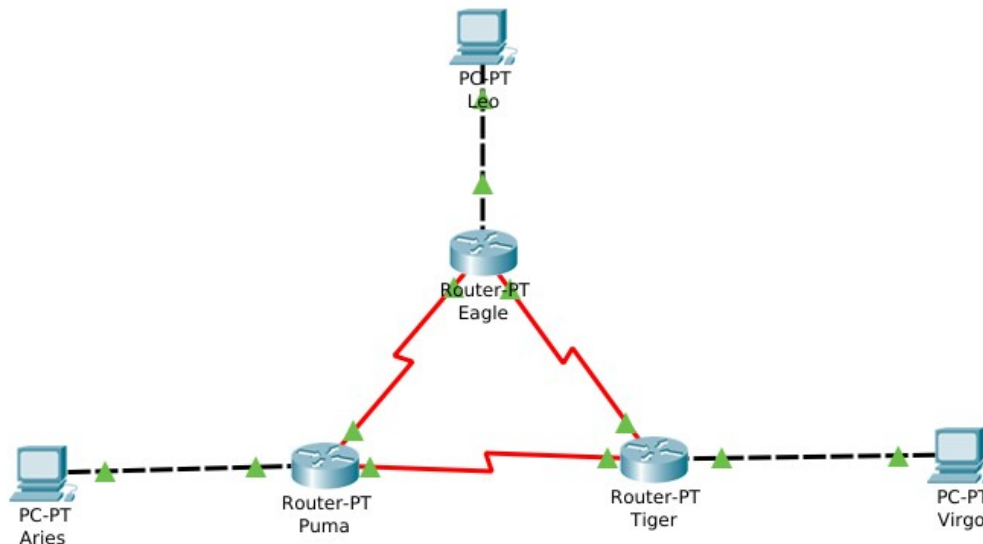


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Kegiatan 1. Topologi 1 (Static Routing)

1. Tampilan topologi menggunakan Router generic. Dengan masing-masing nama Router yaitu *Eagle* , *Puma*, dan *Tiger*. Setiap hubungan antar Router dihubungkan melalui *Serial* sedangkan antara Router dan PC melalui *Fast Ethernet*.



2. Konfigurasi masing-masing Interface pada tiap Router. Sebagai berikut :
 - a) Langkah konfigurasi *IP Address* interface *FastEthernet0/0*(Router *Eagle*).

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 172.21.10.10 255.255.255.0
Router(config-if)#no shutdown
```

- b) Konfigurasi *IP Address* interface *Serial2/0* yang dipakai sebagai *DCS side*(Router *Eagle*).

```
Router(config-if)#int se2/0
Router(config-if)#clock rate 2000000
Router(config-if)#ip add 172.21.1.1 255.255.255.0
Router(config-if)#no shutdown
```

- c) Konfigurasi *IP Address* interface *Serial3/0* yang dipakai sebagai *DCS side*(Router *Eagle*).

```
Router(config-if)#int se3/0
Router(config-if)#clock rate 2000000
Router(config-if)#ip add 172.21.2.1 255.255.255.0
Router(config-if)#no shutdown
```

- d) Langkah konfigurasi *IP Address* interface *FastEthernet0/0*(Router *Puma*).

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 172.21.20.20 255.255.255.0
Router(config-if)#no shutdown
```

- e) Pada Router *Puma* Konfigurasi *IP Address* interface *Serial3/0* yang dipakai sebagai *DCS Side* memiliki langkah yang sama pada Konfigurasi *DCS Side* pada Router *Eagle*.

```
Router(config-if)#int se3/0
Router(config-if)#clock rate 2000000
Router(config-if)#ip add 172.21.3.2 255.255.255.0
Router(config-if)#no shutdown
```

- f) Konfigurasi *IP Address* interface *Serial2/0* yang tidak dipakai sebagai *DCS Side*(Router *Puma*).

```
Router(config-if)#int se2/0
Router(config-if)#ip add 172.21.1.2 255.255.255.0
Router(config-if)#no shutdown
```

- g) Langkah konfigurasi *IP Address* interface *FastEthernet0/0*(Router *Tiger*).

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int fa0/0
Router(config-if)#ip add 172.21.30.30 255.255.255.0
Router(config-if)#no shutdown
```

- h) Konfigurasi *IP Address* interface *Serial2/0* yang tidak dipakai sebagai *DCS Side*(Router *Tiger*).

```
Router(config-if)#int se2/0
Router(config-if)#ip add 172.21.2.3 255.255.255.0
Router(config-if)#no shutdown
```

- i) Konfigurasi *IP Address* interface *Serial3/0* yang tidak dipakai sebagai *DCS Side*(Router *Tiger*).

