MODUL PRAKTIKUM

ADMINISTRASI JARINGAN - D

DOSEN PENGAMPU:

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UNIVERSITAS BRAWIJAYA

FAKULTAS ILMU KOMPUTER

TEKNIK INFORMATIKA

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Bab 1
IPv6

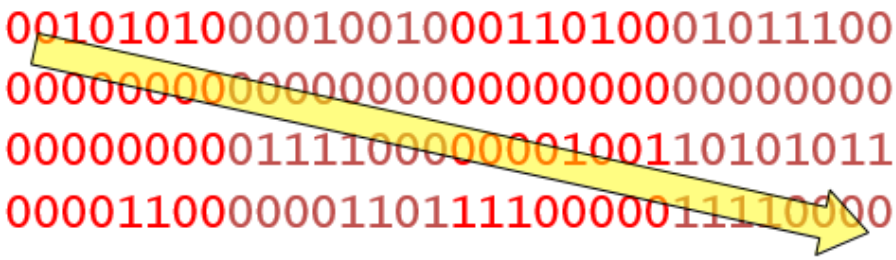
Pendahuluan

Konfigurasi dasar IPv6
R1(config)# **ipv6 unicast-routing**
R1(config)# **interface fastEthernet 1/0**
R1(config-if)# **ipv6 address 2002:5ef:2bc4:1182::/64 eui-64**
R1(config-if)# **no shutdown**
R1(config-if)# **ipv6 enable**

Internet Protocol versi 6 atau yang kita kenal dengan IPv6 merupakan penerus dari versi sebelumnya yaitu IPv4. Perkembangan yang sangat pesat membuat alokasi untuk IPv4 hampir habis, bahkan beberapa literature menyebutkan alokasi IPv4 sudah habis pada tahun 2008.
IPv6 memiliki alokasi sepanjang 128bit (3.1×10^{38}) lebih Panjang daripada IPv4 yang memiliki alokasi 32 bit (4.3×10^{9}). IPv6 didesain untuk menyelesaikan permasalahan yaitu :

- Efisiensi dan hierarikal pengalamatan (addressing) dan routing
- Keamanan
- Auto-configuration
- Plug & Play
- Dukungan lebih baik untuk QoS
- Extensibility

Pengalamatana IPv6



Notasi Pengalamatan IPv6

Contoh :
- 2A12:3456:0:0:78:9AB:C0D:E0F0
- 2001:0db8:85a3:0000:0000:8a2e:0370:7334

Penyerderhanaan pengalamatan IPV6
Contoh kasus :

21da:00d3:0000:2f3b:02aa:00ff:fe28:9c5a

IPV6 diatas dapat disederhanakan dengan membuang angka 0 pada awal setiap blok yang berukuran 16-bit di maka akan menjadi seperti ini :

21da:d3:0:2f3b:2aa:ff:fe28:9c5a

Penyerdehanaan masih dapat di lakukan lebih jauh lagi dengan menghilangkan angka 0 dengan notasi colon-hexadesimal, penyederhanaan alamat IPv6 dengan cara ini hanya bisa digunakan sekali saja di dalam satu alamat, karena kemungkinan nantinya pengguna tidak dapat menentukan berapa banyak bit 0 yang direpresentasikan oleh setiap tanda dua titik dua (**:**) yang terdapat dalam alamat, contoh :

Alamat asli	Alamat asli yang disederhanakan	Alamat setelah dikompres
fe80:0000:0000:0000:02aa:00ff:fe9a:4ca2	fe80:0:0:0:2aa:ff:fe9a:4ca2	fe80::2aa:ff:fe9a:4ca2
ff02:0000:0000:0000:0000:0000:0000:0002	ff02:0:0:0:0:0:0:2	ff02::2

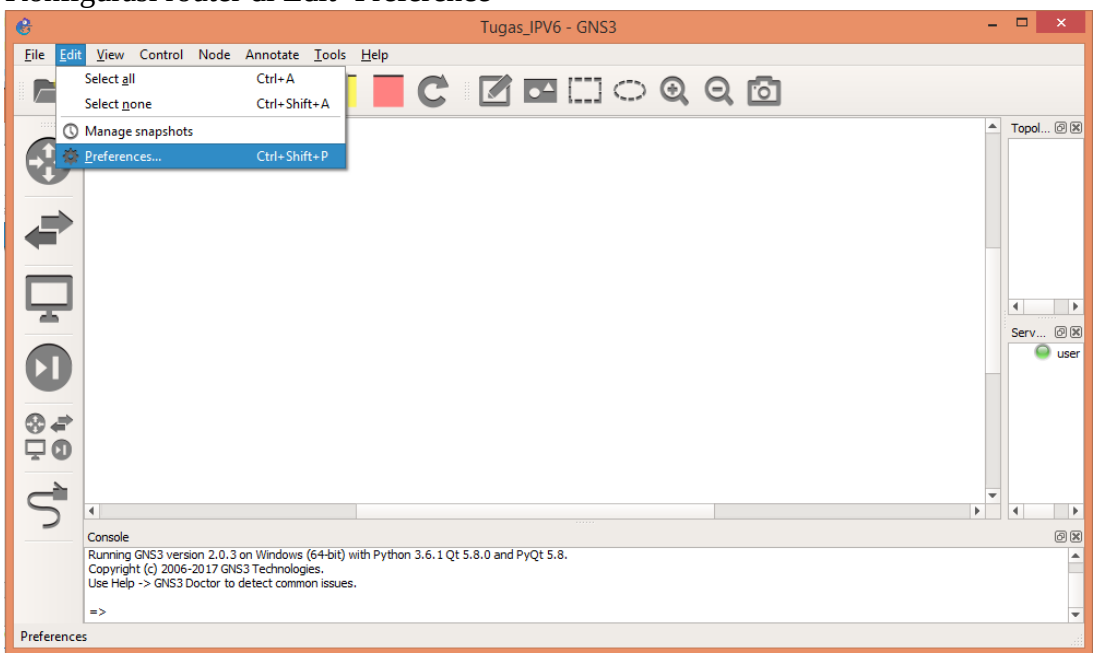
IPv6 mendukung beberapa jenis format prefix, yakni sebagai berikut:

- Alamat Unicast, yang menyediakan komunikasi secara point-to-point, secara langsung antara dua host dalam sebuah jaringan.
- Alamat Multicast, yang menyediakan metode untuk mengirimkan sebuah paket data ke banyak host yang berada dalam group yang sama. Alamat ini digunakan dalam komunikasi one-to-many.
- Alamat Anycast, yang menyediakan metode penyampaian paket data kepada anggota terdekat dari sebuah group. Alamat ini digunakan dalam komunikasi one-to-one-of-many. Alamat ini juga digunakan hanya sebagai alamat tujuan (destination address) dan diberikan hanya kepada router, bukan kepada host-host biasa.

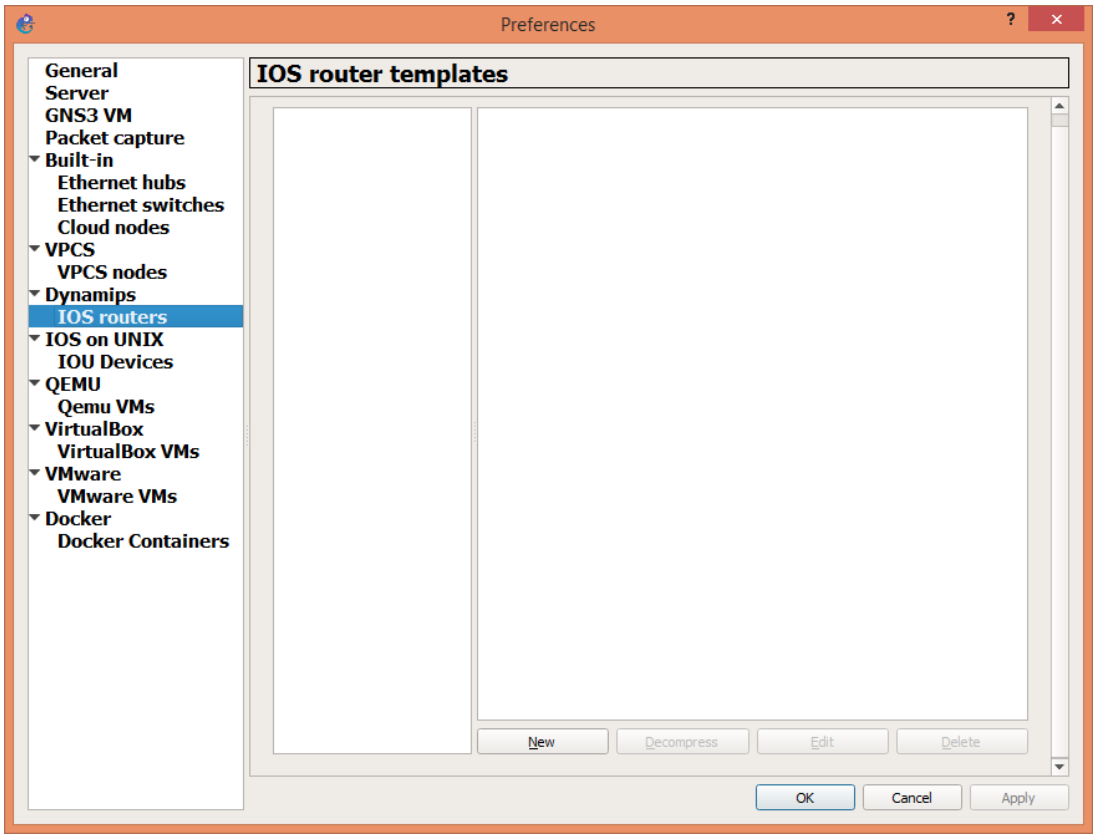
Dokumentasi Percobaan

Pengalamatan IPv6 pada GNS3

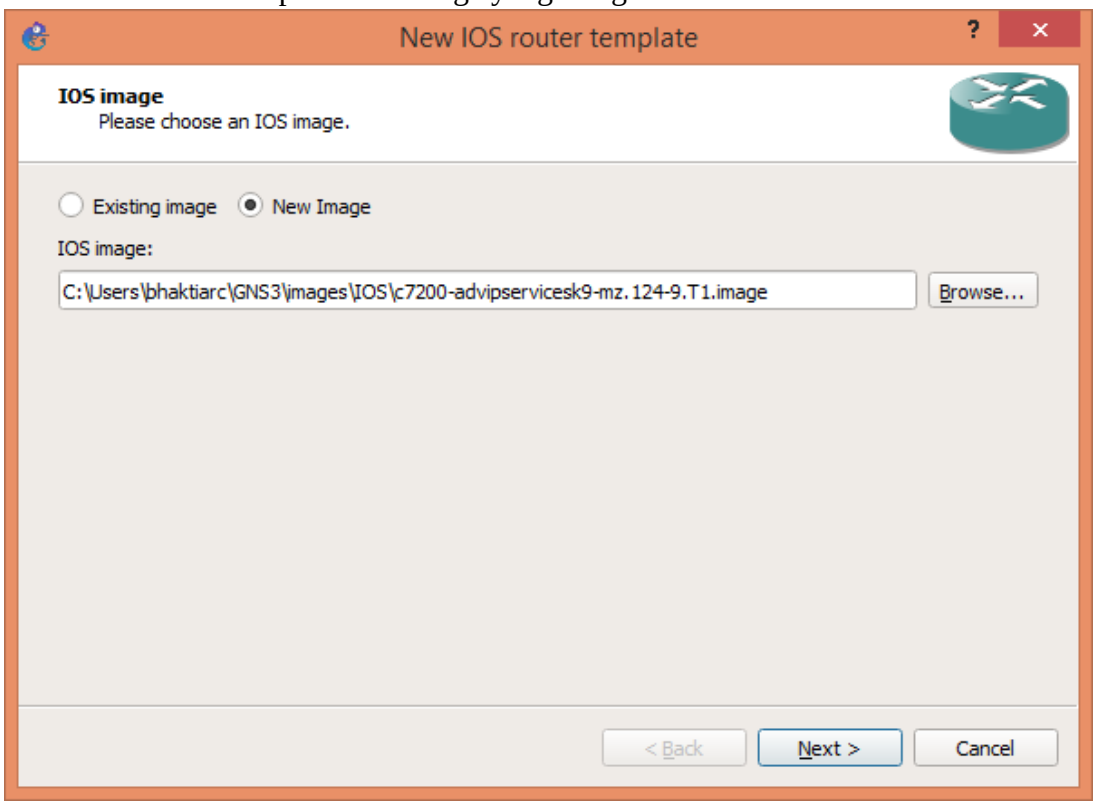
1. Konfigurasi router di Edit>Preference



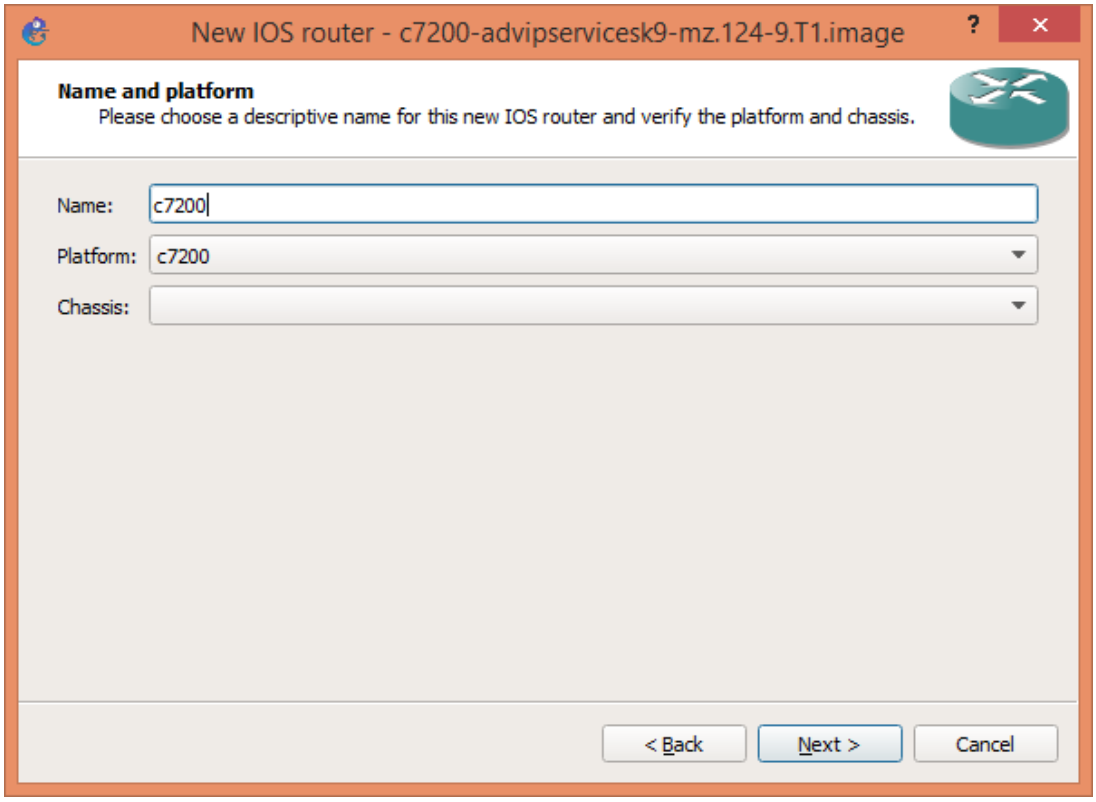
2. Pilih IOS Router > New



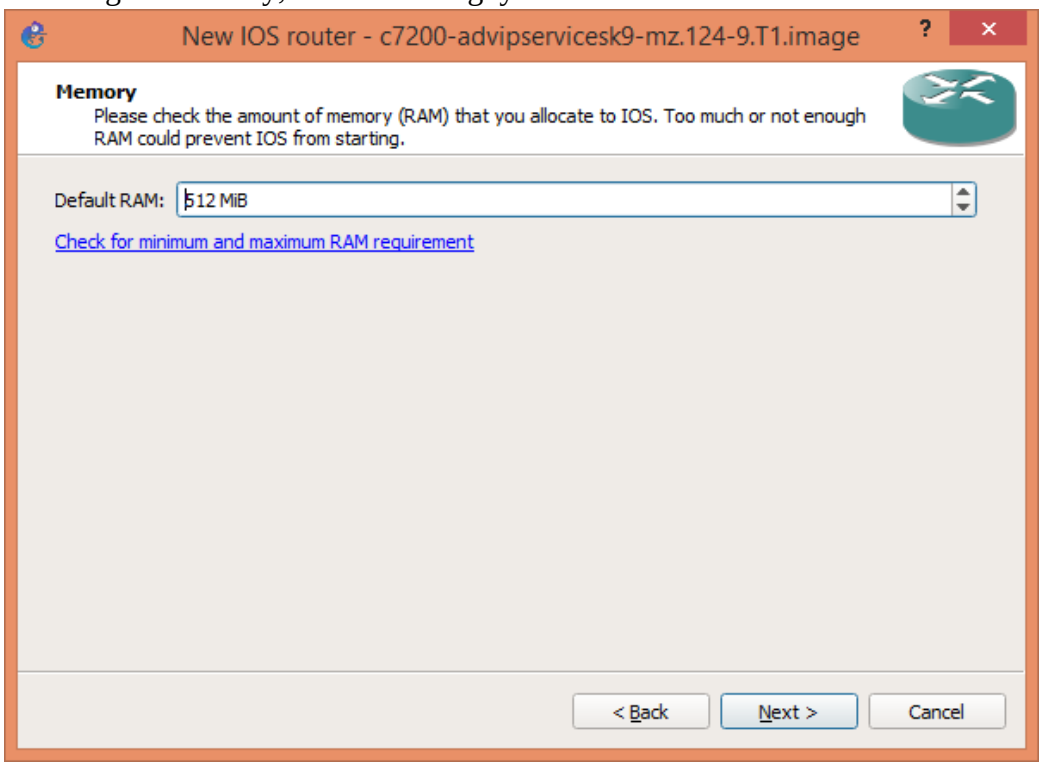
3. Pilih browse > kamu pilih IOS image yang diinginkan



