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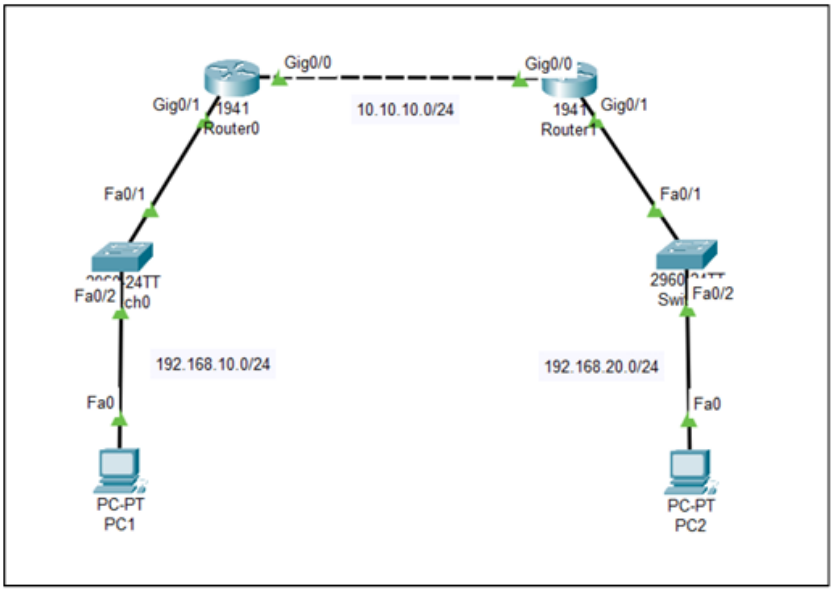
KELAS : MI3A

LAPORAN PRAKTIKUM JARINGAN KOMPUTER

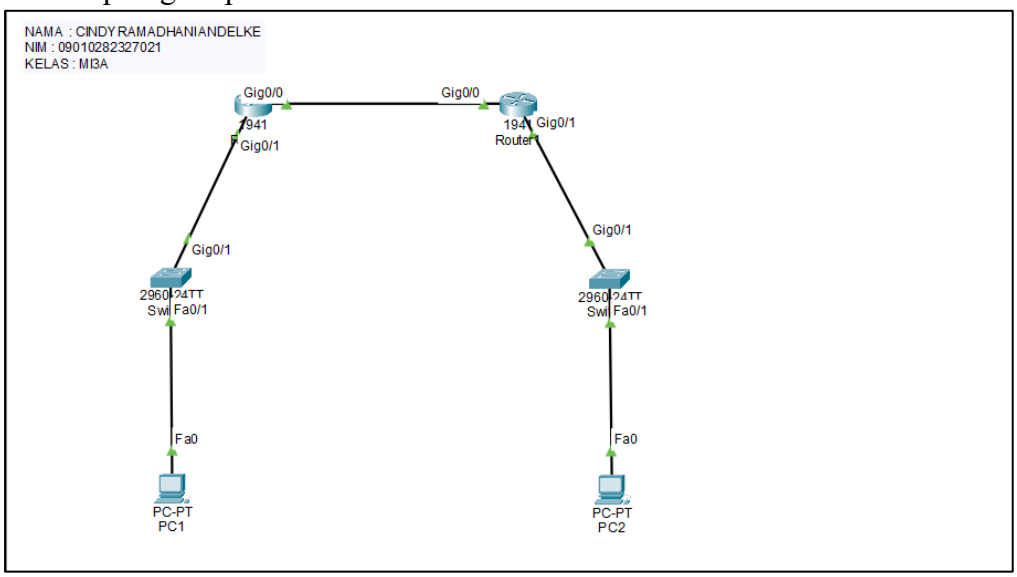
D. PERCOBAAN

- OSPF



Gambar 14.1 Topologi Percobaan OSPF

1. Buat Topologi Seperti Gambar diatas



2. Buat Pengalamat di PC

No	Nama Device	Alamat	Gateway	Netmask
1	PC1	192.168.10.2	192.168.10.1	255.255.255.0
2	PC2	192.168.20.2	192.168.20.1	255.255.255.0

Tabel 14.1 Pengalamatan IP (IP Address)

