num  LSP Checksum  LSP Holdtime      ATT/P/OL
R3.00-00            * 0x00000009   0x935A        751               0/0/0
R3#
```

2. SHOW MPLS R1 table (EIGRP)

```
R1#show mpls forwarding-table
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Pop tag     10.1.1.1/32      17667      Fa0/0       10.0.0.9
17     Pop tag     10.1.1.3/32      14277      Fa1/0       10.0.0.13
R1#
```

MPLS R1 table (ISIS)

```
R1#show mpls forwarding-table
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Untagged    10.0.0.0/30      0          Fa0/0       10.0.0.9
17     Untagged    10.0.0.4/30      0          Fa0/0       10.0.0.9
18     Untagged    10.0.0.16/30     0          Fa1/0       10.0.0.13
19     Untagged    10.0.0.20/30     0          Fa1/0       10.0.0.13
20     Pop tag     10.1.1.3/32      2050       Fa1/0       10.0.0.13
21     Pop tag     10.1.1.1/32      3970       Fa0/0       10.0.0.9
R1#
```

SHOW MPLS R2 table (EIGRP)

```
R2#show mpls forwarding-table
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Pop tag     10.1.1.2/32      0          Fa0/0       10.0.0.10
17     Pop tag     10.0.0.12/30     0          Fa0/0       10.0.0.10
18     17          10.1.1.3/32      0          Fa0/0       10.0.0.10
19     Untagged    172.16.1.0/24[V] 1314       Fa1/0       10.0.0.2
20     Untagged    172.16.1.0/24[V] 1314       Fa2/0       10.0.0.6
R2#
```

MPLS R2 table (ISIS)

```
R2#show mpls forwarding-table
Local  Outgoing    Prefix           Bytes tag  Outgoing    Next Hop
tag    tag or VC   or Tunnel Id     switched   interface
16     Pop tag     10.0.0.12/30     0          Fa0/0       10.0.0.10
17     18          10.0.0.16/30     0          Fa0/0       10.0.0.10
18     19          10.0.0.20/30     0          Fa0/0       10.0.0.10
19     Untagged    172.16.1.0/24[V] 2628       Fa1/0       10.0.0.2
20     Untagged    172.16.1.0/24[V] 2628       Fa2/0       10.0.0.6
21     20          10.1.1.3/32      0          Fa0/0       10.0.0.10
22     Pop tag     10.1.1.2/32      0          Fa0/0       10.0.0.10
R2#
```