4. Pilih Next

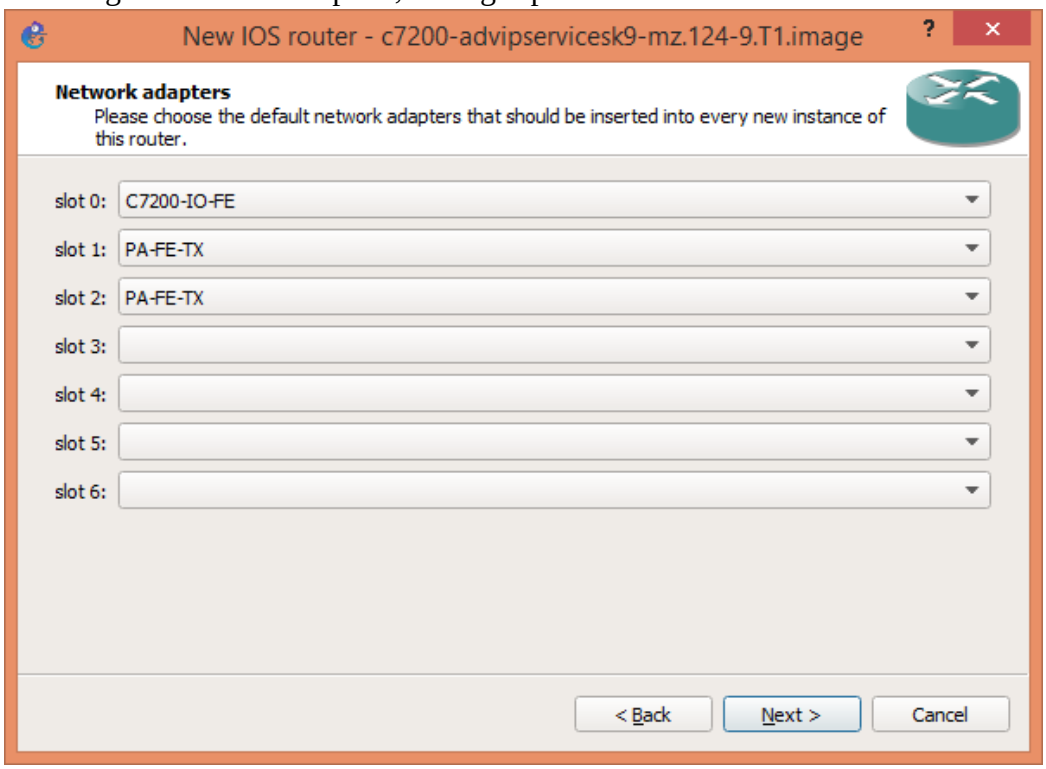


5. Pada bagian Memory, biarkan settingnya default



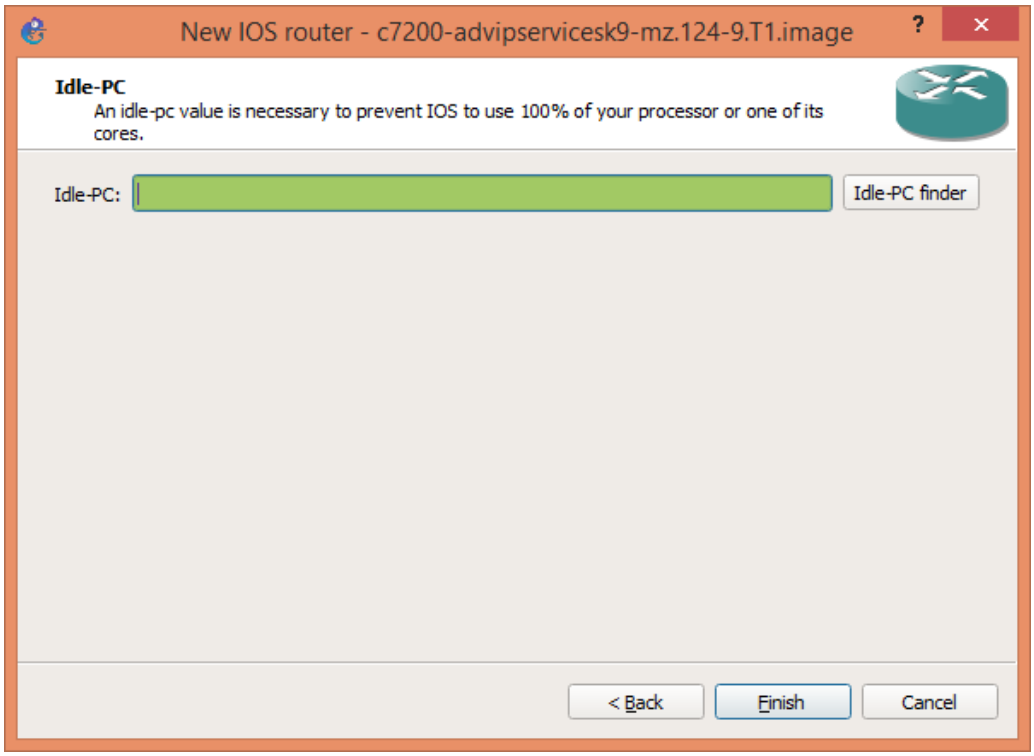
Pilih Next

6. Pada bagian Network adapters, setting seperti berikut

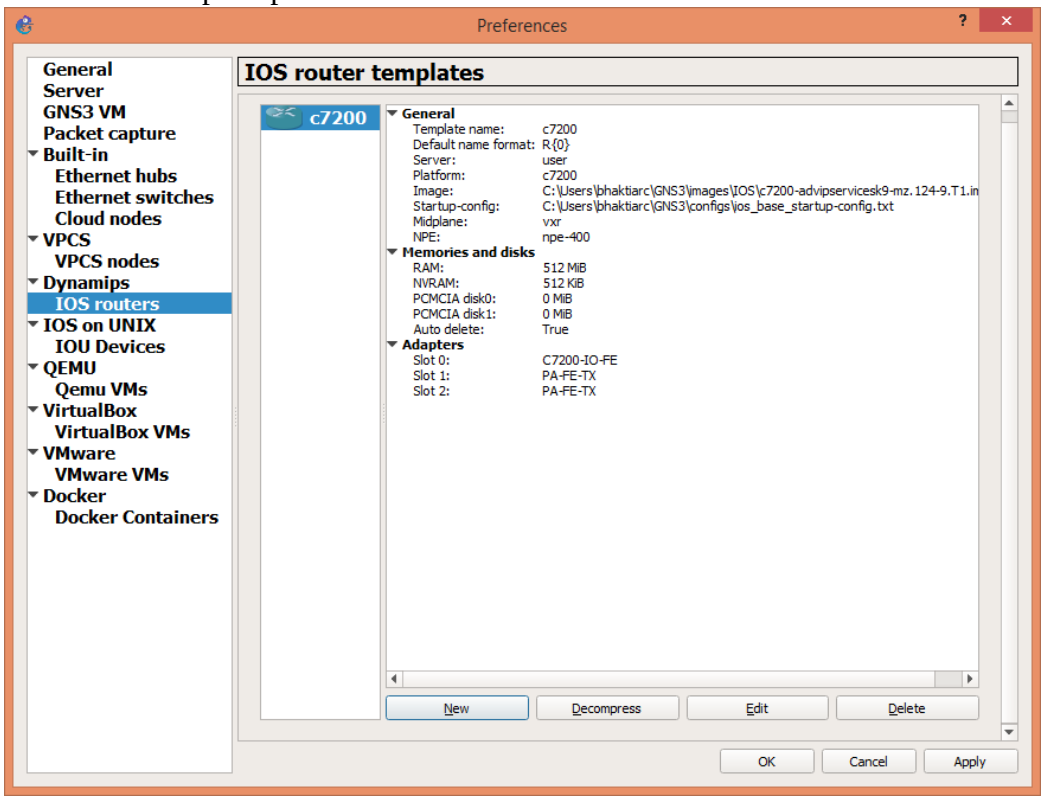


Pilih Next

7. Pilih Finish

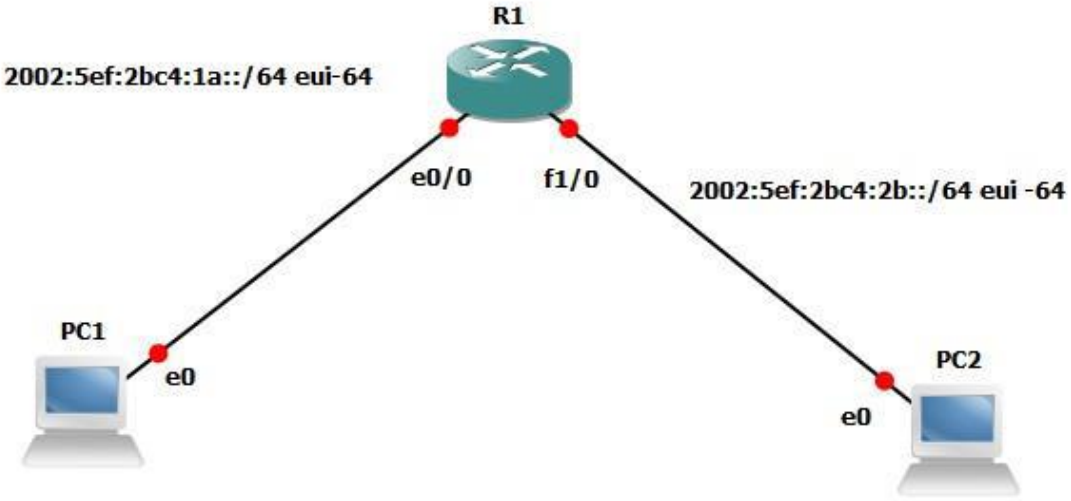


8. Maka akan tampil seperti berikut



Pilih Apply dan OK

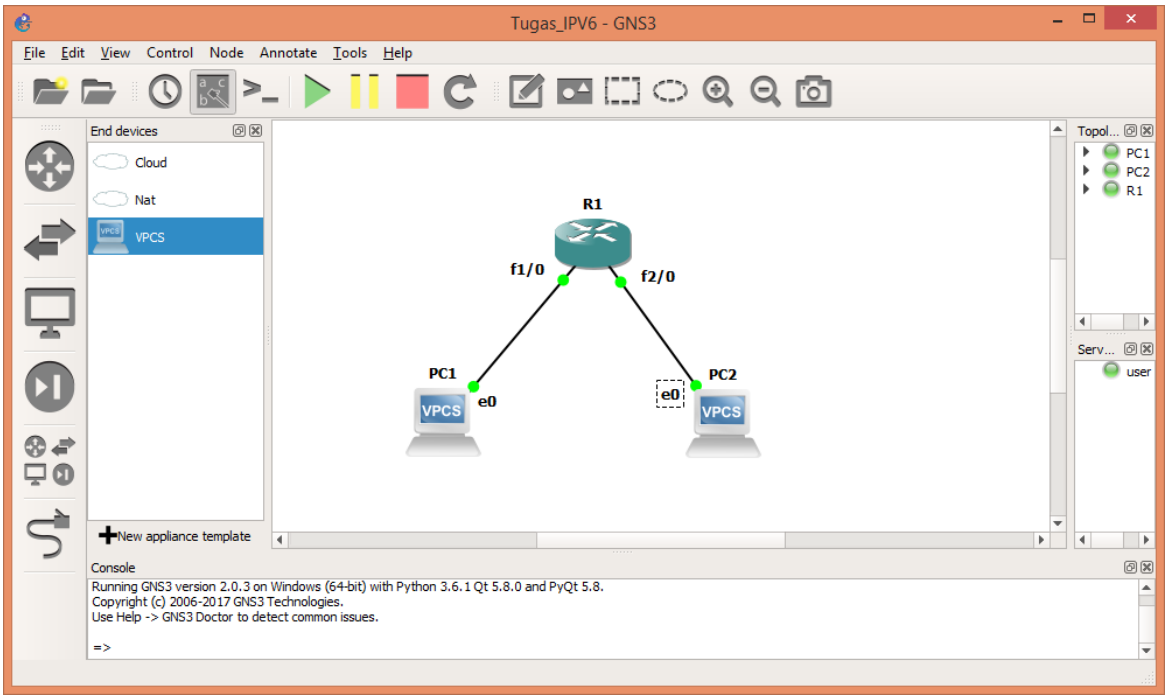
A. Menghubungkan 2 PC dengan menggunakan router R1



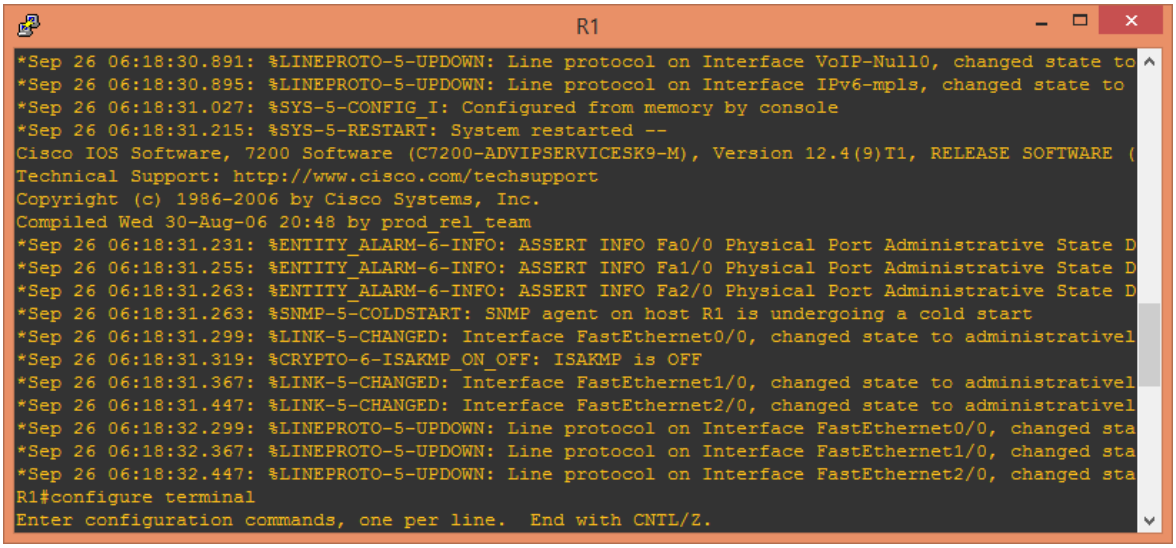
Langkah-langkah yang perlu dilakukan

Tugas : IPV6

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

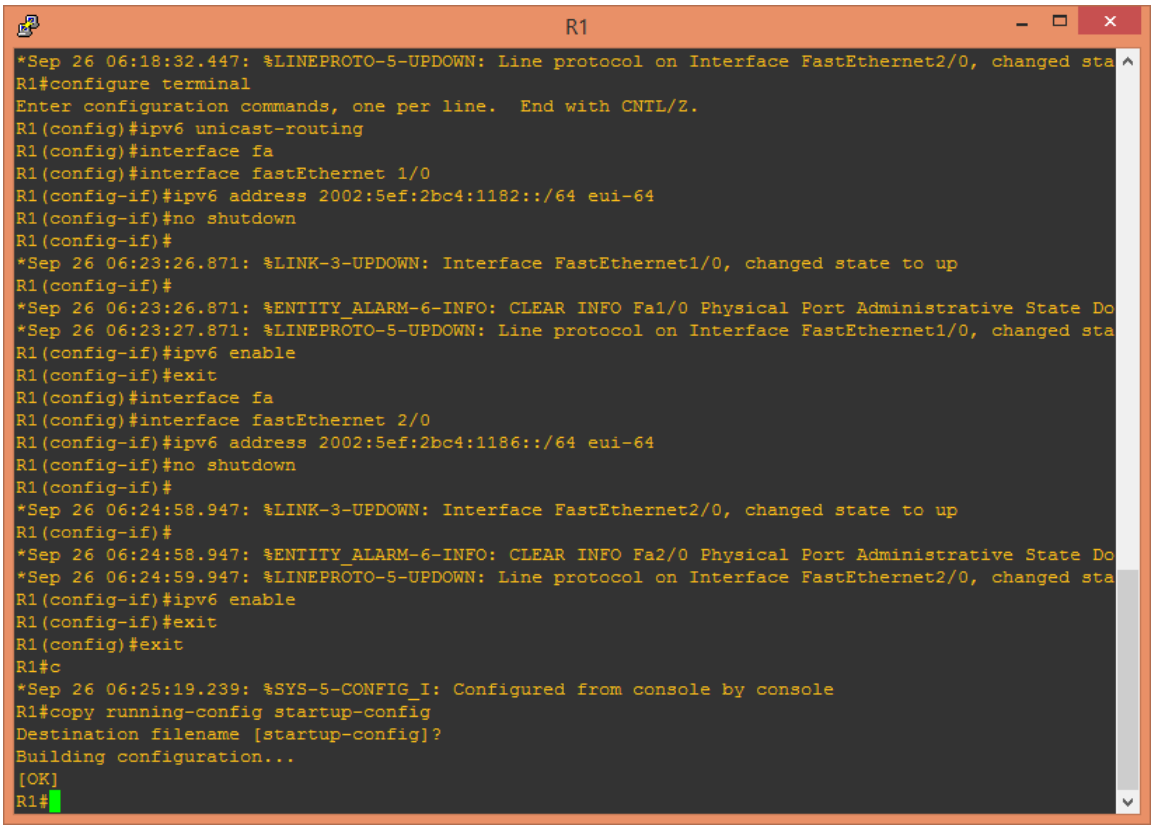


3. Kamu membuka console pada router R1 dengan mengklik kanan Router R1 > console

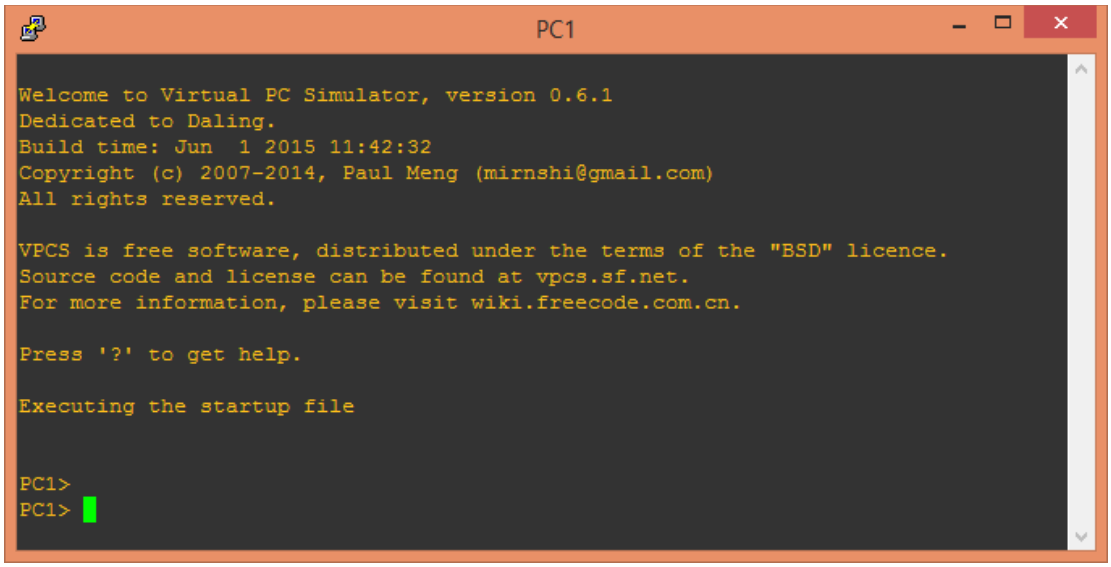


4. Kamu ketikkan syntax berikut

```
R1#configure terminal
R1(config)#ipv6 unicast-routing            // mensetting routing ke static
R1(config)#interface fastEthernet 1/0
R1(config-if)#ipv6 address 2002:5ef:2bc4:1182::/64 eui-64  //(4 digit terakhir nim 1182)
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:2bc4:1186::/64 eui-64 //(4 digit terakhir nim 1186)
R1(config-if)#no shutdown
R1(config-if)#ipv6 enable
R1(config-if)#exit
R1(config)#exit
R1#copy running-config startup-config
Destination filename [startup-config]? <enter>
Building configuration...
[OK]
R1#
```



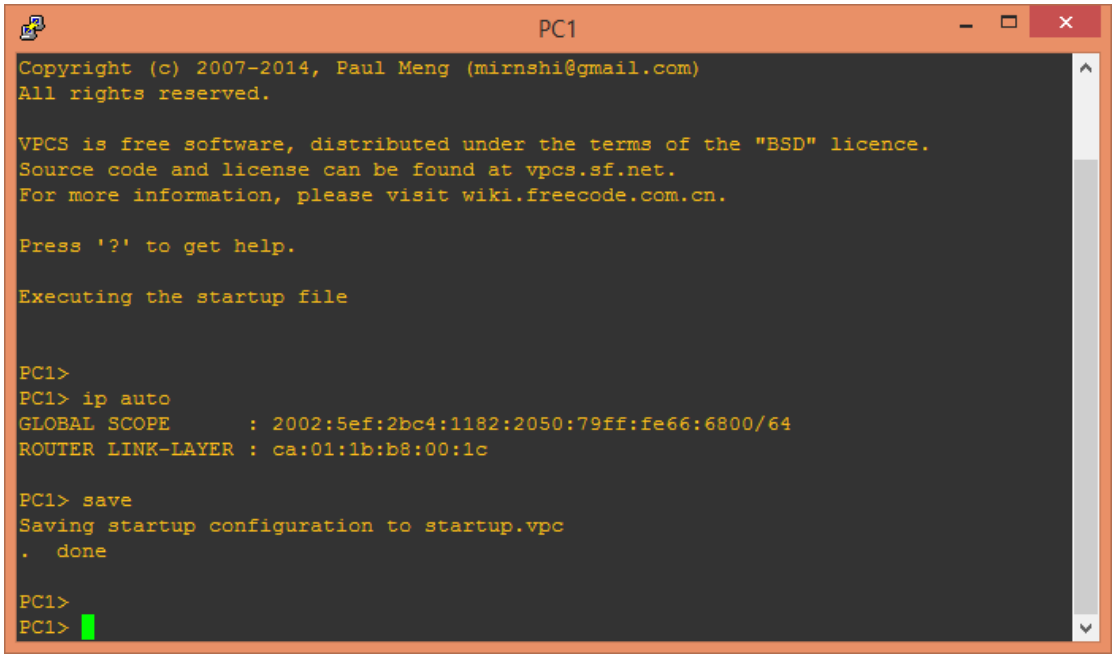
5. Kamu mengkonfigurasi ipv6 pada PC1
   1. Pertama, kamu klik kanan PC1 > console



