

Laporan Praktikum

Desain dan Manajemen Jaringan Komputer



Dosen Pengampu :

Aidil Saputra Kirsan, S.ST., M.Tr.Kom.

Disusun Oleh :

Risky Nur Fatimah Bahar

10231084

Dasar Teori

Routing dinamis adalah metode dimana *router* dapat secara otomatis memperbarui tabel routing tanpa konfigurasi manual. Dengan menggunakan protokol routing seperti *Routing Information Protocol (RIP)* dan *Open Shortest Path First (OSPF)*, setiap *router* dalam jaringan dapat saling berbagi informasi tentang jalur yang tersedia. Protokol ini memungkinkan jaringan untuk beradaptasi terhadap perubahan, seperti kegagalan jalur atau penambahan perangkat baru. Dengan demikian, routing dinamis lebih fleksibel dibandingkan routing statis yang harus diatur secara manual untuk setiap perubahan topologi.

Untuk memastikan tabel routing selalu diperbarui, routing dinamis menggunakan beberapa mekanisme utama. *Periodic updates* mengirim informasi routing dalam interval waktu tertentu, seperti pada *RIP*, meskipun tidak ada perubahan jaringan. *Triggered updates* memperbarui jalur segera setelah ada perubahan, memungkinkan respons yang lebih cepat terhadap kegagalan jaringan. Selain itu, *incremental updates* yang digunakan dalam *OSPF* hanya mengirim perubahan kecil daripada seluruh tabel, mengurangi beban jaringan. Dengan mekanisme ini, routing dinamis dapat bekerja secara optimal dalam berbagai skala jaringan.

Meskipun sama-sama digunakan dalam routing dinamis, *RIP* dan *OSPF* memiliki beberapa perbedaan mendasar. *RIP* lebih sederhana, tetapi kurang efisien untuk jaringan besar karena memiliki batas maksimum *hop*. Sebaliknya, *OSPF* lebih kompleks tetapi lebih cepat dalam menemukan jalur terbaik karena menggunakan *cost* berbasis *bandwidth*. Berikut perbandingan antara keduanya:

Fitur	RIP	OSPF
Jenis Protokol	<i>Distance Vector</i>	<i>Link-State</i>
Metrik	<i>Hop Count</i>	<i>Cost</i> (berbasis <i>bandwidth</i>)
Konvergensi	Lambat	Cepat
Skalabilitas	Terbatas (Maks. 15 <i>hop</i>)	Cocok untuk jaringan besar
Broadcast Update	Setiap 30 detik ke semua <i>router</i>	Hanya mengirim perubahan ke <i>router</i> terkait

Dengan karakteristik tersebut, *RIP* lebih cocok untuk jaringan kecil yang sederhana, sementara *OSPF* lebih optimal untuk jaringan besar yang memerlukan efisiensi dan kecepatan lebih tinggi.

Langkah Praktikum

Pertama menentukan kebutuhan alokasi IP dan subnet untuk membuat sebuah topologi yang terdiri dari 3 router yang saling terhubung. Setiap router menghubungkan 1 atau 2 subnet. Ketentuan router adalah sebagai berikut.

- Router A:
 - Terhubung ke Subnet 10.0.1.0/24 (interface ke jaringan lokal).
 - Terhubung ke Router B melalui link point-to-point (misalnya 192.168.12.0/30).
- Router B:
 - Terhubung ke Router A (link 192.168.12.0/30).
 - Terhubung ke Router C melalui link point-to-point (misalnya 192.168.23.0/30).
 - Terhubung ke Subnet 10.0.2.0/24 (jaringan lokal).
- Router C:
 - Terhubung ke Router B (link 192.168.23.0/30).
 - Terhubung ke Subnet 10.0.3.0/24 (jaringan lokal).