```
Router(config-if)#int se3/0
Router(config-if)#ip add 172.21.3.3 255.255.255.0
Router(config-if)#no shutdown
```

3. Konfigurasi masing-masing PC dengan *IP Address* yang sudah ditentukan.

- a) PC *Leo* 172.21.10.1/24 dengan *Default Gateway* 172.21.10.10

The screenshot shows the configuration window for a PC named 'Leo'. The 'Desktop' tab is selected, displaying the following settings:

- Physical:** DHCP (unselected), Static (selected).
- IP Address:** 172.21.10.1
- Subnet Mask:** 255.255.255.0
- Default Gateway:** 172.21.10.10
- DNS Server:** 0.0.0.0
- IPv6 Configuration:**
 - DHCP (unselected), Auto Config (unselected), Static (selected).
 - IPv6 Address: (empty)
 - Link Local Address: FE80::260:3EFF:FE6A:6CAA
 - IPv6 Gateway: (empty)
 - IPv6 DNS Server: (empty)
- 802.1X:**
 - Use 802.1X Security: (unchecked)
 - Authentication: MD5

At the bottom, there is a 'Top' button.

b) PC Aries 172.21.20.2/24 dengan Default Gateway 172.21.20.20

The screenshot shows the configuration window for PC Aries. The 'Desktop' tab is selected. Under the 'Static' configuration, the IP Address is 172.21.20.2, Subnet Mask is 255.255.255.0, Default Gateway is 172.21.20.20, and DNS Server is 0.0.0.0. The IPv6 Configuration section shows 'Static' selected with a Link Local Address of FE80::207:ECFF:FED3:7BED. The 802.1X section has 'Use 802.1X Security' unchecked and 'Authentication' set to MD5. A 'Top' button is at the bottom left.

Field	Value
IP Address	172.21.20.2
Subnet Mask	255.255.255.0
Default Gateway	172.21.20.20
DNS Server	0.0.0.0
IPv6 Address	
Link Local Address	FE80::207:ECFF:FED3:7BED
IPv6 Gateway	
IPv6 DNS Server	
Use 802.1X Security	<input type="checkbox"/>
Authentication	MD5

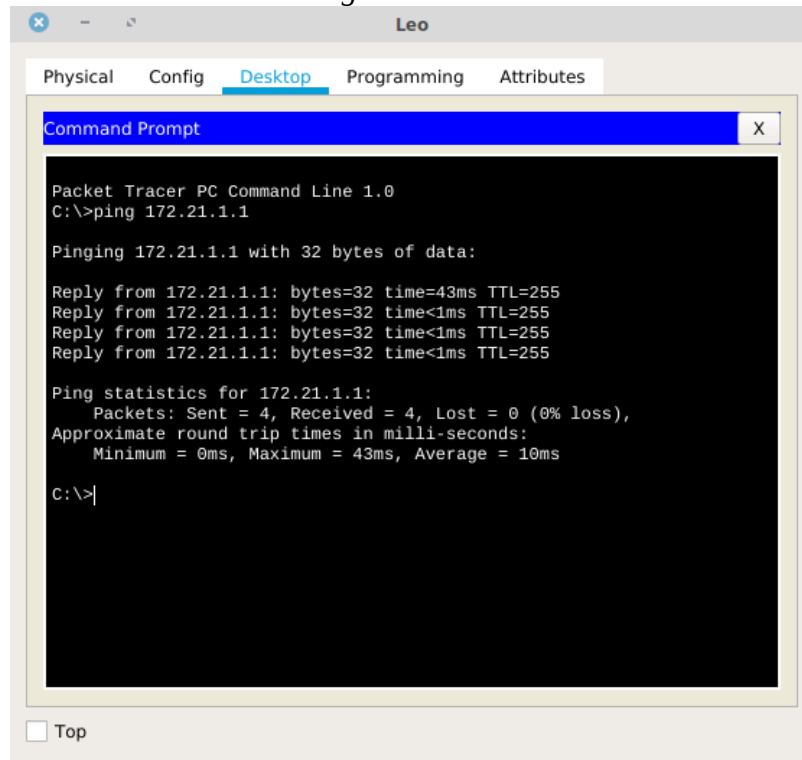
c) PC Virgo 172.21.30.3/24 dengan Default Gateway 172.21.30.30

The screenshot shows the configuration window for PC Virgo. The 'Desktop' tab is selected. Under the 'Static' configuration, the IP Address is 172.21.30.3, Subnet Mask is 255.255.255.0, Default Gateway is 172.21.30.30, and DNS Server is 0.0.0.0. The IPv6 Configuration section shows 'Static' selected with a Link Local Address of FE80::230:A3FF:FE4B:3DD2. The 802.1X section has 'Use 802.1X Security' unchecked and 'Authentication' set to MD5. A 'Top' button is at the bottom left.

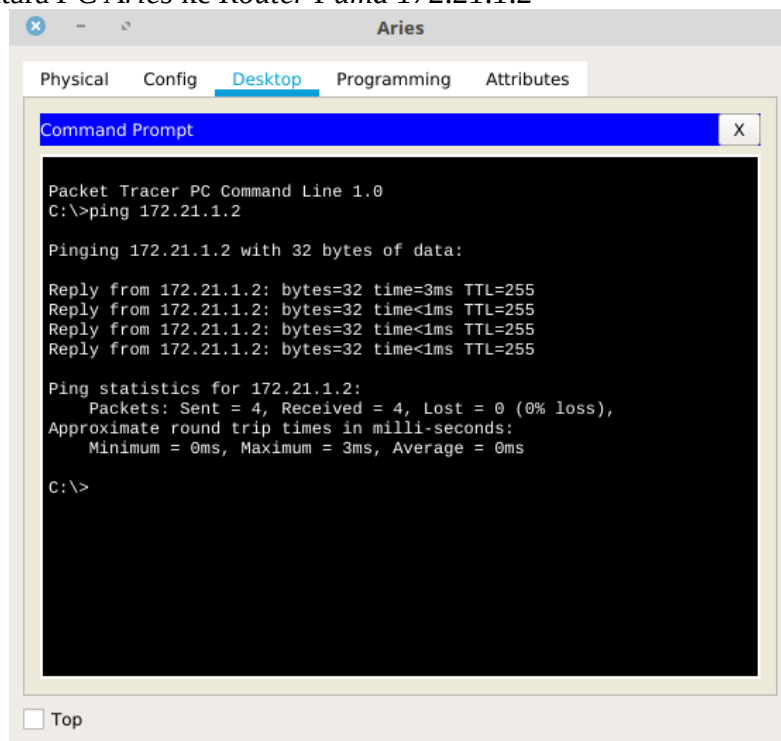
Field	Value
IP Address	172.21.30.3
Subnet Mask	255.255.255.0
Default Gateway	172.21.30.30
DNS Server	0.0.0.0
IPv6 Address	
Link Local Address	FE80::230:A3FF:FE4B:3DD2
IPv6 Gateway	
IPv6 DNS Server	
Use 802.1X Security	<input type="checkbox"/>
Authentication	MD5

4. Langkah pengujian untuk memastikan kesesuaian konfigurasi.

a) *Ping* antara PC Leo ke Router Eagle 172.21.1.1



b) *Ping* antara PC Aries ke Router Puma 172.21.1.2



c) Ping antara PC Virgo ke Router Tiger 172.21.3.3