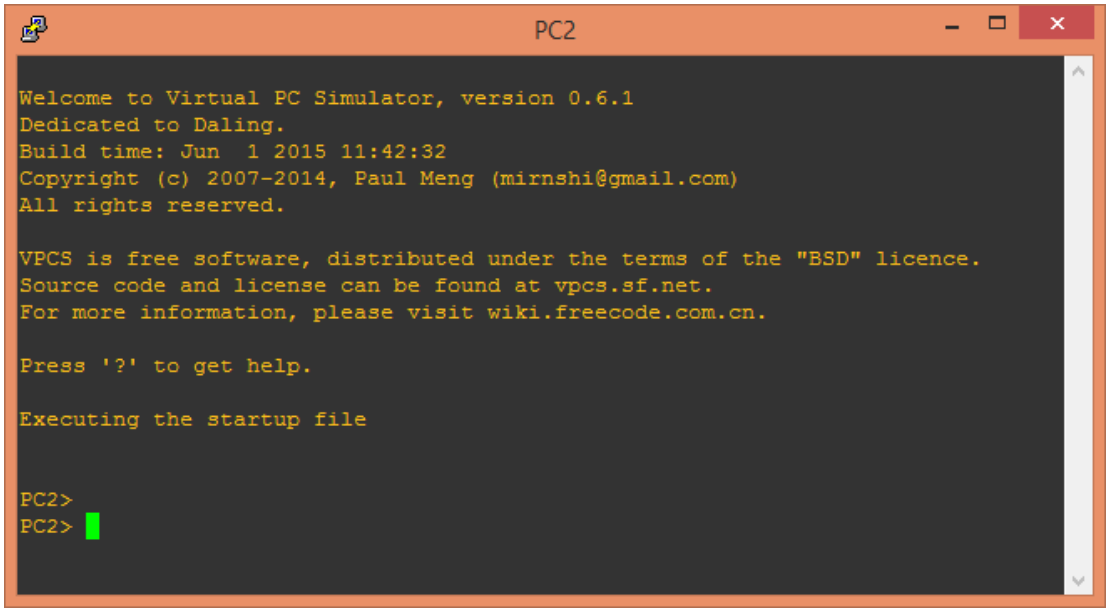
   2. Ketik syntax berikut

```
PC1> ip auto
GLOBAL SCOPE      : 2002:5ef:2bc4:1182:2050:79ff:fe66:6800/64
```

```
ROUTER LINK-LAYER : ca:01:1b:b8:00:1c

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

PC1>
```



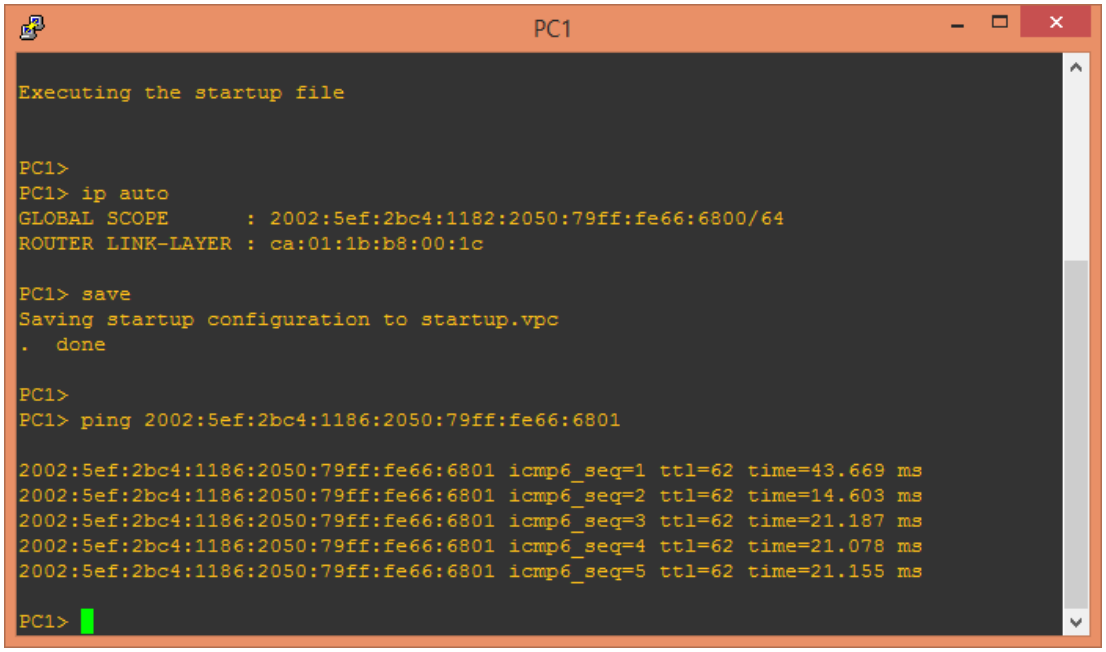
6. Kamu mengkonfigurasi ipv6 pada PC2
    1. Pertama kamu klik kaan PC2 > console



2. Ketik syntax berikut

```
PC2>
PC2> ip auto
GLOBAL SCOPE      : 2002:5ef:2bc4:1186:2050:79ff:fe66:6801/64
ROUTER LINK-LAYER : ca:01:1b:b8:00:38

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

PC2>
```

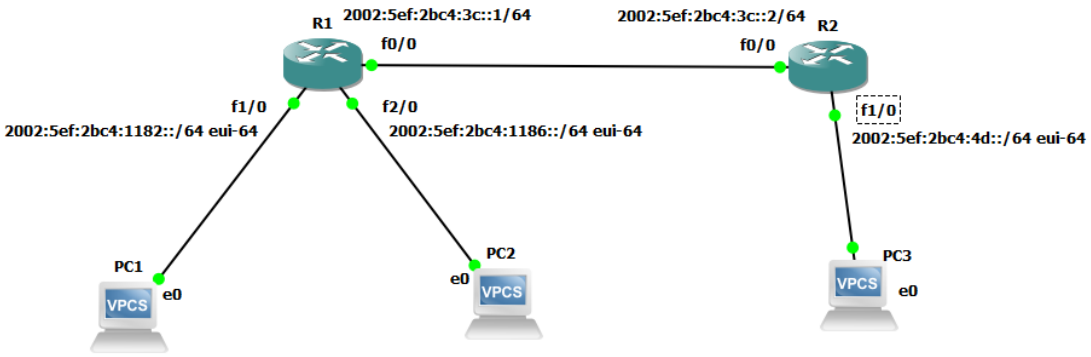
7. Kamu coba lakukan ping dari PC2 melalui PC1
    1. Pertama, kamu copy alamat ipv6 yang dimiliki oleh PC2 melalui console PC2
       Ipv6 PC2 : 2002:5ef:2bc4:1186:2050:79ff:fe66:6801
       Catatan!
       /64 tidak disertakan pada saat melakukan ping!
    2. Kedua, kamu buka console PC1
    3. Terakhir, ketik ping <alamat ipv6 PC2>, dan enter



8. Selesai

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
R1(config)#ipv6 unicast-routing
R1(config)#interface fastEthernet 2/0
R1(config-if)#ipv6 address 2002:5ef:2bc4:3c::1/64
R1(config-if)#no shutdown
R1(config-if)#ipv6 enable
R1(config-if)#exit
R1(config)#
```

```
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)#
*Dec 11 12:49:27.687: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Dec 11 12:49:27.687: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 11 12:49:28.687: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#ipv6 enable
R1(config-if)#exit
```

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

```
R2#configure terminal
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 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)#exit
R2(config)#exit
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

```
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 unicast-routing
R2(config)#int
R2(config)#interface fa
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)#
*Dec 11 12:50:47.899: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Dec 11 12:50:47.899: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 11 12:50:48.899: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#ipv6 enable
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:4d::/64 eui-64
R2(config-if)#no shutdown
R2(config-if)#
*Dec 11 12:51:47.227: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R2(config-if)#
*Dec 11 12:51:47.227: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 11 12:51:48.227: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#ipv6 enable
R2(config-if)#exit
R2(config)#exit
R2#copy
*Dec 11 12:52:06.679: %SYS-5-CONFIG_I: Configured from console by console
R2#copy running
R2#copy running-config sta
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
```

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 : ca:02:0e:bc:00:1c

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

```
PC3>
PC3> ip auto
GLOBAL SCOPE       : 2002:5ef:2bc4:4d:2050:79ff:fe66:6802/64
ROUTER LINK-LAYER  : ca:02:0e:bc:00:1c

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:2bc4:1182:c801:14ff:fed8:1c icmp6_seq=1 ttl=64 time=7.029 ms (ICMP type:1, code:0, No route to desti
nation)
*2002:5ef:2bc4:1182:c801:14ff:fed8:1c icmp6_seq=2 ttl=64 time=10.096 ms (ICMP type:1, code:0, No route to dest
ination)
*2002:5ef:2bc4:1182:c801:14ff:fed8:1c icmp6_seq=3 ttl=64 time=10.068 ms (ICMP type:1, code:0, No route to dest
ination)
*2002:5ef:2bc4:1182:c801:14ff:fed8:1c icmp6_seq=4 ttl=64 time=9.139 ms (ICMP type:1, code:0, No route to desti
nation)
*2002:5ef:2bc4:1182:c801:14ff:fed8:1c icmp6_seq=5 ttl=64 time=10.088 ms (ICMP type:1, code:0, No route to dest
ination)
```

Tidak bisa ping karena kita belum melakukan routing dari R1 ke R2

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)#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:2bc4:1182::/64 2002:5ef:2bc4:3c::1
R2(config)#ipv6 route 2002:5ef:2bc4:1186::/64 2002:5ef:2bc4:3c::1
```

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 route 2002:5ef:2bc4:1182::/64 2002:5ef:2bc4:3c::1
R2(config)#ipv6 route 2002:5ef:2bc4:1186::/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=171.951 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=2 ttl=60 time=78.132 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=3 ttl=60 time=93.807 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=4 ttl=60 time=78.206 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=5 ttl=60 time=62.633 ms

PC1>
```

   - 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=54.152 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=2 ttl=60 time=43.139 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=3 ttl=60 time=43.116 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=4 ttl=60 time=43.157 ms
2002:5ef:2bc4:4d:2050:79ff:fe66:6802 icmp6_seq=5 ttl=60 time=43.142 ms

PC2>
```

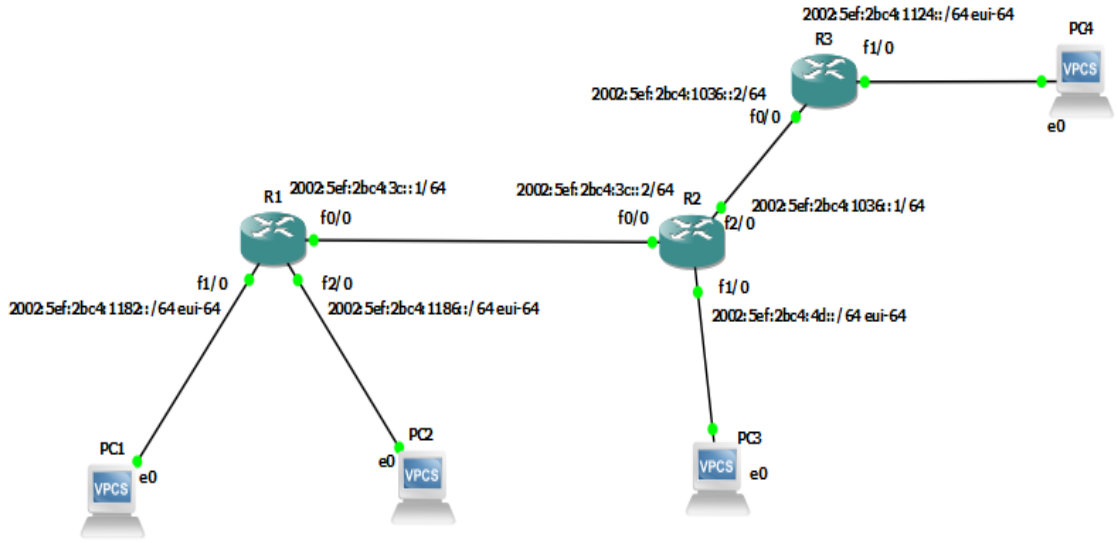
- Ping ke PC1 dan PC2 melalu PC3

```
PC3> ping 2002:5ef:2bc4:1182:2050:79ff:fe66:6801

2002:5ef:2bc4:1182:2050:79ff:fe66:6801 icmp6_seq=1 ttl=60 time=62.620 ms
2002:5ef:2bc4:1182:2050:79ff:fe66:6801 icmp6_seq=2 ttl=60 time=62.616 ms
2002:5ef:2bc4:1182:2050:79ff:fe66:6801 icmp6_seq=3 ttl=60 time=43.089 ms
2002:5ef:2bc4:1182:2050:79ff:fe66:6801 icmp6_seq=4 ttl=60 time=43.138 ms
2002:5ef:2bc4:1182:2050:79ff:fe66:6801 icmp6_seq=5 ttl=60 time=43.112 ms

PC3> ping 2002:5ef:2bc4:1186:2050:79ff:fe66:6800

2002:5ef:2bc4:1186:2050:79ff:fe66:6800 icmp6_seq=1 ttl=60 time=109.426 ms
2002:5ef:2bc4:1186:2050:79ff:fe66:6800 icmp6_seq=2 ttl=60 time=62.589 ms
2002:5ef:2bc4:1186:2050:79ff:fe66:6800 icmp6_seq=3 ttl=60 time=62.559 ms
2002:5ef:2bc4:1186:2050:79ff:fe66:6800 icmp6_seq=4 ttl=60 time=62.564 ms
2002:5ef:2bc4:1186:2050:79ff:fe66:6800 icmp6_seq=5 ttl=60 time=62.627 ms

PC3>
```

Tes Ping dari masing-masing PC berhasil menandakan routing juga berhasil.

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#configure terminal
R2(config)#ipv6 unicast-routing
R2(config)#interface fastEthernet 2/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:1036::1/64
R2(config-if)#no shutdown
R2(config-if)#ipv6 enable
R2(config-if)#exit
R2(config)#exit
R2#
```

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

```
R2#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#ipv6 unicast-routing
R2(config)#int fa
R2(config)#int fastEthernet 2/0
R2(config-if)#ipv6 address 2002:5ef:2bc4:1036::1/64
R2(config-if)#no shutdown
R2(config-if)#
*Dec 11 13:31:36.631: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R2(config-if)#
*Dec 11 13:31:36.631: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 11 13:31:37.631: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config-if)#ipv6 enable
R2(config-if)#exit
R2(config)#exit
R2#
*Dec 11 13:31:48.063: %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#configure terminal
R3(config)#ipv6 unicast-routing
R3(config)#interface ethernet 0/0
R3(config-if)#ipv6 address 2002:5ef:2bc4:1036::2/64
R3(config-if)#no shutdown
R3(config-if)#ipv6 enable
R3(config-if)#exit
R3(config)#interface fastEthernet 1/0
R3(config-if)#ipv6 address 2002:5ef:2bc4:1124::/64 eui-64
R3(config-if)#no shutdown
R3(config-if)#ipv6 enable
R3(config-if)#exit
R3(config)#exit
R3#
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

```
R3#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#ipv6 unicast-routing
R3(config)#interface fa
R3(config)#interface fastEthernet 0/0
R3(config-if)#ipv6 address 2002:5ef:2bc4:1036::2/64
R3(config-if)#no shutdown
R3(config-if)#
*Dec 11 13:36:08.423: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3(config-if)#
*Dec 11 13:36:08.423: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 11 13:36:09.423: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state t
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)#
*Dec 11 13:37:02.511: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R3(config-if)#
*Dec 11 13:37:02.511: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 11 13:37:03.511: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state t
R3(config-if)#ipv6 enable
R3(config-if)#exit
R3(config)#exit
R3#
*Dec 11 13:37:12.503: %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 :

```
PC4> ip auto
GLOBAL SCOPE      : 2002:5ef:2bc4:1124:2050:79ff:fe66:6803/64
ROUTER LINK-LAYER : ca:03:23:94:00:1c
PC4> save
Saving startup configuration to startup.vpc
.  done
PC4>
```

```
PC4>
PC4> ip auto
GLOBAL SCOPE       : 2002:5ef:2bc4:1124:2050:79ff:fe66:6803/64
ROUTER LINK-LAYER  : ca:03:23:94:00:1c

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#configure terminal
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#
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

```
R1#configure terminal
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)#
R1(config)#exit
R1#
*Dec 11 14:16:05.695: %SYS-5-CONFIG_I: Configured from console by console
R1#cop
R1#copy run
R1#copy running-config sta
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

b. Konfigurasi router R2 :

```
R2(config)#ipv6 route 2002:5ef:2bc4:1124::/64 2002:5ef:2bc4:1036::2
R2(config)#exit
R2#
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

```
R2(config)#ipv6 route 2002:5ef:2bc4:1124::/64 2002:5ef:2bc4:1036::2
R2(config)#
R2(config)#exit
R2#co
*Dec 11 14:16:41.147: %SYS-5-CONFIG_I: Configured from console by consol
R2#cop
R2#copy  run
R2#copy  running-config sta
R2#copy  running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
```

c. Konfigurasi router R3 :

```
R3#configure terminal
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:2bc4:1182::/64 2002:5ef:2bc4:1036::1
R3(config)#ipv6 route 2002:5ef:2bc4:1186::/64 2002:5ef:2bc4:1036::1
R3(config)#exit
R3# copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

```
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:2bc4:1182::/64 2002:5ef:2bc4:1036::1
R3(config)#ipv6 route 2002:5ef:2bc4:1186::/64 2002:5ef:2bc4:1036::1
R3(config)#
R3(config)#exit
R3#c
*Dec 11 14:16:26.111: %SYS-5-CONFIG_I: Configured from console by console
R3#cop
R3#copy run
R3#copy running-config sta
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=131.140 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=58 time=65.117 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=58 time=54.142 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=58 time=65.192 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=58 time=64.041 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=93.895 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=58 time=109.165 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=58 time=93.990 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=58 time=93.850 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=58 time=93.765 ms

PC2>
```

- 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=94.028 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=2 ttl=60 time=62.543 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=3 ttl=60 time=62.554 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=4 ttl=60 time=62.628 ms
2002:5ef:2bc4:1124:2050:79ff:fe66:6803 icmp6_seq=5 ttl=60 time=62.583 ms

PC3>
```

7. Pengecekan trace pada router untuk dapat sampai ke PC yang dituju
   a. 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 24 msec 36 msec 24 msec
  2 2002:5EF:2BC4:4D:2050:79FF:FE66:6802 60 msec 48 msec 48 msec
R1#
```

   b. 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 12 msec 12 msec 24 msec
  2 2002:5EF:2BC4:1036::2 32 msec 32 msec 32 msec
  3 2002:5EF:2BC4:1124:2050:79FF:FE66:6803 48 msec 52 msec 36 msec
R1#
```

   c. Trace PC1 melalui router R2