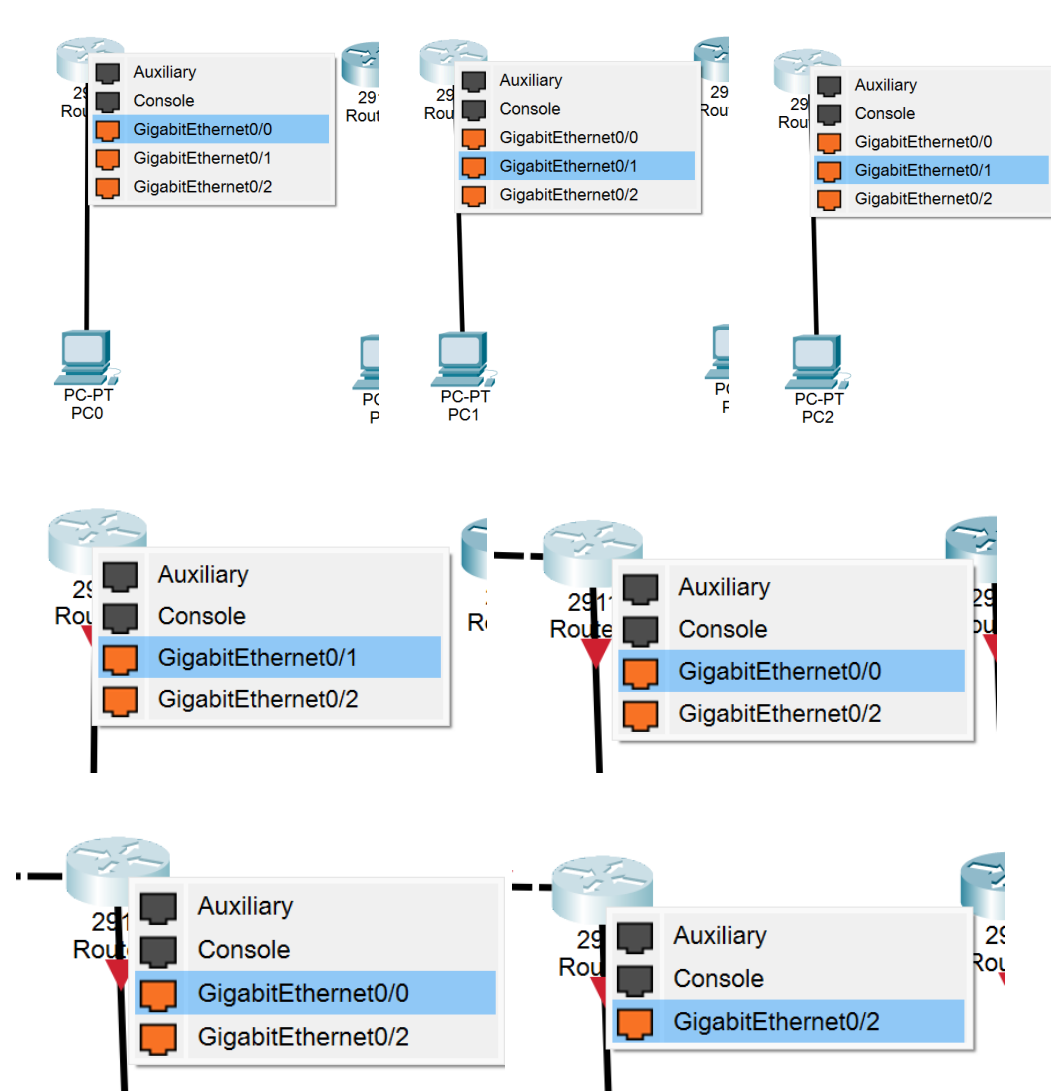
Adapun alokasi IP adalah sebagai berikut.

Subnet	Host Needed	Subnet Mask	Network Address	Broadcast Address	Host Range
A	254	/24 (255.255.255.0)	10.0.1.0	10.0.1.255	10.0.1.1 - 10.0.1.254
B	254	/24 (255.255.255.0)	10.0.2.0	10.0.2.255	10.0.2.1 - 10.0.2.254
C	254	/24 (255.255.255.0)	10.0.3..0	10.0.3..255	10.0.3.1 - 10.0.3.254
Link A-B	2	/30 (255.255.255.252)	192.168.12.0	192.168.12.3	192.168.12.1 - 192.168.12.2
Link B-C	2	/30 (255.255.255.252)	192.168.23.0	192.168.23.3	192.168.23.1 - 192.168.23.2