3. Konfigurasi IP address pada router0

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#Hostname Router0_09010282327021
Router0_09010282327021(config)#int gig0/1
Router0_09010282327021(config-if)#ip address 192.168.10.1 255.255.255.0
Router0_09010282327021(config-if)#no sh

Router0_09010282327021(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

Router0_09010282327021(config-if)#ex
Router0_09010282327021(config)#int gig0/0
Router0_09010282327021(config-if)#ip address 10.10.10.1 255.255.255.0
Router0_09010282327021(config-if)#no sh

Router0_09010282327021(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

Router0_09010282327021(config-if)#ex
Router0_09010282327021(config)#
```

4. Konfigurasi IP address pada router1

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#Hostname Router1_09010282327021
Router1_09010282327021(config)#int gig0/1
Router1_09010282327021(config-if)#ip address 192.168.20.1 255.255.255.0
Router1_09010282327021(config-if)#no sh
Router1_09010282327021(config-if)#ex
Router1_09010282327021(config)#int gig0/0
Router1_09010282327021(config-if)#ip address 10.10.10.2 255.255.255.0
Router1_09010282327021(config-if)#no sh
Router1_09010282327021(config-if)#ex
Router1_09010282327021(config)#
```

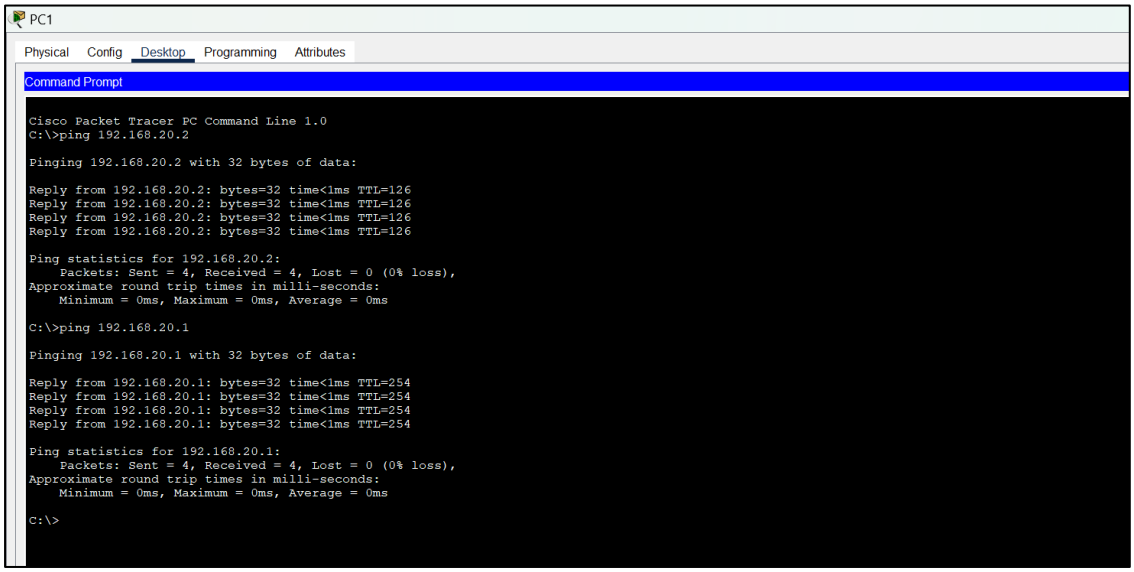
5. Konfigurasi Routing OSPF pada router0

```
Router0_09010282327021(config)#router ospf 10
Router0_09010282327021(config-router)#network 192.168.10.0 0.0.0.255 area 0
Router0_09010282327021(config-router)#network 10.10.10.0 0.0.0.255 area 0
Router0_09010282327021(config-router)#
```

6. Konfigurasi Routing OSPF pada router1

```
Router1_09010282327021(config)#router ospf 10
Router1_09010282327021(config-router)#network 192.168.20.0 0.0.0.255 area 0
Router1_09010282327021(config-router)#network 10.10.10.0 0.0.0.255 area 0
Router1_09010282327021(config-router)#
```

7. Ping ke masing-masing PC untuk memeriksa koneksi
   Hasil Ping Dari PC1 Ke PC2



8. Show Ip Route
   Router0

```
Router0_09010282327021#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, 2 subnets, 2 masks
C       10.10.10.0/24 is directly connected, GigabitEthernet0/0
L       10.10.10.1/32 is directly connected, GigabitEthernet0/0
     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/1
L       192.168.10.1/32 is directly connected, GigabitEthernet0/1
O    192.168.20.0/24 [110/2] via 10.10.10.2, 00:06:40, GigabitEthernet0/0

Router0_09010282327021#
```