```
R2#traceroute 2002:5ef:2bc4:1182:2050:79ff:fe66:6801

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1182:2050:79FF:FE66:6801

  1 2002:5EF:2BC4:3C::1 28 msec 20 msec 24 msec
  2 2002:5EF:2BC4:1182:2050:79FF:FE66:6801 20 msec 32 msec 36 msec
R2#
```

   d. Trace PC2 melalui router R2

```
R2#traceroute 2002:5ef:2bc4:1186:2050:79ff:fe66:6800

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1186:2050:79FF:FE66:6800

  1 2002:5EF:2BC4:3C::1 16 msec 8 msec 16 msec
  2 2002:5EF:2BC4:1186:2050:79FF:FE66:6800 20 msec 24 msec 20 msec
R2#
```

e. 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 28 msec 24 msec 32 msec
  2 2002:5EF:2BC4:1124:2050:79FF:FE66:6803 68 msec 44 msec 44 msec
R2#
```

f. Trace PC1 melalui router R3

```
R3#traceroute 2002:5ef:2bc4:1182:2050:79ff:fe66:6801

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1182:2050:79FF:FE66:6801

  1 2002:5EF:2BC4:1036::1 20 msec 12 msec 24 msec
  2 2002:5EF:2BC4:3C::1 44 msec 44 msec 44 msec
  3 2002:5EF:2BC4:1182:2050:79FF:FE66:6801 64 msec 44 msec 44 msec
R3#
```

g. Trace PC2 melalui router R3

```
R3#traceroute 2002:5ef:2bc4:1186:2050:79ff:fe66:680

Type escape sequence to abort.
Tracing the route to 2002:5EF:2BC4:1186:2050:79FF:FE66:680

  1 2002:5EF:2BC4:1036::1 16 msec 20 msec 24 msec
  2 2002:5EF:2BC4:3C::1 40 msec 36 msec 44 msec
  3  *  !H  *
R3#
```

h. 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 24 msec 24 msec 20 msec
  2 2002:5EF:2BC4:4D:2050:79FF:FE66:6802 44 msec 32 msec 36 msec
R3#
```

8. Menentukan MAC address di setiap PC dengan menggunakan IPv6
    a. Menentukan MAC Address pada PC1
       IPv6 : 2002:5ef:2bc4:1182:2050:79ff:fe66:6801
        - Pertama, kamu copy 64 bit terakhir dari IPv6
          2050:79ff:fe66:6801
        - Kedua, kamu pisahkan 64 bit tadi dengan tanda (-) setiap melewati dua digit
          20-50-79-FF-FE-66-68-01
        - Ketiga, kamu hapus “ff-fe” dari 64 bit diatas
          20-50-79-66-68-01
        - Terakhir, kamu inverse bit ke-6 dari nilai di atas
          2 0 menjadi 2 2
          0010 0000 0010 0010
        - Sehingga MAC address PC1 menjadi : 22-50-79-66-68-01

    b. Menentukan MAC Address pada PC2
       IPv6 : 2002:5ef:2bc4:1186:2050:79ff:fe66:6800
        - Pertama, kamu copy 64 bit terakhir dari IPv6
          2050:79ff:fe66:6800
        - Kedua, kamu pisahkan 64 bit tadi dengan tanda (-) setiap melewati dua digit
          20-50-79-FF-FE-66-68-00
        - Ketiga, kamu hapus “ff-fe” dari 64 bit diatas
          20-50-79-66-68-00
        - Terakhir, kamu inverse bit ke-6 dari nilai di atas
          2 0 menjadi 2 2
          0010 0000 0010 0010
        - Sehingga MAC address PC1 menjadi : 22-50-79-66-68-00

    c. Menentukan MAC Address pada PC3
       IPv6 : 2002:5ef:2bc4:4d:2050:79ff:fe66:6802
        - Pertama, kamu copy 64 bit terakhir dari IPv6
          2050:79ff:fe66:6802
        - Kedua, kamu pisahkan 64 bit tadi dengan tanda (-) setiap melewati dua digit
          20-50-79-FF-FE-66-68-02
        - Ketiga, kamu hapus “ff-fe” dari 64 bit diatas
          20-50-79-66-68-02
        - Terakhir, kamu inverse bit ke-6 dari nilai di atas
          2 0 menjadi 2 2
          0010 0000 0010 0010
        - Sehingga MAC address PC1 menjadi : 22-50-79-66-68-02

    d. Menentukan MAC Address pada PC4
       IPv6 : 2002:5ef:2bc4:4d:2050:79ff:fe66:6803
        - Pertama, kamu copy 64 bit terakhir dari IPv6

2050:79ff:fe66:6803

- Kedua, kamu pisahkan 64 bit tadi dengan tanda (-) setiap melewati dua digit
  20-50-79-FF-FE-66-68-03
- Ketiga, kamu hapus “ff-fe” dari 64 bit diatas
  20-50-79-66-68-03
- Terakhir, kamu inverse bit ke-6 dari nilai di atas
  2 0 menjadi 2 2
  0010 0000 0010 0010
- Sehingga MAC address PC1 menjadi : 22-50-79-66-68-03

Bab 2

VLAN (Virtual Local Area Network)

Pendahuluan

Konfigurasi dasar BGP

```
R1#vlan database
R1(vlan)#vlan 10
VLAN 10 added:
        Name: VLAN0010
R1(vlan)#vlan 20
VLAN 20 added:
        Name: VLAN0020
R1(vlan)#exit
APPLY completed.
Exiting...
R1#configure terminal
R2#conf term
R2(config)#interface fastEthernet 1/1
R2(config-if)#switchport mode access
R2(config-if)#switchport access vlan 10
R2(config-if)#exit
R2(config)#interface fastEthernet 2/2
R2(config-if)#switchport mode access
R2(config-if)#switchport access vlan 20
R2(config-if)#exit
R2(config)#interface fastEthernet 1/0
R2(config-if)#switchport mode trunk
```

Pengertian

VLAN atau Virtual LAN merupakan sekelompok perangkat pada satu LAN atau lebih yang dikonfigurasikan (menggunakan perangkat lunak pengelolaan) sehingga dapat berkomunikasi seperti halnya bila perangkat tersebut terhubung ke jalur yang sama, padahal sebenarnya perangkat tersebut berada pada sejumlah segmen LAN yang berbeda. Vlan dibuat dengan menggunakan jaringan pihak ke tiga. VLAN merupakan sebuah bagian kecil jaringan IP yang terpisah secara logik. VLAN memungkinkan beberapa jaringan IP dan jaringan-jaringan kecil (subnet) berada dalam jaringan switched switched yang sama. Agar computer bisa berkomunikasi pada VLAN yang sama, setiap komputer harus memiliki sebuah alamat IP dan Subnet Mask yang sesuai dengan VLAN tersebut. Switch harus dikonfigurasi dengan VLAN dan setiap port dalam VLAN harus didaftarkan ke VLAN. Sebuah port switch yang telah dikonfigurasi dengan sebuah VLAN tunggal disebut sebagai access port.

- VLAN dibuat untuk menyediakan layanan segmentasi yang secara tradisional disediakan oleh router fisik dalam konfigurasi LAN.

- VLAN menangani skalabilitas, keamanan, dan manajemen jaringan. Router dalam topologi VLAN memberikan penyaringan penyiaran, keamanan, dan manajemen arus lalu lintas.
- Switch mungkin tidak menjembatani lalu lintas di antara VLAN, karena ini akan melanggar integritas domain broadcast VLAN.
- Lalu lintas seharusnya hanya diarahkan antara VLAN.

Configuring VLANs	Description
Statically	Network administrators configure port-by-port. Each Port is associated with a specific VLAN. The network administrator is responsible for keying in the mappings between the ports and VLANs.
Dynamically	The ports are able to dynamically work out their VLAN configuration. Uses a software database of MAC address to VLAN mappings (which the network administrator must set up first).

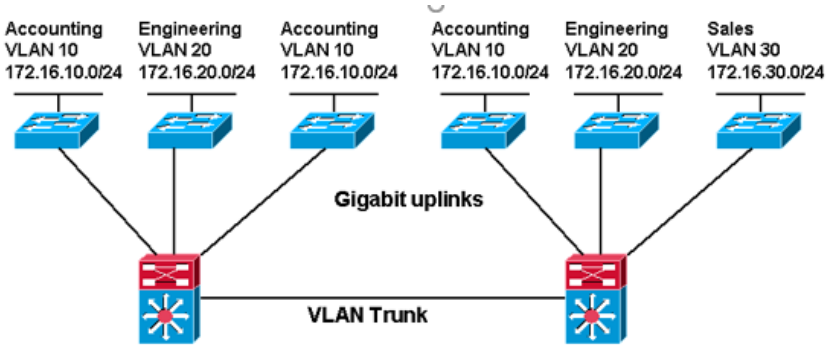
Keuntungan VLAN

Sebuah VLAN memungkinkan seorang Administrator untuk menciptakan sekelompok peralatan yang secara logic dihubungkan satu sama lain.
Manfaat utama VLAN adalah mereka mengizinkan administrator jaringan mengatur LAN **secara logis dan bukan secara fisik**.
Ini berarti administrator dapat melakukan semua hal berikut:

- Mudah memindahkan workstation di LAN.
- Mudah menambahkan workstation ke LAN.
- Mudah mengubah konfigurasi LAN.
- Mudah mengontrol lalu lintas jaringan.
- Meningkatkan keamanan

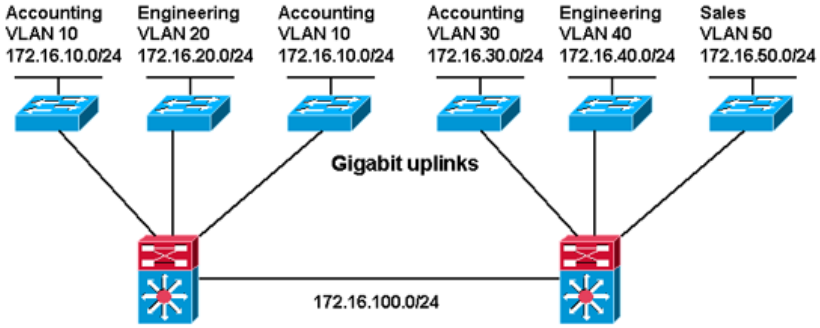
Jenis VLAN

- **Ent-to-End atau Campus Wide VLANs**



VLAN berdasarkan fungsionalitasnya
Model “VLAN everywhere”

- **Geographic atau Local VLANs**



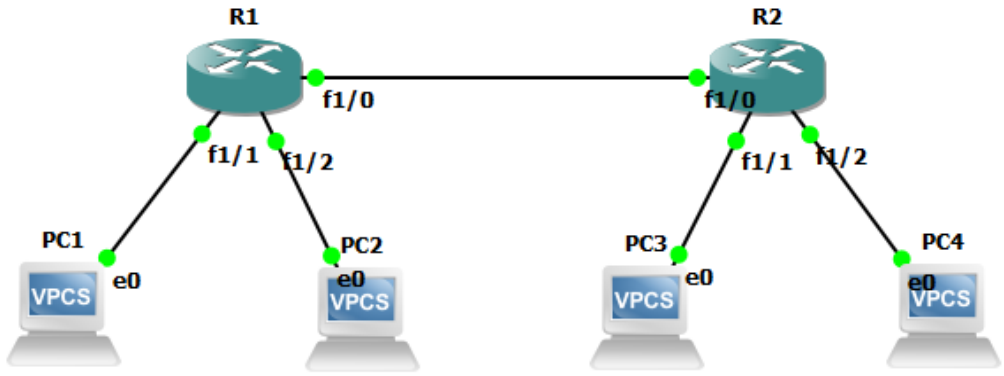
VLAN berdasarkan lokasi fisik
VLAN didedikasikan untuk setiap akses layer cluster switch

Dokumentasi Percobaan

Persiapan :

1. Buka Edit > Preference
2. Pilih menu IOS routers > Edit
3. Pilih tab Slots > isi salah satu slot menggunakan ‘NM-16ESW’ untuk menggunakan switch
4. Pilih tab Memories and disks > isi 12 MiB pada PCMCIA disk0
5. Klik Ok6. Apply
7. Ok.

A. Mengkonfigurasikan 2 vlan
   1. Buat topologi pada GNS3 sesuai gambar dibawah ini kemudian jalankan :



2. Buatlah ID VLAN pada masing-masing router dengan menggunakna console.
   Tiap router menggunakan ID 10 dan ID 20. Ketikkan perintah berikut :

```
R1#vlan database
R1(vlan)#vlan 10
VLAN 10 added:
        Name: VLAN0010
R1(vlan)#vlan 20
VLAN 20 added:
        Name: VLAN0020
R1(vlan)#exit
APPLY completed.
Exiting...
R1#
```

Ulangi untuk R2.

```
R1#vlan database
% Warning: It is recommended to configure VLAN from config mode,
  as VLAN database mode is being deprecated. Please consult user
  documentation for configuring VTP/VLAN in config mode.

R1(vlan)#vlan 10
VLAN 10 added:
    Name: VLAN0010
R1(vlan)#vlan 20
VLAN 20 added:
    Name: VLAN0020
R1(vlan)#exit
APPLY completed.
Exiting....
R1#conf term
```

```
R2#vlan database
% Warning: It is recommended to configure VLAN from config mode,
  as VLAN database mode is being deprecated. Please consult user
  documentation for configuring VTP/VLAN in config mode.

R2(vlan)#vlan 10
VLAN 10 added:
    Name: VLAN0010
R2(vlan)#vlan 20
VLAN 20 added:
    Name: VLAN0020
R2(vlan)#exit
APPLY completed.
Exiting....
R2#E{M'}T
R2#p}
R2#
```

3. Konfigurasi masing-masing interface pada router R1 dan R2 sesuai dengan interface yang kamu gunakan :

```
R1#conf term
R1(config)#interface fastEthernet 1/1
R1(config-if)#switchport mode access
R1(config-if)#switchport access vlan 10
R1(config-if)#exit
R1(config)#interface fastEthernet 1/2
R1(config-if)#switchport mode access
R1(config-if)#switchport access vlan 20
R1(config-if)#exit
R1(config)#interface fastEthernet 1/0
R1(configif)#switchport mode trunk
```

- R1

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface fastEthernet 3/1
                                  ^
% Invalid input detected at '^' marker.

R1(config)#int
R1(config)#interface fa
R1(config)#interface fastEthernet 1/1
R1(config-if)#switchport mode access
R1(config-if)#switchport access vlan 10
R1(config-if)#exit
R1(config)#int fa 1/2
R1(config-if)#switchport mode access
R1(config-if)#switchport access vlan 20
R1(config-if)#exit
R1(config)#int fa 1/0
R1(config-if)#switchport mode trunk
R1(config-if)#exit
R1(config)#exit
R1#cp
R1#cp
*Mar  1 00:09:50.935: %SYS-5-CONFIG_I: Configured from console by console
R1#ccop
R1#cop
R1#copy run
R1#copy running-config sta
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)#interface fa
R2(config)#interface fastEthernet 1/1
R2(config-if)#switchport mode access
R2(config-if)#switchport access vlan 10
R2(config-if)#exit
R2(config)#int fa 1/2
R2(config-if)#switchport mode access
R2(config-if)#switchport access vlan 20
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#switchport mode trunk
R2(config-if)#ex
*Mar  1 00:12:01.139: %DTP-5-TRUNKPORTON: Port Fa1/0 has become dot1q trunk
R2(config-if)#int fa 1/0
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#switchport mode trunk
R2(config-if)#exit
R2(config)#exit
R2#copy
*Mar  1 00:13:03.827: %SYS-5-CONFIG_I: Configured from console by console
R2#copy run
R2#copy running-config sta
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#
R2#
```

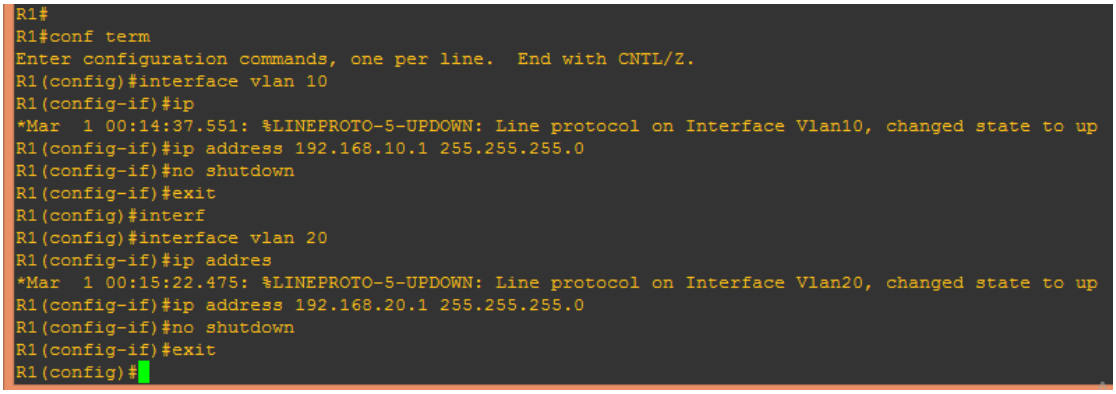
4. Kemudian , konfigurasikan juga IP dari VLAN untuk masing-masing router.