```
Packet Tracer PC Command Line 1.0
C:\>ping 172.21.3.3

Pinging 172.21.3.3 with 32 bytes of data:

Reply from 172.21.3.3: bytes=32 time=3ms TTL=255
Reply from 172.21.3.3: bytes=32 time<1ms TTL=255
Reply from 172.21.3.3: bytes=32 time<1ms TTL=255
Reply from 172.21.3.3: bytes=32 time<1ms TTL=255

Ping statistics for 172.21.3.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 3ms, Average = 0ms

C:\>
```

d) Ping antara Router Eagle Ke Router Puma 172.21.1.2

```
Router>en
Router#ping 172.21.1.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.21.1.2, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/11/47
ms

Router#
```

e) Ping antara Router Eagle Ke Router Tiger 172.21.2.3

```
Router#ping 172.21.2.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.21.2.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/5
ms

Router#
```

f) Ping antara Router Puma Ke Router Tiger 172.21.3.3

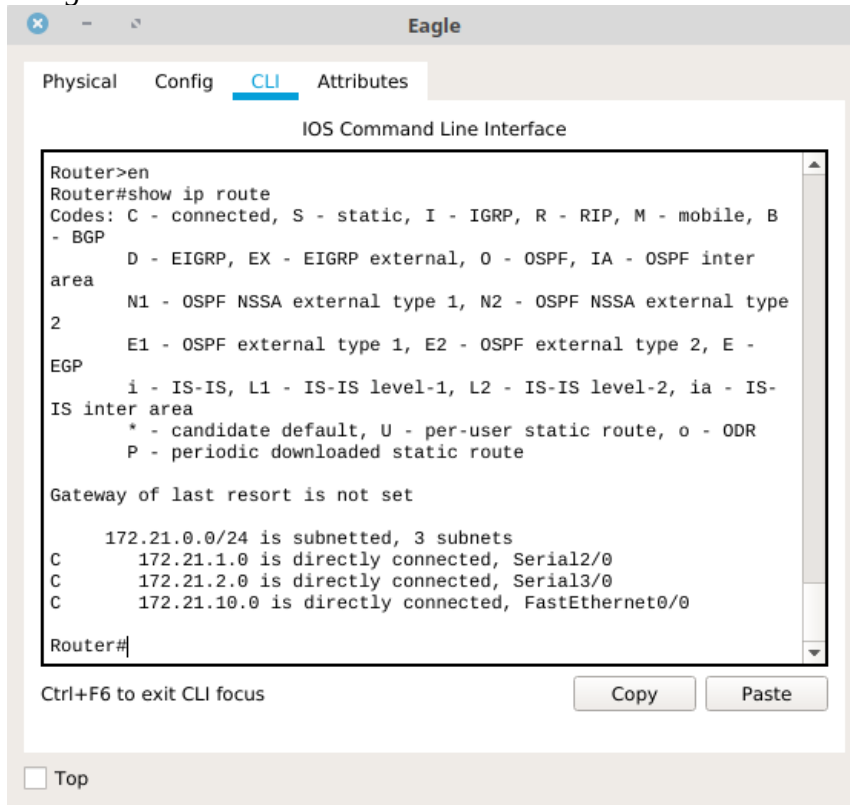
```
Router>en
Router#ping 172.21.3.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.21.3.3, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/3 ms