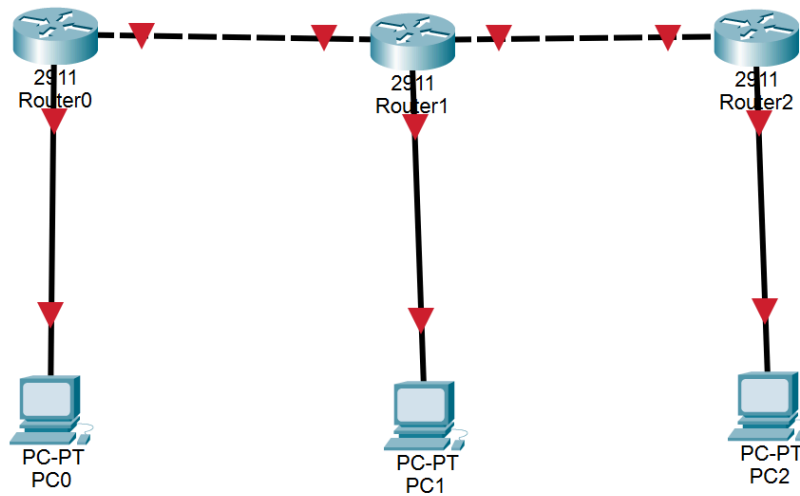
Selanjutnya adalah menyiapkan topologi. Menggunakan 3 router cisco 2911 dan memastikan setiap router memiliki interface yang diperlukan. Menggunakan interface GigabitEthernet untuk link point-to-point dan interface lainnya untuk subnet lokal.



3 router dengan 3 PC pada subnet yang berbeda. Lalu menyambungkan tiap komponen. Antara router dan PC menggunakan kabel straight-through dan antara router menggunakan cross-over.



Setelah semua komponen digabungkan, tampilan topologi akan seperti pada gambar dibawah. Masih berwarna merah karena belum ada IP yang dikonfigurasi.



Selanjutnya melakukan konfigurasi interface pada setiap router sesuai dengan alokasi IP yang sudah tertera pada tabel sebelumnya.

```
Router0
Physical Config CLI Attributes
IOS Command Line Interface
ROM Configuration is 64 Bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 10.0.1.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip address 192.168.12.1 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up
exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

Router1

Physical Config CLI Attributes

IOS Command Line Interface

```
Press RETURN to get started!

Router>en
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.12.2 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip address 10.0.2.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
exit
Router(config)#interface GigabitEthernet0/2
Router(config-if)#ip address 192.168.23.1 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up
exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

Router2

Physical Config CLI Attributes

IOS Command Line Interface

```
249856K bytes of ATA System CompactFlash 0 (Read/Write)

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.23.2 255.255.255.252
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#ip address 10.0.3.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

Selanjutnya, jika tiap interface sudah dikonfigurasi, maka lakukan konfigurasi dynamic routing. Pada praktikum ini menggunakan RIP karena konfigurasinya lebih sederhana dan mudah dikonfigurasi. Seluruh router dilakukan konfigurasi RIP.

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.0.1.0
Router(config-router)#network 192.168.12.0
Router(config-router)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.0.2.0
Router(config-router)#network 192.168.12.0
Router(config-router)#network 192.168.23.0
Router(config-router)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

```
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#router rip
Router(config-router)#version 2
Router(config-router)#network 10.0.3.0
Router(config-router)#network 192.168.23.0
Router(config-router)#exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

Setelah melakukan konfigurasi, lakukan verifikasi routing table untuk memastikan apakah konfigurasi router sudah menyambungkan seluruh komponen atau belum. Untuk melakukan verifikasi bisa menggunakan **show ip route**.