R1

```
R1#configure terminal
R1(config)#interface vlan 10
R1(config-if)#ip address 192.168.10.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface vlan 20
R1(config-if)#ip address 192.168.20.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
```

R2

```
R2#configure terminal
R2(config)#interface vlan 10
R2(config-if)#ip address 192.168.10.11 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface vlan 20
R2(config-if)#ip address 192.168.20.11 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R1(config)#
```



```
R2#
R2#
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface vlan 10
R2(config-if)#ip addre
*Mar  1 00:16:58.627: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up
R2(config-if)#ip address 192.168.10.11 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface vlan 20
R2(config-if)#
*Mar  1 00:17:28.255: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan20, changed state to up
R2(config-if)#ip address 192.168.20.11 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#
```

5. Selanjutnya kita setting IP untuk masing-masing PC :

- PC 1:
  IP = 192.168.10.2
  Netmask = 255.255.255.0
  Gateway = 192.168.10.1

PC1

```
PC1> ip 192.168.10.2 255.255.255.0 192.168.10.1
Checking for duplicate address...
PC1 : 192.168.10.2 255.255.255.0 gateway 192.168.10.1

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

PC1>
```

- PC 2:
  IP = 192.168.20.2
  Netmask = 255.255.255.0
  Gateway = 192.168.20.2

PC2

```
PC2> ip 192.168.20.2 255.255.255.0 192.168.20.1
Checking for duplicate address...
PC1 : 192.168.20.2 255.255.255.0 gateway 192.168.20.1

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

PC2>
```

- PC 3:
  IP = 192.168.10.12
  Netmask = 255.255.255.0
  Gateway = 192.168.10.11

```
PC3

PC3> ip 192.168.10.12 255.255.255.0 192.168.10.11
Checking for duplicate address...
PC1 : 192.168.10.12 255.255.255.0 gateway 192.168.10.11

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

PC3>
```

- PC 4:
  IP = 192.168.20.12
  Netmask = 255.255.255.0
  Gateway = 192.168.20.11

```
PC4

PC4> ip 192.168.20.12 255.255.255.0 192.168.20.11
Checking for duplicate address...
PC1 : 192.168.20.12 255.255.255.0 gateway 192.168.20.11

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

PC4>
```

6. Kita bisa mengetahui konfigurasi telah berhasil jika kita bisa melakukan PING antar PC.

- Tes PING ke PC3 (VLAN 10) melalui PC2 (VLAN 20)

```
PC2>
PC2> ping 192.168.10.12
84 bytes from 192.168.10.12 icmp_seq=1 ttl=63 time=3.596 ms
84 bytes from 192.168.10.12 icmp_seq=2 ttl=63 time=15.160 ms
84 bytes from 192.168.10.12 icmp_seq=3 ttl=63 time=15.679 ms
84 bytes from 192.168.10.12 icmp_seq=4 ttl=63 time=14.674 ms
84 bytes from 192.168.10.12 icmp_seq=5 ttl=63 time=14.216 ms

PC2>
```

- Tes PING ke PC4 (VLAN 20) melalui PC1 (VLAN 10)

```
PC1>
PC1> ping 192.168.20.12
84 bytes from 192.168.20.12 icmp_seq=1 ttl=63 time=9.115 ms
84 bytes from 192.168.20.12 icmp_seq=2 ttl=63 time=17.212 ms
84 bytes from 192.168.20.12 icmp_seq=3 ttl=63 time=12.180 ms
84 bytes from 192.168.20.12 icmp_seq=4 ttl=63 time=12.665 ms
84 bytes from 192.168.20.12 icmp_seq=5 ttl=63 time=10.692 ms

PC1>
```

- Tes PING ke PC2 (VLAN 20) melalui PC1 (VLAN 10)

```
PC1>
PC1> ping 192.168.20.2
192.168.20.2 icmp_seq=1 timeout
84 bytes from 192.168.20.2 icmp_seq=2 ttl=63 time=33.141 ms
84 bytes from 192.168.20.2 icmp_seq=3 ttl=63 time=14.122 ms
84 bytes from 192.168.20.2 icmp_seq=4 ttl=63 time=15.145 ms
84 bytes from 192.168.20.2 icmp_seq=5 ttl=63 time=13.121 ms
```

Bab 3

RIP (Routing Information Protocol)

Pendahuluan

Konfigurasi dasar RIP

R1#**configure terminal**
R1(config)#**router rip**
R1(config-router)#**version 2**
R1(config-router)#**network 192.82.1.64**
R1(config-router)#**network 192.82.1.96**
R1(config-router)#**network 192.82.1.104**
R1(config-router)#**exit**
R1(config)#**exit**

Pengertian

Routing Information Protocol (RIP) adalah sebuah protokol routing dinamis yang digunakan dalam jaringan LAN (Local Area Network) dan WAN (Wide Area Network). Oleh karena itu protokol ini diklasifikasikan sebagai Interior Gateway Protocol (IGP). Protokol ini menggunakan algoritma Distance-Vector Routing. Routing ini menggunakan hop sebagai metrik routing. RIP memiliki palka down time sebesar 180 detik. Jumlah maksimum hop yang digunakan dalam RIP adalah 15 hops.

Awalnya setiap router RIP mentransmisikan / menyebarkan pembaruan(update) penuh setiap 30 detik. Pada awal penyebaran, tabel routing cukup kecil sehingga lalu lintas tidak signifikan. Seiring jaringan tumbuh, menjadi jelas bahwa ada banyak lalu lintas yang meledak (melebihi kapasitas) setiap 30 detik, bahkan jika router telah diinisialisasi pada waktu yang acak. Diperkirakan, sebagai hasil inisialisasi acak, update routing akan menyebar pada waktunya, tapi ini tidak benar dalam praktiknya. Sally Floyd dan Van Jacobson menunjukkan pada tahun 1994 bahwa, tanpa sedikit pengacakan timer update, timer disinkronisasi dari waktu ke waktu.

Kelebihan dan kekurangan

Di sebagian besar lingkungan jaringan, RIP bukanlah pilihan yang lebih disukai untuk routing karena waktunya untuk berkumpul dan skalabilitasnya buruk dibandingkan dengan EIGRP, OSPF, atau IS-IS. Namun, RIP mudah dikonfigurasi, karena RIP tidak memerlukan parameter apapun seperti protokol lainnya.

Versi RIP

1. RIP versi 1

   Spesifikasi asli RIP, yang didefinisikan dalam RFC 1058, diterbitkan pada tahun 1988 dan menggunakan classfull routing. Pembaruan routing periodik tidak membawa informasi subnet, kurang mendukung mask subnet panjang variabel (VLSM). Keterbatasan ini membuat tidak mungkin memiliki subnet berukuran berbeda di dalam kelas jaringan yang sama. Dengan kata lain, semua subnet di kelas jaringan harus memiliki ukuran yang sama. Tidak ada dukungan untuk otentikasi router, membuat RIP rentan terhadap berbagai serangan.

2. RIP versi 2

   Karena kekurangan spesifikasi RIP asli, RIP versi 2 (RIPv2) dikembangkan pada tahun 1993 dan terakhir distandarisasi pada tahun 1998. Ini termasuk kemampuan untuk membawa informasi subnet, sehingga mendukung Classless Inter-Domain Routing (CIDR). Untuk menjaga kompatibilitas, batas hop count 15 tetap. RIPv2 memiliki fasilitas untuk sepenuhnya beroperasi dengan spesifikasi sebelumnya jika semua bidang protokol “Must Be Zero” (semua harus nol) dalam pesan RIPv1 ditentukan dengan benar. Selain itu, fitur sakelar kompatibilitas memungkinkan penyesuaian interoperabilitas dengan halus.

   Dalam upaya untuk menghindari beban yang tidak perlu host yang tidak berpartisipasi dalam routing, RIPv2 me-multicast seluruh tabel routing ke semua router yang berdekatan di alamat 224.0.0.9, sebagai lawan dari RIP yang menggunakan siaran unicast. Alamat 224.0.0.9 ini berada pada alamat IP versi 4 kelas D (range 224.0.0.0 - 239.255.255.255). Pengalamatan unicast masih diperbolehkan untuk aplikasi khusus. (MD5) otentikasi RIP diperkenalkan pada tahun 1997. RIPv2 adalah Standar Internet STD-56

3. RIPng

   RIPng (RIP generasi berikutnya), yang didefinisikan dalam RFC 2080, merupakan perpanjangan dari RIPv2 untuk dukungan IPv6, Protokol Internet generasi berikutnya. Perbedaan utama antara RIPv2 dan RIPng adalah:

   - Dukungan dari jaringan IPv6.
   - RIPv2 mendukung otentikasi RIPv1, sedangkan RIPng tidak. IPv6 router itu, pada saat itu, seharusnya menggunakan IP Security (IPsec) untuk otentikasi.
   - RIPv2 memungkinkan pemberian beragam tag untuk rute , sedangkan RIPng tidak;
   - RIPv2 meng-encode hop berikutnya (next-hop) ke setiap entry route, RIPng membutuhkan penyandian (encoding) tertentu dari hop berikutnya untuk satu set entry route .

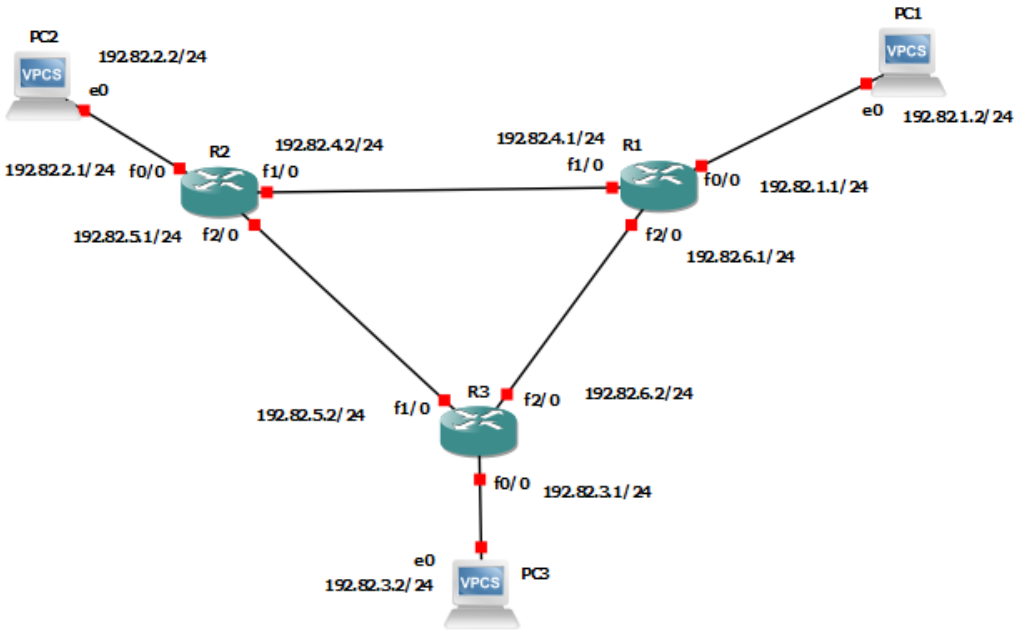
   Batasan :

   - Hop count tidak dapat melebihi 15, dalam kasus jika melebihi akan dianggap tidak sah. Hop tak hingga direpresentasikan dengan angka 16.

- Sebagian besar jaringan RIP datar. Tidak ada konsep wilayah atau batas-batas dalam jaringan RIP.
- Variabel Length Subnet Masks tidak didukung oleh RIP IPv4 versi 1 (RIPv1).
- RIP memiliki konvergensi lambat dan menghitung sampai tak terhingga masalah.

Dokumentasi Percobaan

1. Topologi jaringan dan alokasi IP



2. Konfigurasi IP pada masing-masing interface
   - R1

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fa 0/0
R1(config-if)#ip addr 192.82.1.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 15 21:07:58.923: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Dec 15 21:07:58.923: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:07:59.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 1/0
R1(config-if)#ip addr 192.82.4.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#ex
*Dec 15 21:08:36.003: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R1(config-if)#ex
*Dec 15 21:08:36.003: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:08:37.003: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 2/0
R1(config-if)#ip addr 192.82.6.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 15 21:09:07.127: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R1(config-if)#
*Dec 15 21:09:07.127: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:09:08.127: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R1(config-if)#exit
R1(config)#
```

- 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 192.82.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:10:13.375: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Dec 15 21:10:13.375: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:10:14.375: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ip addr 192.82.4.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:10:39.195: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R2(config-if)#
*Dec 15 21:10:39.195: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:10:40.195: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to
R2(config-if)#exit
R2(config)#int fa 2/0
R2(config-if)#ip addr 192.82.5.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:11:04.415: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R2(config-if)#
*Dec 15 21:11:04.415: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:11:05.415: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to
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 192.82.3.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:01.803: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3(config-if)#
*Dec 15 21:13:01.803: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:13:02.803: %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 192.82.5.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:30.963: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R3(config-if)#
*Dec 15 21:13:30.963: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:13:31.963: %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 192.82.6.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:58.907: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R3(config-if)#
*Dec 15 21:13:58.907: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:13:59.907: %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

```
R3#copy run
R3#copy running-config start
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

- R2

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

- R1

```
*Nov 13 20:19:03.035: %SYS-5-CONFIG_I: Configured from console by console
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

Setting IP pada masing-masing PC

- IP PC1

```
PC1>
PC1> ip 192.82.1.2 255.255.255.0 192.82.1.1
Checking for duplicate address...
PC1 : 192.82.1.2 255.255.255.0 gateway 192.82.1.1

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

PC1>
```

- IP PC2

```
PC2> ip 192.82.2.2 255.255.255.0 192.82.2.1
Checking for duplicate address...
PC1 : 192.82.2.2 255.255.255.0 gateway 192.82.2.1

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

PC2>
```

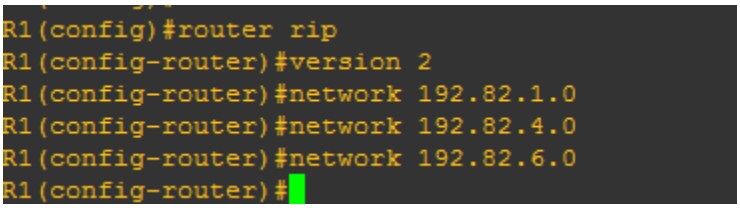
- IP PC3

```
PC3>
PC3> ip 192.82.3.2 255.255.255.0 192.82.3.1
Checking for duplicate address...
PC1 : 192.82.3.2 255.255.255.0 gateway 192.82.3.1

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

PC3>
```

3. Konfigurasi RIP

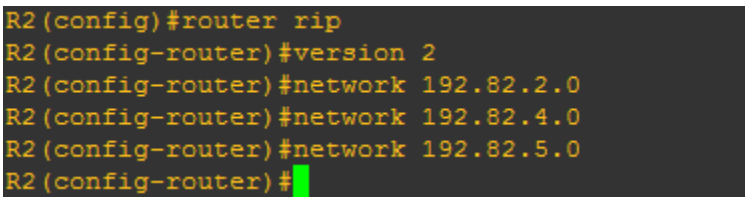
Konfigruasi pada R1

```
R1#configure terminal
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 192.82.1.0
R1(config-router)#network 192.82.4.0
R1(config-router)#network 192.82.6.0
R1(config-router)#exit
R1(config)#exit
R1#
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R1#
```



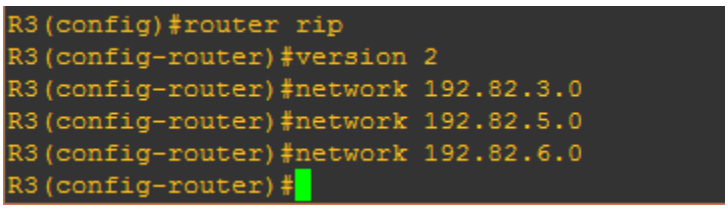
Konfigurasi pada R2

```
R2#configure terminal
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 192.82.2.0
R2(config-router)#network 192.82.4.0
R2(config-router)#network 192.82.5.0
R2(config-router)#exit
R2(config)#exit
R2#
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R2#
```



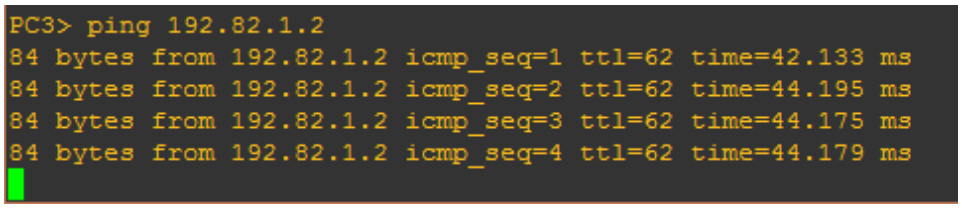
Konfigurasi pada R3

```
R3#configure terminal
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 192.82.3.0
R3(config-router)#network 192.82.5.0
R3(config-router)#network 192.82.6.0
R3(config-router)#exit
R3(config)#exit
R3#
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R3#
```



4. Pembuktian konfigurasi berhasil dengan PING

- PC3 ke PC1



- PC3 ke PC2

```
PC3> ping 192.82.2.2
84 bytes from 192.82.2.2 icmp_seq=1 ttl=62 time=64.033 ms
84 bytes from 192.82.2.2 icmp_seq=2 ttl=62 time=42.145 ms
84 bytes from 192.82.2.2 icmp_seq=3 ttl=62 time=44.136 ms
84 bytes from 192.82.2.2 icmp_seq=4 ttl=62 time=44.140 ms
84 bytes from 192.82.2.2 icmp_seq=5 ttl=62 time=44.166 ms

PC3>
```

- PC1 ke PC2

```
PC1>
PC1> ping 192.82.2.1
84 bytes from 192.82.2.1 icmp_seq=1 ttl=254 time=29.048 ms
84 bytes from 192.82.2.1 icmp_seq=2 ttl=254 time=33.134 ms
84 bytes from 192.82.2.1 icmp_seq=3 ttl=254 time=33.159 ms
84 bytes from 192.82.2.1 icmp_seq=4 ttl=254 time=33.144 ms
84 bytes from 192.82.2.1 icmp_seq=5 ttl=254 time=33.178 ms

PC1>
```

5. Cost RIP

R2#show ip rip database

- R1

```
R1#show ip rip database
192.82.1.0/24    auto-summary
192.82.1.0/24    directly connected, FastEthernet0/0
192.82.2.0/24    auto-summary
192.82.2.0/24
    [1] via 192.82.4.2, 00:00:22, FastEthernet1/0
192.82.3.0/24    auto-summary
192.82.3.0/24
    [1] via 192.82.6.2, 00:00:02, FastEthernet2/0
192.82.4.0/24    auto-summary
192.82.4.0/24    directly connected, FastEthernet1/0
192.82.5.0/24    auto-summary
192.82.5.0/24
    [1] via 192.82.6.2, 00:00:02, FastEthernet2/0
    [1] via 192.82.4.2, 00:00:22, FastEthernet1/0
192.82.6.0/24    auto-summary
192.82.6.0/24    directly connected, FastEthernet2/0
R1#
```

- R2

```
R2#show ip rip database
192.82.1.0/24    auto-summary
192.82.1.0/24
    [1] via 192.82.4.1, 00:00:06, FastEthernet1/0
192.82.2.0/24    auto-summary
192.82.2.0/24    directly connected, FastEthernet0/0
192.82.3.0/24    auto-summary
192.82.3.0/24
    [1] via 192.82.5.2, 00:00:06, FastEthernet2/0
192.82.4.0/24    auto-summary
192.82.4.0/24    directly connected, FastEthernet1/0
192.82.5.0/24    auto-summary
192.82.5.0/24    directly connected, FastEthernet2/0
192.82.6.0/24    auto-summary
192.82.6.0/24
    [1] via 192.82.5.2, 00:00:06, FastEthernet2/0
    [1] via 192.82.4.1, 00:00:06, FastEthernet1/0
R2#
```

- R3

```
R3#show ip rip database
192.82.1.0/24    auto-summary
192.82.1.0/24
    [1] via 192.82.6.1, 00:00:11, FastEthernet2/0
192.82.2.0/24    auto-summary
192.82.2.0/24
    [1] via 192.82.5.1, 00:00:06, FastEthernet1/0
192.82.3.0/24    auto-summary
192.82.3.0/24    directly connected, FastEthernet0/0
192.82.4.0/24    auto-summary
192.82.4.0/24
    [1] via 192.82.5.1, 00:00:06, FastEthernet1/0
    [1] via 192.82.6.1, 00:00:11, FastEthernet2/0
192.82.5.0/24    auto-summary
192.82.5.0/24    directly connected, FastEthernet1/0
192.82.6.0/24    auto-summary
192.82.6.0/24    directly connected, FastEthernet2/0
R3#
```

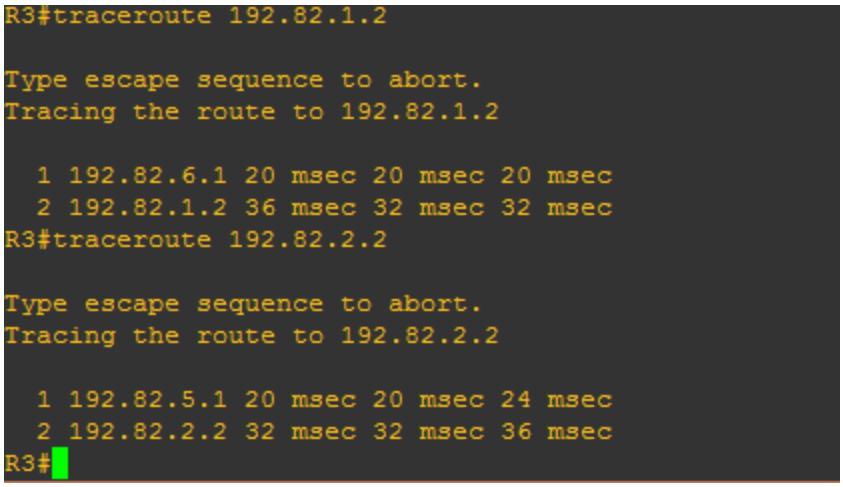
6. Menampilkan traceroute router ke PC
   - R1

```
R1#traceroute 192.82.2.2

Type escape sequence to abort.
Tracing the route to 192.82.2.2

  1 192.82.4.2 16 msec 24 msec 20 msec
  2 192.82.2.2 36 msec 32 msec 32 msec
R1#traceroute 192.82.3.2