Router#
```

5. Hasil *Route Table* pada masing-masing Router.

a) *Router Eagle*



The screenshot shows the Eagle router's CLI interface. The 'CLI' tab is selected. The command 'show ip route' has been executed, displaying the following output:

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

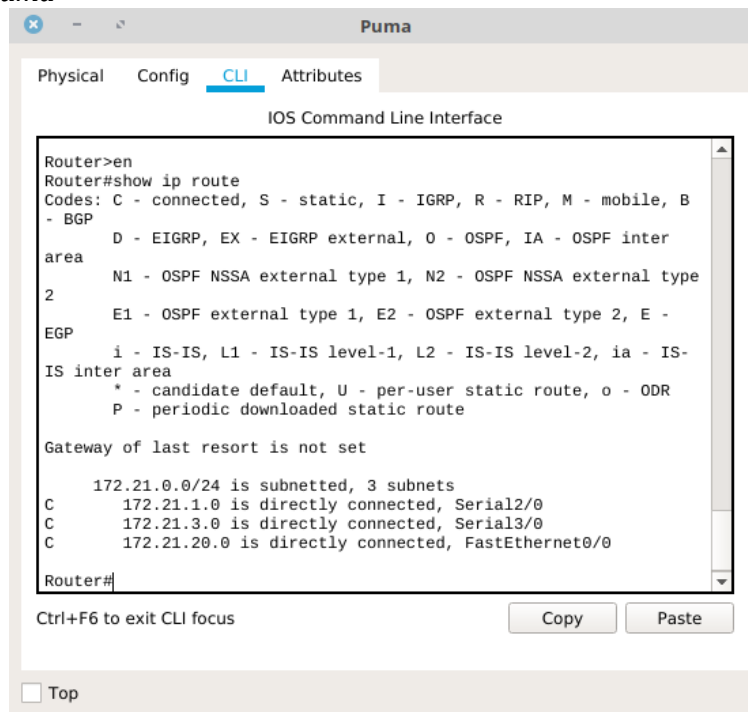
Gateway of last resort is not set

      172.21.0.0/24 is subnetted, 3 subnets
C       172.21.1.0 is directly connected, Serial2/0
C       172.21.2.0 is directly connected, Serial3/0
C       172.21.10.0 is directly connected, FastEthernet0/0

Router#
```

Below the output, there is a 'Ctrl+F6 to exit CLI focus' message and 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

b) *Router Puma*



The screenshot shows the Puma router's CLI interface. The 'CLI' tab is selected. The command 'show ip route' has been executed, displaying the following output:

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

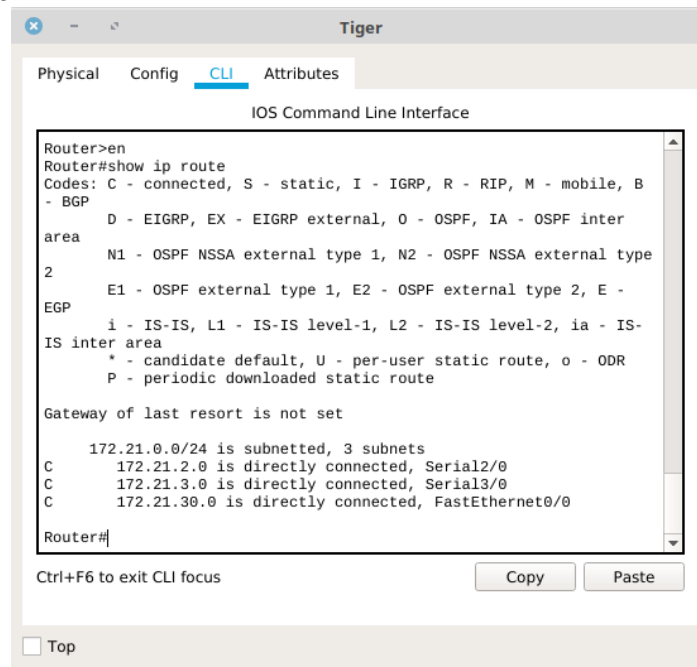
Gateway of last resort is not set

      172.21.0.0/24 is subnetted, 3 subnets
C       172.21.1.0 is directly connected, Serial2/0
C       172.21.3.0 is directly connected, Serial3/0
C       172.21.20.0 is directly connected, FastEthernet0/0