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

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
R       10.0.0.0/8 [120/1] via 192.168.12.2, 00:00:19, GigabitEthernet0/1
C       10.0.1.0/24 is directly connected, GigabitEthernet0/0
L       10.0.1.1/32 is directly connected, GigabitEthernet0/0
    192.168.12.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.12.0/30 is directly connected, GigabitEthernet0/1
L       192.168.12.1/32 is directly connected, GigabitEthernet0/1
R       192.168.23.0/24 [120/1] via 192.168.12.2, 00:00:19, GigabitEthernet0/1

Router#
```

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

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
R       10.0.0.0/8 [120/1] via 192.168.12.1, 00:00:11, GigabitEthernet0/0
           [120/1] via 192.168.23.2, 00:00:18, GigabitEthernet0/2
C       10.0.2.0/24 is directly connected, GigabitEthernet0/1
L       10.0.2.1/32 is directly connected, GigabitEthernet0/1
    192.168.12.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.12.0/30 is directly connected, GigabitEthernet0/0
L       192.168.12.2/32 is directly connected, GigabitEthernet0/0
    192.168.23.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.23.0/30 is directly connected, GigabitEthernet0/2
L       192.168.23.1/32 is directly connected, GigabitEthernet0/2

Router#
```

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

Gateway of last resort is not set

    10.0.0.0/8 is variably subnetted, 3 subnets, 3 masks
R       10.0.0.0/8 [120/1] via 192.168.23.1, 00:00:14, GigabitEthernet0/0
C       10.0.3.0/24 is directly connected, GigabitEthernet0/1
L       10.0.3.1/32 is directly connected, GigabitEthernet0/1
R       192.168.12.0/24 [120/1] via 192.168.23.1, 00:00:14, GigabitEthernet0/0
    192.168.23.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.23.0/30 is directly connected, GigabitEthernet0/0
L       192.168.23.2/32 is directly connected, GigabitEthernet0/0

Router#
```


Setelah seluruh konfigurasi router sudah dilakukan. Terakhir lakukan konfigurasi pada tiap PC dalam subnet. Pembagiannya adalah sebagai berikut.

Perangkat	IP Address	Subnet Mask	Default Gateway
PC A	10.0.1.2	/24 255.255.255.0	10.0.1.1
PC B	10.0.2.2	/24 255.255.255.0	10.0.2.1
PC C	10.0.3.2	/24 255.255.255.0	10.0.3.1

PC0

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.0.1.2

Subnet Mask: 255.255.255.0

Default Gateway: 10.0.1.1

DNS Server: 0.0.0.0

PC1

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 10.0.2.2

Subnet Mask: 255.255.255.0

Default Gateway: 10.0.2.1

DNS Server: 0.0.0.0

PC2

Physical Config **Desktop** Programming Attributes

IP Configuration [X]

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

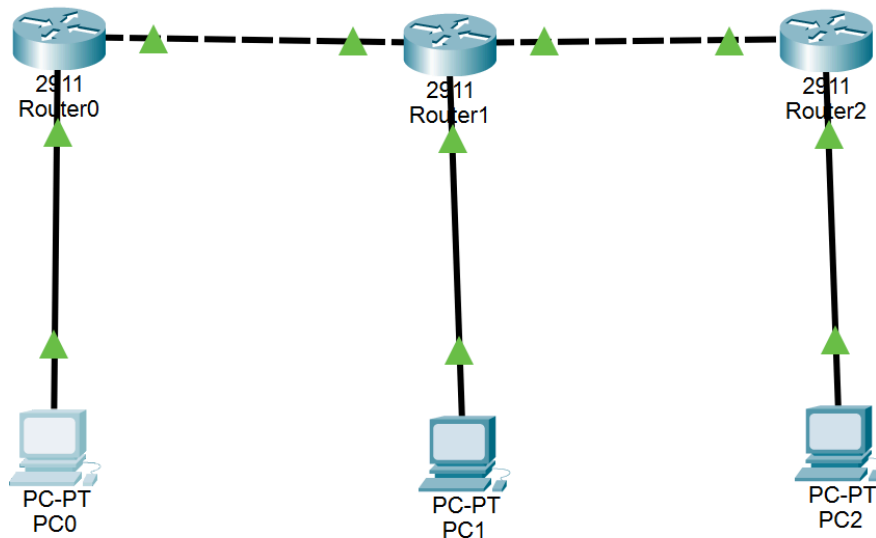
IPv4 Address: 10.0.3.2

Subnet Mask: 255.255.255.0

Default Gateway: 10.0.3.1

DNS Server: 0.0.0.0

Setelah PC dan router sudah dikonfigurasi, topologi akan berubah menjadi warna hijau.



Lakukan pengujian **ping** untuk mengetahui apakah antara router, subnet, dan PC sudah terhubung dengan baik atau belum. Perintah **tracert** juga dilakukan untuk melacak jalur paket antar router dan memastikan paket mengikuti rute dinamis yang telah dikonfigurasi.