Type escape sequence to abort.
Tracing the route to 192.82.3.2

  1 192.82.6.2 16 msec 20 msec 24 msec
  2 192.82.3.2 32 msec 32 msec 36 msec
R1#
```

   - R2

```
R2#traceroute 192.82.1.2

Type escape sequence to abort.
Tracing the route to 192.82.1.2

  1 192.82.4.1 20 msec 24 msec 20 msec
  2 192.82.1.2 32 msec 36 msec 32 msec
R2#traceroute 192.82.3.2

Type escape sequence to abort.
Tracing the route to 192.82.3.2

  1 192.82.5.2 24 msec 20 msec 24 msec
  2 192.82.3.2 32 msec 32 msec 36 msec
R2#
```

   - R3


R3#traceroute 192.82.1.2
Type escape sequence to abort.
Tracing the route to 192.82.1.2
1 192.82.6.1 20 msec 20 msec 20 msec
2 192.82.1.2 36 msec 32 msec 32 msec
R3#traceroute 192.82.2.2
Type escape sequence to abort.
Tracing the route to 192.82.2.2
1 192.82.5.1 20 msec 20 msec 24 msec
2 192.82.2.2 32 msec 32 msec 36 msec
R3#

OSPF (Open Shortest Path First)

Pendahuluan

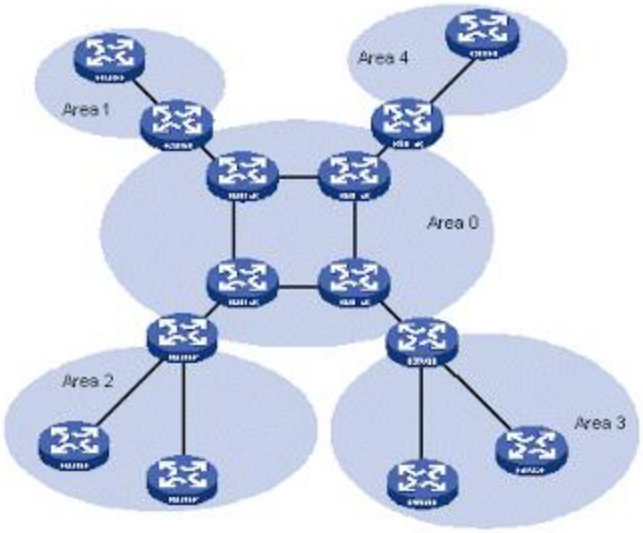
Konfigurasi dasar OSPF

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) merupakan sebuah routing protokol berjenis IGRP (InteriorGateway Routing Protocol) yang hanya dapat bekerja dalam jaringan internal suatu ogranisasi atau perusahaan. Jaringan internal maksudnya adalah jaringan di mana Anda masih memiliki hak untuk menggunakan, mengatur, dan memodifikasinya. Atau dengan kata lain, Anda masih memiliki hak administrasi terhadap jaringan tersebut. Jika Anda sudah tidak memiliki hak untuk menggunakan dan mengaturnya, maka jaringan tersebut dapat dikategorikan sebagai jaringan eksternal.

Selain itu, OSPF juga merupakan routing protokol yang berstandar terbuka. Maksudnya adalah routing protokol ini bukan ciptaan dari vendor manapun. Dengan demikian, siapapun dapat menggunakannya, perangkat manapun dapat kompatibel dengannya, dan di manapun routing protokol ini dapat diimplementasikan. OSPF merupakan routing protokol yang menggunakan konsep hirarki routing, artinya OSPF membagi-bagi jaringan menjadi beberapa tingkatan. Tingkatan-tingkatan ini diwujudkan dengan menggunakan sistem pengelompokan area.



Gambar OSPF

Dengan menggunakan konsep hirarki routing ini sistem penyebaran informasinya menjadi lebih teratur dan tersegmentasi, tidak menyebar ke sana ke mari dengan sembarangan. Efek dari keteraturan distribusi routing ini adalah jaringan yang penggunaan bandwidth-nya lebih efisien, lebih cepat mencapai konvergensi, dan lebih presisi dalam menentukan rute-rute terbaik menuju ke sebuah lokasi. OSPF merupakan salah satu routing protokol yang selalu berusaha untuk bekerja demikian. Teknologi yang digunakan oleh routing protokol ini adalah teknologi link State yang memang didesain untuk bekerja dengan sangat efisien dalam proses pengiriman update informasi rute. Hal ini membuat routing protokol OSPF menjadi sangat cocok untuk terus dikembangkan menjadi network berskala besar. Pengguna OSPF biasanya adalah para administrator jaringan berskala sedang sampai besar. Jaringan dengan jumlah router lebih dari sepuluh buah, dengan banyak lokasi-lokasi remote yang perlu juga dijangkau dari pusat, dengan jumlah pengguna jaringan lebih dari lima ratus perangkat komputer, mungkin sudah layak menggunakan routing protocol ini.

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

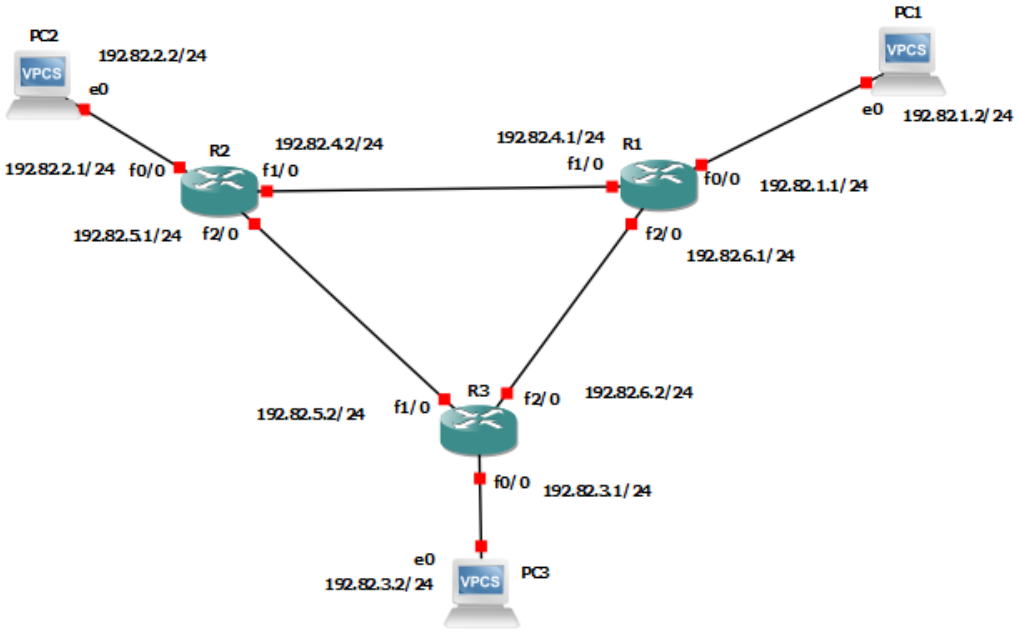
Cara kerja OSPF

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.

Dokumentasi Percobaan

7. Topologi jaringan dan alokasi IP



8. Konfigurasi IP pada masing-masing interface
   - R1

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fa 0/0
R1(config-if)#ip addr 192.82.1.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 15 21:07:58.923: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Dec 15 21:07:58.923: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:07:59.923: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 1/0
R1(config-if)#ip addr 192.82.4.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#ex
*Dec 15 21:08:36.003: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R1(config-if)#ex
*Dec 15 21:08:36.003: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:08:37.003: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 2/0
R1(config-if)#ip addr 192.82.6.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 15 21:09:07.127: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R1(config-if)#
*Dec 15 21:09:07.127: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:09:08.127: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R1(config-if)#exit
R1(config)#
```

   - 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 192.82.2.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:10:13.375: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Dec 15 21:10:13.375: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:10:14.375: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ip addr 192.82.4.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:10:39.195: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R2(config-if)#
*Dec 15 21:10:39.195: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:10:40.195: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to
R2(config-if)#exit
R2(config)#int fa 2/0
R2(config-if)#ip addr 192.82.5.1 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 15 21:11:04.415: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R2(config-if)#
*Dec 15 21:11:04.415: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:11:05.415: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to
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 192.82.3.1 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:01.803: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R3(config-if)#
*Dec 15 21:13:01.803: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Dec 15 21:13:02.803: %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 192.82.5.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:30.963: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R3(config-if)#
*Dec 15 21:13:30.963: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Dec 15 21:13:31.963: %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 192.82.6.2 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 15 21:13:58.907: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R3(config-if)#
*Dec 15 21:13:58.907: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Dec 15 21:13:59.907: %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

```
R3#copy run
R3#copy running-config start
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

- R2

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

- R1

```
*Nov 13 20:19:03.035: %SYS-5-CONFIG_I: Configured from console by console
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

Setting IP pada masing-masing PC

- IP PC1

```
PC1>
PC1> ip 192.82.1.2 255.255.255.0 192.82.1.1
Checking for duplicate address...
PC1 : 192.82.1.2 255.255.255.0 gateway 192.82.1.1

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

PC1>
```

- IP PC2

```
PC2> ip 192.82.2.2 255.255.255.0 192.82.2.1
Checking for duplicate address...
PC1 : 192.82.2.2 255.255.255.0 gateway 192.82.2.1

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

PC2>
```

- IP PC3

```
PC3>
PC3> ip 192.82.3.2 255.255.255.0 192.82.3.1
Checking for duplicate address...
PC1 : 192.82.3.2 255.255.255.0 gateway 192.82.3.1

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

PC3>
```

9. 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#
```

```
R1(config)#
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)#
```

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#
```

```
R2(config)#router ospf 11
R2(config-router)#network 192.82.2.0 0.0.0.255 area 11
R2(config-router)#network 192.82.4.0 0.0.0.255 area 11
R2(config-router)#network 192.82.5.0 0.0.0.255 area 11
R2(config-router)#
```

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#
```

```
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)#
```

10. Pembuktian konfigurasi berhasil dengan PING
    - Dari PC1

```
PC1> ping 192.82.2.2
84 bytes from 192.82.2.2 icmp_seq=1 ttl=62 time=39.133 ms
84 bytes from 192.82.2.2 icmp_seq=2 ttl=62 time=44.179 ms
84 bytes from 192.82.2.2 icmp_seq=3 ttl=62 time=44.119 ms
84 bytes from 192.82.2.2 icmp_seq=4 ttl=62 time=44.189 ms
84 bytes from 192.82.2.2 icmp_seq=5 ttl=62 time=44.105 ms

PC1> ping 192.82.3.2
84 bytes from 192.82.3.2 icmp_seq=1 ttl=62 time=40.115 ms
84 bytes from 192.82.3.2 icmp_seq=2 ttl=62 time=44.128 ms
84 bytes from 192.82.3.2 icmp_seq=3 ttl=62 time=53.092 ms
84 bytes from 192.82.3.2 icmp_seq=4 ttl=62 time=38.111 ms
84 bytes from 192.82.3.2 icmp_seq=5 ttl=62 time=40.119 ms

PC1>
```

- Dari PC2

```
PC2> ping 192.82.1.2
84 bytes from 192.82.1.2 icmp_seq=1 ttl=62 time=62.711 ms
84 bytes from 192.82.1.2 icmp_seq=2 ttl=62 time=47.163 ms
84 bytes from 192.82.1.2 icmp_seq=3 ttl=62 time=33.101 ms
84 bytes from 192.82.1.2 icmp_seq=4 ttl=62 time=44.133 ms
84 bytes from 192.82.1.2 icmp_seq=5 ttl=62 time=33.113 ms

PC2> ping 192.82.3.2
84 bytes from 192.82.3.2 icmp_seq=1 ttl=62 time=43.212 ms
84 bytes from 192.82.3.2 icmp_seq=2 ttl=62 time=44.139 ms
84 bytes from 192.82.3.2 icmp_seq=3 ttl=62 time=42.155 ms
84 bytes from 192.82.3.2 icmp_seq=4 ttl=62 time=42.153 ms
84 bytes from 192.82.3.2 icmp_seq=5 ttl=62 time=52.953 ms

PC2>
```

- Dari PC3

```
PC3>
PC3> ping 192.82.1.2
84 bytes from 192.82.1.2 icmp_seq=1 ttl=62 time=62.606 ms
84 bytes from 192.82.1.2 icmp_seq=2 ttl=62 time=60.132 ms
84 bytes from 192.82.1.2 icmp_seq=3 ttl=62 time=58.338 ms
84 bytes from 192.82.1.2 icmp_seq=4 ttl=62 time=37.183 ms
84 bytes from 192.82.1.2 icmp_seq=5 ttl=62 time=57.122 ms

PC3> ping 192.82.2.2
84 bytes from 192.82.2.2 icmp_seq=1 ttl=62 time=40.129 ms
84 bytes from 192.82.2.2 icmp_seq=2 ttl=62 time=43.105 ms
84 bytes from 192.82.2.2 icmp_seq=3 ttl=62 time=44.153 ms
84 bytes from 192.82.2.2 icmp_seq=4 ttl=62 time=44.112 ms
84 bytes from 192.82.2.2 icmp_seq=5 ttl=62 time=48.563 ms

PC3>
```

11. Menampilkan IP route di setiap router
    - R1

```
R1#show ip route ospf
O    192.82.5.0/24 [110/2] via 192.82.6.2, 00:03:58, FastEthernet2/0
                   [110/2] via 192.82.4.2, 00:03:58, FastEthernet1/0
O    192.82.2.0/24 [110/2] via 192.82.4.2, 00:03:58, FastEthernet1/0
O    192.82.3.0/24 [110/2] via 192.82.6.2, 00:03:58, FastEthernet2/0
R1#
```

    - R2

```
R2#show ip route ospf
O    192.82.6.0/24 [110/2] via 192.82.5.2, 00:05:33, FastEthernet2/0
                   [110/2] via 192.82.4.1, 00:05:33, FastEthernet1/0
O    192.82.1.0/24 [110/2] via 192.82.4.1, 00:05:33, FastEthernet1/0
O    192.82.3.0/24 [110/2] via 192.82.5.2, 00:05:33, FastEthernet2/0
R2#
```

    - R3

```
R3#show ip route ospf
O    192.82.4.0/24 [110/2] via 192.82.6.1, 00:06:03, FastEthernet2/0
                   [110/2] via 192.82.5.1, 00:06:03, FastEthernet1/0
O    192.82.1.0/24 [110/2] via 192.82.6.1, 00:06:03, FastEthernet2/0
O    192.82.2.0/24 [110/2] via 192.82.5.1, 00:06:03, FastEthernet1/0
R3#
```

12. Menampilkan traceroute dari router ke setiap PC
    - R1

```
R1#traceroute 192.82.2.2

Type escape sequence to abort.
Tracing the route to 192.82.2.2

  1 192.82.4.2 24 msec 24 msec 24 msec
  2 192.82.2.2 32 msec 32 msec 32 msec
R1#traceroute 192.82.3.2

Type escape sequence to abort.
Tracing the route to 192.82.3.2

  1 192.82.6.2 12 msec 12 msec 24 msec
  2 192.82.3.2 32 msec 32 msec 32 msec
R1#
```

- R2

```
R2#traceroute 192.82.1.2

Type escape sequence to abort.
Tracing the route to 192.82.1.2

  1 192.82.4.1 20 msec 20 msec 24 msec
  2 192.82.1.2 32 msec 32 msec 36 msec
R2#traceroute 192.82.3.2

Type escape sequence to abort.
Tracing the route to 192.82.3.2

  1 192.82.5.2 28 msec 24 msec 32 msec
  2 192.82.3.2 48 msec 68 msec 44 msec
R2#
```

- R3

```
R3#traceroute 192.82.1.2

Type escape sequence to abort.
Tracing the route to 192.82.1.2

  1 192.82.6.1 32 msec 24 msec 16 msec
  2 192.82.1.2 48 msec 44 msec 48 msec
R3#traceroute 192.82.2.2