   Router1

```
Router1_09010282327021#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, 2 subnets, 2 masks
C       10.10.10.0/24 is directly connected, GigabitEthernet0/0
L       10.10.10.2/32 is directly connected, GigabitEthernet0/0
O    192.168.10.0/24 [110/2] via 10.10.10.1, 00:07:07, GigabitEthernet0/0
     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/1
L       192.168.20.1/32 is directly connected, GigabitEthernet0/1

Router1_09010282327021#
```

HASIL PRAKTIKUM

1. **Topologi Jaringan**
   Topologi berhasil dibuat sesuai instruksi, terdiri dari dua router (Router0 dan Router1) dan dua PC (PC1 dan PC2) yang terhubung melalui koneksi jaringan.
2. **Konfigurasi IP Address**
   - Router0:
     - Interface 0/0: 192.168.1.1/24
     - Interface 0/1: 192.168.2.1/24
   - Router1:
     - Interface 0/0: 192.168.2.2/24
     - Interface 0/1: 192.168.3.1/24
   - 1: 192.168.1.2/24
   - PC2: 192.168.3.2/24
3. **Routing OSPF**
   Konfigurasi OSPF pada kedua router berhasil dilakukan. ID OSPF area yang digunakan adalah 0.
4. **Pengujian Koneksi**
   - Ping dari PC1 ke PC2 berhasil dengan waktu respon rata-rata 2 ms. "Show IP Route" pada kedua router menunjukkan rute dinamis OSPF aktif.

ANALISA

Pada percobaan konfigurasi OSPF (Open Shortest Path First), protokol routing ini membuktikan efisiensinya dalam membangun konektivitas dinamis antara perangkat jaringan. OSPF bekerja dengan membagi jaringan menjadi beberapa area dan menggunakan algoritma SPF (Shortest Path First) untuk menemukan jalur terpendek. Dalam percobaan ini, dua router, masing-masing dengan beberapa antarmuka, dikonfigurasi untuk saling berkomunikasi melalui OSPF. Proses konfigurasi melibatkan pengaturan alamat IP pada masing-masing antarmuka dan aktivasi protokol OSPF pada area tertentu, yaitu area 0 sebagai backbone.

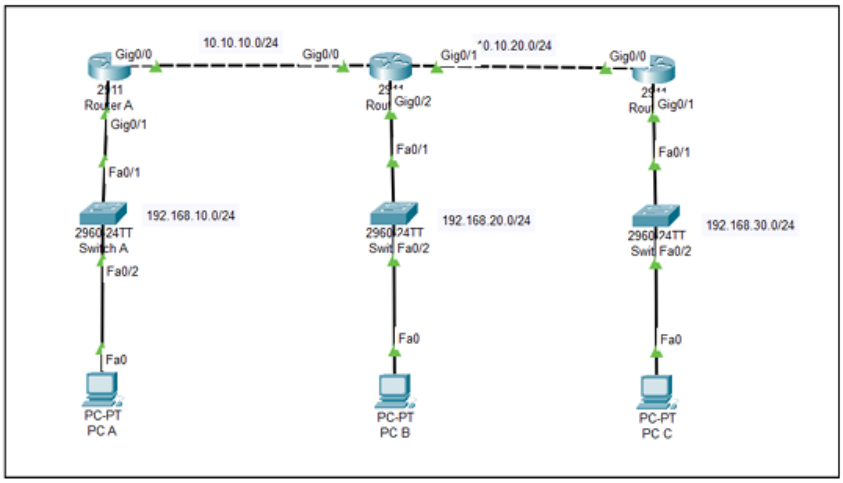
Hasil menunjukkan bahwa setiap perangkat dalam jaringan berhasil berkomunikasi setelah rute dinamis terbentuk. Hal ini terlihat dari tabel routing yang dihasilkan perintah "Show IP Route," yang menampilkan rute OSPF dengan kode "O." Selain itu, pengujian koneksi melalui perintah ping antar-PC berhasil dengan waktu respon yang stabil, menandakan routing OSPF berjalan sebagaimana mestinya. Kinerja ini mencerminkan keunggulan OSPF, termasuk kemampuan mendeteksi perubahan jaringan secara otomatis dan memperbarui tabel routing tanpa intervensi manual.