```
PC0
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 10.0.1.1
Pinging 10.0.1.1 with 32 bytes of data:
Reply from 10.0.1.1: bytes=32 time<1ms TTL=255
Reply from 10.0.1.1: bytes=32 time<1ms TTL=255
Reply from 10.0.1.1: bytes=32 time<1ms TTL=255
Reply from 10.0.1.1: bytes=32 time<1ms TTL=255
Ping statistics for 10.0.1.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.12.2
Pinging 192.168.12.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.12.2: bytes=32 time<1ms TTL=254
Request timed out.
Reply from 192.168.12.2: bytes=32 time<1ms TTL=254
Ping statistics for 192.168.12.2:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 10.0.2.1
Pinging 10.0.2.1 with 32 bytes of data:
Request timed out.
Reply from 10.0.2.1: bytes=32 time<1ms TTL=254
Request timed out.
Reply from 10.0.2.1: bytes=32 time<1ms TTL=254
Ping statistics for 10.0.2.1:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

PC0
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 192.168.23.2
Pinging 192.168.23.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.23.2: bytes=32 time<1ms TTL=253
Request timed out.
Reply from 192.168.23.2: bytes=32 time<1ms TTL=253
Ping statistics for 192.168.23.2:
    Packets: Sent = 4, Received = 2, Lost = 2 (50% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 10.0.3.1
Pinging 10.0.3.1 with 32 bytes of data:
Reply from 10.0.3.1: bytes=32 time<1ms TTL=253
Reply from 10.0.3.1: bytes=32 time<1ms TTL=253
Reply from 10.0.3.1: bytes=32 time<1ms TTL=253
Reply from 10.0.3.1: bytes=32 time<1ms TTL=253
Ping statistics for 10.0.3.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 10.0.3.2
Pinging 10.0.3.2 with 32 bytes of data:
Request timed out.
Reply from 10.0.3.2: bytes=32 time<1ms TTL=125
Reply from 10.0.3.2: bytes=32 time<1ms TTL=125
Reply from 10.0.3.2: bytes=32 time<1ms TTL=125
Ping statistics for 10.0.3.2:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

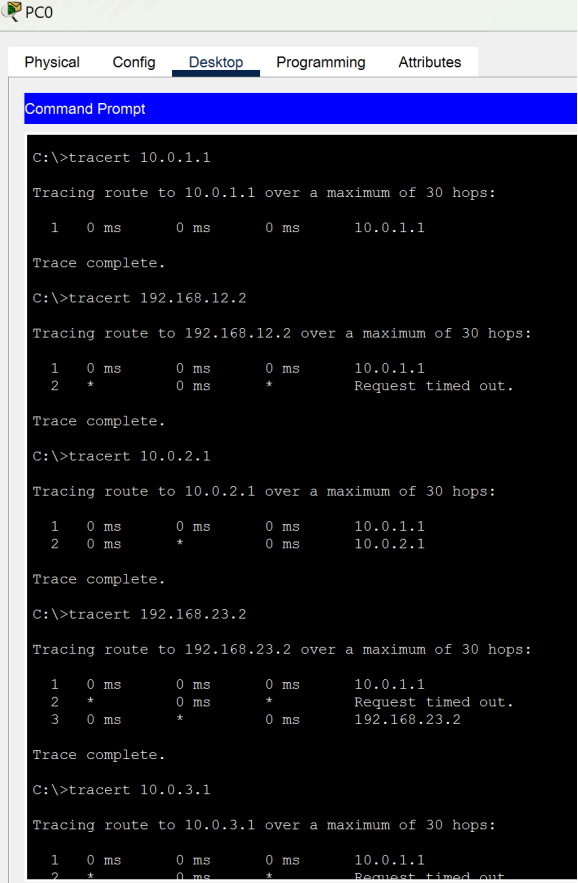
Saat melakukan uji verifikasi pada **ping** terdapat beberapa **request timed out**. Ketika dilakukan troubleshooting seperti:

- Periksa kembali konfigurasi RIP pada setiap router.
- Pastikan semua interface aktif (gunakan show ip interface brief).
- Verifikasi kembali network statement pada konfigurasi routing untuk memastikan tidak ada kesalahan penulisan.