Type escape sequence to abort.
Tracing the route to 192.82.2.2

  1 192.82.5.1 28 msec 32 msec 32 msec
  2 192.82.2.2 28 msec 48 msec 48 msec
R3#
```

Bab 4

BGP

Pendahuluan

Konfigurasi dasar BGP

R2#**configure terminal**
R2(config)#**router bgp 12**
R2(config-router)# **network 192.168.1.0 mask 255.255.255.0**
R2(config-router)# **neighbor 192.168.12.2 remote-as 12**
R2(config-router)# **neighbor 192.168.12.2 next-hop-self #hanya untuk neighbour yang 1 AS**
R2(config-router)# **neighbor 192.168.12.2 soft-reconfiguration inbound**

Pengertian

Border Gateway Protocol (BGP) merupakan salah satu jenis routing protokol yang digunakan untuk koneksi antar Autonomous System (AS), dan salah satu jenis routing protokol yang banyak digunakan di ISP besar (Telkomsel) ataupun perbankan. BGP termasuk dalam kategori routing protokol jenis Exterior Gateway Protokol (EGP).

Dengan adanya EGP, router dapat melakukan pertukaran rute dari dan ke luar jaringan lokal Auotonomous System (AS). BGP mempunyai skalabilitas yang tinggi karena dapat melayani pertukaran routing pada beberapa organisasi besar. Oleh karena itu BGP dikenal dengan routing protokol yang sangat rumit dan kompleks.

Proses pemilihan rute terbaik ini tidak hanya mengacu pada AS-pathterpendek, namun dipengaruhi pula oleh policy yang diterapkan pada masing-masing AS. Terdapat beberapa atribut BGP untuk penerapan policy routing ini, sehingga dapat dikatakan inter-domain routing dengan BGP lebih menfokuskan pada pemilihan jalur yang policy-compliant daripada optimasi jalur terbaik. Atribut BGP local-preference adalah atribut untuk kepentingan policy import. Dengan demikian jika didapati dua atau lebih rute menuju sebuah alamat tujuan prefix yang sama, maka BGP secara berurutan akan memberlakukan aturan eliminasi sampai didapati hanya satu rute yang dipilih. Berikut ini beberapa prosesnya:

- Setiap rute (route) akan diberi atribut nilai local-preference dan rute dengan nilai local-preference tertinggi akan dipilih. Atribut local-preference adalah fasilitas import policy dimana administrator jaringan dapat melakukan pengaturan pada satu AS. Atribut ini bersifat lokal dan hanya akan didistribusikan dalam satu AS saja.

• Jika rute dengan nilai local-preferencesama masih didapati, maka rute dengan AS path terpendek akan dipilih.

• Jika rute dengan nilai local-preferencedan panjang AS-path sama masih didapati, maka rute dengan next-hoprouter terdekat akan dipilih. Dalam hal ini, artian "terdekat" adalah dipilih berdasarkan "cost" terkecil dalamintra-domain routing menuju alamat IP next-hop router tersebut. Kasus seperti ini akan terjadi, jika dalam satu AS terdapat beberapa "border"router, dimana antar border tersebut saling terhubung menggunakan intra-domain routing.

• Jikalau masih didapati lebih dari satu rute, BGP akan memilih router BGP dengan nilai "router-id" terendah untuk memilihnext-hoprouter yang dipilih.

• Jikalau pun "router-id" tersebut sama, maka aturan dalam BGP akan memilih router BGP yang bertetangga dengan nilai alamat IP terendah. Prosedur pemilihan rute terbaik sangat dipengaruhi oleh atribut local-preference yang diterapkan pada setiap informasi routing (route advertisement) yang didapat dari router BGP den AS yang bertetangga. Umumnya penerapan kebijakan import routing ini dapat sangat kompleks, misalnya:

• Menerapkan filter untuk rute yang tidak diinginkan dari AS lain.

• Memanipulasi atribut BGP untuk mempengaruhi pemilihan rute terbaik.

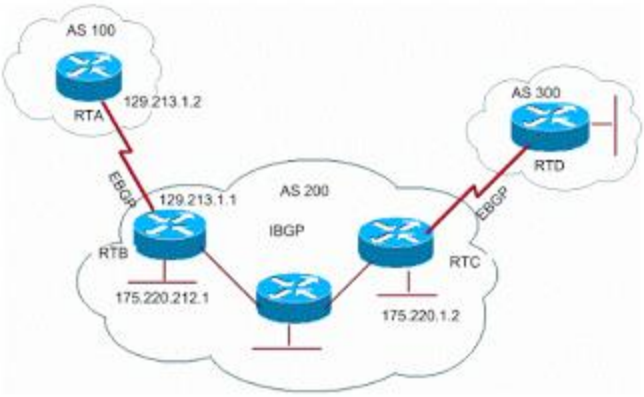
Export Policy

Seperti halnya protokol routing lainnya, protokol routing BGP juga menerima dan mengirim update informasi routing. Jika import policymenerapkan fungsi kontrol untuk update informasi routing yang diterima, pada export policyini adalah sebaliknya.

Penerapan kebijakan export routing misalnya sebagai berikut:

• Menerapkan filter untuk rute yang tidak ingin diinformasikan ke AS lain.

• Memanipulasi atribut BGP pada AS-pathyang diinformasikan ke AS lain.



Gambar BGP

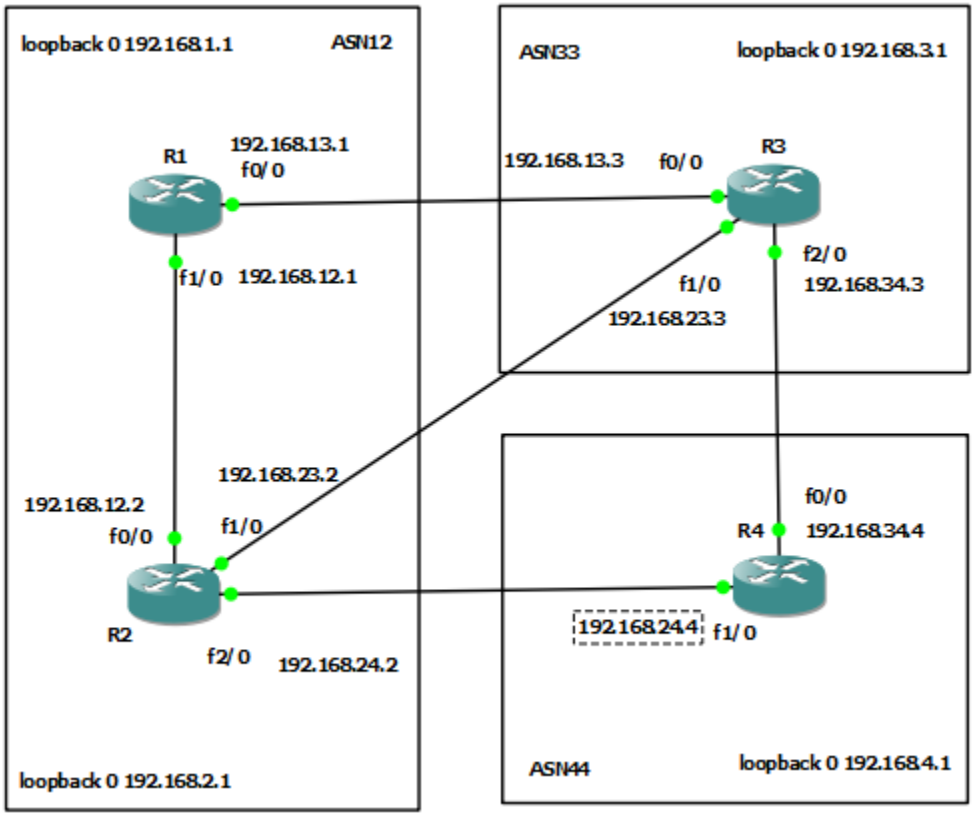
Karakteristik

Menggunakan algoritma routing distance vektor.Algoritma routing distance vector secara periodik menyalin table routing dari router ke router. Perubahan table routing di update antar router yang saling berhubungan pada saat terjadi perubahan topologi. Digunakan antara ISP dengan ISP dan client-client.

Digunakan untuk merutekan trafik internet antar autonomous system. BGP adalah Path Vector routing protocol.Dalam proses menentukan rute-rute terbaiknya selalu mengacu kepada path yang terbaik dan terpilih yang didapatnya dari router BGP yang lainnya. Router BGP membangun dan menjaga koneksi antar-peer menggunakan port nomor 179. Koneksi antar-peer dijaga dengan menggunakan sinyal keepalive secara periodik. Metrik (atribut) untuk menentukan rute terbaik sangat kompleks dan dapat dimodifikasi dengan fleksibel. BGP memiliki routing table sendiri yang biasanya memuat prefiks-prefiks routing yang diterimanya dari router BGP lain

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

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#interface loopback 0
R1(config-if)#192.16
*Dec 16 13:36:36.295: %LINEPROTO-5-UPDOWN: Line protocol on Interface Loo
pback0, changed state to up
R1(config-if)#192.168.1.1 255.255.255.0
              ^
% Invalid input detected at '^' marker.

R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#int fa 0/0
R1(config-if)#ip address 192.168.13.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 16 13:37:40.835: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed
state to up
R1(config-if)#
*Dec 16 13:37:40.835: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Por
t Administrative State Down
*Dec 16 13:37:41.835: %LINEPROTO-5-UPDOWN: Line protocol on Interface Fas
tEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 1/0
R1(config-if)#ip address 192.168.12.1 255.255.255.0
R1(config-if)#no sh
R1(config-if)#
*Dec 16 13:38:09.399: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed
state to up
R1(config-if)#
*Dec 16 13:38:09.399: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Por
t Administrative State Down
*Dec 16 13:38:10.399: %LINEPROTO-5-UPDOWN: Line protocol on Interface Fas
tEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#
```

- R2

```
R2#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#interface loopback 0
R2(config-if)#ip address 1
*Dec 16 13:38:39.995: %LINEPROTO-5-UPDOWN: Line protocol on Interface L
oopback0, changed state to up
R2(config-if)#ip address 192.168.2.1 255.255.255.0
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#int fa 0/0
R2(config-if)#ip address 192.168.12.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 16 13:39:31.495: %LINK-3-UPDOWN: Interface FastEthernet0/0, change
d state to up
R2(config-if)#
*Dec 16 13:39:31.495: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical P
ort Administrative State Down
*Dec 16 13:39:32.495: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
astEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ip address 192.168.23.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 16 13:39:58.595: %LINK-3-UPDOWN: Interface FastEthernet1/0, change
d state to up
R2(config-if)#
*Dec 16 13:39:58.595: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical P
ort Administrative State Down
*Dec 16 13:39:59.595: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
astEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 2/0
R2(config-if)#ip addr 192.168.24.2 255.255.255.0
R2(config-if)#no sh
R2(config-if)#
*Dec 16 13:40:20.967: %LINK-3-UPDOWN: Interface FastEthernet2/0, change
d state to up
R2(config-if)#
*Dec 16 13:40:20.967: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical P
ort Administrative State Down
*Dec 16 13:40:21.967: %LINEPROTO-5-UPDOWN: Line protocol on Interface F
astEthernet2/0, changed state to up
```

- R3

```
R3#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R3(config)#interface loopback 0
R3(config-if)#ip add
*Dec 16 13:40:50.851: %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 fa 0/0
R3(config-if)#ip addr 192.168.13.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 16 13:41:36.763: %LINK-3-UPDOWN: Interface FastEthernet0/0, chang
ed state to up
R3(config-if)#
*Dec 16 13:41:36.763: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical
Port Administrative State Down
*Dec 16 13:41:37.763: %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 192.168.23.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 16 13:41:58.679: %LINK-3-UPDOWN: Interface FastEthernet1/0, chang
ed state to up
R3(config-if)#
*Dec 16 13:41:58.679: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical
Port Administrative State Down
*Dec 16 13:41:59.679: %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 192.168.34.3 255.255.255.0
R3(config-if)#no sh
R3(config-if)#
*Dec 16 13:42:20.579: %LINK-3-UPDOWN: Interface FastEthernet2/0, chang
ed state to up
R3(config-if)#
*Dec 16 13:42:20.579: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical
Port Administrative State Down
*Dec 16 13:42:21.579: %LINEPROTO-5-UPDOWN: Line protocol on Interface
FastEthernet2/0, changed state to up
```

- R4

```
R4#conf term
Enter configuration commands, one per line.  End with CNTL/
Z.
R4(config)#interface loopback 0
R4(config-if)#
*Dec 16 13:42:41.935: %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 fa 0/0
R4(config-if)#ip addr 192.168.34.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Dec 16 13:44:06.755: %LINK-3-UPDOWN: Interface FastEtherne
t0/0, changed state to up
R4(config-if)#
*Dec 16 13:44:06.755: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/
0 Physical Port Administrative State Down
*Dec 16 13:44:07.755: %LINEPROTO-5-UPDOWN: Line protocol on
 Interface FastEthernet0/0, changed state to up
R4(config-if)#exit
R4(config)#int fa 1/0
R4(config-if)#ip addr 192.168.24.4 255.255.255.0
R4(config-if)#no sh
R4(config-if)#
*Dec 16 13:44:53.615: %LINK-3-UPDOWN: Interface FastEtherne
t1/0, changed state to up
R4(config-if)#
*Dec 16 13:44:53.615: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/
0 Physical Port Administrative State Down
*Dec 16 13:44:54.615: %LINEPROTO-5-UPDOWN: Line protocol on
 Interface FastEthernet1/0, changed state to up
R4(config-if)#exit
R4(config)#
```

3. Konfigurasikanlah BGP di setiap router
   - R1

```
R1(config)#
R1(config)#router bgp 12
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-
R1(config-router)#neighbor 192.168.12.2 soft-reconfiguration in
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-recon
R1(config-router)#neighbor 192.168.13.3 soft-reconfiguration inb
R1(config-router)#neighbor 192.168.13.3 soft-reconfiguration inbound
R1(config-router)#
*Dec 16 13:48:59.387: %BGP-5-ADJCHANGE: neighbor 192.168.12.2 Up
R1(config-router)#
*Dec 16 13:50:42.475: %BGP-5-ADJCHANGE: neighbor 192.168.13.3 Up
R1(config-router)#exit
R1(config)#exit
R1#
```

   - R2

```
R2(config)#
R2(config)#router bgp 12
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 next-hop-self
R2(config-router)#neighbor 192.168.12.1 soft
R2(config-router)#neighbor 192.168.12.1 soft-reconfiguration
R2(config-router)#neighbor 192.168.12.1 soft-reconfiguration in
R2(config-router)#neighbor 192.168.12.1 soft-reconfiguration inbound
R2(config-router)#neighbor 192.168.23.3
*Dec 16 13:48:59.775: %BGP-5-ADJCHANGE: neighbor 192.168.12.1 Up
R2(config-router)#neighbor 192.168.23.3 remote-as 33
R2(config-router)#neighbor 192.168.23.3 soft-r
R2(config-router)#neighbor 192.168.23.3 soft-reconfiguration in
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-re
R2(config-router)#neighbor 192.168.24.4 soft-reconfiguration in
R2(config-router)#neighbor 192.168.24.4 soft-reconfiguration inbound
R2(config-router)#
*Dec 16 13:51:46.443: %BGP-5-ADJCHANGE: neighbor 192.168.23.3 Up
R2(config-router)#
*Dec 16 13:52:17.947: %BGP-5-ADJCHANGE: neighbor 192.168.24.4 Up
R2(config-router)#exit
R2(config)#exit
R2#
```

- R3

```
R3(config)#
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-reconfiguratio
*Dec 16 13:50:42.199: %BGP-5-ADJCHANGE: neighbor 192.168.13.1 Up
R3(config-router)#neighbor 192.168.13.1 soft-reconfiguration in
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
R3(config-router)#neighbor 192.168.23.2 soft-reconfiguration in
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
R3(config-router)#neighbor 192.168.34.4 soft-reconfiguration in
R3(config-router)#neighbor 192.168.34.4 soft-reconfiguration inbound
R3(config-router)#
*Dec 16 13:51:45.767: %BGP-5-ADJCHANGE: neighbor 192.168.23.2 Up
R3(config-router)#exit
R3(config)#exit
R3#
```

- R4

```
R4(config)#router bgp 44
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)#neighbor 192.168.24.2 soft-
R4(config-router)#neighbor 192.168.24.2 soft-reconfiguratio
n
*Dec 16 13:52:17.375: %BGP-5-ADJCHANGE: neighbor 192.168.24
.2 Up
R4(config-router)#neighbor 192.168.24.2 soft-reconfiguratio
n in
R4(config-router)#neighbor 192.168.24.2 soft-reconfiguratio
n inbound
R4(config-router)#neighbor 192.168.34.3 remote-as 33
R4(config-router)#neighbor 192.168.34.3 soft-r
R4(config-router)#neighbor 192.168.34.3 soft-reconfiguration in
R4(config-router)#neighbor 192.168.34.3 soft-reconfiguration inbound
R4(config-router)#exit
R4(config)#exit
R4#
```

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 = 20/28/36 ms
R1#
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 = 20/28/32 ms
R1#
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 = 52/60/68 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 = 44/48/52 ms
R2#
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 = 24/31/36 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 = 20/28/32 m
s
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 = 52/63/76 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 = 20/28/32 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 = 20/30/36 ms
R4#
```

5. Cobalah melakukan traceroute antar router
   - R1 ke R2

```
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 36 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 16 msec 36 msec 28 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 16 msec 32 msec 32 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 48 msec 48 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 20 msec 32 msec 32 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 24 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 20 msec 28 msec 36 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

```
R1#conf term
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#route-ma
R1(config)#route-map PREPEND permit 10
R1(config-route-map)#set as-
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

```
R2(config)#route-map LOKAL permit 10
R2(config-route-map)#set local-pre
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)#wzit
          ^
% Invalid input detected at '^' marker.

R2(config)#exit
R2#
*Dec 16 14:17:23.255: %SYS-5-CONFIG_I: Configured from console by console
R2#clear ip bgp 192.168.23.3 soft in
R2#
```

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

- 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#
```

KUIS PRAKTEK

KONFIGURASI RIP DAN OSPF

Dokumentasi Kuis Praktek

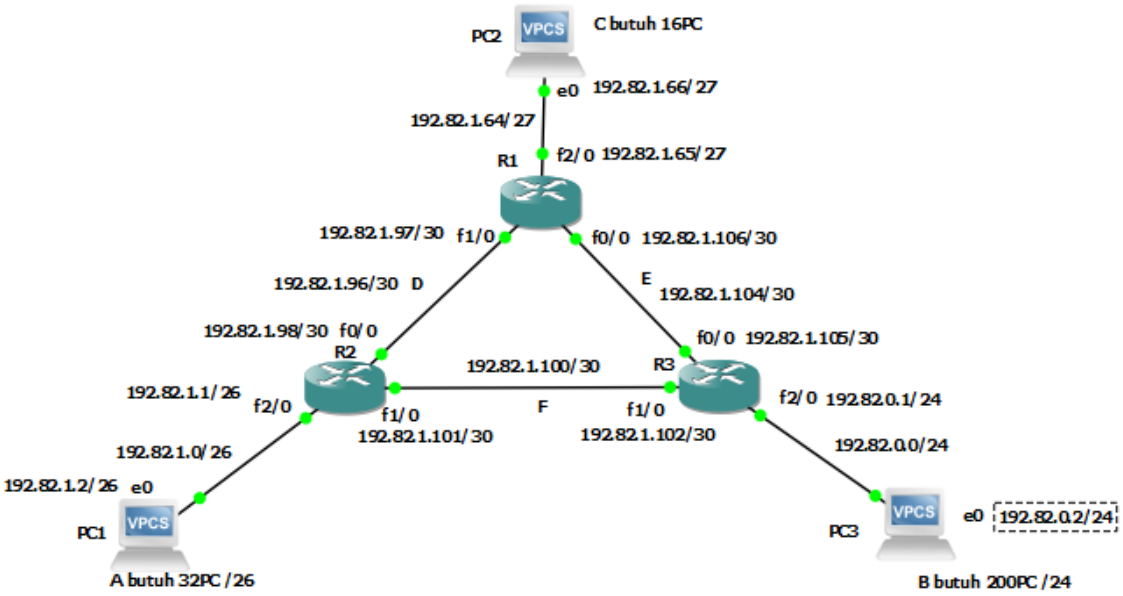
Soal :

1. Alokasikan alamat 192.[XX].0.0/22 untuk network tersebut
2. Konfigurasi IP pada interface jaringan sesuai pertanyaan no.1, kemudian simpan konfigurasi
3. Konfigurasi routing protocol (RIP), buktikan konfigurasi berhasil dan tunjukan cost dari router 2 ke network B, save as project.

**XX diganti dengan 2 digit terakhir dari NIM

Jawab :

1. Topologi jaringan dan alokasi IP



Alokasi IP :

- Subnet B = 200 → 2^8 = 256 , 32 – 8 = 24
  Net Id = 192.82.0.0 /24
  Net Mask = 255.255.255.0
  Broadcast = 192.82.0.0 + (256-1)
  = 192.82.0.255
  Host = 192.82.0.1 - 192.82.0.254

- Subnet A = 32 → 2^6 = 64, 32 – 6 = 26
  Net Id = 192.82.1.0 /26
  Net Mask = 255.255.255.192
  Broadcast = 192.82.1.0 + (64-1)
  = 192.82.1.63
  Host = 192.82.1.1 - 192.82.1.62

- Subnet C = 16 → 2^5 = 32, 32 – 5 = 27
  Net Id = 192.82.1.64 /27
  Net Mask = 255.255.255.224
  Broadcast = 192.82.1.64 + (32-1)
  = 192.82.1.95
  Host = 192.82.1.65 -192.82.1.94

- Subnet D = 2 → 2^2 = 4, 32 – 2 = 30
  Net Id = 192.82.1.96 /30
  Net Mask = 255.255.255.252
  Broadcast = 192.82.1.96 + (4-1)
  = 192.82.1.99
  Host = 192.82.1.97 - 192.82.1.98

- Subnet E = 2 → 2^2 = 4, 32 – 2 = 30
  Net Id = 192.82.1.100 /30
  Net Mask = 255.255.255.252
  Broadcast = 192.82.1.100 + (4-1)
  = 192.82.1.103
  Host = 192.82.1.101 - 192.82.1.102

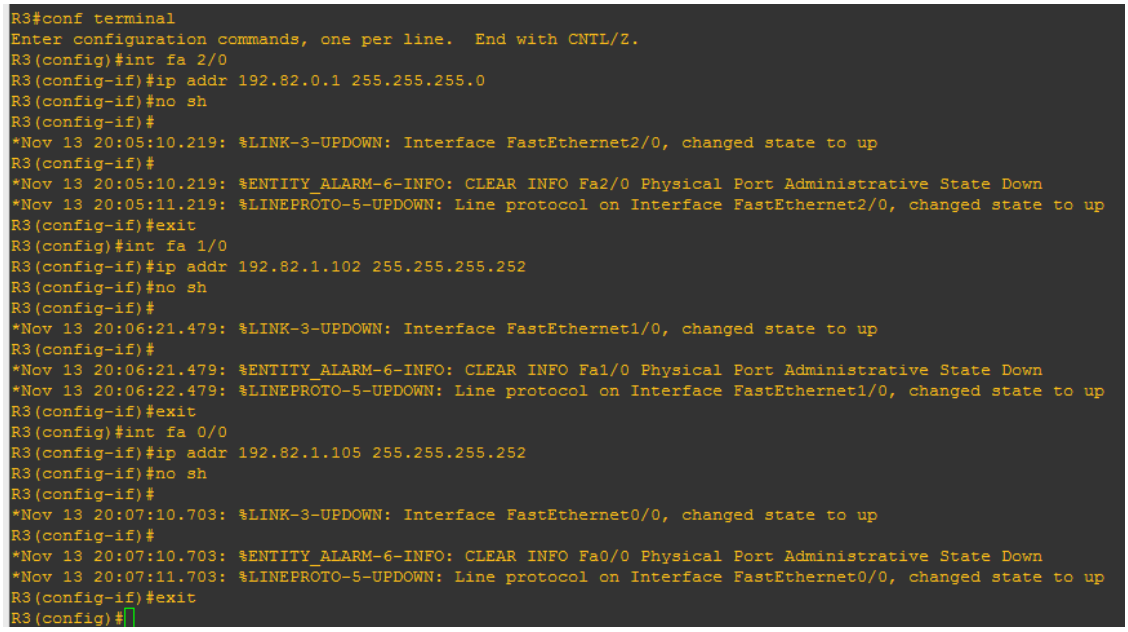
- Subnet F = 2 → 2^2 = 4, 32 – 2 = 30
  Net Id = 192.82.1.104 /30
  Net Mask = 255.255.255.252
  Broadcast = 192.82.1.104 + (4-1)
  = 192.82.1.107
  Host = 192.82.1.105 - 192.82.1.106