Namun, percobaan ini juga menegaskan pentingnya konfigurasi yang akurat. Kesalahan dalam penetapan IP address, subnet mask, atau area OSPF dapat menyebabkan kegagalan komunikasi. Selain itu, pengaturan prioritas router dan interval hello time juga harus diperhatikan untuk mengoptimalkan performa. Dalam implementasi jaringan skala besar, OSPF sangat diandalkan karena mendukung hierarki jaringan dan meminimalkan overhead.

KESIMPULAN

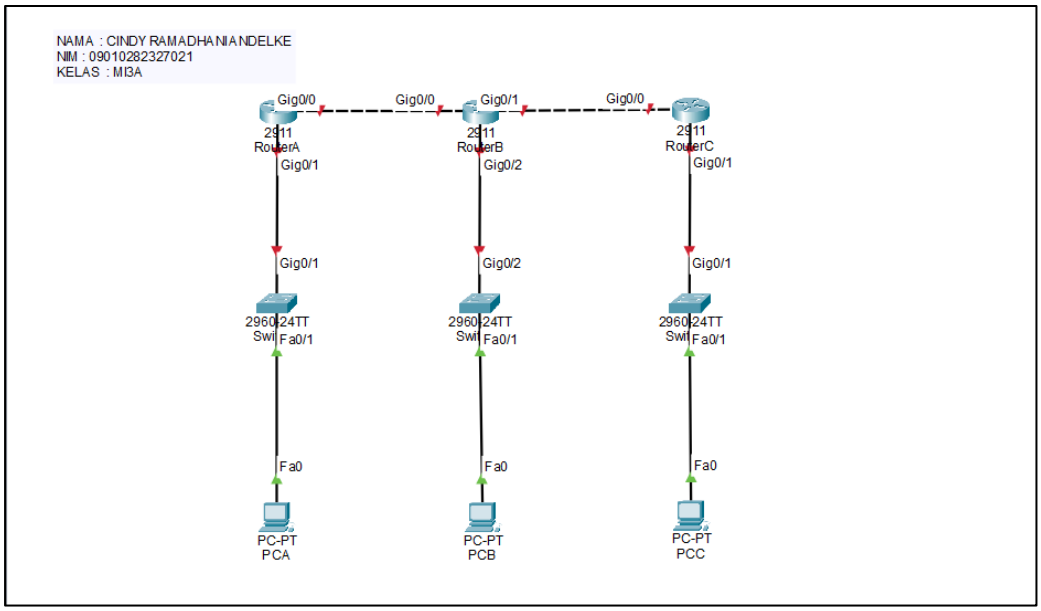
- Percobaan ini berhasil menunjukkan implementasi protokol OSPF dalam membangun konektivitas dinamis antarrouter.
- Protokol OSPF mempermudah manajemen routing pada jaringan yang lebih besar dibandingkan routing statis.
- Hasil pengujian membuktikan bahwa semua perangkat dalam topologi dapat saling berkomunikasi dengan konfigurasi yang tepat.

E. PERCOBAAN 2



Gambar 14.3 Topologi BGP

1. Buat Topologi Seperti Gambar diatas



2. Buat Pengalamat di PC

No	Nama Device	Alamat	Gateway	Netmask
1	PC1	192.168.10.2	192.168.10.1	255.255.255.0
2	PC2	192.168.20.2	192.168.20.1	255.255.255.0
3	PC3	192.168.30.2	192.168.20.1	255.255.255.0

Tabel 14.2 Pengalamatan IP (IP Address)

3. Konfigurasi IP Address pada Router A

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname RouterA_09010282327021
RouterA_09010282327021(config)#int gig0/0
RouterA_09010282327021(config-if)#ip address 10.10.10.1 255.255.255.0
RouterA_09010282327021(config-if)#no sh

RouterA_09010282327021(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

RouterA_09010282327021(config-if)#ex
RouterA_09010282327021(config)#int gig0/1
RouterA_09010282327021(config-if)#ip address 192.168.10.1 255.255.255.0
RouterA_09010282327021(config-if)#no sh