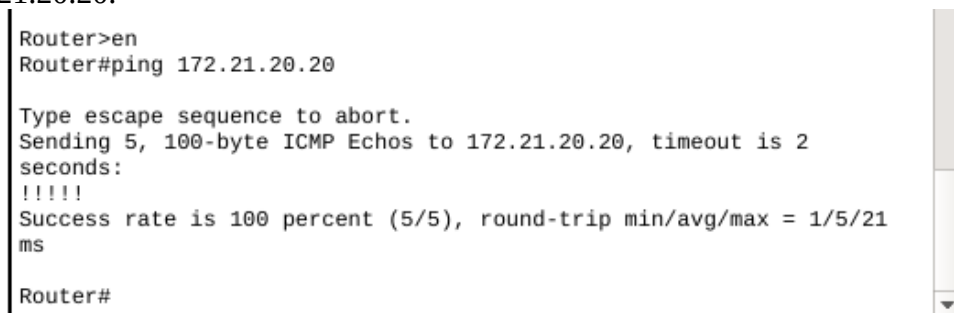
Router#
```

Below the output, there is a 'Ctrl+F6 to exit CLI focus' message and 'Copy' and 'Paste' buttons. At the bottom left, there is a 'Top' button.

c) Router Tiger

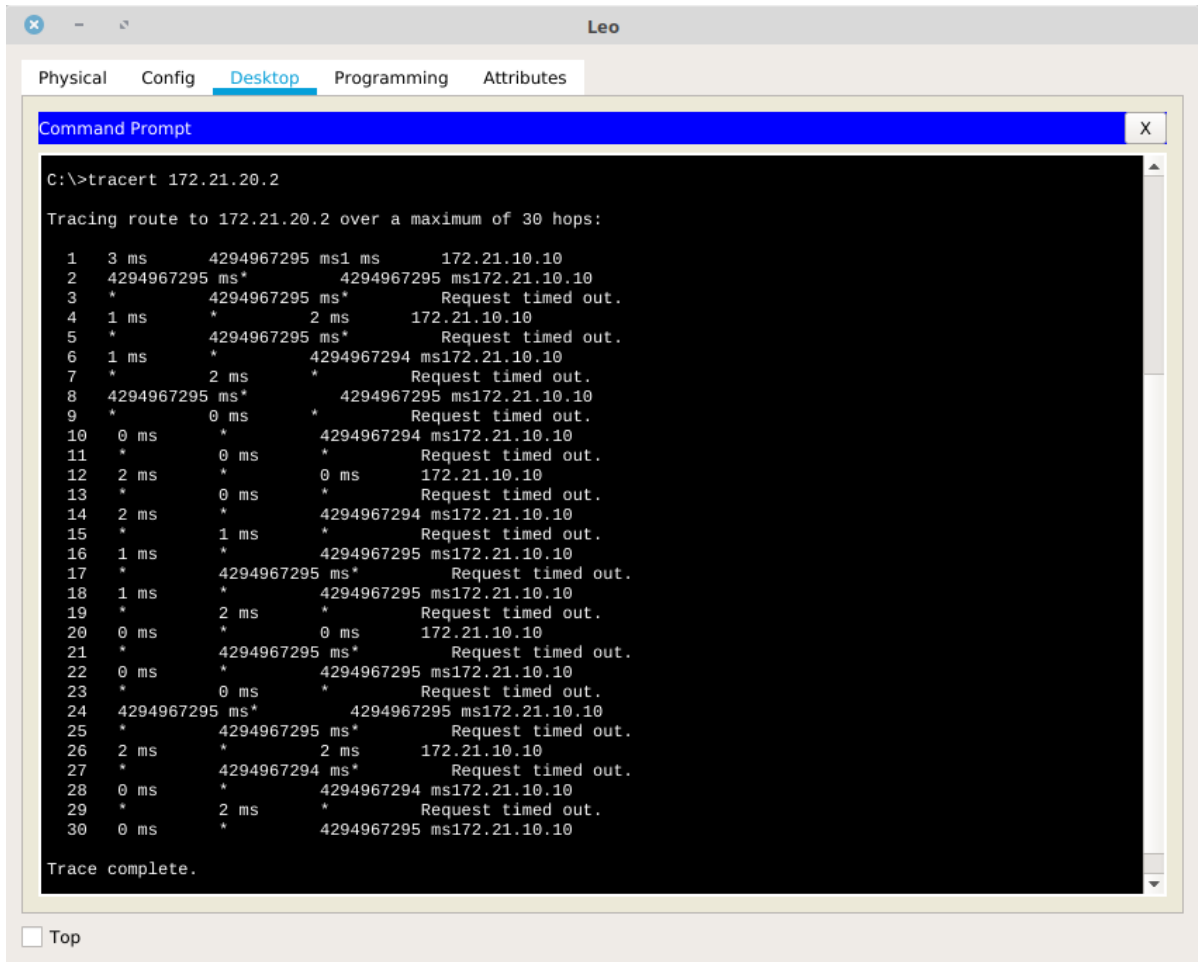


6. Ping dari Router Eagle ke IP Address interface FastEthernet0/0 pada Router Puma 172.21.20.20.



Dari hasil Ping diatas berhasil mendapat tanggapan dari Fa0/0 Router Puma. Karena Router Eagle dengan Router Puma terhubung langsung.

7. Melakukan *Trace* dari *PC Leo* ke *PC Aries*.



```
C:\>tracert 172.21.20.2

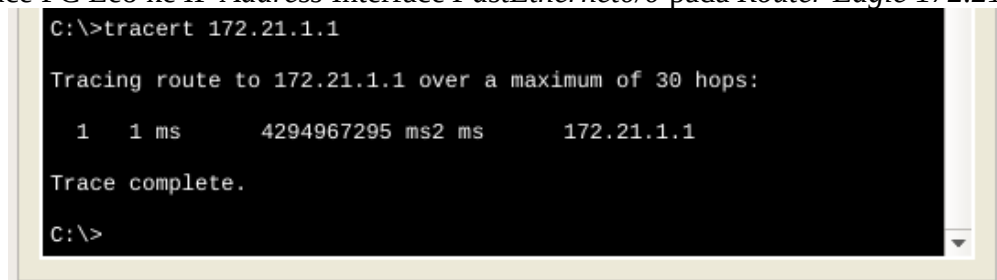
Tracing route to 172.21.20.2 over a maximum of 30 hops:

  0  3 ms    4294967295 ms 1 ms    172.21.10.10
  1  4294967295 ms* 4294967295 ms 172.21.10.10
  2  * 4294967295 ms* Request timed out.
  3  1 ms    * 2 ms    172.21.10.10
  4  * 4294967295 ms* Request timed out.
  5  1 ms    * 4294967294 ms 172.21.10.10
  6  * 2 ms    * Request timed out.
  7  4294967295 ms* 4294967295 ms 172.21.10.10
  8  * 0 ms    * Request timed out.
  9  0 ms    * 4294967294 ms 172.21.10.10
 10  * 0 ms    * Request timed out.
 11  2 ms    * 0 ms    172.21.10.10
 12  * 0 ms    * Request timed out.
 13  2 ms    * 4294967294 ms 172.21.10.10
 14  * 1 ms    * Request timed out.
 15  1 ms    * 4294967295 ms 172.21.10.10
 16  * 4294967295 ms* Request timed out.
 17  1 ms    * 4294967295 ms 172.21.10.10
 18  * 2 ms    * Request timed out.
 19  0 ms    * 0 ms    172.21.10.10
 20  * 4294967295 ms* Request timed out.
 21  0 ms    * 4294967295 ms 172.21.10.10
 22  * 0 ms    * Request timed out.
 23  4294967295 ms* 4294967295 ms 172.21.10.10
 24  * 4294967295 ms* Request timed out.
 25  2 ms    * 2 ms    172.21.10.10
 26  * 4294967294 ms* Request timed out.
 27  0 ms    * 4294967294 ms 172.21.10.10
 28  * 2 ms    * Request timed out.
 29  0 ms    * 4294967295 ms 172.21.10.10
 30  0 ms    * 4294967295 ms 172.21.10.10

Trace complete.
```

Proses Trace digunakan untuk mengetahui jalur pada sebuah interface apakah sudah terhubung atau interface masih mencari jalur sampai maksimal 30 Hops. Dari Trace diatas dapat disimpulkan jika PC Leo dengan PC Aries belum terhubung, perlu dilakukan Routing pada Router Eagle.

8. Trace PC Leo ke IP Address Interface *FastEthernet0/0* pada *Router Eagle* 172.21.1.1



```
C:\>tracert 172.21.1.1

Tracing route to 172.21.1.1 over a maximum of 30 hops:

  0  1 ms    4294967295 ms 2 ms    172.21.1.1

Trace complete.

C:\>
```

Hasil dari Trace dibutuhkan 1 Hops untuk PC Leo berkomunikasi dengan FastEthernet0/0 pada Router Eagle, karena sudah terhubung secara langsung.

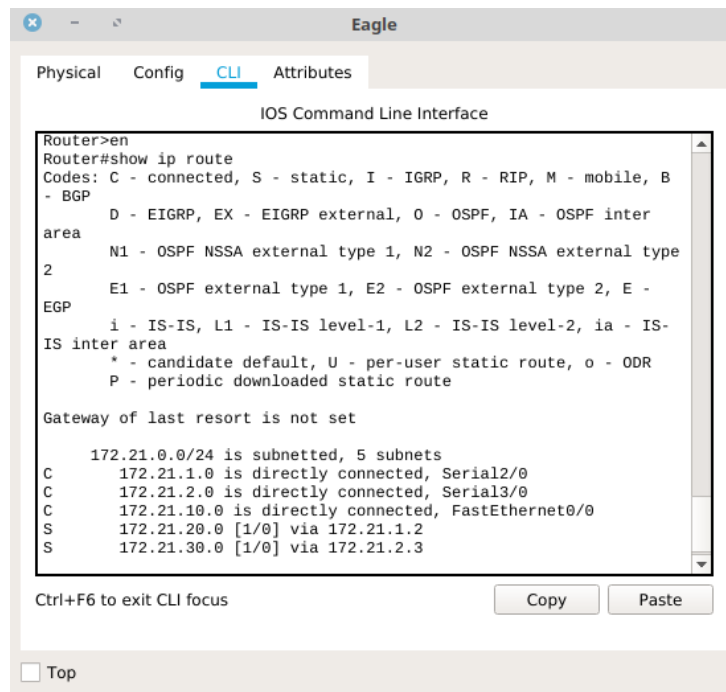
9. Route table pada masing-masing Router untuk setiap alamat jaringan yang tidak terhubung secara langsung dengan interface Router.

a) Pada Router Eagle

- Langkah *Routing*

```
Router>en
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.21.20.0 255.255.255.0 172.21.1.2
Router(config)#ip route 172.21.30.0 255.255.255.0 172.21.2.3
```

- Hasil *Routing Table Router Eagle*



b) Pada Router Puma

- Langkah *Routing*

```

Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.21.10.0 255.255.255.0 172.21.1.1
Router(config)#ip route 172.21.30.0 255.255.255.0 172.21.3.3
Router(config)#
  
```

- Hasil *Routing Table Router Puma*