2. Konfigurasi IP

Setting IP pada R3 , konfigurasikan seperti dibawah ini :

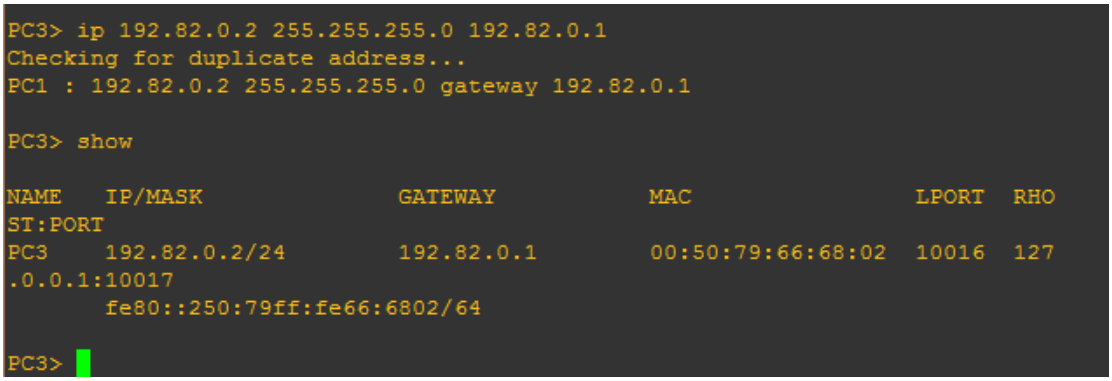
```
R3#configure terminal
R3(config)#interface fastEthernet 2/0
R3(config-if)#ip address 192.82.0.1 255.255.255.0
```

```
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface fastEthernet 1/0
R3(config-if)#ip address 192.82.1.102 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#interface fastEthernet 0/0
R3(config-if)#ip address 192.82.1.105 255.255.255.252
R3(config-if)#no shutdown
R3(config-if)#exit
R3(config)#
```



Konfigurasi IP pada PC3 dan simpan konfigurasinya

```
PC3> ip 192.82.0.2 255.255.255.0 192.82.0.1
PC3> save
```



```
PC3> show

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
PC3    192.82.0.2/24        192.82.0.1        00:50:79:66:68:02  10002  127.0.0.1:10003
       fe80::250:79ff:fe66:6802/64

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

PC3>
```

Setting IP pada R2, konfigurasikan seperti dibawah ini :

```
R2#configure terminal
R2(config)#interface fastEthernet 2/0
R2(config-if)#ip address 192.82.1.1 255.255.255.192
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface fastEthernet 1/0
R2(config-if)#ip address 192.82.1.101 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#interface fastEthernet 0/0
R2(config-if)#ip address 192.82.1.98 255.255.255.252
R2(config-if)#no shutdown
R2(config-if)#exit
R2(config)#
```

```
*Nov 13 20:01:28.947: %LINK-5-CHANGED: Interface FastEthernet2/0, changed state to administratively down
R2#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#int fa 2/0
R2(config-if)#ip addr 192.82.1.1 255.255.255.192
R2(config-if)#no sh
R2(config-if)#
*Nov 13 20:09:08.323: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R2(config-if)#
*Nov 13 20:09:08.323: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Nov 13 20:09:09.323: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 1/0
R2(config-if)#ip addr 192.82.1.101 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Nov 13 20:09:38.459: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R2(config-if)#
*Nov 13 20:09:38.459: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Nov 13 20:09:39.459: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R2(config-if)#exit
R2(config)#int fa 0/0
R2(config-if)#ip addr 192.82.1.98 255.255.255.252
R2(config-if)#no sh
R2(config-if)#
*Nov 13 20:10:15.871: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R2(config-if)#
*Nov 13 20:10:15.871: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 13 20:10:16.871: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R2(config-if)#exit
R2(config)#
```

Konfigurasi IP pada PC1 dan simpan konfigurasinya

```
PC1> ip 192.82.1.2 255.255.255.192 192.82.1.1
```

```
PC1> save
```

```
PC1> ip 192.82.1.2 255.255.255.192 192.82.1.1
Checking for duplicate address...
PC1 : 192.82.1.2 255.255.255.192 gateway 192.82.1.1

PC1> show

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
PC1    192.82.1.2/26        192.82.1.1        00:50:79:66:68:00  10014  127.0.0.1:10015
       fe80::250:79ff:fe66:6800/64

PC1>
```

```
PC1> show

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
PC1    192.82.1.2/26        192.82.1.1        00:50:79:66:68:00  10002  127.0.0.1:10008
       fe80::250:79ff:fe66:6800/64

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

PC1>
```

Setting IP pada R1, konfigruasikan seperti dibawah ini :

```
R1#configure terminal
R1(config)#interface fastEthernet 2/0
R1(config-if)#ip address 192.82.1.65 255.255.255.224
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface fastEthernet 1/0
R1(config-if)#ip address 192.82.1.97 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#interface fastEthernet 0/0
R1(config-if)#ip address 192.82.1.106 255.255.255.252
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
```

```
*Nov 13 20:10:51.607: %SYS-5-CONFIG_I: Configured from console by console
R1#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#int fa 2/0
R1(config-if)#ip addr 192.82.1.65 255.255.255.224
R1(config-if)#no sh
R1(config-if)#
*Nov 13 20:11:52.155: %LINK-3-UPDOWN: Interface FastEthernet2/0, changed state to up
R1(config-if)#
*Nov 13 20:11:52.155: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa2/0 Physical Port Administrative State Down
*Nov 13 20:11:53.155: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet2/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 1/0
R1(config-if)#ip addr 192.82.1.97 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Nov 13 20:12:21.271: %LINK-3-UPDOWN: Interface FastEthernet1/0, changed state to up
R1(config-if)#
*Nov 13 20:12:21.271: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa1/0 Physical Port Administrative State Down
*Nov 13 20:12:22.271: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
R1(config-if)#exit
R1(config)#int fa 0/0
R1(config-if)#ip addr 192.82.1.106 255.255.255.252
R1(config-if)#no sh
R1(config-if)#
*Nov 13 20:12:55.579: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
R1(config-if)#
*Nov 13 20:12:55.579: %ENTITY_ALARM-6-INFO: CLEAR INFO Fa0/0 Physical Port Administrative State Down
*Nov 13 20:12:56.579: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config-if)#exit
R1(config)#
```

Konfigurasi IP pada PC2 dan simpan konfigurasinya :

```
PC2> ip 192.82.1.66 255.255.255.224 192.82.1.65
PC2> save
```

```
VPCS> ip 192.82.1.66 255.255.255.224 192.82.1.65
Checking for duplicate address...
PC1 : 192.82.1.66 255.255.255.224 gateway 192.82.1.65

VPCS> show

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
VPCS1  192.82.1.66/27       192.82.1.65       00:50:79:66:68:01  10012  127.0.0.1:10013
       fe80::250:79ff:fe66:6801/64

VPCS>
```

```
VPCS> show

NAME   IP/MASK              GATEWAY           MAC                LPORT  RHOST:PORT
VPCS1  192.82.1.66/27       192.82.1.65       00:50:79:66:68:01  10004  127.0.0.1:10005
       fe80::250:79ff:fe66:6801/64

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

VPCS>
```

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

```
R3#copy run
R3#copy running-config start
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R3#
```

R2

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

R1

```
*Nov 13 20:19:03.035: %SYS-5-CONFIG_I: Configured from console by console
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

3. Konfigurasi RIP

   Konfigruasi pada R1

```
R1#configure terminal
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 192.82.1.64
R1(config-router)#network 192.82.1.96
R1(config-router)#network 192.82.1.104
R1(config-router)#exit
R1(config)#exit
R1#
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R1#
```

```
R1#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#router rip
R1(config-router)#version 2
R1(config-router)#network 192.82.1.64
R1(config-router)#
R1(config-router)#network 192.82.1.96
R1(config-router)#network 192.82.1.104
R1(config-router)#exit
R1(config)#exit
R1#copy
*Nov 13 21:50:44.603: %SYS-5-CONFIG_I: Configured from console by console
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

Konfigurasi pada R2

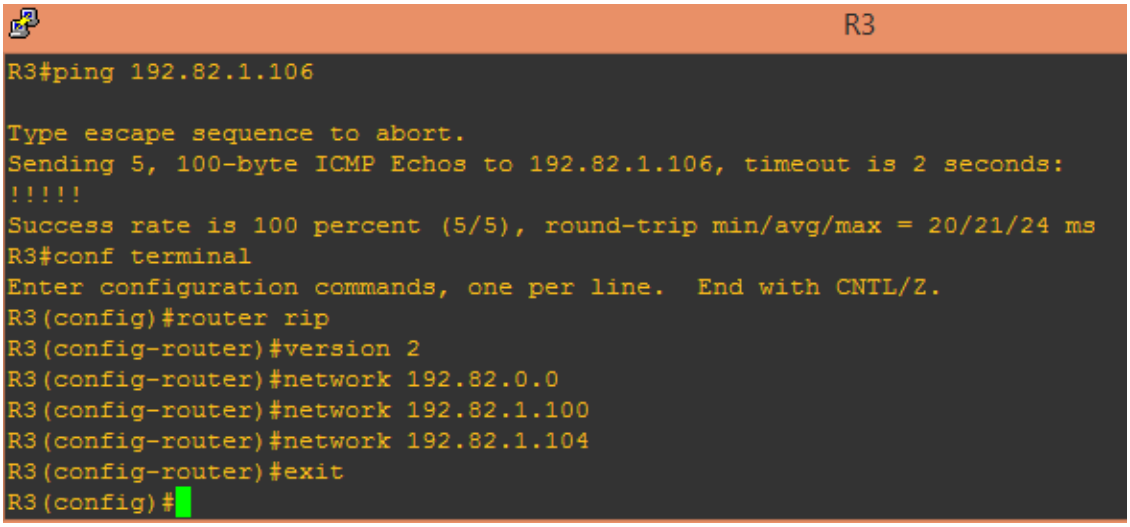
```
R2#configure terminal
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 192.82.1.0
R2(config-router)#network 192.82.1.100
R2(config-router)#network 192.82.1.96
R2(config-router)#exit
R2(config)#exit
R2#
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R2#
```

```
Success rate is 80 percent (4/5), round-trip min/avg/max = 20/22/24 ms
R2#conf terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R2(config)#router rip
R2(config-router)#version 2
R2(config-router)#network 192.82.1.0
R2(config-router)#network 192.82.1.100
R2(config-router)#network 192.82.1.96
R2(config-router)#exit
R2(config)#exit
R2#
*Nov 13 20:37:46.439: %SYS-5-CONFIG_I: Configured from console by console
R2#ping
```

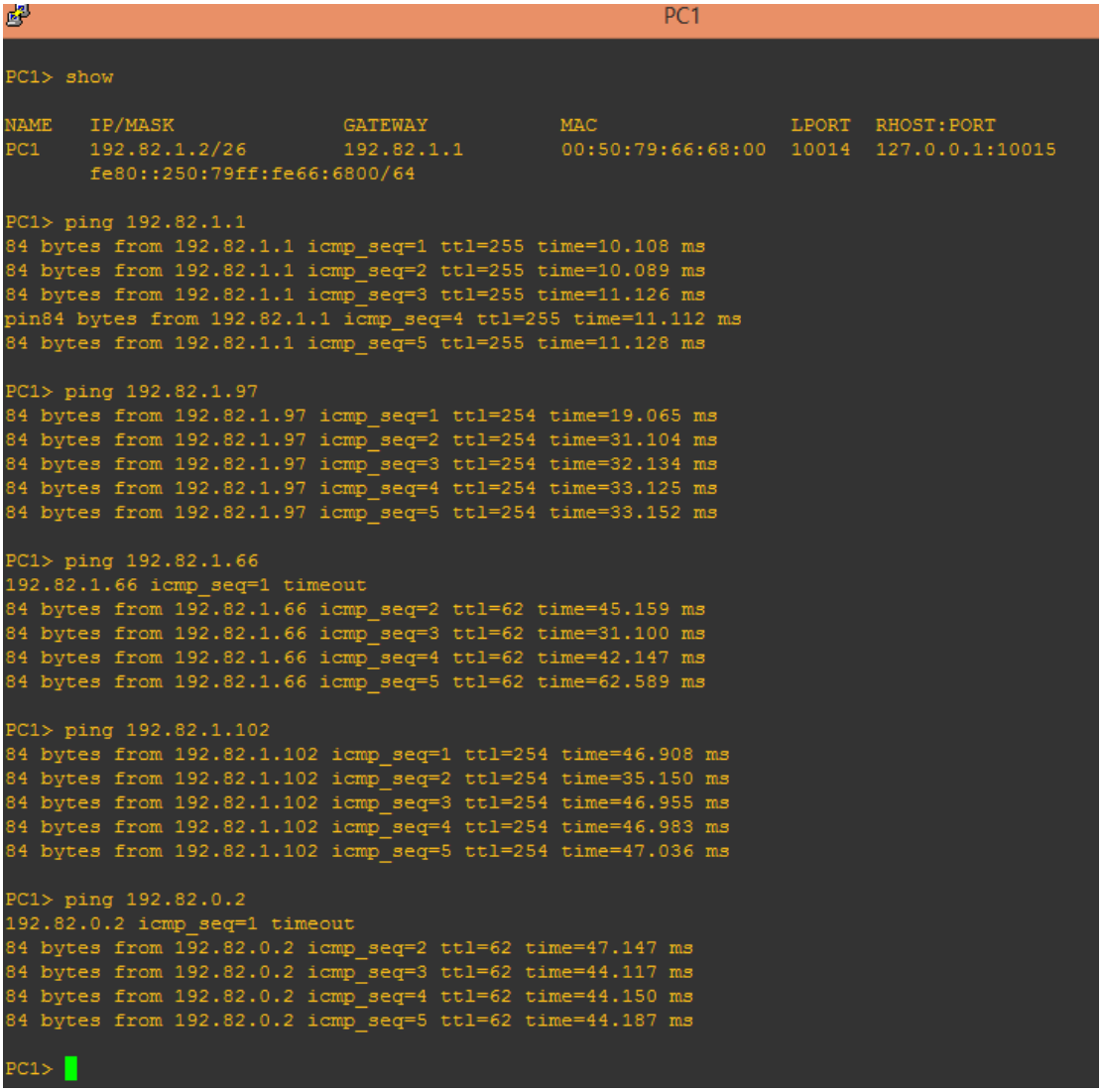
Konfigurasi pada R3

```
R3#configure terminal
```

```
R3(config)#router rip
R3(config-router)#version 2
R3(config-router)#network 192.82.0.0
R3(config-router)#network 192.82.1.100
R3(config-router)#network 192.82.1.104
R3(config-router)#exit
R3(config)#exit
R3#
R3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration. . .
[OK]
R3#
```



Pembuktian konfigurasi berhasil
Bukti 1 : dari PC1



Bukti 2 : dari PC2

PC2

```
VPCS> ip 192.82.1.66 255.255.255.224 192.82.1.65
Checking for duplicate address...
PC1 : 192.82.1.66 255.255.255.224 gateway 192.82.1.65

VPCS> show

NAME   IP/MASK              GATEWAY           MAC               LPORT  RHOST:PORT
VPCS1  192.82.1.66/27       192.82.1.65       00:50:79:66:68:01  10012  127.0.0.1:10013
       fe80::250:79ff:fe66:6801/64

VPCS> ping 192.82.1.2
192.82.1.2 icmp_seq=1 timeout
192.82.1.2 icmp_seq=2 timeout
84 bytes from 192.82.1.2 icmp_seq=3 ttl=62 time=35.102 ms
84 bytes from 192.82.1.2 icmp_seq=4 ttl=62 time=44.129 ms
84 bytes from 192.82.1.2 icmp_seq=5 ttl=62 time=44.152 ms

VPCS> ping 192.82.0.2
192.82.0.2 icmp_seq=1 timeout
192.82.0.2 icmp_seq=2 timeout
84 bytes from 192.82.0.2 icmp_seq=3 ttl=62 time=40.160 ms
84 bytes from 192.82.0.2 icmp_seq=4 ttl=62 time=44.130 ms
84 bytes from 192.82.0.2 icmp_seq=5 ttl=62 time=44.143 ms

VPCS>
```

Bukti 3 : dari PC3

PC3

```
PC3> ip 192.82.0.2 255.255.255.0 192.82.0.1
Checking for duplicate address...
PC1 : 192.82.0.2 255.255.255.0 gateway 192.82.0.1

PC3> show

NAME   IP/MASK              GATEWAY           MAC
LPORT  RHOST:PORT
PC3    192.82.0.2/24        192.82.0.1        00:50:79:66:68:02
10016  127.0.0.1:10017
       fe80::250:79ff:fe66:6802/64

PC3> ping 192.82.1.2
84 bytes from 192.82.1.2 icmp_seq=1 ttl=62 time=42.135 ms
84 bytes from 192.82.1.2 icmp_seq=2 ttl=62 time=44.118 ms
84 bytes from 192.82.1.2 icmp_seq=3 ttl=62 time=32.127 ms
84 bytes from 192.82.1.2 icmp_seq=4 ttl=62 time=43.126 ms
84 bytes from 192.82.1.2 icmp_seq=5 ttl=62 time=33.100 ms

PC3> ping 192.82.1.66
84 bytes from 192.82.1.66 icmp_seq=1 ttl=62 time=31.123 ms
84 bytes from 192.82.1.66 icmp_seq=2 ttl=62 time=33.087 ms
84 bytes from 192.82.1.66 icmp_seq=3 ttl=62 time=33.112 ms
84 bytes from 192.82.1.66 icmp_seq=4 ttl=62 time=32.134 ms
84 bytes from 192.82.1.66 icmp_seq=5 ttl=62 time=33.128 ms

PC3>
```

Cost RIP

R2#show ip rip database

```
R2#show ip rip database
192.82.0.0/24    auto-summary
192.82.0.0/24
    [1] via 192.82.1.102, 00:00:03, FastEthernet1/0
192.82.1.0/24    auto-summary
192.82.1.0/26    directly connected, FastEthernet2/0
192.82.1.64/27
    [1] via 192.82.1.97, 00:00:27, FastEthernet0/0
192.82.1.96/30    directly connected, FastEthernet0/0
192.82.1.100/30    directly connected, FastEthernet1/0
192.82.1.104/30
    [1] via 192.82.1.97, 00:00:27, FastEthernet0/0
    [1] via 192.82.1.102, 00:00:03, FastEthernet1/0
R2#
```

```
R2#traceroute 192.82.0.2

Type escape sequence to abort.
Tracing the route to 192.82.0.2

  1 192.82.1.102 24 msec 20 msec 12 msec
  2  *
    192.82.0.2 28 msec 32 msec
R2#
```