Semua sudah sesuai dengan ketentuan. Lalu mencoba untuk melakukan **add simple PDU** pada cisco packet tracer dan hasilnya adalah **successful**.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	IC...		0.000	N	0	(e...	(delete)
	Successful	PC0	PC2	IC...		0.000	N	1	(e...	(delete)
	Successful	Router0	PC1	IC...		0.000	N	2	(e...	(delete)

Hal ini menunjukkan terdapat kemungkinan ICMP dibatasi. Jika kembali melakukan **tracert** hasilnya adalah sebagai berikut.



```

C:\>tracert 10.0.1.1
Tracing route to 10.0.1.1 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    10.0.1.1
Trace complete.

C:\>tracert 192.168.12.2
Tracing route to 192.168.12.2 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    10.0.1.1
  2  *        0 ms    *        Request timed out.
Trace complete.









C:\>tracert 10.0.2.1
Tracing route to 10.0.2.1 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    10.0.1.1
  2  0 ms    *        0 ms    10.0.2.1
Trace complete.









C:\>tracert 192.168.23.2
Tracing route to 192.168.23.2 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    10.0.1.1
  2  *        0 ms    *        Request timed out.
  3  0 ms    *        0 ms    192.168.23.2
Trace complete.









C:\>tracert 10.0.3.1
Tracing route to 10.0.3.1 over a maximum of 30 hops:
  1  0 ms    0 ms    0 ms    10.0.1.1
  2  *        0 ms    *        Request timed out

```

Terlihat beberapa * yang berarti **timed out** dan **request timed out**. Hal ini menunjukkan ada beberapa titik yang timeout tetapi jalur tetap bisa mencapai tujuan akhirnya. Ini menandakan ada kemungkinan ICMP dibatasi dan beberapa kemungkinan lainnya. Berikut adalah hasil uji konektivitas antar subnet lainnya.

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC0	PC1	IC...		0.000	N	0	(e...	(delete)
	Successful	PC0	PC2	IC...		0.000	N	1	(e...	(delete)
	Successful	PC0	Router1	IC...		0.000	N	2	(e...	(delete)
	Successful	PC0	Router2	IC...		0.000	N	3	(e...	(delete)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC1	PC0	IC...		0.000	N	0	(e...	(delete)
	Successful	PC1	PC2	IC...		0.000	N	1	(e...	(delete)
	Successful	PC1	Router0	IC...		0.000	N	2	(e...	(delete)
	Successful	PC1	Router2	IC...		0.000	N	3	(e...	(delete)

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC2	PC1	IC...		0.000	N	0	(e...	(delete)
	Successful	PC2	PC0	IC...		0.000	N	1	(e...	(delete)
	Successful	PC2	Router1	IC...		0.000	N	2	(e...	(delete)
	Successful	PC2	Router0	IC...		0.000	N	3	(e...	(delete)

Pada percobaan, pada awalnya terdapat percobaan yang **failed**. Tetapi ketika kembali dicoba, status kembali **successful**. Hal ini menunjukkan bahwa konektivitas sudah berhasil.

Hasil topologi <https://github.com/kyfraaa/DMJK-TASK>

Kesimpulan

Konfigurasi routing dinamis menggunakan RIP telah berhasil menghubungkan tiga router dan tiga subnet dalam jaringan. Meskipun terjadi beberapa request timed out pada pengujian ping dan traceroute, hasil Simple PDU yang sukses menunjukkan bahwa jalur komunikasi tetap berfungsi. Kemungkinan besar, ICMP dibatasi atau terjadi rate limiting pada perangkat jaringan. Setelah verifikasi konfigurasi, termasuk network statement RIP, status interface, dan tabel routing, konektivitas antar subnet berhasil dipastikan.