```

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

Gateway of last resort is not set

    172.21.0.0/24 is subnetted, 5 subnets
C       172.21.1.0 is directly connected, Serial2/0
C       172.21.3.0 is directly connected, Serial3/0
S       172.21.10.0 [1/0] via 172.21.1.1
C       172.21.20.0 is directly connected, FastEthernet0/0
S       172.21.30.0 [1/0] via 172.21.3.3
  
```

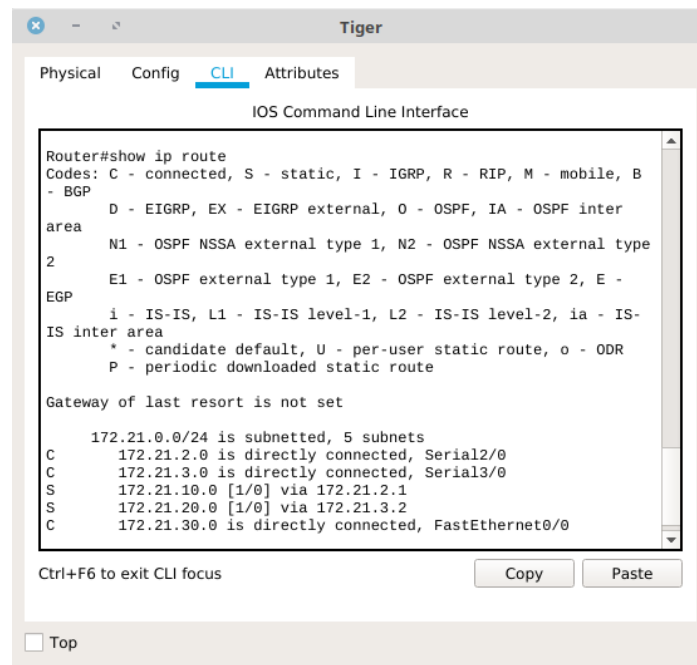
c) Pada Router Tiger

- Langkah *Routing*

```

Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.21.10.0 255.255.255.0 172.21.2.1
Router(config)#ip route 172.21.20.0 255.255.255.0 172.21.3.2
Router(config)#
  
```

- Hasil *Routing Table Router Tiger*



10. Melakukan *Ping* dan *Trace* dari *PC Leo* ke *PC Aries*.

a) *Ping PC Leo ke PC Aries*

```
C:\>ping 172.21.20.2

Pinging 172.21.20.2 with 32 bytes of data:

Reply from 172.21.20.2: bytes=32 time=3ms TTL=126
Reply from 172.21.20.2: bytes=32 time=18ms TTL=126
Reply from 172.21.20.2: bytes=32 time=10ms TTL=126
Reply from 172.21.20.2: bytes=32 time=1ms TTL=126

Ping statistics for 172.21.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 18ms, Average = 8ms
```

Hasil Ping diatas berhasil, karena PC Leo dan PC Aries IP Address-nya sudah terhubung.

b) *Trace PC Leo ke PC Aries*

```
C:\>tracert 172.21.20.2

Tracing route to 172.21.20.2 over a maximum of 30 hops:

  0  1 ms    0 ms    4294967295 ms 172.21.10.10
  1  0 ms    0 ms    4294967295 ms 172.21.1.2
  2  10 ms   0 ms    1 ms    172.21.20.2

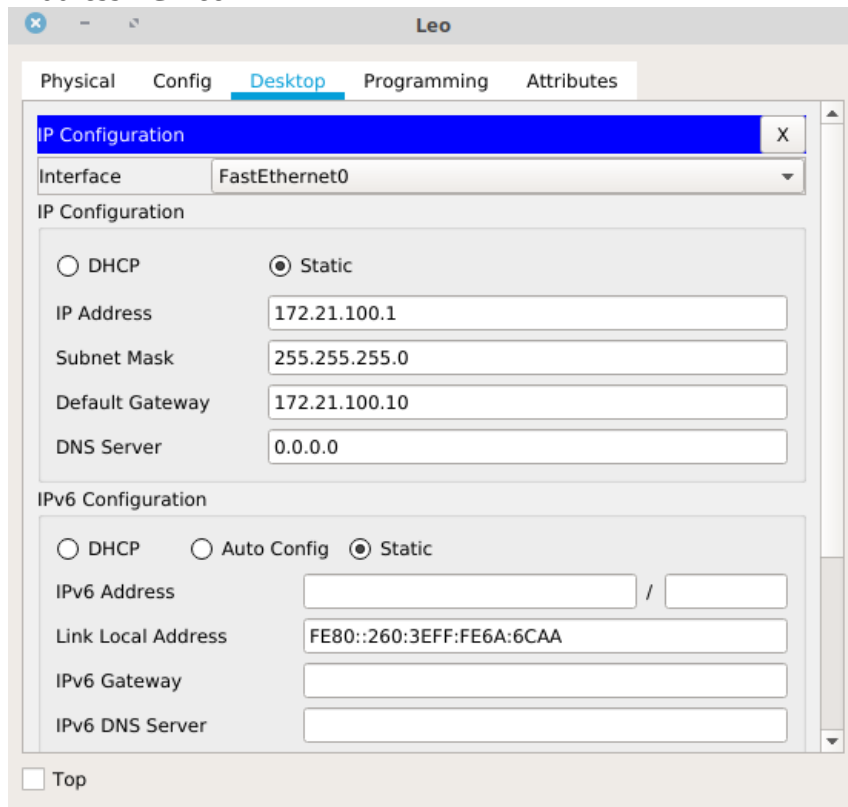
Trace complete.