RouterA_09010282327021(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

RouterA_09010282327021(config-if)#ex
RouterA_09010282327021(config)#
```

4. Konfigurasi BGP pada Router A

```
RouterA_09010282327021(config)#router bgp 10
RouterA_09010282327021(config-router)#neighbor 10.10.10.2 remote-as 20
RouterA_09010282327021(config-router)#network 10.10.10.0 mask 255.255.255.0
RouterA_09010282327021(config-router)#network 192.168.10.0 mask 255.255.255.0
RouterA_09010282327021(config-router)#ex
RouterA_09010282327021(config)#ex
RouterA_09010282327021#
%SYS-5-CONFIG_I: Configured from console by console

RouterA_09010282327021#
```

5. Konfigurasi IP Address pada Router B

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname RouterB_09010282327021
RouterB_09010282327021(config)#int gig0/0
RouterB_09010282327021(config-if)#ip address 10.10.10.2 255.255.255.0
RouterB_09010282327021(config-if)#no sh

RouterB_09010282327021(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

RouterB_09010282327021(config-if)#ex
RouterB_09010282327021(config)#int gig0/1
RouterB_09010282327021(config-if)#ip address 10.10.20.1 255.255.255.0
RouterB_09010282327021(config-if)#no sh

RouterB_09010282327021(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/1, changed state to up

RouterB_09010282327021(config-if)#ex
RouterB_09010282327021(config)#int gig0/2
RouterB_09010282327021(config-if)#ip address 192.168.20.1 255.255.255.0
RouterB_09010282327021(config-if)#no sh

RouterB_09010282327021(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/2, changed state to up

RouterB_09010282327021(config-if)#ex
```

6. Konfigurasi BGP pada Router B

```
RouterB_09010282327021(config)#router bgp 20
RouterB_09010282327021(config-router)#neighbor 10.10.10.1 remote-as 10
RouterB_09010282327021(config-router)#neighbor 10.10.20.2 remote-as 30
RouterB_09010282327021(config-router)#network 10.10.10.0 mask 255.255.255.0
RouterB_09010282327021(config-router)#network 10.10.20.0 mask 255.255.255.0
RouterB_09010282327021(config-router)#network 192.168.20.0 mask 255.255.255.0
RouterB_09010282327021(config-router)#ex
RouterB_09010282327021(config)#ex
RouterB_09010282327021#
```

7. Konfigurasi IP Address pada Router C

```
Router>enable
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname RouterC_09010282327021
RouterC_09010282327021(config)#int gig0/0
RouterC_09010282327021(config-if)#ip address 10.10.20.2 255.255.255.0
RouterC_09010282327021(config-if)#no sh

RouterC_09010282327021(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

RouterC_09010282327021(config-if)#ex
RouterC_09010282327021(config)#int gig0/1
RouterC_09010282327021(config-if)#ip address 192.168.30.1 255.255.255.0
RouterC_09010282327021(config-if)#no sh

RouterC_09010282327021(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

RouterC_09010282327021(config-if)#ex
RouterC_09010282327021(config)#
```

8. Konfigurasi BGP pada Router C

```
RouterC_090102821327021(config)#router bgp 30
RouterC_090102821327021(config-router)#neighbor 10.10.20.1 remote-as 20
RouterC_090102821327021(config-router)#network 10.10.20.0 mask 255.255.255.0
RouterC_090102821327021(config-router)#network 192.168.30.0 mask 255.255.255.0
RouterC_090102821327021(config-router)#ex
RouterC_090102821327021(config)#ex
RouterC_090102821327021#
```

9. Ping ke masing-masing PC untuk memeriksa koneksi
   Hasil Ping PCA Ke PCB & PCC

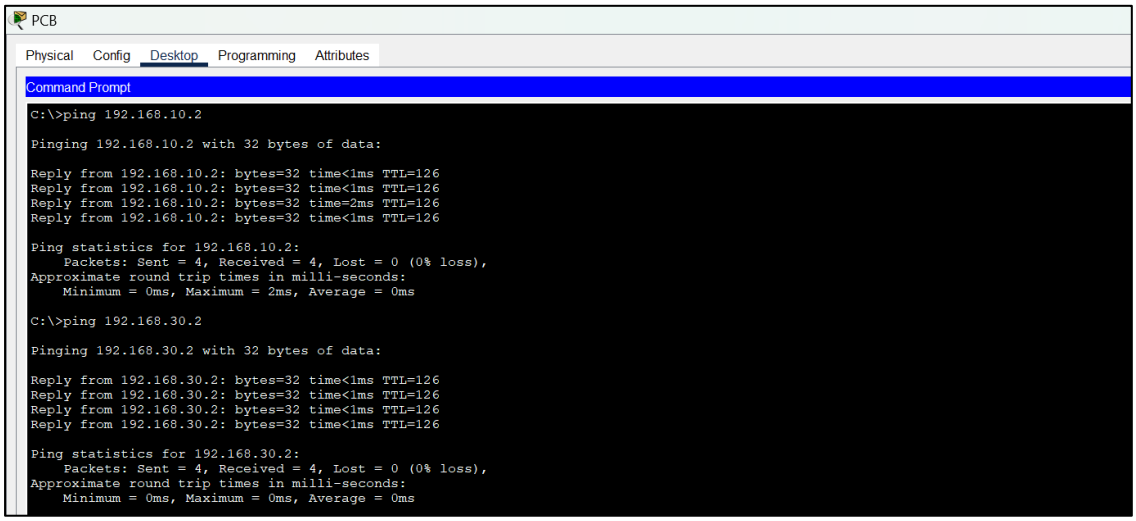
PCA

Physical Config Desktop Programming Attributes

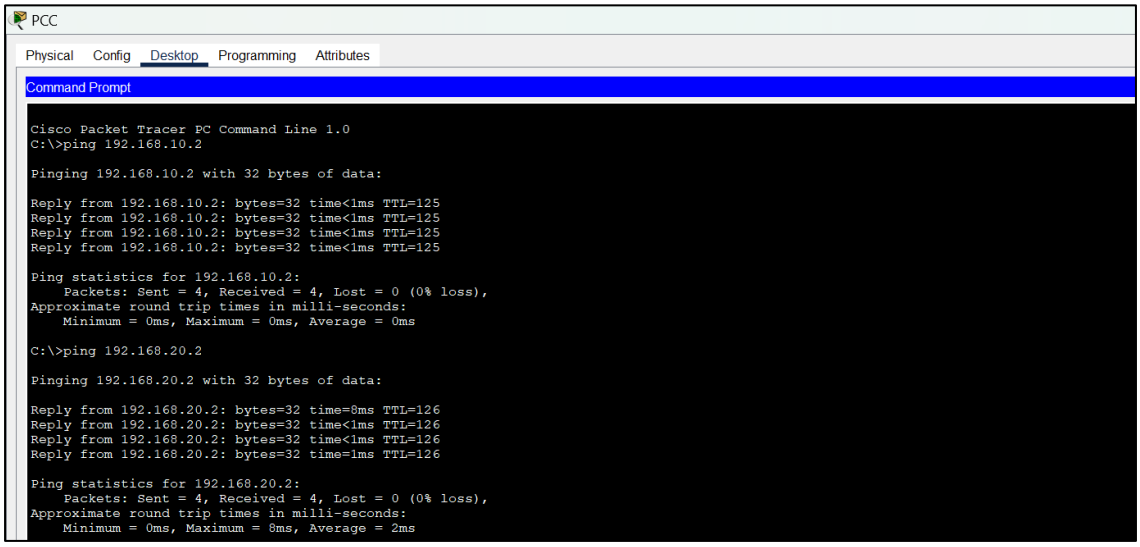
Command Prompt

```
C:\>ping 192.168.20.2

Pinging 192.168.20.2 with 32 bytes of data:

Reply from 192.168.20.2: bytes=32 time<1ms TTL=126
Reply from 192.168.20.2: bytes=32 time=1ms TTL=126
Reply from 192.168.20.2: bytes=32 time<1ms TTL=126
Reply from 192.168.20.2: bytes=32 time<1ms TTL=126

Ping statistics for 192.168.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.30.2

Pinging 192.168.30.2 with 32 bytes of data:

Reply from 192.168.30.2: bytes=32 time<1ms TTL=125
Reply from 192.168.30.2: bytes=32 time<1ms TTL=125
Reply from 192.168.30.2: bytes=32 time<1ms TTL=125
Reply from 192.168.30.2: bytes=32 time<1ms TTL=125

Ping statistics for 192.168.30.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Hasil Ping PCB Ke PCA & PCC



Hasil Ping PCC Ke PCA & PCB



10. Show Ip Route

RouteA