C:\>
```

Hasil Trace diatas hanya membutuhkan 3 Hops karena PC Leo dan PC Aries sudah terhubung, karena sudah dilakukan Routing pada Router Eagle.

11. Apabila IP Address pada PC Leo diubah dari 172.21.10.0/24 menjadi 172.21.100.0/24. Berikut langkah supaya PC Leo bisa berhubungan dengan PC atau Router lain.

- a) Ubah Konfigurasi IP Address serta Default Gateway Pada PC Leo dan FastEthernet0/0 pada Router Eagle.
- IP Address PC Leo



- FastEthernet0/0 pada Router Eagle.

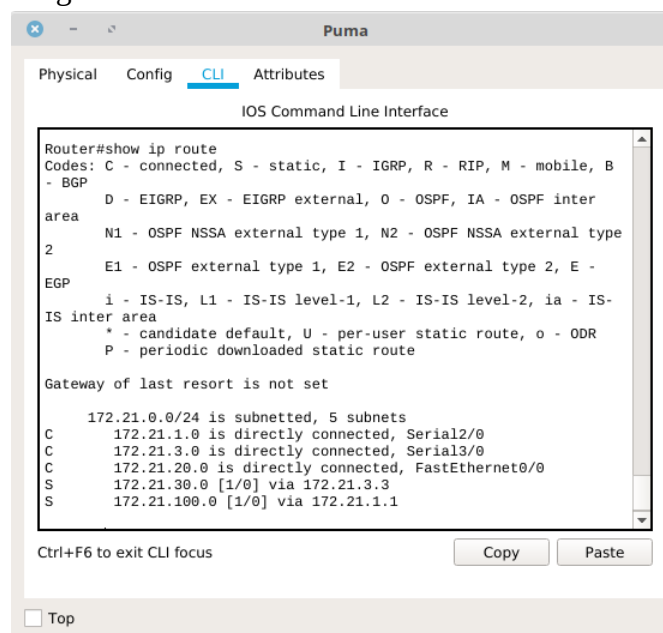
```
Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 172.21.100.10 255.255.255.0
Router(config-if)#
```

- b) Routing ulang pada Router Puma dan Router Tiger.

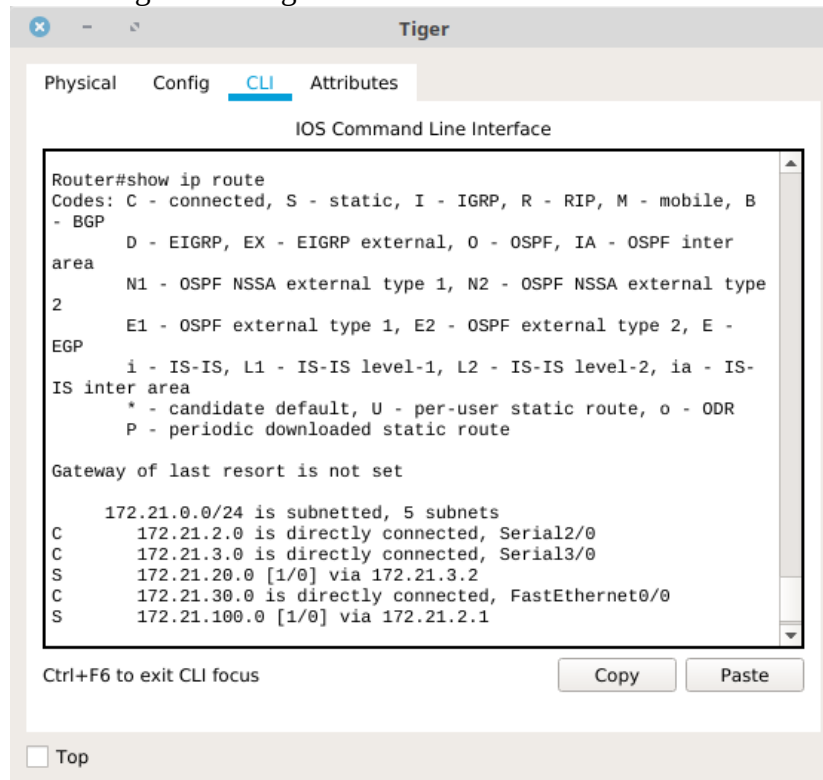
- Router Puma

```
Router#conf term
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip route 172.21.100.0 255.255.255.0 172.21.1.1
```

- Hasil Routing Router Puma



- Router Tiger
 - Router#conf term
 - Enter configuration commands, one per line. End with CNTL/Z.
 - Router(config)#ip route 172.21.100.0 255.255.255.0 172.21.2.1
- Hasil Routing Router Tiger



c) Test Ping ke PC Leo.

- Dari PC Aries

```

C:\>ping 172.21.100.1

Pinging 172.21.100.1 with 32 bytes of data:

Reply from 172.21.100.1: bytes=32 time=3ms TTL=126
Reply from 172.21.100.1: bytes=32 time=1ms TTL=126
Reply from 172.21.100.1: bytes=32 time=10ms TTL=126
Reply from 172.21.100.1: bytes=32 time=11ms TTL=126

Ping statistics for 172.21.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 11ms, Average = 6ms
  
```

- Dari PC Virgo

```

C:\>ping 172.21.100.1

Pinging 172.21.100.1 with 32 bytes of data:

Reply from 172.21.100.1: bytes=32 time=2ms TTL=126
Reply from 172.21.100.1: bytes=32 time=6ms TTL=126
Reply from 172.21.100.1: bytes=32 time=12ms TTL=126
Reply from 172.21.100.1: bytes=32 time=12ms TTL=126

Ping statistics for 172.21.100.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 12ms, Average = 8ms
  
```

langkah diatas harus dilakukan jika kita mengganti Network pada salah satu PC, karena diperlukan Routing ulang pada masing-masing Router untuk bisa saling berkomunikasi.