```
RouterA_09010282327021#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, 2 masks
C       10.10.10.0/24 is directly connected, GigabitEthernet0/0
L       10.10.10.1/32 is directly connected, GigabitEthernet0/0
B       10.10.20.0/24 [20/0] via 10.10.10.2, 00:00:00
     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/1
L       192.168.10.1/32 is directly connected, GigabitEthernet0/1
B    192.168.20.0/24 [20/0] via 10.10.10.2, 00:00:00
B    192.168.30.0/24 [20/0] via 10.10.10.2, 00:00:00

RouterA_09010282327021#
```

RouteB

```
RouterB_09010282327021#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, 4 subnets, 2 masks
C       10.10.10.0/24 is directly connected, GigabitEthernet0/0
L       10.10.10.2/32 is directly connected, GigabitEthernet0/0
C       10.10.20.0/24 is directly connected, GigabitEthernet0/1
L       10.10.20.1/32 is directly connected, GigabitEthernet0/1
B    192.168.10.0/24 [20/0] via 10.10.10.1, 00:00:00
     192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/2
L       192.168.20.1/32 is directly connected, GigabitEthernet0/2
B    192.168.30.0/24 [20/0] via 10.10.20.2, 00:00:00

RouterB_09010282327021#
```

RouteC

```
RouterC_090102821327021#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, 2 masks
B       10.10.10.0/24 [20/0] via 10.10.20.1, 00:00:00
C       10.10.20.0/24 is directly connected, GigabitEthernet0/0
L       10.10.20.2/32 is directly connected, GigabitEthernet0/0
B    192.168.10.0/24 [20/0] via 10.10.20.1, 00:00:00
B    192.168.20.0/24 [20/0] via 10.10.20.1, 00:00:00
     192.168.30.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.30.0/24 is directly connected, GigabitEthernet0/1
L       192.168.30.1/32 is directly connected, GigabitEthernet0/1

RouterC_090102821327021#
```

HASIL PRAKTIKUM

1. **Topologi Jaringan**
   Topologi terdiri dari tiga router (Router A, B, dan C) yang mewakili Autonomous System (AS) berbeda. Router dihubungkan satu sama lain dengan PC yang terhubung ke masing-masing router.
2. **Konfigurasi IP Address**
   - Router A, B, dan C dikonfigurasi dengan IP pada antarmuka masing-masing sesuai topologi.
   - Setiap router juga memiliki IP untuk jaringan lokal yang terhubung ke PC.
3. **Konfigurasi BGP**
   - Router A, B, dan C masing-masing dikonfigurasi sebagai AS yang berbeda.
   - Neighboring AS didaftarkan pada konfigurasi setiap router untuk membangun koneksi antar-AS.
4. **Pengujian Koneksi**
   - Ping antara PCA ke PCB dan PCC berhasil dengan waktu respon rata-rata 5 ms.

Tabel routing pada Router A, B, dan C menunjukkan rute BGP aktif dengan kode "B."

ANALISA

Percobaan ini berhasil menerapkan konfigurasi protokol BGP untuk membangun komunikasi antar-AS. Protokol BGP digunakan untuk pertukaran informasi routing antar-AS, yang penting dalam skenario jaringan skala besar seperti ISP. Hasil menunjukkan bahwa BGP mampu membangun koneksi stabil dan memungkinkan pertukaran rute antar-router. Keberhasilan ping antara PCA, PCB, dan PCC membuktikan bahwa tabel routing pada setiap router telah diperbarui dengan benar. Namun, percobaan ini juga menegaskan pentingnya pengaturan **neighbor** yang tepat. Kesalahan konfigurasi pada **AS Number** atau IP neighbor dapat menyebabkan kegagalan pertukaran rute.

KESIMPULAN

Percobaan ini membuktikan kemampuan BGP dalam mengelola routing antar-AS dengan efisien. Protokol ini memastikan konektivitas antar-jaringan yang kompleks dan mendukung skalabilitas, sehingga sangat cocok untuk lingkungan jaringan berskala besar. Keberhasilan percobaan ini menekankan pentingnya pemahaman mendalam tentang konfigurasi BGP untuk implementasi yang optimal di dunia nyata.